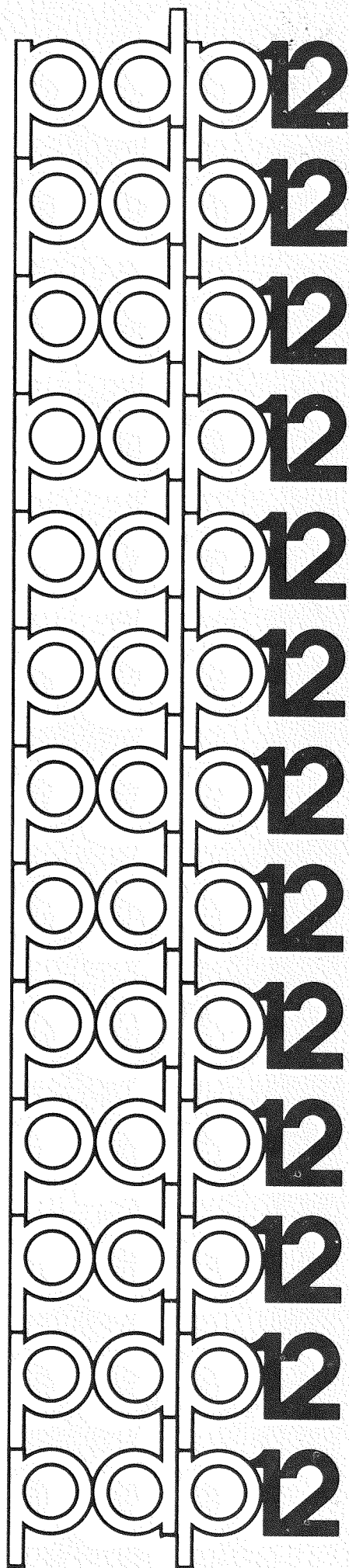


digital

CATACAL



CATACAI ADDENDUM
ASSEMBLING CATACAI
DEC-12- JW1A-DL
JULY, 1970

The CATALACAL program is supplied to the user in both source and binary on the tape. To generate a new binary file if the source program is modified, use the following procedure.

1. Load a DIAL-MS tape on unit 0. Load unit 1 with either a DIAL-V2 or DIAL-MS system tape. If another tape unit is available, mount the tape containing the CLEARSYM and CATALACAL source programs there. If only two tape units are available, place the source programs on unit 0 (with PIP if necessary), in order to reduce the assembly time.
2. Type → ZE) to clear the binary Working Area of unit 1.
3. Type → AS) CLEARSYM . CLEARSYM is a two word program which produces a clean symbol table.

0000
SAVSYM 1
4. Type → AS CAT2,0). Error messages generated at this time should be ignored. Press the RETURN key to terminate the assembly after the errors have all been printed to suppress printing of the symbol table.
5. Type → ZE). This clears the binary Working Area on unit 1.
6. Type → LI CAT3,0). If no listing is desired, use the AS command. Any errors generated now are real and must be corrected.
7. Type → LI CAT2,0). Because the symbol table produced is the same as the one generated in step 6, printing may be suppressed with the RETURN key after it has started to be printed.
8. Type → SB CAT23,0). This saves the binary output from the two previous assemblies.
9. Type → ZE).
10. Two versions of the Floating Point Package are supplied. If the machine has the EAE option, CATLE should be used in the following steps and CATALACAL will be generated. If the machine does not have this option, CAT2 should be used to generate CATALACAL.
11. Type → AB CAT1, 0).
12. Type → AB CAT23,0).
13. Type → SB CATALACAL,0). A binary file of CATALACAL (E) has now been generated and command → LO CATALACAL,0) will cause load and execute.

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CHAPTER 1 USING CATALAC

1.1 Introduction

CATALAC is a box-car averager for data acquisition at rates from 35 seconds/point to 250 microseconds point¹. Any analytical instrument or experiment supplying data within those limits can be interpreted easily and quickly using CATALAC's many facilities.

Initially, CATALAC accepts analog data from the interfaced analytical instruments, averages the information, and displays the averaged data on the PDP-12 oscilloscope. The scientist can then interpret the data as required by his experiment in seconds using any of CATALAC's data handling commands. Thus, a sloping baseline can be aligned, a spectrum can be scaled, many integrations can be performed, and two spectra can be compared simultaneously, each operation requiring only a single command.

An X-Y recorder can be interfaced parallel to a scope channel of the computer if hard copy results are desired.

CATALAC is supplied in two versions -- CATALAC and CATALACLE. The only difference between the two is that the latter version uses EAE (Extended Arithmetic Element) for greater calculating speed.

1.2 Hardware Requirements

The minimum configuration for using CATALAC is:

PDP-12A computer with 8K of core memory and KW12A clock

An X-Y Analog Recorder is recommended for hard copy.

The program does not require, but will support, a high speed reader/punch.

¹If a faster sampling rate is required, the Signal Averager program, DEC-12-YZAA, can be used to collect the data and CATALAC can be used to interpret the supplied information. The TISA program, DEC-12-UW3A, accepts asynchronous data which also can be manipulated by CATALAC.

1.3 Initial Starting Procedure;

Each time the PDP-12 computer is to be used to run CATALAC, the following procedure must be performed.

1. Mount the CATALAC tape on tape unit 0. (Unit 0 is indicated by setting the tape channel indicator to 8). Mount a scratch or library tape on unit 1.
2. Set the switches on the tape units to REMOTE and WRITE ENABLE.
3. Set the mode switch to LINC mode and press the I/O PRESET key on the computer console.
4. Set the Left Switches to 0701 and the Right Switches to 7300.
5. Press the DO console switch.
6. When the tape has stopped moving, press the START 20 key.
7. Press LINE FEED, type

LO CATALAC,0

or

LO CATALAC,0

and press the RETURN key. Either program may be loaded. If only one program is to be used at all times, the other may be removed permanently from the tape.

Refer to the LAP6-DIAL Programmer's Reference Manual, DEC-12-SE2B-D, for additional information on operating procedures.

CATALAC indicates it has been successfully loaded into the computer by typing the message

CALACAL LIVES!

TITLE:

Commentary of any length may be typed in after TITLE. The information is not stored with the data on tape and is used only to supply a titled paper copy record of data operations performed. Type CTRL/A¹ to exit from the title phase. A command may now be issued (refer to Chapter 2).

¹CTRL/A is typed by pressing down the CTRL (control) key and then the letter key (A in this case) in the same manner as a character requiring the SHIFT key is typed.

1.4 Inputting Data

Most calculations are performed with the Floating Point Package (refer to Floating Point System Manual, DEC-08-YQYB-D), but final array results are single precision (12 bit) integers, normally scaled to the range 0-100000. When a numeric value is requested, most conventional formats are acceptable. Thus, for example, the decimal value 10 may be entered as 10.0, 10, 1E1, or .1E+02, etc., as described in the above manual. After a numeric value has been typed in response to a command, any character except 0 to 9, E, or . will terminate input for that entry. A space is recommended as the terminator. (Pressing RETURN does not automatically generate a LINE FEED.) In response to questions, only Y or N are acceptable answers. Any other response generates a question mark on the Teletype and is ignored. No terminator is required after a Y or N response.

In all cases, striking RUBOUT before a terminator will delete all input up to the preceding terminator to allow the correct value to be entered. A RUBOUT during decimal input echoes as an exclamation mark and during octal input as a question mark on the Teletype.

If, during scope display, a command unacceptable to CATAAL is typed, a ? is printed on the Teletype and the program returns to the same scope display.

At all times when using CATAAL, it is strongly recommended that any data, both raw and interpreted, that may possibly be used at a later time be saved on tape (see TAPE I/O, section 2.5) to prevent accidental elimination from the display channel, because most commands replace the previous contents on the scope.

1.5 Stopping and Restarting CATAAL

If an operation must be halted immediately, press the console STOP switch. This should not be used haphazardly; if arrays were being modified the data will be lost. Routines requiring input parameters or initial dialogue can be halted during that stage and before the input is complete. To restart CATAAL after an emergency stop, set the MODE switch to 8 mode, set STOP switch to run position, and press I/O PRESET and then START 400 key. A new CATAAL command can be issued when the display is restarted. If the START 20 key is pressed instead of START 400, the program starts at the beginning as described in Section 1.3.

CHAPTER 2

CATACAL COMMANDS

2.1 Introduction

After starting CATACAL (refer to Section 1.3), a scope channel should be designated to accommodate the incoming data which is loaded into the computer's memory area directly from an analog input channel, the Teletype keyboard, the high-speed or Teletype reader, or storage on LINtape. Any of CATACAL's commands can then be used to interpret the data. For example, the baseline can be linearized and the resulting spectrum integrated.

Each CATACAL command is described in this chapter. The values requested, acceptable ranges, formulas used and available options for each are included in the discussion. After each command is completed, the correct spectrum is displayed (except the MODIFY command). Another command may be issued at that time.

2.2 Scope Channel

The scope on the PDP-12 provides three viewing channels:

- channel 1 - assigned by user
- channel 2 - assigned by user
- channel 3 - channels 1 & 2 simultaneously

Data supplied from the associated instrument or from LINtape is assigned to channel 1 by typing the number 1 on the Teletype; similarly data is assigned to channel 2 by typing the number 2 on the Teletype. The choice of channels 1 or 2 determines which data will be used. If a number between 4 and 9 is typed, channel 1 is assumed. Typing Ø produces a response of question mark on the Teletype.

Each channel can accommodate up to 20000 data points. A channel may be assigned to accommodate data when a new spectrum is being collected or when another CATACAL command has been completed by typing 1 or 2. The present contents of that channel are displayed on the scope. When new data is assigned to a channel which already contains data, it replaces the old data.

¹Teletype is the registered trademark of the Teletype Corporation.

Channel 3 permits the user to view the data in channels 1 and 2 together. When channel 3 is being used, analog knobs 0 and 1 control the X and Y offset for channel 2 to allow comparison of data sets. It can be viewed at any time between commands, but should be followed by a 1 or 2 before calling a command. If left at channel 3, the next command assumes channel 2.

Most of the remaining CATALAL commands are called by typing at least the first two letters of its name and a colon after the termination of the preceding command. Refer to Appendix A for a summary of the commands.

2.3 AVERAGE

The AVERAGE command implements time averaged analog input from the associated instrument. The parameters of the scan are specified on the Teletype in response to AVERAGE's questions and then that operation is performed. The data collected is displayed on the channel specified before the AVERAGE command was initiated.

To collect data, proceed as follows.

1. Prepare the analog instrument for the experiment.
2. Specify a scope channel number (1 or 2) to accommodate the data.
3. Type AV: indicating an averaging operation is to be performed.
4. The Teletype asks

CHANNEL=

requesting the analog channel number (octal) to which the instrument is connected. Type in the analog channel number on the AD12 used by this experiment and press RETURN. Note that digits other than 0-7 will serve as terminators.

5. The Teletype will respond with the message

NO. POINTS=

Type in the number of points to be collected in the scan where $0 < \text{POINTS} < 2048$ and then press the SPACE bar.

6. The next question is

SEC /SCAN=

Type in a value for the length in seconds of each scan where SEC/SCAN= seconds/point x points/scan. Remember that a minimum of 0.25 millisecond/point is required. Press the SPACE bar. If the resultant rate is too high $[(\text{SEC}/\text{SCAN}/\text{NO. POINTS}) < 0.25 \text{ msec}]$, the routine restarts, asking for

NO. POINTS=

7. The program now asks for the desired external sense line (0-15₈), and its state, which is to be used to trigger each scan. In response to

SENSE:

type the octal value of the desired sense line if the desired state is +3 volts. If the desired state is 0 volts, enter the sum of the sense line plus 20₈. Sense line 15 is used by the Teletype. All unconnected sense lines are held at +3 volts.

8. The next question is

DELAY (SEC)=

asking for the delay from receipt of the trigger pulse to the start of data acquisition for each scan. Values from 0 to 20 seconds are legal; resolution is 10 milliseconds. Press the SPACE bar after typing the value.

9. The message

NO. OF SCANS=

is asked last and the reply must be in the range $1 < \text{SCANS} < 2048$. Type in the value and press the SPACE bar. Input will begin with the arrival of the first trigger pulse.

10. Activate the instrument to begin the experiment. The AVERAGE command will now collect the data according to the specified parameters.

The AVERAGER implements two display routines of its own, totally separate from the main scope routine of CATAAL. (This was necessary because of internal timing and intermediate data structure peculiar to the AVERAGER.)

During data acquisition, the value for each point in the current scan is displayed as soon as it is available. Note that the X axis is not scaled to the number of points; thus, if less than 512 points were requested, the trace will wrap-around such that the 513th point will be displayed at the first location, the 514th at the second location, etc.

Bit 0 of the Right Switches can be set to 1 at any time during the run to interrupt the run when the current scan has been completed. The number of scans completed to that time is indicated by the message

NO. SCANS=

and the data are displayed on the scope. To diminish flicker, only one-fourth of the collected points are displayed. The Y axis can be doubled at this time by typing M; type D to halve the Y axis. By typing S, another message,

MORE SCANS?

is printed. Reply with Y if more scans are desired. Type N to terminate scanning with the specified parameters. This sequence of messages is repeated until the number of scans requested in step 9 have been performed or until bit 0 is set to 0. If bit 0 = 0, the collected data is displayed only after all the scans are collected.

2.4 TIME

The constant corresponding to the computer's memory cycle time used to determine timing accuracy for averaging during data acquisition may be reset. The AVERAGE routine may be calibrated as follows.

1. Call the MODIFY routine. Refer to section 2.24.
2. Place 7402 in location 4307 to stop when completed. This routine appears as follows on the Teletype. (The underlined data is typed in by the user.)

```
MO:
4307=4430:7402C
R400
```

The display is restored.

3. Call the AVERAGER by typing AV: then use the values CHANNEL 0, 1000 POINTS, 16 SEC/SCAN, 15 for SENSE to allow the keyboard to initiate (trigger) the run, 0 for DELAY, and 10 for NO. SCANS. Set bit 0 of Right Switches to 0.
4. Time the program from when the keyboard is struck to when the computer halts, approximately 160 seconds later. Call this value T. The memory cycle time, MCT, is then determined by

$$MCT = T \times \frac{1.6 \times 10^{-6}}{16 \times 10} = T \times 10^{-8} \text{ sec.}$$

1.6 microseconds is the value assumed by CATACAL. Restart the display by pressing the START 400 switch as described in Section 1.5.

5. Enter the desired value by typing TI: and supplying the value of MCT after the message

MCT(SEC)=

6. Call the MODIFY routine and replace the correct value in location 4307. Once calibrated, the new value for MCT should be entered as in step 5 above each time CATACAL is loaded from the DIAL system, if the AVERAGER is to be used.

2.5 TAPE I/O

LINtape provides the PDP-12 with large data storage capabilities, each tape block holding 256 single precision data points. When the system has been properly started, a LINtape on any tape unit can be used to store any collected data, either when it is collected initially by AVERAGE or after it has been manipulated by any of the CATACAL commands. Similarly, any stored single precision (12 bit) data can be retrieved from LINtape at any time. Both data storage and retrieval use the same command, as follows:

1. Type TA: to call the TAPE routine.
2. The Teletype responds with

BLK1, U,M,(0=W):

This statement requests the following information when data is to be retrieved from tape: the first tape block number (octal) where the data starts, the number of the tape unit (0-7) holding the tape, and the mode of operation. Type in the three requested parameters, separated by a comma or space. If a non-octal (not 0-7) digit is supplied for block number, 0 is assumed; however, data can not be read or written on LINtape block 0. To request that block will merely repeat the question. Remember that each LINtape contains 777₈ blocks. The mode for data retrieval is READ and is indicated by typing the number 1 for that parameter.

If data is to be stored on tape, either immediately after collection via AVERAGE or after interpretation, the parameters requested are the same as above, except that the mode of operation is 0 for WRITE. When the tape WRITE operation is completed, the data is redisplayed. If the exact location of stored data or of empty blocks is not known, use the MAGSPY program to determine it. (Refer to DEC-12-UZSA-D). It is the user's responsibility to space the data files properly.

3. When the tape parameters have been accepted by the computer for a READ operation only,

NO. POINTS=

is printed on the Teletype. Type the number of points to be retained for this spectrum and press RETURN. Any number of points up to 2047 can be read in (mode=1), not including those to be skipped.

4. The final message is

PTS. TO SKIP=

If some points are to be skipped before the desired portion of the spectrum, type that value now and press RETURN. Type 0 if no points are to be skipped. Up to 2047 points can be skipped during a tape READ operation. The tape READ operation is then performed after step 4. If a value greater than 2047 is typed in step 3 or 4, 2047 is assumed. If, during TAPE I/O, the program halts at location 3717, a checksum error has occurred due to a hardware malfunction or tape error. The program can be restarted by pressing the START 400 switch as described in Section 1.5. The transfer can be retried, if desired.

2.6 PAPER TAPE

Data may be input to the computer from papertape via the high or low speed reader. The data¹ may have been punched directly by the analog instrument or may have been prepared by the CATALAC command OUTPUT. The procedure for inputting data from tape is as follows.

1. Type PA: to call the routine.
2. Answer the message

NO. POINTS=

with a value less than 2048, not including skipped points.

3. The next request is for

PTS TO SKIP=

Type in the number of points to be skipped from the start of the tape before data is retained (less than 2048) and press the SPACE bar.

¹CATALAC will accept data in USA-ASCII format with and without spaces and/or non-numeric characters before a numeric value (each number must be properly terminated, as described in Section 1.4).

4. Two parameters are requested by

YRANGE & MIN:

The range on the Y axis should be at least as large as the difference between the largest and smallest values on the tape. Type the Y-range, a comma, and the minimum value, which should be no larger than the smallest Y value in the data. Press the SPACE bar.

5. The last question is

TTY I/O?

Answer Y if the data is coming from the low-speed reader. A reply of N will start the high-speed reader. Prepare the reader before replying because the tape will be read in immediately after the reply.

2.7 CALCULATE

Spectra can also be calculated from the Teletype keyboard. CATALAC requests information on the peaks, the number of points, and baseline. The spectrum resulting from this calculation is displayed on the presently active channel. The CALCULATE procedure is as follows:

1. Call the routine by typing CA:
2. After the Teletype has printed the message

ABSORPTION 'DIPS'?

reply with Y if the spectrum is to be generated with dips; reply with N if it is to be generated with peaks.

3. The next message is

WIDTHS EQUAL?

Type Y if all peak (or dip) widths are to be entered as equal; type N if unequal widths are to be entered (as specified in step 8 below).

4. Observe the Teletype for the message

CUTOFF AT 8*WIDTH?

If interaction from a peak that is more than eight times the halfwidth away from its position (or crest) is to be ignored, type Y. A considerable saving in time is gained for narrow width, multipeak spectrums if Y is typed. Note that all peak widths must be less than $1/4 \times (X \text{ RNG})$ (step 7) for this option. A response of N will include all interaction and impose no limits on widths.

Note that the messages in steps 2 through 4 are only asked for once each time CATACAL is loaded.

5. Respond to the next message

NO. POINTS=

with a number less than 2048 and press the SPACE bar. Note that both channels 1 and 2 are affected by this value; thus, if the CALCULATE operation is using channel 1, only that number of points will be available for display of the data in channel 2.

6. After the message

NO. PEAKS=

type the desired number of peaks, in the range $0 < \text{PEAKS} < 42$.

7. More data is requested by

X RNG, X1, INT.MPLR, BASE, LOR. FR.(0-1) :

The first three parameters allow the user to define any coordinate grid in which to contain the calculated data. These parameters scale the data to a 500×1000 point grid for compact integer storage. This does, however, impose a minimum on resolution, especially for peak position and width, defined as $X \text{ RNG}/500$. Type in the parameters: X range, initial X location, multiplier which is the Y axis scaler, the location of the base line on the scaled Y axis, and the Lorentzian fraction where 0 is a 100% Gaussian fit and 1 is a complete Lorentzian fit. The fraction must be in the range 0.0 to 1.0. A value of 1 for INT.MPLR implies a range of 0 to 1000 on the Y axis, a value of 10 implies a range of 0 to 100, etc. Base and peak heights should then fall within this scaled range. Peak positions should be in the range $X1$ to $X1 + X \text{ RNG}$. A negative X RNG is legal; e.g., for $X1 = 500$ and $X \text{ RNG} = -500$, the X axis runs from 500 on the left to 0 on the right.

8. The dimensions of each peak requested next by the message

HGT,H-WIDTH,POS:

are height, half width at half height, and position on the scaled X axis. Type in each value followed by a comma or space and then press RETURN after the parameters for each peak. Thus, a two peak spectrum may include the data:

678,5,35
789,4,50

If the equal widths option (step 3) is being used, enter a width for the first peak only. That value will be assumed for all other peaks.

9. After all the necessary data has been typed in, the computer indicates it is busy performing the calculation by the message

COOL IT.

on the Teletype. Do not type any key on the Teletype during the few seconds required for the computation; the keyboard is "dead". When calculated, the spectrum described by steps 2 through 8 is displayed on the scope.

After a display channel has been selected and data has been brought into the computer's memory, any of the following commands may be issued. Any number of them may be requested and in any order. After the data has been interpreted by any of the available commands, it can be stored on tape for later use.

2.8 ALTER

The parameters specified by the most recent CALCULATE command may be modified by an ALTER command. The command is implemented as follows:

1. Type AL: to call the ALTER routine.
2. The message

PK,PA,VL:

is printed on the Teletype, requesting the peak index number where the first peak typed in during CALCULATE is 1, the second is 2, etc., the parameter index where height is 1, half-width is 2, and position is 3, a comma or space, and the new value for that parameter. Type the peak number, a comma or space, the parameter index, and the new value. Press the SPACE bar. All parameters except X RNG and X1 may be altered. The equal widths option has no effect at this time; any width may be altered. Consider the following sequence:

PK,PA,VL: 12,3,674

This series will center the twelfth peak at location 674 on the scaled X axis.

Other spectral parameters may be modified by typing one of the sequences listed below and then the new value in response to the above message.

<u>Sequence</u>	<u>Parameter to be Modified</u>
Ø,1:	intensity multiplier
Ø,2:	baseline
Ø,3:	Lorentzian fraction
N,Ø:	print parameters for peak N
Ø,Ø:	print all parameters

The last two sequences exit to the display without recalculating the spectrum.

3. Type Ø,-1: when all alterations have been made and the resulting spectrum is to be calculated and then displayed.
4. The computer indicates it is recalculating the spectrum by printing the message

COOL IT.

on the Teletype. When it is completed, the new spectrum is displayed.

2.9 COPY

The contents of the currently displayed channel can be copied into another channel, leaving the two with identical data, by typing CO:.. This is particularly useful if the manipulated data is to be compared with the original data.

2.10 XINVERT

The left to right X axis relationship of the displayed array can be inverted by typing XI:..

2.11 YINVERT

Each Y value of the displayed channel is subtracted from 10000 and the differences stored in that channel, thus effectively inverting the Y axis by the command YI:..

2.12 SCALE

If, when data is displayed on the scope, the maximum and minimum points "wrap-around" because they are out of the scope's range or if

the range is smaller than desired, SCALE may be used to bring the Y data into the range $0 \leq Y \leq 1000$. The scaling parameters used, original minimum value, original maximum value, and multiplier, are printed on the Teletype after the computation, as, for example:

```
MIN= -54
MAX= 75
MPY= 7.752
```

where

$$MPY = \frac{1000}{(MAX-MIN)} \quad \text{and} \quad Y_i = (Y_i - MIN) \times MPY$$

2.13 MULTIPLY

Data may be scaled to an arbitrary range other than the 0 to 1000 range assumed by the SCALE routine. The MULTIPLY routine is used mainly in spectrum stripping when a standard and/or background spectrum is to be subtracted from a raw data set after appropriate scaling.

The command is used as follows.

1. Type MU: to call the MULTIPLY routine.
2. The parameter

MIN=

is then requested. This value is to be subtracted from each data point before MPY is applied, as

$$Y_i = (Y_i - MIN) \times MPY$$

The final data should be in the range -2047 to 2047. Values outside of this range are truncated to these limits. Final values less than -5 or greater than 1019 will "wrap-around" when displayed.

3. When

MPY=

is printed, type in the desired multiplier.

2.14 SMOOTH

Collected data can be smoothed by an 11 point least squares curve fit routine via the SMOOTH command. The new spectrum is displayed on the

scope. The first and last five points are not altered. (This routine is a modification of DECUS 5/8-69.)

2.15 CURSORS

Typing CU: will display two movable bright dots, referred to as cursors, on the scope to be used to implement the INTEGRATE and STRIP commands¹ by delimiting the data points to be modified. The two cursors are controlled by four analog channel knobs as follows.

<u>CURSOR</u>	<u>analog channel knob</u>	<u>direction of movement</u>
	4	horizontal
left	5	vertical
	6	horizontal
right	7	vertical

When the two dots appear on the display initially, knobs 4 and 5 must always position one of them to the left of the other.

The decimal values of the location of the cursors are displayed at the top of the screen in the order 4,5,6,7. A grid of $500_{10} \times 1000_{10}$ on the scope is assumed. The actual range extends slightly beyond, but the data points should be within that range.

Typing CU: a second time will remove the cursors from the scope.

Note that the cursors can be used to inspect peak amplitudes, valleys, widths, etc., by positioning them appropriately and noting the displayed values.

2.16 INTEGRATE

The INTEGRATE command provides two options:

1. Integrate the data between the cursors by using them to set a pivot or baseline, print out the area, and leave the data array unchanged.

¹A very slight distortion may occur on the scope when the cursors are used to delimit a portion of the spectrum at the extrema of the Xaxis.

2. Integrate all data using the cursors (extrapolated) to define a pivot line and store a scaled running integral in the data array, then print out a scale down multiplier.

The data is defined as lying on a 500 x 1000 grid, independent of the total number of points in the array. The area at a given point, j, is expressed as

$$A_j = \sum_{i=s}^j (X_{i+1} - X_i) [(Y_{i+1} - P_{i+1}) + (Y_i - P_i)] / 2$$

where $X_0 = 0$, $X_n = 500$ and s is the starting point which is equal to the X value of the left cursor for option 1 or is equal to 0 for option 2. Similarly, $j = x$ value of the right cursor and P_j is the value of the pivot line at that point.

An integration is performed as follows.

1. Type CU: and position the cursors as required for the desired option (refer to section 2.15).
2. Type IN: to call the routine.
3. The message

SCAN INT'L?

is printed. Type Y if a running integral (option 2) is desired; type N if a partial integral and area printout (option 1) are desired.

If, when the routine is first called, the message

BAD X POINTS!

is printed, the left-right relationship of the cursors has been inverted. The display is restarted to allow correct positioning. When corrected, type IN: to call the routine again.

2.17 STRIP

Three options are available for altering portions of the displayed spectrum.

1. Replace the data between the cursors with the best straight line.
2. Subtract a sloping baseline from all data points.

3. Subtract a straight line interpolated between the cursors from the data between the cursors.

The STRIP command is implemented as follows:

1. Type CU: and position the cursors as explained below.
2. Type ST: to call the STRIP program.¹
3. The message

STRIP PEAK?

is printed on the Teletype and the two dots are displayed on the scope. If some of the data points are to be replaced by the best straight line, position the left dot at the first data point to be replaced, and the right dot at the last data point to be replaced. Then type Y and the delimited portion of the spectrum is replaced by a straight line. The STRIP program is exited. Continue with another CATACAL operation. If one of the other STRIP operations is desired, type a response of N.

4. A reply of N generates the message

FULL BASE?

If a (sloping) baseline is to be subtracted from all the data points, the two dots should have been positioned on the scope with the desired slope and amplitude. The dots need not be on the data curve nor on the X axis extrema because they are extrapolated. Type Y and the new display will appear. If a straight line is to be subtracted from some data points, i.e., partial baseline restoration is desired, type N.

If, when the STRIP routine is called, the message

BAD X POINTS!

is printed, it means that the left and right dots have been inverted. The original display with the cursors appears. Correct the dots by adjusting the knobs; then call the routine again.

2.18 DIFFERENTIATE

The derivative curve of a spectrum is computed by the DIFFERENTIATE command.² Derivatives to a depth of at least six can be calculated for some spectra with minimal distortion of the data. These are

¹If STRIP is called without calling CURSORS first, stop and restart the program (refer to section 1.5) and call the CURSORS and then STRIP routines.

²Note that the DIFFERENTIATE function is called by typing DE:

produced, not by adjacent point differences, but by the following procedure.

$$Y = Y_{i+2} - Y_{i-2}$$

with

$$Y_1 = Y_2 = Y_3 \quad \text{and} \quad Y_{n-2} = Y_{n-1} = Y_n$$

If multi-depth derivatives are desired, scaling and smoothing are suggested before each level to reduce quantization error or "stairsteps" that result from integer arithmetic. It may also be necessary to strip out the first and last five points if they interfere with scaling (they are unaffected by smoothing).

2.19 PLOT

Any displayed spectrum can be plotted on an X-Y recorder interfaced to a scope channel for a hard copy of that spectrum using the PLOT command. The size and rate of the plot are controlled by the user; the pen is controlled by relay Ø.

To generate a plot of the presently displayed spectrum, proceed as follows:

1. Type PL: to call the plotting routine.
2. The first message printed on the Teletype is

LINE PLOT?

Type Y if a line plot is desired or type N if a point plot is preferred.

3. The plotting routine is now waiting for the user to calibrate an area on the X-Y recorder. A small dot appears on the scope and will make the same movements as the plotter pen. The speed for drawing the axes, as well as for the actual plotting, is controlled by knob 3 of the analog channel controls and may be adjusted at any time while using the PLOT command. Turning knob 3 clockwise increases the rate of plotting; turning it counterclockwise decreases the rate. The axes are calibrated by typing the following letters to perform the indicated operations.

<u>Letter</u>	<u>Operation</u>
X	locates maximum X co-ordinate
Y	locates maximum Y co-ordinate
O	returns pen to X-Y origin

TEXT LINE IN THIS LINE IS READABLE. THE
NEXT LINE IS THE NEXT LINE IN THE
The pen on the X-Y recorder should be set initially to the origin. Type X and then manually reposition the pen to the desired maximum X coordinate. After the X_{max} position has been determined, type Y. Set the pen to the maximum Y coordinate ($X_{max} Y_{max}$) similarly. The axes have now been determined for the plot. Type O to move the pen automatically back to the origin ($X_0 Y_0$).

4. The axes and quadrant markers of the graph may now be marked off on the plot if desired. Type M to mark off the frame and quadrants. Knob 3 controls the pen speed.
5. When the axes have been marked, the spectrum is ready to be plotted. Type G to initiate the plot. As before, analog channel knob 3 is used to adjust the plotting speed.

Any characters other than X, Y, O, M or G during this sequence produce a question mark on the Teletype and are ignored.

6. When the spectrum has been plotted, the following message is printed.

PLOTTER OFF?

The plotter should be turned off or set to standby and then Y typed. If the plotter is not turned off, the pen will start to move wildly in its effort to follow the scope analog signals when the display starts.

2.20 SUBTRACT

Using the SUBTRACT command, data in the displayed channel will be subtracted from data in the other channel. The result will appear in the displayed channel. The spectrum in the displayed channel will be lost; therefore, the TAPE I/O command is suggested before using this command if that data is to be used later.

2.21 ADD

The two channels can be averaged and the result seen in the displayed channel by issuing an ADD command. As with SUBTRACT, the data in the displayed channel will be lost when the ADD command is executed.

2.22 SWAP

The data currently in channel 1 can be placed in channel 2 and the

data in channel 2 placed in channel 1 with the SWAP command. This facility is especially useful with ADD and SUBTRACT.

2.23 SQUEEZE

The SQUEEZE command compresses the data array by a factor of 2 by averaging adjacent data points. It is recommended that this command be used immediately after data input (TAPE I/O, COMPUTER or AVERAGE) because the number of points is halved for each issuance of this command. If the current channel was 1 or 2, only that channel is affected, but if both channels were being displayed (3 was typed during display), both are halved. The purpose of this command is to reduce the number of points in order to diminish flicker and allow faster smoothing, scaling, etc.

2.24 MODIFY

The CATALAC program itself can be modified by a routine that is similar to ODT-8 (DEC-8-COCO-D) to make changes in core locations. After calling the MODIFY routine, any of the following can be performed in a logical sequence. Each must begin at the left margin.

open location	Type the location (octal) and press the SPACE bar. The contents of that location are printed followed by a colon.
change contents	After the present contents of a location have been printed, type the new contents and the letter C to enter the correction and press the SPACE bar.
inspect next location	After pressing the SPACE bar, type N. The next location and its contents can be printed followed by a colon.
reinspect same	After pressing the SPACE bar, the contents of the last location opened can be printed again by typing S.
transfer control to any location	Type R and the location and press the SPACE bar. Execution of the program will continue from that location.

Pressing RUBOUT at any time will terminate the operation and restart the routine.

2.25 OUTPUT

Collected data can be listed and/or output on paper tape by using the OUTPUT command. After calling the routine, the question

TTY I/O?

is asked. A response of Y implies the Teletype punch, and a response of N implies the high-speed punch. Be sure the device is prepared before responding to the question. The format is 10 columns of four digit integers.

2.26 RESTART

The CATALAC program can be restarted from the beginning at any time. The message

CATALAC LIVES!

is printed. This command is equivalent to pressing the START 20 key as described in Section 1.5.

2.27 DIAL

An exit from CATALAC and a return to DIAL are performed by typing DI:. Any DIAL commands can be issued at this time, including calling another program from the tape. Refer to the DIAL Manual, DEC-12-SE2B-D.

¹ DIAL refers to LAP6-DIAL.

CHAPTER 3

CATACAL EXAMPLE

The printout on the left side of the page is an actual CATACAL sequence. The commentary on the right was added to indicate the operation performed. Underlined information on the left is that typed in by the user.

LO CATACALE,0

LOAD CATACALE

CATACAL LIVES!

PROGRAM IS READY

TITLE:DEMOL

NAME THIS SEQUENCE "DEMOL"

OK, HIT ME!

READY FOR A COMMAND. CHANNEL
1 IS ASSUMED.

1CA:
ABSORPTION 'DIPS'?N
WIDTHS EQUAL?N
CUTOFF AT 8*WIDTH?Y

CALCULATE SPECTRUM WITH
PEAKS
UNEQUAL WIDTHS
CONSIDER INTERACTION

NO. POINTS=1000

1000 POINTS

NO. PEAKS=5

5 PEAKS

X RNG, X1, INT.MPLR, BASE, LOR. FR.(0-1):

PARAMETERS FOR SPECTRUM

1000,0,1,0,0

HGT, H-WIDTH, POS:

100,5,100

200,5,200

300,10,300

400,15,400

500,15,500

COOL IT

SPECTRUM COMPUTED

CO:

COPY DATA ONTO CHANNEL 2

1AL:

ALTER SPECTRUM ON CHANNEL 1

PK,PA,VL:1,1,500

ALTER HEIGHT OF FIRST PEAK TO 500

PK,PA,VL:2,2,10

CHANGE HALF WIDTH OF PEAK 2 TO 10

PK,PA,VL:3,3,800

CENTER THIRD PEAK AT LOCATION 800

PK,PA,VL:0,-1

ALL THE CHANGES REQUIRED

COOL IT

SPECTRUM COMPUTED

1TA:

PUT CHANNEL 1 DATA ONTO LINCTAPE

BLK1, U, M(0=W):200,1,0

STARTING AT BLOCK 200 UNIT 1

2TA:

PUT CHANNEL 2 DATA ONTO LINCTAPE

BLK1, U, M(0=W):210,1,0

STARTING AT BLOCK 210 OF UNIT 1

1TA:

GET DATA FROM LINCTAPE

BLK1, U, M(0=W):210,1,1

READ OFF UNIT 1 STARTING WITH
BLOCK 210

NO. POINTS= 1000

READ 1000 POINTS

PTS. TO SKIP=020

SKIP FIRST 20 POINTS

1SQ:

HALVE DATA POINTS ON CHANNEL 1

1CU:

DISPLAY CURSORS (POSITION CURSORS)

1IN:

INTEGRATE CHANNEL 1

SCAN INT'L?N

PARTIAL INTEGRAL REQUESTED

AREA= 0.110309E+06

AREA UNDER CURVE

SM:

SMOOTH DATA

CO:
CU:
ST:
 STRIP PEAK?N
 FULL BASE?Y
SC:

 MIN=- 52
 MAX= 1029
 MPY= 0.925
MU:

 MIN=0
 MPY=.5
 21AD:
OU:
 TTY I/O?N
 2AV:
 CHANNEL=1

 NO. POINTS=10000
 SEC/SCAN =10
 SENSE:15

 DELAY(SEC)=10
 NO. SCANS=3

 NO. SCANS=1

 MORE SCANS?N

 3121MO:
4307=4030:7402C
R400
AV:
 CHANNEL= 0

 NO. POINTS= 10000
 SEC/SCAN= 16
 SENSE=15
 DELAY(SEC)=0
 NO. SCANS=10

 1TI:
 MCT(SEC)=1.72E-6

 MO:
4307=7402:4430C
R400
I2SW
SU:
IPL:
 LINE PLOT?Y
OXYOM

 G
 PLOTTER OFF?Y

RE:
 CATALAL LIVES!

 TITLE:DEMO2

 OK,HIT ME!

COPY DATA INTO CHANNEL 2
 DISPLAY CURSORS (POSITION CURSORS)
 STRIP OUT A

 (SLOPING) BASELINE
 SCALE DATA

 PARAMETERS USED

 SCALE DATA TO ANOTHER RANGE

 WITH THIS MINIMUM AND THIS
 MULTIPLIER (AXIS IS HALVED)
 ADD DATA IN CHANNEL 2 TO CHANNEL 1
 OUTPUT THIS DATA
 ON HIGH-SPEED PUNCH
 ACQUIRE DATA IN DISPLAY CHANNEL 2
 INPUT FROM CHANNEL 1:

 10000 POINTS,
 10 SECONDS/SCAN,
 TRIGGER VIA TELETYPE, START WHEN
 KEY IS PRESSED,
 10 SECOND DELAY,
 3 SCANS MAXIMUM. TYPE A KEY.
 (BIT 0 SET)
 1 SCAN COMPLETED
 S IS TYPED BUT NOT ECHOED
 NO MORE SCANS DESIRED

 MODIFY THE PROGRAM
 LOCATION TO BE MODIFIED
 START PROGRAM AT LOCATION 400
 CALL AVERAGER TO TIME MEMORY CYCLE
 USE THESE PARAMETERS (BIT 0=0)

 TIME THE PROGRAM FROM WHEN THE
 KEYBOARD IS STRUCK TO WHEN
 COMPUTER HALTS.
 CHANGE TIME OF THIS PROGRAM
 SET CONSTANT TO 1.72 MICROSECONDS

 RESTORE ORIGINAL CONTENTS
 TO MODIFIED LOCATION
 START PROGRAM AT LOCATION 400
 VIEW AND THEN SWAP CHANNELS
 SUBTRACT CHANNEL 2 FROM CHANNEL 1
 PLOT SPECTRUM ON X-Y RECORDER
 LINE PLOT
 CALIBRATE AXES THEN MARK BOX
 AND QUADRANTS
 PLOT
 DONE PLOTTING

 RESTART CATALAL

 PROGRAM IS READY

 NAME THIS SEQUENCE "DEMO2"

 READY FOR A COMMAND

PA:
NO. POINTS= 600
PTS TO SKIP=0
YRANGE & MIN: 400.0

TTY I/O?N

XI:

YI:

DE:

DI:

READ IN FROM PAPERTAPE:
600 POINTS
START WITH FIRST POINT
400 POINTS ON Y AXIS
WITH MIN. VALUE OF 0
VIA HIGH SPEED READER
INVERT LEFT-RIGHT RELATIONSHIP
ON X AXIS
INVERT Y AXIS
CALCULATE FIRST DERIVATIVE OF
DISPLAYED DATA
EXIT TO DIAL

APPENDIX A
COMMAND SUMMARY

At least the first two characters of a command must be typed before colon is typed.

INPUT-OUTPUT COMMANDS

TAPE: Read or write LINCTape
AVERAGE: Accept time averaged analog data
PAPERTAPE: Input data from paper tape or keyboard
OUTPUT: Print/punch paper tape
PLOT: Plot data on X-Y analog recorder

PROCESSING COMMANDS

CALCULATE: Calculate Lorentzian and/or Gaussian spectrum
ALTER: Alter parameters input by previous CALCULATE command
COPY: Copy CDC into NDC
XINVERT: Invert X axis
YINVERT: Invert Y axis
SCALE: Scale to range of $0-10000$
MULTIPLY: Scale to arbitrary range
SMOOTH: Apply eleven point digital filter
CURSORS: Set up two cursors on scope
INTEGRATE: Integrate between cursors or running integration (preceded by CURSOR command)
STRIP: Strip out data or baseline (preceded by CURSOR command)
DERIVATIVE: Form differences (derivatives)
SUBTRACT: Subtract CDC from NDC; results in CDC
ADD: Add NDC to CDC; results in CDC
SWAP: Swap CDC and NDC
SQUEEZE: Average adjacent points of displayed channels

SPECIAL COMMANDS

MODIFY: ODT-like core modifier
TIME: Set machine cycle time constant to calibrate AVERAGER
RESTART: Restart program
DIAL: Exit to DIAL Editor

CDC = currently displayed channel
NDC = non-displayed channel

APPENDIX B

ASSEMBLING CATALAC

of error sheet inside front cover

The CATALAC program is supplied to the user in both source and binary on the tape. To generate a new binary file if the source program is modified, use the following procedure.

1. Load a DIAL-MS tape on unit 0. Load unit 1 with either a DIAL-V2 or DIAL-MS system tape. If another tape unit is available, mount the tape containing the CLEARSYM and CATALAC source programs there. If only two tape units are available, place the source programs on unit 0 (with PIP if necessary), in order to reduce the assembly time.
2. Type `+ZE` to clear the binary Working Area of unit 1.
3. Type `+AS CLEARSYM`. CLEARSYM is a two word program which produces a clean symbol table.

 `00000`
 `SAVSYM 1`
4. Type `+AS CAT2,0`. Error messages generated at this time should be ignored. Press the RETURN key to terminate the assembly after the errors have all been printed to suppress printing of the symbol code.
5. Type `+ZE`. This clears the binary Working Area on unit 1.
6. Type `+LI CAT3,0`. If no listing is desired, use the AS command. Any errors generated now are real and must be corrected.
7. Type `+LI CAT2,0`. Because the symbol table produced is the same as the one generated in step 6, printing may be suppressed with the RETURN key after it has started to be printed.
8. Type `+SB CAT23,0`. This saves the binary output from the two previous assemblies.
9. Type `+ZE`.
10. Two versions of the Floating Point Package are supplied. If the machine has the EAE option, CAT1E should be used in the following steps and CATALAC will be generated. If the machine does not have this option, CAT2 should be used to generate CATALAC.
11. Type `+AB CAT1,0`.
12. Type `+AB CAT23,0`.
13. Type `+SB CATALAC,0P`. A binary file of CATALAC(E) has now been generated and the command `+LO CATALAC,0` will cause load and execute.

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53		
									/CATACAL	PAL10	V141	15-APR-70	1101	PAGE 1																																								
									/CATACAL																																													
									/THE COMPUTER OF AVERAGE TRANSIENTS AND																																													
									/CALCULATOR OF LORENTZIAN AND/OR GAUSSIAN																																													
									/SPECTRA FOR COMPARISON. THE PROGRAM USES PDP-8																																													
									/CODE ALMOST EXCLUSIVELY EXCEPT FOR THAT NECESSARY																																													
									/TO IMPLEMENT THE PDP-12 HARDWARE.																																													
									/WRITTEN BY G.W. DULANEY, DIG.EQ.CORP., FEB., 1970,																																													
									/USING MANY OF THE CONCEPTS AND CODE AS WAS IN																																													
									/LORCAP-MADCAP PACKAGES (DECUS #8-237).																																													
									FIXMRI CALL=4400																																													
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									FIXMRI FMPLY=3000																																													
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									FIXMRI FGET=5000																																													
									FIXMRI FPUT=6000																																													
									FIXMRI FLOT=7000																																													
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									6132	CLLR=6132																																												
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									6134	CLEN=6134																																												
									6135	CLSA=6135																																												
									6136	CLBA=6136																																												
									6137	CLCA=6137																																												
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									0015	RTA=0015																																												
									0100	SAM=0100																																												
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									6141	LINC=6141																																												
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									0600	LIF=0600																																												
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									0340	SCR=0340																																												
									0400	SXL=0400																																												
									0300	FOR=0300																																												
									0240	ROL=0240																																												
									1600	BSE=1600																																												
									0455	CLZ=0455																																												
									0000																																													

/USED TO CALL SUBR'S INDIRECTLY

1100
1000
1000
4000
0702
0701
0700
0706
0704
0705
0707
0703
0004
0003
0023
0001
0006
0024

ADA=1100
ADD=1000
LDA=1000
STC=4000
RDE=0702
RCG=0701
RDC=0700
WRI=0706
WRC=0704
WCG=0705
CHK=0707
MTB=0703
ESF=0004
TAC=0003
TMA=0023
AXO=0001
DJR=0006
SFA=0024

FIXTAB

/SHORT HAND SUBR. CALLS

FIXTJ JMS I FIXER
FLOATE JMS I FLOTTER
INITARE JMS I INIT
HEDITE JMS I HEADR1
HEDITE JMS I HEADR2
ENTRE JMS I 7
GETNO JMS I READXY
RDITY JMS I TELRED
ASK JMS I QUERY
CRLFD JMS I CRTLPD
DISPLAY JMS I DISM2

/COMMON EXIT TO DISPLAY

/THE FOLLOWING ARE USED TO CALL CERTAIN
/OPERATIONS WHILE IN INTERPRETER MODE.

SQUARE 1
SQROOT 2
NEGATE 3
READ 4
OUTPUT 5
HEDITE 6
FNOR 7
EXPONE 10

/NEGATE FL. PT. AC
/READ FPN, IGNORE NON-NUMERICS
/PRINT FAC, IN E FORMAT
/PRINT HEADING WITH 'HEADER2'
/NORMALIZE C(FAC)
/FORM EXP(FAC); RESULT IN FAC

0001
0002
0003
0004
0005
0006
0007
0010

4424
4423
4430
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4434
4407
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4432
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155

/THese DEFINE X-Y DAC RANGE AND PLOTTER
/LIMITS AS USED BY THIS PRGM.

AXR=764      /X RANGE=500(10)
AYR=764      /Y RANGE=500(10)
AXL=6        /LOWER X LIMIT=6
AYL=7406     /LOWER Y LIMIT=-250(10)

/THese ARE USED BY 'MARKER' TO SET
/UP QUADRANT COORDINATES NEEDED.

AX1=AXL*175  /1ST X QUAD.=131(10)
AX2=AXL*372  /2ND " =256(10)
AX3=AXL*567  /3RD " =381(10)
AY1=AYL*175  /1ST Y QUAD.=125(10)
AY2=AYL*372  /2ND " =0
AY3=AYL*567  /3RD " =125(10)

BUF1=0        /STARTING ADDR.=1 OF FIRST BUFFER
DLBUF=4000    /ARRAY SIZE OR OFFSET
PTABST=DIALOG /START OF PARA ARRAY

FIELD 0
*5
XDIS,        /CURRENT X COORDINATE FOR DISPLAY
7200         /START OUTPUT CONTROLLER
5600         /START INTERPRETER

XIND,        /AUTO-INDEX REGISTERS
YIND,        /
ZIND,        /
AUTO,        /USED FOR TEMPORARY WORK.

*20
POP          /IN CASE DUM-DUM STARTS IN LINC MODE
JMP I ,*1
START

FLOTER, FLOATR
FIXER, FIXR
READYX, READER
HOLD, STALL
TELRED, MODTTI
INIT, INITIZ
OUT, SELECT
CTRLFD, MODCR
HEADR1, HEDER1
HEADR2, HEDER2
QUERY, ASKER
PENUP, UPEN
PENDN, ONPEN

SUBROUTINE TABLE
/FLOAT C(AC) INTO FAC
/FIX C(FAC) INTO AC AND LOG'N 45
/INPUT A FB #
/RC CLOCK DELAY SUBR.
/GET & PRINT CHAR. ON ASR
/INITIALIZE STORAGE POINTERS
/OUTPUT CHAR TO ASR OR HSP
/ISSUE CR-LF
/OUTPUT STRIPPED ASCII ADDR. AFTER JMS
/DITTO! NO ADDRESS
/ACCEPT Y OR N IN ANSWER TO QUESTION
/CLOSE RELAY ONE TO LIFT PEN
/OPEN " TO DROP PEN

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245
246
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/PAGE ONE! MAIN CALLING ROUTINE AND
/DISPLAY LOOP PLUS SMALL SUBR'S.

*400
PDP
DCA IOSWT
JMP BEGDIS-1
CLA CLL
DCA IOSWT
HEDIT1
HD1
RDTTY
TAD MALT
SEA CLA
JMP I-3
DCA BLOCK
DCA MODE
IAC
DCA NPTS
HEDIT2
CALL PENUP

/SA=400 TO RE-ENTER DISPLAY
/CLR I/O SWITCH FOR LOW SPD
/CATACAL LIVES!+TITLE!
/READ IN TEXT UNTIL CTRL/A
/IS ENTERED, THEN GO ON TO INPUT
/CLEAR FOR BLOCK ONE
/NO CURSORS
/SET # PTS TO ONE FOR INITIAL COMMAND
/OK, HIT ME!
/BE SURE PLOTTER PEN IS UP

/NORMAL EXIT POINT FROM ROUTINES
/CLEAR FOR EXP, FORMATTED OUTPUT
/KNOCK DOWN TTY FLAG
/WANT CURSORS?
/YES
/IS A SWITCH USED TO SWAP BLOCKS
/IS Y AXIS OFFSET IF BLOCK#2
/BLOCK#1(I.E., WANT BUFFER 2)?
/YES, SET BIT 0 FOR CHANNEL 2

/BLOCK 1?
/YES, ADD ARRAY OFFSET

STYN,
TAD OFFSET
TAD YONE
DCA YIND
TAD NPTS
CIA CNTR
DCA TXSM+1
KSF
SKP I INTRP
JMP I INTRP
CDF 10

0400
0002
0401
3056
5220
0402
0403
7300
0404
3056
0405
4433
0406
5107
0407
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6201
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3135
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7130
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3005
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0440
7640
0441
1111
0442
1110
0443
3011
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1074
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7041
0446
3132
0447
3116
0450
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0451
7410
0452
5722
0453
6211

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295
296 0454 1411 SCPL0P, TAD I YIND /GET Y VALUE (0-1000)
297 0455 7110 CLL RAR /DIVIDE FOR DISPLAY
298 0456 1105 TAD YLIM /ADD LOWER LIMIT
299 0457 1136 TAD TEMP1
300 0460 6141 LINC
301 0461 0145 DIS XDIS
302 0462 0002 PDP
303 0463 7300 CLA CLL
304 0464 1114 TAD XNC*1 /INCR. X DISPLAY SUM
305 0465 1116 TAD TXSM*1
306 0466 3116 DCA TXSM*1
307 0467 7004 RAL
308 0470 1005 TAD XDIS
309 0471 1113 TAD XNC
310 0472 3005 DCA XDIS
311 0473 2132 ISZ CNTR
312 0474 5294 JHP SCPL0P /MORE PTS?
313 0475 6201 CDF 0 /YES
314 0476 7240 STA
315 0477 1144 TAD BLOCK
316 0500 7750 SPA SNA CLA /BLOCK #=2?
317 0501 5226 JHP SCPL0P /NO, CONTINUE WITH CDA
318 0502 2135 ISZ TEMP /IS SWITCH SET FOR BUFFER 1?
319 0503 5307 JMP :+4 /NO
320 0504 3005 DCA XDIS /YES CLEAR X AND Y OFFSET
321 0505 3136 DCA TEMP1
322 0506 5242 JHP STYN*1 /AND RETURN
323 0507 7240 STA TEMP /SET SWITCH TO SKIP
324 0510 3135 DCA TEMP
325 0511 7001 IAC
326 0512 4465 CALL ADCON /GET A NEW Y OFFSET
327 0513 7010 RAR /DIVIDE BY 2
328 0514 3136 DCA TEMP1
329 0515 4465 CALL ADCON /GET NEW X OFFSET
330 0516 7130 STL RAR /DIVIDE BY 2, LEAVE BIT 0 SET
331 0517 3005 DCA XDIS
332 0520 5241 JHP STYN /AND RETURN TO GET ARRAY OFFSET
333 0521 3324 DSPTS,
334 0522 2000 INTRP, /DECODE KBD CHAR'S AND ACT
335 0523 7577 HALT, /-CTRL/A

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0524 0000
0525 7200
0526 1044
0527 7750
0530 5351
0531 1044
0532 1354
0533 7450
0534 5352
0535 7500
0536 5344
0537 3356
0540 4755
0541 2356
0542 5340
0543 5352
0544 7300
0545 1045
0546 7710
0547 7046
0550 7050
0551 3045
0552 1045
0553 5724
0554 7765
0555 6200

0556 0000
0557 3045
0560 1366
0561 3044
0562 3046
0563 4765
0564 5756
0565 6600
0566 0013

0567 1040
0570 4423
0571 5772
0572 5601

FIXR, 0
CLA 44
TAD 44
SPA SNA CLA
JMP DONE=1
TAD 44
TAD M13
SNA
JMP DONE
SMA
JMP LRG
DCA FLOATR
CALL DIV1
ISZ FLOATR
JMP =2
JMP DONE
CLA CLL
TAD 45
SPA CLA
CMA RTL
CMA RAR
DCA 45
TAD 45
JMP I FIXR
M13, -13
DIV1, 6200

LRG,
DONE,
M13,
DIV1,

FLOATR, 0
DCA 45
TAD P13
DCA 44
DCA 46
CALL FPNORM
JMP I FLOATR
FPNORM, 6600
P13, 13

INTFLT, TAD 40
FLOATR
JMP I =1
5601

/THIS SUBR. TRUNCATES FAC TO INTEGER
/AND LEAVES IT IN THE AC & LOC'N 45,
/EXPO.<1?
/YES; TRUNCATE TO ZERO
/EXPO.<13?
/NO, IS TOO LARGE
/USE FLOATR AS TEMP REG.
/IS FAC ROTATE RIGHT; LEAVE
/FRACTION AS C(46)
/WAS IT NEG.?
/YES; SET AC=7775
/IF =,=3777;IF -,=4001
/CONVERTS INTEGER IN AC TO F.P.#
/AND LEAVES IT IN FAC
/USED TO GET FLOAT THRU INTERPRETER

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379 /THIS IS A SHORT DEBUG AND CORE MODIFIER ROUTINE
 380 /THE RETURN LOCATION IS SPECIFIED BY
 381 /TYPING 'R' THEN RETURN LOC'N.
 382 /TYPE 'N' TO OPEN NEXT LOCATION; TYPE 'C'
 383 /AFTER A CORRECTION TO ENTER IT;
 384 /AND TYPE 'S' TO REOPEN LAST LOCATION USED,
 385 /'RUBOUT' WILL TERMINATE ANY OPERATION
 386 /THEN RESTART ROUTINE.
 387

388 *200 /NOTE: OUT OF SEQUENCE,
 389 STRTIT, JMS MODCR /GET A LOCATION TO OPEN
 390 JMS OCTIN
 391 JMP I-2
 392 SZA GOTIT /GET A NUMBER>0?
 393 JMP GOTIT /YES
 394 TAD LSCHR /IS LAST CHARACTER READ
 395 TAD MEN
 396 SNA NLOC /WAS IT 'N'?
 397 JMP NLOC /YES
 398 TAD MES /WAS IT 'S'?
 399 SNA NLOC+1 /YES
 400 JMP NLOC+1
 401 IAC
 402 SZA CLA /WAS IT 'R'?
 403 JMP STRTIT /NO, IGNORE IT
 404 JMS OCTIN /YES, GET EXIT LOC'N
 405 JMP STRTIT /IF ERROR, RESTART
 406 SNA CLA /MUST BE NONZERO ADDR.
 407 JMP STRTIT
 408 JMS MODCR /HAS OK
 409 JMP I VALU /EXIT TO THERE.
 410

411 NLOC, ISZ LSLOC
 412 TAD LSLOC
 413 JMS OCTOUT
 414 SKP
 415 DCA LSLOC
 416 TAD EQUAL
 417 CALL OUT
 418 TAD I LSLOC
 419 JMS OCTOUT
 420 TAD COLON
 421 CALL OUT
 422 JMS OCTIN
 423 JMP STRTIT
 424 CLA
 425 TAD LSCHR
 426 TAD MSEE
 427 SZA CLA
 428 JMP STRTIT
 429 TAD VALU
 430 DCA I LSLOC
 431 JMP STRTIT

432 /GET CONTENTS OF OPEN LOC'N
 433 /PRINT IT
 434 /GET CORRECTION
 435 /HAS LAST CHAR. A 'C'?
 436 /NO, RESTART.
 437 /YES
 438 /STORE CORRECTION

/CATACALI

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432 0252 0000
433 0253 7104
434 0254 3355
435 0255 1126
436 0256 3351
437 0257 1355
438 0260 7006
439 0261 7004
440 0262 3355
441 0263 1355
442 0264 0345
443 0265 1337
444 0266 4431
445 0267 2351
446 0270 5257
447 0271 5652
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450 0272 0000
451 0273 7200
452 0274 3354
453 0275 3351
454 0276 4356
455 0277 3353
456 0300 1353
457 0301 1341
458 0302 7540
459 0303 5323
460 0304 1342
461 0305 7510
462 0306 5323
463 0307 3355
464 0310 1354
465 0311 7106
466 0312 7004
467 0313 1355
468 0314 3354
469 0315 2351
470 0316 1351
471 0317 1126
472 0320 7740
473 0321 5333
474 0322 5276
475 0323 7200
476 0324 1353
477 0325 1340
478 0326 7650
479 0327 5333
480 0330 2272
481 0331 1354
482 0332 5672
483 0333 1350
484 0334 4431
0335 5672

OCTOUT, 0
CLL RAL
DCA DTEM
TAD NEG4
DCA NCNTR
TAD DTEM
RTL
RAL
DCA DTEM
TAD DTEM
AND MS7
TAD AS260
CALL OUT
IS2 NCNTR
JMP SETIT
JMP I OCTOUT

OCTIN, 0
CLA VALU
DCA NCNTR
JMS MODTTI
DCA LSCHR
TAD LSCHR
TAD MN7
SMA SEA
JMP FNISH
TAD P7H0
SPA
JMP FNISH
DCA DTEM
TAD VALU
CLL RTL
RAL DTEM
DCA VALU
IS2 NCNTR
TAD NCNTR
TAD NEG4
SEA SMA CLA
JMP BAD
JMP GTCHR
CLA
TAD LSCHR
TAD MRBT
SNA CLA
JMP +4
IS2 OCTIN
TAD VALU
JMP I OCTIN
TAD QUEST
CALL OUT
JMP I OCTIN

SETIT,
RTL
RAL
DCA DTEM
TAD DTEM
AND MS7
TAD AS260
CALL OUT
IS2 NCNTR
JMP SETIT
JMP I OCTOUT

MASK RIGHTMOST 3 BITS

PRINTED 4 DIGITS?
/NO
/YES, WE'RE DONE.

OCTAL INPUT ROUTINE
/ANY NON OCTAL CHAR TERMINATES
/>4 DIGITS OR RUBOUT GENERATE ERROR RETURN
/GET A CHARACTER

/OK= ASCII '0'?
/NO, IS NOT DIGIT

/ASCII '0'?
/NO, DEFINITELY NOT DIGIT.
/IS DIGIT, KEEP IT.
/IS CURRENTLY ASSEMBLED LOC'N

/ADD NEW DIGIT

/HAVE MORE THAN 4 CHAR'S?

/YES, ERROR
/NO, GET ANOTHER
/EXIT HERE WITH OPEN LOC'N IN AC

/WAS LAST CHAR A RUBOUT?
/YES, ERROR!
/INDEX RETURN IF NO ERROR
/AND LEAVE RESULT IN AC

BAD,

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0336 7475 MSEE, -303
0337 0260 AS260, 260
0340 7401 MRBT, -377
0341 7511 MN7, -267
0342 0007 P7M0, 267-260
0343 0275 EQUAL, 275
0344 0272 COLON, 272
0345 0007 MS7, 7
0346 7462 MEN, -316
0347 7773 MES, 316-323
0350 0277 QUEST, 277
0351 0000 NCNTR, 0
0352 0000 LSLOC, 0
0353 0000 LSCHR, 0
0354 0000 VALU, 0
0355 0000 DTEM, 0

0356 0000 MODTTI, 0
0357 6031 KSF
0360 5357 JMP, -1
0361 6036 KRB
0362 6046 TLS
0363 6041 TSF
0364 5363 JMP, -1
0365 5756 JMP I MODTTI

0366 0000 MODCR, 0
0367 7200 CLA MODCR
0370 1375 TAD MODCR
0371 4431 CALL OUT
0372 1376 TAD MODL
0373 4431 CALL OUT
0374 5766 JMP I MODCR
0375 0215 MODCR, 215
0376 0212 MODL, 212

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521      0600
522      0600 0000
523      0601 4606
524      0602 1060
525      0603 7650
526      0604 5201
527      0605 5600
528      0606 7400
529      0607 0000
530      0610 3227
531      0611 1056
532      0612 7650
533      0613 5221
534      0614 1227
535      0615 6026
536      0616 6021
537      0617 5216
538      0620 5225
539      0621 1227
540      0622 6046
541      0623 6041
542      0624 5223
543      0625 7200
544      0626 5607
545      0627 0000
546      0630 0000
547      0631 1261
548      0632 3013
549      0633 1413
550      0634 3135
551      0635 1135
552      0636 7001
553      0637 7650
554      0640 5630
555      0641 1135
556      0642 7700
557      0643 5246
558      0644 1413
559      0645 3005
560      0646 1135
561      0647 7004
562      0650 7700
563      0651 5254
564      0652 1413
565      0653 3112
566      0654 7201
567      0655 0135
568      0656 4600
569      0657 5233
570      0660 1600
571      0600 0000
572      0601 4606
573      0602 1060
574      0603 7650
575      0604 5201
576      0605 5600
577      0606 7400
578      0607 0000
579      0610 3227
580      0611 1056
581      0612 7650
582      0613 5221
583      0614 1227
584      0615 6026
585      0616 6021
586      0617 5216
587      0620 5225
588      0621 1227
589      0622 6046
590      0623 6041
591      0624 5223
592      0625 7200
593      0626 5607
594      0627 0000
595      0630 0000
596      0631 1261
597      0632 3013
598      0633 1413
599      0634 3135
600      0635 1135
601      0636 7001
602      0637 7650
603      0640 5630
604      0641 1135
605      0642 7700
606      0643 5246
607      0644 1413
608      0645 3005
609      0646 1135
610      0647 7004
611      0650 7700
612      0651 5254
613      0652 1413
614      0653 3112
615      0654 7201
616      0655 0135
617      0656 4600
618      0657 5233
619      0660 1600

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READER, 0 /FP INPUT SUBR. TO IGNORE NON-NUMERICS.

CALL FLIN /GET CONVERSION

TAD 60 /NUMERIC INPUT?

SNA CLA /NO, TRY AGAIN

JMP I=-3 /YES, EXIT.

JMP I READER

7400

FLIN, 7400

SELECT, 0 /OUTPUT SELECTOR ACCORDING TO IOSWT

DCA OUTCHR /KEEP CHAR,

TAD IOSWT

SNA CLA /HAS IT >0?

JMP TTOUT /NO, USE TELETYPE

TAD OUTCHR

PLS

PSF

JMP I=-1

JMP I=-5

TAD OUTCHR

TLS

TSP

JMP I=-1

CLA

JMP I SELECT

OUTCHR, 0

MARKER, 0 /TABLE DRIVEN AXIS MARKER ROUTINE

TAD CORTAB /INITIALIZE COORD. TABLE POINTER

DCA AUTO

TAD I AUTO

DCA TEMP

TAD TEMP

IAC

SNA CLA /END OF TABLE?

JMP I MARKER /YES

TAD TEMP

SNA CLA /NEED X COORD.?

JMP I=-3 /NO

TAD I AUTO

DCA XDIS

TAD TEMP

RAL

SNA CLA /NEED Y COORD.?

JMP I=-3 /NO

TAD I AUTO

DCA YDIS

CLA IAC

AND TEMP

CALL PLTMV

JMP LOKIN

PLTMV, PLTING

IF BIT 11=1, MOVE TO COORD'S

THEN PUT PEN DOWN; IF =0,

INCREMENT TO COORD'S W/PEN DOWN.

CONTINUE SCANNING TABLE

574 /THE FOLLOWING TABLE OF COORD'S IS STRUCTURED
 575 /THUSLY: 1ST WORD=STATUS, BIT 0=1 MEANS
 576 /X COORD, FOLLOWS, BIT 1=1 Y COORD, FOLLOWS,
 577 /BOTH SET MEANS X THEN Y COORD'S FOLLOW,
 578 /BIT 11 DESCRIBES PEN STATUS: =0
 579 /LEAVE PEN AS IS, AND =1 RAISE PEN.
 580
 581 PX=4000;PY=2000;PU=1
 582
 583
 584
 585
 586
 587

4000
 2000
 0001

0661 0661 CORTAB, .

/THESE DRAW A BOX STARTING FROM AXES ORIGIN
 PX+PY+PU /GO TO AXES ORIGIN

0662 6001
 0663 0001
 0664 7401
 0665 4000
 0666 0777
 0667 2000
 0670 0377
 0671 4000
 0672 0001
 0673 2000
 0674 7401

PX /GO TO RIGHT
 AXL+AXR+5
 PY /GO TO TOP
 AYL+AYR+5
 PX /GO TO LEFT TOP
 AXL+5
 PY /GO TO AXES ORIGIN
 AYL+5

/THESE DRAW TICS ON X AXIS

0675 4001
 0676 0006
 0677 2000
 0700 7404
 0701 6001
 0702 0203
 0703 7401
 0704 2000
 0705 7404
 0706 6001
 0707 0400
 0710 7401
 0711 2000
 0712 7404
 0713 6001
 0714 0575
 0715 7401
 0716 2000
 0717 7404
 0720 6001
 0721 0772
 0722 7401
 0723 2000
 0724 7404

PX+PU
 AXL
 PY
 AYL=2
 PX+PY+PU
 AX1
 AYL=5
 PY
 AYL=2
 PX+PY+PU
 AX2
 AYL=5
 PY
 AYL=2
 PX+PY+PU
 AX3
 AYL=5
 PY
 AYL=2
 PX+PY+PU
 AXR+AXL
 AYL=5
 PY
 AYL=2

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0725 6001
0726 0001
0727 7406
0730 4000
0731 0004
0732 6001
0733 0001
0734 7603
0735 4000
0736 0004
0737 6001
0740 0001
0741 0000
0742 4000
0743 0004
0744 6001
0745 0001
0746 0175
0747 4000
0750 0004
0751 6001
0752 0001
0753 0372
0754 4000
0755 0004
0756 6001
0757 0006
0760 7406
0761 7777

MINI. =1 /END OF TABLE.

NORMAT. 0 /SCALE HGT VALUE IN PAC
ENTR EMPY I MPYR
FADD HALF
FEXT
FIXT /LEAVE RESULT IN AC
JMP I NORMAT

HIGHT. 0 /GET AND SCALE HGT VALUE
GETNO
JMS NORMAT
DCA I PIND1
JMP I HIGHT
0771 0000
0772 4425
0773 4362
0774 3547
0775 5771

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673	1000	PAL10	V141	15=APR=70	1:01	PAGE 15
674	1000	CALBRT,	*1000			
675	1001	HEdit1			/CALIBRATE: LINE PLOT?	
676	1002	HD3	ASK			
677	1003		DCA I PTPLT		/=0 FOR LINE PLOT:1 FOR POINT	
678	1004	CLSTRT,	CLFLD			
679	1005		CALL PENUP			
680	1006		JMP ORGN		/START PEN AT ORIGIN OF DATA	
681	1007	INSTRK,	CALL DISMOV		/BEGIN INTERROGATION	
682	1010		KSF			
683	1011		JMP ,=2		/MUST REFRESH DISPLAY	
684	1012		KRB			
685	1013		TLS			
686	1014		TAD YES		/LEGAL CHARACTERS ARE	
687	1015		SNA		/X,Y,O,M, OR G	
688	1016		JMP YMAX		/WAS Y, GO TO YMAX	
689	1017		IAC		/WAS IT X?	
690	1020		SNA			
691	1021		JMP XMAX		/YES, GO TO XMAX,	
692	1022		TAD HCEE		/WAS IT G?	
693	1023		SNA			
694	1024		JMP I PLTXIT		/YES, EXIT.	
695	1025		TAD MEM		/WAS IT M?	
696	1026		SEA			
697	1027		JMP ,=3		/NO	
698	1030		CALL MARKR		/YES, MARK COORDINATE AXES,	
699	1031		JMP CLSTRT			
700	1032		TAD MCH		/WAS IT O?	
701	1033		SNA CLA			
702	1034		JMP ORGN		/YES, GO TO DATA MINIMA,	
703	1035		TAD QUES		/NO, FOUND INVALID CHARACTER	
704	1036		CALL OUT			
705	1037		JMP INSTRK			
706						
707	1040	XMAX,	TAD XLIM			
708	1041		TAD XRNG			
709	1042		DCA XDIS			
710	1043		JMP INSTRK			
711						
712	1044	YMAX,	TAD YLIM			
713	1045		TAD YRNG			
714	1046		DCA YDIS			
715	1047		JMP INSTRK			
716						
717	1050	ORGN,	TAD XLIM			
718	1051		DCA XDIS			
719	1052		TAD YLIM			
720	1053		DCA YDIS			
721	1054		JMP INSTRK			
722						

722	1055	0277	QUES,	277	/?	
723	1056	7447	YES,	-331	/=Y	
724	1057	0013	NO,	331-316	/Y=N	
725	1058	0021	MGEE,	330-307	/X=G	
726	1060	0021	MEM,	307-315	/G=M	
727	1061	7772		319-317	/M=O	
728	1062	7776	MOH,			
729	1063	1364	PTPLT,	PNTRPLT		
730	1064	0630	MARKR,	MARKR		
731	1065	1335	PLTXIT,	PLTXIT		
732						
733						
734	1066	0000	ASKER,	0	/SUBR. ACCEPTS ONLY 'Y' OR 'N' FROM	
735	1067	4427		ROTTY	/ASR. GIVES '?' IF NOT. SETS AC=1	
736	1070	1256		TAD YES	/FOR 'N' ANSWER, AC=0 FOR 'Y'	
737	1071	7450		SNA		
738	1072	5666		JMP I ASKER	/=0 FOR YES	
739	1073	1257		TAD NO		
740	1074	7640		SZA CLA		
741	1075	5300		JMP I+3		
742	1076	7001		IAC	/=1 FOR NO	
743	1077	5666		JMP I ASKER		
744	1100	1255		TAD QUES		
745	1101	4431		CALL OUT		
746	1102	5267		JMP ASKER+1		
747						
748	1103	0000	STALL,	0		
749	1104	7300		CLA CLL		
750	1105	1322		TAD SET		
751	1106	7650		SNA CLA	/WANT FAST CLOCK?	
752	1107	1130		TAD K1000	/NO SET FOR 1KC	
753	1110	1323		TAD K3100	/IF SKIPPED SET FOR 10KC	
754	1111	3317		DCA CCLDR		
755	1112	7125		STL IAC RAL	/GET VARIABLE COUNT FROM CHAN 3	
756	1113	4465		CALL ADCON		
757	1114	1130		TAD K1000	/TIMES 4	
758	1115	7106		CLL RTL	/INSERT DELAY TIME	
759	1116	4721		CALL CLKSET		
760	1117	0000	CCLDR,	0		
761	1120	5703		JMP I STALL		
762	1121	4343	CLKSET,	SETCLK		
763	1122	0000	SET,	0		
764	1123	3100	K3100,	3100		
765						
766	1124	0000	ADCONV,	0	/FORM SAM N1 CHANNEL IN AC	
767	1125	1333		TAD CSAM		
768	1126	3330		DCA I+2		
769	1127	6141		LINC		
770	1130	0000		0		
771	1131	0002		PDP	/LEAVE RESULT IN AC	
772	1132	5724		JMP I ADCONV		
773	1133	0100	CSAM,	SAM		

774	1134	0000	RESET,	0	/RESET DISPLAY COORD'S
775	1135	7200		CLA	
776	1136	1112		TAD YDIS	
777	1137	6141		LINC	
778	1140	0145		DIS XDIS	
779	1141	0002		PDP	
780	1142	7200		CLA	
781	1143	5734		JMP I RESET	
782					
783					
784					
785	1144	0000	UPPEN,	0	/THESE TWO SUBR'S OPEN AND CLOSE RELAY 1
786	1145	4426		CALL HOLD	
787	1146	7001		IAC	
788	1147	6141		LINC	
789	1150	0014		ATR	
790	1151	0002		PDP	
791	1152	4426		CALL HOLD	
792	1153	5744		JMP I UPPEN	
793					
794	1154	0000	DNPEN,	0	
795	1155	4426		CALL HOLD	
796	1156	6141		LINC	
797	1157	0014		ATR	
798	1160	0002		PDP	
799	1161	4426		CALL HOLD	
800	1162	5754		JMP I DNPEN	
801					
802	1163	0007	HNDRD,	FLTG 100.0	
	1164	3100			
	1165	0000			
803	1166	0000	XMPYI,	01010	
	1167	0000			
	1170	0000			
804	1171	0000	MPYRI,	01010	
	1172	0000			
	1173	0000			
805	1174	0000	FLLORF,	01010	
	1175	0000			
	1176	0000			

806	1200	*1200	
807	0000	LEADER, 0	
808	1201	CRLF0	/OUTPUT 10 INCHES OF LOR=TRLR,
809	1202	TAD LNUM	
810	1203	DCA PTR	
811	1204	TAD C200	
812	1205	CALL OUT	
813	1206	ISZ PTR	
814	1207	JMP I-3	
815	1208	JMP I LEADER	
816	1209	-144	
817	1210	LNUM, 200	
818	1211		
819	1212		
820	1213	XSETUP, 0	
821	1214	STA NPTS	/FOLLOWING ROUTINE COMPUTES
822	1215	FLOAT	/X DISPLAY INCREMENT SCALED
823	1216	ENTR	/TO THE NO. OF PTS., NPTS.
824	1217	FPUT XSCLFC	
825	1218	FLOT XRNG	
826	1219	FDIV XSCLFC	/LEAVES X UNITS/PY IN FAC
827	1220	FPUT XSCLFC	/AND XSCLFC.
828	1221	FEXT	
829	1222	TAD 44	
830	1223	SZA SMA CLA	/WAS FAC<1?
831	1224	JMP GTZR	/NO
832	1225	DCA XNC	/YES, CLEAR INTEGER PART
833	1226	TAD 45	/ASSUMES FACTOR IS ALWAYS
834	1227	CLL RAL	/0.25 OR GREATER; RAL FOR SIGN BIT
835	1228	ISZ 44	/WAS C(44)--1?
836	1229	SKP RAR	/NO, WAS 0
837	1230	CLL RAR	/YES, DIVIDE BY 2
838	1231	JMP .04	
839	1232	FIXT	
840	1233	DCA XNC	
841	1234	TAD 46	
842	1235	DCA XNC*1	
843	1236	JMP I XSETUP	
844	1237		
845	1238		
846	1239		
847	1240		
848	1241		
849	1242		
850	1243		

/CATALOG

845	1244	4307	JMS DATYP	
846	1245	4434	HEDIT2	/PTS. TO SKIP:
847	1246	4425	GETNO	
848	1247	4424	FIXT	
849	1250	7040	DCA PCTR	/KEEP AS ONE'S COMP.
850	1251	3131	HEDIT1	/Y RANGE AND MIN.1
851	1252	4433	DIHDI	
852	1253	5352	GETNO	
853	1254	4425	JMS YSVAL	
854	1255	4324	ENTR	
855	1256	4407	READ	/READ MINIMUM Y
856	1257	0004	FPUT YMIN	
857	1260	6166	FEXT	
858	1261	0000	CALL IOASK	/LOW SPEED I/O?
859	1262	4464	RFC	
860	1263	6014	INITAR	
861	1264	4430	ENTR	/READ A Y VALUE
862	1265	4407	READ	
863	1266	0004	FSUB YMIN	
864	1267	2166	FMPY YSCLFC	
865	1270	3174	FADD HALF	
866	1271	1123	FEXT	
867	1272	0000	FIXT	
868	1273	4424	ODF 10	
869	1274	6211	DCA I YIND	
870	1275	3411	ODF 0	
871	1276	6201	ISZ PCTR	/KEEPING THIS POINT?
872	1277	2131	JMP XYSICAL-1	/NO, RE-INIT. TO IGNORE PTS.
873	1300	5264	STA	/AFTER FIRST SKIP, ALWAYS SKIP
874	1301	7240	DCA PCTR	
875	1302	3131	ISZ CNTR	
876	1303	2132	JMP XYSICAL	
877	1304	5265	DCA IOSNT	
878	1305	3056	DISPLAY	/CLEAR I/O SWITCH
879	1306	5467		/EXIT FOR DISPLAY
880				
881	1307	0000	0	
882	1310	4433	HEDIT1	
883	1311	5133	HDZ	/NO. PTS=
884	1312	4425	GETNO	
885	1313	4424	FIXT	
886	1314	7041	CIA	
887	1315	1111	TAD OFFSET	
888	1316	7710	SPA CLA	/LESS THAN ARRAY SIZE?
889	1317	5310	JMP DATYP+1	/NO. TRY AGAIN
890	1320	1045	TAD 45	
891	1321	3074	DCA NPTS	
892	1322	4466	CALL XSET	/SET X DISPLAY INCREMENT
893	1323	5707	JMP 1 DATYP	

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894 1324 0000
895 1325 4407
896 1326 3123
897 1327 6174
898 1328 7107
899 1330 7107
900 1331 4174
901 1332 6174
902 1333 0000
903 1334 5724
904
905 1335 4430
906 1336 4436
907 1337 4466
908 1340 7001
909 1341 3133
910 1342 6211
911 1343 1411
912 1344 6201
913 1345 7110
914 1346 1105
915 1347 3112
916 1350 1364
917 1351 1133
918 1352 4765
919 1353 3133
920 1354 4471
921 1355 2132
922 1356 5342
923 1357 4436
924 1360 4433
925 1361 5170
926 1362 4435
927 1363 5467
928 1364 0000
929 1365 1600
930
931 1366 4430
932 1367 6211
933 1370 1411
934 1371 7041
935 1372 1107
936 1373 1107
937 1374 3412
938 1375 2132
939 1376 5370
940 1377 5467

      YSVAL, 0
      ENTR HALF
      FMPY YSCLFC
      FLOT YRNG
      FDIY YSCLFC
      FPUT YSCLFC
      FEXT
      JMP I YSVAL

      PLTINT, INITAR
      CALL PENUP
      CALL XSET
      IAC
      DCA LNCTR
      CDF 10
      TAD I YIND
      CDF 0
      CLL RAR
      TAD YLIM
      DCA YDIS
      TAD PNTPLT
      TAD LNCTR
      CALL PLTMOV
      DCA LNCTR
      CALL ADINX
      ISZ CNTR
      JMP PLTLOP
      CALL PENUP
      HEDIT1
      HD6
      ASK
      DISPLAY
      0
      PNTPLT, 0
      PLTMOV, PLTING

      YFLIP, INITAR
      CDF 10
      TAD I YIND
      CIA
      TAD YRNG
      TAD YRNG
      DCA I ZIND
      ISZ CNTR
      JMP FLY
      DISPLAY

      /DATA RANGE IN FAC ON ENTRY
      /FIND YRNG/D.R.=YSCLFC
      / AND LEAVE FACTOR IN FAC

      /INCREMENTAL X-Y ANALOG PLOTTING ROUTINE
      /RAISE PEN
      /SET SWITCH FOR 1 ST PT ONLY
      /SET UP Y VALUE

      /=0 FOR LINE PLOT1 =1 FOR POINT
      /MOVE PEN
      /CLEAR 1 ST PT SWITCH
      /INCR. X DISPLAY SUM
      /MORE PTS?
      /YES
      /LIFT PEN * EXIT
      /DONE. IS PLOTTER OFF?
      /IGNORE RESPONSE

      /INVERT Y AXIS
      /Y(I)=2*YRNG-Y(I)
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1400 4464
1401 4634
1402 4430
1403 3055
1404 1231
1405 3062
1406 1232
1407 3134
1410 6211
1411 1411
1412 6201
1413 4423
1414 1233
1415 4431
1416 4406
1417 2132
1420 7410
1421 5226
1422 2134
1423 5210
1424 4432
1425 5206
1426 4634
1427 3056
1430 5467
1431 0004
1432 7766
1433 0240
1434 1200

1435 0000
1436 4433
1437 1446
1440 4435
1441 7110
1442 4432
1443 7004
1444 3056
1445 5635
1446 2424
1447 3140
1450 1157
1451 1777
1452 0000

FPOUT,
CALL IOASK
CALL LEGER
INITAR
DCA 55
TAD NDIG
DCA 62
TAD NLIN
DCA MCTR
CDF 10
TAD I YIND
CDF 0
FLOAT
TAD SPAACE
CALL OUT
CALL 6
ISE CNTR
SKP DNE
JMP DNE
ISE MCTR
JMP LOOP6
CRLF0
JMP NULINE
CALL LEGER
DCA IOSWT
DISPLAY
4
-12
NLIN,
SPAACE,
LEDER,

DNE,
NDIG,
NLIN,
SPAACE,
LEDER,

DCA IOSWT
DCA 10SWT
JMP I ASKIO
TEXT \TTY I/O?

/SUBR. PRINTS DEC. NOS. IN 10 COLUMNS
/OF UP TO 4 DIGIT INTEGERS,
/CLEAR CR-LF SWITCH IN FPP.
/NO. OF DIGITS TO OUTPUT

/CHECK WHICH I/O DEVICES TO USE
HEDIT1
HDIO
ASK
CLL RAR
CRLF0
RAL
DCA IOSWT
JMP I ASKIO
TEXT \TTY I/O?

/KEEP ANSWER IN LINK
/MUST HAVE LOW I/O FOR CR-LF
/NOW SET UP SWITCH
/=1,HIGH:=0,LOW

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989	1453	4430	SCALY,	INITAR		
990	1454	2132		ISE CNTR	/UPDATE BY ONE	
991	1455	6211		COF 10		
992	1456	1411		TAD I YIND		
993	1457	3141		DCA MIN		
994	1458	1141		TAD MIN		
995	1460	1141		DCA MAX		
996	1461	3142		TAD I YIND	/FIND YMAX AND YMIN IN DATA	
997	1462	1411	LOOP4,	DCA TEMP	/SUB Y FROM MIN	
998	1463	3135		TAD TEMP		
999	1464	1135		CIA MIN		
1000	1465	7041		SMA CLA	/MINCY?	
1001	1466	1141		JMP LOW	/NO, SET MIN=Y	
1002	1467	7700		TAD TEMP	/YES, SUB Y FROM MAX	
1003	1470	5277		CIA MAX		
1004	1471	1135		SPA CLA	/MAX>Y?	
1005	1472	7041		JMP INCR	/NO, SET MAX=Y	
1006	1473	1142		TAD TEMP		
1007	1474	7710	LOW,	JMP HIGH		
1008	1475	5302		JMP INCR		
1009	1476	5304		TAD TEMP		
1010	1477	1135		DCA MIN		
1011	1500	3141		JMP INCR		
1012	1501	5304		TAD TEMP		
1013	1502	1135	HIGH,	DCA MAX		
1014	1503	3142		ISE CNTR		
1015	1504	2132		JMP LOOP4		
1016	1505	5262	INCR,	COF 0		
1017	1506	6201		TAD MIN		
1018	1507	1141		CIA MAX		
1019	1510	7041		TAD MAX		
1020	1511	1142		FLOAT		
1021	1512	4423		CALL YSCVAL		
1022	1513	4756		HEDIT1	/MIN=	
1023	1514	4433		HDS	/SET C(62) FOR 'NDIG' DIGITS	
1024	1515	5157		TAD NDIG		
1025	1516	1231		DCA 62		
1026	1517	3062		TAD MIN		
1027	1520	1141		FLOAT		
1028	1521	4423		CALL 6	/OUTPUT 'NDIG' DIGIT INTEGER	
1029	1522	4406		HEDIT2	/MAX=	
1030	1523	4434		TAD MAX		
1031	1524	1142		FLOAT		
1032	1525	4423		CALL 6		
1033	1526	4406		ENTR	/MPY=	
1034	1527	4407		HEDIT		
1035	1530	0006		FCGET YSCLCF		
1036	1531	5174		FEXT	/SET 3 IN AC FOR 3 DEC. PLACES	
1037	1532	0000		STL IAC RAL	/NDIG' DIGITS WITH 3 " "	
1038	1533	7125		CALL 6		
1039	1534	4406				
1040						

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1041					
1042		INITAR			
1043	SKL,	TAD MIN		/SCALE DATA AFTER SUB'G MIN Y.	
1044		CIA			
1045		CDF 10			
1046		TAD I YIND			
1047		CDF 0			
1048		FLOAT			
1049		ENTR YSCLFC			
1050		FADD HALF		/CORRECT FOR TRUNCATION.	
1051		FEXT			
1052		FIXT			
1053		CDF 10			
1054		DCA I ZIND			
1055		ISE CNTR			
1056		JMP SKL			
1057		DISPLAY			
1058	YSCVAL,	YSVAL			
1059					
1060		/LOADS CURRENT XD1S AND READY'S NEXT.			
1061	ADDMX,	0			
1062		CLA CLL		/GET LOW ORDER	
1063		TAD TXSM+1		/PUT BIT 0 IN 11 FOR ROUNDOFF	
1064		CLL RAL			
1065		CLA RAL		/GET HIGH ORDER	
1066		TAD TXSM			
1067		TAD XLIM		/IS CURRENT X DISPLAY VALUE,	
1068		DCA XD1S		/FOR NEXT TIME! GET FRACTIONS	
1069		TAD TXSM+1			
1070		TAD XNC+1			
1071		DCA TXSM+1			
1072		RAL		/PUT OVERFLOW IN BIT 11	
1073		TAD TXSM		/GET INTEGER PARTS	
1074		TAD XNC			
1075		DCA TXSM			
1076		JMP I ADDMX			
1077					

[illegible]

1120	1643	4407	ENTR			
1121	1644	7134	FLOT MCTR			
1122	1645	6160	FPUT TEMFP			
1123	1646	7315	FLOT OLDX			/# MOVES
1124	1647	6163	FPUT XMIN			
1125	1650	7316	FLOT OLDY			
1126	1651	6166	FPUT YMIN			
1127	1652	7131	FLOT PCTR			/DELTA X
1128	1653	4180	FDIV TEMFP			
1129	1654	6171	FPUT XSCLFC			/X UNITS/MOVE
1130	1655	7136	FLOT TEMPI			/DELTA Y
1131	1656	4160	FDIV TEMFP			
1132	1657	6174	FPUT YSCLFC			/Y UNITS/MOVE
1133	1660	0000	FEXT			
1134	1661	2714	ISE I CSET			/USE FAST CLOCK CYCLE
1135	1662	4407	ENTR			
1136	1663	5163	FGET XMIN			
1137	1664	1171	FADD XSCLFC			
1138	1665	6163	FPUT XMIN			
1139	1666	1123	FADD HALF			
1140	1667	0000	FEXT			
1141	1670	4424	FIXT			
1142	1671	3005	DCA XD1S			
1143	1672	4407	ENTR			/TRUNCATE XPOS TO NEAREST INTEGER
1144	1673	5166	FGET YMIN			
1145	1674	1174	FADD YSCLFC			
1146	1675	6166	FPUT YMIN			
1147	1676	1123	FADD HALF			
1148	1677	0000	FEXT			
1149	1700	4424	FIXT			
1150	1701	3112	DCA YD1S			/DO SAME FOR Y,
1151	1702	4463	CALL DISMOV			/MOVE PEN TO NEW COORD'S
1152	1703	4426	CALL HOLD			/WAIT FOR FAST CLOCK CYCLE
1153	1704	2133	ISE LNCYR			/MORE MOVES?
1154	1705	5262	JMP SCANIT			/YES.
1155	1706	3714	DCA I CSET			/RESTORE FOR SLOW CLOCK
1156	1707	1005	TAD XD1S			
1157	1710	3315	DCA OLDX			
1158	1711	1112	TAD YD1S			
1159	1712	3316	DCA OLDY			
1160	1713	5600	JMP I PLTINC			
1161	1714	1122	SET			
1162	1715	0000	OLDX,			
1163	1716	0000	OLDY,			
1164	1717	0000	SETPP,			
1165	1720	3147	DCA PIND1			/SET UP PARA TABLE POINTERS
1166	1721	1147	TAD PIND1			/VALUE FOR PIND1 IS IN AC
1167	1722	7001	IAC			
1168	1723	3150	DCA PIND2			
1169	1724	1150	TAD PIND2			
1170	1725	7001	IAC			
1171	1726	3151	DCA PIND3			
1172	1727	5717	JMP I SETPP			

/CAȚACAL:

LINE	ADDRESS	DATA	INSTR	COMMENT
1174	1730	0000	HEDER1, 0	/ENTER HEDER1 WITH MESSAGE ADDRESS IN
1175	1731	7301	CLA CLL IAC	/LOCATION FOLLOWING THE JMS (HEDER1),
1176	1732	1330	TAD HEDER1	/ENTER HEDER2 TO CONTINUE ON WITH A
1177	1733	3340	DCA HEDER2	/BROKEN STRING (E.G., SEE 'HDI' BELOW)
1178	1734	7240	STA	/AND DO NOT SUPPLY ADDRESS AFTER THE JMS,
1179	1735	1730	TAD I HEDER1	/THESE SUBR'S OUTPUT PACKED ASCII
1180	1736	3330	DCA HEDER1	/AS GENERATED BY MACRO-8 ASSEMBLER,
1181	1737	7410	SKP	/A SINGLE CODE, UP ARROW, =CR+LF
1182	1740	0000	HEDER2, 0	/ALWAYS RETURN THRU HEDER2
1183	1741	432	CRLF	/GET MESSAGE ADDRESS-1
1184	1742	2330	ISZ HEDER1	/USE HEDER1 AS TEMP REG
1185	1743	1730	TAD I HEDER1	/ENTER HERE IF NO ADDRESS GIVEN
1186	1744	7012	RTR	/BEGIN ALL MESSAGES WITH THIS
1187	1745	7012	RTR	
1188	1746	7012	RTR	
1189	1747	4353	JMS TYPCH	/SWAP HALVES
1190	1750	1730	TAD I HEDER1	/SET UP & TYPE ORIGINAL LEFT HALF
1191	1751	4353	JMS TYPCH	
1192	1752	5342	JMP NPR	/
1193				" RIGHT HALF
1194				
1195				
1196				
1197				
1198				
1199	1753	0000	TYPCH, 0	/DELETE CURRENT LEFT HALF
1200	1754	0127	AND RN77	/ZERO IN EITHER HALF SIGNIFIES
1201	1755	7450	SNA	/END OF STRING; RETURN
1202	1756	5740	JMP I HEDER2	
1203	1757	1374	TAD M36	
1204	1760	7510	SPA	/CODE 300 SERIES?
1205	1761	5367	JMP PRTT	/YES
1206	1762	7440	SEA	/SPECIAL CODE?
1207	1763	5366	JMP +3	
1208	1764	4432	CRLF	/YES, CODE 36; CARR.RET.+LN.FEED
1209	1765	5753	JMP I TYPCH	
1210	1766	1373	TAD P236	
1211	1767	1372	TAD P336	
1212	1770	4431	CALL OUT	
1213	1771	5753	JMP I TYPCH	
1214	1772	0336	P336,	
1215	1773	7700	P236,	
1216	1774	7742	M36,	
1217				
1218	1775	0000	FLAGSF, 01010	
	1776	0000		
	1777	0000		

/CATACALI		PAL10	V141	15-APR-70	1101	PAGE 27
1219	2000	SERVIS,	*2000			
1220	6036		KRB			/DISPLAY INTERRUPT SERVICE ROUTINE
1221	6046		TLS			/PRINT LAST CHAR,
1222	2001		TSF			
1223	2002		JMP			
1224	2003		JMP			
1225	2004		TAD			
1226	2005		SPA			/WAS IT A LETTER?
1227	2006		JMP			/NO, MAY BE NEW BLOCK #
1228	2007		CLL			
1229	2008		RTL			
1230	2009		RTL			
1231	2010		DCA			/GET NEXT CHAR
1232	2011		RTTY			
1233	2012		TAD			/LETTER?
1234	2013		SPA			/NO, ERROR
1235	2014		JMP			
1236	2015		JMP			
1237	2016		TAD			
1238	2017		CIA			/KEEP 6-BIT PR AS 2'S COMP,
1239	2018		DCA			
1240	2019		DCA			/SET UP SEARCH TABLE
1241	2020		TAD			
1242	2021		DCA			/GET MORE INPUT
1243	2022		RTTY			
1244	2023		TAD			/WAS IT A COLON?
1245	2024		SNA			/YES, LOOKUP JUMP ADDR,
1246	2025		JMP			
1247	2026		JMP			
1248	2027		TAD			
1249	2028		SZA			/RUBOUT?
1250	2029		CLA			/NO, GET MORE
1251	2030		TAD			/OUTPUT '9'
1252	2031		CALL			/AND EXIT TO DISPLAY
1253	2032		OUT			
1254	2033		DISP			/GET 6 BIT PAIR
1255	2034		ISZ			/END OF TABLE?
1256	2035		TAD			/YES, INVALID COMMAND
1257	2036		SNA			
1258	2037		JMP			/GET A MATCH?
1259	2038		TAD			/NO, TRY NEXT ENTRY
1260	2039		SZA			/YES, GET TABLE POINTER
1261	2040		JMP			/FORM JUMP ADDR,
1262	2041		TAD			
1263	2042		DCA			
1264	2043		TAD			
	2044		JMP			/AND GO THERE
	2045		SZA			
	2046		JMP			
	2047		TAD			
	2048		TAD			
	2049		DCA			
	2050		TAD			
	2051		JMP			
	2052		DCA			
	2053		TAD			
	2054		JMP			

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2059	7344				
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2061	7740				
2062	3144				
2063	5673				
2064	0277				
2065	7500				
2066	0017				
2067	7506				
2068	7673				
2069	0425				
2070	2126				
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2076	3254				
2077	3025				
2078	3400				
2079	2243				
2080	2200				
2081	2361				
2082	1400				
2083	1000				
2084	1453				
2085	3000				
2086	0403				
2087	1244				
2088	3613				
2089	4003				
2090	4153				
2091	0200				
2092	4663				
2093	3156				
2094	4600				
2095	4011				
2096	4726				
2097	1366				
2098	4752				
2099	3170				
2100	4761				

2055	1270				
2056	7510				
2057	5234				
2058	3144				
2059	7344				
2060	1144				
2061	7740				
2062	3144				
2063	5673				
2064	0277				
2065	7500				
2066	0017				
2067	7506				
2068	7673				
2069	0425				
2070	2126				
2071	2075				
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2075					

2076	3254				
2077	3025				
2078	3400				
2079	2243				
2080	2200				
2081	2361				
2082	1400				
2083	1000				
2084	1453				
2085	3000				
2086	0403				
2087	1244				
2088	3613				
2089	4003				
2090	4153				
2091	0200				
2092	4663				
2093	3156				
2094	4600				
2095	4011				
2096	4726				
2097	1366				
2098	4752				
2099	3170				
2100	4761				

/SET UP BLOCK PARAMETER. 0=BUFFER 1, 1=BUFFER 2
 /AND 2= BOTH BUFFERS W/OFFSETS FOR 2

/<261?
 /YES
 /KEEP IT TEMPORARILY

/>2?
 /YES, SET TO 0
 /EXIT TO DISPLAY W/O CR-LF

NMCHK,
 TAD M261
 JPA INVAL
 DCA BLOCK
 STA CLL RAL
 TAD BLOCK
 SMA SZA CLA
 DCA BLOCK
 JMP I CDISPL
 277
 ERRQ,
 M300,
 M261,
 M272,
 RUBIT,
 CDISPL,
 CHTAB,
 JUMPTB,
 JUMPTB=1

/JUMP ADDR, TABLE FOR 'SERVIS'

JUMPTB,
 STRIPR
 SHOT11
 INTEG
 CALPRT
 LORCL4
 SUBTRT
 FPOUT
 CALBRT
 SCALY
 SHAPBL
 START
 ISDIG
 TAPHAN
 ANINPT
 CALSET
 STRYIT
 SQUEZE
 ADDTWO
 DERIV
 DILST
 XFLIP
 YFLIP
 COPY
 CURSR
 MULP

1311	2127	2324	/ST-RIP
1312	2130	2315	/SM-00TH
1313	2131	1116	/IN-TEGRATE
1314	2132	0114	/AL-TER
1315	2133	0301	/CALCULATE
1316	2134	2325	/SUBTRACT CDA FROM OTHER
1317	2135	1725	/OUTPUT
1318	2136	2014	/PL-OT
1319	2137	2303	/SC-ALE
1320	2140	2327	/SW-AP
1321	2141	2205	/RE-START
1322	2142	2001	/PA-PER TAPE INPUT
1323	2143	2401	/TAPE I/O
1324	2144	0126	/AVERAGER INPUT
1325	2145	2411	/TIME CALIBRATION
1326	2146	1517	/MODIFIER ROUTINE
1327	2147	2321	/SQ-UEEZE DATA DENSITY
1328	2150	0104	/AD-D OTHER TO CDA
1329	2151	0405	/DERIVATIVE FORMATION
1330	2152	0411	/DIGITAL EXIT
1331	2153	3011	/XI-NVERT
1332	2154	3111	/XI-NVERT
1333	2155	0317	/COPY CDA INTO OTHER
1334	2156	0325	/CURSORS
1335	2157	1525	/MULTIPLY (SCALE) CDA
1336	2160	0000	/END TABLE
1337			
1338			
1339	2161	0000	RECALC, 0 /USED TO RESCALE HGTS FOR NEW INT, MPYR,
1340	2162	4470	CALL PPSET
1341	2163	4407	ENTR I PIND1
1342	2164	7547	FLOV TEMFP
1343	2165	4160	FEXT
1344	2166	0000	/HAS OLD MPYR
1345	2167	4776	CALL NEWMP
1346	2170	3547	DCA I PIND1
1347	2171	7001	IAC
1348	2172	1151	TAD PIND3
1349	2173	2135	ISZ TEMP
1350	2174	5362	JMP RECALC+1
1351	2175	5761	JMP I RECALC
1352	2176	0762	NEWMP, NORMAT
			/MULT BY NEW MPYR
			/MORE PEAKS?
			/YES

1353	2200	*2200		
1354	4601	CALL *1	LORCL4,	
1355	2201	DIALOG		/CALL INITIAL DIALOG
1356	2202	CALL GETVAR		/GET SCALING VARIABLES, ETC,
1357	2203	HEDIT2		/'HGT', HALF-WIDTH, POSITIONI,'
1358	2204	IAC		/IS SWITCH FOR FIRST PEAK
1359	2205	DCA TEM3		
1360	2206	TAD PK5		
1361	2207	DCA TEM2		
1362	2210	TAD PARPTR		
1363	2211	CALL PPSET	NUPEEK,	
1364	2212	CALL HGT		
1365	2213	TAD WIDSWT		
1366	2214	TAD TEM3		
1367	2215	SNA CLA		
1368	2216	JMP *3		/FIRST PEAK OR UNEQUAL WIDTHS?
1369	2217	CALL WID		/NO
1370	2220	JMP *3		
1371	2221	TAD I WIDONE		/GET FIRST WIDTH AND PUT INTO
1372	2222	DCA I PIND2		/OTHER PEAKS
1373	2223	DCA TEM3		/CLEAR SWITCH AFTER FIRST PEAK
1374	2224	CALL POS		
1375	2225	GRUFD		
1376	2226	TAD PIND3		
1377	2227	IAC		
1378	2230	IS2 TEM2		
1379	2231	JMP NUPEEK		
1380	2232	CALL CLARR	GCAL,	
1381	2233	JMP I CALCY		/CLEAR ARRAY STORAGE
1382	2234	CLRR		
1383	2235	0		
1384	2236	PTABST*1		/IS SET BY INITIAL DIALOG ROUTINE
1385	2237	VARGET		/ADDRESS FOR FIRST WIDTH
1386	2240	YCALC		
1387	2241	PARDMP		
1388	2242	PEKOMP		
1389				
1390				

1391	2243	4433	CALPRT, HEDIT1	/PEAK, PARA, VALUEI
1392	2244	5315	HD21	
1393	2245	4425	GETNO	
1394	2246	4424	FIXT	
1395	2247	7510	SPA	/PEAK #<0?
1396	2250	5243	JMP CALPRT	/YES, NO GOOD
1397	2251	7104	CLL RAL	
1398	2252	1045	TAD 45	
1399	2253	1351	TAD MIN3	
1400	2254	3136	DCA TEMP1	/3*PKS-3=PK INDEX #
1401	2255	1145	TAD PKS	
1402	2256	1045	TAD 45	
1403	2257	7740	SHA SZA CLA	/PK NO, > NO, PKS?
1404	2260	5243	JMP CALPRT	/YES, IGNORE
1405	2261	1045	TAD 45	
1406	2262	3135	DCA TEMP	
1407	2263	4425	GETNO	
1408	2264	4424	FIXT	
1409	2265	7510	SPA	/PARA #<0?
1410	2266	5232	JMP GCAL	/YES, EXIT TO CALC SPECTRUM
1411	2267	1135	TAD TEMP	
1412	2270	7650	SNA CLA	/BOTH ENTRIES = 0?
1413	2271	5641	JMP I DUMPTT	/YES, SIGNALS ALL PARA DUMP
1414	2272	1045	TAD 45	
1415	2273	7450	SNA	/PARA #<0?
1416	2274	5642	JMP I PKDMP	/YES, SIGNALS PEAK PARA DUMP
1417	2275	1351	TAD MIN3	
1418	2276	7740	SHA SZA CLA	/PARA #>3?
1419	2277	5243	JMP CALPRT	/YES, ILLEGAL TRY AGAIN
1420	2300	1136	TAD TEMP1	
1421	2301	7510	SPA	/PK #>0?
1422	2302	5314	JMP P123	/NO, GET MPYR, BASE, OR LOR FR
1423	2303	1075	TAD PARPTR	/=POINTER TO HGT PARA
1424	2304	4470	CALL PRSET	
1425	2305	1045	TAD 45	
1426	2306	1355	TAD PSTAB	/NOW, GET SUBR FOR INPUT
1427	2307	3135	DCA TEMP	
1428	2310	1335	TAD I TEMP	
1429	2311	3135	DCA TEMP	
1430	2312	4535	CALL TEMP	
1431	2313	5243	JMP CALPRT	

/CATALI

1434	2314	7240	P123,	STA		
1435	2315	1045		TAD 45		
1436	2316	7640		SZA CLA		/WANT MPYR?
1437	2317	5337		JMP GTP2		/NO, GET BASE OR LOR FR
1438	2320	4407		ENTR		
1439	2321	5472		FGET I MPYR		/KEEP OLD VALUE
1440	2322	6160		FPUT TENFP		
1441	2323	0004		READ		/GET NEW
1442	2324	6472		FPUT I MPYR		
1443	2325	0000		FEXT		/UPDATE OLD HGT'S & BASE
1444	2326	1145		TAD PKS		
1445	2327	3135		DCA TEMP		
1446	2330	1075		TAD PARPTR		
1447	2331	4754		CALL NUCALC		/RESCALE HGTS
1448	2332	4407		ENTR		
1449	2333	7146		FLOT PAR1		
1450	2334	4160		FDIV TENFP		
1451	2335	0000		FEXT		
1452	2336	5346		JMP PR1T		
1453	2337	1045	GTP2,	TAD 45		/WANT NEW BASE?
1454	2340	1351		TAD MIN3		/YES
1455	2341	7640		SZA CLA		/NO, GET NEW LOR, FR,
1456	2342	5345		JMP .43		
1457	2343	4252		CALL LGFRAC		
1458	2344	5243		JMP CALPRT		
1459	2345	4425		GETNO		
1460	2346	4753		CALL NUMP		/SCALE IT.
1461	2347	3146		DCA PAR1		
1462	2350	5243		JMP CALPRT		
1463	2351	7775		.43		
1464	2352	2754		LGFRAC		
1465	2353	0762		NUMP, NORMAT		
1466	2354	2161		NUCALC, RECALC		
1467	2355	2355		PSTAB,		
1468	2356	0771		HGT,		
1469	2357	4532		WID,		
1470	2360	4714		POSTN		
1471	2361	4773		CALL INTSP		/SUBTRACT CDA FROM OTHER
1472	2362	1105		TAD YLIN		/USE -2*YLIN FOR OFFSET
1473	2363	7104		CLL RAL		
1474	2364	1411		TAD I YIND		/GET CDA
1475	2365	7041		CIA		
1476	2366	1413		TAD I AUTO		/SUBTRACT FROM OTHER
1477	2367	3412		DCA I ZIND		/RESTORE IN CDA
1478	2370	1312		ISE CNTR		/MORE POINTS?
1479	2371	5362		JMP SUBSTR+1		/YES
1480	2372	5467		DISPLAY		/EXIT TO DISPLAY
1481	2373	3014		SPINT		
1482	2374					

1483	/CATACAL	2400	*2400		
1484			/COMPUTES LORENTZIAN AND/OR GAUSSIAN 'DIPS'		
1485			HEDIT1	/ 'COOL IT'	
1486	YCALC,	2400	H023		
1487		2401	INITAR		
1488		2402	CALL XSET	/GET XSCLFC (X DIS, UNITS/PT)	
1489		2403	DCA FTEM2	/USED AS TEMP REGS	
1490		2404	DCA FTEM2+1		
1491		2405	DCA FTEM2+2		
1492		2406	TAD PKS		
1493		2407	DCA TEM2		
1494	NUPNT,	2410	DCA YSCLFC		
1495		2411	DCA YSCLFC+1		
1496		2412	DCA YSCLFC+2		
1497		2413	CALL LOADX		
1498		2414	TAD PARPTR		
1499		2415	CALL PPSET		
1500	YCLC,	2416	TAD I PIND2	/CHECK FOR PEAK IN RANGE OF X	
1501		2417	SPA	/WAS RANGE NEG?	
1502		2420	CIA	/YES, MAKE WIDTH POS	
1503		2421	CLL RTL		
1504		2422	RAL	/IS 8 * WIDTH	
1505		2423	DCA TEMP		
1506		2424	TAD TEMP		
1507		2425	CIA	/GET POSITION - 8 * W	
1508		2426	TAD I PIND3	/SUBTRACT FROM CURRENT X	
1509		2427	CIA	/IS POS -8*W<X	
1510		2430	TAD TXSM	/YES, IGNORE THIS PK	
1511		2431	SPA CLA	/GET W**2 AND (P-X)**2	
1512		2432	JMP NXPK	/ANY LOR, CONTRIBUTION?	
1513		2433	TAD TEMP	/NO	
1514		2434	TAD I PIND3	/YES, COMPUTE IT	
1515		2435	CIA	/GET (P-X)**2*W**2	
1516		2436	TAD TXSM	/TEMP STORE	
1517		2437	SMA CLA	/GET HGT	
1518		2440	JMP NXPK	/GET H**2	
1519		2441	CALL CALBEG	/GET H**2/((P-X)**2*W**2)	
1520		2442	TAD LORPR	/SCALE BY LOR, PR	
1521		2443	SNA CLA	/ADD TO CURRENT SUM FOR THIS PT	
1522		2444	JMP ALLGS		
1523		2445	ENTR		
1524		2446	FADD TEMP		
1525		2447	FPUT FTEM1		
1526		2450	FLOT I PIND1		
1527		2451	FMPY XMIN		
1528		2452	FDIV FTEM1		
1529		2453	FMPY I FLORF		
1530		2454	FADD YSCLFC		
1531		2455	FPUT YSCLFC		
1532		2456	FEXT		
1533		2457	TAD GASFR		
1534		2460	SNA CLA		
1535		2461	JMP NXPK		
1536		2462	SPCJ=JMP STRCL	/DEFINE IT FOR INIT. DIALOG	
1537					

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1538 /CATACAL
1539 2463 4407
1540 2464 5160
1541 2465 4163
1542 2466 3123
1543 2467 0003
1544 2470 0010
1545 2471 6160
1546 2472 7547
1547 2473 3160
1548 2474 3500
1549 2475 1174
1550 2476 6174
1551 2477 0000
1552 2500 1151
1553 2501 7001
1554 2502 2137
1555 2503 5216
1556 2504 4424
1557 2505 7041
1558 2506 1146
1559 2507 6211
1560 2510 3411
1561 2511 6201
1562 2512 4471
1563 2513 2132
1564 2514 5207
1565 2515 5467
1566 2516 2705
1567 2517 3600
1568 2520 4433
1569 2521 5256
1570 2522 4407
1571 2523 7106
1572 2524 4473
1573 2525 0005
1574 2526 5901
1575 2527 0005
1576 2530 5472
1577 2531 0005
1578 2532 7146
1579 2533 4472
1580 2534 0005
1581 2535 5477
1582 2536 0005
1583 2537 0000
1584 2540 4434
1585 2541 1145
1586 2542 3131
1587 2543 5350
1588

ALLGS, ENTR TEMFP
      FDIV XMIN
      FMPY HALF
      NEGATE
      EXPON
      FPUT TEMFP
      FLOT I PIND1
      FMPY TEMFP
      FMPY I PGASF
      FADD YSCLFC
      FPUT YSCLFC
      FEXT
      TAD PIND3
      IAC
      ISZ TEM2
      JMP YCLC
      FIXT
      CIA
      TAD PAR1
      CDF 10
      DCA I YIND
      CDF 0
      CALL ADINX
      ISZ CNTR
      JMP NUPNT
      DISPLAY
      XLOAD
      CALBEG, BEGAL

NXPK, TAD PIND3
      IAC
      ISZ TEM2
      JMP YCLC
      FIXT
      CIA
      TAD PAR1
      CDF 10
      DCA I YIND
      CDF 0
      CALL ADINX
      ISZ CNTR
      JMP NUPNT
      DISPLAY
      XLOAD
      CALBEG, BEGAL

BSCHNG, CIA
      TAD PAR1
      CDF 10
      DCA I YIND
      CDF 0
      CALL ADINX
      ISZ CNTR
      JMP NUPNT
      DISPLAY
      XLOAD
      CALBEG, BEGAL

LOADX, XLOAD
      CALBEG, BEGAL

PARDMP, HEDIT1
      H020B
      ENTR
      FLOT XRNG
      FDIV I XMPY
      OUTPUT
      FGET I X1
      OUTPUT
      FGET I MPYR
      OUTPUT
      FLOT PAR1
      FDIV I MPYR
      OUTPUT
      FGET I FLORF
      OUTPUT
      FEXT
      HEDIT2
      TAD PKS
      DCA PCTR
      JMP PKPRNT

      /GET -(X-P)**2/(2*W**2)=Z
      /GET EXP(-Z)

      /GET H*EXP(-Z)
      /SCALE BY GAUSS, FRACTION
      /ADD TO SUM

      /RESET PARA PTRS,

      /ANOTHER PEAK?
      /YES
      /NO, FORM INTEGER FROM SUM
      /SUBTRACT FROM BASELINEJ CHANGE
      /TO INOP, FOR PEAK SPECTRA,

      /STORE INTEGER RESULT
      /INCREMENT TXSM
      /MORE POINTS?
      /YES
      /EXIT

      /X RANGE, X1, INT,MPYR,BASE,LOR FR:

      /HGT, H-WIDTH,POS1
      /SET TO PRINT ALL PEAKS
      /STARTING FROM FIRST PEAK

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2544 7240
2545 3131
2546 4432
2547 1136
2550 1075
2551 4470
2552 4407
2553 7547
2554 4472
2555 0005
2556 7550
2557 4473
2560 0005
2561 7551
2562 4473
2563 1501
2564 0005
2565 0000
2566 4432
2567 7001
2570 1151
2571 2131
2572 5351
2573 5467

PEKDMP, STA
DCA PCTR
CRLF
TAD TEMP1
PKPRNT, TAD PARPTR
CALL PPSET
ENTR
FLOT I PIND1
FOIV I MPYR
OUTPUT
FLOT I PIND2
FOIV I XMPY
OUTPUT
FLOT I PIND3
FOIV I XMPY
FADD I X1
OUTPUT
FEXT
CRLF
IAC
TAD PIND3
ISZ PCTR
JMP PKPRNT+1
DISPLAY

/SET TO PRINT ONLY ONE PEAK
/GET PEAK INDEX
/OUTPUT CURRENT PARA'S IN INPUT UNITS

/MORE PEAKS?
/YES
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*2600
/THIS IS AN EXPONENTIATION ROUTINE
/IDENTICAL TO THAT USED BY FLOATING
/POINT PKG WITH EXTENDED FUNCTIONS.
/THE ONLY DIFFERENCES ARE IN THE USE
/OF TEMPORARY STORAGE AND THE 'FIX'
/AND 'FLOAT' OPERATIONS.

FLEXPO. 0
TAD 45
SMA CLA
JMP ,03
CALL NEGIT
STA SINE
DCA SINE
ENTR
FMPY LG2E
FPUT XMIN
FEXT
FIXT
DCA FLAG2
ENTR
FLOT 45
FPUT YMIN
FGET XMIN
FSUB YMIN
FPUT XMIN
FMPY XMIN
FPUT YMIN
FADD D
FPUT TEMFP
FGET C
FDIV TEMFP
FSUB XMIN
FADD A
FPUT TEMFP
FGET B
FMPY YMIN
FADD TEMFP
FPUT TEMFP
FGET XMIN
FDIV TEMFP
FADD 44
FADD ONE
FEXT
TAD FLAG2
TAD 44
DCA 44

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15-APR-70

1:01

V141

PAL10

/CATACALI

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6163
5302
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5600
6000
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0004
2372
1402
7774
2157
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0012
5454
0343
0007
2566
5341
0001
2705
2435
0001
2000
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0004
2372
1402
7774
2157
5157
0012
5454
0343
0007
2566
5341
0001
2705
2435
0001
2000
0000

NEGIT, 6000
SINE, 0
FLAG2, 0
A, 0004
B, 7774
C, 2157
D, 5157
LG2E, 0012
ONE, 5454
XLOAD, 0343
ENTR FTEM2
FGET XSCLFC
FADD LOORD
FPUT LOORD
FEXT DCA 44
JMP I XLOAD

/UPDATE CURRENT X FOR 'YCALC'

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	PAL10	V141	15-APR-70	1101	PAGE 30
1706	/CATACAL				
1707		VARGET, 0			/CALLED BY LORCL4 TO GET VARIABLES
1708		CALL GETPTS			/GET # PTS
1709		HEDIT1			/'NO, OF PEAKS'
1710		HD20A			
1711		GETNO			
1712		FIXT			
1713		CIA			
1714		DCA PKS			/KEEP AS 2'S COMP
1715		HEDIT2			/XRNG,X1,INT,MPYR,,BASE,LOR,FR,1
1716		ENTR			
1717		READ			
1718		FPUT XSCLFC			
1719		FLOT XRNG			
1720		F01V XSCLFC			
1721		FPUT I XMPY			
1722		READ			/GET INT, MULTIPLIER
1723		FPUT I X1			
1724		READ			/GET BASELINE
1725		FPUT I MPYR			/SCALE IT
1726		READ			
1727		FMPY I MPYR			
1728		FADD HALF			
1729		FEXT			
1730		FIXT			
1731		DCA PAR1			/PAR1=BASELINE
1732		JMS GLFRAC			/GET LOR, FRACTION; SET G.F. AND PERCENTS
1733		JMP I VARGET			
1734		DATYP			
1735		GETPTS, 01010			
		X11,			
1736		GLFRAC, 0			
1737		ENTR			
1738		READ			/GET LORENTZIAN FRACTION
1739		FPUT I FLORF			
1740		NEGATE			
1741		FADD ONE			/FIND GAUSSIAN FRACTION
1742		FPUT I FGASF			
1743		FMPY I HUNDRD			
1744		FEXT			
1745		FIXT			/SET GAUSS PERCENT
1746		DCA GASFR			
1747		TAD GASFR			
1748		CIA			/AND LOR, PERCENT
1749		TAD PK100			
1750		DCA LORFR			
1751		JMP I GLFRAC			
1752		PK100, 144			
1753					


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4407
6163
6166
0000

+3000
SWAPBL, JMS SPINIT
TAD AUTO
DCA XIND
TAD I XIND
DCA TEMP
TAD I ZIND
DCA I AUTO
TAD TEMP
DCA I YIND
ISE CNTR
JMP SWLOOP
DISPLAY

/SWAP THE TWO BUFFERS

/MORE POINTS?
/YES
/NO, EXIT

SPINIT, 0
INITAR
TAD BLOCK
SNA CLA
TAD OFFSET
TAD YONE
DCA AUTO
COF 10
JMP I SPINIT

/SPECIAL INIT. ROUTINE

SMOT11,
INITAR
TAD YIND
TAD PL13
DCA TEM2
CMA
TAD CNTR
TAD PL13
DCA CNTR
TAD MINS
DCA TEMP
TAD COTAG
DCA TEMP1
FLOAT
ENTR
FPUT XMIN
FPUT YMIN
FEXT

/MODIFIED DECUS 5/8-69 (LESQ11)
/11 POINT SMOOTHER

NEWY,

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1797
1798 CDF 10 6211
1799 TAD I YIND 3046
1800 TAD I TEM2 3047
1801 CDF 0 1411
1802 FLOAT 3050
1803 ENTR 3051
1804 FPUT TEMFP 3052
1805 FADD XMIN 4407
1806 FPUT XMIN 3053
1807 FCET TEMFP 6160
1808 FMPY I TEMPI 1163
1809 FADD YMIN 3055
1810 FPUT YMIN 3056
1811 FEXT 6166
1812 STL IAC RAL 3057
1813 TAD TEMPI 3058
1814 DCA TEMPI 3059
1815 CMA 3136
1816 TAD TEM2 7040
1817 DCA TEM2 3070
1818 ISZ TEM 3071
1819 JMP LOOP9 3137
1820 CDF 10 2135
1821 TAD I TEM2 3072
1822 CDF 0 5246
1823 FLOAT 6211
1824 ENTR 1537
1825 FADD XMIN 3073
1826 FMPY F125 3074
1827 FSUB YMIN 6211
1828 FDIV F161 1537
1829 FADD HALF 3075
1830 FEXT 6201
1831 FIXT 3076
1832 CDF 10 4423
1833 DCA I TEM2 3077
1834 CDF 0 4407
1835 TAD YIND 3100
1836 TAD NEG4 3101
1837 DCA YIND 3163
1838 TAD TEM2 3325
1839 TAD P6 2166
1840 ISZ CNTR 4330
1841 JMP NEWY 3104
1842 DISPLAY 3105
1843
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1845	3124	3137			
1846	3125	0005	COTAG,	TAGCO	
1847	3126	2163	F125,	0005	
1848	3127	1463		2163	
1849	3130	0007	F161,	1463	
1850	3131	2534		0007	
1851	3132	6314		2534	
1852	3133	0013	PL13,	6314	
1853	3134	0006	P6,	13	
1854	3135	7764	M12,	6	
1855	3136	7773	M15,	-14	
1856	3137	0005	MIN5,	-5	
1857	3140	3100	TAGCO,	5	
1858	3141	0000		3100	
1859	3142	0005		0	
1860	3143	2000		5	
1861	3144	0000		2000	
1862	3145	0004		0	
1863	3146	2200		4	
1864	3147	0000		2200	
1865	3150	0003		0	
1866	3151	2000		3	
1867	3152	0000		2000	
1868	3153	0001		0	
1869	3154	2000		1	
1870	3155	0000		2000	
1871				0	
1872	3156	4214	ADDTWO,	JMS SPINIT	/ADD DISP. CHAN TO OTHER
1873	3157	1411		TAD I YIND	
1874	3160	1413		TAD I AUTO	
1875	3161	7110		CLL RAR	
1876	3162	7430		SEL	
1877	3163	7001		IAC	
1878	3164	3412		DCA I ZIND	/RESULTS IN DISP. CHAN.
1879	3165	2132		ISE CNTR	
1880	3166	5357		JMP ADDTWO*1	
1881	3167	5467		DISPLAY	
1882					
1883	3170	1143	CURSR,	TAD MODE	
1884	3171	7700		SMA CLA	/CURSORS ON SCOPE?
1885	3172	7240		STA	/NO. PUT THEM UP
1886	3173	3143		DCA MODE	
1887	3174	5467		DISPLAY	

1888	3200				
1889	0000	SETSTR, 0			
1890	3201	INITAR		/GET LEFT Y	
1891	3202	TAD TPNT*1			
1892	3203	CIA		/RIGHT Y	
1893	3204	TAD TPNT*3		/KEEP DELTA Y	
1894	3205	DCA TPNT*3		/GET LEFT X	
1895	3206	TAD TPNT			
1896	3207	CIA		/RIGHT X	
1897	3210	TAD TPNT*2		/RIGHT>LEFT?	
1898	3211	SPA SNA		/NO, ARE INVERTED	
1899	3212	JMP ERRO		/KEEP DELTA X	
1900	3213	DCA TPNT*2		/GET X INCREMENT	
1901	3214	CALL XSET			
1902	3215	ENTR		/GET LEFT Y	
1903	3216	FLOT TPNT*1		/GET DELTA X	
1904	3217	FPUT YMIN		/SCALE IT	
1905	3220	FLOT TPNT*2		/IS # OF PTS	
1906	3221	FDIV XSCLFC			
1907	3222	FPUT XMIN		/INSURE CNTR<0!	
1908	3223	FADD HALF			
1909	3224	FEXT		/IS # PTS IN RANGE	
1910	3225	FIXT			
1911	3226	SPA SNA		/GET DELTA Y	
1912	3227	CLA IAC		/Y DIS UNITS /PT	
1913	3230	CIA		/LEFT X	
1914	3231	DCA CNTR		/FAC=#PTS TO LEFT X	
1915	3232	ENTR			
1916	3233	FLOT TPNT*3		/SETS INDEX	
1917	3234	FPUT XMIN			
1918	3235	FPUT YSCLFC			
1919	3236	FLOT TPNT			
1920	3237	FDIV XSCLFC			
1921	3240	FADD HALF			
1922	3241	FEXT			
1923	3242	FIXT			
1924	3243	TAD YIND			
1925	3244	DCA YIND			
1926	3245	TAD YIND			
1927	3246	DCA ZIND			
1928	3247	DCA MODE			
1929	3250	JMP I SETSTR			
1930					
1931					
1932	3251	ERRD,		/BAD X PTS!	
1933	3252	H026			
1934	3253	DISPLAY			

1935						
1936	3254	4200	STRIPR,	JMS SETSTR		
1937	3255	4433		HEDIT1	/STRIP PEAK?	
1938	3256	5327		HD25		
1939	3257	4435		ASK		
1940	3260	7640		SEA CLA		
1941	3261	5267		JMP STRBS		
1942	3262	4311	STRPK,	JMS YSTEP	/GET NEW Y	
1943	3263	3411		DCA I YIND		
1944	3264	2132		ISZ CNTR		
1945	3265	5262		JMP STRPK		
1946	3266	5467		DISPLAY		
1947	3267	4434	STRBS,	HEDIT2	/FULL BASE STRIP?	
1948	3270	4435		ASK		
1949	3271	7640		SEA CLA		
1950	3272	5275		JMP .-3	/NO	
1951	3273	4430		INITAR		
1952	3274	4704		CALL EXTRP		
1953	3275	4311	REMOV,	JMS YSTEP		
1954	3276	7041		CIA		
1955	3277	1411		TAD I YIND	/SUB. FROM Y	
1956	3300	3412		DCA I ZIND		
1957	3301	2132		ISZ CNTR		
1958	3302	5275		JMP REMOV		
1959	3303	5467		DISPLAY		
1960	3304	5074	EXTRP,	EXTRAP		
1961						
1962	3305	0000	TPNT,	0	/TABLE OF LAST ADC COORD'S	
1963	3306	0000		0		
1964	3307	0000		0		
1965	3310	0000		0		
1966						
1967	3311	0000	YSTEP,	0	/COMPUTE Y VALUE	
1968	3312	6201		COF 0		
1969	3313	4407		ENTR		
1970	3314	5166		FGET YMIN		
1971	3315	1174		FADD YSCLFC		
1972	3316	6166		FPUT YMIN		
1973	3317	1123		FADD HALF		
1974	3320	0000		FEXT		
1975	3321	4424		FIXT		
1976	3322	6211		COF 10		
1977	3323	5711		JMP I YSTEP		

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3324	0000	DISPTS, 0	STA CLL RAL	/-2
3325	7344		DCA TEM3	
3326	3140		TAD OPTR	/SET UP STORAGE TABLE
3327	1376		DCA AUTO	
3330	3013		CLL IAC RTL	/SET 4 AS FIRST CHANNEL
3331	7107		DCA TEM2	
3332	3137		TAD TEM2	
3333	1137	NXPT,	CALL ADCON	/MAKE ADC ON CHAN'S 4 THEN 6
3334	4465		TAD K1000	/ADD 512 TO GET RESULT
3335	1130		CLL RAR	
3336	7110		DCA XD1S	
3337	3005		TAD XLIM	/SUBTRACT XLIM
3340	1104		CIA XD1S	
3341	7041		TAD FUDGE	/CORRECT FOR HARDWARE HYSTERESIS
3342	1005		SPA	/RESULT<0?
3343	1377		CLA	/YES, SET IT=0
3344	7510		DCA I AUTO	/KEEP RESULT
3345	7200		ISE TEM2	/INCR. CHAN
3346	3413		TAD TEM2	
3347	2137		CALL ADCON	/ADC ON CHAN'S 5 THEN 7
3350	1137		CLL RAR	
3351	4465		DCA YD1S	/SUB. YLIM
3352	7110		TAD YLIM	
3353	3112		CIA YD1S	
3354	1105		TAD RAL	/FOR HYSTERESIS
3355	7041		TAD FUDGE	/KEEP IT
3356	1112		DCA I AUTO	
3357	7104		ISE TEM2	/SET DELAY COUNTER
3360	1377		TAD DCT	/REFRESH DISPLAY
3361	3413		DCA MCTR	
3362	2137		CALL DISMOV	
3363	1375		ISE MCTR	
3364	3134		JMP I-2	/NEED 2ND PT THIS TIME?
3365	5365		ISE TEM3	/YES
3370	2140		JMP NXPT	/DISPLAY CURSOR VALUES IN DECIMAL
3371	5333		CALL DISCUR	/GOT IT? EXIT
3372	4774		JMP I DISPTS	
3373	5724		CROIS	
3374	5000		DCT, -100	
3375	7700		DPTR, TPNT=1	/STORAGE ADDR.
3376	3304		FUDGE, 4	
3377	0004			

2067	3447	4407	ENTR	
2068	3450	5152	FGET FTEM1	/FIND INTEGRAL RANGE.
2069	3451	2155	FSUB FTEM2	
2070	3452	3123	FMPY HALF	/DIV BY 2 SINCE DATA RNG=2*DISP RNG
2071	3453	6152	FPUT FTEM1	
2072	3454	7107	FLOT YRNG	/COMPUTE SCALE=DOWN FACTOR
2073	3455	4152	FDIV FTEM1	
2074	3456	6152	FPUT FTEM1	
2075	3457	3155	FMPY FTEM2	/SCALE MIN VALUE
2076	3460	6155	FPUT FTEM2	
2077	3461	5152	FGET FTEM1	
2078	3462	3171	FMPY XSCLFC	/GET NEW MULT'R INCLUDING SCL-DN
2079	3463	6171	FPUT XSCLFC	
2080	3464	0000	FEXT	
2081	3465	4323	JMS RDY	
2082				
2083				
2084				
2085				
2086	3466	4345	CMPTNT, FIXT	/THIS LOOP COMPUTES AND STORES
2087	3467	4424	COF 10	/SCALED DOWN INTEGRAL VALUE AT EACH POINT,
2088	3470	6211	DCA I ZIND	/GET INTEGRAL-BASELINE
2089	3471	3412	ISZ CNTR	
2090	3472	2132	JMP CMPINT	/MORE POINTS?
2091	3473	5266	TAD 45	/YES
2092	3474	1045	DCA I ZIND	/PUT N-1 VALUE INTO NTH
2093	3475	3412	COF 0	
2094	3476	6201	HEDIT1	/Y MULT'D BY:
2095	3477	4433	HDS+6	
2096	3500	5165	ENTR	
2097	3501	4407	FGET XSCLFC	
2098	3502	5171	FDIV HALF	
2099	3503	4123	OUTPUT	
2100	3504	0005	FEXT	
2101	3505	0000	DISPLAY	/RETURN TO DISPLAY
2102	3506	5467	CURSET, SETSTR	
2103	3507	3200	SETLY, EXTRAP	
2104	3510	5074	PTINT,	
2105	3511	4345	JMS SCASM	/INTEGRATES BETWEEN CURSORS
2106	3512	2132	ISZ CNTR	/AND PRINTS AREA; NO CHANGE
2107	3513	5311	JMP *-2	/IN DATA ARRAY
2108	3514	4434	HEDIT2	/AREA=
2109	3515	4407	ENTR TENFP	
2110	3516	5160	OUTPUT	
2111	3517	0005	FEXT	
2112	3520	0000	DISPLAY	
2113	3521	5467	TPNT+1	
2114	3522	3306	LEFY,	

	/CATA	PAL10	V141	15-APR-70	1101	PAGE 47
2115						
2116	3523	RDY,	0			
2117	3524		INITAR			
2118	3525		ISZ CNTR			
2119	3526		FLOAT			
2120	3527		ENTR			
2121	3530		FPUT TEMFP	/CLEAR TEMFP		
2122	3531		FPUT MIN	/SET LEFT Y		
2123	3532		FPUT YMIN			
2124	3533		FEXT			
2125	3534		JMP I RDY			
2126						
2127	3535	CLRR,	0	/CLEAR Y ARRAY		
2128	3536		INITAR			
2129	3537		ODF 10			
2130	3540		DCA I YIND			
2131	3541		ISZ CNTR			
2132	3542		JMP I -2			
2133	3543		ODF 0			
2134	3544		JMP I CLRR			
2135						
2136	3545	SCASM,	0			
2137	3546		ODF 10			
2138	3547		TAD I YIND			
2139	3550		TAD I YIND			
2140	3551		ODF 0			
2141	3552		FLOAT			
2142	3553		ENTR YMIN	/SUBTRACT PIVOT VALUE		
2143	3554		FPUT XMIN	/KEEP THIS		
2144	3555		FGET YSCLFC	/INCR. PIVOT VALUE		
2145	3556		FADD YMIN	/KEEP FOR NEXT POINT		
2146	3557		FPUT YMIN	/SUBTRACT FROM PT SUM		
2147	3560		NEGATE	/FAC=Y(I+1)*Y(I)-P(I+1)-P(I)		
2148	3561		FADD XMIN	/SCALE DOWN		
2149	3562		FMPY XSCLFC			
2150	3563		FADD TEMFP			
2151	3564		FPUT TEMFP			
2152	3565		FSUB PTM2	/SUBTRACT MIN VALUE		
2153	3566		FEXT	/RESET Y POINTER		
2154	3567		CHN			
2155	3570		TAD YIND			
2156	3571		DCA YIND			
2157	3572		JMP I SCASM			
2158	3573					


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3746 0272      INOCT, OCTIN
3747 1307      GTNPT, DATYP
3750 1020      CX08,  1020
3751 0007      MK7,   7
3752 0400      P256,  400
3753 7400      M256,  -400
3754 0704      CWRC,   WRC
3755 7774      CRDC,   ROC=WRC

      INITI2, 0      /SETS UP A COUNTER=NPTS. INITIALIZES
      CLA CLL /X,Y, & Z ARRAY STARTING LOC'NS.
      TAD NPTS
      CIA
      DCA CNTR
      TAD BLOCK
      SEA CLA
      TAD OFFSET
      DCA YONE
      TAD YIND
      TAD NPTS
      TAD YIND
      DCA XIND
      TAD YIND
      DCA ZIND
      DCA TXSM
      DCA TXSM+1
      JMP I INITI2

      /BUFFER 1?
      /NO, ADD ARRAY OFFSET
      /X ARRAY BEGINS AFTER Y'S
      /AUXILIARY AUTO REG. FOR Y ARRAY
      /CLEAR X DISPLAY SUM

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2292	4000	PAL10	V141	15-APR-70	1101	PAGE 51
2293	4000	*4000	/THIS IS THE AVERAGE INPUT ROUTINE			
2294	4001	0	/DUMMY CELL FOR LINC JUMP IN ROUTINE AVGMH			
2295	4002	0	/BETA REG'S FOR CHRDIS			
2296	4003	4000				
2297	4004	4000				
2298	4005	4000	ANINPT, HEDIT1			
2299	4006	4000	HD7			
2300	4007	4000	CALL GETOCT			
2301	4008	4000	JMP			
2302	4009	4000	DCA MCHAN			
2303	4010	4000	JMP AGO			
2304	4011	4000	DILST, LINC			
2305	4012	4000	LDA 20			
2306	4013	4000	20			
2307	4014	4000	ESP			
2308	4015	4000	LDF 3			
2309	4016	4000	RCG			
2310	4017	4000	7300			
2311	4018	4000	HEDIT1			
2312	4019	4000	HD2			
2313	4020	4000	GETNO			
2314	4021	4000	FIXT			
2315	4022	4000	DCA TEM3			
2316	4023	4000	TAD TEM3			
2317	4024	4000	CALL RTR			
2318	4025	4000	DCA NPTS			
2319	4026	4000	CALL XSET			
2320	4027	4000	TAD TEM3			
2321	4028	4000	DCA NPTS			
2322	4029	4000	HEDIT1			
2323	4030	4000	HD8			
2324	4031	4000	ENTR			
2325	4032	4000	FLOT NPTS			
2326	4033	4000	FPUT XMIN			
2327	4034	4000	READ			
2328	4035	4000	FDIV XMIN			
2329	4036	4000	FPUT XMIN			
2330	4037	4000	FEXT			
2331	4038	4000	TAD PK14			
2332	4039	4000	TAD 44			
2333	4040	4000	SPA SNA			
2334	4041	4000	JMP AGO			
2335	4042	4000	DCA 44			
2336	4043	4000	STL IAC RTR			
2337	4044	4000	DCA 45			
2338	4045	4000	FIXT			
2339	4046	4000	DCA AVSUM			
2340	4047	4000	TAD AVSUM			
2341	4048	4000	FLOAT			
	4049	4000	TAD 44			
	4050	4000	DCA EXPFC			
	4051	4000				
	4052	4000				
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	4058	4000				
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	4060	4000				

2342	/CATACALI	PAL10	V141	15-APR-70	1101	PAGE 52
2343	4061	4407	ENTR	YMIN		
2344	4062	6166	FPUT	XMIN		
2345	4063	5163	FQIV	CYCTM		
2346	4064	4367	FSUB	NCY		
2347	4065	2375	FQIV	YMIN		
2348	4066	4166	FADD	FUGCY		
2349	4067	1372	FMPY	HALF		
2350	4070	3123	FEXT			
2351	4071	0000	FIXT			
2352	4072	4424	SMA			
2353	4073	7500	JMP	AGO		
2354	4074	5220	CLL	RAL		
2355	4075	7104	DCA	CLTM		
2356	4076	3152	TAD	46		
2357	4077	1046	SPA	CLA		
2358	4100	7710	ISZ	CLTM		
2359	4101	2152	HEDIT2			
2360	4102	4434	CALL	GETOCT		
2361	4103	4751	JMP	-1		
2362	4104	5303	TAD	ISXL		
2363	4105	1350	DCA	CSXL		
2364	4106	3747	HEDIT2			
2365	4107	4434	ENTR			
2366	4110	4407	READ			
2367	4111	0004	FMPY	1 HUNDRD		
2368	4112	3476	FEXT			
2369	4113	0000	FIXT			
2370	4114	4424	CIA			
2371	4115	7041	SMA			
2372	4116	7500	CLA			
2373	4117	7200	DCA	DLATM		
2374	4120	3153	HEDIT2			
2375	4121	4434	GETNO			
2376	4122	4425	FIXT			
2377	4123	4424	CIA			
2378	4124	7041	DCA	PCTR		
2379	4125	3131	DCA	RUN		
2380	4126	3117	CRLFO			
2381	4127	4432	INITAR			
2382	4130	4430	TAD	NPTS		
2383	4131	1074	CLL	CHA RAL		
2384	4132	7144	DCA	TEMP		
2385	4133	3135	CDF	10		
2386	4134	6211	DCA	I YIND		
2387	4135	3411	ISZ	TEMP		
2388	4136	2135	JMP	-2		
2389	4137	5335	CDF	0		
2390	4140	6201	TAD	DILST*2		
2391	4141	1213	LINC			
2392	4142	6141	ESF			
2393	4143	0004	PDP			
2394	4144	0002	JMP	1 ESRNMR		
2395	4145	5752				

2397	4146 0014	PK14, 14	
2398	4147 4212	CSXL, AVLOP*3	
2399	4150 0400	ISXL, SXL	
2400	4151 0272	GETOCT, OCTIN	
2401	4152 4200	ESRNM, AVGMR	
2402			
2403			
2404	4153 4433	CALSET, HEDIT1	/SPECIAL ROUTINE TO RESET
2405	4154 5362	HDSP	/MACHINE CYCLE TIME FOR
2406	4155 4407	ENTR	/ACCURATE CALIBRATION.
2407	4156 0004	READ	
2408	4157 3364	FMPY FK3	
2409	4160 6367	FPUT CYCTM	/3*CYCLE TIME
2410	4161 0000	FEXT	
2411	4162 4432	CRLFD	
2412	4163 5467	DISPLAY	/EXIT
2413	4164 0002	FLTG 3.0	
	4165 3000	FK3,	
	4166 0000		
2414			
2415	4167 7757		/NEXT 3 CONSTANTS SET TIMING FOR AVERAGER
2416	4170 2410	CYCTM, FLTG 4.8E-6	/IS 3* MACHINE CYCLE TIME
	4171 3730		
2417	4172 0004	FUGCY, FLTG 12.333	/IS # CYCLES IN LOOP 'ADDUP' /3
	4173 3052		
	4174 4774		
2418	4175 0005	NCY, FLTG 16.450	/IS # OVERHEAD CYCLES PER PT /3
	4176 2034		
	4177 6315		

2419	4200	*4200		
2420	4200	CLA CLL		
2421	4201	TAD EXPFC		
2422	4202	TAD ISCR		
2423	4203	DCA HIORD+1		
2424	4204	TAD KSAM		
2425	4205	TAD MCHAN		
2426	4206	DCA GTAD		
2427	4207	INITAR		
2428	4210	LINC		
2429	4211	STC 1		
2430	4212	SXL 0	/SKIP IF EXT, LEVEL 0 IS +3V	
2431	4213	6000 .-1	/LINC JMP .-1	
2432	4214	POP		
2433	4215	TAD DLATH		
2434	4216	SNA .-3		
2435	4217	JMP .-3		
2436	4220	JMS SETCLK		
2437	4221	5100		
2438	4222	COF 10		
2439	4223	TAD AVSUM	/THIS ROUTINE TAKES ADD	
2440	4224	DCA LNCNR	/SAMPLES, -AVSUM IN #, IN A TIME	
2441	4225	DCA HIORD	/PER SAMPLE VARIED BY CLTM	
2442	4226	DCA LOORD	/BASE TIME PER SAMPLE=98 USEC.	
2443	4227	TAD CLTM	/OVERHEAD/PT=77.8-80,2 USEC	
2444	4230	DCA TMCTR		
2445	4231	LINC		
2446	4232	SAM		
2447	4233	POP	/MAKE ALL RESULTS POS.	
2448	4234	TAD K1000	/STORED AS DOUBLE PREC, INTEGER	
2449	4235	CLL	/LOORD OVERFLOW SETS LINK	
2450	4236	TAD LOORD		
2451	4237	DCA LOORD		
2452	4240	RAL		
2453	4241	TAD HIORD		
2454	4242	DCA HIORD		
2455	4243	ISE TMCTR		
2456	4244	JMP .-1	/ADD SOME TIME BETWEEN SAMPLES	
2457	4245	ISE LNCNR		
2458	4246	JMP ADDUP		
2459	4247	TAD LOORD		
2460	4250	LINC	/DIVIDE BY NO. SAMPLES	
2461	4251	SCR 14		
2462	4252	LDA 20		
2463	4253	0		
2464	4254	0		

2465	/CATACALI	4255 0005	PAL10	V141	QAC		
2466		4256 1120			ADA 20		
2467		4257 7400			-400		
2468		4260 0161			DIS 20 1		
2469		4261 0005			QAC		
2470		4262 0241			ROL 1	/GET 12 BITS FROM MQ	
2471		4263 0475			QL2 20		
2472		4264 6267			6000 .+3		
2473		4265 1620			BSE 20		
2474		4266 0001			1		
2475		4267 0002			PDP		
2476		4270 7100			CLL		
2477		4271 1411			TAD I YIND		
2478		4272 3412			DCA I ZIND		
2479		4273 7004			RAL		
2480		4274 1411			TAD I YIND		
2481		4275 3412			DCA I ZIND		
2482		4276 2132			ISE CNTR		
2483		4277 5223			JMP COSUM		
2484		4300 6201			CDF 0		
2485		4301 2117			ISE RUN	/IS NO OF SCANS TAKEN	
2486		4302 7604			LAS	/CHECK BIT 0	
2487		4303 7710			SPA CLA	/WANT TO INTERRUPT?	
2488		4304 4740			CALL LOOK	/YES, CALL DISPLAY ROUTINES	
2489		4305 2131			ISE PTR	/INCR. COUNTER, MORE SCANS?	
2490		4306 5207			JMP AVLOP	/YES.	
2491		4307 4430			INITAR	/NO, WE'RE FINISHED.	
2492		4310 4407			ENR	/PREPARE TO NORMALIZE THE 24	
2493		4311 7117			FLOT RUN	/BIT Y STORAGE DOWN TO 12 BITS	
2494		4312 6160			FPUT TEMFP	/BY DIVIDING BY NO. OF SCANS	
2495		4313 0000			FEXT		
2496		4314 6211			CDF 10		
2497		4315 1411			TAD I YIND	/GET LOW ORDER BITS OF 1ST WORD	
2498		4316 3046			DCA 46		
2499		4317 1411			TAD I YIND		
2500		4320 3045			DCA 45		
2501		4321 6201			CDF 0		
2502		4322 1342			TAD P27		
2503		4323 3044			DCA 44		
2504		4324 4407			ENR		
2505		4325 0007			FNOR		
2506		4326 4160			FDIV TEMFP		
2507		4327 1123			FADD HALF		
2508		4330 0000			FEXT		
2509		4331 4424			FIXT		
2510		4332 6211			CDF 10		
2511		4333 3412			DCA I ZIND		
2512		4334 2132			ISE CNTR		
2513		4335 5314			JMP DIVD		
2514		4336 5467			DISPLAY		
2515		4337 0337			SCR=1		
2516		4340 4400			LOOKER		
2517		4341 0100			SAM		
2518		4342 0027			P27.		

2519	4343	0000	SETCLK, 0	
2520	4344	3376	DCA CNTS	
2521	4345	6133	CLAB	
2522	4346	1374	TAD KK100	
2523	4347	6132	CLLR	
2524	4348	7200	CLA	
2525	4349	1376	TAD CNTS	
2526	4350	6133	CLAB	
2527	4351	6135	CLSA	
2528	4352	7200	CLA	
2529	4353	1375	TAD KK300	
2530	4354	6134	CLEN	
2531	4355	7200	CLA	
2532	4356	1743	TAD I SETCLK	
2533	4357	6132	CLLR	
2534	4358	6131	CLSK	
2535	4359	7410	SKP	
2536	4360	5367	JMP 1,3	
2537	4361	4463	CALL DISMOV	/REFRESH DISPLAY
2538	4362	5362	JMP 1,4	
2539	4363	6135	CLSA	
2540	4364	7300	CLA CLL	
2541	4365	6132	CLLR	
2542	4366	2343	ISE SETCLK	
2543	4367	5743	JMP I SETCLK	
2544	4368	0100	KK100,	
2545	4369	0300	KK300,	
2546	4370	0000	CNTS,	
2547	4371	0000	0	

/CATACAL

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2548 4400 4400
2549 4400 0000
2550 4401 6032
2551 4402 4433
2552 4403 5223
2553 4404 7125
2554 4405 3062
2555 4406 1117
2556 4407 4423
2557 4410 1044
2558 4411 3134
2559 4412 4406
2560 4413 4432
2561 4414 4430
2562 4415 6031
2563 4416 7410
2564 4417 4305
2565 4420 6211
2566 4421 1411
2567 4422 3155
2568 4423 1411
2569 4424 6201
2570 4425 3243
2571 4426 7127
2572 4427 1011
2573 4430 3011
2574 4431 1134
2575 4432 7550
2576 4433 5250
2577
2578 4434 0303
2579 4435 1304
2580 4436 3244
2581 4437 1135
2582 4440 6141
2583 4441 0354
2584 4442 1020
2585 4443 0000
2586 4444 0000
2587 4445 0005
2588 4446 0002
2589 4447 5261
2590 4450 7500
2591 4451 5260
2592 4452 3133
2593 4453 1155
2594 4454 7104
2595 4455 2133
2596 4456 5254
2597 4457 7410

LOOKER, 0
KCC
HED11
HD9
STL IAC RAL
DCA 62
TAD RUN /IS NO. OF COMPLETED SCANS
FLOAT
TAD 44
DCA MCTR
CALL 6
CRFLD
STLOOP, IN1TAR
KSF
SKP
JMS MULT
CDF 10
TAD I YIND
DCA LOORD
TAD I YIND
CDF 0
DCA LHORD
STL IAC RTL
TAD YIND
DCA YIND
TAD MCTR
SPA SNA
JMP NODIV

DVID,
AND MSK17
TAD CSCR
DCA LHORD+1
TAD LOORD
LINC
SCR 14
LDA 20
0
0
QAC
PDP
JMP DSPIT+1
SMA
JMP DSPIT
DCA LNCNR
TAD LOORD
CLL RAL
ISE LNCNR
JMP -2
SKP

/NO. OF SCANS=
/*3
/KEEP TWO'S EXPONENT
/MCTR IS APPROX. 2'S DIVISOR
/WANT TO CHANGE SCALE OR STOP?
/NO
/YES, FIND OUT WHAT,
/LOW ORDER
/HIGH ORDER
/*6
/GET EVERY 4TH VALUE
/MCTR>0, I.E. NEED DIVIDE?
/NO
/LOAD MQ
/WILL CONTAIN SCR N
/MAGNIFY IT?
/DO NEITHER
/YES
/VALUE IS ACTUALLY SINGLE PREC.
/MULT. BY 2
/MULT. AGAIN

```

2598	4460	1155			
2599	4461	1105	DSPIT,	TAD LOORD	
2600	4462	3112		TAD YLIM	
2601	4463	4463		DCA YDIS	
2602	4464	4471		CALL DISMOV	/MOVE POINT ON SCOPE
2603	4465	7107		CALL ADINX	/GET & INCR, X COORD
2604	4466	1132		CLL IAC RTL	
2605	4467	7500		TAD CNTR	
2606	4470	5214		SMA	/MORE PTS?
2607	4471	3132		JMP STLOOP	/NO
2608	4472	5220		DCA CNTR	/YES
2609				JMP LOOPIT	
2610					
2611	4473	4434	ENDCHK,	HEDIT2	/MORE SCANS?
2612	4474	4435		ASK	
2613	4475	7650		SNA CLA	
2614	4476	5301		JMP ,#3	/YES
2615	4477	7240		STA	
2616	4500	3131		DCA PCTR	
2617	4501	4432		CRLF0	
2618	4502	5600		JMP I LOOKER	
2619	4503	0017	MSK17,	17	
2620	4504	0337	CSCR,	SCR=1	
2621					
2622	4505	0000	MULT,	0	
2623	4506	6036		KRB	
2624	4507	1327		TAD MD	
2625	4510	7440		SZA	/DECREASE SIZE?
2626	4511	5314		JMP ,#3	/NO
2627	4512	2134		ISE MCTR	
2628	4513	5705		JMP I MULT	
2629	4514	1330		TAD MM	
2630	4515	7440		SZA	/INCREASE SIZE?
2631	4516	5323		JMP MORE	/NO
2632	4517	7240		STA	
2633	4520	1134		TAD MCTR	
2634	4521	3134		DCA MCTR	
2635	4522	5705		JMP I MULT	
2636	4523	1331	MORE,	TAD MS	
2637	4524	7650		SNA CLA	/GET '8' FOR STOP?
2638	4525	5273		JMP ENDCBK	/YES
2639	4526	5705		JMP I MULT	
2640	4527	7474	MD,	=304	
2641	4530	7767	MM,	304-315	
2642	4531	7772	MS,	315-323	

2729	4663	1074				
2730	4664	7110	SQUEEZE,	TAD NPTS	/COMPRESS ONE OR BOTH BUFFERS	
2731	4665	3074	CLL RAR		/BY AVERAGING ADJACENT PTS.	
2732	4666	7240	DCA NPTS			
2733	4667	1144	STA	TAD BLOCK		
2734	4670	7750	SPA SNA CLA		/BLOCK=2 FOR DOUBLE SQUEEZE?	
2735	4671	5274	JMP ,#3		/NO	
2736	4672	3144	DCA BLOCK		/SQUEEZE BUFF. 1 FIRST	
2737	4673	7240	STA		/=1 FOR DOUBLE SQUEEZE, 0 FOR SINGLE	
2738	4674	3135	DCA TEMP			
2739	4675	4430	INITAR			
2740	4676	6211	CDF 10			
2741	4677	1411	TAD I YIND			
2742	4678	1411	TAD I YIND			
2743	4701	7110	CLL RAR			
2744	4702	7430	SZL		/ROUND OFF?	
2745	4703	7001	IAC		/YES	
2746	4704	3412	DCA I ZIND			
2747	4705	2132	ISE CNTR			
2748	4706	5277	JMP SOLP			
2749	4707	2135	ISE TEMP		/FINISHED?	
2750	4710	5467	DISPLAY		/YES OR IS SINGLE SQUEEZE	
2751	4711	7001	IAC		/NO, DO BUFF. 2	
2752	4712	3144	DCA BLOCK			
2753	4713	5275	JMP SOLP=2			
2754						
2755						
2756						
2757	4714	0000	POSTN,	0	/GET POSITION AND SCALE IT	
2758	4715	4407	ENTR			
2759	4716	0004	READ			
2760	4717	2501	FSUB I X1			
2761	4720	3473	FMPY I XMPY			
2762	4721	1123	FADD HALF			
2763	4722	0000	FEXT			
2764	4723	4424	FLXT			
2765	4724	3551	DCA I PIND3			
2766	4725	5714	JMP I POSTN			
2767						

2768						
2769	4726	4430				
2770	4727	1011	XFLIP,	INITAR	/INVERT X AXIS	
2771	4730	1074		TAD YIND	/Y(I)=Y(NPTS+1-I)	
2772	4731	3135		TAD NPTS		
2773	4732	1132		DCA TEMP		
2774	4733	7130		TAD CNTR		
2775	4734	3132		STL RAR		
2776	4735	6211		DCA CNTR		
2777	4736	1411	FLX,	CDF 10		
2778	4737	3136		TAD I YIND		
2779	4740	1535		DCA TEMP1		
2780	4741	3412		TAD I TEMP		
2781	4742	1136		DCA I ZIND		
2782	4743	3535		TAD TEMP1		
2783	4744	7240		DCA I TEMP		
2784	4745	1135		STA		
2785	4746	3135		TAD TEMP		
2786	4747	2132		DCA TEMP		
2787	4750	5336		ISE CNTR		
2788	4751	5467		JMP FLX		
2789				DISPLAY		
2790	4752	4760	COPY,	CALL SPCIN	/COPY DISP. CHAN INTO OTHER	
2791	4753	1411		TAD I YIND		
2792	4754	3413		DCA I AUTO		
2793	4755	2132		ISE CNTR		
2794	4756	5353		JMP -3		
2795	4757	5467		DISPLAY		
2796	4760	3014	SPCIN,	SPINIT		
2797						
2798	4761	4433	MULP,	HEDIT1	/MIN	
2799	4762	5157		HDS		
2800	4763	4425		GETNO		
2801	4764	4424		FIXT		
2802	4765	3141		DCA MIN		
2803	4766	4433		HEDIT1	/MPY	
2804	4767	5165		HDS+6		
2805	4770	4407		ENTR		
2806	4771	0004		READ		
2807	4772	6174		FPUT YSCLFC		
2808	4773	0000		FEXT		
2809	4774	5775		JMP I r+1		
2810	4775	1535		SKL=1		

/CATACAL I

2861 5060 0000
 2862 5061 1273
 2863 5062 6141
 2864 5063 4002
 2865 5064 1020
 2866 5065 0000
 2867 5066 1762
 2868 5067 1762
 2869 5070 0002
 2870 5071 7300
 2871 5072 5660
 2872 5073 4541
 2873
 2874 5074 0000
 2875 5075 4407
 2876 5076 7045
 2877 5077 3174
 2878 5100 0003
 2879 5101 1166
 2880 5102 6166
 2881 5103 0000
 2882 5104 4424
 2883 5105 3141
 2884 5106 5674
 2885
 2886

CHRDIS, 0
 YAD BTBS
 LINC
 STC 2
 LDA 20
 0
 YCD,
 DSC 20 2
 DSC 20 2
 PDP
 CLA CLL
 JMP I CHRDIS
 BTBS, BTPBS-1
 EXTRAP, 0
 ENTR
 FLOT 45
 FMPY YSCLFC
 NEGATE
 FADD YMIN
 FPUT YMIN
 FEXT
 FIXT
 DCA MIN
 JMP I EXTRAP

HD1, TEXT /*CATACAL LIVES!/*TITLE!/*

5107 3603
 5110 0124
 5111 0103
 5112 0114
 5113 4014
 5114 1126
 5115 0523
 5116 4136
 5117 3624
 5120 1124
 5121 1405
 5122 7200
 5123 3636
 5124 1713
 5125 5440
 5126 1011
 5127 2440
 5130 1505
 5131 4136
 5132 3600
 5133 3616
 5134 1756
 5135 4020
 5136 1711
 5137 1624
 5140 2375
 5141 4000
 5142 2024
 5143 2356
 2887

TEXT /*OK, HIT ME!/*

2888

HD2, TEXT /*NO. POINTS= /

2889

TEXT /*PTS. TO SKIP= /

2890

2891	5144 4024	HD3,	TEXT	/LINE PLOT?/
	5145 1740			
	5146 2313			
	5147 1120			
	5150 7500			
	5151 1411			
	5152 1605			
	5153 4020			
	5154 1417			
	5155 2477			
	5156 0000			
2892	5157 3615	HD5,	TEXT	/MIN= /
	5160 1116			
	5161 7500			
2893	5162 1501	TEXT		/MAX= /
	5163 3075			
	5164 0000			
2894	5165 1520	TEXT		/MPY= /
	5166 3175			
	5167 0000			
2895	5170 2014	HD6,	TEXT	/PLOTTER OFF? /
	5171 1724			
	5172 2405			
	5173 2240			
	5174 1706			
	5175 0677			
	5176 0000			
2896	5177 0310	HD7,	TEXT	/CHANNEL= /
	5200 0116			
	5201 1605			
	5202 1475			
	5203 4000			
2897	5204 2305	HD8,	TEXT	\SEC/SCAN= \
	5205 0357			
	5206 2303			
	5207 0116			
	5210 7500			
2898	5211 2305	TEXT		/SENSEI /
	5212 1623			
	5213 0572			
	5214 0000			
2899	5215 0405	TEXT		/DELAY(SEC)= /
	5216 1401			
	5217 3150			
	5220 2305			
	5221 0351			
	5222 7500			
2900	5223 1617	HD9,	TEXT	/NO. SCANS= /
	5224 5640			
	5225 2303			
	5226 0116			
	5227 2375			
	5230 4000			
2901	5231 1517	TEXT		/MORE SCANS? /
	5232 2205			

2902	HD15,	TEXT	/SCAN INT'L?/
2903		TEXT	/AREA= /
2904	HD20A,	TEXT	/NO. PEAKS/
2905	HD20B,	TEXT	/X RNG, X1, INT.MPLR, BASE, LOR, FR.(0-1)1:/
2906		TEXT	/HGT,H=WIDTH,POS1:/
2907	HD21,	TEXT	/PK,PA,VLI/

5233 4023
 5234 0301
 5235 1623
 5236 7700
 5237 2303
 5240 0116
 5241 4011
 5242 1624
 5243 4714
 5244 7700
 5245 0122
 5246 0501
 5247 7500
 5250 1617
 5251 5640
 5252 2005
 5253 0113
 5254 2375
 5255 0000
 5256 3040
 5257 2216
 5260 0754
 5261 4030
 5262 6154
 5263 4011
 5264 1624
 5265 5615
 5266 2014
 5267 2254
 5270 4002
 5271 0123
 5272 0554
 5273 4014
 5274 1722
 5275 5640
 5276 0622
 5277 5650
 5300 6055
 5301 6151
 5302 7236
 5303 0000
 5304 1007
 5305 2454
 5306 1055
 5307 2711
 5310 0424
 5311 1054
 5312 2017
 5313 2372
 5314 2600
 5315 2013
 5316 5420
 5317 0154
 5320 2614
 5321 7200

2908 5322 3603
5323 1717
5324 1440
5325 1124
5326 5600
5327 2324
5330 2211
5331 2040
5332 2005
5333 0113
5334 7700
5335 0625
5336 1414
5337 4002
5340 0123
5341 0577
5342 0000
5343 3602
5344 0104
5345 4030
5346 4020
5347 2423
5350 4136
5351 0000

2909 5322 3603
5323 1717
5324 1440
5325 1124
5326 5600
5327 2324
5330 2211
5331 2040
5332 2005
5333 0113
5334 7700
5335 0625
5336 1414
5337 4002
5340 0123
5341 0577
5342 0000
5343 3602
5344 0104
5345 4030
5346 4020
5347 2423
5350 4136
5351 0000

2910 5322 3603
5323 1717
5324 1440
5325 1124
5326 5600
5327 2324
5330 2211
5331 2040
5332 2005
5333 0113
5334 7700
5335 0625
5336 1414
5337 4002
5340 0123
5341 0577
5342 0000
5343 3602
5344 0104
5345 4030
5346 4020
5347 2423
5350 4136
5351 0000

2911 5322 3603
5323 1717
5324 1440
5325 1124
5326 5600
5327 2324
5330 2211
5331 2040
5332 2005
5333 0113
5334 7700
5335 0625
5336 1414
5337 4002
5340 0123
5341 0577
5342 0000
5343 3602
5344 0104
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5346 4020
5347 2423
5350 4136
5351 0000

2912 5322 3603
5323 1717
5324 1440
5325 1124
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5331 2040
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5336 1414
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5342 0000
5343 3602
5344 0104
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5347 2423
5350 4136
5351 0000

2913 5322 3603
5323 1717
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2914 5322 3603
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5351 0000

2915 5322 3603
5323 1717
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5332 2005
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5334 7700
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5336 1414
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5342 0000
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5346 4020
5347 2423
5350 4136
5351 0000

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HD23, TEXT /°COOL IT./

HD25, TEXT /STRIP PEAK?/

TEXT /FULL BASE?/

HD26, TEXT /°BAD X PTS!°/

DIND1, TEXT /°Y RANGE & MINI/

HDSP, TEXT /MCT(SEC)=/

THD1, TEXT /BLK1, U, M(0°W)! /

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/CATACAL I      7600
2916              7600 0000
2917              7600 4433
2918              7601 4433
2919              7602 7640
2920              7603 4435
2921              7604 7650
2922              7605 5210
2923              7606 1237
2924              7607 3634
2925              7610 4434
2926              7611 4435
2927              7612 3632
2928              7613 4434
2929              7614 4435
2930              7615 7650
2931              7616 5221
2932              7617 1235
2933              7620 3636
2934              7621 4432
2935              7622 4432
2936              7623 7240
2937              7624 1200
2938              7625 3237
2939              7626 1233
2940              7627 3637
2941              7630 2200
2942              7631 5600
2943              7632 2235
2944              7633 7410
2945              7634 2505
2946              7635 5242
2947              7636 2417
2948              7637 7000
2949              7640 0102
2950              7641 2317
                7642 2220
                7643 2411
                7644 1716
                7645 0447
                7646 0411
                7647 2023
                7650 4777
                7651 0000
                7652 2711
                7653 0424
                7654 1023
                7655 4005
                7656 2125
                7657 0114
                7660 7700
                7661 0325
                7662 2417
                7663 0606
                7664 4001

DIALOG, 0
HEDIT1
DHD1
ASK
SNA CLA
JMP :a3
TAD NOOP
DCA I INSCHN
HEDIT2
ASK
DCA I WDSWT
HEDIT2
ASK
SNA CLA
JMP :a3
TAD SPECJ
DCA I CALCJ
CRLFD
CRLFD
STA DIALOG
DCA NOOP
TAD SKIP
DCA I NOOP
ISE DIALOG
JMP I DIALOG
WDSWT, WDSWT
SKIP, SKIP
INSCHN, BSCHNG
SPECJ, SPCJ
CALCJ, YCLO+1
NOOP, NOOP
DHD1, TEXT
/ABSORPTION 'DIPS'9/

/WILL BE CLOBERBER BY PARA'S
/IS USED ONLY FOR FIRST STARTUP
/WORKING W/ ABS. DIPS?

/NO, INSERT NOP
/EQUAL WIDTHS?
/CUTOFF AT 8*W?

/YES, LEAVE AS IS
/NO, FULL BORE CALC.

/THIS WILL PREVENT RECALL OF

/THIS ROUTINE AGAIN W/O RELOADING.

TEXT /WIDTHS EQUAL?/

TEXT /CUTOFF AT 8*WIDTH?/

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/CATACAL: PAL10 V141 13-APR-70 1101 PAGE 65-1

7665 2440
7666 7052
7667 2711
7670 0424
7671 1077
7672 0000

	CATACAL	PAL10	V141	15-APR-70	1101	PAGE 66
2953						/THE FOLLOWING ARE A SET OF OVERLAYS
2954						/FOR FLOATING POINT PKGS. #1,2, & 4
2955						/WHICH ALLOWS INPUT FROM THE HIGH
2956						/OR LOW SPEED READERS. SET IOSWT=1 TO USE
2957						/THE HIGH SPEED READER OR PUNCH.
2958						/HERE ALSO IS AN OVERLAY WHICH ALLOWS
2959						/BLANKS TO FOLLOW A + OR - SIGN ON INPUT.
2960						/PLUS SIGNS ARE DELETED FROM OUTPUT.
2961						
2962	0055		*55			
2963	0053		0			
2964	0056		IOSWT, 0			
2965						
2966	7142		*7142			
2967	7142		0			/THIS IS THE INPUT OVERLAY
2968	7143		TAD IOSWT			/CHECK I/O SWITCH
2969	7144		CLL RAR			
2970	7145		SEL CLA			/SETS LINK FOR HI SPD RDR.
2971	7146		JMP :+3			/USE HI SPD RDR.
2972	7147		RDTTY			
2973	7150		SKP			
2974	7151		CALL HSR1			
2975	7152		DCA 57			
2976	7153		TAD 57			
2977	7154		SNA			
2978	7155		JMP INPUT+1			
2979			MRBOUT=RESTRY			/TOTAL VALUE OF RESTRY=377.
2980	7156		TAD MRBOUT			
2981	7157		SEA CLA			
2982	7160		JMP GOOD			
2983	7037		XCPT=7037			/4241 PRINTS AS 241.
2984	7161		TAD XCPT			/PRINT '!' IF RUBOUT.
2985	7162		CALL OUTPT			
2986	7163		JMP I RESTRY			
2987	7164		TAD 57			
2988	7165		JMP I INPUT			
2989	7166		OUTPT, 7344			
2990	7167		RESTRY, 7401			
2991	7170		HSR1, HSR			
2992						
2993	6573		*6573			
2994	6573		0			
2995	6574		RSE			
2996	6575		JMP :+1			
2997	6576		RRB RFC			
2998	6577		JMP I HSR			
2999						
3000	7327		*7327			/REPLACE ASCII + WITH SPACE
3001	7327		240			
3002	7330		255-240			

3003					
3004	7004	*7004		/MODIFY 'DECONV' TO ACCEPT SPACES	
3005	3266	DCA 7066		/AFTER + OR = SIGN.	
3006	7005	JMS INPUT			
3007	7006	TAD 7136			
3008	7007	SNA 7450		/GET + SIGN?	
3009	7010	JMP SPCHK		/YES, CHECK FOR SPACES	
3010	7011	TAD 7135			
3011	7012	SZA 7440		/GET - SIGN?	
3012	7013	JMP 7020		/NO	
3013	7014	STA		/SET SIGN SWITCH TO -1	
3014	7015	JMP I, +1		/READ SPACES, IF ANY; RETURN .+3	
3015	7016	CHKBK			
3016					
3017	6766	*6766		/0 IF +1 -1 IF -.	
3018	6766	DCA I SIGN			
3019	6767	CALL INPT			
3020	6770	TAD MBLNK			
3021	6771	SZA CLA			
3022	6772	JMP I RETDEC			
3023	6773	JMP I -4			
3024	6774	SPCHK +3			
3025	6775	-240			
3026	6776	INPT			
3027	6777	SIGN			
3028					
3029	5675	*5675		/REPLACE FNOR CALL WITH FLOAT	
3030	5675	INTFLT			
3031					
3032	7345	*7345		/SELECT OUTPUT DEVICE	
3033	7345	CALL I, +2			
3034	7346	JMP I, +2			
3035	7347	SELECT			
3036					
3037	7430	*7430		/CAN'T USE INTERPRETIVE FNOR ON INPUT	
3038	7430	CALL 7975			
3039	7431	ENTR			
3040	7575	*7575			
3041	7575	6600			
3042					
3043	6547	*6547		/INTERPRETIVE INSTR. JUMP TABLE	
3044	6547	6000			
3045	6550	READER			
3046	6551	7200			
3047	6552	HEADER2			
3048	6553	6600			
3049	6554	FLEXPO			

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7375 *7375
7375 5565 SCAD, SAC
7376 5566 BFRST, BUFFER=1
7377 5400 FXAD, FIX
7301 *7301
7301 3415 DCA I 15
7305 *7305
7305 3415 DCA I 15
7310 *7310
7310 5212 JMP RETN
0045
7330 HORDER=45
7327 SMINUS=7330
7324 SPLUS=7327
7343 BEXP=7324
7337 CHE=7343
7344 EXPT=7337
0055 ASCOUT=7344
7341 SHIT1=55
7342 CARRTN=7341
LNFEED=7342

3178	5446	2766	ISZ 1 PLCE /YES, SET MANTISSA TO 0.1
3179	5447	2044	ISZ 44 /COMPENSATE BY INCREMENTING EXPONENT
3180	5450	7200	CLA TAD BUFST
3181	5451	1356	DCA 15 /SET AUTO-INDEX REGISTER
3182	5452	3015	TAD 62
3183	5453	1062	SNA FLOP / F = 0 ?
3184	5454	7450	JMP FLOP /YES, OUTPUT AS FLOATING NUMBER
3185	5455	5342	CIA /NO,
3186	5456	7041	DCA FCOUNT /SET UP COUNT TO PRINT F PLACES
3187	5457	3366	TAD FCOUNT
3188	5460	1366	TAD 44
3189	5461	1044	SMA SEA / E > F ?
3190	5462	7540	JMP XXX /YES, PRINT X'S
3191	5463	5317	TAD SAC / E < F-D ?
3192	5464	1365	SMA /NO, TAKE P = E
3193	5465	7500	CLA /YES, TAKE P = F-D
3194	5466	7200	CIA
3195	5467	7041	TAD 44
3196	5470	1044	CIA TEMPX /SET UP MINUS P
3197	5471	7041	DCA M7
3198	5472	3364	TAD M7
3199	5473	1361	DCA SCOUNT /SET COUNT OF MAX, NO, OF SIG. FIGS,
3200	5474	3365	TAD 44
3201	5475	1044	TAD TEMPX
3202	5476	1364	SNA CLA / P = E ?
3203	5477	7650	JMP DIG /YES, PRINT DIGIT
3204	5500	5330	TAD TEMPX /NO,
3205	5501	1364	IAC
3206	5502	7001	SPA CLA / P > 1 ?
3207	5503	7710	TAD SPACE /YES, TAKE SPACE; OTHERWISE ZERO
3208	5504	1360	JMS OUTX /PRINT CHARACTER
3209	5505	4323	ISE TEMPX /P CHARACTERS PRINTED?
3210	5506	2364	JMP BACK /NO
3211	5507	5275	TAD POINT /YES,
3212	5510	1362	CALL OPUT /PRINT DECIMAL POINT
3213	5511	4757	JMP BACK
3214	5512	5275	
3215	5513	7040	CMA
3216	5514	1366	TAD PLCE
3217	5515	3366	DCA PLCE
3218	5516	5236	JMP RET
3219			
3220			

[illegible]

[illegible]

/CATACAL	PAL10	V141	15-APR-70	1101	PAGE 72-3	
A	2663	CALSET	4153	DISPLA	5467	FOUT
ADCON	0065	CARRTN	7341	DISPTS	3324	FPNORM
ADCONV	1124	CCLDR	1117	DIV1	0555	FPOUT
ADDMX	1557	CDISPL	2073	DIVD	4314	FTEM1
ADDIWO	3156	CDTB	5051	DLATM	0153	FTEM2
ADDUP	4227	CHE	7343	DLBUF	4000	FUDGE
ADINX	0071	CHECK	7152	DNE	1426	FUGCY
AGO	4020	CHKBLK	6766	DNPEN	1154	FXAD
ALLGS	2463	CHLOP	2040	DONE	0552	GASFR
ANINPT	4003	CHRDIS	5060	DPTR	3376	GCAL
AS260	0337	CHTAB	2074	DRLOP1	4612	GETNO
ASCOIT	7344	CHX	5563	DRLOP2	4640	GETOCT
ASK	4435	CLARR	2234	DSPT	4460	GETPTS
ASKER	1066	CLKSET	1121	DSPTS	0521	GETVAR
ASKIO	1435	CLRR	3535	DTEM	0355	GLFRAC
ASPC	4566	CLSTR	1004	DUMPT	2241	GOOD
AUTO	0013	CLTM	0152	DVID	4434	GOSUM
AVGMR	4200	CMPT	3466	ENDCHK	4473	GOTIT
AVLOP	4207	CNTR	0132	ENTR	4407	GSCAN
AVSUM	0121	CNTS	4376	EQUAL	0343	GTAD
AX1	0203	COLON	0344	ERRD	3251	GTCHR
AX2	0400	COPY	4752	ERRQ	2066	GTNPT
AX3	0575	CORTAB	0661	ESRNR	4152	GTP2
AXL	0006	COYAG	3124	EXPFC	0122	GTR
AXR	0764	CRDC	3755	EXPON	0010	HALF
AY1	7603	CRDIS	5000	EXPT	7337	HD1
AY2	0000	CRLF	7223	EXTRAP	5074	HD15
AY3	0175	CRCPD	4432	EXTRP	3304	HD2
AYL	7406	CRTLFD	0032	F125	3125	HD20A
AYR	0764	CSAM	1133	F161	3130	HD20B
B	2666	CSCR	4504	FCOUNT	5566	HD21
BACK	5475	CSET	1714	FGASF	0100	HD23
BAD	0333	CSXL	4147	FIX	5400	HD25
BEGCAL	3600	CURSET	3507	FIXER	0024	HD26
BEGDIS	0421	CURSR	3170	FIXR	0524	HD3
BEXP	7324	CHRC	3754	FIXT	4424	HD5
BFRST	7376	CXOB	3750	FKS	4164	HD6
BLKIO	3702	CYCTM	4167	FLAG2	2662	HD7
BLOCK	0144	D	2674	FLEXPO	2600	HD8
BSCNG	2505	DATYP	1307	FLGASF	1775	HD9
BTBS	5073	DCT	3375	FLIN	0606	HD10
BTPBS	4542	DCTAB	2127	FLORF	1174	HDSP
BUF1	0000	DECR	5513	FLOAT	4423	HEADR1
BUFFER	5567	DERIV	4600	FLOATR	0556	HEADR2
BUFSY	5556	DHD1	7640	FLOP	5542	HEDER1
C	2671	DIALOG	7600	FLOPF	0077	HEDER2
C200	1212	DIG	5530	FLOTFR	0023	HEDIT
CALBEG	2517	DIND1	5352	FLX	4736	HEDIT1
CALBRT	1000	DILST	4011	FLY	1370	HEDIT2
CALCJ	7636	DISCUR	3374	FNISH	0323	HGT
CALCY	2243	DISH2	0067	FNOR	0007	HIGH
CALPRT		DISHOV	0063	FNTOT	3422	HIGHT

/CATACAL	PAL10	V141	15-APR-70	1101	PAGE 72-4	
HIORD	4253	LOOPIT	4420	MS	4531	PAR1
HNORD	1163	LOORD	0155	MS7	0345	PARDMP
HOLD	0026	LORCL4	2200	MSEE	0336	PARPTR
HORDER	0045	LORFR	0102	MSK17	4503	PCTR
HSR	6573	LOW	1477	MTBF	5053	PERDMP
HSRI	7170	LP1	5016	MULP	4761	PENDN
HUNDRO	0076	LP2	5023	MULT	4505	PENUP
IN	5505	LRG	0544	NCNTR	0351	PIND1
INCR	1504	LSCHR	0353	NCY	4175	PIND2
INIT	0030	LSLOC	0352	NDIG	1431	PIND3
INITAR	4430	M10	5555	NEGA	0126	PK100
INITIZ	3756	M12	3135	NEGATE	0003	PK14
INOCT	3746	M13	0554	NEGIT	2660	PKOMP
INPT	6776	M256	3753	NEWMP	2176	PKPRNT
INPUT	7142	M261	2070	NEWY	3035	PKS
INSTRK	7634	M272	2071	NLIN	1432	PL13
INSTRN	1007	M300	2067	NLOC	0225	PLCE
INTEGT	3400	M36	1774	NMCHK	2055	PLXT
INTFLT	0567	M6	5594	NO	1057	PLSS
INTRP	0522	M7	5561	NODIV	4450	PLTINC
INTSP	2373	MALT	0523	NOOP	7637	PLTINT
INVAL	2034	MARKR	0630	NORMAT	0762	PLTLOP
IOASK	0064	MARKR	1064	NPR	1742	PLTHOV
IOSWT	0056	MAX	0142	NPTS	0074	PLTMV
ISCR	4337	MBLNK	6775	NUCALC	2354	PLTXIT
ISDIG	1244	MCHAN	0120	NULINE	1406	PNTPLT
ISXL	4150	MCTR	0134	NUMP	2353	POINT
JMP18	2076	MD	4527	NUPEEK	2211	POS
JUMPTB	2075	MDQR	0375	NUPNT	2407	POSTN
K1000	0130	MDLF	0376	NXPK	2500	PPSET
K3100	1123	MEM	1061	NXPT	3333	PR1T
K7	5553	MEN	0346	OCTIN	0272	PRNT
KK100	4374	MES	0347	OCTOUT	0252	PRIT
KK300	4375	MGEF	1060	OFFSET	0111	PSTAB
KSAM	4341	MIN	0141	OLDX	1715	PT1
KSPC	5052	MIN1	0761	OLDY	1716	PT2
LEADER	1200	MIN3	2351	ONE	2702	PTABST
LEDER	1434	MIN5	3136	OPUT	5557	PTINT
LEFY	3522	MK7	3751	ORGN	1050	PTPLT
LG2E	2677	MM	4530	OUT	0031	PU
LGFRAC	2352	MN7	0341	OUTCHR	0627	PX
LHORD	4443	MODCR	0366	OUTPT	7166	PY
LNCTR	0133	MODE	0143	OUTPUT	0005	QUERY
LNFEED	7342	MODTT1	0356	OUTX	5523	QUES
NUM	1211	MOH	1062	P123	2314	QUEST
LOADX	2516	MORE	4523	P13	0566	R6
LOKIN	0633	MPYR	0072	P236	1773	RDTY
LOOK	4340	MPYRI	1171	P256	3752	RDY
LOOKFR	4400	MRBKS	3737	P27	4342	READ
LOOP4	1462	MRBOUT	7167	P336	1772	READER
LOOP6	1410	MRBT	0340	P6	3134	READY
LOOP9	3046	MRRED	2025	P7M0	0342	RECALC

/CATACAL I	PAL10	V141	15-APR=70	1101	PAGE 72=5
REMOV	3275	STRPK	3262	XYSCAL	1265
RESET	1134	STRIT	0200	YCALC	2400
RESTR	7167	STYN	0441	YCD	5065
RET	5436	SUBRT	2361	YCLC	2416
RETEC	6774	SWAPBL	3000	YDIS	0112
RETN	7212	SWIT1	0055	YES	1056
RH77	0127	SWLOOP	3003	YFLIP	1366
RUBIT	2072	TAGCO	3137	YIND	0011
RUN	0117	TAP1	3661	YLM	0105
SAC	5565	TAPHAN	3613	YMAX	1044
SBPTR	3671	TELRED	0027	YMIN	0166
SCAD	7375	TEM2	0137	YONE	0110
SCALY	1453	TEM3	0140	YRNG	0107
SCANIT	1662	TEMP	0160	YSCFC	0174
SCASM	3545	TEMP	0135	YSCVAL	1556
SCOUNT	5565	TEMP1	0136	YSTEP	3311
SCPINT	0426	TEMPX	5564	YSVAL	1324
SCPLOP	0454	THD1	5367	YTP	5050
SELECT	0607	TMCTR	0157	ZIND	0012
SERVIS	2000	TMXP	0156		
SET	1122	TPNT	3305		
SETCLK	4343	TTOUT	0621		
SETIT	0257	TXSM	0115		
SETLY	3510	TYPCN	1753		
SETPP	1717	UPPEN	1144		
SETSTR	3200	VALU	0354		
SHE	4662	VARGET	2715		
SIGN	6777	WDSWT	7632		
SINE	2661	WID	2397		
SKIP	7633	WIDONE	2236		
SKL	1536	WIDSWT	2235		
SHINUS	7330	WIDTH	4532		
SHOT11	3025	WRTP	3711		
SPACE	1433	X1	0101		
SPACE	5560	X11	2751		
SPCHK	7015	XCPT	7037		
SPCIN	4760	XDIS	0005		
SPCJ	5242	XFLIP	4726		
SPCJ	7635	XIND	0010		
SPINIT	3014	XLM	0104		
SPLUS	7327	XLOAD	2705		
SQUEZE	4663	XMAX	1040		
SQLP	4677	XMIN	0163		
SQROOT	0002	XMPY	0073		
SQUARE	0001	XMPY1	1166		
STALL	1103	XNC	0113		
START	0403	XOBL	3707		
STBLK	3712	XRNG	0106		
STLOOP	4414	XSCFC	0171		
STRBS	3267	XSET	0066		
STRCL	2442	XSETUP	1213		
STRIPR	3254	XXX	5517		

ERRORS DETECTED: 0

LINKS GENERATED: 0

RUN-TIME: 29 SECONDS

3K CORE USED

	1679#	329	736	1988	2001		1984	1988	1998
A	1651								
ADCON	326	329	736	1988	2001				
ADCONV	161#	772							
ADDMX	165	1076							
ADDTWO	1303	1880							
ADDUP	2443#								
ADINX	165#	1562	2603						
AGO	2301	2332	2355						
ALLGS	1523								
ANINPT	1299								
AS260	443								
ASCOUT	3068								
ASK	87#	3086	3088	3125#					
ASKER	152	926	981	1939	1948	2032	2612	2921	2930
ASKIO	160	738	743	746					
ASPC	2673#	986							
AUTO	135#	552	561	567	1240	1253	1477	1757	1775
	2009	2823	2831						
AVGMR	2401								
AVLOP	2398	2490							
AVSUM	194#	2338	2439						
AX1	114#	607							
AX2	115#	612							
AX3	116#	617							
AXL	108#	114	115	176	590	593	597	603	631
	641	646	649	651	654	656			
AXR	106#	593	622						
AY1	117#	637							
AY2	118#	642							
AY3	119#	647							
AYL	109#	117	118	177	591	593	599	605	610
	620	625	632	652	657				
AYR	107#	595	652						
B	1653	1682#							
BACK	3202#	3215							
BAD	472	482#							
BEGCAL	1567	2170							
BEGDIS	163	268#							
BEXP	3073	3122#							
BFRST	3069	3098#							
BLKIO	2220	2227#							
BLOCK	216#	261							
BSCNCG	1557#	2946							
BTBS	2862	2872#							
BTPBS	2653#	2872							
BUFI	122#	180							
BUFFER	3098	3258							
BUFSY	3163	3182							
C	1648	1685#							
C200	812	818#							
CALBEG	1520	1567#							
CALBRT	674#	1293							
CALCJ	2934	2948#							

NAME	1398	1406	1421	1433	1458	1462
CALCY	1388#					
CALPRT	1393#					
CALSET	2404#					
CARRTN	3127#					
CCLDR	760#					
COISPL	1281#					
COTB	2854#					
CHE	3123#					
CHECK	2975#					
CHKBK	3018#					
CHLOR	1252#					
CHRDIS	2847	2861#	2871			
CHTAB	1239					
CHX	3224					
CLARR	1382					
CLKSET	759					
CLRR	1384					
CLSTRT	678#					
CLTN	2039	2443				
CPINT	206#					
CNTR	1787	876	921	938	962	992
	2605	1915	1944	1997	2065	2089
	2521	2684	2693	2709	2718	2749
CNTS	420					
COLON	2790#					
COPY	550					
CORTAB	1790					
COTAG	2191					
CRDC	2020					
CROIS	3076					
CRLF	80#					
CRLFD	2617	809	967	983	1188	1208
	80					
CSAM	767					
CSCR	2579					
CSET	1134					
CSXL	2385					
CURSET	2026					
CURSR	1309					
CHRC	2192					
CXOB	2183					
CYCTM	2347					
DATYP	1646					
DCT	845					
DCTAB	2011					
DECR	1282					
DERIV	3177					
DH01	1304					
DIALOG	2920					
DIG	124					
DIH01	3205					
	852					
	2918#	2938	2942	2943		
	2416#					
	889	893	1734	2266		
	1161#					
	2852					
	678					
	2936					
	2935					
	149#					
	773#					
	2620#					
	1155					
	2398#					
	2102#					
	1803#					
	2271#					
	2267#					
	2409					
	1688#					
	881#					
	2021#					
	1312#					
	3217#					
	2678#					
	2950#					
	1357					
	3234#					
	2913#					
	1765					
	2482					
	1563					
	1479					
	2131					
	2786					
	1055					
	2118					
	2775					
	1016					
	2106					
	2773					
	992					
	2089					
	2749					
	962					
	2065					
	2718					

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NAME	2405	2914#	1181	1184	1185	1189	1190	1195	1486	1569	1709	1932	1937
WDSP	2405	2914#	1181	1184	1185	1189	1190	1195	1486	1569	1709	1932	1937
HEADR1	82	150#											
HEADR2	83	151#											
HEDEI1	150	1179#											
HEDEI2	151	1182	1187#	1202	3047								
HEDEI3	99#	1036											
HEDEI4	82#	255	674	851	882	924	979	1024	1393	1569	1709	1932	1937
HEDEI5	2030	2094	2172	2296	2309	2320	2404	2551	2798	2919	2366	2376	2611
HEDEI6	83#	265	846	1031	1059	1585	1715	1947	2108	2361			
HEDEI7	2926	2929											
HGT	1366	1468#											
HIGH	1009	1014#											
HIGHT	668#	672											
HIORD	2423	2441	1468	2454	2463#								
HINDR	170	802#	2453										
HOLD	145#	786	791	795	799	1152							
HORDER	3064	3119#											
HSR	2991	2994#	2998										
HSRI	2974	2991#											
HUNDRO	170#	1744	2369										
IN	3210#	3241	3243										
INCR	1010	1013	1016#										
INIT	81	147#											
INITAR	81#	861	905	931	949	991	1041	1488	1770	1891	1951	2117	2128
INITI2	2195	2383	2427	2491	2561	2678	2741	2769					
INOCIT	147	2274#	2291										
INOCIT	2174	2265#											
INPT	3019	3026#											
INPUT	2967#	2978	2988	3006	3026								
INSCHN	2925	2946#											
INSTRK	681#	705	710	715	721								
INTEG	1288	2025#	2037										
INTFLT	375#	3030											
INTPLT	293	334#											
INTSP	1472	1482#											
INVAL	1234	1248#											
IOASK	160#	859	1255	1269									
IOSWT	251	254	947	878	970	985	2964#	2968					
ISCR	2422	2515#	533										
ISDIG	845#	1297											
ISXL	2364	2399#											
IMPTB	1283	1286#											
JUMPTB	1260	1283#											
K1000	204#	752	757	1989	2448								
K3100	753	764#											
K7	3161	3255#											
KK100	2523	2545#											

NAME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	
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	OUT	148#	417	421	444	483	515	517	704	745	813	960	1212	1250
OUTCHRR	532	541			547#									
OUTPT	2985		2989#											
OUTPUT	98#													
OUTX	3210	1576	1574	1578		1581	1583	1600	1603	1607	2099	2111		
P123	1424	3228#	3225	3231		3252								
P13	367		1434#											
P236	1210		373#											
P256	2256		1215#											
P27	2502		2269#											
P336	1211		2518#											
P6	1839		1214#											
P7M0	459		1853#											
PARI	218#		490#											
PARDMP	1389	1461	1449	1558	1579	1731								
PARPTR	169#	1425	1364	1446	1499	1595								
PCTR	205#	814	811	850	872	875		1101	1106	1127	1587	1592	1612	2380
PEKOMP	2616													2489
PENDN	1390		1591#											
PENUP	154#		1095											
PIND1	153#	679	266	906	923		1091	1093	1094					
PIND2	219#	1166	671	1167	1342		1346	1527	1546	1598				
PIND3	220#	1170	1169	1374	1501		1601	2166	2650					
PK100	221#	1348	1172	1378	1509		1515	1552	1604	1611	2162	2765		
PK14	2329		1753#											
PKOMP	1390#		2397#											
PKPRNT	1588	1613	1418											
PKS	217#	1403	1595#				1506							
PL13	1782	1852#	1362	1444	1493			1714						
PLCE	3165	3170	1786	3175	3179		3218	3219	3267#					
PLEXT	1088	1117	3170	1156#										
PL85	2679	2727#	1096											
PLTINC	573	1084#	2682											
PLTINT	731		929	1160										
PLTLOP	910#		905#											
PLTHOV	910		922											
PLTMV	571		929#											
PLTXIT	694		573#											
PNTPLT	729		731#											
POINT	3213	920#	916											
POS	1376	3262#	3248											
POSTN	1470		1470#											
PPSET	164#	2766	2757#											
PRIT	1452	1365	1340	1426	1500		1596							
PRNT	3157	3182#	3174											
PRTY	1205		1211#			</								

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