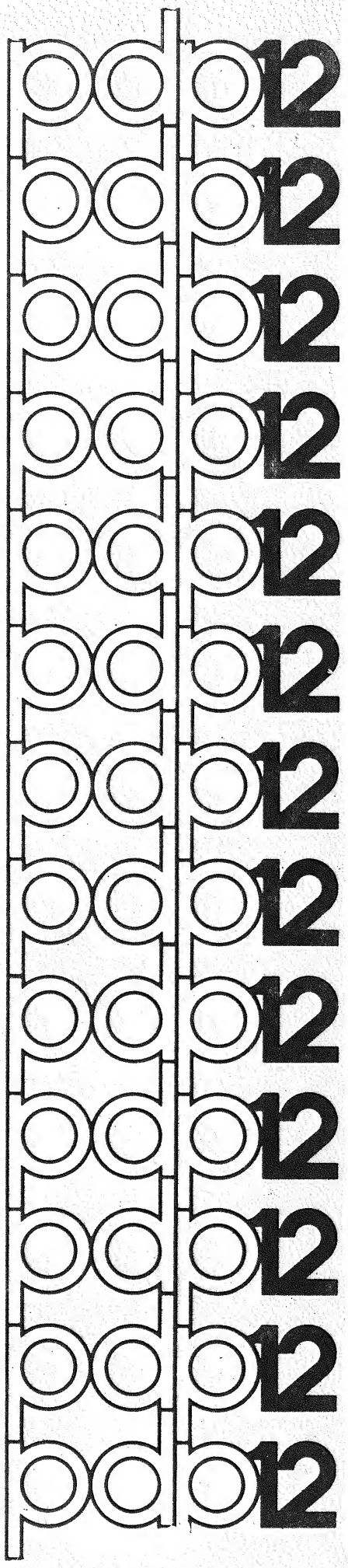
digital

LIFE



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1.0 INTRODUCTION

LIFE (LIbrary File Entry) is a data storage and retrieval program designed to characterize and store data acquired with the PDP-12 Signal Processing Programs. Prominent features of the spectrum are located using an interactive display and then characterized and stored on LINC-tape or disk (RK8 or RFØ8) as an independent entry in a LIFE "library" of spectra data. An unknown sample can then be identified by comparing its spectrum with spectra of known library samples (fingerprinting) for that instrument.

2.0 HARDWARE REQUIREMENTS

The minimum configuration for using LIFE is:

PDP-12A computer with 8K of core memory

The program does not require, but will support, an RK8 or RFØ8 disk.

3.0 INITIAL STARTING PROCEDURE

LIFE runs under and must be loaded via LAP6-DIAL-MS[1] using the command

→ LO LIFE,n)

where n is the unit containing LIFE. DIAL-MS must be on logical unit Ø, regardless of the value of n.

4.0 OPERATING PROCEDURES

4.1 Initialization

LIFE indicates that it has been successfully loaded into the computer by displaying the following message:

Message 1

```
LIFE IS CREATED
LIFE UNIT  --
```

[1] Hereafter referred to as DIAL-MS.

The tape/disk unit which contains the LIFE library must be defined by typing a one or two digit number followed by line feed on the teleprinter. Any of the DIAL-MS device unit numbers are applicable (refer to the LAP6-DIAL Programmer's Reference Manual, DEC-12-SE2D-D). (All scope messages are presented using the QANDA subroutine, DEC-12-FISA-D. It is assumed that the user is familiar with the conventions of QANDA. Briefly, they are: 1. The last reply to a scope message is terminated by pressing line feed. 2. Replies other than the last one to any scope message are terminated by pressing carriage return.)

At this time, the LIFE library unit must be on-line to the PDP-12 and its WRITE feature must be enabled. If it is not, the program will wait until either the I/O PRESET key is pressed, in which case the LIFE program may be reloaded, or until the above conditions are satisfied. The program then interrogates the defined LIFE tape/disk and displays the following message if the tape/disk has never been initialized by the LIFE program:

Message 2

```
NOT LIFE TAPE
INITIALIZE?  Y OR N:_
```

Entering a Y and pressing line feed will cause the tape/disk on the defined unit to be initialized.

Typing an N and line feed will cause message 1 to be displayed and no initialization will take place.

If the tape/disk was initialized, all other characters are ignored, or if a Y was entered in response to message 2, the following message is displayed:

Message 3

```
FUNCTIONS:

1.  GENERATE NEW SPECTRUM
2.  PRINT
3.  ERASE
4.  CALL DIAL

CHOICE:_
```

The four major modes of operation are defined in the above message. The user indicates his choice by entering the number (1-4) associated with the chosen mode.

CTRL/R may be typed in response to any subsequent display, causing an immediate return to message 3.

4.2 Choice 1 - GENERATE NEW SPECTRUM

A spectrum which is stored on tape/disk can be displayed using choice 1. A definitive set of parameters can then be entered to the LIFE library tape/disk or the LIFE library tape/disk may be searched for those previously stored spectra which have similar characteristics.

4.2.1 Instrument Definition

The following message is displayed after choice 1 is specified:

Message 4

```
INSTRUMENT NAME  ----
```

All entries to the LIFE library tape/disk are classified by the instrument from which the sample was taken. Up to 67 different instrument names may be defined; each name may be up to four alphanumeric characters in length.

Once the instrument name for the data has been defined, LIFE interrogates its library tape for a match. If no match is found (i.e., this is the first entry under the particular instrument name) the following message is displayed.

Message 5

```
NEW INSTRUMENT
ACCEPT?  Y OR N:_

TYPE
1 IF X ONLY
2 IF X AND Y
_
```

To add a new instrument class to the library tape, type Y and press RETURN. The method by which the spectrum data stored under this instrument class must be defined consists of two choices, 1 for X only or 2 for X and Y. X is the position in the file (nth point) and Y is the magnitude (value of the nth point). Therefore, if a new instrument class is to be entered, first type Y, then type 1 or 2 (describing the number of parameters) and line feed.

If a new instrument class is not to be opened (e.g., a typographical error occurred), type N and line feed; LIFE will return to message 4.

4.2.2 Spectrum Definition

In either case, once the instrument name has been defined, the following message is displayed:

Message 6

```
UNIT NAME  ----
SPECTRUM NAME  -------
               --------
```

The name assigned to the tape/disk on which the raw data is stored is entered in the first line followed by pressing return. This name can be one to four alphanumeric characters. (NOTE: It is suggested that each tape or disk be labeled or numbered and that this name or number be entered in response to line 1 of message 6.)

The spectrum name is then requested by the LIFE program. This name may be up to 16 alphanumeric characters in length and must be entered in two groups of up to eight characters each. The first group is terminated by a carriage return or line feed. The second is terminated by a line feed. For example,

```
SPECTRUM NAME  SODIUM C
               ARBONATE
```

or

```
SPECTRUM NAME  STYRENE
```

The location of the defined spectrum is specified next.

Message 7

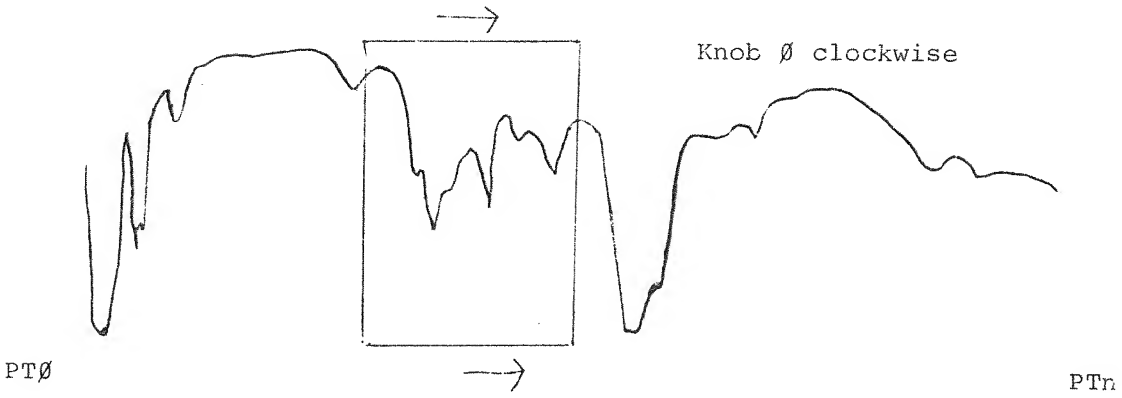
```
UNIT NUMBER  --
START BLOCK  ---
PTS IN SPECTRUM  ----
```

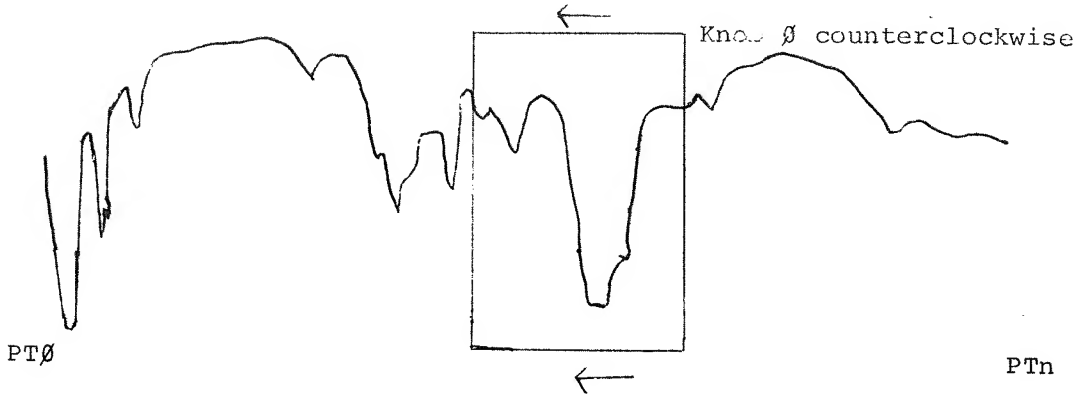
The UNIT NUMBER may be Ø-7, defining one of eight tape drives, or 1Ø-17, defining one of eight logical disk units. The defined unit must be on-line to the PDP-12 at this time. If it is not, the program will wait until the above condition is satisfied.

START BLOCK is a one to three digit octal number (Ø-777) defining the starting block of the raw data.

PTS IN SPECTRUM defines the number of points in the spectrum and is a decimal number in the range 513 to 2Ø4Ø.

The location of the spectrum is now completely defined and LIFE displays it on the scope. The user may control the position of the display with A/D knob Ø. A clockwise motion of knob Ø moves the display window to the right; a counter-clockwise motion moves the display window to the left. The farther the knob is rotated from the mid-point position, the faster the window moves. The display is made stationary by leaving knob Ø in a middle position between its two extreme positions.





It should be noted that the display window wraps around either end of the file, that is, PTØ and PTn are assumed to be adjacent.

There is also a cursor which is fixed to the curve. A/D knob 1 can be moved clockwise to move the cursor to the right or counterclockwise to move it to the left.

When knob 1 is turned to its furthermost clockwise (counter-clockwise) position, the cursor sits upon the rightmost (leftmost) scope point.

Associated with the cursor are four octal words displayed in the top left corner of the scope. The first word will always be zero. The second word is the actual core address of the cursor point. Its range is from 2000 (representing the first point of the file) to 577Ø. For example, if the defined file contains 1ØØ1 octal points (513 decimal), this word will range from 2ØØØ to 3ØØØ, where 2ØØØ represents the first point of the file and 3ØØØ the 513th point of the file. The third word is the octal equivalent of the contents of the cursor point (i.e., the actual 12 bit value in the data buffer of the data word which corresponds to the cursor point) and is in the range Ø to $1ØØØ_8$ (top to bottom), where the center value is $4ØØ_8$. The fourth word is relative to the third word and reflects the Y offset and Y scale and is of no interest to the LIFE user.

4.2.3 Commands

Once the display appears, the Teletype becomes active and the user may enter a number of commands. These command operations are performed immediately; no terminating character is required. They are:

- (halve display size)

The command dash (-) divides each data point by 2 before it is displayed. The actual data is untouched, but the peak heights seen on the scope are smaller.

The dash may be typed repeatedly up to three times (division by 8). It should be noted that the display window returns to the beginning of the file each time dash is typed. The function of the halve command is to enable 12-bit unsigned data (not gathered through the PDP-12 Signal Processing System perhaps) to be processed.

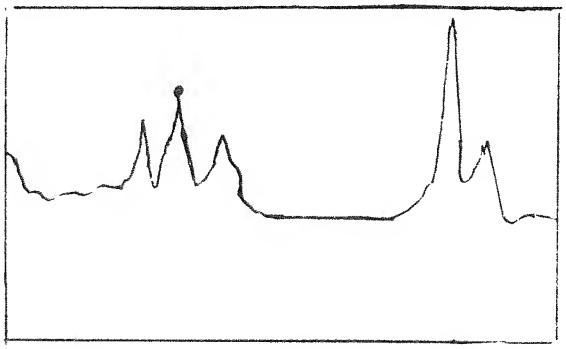
+ (double display size)

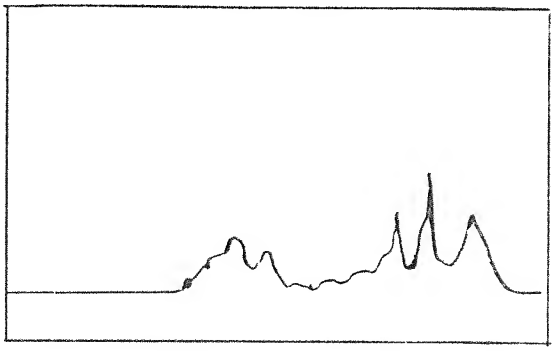
Typing a plus sign (via the ; key and the SHIFT key) multiplies the value of the displayed points by 2 each time the key is struck. It may only be used after a dash (the initial display is the largest representation of the data available). Doubling the display size only changes the spectrum displayed; there is no change in the data file. Each time a

plus sign is typed the display window is positioned to the beginning of the spectrum.

B (baseline correction)

When B is typed, the base line of the spectrum is set to the Y axis cursor value. Then the base line is positioned to the vertical center of the scope and the display window returns to the beginning of the spectrum. All subsequent Y values will be interpreted relative to the baseline.





O (offset)

The zero point of the X axis is set to the cursor X value (i.e., the point in the raw data file) which effectively sets the reference point for all future X values. Typically, the cursor would be positioned on a reference or identity peak and then O will be typed. In this way, all library entries for a particular instrument have a common reference point. The spectrum must be offset before any values are fixed or an error message will result. (In that case, fixed values must be deleted with the E command.)

F (fix point value)

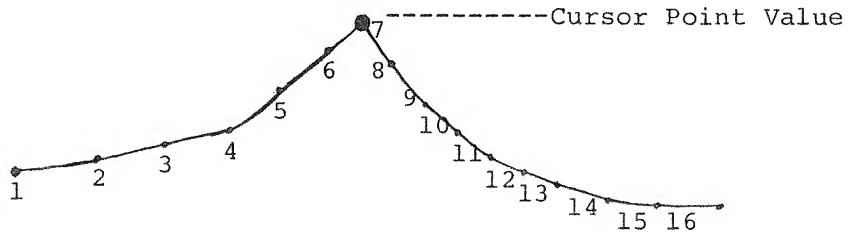
Characteristic peaks of the displayed spectrum may be specified by the user to describe the points of interest. These values are stored on the LIFE library tape/disk and used when identifying an unknown spectrum by comparison. A point is fixed by the following procedure.

1. Position the display window (using knob Ø) so that the desired peak is in view, and the display has stopped moving.

2. Position the cursor (using knob 1) to the characteristic value of the peak. The third word of the cursor display may be helpful in this positioning.

3. Type F on the Teletype. The value of the cursor point is now recorded and the above procedure may be repeated for the next point of interest.

As many as 95 values may be fixed at a time (190 for a single parameter instrument); at least five must be specified. In addition, each successive X value must be greater than the previously specified X value as determined from the second number displayed in the left corner of the scope.

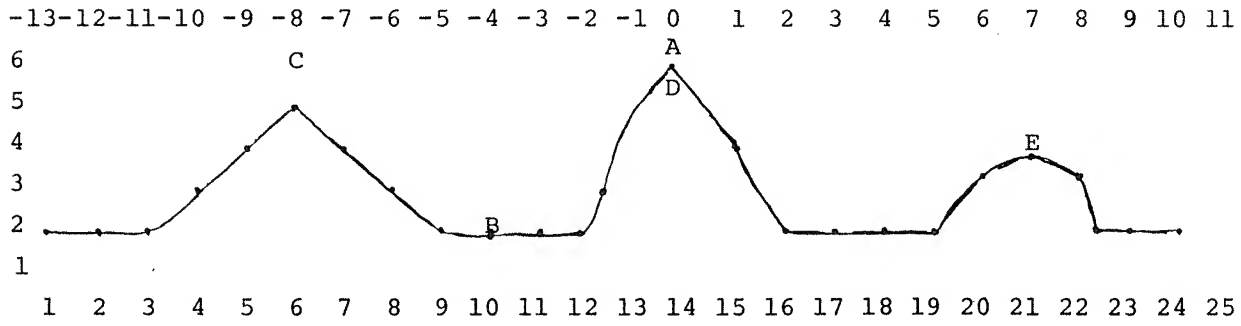


The response to message 5, type of instrument, determines what data is stored.

For one parameter instruments, only the X value is stored. In the above diagram, 7 will be stored if an F is typed at the cursor value shown.

For two parameter instruments, both the X and Y values of the cursor point will be stored. In the above example, X will still be 7. Y will be the difference between the cursor data point value and the baseline value. Note that if the baseline has not been set using the B command, it is assumed to be zero.

In the following example, the O, B, and F commands are used. The bottom horizontal scale shows the X values of the raw data for a 25 point spectrum. The vertical scale shows the Y values of the raw data. The lettered points represent the cursor values.



1. First the cursor is moved to position A and O (for offset) is typed to set the X axis zero point at raw data point 14. The top horizontal scale shows the X axis relative to the offset zero point.

2. The cursor is then moved to position B and B (for baseline) is typed. This sets the baseline to a value of 2 on the vertical scale.

3. Finally, the cursor is moved to positions C, D, and E, and F (for fix location) is typed at each position. The values stored are as follows:

Cursor Position	X Value	Y Value
C	-8	3
D	Ø	4
E	7	2

P (print selected peak points)

The P command allows the user to print out the selected peaks just defined. For the above example, the printout would be as follows:

```
SPECTRUM :    EXAM1

  INSTRUMENT :  NMR

  PK     X VAL          Y VAL

  Ø1    -ØØØ8           ØØØ3
  Ø2     ØØØØ           ØØØ4
  Ø3     ØØØ7           ØØØ2
```

The above commands are used to define or characterize a spectrum. Each one of them may be implemented at any time and as often as desired. When a spectrum has been completely characterized two options remain:

X (exit)

An exit request will store the fixed spectrum characteristics on the LIFE library tape/disk. If less than five parameters have been defined, an error message will result. If E has purged the list of parameters, or if no parameters were saved, no storage will take place, and the program will redisplay message 3.

U (identify unknown spectrum)

This mode allows the user to search the LIFE library tape for spectra with similar characteristics to the spectrum just defined. The search will include only those spectra which were previously stored under the defined instrument name of the unknown. The comparison will be carried out on those parameters defined by the fix command.

When U is typed, the following sequence of messages is generated:

Message 8

```
ALLOWABLE ERROR TOLERANCE

1 - PERCENT
2 - ABSOLUTE

CHOICE:_

X TOLERANCE:  ___
Y TOLERANCE:  ___
```

Because an exact match of parameters is not likely, LIFE allows the user to specify the allowable error tolerance around a library spectrum peak value within which the defined spectrum peak value being compared may fall and still be considered a match. This tolerance may be specified as a percent of the library peak [Ø-99%] or as an absolute difference from the library peak [Ø-999].

The choice of percent or absolute tolerances is made in the first line of the above message by typing 1 for percent or 2 for absolute.

X tolerance is the tolerance applied to the X peak parameter. If percent was chosen, its range may be 0% to 99% of the library peak. If absolute was chosen, its range may be Ø to 999 (decimal). Y tolerance is the tolerance applied to the Y peak. Its restraints are the same as those for the X tolerance. Y tolerance will be ignored if the instrument's spectra contain only X values.

The tolerance, whether percent or absolute, extends to both sides of the library peak value. Therefore, a match exists for X values between X_L of the library spectrum and X_U of the unknown spectrum if the following condition is true:

$$X_L - TOL \leq X_U \leq X_L + TOL$$

where

$$TOL = X \text{ VALUE (absolute)}$$

or

$$TOL = X_L \cdot \frac{X \text{ VALUE}}{100} \text{ (percent)}$$

The next display for identifying unknown spectra is:

Message 9

MISSES ALLOWED --

The number of misses, or non-matches, that will be accepted in the comparison of the peaks of two spectra must be specified. This number may range from Ø to 94 and must be less than the number of fixed peaks in the unknown spectrum, because the matching algorithm determines that each peak in the smaller [fewer peaks] of the two spectra being compared is either a "match" or a "miss". If the number of misses is greater than the number of points in the unknown, each library spectrum would be considered a match for that unknown, regardless of the similarity of the spectra.

After the number of misses is specified, the LIFE program will search the LIFE library tape for matching spectra using the restrictions defined above. If no spectra have been saved previously for this instrument, the program returns immediately to the spectrum display. The following is a summary of the matching algorithm for a two parameter [X,Y] instrument. (The matching algorithm for a one parameter [X] instrument is a subset of this algorithm.)

To determine if an unknown spectrum peak matches a library spectrum peak it is necessary to know:

1. which spectrum has fewer fixed peaks [if the number of spectrum peaks are equal, the library spectrum is assumed to be smaller],
2. the X and Y components of this library peak,
3. the X and Y components of the unknown peak,
4. the absolute tolerance [if a percent tolerance was chosen it is now multiplied first by the library peak X component to yield the absolute X tolerance for this peak, and then by the library peak Y component to yield the absolute Y tolerance].

It is assumed that, for both spectra, all peak X values are in ascending order.

For the program to consider the library peak with which to "match" the unknown peak, it is necessary that:

a. LIB X VAL - XTOL$\leq$UNK X VAL$\leq$LIB X VAL + XTOL
b. LIB Y VAL - XTOL$\leq$UNK Y VAL$\leq$LIB Y VAL + YTOL

If both conditions are true, the peaks match, and the next peak in each spectrum is considered.

If either one is untrue, the peaks do not match, but a "miss" is not yet said to occur. [A "miss" is a peak on the smaller of the two spectra that does not match any peak on the larger]. A miss will occur for a peak if the following are true:

1. the peak is on the smaller spectrum,
2. the peak X value is less than the X value of the larger spectrum,
3. the matching criteria a and b above are not met.

If the matching criteria are not met, the spectrum peak with the smaller X value is replaced with the next peak from that spectrum, and a new comparison is made.

Whenever the number of missed peaks on the smaller spectrum exceeds the number of misses specified, the program immediately reinitializes and starts comparing the unknown to the next library spectrum [if any].

If all spectrum peaks on the smaller spectrum have been compared, and the allowed number of misses has not been exceeded, the library spectrum is output as a match for the unknown.

If all spectrum peaks on the larger spectrum have been compared, all remaining uncompared peaks on the smaller spectrum are considered as misses, and the decision to output is made immediately thereafter.

The following is an example of the printout that will occur during the matching operation:

```
UNKNOWN:

  SPECTRUM              PK, PTS

  T-BUTCL2                50

LIBRARY:

  SPECTRUM              PK, PTS        MISSES

  T-BUTCL2-SAM1           60             1
  T-BUTCL2-SAM2           43             2
  T-BUTCL2-SAM3           54             0
```

Note that either the library spectrum or the unknown spectrum may be a subset of the other, and a match will still occur.

When the matching operation has been completed, LIFE returns to the display mode and the +, -, B, O, F, P, X, and U commands again become active.

4.3 Choice 2 - PRINT

After initialization, the PRINT mode generates on the teleprinter the index of the LIFE library tape/disk unit or the peak values for a particular spectrum for a specified instrument.

The initial PRINT display is:

Message 11

```
1.  INDEX
2.  LIBRARY SPECTRUM
3.  EXIT

CHOICE_
```

Type the appropriate number 1 to 3.

Typing 1 prints an index containing the instrument's name, spectrum name, unit name, starting block and number of points fixed similar to the following. The order in which the spectra are listed is the order in which they were placed on tape.

INDEX OF LIBRARY SPECTRA

INSTRUMENT	SPECTRUM NAME	TAPE NAME	STARTING BLK	PKS
NMR	ODCB	DEC	010	0018
NMR	PYRIDINE	DEC	160	0032
NMR	INDENE	DEC	170	0025
NMR	DIOXANE W/ C13	DEC	220	0012
NMR	TETRAGLYME	DEC	230	0014
NMR	DIPHENYL METHANE	DEC	240	0007
NMR	TETRAHYDROFURAN	DEC	250	0020
NMR	XYLENOL	DEC	260	0007
NMR	POLYSTYRENE	DEC	270	0014
NMR	METHYL FORMAMIDE	DEC	320	0026
NMR	DIMETHOXYNAPTHA	DEC	350	0012
NMR	T-BUTANOL	DEC	370	0015
NMR	T-BUTCL2-SAM1	DEC	390	0060
NMR	T-BUTCL2-SAM2	DEC	410	0043
NMR	T-BUTCL2-SAM3	DEC	430	0094
NMR	T-BUTCL2	DEC	450	0090

Typing 2 displays the following message:

Message 12

INSTRUMENT NAME ____
SPECTRUM NAME ________
____

See message 4 and message 6 for the acceptable response sequence for message 12.

The number of peaks printed is the number of peaks that were fixed. A sample printout has the format:

SPECTRUM : T-BUTANOL

INSTRUMENT : NMR

PK	X VAL	Y VAL
01	-0033	0044
02	-0026	0051
03	0050	0129
04	0054	0053
05	0077	0084

At the completion of either printout, LIFE returns to message 3.

Typing 3 causes LIFE to return directly to message 3.

4.4 Choice 3 - ERASE

The ERASE mode permits deletion of the entire LIFE library (essentially reinitialize the tape), an entire instrument type, or a single spectrum.

The first message displayed for the ERASE option is:

Message 13

```
ERASE
1.  ENTIRE LIBRARY
2.  ENTIRE INSTRUMENT
3.  SINGLE SPECTRUM
4.  EXIT

CHOICE_
```

The choice is made by typing the appropriate number followed by line feed.

If 1 is typed, the LIFE library is to be reinitialized, removing all files from the library tape/disk. A warning message is displayed first to minimize accidentally destroying a library tape.

Message 14

```
SURE?_
```

Type Y if the whole tape is to be erased; type N if this was an incorrect choice. Message 3 is displayed after either response.

Typing 2 indicates that an instrument name is to be deleted from the LIFE library tape/disk. The following message is displayed:

Message 15

```
INSTRUMENT NAME  ----
```

Refer to message 4 for the response syntax. The instrument name and all the associated spectra are then deleted from the LIFE library tape/disk and message 3 is displayed.

If 3 is typed, a particular spectrum is deleted from the LIFE library tape/disk. Message 12 is displayed in order to define the spectrum to be deleted. Refer to message 6 for the response syntax. After typing the reply, the spectrum is deleted and message 3 is displayed.

A response of 4 to message 13 causes LIFE to return to message 3.

4.5 Choice 4 - RETURN TO DIAL

After initialization, the user may return to the DIAL system by typing 4 on the teleprinter.

5.0 ERROR MESSAGES

An error will be indicated by a message in the form

```
ERROR
N
PRESS LINE FEED    TRY AGAIN
```

where N is one of the following numeric error codes:

1. ATTEMPTED TO ADD SPECTRUM THAT WAS ALREADY IN LIFE FILES.
2. ILLEGAL CHARACTER TYPED.
3. OFFSET [O] REQUESTED, BUT PEAK VALUES HAVE ALREADY BEEN SAVED.
6. NUMBER OF MISSES REQUESTED > NUMBER OF POINTS IN UNKNOWN SPECTRUM.
7. ATTEMPTED TO SAVE A SPECTRUM WHOSE NUMBER OF PEAKS IS NOT BETWEEN 5 AND 95.
8. X VALUE OF CURRENT PEAK $\leq$ X VALUE OF LAST PEAK STORED. F COMMAND CANNOT BE CARRIED OUT.
9. NO MORE ROOM ON LIFE UNIT [INDEX OR BLOCKS].

6.0 ASSEMBLY INSTRUCTIONS

There are four subprograms to the LIFE system, which are assembled together via the chaining feature of DIAL-MS. They are:

```
LIFE BØ     [resides in instruction field Ø]
LIFE B4     [resides in instruction field 4]
LIFE B6     [resides in instruction field 6]
LIFE B5     [resides in instruction field 5]
```

To assemble LIFE, the command is simply

```
→ AS LIFE BØ1,Ø )
```

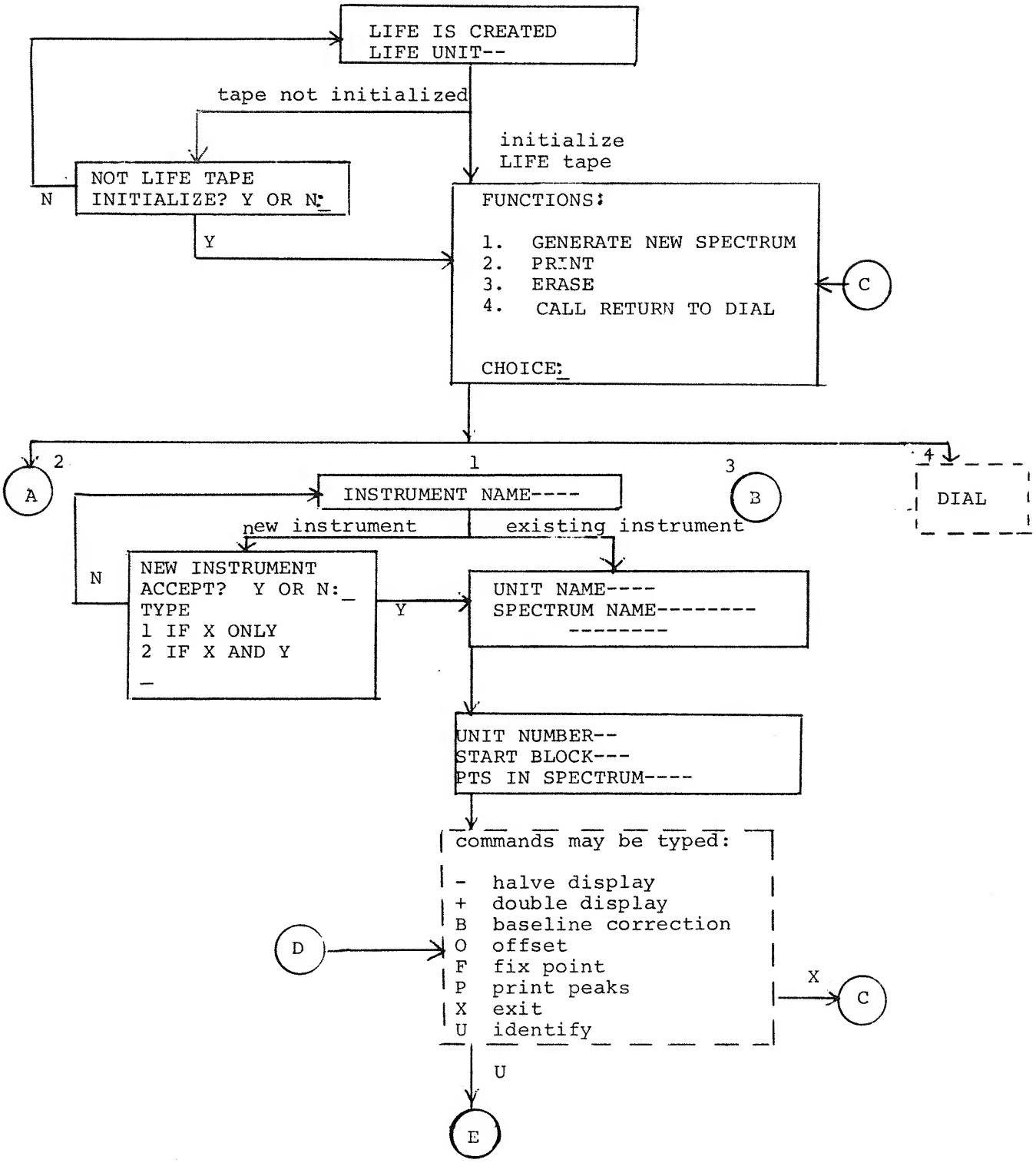
assuming the DIAL-MS tape containing LIFE is mounted on unit Ø.

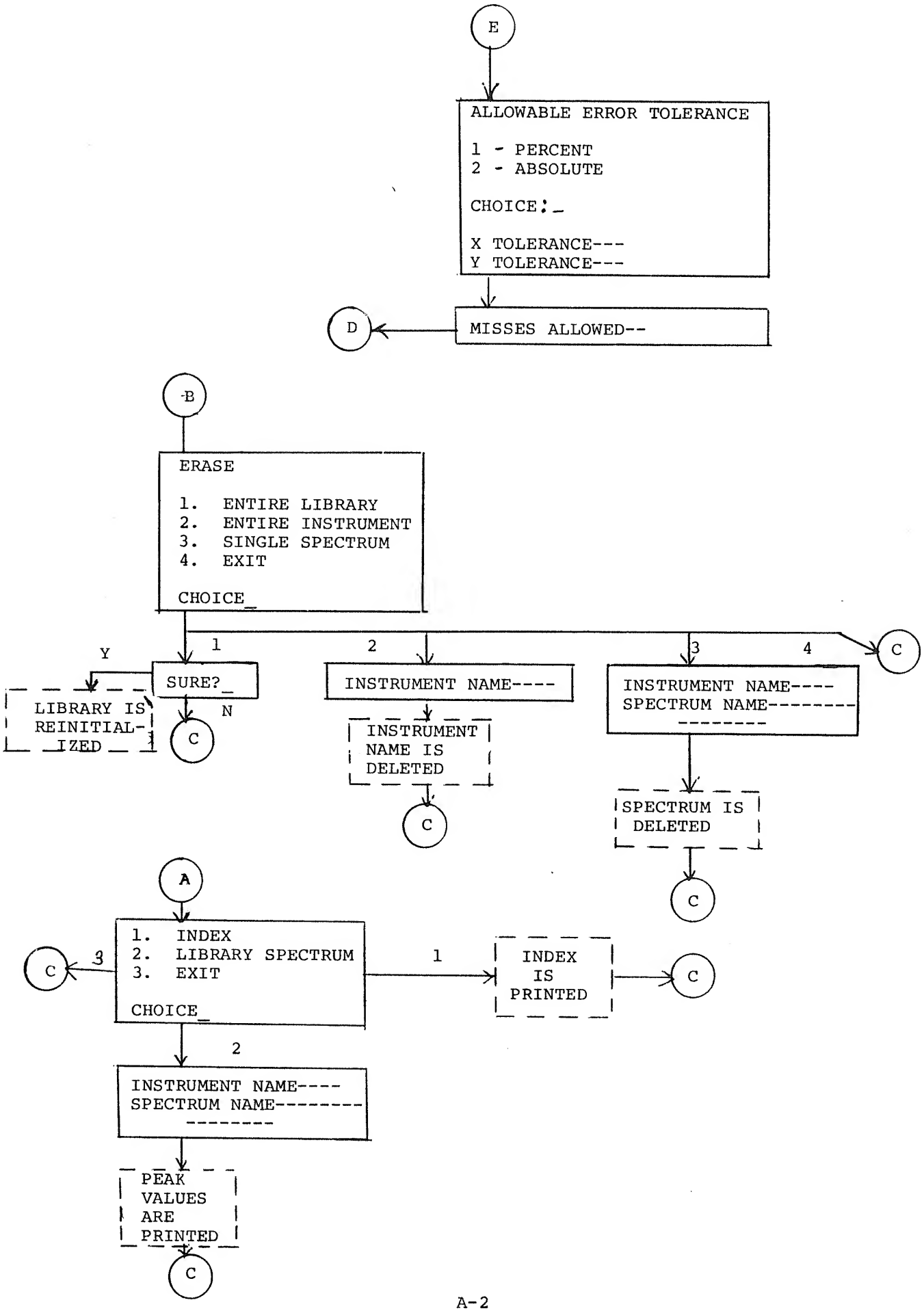
To save the binary, the proper DIAL command is:

```
→ SB LIFE,Ø,L1ØØ26)
```

APPENDIX A

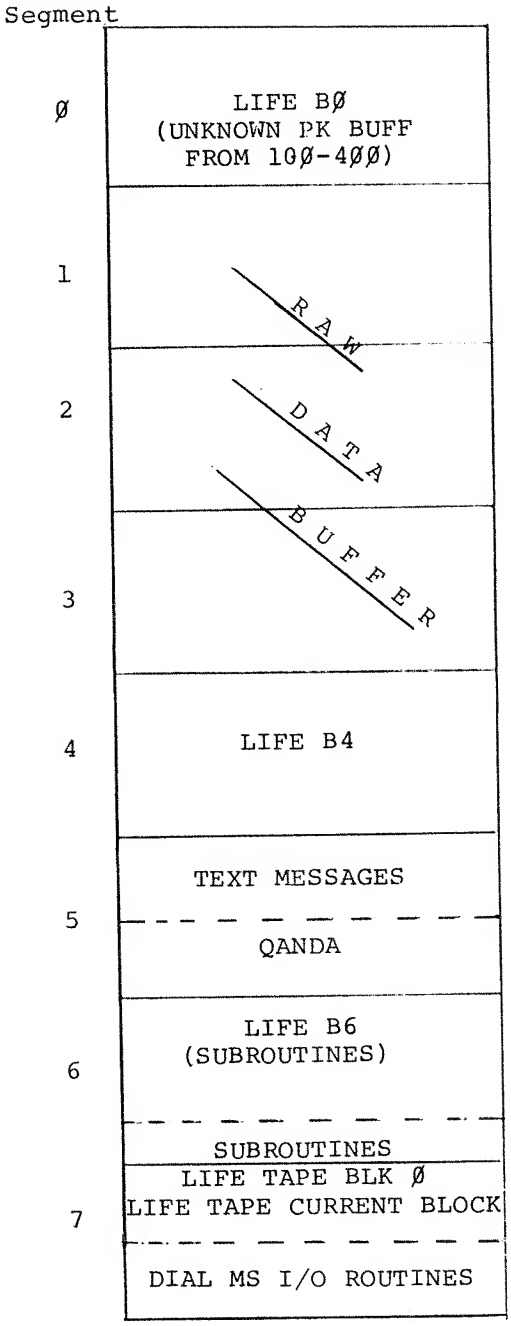
SUMMARY OF DISPLAYED MESSAGES




E
ALLOWABLE ERROR TOLERANCE
1 - PERCENT
2 - ABSOLUTE
CHOICE:_
X TOLERANCE---
Y TOLERANCE---
MISSES ALLOWED--
D
B
ERASE
1. ENTIRE LIBRARY
2. ENTIRE INSTRUMENT
3. SINGLE SPECTRUM
4. EXIT
CHOICE_
1
2
3
4
C
Y
SURE?_
N
LIBRARY IS REINITIAL-IZED
INSTRUMENT NAME----
INSTRUMENT NAME IS DELETED
INSTRUMENT NAME----
SPECTRUM NAME--------
SPECTRUM IS DELETED
A
1. INDEX
2. LIBRARY SPECTRUM
3. EXIT
CHOICE_
INDEX IS PRINTED
INSTRUMENT NAME----
SPECTRUM NAME--------
PEAK VALUES ARE PRINTED

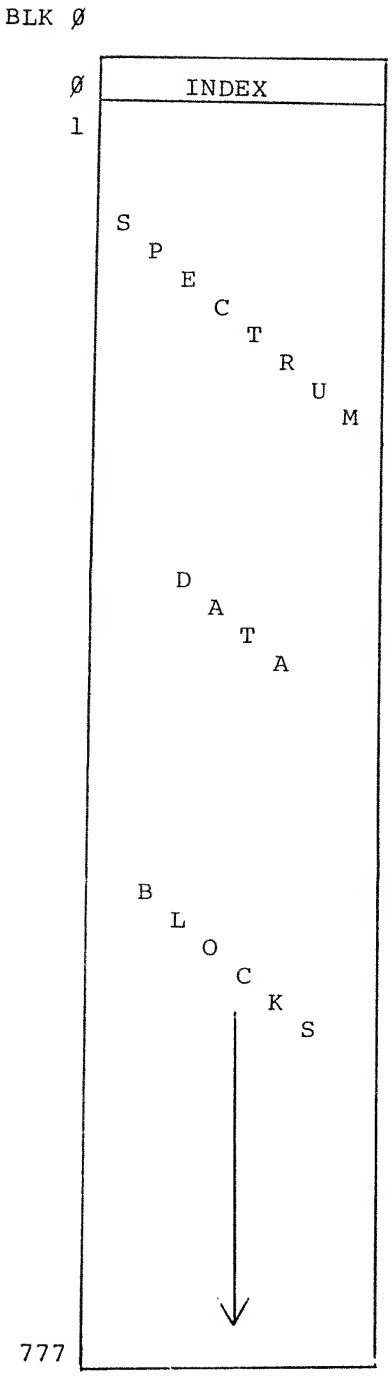
APPENDIX B

CORE MAP



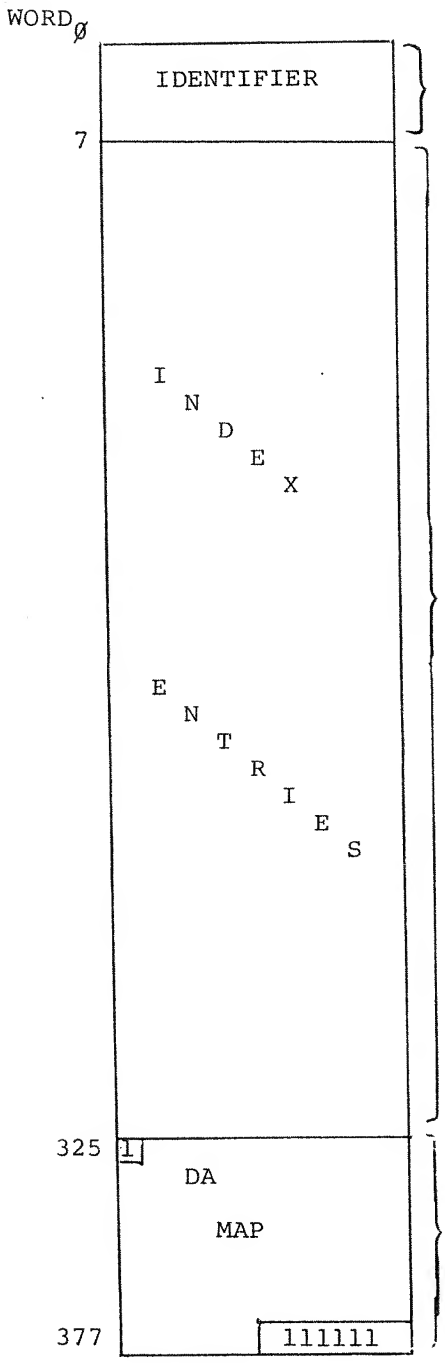
APPENDIX C

LIFE DATA TAPE



APPENDIX D

SPECTRUM DATA INDEX (BLOCK Ø)



7770-7777

3 word format/instrument

words 1,2: 4 ASCII character instrument name

word 3: Bits Ø,1 = Numerical parameter of instrument

Bits 2-11 = START BLOCK of instrument data

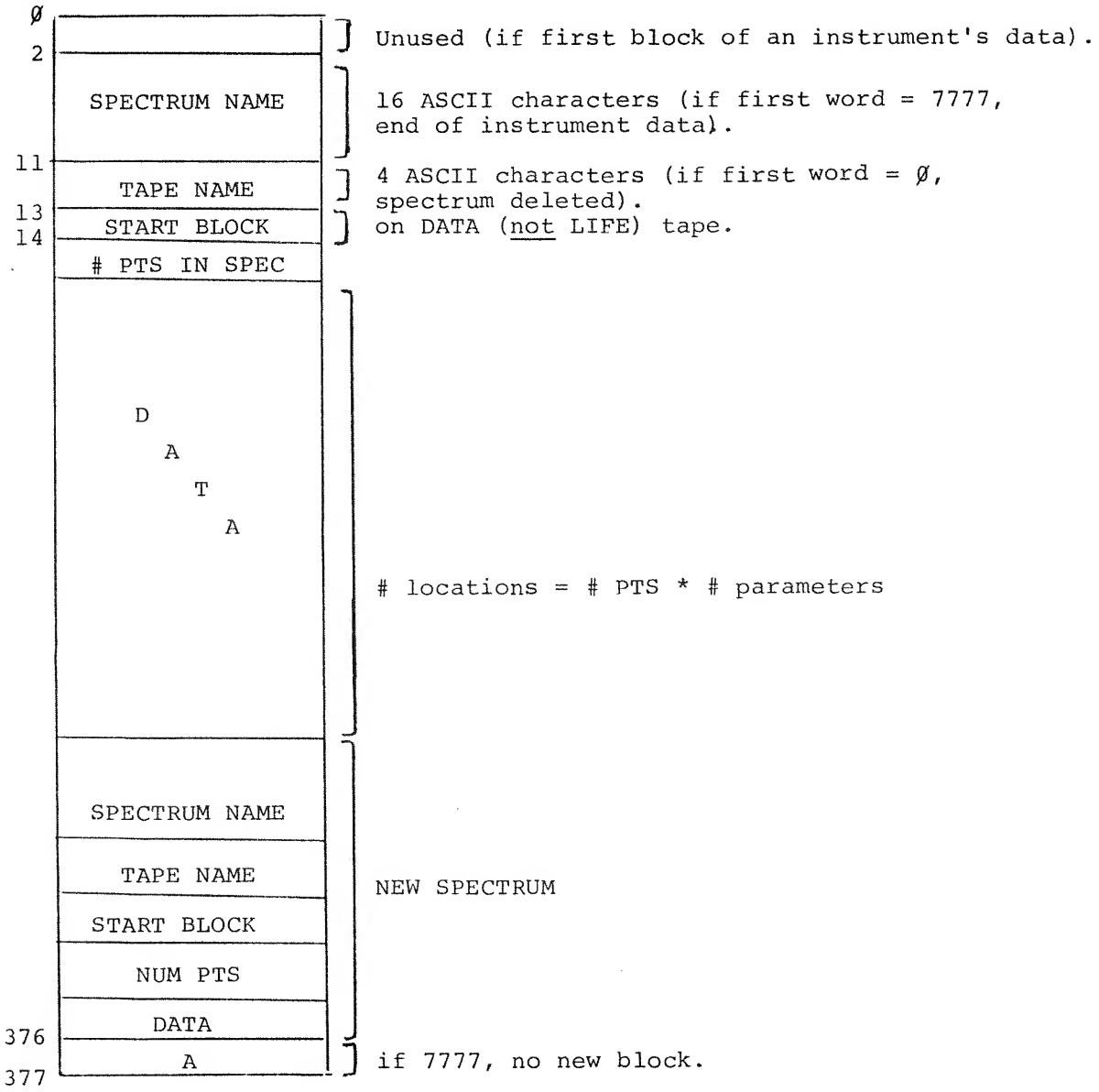
Maximum of 60 instruments

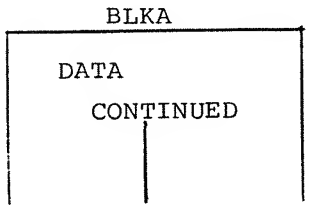
1 bit corresponding to each block from Ø→7777

Set if Block in use.
Clear if Block unassigned.
Bit Ø always set.
End bits corresponding to Blocks > 7777 always set.

APPENDIX E

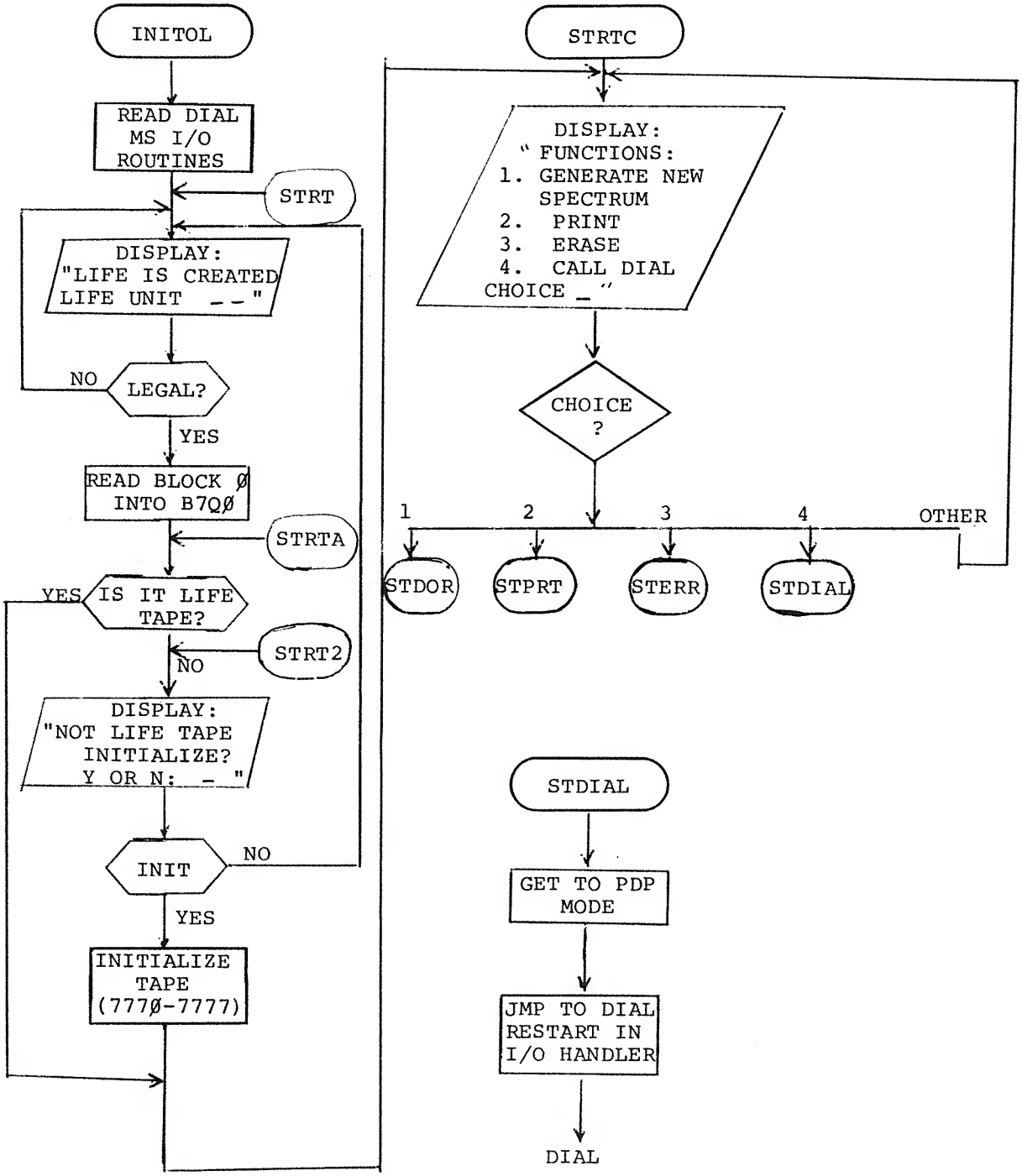
SPECTRUM DATA BLOCKS

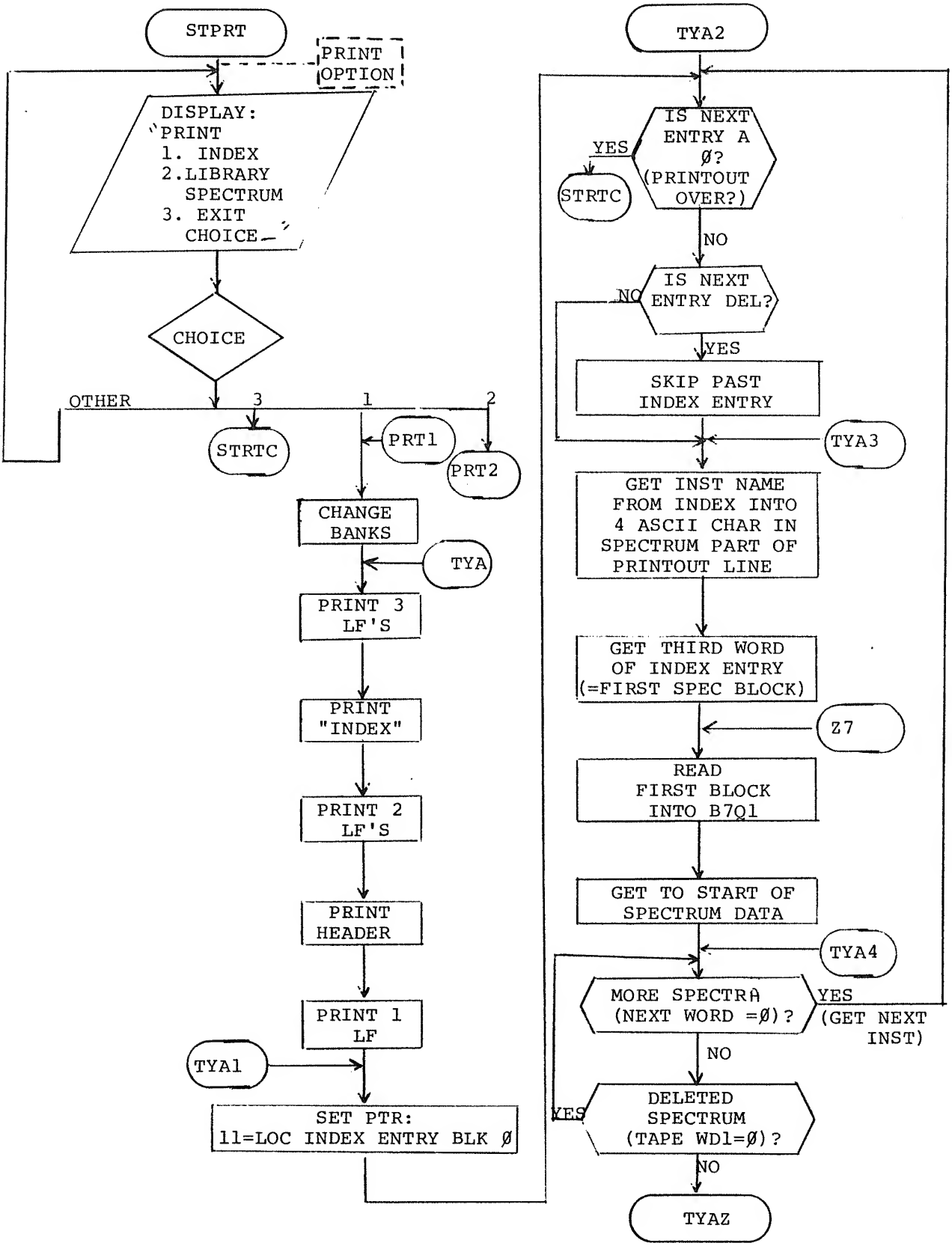


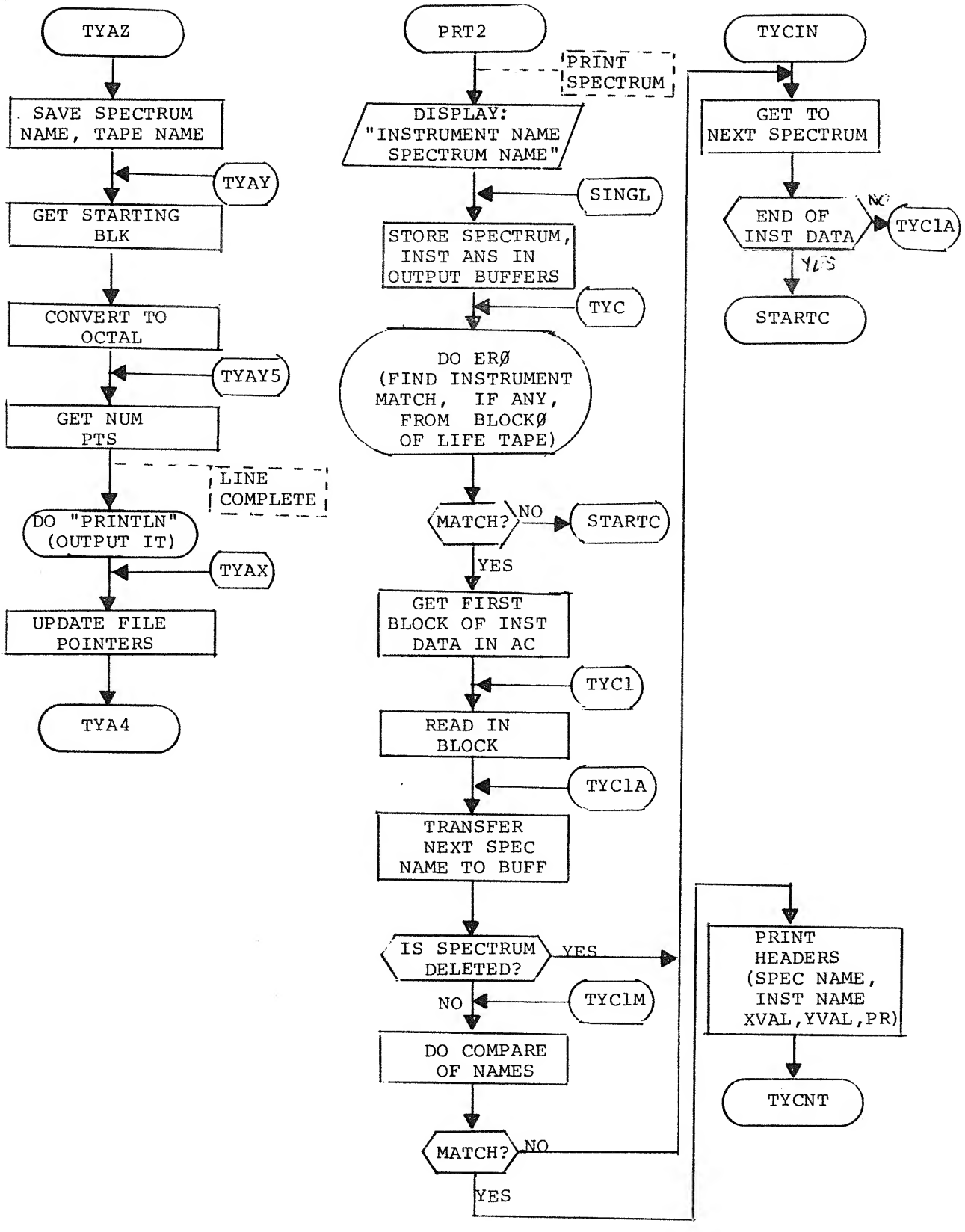


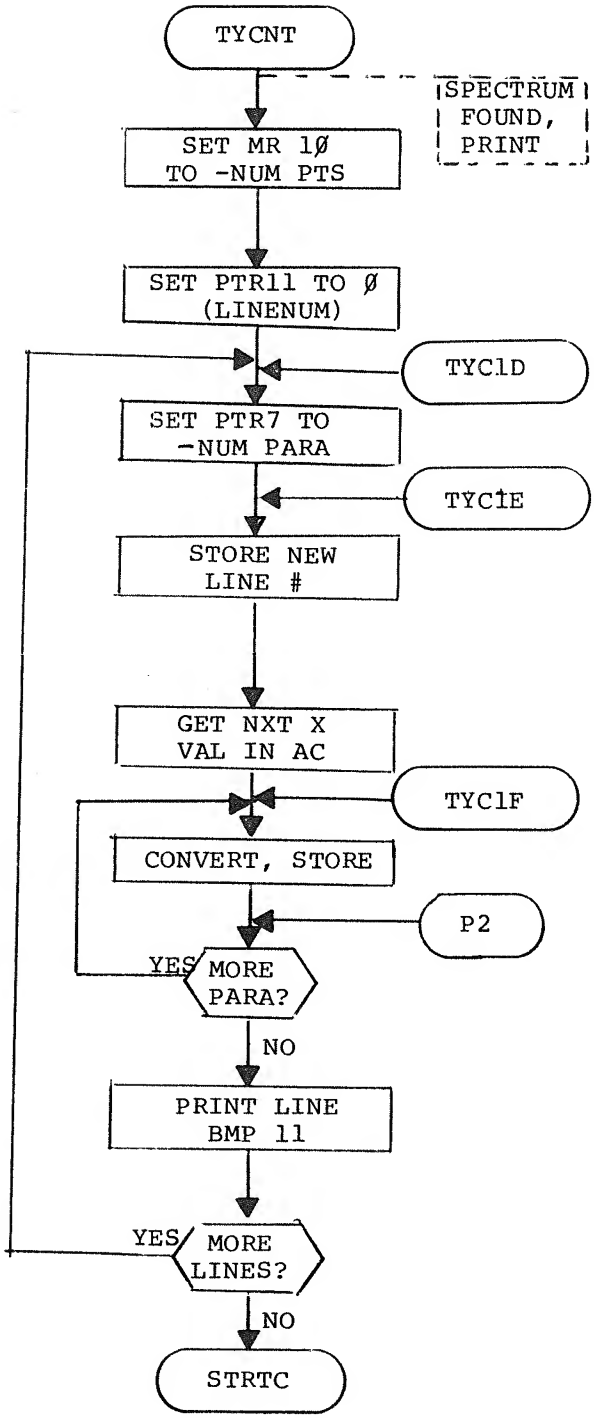
APPENDIX F

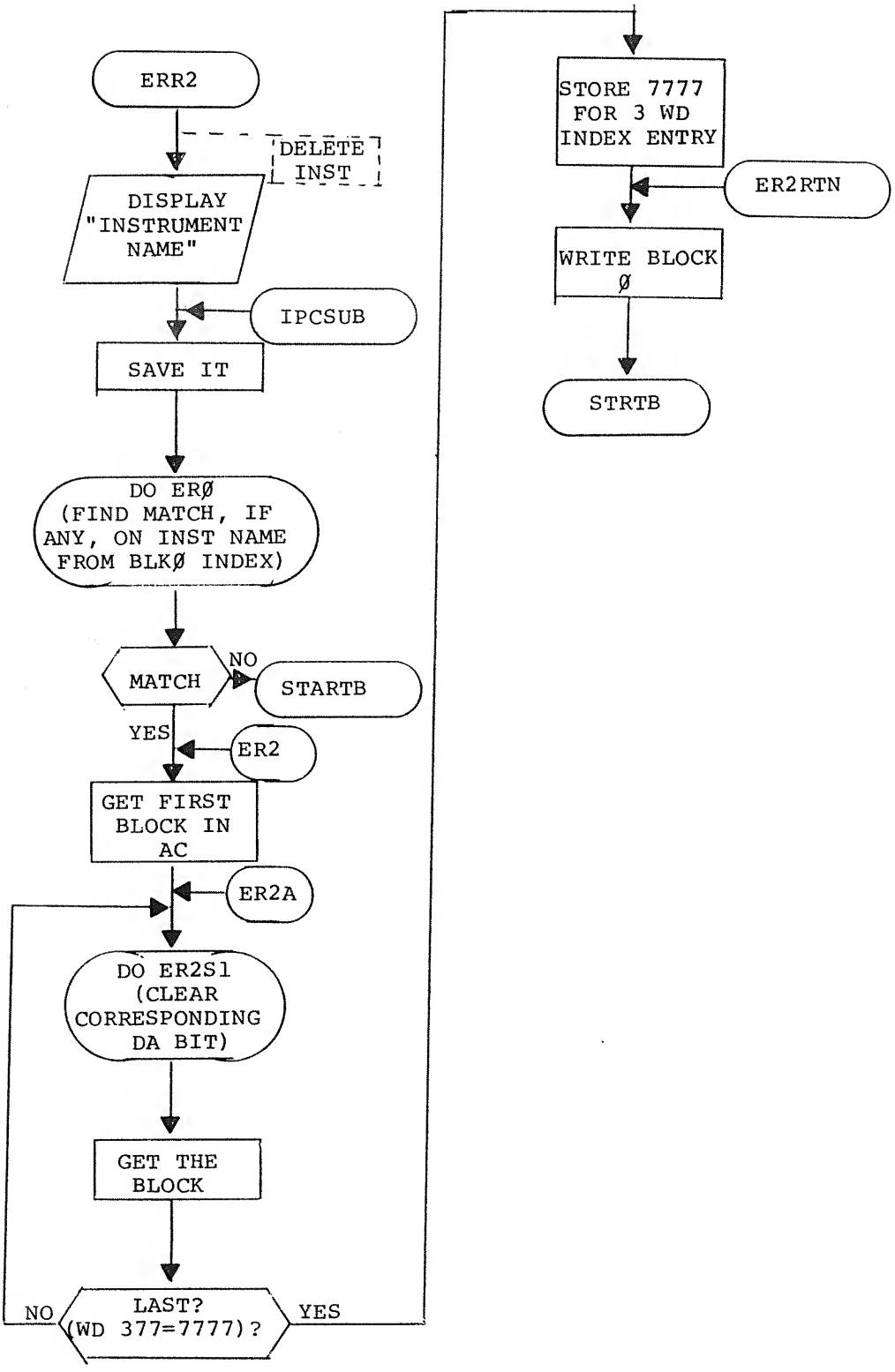
FLOWCHARTS

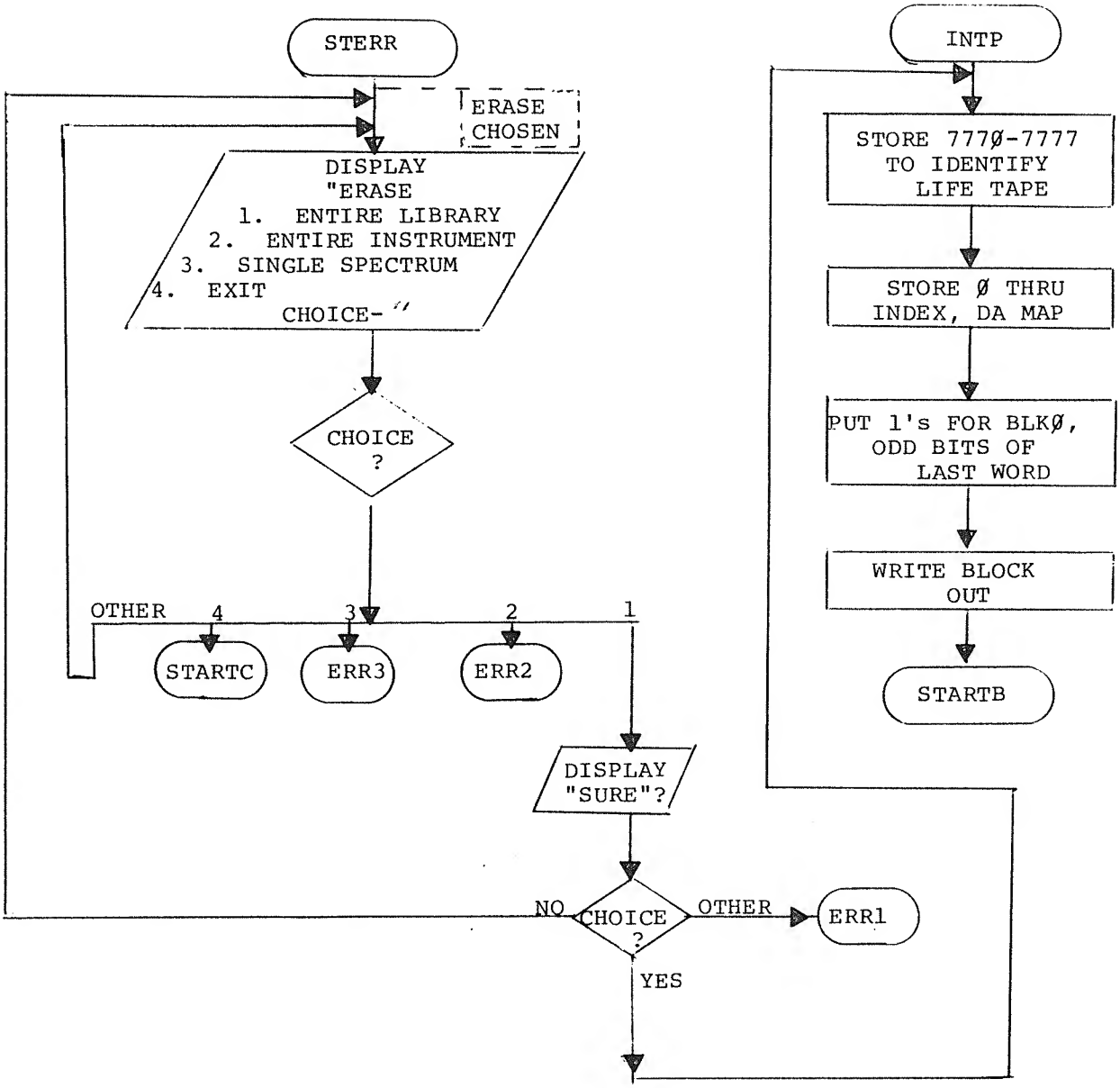


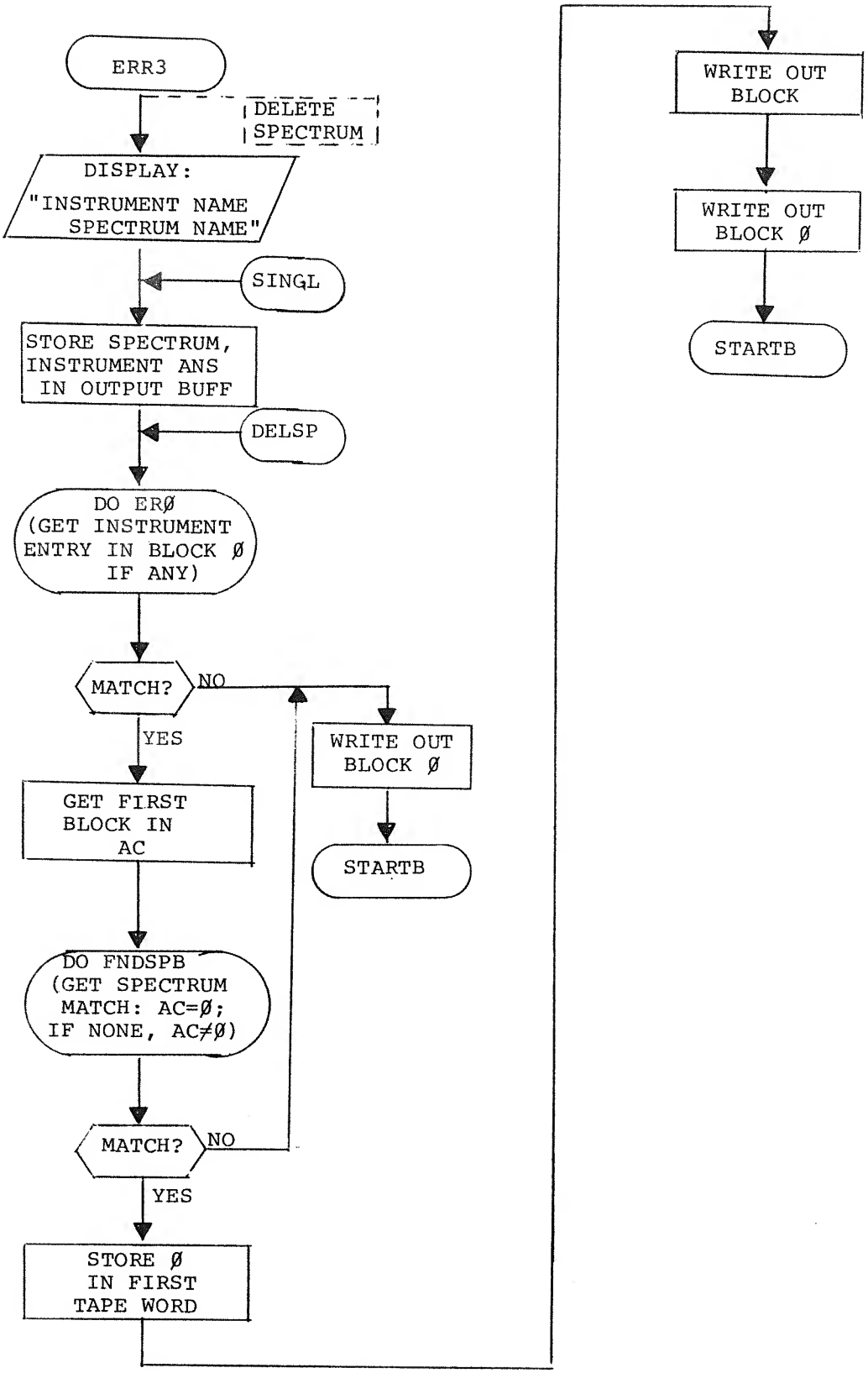

STPRT
PRINT OPTION
DISPLAY:
"PRINT
1. INDEX
2.LIBRARY
SPECTRUM
3. EXIT
CHOICE_"
CHOICE
OTHER
3
1
2
STRTC
PRT1
PRT2
CHANGE BANKS
TYA
PRINT 3 LF'S
PRINT "INDEX"
PRINT 2 LF'S
PRINT HEADER
PRINT 1 LF
TYA1
SET PTR:
11=LOC INDEX ENTRY BLK Ø
TYA2
IS NEXT ENTRY A Ø? (PRINTOUT OVER?)
YES
STRTC
NO
IS NEXT ENTRY DEL?
NO
YES
SKIP PAST INDEX ENTRY
TYA3
GET INST NAME FROM INDEX INTO 4 ASCII CHAR IN SPECTRUM PART OF PRINTOUT LINE
GET THIRD WORD OF INDEX ENTRY (=FIRST SPEC BLOCK)
Z7
READ FIRST BLOCK INTO B7Q1
GET TO START OF SPECTRUM DATA
TYA4
MORE SPECTRA (NEXT WORD =Ø)?
YES
(GET NEXT INST)
NO
DELETED SPECTRUM (TAPE WD1=Ø)?
YES
NO
TYAZ

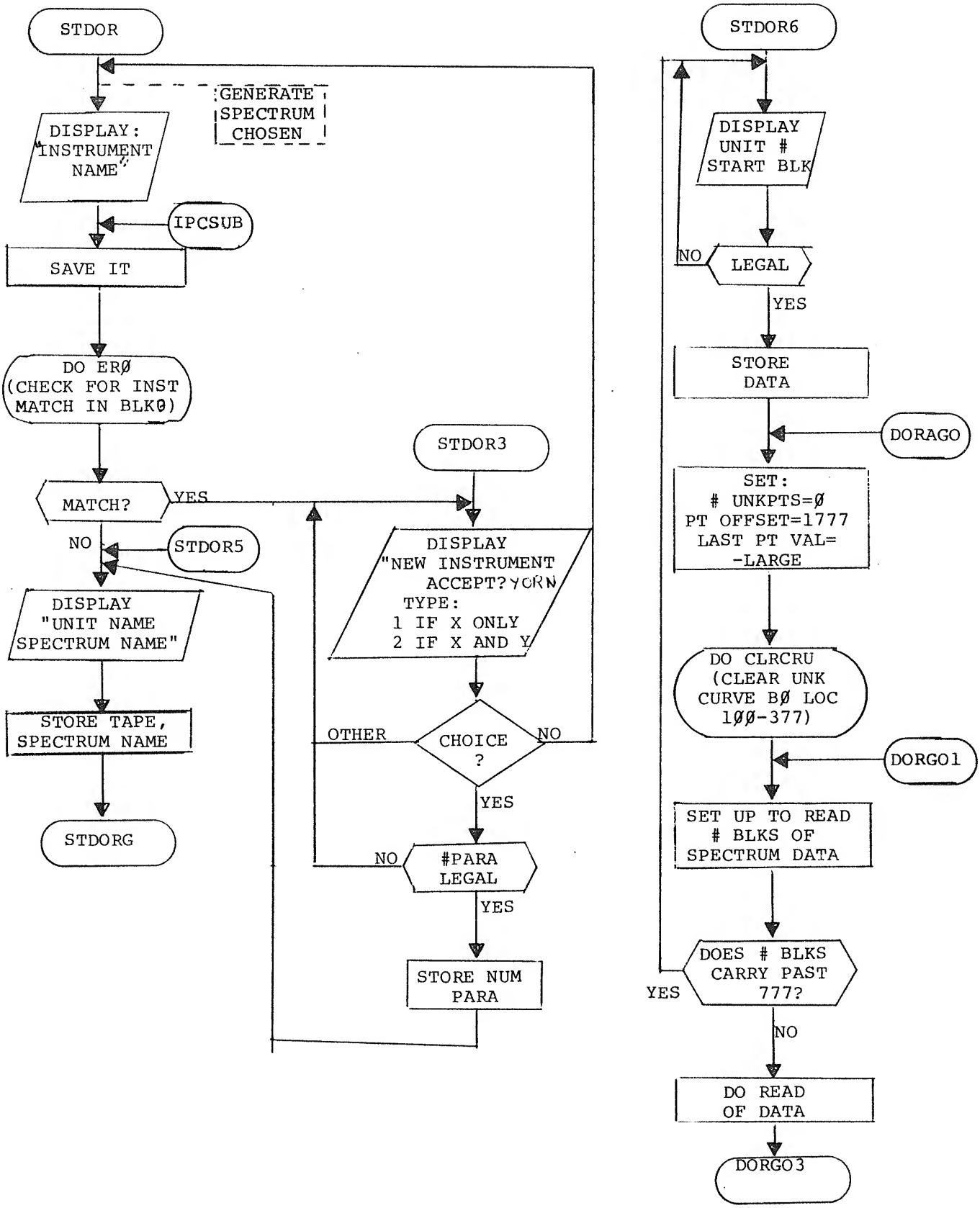

TYAZ
SAVE SPECTRUM NAME, TAPE NAME
TYAY
GET STARTING BLK
CONVERT TO OCTAL
TYAY5
GET NUM PTS
LINE COMPLETE
DO "PRINTLN" (OUTPUT IT)
TYAX
UPDATE FILE POINTERS
TYA4
PRT2
PRINT SPECTRUM
DISPLAY: "INSTRUMENT NAME SPECTRUM NAME"
SINGL
STORE SPECTRUM, INST ANS IN OUTPUT BUFFERS
TYC
DO ERØ (FIND INSTRUMENT MATCH, IF ANY, FROM BLOCKØ OF LIFE TAPE)
MATCH?
NO
STARTC
YES
GET FIRST BLOCK OF INST DATA IN AC
TYC1
READ IN BLOCK
TYC1A
TRANSFER NEXT SPEC NAME TO BUFF
IS SPECTRUM DELETED?
YES
NO
TYC1M
DO COMPARE OF NAMES
MATCH?
NO
YES
TYCIN
GET TO NEXT SPECTRUM
END OF INST DATA
NO
TYC1A
YES
STARTC
PRINT HEADERS (SPEC NAME, INST NAME XVAL,YVAL,PR)
TYCNT

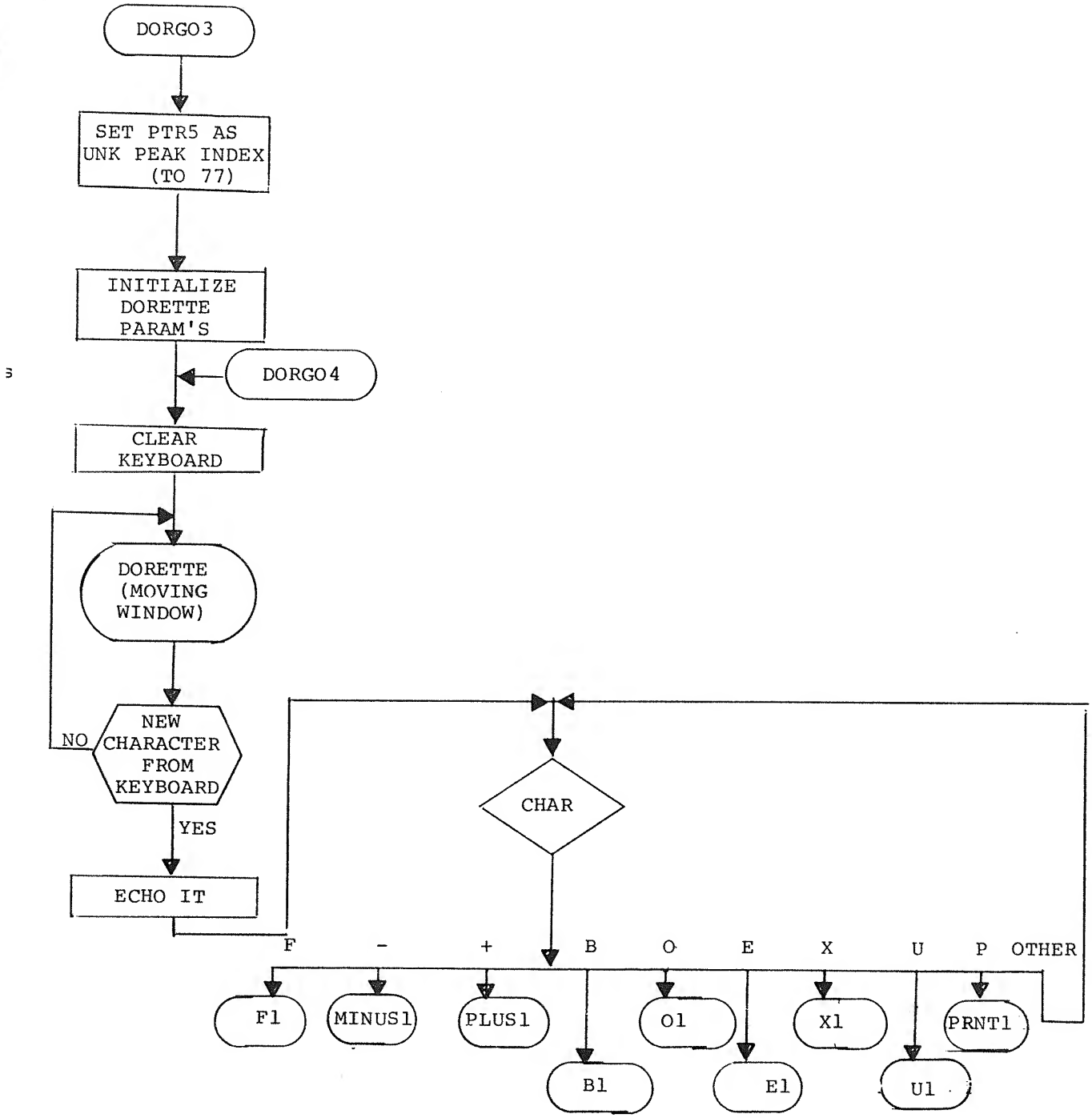

TYCNT
SPECTRUM FOUND, PRINT
SET MR 1Ø TO -NUM PTS
SET PTR11 TO Ø (LINENUM)
TYC1D
SET PTR7 TO -NUM PARA
TYC1E
STORE NEW LINE #
GET NXT X VAL IN AC
TYC1F
CONVERT, STORE
P2
YES
MORE PARA?
NO
PRINT LINE BMP 11
YES
MORE LINES?
NO
STRTC

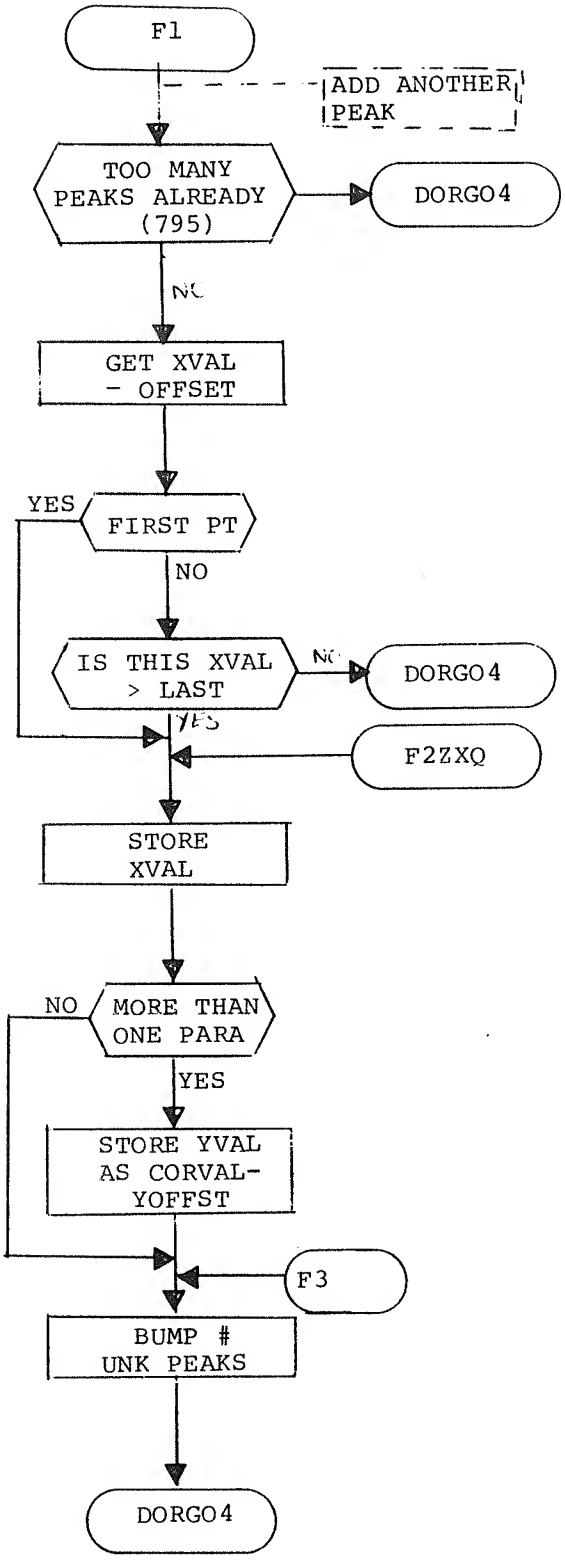

ERR2
DELETE INST
DISPLAY "INSTRUMENT NAME"
IPCSUB
SAVE IT
DO ERØ (FIND MATCH, IF ANY, ON INST NAME FROM BLKØ INDEX)
MATCH
NO
STARTB
YES
ER2
GET FIRST BLOCK IN AC
ER2A
DO ER2S1 (CLEAR CORRESPONDING DA BIT)
GET THE BLOCK
LAST? (WD 377=7777)?
NO
YES
STORE 7777 FOR 3 WD INDEX ENTRY
ER2RTN
WRITE BLOCK Ø
STRTB

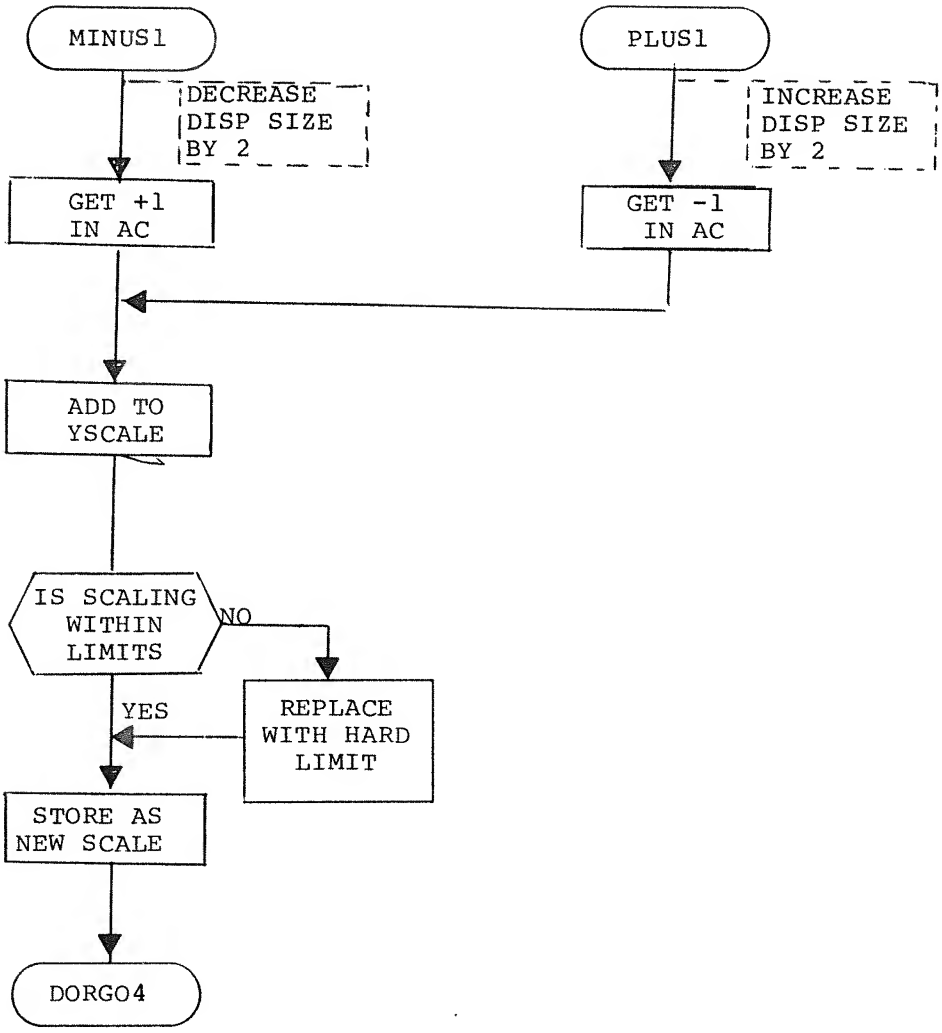

STERR
ERASE CHOSEN
DISPLAY "ERASE
1. ENTIRE LIBRARY
2. ENTIRE INSTRUMENT
3. SINGLE SPECTRUM
4. EXIT
CHOICE-
CHOICE ?
OTHER
4
3
2
1
STARTC
ERR3
ERR2
DISPLAY "SURE"?
NO
CHOICE ?
OTHER
ERR1
YES
INTP
STORE 7770-7777 TO IDENTIFY LIFE TAPE
STORE 0 THRU INDEX, DA MAP
PUT 1's FOR BLK0, ODD BITS OF LAST WORD
WRITE BLOCK OUT
STARTB

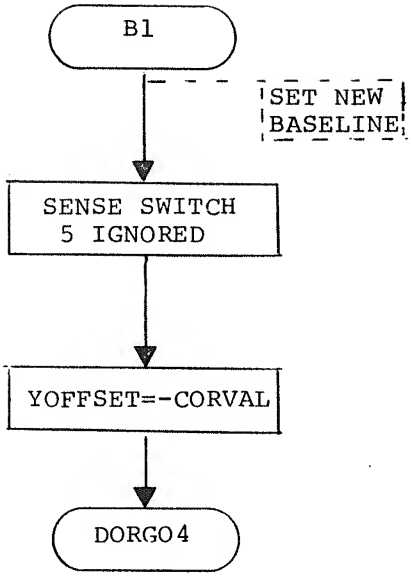

ERR3
DELETE SPECTRUM
DISPLAY: "INSTRUMENT NAME SPECTRUM NAME"
SINGL
STORE SPECTRUM, INSTRUMENT ANS IN OUTPUT BUFF
DELSP
DO ERØ (GET INSTRUMENT ENTRY IN BLOCK Ø IF ANY)
MATCH?
NO
YES
WRITE OUT BLOCK Ø
STARTB
GET FIRST BLOCK IN AC
DO FNDSPB (GET SPECTRUM MATCH: AC=Ø; IF NONE, AC≠Ø)
MATCH?
NO
YES
STORE Ø IN FIRST TAPE WORD
WRITE OUT BLOCK
WRITE OUT BLOCK Ø
STARTB

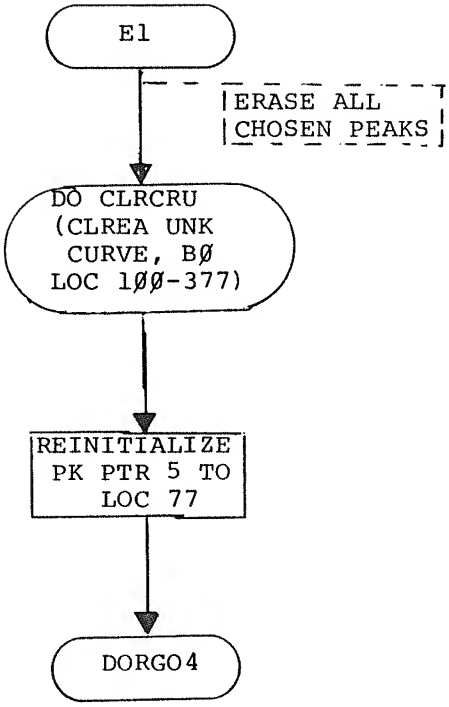

STDOR
GENERATE SPECTRUM CHOSEN
DISPLAY: INSTRUMENT NAME
IPCSUB
SAVE IT
DO ERØ (CHECK FOR INST MATCH IN BLKØ)
MATCH?
YES
NO
STDOR5
DISPLAY "UNIT NAME SPECTRUM NAME"
STORE TAPE, SPECTRUM NAME
STDORG
STDOR3
DISPLAY "NEW INSTRUMENT ACCEPT? YORN TYPE: 1 IF X ONLY 2 IF X AND Y
CHOICE ?
OTHER
NO
YES
#PARA LEGAL
NO
YES
STORE NUM PARA
STDOR6
DISPLAY UNIT # START BLK
NO
LEGAL
YES
STORE DATA
DORAGO
SET: # UNKPTS=Ø PT OFFSET=1777 LAST PT VAL= -LARGE
DO CLRCRU (CLEAR UNK CURVE BØ LOC 1ØØ-377)
DORGO1
SET UP TO READ # BLKS OF SPECTRUM DATA
DOES # BLKS CARRY PAST 777?
YES
NO
DO READ OF DATA
DORGO3

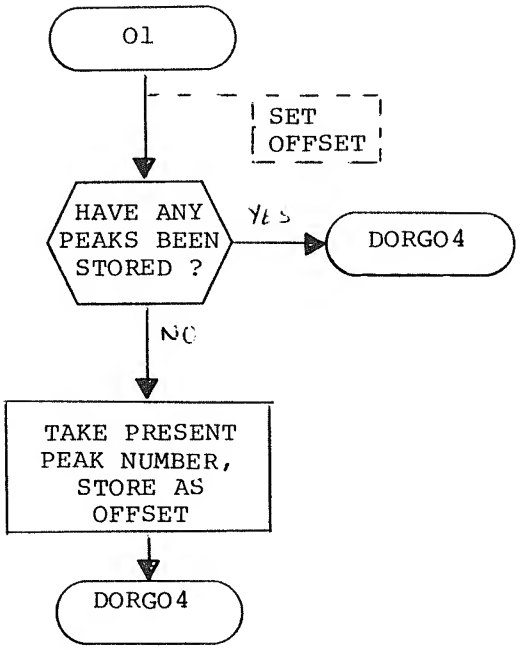

DORGO3
SET PTR5 AS UNK PEAK INDEX (TO 77)
INITIALIZE DORETTE PARAM'S
DORGO4
CLEAR KEYBOARD
DORETTE (MOVING WINDOW)
NEW CHARACTER FROM KEYBOARD
NO
YES
ECHO IT
CHAR
F
-
+
B
O
E
X
U
P
OTHER
F1
MINUS1
PLUS1
B1
O1
E1
X1
U1
PRNT1

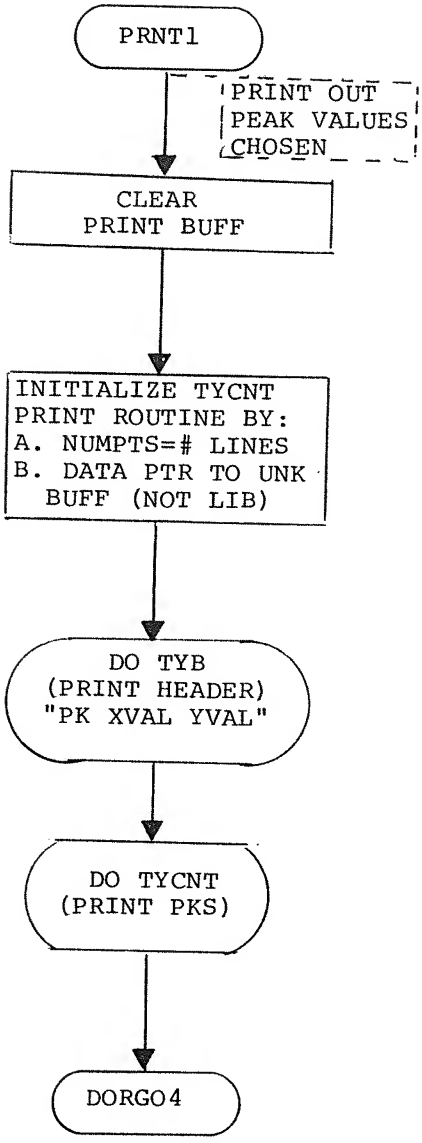

F1
ADD ANOTHER PEAK
TOO MANY PEAKS ALREADY (795)
DORGO4
NO
GET XVAL - OFFSET
YES
FIRST PT
NO
IS THIS XVAL > LAST
NO
DORGO4
YES
F2ZXQ
STORE XVAL
NO
MORE THAN ONE PARA
YES
STORE YVAL AS CORVAL-YOFFST
F3
BUMP # UNK PEAKS
DORGO4

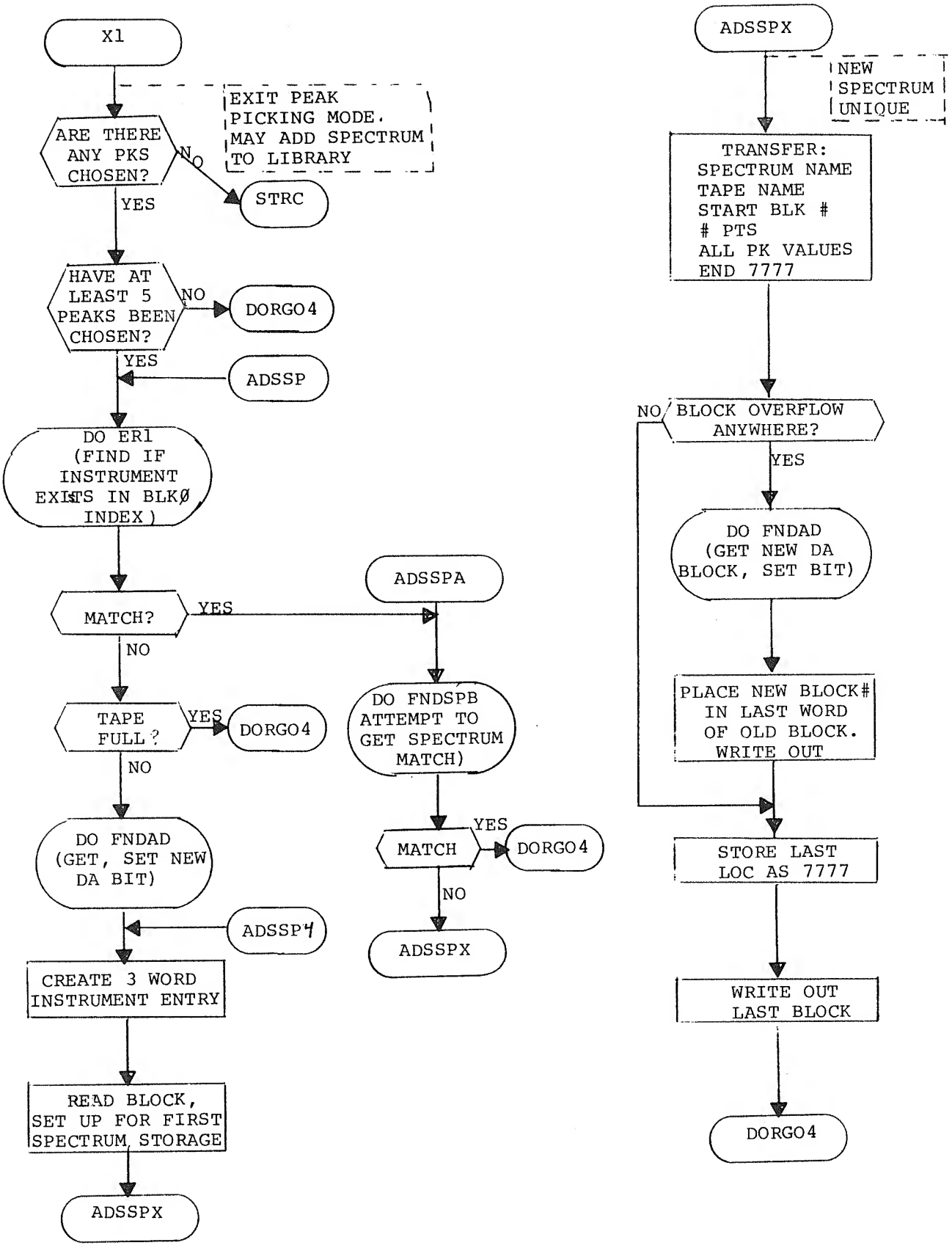

MINUS1
DECREASE
DISP SIZE
BY 2
GET +1
IN AC
PLUS1
INCREASE
DISP SIZE
BY 2
GET -1
IN AC
ADD TO
YSCALE
IS SCALING
WITHIN
LIMITS
NO
YES
REPLACE
WITH HARD
LIMIT
STORE AS
NEW SCALE
DORGO4

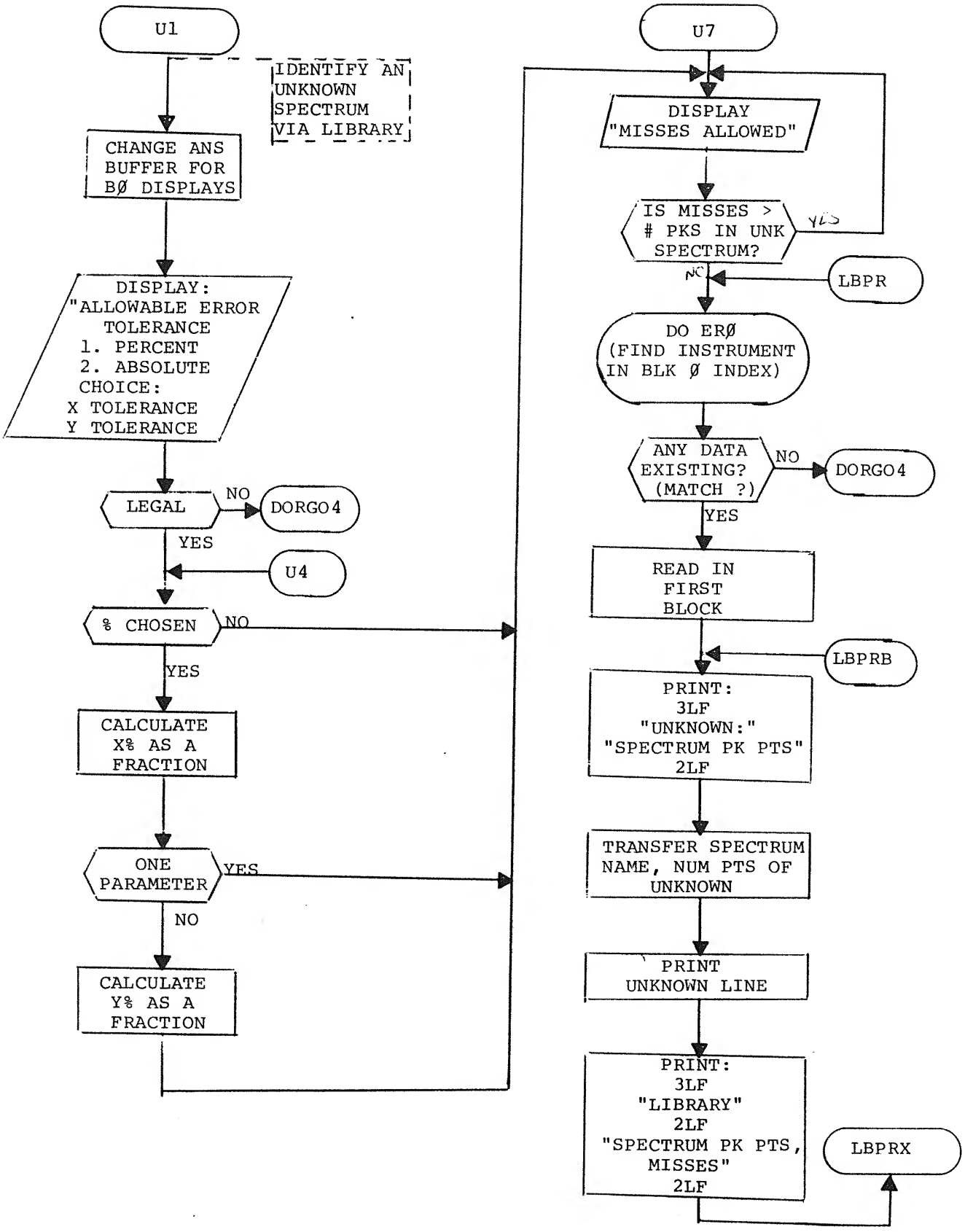

B1
SET NEW BASELINE
SENSE SWITCH 5 IGNORED
YOFFSET=-CORVAL
DORGO4

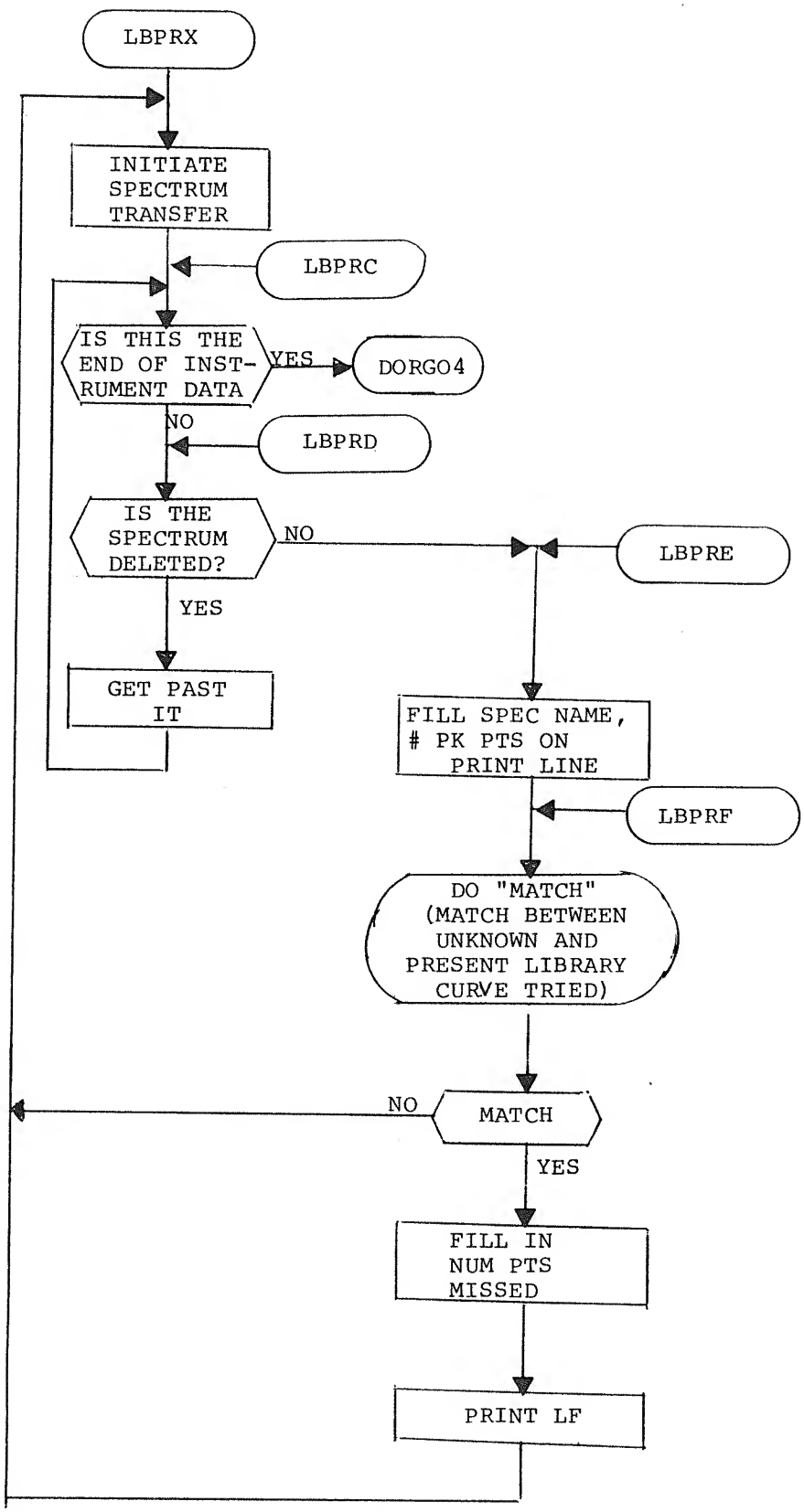

E1
ERASE ALL CHOSEN PEAKS
DO CLRCRU (CLREA UNK CURVE, BØ LOC 1ØØ-377)
REINITIALIZE PK PTR 5 TO LOC 77
DORGO4

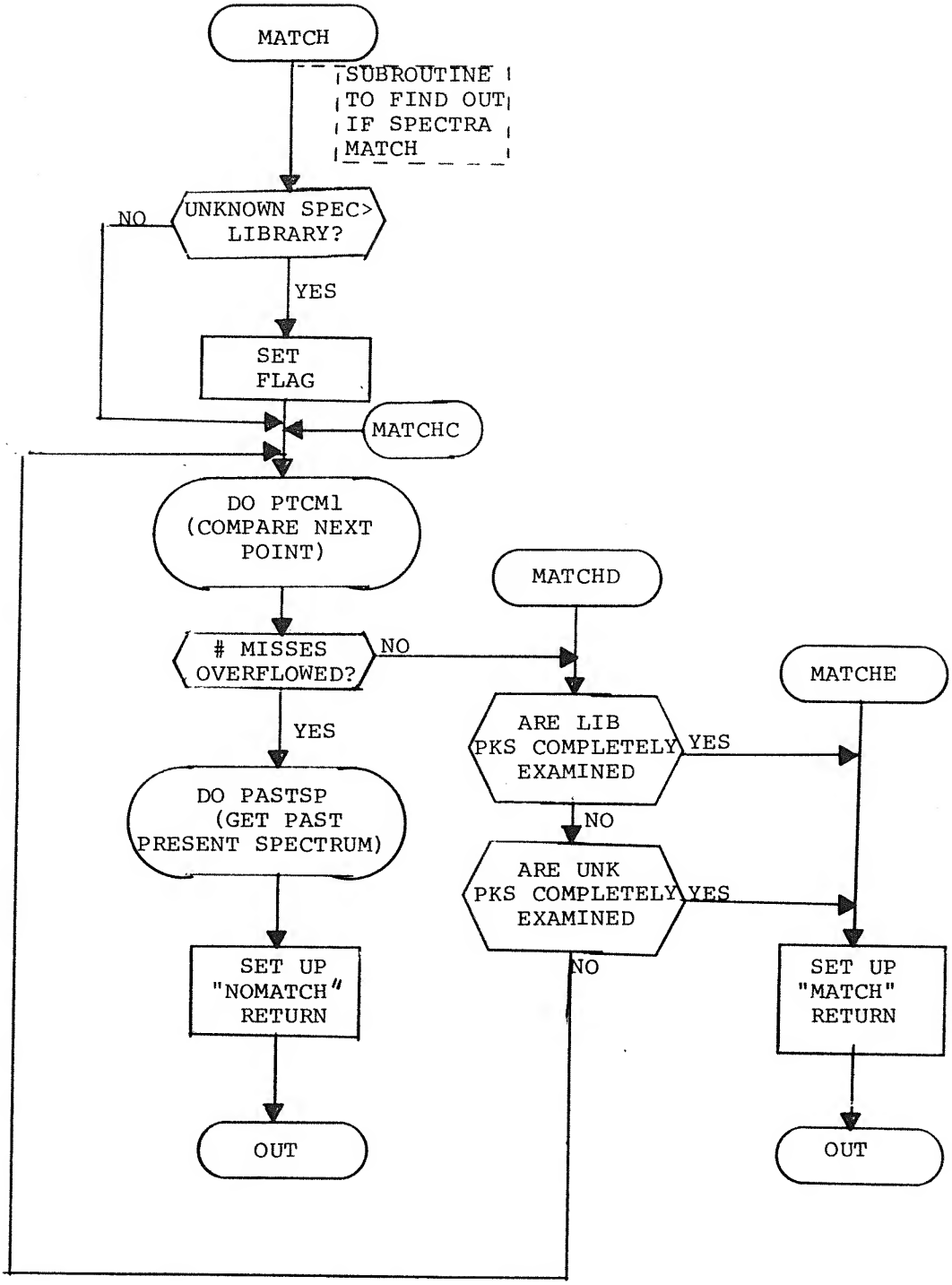

O1
SET OFFSET
HAVE ANY PEAKS BEEN STORED ?
YES
DORGO4
NO
TAKE PRESENT PEAK NUMBER, STORE AS OFFSET
DORGO4

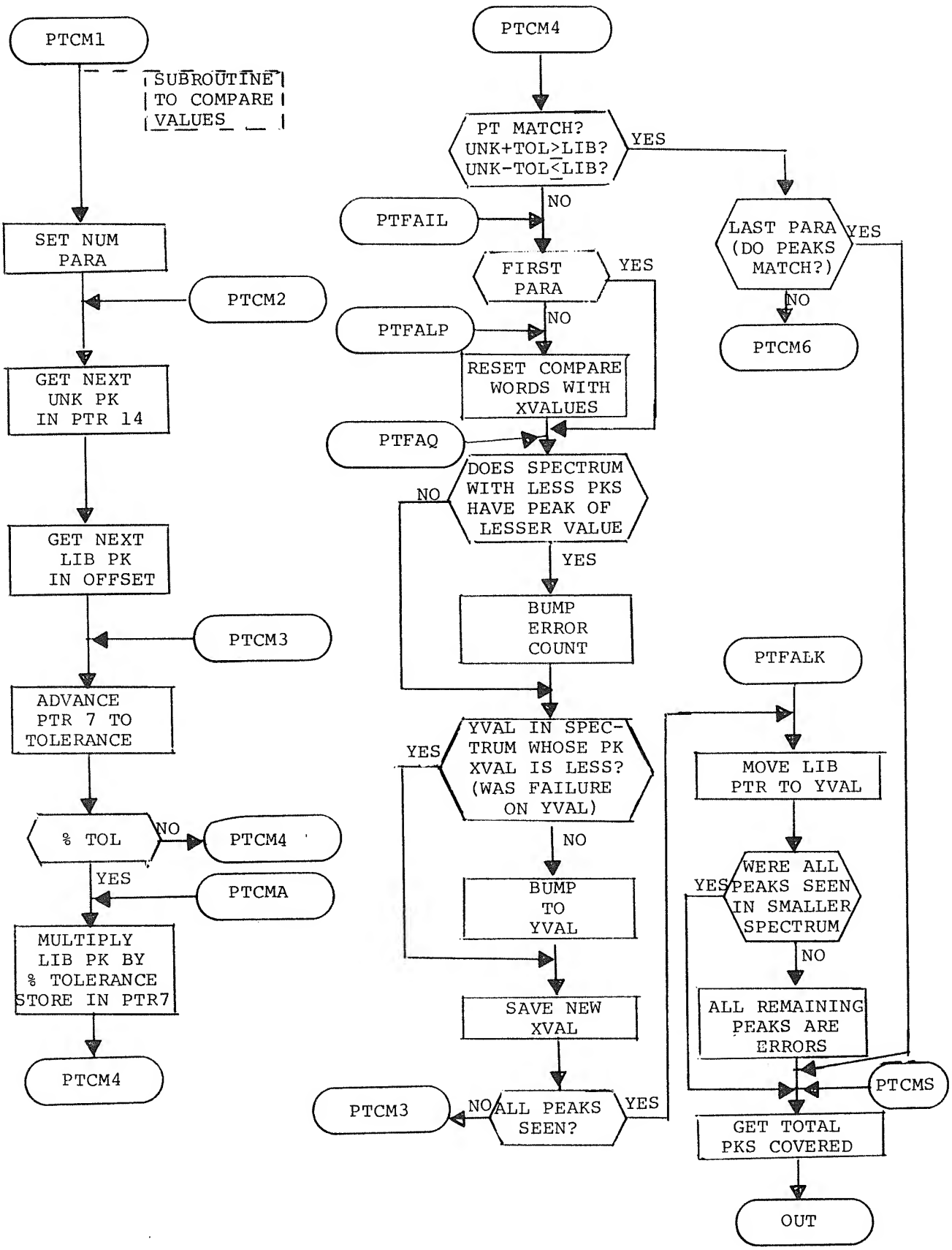

PRNT1
PRINT OUT
PEAK VALUES
CHOSEN
CLEAR
PRINT BUFF
INITIALIZE TYCNT
PRINT ROUTINE BY:
A. NUMPTS=# LINES
B. DATA PTR TO UNK
BUFF (NOT LIB)
DO TYB
(PRINT HEADER)
"PK XVAL YVAL"
DO TYCNT
(PRINT PKS)
DORGO4

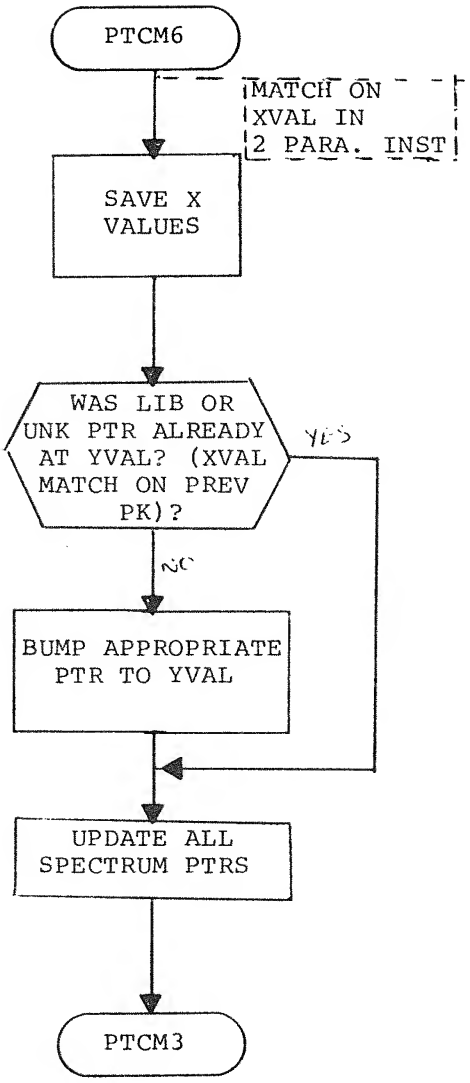

X1
ARE THERE ANY PKS CHOSEN?
NO
EXIT PEAK PICKING MODE. MAY ADD SPECTRUM TO LIBRARY
STRC
YES
HAVE AT LEAST 5 PEAKS BEEN CHOSEN?
NO
DORGO4
YES
ADSSP
DO ER1 (FIND IF INSTRUMENT EXISTS IN BLKØ INDEX)
MATCH?
YES
ADSSPA
NO
TAPE FULL?
YES
DORGO4
NO
DO FNDAD (GET, SET NEW DA BIT)
ADSSP4
CREATE 3 WORD INSTRUMENT ENTRY
READ BLOCK, SET UP FOR FIRST SPECTRUM STORAGE
ADSSPX
DO FNDSPB ATTEMPT TO GET SPECTRUM MATCH)
MATCH
YES
DORGO4
NO
ADSSPX
ADSSPX
NEW SPECTRUM UNIQUE
TRANSFER:
SPECTRUM NAME
TAPE NAME
START BLK #
PTS
ALL PK VALUES
END 7777
NO
BLOCK OVERFLOW ANYWHERE?
YES
DO FNDAD (GET NEW DA BLOCK, SET BIT)
PLACE NEW BLOCK# IN LAST WORD OF OLD BLOCK. WRITE OUT
STORE LAST LOC AS 7777
WRITE OUT LAST BLOCK
DORGO4


U1
IDENTIFY AN UNKNOWN SPECTRUM VIA LIBRARY
CHANGE ANS BUFFER FOR BØ DISPLAYS
DISPLAY: "ALLOWABLE ERROR TOLERANCE 1. PERCENT 2. ABSOLUTE CHOICE: X TOLERANCE Y TOLERANCE
LEGAL
NO
DORGO4
YES
U4
% CHOSEN
NO
YES
CALCULATE X% AS A FRACTION
ONE PARAMETER
YES
NO
CALCULATE Y% AS A FRACTION
U7
DISPLAY "MISSES ALLOWED"
IS MISSES > # PKS IN UNK SPECTRUM?
YES
NO
LBPR
DO ERØ (FIND INSTRUMENT IN BLK Ø INDEX)
ANY DATA EXISTING? (MATCH ?)
NO
DORGO4
YES
READ IN FIRST BLOCK
LBPRB
PRINT: 3LF "UNKNOWN:" "SPECTRUM PK PTS" 2LF
TRANSFER SPECTRUM NAME, NUM PTS OF UNKNOWN
PRINT UNKNOWN LINE
PRINT: 3LF "LIBRARY" 2LF "SPECTRUM PK PTS, MISSES" 2LF
LBPRX


LBPRX
INITIATE SPECTRUM TRANSFER
LBPRC
IS THIS THE END OF INST-RUMENT DATA
YES
DORGO4
NO
LBPRD
IS THE SPECTRUM DELETED?
NO
LBPRE
YES
GET PAST IT
FILL SPEC NAME, # PK PTS ON PRINT LINE
LBPRF
DO "MATCH" (MATCH BETWEEN UNKNOWN AND PRESENT LIBRARY CURVE TRIED)
NO
MATCH
YES
FILL IN NUM PTS MISSED
PRINT LF


MATCH
SUBROUTINE TO FIND OUT IF SPECTRA MATCH
UNKNOWN SPEC> LIBRARY?
NO
YES
SET FLAG
MATCHC
DO PTCM1 (COMPARE NEXT POINT)
MISSES OVERFLOWED?
NO
YES
DO PASTSP (GET PAST PRESENT SPECTRUM)
SET UP "NOMATCH" RETURN
OUT
MATCHD
ARE LIB PKS COMPLETELY EXAMINED
YES
NO
ARE UNK PKS COMPLETELY EXAMINED
YES
NO
MATCHE
SET UP "MATCH" RETURN
OUT


PTCM1
SUBROUTINE TO COMPARE VALUES
SET NUM PARA
PTCM2
GET NEXT UNK PK IN PTR 14
GET NEXT LIB PK IN OFFSET
PTCM3
ADVANCE PTR 7 TO TOLERANCE
% TOL
NO
PTCM4
YES
PTCMA
MULTIPLY LIB PK BY % TOLERANCE STORE IN PTR7
PTCM4
PTCM4
PT MATCH? UNK+TOL>LIB? UNK-TOL<LIB?
YES
NO
PTFAIL
FIRST PARA
YES
NO
PTFALP
RESET COMPARE WORDS WITH XVALUES
PTFAQ
DOES SPECTRUM WITH LESS PKS HAVE PEAK OF LESSER VALUE
NO
YES
BUMP ERROR COUNT
YVAL IN SPEC-TRUM WHOSE PK XVAL IS LESS? (WAS FAILURE ON YVAL)
YES
NO
BUMP TO YVAL
SAVE NEW XVAL
PTCM3
NO
ALL PEAKS SEEN?
YES
LAST PARA (DO PEAKS MATCH?)
YES
NO
PTCM6
PTFALK
MOVE LIB PTR TO YVAL
WERE ALL PEAKS SEEN IN SMALLER SPECTRUM
YES
NO
ALL REMAINING PEAKS ARE ERRORS
PTCMS
GET TOTAL PKS COVERED
OUT


PTCM6
MATCH ON XVAL IN 2 PARA. INST
SAVE X VALUES
WAS LIB OR UNK PTR ALREADY AT YVAL? (XVAL MATCH ON PREV PK)?
YES
NO
BUMP APPROPRIATE PTR TO YVAL
UPDATE ALL SPECTRUM PTRS
PTCM3

INDEX

```
0000                    *20
0001                    /LIFE B0
0002                    /REAL TIME LIBRARY LOOKUP OF UNKNOWN SPECTRA
0003                    /COPYRIGHT 1970; DIGITAL EQUIPMENT CORPORATION
0004                    /                MAYNARD, MASSACHUSETTS 01754
0005                    /
0006                    /
0007                    /RELEASED OCTOBER 1970
0010                    /
0011                    /
0012                    /WRITTEN BY RON KLEINMAN
0013                    /
0014                    /
0015                            /PTR BUFF IN THIS BANK
0016                    SEGMNT 0
0017                    *20
0020                            /CONSTANTS, TEMP STORAGE, REF FLGS ETC.
0021        0020  0000  PARDAT, 0       /DATA TAPE UNIT = SET BY DISP
0022        0021  0004          4       /CORE LOCATION - B1 - CNST
0023        0022  0000          0       /STARTING BLK NUM = SET BY DISP
0024        0023  0000          0       /NUM BLKS = SET BY DORETTE PROC
0025        0024  0000  NUMPT0, 0       /NUM PTS, SET BY DISP. - LEGALITY >200, <6000
0026        0025  1777  OFFSET, 1777    /ALSO TEMP FOR PAST SPECTRUM
0027        0026  0000  BASLIN, 0
0030        0027  0000  NUMPRA, 0       /PARA IN CURVES = NOW LEGALLY 1 OR 2
0031        0030  0000  TLRNCE, 0       /FOR PARA 1,2,3 RESPECTIVELY IF ABSOLUTE
0032        0031  0000          0
0033        0032  0000          0
0034        0033  0000  MISSES, 0       /NUM MISSES ALLOWED
0035        0034  0000  PTSLIB, 0       /NUM PTS IN LIBRARY TOTAL
0036        0035  0000  PTSUNK, 0       /NUM PTS IN UNKNOWN - RUNNING TOTAL, SET PRIOR MATCH
0037        0036  0000  COMMIS, 0       /NUM MISSES FOR THIS SPECTRUM
0040        0037  0000  PTSCVD, 0       /NUM PTS COVERED IN MATCH ROUT
0041        0040  0024  PRCNT1, 24      /ONE PERCENT - CONSTANT
0042        0041  3700          3700
0043        0042  4040  SPSPA,  4040
0044        0043  0012  P12,    12
0045        0044  0000  UNKVAL, 0
0046        0045  0000  BUMPR,  0               /SET=NO BUMP PTR 14,UNK
0047        0046  0000  BUMPR1, 0               /SET=NO BUMP PTR 16,LIB
0050        0047  0000  XWORD,  0
0051        0050  0000  XWORD1, 0
0052                    /ABOVE 3 FROM MATCH ROUTINE
0053        0051  0000  FLAGWD, 0       /FLAG WORD
0054                            /BIT0=1, UNKNOWN SPECTRA>LIBRARY SPECTRA PTWISE
0055                            /BIT1=1, PERCENT TOLERANCE,
0056        0052  0000  PRCT1,  0       /FOR PARA 1,2,3, RESPECTIVELY IF PERCENT
0057        0053  0000          0
0060        0054  0000  PRCT2,  0
0061        0055  0000          0
0062        0056  0000  PRCT3,  0
0063        0057  0000          0
0064        0060  0000  XNMBUF, 0       /FOR MULT
0065        0061  0000          0
0066        0062  0000  XNMTMP, 0       /IN PTFAIL ROUT ALSO
0067                    /NEG IF LIB XVAL>UNK XVAL
0070        0063  3777  P3777,  3777
0071        0064  7774  QRD,    READ
0072        0065  7775  QWT,    WRITE
=
```

```
0073                    *400
0074      0400  0000    BUFB0,  0       /10 WD BUFFER FOR TEXT STRINGS
0075                    *415
0076                            /CALL SUBROUTINE IN B6 FROM B0
0077      0415  0261    B6FRB0, ROL I 1
0100      0416  0301            ROR 1           /SAVE BIT 0 IN LINC
0101      0417  0353            SCR 13          /SAVE BITS 1-11 IN MQ
0102      0420  1000            LDA
0103      0421  0000            0
0104      0422  1040            STA
0105      0423  0016            16
0106      0424  1560            BCL I
0107      0425  6000            6000
0110      0426  4015            STC 15
0111      0427  0640            LDF 0
0112      0430  1015            LDA 15  /GET CONTENTS OF LOC AFTER CALL TO B6FRB0
0113      0431  0236            XSK I  16
0114      0432  0606            LIF 6
0115      0433  6020            JMP B6CALL
0116      0434  0647            LDF 7   /RETURN, VALUE IN AC IS OUTCOME
0117      0435  6016            JMP 16
0120                            /SUBROUTINE TO COMPARE UNKNOWN TO LIBRARY
0121                            /ASSUMES TOL, MISSES, NUM PTS IN BOTH SET
0122                            /WILL HAVE BUMP IF MATCH, RET IF NO MATCH,
0123                            /PTRS 7-14, 15,16 IN B6SUB CALLER
0124                            /AC CONTAINS  POINTS IN LIB, FLAGWD CORRECTLY SET
0125                            /PTR 16 AT PTS LIB, ENDS AT LAST LOC IN DATA
0126                            PMODE
0127      0436  1051    MATCHF, TAD Z FLAGWD
0130      0437  0063            AND Z P3777
0131      0440  5257            JMP MATCHB-1
0132                            LMODE
0133      0441  4034    MATCH,  STC PTSLIB
0134      0442  4036            STC COMMIS
0135      0443  2000            ADD 0
0136      0444  4017            STC 17  /SAVE RET
0137      0445  4037            STC PTSCVD
0140                            /FIND WHICH SPECTRUM HAS MORE POINT - 8 CODE
0141      0446  0002            PDP
0142                            PMODE
0143      0447  1035            TAD Z PTSUNK
0144      0450  7140            CMA CLL
0145      0451  1034            TAD Z PTSLIB    /LIB-UNK
0146      0452  7700            SMA CLA
0147      0453  5236            JMP MATCHF
0150      0454  1051            TAD Z FLAGWD    /IF LIB<UNK
0151      0455  7004            RAL
0152      0456  7130            STL RAR         /SET BIT 0
0153      0457  3051            DCA Z FLAGWD
0154                            /LIB HAS LESS PTS
0155      0460  1034    MATCHB, TAD Z PTSLIB
0156      0461  7040            CMA
0157      0462  3012            DCA 12  /PTR 12 HAS - NUM LIB PTS
0160      0463  1035            TAD Z PTSUNK
0161      0464  7040            CMA
0162      0465  3013            DCA 13  /PTR 13 HAS - NUM UNK PTS
0163      0466  6141            LINC
0164                            LMODE
0165                            /PTR 16 VIA TRANSB IS AT START OF LIB DATA
0166      0467  0074            SET I 14
0167      0470  0077            77      /SET PTR 14 TO START OF UNKNOWN DATA
0170                            /COMPARE NEXT POINT
0171      0471  6557    MATCHC, JMP PTCM1
-
```

```
0172                                /CHECK  MISSES
0173        0472    2033            ADD MISSES
0174        0473    0017            COM
0175        0474    2036            ADD COMMIS
0176        0475    0451            APO
0177        0476    6501            JMP MATCHD
0200                                /NUM MISSES TOO HIGH, NOMATCH
0201        0477    6535    MTHRT,  JMP PASTSP      /GET PAST SPECTRUM
0202        0500    6017            JMP 17  /EXIT
0203                                /GO ON, CHECK MORE PTS
0204        0501    0212    MATCHD, XSK 12
0205        0502    6504            JMP .+2
0206        0503    6506            JMP MATCHE
0207        0504    0213            XSK 13
0210        0505    6471            JMP MATCHC
0211                                /OVER MATCH FOUND, NUM MISSES IN COMMIS, BUMP RET
0212        0506    0237    MATCHE, XSK I 17
0213        0507    6477            JMP MTHRT
0214        0510    1000    PTCM6,  LDA
0215        0511    0044            UNKVAL
0216        0512    4050            STC XWORD1
0217        0513    2025            ADD OFFSET
0220        0514    4047            STC XWORD
0221                        /XVALS SAVED, NOW BUMP PTRS,MAYBE
0222        0515    7005            JMP PTZA
0223        0516    7014            JMP PTZA1       /ONLY BUMP IF PTR AT XVAL
0224                        /MUST ALSO RESTORE BOTH Y VALS
0225                        /JUST IN CASE 1 NOT BUMPED
0226        0517    0646            LDF 6
0227        0520    1000            LDA
0230        0521    2016            2016
0231        0522    4001            STC 1
0232        0523    0647            LDF 7
0233        0524    1001            LDA 1
0234        0525    4025            STC OFFSET
0235        0526    1014            LDA 14
0236        0527    4044            STC UNKVAL
0237        0530    0017            COM
0240        0531    4045            STC BUMPR
0241        0532    0017            COM
0242        0533    4046            STC BUMPR1
0243        0534    6571            JMP PTCM3
0244                                /GET PAST SPECTRUM = SUBSUB
0245                                /PTR 16 IN MIDDLE AT (PTSLIB = PTSCUD)XPARA
0246                                /SET PTR 15 B6 TO = THIS, THEN DO SUB ADV16
0247        0535    1000    PASTSP, LDA
0250        0536    0000            0
0251        0537    4545            STC PASTRT
0252        0540    2027            ADD NUMPRA
0253        0541    0017            COM
0254        0542    4006            STC 6   /-NUM PAR IN 6
0255        0543    2012            ADD 12
0256        0544    0470            AZE I
0257        0545    6000    PASTRT, RETURN  /IF NO POINTS LEFT, RETURN(16 AT LAST SPEC PT), AC CL
0260        0546    0017            COM
0261        0547    4025            STC OFFSET      /STORE DIFF IN TEMP
0262        0550    2025    PASTS1, ADD OFFSET
0263        0551    0226            XSK I 6
0264        0552    6550            JMP PASTS1
0265        0553    0017            COM
0266                                /MOVE  LOC IN AC. PTR16 AT LAST SPEC PT
0267        0554    6415            JMP B6FRB0
0270        0555    6626            JMP MV16        /MOVE 16 TO SAFETY
```

```
0271    0556  6545          JMP PASTRT      /EXIT
0272                        /SUBROUTINE TO COMPARE POINTS
0273                        /IF MATCH, OK, NO, BUMP COMMIS, CLEAR AC
0274    0557  1000  PTCM1,  LDA
0275    0560  0000          0
0276    0561  4630          STC PTCMRT
0277    0562  4045          STC BUMPR
0300    0563  4046          STC BUMPR1
0301                /SET IS PTR AT Y VAL FLAGS
0302    0564  6700          JMP PTFALC      /SET PTR6 TO - PARA
0303    0565  7002  PTCM2,  JMP PTR14B
0304    0566  6415          JMP B6FRB0      /GET NEXT LIB PARAMETER IN OFFSET
0305    0567  6244          JMP TRANSB      /GET TO NEXT UNK PTR IN UNKVAL
0306    0570  4025          STC OFFSET
0307    0571  1020  PTCM3,  LDA I
0310    0572  0030          TLRNCE  /ABSOLUTE TOLERANCE LOCATION
0311    0573  2027          ADD NUMPRA
0312    0574  2006          ADD 6
0313    0575  4007          STC 7   /IN PTR 7
0314    0576  2051          ADD FLAGWD
0315    0577  0241          ROL 1
0316    0600  0451          APO
0317    0601  6753          JMP PTCMA       /IF PERCENT, GET CONVERTED TOL WD
0320                        /ASSUME TOL WD SET, IN PTR7
0321    0602  1007  PTCM4,  LDA 7   /CHECK UPPER LIMIT
0322    0603  2044          ADD UNKVAL      /UNK+TOL>,=LIB,OK
0323    0604  0017          COM
0324    0605  2025          ADD OFFSET
0325    0606  0017          COM
0326    0607  0451          APO
0327    0610  6631          JMP PTFAIL      /FAILURE, UPPER, AC-
0330                        /CHECK LOWER LIMIT
0331    0611  1007          LDA 7   /UNK=TOL<,=LIB, OK
0332    0612  2025          ADD OFFSET
0333    0613  0017          COM
0334    0614  2044          ADD UNKVAL
0335    0615  0471          APO I
0336    0616  6631          JMP PTFAIL      /FAILURE LOWER, AC+
0337                        /SUCCESS FOR THIS PARAMETER
0340    0617  0226          XSK I 6
0341    0620  6510          JMP PTCM6       /GET NEXT,SAVE LIB X VAL
0342                        /POINT CHECKS
0343    0621  1020  PTCM5,  LDA I   /BUMP PTS CVD
0344    0622  0001  PONE,   1
0345    0623  2037          ADD PTSCVD
0346    0624  4037          STC PTSCVD
0347    0625  1032          LDA I 12
0350    0626  1033          LDA I 13
0351                /BUMP BOTH PT COUNTS
0352    0627  0011          CLR
0353    0630  6000  PTCMRT, RETURN  /EXIT
0354                        /FAILURE
0355    0631  4062  PTFAIL, STC XNMTMP
0356    0632  2006          ADD 6   /IS THIS THE FIRST PARAMETER
0357    0633  2027          ADD NUMPRA
0360    0634  0450          AZE
0361    0635  6770          JMP PTFALP      /NO, TRY TRY AGAIN
0362                        /YES, DOES THE CURVE WITH LESS POINTS HAVE THE LESSER VALUE
0363                        /IF YES, THAN THIS IS A FAILURE, BUMP NUM MISSES
0364                        /IF NO, BUMP CURVE WITH GREATER POINTS, TRY AGAIN
0365                        /FLAGWD NEG IF UNK HAS MORE PTS
0366                        /XNMTMP NEG IF LIB HAS GREATER VALUE
0367    0636  2062  PTFAQ,  ADD XNMTMP
```

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0370    0637  1640          BCO
0371    0640  0051          FLAGWD  /EXCLUSIVE OR IF NEG, EITHER LIB OR UNK HAS
0372    0641  0451          APO     /LESS VALUE AND LESS PTS, ERROR
0373    0642  6743          JMP PTFALB      /BUMP ERROR
0374                        /BUMP PAST POINT IN SPEC WITH LESSER VALUE, MAY NOT BE ERROR
0375    0643  1000          LDA
0376    0644  0062          XNMTMP
0377    0645  0451          APO
0400    0646  6705          JMP PTFALH
0401                        /LIB HAS LESSER VALUE
0402    0647  0226  PTFALD,  XSK I 6
0403    0650  6652          JMP .+2
0404    0651  6654          JMP PTFALE
0405    0652  7014          JMP PTZA1       /MAYBE BUMP LIB PTR
0406    0653  6647          JMP PTFALD
0407    0654  6700  PTFALE,  JMP PTFALC      /RESTORE PTR6 TO NUM PARA
0410    0655  4046          STC BUMPR1      /RESET LIB BMP FLAG
0411    0656  0232          XSK I 12
0412    0657  0456          SKP
0413    0660  6665          JMP YQ1         /LIB OVER
0414    0661  6415          JMP B6FRB0
0415    0662  6244          JMP TRANSB
0416    0663  4025          STC OFFSET
0417                        /NEW LIBX VAL SAVED
0420    0664  6571          JMP PTCM3       /PROCESS MORE OR
0421    0665  0072  YQ1,     SET I 12        /OVER, RESET PTR TO SKIP, BUMP ERROR
0422    0666  7776  PM1,     7776
0423    0667  2051          ADD FLAGWD
0424    0670  0451          APO             /IF UNK SMALLER
0425    0671  6621          JMP PTCM5
0426    0672  1000          LDA
0427    0673  0013          13
0430                        /ALL REMAINING UNK PTS ARE ERRORS
0431    0674  0017  Z6,      COM
0432    0675  2036          ADD COMMIS
0433    0676  4036          STC COMMIS
0434    0677  6621          JMP PTCM5
0435                        /RESTORE PTR 6
0436    0700  1000  PTFALC,  LDA
0437    0701  0027          NUMPRA
0440    0702  0017          COM
0441    0703  4006          STC 6
0442    0704  6000          JMP 0
0443                        /UNK HAS LESSER VALUE
0444    0705  0226  PTFALH,  XSK I 6
0445    0706  6710          JMP .+2
0446    0707  6712          JMP PTFALJ      /BUMP 1 WD FOR EACH PTR
0447    0710  7005          JMP PTZA        /GET NEXT UNK LOC, MAYBE
0450    0711  6705          JMP PTFALH
0451    0712  6700  PTFALJ,  JMP PTFALC      /RESTORE PTR6 TO NUM PARA
0452    0713  4045          STC BUMPR       /RESET FLG
0453    0714  1034          LDA I 14
0454                        /SAVE NEW UNK VAL-FRST PARA OF NXT PT
0455    0715  4044          STC UNKVAL
0456    0716  0233          XSK I 13        /CURVE OVER?
0457    0717  6571          JMP PTCM3       /NO, JUMP NEW COMPARE
0460                        /YES, MOVE LIB PTR TO Y PARA
0461                        /IF NOT ALREADY THERE
0462                        /AND A 2 PARA INST
0463    0720  2027  PTFALK,  ADD NUMPRA
0464    0721  1460          SAE I
0465    0722  0002          2
0466    0723  6732          JMP PTFALL      /IF 1 PARA,OUT
-
```

```
0467    0724  1000          LDA
0470    0725  0046          BUMPR1
0471    0726  0451          APO
0472    0727  6732          JMP PTFALL      /IF LIB ON Y,OUT
0473    0730  6415          JMP B6FRB0
0474    0731  6244          JMP TRANSB      /ELSE MOVE LIB
0475    0732  0011  PTFALL, CLR
0476    0733  0073          SET I 13
0477    0734  7776          7776
0500    0735  2051          ADD FLAGWD
0501    0736  0471          APO I           /IF LIB SMALLER
0502    0737  6621          JMP PTCM5
0503    0740  1000          LDA
0504    0741  0012          12
0505                  /ALL REMAINING LIB PTS ARE ERRORS
0506    0742  6674          JMP Ż6
0507                  /FAILURE, AT LAST PARA
0510    0743  1020  PTFALB, LDA I   /INCREMENT MISSES, EXIT
0511    0744  0001          1
0512    0745  2036          ADD COMMIS
0513    0746  4036          STC COMMIS
0514    0747  2622          ADD PONE
0515    0750  2037          ADD PTSCVD
0516    0751  4037          STC PTSCVD
0517    0752  6000          JMP 0
0520                        /CONVERT PERCENT TO ABSOLUTE TOL FOR THIS PT
0521                        /LIB PT IN OFFSET
0522    0753  1020  PTCMA,  LDA I
0523    0754  0052          PRCT1
0524    0755  2027          ADD NUMPRA
0525    0756  2027          ADD NUMPRA
0526    0757  2006          ADD 6
0527    0760  2006          ADD 6
0530    0761  1620          BSE I    /PTR 10 HAS SINGLE PREC PARA MULTIPLIER
0531    0762  4000          4000     /4000 FOR FRACTIONAL MULT
0532    0763  4010          STC 10
0533    0764  2025          ADD OFFSET
0534    0765  1250          MUL 10   /TOLERANCE IS IN AC
0535    0766  1047          STA 7    /STORE IN TOL WD
0536    0767  6000          JMP 0    /JUMP LIMIT CHECKING
0537                  /FAILURE ON Y, BMP APPROPRIATE PT
0540    0770  1000  PTFALP, LDA
0541    0771  0047          XWORD
0542    0772  4025          STC OFFSET
0543    0773  2050          ADD XWORD1
0544    0774  4044          STC UNKVAL
0545                  /GET XTMP NEG IF LIBX>UNKX
0546    0775  2047          ADD XWORD
0547    0776  0017          COM
0550    0777  2050          ADD XWORD1
0551    1000  4062          STC XNMTMP
0552    1001  6636          JMP PTFAQ       /SAVE X VALS
0553    1002  1034  PTR14B, LDA I 14
0554    1003  4044          STC UNKVAL
0555    1004  6000          JMP 0
0556                  /BUMP ONLY UNK PTR MAYBE
0557    1005  1000  PTŻA,   LDA
0560    1006  0000          0
0561    1007  5013          STC PTŻAR
0562    1010  2045          ADD BUMPR
0563    1011  0471          APO I
0564    1012  7002          JMP PTR14B
0565    1013  0000  PTŻAR,  0
```

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0566                        /BUMP ONLY LIB PTR, MAYBE
0567      1014  1000  PTZA1,  LDA
0570      1015  0000          0
0571      1016  5025          STC PTZAR1
0572      1017  2046          ADD BUMPR1
0573      1020  0451          APO
0574      1021  7025          JMP PTZAR1
0575      1022  6415          JMP B6FRB0
0576      1023  6244          JMP TRANSB
0577      1024  4025          STC OFFSET
0600      1025  0000  PTZAR1, 0
0601                          EJECT
=
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0602                                    /SUBROUTINE TO MULTIPLY NUM IN XNMBUF BY AC, STORE IN PTR 6
0603      1026  0017  XNUM,   COM
0604      1027  4007          STC 7   /PTR 7 HAS =
0605      1030  2000          ADD 0
0606      1031  5051          STC XNMRET      /SAVE RET
0607      1032  0050  XNUMA,  SET 10
0610      1033  0006          6
0611      1034  1046          STA 6
0612      1035  1066          STA I 6 /CLEAR BUFF INIT
0613                          /PTR 10 HAS UPPER ORDER, PTR 6 LOWER
0614      1036  1010  XNUMB,  LDA 10
0615      1037  2060          ADD XNMBUF
0616      1040  1050          STA 10  /GET UPPER ORDER
0617      1041  0011          CLR
0620      1042  2061          ADD XNMBUF+1
0621      1043  1206          LAM 6
0622      1044  4062          STC XNMTMP      /GET LOWER ORDER, CLEAR AC
0623      1045  1210          LAM 10  /GET CARRY IN UPPER ORDER
0624      1046  0227          XSK I 7
0625      1047  7036          JMP XNUMB       /IF MORE MULT, DO AGAIN
0626      1050  0011          CLR
0627      1051  6000  XNMRET, RETURN  /ELSE OUT
0630      1052  0000  LBDATA, 0
0631      1053  0000          0
0632                          /SUB TO PRINT OUT MATCHING LIB SPECS
0633      1054  6441  LBPRF,  JMP MATCH       /DO CURVES MATCH
0634      1055  7102          JMP LBPRŻ       /NO MATCH
0635      1056  0646          LDF 6   /MATCH, FILL IN NUM PTS MISS
0636      1057  1020          LDA I
0637      1060  7051          LBDATA+5777
0640      1061  1040          STA
0641      1062  2017          2017    /SET PTR 17 IN B6 DECML ROUT
0642      1063  1000          LDA
0643      1064  0036          COMMIS
0644      1065  6415          JMP B6FRB0
0645      1066  6430          JMP DECML
0646      1067  0644          LDF 4
0647      1070  3053          ADD LBDATA+1
0650      1071  1040          STA
0651      1072  3627          TYAN1C+2000     /STORE  MISSES
0652                          /LINE COMPLETE, PRINT
0653      1073  1020          LDA I
0654      1074  7603          TYANS+5777
0655      1075  0646          LDF 6
0656      1076  1040          STA
0657      1077  2001          2001    /SET PTR1 IN PRINTOUT
0660      1100  0604  LBPRG,  LIF 4
0661      1101  7475          JMP LBPR4       /PRT LN,GET NXT SPEC
0662      1102  0606  LBPRŻ,  LIF 6
0663      1103  7114          JMP LBPRX       /JUST GET NEXT SPEC
0664                          EJECT
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0665                                /START OF INITIALIZE DORRETTE
0666      1104  0604  DORART, LIF 4   /RETURN TO CHOICE OPT
0667      1105  7135          JMP STRTC
0670      1106  0646  DORAGO, LDF 6
0671      1107  4035          STC PTSUNK
0672      1110  1020          LDA I
0673      1111  1777          1777
0674      1112  4025          STC OFFSET
0675      1113  1020          LDA I
0676      1114  4400          4400
0677      1115  1040          STA
0700      1116  0075          75
0701      1117  1040          STA
0702      1120  0076          76
0703      1121  4077          STC 77  /SET INITIAL UNK VAL TO -LARGE
0704      1122  7124          JMP CLRCRV      /CLR UNK CURVE
0705      1123  7137          JMP DORG01
0706      1124  1000  CLRCRV, LDA
0707      1125  0000          0
0710      1126  5136          STC CLRT
0711                          /CLR UNK CURVE LOC 100-377
0712      1127  0061          SET I 1
0713      1130  0077          77
0714      1131  0062          SET I 2
0715      1132  7477          -300
0716      1133  1061  CLRMOR, STA I 1
0717      1134  0222          XSK I 2
0720      1135  7133          JMP CLRMOR
0721      1136  6000  CLRT,   RETURN
0722      1137  0063  DORG01, SET I 3
0723      1140  4064          4064
0724                          /READ APPROPRIATE NUM BLKS
0725      1141  1000          LDA
0726      1142  0024          NUMPT0
0727      1143  2666          ADD PM1
0730      1144  0350          SCR 10
0731      1145  2622          ADD PONE
0732                    /SET NUM BLKS>NUM PTS*256
0733      1146  4023          STC PARDAT+3
0734                          /LEGALITY1 - NUMBLKS+STBLKS<777
0735                          /ASSUME NUMPTS<6000
0736      1147  2023          ADD PARDAT+3
0737      1150  2022          ADD PARDAT+2
0740      1151  2666          ADD PM1
0741      1152  1560          BCL I
0742      1153  0777          777
0743      1154  0470          AZE I
0744      1155  7160          JMP .+3
0745                    /ERROR, DO NOT DO READ
0746      1156  0604          LIF 4
0747      1157  7261          JMP STDOR6
0750                          /DO READ
0751      1160  0002          PDP
0752                          PMODE
0753      1161  6201          CDF 0
0754      1162  6212          CIF 10
0755      1163  4464          JMS I QRD
0756      1164  0020          PARDAT
0757      1165  6141          LINC
0760                          LMODE
0761      1166  0646          LDF 6
0762      1167  0065  DORG03, SET I 5
0763      1170  0077          77      /INITIALIZE DATA PTR
=
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0764    1171  1020          LDA I
0765    1172  1777          1777
0766                        /INITIALIZE DORETTE CALL LOCATIONS
0767    1173  2024          ADD NUMPT0
0770    1174  1040          STA
0771    1175  6071          DREND+2000      /END PT
0772    1176  0011          CLR
0773    1177  1040          STA
0774    1200  6072          YOFFST+2000     /OFFSET=0
0775    1201  4035          STC PTSUNK
0776    1202  1020          LDA I
0777    1203  0341          SCR 1
1000    1204  1040          STA     /SCALE=1
1001    1205  6073          YSCALE+2000
1002    1206  6415  DORG04, JMP B6FRB0
1003    1207  6061          JMP INTDRA      /INITIALIZE DORA, READ BLKS
1004    1210  0646  PROCMD, LDF 6   /PROCESS COMMAND
1005    1211  5221          STC DORG08
1006    1212  0063          SET I 3         /IS BRT SPOT ON CURVE
1007    1213  4065          4065            /IF NOT ERROR 5
1010    1214  1000          LDA
1011    1215  7773          CURCNT+2000
1012    1216  0451          APO
1013    1217  0016          NOP             /***
1014                /JMP ILLG IF < 512 PTS
1015    1220  1020          LDA I   /YES
1016    1221  0000  DORG08, 0       /RESTORE AC, PROCEED
1017                        /COMMAND CHAR IN AC
1020    1222  0061  DORG05, SET I 1
1021    1223  1240          INTTBL-1        /INTERPRETATION TABLE
1022    1224  0062          SET I 2
1023    1225  7766          -11     /-NUM LEGAL COMMANDS
1024    1226  0063          SET I 3
1025    1227  7252          JMPTBL+6000     /JUMP TABLE
1026    1230  1461  DORG06, SAE I 1 /IS COMMAND SAME AS AC
1027    1231  7233          JMP DORG07
1030    1232  6003          JMP 3   /YES, JUMP PROCESSING ROUTINE
1031    1233  0223  DORG07, XSK I 3
1032    1234  0222          XSK I 2
1033    1235  7230          JMP DORG06      /END, NO JUMP BACK
1034    1236  0063          SET I 3
1035    1237  4062          4062            /ERR CD 2
1036    1240  7764          JMP ILLG        /YES, JUMP ILLEGAL
1037                        /INTERPRETATION TABLE
1040    1241  0306  INTTBL, 306     /F
1041    1242  0255          255     /-
1042    1243  0253          253     /+
1043    1244  0302          302     /B
1044    1245  0317          317     /O
1045    1246  0305          305     /E
1046    1247  0330          330     /X
1047    1250  0320          320     /P
1050    1251  0325          325     /U
1051                        /JUMP TABLE
1052    1252  7264  JMPTBL, JMP F1
1053    1253  7371          JMP MINUS1
1054    1254  7420          JMP PLUS1
1055    1255  7423          JMP B1
1056    1256  7467          JMP O1
1057    1257  7503          JMP E1
1060    1260  7510          JMP X1
1061    1261  7525          JMP PRNT1
1062    1262  7603          JMP U1
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1063                            /SUBROUTINE TO FILE POINT VALUE
1064      1263  0000  FTEMP,   0         /TEMP
1065      1264  1020  F1,      LDA I     /HAVE TOO MANY PTS BEEN FILED
1066      1265  0374            374
1067      1266  0063            SET I 3
1070      1267  4067            4067              /YES,ERROR 7
1071      1270  0017            COM
1072      1271  2005            ADD 5
1073      1272  0471            APO I
1074      1273  7764            JMP ILLG          /YES, ILLEGAL
1075                            /NO, GET X VALUE SUBTRACT OFFSET
1076      1274  0644            LDF 4
1077      1275  1000            LDA
1100      1276  0025            OFFSET
1101      1277  0017            COM
1102      1300  1100            ADA
1103      1301  2022            2022
1104      1302  0646            LDF 6
1105      1303  5263            STC FTEMP         /SAVE
1106      1304  1000            LDA               /IF FRST PT,SKIP COMPARE
1107      1305  0005            5
1110      1306  1460            SAE I
1111      1307  0077            77
1112      1310  0456            SKP
1113      1311  7331            JMP F2ŻXQ
1114      1312  0011            CLR
1115      1313  0046            SET 6
1116      1314  0005  POS5,     5
1117      1315  0226            XSK I 6
1120      1316  2027            ADD NUMPRA
1121      1317  0017            COM
1122      1320  2006            ADD 6     /IS X VALUE LESS THAN LAST X VALUE
1123      1321  4006            STC 6     /IN PTR 6
1124      1322  0063            SET I 3
1125      1323  4070            4070
1126                    /ERR CD 8
1127      1324  1006            LDA 6
1130      1325  0017            COM
1131      1326  3263            ADD FTEMP
1132      1327  0451            APO
1133      1330  7764            JMP ILLG          /YES, ERROR
1134      1331  1000  F2ŻXQ,    LDA
1135      1332  1263            FTEMP
1136      1333  1065            STA I 5 /NO, STORE VALUE
1137                            /MORE THAN ONE PARAMETER
1140      1334  1020            LDA I
1141      1335  0002            2
1142      1336  1440            SAE
1143      1337  0027            NUMPRA
1144      1340  7342            JMP F3            /IF 1 IN AC,BUMP PTS
1145      1341  7351            JMP F2            /IF 2 PARA,PROC Y VAL
1146      1342  1000  F3,       LDA               /BMP NUM UNK PTS
1147      1343  0622            PONE
1150      1344  2035            ADD PTSUNK
1151      1345  4035            STC PTSUNK
1152      1346  6415  KEEPDR,   JMP B6FRB0        /REFRESH DORETTE
1153      1347  6075            JMP CLLDRA
1154      1350  7210            JMP PROCMD        /PROCESS NEXT CHAR
1155                    /STORE YVAL=CORVAL-OFFSET
1156      1351  0016  F2,       NOP               /REPLACE WITH SNS 5
1157                    /IF FREE STANDING MODE DESIRED
1160      1352  7356            JMP G1
1161                    /YES,CORVAL=OFFSET=KNOB 5X2!(YSCL-1)
```

```
1162    1353  7443  F4,     JMP R1
1163    1354  1065  F5,     STA I 5          /STORE
1164    1355  7342          JMP F3
1165                /SS5 OFF,STORE CORVAL-OFFSET
1166    1356  1000  G1,     LDA
1167    1357  6072          YOFFST+2000
1170    1360  0016          NOP
1171    1361  0644          LDF 4
1172    1362  1100          ADA
1173    1363  2023          2023
1174    1364  0646          LDF 6
1175    1365  7354          JMP F5
1176    1366  7436  YSCRNG, -341             /=SCR 1
1177    1367  7433          -344             /=SCR 4
1200    1370  0000  YSCTMP, 0
1201                /SUBROUTINE TO SCALE DISPLAY SMALLER BY HALF
1202    1371  1000  MINUS1, LDA
1203    1372  0622          PONE    /ADD 1 TO YSCALE
1204    1373  1100  MORP2,  ADA
1205    1374  6073          YSCALE+2000
1206    1375  1040          STA
1207    1376  1370          YSCTMP
1210    1377  0063          SET I 3
1211    1400  1366          YSCRNG
1212    1401  1103  MORP3,  ADA 3            /ADD  -SCR 1
1213    1402  0451          APO
1214    1403  7413          JMP MORP4        /ERROR
1215    1404  1023          LDA I 3
1216    1405  3370          ADD YSCTMP
1217    1406  0471          APO I
1220    1407  7413          JMP MORP4        /ERROR TOO HIGH
1221    1410  0011          CLR
1222    1411  3370          ADD YSCTMP       /OK, CHANGE SCALE
1223    1412  7415          JMP MORP5
1224    1413  1003  MORP4,  LDA 3            /ERR,STR LIMIT
1225    1414  0017          COM
1226    1415  1040  MORP5,  STA
1227    1416  6073          YSCALE+2000
1230    1417  7206          JMP DORG04       /INITIALIZE DORA
1231                /SUBROUTINE TO SCALE DISPLAY BIGGER BY DOUBLE
1232    1420  1020  PLUS1,  LDA I
1233    1421  7776          7776
1234    1422  7373          JMP MORP2
1235                /SUBROUTINE TO REDEFINE BASELINE
1236    1423  0644  B1,     LDF 4
1237    1424  0016          NOP              /REPLACE WITH SNS 5 IF FREESTANDING
1240                /MODE OF DISPLAY DESIRED
1241    1425  7436          JMP C1
1242                /YES: OFFSET=CORVAL=(KNOB5)X2!(YSCL-1)
1243    1426  7443  B2,     JMP R1
1244    1427  0017          COM
1245    1430  1100          ADA
1246    1431  2023          2023             /CORVAL
1247    1432  0646  B3,     LDF 6
1250    1433  1040          STA
1251    1434  6072          YOFFST+2000      /STORE Y OFFSET
1252    1435  7206          JMP DORG04
1253                /NO SS5, YOFFSET=-CORVAL
1254    1436  1000  C1,     LDA
1255    1437  2023          2023             /CORVAL
1256    1440  0017          COM
1257    1441  7432          JMP B3
1260                /SUB TO ROTATE KNOB 5 VAL 1 LFT FOR EVERY + DIG IN YSCL-1
```

```
1261    1442  0000  R0,     0
1262    1443  0105  R1,     FRESAM          /SAM 5
1263    1444  5442          STC R0
1264    1445  0646          LDF 6
1265    1446  2666          ADD PM1
1266    1447  1100          ADA
1267    1450  6073          YSCALE+2000
1270    1451  1560          BCL I
1271    1452  7770          7770
1272    1453  0017          COM
1273    1454  4004          STC 4           /=YSCL+1
1274    1455  2000          ADD 0
1275    1456  5462          STC R9
1276    1457  3442          ADD R0
1277    1460  0204          XSK 4           /NO ROTATES
1300    1461  7463          JMP R2
1301    1462  6000  R9,     RETURN
1302    1463  0241  R2,     ROL 1
1303    1464  0224          XSK I 4
1304    1465  7463          JMP R2
1305    1466  7462          JMP R9          /OVER
1306                        /SUBROUTINE TO SET UP OFFSET
1307    1467  1000  01,     LDA
1310    1470  0005          5
1311    1471  0063          SET I 3
1312    1472  4063          4063
1313    1473  1460          SAE I
1314    1474  0077          77
1315    1475  7764          JMP ILLG        /IF PTS HAVE ALREADY BEEN STORED=ILLEGAL
1316    1476  0644          LDF 4
1317    1477  1000          LDA
1320    1500  2022          2022
1321    1501  4025          STC OFFSET      /IF NOT, STORE, JUMP REFRESH DORETTE
1322    1502  7346          JMP KEEPDR
1323                        /SUBROUTINE TO ERASE ALL PREVIOUS UNKNOWN PTS
1324    1503  7124  E1,     JMP CLRCRV      /CLEAR UNKNOWN CURVE
1325    1504  0065          SET I 5 /REINITIALIZE CURVE PTR
1326    1505  0077          77
1327    1506  4035          STC PTSUNK      /SET NUM PTS=0
1330    1507  7346          JMP KEEPDR      /REFRESH DORETTE
1331                        /SUBROUTINE TO EXIT DORETTE
1332    1510  1000  X1,     LDA
1333    1511  0035          PTSUNK
1334    1512  0063          SET I 3
1335    1513  4067          4067
1336    1514  0470          AZE I
1337    1515  7104          JMP DORART      /IF NO POINTS, EXIT,
1340    1516  0017          COM
1341    1517  3314          ADD POS5
1342    1520  0471          APO I
1343    1521  7764          JMP ILLG        /IF LESS THAN 5 PTS, ILLEGAL
1344                        /IF MORE THAN 5 POINTS, ADD SPECTRUM
1345                        /INST NAME IN INSTNUM, SPEC IN TY07A OF B7
1346    1522  0604          LIF 4
1347    1523  6707          JMP X2  /GO TO B4 PROCESSOR
1350                        /SPECTRUM ADDED, BLOCK 0 WRITTEN OUT
1351    1524  7104  X4,     JMP DORART      /RETURN TO DORETTE CALLER
1352                        /SUBROUTINE TO PRINT VALUE OF POINTS ALREADY STORED VIA DORETTE
1353    1525  0646  PRNT1,  LDF 6
1354    1526  0500          IOB
1355    1527  6041          6041            /TSF=CLR PRNT BUFF
1356    1530  7526          JMP .=2
1357    1531  1000          LDA     /INITIALIZE PRINT ROUTINE TYCNT
-
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```
1360    1532  0035          PTSUNK
1361    1533  1040          STA
1362    1534  2056          NUMPTS+2000     /TELL NUM PTS TO PRINT
1363    1535  6415          JMP B6FRB0
1364    1536  6531          JMP TYB         /GET HEADER
1365    1537  0646          LDF 6
1366    1540  1020          LDA I
1367    1541  2077          2077
1370    1542  1040          STA
1371    1543  2016          2016    /GET DATA PTR TO UNK, NOT LIB BLK
1372    1544  1020          LDA I
1373    1545  7234          JMP P4
1374    1546  1040          STA
1375    1547  2766          P2+2000 /BUMP UNK, NOT LIB PTR
1376    1550  1000          LDA
1377    1551  0027          NUMPRA
1400    1552  1040          STA
1401    1553  2047          PRMTRS+2000     /TELL NUM PARA
1402    1554  1020          LDA I
1403    1555  6734          JMP P5
1404    1556  0644          LDF 4
1405    1557  1040          STA
1406    1560  2005          2005    /SET UP RETURN TO P5 IN B4
1407    1561  0011          CLR
1410    1562  0606          LIF 6   /JUMP PRINT ROUTINE
1411    1563  6735          JMP TYCNT
1412                        /PRINT ROUTINE ACCOMPLISHED, REFRESH DORETTE
1413    1564  7346  P6,     JMP KEEPDR
1414                        /TEXT PROC INITIALIZATION SUB
1415    1565  5571  U1A,     STC U1AA
1416    1566  2000          ADD 0
1417    1567  5602          STC U1ARET
1420    1570  1020          LDA I
1421    1571  0000  U1AA,    0
1422    1572  6415          JMP B6FRB0
1423    1573  7237          JMP GETANS      /ANS IN LOC 65
1424    1574  0066          SET I 6
1425    1575  2400          BUFB0+2000
1426    1576  0067          SET I 7
1427    1577  7774          7774
1430    1600  6415          JMP B6FRB0
1431    1601  7310          JMP BMULT       /GET PROCESSED NUM IN AC
1432    1602  6000  U1ARET, RETURN
1433                        /SUBROUTINE TO COMPARE UNK SPECTRUM WITH LIB SPECTRA
1434                        /OUTPUT MATCHES TO TTY
1435    1603  1020  U1,     LDA I
1436    1604  2400          BUFB0+2000
1437    1605  0645          LDF 5
1440    1606  1040          STA
1441    1607  2022          ANSWER+2000     /SET UP ANS BUFF AT LOC 65 OF B0
1442    1610  0063          SET I 3
1443    1611  4062          4062
1444    1612  0011          CLR
1445    1613  4036          STC COMMIS
1446    1614  1020          LDA I   /DISPLAY ALLOWABLE ERROR TOL
1447    1615  0336          DSP2P1
1450    1616  7565          JMP U1A
1451                        /PROC NUM IN AC
1452                        /GET PERCNT OR ABSOL
1453    1617  1460          SAE I
1454    1620  0001          1
1455    1621  7627          JMP U2
1456                        /1, PERCENT
```

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1457    1622  1000          LDA
1460    1623  0051          FLAGWD
1461    1624  1620          BSE I
1462    1625  2000          2000     /SET BIT 1 FLAGWD
1463    1626  7636          JMP U3
1464    1627  1460  U2,     SAE I
1465    1630  0002          2
1466    1631  7764          JMP ILLG         /IF NOT 1, 2 ILLEGAL
1467    1632  1000          LDA
1470    1633  0051          FLAGWD
1471    1634  1560          BCL I    /ABSL, CLEAR BIT
1472    1635  2000          2000
1473                        /PROCESS PARAMETER TOLERANCES
1474    1636  0066  U3,     SET I 6
1475    1637  2401          BUFB0+2001
1476    1640  4051          STC FLAGWD       /PROCESS PARAMETER 1
1477    1641  7660          JMP UA
1500                        /VALUE OCTAL OR DECIMAL IS IN AC
1501    1642  0451          APO
1502    1643  7764          JMP ILLG         /IF NEGATIVE, ERROR
1503    1644  4030          STC TLRNCE       /ELSE STORE PRA 1
1504    1645  2027          ADD NUMPRA
1505    1646  1460          SAE I
1506    1647  0002          2
1507    1650  7700          JMP U4  /IF ONE PARA, GO ON
1510    1651  0066          SET I 6
1511    1652  6403          BUFB0+6003
1512    1653  7660          JMP UA   /ELSE PROCESS SECOND
1513    1654  0451          APO
1514    1655  7764          JMP ILLG         /IF NEG, ERROR
1515    1656  4031          STC TLRNCE+1     /ELSE STORE PARA2
1516    1657  7700          JMP U4
1517                        /PROCESS PARAMETER TOLERANCE, SUB
1520    1660  2000  UA,     ADD Ø
1521    1661  5674          STC UARET
1522    1662  0067          SET I 7
1523    1663  7773          7773
1524    1664  2051          ADD FLAGWD
1525    1665  0241          ROL 1
1526    1666  0471          APO I
1527    1667  7675          JMP UB   /IF PERCNT, ONLY 2 DIG ALLOWED
1530    1670  0227          XSK I 7
1531    1671  0011          CLR      /AC=+Ø
1532    1672  6415  UC,     JMP B6FRBØ
1533    1673  7310          JMP BMULT        /DO CONVERT 2 DECIMAL
1534    1674  6000  UARET,  RETURN
1535    1675  0011  UB,     CLR
1536    1676  0016          NOP
1537    1677  7672          JMP UC   /DO CONVERT 3 ABSOLUTE  DEC
1540    1700  2051  U4,     ADD FLAGWD
1541    1701  0241          ROL 1
1542    1702  0471          APO I
1543    1703  7726          JMP U7   /IF ABSOLUTE, GO ON
1544                        /PERCENT, CONVERT TO ABSOLUTE
1545    1704  1000          LDA
1546    1705  0040          PRCNT1
1547    1706  4060          STC XNMBUF
1550    1707  2041          ADD PRCNT1+1
1551    1710  4061          STC XNMBUF+1     /GET MULT NUM AS 1 PERCNT
1552    1711  0066          SET I 6
1553    1712  0052          PRCT1    /SET PRCENT TOL 1
1554    1713  2030          ADD TLRNCE
1555    1714  7026          JMP XNUM         /PARA 1 PERCENT SET
=
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1556    1715  2027          ADD NUMPRA
1557    1716  1460          SAE I
1560    1717  0002          2
1561    1720  7726          JMP U7  /IF ONE PARA GO ON
1562    1721  0066          SET I 6
1563    1722  0054          PRCT1+2
1564    1723  0011          CLR
1565    1724  2031          ADD TLRNCE+1
1566    1725  7026          JMP XNUM        /PARA 2 PERCENT SET UP
1567                        /GET NUM MISSES ALLOWED, SAME ANS BUFF
1570    1726  0645  U7,     LDF 5
1571    1727  1020          LDA I
1572    1730  0431          DSP2P2
1573    1731  7565          JMP U1A /PROCESSED NUM IN AC
1574    1732  4033          STC MISSES      /STORE NUM MISSES
1575    1733  2033          ADD MISSES
1576    1734  0017          COM
1577    1735  2035          ADD PTSUNK
1600    1736  0063          SET I 3
1601    1737  4066          4066
1602    1740  0451          APO
1603    1741  7764          JMP ILLG        /IF NUM PTS<NUM MISSES, ERROR
1604                        /ALL OK, DO MATCH
1605    1742  0604          LIF 4
1606    1743  6743          JMP U8
1607                        /SPECTRUM MATCHES OUTPUTTED
1610    1744  7346  U9,     JMP KEEPDR      /REFRESH DORETTE
1611                        /SOMETHING ILLEGAL HAS BEEN ENTERED
1612                  /MUST RESTORE ANSWER BUFF
1613    1745  1020  ILLGL,  LDA I
1614    1746  2400          BUFB4+2000
1615    1747  0645          LDF 5
1616    1750  1040          STA
1617    1751  2022          ANSWER+2000
1620    1752  1020          LDA I
1621    1753  0657          DSPERA
1622    1754  6415  ILLGL1, JMP B6FRB0
1623    1755  7237          JMP GETANS      /WAIT FOR CR
1624    1756  6415          JMP B6FRB0
1625    1757  6075          JMP CLLDRA      /WAIT FOR CHAR
1626    1760  7210          JMP PROCMD      /YES, PROCESS IT
1627    1761  1020  NOTUNQ, LDA I
1630    1762  0657          DSPERA
1631    1763  7754          JMP ILLGL1      /DISPLAY ADD SPEC NOT UNIQUE
1632    1764  1000  ILLG,   LDA             /STR CODE IN PTR 3
1633    1765  0003          3
1634    1766  0645          LDF 5
1635    1767  1040          STA
1636    1770  2663          ERRCXX+2000
1637    1771  7745          JMP ILLGL
1640                        CHAIN "LIFE B4"
```

```
0000                    *20
0001                            /LIFE MAINLINE PROCESSING
0002                            /START DISPLAY INTERPRETATION
0003                    SEGMNT 4
0004                    *17
0005        0017  6201  FLDZ0,   6201              /CDF 1=DORA
0006                            /LOC 21-24 ARE DORETTE PTRS
0007                    *26
0010        0026  0647  INITDL,  LDF 7
0011        0027  0700           RDC
0012        0030  6322           6322
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```
0013    0031  0700          RDC
0014    0032  7323          7323
0015    0033  0002          PDP
0016                        PMODE
0017    0034  6032          KCC
0020    0035  6046          TLS
0021    0036  6141          LINC
0022                        LMODE
0023    0037  7066          JMP STRT
0024                        /CONSTANTS, TEMP STOR, REF, FLAGS
0025    0040  7777  DIAL77,  7777
0026                        READ=7774
0027                        WRITE=7775
0030    0041  6000  RTN,     RETURN  /RETURN, INIT TP
0031    0042  7774  PREAD,   READ
0032    0043  7775  PWRITE,  WRITE
0033                        /PARAMETERS - BLOCK 0
0034    0044  0000  PARA0,   0       /TAPE UNIT = SETFROM QUANDA
0035    0045  0034          34      /CORE LOCATION - B7Q0
0036    0046  0000          0       /ST BLK
0037    0047  0001          1       /BLKS
0040    0050  0000  NAMETP,  0       /4 CHAR TAPE NAME
0041    0051  0000          0
0042    0052  6777  NUMDIS,  6777            /= NUM PTS DISP
0043                        /DO SUBROUTINE IN B6 - PTRS 10,11
0044    0053  0261  DOSUB,   ROL I 1         /SAVE BIT 0
0045    0054  0301          ROR 1
0046    0055  0353          SCR 13
0047    0056  1000          LDA
0050    0057  0000          0
0051    0060  1040          STA
0052    0061  0011          11      /RETURN JUMP TO MAINLINE CALL
0053    0062  1560          BCL I
0054    0063  6000  SPCCST,  6000    /CONSTANT IN SPCSR ROUT
0055    0064  4010          STC 10
0056    0065  0644          LDF 4
0057    0066  1010          LDA 10  /CONTENTS OF NEXT LOC - JUMP SUB
0060    0067  0231          XSK I 11
0061    0070  0606          LIF 6
0062    0071  6020          JMP B6CALL
0063    0072  6011          JMP 11
0064                        /PARAMETERS - REST OF LIFE TAPE
0065    0073  0000  PARA,    0       /TAPE UNIT = SET FROM QUANDA
0066    0074  0035          35      /CORE LOCATION - B7,Q
0067    0075  0000          0       /ST BLK - SET FROM SUBROUTINES
0070    0076  0001          1       /BLKS
0071    0077  0000  NUMPT4,  0       /PARAPTS
0072    0100  0000  NUMPAR,  0       /DATA PARA
0073    0101  0000  INSTNM,  0       /4 CHAR INST NAME
0074    0102  0000          0
0075    0103  0000  FSTBLK,  0       /FIRST BLK OF INST
0076    0104  7775  M2,      7775    /CONSTS
0077    0105  0001  P1B4,    0001
0100    0106  0000  ERAST,   0
0101                        /SUBROUTINE - CHECK IF LIFE TAPE
0102                        /PTRS 5,6,7 BLOCK 0 OF LIFE TAPE IN B7Q1
0103                        /IF LIFE, BUMP RET, ELSE NOT
0104    0107  1020  CKTPIN,  LDA I   /SET FOR FIRST 8 WORDS
0105    0110  2377          2377
0106    0111  4006          STC 6
0107    0112  0065          SET I 5
0110    0113  7767          7767    /IN QUARTER1 B7
0111    0114  0647          LDF 7
```

```
0112      0115  6000          JMP 0
0113      0116  0047  CKTP,   SET 7   /THIS MUST ALSO BE CALLED *
0114      0117  0000          0
0115      0120  1025          LDA I 5 /GET NEXT WD
0116      0121  1026          LDA I 6
0117      0122  1440          SAE
0120      0123  0005          5       /IS IT CORRECT
0121      0124  6007          JMP 7   /NO, GET OUT
0122      0125  0205          XSK 5   /YES, OVER?
0123      0126  6120          JMP CKTP+2
0124      0127  0227  CKTPB,  XSK I 7 /YES, BUMP, EXIT
0125      0130  6007          JMP 7
0126                          /SUBROUTINE TO INITIALIZE LIFE TAPE - OR DELETE ALL
0127                          /SET UP BLK 0 IN B3Q0
0130      0131  0047  INTP,   SET 7   /SET PTRS
0131      0132  0000          0
0132      0133  6107          JMP CKTPIN
0133      0134  1025  INTPA,  LDA I 5 /STORE 7770-7777
0134      0135  1000          LDA
0135      0136  0005          5
0136      0137  1066          STA I 6
0137      0140  0205          XSK 5
0140      0141  6134          JMP INTPA
0141      0142  0011  INTPB,  CLR     /WHEN FINISHED, STORE REST AS 0
0142      0143  1066          STA I 6
0143      0144  1000          LDA
0144      0145  0006          6
0145      0146  1460          SAE I
0146      0147  2777          2777
0147      0150  6142          JMP     INTPB
0150                          /STORE DAD NULL FOR BLK0, TRAILER
0151      0151  0011          CLR
0152      0152  1620          BSE I   /TRAILER
0153      0153  0077          77
0154      0154  1046          STA 6
0155      0155  1000          LDA     /BLK0
0156      0156  2725          2725
0157      0157  1620          BSE I
0160      0160  4000          4000
0161      0161  1040          STA
0162      0162  2725          2725
0163      0163  6007          JMP 7
0164                EJECT
```

```
0165                                /SUBROUTINE SET TO ERASE AN INSTRUMENT
0166                                /B0 IN BNK 7 Q0
0167                                /SUB1 = IDENTIFY INSTRUMENT, GET STARTING BLOCK
0170                                /RET IF NONE, BUMP IF FOUND, 2 BUMPS IF OVERFLOW, PTR6 HAS 0 OR 7777
0171    0164  0066  ER1,    SET I 6
0172    0165  2006         2006
0173    0166  0226         XSK I 6
0174    0167  0226         XSK I 6
0175    0170  0047         SET 7
0176    0171  0000         0
0177    0172  0647  ER0C,   LDF 7
0200    0173  1006  ER1A,   LDA 6   /IS THIS END - NEXT WD 0
0201    0174  0470         AZE I
0202    0175  6007         JMP 7   /YES, ERROR RETURN, PTR6 HAS FIRST 0
0203                        /COMPARE FIRST 2 CHAR
0204    0176  1440         SAE
0205    0177  0101         INSTNM
0206    0200  6226         JMP ER1B
0207    0201  1026         LDA I 6
0210    0202  1440         SAE
0211    0203  0102         INSTNM+1
0212    0204  6227         JMP ER1B+1
0213    0205  1026         LDA I 6 /MATCH MADE, GET FIRST BLK
0214    0206  1560         BCL I
0215    0207  6000         6000
0216    0210  4103         STC     FSTBLK
0217                /MATCH MADE, STORE NUM PARA
0220    0211  1006         LDA 6
0221    0212  0242         ROL 2
0222    0213  1560         BCL I
0223    0214  7774         7774
0224    0215  0646         LDF 6
0225    0216  1040         STA
0226    0217  2047         PRMTRS+2000
0227    0220  0640         LDF 0
0230    0221  1040         STA
0231    0222  2027         NUMPRA+2000
0232    0223  4100         STC NUMPAR
0233    0224  0647         LDF 7
0234    0225  6240         JMP ER1C
0235    0226  0226  ER1B,   XSK I 6 /GET TO NEXT INSTRUMENT
0236    0227  0226         XSK I 6
0237    0230  0226         XSK I 6
0240    0231  1020         LDA I
0241    0232  5457         5457    /MAKE SURE INDEX DOES NOT OVERFLOW
0242    0233  2006         ADD 6
0243    0234  0451         APO
0244    0235  6173         JMP ER1A        /OK, RETURN
0245    0236  0011         CLR
0246    0237  0227         XSK I 7
0247    0240  0227  ER1C,   XSK I 7
0250    0241  6007         JMP 7   /INDEX OVERFLOW, 2 BUMPS
0251                        /SUBROUTINE FOR MATCH SEARCH OF TAPE INDEX
0252                        /MATCH = 0 BUMPS, OVERFLOW = 1 BUMP, NO MATCH = 2 BUMPS
0253    0242  0044  ER0,    SET 4
0254    0243  0000         0
0255    0244  6164         JMP ER1 /JUMP MATCH
0256    0245  6251         JMP .+4
0257    0246  6004         JMP 4   /IF MATCH, 0 BUMPS
0260    0247  0224  ER0A,   XSK I 4 /IF OVERFLOW
0261    0250  6004         JMP 4
0262    0251  0451         APO     /IF NO MATCH, CHECK FOR 7777
0263    0252  6255         JMP ER0B        /YES, RETURN
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0264    0253  0224          XSK I 4
0265    0254  6247          JMP ER0A        /NO MATCH, 2 BUMPS
0266    0255  0226  ER0B,    XSK I 6
0267    0256  0226          XSK I 6
0270    0257  0226          XSK I 6
0271    0260  6172          JMP ER0C        /REENTRENT TO ER0
0272                        /SUB2 = DELETE INSTRUMETNT, GIVEN ST BLK
0273                        /PTR6 AT FST BLK OF INSTRUMENT
0274    0261  0011  ER2,     CLR
0275    0262  2103          ADD      FSTBLK
0276    0263  4075  ER2A,    STC PARA+2      /SETUP READ PTRS
0277    0264  0647          LDF 7
0300    0265  6307          JMP ER2S1       /SUB SUB TO CLR BIT COORESP TO WD IN PARA+2
0301    0266  2075          ADD PARA+2
0302    0267  6053          JMP DOSUB
0303    0270  6150          JMP RDTAPE      /DO TPAPEREAD OF NEXT BLK
0304    0271  1000          LDA     /WAS THIS THE LAST BLK
0305    0272  2777          2777
0306    0273  0450          AZE
0307    0274  6263          JMP ER2A        /NO, CLR NEXT DAD BIT
0310    0275  2104          ADD M2
0311    0276  2006          ADD 6   /YES, STORE 7777 IN INDEX FILE
0312    0277  4006          STC 6
0313    0300  0017          COM
0314    0301  1046          STA 6
0315    0302  1066          STA I 6
0316    0303  1066          STA I 6
0317    0304  6053  ER2RTN, JMP DOSUB       /JUMP WRITE UNIT 0
0320    0305  7566          JMP WTUN0
0321    0306  7127          JMP STRTB
0322                        /SUB SUB TO CLR BIT COORSP TO WD IN PARA 2
0323    0307  1000  ER2S1,   LDA
0324    0310  0000          0
0325    0311  4350          STC ER2SRT
0326    0312  4004          STC 4   /WD CNT
0327    0313  2075          ADD PARA+2
0330    0314  4106          STC ERAST
0331    0315  0065          SET I 5 /=12 BITS
0332    0316  7763          7763
0333    0317  2106  ER2S2,   ADD ERAST       /GET PROPER WD
0334    0320  2005          ADD 5
0335    0321  0470          AZE I
0336    0322  0011          CLR
0337    0323  0451          APO
0340    0324  6330          JMP ER2S3       /AT WD
0341    0325  0224          XSK I 4
0342    0326  4106          STC ERAST
0343    0327  6317          JMP ER2S2
0344                        /AT WD, ROTATE 0001 LEFT 1 BIT FOR EVERY NEG INT FROM 12 DIV
0345    0330  4007  ER2S3,   STC 7
0346    0331  2105          ADD P1B4
0347    0332  0241          ROL 1
0350    0333  0227          XSK I 7
0351    0334  6332          JMP ER2S3+2
0352    0335  0301          ROR 1
0353    0336  4007          STC 7   /PROPEL BIT MASK SET
0354    0337  2004          ADD 4
0355    0340  1120          ADA I   /START OF DAD IN BLK 0
0356    0341  2324          2324
0357    0342  4004          STC 4   /SET FIRST LOC OF BIT MAP
0360    0343  1024          LDA I 4
0361    0344  1540          BCL     /DO BIT CLEAR
0362    0345  0007          7
-
```

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0363    0346  1044          STA 4
0364    0347  0011          CLR
0365    0350  6000  ER2SRT,  RETURN
0366                        /SUBROUTINE TO PRINT SPECTRUM DATA
0367                        /PTRS 10, 11, 12, 1, 13-17 USED IN SUBSUB
0370                        /HEADER ALREADY ASSUMED PRINTED
0371                        /B0 IN B7Q0
0372                        /AC=0 IF NO MATCH, =4000 IF MATCH
0373                        /4 CHAR NAME IN INSTNM
0374    0351  0045  TYC,    SET 5           /SAVE RET
0375    0352  0000          0
0376    0353  6242          JMP ER0 /FIND INSTRUMENT
0377    0354  6357          JMP TYCA        /MATCH, DO PRINTOUT
0400    0355  0016          NOP     /OVERFLOW ILLEGAL
0401    0356  6005          JMP 5   /NO MATCH, EXIT
0402    0357  2103  TYCA,   ADD FSTBLK
0403    0360  0606          LIF 6
0404    0361  6655          JMP TYC1
0405                        EJECT
=
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0406                                /SUBROUTINE TO PRINT ALL MATCHING LIBRARY CURVES
0407                                /FOR UNKNOWN SPECTRUM IN B0
0410                                /INSTNM BUFFER SET UP
0411                                /AC=0, NO MATCH ON INST, A NOT=0, OK
0412                                /ALL PARA IN B0, B4, B6 ASSUMED SET UP
0413    0362  1000  LBPR,    LDA
0414    0363  0000           0
0415    0364  4370           STC LBPRRT
0416    0365  6242           JMP ER0 /GET FIRST BLOCK OF INSTRUMENT
0417    0366  6371           JMP LBPRA
0420    0367  0016           NOP
0421    0370  6000  LBPRRT,  RETURN
0422    0371  2103  LBPRA,   ADD FSTBLK
0423    0372  6053           JMP DOSUB
0424    0373  6150           JMP RDTAPE        /READ IN FIRST DATA BLK
0425    0374  0606           LIF 6
0426    0375  7020           JMP LBPRB         /GO TO B6 FOR PRINTOUT
0427                  *400
0430    0400  0000  BUFB4,   0
0431                  *415
0432                                /SUBROUTINE TO DELETE A SPECTROM
0433                                /WHOSE NAME IS IN TY07A OF B5
0434                                /AC=0 IF DELETED, AD - IF NO INST, + IF NO SPECTRA
0435    0415  1000  DELSP,   LDA
0436    0416  0000           0
0437    0417  4424           STC DELSRT
0440    0420  6242           JMP ER0 /GET FIRST BLOCK
0441    0421  6425           JMP DELSPA
0442    0422  0016           NOP
0443    0423  2063           ADD SPCCST
0444    0424  6000  DELSRT,  RETURN  /ERROR, NOT FOUND, AC NEG
0445    0425  2103  DELSPA,  ADD FSTBLK
0446    0426  6053           JMP DOSUB         /READ IN FIRST DATA BLOCK FIND MATCH
0447    0427  7155           JMP FNDSPB
0450    0430  0450           AZE
0451    0431  6424           JMP DELSRT        /RETURN, NO SPEC MATCH, AC +
0452                                /MATCH, DELETE SPEC
0453                                /PTR 16 AT LAST SPEC WD
0454    0432  0016  DELSPC,  NOP
0455    0433  0016           NOP
0456    0434  0011           CLR               /AT FRST TAPE CHARS
0457    0435  0646           LDF 6   /STORE 0 IN LOC
0460    0436  1000           LDA
0461    0437  2016           2016
0462    0440  4003           STC 3
0463    0441  0647           LDF 7
0464    0442  1043           STA 3
0465    0443  2075           ADD PARA+2
0466    0444  6053           JMP DOSUB
0467    0445  6173           JMP WTTAPE        /WRITE IT
0470    0446  6424           JMP DELSRT        /RETURN OK, AC=0
0471                                /B4 PART OF B6 SUB TO STORE IN LIFE BLK
0472    0447  6516  STRLFB,  JMP FNDAD
0473    0450  6726           JMP ERNNX         /IF NO BLKS LEFT, JUMP ERROR
0474    0451  2515           ADD ADSBLK        /BLOCK ASSIGNED, IN AC
0475    0452  0606           LIF 6
0476    0453  7217           JMP STRLFC
0477                                /TRANSFER-NUM WDS IN PTR 6
0500                                /FROM PTR 7 TO PTR 16 B7.  PTR 16 AT START OF BUFF, NOT -1
0501                                /ASSUME LDF=4
0502                                /PTR 16 ENDS AT NEXT WD AFTER BUFF
0503    0454  1000  INSRT,   LDA
0504    0455  0000           0
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0505    0456  4464          STC INSRTN
0506    0457  1027  INSRTA, LDA I 7 /GET NEXT WD
0507    0460  6053          JMP DOSUB
0510    0461  7203          JMP STRLF       /STORE
0511    0462  0226          XSK I 6 /END
0512    0463  6457          JMP INSRTA      /NO, GO BACK
0513    0464  6000  INSRTN, RETURN  /YES
0514                        /SUBROUTINE TO ADD A SPECTRUM
0515                        /WHOSE NAME IS IN TY07A OF B5, INST NAME IN INSTNM
0516                        /EXIT IF NAME REDUNDANT
0517                        /ONE BUMP IF NO MORE ROOM IN INDEX OR TAPE
0520                        /TWO BUMPS IF OK
0521                        /PTRS BY ERO HAS 4,6,7, USE 12,3
0522    0465  0000  ADSTMP, 0       /LOC BLK 0 OF FIRST 7777, 0 IF UNFILLED
0523    0466  0000          0
0524    0467  1000  ADSSP,  LDA     /SAVE RET, INIT TRMP
0525    0470  0000          0
0526    0471  4002          STC 2
0527    0472  4465          STC ADSTMP
0530    0473  4466          STC ADSTMP+1
0531                        /FIND IF INSTRUMENT EXISTS
0532    0474  6164          JMP ER1
0533    0475  6505          JMP ADSSP1      /NO MATCH
0534    0476  6617          JMP ADSSPA      /MATCH
0535                  /CHECK IF DELETED SPECTRA FOUND
0536                  /BEFORE END REACHED
0537    0477  1000          LDA
0540    0500  0465          ADSTMP
0541    0501  0450          AZE
0542    0502  6565          JMP ADSSP5      /STORE IN DELETED AREA
0543    0503  0222  ADSBMP, XSK I 2 /INDEX OVERFLOW
0544    0504  6002          JMP 2   /BUMP RETURN, EXIT
0545                        /NO MATCH,  EITHER END OF INDEX OR DEL INST
0546    0505  0471  ADSSP1, APO I
0547    0506  6557          JMP ADSSP2
0550    0507  2465          ADD ADSTMP      /DELETED INST, SAVE LOC
0551    0510  0450          AZE
0552    0511  6255          JMP ER0B        /UNLESS PRIOR ONE FOUND
0553    0512  2006          ADD 6
0554    0513  4465          STC ADSTMP
0555    0514  6255          JMP ER0B        /RET
0556    0515  0000  ADSBLK, 0
0557                        /SEARCH DAD MAP BLK0,  GET BLK NUM COORESP
0560                        /TO FIRST FREE BIT IN ADSBLK, SET BIT, BMP RETURN
0561                        /IF NO FREE BLOCKS, RET
0562                        /PTRS 3,5,10,11
0563    0516  1000  FNDAD,  LDA
0564    0517  0000          0
0565    0520  4012          STC 12  /SAVE RET
0566    0521  4013          STC 13  /INIT BLK CNT
0567    0522  0647          LDF 7
0570    0523  0063          SET I 3 /SET WD TO STRT OF MAP
0571    0524  2324          2324
0572    0525  0065  FNDAD1, SET I 5 /RESET BIT CNT
0573    0526  7763          7763
0574                        /START NEXT WD
0575    0527  1023  FNDAD2, LDA I 3
0576    0530  0471          APO I   /IS BIT A 0
0577    0531  6544          JMP FNDAD3
0600    0532  0241          ROL 1   /NO, ROTATE
0601    0533  0233          XSK I 13        /BUMP BLK CNT
0602    0534  0225          XSK I 5 /IS IT END OF WD
0603    0535  6530          JMP FNDAD2+1
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0604    0536  1000          LDA
0605    0537  0003          3
0606    0540  1460          SAE I           /END OF DAD ?
0607    0541  2377          2377
0610    0542  6525          JMP FNDAD1      /NO GET NEXT, ELSE
0611    0543  6012          JMP 12  /RETURN
0612                        /OPEN BLOCK FOUND, SET BIT, GET IN ADSBLK
0613    0544  1620  FNDAD3, BSE I
0614    0545  4000          4000
0615    0546  0241          ROL 1
0616    0547  0225          XSK I 5         /REROTATE
0617    0550  6546          JMP .-2
0620    0551  1043          STA 3
0621    0552  1000          LDA
0622    0553  0013          13
0623    0554  4515          STC ADSBLK
0624    0555  0232          XSK I 12
0625    0556  6012          JMP 12  /RETURN
0626                        /END OF INDEX. ADD ENTRY
0627                        /PTR 6 AT INDEX ENTRY WD1
0630    0557  6516  ADSSP2, JMP FNDAD       /GET FIRST DAD LOC
0631    0560  6503          JMP ADSBMP      /TAPE FULL, EXIT
0632                        /TRANSFER 3 WD ENTRY
0633    0561  1000          LDA
0634    0562  0465          ADSTMP  /ANY DEL ENTRIES
0635    0563  0470          AZE I
0636    0564  6567          JMP ADSSP4      /NO, STORE
0637    0565  0046  ADSSP5, SET 6
0640    0566  0465          ADSTMP  /YES, FILL IT
0641    0567  1000  ADSSP4, LDA
0642    0570  0515          ADSBLK
0643    0571  4103          STC FSTBLK
0644    0572  1000  ADSSP3, LDA
0645    0573  0101          INSTNM
0646    0574  1046          STA 6
0647    0575  1000          LDA
0650    0576  0102          INSTNM+1
0651    0577  1066          STA I 6 /STORE INST NAME
0652    0600  1000          LDA
0653    0601  0100          NUMPAR
0654    0602  0302          ROR 2
0655    0603  2515          ADD ADSBLK
0656    0604  1066          STA I 6 /STORE NUM PAR, INIT BLK NUM
0657    0605  1000          LDA
0660    0606  0515          ADSBLK
0661    0607  6053          JMP DOSUB       /READ BLOCK
0662    0610  6150          JMP RDTAPE
0663    0611  1020          LDA I
0664    0612  2402          2402
0665    0613  0646          LDF 6
0666    0614  1040          STA
0667    0615  2016          2016    /SET PTR 16 TO START OF STORAGE
0670    0616  6626          JMP ADSSPX      /JMP TO TRANSFER
0671                        /MATCH MADE IN INDEX, DO SEARCH FOR REDUNDANT SPEC
0672                        /INSTRUMENT ALREADY HAS CURVES
0673                        /SEE IF ONE TO BE ADDED IS REDUNDANT
0674    0617  1006  ADSSPA, LDA 6   /GET FIRST BLOCK
0675    0620  1560          BCL I
0676    0621  6000          6000
0677    0622  6053          JMP DOSUB
0700    0623  7155          JMP FNDSPB      /CHECK MATCH
0701    0624  0470          AZE I
0702    0625  6002          JMP 2   /IF MATCH, EXIT
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0703                                /NO MATCH, PTR 16 AT FIRST NEW LOCATION IN SPECTRA
0704                                /TRANSFER IN SPECTRUM DATA
0705      0626  0066    ADSSPX,     SET I 6
0706      0627  7767                7767
0707      0630  0067                SET I 7
0710      0631  1531                TYO7A=1
0711      0632  6454                JMP INSRT         /TRANSFER NEW SPECTRUM TO FILE
0712      0633  0066                SET I 6
0713      0634  7775                7775
0714      0635  0067                SET I 7
0715      0636  0047                NAMETP+7776
0716      0637  6454                JMP INSRT         /TRANSFER TAPE NAME
0717      0640  0640                LDF 0
0720      0641  1000                LDA
0721      0642  2022                PARDAT+2002
0722      0643  6053                JMP DOSUB
0723      0644  7203                JMP STRLF         /STORE ST BLK NUM
0724      0645  0640                LDF 0
0725      0646  1000                LDA
0726      0647  2035                PTSUNK+2000
0727      0650  1040                STA
0730      0651  0077                NUMPT4
0731      0652  6053                JMP DOSUB
0732      0653  7203                JMP STRLF         /STORE NUM PTS IN SPECTRUM
0733      0654  0067                SET I 7
0734      0655  2077                2077
0735      0656  0640                LDF 0
0736      0657  2077                ADD NUMPT4        /GET-NUM PTS X NUM PARA
0737      0660  1240                MUL
0740      0661  0100                NUMPAR
0741      0662  0017                COM
0742      0663  4004                STC 4             /MUST RESET LDF TO B0 EACH LINE
0743      0664  0066    V2,         SET I 6
0744      0665  7776                7776
0745      0666  0640                LDF 0
0746      0667  6454                JMP INSRT
0747      0670  0224                XSK I 4
0750      0671  6664                JMP V2
0751      0672  0017                COM
0752      0673  6053                JMP DOSUB
0753      0674  7203                JMP STRLF         /STORE TERMINATING 7777
0754      0675  0017                COM
0755      0676  0647                LDF 7
0756      0677  1040                STA
0757      0700  2777                2777    /AFTER CURVE AND AS LAST WD OF BLK
0760                                /WRITE OUT LAST BLOCK,
0761      0701  0011                CLR
0762      0702  2075                ADD PARA+2
0763      0703  6053                JMP DOSUB
0764      0704  6173                JMP WTTAPE
0765      0705  0222                XSK I 2
0766      0706  6503                JMP ADSBMP        /RETURN, BUMP TWICE
0767                                /DORETTE HANDLER TO ADD SPECTRUM
0770      0707  6467    X2,         JMP ADSSP
0771      0710  6731                JMP ERNNU         /JUMP ERROR, NAME NOT UNIQUE
0772      0711  6726                JMP ERNNX         /JUMP ERROR,NO MORE ROOM
0773                                /OK, SPECTRUM ADDED
0774                                /NOW WRITE BLOCK 0
0775      0712  0002                PDP
0776                                PMODE
0777      0713  6211                CDF 10
1000      0714  4443                JMS I PWRITE
1001      0715  0044                PARA0
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1002    0716  6141          LINC
1003                        LMODE
1004    0717  0600          LIF 0
1005    0720  7524          JMP X4
1006    0721  0640  X3,     LDF 0           /ILLEGAL CODE CALLER
1007    0722  1040          STA
1010    0723  2003          2003
1011    0724  0600          LIF 0           /JMP ERR,NO MORE ROOM
1012    0725  7764          JMP ILLG
1013    0726  1020  ERNNX,  LDA I
1014    0727  4071          4071
1015    0730  6721          JMP X3          /ERROR 9
1016    0731  1020  ERNNU,  LDA I
1017    0732  4061          4061            /ERROR 1
1020    0733  6721          JMP X3
1021                        /DORETTE PRINT ROUTINE RESTORER
1022    0734  1020  P5,     LDA I
1023    0735  6244          JMP TRANSB
1024    0736  0646          LDF 6
1025    0737  1040          STA
1026    0740  2766          P2+ 2000
1027    0741  0600          LIF 0
1030    0742  7564          JMP P6  /JMP BACK
1031                        /MATCH SPECTRUM FOR DORETTE
1032    0743  6362  U8,     JMP LBPR
1033    0744  7056          JMP B4INTB      /REINIT ANS BUFF
1034    0745  0600          LIF 0
1035    0746  7744          JMP U9  /PRINTOUT OK, EXIT
1036                        /HELP INITIALIZE DISPLAY ROUTINE
1037                        /PTR7 MUST BE SET, PROCESSED NUM IN AC
1040    0747  4753  HELPDS, STC HELP1
1041    0750  2000          ADD 0
1042    0751  4763          STC HELPRT
1043    0752  1020  HELP2,  LDA I
1044    0753  0000  HELP1,  0
1045    0754  6053          JMP DOSUB
1046    0755  7237          JMP GETANS      /OCTAL ANS IN 1365
1047    0756  0066          SET I 6
1050    0757  2400          BUFB4+2000
1051    0760  0017          COM     /MAKE OCTAL
1052    0761  6053          JMP DOSUB
1053    0762  7310          JMP BMULT       /ANS CONV, PUT INAC
1054    0763  6000  HELPRT, RETURN
1055                        /ERROR, DISPLAY, THEN BACK TO SAME DISPLAY
1056    0764  1020  MNLNER, LDA I   /DISPLAY ILLEGAL = ON NUM CONV
1057    0765  4062          4062
1060    0766  0645          LDF 5
1061    0767  1040          STA
1062    0770  2663          ERRCXX+2000     /ERROR 2 IF NEEDED
1063    0771  1020          LDA I
1064    0772  0656          DSPERB
1065    0773  6053  MNLNE1, JMP DOSUB       /GET CR
1066    0774  7237          JMP GETANS
1067    0775  6752          JMP HELP2       /REDISPLAY LAST DISPLAY
1070                        /MOVE = NUM HALF WDS IN PTR 6
1071                        /FROM PTR 5 BUF
1072                        /TO PRT 7 BUFF
1073                        /0 BECOMES 40
1074    0776  0040  P40,    40
1075    0777  1000  SHOVE,  LDA
1076    1000  0000          0
1077    1001  5013          STC SHOVER
1100    1002  1325  SHOVEA, LDH I 5
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1101    1003  0470          AZE I
1102    1004  2776          ADD P40 /IF 0, MAKE 40
1103    1005  1420          SHD I           /IF STRT OF NEW FIELD, IGNORE
1104    1006  7400          7400
1105    1007  7002          JMP SHOVEA
1106    1010  1367          STH I 7
1107    1011  0226          XSK I 6
1110    1012  7002          JMP SHOVEA
1111    1013  6000  SHOVER,  RETURN
1112                        /SET OF SUBROUTINES TO INTERFACE WITH AND CONTROL DORETTE
1113                        /SUBSUB=IS GIVEN NUMBER IN AC BETWEEN OR=2 VALUES IN PTR6
1114                        /YES, BUMP RET, NO, RETURN
1115    1014  1040  LEGAL,  STA
1116    1015  1031          LEGAL1
1117    1016  0017          COM
1120    1017  1106          ADA 6
1121    1020  0471          APO I
1122    1021  6000          JMP 0   /IF MIN=NUM=+, ERROR
1123    1022  1026          LDA I 6         /MAX
1124    1023  0017          COM
1125    1024  3031          ADD LEGAL1      /NUM-MAX=+,ERROR
1126    1025  0471          APO I
1127    1026  6000          JMP 0   /ELSE BUMP, RETURN,  IN AC
1130    1027  0220          XSK I 0
1131    1030  1020          LDA I   /RESTORE AC
1132    1031  0000  LEGAL1,  0
1133    1032  6000          JMP 0
1134                        /LEGALITY LIMITS FOR VARIOUS LIFE PARAMETERS
1135    1033  0000  LFUNIT,  0       /UNIT NUM
1136    1034  0017          17
1137    1035  0001  SHOW3,   1       /CHOICES
1140    1036  0004          4
1141    1037  0061  SHOW12,  61      /NUM PARA=SHOW31,
1142    1040  0062          62
1143    1041  0000  SHOW14,  0       /BLOCK NUM RAW DATA
1144    1042  0777          777
1145    1043  1001          1001    /NUM PTS
1146    1044  3770          3770
1147    1045  0000  SHW21M,  0       /NUM MISSES
1150    1046  0277          277
1151    1047  0001  SHOW41,  1
1152    1050  0003          3
1153                        /START CHOICE TABLE
1154    1051  0000  STTAB,   0
1155    1052  7157          JMP STDOR       /JUMP GENERATE CURVE
1156    1053  7334          JMP STPRT       /JUMP PRINT
1157    1054  7433          JMP STERR       /JUMP ERASE
1160    1055  7470          JMP STDIAL      /JUMP START DIAL
1161                        /MAINLINE CODING, DIAL MS I/O READIN
1162                        /PROCESS DATA FROM EARLY DISPLAYS
1163                        /TEXT BUFFER IS BY LOC 1365=CALL BUFB4
1164    1056  1020  B4INTB, LDA I   /SUB TO INIT ANS BUFF
1165    1057  2400          BUFB4 + 2000
1166    1060  0645          LDF 5
1167    1061  1040          STA
1170    1062  2022          ANSWER + 2000   /SET UP ANS BUFF
1171    1063  0067          SET I 7
1172    1064  7775          7775
1173    1065  6000          JMP 0
1174    1066  7056  STRT,   JMP B4INTB
1175    1067  1020          LDA I
1176    1070  0026          DSP1
1177    1071  0067          SET I 7
-
```

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1200    1072  7774          7774
1201    1073  0016          NOP
1202    1074  6747          JMP HELPDS      /GET NUM IN AC
1203    1075  0066          SET I 6
1204    1076  1033          LFUNIT
1205    1077  7014          JMP LEGAL
1206    1100  6764          JMP MNLNER      /NOT 1-17, ERROR, TRY AGAIN
1207                        /LIFE TAPE UNIT NUM IN AC
1210    1101  1040  STRTA,  STA
1211    1102  0044          PARAØ
1212    1103  4073          STC PARA        /STORE IN TAPE PARA
1213    1104  6053          JMP DOSUB
1214    1105  6150          JMP RDTAPE      /READ BLK Ø INTO QUARTER 1,B7
1215                        /SET UP FOR CHECKING
1216    1106  6107          JMP CKTPIN      /INITIALIZE
1217    1107  6116          JMP CKTP        /DO CHECK
1220    1110  0456          SKP
1221    1111  7127          JMP STRTB
1222                        /NOT INITIALIZED LIFE TAPE
1223    1112  1020  STRT2,  LDA I
1224    1113  0053          DSP2
1225    1114  6053          JMP DOSUB
1226    1115  7237          JMP GETANS      /ANSWER IN BUFB4
1227    1116  1000          LDA
1230    1117  0400          BUFB4
1231    1120  1460          SAE I
1232    1121  7431          7431    /INITIALIZE LIFE TAPE
1233    1122  7066          JMP STRT        /ANY ANSWER BUT YES, START OVER
1234    1123  6131          JMP INTP        /INITIALIZE LIFE TAPE IF YES
1235    1124  0011          CLR
1236    1125  6053          JMP DOSUB
1237    1126  6173          JMP WTTAPE      /WRITE OUT BLOCK Ø ON LIFE TAPE UNIT
1240                        /READ LIFE BLOCK Ø INTO QØB7
1241                        /LIFE TAPE INITIALIZED
1242    1127  0002  STRTB,  PDP
1243                        PMODE
1244    1130  6211          CDF 10
1245    1131  6212          CIF 10
1246    1132  4442          JMS I PREAD
1247    1133  0044          PARAØ
1250    1134  6141          LINC
1251                        LMODE
1252                        /DO CHOICE OPTIONS
1253    1135  1020  STRTC,  LDA I
1254    1136  0102          DSP3
1255    1137  0067          SET I 7
1256    1140  7775          7775
1257    1141  6747          JMP HELPDS      /GET OCTAL NUM IN AC
1260    1142  0066          SET I 6
1261    1143  1035          SHOW3
1262    1144  7014          JMP LEGAL
1263    1145  6764          JMP MNLNER      /NOT 1-4, ERROR, TRY AGAIN
1264    1146  1120          ADA I
1265    1147  7051          STTAB+6000
1266    1150  4006          STC 6
1267    1151  6006          JMP 6
1270                        /SETUP SHOVE ROUTINE
1271    1152  0066  SETSHV, SET I 6 /BUFB4, 4 CHAR
1272    1153  7773          7773
1273    1154  0065          SET I 5
1274    1155  0400          BUFB4
1275    1156  6000          JMP Ø
1276    1157  7161  STDOR,  JMP IPCSUB      /START DORETTE
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```
1277    1160  7201          JMP STDORZ       /GET INSTRUMENT NAME
1300    1161  1000  IPCSUB, LDA
1301    1162  0000          0
1302    1163  5200          STC IPCRT        /SUB TO SAVE INST NAME
1303    1164  1020          LDA I
1304    1165  0167          DSP1P1
1305    1166  6053          JMP DOSUB
1306    1167  7237          JMP GETANS       /4 CHAR NAME IN BUFB4
1307    1170  7152          JMP SETSHV
1310    1171  0067          SET I 7 /TRANSFER TO INSTNM
1311    1172  4100          INSTNM+3777
1312    1173  6777          JMP SHOVE
1313    1174  0067          SET I 7
1314    1175  5553          TY08A+3777
1315    1176  7152          JMP SETSHV
1316    1177  6777          JMP SHOVE
1317    1200  6000  IPCRT,   RETURN
1320                        /CHECK IF NEW INSTRUMENT
1321    1201  6242  STDORZ, JMP ER0
1322    1202  7237          JMP STDOR5       /NO
1323    1203  0016          NOP
1324                        /YES, GET NUM PAR
1325    1204  1020  STDOR3, LDA I
1326    1205  0201          DSP1P2
1327    1206  6053          JMP DOSUB
1330    1207  7237          JMP GETANS       /ANSWER IN BUFB4
1331    1210  1000          LDA
1332    1211  0400          BUFB4
1333    1212  1460          SAE I
1334    1213  7431          7431
1335    1214  7157          JMP STDOR        /IF NEW INST, NOT ACCEPTED, ASK AGAIN
1336    1215  1000          LDA
1337    1216  0401          BUFB4+1
1340    1217  1560          BCL I
1341    1220  7700          7700     /LEAVE 006 NUM IN AC
1342    1221  0066          SET I 6
1343    1222  1037          SHOW12
1344    1223  7014          JMP LEGAL        /IS NUM PAR FROM 1-2
1345    1224  7204          JMP STDOR3       /NO,REFUSE INFORMATION
1346    1225  1560  STDOR4, BCL I
1347    1226  7774          7774     /GET NUM PAR IN AC
1350    1227  0646          LDF 6
1351    1230  1040          STA
1352    1231  2047          PRMTRS+2000
1353    1232  0640          LDF 0
1354    1233  1040          STA
1355    1234  2027          NUMPRA+2000
1356    1235  4100          STC NUMPAR       /STORE IN ALL BANKS
1357    1236  7237          JMP STDOR5
1360                        /NOT NEW INSTRUMENT, GET NUM PAR IN AC
1361                        /GET TAPE NAME, SPECTRUM NAME
1362    1237  1020  STDOR5, LDA I
1363    1240  0246          DSP1P3
1364    1241  6053          JMP DOSUB
1365    1242  7237          JMP GETANS       /GET ANS BUFF IN BUFB4
1366    1243  7152          JMP SETSHV
1367    1244  0067          SET I 7
1370    1245  4047          NAMETP+3777
1371    1246  6777          JMP SHOVE        /STORE TAPE NAME
1372    1247  7251          JMP SHVSB1
1373    1250  7260          JMP STDORX
1374    1251  0066  SHVSB1, SET I 6 /SET UP 16 CHAR SPEC TRANSFER
1375    1252  7757          7757
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1376    1253  0065          SET I 5
1377    1254  4402          BUFB4+4002
1400    1255  0067          SET I 7
1401    1256  5531          TY07A+3777
1402    1257  6000          JMP 0   /STORE SPECTRUM NAME
1403    1260  6777  STDORX, JMP SHOVE
1404                        /GET START BLK, UNIT NUM, NUM PTS
1405    1261  1020  STDOR6, LDA I
1406    1262  0275          DSP1P4
1407    1263  0067          SET I 7
1410    1264  7774          7774
1411    1265  6747          JMP HELPDS      /GET UNIT NUM IN AC
1412    1266  0066          SET I 6
1413    1267  1033          LFUNIT
1414    1270  7014          JMP LEGAL
1415    1271  6764          JMP MNLNER      /NOT CORRECT, ERROR, TRY AGAIN
1416                        /START BLK NUM IN AC
1417    1272  0640          LDF 0
1420    1273  1040          STA
1421    1274  2020          PARDAT+2000     /STORE IN DATA TAPE
1422                        /HELP1 ALREADY SET UP, SO BMULT CAN BE USED
1423    1275  0067          SET I 7
1424    1276  7773          7773    /SET 3 DIGITS
1425    1277  0066          SET I 6
1426    1300  6401          BUFB4+6001
1427    1301  0011          CLR
1430    1302  0017          COM     /MAKE OCTAL CONVERSION-START BLK
1431    1303  6053          JMP DOSUB
1432    1304  7310          JMP BMULT       /ANS IN OCTAL, IN AC, 0-777 IS LEGAL
1433    1305  0640          LDF 0
1434    1306  1040          STA
1435    1307  2022          PARDAT+2002     /STORE FOR DATA TAPE
1436                        /GET NUMPTS-DECIMAL
1437    1310  0067          SET I 7
1440    1311  7772          7772    /4 DIGITS MAX
1441    1312  0066          SET I 6
1442    1313  6403          BUFB4+6003
1443    1314  0011          CLR
1444    1315  6053          JMP DOSUB
1445    1316  7310          JMP BMULT       /GET DECIMAL NUM PTS IN AC
1446    1317  0066          SET I 6
1447    1320  1043          SHOW14+2
1450    1321  7014          JMP LEGAL
1451    1322  6764          JMP MNLNER      /ERROR, TRY AGAIN
1452    1323  0640          LDF 0
1453    1324  1040          STA
1454    1325  2024          NUMPT0+2000     /STORE NUM DATA POINTS
1455    1326  0600          LIF 0   /START DORETTE
1456    1327  7106          JMP DORAGO
1457    1330  0000  PRTABL, 0
1460    1331  7350          JMP PRT1        /PRINT SPECTRA
1461    1332  7375          JMP PRT2        /PRINT LIBRARY SPECTRUM
1462    1333  7135          JMP STRTC       /STOP, GO TO CHOICE OPTION
1463                        /START PRINT ROUTINE-MAINLINE
1464    1334  7056  STPRT,  JMP B4INTB      /INIT ANS BUFF
1465    1335  1020          LDA I
1466    1336  0444          DSP3P1
1467    1337  6747          JMP HELPDS      /NUM IN AC
1470    1340  0066          SET I 6
1471    1341  1047          SHOW41
1472    1342  7014          JMP LEGAL
1473    1343  6764          JMP MNLNER      /ERROR TRY AGAIN
1474                        /CHOICE IN AC
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1475    1344  1120          ADA I
1476    1345  7330          PRTABL+6000
1477    1346  4006          STC 6
1500    1347  6006          JMP 6             /JUMP TO CHOICE 1-3
1501    1350  6053  PRT1,   JMP DOSUB         /PRINT SPECTRA
1502    1351  6267          JMP TYA
1503    1352  7135          JMP STRTC         /GO TO CHOICE OPTIONS
1504                        /GET SINGLE SPECTRUM, STORE DATA
1505    1353  1000  SINGL,  LDA
1506    1354  0000          0
1507    1355  5374          STC SIGR
1510    1356  1020          LDA I
1511    1357  0515          DSP3P2
1512    1360  6053          JMP DOSUB
1513    1361  7237          JMP GETANS        /GET NAME OF INST, SPEC IN BUFB4
1514    1362  7251          JMP SHVSB1        /SET UP SPECTRUM STORE
1515    1363  6777          JMP SHOVE
1516    1364  7152          JMP SETSHV        /SET 4 CHAR AT START BUFF
1517    1365  0067          SET I 7
1520    1366  4100          INSTNM+3777
1521    1367  6777          JMP SHOVE         /INST NAME STORED
1522                /STORE IN PRT BUFF
1523    1370  7152          JMP SETSHV
1524    1371  0067          SET I 7
1525    1372  5553          TYO8A+3777
1526    1373  6777          JMP SHOVE
1527    1374  6000  SIGR,   RETURN
1530    1375  7353  PRT2,   JMP SINGL         /GET ALL DATA INTO BUFF
1531    1376  6351          JMP TYC /PRINT REMAINDER
1532    1377  7135          JMP STRTC         /GO TO CHOICE DISPLAY
1533    1400  0243  TYAY1,  ROL 3             /SAVE TAPE BLK-OCTAL
1534    1401  4041          STC RTN
1535    1402  0075          SET I 15
1536    1403  5663          TYAN3D+3777
1537    1404  0074          SET I 14
1540    1405  7774          7774
1541    1406  2041  TYAY2,  ADD RTN
1542    1407  0243          ROL 3
1543    1410  1040          STA
1544    1411  0041          RTN
1545    1412  1560          BCL I
1546    1413  7770          7770              /GET NXT DIG
1547    1414  1120          ADA I
1550    1415  0060          60
1551    1416  1375          STH I 15
1552    1417  0011          CLR
1553    1420  0234          XSK I 14
1554    1421  7406          JMP TYAY2
1555    1422  0606          LIF 6
1556    1423  6372          JMP TYAY5
1557    1424  7056  QAA1,   JMP B4INTB
1560    1425  7127          JMP STRTB         /CNTRL R REINITIALIZATION
1561    1426  0000  ERTABL, 0
1562    1427  7447          JMP ERR1          /ERASE TAPE
1563    1430  7455          JMP ERR2          /ERASE INSTRUMENT
1564    1431  7463          JMP ERR3          /ERASE SPECTRUM
1565    1432  7135          JMP STRTC         /STOP, GO TO CHOICE OPTION
1566                        /PROCESS ERROR DATA
1567    1433  7056  STERR,  JMP B4INTB        /INIT ANS BUFF
1570    1434  1020          LDA I
1571    1435  0560          DSP4P1
1572    1436  6747          JMP HELPDS
1573    1437  0066          SET I 6
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1574    1440  1035          SHOW3
1575    1441  7014          JMP LEGAL
1576    1442  6764          JMP MNLNER       /ERROR IN CHOICE, TRY AGAIN
1577                        /CHOICE IN AC
1600    1443  1120          ADA I
1601    1444  7426          ERTABL+6000
1602    1445  4006          STC 6
1603    1446  6006          JMP 6   /JUMP TO CHOICE 1=4.
1604                        /ERASE TAPE
1605    1447  7501  ERR1,   JMP ERRNW0       /CLR BLK0 IN B7Q1
1606    1450  6131          JMP INTP
1607    1451  0011          CLR
1610    1452  6053          JMP DOSUB
1611    1453  6173          JMP WTTAPE       /WRITE IT OUT
1612    1454  7127          JMP STRTB        /GO TO REREAD LIFE TAPE
1613                        /ERASE INDEX
1614    1455  0016  ERR2,   NOP      /SAVE INST NAME
1615    1456  7161          JMP IPCSUB
1616    1457  6242          JMP ER0
1617    1460  6261          JMP ER2 /MATCH, DELETE INST
1620    1461  0016          NOP
1621    1462  7127  ERR2A,  JMP STRTB        /NO MATCH, RETURN
1622                        /DELETE INDIVIDUAL SPECTRA
1623    1463  7353  ERR3,   JMP SINGL        /GET INST, SPEC STORED
1624    1464  6415          JMP DELSP        /DELETE SPECTRUM
1625                  /WRITE OUT BLK 0
1626    1465  6053          JMP DOSUB
1627    1466  7566          JMP WTUN0
1630    1467  7127          JMP STRTB        /RETURN
1631                        /START DIAL
1632    1470  0002  STDIAL,  PDP
1633                        PMODE
1634    1471  5440          JMP I Z DIAL77
1635                        LMODE
1636    1472  1020  NOMORE,  LDA I            /MAY BE UNUSED
1637    1473  6165          6165  /ERR CD 5
1640    1474  6721          JMP X3
1641                  /PTR 1 SET,PRNT LINE
1642    1475  6053  LBPR4,   JMP DOSUB
1643    1476  6112          JMP PRNTLN       /PRINT MATCH SPECTRUM LINE
1644    1477  0606          LIF 6
1645    1500  7114          JMP LBPRX        /GET NXT SPECTRA
1646    1501  1000  ERRNW0,  LDA              /ASK IF SURE
1647    1502  0000          0
1650    1503  5514          STC ERRNW9
1651    1504  1020  ERRNW1,  LDA I
1652    1505  1674          DSPNEW
1653    1506  6053          JMP DOSUB
1654    1507  7237          JMP GETANS       /GET Y OR N IN BUFB4
1655    1510  7152          JMP SETSHV
1656    1511  1325          LDH I 5
1657    1512  1420          SHD I
1660    1513  3100          3100
1661    1514  6000  ERRNW9,  RETURN          /IF Y GO ON
1662    1515  1420          SHD I
1663    1516  1600          1600
1664    1517  7433          JMP STERR        /IF N BACK TO ERASE DISP
1665    1520  7504          JMP ERRNW1       /ELSE RESHOW SURE
1666    1521  4040          4040
1667    1522  4040  TY07,   4040
1670    1523  2320
1670    1524  0503
1670    1525  2422
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1670      1526  2515
1670      1527  4072
1670                          TEXT QSPECTRUM :Q
1671      1530  4040          4040
1672      1531  4040          4040
1673      1532  4040  TY07A,  4040     /ANSWER BUFFER
1674      1533  4040          4040
1675      1534  4040          4040
1676      1535  4040          4040
1677      1536  4040          4040
1700      1537  4040          4040
1701      1540  4040          4040
1702      1541  4040          4040
1703      1542  0000          0000
1704      1543  4040  TY08,   4040
1705      1544  4040          4040
1706      1545  1116
1706      1546  2324
1706      1547  2225
1706      1550  1505
1706      1551  1624
1706      1552  4072
1706                          TEXT QINSTRUMENT :Q
1707      1553  4040          4040
1710      1554  4040  TY08A,  4040     /ANSWER BUFFER - USE AS FIRST LINE OF INDEX PRINTOUT
1711      1555  4040          4040
1712      1556  0000          0000
1713      1557  4040  TY09,   4040
1714      1560  4040          4040
1715      1561  2013          2013           /PK
1716      1562  4040          4040
1717      1563  4040          4040
1720      1564  3040
1720      1565  2601
1720      1566  1440
1720                          TEXT QX VAL Q
1721      1567  4040          4040
1722      1570  0000  TY09A,  0        /0 HERE IF ONE PARA
1723      1571  4040          4040
1724      1572  3140
1724      1573  2601
1724      1574  1440
1724                          TEXT QY VAL Q
1725      1575  4040          4040
1726      1576  0000  TY09B,  0        /0 HERE IF TWO PARA
1727      1577  4040          4040
1730      1600  2001
1730      1601  2201
1730      1602  4063
1730                          TEXT QPARA 3Q
1731      1603  0000  TY09C,  0000
1732      1604  4040  TYANS,  4040
1733      1605  4040          4040
1734      1606  4040  TYAN1,  4040
1735      1607  4040  TYAN1A, 4040     /SPECTRUM NAME
1736      1610  4040          4040
1737      1611  4040          4040
1740      1612  4040          4040
1741      1613  4040          4040
1742      1614  4040          4040
1743      1615  4040          4040
1744      1616  4040          4040
1745      1617  4040          4040
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1746      1620  4040          4040
1747      1621  0000  TYAN1F, 0000    /PEAK PTS
1750      1622  4040          4040
1751      1623  4040  TYAN1B, 4040    /0 IF UNKNOWN LINE
1752      1624  4040          4040
1753      1625  4040          4040
1754      1626  4040          4040
1755      1627  4040  TYAN1C, 4040    /MISSES
1756      1630  0000          0000
1757      1631  0000          0000
1760      1632  4040  TYAN3,  4040
1761      1633  4040          4040
1762      1634  4040  TYANA,  4040    /INSTRUMENT NAME
1763      1635  4040          4040
1764      1636  4040          4040
1765      1637  4040          4040
1766      1640  4040          4040
1767      1641  4040          4040
1770      1642  4040          4040
1771      1643  0000  TYAN3B, 0       /SPECTRUM NAME
1772      1644  0000          0
1773      1645  0000          0
1774      1646  0000          0
1775      1647  0000          0
1776      1650  0000          0
1777      1651  0000          0
2000      1652  0000          0
2001      1653  4040          4040
2002      1654  4040          4040
2003      1655  4040          4040
2004      1656  0000  TYAN3C, 0       /TAPE NAME
2005      1657  0000          0
2006      1660  4040          4040
2007      1661  4040          4040
2010      1662  4040          4040
2011      1663  4040          4040
2012      1664  0000  TYAN3D, 0       /ST BLK
2013      1665  0040          40
2014      1666  4040          4040
2015      1667  4040          4040
2016      1670  4040          4040
2017      1671  0000  TYAN3E, 0       /PTS - 4 DIGITS
2020      1672  0000          0
2021      1673  0000          0       /END
2022      1674  4040  TYAN4,  4040
2023      1675  0000  TYAN4A, 0       /PEAK
2024      1676  0000          0
2025      1677  4040          4040
2026      1700  4040          4040
2027      1701  4000          4000    /PARA1 - 3 DIGITS
2030      1702  0000          0
2031      1703  4000  TYAN4B, 4000    /0 IF ONLY 1 PARA
2032      1704  4040          4040
2033      1705  4040          4040
2034      1706  4040          4040
2035      1707  4000          4000    /PARA 2 - 3 DIGITS
2036      1710  0000          0
2037      1711  4040  TYAN4C, 4040    /0 IF ONLY 2 PARA
2040      1712  4040          4040
2041      1713  4040          4040
2042      1714  4000          4000    /PARA 3 - 3 DIGITS
2043      1715  0000          0
2044      1716  0000  TYAN4D, 0               /END OF LINE
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2045    1717  4040  TYO6,   4040
2046    1720  1116
2046    1721  2324
2046    1722  2225
2046    1723  1505
2046    1724  1624
2046                        TEXT QINSTRUMENTQ
2047    1725  4040          4040
2050    1726  4040          4040
2051    1727  2320
2051    1730  0503
2051    1731  2422
2051    1732  2515
2051    1733  4016
2051    1734  0115
2051                        TEXT QSPECTRUM NAMQ
2052    1735  0540          0540
2053    1736  4040          4040
2054    1737  4040          4040
2055    1740  4040          4040
2056    1741  2401
2056    1742  2005
2056    1743  4016
2056    1744  0115
2056                        TEXT QTAPE NAMQ
2057    1745  0540          0540
2060    1746  4040          4040
2061    1747  2324
2061    1750  0122
2061    1751  2411
2061    1752  1607
2061    1753  4002
2061    1754  1413
2061                        TEXT QSTARTING BLKQ
2062    1755  4040          4040
2063    1756  2013
2063    1757  2300
2063                        TEXT QPKSQ
2064    1760  0000          0000
2065                        CHAIN "LIFE B6"
```

```
0000                    *20
0001                            /SUBROUTINE FIELD, DISPLAY IN LAST QRT
0002                    SEGMNT  6
0003                    *20
0004                            /B6 SUBROUTINE CALLER CALLING BANK IN DATA FIELD
0005                            RETURN=6000
0006        0020  4037  B6CALL, STC JMPSUB
0007        0021  0005          QAC
0010        0022  0452          LZE             /IS L=0
0011        0023  2051          ADD P4000       /NO,SET BIT 0
0012        0024  4036          STC ACVALZ      /SAVE AC
0013        0025  0500          IOB
0014                            PMODE
0015        4026  6214          RDF     /GET DATA FIELD SET UP RETURN INSTR FIELD
0016                            LMODE
0017        0027  0301          ROR 1
0020        0030  1120          ADA I
0021        0031  0600          LIF
0022        0032  4040          STC LIFX
0023        0033  2000          ADD 0
0024        0034  4041          STC     BXRET
0025        0035  1020          LDA I
=
```

```
0026    0036  0000  ACVALZ, 0               /RESTORE AC
0027    0037  0000  JMPSUB, 0
0030    0040  0000  LIFX,   0       /RETURN, EXIT
0031    0041  0000  BXRET,  0
0032                      /CONSTANTS, TEMP STOR, REF, FLAGS
0033    0042  0212  LF,     212
0034    0043  0215  CR,     215
0035    0044  0100  P100,   100
0036    0045  4442  JMQR,   4400+PREAD
0037    0046  4443  JMQW,   4400+PWRITE
0040    0047  0000  PRMTRS, 0       /PARA IN CORR TAPE
0041    0050  0000  TEMP1,  0       /DECML
0042    0051  4000  P4000,  4000
0043    0052  0002  PLUS2,  2
0044    0053  0003  P3,     3
0045    0054  0001  P1,     1
0046    0055  4040  SPSP,   4040
0047    0056  0000  NUMPTS, 0       /NUMPTS IN PRINT SPECTROM
0050    0057  5400  KIDORA, IDORA
0051    0060  5544  KRDORA, RDORA
0052                      /DORETTE CALLER
0053    0061  0046  INTDRA, SET 6
0054    0062  0000          0
0055    0063  0002          PDP
0056                        PMODE
0057    4064  6032          KCC     /CLEAR KEYBOARD FLAG
0060    4065  4657          JMS I KIDORA
0061    4066  0000  DRSTRT, 0
0062    4067  2000          2000    /BEG CORE LOC
0063    4070  0000          0
0064    4071  0000  DREND,  0       /END CORE LOC
0065    4072  0000  YOFFST, 0
0066    4073  0341  YSCALE, 341             /SCR 1
0067    4074  5300          JMP .+4
0070                        LMODE
0071    0075  0046  CLLDRA, SET 6
0072    0076  0000          0
0073    0077  0002          PDP
0074                        PMODE
0075    4100  6032          KCC
0076    4101  4660          JMS I KRDORA    /REFRESH DORA
0077    4102  6031          KSF
0100    4103  5301          JMP .-2 /IF NO NEW CHAR, REFRESH DORA
0101    4104  6036          KRB     /CHAR IN AC, KEYBOARD FLAG CLEAR
0102    4105  6041          TSF             /PRINTER READY ?
0103    4106  5305          JMP .-1
0104    4107  6046          TLS             /OUTPUT CHAR
0105    4110  6141          LINC
0106                        LMODE
0107    0111  6006          JMP 6   /RETURN
0110                      /OUTPUT LINE OF DATA TO TTY:  PTR1 AT ST-1
0111    0112  1000  PRNTLN, LDA
0112    0113  0000          0
0113    0114  4126          STC PRNTPC      /SAVE RET
0114    0115  1321  PRNTLA, LDH I 1 /GET NEXT CHARACTER
0115    0116  0450          AZE
0116    0117  6127          JMP PRNTCH
0117    0120  2043          ADD CR  /IF 0, PRINT LF,CR
0120    0121  6137          JMP GOPRT
0121    0122  0011          CLR
0122    0123  2042          ADD LF
0123    0124  6137          JMP GOPRT
0124    0125  0011          CLR
-
```

```
0125    0126  6000  PRNTPC, RETURN
0126                      /TURN 6 BIT DATA INTO 12 BIT
0127    0127  1120  PRNTCH, ADA I
0130    0130  7740          7740
0131    0131  0451          APO
0132    0132  2044          ADD P100        /LESS THAN 40, ADD 300
0133    0133  1120          ADA I
0134    0134  0237          237     /ELSE ADD 200
0135    0135  6137          JMP GOPRT       /PROCESS
0136    0136  6115          JMP PRNTLA
0137                      /PRINT A CHARACTER IN AC
0140    0137  0500  GOPRT,  IOB
0141    0140  6046          GATLS   /TLS
0142    0141  1000          LDA
0143    0142  0000          0
0144    0143  4147          STC .+4
0145    0144  0500          IOB
0146    0145  6041          GATSF   /TSF
0147    0146  6144          JMP .-2
0150    0147  6000          RETURN
0151                      /SUBROUTINE TO READ, BLOCK TAPE IN AC
0152                      /INTO B7Q1, FROM PARA IN B4
0153    0150  4172  RDTAPE, STC RWTAPE
0154    0151  2045          ADD JMQR        /TAPE READ
0155    0152  4164          STC TAPE21
0156    0153  2000          ADD 0
0157    0154  4171          STC RDTPRT
0160    0155  0644  TAPE2,  LDF 4
0161    0156  1000          LDA
0162    0157  0172          RWTAPE
0163    0160  1040          STA
0164    0161  2075          PARA+2002
0165    0162  0002          PDP
0166                      PMODE
0167    4163  6211          CDF 10
0170    4164  4442  TAPE21, JMS I PREAD
0171    4165  0073          PARA
0172    4166  6141          LINC
0173                      LMODE
0174    0167  0647          LDF 7
0175    0170  0011          CLR
0176    0171  6000  RDTPRT, RETURN
0177    0172  0000  RWTAPE, 0       /STORE PARA 2
0200                      /SUBROUTINE TO WRITE 1 BLK TAPE IN AC
0201                      /INTO B7 QV FROM PARA IN B4
0202    0173  4172  WTTAPE, STC RWTAPE
0203    0174  2046          ADD JMQW        /TAPE WRITE
0204    0175  4164          STC TAPE21
0205    0176  2000          ADD 0
0206    0177  4171          STC RDTPRT
0207    0200  6155          JMP TAPE2
0210                      /SUBROUTINE TO PRINT LF,CR
0211                      /LINES IN AC
0212    0201  0017  PRLF,   COM
0213    0202  4001          STC 1
0214    0203  2000          ADD 0
0215    0204  4216          STC PRLFRT
0216    0205  0011  PRLFA,  CLR
0217    0206  2043          ADD CR
0220    0207  6137          JMP GOPRT
0221    0210  0221          XSK I 1
0222    0211  6205          JMP PRLFA
0223    0212  0011          CLR
```

```
0224    0213  2042          ADD LF
0225    0214  6137          JMP GOPRT
0226    0215  0011          CLR
0227    0216  6000  PRLFRT,  RETURN
0230                        /SUBSUB TO STORE- WDS IN PTR15
0231                        /FROM DATA FIELD IN PTR 16 LDF 7
0232                        /TO DATA FIELD -1 IN PTR 17 LDF 1
0233                        /IF PAST BLOCK, READ IN NEW BLK
0234    0217  1000  TRNSMD, LDA             /SET UP TRNXFER FROM B4
0235    0220  0000          0
0236    0221  4227          STC TRNSMT
0237    0222  2344          ADD Z7          /LDF 4
0240    0223  4235          STC TRNMD1
0241    0224  6230          JMP TRANS       /DO TRANSFER
0242    0225  2271          ADD TRNMD2
0243    0226  4235          STC TRNMD1      /RESTORE LDF5
0244    0227  6000  TRNSMT, RETURN
0245    0230  1000  TRANS,  LDA
0246    0231  0000          0
0247    0232  4243          STC TRNSRT
0250    0233  0647  TRANSA, LDF 7   /GET NEXT LIFE BLOCK WD
0251    0234  1016          LDA 16
0252    0235  0645  TRNMD1, LDF 5
0253    0236  1077          STA I 17
0254    0237  6244          JMP TRANSB
0255    0240  0235          XSK I 15        /HAS BLOCK ENDED
0256    0241  6234          JMP TRANSA+1    /YES, INIT, READ NEXT
0257    0242  0011          CLR
0260    0243  6000  TRNSRT, RETURN
0261                        /PRT 16 MUST BE ADVANCED,  READ IN NEW BLOCK IF NECC,
0262                        / PTR 16 IS LIFE BLOCK PTR B7Q1
0263    0244  1000  TRANSB, LDA
0264    0245  0000          0
0265    0246  4266          STC TRABRT
0266    0247  0647          LDF 7
0267    0250  0236          XSK I 16
0270    0251  2016          ADD 16
0271    0252  1460          SAE I
0272    0253  2777          2777
0273    0254  6265          JMP TRABRT+1
0274                  /WRITE OLD BLK
0275    0255  0644          LDF 4
0276    0256  1000          LDA
0277    0257  2075          PARA+2002
0300    0260  6173          JMP WTTAPE
0301    0261  1016          LDA 16  /READ NEW BLOCK
0302    0262  6150          JMP RDTAPE
0303    0263  0076          SET I 16
0304    0264  2400          2400
0305    0265  1016          LDA 16
0306    0266  6000  TRABRT, RETURN
0307                        /SUBROUTINE TO PRINT INDEX SPECTRA
0310                        /PTRS 10,11,12-1,15,16,17 USED IN SUBSUB
0311                        /B0 ASSUMED IN B7Q0
0312    0267  0050  TYA,     SET 10
0313    0270  0000          0
0314    0271  0645  TRNMD2, LDF 5           /CNST IN TRNMD
0315    0272  1020          LDA I
0316    0273  0003          3
0317    0274  6201          JMP PRLF        /PRINT 3 LF
0320    0275  0061          SET I 1
0321    0276  6751          TYO5+5777
0322    0277  6112          JMP PRNTLN      /PRINT INDEX
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0323    0300  2052          ADD PLUS2
0324    0301  6201          JMP PRLF        /PRINT 2 LF
0325    0302  0644          LDF 4
0326    0303  0061          SET I 1
0327    0304  7716          TY06+5777
0330    0305  6112          JMP PRNTLN      /PRINT INST, SPEC, TP, STBLK, PTS
0331    0306  2054          ADD P1
0332    0307  6201          JMP PRLF        /PRINT 1 LF
0333                        /START OF DATA PROC FOR SUB COLUMNS
0334    0310  0647  TYA1,    LDF 7
0335    0311  0071          SET I 11        /PTR 11 IS INDEX PTR-AT FRST BLK  OF LAST INST
0336    0312  2007          2007
0337    0313  1031  TYA2,    LDA I 11
0340    0314  0450          AŻE
0341    0315  6323          JMP TYA3
0342    0316  0471          APO I
0343    0317  6010          JMP 10  /IF NEXT ENTRY=0, PRINTOUT OVER
0344    0320  0231          XSK I 11
0345    0321  0231          XSK I 11
0346    0322  6313          JMP TYA2        /IF ENTRY=7777, DELETED, SKIP
0347    0323  0056  TYA3,    SET 16  /SET UP INST DATA FIELD PTR
0350    0324  0011          11
0351    0325  0075          SET I 15        /4 CHAR=2WDS
0352    0326  7775          7775
0353    0327  0077          SET I 17
0354    0330  3633          TYANA+1777
0355    0331  6217          JMP TRNSMD      /TRNS INTO INST LN
0356                        /GET SPECTUM DATA
0357    0332  0647          LDF 7
0360    0333  0231          XSK I 11
0361    0334  1031          LDA I 11        /FIRST BLK  IN AC
0362    0335  0242          ROL 2
0363    0336  1560          BCL I
0364    0337  7774          7774
0365    0340  4047          STC PRMTRS      /GET  PARA
0366    0341  1011          LDA 11
0367    0342  1560          BCL I   /CLEAR PARA FROM TAPE BITS
0370    0343  6000          6000
0371    0344  0644  Ż7,      LDF 4
0372    0345  1040          STA
0373    0346  2103          FSTBLK+2000
0374    0347  6150          JMP ROTAPE      /READ IN FIRST DATA BLOCK
0375                        /GET SPECTRUM LINE
0376    0350  6616          JMP SET16       /INITIALIŻE, STORE
0377    0351  0236          XSK I 16
0400    0352  6357          JMP TYA4A
0401    0353  6244  TYA4,    JMP TRANSB      /START OF SPEC DATA
0402    0354  0470          AŻE I
0403    0355  6313          JMP TYA2        /IF=0, GET NEW INST
0404    0356  6620          JMP SET16+2     /NO, PROC NEW ANS
0405    0357  6217  TYA4A,   JMP TRNSMD      /TRANS SPEC DATA
0406    0360  1016          LDA 16          /FST TAPE WD,0 IF DEL
0407    0361  0450          AŻE
0410    0362  6404          JMP TYAŻ
0411    0363  6244          JMP TRANSB      /DELETED SPECTRA, GET PAST
0412    0364  6244          JMP TRANSB
0413    0365  6244          JMP TRANSB      /TO NUMPTS
0414    0366  6402          JMP TYAX        /TO START OF NEXT SPECTRUM
0415    0367  6244  TYAY,    JMP TRANSB      /GET STBLK
0416    0370  0604          LIF 4
0417    0371  7400          JMP TYAY1       /GET OCTAL
0420    0372  6244  TYAY5,   JMP TRANSB      /GET PTS
0421    0373  0077          SET I 17
```

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0422    0374  3670          TYAN3E+1777
0423    0375  0644          LDF 4
0424    0376  6430          JMP DECML       /PROCESS INTO 4 DIG, COMPL LINE
0425    0377  0061          SET I 1
0426    0400  7631          TYAN3+5777
0427    0401  6112          JMP PRNTLN      /OUTPUT SPECTRUM LINE
0430    0402  6635  TYAX,   JMP ADV16       /MOVE PTR 16 FROM PARA TO FIRST
0431    0403  6353          JMP TYA4
0432                        /GET PAST TAPE NAME, STORE
0433    0404  0644  TYAŻ,   LDF 4
0434    0405  1040          STA
0435    0406  3656          TYAN3C+2000
0436    0407  6244          JMP TRANSB
0437    0410  0644          LDF 4
0440    0411  1040          STA
0441    0412  3657          TYAN3C+2001
0442    0413  6367          JMP TYAY
0443                        /SUBROUTINE STORES WD IN AC AS 4 DEC ASC DIGITS
0444                        /IN BUFF LOCATED BY PTR 17.  PTRS 13,14,2
0445    0414  0017  DECMRM, COM
0446    0415  4050          STC TEMP1       /GET + VAL
0447    0416  1020          LDA I
0450    0417  0055          55
0451    0420  1357  V4,     STH 17
0452    0421  0011          CLR
0453    0422  2050          ADD TEMP1       /RESTORE AC
0454    0423  6446          JMP DECMLA
0455    0424  6027  M1THS,  6027
0456    0425  7633  M100,   7633
0457    0426  7765  M10,    7765
0460    0427  7776  M1,     7776
0461    0430  4050  DECML,  STC TEMP1
0462    0431  2000          ADD 0
0463    0432  4463          STC DECMRT
0464    0433  4014          STC 14  /CLEAR DIGIT VALUE
0465    0434  0073          SET I 13
0466    0435  7773          7773    /SET DIGIT CNT
0467    0436  0072          SET I 12
0470    0437  0424          M1THS           /INIT PLACE PTR
0471    0440  2050          ADD TEMP1       /RESTORE AC
0472    0441  0451          APO             /IS VAL =
0473    0442  6414          JMP DECMRM
0474    0443  1020          LDA I
0475    0444  0040          40
0476    0445  6420          JMP V4          /NO STORE SP
0477    0446  1112  DECMLA, ADA 12
0500    0447  0470          AŻE I
0501    0450  6455          JMP DECMLB      /IF NEXT ADD 0, PROCESS
0502    0451  0451          APO
0503    0452  6466          JMP DECMLC      /IF NEG, RESET
0504    0453  0234          XSK I 14        /IF +, BUMP DIGIT VALUE
0505    0454  6446          JMP DECMLA
0506    0455  0234  DECMLB, XSK I 14        /0 SEEN,  TERMINATE
0507    0456  2014          ADD 14
0510    0457  6504          JMP M1S /ADD VALUE TO 60, STORE IN PTR 17
0511    0460  0060          60
0512    0461  0233          XSK I 13        /IS IT LAST DIGIT
0513    0462  0456          SKP
0514    0463  6000  DECMRT, RETURN
0515    0464  4014          STC 14  /RECLEAR DIGIT CNT
0516    0465  6456          JMP DECMLB+1    /FILL WITH 0
0517    0466  0017  DECMLC, COM     /NEG, RESTORE VALUE
0520    0467  1112          ADA 12
```

```
0521    0470  0017          COM
0522    0471  4050          STC TEMP1
0523    0472  2014          ADD 14
0524    0473  6504          JMP M1S /WRITE IT
0525    0474  0060          60
0526    0475  4014          STC 14
0527    0476  2050          ADD TEMP1
0530    0477  0232          XSK I 12        /SET TO NEXT DIGIT
0531    0500  0233          XSK I 13        /OVER
0532    0501  6446          JMP DECMLA      /NO, GET MORE
0533    0502  0011          CLR
0534    0503  6463          JMP DECMRT      /YES, RETURN
0535                        /SUBROUTINE PUTS 6 BIT ASC IN HALF WD OF PTR 17
0536    0504  4514  M1S,     STC M1A
0537    0505  2000          ADD 0
0540    0506  1560          BCL I
0541    0507  6000          6000
0542    0510  4002          STC 2   /PTR 2 HAS NEXT LOC
0543    0511  0220          XSK I 0
0544    0512  1002          LDA 2
0545    0513  1120          ADA I
0546    0514  0000  M1A,     0       /ADDED TO AC
0547    0515  1377          STH I 17        /STORE HALF WD
0550    0516  0011          CLR
0551    0517  6000          JMP 0
0552                        EJECT
```

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0553                                /SUBROUTINE TO PRINT SPECTRUM POINTS HEADER, SET COMPUTE LINE
0554                                /PTRS 10,11,12=1,15,16,17 USED IN SUBSUB
0555                                /B0 ASSUMED IN B7Q0
0556                                /SPECTRUM NAME, INSTRUMENT ALREADY STORED FROM DSP
0557                                /PRMTRS CONTAINS  PARA
0560    0520  4526  X12,    STC X32
0561    0521  1031          LDA I 11
0562    0522  4524          STC X22         /SAVE LOC
0563    0523  0072          SET I 12
0564    0524  0000  X22,    0               /12 REACHES BUF
0565    0525  1020          LDA I
0566    0526  0000  X32,    0
0567    0527  1052          STA 12
0570    0530  6000          JMP 0
0571    0531  0050  TYB,    SET 10
0572    0532  0000          0
0573    0533  0644          LDF 4
0574    0534  1020          LDA I
0575    0535  0003          3
0576    0536  6201          JMP PRLF        /PRINT 3 LF
0577    0537  0061          SET I 1
0600    0540  7521          TYO7+5777
0601    0541  6112          JMP PRNTLN      /PRINT SPECTRUM
0602    0542  2052          ADD PLUS2
0603    0543  6201          JMP PRLF        /PRINT 2 LF
0604    0544  0061          SET I 1
0605    0545  7542          TYO8+5777       /PRINT INSTRUMENT
0606    0546  6112          JMP PRNTLN
0607    0547  2052          ADD PLUS2
0610    0550  6201          JMP PRLF        /PRINT 2 LF
0611    0551  2047          ADD PRMTRS
0612    0552  0017          COM
0613    0553  4001          STC 1   /SET 1=:PARA
0614    0554  0071          SET I 11
0615    0555  0572          TYB1=1
0616    0556  0221  TYB2,    XSK I 1 /IS THERE MORE PARA
0617    0557  2055          ADD SPSP        /IF YES, INSERT SPACES
0620    0560  6520          JMP X12
0621    0561  6520          JMP X12         /NO,STORE TERM 0
0622    0562  0011          CLR
0623    0563  0201          XSK 1   /IS IT OVER
0624    0564  6556          JMP TYB2        /NO.  STORE MORE 40S
0625                        /YES PRINT LINE
0626    0565  0061          SET I 1
0627    0566  7556          TYO9+5777
0630    0567  6112          JMP PRNTLN
0631    0570  2052          ADD PLUS2
0632    0571  6201          JMP PRLF        /PRINT 2 LF
0633    0572  6010          JMP 10  /RETURN
0634                        /PARAMETER COUNT TABLE
0635    0573  3570  TYB1,    TYO9A+2000
0636    0574  3703          TYAN4B+2000
0637    0575  3576          TYO9B+2000
0640    0576  3711          TYAN4C+2000
0641    0577  3603          TYO9C+2000
0642    0600  3716          TYAN4D+2000
0643                        /SUBSUB TO COMPARE BUFFERS-1 IN PTR 6,7
0644                        /WDS IN PTR 10
0645                        /IF YES, 0, IF NO 4000
0646    0601  1000  COMPR,   LDA
0647    0602  0000          0
0650    0603  4612          STC     COMPRT  /SAVE RET
0651    0604  1026  COMPR1,  LDA I 6 /COMPARE
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0652    0605  1467          SAE I 7
0653    0606  6613          JMP COMPR2
0654    0607  0230          XSK I 10          /YES, END
0655    0610  6604          JMP COMPR1
0656    0611  0011          CLR      /YES, OUT WITH 0 IN AC
0657    0612  6000  COMPRT, RETURN
0660    0613  1020  COMPR2, LDA I    /NO COMPARE
0661    0614  7777          7777
0662    0615  6612          JMP COMPRT        /EXIT, 4000 IN AC
0663    0616  0076  SET16,  SET I 16          /SET UP FOR SEARCH LIFB DATA PTR 16-SUB
0664    0617  2401          2401
0665    0620  0647          LDF 7
0666    0621  0077          SET I 17
0667    0622  3642          TYAN3B+1777
0670    0623  0075          SET I 15
0671    0624  7767          7767
0672    0625  6000          JMP 0
0673    0626  4015  MV16,   STC 15  /MOVE 16  =LOC IN AC
0674    0627  2000          ADD 0
0675    0630  4634          STC MVRT
0676    0631  6244  MV16A,  JMP TRANSB
0677    0632  0235          XSK I 15
0700    0633  6631          JMP MV16A
0701    0634  6000  MVRT,   RETURN
0702                        /SUBROUTINE TO CALCULATE PTS IN PTR 16
0703                        /X PARAMETERS IN PRMTRS
0704                        /AND ADVANCE PTR 16 THAT MANY
0705                        /PTR 16 AT NUM PTS,BNDS IN FIRST WD OF NEXT SPECTRUM
0706    0635  0647  ADV16,  LDF 7
0707    0636  1000          LDA
0710    0637  0047          PRMTRS
0711    0640  0017          COM
0712    0641  4015          STC 15  /SET 15 TO -PAR
0713    0642  2000          ADD 0
0714    0643  4654          STC ADVRT         /SAVE RET
0715    0644  1116  ADV16A, ADA 16  /GET PTS X PARA
0716    0645  0235          XSK I 15
0717    0646  6644          JMP ADV16A
0720    0647  0017          COM
0721    0650  4015          STC 15  /STORE NEG IN 15
0722    0651  6244  ADV16B, JMP      TRANSB  /MOVE PTR 16 PAST PARA
0723    0652  0235          XSK I 15
0724    0653  6651          JMP ADV16B
0725    0654  6000  ADVRT,   RETURN
0726                        /B6 PART OF B4 SUB FST BLK, AC CONT INIT BLK
0727    0655  6661  TYC1,    JMP TYCSB         /FIND SPECTRA
0730    0656  6735          JMP TYCNT         /CONTINUE
0731    0657  0604          LIF 4   /NO MATCH, EXIT
0732    0660  6005          JMP 5
0733                        /SUBROUTINE TO FIND SPECTRUM
0734                        /PTR 16 WILL BE AT NUMPTS, INIT BLK IN AC
0735                        /SPECTRUM NAME IN TY07A IN B5
0736                        /IF NO MATCH, BUMP RETURN. PTRS6,7,10
0737    0661  4665  TYCSB,  STC TYCSB1
0740    0662  2000          ADD 0
0741    0663  4726          STC RETTY         /SAVE RET
0742    0664  1020          LDA I
0743    0665  0000  TYCSB1, 0         /INIT BLK NUM
0744    0666  6150          JMP RDTAPE        /READ IN LIFE TAPE BLOCK
0745    0667  6616          JMP SET16         /SET UP FOR SPECTRUM READ
0746    0670  6244          JMP TRANSB        /PUT SPECTRUM NAME IN B4 TYAN3B
0747    0671  6217  TYC1A,  JMP TRNSMD
0750                        /PTR16 STILL AT LAST SPECTRUM LOC
=
```

```
0751                                /SET UP COMPARE
0752      0672  1016                LDA 16          /IS SPEC DEL
0753      0673  0470                AZE I
0754      0674  6711                JMP TYC1N
0755      0675  0644    TYC1M,      LDF 4
0756      0676  0066                SET I 6
0757      0677  3642                TYAN3B+1777
0760      0700  0067                SET I 7
0761      0701  3531                TY07A+1777
0762      0702  0070                SET I 10
0763      0703  7767                7767
0764      0704  6601                JMP COMPR       /DO COMPARE
0765      0705  0451                APO             /IF + AC MATCH
0766                          /ONLY NOW PRINT HEADER
0767      0706  6711                JMP TYC1N
0770      0707  6531    TYC1X,      JMP TYB         /DO PRINT OF HEAD
0771      0710  6727                JMP TYC2
0772                                /NO MATCH GET NEXT SPECTRA, TRY AGAIN
0773                                /FIRST MOVE PTR 16 TO START OF NEXT SPECTRA FROM END OF THIS
0774      0711  1020    TYC1N,      LDA I
0775      0712  7774                7774
0776      0713  6626                JMP MV16        /GET TO NUM PTS LOCATION WITH PTR 16
0777      0714  6635                JMP ADV16       /GET TO LAST LOCATION OF OLD SPECTRA
1000      0715  6244                JMP TRANSB
1001      0716  0470                AZE I
1002      0717  6722                JMP TYC1B
1003      0720  6620                JMP SET16+2     /IF MORE SPECTRA, PROCESS
1004      0721  6671                JMP TYC1A
1005                                /IF NO MORE SPECTRA
1006      0722  1020    TYC1B,      LDA I
1007      0723  0001                1       /BUMP RET
1010      0724  2726                ADD RETTY
1011      0725  4726                STC RETTY
1012      0726  6000    RETTY,      RETURN
1013                                /MATCH, PRINT VALUES, PTR 16 AT FRST WD OF TSTNAME
1014      0727  0016    TYC2,       NOP     /RESET BY DELSPEC ROUTINE
1015      0730  1020                LDA I
1016      0731  7774                7774
1017      0732  6626                JMP MV16        /GET TO NUM PTS
1020      0733  4056                STC NUMPTS      /SAVE
1021      0734  6726                JMP RETTY       /RETURN
1022                                /PRINT SUB CONTINUED
1023      0735  4011    TYCNT,      STC 11  /INIT LINE NUM
1024      0736  2056    TYC1C,      ADD     NUMPTS
1025      0737  0470                AZE I
1026      0740  7005                JMP V1          /IF NO PTS,NO PRINT
1027      0741  0017                COM
1030      0742  4010                STC 10  /SAVE - NUMPTS
1031      0743  2047    TYC1D,      ADD PRMTRS
1032      0744  0017                COM
1033      0745  4007                STC 7   /INIT - NUM PARA
1034      0746  0066    TYC1E,      SET I 6
1035      0747  0574                TYB1+1
1036      0750  0231                XSK I 11        /STORE NEW LINE NUM
1037      0751  1000                LDA
1040      0752  0011                11
1041      0753  0077                SET I 17
1042      0754  7674                TYAN4A+5777
1043      0755  0644                LDF 4
1044      0756  6430                JMP DECML
1045      0757  2055                ADD SPSP
1046      0760  1040                STA
1047      0761  3675                TYAN4A+2000  /LINE NUM SHOULD BE ONLY 2 DIG
-
```

```
1050                                    /PROCESS NEXT POINT
1051        0762  1020  TYC1F,  LDA I
1052        0763  3775           3775
1053        0764  1106           ADA 6
1054        0765  4017           STC 17  /SET UP FOR VALUE STORAGE VIA DECML
1055        0766  6244  P2,      JMP TRANSB      /OVERLAY BE DORA PRT ROUT
1056        0767  0644           LDF 4   /GET NEXT PT VAL IN AC
1057        0770  6430           JMP DECML       /CONVERT, STORE
1060        0771  0226           XSK I 6
1061        0772  0226           XSK I 6 /ADVANCE PTR 6 TO NEXT TTB1 PTR
1062        0773  0227           XSK I 7
1063        0774  6762           JMP     TYC1F   /GET NEXT PARAMETER
1064                             /NO MORE PARAMETERS
1065                    /PRINT LINE
1066        0775  0644           LDF 4
1067        0776  2054           ADD P1          /PRNT LF,CR
1070        0777  6201           JMP PRLF
1071        1000  0061           SET I 1
1072        1001  7673           TYAN4+5777
1073        1002  6112           JMP PRNTLN
1074        1003  0230           XSK I 10
1075        1004  6743           JMP TYC1D       /REINITIALIZE, GET NEXT POINT PARA
1076        1005  0604  V1,      LIF 4           /IF ALL PTS DONE, RETURN
1077        1006  6005           JMP 5
1100                             EJECT
```

```
1101                                /SUBROUTINE TO TRANSFER DATA
1102                                /PTR 2 HAS START OF TAKE -1
1103                                /PTR 3 HAS START OF PUT =1
1104                                /PRT 4 HAS =NUM WDS OF TRANS
1105      1007  1000  TRDTA,  LDA
1106      1010  0000        0
1107      1011  5017        STC TRDTAR
1110      1012  1022  TRDTA1, LDA I 2
1111      1013  1063        STA I 3
1112      1014  0011        CLR
1113      1015  0224        XSK I 4
1114      1016  7012        JMP TRDTA1
1115      1017  6000  TRDTAR, RETURN
1116                          /B6 PART OF SUB TO PRINT MATCHING SPECTRA
1117      1020  0645  LBPRB,  LDF 5
1120      1021  1020        LDA I
1121      1022  0003        3
1122      1023  6201        JMP PRLF          /PRINT 3 LF
1123      1024  0061        SET I 1
1124      1025  6704        TY01+5777
1125      1026  6112        JMP PRNTLN        /PRINT UNKNOWN
1126      1027  1040        STA
1127      1030  2745        TY02A+2000        /SET TO 0 TO CUT OFF NUM MISSES
1130      1031  0061        SET I 1
1131      1032  6722        TY04+5777         /PRINT SPEC, NUM PK PTS
1132      1033  6112        JMP PRNTLN
1133      1034  2052        ADD PLUS2
1134      1035  6201        JMP PRLF          /PRINT 2 LF
1135      1036  0644        LDF 4
1136      1037  1040        STA
1137      1040  3623        TYAN1B+2000       /SET TO 0 TO CUT OFF NUM MISSES ANS
1140                          /TRANSFER SPECTRUM NAME, NUM PTS OF UNKNOWN
1141      1041  0062        SET I 2
1142      1042  3531        TY07A+1777
1143      1043  0063        SET I 3
1144      1044  3606        TYAN1A+1777
1145      1045  0064        SET I 4
1146      1046  7767        7767
1147      1047  7007        JMP TRDTA         /TRANSFER SPEC NAME
1150      1050  0640        LDF 0
1151      1051  1000        LDA
1152      1052  2035        PTSUNK+2000
1153      1053  0644        LDF 4
1154      1054  0077        SET I 17
1155      1055  7620        TYAN1F+5777
1156      1056  6430        JMP DECML         /GET  PTS
1157      1057  2055        ADD SPSP
1160      1060  1040        STA
1161      1061  3621        TYAN1F+2000       /IN 2 DIGITS
1162                          /PRINT UNKNOWN LINE
1163      1062  0061        SET I 1
1164      1063  7603        TYANS+5777
1165      1064  6112        JMP PRNTLN
1166      1065  2055        ADD SPSP
1167      1066  0645        LDF 5
1170      1067  1040        STA
1171      1070  2745        TY02A+2000
1172      1071  0644        LDF 4
1173      1072  1040        STA
1174      1073  3623        TYAN1B+2000       /RESTORE IT
1175      1074  1020        LDA I
1176      1075  0003        3
1177      1076  6201        JMP PRLF          /PRINT 3 LF
-
```

```
1200    1077  0645          LDF 5
1201    1100  0061          SET I 1
1202    1101  6713          TYO3+5777
1203    1102  6112          JMP PRNTLN      /PRINT LIB
1204    1103  2052          ADD PLUS2
1205    1104  6201          JMP PRLF        /PRINT 2 LF
1206    1105  0061          SET I 1
1207    1106  6722          TYO4+5777
1210    1107  6112          JMP PRNTLN      /PRINT SPEC, NUM PK PTS, MISSES
1211    1110  2052          ADD PLUS2
1212    1111  6201          JMP PRLF        /PRINT 2 LF
1213    1112  0076          SET I 16
1214    1113  2401          2401
1215    1114  6620  LBPRX,  JMP SET16+2
1216    1115  0077          SET I 17
1217    1116  3606          TYAN1+2000      /INIT FOR SPEC TRANS
1220    1117  6244  LBPRC,  JMP TRANSB      /PTR 16 AT INIT LOC SPEC
1221    1120  0450          AZE     /IS THIS THE END
1222    1121  7124          JMP LBPRD
1223    1122  0604          LIF 4           /YES,EXIT
1224    1123  6370          JMP LBPRRT
1225    1124  6217  LBPRD,  JMP TRNSMD      /NO, TRANSFER DATA
1226    1125  1016          LDA 16
1227    1126  0450          AZE     /IS SPECTRUM DELETED = TAPE NAME=0
1230    1127  7137          JMP LBPRE
1231    1130  6244          JMP TRANSB      /YES, GET PAST IT
1232    1131  6244          JMP TRANSB
1233    1132  6244          JMP TRANSB      /TO PARA PTS
1234    1133  6635          JMP ADV16       /TO LAST SPECTRUM PT
1235    1134  0075          SET I 15
1236    1135  7767          7767
1237    1136  7115          JMP LBPRC=2     /TRY AGAIN
1240                        /SET UP REST OF LINE
1241    1137  6244  LBPRE,  JMP TRANSB
1242    1140  6244          JMP TRANSB
1243    1141  6244          JMP TRANSB
1244    1142  0077          SET I 17
1245    1143  7620          TYAN1F+5777
1246    1144  0644          LDF 4
1247    1145  6430          JMP DECML       /CONVERT NUM PK PTS INTO TEXT BUFF
1250    1146  2055          ADD SP SP
1251    1147  1040          STA
1252    1150  3621          TYAN1F+2000     /WITH 2 DIGITS ONLY
1253    1151  0647          LDF 7
1254    1152  1016          LDA 16
1255    1153  0600          LIF 0   /GO TO B0 PORTION WITH NUM PTS IN AC
1256    1154  7054          JMP LBPRF
1257                        /FIND SPECTRA MATCH, YES, AC=0, STOP LAST SPEC NMLOC
1260                        /NO, AC NOT=0 =BUT, INIT BLK NUM IN AC CALL
1261    1155  4665  FNDSPB, STC TYCSB1      /STORE INIT BLK NUM
1262    1156  2000          ADD 0
1263    1157  5171          STC FNDRT
1264    1160  1020          LDA I
1265    1161  6726          JMP RETTY
1266    1162  4727          STC TYC2        /SET UP FIND SPEC ROUTINE
1267    1163  3173          ADD P16
1270                /AVOID HEADER PRINTOUT
1271    1164  4707          STC TYC1X
1272    1165  6662          JMP TYCSB+1     /GET SPEC PT
1273    1166  7201          JMP FNDSPC
1274    1167  7172          JMP RSTRTY      /NO MATCH, RESTORE
1275    1170  2042          ADD LF
1276    1171  6000  FNDRT,  RETURN  /RETURN, AC+
```

```
1277    1172  1020  RSTRTY, LDA I   /RESTORE FIND SPEC ROUT
1300    1173  0016  P16,    16
1301    1174  4727          STC TYC2
1302    1175  1020          LDA I
1303    1176  6531          JMP TYB
1304    1177  4707          STC TYC1X
1305    1200  6000          JMP 0
1306    1201  7172  FNDSPC, JMP RSTRTY       /MATCH, RESTORE
1307    1202  7171          JMP FNDRT        /0 IN AC
1310                        /SUBROUTINE TO STORE DATA WD IN THE AC IN THE
1311                        /NEXT LOCATION IN A DATA BLK
1312                        /IF NEXT LOC LAST IN BLOCK, GET NEW DATA BLK STORE
1313                        /SET BIT MAP ETC,
1314    1203  0647  STRLF,  LDF 7
1315    1204  1056          STA 16  /STORE VALUE
1316    1205  1000          LDA
1317    1206  0000          0
1320    1207  5233          STC STRTRT
1321    1210  0236          XSK I 16         /IS THIS THE END OF A BLOCK
1322    1211  2016          ADD 16
1323    1212  1460          SAE I
1324    1213  2777          2777
1325    1214  7231          JMP STRTRT-2
1326    1215  0604          LIF 4   /YES
1327    1216  6447          JMP STRLFB       /GET DAD SET, NEW BLK NUM IN AC
1330    1217  1056  STRLFC, STA 16  /STORE NEXT BLOCK
1331    1220  5223          STC STRTPA       /WRITE OUT OLD BLOCK
1332    1221  6174          JMP WTTAPE+1
1333                        /SET NEW BLOCK IN PARA, AND PTR 16
1334    1222  1020          LDA I
1335    1223  0000  STRTPA, 0        /GET BLK NUM IN PARA
1336    1224  0644          LDF 4
1337    1225  1040          STA
1340    1226  2075          PARA+2002
1341    1227  0076          SET I 16
1342    1230  2400          2400    /INITIALIZE PTR 16
1343    1231  0644          LDF 4
1344    1232  0011          CLR
1345    1233  6000  STRTRT, RETURN  /GO BACK, AC CLEAR
1346                        /DORETTE PRINT ROUTINE PTR FAKE
1347    1234  0640  P4,     LDF 0   /BUMP DATA PTR
1350    1235  1036          LDA I 16
1351    1236  6000          JMP 0
1352                        /SUBROUTINE TO GET DISPLAY ANSWER - NEVER CALL FROM B6
1353                        /STORE AC VALUE IN TEXT STRING
1354    1237  0645  GETANS, LDF 5
1355    1240  1040          STA
1356    1241  2021          TXTSTR+2000
1357    1242  1020          LDA I
1360    1243  0040          40
1361    1244  2040          ADD LIFX
1362    1245  5246          STC ,+1
1363    1246  0000          0        /GET BACK ORIGINAL LDF
1364    1247  0605          LIF 5
1365    1250  6020          JMP DSCALL       /DO DSP, GET ANS, COULD BE IN LDF BUFF
1366    1251  0644  GTANS1, LDF 4
1367    1252  0011          CLR      /RETURN TO MAINLINE VIA B6 CALL
1370    1253  6040          JMP LIFX
1371                        /SUBROUTINE TO MULTIPLY MULTMP,
1372                        /ADD CONTENTS OF AC, STORE BACK
1373    1254  0000  MULTMP, 0
1374    1255  0000  MULACV, 0
1375    1256  5255  MULT10, STC MULACV
=
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```
1376    1257  3254          ADD MULTMP
1377    1260  1120          ADA I             /CHECK FOR OVERFLOW
1400    1261  7177          -600              /-3840 IF X10
1401    1262  0471          APO I
1402    1263  7360          JMP MULT8E
1403    1264  0011          CLR
1404    1265  3254          ADD MULTMP
1405    1266  0243          ROL 3
1406    1267  3254          ADD MULTMP
1407    1270  3254          ADD MULTMP
1410    1271  3255          ADD MULACV        /HIGH ORDER X10
1411    1272  5254          STC MULTMP        /+AC, SAVE
1412    1273  6000          JMP 0
1413                        /SUBROUTINE TO MULTIPLY MULTMP BY 8
1414                        /ADD CONTENTS OF AC, STORE BACK
1415                        /IF AC>7, JUMP ILLEGAL
1416    1274  1040  MULT8,   STA
1417    1275  1255          MULACV
1420    1276  1560          BCL I
1421    1277  0007          7
1422    1300  0450          AZE
1423    1301  7360          JMP MULT8E        /8 OR 9, JUMP ILLEGAL
1424    1302  3254          ADD MULTMP
1425    1303  0243          ROL 3
1426    1304  3255          ADD MULACV        /ELSE MULT, ADD AC
1427    1305  5254          STC MULTMP
1430    1306  6000          JMP 0
1431                        /SUBROUTINE TO PROCESS BUFFER WHOOSE LOC
1432                        /IN PTR6, -NUM CHAR+1MAX PN PTR 7
1433                        /AC+01F DEC,+3777 IF OCTAL
1434    1307  0000  BMULT1, 0
1435    1310  5307  BMULT,  STC BMULT1
1436    1311  2000          ADD 0
1437    1312  5357          STC BMULTR        /SAVE RET
1440    1313  5254          STC MULTMP        /INITIALIZE BUFF
1441    1314  0046          SET 6    /COPY PTRS
1442    1315  2006          2006
1443    1316  0047          SET 7
1444    1317  2007          2007
1445    1320  1326  BMULT2, LDH I 6 /GET NUM IN AC, IF NOT NUM, JMP ILLEGAL
1446    1321  1420          SHD I
1447    1322  3400          3400     /IS IT END OF FIELD
1450    1323  7355          JMP BMULTS
1451    1324  1420          SHD I
1452    1325  7400          7400
1453    1326  7355          JMP BMULTS
1454    1327  0470          AZE I
1455    1330  7355          JMP BMULTS        /YES, OUT
1456    1331  1120          ADA I
1457    1332  7706          7706
1460    1333  0471          APO I
1461    1334  7360          JMP MULT8E
1462    1335  1120          ADA I
1463    1336  0011          11
1464    1337  0470          AZE I
1465    1340  0011          CLR
1466    1341  0451          APO
1467    1342  7360          JMP MULT8E
1470    1343  1500          SRO
1471    1344  1307          BMULT1
1472    1345  7274          JMP MULT8         /EITHER X8, BIT SET
1473    1346  1500          SRO
1474    1347  1307          BMULT1
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1475    1350  0456          SKP
1476    1351  7256          JMP MULT10      /OR X10, BIT CLEAR
1477    1352  0227          XSK I 7
1500    1353  7320          JMP BMULT2      /JUMP BACK
1501    1354  7360          JMP     MULT8E  /ELSE TOO MANY CHAR, ERROR
1502    1355  1000  BMULTS, LDA
1503    1356  1254          MULTMP  /RESTORE PROCESSED NUM TO AC
1504    1357  6000  BMULTR, RETURN
1505                        /ERROR, DETERMINE CALLING BANK - 0 OR 4
1506    1360  1000  MULT8E, LDA
1507    1361  0040          LIFX    /GET UPPER=CALLING-FIELD
1510    1362  1460          SAE I
1511    1363  0600          600
1512    1364  7373          JMP CHBANK
1513    1365  0640          LDF 0
1514    1366  1020          LDA I           /SET UP ERR CD
1515    1367  4062          4062
1516    1370  3043          STA 2003
1517    1371  0600          LIF 0   /B0
1520    1372  7764          JMP ILLG
1521                        /B4
1522    1373  0604  CHBANK, LIF 4
1523    1374  6764          JMP MNLNER      /JUMP MAINLINE ERROR
1524                        *1400
1525                  /DISPLAY (MINI MAGSPY )
1526                  /COPYRIGHT 1970
1527                  /DIGITAL EQUIPMENT CORPORATION,MAYNARD,MASS.
1530                  /MOVING WINDOW DISPLAY SUBROUTINE
1531                  /CURSOR READ OUT
1532                  /CORE OR TAPE FILE
1533                          PMODE
1534
1535
1536                  /INITIAL CALL GET PARAM LIST
1537                  /SET ARGS FOR RDORA
1540
1541
1542    5400  0000  IDORA,  0               /GET BOUNDS
1543    5401  7300          CLA CLL
1544    5402  6211          CDF 10
1545    5403  1600          TAD I IDORA     /DATA BUFFER
1546    5404  3635          DCA I KMNFLD    /15 BIT
1547    5405  2200          ISZ IDORA       /LOWER BOUND
1550    5406  1600          TAD I IDORA     /AT P+1, P+2
1551    5407  3636          DCA I KMNADR    /MINFLD,MINADR
1552    5410  2200          ISZ IDORA
1553    5411  1600          TAD I IDORA     /UPPER BOUND
1554    5412  3637          DCA I KMXFLD    /AT P+3, P+4
1555    5413  2200          ISZ IDORA
1556    5414  7001          IAC             /RDORA USES
1557    5415  1600          TAD I IDORA     /MAX+1
1560    5416  3640          DCA I KMXADR
1561    5417  7004          RAL
1562    5420  1637          TAD I KMXFLD
1563    5421  3637          DCA I KMXFLD
1564    5422  2200          ISZ IDORA
1565    5423  1600          TAD I IDORA     /Y SHIFT
1566    5424  3020          DCA YSHFT
1567    5425  2200          ISZ IDORA
1570    5426  1600          TAD I IDORA     /Y SCALE
1571    5427  3643          DCA I KYSCAL
1572    5430  1635          TAD I KMNFLD    /INITIALIZE
1573    5431  3641          DCA I KBUFHI    /WINDOW
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1574    5432  1636          TAD I KMNADR    /STARTING ADDR
1575    5433  3642          DCA I KBUFLO
1576    5434  5600          JMP I IDORA     /RTN TO SCR N
1577    5435  5615  KMNFLD, MINFLD
1600    5436  5616  KMNADR, MINADR
1601    5437  5674  KMXFLD, MAXFLD
1602    5440  5675  KMXADR, MAXADR
1603    5441  5774  KBUFHI, BUFHI
1604    5442  5775  KBUFLO, BUFLO
1605    5443  5644  KYSCAL, YSCAL
1606    5444  0401  P401,   401
1607    5445  1244  DSCLOC, TAD P401        /DSC X,Y COORD
1610    5446  3275          DCA VCOORD
1611    5447  1021          TAD XCURHI      /FIELD
1612    5450  4262          JMS DSCWD
1613    5451  1022          TAD XCURLO      /ADDRESS
1614    5452  4262          JMS DSCWD
1615    5453  1023          TAD CORVAL      /CONTENTS OF
1616    5454  4262          JMS DSCWD       /CURSR CORE LOC
1617    5455  1024          TAD YCUR        /Y COORD OF
1620    5456  1244          TAD P401
1621    5457  4262          JMS DSCWD       /CURSOR POINT
1622    5460  0000  RTNCDF, 0               /RESTORE USER
1623                                        /DATA FLD
1624    5461  5744          JMP I RDORA     /RTN
1625    5462  0000  DSCWD,  0               /DSC C(AC)
1626    5463  6141          LINC
1627                        LMODE
1630    1464  5477          STC TEMP        /SAVE VALUE
1631    1465  4001          STC XCORD       /CHAN 1
1632    1466  0024          SFA             /VC FOR FULL
1633    1467  0265          ROL I 5         /SIZE IS =40
1634    1470  1020          LDA I           /-20 FOR HALF
1635    1471  7757          -20
1636    1472  0452          LZE             /FULL CHARS ?
1637    1473  0241          ROL 1           /NO VC-40
1640    1474  1160          ADM I           /UPDATE VC
1641    1475  0000  VCOORD, 0
1642    1476  1020  DSCLOP, LDA I
1643    1477  0000  TEMP,   0
1644    1500  0243          ROL 3           /1 DIGIT
1645    1501  1040          STA             /AT A TIME
1646    1502  1477          TEMP            /UPDATE
1647    1503  1560          BCL I           /LOW 3 BITS
1650    1504  7770          7770            /ONLY
1651    1505  0241          ROL 1           /*2 AND REL
1652    1506  1120          ADA I           /TO GRID TAB
1653    1507  1524          TAB&1777
1654    1510  4002          STC 2
1655    1511  3475          ADD VCOORD
1656    1512  1742          DSC 2
1657    1513  1762          DSC I 2
1660    1514  0221          XSK I 1         /MAKE GAP
1661    1515  0221          XSK I 1         /BETWEEN CHARS
1662    1516  1520          SRO I           /DSC 4 CHARS ?
1663    1517  3567          3567
1664    1520  7476          JMP DSCLOP      /NO CONT
1665    1521  0002          PDP
1666                        PMODE
1667    5522  7300          CLA CLL
1670    5523  5662          JMP I DSCWD     /RTN
1671    5524  4536  TAB,    4536    /60,0
1672    5525  3651          3651
-
```

```
1673    5526  2101          2101    /61,1
1674    5527  0177          0177
1675    5530  4523          4523    /62,2
1676    5531  2151          2151
1677    5532  4122          4122    /63,3
1700    5533  2651          2651
1701    5534  2414          2414    /64,4
1702    5535  0477          0477
1703    5536  5172          5172    /65,5
1704    5537  0651          0651
1705    5540  1506          1506    /66,6
1706    5541  4225          4225
1707    5542  4443          4443    /67,7
1710    5543  6050          6050
1711    5544  0000  RDORA,  0
1712    5545  7300          CLA CLL          /SAVE USER DF
1713    5546  6214          RDF
1714    5547  1017          TAD Z FLDZ0
1715    5550  3260          DCA RTNCDF
1716    5551  6141          LINC
1717                        LMODE
1720    1552  0101  CSAM,   CURSAM          /CURSOR
1721    1553  0341          SCR 1            /9 BITS COVERS
1722    1554  0002          PDP              /SCOPE
1723                        PMODE            /MAKE RANGE
1724    5555  1244          TAD P401         /-1 TO =1000
1725    5556  7141          CIA CLL
1726    5557  6141          LINC
1727                        LMODE
1730    1560  5773          STC CURCNT&1777
1731    1561  0100  WSAM,   WINSAM          /WINDOW
1732    1562  0344          SCR 4            /75 CENTS WORTH
1733    1563  0061          SET I XCORD
1734    1564  6777  XXCRD,  -1000           /OVERLAYED IF <1000 PTS
1735    1565  7600          JMP CONT&1777
1736                /WRITE TAPE UNIT 0
1737                /THIS IS NOT DORETTE
1740                /THIS IS A LIFE INSERT
1741    1566  0041  WTUN0,   SET 1
1742    1567  0000          0
1743    1570  0002          PDP
1744                        PMODE
1745    5571  6211          CDF 10
1746    5572  4443          JMS I PWRITE
1747    5573  0044          PARA0
1750    5574  6141          LINC
1751                        LMODE
1752    1575  0647          LDF 7
1753    1576  0011          CLR
1754    1577  6001          JMP 1
1755                        PMODE
1756                        PAGE
1757    5600  0002  CONT,    2
1760    5601  6211  CDF0,    CDF 10
1761    5602  3347          DCA DBLLO        /PUT KNOB VAL
1762    5603  1347          TAD DBLLO        /IN DAC
1763    5604  7710          SPA CLA          /PROPAGATE SIGN
1764    5605  7040          CMA              /BIT HI ORD
1765    5606  3341          DCA DBLHI
1766    5607  4304          JMS DADD
1767    5610  1347          TAD DBLLO        /UPDATE WIN ADDR
1770    5611  3375          DCA BUFLO
1771    5612  1341          TAD DBLHI
```

```
1772    5613  3374          DCA BUFHI
1773                                    /MUST CHK
1774                                    /WINDOW SA
1775                                    /WITH BOUNDS
1776                                    /TO MAINTAIN
1777                                    /BUFFER RING
2000
2001    5614  4316          JMS BOUND       /LOWER BOUND
2002    5615  0001  MINFLD, 1
2003    5616  0000  MINADR, 0
2004    5617  7700          SMA CLA         /LOW END WRAP?
2005    5620  5273          JMP CHKHI       /NO
2006    5621  1274          TAD MAXFLD      /RESET TO
2007    5622  3374          DCA BUFHI       /UPPER BOUND
2010    5623  1275          TAD MAXADR
2011    5624  3375  WRAP,   DCA BUFLO
2012    5625  4304          JMS DADD        /CORRECT WRAP
2013    5626  1347          TAD DBLLO       /CORRECTED
2014    5627  3375          DCA BUFLO       /WINDOW SA
2015    5630  1341          TAD DBLHI
2016    5631  3374          DCA BUFHI
2017    5632  1375  SETFLD, TAD BUFLO       /SET DISPLAY
2020    5633  3304          DCA BUFPTR      /ARGS
2021    5634  1052          TAD NUMDIS
2022    5635  3025          DCA COUNT
2023    5636  1374          TAD BUFHI
2024    5637  3316          DCA BOUND
2025    5640  4341          JMS SETDF
2026    5641  1704  NXTPNT, TAD I BUFPTR
2027    5642  1020          TAD YSHFT       /OFF SET
2030    5643  6141          LINC
2031                        LMODE
2032    1644  0341  YSCAL,  SCR 1           /SCALE FACTOR
2033    1645  0161          DIS I XCORD
2034    1646  0002          PDP
2035                        PMODE
2036    5647  2373          ISZ CURCNT      /READY TO DIS
2037                                    /CURSOR ?
2040    5650  7610  CURRTN, SKP CLA         /NO
2041    5651  5351          JMP CURDIS
2042    5652  2376          ISZ ENDLO       /CHK FOR HI
2043    5653  5263          JMP OKEND       /END WRAP
2044    5654  2377          ISZ ENDHI
2045    5655  5263          JMP OKEND
2046    5656  1216          TAD MINADR      /RESET TO
2047    5657  3304          DCA BUFPTR      /LOWER BOUND
2050    5660  1215          TAD MINFLD
2051    5661  3316          DCA BOUND
2052    5662  5266          JMP NXTDF
2053    5663  2304  OKEND,  ISZ BUFPTR      /CHK FOR FIELD
2054                                    /BOUNDARY
2055    5664  5267          JMP OKFLD       /ITS OK
2056    5665  2316          ISZ BOUND       /SET NXT FLD
2057    5666  4341  NXTDF,  JMS SETDF
2060    5667  2025  OKFLD,  ISZ COUNT       /512 PNTS ?
2061    5670  5241          JMP NXTPNT      /NO
2062    5671  5672          JMP I .+1       /DSC READ OUT
2063    5672  5445          DSCLOC
2064    5673  4316  CHKHI,  JMS BOUND       /CHK UPR BOUND
2065    5674  0002  MAXFLD, 2
2066    5675  0000  MAXADR, 0
2067    5676  7710  M70,    SPA CLA         /HI WRAP ?
2070    5677  5232          JMP SETFLD
=
```

```
2071      5700  1215          TAD MINFLD      /YES
2072      5701  3374          DCA BUFHI       /RESET TO
2073      5702  1216          TAD MINADR      /LOWER BOUND
2074      5703  5224          JMP WRAP
2075                  /DOUBLE PRECISION ADD
2076                  /(DBLHI,DBLLO)+(BUFHI,BUFLO)
2077                  /RESULT IN (DBLHI,DBLLO)
2100                  /(BUFHI,BUFLO)=INITIAL SCOPE ADDRESS
2101
2102      5704  0000  DADD,   0
2103      5705  7300          CLA CLL
2104      5706  1347          TAD DBLLO
2105      5707  1375          TAD BUFLO
2106      5710  3347          DCA DBLLO
2107      5711  7004          RAL
2110      5712  1341          TAD DBLHI
2111      5713  1374          TAD BUFHI
2112      5714  3341          DCA DBLHI
2113      5715  5704          JMP I DADD
2114
2115                  /ADD -UPPER OR -LOWER BOUND
2116                  /TO (BUFHI,BUFLO)
2117                  /BOUND IS AT P+1,P+2 OF CALL
2120
2121      5716  0000  BOUND,  0
2122      5717  1716          TAD I BOUND     /2S COM OF ARG
2123      5720  7140          CMA CLL         /TO DAC
2124      5721  3341          DCA DBLHI
2125      5722  2316          ISZ BOUND
2126      5723  1716          TAD I BOUND
2127      5724  7041          CIA
2130      5725  7430          SZL
2131      5726  2341          ISZ DBLHI
2132      5727  7000  M1000,  NOP
2133      5730  3347          DCA DBLLO
2134      5731  4304          JMS DADD
2135      5732  1341          TAD DBLHI
2136      5733  3377          DCA ENDHI       /DAC HOLDS -NUM
2137      5734  1347          TAD DBLLO       /TO END OF BUF
2140      5735  3376          DCA ENDLO       /NO MATTER FOR
2141                                          /LOW END WRAP
2142      5736  1341          TAD DBLHI       /TO CHK FOR
2143      5737  2316          ISZ BOUND       /UPON RTN
2144      5740  5716          JMP I BOUND
2145      5741  0000  SETDF,  0               /SET B FIELD
2146      5742  1316          TAD BOUND       /REL TO BOUND
2147      5743  7106          CLL RTL
2150      5744  7004          RAL
2151      5745  1017          TAD Z FLDZ0
2152      5746  3347          DCA ,+1
2153      5747  0000  DBLLO,  0
2154      5750  5741          JMP I SETDF
2155      5751  3024  CURDIS, DCA YCUR        /DISP CURSOR
2156      5752  1316          TAD BOUND       /SAVE X,Y
2157      5753  3021          DCA XCURHI      /COORDINATES
2160      5754  1304          TAD BUFPTR
2161      5755  3022          DCA XCURLO
2162      5756  1704          TAD I BUFPTR
2163      5757  3023          DCA CORVAL
2164      5760  1276          TAD M70
2165      5761  3347          DCA DBLLO
2166      5762  1024          TAD YCUR
2167      5763  6141  CURLOP, LINC
-
```

```
2170                                    LMODE
2171        1764    0465                SNS I 5
2172        1765    0016                NOP             /CHANGE TO JMP FREE
2173                            /IF FREE CURSOR MOTION DESIRED
2174        1766    0141                DIS XCORD
2175        1767    0002                PDP
2176                                    PMODE
2177        5770    2347                ISZ DBLLO
2200        5771    5363                JMP CURLOP
2201        5772    5250                JMP CURRTN
2202        5773    0000    CURCNT, 0
2203                            /THESE 5 GUYS MAY BE PAGE 0
2204        5774    0001    BUFHI,  1
2205        5775    0000    BUFLO,  0
2206        5776    0000    ENDLO,  0
2207        5777    0000    ENDHI,  0
2210                                    DBLHI=SETDF
2211                                    BUFPTR=DADD
2212                                    XCORD=1
2213                                    LMODE
2214                                    CURSAM=SAM 1    /CURSOR KNOB
2215                                    WINSAM=SAM 0    /WINDOW KNOB
2216                                    FRESAM=SAM 5    /FREE CURSOR
2217                                    SCALE=SCR
2220                                    SC12BU=SCR 3    /SCALE FACTOR
2221                                                    /12 BIT UNSIGNED
2222                                    OF12BU=4000     /Y OFFSET FOR
2223                                                    /12 BIT UNSIGNED
2224                            /THESE 6 GUYS MUST BE PAGE 0
2225                            /THEY ARE ALL CONTIGUOUS AND DEFINED
2226                            /RELATIVE TO YSHFT BUT THIS IS NOT
2227                            /A REQUIREMENT
2230                                    YSHFT=20
2231                            /THE 4 SCOPE READ OUT VALUES
2232                                    XCURHI=YSHFT+1
2233                                    XCURLO=XCURHI+1
2234                                    CORVAL=XCURLO+1
2235                                    YCUR=CORVAL+1
2236                                    COUNT=YCUR+1
2237                            /AN EXAMPLE TO DISPLAY ALL OF FIELD 1
2240                            /12 BIT UNSIGNED DATA
2241                            /PMODE
2242                            /*SOMEWHERE
2243                            /JMS I KIDORA           /INITIAL CALL
2244                            /1                      /FLD
2245                            /0000                   /ADDR
2246                            /1                      /FLD
2247                            /7777                   /ADDR
2250                            /OF12BU                 /Y OFF SET
2251                            /SC12BU                 /Y SCALE FAC
2252                            /JMS I KRDORA           /REFRESH CALL
2253                            /JMP .-1
2254                            /KIDORA,IDORA
2255                            /KRDORA,RDORA
2256                                    CHAIN "LIFE B5"
```

```
0000                    *20
0001                            /THIS BANK WILL CONTAIN
0002                            /ALL TEXT STATEMENTS FOR QANDA
0003                            /IN ADDITION TO THE CALLING
0004                            /SEQUENCE FOR QANDA, AND QANDA ITSELF
0005                            /IN THE LAST TWO BLOCKS
0006                    SEGMNT 5
```

```
0007                    *20
0010                            /DISPLAY UNTIL ANSWER GIVEN
0011        0020  7000  DSCALL, JMP QAINIT
0012                    /QANDA PTRS
0013        0021  0000  TXTSTR, 0
0014        0022  0000  ANSWER, 0
0015        0023  7053          JMP QARFSH
0016        0024  0606          LIF 6
0017        0025  7251          JMP GTANS1
0020        0026  0614
0020        0027  1106
0020        0030  0540
0020        0031  1123
0020        0032  4003
0020        0033  2205
0020        0034  0124
0020        0035  0504
0020                    DSP1,   TEXT QFLIFE IS CREATED,
0021        0036  5643
0021
0022        0037  4740
0022        0040  4347
0022
0023        0041  4043
0023
0024        0042  4740
0024        0043  4347
0024        0044  1411
0024        0045  0605
0024        0046  4025
0024        0047  1611
0024        0050  2440
0024        0051  7462
0024        0052  3400
0024                            LIFE UNIT <2\Q
0025        0053  1617
0025        0054  2440
0025        0055  1411
0025        0056  0605
0025        0057  4024
0025        0060  0120
0025                    DSP2,   TEXT QNOT LIFE TAPE,
0026        0061  0556
0026        0062  4347
0026
0027        0063  4043
0027
0030        0064  4740
0030        0065  4347
0030        0066  1116
0030        0067  1124
0030        0070  1101
0030        0071  1411
0030        0072  3205
0030        0073  7740
0030        0074  3140
0030        0075  1722
0030        0076  4016
0030        0077  7240
0030        0100  7461
0030        0101  3400
0030                            INITIALIZE? Y OR N: <1\Q
0031        0102  0606
```

```
0031        0103  2516
0031        0104  0324
0031        0105  1117
0031        0106  1623
0031                    DSP3,   TEXT QFFUNCTIONS:
0032        0107  7243
0032
0033        0110  4740
0033        0111  4347
0033
0034        0112  4043
0034        0113  4761
0034        0114  5640
0034        0115  0705
0034        0116  1605
0034        0117  2201
0034        0120  2405
0034        0121  4016
0034        0122  0527
0034        0123  4023
0034        0124  2005
0034        0125  0324
0034        0126  2225
0034                            1, GENERATE NEW SPECTRUM
0035        0127  1543
0035
0036        0130  4740
0036        0131  4347
0036        0132  6256
0036        0133  4020
0036        0134  2211
0036                            2, PRINT
0037        0135  1624
0037        0136  4347
0037
0040        0137  4043
0040        0140  4763
0040        0141  5640
0040        0142  0522
0040        0143  0123
0040                            3, ERASE
0041        0144  0543
0041
0042        0145  4740
0042        0146  4347
0042        0147  6456
0042        0150  4003
0042        0151  0114
0042        0152  1440
0042        0153  0411
0042                            4, CALL DIAL
0043        0154  0114
0043        0155  4347
0043
0044        0156  4043
0044
0045        0157  4740
0045        0160  4340
0045        0161  0310
0045        0162  1711
0045        0163  0305
0045        0164  7240
0045        0165  7461
```

```
0045    0166  3400
0045                CHOICE: <1\Q
0046    0167  1116
0046    0170  2324
0046    0171  2225
0046    0172  1505
0046    0173  1624
0046    0174  4016
0046    0175  0115
0046    0176  0540
0046    0177  4074
0046    0200  6434
0046                DSP1P1, TEXT QINSTRUMENT NAME  <4\Q
0047                          /ABOVE ALSO USED IN DELETE
0050    0201  1605
0050    0202  2740
0050    0203  1116
0050    0204  2324
0050    0205  2225
0050    0206  1505
0050                DSP1P2, TEXT QNEW INSTRUMENT
0051    0207  1624
0051    0210  4301
0051    0211  0303
0051    0212  0520
0051    0213  2477
0051    0214  4031
0051    0215  4017
0051    0216  2240
0051    0217  1672
0051    0220  4074
0051                ACCEPT? Y OR N: <1
0052    0221  6143
0052
0053    0222  4740
0053    0223  4347
0053    0224  2431
0053                        TYPE
0054    0225  2005
0054    0226  4347
0054    0227  6140
0054    0230  1106
0054    0231  4030
0054    0232  4017
0054    0233  1614
0054                        1 IF X ONLY
0055    0234  3143
0055    0235  4762
0055    0236  4011
0055    0237  0640
0055    0240  3040
0055    0241  0116
0055    0242  0440
0055                        2 IF X AND Y
0056    0243  3143
0056    0244  4774
0056    0245  6134
0056                        <1\Q
0057    0246  2516
0057    0247  1124
0057    0250  4016
0057    0251  0115
0057    0252  0540
-
```

```
0057      0253  4074
0057                  DSP1P3, TEXT QUNIT NAME  <4
0060      0254  6443
0060
0061      0255  4740
0061      0256  4347
0061
0062      0257  4043
0062
0063      0260  4740
0063      0261  4347
0063      0262  2320
0063      0263  0503
0063      0264  2422
0063      0265  2515
0063      0266  4016
0063      0267  0115
0063      0270  0540
0063      0271  4074
0063                        SPECTRUM NAME  <8
0064      0272  7043
0064      0273  4774
0064      0274  7034
0064                        <8\Q
0065      0275  2516
0065      0276  1124
0065      0277  4016
0065      0300  2515
0065      0301  0205
0065      0302  2240
0065      0303  4074
0065                  DSP1P4, TEXT QUNIT NUMBER  <2
0066      0304  6243
0066
0067      0305  4740
0067      0306  4347
0067
0070      0307  4043
0070      0310  4723
0070      0311  2401
0070      0312  2224
0070      0313  4002
0070      0314  1417
0070      0315  0313
0070      0316  4040
0070                        START BLOCK  <3
0071      0317  7463
0071      0320  4347
0071
0072      0321  4043
0072
0073      0322  4740
0073      0323  4347
0073      0324  2024
0073      0325  2340
0073      0326  1116
0073      0327  4023
0073      0330  2005
0073      0331  0324
0073      0332  2225
0073      0333  1540
0073      0334  4074
0073      0335  6434
=
```

```
0073                                    PTS IN SPECTRUM  <4\Q
0074        0336  0114
0074        0337  1417
0074        0340  2701
0074        0341  0214
0074        0342  0540
0074        0343  0522
0074        0344  2217
0074        0345  2240
0074        0346  2417
0074        0347  1405
0074        0350  2201
0074        0351  1603
0074                        DSP2P1, TEXT QALLOWABLE ERROR TOLERANCE:
0075        0352  0572
0075        0353  4347
0075
0076        0354  4043
0076        0355  4761
0076        0356  5540
0076        0357  2005
0076        0360  2240
0076        0361  0305
0076                                    1- PER CENT
0077        0362  1624
0077        0363  4347
0077        0364  6255
0077        0365  4001
0077        0366  0223
0077        0367  1714
0077        0370  2524
0077                                    2- ABSOLUTE
0100        0371  0543
0100
0101        0372  4740
0101        0373  4347
0101        0374  0310
0101        0375  1711
0101        0376  0305
0101        0377  7240
0101        0400  4074
0101                                    CHOICE:  <1
0102        0401  6143
0102
0103        0402  4740
0103        0403  4347
0103
0104        0404  4043
0104        0405  4730
0104        0406  4024
0104        0407  1714
0104        0410  0522
0104        0411  0116
0104        0412  0305
0104        0413  7240
0104        0414  4074
0104                                    X TOLERANCE:  <3
0105        0415  6343
0105
0106        0416  4740
0106        0417  4347
0106        0420  3140
0106        0421  2417
```

```
0106      0422  1405
0106      0423  2201
0106      0424  1603
0106      0425  0572
0106      0426  4040
0106      0427  7463
0106      0430  3400
0106                        Y TOLERANCE:  <3\Q
0107      0431  4015
0107      0432  1123
0107      0433  2305
0107      0434  2340
0107      0435  0114
0107      0436  1417
0107      0437  2705
0107      0440  0472
0107      0441  4040
0107      0442  7462
0107      0443  3400
0107                  DSP2P2, TEXT Q MISSES ALLOWED:  <2\Q
0110      0444  0640
0110      0445  2022
0110      0446  1116
0110                  DSP3P1, TEXT QF PRINT:
0111      0447  2472
0111      0450  4347
0111
0112      0451  4043
0112
0113      0452  4740
0113      0453  4347
0113      0454  6156
0113      0455  4011
0113      0456  1604
0113                        1. INDEX
0114      0457  0530
0114      0460  4347
0114
0115      0461  4043
0115      0462  4762
0115      0463  5640
0115      0464  1411
0115      0465  0222
0115      0466  0122
0115      0467  3140
0115      0470  2320
0115      0471  0503
0115      0472  2422
0115                        2, LIBRARY SPECTRUM
0116      0473  2515
0116      0474  4347
0116
0117      0475  4043
0117      0476  4763
0117      0477  5640
0117      0500  0530
0117                        3. EXIT
0120      0501  1124
0120      0502  4347
0120
0121      0503  4043
0121
0122      0504  4740
```

```
0122      0505  4347
0122
0123      0506  4043
0123      0507  4703
0123      0510  1017
0123      0511  1103
0123      0512  0572
0123      0513  7461
0123      0514  3400
0123                        CHOICE:<1\Q
0124      0515  0640
0124      0516  2431
0124                DSP3P2, TEXT QF TYPE
0125      0517  2005
0125      0520  4347
0125
0126      0521  4043
0126
0127      0522  4740
0127      0523  4347
0127      0524  1116
0127      0525  2324
0127      0526  2225
0127      0527  1505
0127      0530  1624
0127      0531  4016
0127      0532  0115
0127      0533  0572
0127      0534  4040
0127      0535  4040
0127                        INSTRUMENT NAME:     <4
0130      0536  7464
0130      0537  4347
0130
0131      0540  4043
0131
0132      0541  4740
0132      0542  4347
0132      0543  2320
0132      0544  0503
0132      0545  2422
0132      0546  2515
0132      0547  4016
0132      0550  0115
0132      0551  0572
0132      0552  4040
0132      0553  4040
0132                        SPECTRUM NAME:     <8
0133      0554  7470
0133      0555  4347
0133      0556  7470
0133      0557  3400
0133                        <8\Q
0134                        /DSP 4.2 IS DSP 1.1
0135      0560  0605
0135      0561  2201
0135      0562  2305
0135                DSP4P1, TEXT QFERASE:
0136      0563  7243
0136
0137      0564  4740
0137      0565  4347
0137
```

```
0140      0566  4043
0140      0567  4761
0140      0570  5640
0140      0571  0516
0140      0572  2411
0140      0573  2205
0140      0574  4014
0140      0575  1102
0140      0576  2201
0140                        1, ENTIRE LIBRARY
0141      0577  2231
0141      0600  4347
0141      0601  6256
0141      0602  4005
0141      0603  1624
0141      0604  1122
0141      0605  0540
0141      0606  1116
0141      0607  2324
0141      0610  2225
0141      0611  1505
0141                        2, ENTIRE INSTRUMENT
0142      0612  1624
0142      0613  4347
0142      0614  6356
0142      0615  4023
0142      0616  1116
0142      0617  0714
0142      0620  0540
0142      0621  2320
0142      0622  0503
0142      0623  2422
0142                        3, SINGLE SPECTRUM
0143      0624  2515
0143      0625  4347
0143      0626  6456
0143      0627  4005
0143      0630  3011
0143                        4, EXIT
0144      0631  2443
0144
0145      0632  4740
0145      0633  4347
0145
0146      0634  4043
0146      0635  4703
0146      0636  1017
0146      0637  1103
0146      0640  0574
0146      0641  6134
0146                        CHOICE<1\Q
0147      0642  0640
0147      0643  2320
0147      0644  0503
0147      0645  2422
0147      0646  2515
0147      0647  4016
0147      0650  0115
0147      0651  0572
0147      0652  4040
0147      0653  4040
0147      0654  7464
0147      0655  3400
```

```
0147                    DSP4P3, TEXT QF SPECTRUM NAME:     <4\Q
0150      0656  4040    DSPERB, 4040
0151      0657  0522
0151      0660  2217
0151                    DSPERA, TEXT QERROR
0152      0661  2240
0152      0662  4347
0152                            Q
0153      0663  3131    ERRCXX, 3131              /XX
0154      0664  4043            4043
0155      0665  4043            4043
0156      0666  2022
0156      0667  0523
0156      0670  2340
0156      0671  1411
0156      0672  1605
0156      0673  4006
0156      0674  0505
0156      0675  0454
0156      0676  4024
0156      0677  2231
0156      0700  4001
0156      0701  0701
0156      0702  1116
0156      0703  7461
0156      0704  3400
0156                            TEXT QPRESS LINE FEED, TRY AGAIN<1\Q
0157      0705  4040    TY01,   4040
0160      0706  4040            4040
0161      0707  2516
0161      0710  1316
0161      0711  1727
0161      0712  1672
0161                            TEXT QUNKNOWN:Q
0162      0713  0000            0000
0163      0714  4040    TY03,   4040
0164      0715  4040            4040
0165      0716  1411
0165      0717  0222
0165      0720  0122
0165      0721  3172
0165                            TEXT QLIBRARY:Q
0166      0722  0000            0000
0167      0723  4040    TY04,   4040
0170      0724  4040            4040
0171      0725  4040            4040
0172      0726  2320
0172      0727  0503
0172      0730  2422
0172      0731  2515
0172                            TEXT QSPECTRUMQ
0173      0732  4040            4040
0174      0733  4040            4040
0175      0734  4040            4040
0176      0735  4040            4040
0177      0736  4040            4040
0200      0737  4040            4040
0201      0740  2013
0201      0741  5640
0201      0742  2024
0201      0743  2340
0201                            TEXT QPK, PTS Q
0202      0744  4040            4040
=
```

```
0203    0745  4040  TYO2A,  4040    /SET TO 0 IF UNKNOWN LINE
0204    0746  1511
0204    0747  2323
0204    0750  0523
0204                        TEXT QMISSESQ
0205    0751  0000          0000
0206    0752  4040  TYO5,   4040
0207    0753  4040          4040
0210    0754  4040          4040
0211    0755  4040          4040
0212    0756  4040          4040
0213    0757  4040          4040
0214    0760  1116
0214    0761  0405
0214    0762  3040
0214    0763  1706
0214    0764  4014
0214    0765  1102
0214    0766  2201
0214    0767  2231
0214    0770  4023
0214    0771  2005
0214    0772  0324
0214    0773  2201
0214                        TEXT QINDEX OF LIBRARY SPECTRAQ
0215    0774  0000          0000
0216                /QANDA SUBROUTINE FOR THE
0217                /PDP-12
0220                *1000
0221                /
0222                /TO HERE TO INITIALIZE THE ROUTINE
0223                /
0224    1000  1020  QAINIT, LDA I           /SAVE JMP RETURN
0225    1001  0002          2
0226    1002  2000          ADD 0
0227    1003  1060          STA I
0230    1004  0000  QAB,    0               /JMP    +3
0231    1005  3200          ADD QAL+3
0232    1006  4001          STC 1           /PTR TO FIRST PARAM
0233    1007  1001          LDA 1           /GET FIRST PARAM
0234    1010  3264          ADD QAQ+1       /PTR TO HALFWORD-1
0235    1011  5057          STC QAG-3
0236    1012  1021          LDA I 1
0237    1013  5052          STC QARFSH-1
0240    1014  4006          STC 6           /XR6 USED AS A SWITCH, =0 IF NO ANSWER FIELD, =1777 IF YES
0241    1015  0043  QACA,   SET 3   /XR3 TO PTR TO ANSWERS
0242    1016  1052          QARFSH=1
0243    1017  0044          SET 4           /XR4 TO PTR TO QUESTIONS
0244    1020  1057          QAG=3
0245                                        /TO HERE IF FIRST TIME THROUGH OR FOLLOWING A CR
0246    1021  0041          SET 1
0247    1022  0004          4
0250    1023  7270          JMP QAT
0251    1024  0016          NOP             /F
0252    1025  1324          LDH I 4         /H, BUMP PTR IF H OR F
0253    1026  7231  QAD,    JMP QAO
0254    1027  7035          JMP .+6         /74
0255    1030  7050          JMP QAE         /34
0256    1031  1460          SAE I           /CR?
0257    1032  0043          43
0260    1033  7026          JMP QAD         /NO
0261    1034  7021          JMP QACA+4 /EXAMINE NEXT CHAR
0262                                        /INITIALIZE ANSWER BUFR
=
```

```
0263    1035  1343          STH 3           /74 TO ANSWERS
0264    1036  1324          LDH I 4         /NEXT HALFWORD
0265    1037  1120          ADA I
0266    1040  7717          -60
0267    1041  0017          COM
0270    1042  4006          STC 6
0271    1043  1363          STH I 3         /0 IN AC
0272    1044  0226          XSK I 6
0273    1045  7043          JMP .=2
0274    1046  1323          LDH I 3         /BUMP PTR TO ANSWERS
0275    1047  7026          JMP QAD
0276                                        /ANSWER BUFR IS INITIATED
0277    1050  1343  QAE,     STH 3
0300    1051  0064          SET I 4         /XR4 TO PTR TO LAST TYPED CHAR IN ANSWER BUFR
0301    1052  0000          0
0302                                        /----RE-ENTER HERE TO REFRESH----
0303    1053  1020  QARFSH, LDA I           /INITIAL Y POSITION
0304    1054  0277  277
0305    1055  5113          STC QAH-1
0306    1056  0063          SET I 3         /XR3 TO PTR TO HALFWORD QUESTIONS-1
0307    1057  0000          0
0310    1060  0045          SET 5           /XR5 TO PTR TO LAST DISPLAYED CHAR IN ANSWER BUFR
0311    1061  1052          QARFSH=1
0312    1062  0041  QAG,     SET 1
0313    1063  0003          3
0314    1064  7270          JMP QAT
0315    1065  7074          JMP .+7         /F
0316    1066  1323          LDH I 3         /H, BUMP PTR
0317    1067  1020          LDA I           /NEITHER, ASSUME HALF SIZE
0320    1070  1560          BCL I
0321    1071  5103          STC QAM+2       /SET INSTR TO CLEAR FF FOR HALF SIZE
0322    1072  3512          ADD QAW         /NOP IN AC
0323    1073  7101          JMP QAM
0324    1074  1323          LDH I 3         /BUMP PTR
0325    1075  1020          LDA I
0326    1076  1620          BSE I
0327    1077  5103          STC QAM+2       /SET INSTR TO SET FF FOR FULL SIZE
0330    1100  3513          ADD QAW+1       /ADD 9U IN AC
0331    1101  5245  QAM,     STC QAP+3
0332    1102  0024          MSC I 4         /EAD CONTROL REGISTER
0333    1103  1620          BSE I           /THIS INSTR CHANGES, EITHER BSE & OR BCL &
0334    1104  0200          200
0335    1105  0004          MSC 4           /AC TO CONTROL REGISTER
0336    1106  0061          SET I 1         /XR1 TO INITIAL X POSITION
0337    1107  0100          100
0340    1110  1020          LDA I           /Y COORDINATE MULTIPLE
0341    1111  7737          =40
0342    1112  1160          ADM I           /Y COORDINATE
0343    1113  0000          0
0344    1114  1323  QAH,     LDH I 3
0345    1115  7232          JMP QAO+1
0346    1116  7301          JMP QAZ         /74 BUMP PTR TO NEXT CHAR, PUT 40 IN AC
0347    1117  7136          JMP QAJ         /34
0350    1120  1420          SHD I           /NEITHER
0351    1121  4300          4300
0352    1122  7062          JMP QAG         /CR, MOVE X AND Y COORDINATE
0353    1123  7242          JMP QAP         /ISPLAY CHAR
0354    1124  7114          JMP QAH         /PICK UP NEXT CHAR
0355    1125  7242          JMP QAP         /TO HERE IF DISPLAYING ANSWER BUFR
0356    1126  1520          SRO I    /SWITCH TO DISPLAY CURSOR, EITHER 0000 OR 7777
0357    1127  0000          0               /IFXR4=XR5, THEN SWITCH=7777
0360    1130  7516          JMP QAF
0361                                        /QUESTION MODE
-
```

```
0362    1131  1325  QAI,    LDH I 5
0363    1132  7232          JMP QAO+1
0364    1133  7114          JMP QAH          /74
0365    1134  7114          JMP QAH          /34
0366    1135  7125          JMP QAI-4        /NEITHER, DISPLAY IT
0367    1136  7521  QAJ,    JMP GETKBD       /TO HERE IF DISPLAYED BUFFER
0370    1137  0470          AZE I
0371    1140  7004          JMP QAB /NOTHING TYPED , EXIT
0372    1141  0062          SET I 2
0373    1142  1412          QAY
0374    1143  1402          SHD 2            /LF?
0375    1144  7311          JMP QAK+4        /YES. EXIT
0376    1145  1422          SHD I 2          /CR?
0377    1146  7223          JMP QAN
0400    1147  0206          XSK 6            /IS THERE AN ANSWER FIELD?
0401    1150  7053          JMP QARFSH
0402    1151  1422          SHD I 2          /<?
0403    1152  7175          JMP QAL
0404    1153  1422          SHD I 2          />?
0405    1154  7305          JMP QAK
0406    1155  1422          SHD I 2          /ALT?
0407    1156  7015          JMP QACA /REINITIALIZE
0410    1157  1422          SHD I 2          /BACK SLASH?
0411    1160  7053          JMP QARFSH       /IGNORE
0412    1161  1422          SHD I 2          /RUBOUT?
0413    1162  7175          JMP QAL          /IGNORE
0414    1163  1422          SHD I 2          /TAB?
0415    1164  7053          JMP QARFSH       /IGNORE
0416    1165  5172          STC .+5          /ACCEPTABLE CHAR
0417    1166  7231          JMP QAO          /TEST NEXT CHAR
0420    1167  7263          JMP QAQ          /74 BACK PTR UP BY 1
0421    1170  7263          JMP QAQ          /34 "
0422    1171  1020          LDA I            /OK, STORE IT
0423    1172  0000          0
0424    1173  1344          STH 4
0425    1174  7053          JMP QARFSH       /REDISPLAY
0426    1175  1304  QAL,    LDH 4            /TO HERE IF RUBBOUT OR <
0427    1176  7232          JMP QAO+1
0430    1177  7053          JMP QARFSH       /74 IGNORE
0431    1200  1775          -6002
0432    1201  1302          LDH 2            /TEST THE CHAR
0433    1202  1460          SAE I            /RUBOUT?
0434    1203  0037          37
0435    1204  7263          JMP QAQ          /NO, BACK PTR UP BY 1
0436    1205  0045          SET 5
0437    1206  0004          4
0440    1207  0043          SET 3
0441    1210  0004          4
0442    1211  7213          JMP .+2
0443    1212  1325          LDH I 5          /BUMP PTR
0444    1213  1323          LDH I 3          /GET NEXT CHAR
0445    1214  7232          JMP QAO+1
0446    1215  0016          NOP              /IF 74 OR 34, REPLACE CURRENT CHAR WITH 0
0447    1216  0011          CLR
0450    1217  1345          STH 5
0451    1220  0450          AZE              /WAS IT 74 OR 34?
0452    1221  7212          JMP .-7          /NO, CONTINUE
0453    1222  7263          JMP QAQ          /BACK PTR UP BY 1
0454                                         /TO HERE IF CR
0455    1223  0206  QAN,    XSK 6
0456    1224  7311          JMP QAK+4        /EXIT ROUTINE IF NO ANSWER FIELD
0457    1225  7231          JMP QAO
0460    1226  7053          JMP QARFSH       /74 MOVE PTR TO NEXT QUESTION FIELD
=
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```
0461    1227  7051          JMP QAE+1       /34 END OF BUFR, MOVE PTR TO FIRST QUESTION FIELD
0462    1230  7225          JMP QAN+2
0463
0464    1231  1324  QAO,    LDH I 4         /S\R
0465    1232  1420          SHD I           /       +1 74 BEGIN FIELD
0466    1233  7400          7400            /       +2 34 END BUFR
0467    1234  6000          JMP 0           /       +3 NEITHER 74 NOR 34
0470    1235  1460          SAE I
0471    1236  0034          34
0472    1237  0220          XSK I 0
0473    1240  0220          XSK I 0
0474    1241  6000          JMP 0
0475                                        /S\R TO DISP LINC CHAR IN AC
0476    1242  0241  QAP,    ROL 1           /MULT BY 2 FOR INDEX TO ADDRESS OF TABLE
0477    1243  3430          ADD QAX+4
0500    1244  4002          STC 2           /ADDRESS OF CHAR TO DISP IN XR2
0501    1245  3506          ADD QAU         /THIS INSTR CHANGES, EITHER OP OR ADD 9U
0502    1246  3506          ADD QAU
0503    1247  2001          ADD 1           /ADD 4 TO XR1 TO SPACE CHAR
0504    1250  4001          STC 1
0505    1251  2005          ADD 5           /GET ADDRESS OF ANSWER BUFR
0506    1252  0017          COM
0507    1253  2004          ADD 4
0510    1254  0450          AZE
0511    1255  0011          CLR
0512    1256  5127          STC QAI=2       /SWITCH=0 OR 7777
0513    1257  3113          ADD QAH=1       /Y COORDINATE IN AC
0514    1260  1742          DSC 2
0515    1261  1762          DSC I 2         /DISPLAY CHAR
0516    1262  6000          JMP 0
0517    1263  1020  QAQ,    LDA I           /BACK UP PTR BY 1
0520    1264  3777          =4000
0521    1265  1140          ADM
0522    1266  0004          4
0523    1267  7053          JMP QARFSH      /REDISPLAY
0524                                        /
0525    1270  1321  QAT,    LDH I 1         /S\R
0526    1271  1420          SHD I           /       +1 F
0527    1272  0600          0600            /       +2 H
0530    1273  6000          JMP 0           /       +3 NEITHER
0531    1274  1460          SAE I
0532    1275  0010          10
0533    1276  0220          XSK I 0
0534    1277  0220          XSK I 0
0535    1300  6000          JMP 0
0536                                        /
0537    1301  1323  QAZ,    LDH I 3
0540    1302  1020          LDA I
0541    1303  0040          40
0542    1304  7125          JMP QAI=4
0543                                        /TO HERE IF >
0544    1305  1324  QAK,    LDH I 4
0545    1306  0470          AZE I           /IS CURRENT CHAR BLANK?
0546    1307  7263          JMP QAQ         /YES. IGNORE
0547    1310  7424          JMP QAX         /MOVE DOT FORWARD
0550                                        /TO HERE TO EXIT WITH SKIP
0551    1311  1020          LDA I
0552    1312  0001          1
0553    1313  1140          ADM
0554    1314  1004          QAB
0555    1315  7004          JMP QAB
0556                                        /CHARACTER PATTERNS
0557    1316  0101  QAV,    0101            /KBD 0, ILLEGAL, USED AS MARKER
=
```

```
0560    1317  0101          0101
0561    1320  4477          4477          /1:A
0562    1321  7744          7744
0563    1322  5177          5177          /2:B
0564    1323  2651          2651
0565    1324  4136          4136          /3:C
0566    1325  2241          2241
0567    1326  4177          4177          /4:D
0570    1327  3641          3641
0571    1330  4577          4577          /5:E
0572    1331  4145          4145
0573    1332  4477          4477          /6:F
0574    1333  4044          4044
0575    1334  4136          4136          /7:G
0576    1335  2645          2645
0577    1336  1077          1077          /10:H
0600    1337  7710          7710
0601    1340  7741          7741          /11:I
0602    1341  0041          0041
0603    1342  4142          4142          /12:J
0604    1343  4076          4076
0605    1344  1077          1077          /13:K
0606    1345  4324          4324
0607    1346  0177          0177          /14:L
0610    1347  0301          0301
0611    1350  3077          3077          /15:M
0612    1351  7730          7730
0613    1352  3077          3077          /16:N
0614    1353  7706          7706
0615    1354  4177          4177          /17:O
0616    1355  7741          7741
0617    1356  4477          4477          /20:P
0620    1357  3044          3044
0621    1360  4276          4276          /21:Q
0622    1361  0376          0376
0623    1362  4477          4477          /22:R
0624    1363  3146          3146
0625    1364  5121          5121          /23:S
0626    1365  4651          4651
0627    1366  4040          4040          /24:T
0630    1367  4077          4077
0631    1370  0177          0177          /25:U
0632    1371  7701          7701
0633    1372  0176          0176          /26:V
0634    1373  7402          7402
0635    1374  0677          0677          /27:W
0636    1375  7701          7701
0637    1376  1463          1463          /30:X
0640    1377  6314          6314
0641    1400  0770          0770          /31:Y
0642    1401  7007          7007
0643    1402  4543          4543          /32:Z
0644    1403  6151          6151
0645    1404  4177          4177          /33:/
0646    1405  0000          0000
0647                                      /34:BACKSLASH IGNORED ON INPUT
0650    1406  0000          0             /NOT USED
0651    1407  0000          0             /NOT USED
0652    1410  0000          0000          /35:]
0653    1411  7741          7741
0654                                      /CODES 36:ALT, 37:RUBOUT NOT DISPLAYED
0655    1412  4543  QAY,    4543          /LF,CR
0656    1413  7476          7476          /<,>
=
```

```
0657    1414  3634          3634            /ALT, BACKSLASH
0660    1415  3747          3747            /RUBOUT, TAB
0661    1416  0000          0000            /40:SPACE
0662    1417  0000          0000
0663    1420  7500          7500            /41:X!
0664    1421  0000          0000
0665    1422  7000          7000            /42:"
0666    1423  0070          0070
0667                                        /CODES 43:, 44:, 45:LF NOT DISPLAYED
0670    1424  7232  QAX,    JMP QAO+1
0671    1425  7263          JMP QAQ
0672    1426  7263          JMP QAQ
0673    1427  7053          JMP QARFSH
0674    1430  1316          QAV
0675    1431  0000          0               /NOT USED
0676    1432  5166          5166            /46: &
0677    1433  0526          0526
0700                                        /CODE 47:TAB NOT DISPLAYED
0701    1434  0000          0               /NOT USED
0702    1435  0000          0               /NOT USED
0703    1436  3600          3600            /50:(
0704    1437  0041          0041
0705    1440  4100          4100            /51:)
0706    1441  0036          0036
0707    1442  2050          2050            /52:*
0710    1443  0050          0050
0711    1444  0404          0404            /53:+
0712    1445  0437          0437
0713    1446  0500          0500            /54:,
0714    1447  0006          0006
0715    1450  0404          0404            /55:-
0716    1451  0404          0404
0717    1452  0001          0001            /56:.
0720    1453  0000          0000
0721    1454  0601          0601            /57:\
0722    1455  4030          4030
0723    1456  4536          4536    /60:0
0724    1457  3651          3651
0725    1460  2101          2101            /61:1
0726    1461  0177          0177
0727    1462  4523          4523            /62:2
0730    1463  2151          2151
0731    1464  4122          4122            /63:3
0732    1465  2651          2651
0733    1466  2414          2414            /64:4
0734    1467  0477          0477
0735    1470  5172          5172            /65:5
0736    1471  0651          0651
0737    1472  1506          1506            /66:6
0740    1473  4225          4225
0741    1474  4443          4443            /67:7
0742    1475  6050          6050
0743    1476  5126          5126    /70:8
0744    1477  2651          2651
0745    1500  5122          5122            /71:9
0746    1501  3651          3651
0747    1502  2200          2200            /72::
0750    1503  0000          0000
0751    1504  4601          4601            /73:;
0752    1505  0000          0000
0753                                        /CODE 74:<NOT DISPLAYED
0754    1506  0002  QAU,     2               /CONSTANT
0755    1507  0000          0       /NOT USED
=
```

```
0756    1510  1212          1212            /75:=
0757    1511  1212          1212
0760                                        /CODE 76:> NOT DISPLAYED
0761    1512  0016  QAW,     NOP
0762    1513  3506          ADD QAU
0763    1514  4020          4020            /77:?
0764    1515  2055          2055
0765                /
0766    1516  1760  QAF,     DSC I
0767    1517  6000          6000
0770    1520  7131          JMP QAI
0771                /
0772                                        /END Q*A
0773                /
0774                /
0775                /
0776                /
0777                /KEYBOARD INPUT ROUTINE
1000                /
1001                QAKRB=6036      /PDP-8 IOT KBD
1002                QATSF=6041      /TSF
1003                QATLS=6046      /TLS
1004                /
1005    1521  1000  GETKBD, LDA
1006    1522  0000          0
1007    1523  5647          STC QAEXIT+6    /SAVE RETURN
1010    1524  2001          ADD 1           /SAVE XRS 1 AND 2
1011    1525  5644          STC QAEXIT+3
1012    1526  2002          ADD 2
1013    1527  5646          STC QAEXIT+5
1014    1530  5642          STC QAEXIT+1
1015    1531  0415          KST     /WAS SOMETHING TYPED?
1016    1532  6000          JMP 0           /NO! EXIT
1017    1533  0500          IOB
1020    1534  6036          QAKRB   /GET TTY CHAR, CLEAR FLAG
1021    1535  1060          STA I           /SAVE IT
1022    1536  0000  QATY,    0
1023    1537  1120          ADA I
1024    1540  7540          -237
1025    1541  0451          APO             /BETWEEN 200 AND 237?
1026    1542  7604          JMP QACNTR      /CONTROL CHAR. CHECK FOR CR,LF,TAB
1027                /
1030    1543  0061          SET I 1         /NO
1031    1544  1660          QACHAR-1
1032    1545  0062          SET I 2
1033    1546  7770          -7
1034    1547  1000          LDA
1035    1550  1536          QATY
1036    1551  1461          SAE I 1
1037    1552  7554          JMP .+2
1040    1553  7641          JMP QAEXIT      /ILLEGAL CHAR. DONT ECHO
1041    1554  0222          XSK I 2 /CHECKED THEM ALL?
1042    1555  7551          JMP .-4
1043                /
1044    1556  1120          ADA I
1045    1557  7440          -337
1046    1560  0451          APO             /BETWEEN 240 AND 337?
1047    1561  7575          JMP QALEGL      /YES, LEGAL CHAR
1050                /
1051    1562  1461          SAE I 1         /NO, CHECK FURTHER,
1052    1563  7572          JMP .+7
1053    1564  1020          LDA I           /RUBOUT
1054    1565  0334          334
=
```

```
1055    1566  7650          JMP QATPE       /ECHO BACKSLASH
1056    1567  1020          LDA I
1057    1570  0037          37
1060    1571  7643          JMP QAEXIT+2    /LEGAL EXIT
1061                  /
1062    1572  1461          SAE I 1
1063    1573  7641          JMP QAEXIT      /ILLEGAL
1064                                        /ALT
1065    1574  7643          JMP QAEXIT+2    /EXIT, DONT ECHO
1066                  /
1067    1575  1000  QALEGL,  LDA
1070    1576  1536          QATY
1071    1577  7650          JMP QATPE       /ECHO CHAR
1072    1600  3536          ADD QATY
1073    1601  1560          BCL I           /STRIP IT TO 6-BIT
1074    1602  7700          7700
1075    1603  7643          JMP QAEXIT+2
1076                  /TO HERE IF CONTROL CHAR
1077    1604  1460  QACNTR,  SAE I
1100    1605  7755          7755
1101    1606  7621          JMP QACKLF
1102    1607  1020          LDA I           /CR
1103    1610  0043          43
1104    1611  5642          STC QAEXIT+1
1105    1612  1020          LDA I
1106    1613  0215          215
1107    1614  7650          JMP QATPE
1110    1615  1020          LDA I
1111    1616  0212          212
1112    1617  7650          JMP QATPE
1113    1620  7641          JMP QAEXIT
1114                  /
1115    1621  1460  QACKLF,  SAE I
1116    1622  7752          7752
1117    1623  7627          JMP .+4
1120    1624  1020          LDA I           /LF
1121    1625  0045          45
1122    1626  7611          JMP QACNTR+5
1123    1627  1460          SAE I           /CNTRL R SEEN ?
1124    1630  7762          7762
1125    1631  0456          SKP
1126    1632  7672          JMP QAA0
1127    1633  1460          SAE I
1130    1634  7751          7751
1131    1635  7641          JMP QAEXIT      /ILLEGAL
1132    1636  1020          LDA I
1133    1637  0047          47
1134    1640  7643          JMP QAEXIT+2    /EXIT, DONT ECHO
1135                  /
1136    1641  1020  QAEXIT,  LDA I   /GET 6-BIT ASCII
1137    1642  0000          0
1140    1643  0061          SET I 1         /RESTORE XRS
1141    1644  0000          0
1142    1645  0062          SET I 2
1143    1646  0000          0
1144    1647  6000          JMP             /EXIR S\R GETKBD
1145                  /S\R TO PRINT C(AC)
1146    1650  0500  QATPE,   IOB
1147    1651  6046          QATLS   /PDP-8 IOT TLS
1150    1652  1000          LDA
1151    1653  0000          0
1152    1654  5660          STC .+4 /SAVE RETURN
1153    1655  0500          IOB
```

```
1154    1656  6041          QATSF   /WAIT FOR FLAG
1155    1657  7655          JMP .-2
1156    1660  6000          JMP     /EXIT
1157                /
1160    1661  0243  QACHAR, 243     /HASH
1161    1662  0244  244     /DOLLAR SIGN
1162    1663  0245          245     /PER CENT
1163    1664  0247          247     /APOSTROPHE
1164    1665  0300          300     /AT SIGN
1165    1666  0336          336     /UP ARROW
1166    1667  0337          337     /BACK ARROW
1167    1670  0040          40      /RUBOUT
1170    1671  0036          36      /ALT
1171                /END OF S\R GETKBD
1172    1672  0604  QAA0,   LIF 4
1173    1673  7424          JMP QAA1        /CNTRL R EXIT
1174    1674  0623
1174    1675  2522
1174    1676  0540
1174    1677  7740
1174    1700  7461
1174    1701  3400
1174                DSPNEW, TEXT QFSURE ? <1\Q
```

NO ERRORS

```
ACVALZ 4036
ADSBLK 0515
ADSBMP 0503
ADSSP  0467
ADSSPA 0617
ADSSPX 0626
ADSSP1 0505
ADSSP2 0557
ADSSP3 0572
ADSSP4 0567
ADSSP5 0565
ADSTMP 0465
ADVRT  4654
ADV16  4655
ADV16A 4644
ADV16B 4651
ANSWER 2022
BASLIN 0026
BMULT  5310
BMULTR 5357
BMULTS 5355
BMULT1 5307
BMULT2 5320
BOUND  5716
BUFB0  0400
BUFB4  0400
BUFHI  5774
BUFLO  5775
BUFPTR 5704
BUMPR  0045
BUMPR1 0046
BXRET  4041
B1     1423
B2     1426
B3     1432
B4INTB 1056
B6CALL 4020
=
```

```
B6FRB0 0415
CDF0   5601
CHBANK 5373
CHKHI  5673
CKTP   0116
CKTPB  0127
CKTPIN 0107
CLLDRA 4075
CLRCRV 1124
CLRMOR 1133
CLRT   1136
COMMIS 0036
COMPR  4601
COMPRT 4612
COMPR1 4604
COMPR2 4613
CONT   5600
CORVAL 0023
COUNT  0025
CR     4043
CSAM   5552
CURCNT 5773
CURDIS 5751
CURLOP 5763
CURRTN 5650
CURSAM 0101
C1     1436
DADD   5704
DBLHI  5741
DBLLO  5747
DECML  4430
DECMLA 4446
DECMLB 4455
DECMLC 4466
DECMRM 4414
DECMRT 4463
DELSP  0415
DELSPA 0425
DELSPC 0432
DELSRT 0424
DIAL77 0040
DORAGO 1106
DORART 1104
DORG01 1137
DORG03 1167
DORG04 1206
DORG05 1222
DORG06 1230
DORG07 1233
DORG08 1221
DOSUB  0053
DREND  4071
DRSTRT 4066
DSCALL 2020
DSCLOC 5445
DSCLOP 5476
DSCWD  5462
DSPERA 2657
DSPERB 2656
DSPNEW 3674
DSP1   2026
DSP1P1 2167
DSP1P2 2201
```

```
DSP1P3 2246
DSP1P4 2275
DSP2   2053
DSP2P1 2336
DSP2P2 2431
DSP3   2102
DSP3P1 2444
DSP3P2 2515
DSP4P1 2560
DSP4P3 2642
ENDHI  5777
ENDLO  5776
ERAST  0106
ERNNU  0751
ERNNX  0726
ERRCXX 2663
ERRNW0 1501
ERRNW1 1504
ERRNW9 1514
ERR1   1447
ERR2   1455
ERR2A  1462
ERR3   1463
ERTABL 1426
ER0    0242
ER0A   0247
ER0B   0255
ER0C   0172
ER1    0164
ER1A   0173
ER1B   0226
ER1C   0240
ER2    0261
ER2A   0263
ER2RTN 0304
ER2SRT 0350
ER2S1  0307
ER2S2  0317
ER2S3  0330
E1     1503
FLAGWD 0051
FLDZ0  0017
FNDAD  0516
FNDAD1 0525
FNDAD2 0527
FNDAD3 0544
FNDRT  5171
FNDSPB 5155
FNDSPC 5201
FRESAM 0105
FSTBLK 0103
FTEMP  1263
F1     1264
F2     1351
F2ZXQ  1331
F3     1342
F4     1353
F5     1354
GETANS 5237
GETKBD 3521
GOPRT  4137
GTANS1 5251
G1     1356
```

```
HELPDS  0747
HELPRT  0763
HELP1   0753
HELP2   0752
IDORA   5400
ILLG    1764
ILLGL   1745
ILLGL1  1754
INITDL  0026
INSRT   0454
INSRTA  0457
INSRTN  0464
INSTNM  0101
INTDRA  4061
INTP    0131
INTPA   0134
INTPB   0142
INTTBL  1241
IPCRT   1200
IPCSUB  1161
JMPSUB  4037
JMPTBL  1252
JMQR    4045
JMQW    4046
KBUFHI  5441
KBUFLO  5442
KEEPDR  1346
KIDORA  4057
KMNADR  5436
KMNFLD  5435
KMXADR  5440
KMXFLD  5437
KRDORA  4060
KYSCAL  5443
LBDATA  1052
LBPR    0362
LBPRA   0371
LBPRB   5020
LBPRC   5117
LBPRD   5124
LBPRE   5137
LBPRF   1054
LBPRG   1100
LBPRRT  0370
LBPRX   5114
LBPRZ   1102
LBPR4   1475
LEGAL   1014
LEGAL1  1031
LF      4042
LFUNIT  1033
LIFX    4040
MATCH   0441
MATCHB  0460
MATCHC  0471
MATCHD  0501
MATCHE  0506
MATCHF  0436
MAXADR  5675
MAXFLD  5674
MINADR  5616
MINFLD  5615
MINUS1  1371
=
```

```
MISSES 0033
MNLNER 0764
MNLNE1 0773
MORP2  1373
MORP3  1401
MORP4  1413
MORP5  1415
MTHRT  0477
MULACV 5255
MULTMP 5254
MULT10 5256
MULT8  5274
MULT8E 5360
MVRT   4634
MV16   4626
MV16A  4631
M1     4427
M1A    4514
M1S    4504
M1THS  4424
M10    4426
M100   4425
M1000  5727
M2     0104
M70    5676
NAMETP 0050
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NOTUNQ 1761
NUMDIS 0052
NUMPAR 0100
NUMPRA 0027
NUMPTS 4056
NUMPT0 0024
NUMPT4 0077
NXTDF  5666
NXTPNT 5641
OFFSET 0025
OF12BU 4000
OKEND  5663
OKFLD  5667
01     1467
PARA   0073
PARA0  0044
PARDAT 0020
PASTRT 0545
PASTSP 0535
PASTS1 0550
PLUS1  1420
PLUS2  4052
PM1    0666
PONE   0622
POS5   1314
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PRCT1  0052
PRCT2  0054
PRCT3  0056
PREAD  0042
PRLF   4201
PRLFA  4205
PRLFRT 4216
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-
```

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PRNTLN 4112
PRNTPC 4126
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PRTABL 1330
PRT1   1350
PRT2   1375
PTCMA  0753
PTCMRT 0630
PTCM1  0557
PTCM2  0565
PTCM3  0571
PTCM4  0602
PTCM5  0621
PTCM6  0510
PTFAIL 0631
PTFALB 0743
PTFALC 0700
PTFALD 0647
PTFALE 0654
PTFALH 0705
PTFALJ 0712
PTFALK 0720
PTFALL 0732
PTFALP 0770
PTFAQ  0636
PTR14B 1002
PTSCVD 0037
PTSLIB 0034
PTSUNK 0035
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PTŻAR  1013
PTŻAR1 1025
PTŻA1  1014
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P1B4   0105
P100   4044
P12    0043
P16    5173
P2     4766
P3     4053
P3777  0063
P4     5234
P40    0776
P4000  4051
P401   5444
P5     0734
P6     1564
QAA0   3672
QAA1   1424
QAB    3004
QACA   3015
QACHAR 3661
QACKLF 3621
QACNTR 3604
QAD    3026
QAE    3050
QAEXIT 3641
QAF    3516
QAG    3062
QAH    3114
QAI    3131
```

```
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QAJ    3136
QAK    3305
QAKRB  6036
QAL    3175
QALEGL 3575
QAM    3101
QAN    3223
QAO    3231
QAP    3242
QAQ    3263
QARFSH 3053
QAT    3270
QATLS  6046
QATPE  3650
QATSF  6041
QATY   3536
QAU    3506
QAV    3316
QAW    3512
QAX    3424
QAY    3412
QAZ    3301
QRD    0064
QWT    0065
RDORA  5544
RDTAPE 4150
RDTPRT 4171
READ   7774
RETTY  4726
RETURN 6000
RSTRTY 5172
RTN    0041
RTNCDF 5460
RWTAPE 4172
RØ     1442
R1     1443
R2     1463
R9     1462
SCALE  0340
SC12BU 0343
SETDF  5741
SETFLD 5632
SETSHV 1152
SET16  4616
SHOVE  0777
SHOVEA 1002
SHOVER 1013
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SHOW14 1041
SHOW3  1035
SHOW41 1047
SHVSB1 1251
SHW21M 1045
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SPSP   4055
SPSPA  0042
STDIAL 1470
STDOR  1157
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STDORZ 1201
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STDOR4  1225
STDOR5  1237
STDOR6  1261
STERR   1433
STPRT   1334
STRLF   5203
STRLFB  0447
STRLFC  5217
STRT    1066
STRTA   1101
STRTB   1127
STRTC   1135
STRTPA  5223
STRTRT  5233
STRT2   1112
STTAB   1051
TAB     5524
TAPEZ   4155
TAPEZ1  4164
TEMP    5477
TEMP1   4050
TLRNCE  0030
TRABRT  4266
TRANS   4230
TRANSA  4233
TRANSB  4244
TRDTA   5007
TRDTAR  5017
TRDTA1  5012
TRNMD1  4235
TRNMD2  4271
TRNSMD  4217
TRNSMT  4227
TRNSRT  4243
TXTSTR  2021
TYA     4267
TYANA   1634
TYANS   1604
TYAN1   1606
TYAN1A  1607
TYAN1B  1623
TYAN1C  1627
TYAN1F  1621
TYAN3   1632
TYAN3B  1643
TYAN3C  1656
TYAN3D  1664
TYAN3E  1671
TYAN4   1674
TYAN4A  1675
TYAN4B  1703
TYAN4C  1711
TYAN4D  1716
TYAX    4402
TYAY    4367
TYAY1   1400
TYAY2   1406
TYAY5   4372
TYAZ    4404
TYA1    4310
TYA2    4313
TYA3    4323
```

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TYA4A   4357
TYB     4531
TYB1    4573
TYB2    4556
TYC     0351
TYCA    0357
TYCNT   4735
TYCSB   4661
TYCSB1  4665
TYC1    4655
TYC1A   4671
TYC1B   4722
TYC1C   4736
TYC1D   4743
TYC1E   4746
TYC1F   4762
TYC1M   4675
TYC1N   4711
TYC1X   4707
TYC2    4727
TYO1    2705
TYO2A   2745
TYO3    2714
TYO4    2723
TYO5    2752
TYO6    1717
TYO7    1522
TYO7A   1532
TYO8    1543
TYO8A   1554
TYO9    1557
TYO9A   1570
TYO9B   1576
TYO9C   1603
UA      1660
UARET   1674
UB      1675
UC      1672
UNKVAL  0044
U1      1603
U1A     1565
U1AA    1571
U1ARET  1602
U2      1627
U3      1636
U4      1700
U7      1726
U8      0743
U9      1744
VCOORD  5475
V1      5005
V2      0664
V4      4420
WINSAM  0100
WRAP    5624
WRITE   7775
WSAM    5561
WTTAPE  4173
WTUNØ   5566
XCORD   0001
XCURHI  0021
XCURLO  0022
```

```
XNMBUF  0060
XNMRET  1051
XNMTMP  0062
XNUM    1026
XNUMA   1032
XNUMB   1036
XWORD   0047
XWORD1  0050
XXCRD   5564
X1      1510
X12     4520
X2      0707
X22     4524
X3      0721
X32     4526
X4      1524
YCUR    0024
YOFFST  4072
YQ1     0665
YSCAL   5644
YSCALE  4073
YSCRNG  1366
YSCTMP  1370
YSHFT   0020
Z6      0674
Z7      4344
```

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