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IBM360 AND NOVA SOFTWARE DEVELOPED TO ALLOW PLOTTER OUTPUT TO BE DISPLAYED ON THE TEKTRONIX T4002 GRAPHICAL DISPLAY TERMINAL

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June 1973

ISBN 0 642 99576 1

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ABSTRACT

The interaction of IBM360 programs with the Tektronix T4002 Graphical Display terminal attached to the NOVA computer is described. These interactive facilities are used to allow plotter output from the IBM360 computer to be displayed on the Tektronix Display Screen. Arbitrary sections of plots may be enlarged to any desired magnification for detailed viewing without the traditional 'wrap-around' problem. This application is the first example of interactive computing using the AAEC Network and demonstrates the effectiveness of both the hardware and the software involved.

National Library of Australia card number and ISBN 0 642 99576 1

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A CODES; DISPLAY DEVICES; IBM COMPUTERS; MAGNETIC TAPES; PLOTTERS; W CODES

CONTENTS

1. INTRODUCTION

At the Australian Atomic Energy Commission Research Establishment, a number of computers are being linked together via the AAEC Dataway (Ellis 1970) to form a Computer Network (Richardson 1970) connected to the IBM360 central computer. A NOVA computer supporting five teletypewriter terminals and a Tektronix T4002 Graphical Display terminal using the ACL-NOVA system (Sanger 1971; Bennett and Sanger 1972) was the first computer on the Dataway. A PDP9L computer was the next computer on the Dataway and, since this computer was already attached to Selector Channel 2 of the IBM360 computer, this provided the path for NOVA access to the IBM360 computer. The PDP9L computer essentially acts as the 'telephone exchange' for all Dataway communication with the IBM360 computer.

To demonstrate the effectiveness of Dataway communication for interactive computing, software was developed to allow interaction between IBM360 programs and the Tektronix Display terminal attached to the NOVA computer. The first application of this interactive software allowed IBM360 plotter output to be displayed on the Tektronix Display terminal.

The IBM360 user has access to a Calcomp Incremental Plotter attached to the PDP9L computer via AAEC-written IBM360 and PDP9L software (G.W. Cox, AAEC unpublished report) and the data generated by these routines is sent to the PDP9L computer for plotting using the IBM360-PDP9L Link. Backup copies of all plots are held on a series of 9-track magnetic tapes for a period of seven days and it is from these backup tapes that the data for the displaying of plotter output is obtained. The incremental plotter data is used to produce a vector description (where the end-point coordinates only are required) and this is saved on IBM2314 disk storage. It is more efficient to use a vector description on the Tektronix Display terminal, and the typical data reduction of approximately 3 to 1 from incremental to vector mode also results in a very substantial reduction in the disk space required to describe the plot.

The viewer may choose either to add new plots to ones currently held on disk or to view those already present. The X or Y scales of the plot may be changed easily to allow the full plot to be viewed and, with the aid of the Tektronix 'joystick', any part of the plot may be enlarged to fill the screen for viewing in greater detail. This view may be enlarged repeatedly, thus producing any required magnification of any part of the original plot without 'wrap-around' from 'off-screen' vectors producing spurious lines across the display screen.

The displaying of plotter data on the Tektronix Display screen provides

the first example of interactive Dataway communication between the NOVA and IBM360 computers and demonstrates the effectiveness of both the hardware and software involved as well as providing a most useful facility for studying the graphical output of IBM360 programs in great detail.

2. CURRENT PLOTTING FACILITIES

2.1 IBM360 Software

The IBM360 Fortran user generates plotter output via calls to AAEC-written subroutines (G.W. Cox, AAEC unpublished report) such as GPSEND (which initialises the graph), GPLOT (which generates series of plotter movements that correspond to either a pen-up or pen-down motion from the current point to the point (X, Y)),GPTEXT (which allows text of arbitrary size and orientation to be plotted) and GPNUMB (which allows numerical data to be plotted in I, F, E, D or G Format). The output consists of a series of EBCDIC characters specifying pen-up, pen-down or any of the eight directions of motion of the plotter pen. In addition, there are Start of Plot, End of Plot and Start of Text characters to allow the drawing of several plots from the one Fortran program. The Start of Text character (followed by a 1-byte character count and a message) allows Operator messages to be included in the plotter data (e.g. PLEASE MOUNT RULED PAPER AND BLUE PEN), and are in ASCII code for printing on the teletypewriter terminal attached to the PDP9L computer. The plotter output generated for a long straight line consists either of a long series of identical increments in one of the 8 principal directions or of a long series of recurring patterns of two different plotter increments. In each case, the vector representation results in a marked reduction since only the end-point coordinates are required. For short lines and detailed plotting, the vector representation may be wasteful, but for a typical graph composed of axes, text, numerical data and plotted points, the overall reduction is approximately 3 to 1 in favour of the vector representation.

The Tektronix Display terminal could have been used to draw the plots in an incremental mode, but this would have been nearly as slow as drawing them on the Calcomp plotter. By setting up a vector representation of the plot and taking advantage of the vector mode available on the Tektronix Display terminal, the time taken to draw the plot on the Tektronix Display screen is greatly reduced.

2.2 The WTRC Program

All plotter output data generated by the Fortran user is added to the SYSOUT=C output queue by the IBM360 MVT (Multiprogramming with a Variable Number of Tasks) Operating System and remains on the IBM2314 disks until an output

writer program WTRC (R.P. Backstrom, AAEC unpublished report) is started by the Operator. The WTRC program sends the plotter (and punched paper tape) output to the PDP9L 7-Track magnetic tapes to form a Jobstream for the PDP9L computer, and at the same time produces a backup copy of the output on the IBM360 9-Track Magnetic tapes. When the SYSOUT=C queue is empty, the Operator stops the Writer and allows the PDP9L to produce the punched paper tape and the plotter output required. A series of backup tapes allows data to be saved for a period of up to 7 days, and it can be recovered by using the COPYWTRC program (R.P. Backstrom and B.L. Arnold, AAEC unpublished report).

The WTRC program also produces a list of jobs added to the backup tapes and a record count from each SYSOUT=C data set produced by each job. This list provides a valuable guide when deciding which plots to display since large plots could overflow the preallocated disk data set (currently set up with a primary allocation of 5 cylinders with 1 cylinder extents) used for saving the vector representation of the plots.

3. NOVA SOFTWARE

3.1 Communicating with the IBM360 Computer

There are a number of modes of communication between the NOVA and IBM360 computers (Sanger and Backstrom 1973) and these fall into three main types. Firstly, the NOVA computer may initiate requests for programs stored on the IBM2314 disks to be loaded directly into the NOVA computer via the Dataway. These requests are serviced as soon as there is sufficient core storage available in the IBM360 computer to allow the AEATN48 routine to send the program to the NOVA computer. These program loading requests are usually of short duration (approximately 1 or 2 seconds) and so are given a high priority.

The second type of communication results in the addition of a batch job into the IBM360 Jobstream, which is accomplished by the IBM360 routine AEATR48 writing the appropriate Job Control Language (JCL) and data (SYSIN data) to the 'internal reader' of HASP (Houston Automatic Spooling and Priority package). This second type of request is also of short duration and again is given a high priority.

The third type of communication takes place when a currently running batch job (added to the Jobstream by writing to the HASP internal reader) interacts with the Tektronix Display terminal attached to the NOVA computer. The batch job issues Read and Write commands to the Tektronix Display terminal as if it were a normal IBM360 7-Track Magnetic tape unit; meanwhile the software in the NOVA computer is set up to allow information to be displayed on the Tektronix Display screen as the result of the Write commands and to allow information typed at the Tektronix Display keyboard to satisfy the Read

requests. This third type of communication requires only short bursts of IBM360 CPU activity over a long period of time. These jobs should really be run under a proper time-sharing monitor as discussed by Sanger and Backstrom (1973). The various responses given by the NOVA computer to the Read and Write commands issued to the Tektronix Display Terminal are discussed in the next Section.

3.2 The ACLNOVAT Program

3.2.1 General discussion

A special version of the ACL-NOVA system, ACLNOVAT, was set up to allow ACL-NOVA to be used at the five teletypewriter terminals while the Tektronix Display terminal was being used to interact with a program in the IBM360 computer via the Dataway. The ACLNOVAT program used $7\frac{3}{4}$ K words in the NOVA computer (an extra 1K words) leaving 4K words for ACL-NOVA work areas. The interaction with the Tektronix Display terminal is handled entirely under Interrupt, with the AETAM routine in the NOVA computer processing the interrupts from the Dataway and from the Tektronix Display and passing any other interrupts to the ACL-NOVA interrupt handler. The only other modification made to the normal ACL-NOVA system was to allow Dataway Interrupts always to be enabled (that is, Interrupt Priority line 8 is always enabled (Sanger, Jones and Ellis 1973)).

To run a job on the IBM360 computer that will interact with the Tektronix Display terminal, the user should first type the appropriate ∮ command (see Section 3.2.2) at the display keyboard. The NOVA computer then sends a job-stream request to the IBM360 computer and signals the PDP9L computer that the Tektronix Display, Dataway address X '49', is now Ready. The JCL and SYSIN data required to run the interactive display job is added to the normal IBM360 Jobstream and subsequently executed.

The interactive display job communicates with the Tektronix Display terminal using normal IBM360 device allocation (using a DD card in the JCL referencing device address X '249' as a magnetic tape unit) and the EXCP (Execute Channel Program) Macro instruction to perform the actual data transfers (reads and writes). As far as the IBM360 program is concerned the Tektronix Display appears to be a 'passive device' that will display whatever is written to it and supply a line of input in response to a Read request. This means that the interaction with the Tektronix Display terminal must be built into the IBM360 program in the form of appropriate Read and Write sequences with the IBM360 program controlling, for example, the output mode of the Tektronix Display terminal (that is, making sure that it is in the

required alphanumeric, incremental, point or vector mode) or enabling the cross-hair cursor associated with the Interactive Graphic Unit ('joystick') attachment of the Tektronix display if the coordinates of a point on the screen are required.

The 'passive device' function of the NOVA software gives IBM360 programs complete flexibility in their interaction with the Tektronix Display terminal; the responses given to the Read and Write sequences will be discussed in greater detail in Sections 3.2.3 and 3.2.4.

3.2.2 Job initiation by the NOVA

When a job is to be run on the IBM360 computer that will interact with the Tektronix Display terminal, the ∯ key followed by up to 22 characters of information (terminated by a carriage return) should first be entered at the Tektronix Display keyboard.

A Primary Write of 24 bytes, containing the characters X '0003' followed by the 22 characters of information, is sent to the PDP9L computer. The PDP9L computer signals Attention to the IBM360 computer and marks the NOVA computer address X '48' as being Ready (Sanger and Backstrom 1973). The NOVA then sends a NOP Control (Command Code X '03') sequence to the PDP9L computer to indicate that the Tektronix Display terminal, address X '49', is now Ready.

On receipt of the Attention signal from the PDP9L computer, the IBM360 computer performs a Diagnostic Read to the PDP9L to obtain the 24 bytes sent by the NOVA. Since the first two bytes are X '0003', control is passed to the AEATR48 routine and the next 22 bytes are matched against entries in an authorised procedure list. If the 22-byte character string appears in the authorised procedure list, then a corresponding procedure name is taken from the list and added to the JCL that is then written to the HASP internal reader.

The interactive display job is now part of the normal IBM360 Jobstream and is subsequently run as a normal CLASS=F job. When the job begins execution, the IBM360 Operating System sends a number of commands to the device address X '249' as part of its Job Allocation procedure. To avoid problems at Job Allocation time, care must be taken to specify the correct JCL on the DD card referring to device address X '249'; the appropriate JCL is shown in Appendix A for the AENVPLT1 and AENVPLT2 procedures.

The software in the NOVA computer copes with the requests to R 249 (remove the magnetic tape mounted on device address X '249') and M 249, NOVA, NL, AENVPLT2, PLOT (mount an unlabelled tape on device address X '249') by replying with immediate Unit Check (UC) status to the Rewind/Unload command sent to R 249 (this marks address X '49' as Not Ready in the PDP9L computer), and then

sending a NOP Control sequence to present Device End (DE) status to satisfy the Mount request (this marks address X '49' as being Ready again).

3.2.3 Sending information to the Tektronix Display

Three Write commands, with Command Codes X '01', X '05' and X '09' addressed to X '249', can be used to send information to the Tektronix Display terminal. For each of these commands, 512 bytes of data should be sent to the NOVA computer which stores them in one of two 256-word (512 byte) buffers. Each 512-byte record should contain the actual data byte count in the first two bytes, followed by up to 510 bytes of display data. The NOVA computer sends the information as it is received to the Tektronix Display terminal and it is up to the IBM360 program to ensure that the output mode of the display is correct (that is, that the display is in the required alphanumeric, incremental, point or vector mode).

A 'Pure Write', command code X '01', should normally be used to transmit data that is to be written to the Tektronix Display screen. On receipt of a 512-byte record, the NOVA computer sends Channel End, Device End (CE, DE) status if the second data buffer is free. Otherwise, Channel End status plus a Busy Sense Code is sent to the PDP9L computer, followed later by a NOP Control sequence to the PDP9L computer to present asynchronous Device End status when the next data buffer is free. In this second case, the IBM360 interactive display program remains in the 'wait state' until the asynchronous Device End is presented; this allows other programs in the IBM360 computer to continue execution. Equally important is the fact that the CE response immediately frees the IBM Selector Channel 2 thus allowing other devices to use this channel (Richardson 1973) while the interactive display program is waiting for the DE status. Pure Write commands should normally be used to send graphical data to the Tektronix Display screen to draw pictures, set up tables of results and so on.

Command code X '05' is termed a 'Write to be followed by Read' command and indicates that a line of input is required from the Tektronix Display terminal once all the output has been sent to the display. The NOVA computer responds to this command by giving CE status plus Busy Sense Code to the PDP9L computer. Once all the output has been sent to the Tektronix Display terminal and a line of input received from the display (terminated by a carriage return), then a NOP Control sequence is sent to the PDP9L computer to present DE status. The asynchronous DE status indicates that the IBM360 program should issue a 'Pure Read' command (Command Code X '02') to receive the line of data from the Tektronix Display terminal. The command X '05' also indicates that the input

characters received from the Tektronix Display terminal are to be sent back to the display screen (echoed) for visual checking. Typically, this command will be used to write a question on the display screen for the viewer to answer such as: SPECIFY PLOT NUMBER. Only when an answer has been given by the viewer and carriage return pressed is the asynchronous DE sent to the IBM360 computer. The subsequent Read command is answered immediately by the NOVA computer.

Command code X '09' is also a 'Write to be followed by Read' command and is identical to the command X '05' except that input characters received from the Tektronix Display terminal are *not* to be echoed at the display screen. This command is used to enable the cross-hair cursor by sending special output characters to the display (see Section 3.2.7), and to suppress the echoing of the data transmitted to the NOVA computer when the viewer presses a keyboard character to specify the coordinates of a point on the screen. A series of 6 characters is sent to the NOVA computer when this occurs: the ASCII code for the character pressed, two X and two Y coordinate characters indicating the coordinates of the intersection of the cross-hair cursor lines, and finally a carriage return character. The coordinate characters, if echoed, would produce unpredictable results, thus spoiling the appearance of the graphical output, and so are suppressed. Another possible use for the non-printing reply is for entering passwords or codes for security reasons. In fact, the AENVPLT2 program (see Section 5) has a facility for deleting plots which depends on the acceptance of a non-printing password.

3.2.4 Reading information from the Tektronix Display

Two Read commands, with Command Codes X '02' and X '0A', addressed to X '249' can be used to read information received from the Tektronix Display terminal. In response to each Read request an 80-byte record containing the actual data is either sent to the IBM360 computer or set up to be Read by the IBM360 computer.

If the NOVA computer receives a Read command and there is no input available from the Tektronix Display terminal, then immediate CE status plus Busy Sense Code is given to the PDP9L computer followed later by a NOP Control sequence to the PDP9L computer to present DE status when the input line is available. On the receipt of the DE status, the IBM360 program should check that no data was transferred (by examining the residual byte count in the Channel Status Word) and re-issue the Read command to receive the input from the Tektronix Display. In this case the command code X '02' indicates a 'Pure Read' or a 'Read with Echo' and the input from the Tektronix Display is echoed on the display screen, while command code X '0A' indicates a 'Read

without Echo' and the input from the display is *not* echoed on the display screen.

When a Read command is sent to the NOVA computer after a previous Write X '05' or X '09' command has been used to obtain a line of input from the screen, then the 80-byte data record is sent to the IBM360 computer and CE, DE status given to the PDP9L computer. In this case, it does not matter which Read command is issued to obtain the Tektronix Display input since it is the Write command code that determines whether the input is to be echoed or not. It is probably more consistent to use the Read command X 'OA' with a Write X '09' command, and the Read command X '02' with a Write X '05' command.

Input from the Tektronix Display terminal can thus be read in two different ways, but the use of a Write command followed by a Read command is more efficient in terms of IBM360 CPU activity and Dataway resources. It is up to the IBM360 program to check the validity of the input received from the Tektronix Display terminal. For example, the response resulting from an immediate carriage return is an 80-byte record containing a zero byte count. To a question such as: X SCALE =, it would imply that no change was required from the previous value of the X scale, but in response to the question: SPECIFY BACKUP TAPE LABEL, a null response is unacceptable and the question is repeated by the IBM360 display program.

3.2.5 Interrupting display output

If the ? character is pressed while output is being sent to the Tektronix Display screen, then the transmission of characters to the display is terminated by the two buffers being marked empty, and immediate Unit Exception (UE) status given in reply to the next 'Pure Write' command from the IBM360 computer. It is up to the IBM360 program to recognise this UE status, and this feature is used in the AENVPLT2 program to allow the viewer to interrupt a graph in process of being displayed (so that the scales may be respecified, the picture enlarged or another plot chosen for display).

3.2.6 Correcting input at the Tektronix Display

If an error is made while input is being entered from the Tektronix Display keyboard, then the < character should be typed. The NOVA computer responds to this by cancelling the current input and sending a < character, carriage return and line feed to the display. The input line should then be retyped.

3.2.7 Special features of the Tektronix Display

The IBM360 interactive display program should also cope with the special features of the Tektronix Display terminal. For example, it takes $\frac{1}{2}$ second to clear the screen of the Tektronix Display and no displayable output should be

sent to the display during this period. The IBM360 can handle this quite simply by sending a record to the NOVA computer containing the US character (to set alphanumeric mode), the CAN character (to clear the screen) followed by 200 null characters (zeros).

To allow tracking mode on the Tektronix Display to be used by the IBM360 program, the US character and DC1 character (to enable the cross-hair cursor) should be followed by four null characters, before sending the ENQ character to read the coordinates of the cursor, to ensure that 10 milliseconds have elapsed before requesting the coordinates of the cursor. Whenever the co-ordinates of the cross-hair cursor are sent to the IBM360 computer, a check should be made that exactly five characters are received or the request should be repeated.

To reduce the amount of data that has to be sent to the Tektronix Display the IBM360 program should take advantage of the fact that in vector mode if the high order X and/or high order Y coordinates of successive points are identical, then only the corresponding low order coordinates need be sent to the display.

3.2.8 Responses to Rewind/Unload commands

Providing the correct JCL has been specified on the DD card referring to device address X '249' as discussed in Appendix A, then the IBM360 computer will only issue Rewind/Unload commands at the start and at the end of the interactive display job. The NOVA software copes with these commands by replying with immediate UC status (to mark the address X '49' as Not Ready in the PDP9L computer) and if a Read or Write command to address X '249' has *not* been received by the NOVA computer after the initial Primary Write to the PDP9L, then a NOP Control sequence is used to present DE status to the PDP9L computer (to mark the address X '49' as Ready again).

4. IBM360 SOFTWARE

4.1 Introduction

The first IBM360 programs to interact with the Tektronix Display terminal via the Dataway were developed to allow WTRC plotter output to be viewed on the Tektronix Display screen. The AENVPLT1 program allows plots stored on WTRC backup tapes to be converted from incremental form to vector form and stored in a partitioned data set on IBM360 disk for later viewing at the Tektronix Display; this is discussed in Section 4.2.

The AENVPLT2 program allows plots already stored in vector form as members of a partitioned data set on IBM360 disk to be viewed at the Tektronix Display terminal. Arbitrary sections of the plots may be enlarged to any desired

magnification for detailed viewing without the traditional 'wrap-around' problems; this is discussed in Section 4.3.

4.2 The AENVPLT1 Program

4.2.1 Preparing plots for viewing

To prepare plots from any of the WTRC backup tapes for viewing, the initiating message: $CREATE WTRC, typed at the Tektronix Display keyboard causes the following JCL statements:

```
//AENVPLT1      JOB   (C1F90072,NOVA),DATAWAY.USE,
//                    CLASS=F, TIME=15, PRTY=9
//NOVA          EXEC  AENVPLT1
```

to be added to the IBM360 Jobstream. When this is initiated by the MVT Operating System, it will begin communication with the Tektronix Display terminal. The first message to appear on the display is the heading: AENVPLOT followed by the request: WTRC BACKUP TAPE = to specify the label of the required backup tape. The viewer should then enter the tape label of the backup tape containing the plots required for viewing. An IBM360 console message is then issued asking the Operator to mount the specified tape on one of the IBM 9-Track Magnetic tape units. When this has been done, the AENVPLT1 program searches for the first job identification record (produced by the WTRC program) which consists of a 24-byte record containing the 8-byte jobname plus date and time of job initiation in the following format: JOBNAME1 73.044 10.39.43 which is translated to ASCII code and sent to the display in the form of a question: JOBNAME1 73.044 10.39.43? to which the reply is Y (meaning yes), N (no) or E (to end the processing of the current backup tape). If the reply is Y, the plot data is read from the tape and translated into a vector description and stored on disk, continuing until the next job identification record is found. The current list of plot jobs held on disk is then displayed, along with the percentage of utilisation of the disk data set, and the next job identifier record is displayed for decision. If the reply N is given, a search is made for the next job identifier record without rewriting the plot job list on the screen.

The reply E allows the viewer to end processing of the current backup tape. The message: ANOTHER BACKUP TAPE REQUIRED? then appears on the screen and the reply again, is Y or N. If the viewer replies Y, the tape label request: WTRC BACKUP TAPE = is reissued and the above process repeated. Any number of WTRC backup tapes may therefore be used without the need to start the AENVPLT1 program more than once. If the reply is N, however, the message: END OF STEP appears on the display screen while the IBM360 Operating System terminates the first step of the AENVPLT1 procedure and initiates the next step (which is,

in fact, the same as the AENVPLT2 procedure) to execute the AENVPLT2 program and to display the plots now currently held on disk. The advantage of setting up the AENVPLT1 procedure to use two steps instead of one is to allow the IBM360 Operating System to release the IBM 9-Track Magnetic tape unit for use by some other job while the plots are being viewed on the Tektronix Display screen. It would clearly be most undesirable to tie up one of the Magnetic tape units for, say, periods of up to 45 minutes when the AENVPLT1 program required it for only the first 5 minutes.

4.2.2 Conversion to a vector description

The WTRC backup tape data consists of 800-byte records containing plotter increment characters and other special characters such as Start and End of Plot and Start of Text which is followed by ASCII characters for printing as an Operator message on the PDP9L teletypewriter. The pen increment characters (0 to 7) describe the 8 principal directions (45^{o} apart) starting with the positive X direction and proceeding anticlockwise. Pen-up and pen-down are represented by the characters 8 and 9 respectively and the Start and End of Plot characters are Y and Z.

The method adopted for reconstructing the vector description from the incremental mode data is based on the fact that any pen-down motion which represents a single straight line must be described by a series of plotter increments in at most two adjacent principal directions (G.W. Cox, AAEC unpublished report). If the line was originally in one of these eight directions, then clearly this may be represented by a series of identical increment characters. Otherwise, the line must be strictly between two adjacent principal directions. If the line is exactly halfway between them, the optimal description of the line will include alternately pen movement characters in each of these directions. Suppose the line is closer to the first principal direction than the second. In this case, there will be a number of pen movements in the first direction and then precisely one movement in the second followed by a number in the first direction and a single movement in the second direction. For optimal approximation of the line, the number of consecutive movements in the first direction that now follow may vary by one till the end of the line, but there may only be single increments in the second direction.

By these means it is possible to follow each line and to detect the starting of a new line. Movements with the pen up, of course, need no such sophisticated tracking alogorithms because only the coordinates of the next point with the pen down need be noted for the continuation of the plot.

The format chosen for the vector description was to record the X and Y coordinates in a binary format in units of plotter increments which are stored as pairs of 16-bit halfwords with the two high order Y bits signifying pen-up or pen-down and start of plot. This allowed for more than adequate pen movement ($13\frac{1}{2}$ feet (16383 increments) in the Y direction and 54 feet (65535 increments) in the X direction).

4.2.3 Disk data set organisation

The format of the disk data set to hold the plotter information for display was chosen to be a Partitioned Data Set (PDS) containing each individual plot as a separate member (to allow fast retrieval of any specified plot) and a special member (named DISPLAY) holding the current list of plots available for viewing. The DCB parameters of the data set are: RECFM=F, BLKSIZE=802 with each record containing up to 800 bytes of information, the actual byte count being indicated in the first two bytes. The 'directory' member, DISPLAY, holds up to 25 entries, each containing a 24-byte job identification record, the number of plots produced by this job and also record counts of both the original incremental mode description and the vector description for assessing the compression ratio.

The member name of each plot is constructed as follows: the first three bytes of the associated jobname, then a 2-character index value indicating its position in the directory and, finally, a three-character plot number. For example, the member name of the third plot of the job RPBPLOT which is second in the directory list would be: RPB02003. This descriptive member-naming convention (besides being simple to implement) proved to be most useful during the early weeks of the testing and development of this plot display system.

All disk Input/Output is performed using the BPAM (Basic Partitioned Access Method) macros READ, WRITE, CHECK and STOW. The FIND macro is also used to position the data set logically prior to READ instructions to access particular plot members. The directory member, DISPLAY, is rewritten in place (using the UPDAT option of BPAM) as each new plot is added to the data set so that, in the event of an IBM360 System failure, the most recent member information would be available. A listing of the AENVPLT1 program is given in Appendix C.

4.3 The AENVPLT2 Program

4.3.1 Viewing plots on the Tektronix Display

To begin viewing plots (assuming that no additional plots are to be added to the disk data set), enter: ØDISPLAY WTRC at the Tektronix Display keyboard. This will cause the addition of the following JCL statements to the IBM360 Jobstream:

```
//AENVPLT2      JOB   (C1F90072,NOVA),DATAWAY.USE,
//                    CLASS=F, TIME=15, PRTY=9
//NOVA          EXEC  AENVPLT2
```

When this job begins executing, it will display the current list of plot jobs available for viewing, numbering them from 1 to n. The message: SELECT JOB NUMBER: then appears. The viewer should then enter a number in the range 1 to n followed by carriage return (CR). The request is repeated if any other reply is given. The number of plots produced by each job appears in the jobname list and, if there is more than one present, the request: SELECT PLOT NUMBER: is issued. Again, an appropriate number should be entered. The X and Y scales must next be entered in response to the requests: X SCALE = and Y SCALE =. There are default values of 1 for each direction which produces a view of approximately one plotter page (11" by 16" on the plotter). If these defaults are acceptable, the viewer should press carriage return in response to each request. Otherwise, values expressed as rational fractions should be given. For example, to fit two plotter pages on the screen, the X scale should be specified as 1/2 and the Y scale as 1 (by giving an initial CR or by specifying 1 explicitly). The convention chosen for these scale quantities is that they apply directly as scale factors in the X and Y directions, and so to allow more to be displayed initially on the screen, small scales (such as 1/2 or 2/5 etc.) should be chosen.

Once all the required parameters have been chosen, the display output proceeds to give a view of the particular plot on the required scale. When the plot is finished (or is interrupted by the viewer pressing the ? character) a US character (to set alphanumeric mode) and a HOME character (to position the beam at the top left-hand corner of the display screen) are sent to the display via a Write X'05' command. No messages are written on the screen at this point to allow photographs (or photocopies) to be made of the plot without operator messages spoiling the output.

Two responses can now be made by the viewer, namely, an immediate CR or the letter C followed by CR. If CR alone is pressed, the screen is cleared and a list of options presented. These include:

1 - Reset Scale of Current Plot

2 - Choose New Plot in Current Job

3 - Specify New Plot Job

and 4 - End of Run

which are followed by the request: SELECT OPTION NUMBER:. A number from 1 to 4 should then be entered. Option 4 ends the running of the AENVPLT2 job and

terminates the current interaction with the IBM360 computer. Option 3 provides the plot job list again for selection of a new plot. Option 2 allows a new plot from the current job to be selected and the X and Y scales to be respecified (if necessary). Option 1 assumes everything is unchanged except the scales. Pressing CR to the X SCALE = and Y SCALE = requests, in fact, leaves the scales (as previously specified) unaltered.

If C, followed by CR, is pressed the cross-hair cursor is enabled so that any area of the graph may be enlarged to full-screen dimensions. After choosing a rectangular area to magnify, the cursor should be positioned at one corner and the space key pressed; it should then be positioned at the opposite corner and the space key pressed again. The area thus enclosed will be enlarged to fill the screen (possibly distorting the image vertically and horizontally depending on the relative dimensions of the chosen rectangle). When each cursor point is specified correctly, the response from the IBM360 computer is to print the letters OK at the top left-hand corner of the screen.

When the drawing is complete (or has been interrupted by pressing the ? character) the same choice of responses is again available, namely to press CR to list the available options or to enter C followed by CR to enable the cross-hair cursor. In the latter case, a further magnification of any portion of the viewing area is possible, thus allowing arbitrary enlargement of any part of the plot for detailed viewing.

4.3.2 The wrap-around problem

The Tektronix Display screen is considered to be an area addressable by 1024 points (10-bit accuracy) in the X and Y directions, even though the viewing area is restricted to 1024 points in the X direction and 760 points in the Y direction. Any point outside the addressable region will have coordinates the low 10 bits of which represent a point on the screen. This means that when attempting to draw a line between two arbitrary points, the line which is actually drawn is the line between their addressable images. For example, the result of drawing a line between the points (1000,500) and (1100,500) is not a line from left to right disappearing off the screen at the right-hand edge, but a line from right to left joining the points (1000,500) and (76,500) because all coordinates are reduced to their low 10 bits, and 1100-1024 = 76. Not only has the line been drawn in the wrong direction but it would also have obscured other parts of the plotted graph.

It was therefore essential to solve this so-called 'wrap-around' problem if scaling and enlargement of the plots were to be possible.

4.3.3 Solution of the wrap-around problem

The first step in the solution of the wrap-around problem was to consider the screen extended indefinitely in the X and Y directions. The real screen was then considered to be one region (region 5) of this extended screen as shown in Figure 1, where the equations of the boundary lines of the 9 regions were taken to be X=0, X=990, Y=740 and Y=0 (suitable for use on the Tektronix Display terminal).

As the plot data is read from disk, the appropriate scaling and origin shifts are performed and the region number associated with each point is noted. If the current and previous points are both in region 5, then the coordinates of the current point are sent to the display. For all other lines, some modification of the output sent to the display is required. For example, to draw a line from, say, region 2 to region 5, the point of intersection of the line Y=740 must be calculated so that a line from the edge of region 5 to the second point can be drawn. Other lines may completely cross region 5 to reach another region, while some lines may not intersect region 5 at all.

A Feasibility Matrix (Figure 2) which describes the possible intersections of a given line with the four boundary lines of region 5 was then developed and is described in detail in Appendix B. This matrix also indicates the order in which solutions should be sought. For example, for a line from region 4 to region 3, if it is found that the line does not cross the line X=0 between Y=0 and Y=740, then there is no use seeking the intersection with Y=740 or X=990 because they will both be outside region 5. The first solution (with the line X=0) is termed a 'prime' solution. In this example, advantage can also be taken of the fact that if the line intersects the line Y=740 between X=0 and X=990, then there is no need to solve for the intersection with the line X=990 between Y=0 and Y=740. A similar situation occurs for a line going in the opposite direction from region 3 to region 4. If the prime solution (again with the line X=0 between Y=0 and Y=740) does not exist, then there is no need to look for other boundary intersections. In this case, if a pair of solutions exists then, since the prime solution will have been calculated first, the order in which the coordinates of the solutions are sent to the display must be reversed. This reversal of solutions must also be indicated in the feasibility matrix.

When a line passes into region 5 from an outside region, a 'pen-up' movement to the boundary intersection (that is specification of a 'dark' vector to that point) is followed by a 'pen-down' movement to the second point (a'bright' vector). It is important to draw the vectors in the original order (with a

solution 'swap', as indicated above, being sometimes necessary) because lines may otherwise be drawn to the wrong ends of existing lines.

Finally, consider a line from region 1 to region 9. In this case, the prime solution corresponds to the intersection with the line X=0 between Y=0 and Y=740, or to the intersection with the line Y=740 between X=0 and X=990. If a prime solution exists, the second solution corresponds to the intersection with the line X=990 between Y=0 and Y=740 or to the intersection with the line Y=0 between X=0 and X=990. A 'dark' vector is drawn to the first intersection followed by a 'bright' vector to the second intersection, the solutions being in the correct order in this case. An AENVPLT2 program listing is given in Appendix D.

4.4 Tektronix Display Data Formats

The Tektronix T4002 Graphical Display terminal can be used in alphanumeric or graphics mode, where the graphics mode includes point, incremental and vector mode (Tektronix Users Manual 070-1098-00).

Alphanumeric mode allows the full USASCII character set to be displayed except for the non-printing control characters. The display screen has a fixed format of thirty nine 85-character lines. The display is set to this mode by initial turn-on of the terminal, pressing the HOME button, or receiving the US character (X'9F').

In point mode the terminal displays any point on a fixed matrix of 1024 x 760 points. In this mode, set by the FS character (X'9C'), the terminal decodes the X and Y address (see Section 4.4.3) contained in a series of data words and displays the appropriate points.

In incremental mode, set by the RS character (X'1E'), the terminal plots one increment (dot) in any one of eight directions from the previous point, on the same 1024 x 760 matrix.

Vector mode allows a smooth line to be drawn between any pair of Y/X coordinates contained in a data sequence, on the 1024 x 760 matrix. The line (vector) can be intensified or dark, but the first line after the mode is set by a GS character (X'1D') is always dark. The lines can be any length, but for uniform intensity they should be held to two inches or less.

A Tektronix 4901 Interactive Graphic Unit is also attached to the Tektronix Display and if this unit is enabled then a cross-hair cursor associated with a joystick control appears on the display screen. If a character is pressed at the display keyboard, the ASCII code for the character pressed and the X and Y coordinates of the cross-hair cursor are sent to the NOVA computer. This is discussed in detail in Section 4.4.4.

The AENVPLT1 and AENVPLT2 programs use the alphanumeric and vector display

modes which will be discussed in more detail in Sections 4.4.2 and 4.4.3.

4.4.2 Alphanumeric mode

When the Tektronix Display terminal is operating in alphanumeric mode, it is used to display any of the printing ASCII characters. Two sizes of characters are available under program control. Large size characters are achieved by preceding the initial character with the EM character (X'99') and following each character with a space character. A CR or US character resets the large character size.

A pulsating write-through cursor is displayed on the screen to indicate the current writing position. The cursor may be positioned under program control by appropriate combinations of CRs, line feeds and spaces. Alternatively, the cursor may be positioned by entering graphics mode, locating to any desired screen position, and then returning to alphanumeric mode. Using the current NOVA interface to the Tektronix Display terminal in alphanumeric mode, characters can be sent to the display every 2.5 milliseconds.

Input from the Tektronix Display keyboard can be sent to the NOVA computer and can include the full ASCII character set (e.g. both upper and lower case alphabetic characters) or just the TTY subset of the full ASCII code (e.g. only upper case characters). The mode of input sent to the computer depends on the setting of the TTY/ASCII and INPUT-KEYBOARD/AUX buttons on the front of the display (see Section 4.4.5).

4.4.3 Vector mode

In vector mode, each 10-bit X and 10-bit Y coordinate is split into halves and transmitted in consecutive bytes. The first two bytes comprise the high order and low order bits of the coordinate address. The normal order of transmission to specify a point is: high order Y, low order Y, high order X and low order X with the top three bits of each byte being P01, P11, P01 and P10 respectively, where P is an even parity bit.

If the high order parts (X or Y) of the current point to be transmitted do not differ from the previously transmitted high order X (or Y) bits, then only the low order parts need be sent (this applies within the same 32-increment vertical or horizontal strip). This feature allows higher effective data rates to be achieved. It can therefore be appreciated that not only is plotting on the screen using relatively large beam movements very fast, but detailed plotting is also very efficient where the high X or Y values are unchanged over a number of beam movements.

To set vector mode, a GS character must first be sent to the screen. The first set of coordinate points that follow result in a dark vector being drawn

to the starting point. Subsequent coordinate pairs cause bright vectors to be drawn to each new point. Whenever a 'pen-up' movement is required, another GS character should be sent before transmitting the next set of coordinates.

The vector plot time in this mode is 8 milliseconds for a two inch vector. This is much slower than the time required to write a point on the screen in point mode (approximately 14 microseconds).

4.4.4 Input using the cross-hair cursor

If a US character followed by a DC1 character (X'11') is sent to the Tektronix Display terminal when the AUX button is ON, then a cross-hair cursor associated with the joystick of the 4901 Interactive Graphic Unit (IGU) appears on the display screen (Tektronix Manual 070-1059-00). Once the cross-hair cursor is enabled in this way, the pressing of a keyboard character causes a series of six characters to be sent to the NOVA computer. These comprise the ASCII code for the character pressed (this depends on the setting of the TTY/ASCII button), the high order X coordinate, the low order X coordinate, the high order Y coordinate, the low order Y coordinate and a carriage return (this depends on the CR option). The top three bits of each of the four coordinate bytes contain P01, where P is an even parity bit.

It is important to note (i) that the order in which coordinates come from the IGU is different from the order in which they must be sent to the display, and (ii) that the high order bits do not distinguish between any of the coordinate bytes. Thus care must be exercised before 'echoing' the coordinates of the cross-hair cursor.

4.4.5 Setting up the Tektronix Display

Before the Tektronix Display terminal is used for interaction with the AENVPLT1 and AENVPLT2 programs, the buttons at the front must be used to put the display on-line (ON LINE-GREEN) ready to transmit the TTY subset of ASCII characters (TTY GREEN) and ready to enable the cross-hair cursor (KEYBOARD-GREEN, AUX-WHITE).

5. CONCLUSIONS

The software described in this report allows IBM360 programs to interact with the Tektronix T4002 Graphical Display terminal via the AAEC Dataway. Sufficient detail is given to indicate how similar software can be written to provide interaction between the IBM360 computer and devices attached to other Dataway computers.

The AENVPLT1 and AENVPLT2 programs provide the first example of interactive computing over the Dataway and they allow plots produced on the IBM360 computer to be viewed on the Tektronix Display screen. Plots may be scaled and arbitrary

sections enlarged to any desired magnification with the solution of the wrap-around problem playing an essential part in the provision of these facilities. The system for obtaining plots on the IBM360 computer will be expanded to allow plots to be displayed directly from the original disk output queues without the necessity of creating a backup data file for later retrieval. This will allow a plot to be viewed on the display and the output to be deleted from disk if the actual plot is not required. The system would further be enhanced by the addition of a hard copy unit since users would be able to obtain a photocopy of their plot from the display screen. This has the advantage that detailed parts of a plot may be recorded very quickly. The hard copy unit would also reduce the load on the slower Calcomp incremental plotter.

The descriptions of the IBM360 programs presented in this report indicate how other IBM360 programs can make effective use of interaction with the Tektronix Display terminal.

6. ACKNOWLEDGEMENTS

The authors thank Dr. D.J. Richardson for valuable discussions on Dataway signalling conventions and IBM360 attention - handling facilities. The authors also thank Dr. G.W. Cox for detailed discussions on his plotter algorithms, particularly the incremental descriptions of straight lines.

7. REFERENCES

Bennett, N.W. and Sanger, P.L. (1972) - The Development of the ACL Language and its Implementation ACL - NOVA. Submitted to Australian Computer Journal.

Ellis, P.J. (1970) - A Multiplexed Computer-Computer, Computer-Device Data Link. AAEC/E206.

Richardson, D.J. (1970) - The AAEC Computer Network. AAEC/TM576.

Richardson, D.J. (1973) - Signalling Conventions for the AAEC Computer Network. AAEC/E264.

Sanger, P.L. (1971) - ACL-NOVA: A Multi-User Conversational Interpreter for the NOVA Computer. AAEC/E221 (Revised July, 1972).

Sanger, P.L. and Backstrom, R.P. (1973) - IBM360 and NOVA Software Developed to give the NOVA Computer Access to the Resources of the IBM360 Computer. AAEC/E262.

Sanger, P.L., Jones, C.G. and Ellis, P.J. (1973) - Programming the NOVA Computer for Dataway Communication. AAEC/E268.

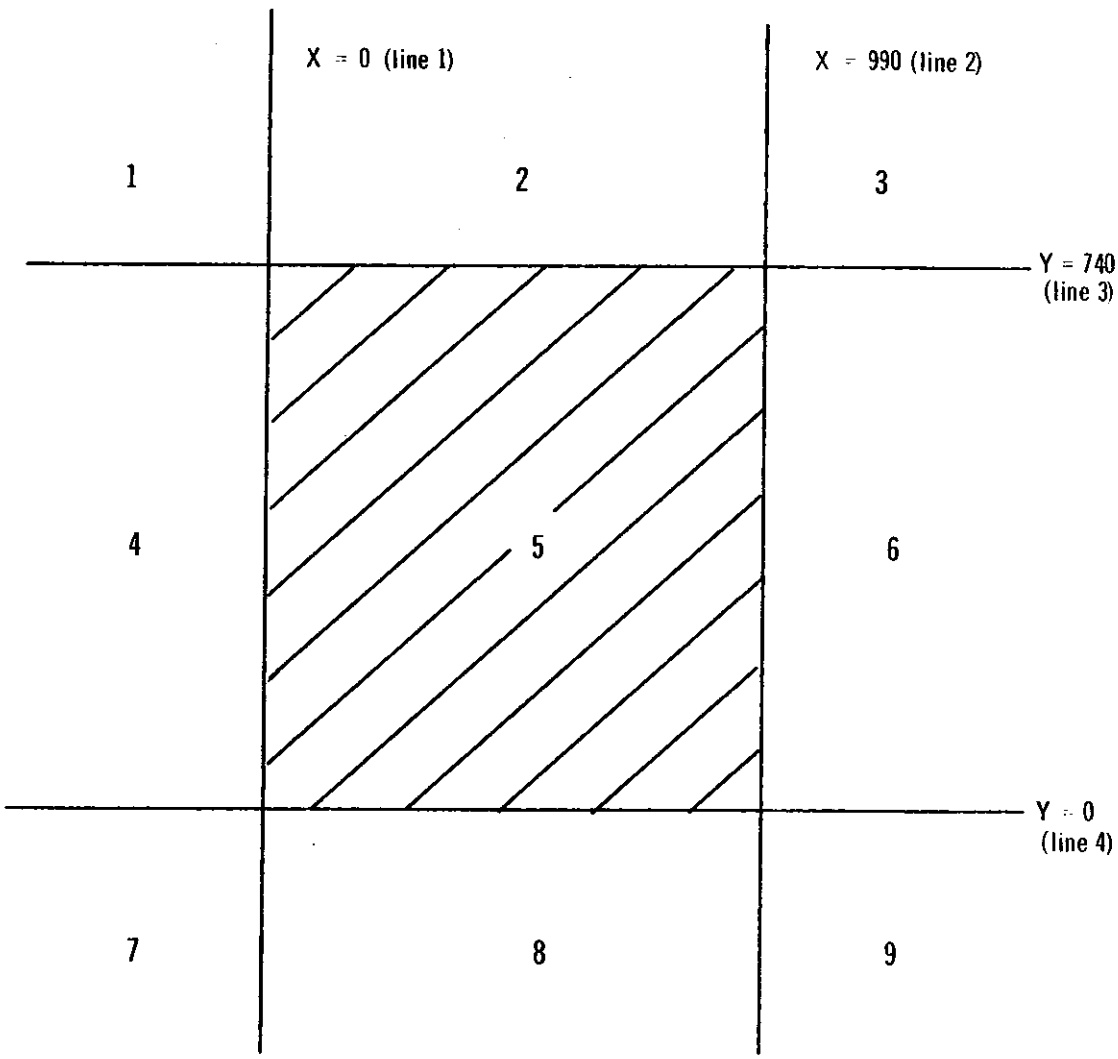

FIGURE 1 REGION DIAGRAM USED IN THE SOLUTION OF THE WRAP-AROUND PROBLEM

		Second Region								
		1	2	3	4	5	6	7	8	9
First Region	1	0000	0000	0000	0000	9300	8293	0000	8493	93A4
	2	0000	0000	0000	F310	3000	F320	F394	3400	F3A4
	3	0000	0000	0000	81A3	A300	0000	A394	84A3	0000
	4	0000	F130	F1A3	0000	1000	1200	0000	F140	F1A4
	5	9300	3000	A300	1000	FFFF	2000	9400	4000	A400
	6	F2B1	F230	0000	2100	2000	0000	F294	F240	0000
	7	0000	8394	94A3	0000	9400	8294	0000	0000	0000
	8	F493	4300	F4A3	F410	4000	F420	0000	0000	0000
	9	C293	83A4	0000	81A4	A400	0000	0000	0000	0000

FIGURE 2 FEASIBILITY MATRIX FOR THE SOLUTION OF THE WRAP-AROUND PROBLEM

APPENDIX A

THE AENVPLT1 and AENVPLT2 PROCEDURES

The Job Control Language used in the AENVPLT1 Procedure is as follows:

```
//AENVPLT1 PROC TAPE = TAPE, DISPLAY = 249
//PLOT1    EXEC PGM = AENVPLT1,REGION = 2ØK
//DISPLAY  DD UNIT=(&DISPLAY,,DEFER),VOL=(,RETAIN,SER=NOVA),LABEL=(,BLP)
//STEPLIB  DD DSN=RPB.ASM,DISP=SHR
//SYSUDUMP DD SYSOUT=A
//SYSUT1   DD UNIT=(&TAPE,,DEFER),VOL=SER=XXXXXX,DSN=SYSOUT
//SYSUT2   DD DSN=RPB.PLOT,DISP=OLD
//PLOT2    EXEC PGM=AENVPLT2,REGION=2ØK
//DISPLAY  DD UNIT=(&DISPLAY,,DEFER),VOL=SER=NOVA,LABEL=(,BLP)
//STEPLIB  DD DSN=RPB.ASM,DISP=SHR
//SYSUDUMP DD SYSOUT=A
//SYSUT1   DD DSN=RPB.PLOT,DISP=SHR
```

The first DISPLAY DD card contains two special features: VOL = (,RETAIN, ...) and LABEL = (,BLP). The first ensures that the device referred to is not 'unloaded' between the two job steps in this procedure and avoids the problems associated with the manual 'Readying' of devices on the Dataway. The second prevents the IBM360 Operating System from attempting to verify the 'tape label' of the device referred to in the DISPLAY DD card.

The use of the symbolic parameter, TAPE, on the SYSUT1 DD card allows the Operating System to allocate the WTRC backup tape to any available magnetic tape unit, thus avoiding problems that occur when specific units are already in use. The inclusion of the parameter ',,DEFER' allows the request to mount the tape specified by the viewer at the Tektronix Display terminal to be typed at the Operators console when the DCB is opened, rather than a request to mount tape XXXXXX at job step initiation time. The DEFER parameter makes it possible for a number of backup tapes to be used (via the same SYSUT1 DD card) during execution of the AENVPLT1 program.

The second step of the procedure AENVPLT1 is used as the only step of the procedure AENVPLT2 as shown below.

```
//AENVPLT2 PROC DISPLAY=249
//PLOT     EXEC PGM=AENVPLT2, REGION=2ØK
//DISPLAY  DD UNIT=(&DISPLAY,,DEFER),VOL=SER=NOVA,LABEL=(,BLP)
//STEPLIB  DD DSN=RPB.ASM,DISP=SHR
//SYSUDUMP DD SYSOUT=A
//SYSUT1   DD DSN=RPB.PLOT,DISP=SHR
```

APPENDIX B

DESCRIPTION OF THE FEASIBILITY MATRIX USED IN THE SOLUTION OF THE WRAP-AROUND PROBLEM

The feasibility matrix used for the solution of the wrap-around problem is shown in Figure 2. Each matrix entry consists of four hexadecimal digits indicating which boundary lines might be intersected by a line from the first region (numbered at the left) to the second region (at the top of the matrix), where Figure 1 defines the position of the nine regions.

If an entry in the matrix is zero (such as for (2,1)), then no line joining points in the indicated regions (in this case 2 and 1) intersect region 5 (the display area). The nonzero digits in the matrix indicate which lines are to be solved for intersection with the given line, and also the order in which the solutions should be calculated. The four lines referred to are the region 5 boundary lines X = 0 (line 1), X = 990 (line 2), Y = 740 (line 3) and Y = 0 (line 4) as shown in Figure 1. The line numbers are contained in the low order 3 bits of each hexadecimal digit in a matrix entry. The top bit of each hexadecimal digit indicates whether to skip the next solution digit if an intersection has been found using the current digit. An F as the first hexadecimal digit in a matrix entry means that the next digit is a prime solution (that is, there is no need to look for other solutions if no intersection is found using this digit). If the first hexadecimal digit is an 8, the next digit indicates a prime solution and, if a pair of solutions is found, the solutions are to be reversed before sending the corresponding coordinates to the Tektronix Display terminal so that the picture will be drawn in the correct order. In the special case where the four hexadecimal digits are nonzero and the first digit is not F or 8 (such as (1,9)) then the first two digits are used to check for a prime solution and, if one exists, then the next two digits are used to check for the second solution. This interpretation means that a fifth digit does not have to be used to indicate that the next two nonzero digits should be checked for a prime solution (which would have expanded the size of the matrix) and it produces no conflicts. The special (5,5) entry indicates that no calculations are required because both points are already within region 5.

Several examples, explaining the above principles are given below:

Example 1 — Entry (5,4) - 1000 - The line crosses line 1 when going from region 5 to region 4.

Example 2 — Entry (2,8) - 3400 - The line must cross both lines 3 and 4 and in that order.

Example 3 Entry (6,7) - F294 - This indicates a prime solution. If the line does not cross line 2, there can be no solution. If there is, however, line 1 should next be checked for a solution. Finally, if there is no line 1 solution, then line 4 must produce a solution.

Example 4 Entry (7,2) - 8394 - This indicates a 'prime with swap' solution. If the line does not cross line 3 there can be no solution. Lines 1 and 4 are then checked if necessary for possible solutions. Finally, the solutions are reversed.

Example 5 Entry (3,7) - A394 - This indicates that lines 2 and 3 are to be checked for a prime solution. Lines 1 and 4 are then checked, if necessary, for a possible solution.

In these examples it should be remembered that the terms 'crossing a line' and 'solution' represent for line 1 an intersection with X = 0 between Y = 0 and Y = 740, for line 2 an intersection with X = 990 between Y = 0 and Y = 740, for line 3 an intersection with Y = 740 between X = 0 and X = 990 and for line 4 an intersection with Y = 0 between X = 0 and X = 990.

It can be seen that whatever the graph enlargement, the two dimensional area can always be considered to be divided into the above nine regions, solutions found for possible line intersections and appropriate on-screen lines drawn.

For the case where the desired line to be displayed lies exactly on lines 1, 2, 3 or 4, no solution is indicated because a boundary is drawn on the screen before the graph is displayed so that redrawing these boundary lines would not change the appearance of the graph.

APPENDIX C

LISTING OF THE AENVPLT1 PROGRAM

```
//RPB       JOB (C1C18937,B1),R.P.BACKSTROM,                                JOB  15
//              MSGCLASS=D,
//              CLASS=A,TIME=3
//AENVPLT1 EXEC ASMFCL,PARM.ASM='NODECK,LOAD'
XXASM     EXEC  PGM=IEUASM,PARM='LOAD',REGION=50K                          00000010
XXSYSLIB   DD   DSN=SYS1.MACLIB,DISP=SHR                                   00000020
XX         DD   DSNAME=AAE.MACLIB,DISP=SHR                                 00000030
XXSYSGO    DD   DSN=&&OBJ,UNIT=SYSDA,DISP=(,PASS),                         00000040
XX              DCB=(RECFM=FB,BLKSIZE=800,LRECL=80),                       00000050
XX              SPACE=(3200,(20,40))                                       00000060
XXSYSUT1   DD   DSN=&&UT1,UNIT=(SYSDA,SEP=SYSGO),                          00000070
XX              SPACE=(1700,(50,100))                                      00000080
XXSYSUT2   DD   DSN=&&UT2,UNIT=(SYSDA,SEP=(SYSUT1,SYSGO)),                 00000090
XX              SPACE=(1700,(50,100))                                      00000100
XXSYSUT3   DD   DSN=&&UT3,UNIT=(SYSDA,SEP=(SYSUT1,SYSUT2,SYSGO)),          00000110
XX              SPACE=(1700,(50,100))                                      00000120
//ASM.SYSPRINT DD SYSOUT=D
X/SYSPRINT DD   SYSOUT=A,                                                  00000130
XX              DCB=(BLKSIZE=1210,LRECL=121,RECFM=FBSM)                    00000140
XXSYSPUNCH DD   SYSOUT=B,DCB=BLKSIZE=800                                   00000150
//ASM.SYSIN DD *
IEF236I ALLOC. FOR RPB      ASM      AENVPLT1
IEF237I 137   ALLOCATED TO SYSLIB
IEF237I 136   ALLOCATED TO
IEF237I 134   ALLOCATED TO SYSGO
IEF237I 135   ALLOCATED TO SYSUT1
IEF237I 124   ALLOCATED TO SYSUT2
IEF237I 125   ALLOCATED TO SYSUT3
IEF237I 124   ALLOCATED TO SYSPRINT
IEF237I 331   ALLOCATED TO SYSPUNCH
IEF237I 312   ALLOCATED TO SYSIN
```

EXTERNAL SYMBOL DICTIONARY

```
SYMBOL    TYPE ID   ADDR   LENGTH LD ID

AENVPLT1  SD   01 000000 001BCC
```

```
 LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

                                     1          MACRO
                                     2 &NAME    DISPLAY &CMD,&ADR,&LEN
                                     3 &NAME    LA      0,&CMD
                                     4          LA      1,&ADR
                                     5          LA      2,&LEN
                                     6          BAL     14,PLD
                                     7          MEND
                                     8 AENVPLT1 STBR    N=2                      SET 2 BASE REGISTERS
                                     9+AENVPLT1 CSECT
000000
000000 47F0 F058              00058 10+        B       88(0,15)
000004 08C1C5D5E5D7D3E3            11+        DC      AL1(8),CL11'AENVPLT1'
000010                             12+        DS      18F
000058 90EC D00C              0000C 13+        STM     14,12,12(13)
00005C 5000 F014              00014 14+        ST      13,20(0,15)
000060 18CD                        15+        LR      12,13
000062 41D0 F010              00010 16+        LA      13,16(0,15)
000066 5000 C008              00008 17+        ST      13,8(0,12)
000010                             18+        USING AENVPLT1+16,13
00006A 41C0 D800              20800 19+        LA      12,2048(0,13)
00006E 41C0 C800              00800 20+        LA      12,2048(0,12)
001010                             21+        USING AENVPLT1+4112,12
                                   22         OPEN    (PL1D,,PL2D,OUTPUT)      OPEN DISPLAY AND DISK DCB'S
000072 0700                        23+        CNOP    0,4
000074 4510 D070              00080 24+        BAL     1,*+12 LOAD REG1 W/LIST ADDR.
000078 00                          25+        DC      AL1(0) OPTION BYTE
000079 00197C                      26+        DC      AL3(PL1D) DCB ADDRESS
00007C 8F                          27+        DC      AL1(143) OPTION BYTE
00007D 001980                      28+        DC      AL3(PL2D) DCB ADDRESS
000080 0A13                        29+        SVC     19 ISSUE OPEN SVC
                                   30         OPEN    (PL4D,UPDAT,PL5D)        OPEN DISK DCB'S
000082 0700                        31+        CNOP    0,4
000084 4510 D080              00090 32+        BAL     1,*+12 LOAD REG1 W/LIST ADDR.
000088 04                          33+        DC      AL1(4) OPTION BYTE
000089 001A68                      34+        DC      AL3(PL4D) DCB ADDRESS
00008C 80                          35+        DC      AL1(128) OPTION BYTE
00008D 001AC8                      36+        DC      AL3(PL5D) DCB ADDRESS
000090 0A13                        37+        SVC     19 ISSUE OPEN SVC
000092 9110 C99C      019AC        38         TM      PL1D+48,X'10'            TEST DISPLAY
000096 47E0 D0A4              00084 39         BNO     PL10                     DATA SET
00009A 9110 CA88      01A98        40         TM      PL4D+48,X'10'            TEST DISK
00009E 47E0 D0A4              000B4 41         BNO     PL10                     OPEN
0000A2 9110 CAE0      01AF0        42         TM      PL5D+48,X'10'            TEST DISK
0000A6 47E0 D0A4              000B4 43         BNO     PL10                     OPEN
0000AA 9110 C9D0      019E0        44         TM      PL2D+48,X'10'            TEST DISK
0000AE 4710 D15E              0016E 45         BO      PL52                     DATA SET
                                   46 PL10    WTO     'AENVPLOT OPEN ERROR'    WRITE TO OPERATOR
0000B2 0700                        47+        CNOP    0,4
0000B4 4510 D0C0              000D0 48+PL10    BAL     1,IHB0004A BRANCH AROUND MESSAGE
0000B8 0017                        49+        DC      AL2(23) TEXT LENGTH
0000BA 0000                        50+        DC      B'0000000000000000' MCS FLAGS
0000BC C1C5D5E5D7D3D6E3            51+        DC      C'AENVPLOT OPEN ERROR'
0000D0                             52+IHB0004A DS     0H
0000D0 0A23                        53+        SVC     35
0000D2 9204 D0F9      00109        54 PL20    MVI     PL40+3,4                 SET NON-ZERO RETURN CODE
                                   55 PL30    CLOSE (PL1D,REREAD,PL2D,,PL3D) CLOSE ALL DATA SETS
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

0000D6 0700                        56+          CNOP  0,4
0000D8 4510 00D8           000E8   57+PL30      BAL   1,*+16 BRANCH AROUND LIST
0000DC 10                          58+          DC    AL1(16) OPTION BYTE
0000DD 00197C                      59+          DC    AL3(PL1D) DCB ADDRESS
0000E0 00                          60+          DC    AL1(0) OPTION BYTE
0000E1 0019B0                      61+          DC    AL3(PL2D) DCB ADDRESS
0000E4 80                          62+          DC    AL1(128) OPTION BYTE
0000E5 001A08                      63+          DC    AL3(PL3D) DCB ADDRESS
0000E8 0A14                        64+          SVC   20 ISSUE CLOSE SVC
                                   65           CLOSE (PL4D,,PL5D)            CLOSE DCB'S
0000EA 0700                        66+          CNOP  0,4
0000EC 4510 00E8           000F8   67+          BAL   1,*+12 BRANCH AROUND LIST
0000F0 00                          68+          DC    AL1(0) OPTION BYTE
0000F1 001A68                      69+          DC    AL3(PL4D) DCB ADDRESS
0000F4 80                          70+          DC    AL1(128) OPTION BYTE
0000F5 001AC0                      71+          DC    AL3(PL5D) DCB ADDRESS
0000F8 0A14                        72+          SVC   20 ISSUE CLOSE SVC
0000FA 58D0 D004           00004   73           L     13,4(0,13)              RESTORE
0000FE 98EC D00C           0000C   74           LM    14,12,12(13)            REGISTERS
000102 92FF D00C      0000C        75           MVI   12(13),255              INDICATE
000106 41F0 0000           00000   76 PL40      LA    15,0                    RETURN
00010A 07FE                        77           BR    14                      EXIT
                                   78 PL45      DISPLAY 1,PL5C,PL6C-PL5C-2    WRITE 'END OF TAPE'
00010C 4100 0001           00001   79+PL45      LA    0,1
000110 4110 C834           01844   80+          LA    1,PL5C
000114 4120 000E           0000E   81+          LA    2,PL6C-PL5C-2
000118 45E0 DCD4           00CE4   82+          BAL   14,PL0
00011C 92FF DD6C      00D7C        83           MVI   PL17A,255               INDICATE END OF FILE
000120 95FF DD6B      00D7B        84           CLI   PL16A,255               TEST FOR MISSING
000124 4780 DAA2           00AB2   85           BE    PLC102                  END OF PLOT
000128 9200 DD6C      00D7C        86 PL47      MVI   PL17A,0                 CLEAR END OF FILE
                                   87           CLOSE PL3D                    CLOSE TAPE DCB
00012C                             88+          CNOP  0,4
00012C 4510 0124           00134   89+          BAL   1,*+8 BRANCH AROUND LIST
000130 80                          90+          DC    AL1(128) OPTION BYTE
000131 001A08                      91+          DC    AL3(PL3D) DCB ADDRESS
000134 0A14                        92+          SVC   20 ISSUE CLOSE SVC
                                   93 PL48      DISPLAY 5,PL7C,PL8C-PL7C-2    ANOTHER BACKUP
000136 4100 0005           00005   94+PL48      LA    0,5
00013A 4110 C85A           0186A   95+          LA    1,PL7C
00013E 4120 0022           00022   96+          LA    2,PL8C-PL7C-2
000142 45E0 DCD4           00CE4   97+          BAL   14,PL0
                                   98           DISPLAY 2,PL1B,80             TAPE WANTED ?
000146 4100 0002           00002   99+          LA    0,2
00014A 4110 DD90           00DA0  100+          LA    1,PL1B
00014E 4120 0050           00050  101+          LA    2,80
000152 45E0 DCD4           00CE4  102+          BAL   14,PL0
000156 4780 D126           00136  103           BZ    PL48                    REPEAT QUESTION IF ZERO BYTE CT
00015A 95E8 DD92      00DA2       104           CLI   PL1B+2,C'Y'             IS IT YES ?
00015E 4780 D25E           0026E  105           BE    PL60                    REQUEST NEXT TAPE
000162 95D5 DD92      00DA2       106           CLI   PL1B+2,C'N'             EXIT
000166 4780 D60A           0061A  107           BE    PL610                   IF NO
00016A 47F0 D126           00136  108           B     PL48                    REPEAT QUESTION
00016E                             109 PL52     DS    0H                      TRANSLATE SCREEN MESSAGES
00016E DC03 C7FD C5D8 01800 015E8  110          TR    PL1C+5(PL2C-PL1C-7),PL1T
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 LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

000174 DC13 C80C C5D8 0181C 015E8   111          TR    PL2C+4(PL3C-PL2C-4),PL1T
00017A DC0D C822 C5D8 01832 015E8   112          TR    PL3C+2(PL4C-PL3C-2),PL1T
000180 DC0A C836 C5D8 01846 015E8   113          TR    PL5C+2(PL6C-PL5C-5),PL1T
000186 DC11 C846 C5D8 01856 015E8   114          TR    PL6C+2(PL7C-PL6C-4),PL1T
00018C DC1F C85E C5D8 0186E 015E8   115          TR    PL7C+4(PL8C-PL7C-4),PL1T
000192 DC18 C882 C5D8 01892 015E8   116          TR    PL8C+4(PL9C-PL8C-7),PL1T
000198 DC34 C8A2 C5D8 018B2 015E8   117          TR    PL9C+4(PL11C-PL9C-7),PL1T
00019E DC0A C8DF C5D8 018EF 015E8   118          TR    PL11C+5(PL12C-PL11C-9),PL1T
0001A4 DC1D C8F0 C5D8 01900 015E8   119          TR    PL12C+2(PL13C-PL12C-4),PL1T
0001AA DC0E C912 C5D8 01922 015E8   120          TR    PL13C+2(PL14C-PL13C-5),PL1T
                                    121          RDJFCB PL3D                    READ JOB FILE CONTROL BLOCK
000160                              122+         CNOP  0,4
0001B0 4510 D1A8            00188   123+         BAL   1,**+8 LOAD REG1 W/LIST ADDR.
0001B4 80                           124+         DC    AL1(128) OPTION BYTE
0001B5 001A08                       125+         DC    AL3(PL3D) DCB ADDRESS
0001B8 0A40                         126+         SVC   64 ISSUE RDJFCB SVC
                                    127          DISPLAY 1,PL1C,PL2C-PL1C-2     WRITE 'AENVPLOT'
0001BA 4100 0001            00001   128+         LA    0,1
0001BE 4110 C7F8            01808   129+         LA    1,PL1C
0001C2 4120 000E            0000E   130+         LA    2,PL2C-PL1C-2
0001C6 45E0 DCD4            00CE4   131+         BAL   14,PLD
                                    132          FIND  PL5D,PL12A,D             FIND DISPLAY MEMBER
0001CA 4110 CAB0            01AC0   133+         LA    1,PL5D LOAD PARAMETER REG 1
0001CE 4100 0D58            00D68   134+         LA    0,PL12A LOAD PARAMETER REG 0
0001D2 1311                         135+         LCR   1,1 INDICATE TYPE D
0001D4 0A12                         136+         SVC   18 ISSUE FIND SVC
0001D6 12FF                         137          LTR   15,15                    BRANCH
0001D8 4780 D21C            0022C   138          BZ    DS20                     IF FOUND
0001DC 4110 0000            00000   139          LA    1,0                      INDICATE NO
0001E0 4010 0F92            00FA2   140          STH   1,PL2B-2                 DIRECTORY INFORMATION
                                    141          WRITE DS10,SF,PL2D,PL2B-2,'S' WRITE
0001E4                              142+         CNOP  0,4
0001E4 4510 D1EC            001FC   143+         BAL   1,**+24 LOAD DECB ADDRESS
0001E8 00000000                     144+DS10     DC    F'0' EVENT CONTROL BLOCK
0001EC 80                           145+         DC    X'80' TYPE FIELD
0001ED 20                           146+         DC    X'20' TYPE FIELD
0001EE 0000                         147+         DC    AL2(0) LENGTH
0001F0 000019B0                     148+         DC    A(PL2D) DCB ADDRESS
0001F4 00000FA2                     149+         DC    A(PL2B-2) AREA ADDRESS
0001F8 00000000                     150+         DC    A(0) RECORD POINTER WORD
0001FC 58F1 0008            00008   151+         L     15,8(1,0) LOAD DCB ADDRESS
000200 58F0 F030            00030   152+         L     15,48(0,15) LOAD RDWR ROUTINE ADDR
000204 05EF                         153+         BALR  14,15 LINK TO RDWR ROUTINE
                                    154          CHECK DS10                     MEMBER
000206 4110 D1D8            001E8   155+         LA    1,DS10 LOAD PARAMETER REG 1
00020A 58E0 1008            00008   156+         L     14,8(0,1) PICK UP DCB ADDRESS
00020E 58F0 E034            00034   157+         L     15,52(0,14) LOAD CHECK ROUT. ADDR.
000212 05EF                         158+         BALR  14,15 LINK TO CHECK ROUTINE
                                    159          STOW  PL2D,PL12A               INFORMATION
000214 4110 C9A0            019B0   160+         LA    1,PL2D LOAD PARAMETER REG 1
000218 4100 0D58            00D68   161+         LA    0,PL12A LOAD PARAMETER REG 0
00021C 0A15                         162+         SVC   21 ISSUE STOW SVC
                                    163          FIND  PL5D,PL12A,D             FIND DISPLAY MEMBER
00021E 4110 CAB0            01AC0   164+         LA    1,PL5D LOAD PARAMETER REG 1
000222 4100 0D58            00D68   165+         LA    0,PL12A LOAD PARAMETER REG 0
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000226 1311                          166+         LCR   1,1 INDICATE TYPE D
000228 0A12                          167+         SVC   18 ISSUE FIND SVC
                                     168 DS20     READ  DS3D,SF,PL5D,PL2B-2,'S' READ DIRECTORY BLOCK
00022A 0700                          169+         CNOP  0,4
00022C 4510 D234             00244   170+DS20     BAL   1,*+24 LOAD DECB ADDRESS
000230 00C00000                      171+DS3D     DC    F'0' EVENT CONTROL BLOCK
000234 80                            172+         DC    X'80' TYPE FIELD
000235 80                            173+         DC    X'80' TYPE FIELD
000236 0000                          174+         DC    AL2(0) LENGTH
000238 00001AC0                      175+         DC    A(PL5D) DCB ADDRESS
00023C 00000FA2                      176+         DC    A(PL2B-2) AREA ADDRESS
000240 00000000                      177+         DC    A(0) RECORD POINTER WORD
000244 58F1 0008             00008   178+         L     15,8(1,0) LOAD DCB ADDRESS
000248 58F0 F030             00030   179+         L     15,48(0,15) LOAD RDWR ROUTINE ADDR
00024C 05EF                          180+         BALR  14,15 LINK TO RDWR ROUTINE
                                     181          CHECK DS3D                        CHECK I/O
00024E 4110 D220             00238   182+         LA    1,DS3D LOAD PARAMETER REG 1
000252 58E0 1008             00008   183+         L     14,8(0,1) PICK UP DCB ADDRESS
000256 58F0 E034             00034   184+         L     15,52(0,14) LOAD CHECK ROUT. ADDR.
00025A 05EF                          185+         BALR  14,15 LINK TO CHECK ROUTINE
00025C 4890 DF92             00FA2   186          LH    9,PL2B-2                    INITIALISE DIRECTORY
000260 4199 DF74             00F84   187          LA    9,PL2B-32(9)                POINTER
000264 41A0 C294             012A4   188          LA    10,PL2B+768                 TEST FOR
000268 199A                          189          CR    9,10                        DIRECTORY
00026A 4780 D2C4             002D4   190          BNL   JB5                         FULL
                                     191 PL60     DISPLAY 5,PL2C,PL3C-PL2C-2        REQUEST TAPE
00026E 4100 0005             00005   192+PL60     LA    0,5
000272 4110 C808             01818   193+         LA    1,PL2C
000276 4120 0016             00016   194+         LA    2,PL3C-PL2C-2
00027A 45E0 DCD4             00CE4   195+         BAL   14,PLD
                                     196          DISPLAY 2,PL1B,80                 VOL SER
00027E 4100 0002             00002   197+         LA    0,2
000282 4110 DD90             00DA0   198+         LA    1,PL1B
000286 4120 0050             00050   199+         LA    2,80
00028A 45E0 DCD4             00CE4   200+         BAL   14,PLD
00028E 4780 D25E             0026E   201          BZ    PL60                        REPEAT IF ZERO BYTE COUNT
000292 D205 CB82 DD92 01B92  00DA2   202          MVC   PLJ+118(6),PL1B+2           SET INTO JFCB
                                     203          OPEN  PL3D,TYPE=J                 OPEN TAPE DCB
000298                               204+         CNOP  0,4
000298 4510 D290             002A0   205+         BAL   1,*+8 LOAD REG1 W/LIST ADDR.
00029C 80                            206+         DC    AL1(128) OPTION BYTE
00029D 001A08                        207+         DC    AL3(PL3D) DCB ADDRESS
0002A0 0A16                          208+         SVC   22 ISSUE OPENJ SVC
0002A2 9110 CA28       01A38         209          TM    PL3D+48,X'10'               TEST
0002A6 47E0 D0A4             000B4   210          BNO   PL10                        OPEN
                                     211 PL80     GET   PL3D,PL3B                   READ RECORD
0002AA 4110 C9F8             01A08   212+PL80     LA    1,PL3D LOAD PARAMETER REG 1
0002AE 4100 C2B8             012C8   213+         LA    0,PL3B LOAD PARAMETER REG 0
0002B2 58F0 1030             00030   214+         L     15,48(0,1) LOAD GET ROUTINE ADDR.
0002B6 05EF                          215+         BALR  14,15 LINK TO GET ROUTINE
0002B8 4100 0018             00018   216          LA    0,24                        CONTINUE
0002BC 4900 CA4A             01A5A   217          CH    0,PL3D+82                   IF NOT
0002C0 4770 D29A             002AA   218          BNE   PL80                        24 BYTES
0002C4 9500 C2B8       012C8         219 PL82     CLI   PL3B,0                      CONTINUE IF NOT
0002C8 4780 D29A             002AA   220          BE    PL80                        24 BYTE ID RECORD
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

0002CC 95FF DD6A      00D7A          221          CLI   PL15A,255              NO NEW LIST
0002D0 4780 D434            00444    222          BE    J850                   UNLESS CHANGED
0002D4 9200 DD90      00DA0          223 J85      MVI   PL1B,0                 CLEAR OUTPUT
0002D8 D2FE DD91 DD90 00DA1 00DA0    224          MVC   PL1B+1(255),PL1B       BUFFER
0002DE 9218 DD92      00DA2          225          MVI   PL1B+2,X'18'           CANCEL
0002E2 929F UE8E      00E9E          226          MVI   PL1B+254,X'9F'         US
0002E6 9281 DE8F      00E9F          227          MVI   PL1B+255,X'81'         AND HOME
                                     228          DISPLAY 1,PL1B,254           CLEAR DISPLAY SCREEN
0002EA 4100 0001            00001    229+         LA    0,1
0002EE 4110 DD90            00DA0    230+         LA    1,PL1B
0002F2 4120 00FE            000FE    231+         LA    2,254
0002F6 45E0 DCD4            00CE4    232+         BAL   14,PLD
0002FA 4870 DF92            00FA2    233          LH    7,PL2B-2               LOAD AND
0002FE 8870 0005            00005    234          SRL   7,5                    TEST
000302 1277                          235          LTR   7,7                    DIRECTORY
000304 4770 D30C            0031C    236          BNZ   J810                   COUNT
                                     237          DISPLAY 1,PL8C,PL9C-PL8C-2   NO PLOTS CURRENTLY HELD
000308 4100 0001            00001    238+         LA    0,1
00030C 4110 C87E            0188E    239+         LA    1,PL8C
000310 4120 001E            0001E    240+         LA    2,PL9C-PL8C-2
000314 45E0 DCD4            00CE4    241+         BAL   14,PLD
000318 47F0 D434            00444    242          B     J850                   ON DISK DATA SET
00031C 4160 0001            00001    243 J810     LA    6,1                    INITIALISE COUNTER
000320 4180 DF94            00FA4    244          LA    8,PL2B                 AND POINTER
                                     245          DISPLAY 1,PL9C,PL11C-PL9C-2  WRITE HEADING
000324 4100 0001            00001    246+         LA    0,1
000328 4110 C89E            018AE    247+         LA    1,PL9C
00032C 4120 003A            0003A    248+         LA    2,PL11C-PL9C-2
000330 45E0 DCD4            00CE4    249+         BAL   14,PLD
000334 4130 DD92            00DA2    250          LA    3,PL1B+2               SET OUTPUT POINTER
000338 4140 0000            00000    251          LA    4,0                    CLEAR RECORD TOTAL
00033C 9240 3000      00000          252 J820     MVI   0(3),C' '              CLEAR
000340 D232 3001 3000 00001 00000    253          MVC   1(51,3),0(3)           MESSAGE
000346 4E60 DD50            00D60    254          CVD   6,PL11A                CONVERT
00034A F342 DD50 DD56 00D60 00D66    255          UNPK  PL11A(5),PL11A+6(3)    NUMBER
000350 D201 3000 DD51 00000 00D61    256          MVC   0(2,3),PL11A+1         TO DECIMAL
000356 95F0 3000      00000          257          CLI   0(3),C'0'              SUPPRESS
00035A 4770 D352            00362    258          BNE   J830                   LEADING
00035E 9240 3000      00000          259          MVI   0(3),C' '              ZERO
000362 D217 3003 8000 00003 00000    260 J830     MVC   3(24,3),0(8)           SET JOBNAME IN PLACE
000368 4850 8018            00018    261          LH    5,24(0,8)              CONVERT
00036C 4E50 DD50            00D60    262          CVD   5,PL11A                NUMBER
000370 D205 301D DD64 0001D 00D74    263          MVC   29(6,3),PL13A          OF PLOTS
000376 DE05 301D DD55 0001D 00D65    264          ED    29(6,3),PL11A+5        TO DECIMAL
00037C 4850 801A            0001A    265          LH    5,26(0,8)              CONVERT
000380 4E50 DD50            00D60    266          CVD   5,PL11A                NUMBER OF INPUT
000384 D205 3027 DD64 00027 00D74    267          MVC   39(6,3),PL13A          RECORDS
00038A DE05 3027 DD55 00027 00D65    268          ED    39(6,3),PL11A+5        TO DECIMAL
000390 4850 801C            0001C    269          LH    5,28(0,8)              CONVERT
000394 4E50 DD50            00D60    270          CVD   5,PL11A                NUMBER OF OUTPUT
000398 D205 302D DD64 0002D 00D74    271          MVC   45(6,3),PL13A          RECORDS
00039E DE05 302D DD55 0002D 00D65    272          ED    45(6,3),PL11A+5        TO DECIMAL
0003A4 DC33 3000 C5D8 00000 015E8    273          TR    0(52,3),PL1T           TRANSLATE TO ASCII
0003AA 928D 3034            00034    274          MVI   52(3),X'8D'            ADD CR
0003AE 920A 3035            00035    275          MVI   53(3),X'0A'            AND LF
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

0003R2 1A45                        276          AR    4,5                     ADD TO TOTAL
0003R4 4130 3036             00036 277          LA    3,54(0,3)               UPDATE OUTPUT POINTER
000388 4110 0F78             00F88 278          LA    1,PL1B+2+9*54           TEST FOR END
00038C 1913                        279          CR    1,3                     OF BUFFER
00038E 4720 03C6             003D6 280          BH    JB35                    BRANCH IF NOT FULL
                                   281          DISPLAY 1,PL1B,9*54           SEND BUFFER TO NOVA
0003C2 4100 0001             00001 282+         LA    0,1
0003C6 4110 DD90             00DA0 283+         LA    1,PL1B
0003CA 4120 01E6             001E6 284+         LA    2,9*54
0003CE 45E0 0CD4             00CE4 285+         BAL   14,PLD
0003D2 4130 DD92             00DA2 286          LA    3,PL1B+2                RESET OUTPUT POINTER
0003D6 4160 6001             00001 287 JB35     LA    6,1(0,6)                UPDATE COUNTER
0003DA 4180 8020             00020 288          LA    8,32(0,8)               AND POINTER
0003DE 4670 D32C             0033C 289          BCT   7,JB20                  LOOP N TIMES
0003E2 4100 0001             00001 290          LA    0,1                     SET WRITE COMMAND
0003E6 4110 DD90             00DA0 291          LA    1,PL1B                  SET OUTPUT POINTER
0003EA 4120 DD92             00DA2 292          LA    2,PL1B+2                CALCULATE
0003EE 1B32                        293          SR    3,2                     SIZE OF BUFFER SO FAR
0003F0 4780 D3EA             003FA 294          BZ    JB38                    BRANCH IF EMPTY
0003F4 1823                        295          LR    2,3                     LOAD BUFFER LENGTH
0003F6 45E0 0CD4             00CE4 296          BAL   14,PLD                  SEND RESIDUAL RECORD
0003FA 4130 0064             00064 297 JB38     LA    3,100                   MULTIPLY THE RECORD COUNT
0003FE 1C24                        298          MR    2,4                     BY 100
000400 5840 CA24             01A34 299          L     4,PL3D+44               LOAD DEB ADDRESS
000404 4840 402E             0002E 300          LH    4,46(0,4)               LOAD NO OF TRACKS IN 1ST EXTENT
000408 1D24                        301          DR    2,4                     DIVIDE BY TRACK NUMBER
00040A 8830 0003             00003 302          SRL   3,3                     DIVIDE BY NO OF RECORDS/TRACK
                                   303 *
                                   304 *        NOTE: THIS ASSUMES 8 RECORDS (802 BYTES) PER TRACK
                                   305 *              I.E. 2314 DISK DRIVE CAPACITY.
                                   306 *
00040E 4E30 0D50             00D60 307          CVD   3,PL11A                 CONVERT
000412 D205 DD90 0D64 00DA0  00D74 308          MVC   PL1B(6),PL13A           PERCENT
000418 DE05 DD90 DD55 00DA0  00D65 309          ED    PL1B(6),PL11A+5         TO
00041E D202 C8F0 DD93 01900  00DA3 310          MVC   PL12C+2(3),PL1B+3       DECIMAL
000424 DC02 C8F0 C5D8 01900  015E8 311          TR    PL12C+2(3),PL1T         TRANSLATE TO ASCII
                                   312          DISPLAY 1,PL12C,PL14C-PL12C-2 PRINT PERCENT UTILISATION
00042A 4100 0001             00001 313+         LA    0,1
00042E 4110 C8EE             01AFE 314+         LA    1,PL12C
000432 4120 0034             00034 315+         LA    2,PL14C-PL12C-2
000436 45E0 0CD4             00CE4 316+         BAL   14,PLD
00043A 41A0 C294             012A4 317 JB40     LA    10,PL2B+768             TEST FOR
00043E 199A                        318          CR    9,10                    DIRECTORY
000440 47B0 D5FA             0060A 319          BNL   PL600                   FULL
000444 D217 9020 C2B8 0002C  012C8 320 JB50     MVC   32(24,9),PL3B           SAVE JOB INFORMATION
00044A D203 C2D0 C830 012E0  01840 321          MVC   PL3B+24(4),PL4C         ADD ? TO LINE
000450 DC17 C2B8 C5D8 012C8  015E8 322          TR    PL3B(24),PL1T           TRANSLATE TO ASCII
000456 92FF DD6A       00D7A       323          MVI   PL15A,255               INDICATE NO PLOT DATA FOUND
                                   324 JB60     DISPLAY 5,PL3B-2,28           VERIFY JOBNAME
00045A 4100 0005             00005 325+JB60     LA    0,5
00045E 4110 C2B6             012C6 326+         LA    1,PL3B-2
000462 4120 001C             00F1C 327+         LA    2,28
000466 45E0 0CD4             00CE4 328+         BAL   14,PLD
                                   329          DISPLAY 2,PL1B,60             AND TIME
00046A 4100 0002             00002 330+         LA    0,2
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

00046E 4110 DD90             00DA0  331+         LA    1,PL1B
000472 4120 0050             00050  332+         LA    2,80
000476 45E0 DCD4             00CE4  333+         BAL   14,PLD
00047A 4780 D44A             0045A  334          BZ    JB60                REPEAT QUESTION IF ZERO BYTE CT
00047E 95C5 DD92       00DA2        335          CLI   PL1B+2,C'E'         IS IT
000482 4780 D118             00128  336          BE    PL47                END ?
000486 95E8 DD92       00DA2        337          CLI   PL1B+2,C'Y'         IS IT
00048A 4780 D48A             0049A  338          BE    PL84                YES ?
00048E 95D5 DD92       00DA2        339          CLI   PL1B+2,C'N'         IS IT
000492 4780 D29A             002AA  340          BE    PL80                NO ?
000496 47F0 D44A             0045A  341          B     JB60                REPEAT QUESTION
00049A 9200 DD3B       00D4B        342 PL84     MVI   PL4A,0               INDICATE FIRST START OF PLOT
                                    343 PL90     GET   PL3D,PL3B           READ RECORD
00049E 4110 C9F8             01A08  344+PL90     LA    1,PL3D LOAD PARAMETER REG 1
0004A2 4100 C2B8             012C8  345+         LA    0,PL3B LOAD PARAMETER REG 0
0004A6 58F0 1030             00030  346+         L     15,48(0,1) LOAD GET ROUTINE ADDR.
0004AA 05EF                         347+         BALR  14,15 LINK TO GET ROUTINE
0004AC 4100 0018             00018  348          LA    0,24                CHECK FOR
0004B0 4900 CA4A             01A5A  349          CH    0,PL3D+82           24 BYTE
0004B4 4770 D4C4             004D4  350          BNE   PL95                RECORDS
0004B8 9500 C2B8       012C8        351          CLI   PL3B,0              IGNORE 24 BYTE
0004BC 4780 D48E             0049E  352          BE    PL90                PRIMARY WRITE RECORD
                                    353          DISPLAY 1,PL6C,PL7C-PL6C-2  NO PLOT DATA FOUND
0004C0 4100 0001             00001  354+         LA    0,1
0004C4 4110 C844             01854  355+         LA    1,PL6C
0004C8 4120 0014             00014  356+         LA    2,PL7C-PL6C-2
0004CC 45E0 DCD4             00CE4  357+         BAL   14,PLD
0004D0 47F0 D434             00444  358          B     JB50                CONTINUE SEARCH
0004D4 4100 0320             00320  359 PL95     LA    0,800               FIND
0004D8 4900 CA4A             01A5A  360          CH    0,PL3D+82           800 BYTE
0004DC 4770 D48E             0049E  361          BNE   PL90                RECORDS
0004E0 95E8 C2B8       012C8        362          CLI   PL3B,C'Y'           CHECK FOR START OF
0004E4 4770 D48E             0049E  363          BNE   PL90                PLOT CHARACTER
0004E8 9200 DD6A       00D7A        364          MVI   PL15A,0             INDICATE PLOT DATA FOUND
0004EC 4190 9020             00020  365          LA    9,32(0,9)           UPDATE DIRECTORY POINTER
0004F0 D707 9018 9018 00018 00018  366          XC    24(8,9),24(9)       CLEAR COUNTERS
0004F6 9201 901B       001B         367          MVI   27(9),1             INDICATE 1 INPUT RECORD
0004FA 4110 C2B8             012C8  368          LA    1,PL3B              SET START
0004FE 5010 DCCC             00CDC  369          ST    1,PLC1P             AND END OF
000502 4A10 CA4A             01A5A  370          AH    1,PL3D+82           BUFFER
000506 5010 DCD0             00CE0  371          ST    1,PLC2P             ADDRESSES
00050A D727 DD70 DD70 00D80 00D80  372 PL100    XC    PL1P(40),PL1P       CLEAR CO-ORDINATES
000510 9200 DD3A       00D4A        373          MVI   PL3A,0              INDICATE PEN UP
000514 45B0 D9E0             009F0  374 PL130    BAL   11,PLC             4 LOAD NEXT PLOTTER INCREMENT
000518 4210 DD38             00D48  375          STC   1,PL1A              STORE CHARACTER 1
00051C 4150 0000             00000  376 PL140    LA    5,0                 CLEAR
000520 4160 0000             00000  377          LA    6,0                 COUNTERS
000524 4150 5001             00001  378 PL150    LA    5,1(0,5)            5 INCREMENT COUNTER 1
000528 D207 DD78 DD88 00D88 00D98  379          MVC   PL2P(8),PL4P        SET NPO = CP
00052E 45B0 D9E0             009F0  380          BAL   11,PLC              LOAD NEXT PLOTTER INCREMENT
000532 4410 C924             01934  381 PL160    EX    1,PL1X              6 SAME AS CHAR 1 ?
000536 4780 D514             00524  382          BE    PL150               CONTINUE IF SO
00053A 4120 0000             00000  383          LA    2,0                 RELOAD
00053E 4320 DD38             00D48  384          IC    2,PL1A              CHAR 1
000542 1821                         385          SR    2,1                 FORM DIFFERENCE
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000544 1022                        386          LPR   2,2                    MAKE POSITIVE
000546 4920 DD3C             00D4C 387          CH    2,PL5A                 IS IT
00054A 4780 D556             00566 388          BE    PL180                  ONE ?
00054E 4920 DD3E             00D4E 389          CH    2,PL6A                 OR
000552 4780 D556             00566 390          BE    PL180                  SEVEN ?
000556 4210 DD38             00D48 391 PL170    STC   1,PL1A                7 STORE AS CHARACTER 1
00055A 9801 DD78             00D88 392          LM    0,1,PL2P               LOAD OUTPUT VECTOR
00055E 45A0 D61E             0062E 393          BAL   10,PL8                 ADD TO OUTPUT
000562 47F0 D50C             0051C 394          B     PL140                  CONTINUE
000566 D207 DD80 DD88 00D90  00D98 395 PL180    MVC   PL3P(8),PL4P           8 SET APO = CP
00056C 4210 DD39             00D49 396          STC   1,PL2A                 STORE AS CHAR 2
000570 4580 D9E0             009F0 397          BAL   11,PLC                 LOAD NEXT PLOTTER INCREMENT
000574 4410 C924             01934 398          EX    1,PL1X                 SAME AS CHAR 1 ?
000578 4780 D596             005A6 399          BE    PL200                  BRANCH IF SO
00057C 4350 DD39             00D49 400 PL190    IC    5,PL2A                 9 SET CHAR 1
000580 4250 DD38             00D48 401          STC   5,PL1A                 = CHAR 2
000584 4210 DD39             00D49 402          STC   1,PL2A                 STORE CHAR TEMPORARILY
000588 9801 DD78             00D88 403          LM    0,1,PL2P               LOAD OUTPUT VECTOR
00058C 45A0 D61E             0062E 404          BAL   10,PL8                 OUTPUT VECTOR
000590 D207 DD78 DD80 00D88  00D90 405          MVC   PL2P(8),PL3P           SET NPO = APO
000596 4150 0001             00001 406          LA    5,1                    SET COUNTER TO 1
00059A 4110 0000             00000 407          LA    1,0                    CLEAR REGISTER 1
00059E 4310 DD39             00D49 408          IC    1,PL2A                 LOAD CURRENT CHARACTER
0005A2 47F0 D522             00532 409          B     PL160                  BRANCH
0005A6 4160 6001             00001 410 PL200    LA    6,1(0,6)              10 UPDATE COUNTER 2
0005AA D207 DD78 DD88 00D88  00D98 411          MVC   PL2P(8),PL4P           SET NPO = CP
0005B0 45B0 D9E0             009F0 412          BAL   11,PLC                 LOAD NEXT PLOTTER INCREMENT
0005B4 4410 C924             01934 413          EX    1,PL1X                 SAME AS CHAR 1 ?
0005B8 4780 D596             005A6 414          BE    PL200                  CONTINUE IF SO
0005BC 1856                        415          SR    5,6                    COMPARE TWO
0005BE 4720 D546             00556 416          BP    PL170                  COUNTERS
0005C2 4410 C928             01938 417 PL210    EX    1,PL2X                11 SAME AS CHAR 2 ?
0005C6 4770 D546             00556 418          BNE   PL170                  NO
0005CA D207 DD80 DD88 00D90  00D98 419          MVC   PL3P(8),PL4P           SET APO = CP
0005D0 4580 D9E0             009F0 420          BAL   11,PLC                 LOAD NEXT PLOTTER INCREMENT
0005D4 4410 C924             01934 421          EX    1,PL1X                 SAME AS CHAR 1 ?
0005D8 4770 D56C             0057C 422          BNE   PL190                  NO
0005DC 4150 0000             00000 423          LA    5,0                    CLEAR COUNTER 3
0005E0 4150 5001             00001 424 PL230    LA    5,1(0,5)              13 UPDATE COUNTER 3
0005E4 D207 DD78 DD88 00D88  00D98 425          MVC   PL2P(8),PL4P           SET NPO = CP
0005EA 45B0 D9E0             009F0 426          BAL   11,PLC                 LOAD NEXT PLOTTER INCREMENT
0005EE 4410 C924             01934 427          EX    1,PL1X                 SAME AS CHAR 1 ?
0005F2 4780 D5D0             005E0 428          BE    PL230                  LOOP IF SO
0005F6 1856                        429          SR    5,6                    FORM MODULUS
0005F8 1055                        430          LPR   5,5                    OF DIFFERENCE
0005FA 4780 D5B2             005C2 431          BZ    PL210                  BRANCH
0005FE 4950 DD3C             00D4C 432          CH    5,PL5A                 IF ZERO
000602 4770 D546             00556 433          BNE   PL170                  OR ONE
000606 47F0 D5B2             005C2 434          B     PL210                  CONTINUE
                                   435 PL600    DISPLAY 1,PL3C,PL4C-PL3C-2   DIRECTORY FULL
00060A 4100 0001             00001 436+PL600    LA    0,1
00060E 4110 C820             01830 437+         LA    1,PL3C
000612 4120 000E             0000E 438+         LA    2,PL4C-PL3C-2
000616 45E0 DCD4             00CE4 439+         BAL   14,PLD
                                   440 PL610    DISPLAY 1,PL11C,PL12C-PL11C-2 WRITE 'END OF STEP'
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

00061A 4100 0001            00001   441+PL610    LA    0,1
00061E 4110 C8DA            018EA   442+         LA    1,PL11C
000622 4120 0012            00012   443+         LA    2,PL12C-PL11C-2
000626 45E0 DCD4            00CE4   444+         BAL   14,PLD
00062A 47F0 D0C8            000D8   445          B     PL30                    EXIT
                                    446 *
                                    447 *        SEND PLOT CO-ORDINATES TO OUTPUT BUFFER
                                    448 *
00062E 9001 DD70            00D80   449 PLB      STM   0,1,PL1P                STORE AS NEW CO
000632 5840 D6B4            006C4   450          L     4,PLB1P                 TEST
000636 5940 D6B8            006C8   451          C     4,PLB2P                 POINTERS
00063A 4740 D67C            0068C   452          BL    PLB10                   BRANCH IF LOW
00063E 4100 0320            00320   453          LA    0,PLB2D-PLB1D           SET
000642 4000 D6BE            006CE   454          STH   0,PLB1D-2               BLKSIZE IN RECORD
                                    455          WRITE PL85,SF,PL2D,PLB1D-2,'S' WRITE RECORD
000646 0700                         456+         CNOP  0,4
000648 4510 D650            00660   457+         BAL   1,*+24 LOAD DECB ADDRESS
00064C 00000000                     458+PLB5     DC    F'0' EVENT CONTROL BLOCK
000650 80                           459+         DC    X'80' TYPE FIELD
000651 20                           460+         DC    X'20' TYPE FIELD
000652 0000                         461+         DC    AL2(0) LENGTH
000654 00001980                     462+         DC    A(PL2D) DCB ADDRESS
000658 000006CE                     463+         DC    A(PLB1D-2) AREA ADDRESS
00065C 00000000                     464+         DC    A(0) RECORD POINTER WORD
000660 58F1 0008            00008   465+         L     15,8(1,0) LOAD DCB ADDRESS
000664 58F0 F030            00030   466+         L     15,48(0,15) LOAD RDWR ROUTINE ADDR
000668 05EF                         467+         BALR  14,15 LINK TO RDWR ROUTINE
                                    468          CHECK PLB5                    WAIT
00066A 4110 D63C            0064C   469+         LA    1,PLB5 LOAD PARAMETER REG 1
00066E 58E0 1008            00008   470+         L     14,8(0,1) PICK UP DCB ADDRESS
000672 58F0 E034            00034   471+         L     15,52(0,14) LOAD CHECK ROUT. ADDR.
000676 05EF                         472+         BALR  14,15 LINK TO CHECK ROUTINE
000678 4840 901C            0001C   473          LH    4,28(0,9)               KEEP OUTPUT
00067C 4140 4001            00001   474          LA    4,1(0,4)                RECORD
000680 4040 901C            0001C   475          STH   4,28(0,9)               COUNT
000684 4140 D6C0            006D0   476          LA    4,PLB1D                 RESET
000688 5040 D6B4            006C4   477          ST    4,PLB1P                 POINTER
00068C D201 4000 DD76 00000 00D86   478 PLB10    MVC   0(2,4),PL1P+6           STORE
000692 D201 4002 DD72 00002 00D82   479          MVC   2(2,4),PL1P+2           CO-ORDINATES IN BUFFER
000698 947F 4002      00002         480          NI    2(4),X'7F'              CLEAR PEN UP BIT
00069C 95FF DD3A      00D4A         481          CLI   PL3A,255                TEST FOR
0006A0 4780 D698            006A8   482          BE    PLB20                   PEN DOWN
0006A4 9680 4002      00002         483          OI    2(4),X'80'              SET PEN UP INDICATOR
0006A8 95FF DD3B      00D4B         484 PLB20    CLI   PL4A,255                INDICATE
0006AC 4770 D6A8            00688   485          BNE   PLB30                   START
0006B0 9640 4002      00002         486          OI    2(4),X'40'              OF
0006B4 92F0 DD3B      00D4B         487          MVI   PL4A,240                PLOT
0006B8 4140 4004            00004   488 PLB30    LA    4,4(0,4)                UPDATE
0006BC 5040 D6B4            006C4   489          ST    4,PLB1P                 POINTER
0006C0 07FA                         490          BR    10                      RETURN
                                    491 *
0006C2 0000
0006C4 000006D0                     492 PLB1P    DC    A(PLB1D)                OUTPUT
0006C8 000009F0                     493 PLB2P    DC    A(PLB2D)                POINTERS
0006CC                              494          DS    F                       BLKSIZE
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

0006D0                            495 PLB1D    DS    200F                    OUTPUT BUFFER
0009F0                            496 PLB2D    EQU   *
                                  497 *
                                  498 *        LOAD NEXT PLOTTER CHARACTER
                                  499 *
0009F0 5820 DCCC          00CDC   500 PLC      L     2,PLC1P                 IS BUFFER
0009F4 5920 DCD0          00CE0   501          C     2,PLC2P                 EMPTY ?
0009F8 4740 DA26          00A36   502          BL    PLC20                   BRANCH IF NOT
                                  503          GET   PL3D,PL3B               READ NEXT RECORD
0009FC 4110 C9F8          01A08   504+         LA    1,PL3D LOAD PARAMETER REG 1
000A00 4100 C2B8          012C8   505+         LA    0,PL3B LOAD PARAMETER REG 0
000A04 58F0 1030          00030   506+         L     15,48(0,1) LOAD GET ROUTINE ADDR.
000A08 05EF                       507+         BALR  14,15 LINK TO GET ROUTINE
000A0A 4100 0018          00018   508          LA    0,24                    EXIT IF
000A0E 4900 CA4A          01A5A   509          CH    0,PL3D+82               24 BYTE
000A12 4780 DCA0          00CB0   510          BE    PLC200                  RECORD FOUND
000A16 4120 C2B8          012C8   511          LA    2,PL3B                  SET START
000A1A 5020 DCCC          00CDC   512          ST    2,PLC1P                 AND END
000A1E 4A20 CA4A          01A5A   513          AH    2,PL3D+82               OF BUFFER
000A22 5020 DCD0          00CE0   514          ST    2,PLC2P                 ADDRESSES
000A26 5820 DCCC          00CDC   515          L     2,PLC1P                 RELOAD POINTER
000A2A 4810 901A          0001A   516          LH    1,26(0,9)               KEEP INPUT
000A2E 4110 1001          00001   517          LA    1,1(0,1)                RECORD
000A32 4010 901A          0001A   518          STH   1,26(0,9)               COUNT
000A36 4310 2000          00000   519 PLC20    IC    1,0(0,2)                LOAD CHARACTER
000A3A 4130 2001          00001   520          LA    3,1(0,2)                UPDATE
000A3E 5030 DCCC          00CDC   521          ST    3,PLC1P                 POINTER
000A42 4130 003F          0003F   522          LA    3,63                    ISOLATE LOW
000A46 1413                       523          NR    1,3                     ORDER 6 BITS
000A48 4780 D9E0          009F0   524          BZ    PLC                     REJECT IF NULL
000A4C 95F0 2000    00000         525          CLI   0(2),C'0'               COMPARE WITH
000A50 4740 DA7A          00A8A   526          BL    PLC100                  PLOT DIRECTIONS
000A54 95F7 2000    00000         527          CLI   0(2),C'7'               ZERO TO
000A58 4720 DA7A          00A8A   528          BH    PLC100                  SEVEN
000A5C 4121 1000          00000   529          LA    2,0(1,1)                POINT
000A60 4122 2000          00000   530          LA    2,0(2,2)                TO APPROPRIATE
000A64 4122 DBEC          00BFC   531          LA    2,PLC1C-192(2)          CO-ORDINATES
000A68 5830 DD88          00D98   532          L     3,PL4P                  UPDATE
000A6C 4A30 2000          00000   533          AH    3,0(0,2)                Y
000A70 5030 DD88          00D98   534          ST    3,PL4P                  CO-ORDINATE
000A74 5830 DD8C          00D9C   535          L     3,PL4P+4                UPDATE
000A78 4A30 2002          00002   536          AH    3,2(0,2)                X
000A7C 5030 DD8C          00D9C   537          ST    3,PL4P+4                CO-ORDINATE
000A80 95FF DD3A    00D4A         538          CLI   PL3A,255                NEXT PLOT INCREMENT
000A84 4770 D9E0          009F0   539          BNE   PLC                     IF PEN UP
000A88 07FB                       540          BR    11                      RETURN
000A8A 95E8 2000    00000         541 PLC100   CLI   0(2),C'Y'               START OF PLOT ?
000A8E 4770 DBDC          00BEC   542          BNE   PLC120                  BRANCH IF NOT
000A92 92FF DD6B    00D78         543          MVI   PL16A,255               INDICATE START OF PLOT
000A96 9500 DD3B    00D4B         544          CLI   PL4A,0                  BYPASS IF INITIAL
000A9A 4780 DB8C          00BCC   545          BE    PLC110                  START OF PLOT
000A9E 9801 DD88          00D98   546          LM    0,1,PL4P                LOAD OUTPUT VECTOR
000AA2 95FF DD3A    00D4A         547          CLI   PL3A,255                PEN
000AA6 4770 DAA2          00A82   548          BNE   PLC102                  DOWN ?
000AAA 4A00 DD40          00D50   549          AH    0,PL7A                  ADD END OF PLOT INDICATOR
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000AAE 45A0 D61E            0062E   550           BAL   10,PLB                  OUTPUT VALUE
000AB2 4140 D6C0            006D0   551 PLC102    LA    4,PLB1D                 TEST
000AB6 1344                         552           LCR   4,4                     OUTPUT
000AB8 5A40 D6B4            006C4   553           A     4,PLB1P                 POINTER
000ABC 4780 DAF8            00B08   554           BZ    PLC106                  BRANCH IF NO
000AC0 4040 D6BE            006CE   555           STH   4,PLB1D-2               OUTPUT REQUIRED
                                    556           WRITE PLC104,SF,PL2D,PLB1D-2,'S' WRITE RECORD
000AC4                              557+          CNOP  0,4
000AC4 4510 DACC            00ADC   558+          BAL   1,*+24 LOAD DECB ADDRESS
000AC8 00000000                     559+PLC104    DC    F'0' EVENT CONTROL BLOCK
000ACC 80                           560+          DC    X'80' TYPE FIELD
000ACD 20                           561+          DC    X'20' TYPE FIELD
000ACE 0000                         562+          DC    AL2(0) LENGTH
000AD0 00001980                     563+          DC    A(PL2D) DCB ADDRESS
000AD4 000006CE                     564+          DC    A(PLB1D-2) AREA ADDRESS
000AD8 00000000                     565+          DC    A(0) RECORD POINTER WORD
000ADC 58F1 0008            00008   566+          L     15,8(1,0) LOAD DCB ADDRESS
000AE0 58F0 F030            00030   567+          L     15,48(0,15) LOAD RDWR ROUTINE ADDR
000AE4 05EF                         568+          BALR  14,15 LINK TO RDWR ROUTINE
                                    569           CHECK PLC104                  WAIT
000AE6 4110 DAB8            00AC8   570+          LA    1,PLC104 LOAD PARAMETER REG 1
000AEA 58E0 1008            00008   571+          L     14,8(0,1) PICK UP DCB ADDRESS
000AEE 58F0 E034            00034   572+          L     15,52(0,14) LOAD CHECK ROUT. ADDR.
000AF2 05EF                         573+          BALR  14,15 LINK TO CHECK ROUTINE
000AF4 4840 901C            0001C   574           LH    4,28(0,9)               UPDATE
000AF8 4140 4001            00001   575           LA    4,1(0,4)                RECORD
000AFC 4040 901C            0001C   576           STH   4,28(0,9)               COUNT
000B00 4140 D6C0            006D0   577           LA    4,PLB1D                 RESET
000B04 5040 D6B4            006C4   578           ST    4,PLB1P                 OUTPUT POINTER
000B08 D202 DD44 9000 00D54 00000   579 PLC106    MVC   PL10A(3),0(9)           USE 1ST 3 LETTERS OF JOBNAME
000B0E 4140 DF74            00F84   580           LA    4,PL2B-32               CALCULATE
000B12 1344                         581           LCR   4,4                     PLOT
000B14 1A49                         582           AR    4,9                     NUMBER
000B16 8840 0005            00005   583           SRL   4,5                     DIVIDE BY 32
000B1A 4E40 DD50            00D60   584           CVD   4,PL11A                 CONVERT TO DECIMAL
000B1E F342 DD50 DD56 00D60 00D66   585           UNPK  PL11A(5),PL11A+6(3)     USE TWO
000B24 D201 DD47 DD51 00D57 00D61   586           MVC   PL10A+3(2),PL11A+1      DIGITS
000B2A 4840 9018            00018   587           LH    4,24(0,9)               INCREMENT
000B2E 4140 4001            00001   588           LA    4,1(0,4)                PLOT
000B32 4040 9018            00018   589           STH   4,24(0,9)               NUMBER
000B36 4E40 DD50            00D60   590           CVD   4,PL11A                 USE THREE DIGITS
000B3A F342 DD52 DD56 00D60 00D66   591           UNPK  PL11A(5),PL11A+6(3)     OF PLOT
000B40 D202 DD49 DD50 00D59 00D60   592           MVC   PL10A+5(3),PL11A        NUMBER
                                    593           STOW  PL2D,PL10A              CREATE MEMBER NAME
000B46 4110 C9A0            019B0   594+          LA    1,PL2D LOAD PARAMETER REG 1
000B4A 4100 DD44            00D54   595+          LA    0,PL10A LOAD PARAMETER REG 0
000B4E 0A15                         596+          SVC   21 ISSUE STOW SVC
000B50 D21F C7D8 9000 017E8 00000   597           MVC   PL4J(32),0(9)           SAVE DIRECTORY ENTRY
                                    598           FIND  PL4D,PL12A,D            FIND DIRECTORY
000B56 4110 CA58            01A68   599+          LA    1,PL4D LOAD PARAMETER REG 1
000B5A 4100 DD58            00D68   600+          LA    0,PL12A LOAD PARAMETER REG 0
000B5E 1311                         601+          LCR   1,1 INDICATE TYPE D
000B60 0A12                         602+          SVC   18 ISSUE FIND SVC
                                    603           READ  DSDFCB,SF,MF=E          READ
000B62 4110 C958            01968   604+          LA    1,DSDECB LOAD DECB ADDRESS
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000B66 9280 1005       00005        605+         MVI   5(1),X'80' SET TYPE FIELD
000B6A 58F1 0008             00008  606+         L     15,8(1,0) LOAD DCB ADDRESS
000B6E 58F0 F030             00030  607+         L     15,48(0,15) LOAD RDWR ROUTINE ADDR
000B72 05EF                         608+         BALR  14,15 LINK TO RDWR ROUTINE
                                    609          CHECK DSDECB                    AND CHECK I/O
000B74 4110 C958             01968  610+         LA    1,DSDECB LOAD PARAMETER REG 1
000B78 58E0 1008             00008  611+         L     14,8(0,1) PICK UP DCB ADDRESS
000B7C 58F0 E034             00034  612+         L     15,52(0,14) LOAD CHECK ROUT. ADDR.
000B80 05EF                         613+         BALR  14,15 LINK TO CHECK ROUTINE
000B82 D21F 9000 C7D8 00000 017E8    614          MVC   0(32,9),PL4J              RESET ENTRY
000B88 4140 DF74             00F84  615          LA    4,PL2B-32                 CALCULATE
000B8C 1344                         616          LCR   4,4                       CURRENT
000B8E 1A49                         617          AR    4,9                       DIRECTORY
000B90 4040 DF92             00FA2  618          STH   4,PL2B-2                  SIZE
                                    619          WRITE DSDECB,SF,MF=E            RE-WRITE DIRECTORY MEMBER
000B94 4110 C958             01968  620+         LA    1,DSDECB LOAD DECB ADDRESS
000B98 9220 1005       00005        621+         MVI   5(1),X'20' SET TYPE FIELD
000B9C 58F1 0008             00008  622+         L     15,8(1,0) LOAD DCB ADDRESS
000BA0 58F0 F030             00030  623+         L     15,48(0,15) LOAD RDWR ROUTINE ADDR
000BA4 05EF                         624+         BALR  14,15 LINK TO RDWR ROUTINE
                                    625          CHECK DSDECB                    CHECK I/O
000BA6 4110 C958             01968  626+         LA    1,DSDECB LOAD PARAMETER REG 1
000BAA 58E0 1008             00008  627+         L     14,8(0,1) PICK UP DCB ADDRESS
000BAE 58F0 E034             00034  628+         L     15,52(0,14) LOAD CHECK ROUT. ADDR.
000BB2 05EF                         629+         BALR  14,15 LINK TO CHECK ROUTINE
000BB4 95FF DD6C       00D7C        630          CLI   PL17A,255                 CONTINUE IF
000BB8 4780 D118             00128  631          BE    PL47                      END OF TAPE
000BBC 4100 0018             00018  632          LA    0,24                      WAS IT 24
000BC0 4900 CA4A             01A5A  633          CH    0,PL3D+82                 BYTE
000BC4 4780 D2B4             002C4  634          BE    PL82                      RECORD ?
000BC8 47F0 D4FA             0050A  635          B     PL100                     RESTART
000BCC D727 DD70 DD70 00D80 00D80    636 PLC110   XC    PL1P(40),PL1P             CLEAR CO-ORDINATES
000BD2 92FF DD3B       00D4B        637          MVI   PL4A,255                   INDICATE START OF PLOT
000BD6 4130 003F             0003F  638          LA    3,63                      STEP
000BDA 4310 2001             00001  639          IC    1,1(0,2)                  OVER
000BDE 1413                         640          NR    1,3                       PAGE COUNT
000BE0 4121 2003             00003  641          LA    2,3(1,2)                  AND
000BE4 5020 DCCC             00CDC  642          ST    2,PLC1P                   TEXT
000BE8 47F0 D9E0             009F0  643          B     PLC                       LOAD NEXT CHARACTER
000BEC 95F9 2000       00000        644 PLC120   CLI   0(2),C'9'                 PEN UP
000BF0 4770 DBFC             00C0C  645          BNE   PLC130                    CHARACTER ?
000BF4 95FF DD3A       00D4A        646          CLI   PL3A,255                  WAS PEN DOWN ?
000BF8 4770 D9E0             009F0  647          BNE   PLC                       BRANCH IF NOT
000BFC 9801 DD88             00D98  648          LM    0,1,PL4P                  LOAD VECTOR
000C00 45A0 D61E             0062E  649          BAL   10,PL8                    SEND CO-ORDINATES
000C04 9200 DD3A       00D4A        650          MVI   PL3A,0                    INDICATE PEN UP
000C08 47F0 D9E0             009F0  651          B     PLC                       LOAD NEXT CHARACTER
000C0C 95F8 2000       00000        652 PLC130   CLI   0(2),C'8'                 PEN DOWN
000C10 4770 DC1C             00C2C  653          BNE   PLC140                    CHARACTER ?
000C14 95FF DD3A       00D4A        654          CLI   PL3A,255                  DOES SWITCH INDICATE
000C18 4780 D9E0             009F0  655          BE    PLC                       PEN DOWN ?
000C1C 9801 DD88             00D98  656          LM    0,1,PL4P                  LOAD VECTOR
000C20 45A0 D61E             0062E  657          BAL   10,PL8                    SEND CO-ORDINATES
000C24 92FF DD3A       00D4A        658          MVI   PL3A,255                  INDICATE PEN DOWN
000C28 47F0 D504             00514  659          B     PL130                     EXIT
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 LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000C2C 95C0 2000      00000          660 PLC140   CLI   0(2),X'C0'              START OF TEXT
000C30 4770 DC66            0C76     661          BNE   PLC150                  CHARACTER ?
000C34 4330 2001            00001    662          IC    3,1(0,2)               LOAD BYTE COUNT
000C38 4110 003F            003F     663          LA    1,63                   ISOLATE LOW
000C3C 1413                          664          NR    1,3                    ORDER 6 BITS
000C3E 4111 2002            00002    665          LA    1,2(1,2)               ADJUST
000C42 5010 DCCC            0CDC     666          ST    1,PLC1P                POINTER
000C46 5910 DCD0            0CE0     667          C     1,PLC2P                CONTINUE
000C4A 4740 D9E0            09F0     668          BL    PLC                    IF IN CURRENT BLOCK
000C4E 4120 0320            0320     669          LA    2,800                  MOVE POINTER
000C52 1A12                          670          SR    1,2                    BACK 800
000C54 5010 DCCC            0CDC     671          ST    1,PLC1P                BYTES
                                     672          GET   PL3D,PL3B              READ NEXT RECORD
000C58 4110 C9F8            01A08    673+         LA    1,PL3D LOAD PARAMETER REG 1
000C5C 4100 C2B8            012C8    674+         LA    0,PL3B LOAD PARAMETER REG 0
000C60 58F0 1030            0030     675+         L     15,48(0,1) LOAD GET ROUTINE ADDR.
000C64 05EF                          676+         BALR  14,15 LINK TO GET ROUTINE
000C66 4810 901A            001A     677          LH    1,26(0,9)              UPDATE INPUT
000C6A 4110 1001            0001     678          LA    1,1(0,1)               RECORD
000C6E 4010 901A            001A     679          STH   1,26(0,9)              COUNTER
000C72 47F0 D9E0            09F0     680          B     PLC                    LOAD NEXT CHARACTER
000C76 95E9 2000      00000          681 PLC150   CLI   0(2),C'Z'              END OF PLOT
000C7A 4770 D9E0            09F0     682          BNE   PLC                    CHARACTER ?
000C7E 9200 DD6B      00D7B          683          MVI   PL16A,0                INDICATE END OF PLOT
000C82 9200 DD3B      00D4B          684          MVI   PL4A,0                 CLEAR START OF PLOT INDICATOR
000C86 4330 2001            00001    685          IC    3,1(0,2)               ADJUST
000C8A 4110 003F            003F     686          LA    1,63                   INPUT
000C8E 1413                          687          NR    1,3                    BUFFER
000C90 4111 2002            00002    688          LA    1,2(1,2)               POINTER
000C94 5010 DCCC            0CDC     689          ST    1,PLC1P                STEP OVER CHARACTERS
000C98 9801 DD86            0D98     690          LM    0,1,PL4P               LOAD VECTOR
000C9C 95FF DD3A      00D4A          691          CLI   PL3A,255               IS PEN
000CA0 4770 DAA2            0AB2     692          BNE   PLC102                DOWN ?
000CA4 4A00 DD40            0D50     693          AH    0,PL7A                 INDICATE END OF PLOT
000CA8 45A0 D61E            062E     694          BAL   10,PL8                 OUTPUT CO-ORDINATES
000CAC 47F0 DAA2            0AB2     695          B     PLC102                 START NEW PLOT
000CB0 95FF DD6B      00D7B          696 PLC200   CLI   PL16A,255              TEST FOR MISSING
000CB4 4780 DAA2            0AB2     697          BE    PLC102                 END OF PLOT
000CB8 47F0 D2B4            02C4     698          B     PL82                   INDICATOR
                                     699 *
000CBC 00000001                      700 PLC1C    DC    H'0,1'                 0
000CC0 00010001                      701          DC    H'1,1'                 1
000CC4 00010000                      702          DC    H'1,0'                 2
000CC8 0001FFFF                      703          DC    H'1,-1'                3
000CCC 0000FFFF                      704          DC    H'0,-1'                4
000CD0 FFFFFFFF                      705          DC    H'-1,-1'               5
000CD4 FFFF0000                      706          DC    H'-1,0'                6
000CD8 FFFF0001                      707          DC    H'-1,1'                7
                                     708 *
000CDC 000012C8                      709 PLC1P    DC    A(PL3B)                CURRENT INPUT POINTER
000CE0 000015E8                      710 PLC2P    DC    A(PL3B+800)            END OF BUFFER
                                     711 *
                                     712 *        DISPLAY I/O ON TEKTRONIX
                                     713 *
000CE4 5010 C950            1960     714 PLD      ST    1,PLCCW                CONSTRUCT
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 LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000CE8 4200 C950            01960   715          STC   0,PLCCW                 THE CCW
000CEC 4020 1000            00000   716          STH   2,0(0,1)                SET NOVA BYTE COUNT
000CF0 9101 C950      01960         717          TM    PLCCW,1                 TEST FOR
000CF4 4120 0200            00200   718          LA    2,512                   WRITE COMMAND
000CF8 4710 DCF0            00D00   719          BO    PLD10                   BRANCH IF SO
000CFC 4120 0050            00050   720          LA    2,80                    RESET CCW
000D00 4020 C956            01966   721 PLD10    STH   2,PLCCW+6               BYTE COUNT
000D04 4120 0003            00003   722          LA    2,3                     SET RETRY COUNTER
                                    723 PLD20    EXCP  PLIOB                   PERFORM I/O
000D08 4110 C92C            0193C   724+PLD20    LA    1,PLIOB LOAD PARAMETER REG 1
000D0C 0A00                         725+         SVC   0 ISSUE SVC FOR EXCP
                                    726          WAIT  ECB=PLECB               WAIT
000D0E 4110 C94C            0195C   727+         LA    1,PLECB LOAD PARAMETER REG 1
000D12 4100 0001            00001   728+         LA    0,1(0,0) COUNT OMITTED,1 USED
000D16 0A01                         729+         SVC   1 LINK TO WAIT ROUTINE
000D18 4810 C93A            0194A   730          LH    1,PLCSW+6               TEST FOR
000D1C 4910 C956            01966   731          CH    1,PLCCW+6               ZERO DATA
000D20 4780 DD30            00D40   732          BE    PLD30                   TRANSFER
000D24 957F C94C      0195C         733          CLI   PLECB,X'7F'             TEST FOR
000D28 4770 DD30            00D40   734          BNE   PLD30                   ERRORS
000D2C 9101 C950      01960         735          TM    PLCCW,1                 RETURN
000D30 071E                         736          BCR   1,14                    IF WRITE
000D32 DC4D DD92 C6D8 00DA2 016E8   737          TR    PL1B+2(78),PL2T         TRANSLATE ASCII TO EBCDIC
000D38 4820 DD90            00DA0   738          LH    2,PL1B                  LOAD AND TEST
000D3C 1222                         739          LTR   2,2                     BYTE COUNT
000D3E 07FE                         740          BR    14                      RETURN
000D40 4620 DCF8            00D08   741 PLD30    BCT   2,PLD20                 TRY AGAIN
000D44 47F0 D0C2            000D2   742          B     PL20                    TAKE ERROR EXIT
                                    743 *
000D48                              744 PL1A     DS    C                       PLOT CHARACTER 1
000D49                              745 PL2A     DS    C                       PLOT CHARACTER 2
000D4A                              746 PL3A     DS    C                       PEN UP/DOWN INDICATOR
000D4B 00                           747 PL4A     DC    AL1(0)                  START OF PLOT INDICATOR
000D4C 0001                         748 PL5A     DC    H'1'                    CONSTANT, 1
000D4E 0007                         749 PL6A     DC    H'7'                    CONSTANT, 7
000D50 2000                         750 PL7A     DC    X'2000'                 CONSTANT, END OF PLOT
000D54                              751          DS    0F
000D54 D1D1D1E7E7E7E7E7             752 PL10A    DC    C'JJJXXXXX',A(0)        STOW WORK AREA
000D60                              753 PL11A    DS    D                       WORK AREA
000D68 C4C9E2D7D3C1E840             754 PL12A    DC    C'DISPLAY ',A(0)
000D74 402020202120                 755 PL13A    DC    C' ',X'20202021'        EDIT PATTERN
000D7A 00                           756 PL15A    DC    AL1(0)                  PLOT FOUND INDICATOR
000D7B                              757 PL16A    DS    C                       END OF PLOT INDICATOR
000D7C 00                           758 PL17A    DC    AL1(0)                  END OF FILE INDICATOR
                                    759 *
000D80                              760 PL1P     DS    2F                      CURRENT ORIGIN (CO)
000D88                              761 PL2P     DS    2F                      NEXT POSSIBLE ORIGIN (NPO)
000D90                              762 PL3P     DS    2F                      ALTERNATE POSSIBLE ORIGIN (APO)
000D98                              763 PL4P     DS    2F                      CURRENT POSITION (CP)
                                    764 *
000DA0                              765 PL1B     DS    128F                    DISPLAY I/O BUFFER
000FA0                              766          DS    F                       BLKSIZE
000FA4                              767 PL2B     DS    200F                    DIRECTORY BLOCK
0012C4                              768          DS    F
0012C8                              769 PL3B     DS    200F                    TAPE BUFFER
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 LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

                                   770 *
0015E8                             771 PL1T     DS    0H                        TRANSLATE EBCDIC TO ASCII
0015E8 A0A0A0A0A0A0A0A0            772          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          000-015
0015F8 A0A0A0A0A0A0A0A0            773          DC    X'A0A0A0A0A0A0A0A0A0A0A2A0A0A0A0'          016-031
001608 A0A0A0A0A0A0A0A0            774          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A3A0'          032-047
001618 A0A0A0A0A0A0A0A0            775          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          048-063
001628 A0A0A0A0A0A0A0A0            776          DC    X'A0A0A0A0A0A0A3A0A0A0A08D2E3C282BDE'      064-079
001638 A6A0A0A0A0A0A0A0            777          DC    X'A6A0A0A0A0A0A0A0A0A0A02124AAA9BB5F'      080-095
001648 2DAFA0A0A0A0A0A0            778          DC    X'2DAFA0A0A0A0A0A0A0A0A0ACA50ABE3F'        096-111
001658 A0A0A0A3A0A0A0A0            779          DC    X'A2A0A0A0A0A0A0A0A0A0A03AA3C027BD22'      112-127
001668 A0A0A0A0A0A0A0A0            780          DC    X'A3A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'        128-143
001678 A0A0A0A0A0A0A0A0            781          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          144-159
001688 A0A0A0A0A0A0A0A0            782          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          160-175
001698 A0A0A0A0A0A0A0A0            783          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          176-191
0016A8 A04142C344C5C647            784          DC    X'A04142C344C5C64748C9A0A0A0A0A0A0'        192-207
0016B8 A0CA4BCC4D4ECF50            785          DC    X'A0CA4BCC4D4ECF50D1D2A0A0A0A0A0A0'        208-223
0016C8 A0A053D45556D7D8            786          DC    X'A0A053D45556D7D8595AA0A0A0A0A0A0'        224-239
0016D8 30B1B233B43536B7            787          DC    X'30B1B233B43536B7B839A0A0A0A0A0A0'        240-255
                                   788 *
0016E8                             789 PL2T     DS    0H                        TRANSLATE ASCII TO EBCDIC
0016E8 4040404040404040            790          DC    33C' ',C':"#$%&&''()*+,-./0123456789:;<=>?@'
001729 C1C2C3C4C5C6C7C8            791          DC    C'ABCDEFGHIJKLMNOPQRSTUVWXYZ      '
001748 4040404040404040            792          DC    32C' '
001768 4040404040404040            793          DC    33C' ',C':"#$%&&''()*+,-./0123456789:;<=>?@'
0017A9 C1C2C3C4C5C6C7C8            794          DC    C'ABCDEFGHIJKLMNOPQRSTUVWXYZ      '
0017C8 4040404040404040            795          DC    32C' '
                                   796 *
0017E8                             797 PL4J     DS    8F                        1 DIRECTORY ENTRY
001808 00009F8D0AC1C5D5            798 PL1C     DC    H'0',X'9F8D0A',C'AENVPLOT ',X'8D0A'
001818 00008D0AE6E3D9C3            799 PL2C     DC    H'0',X'8D0A',C'WTRC BACKUP TAPE =  '
001830 0000C4C9D9C5C3E3            800 PL3C     DC    H'0',C'DIRECTORY FULL'
001840 A03FA0A0                    801 PL4C     DC    X'A03FA0A0'               QUESTION MARK
001844 0000C5D5C440D6C6            802 PL5C     DC    H'0',C'END OF TAPE',X'8D0A0A'
001854 0000D5D640D7D3D6            803 PL6C     DC    H'0',C'NO PLOT DATA FOUND',X'8D0A'
00186A 00008D0AC1D5D6E3            804 PL7C     DC    H'0',X'8D0A',C'ANOTHER BACKUP TAPE REQUIRED ?  '
00188E 00008D0AD5D640D7            805 PL8C     DC    H'0',X'8D0A',C'NO PLOTS IN DISK DATA SET',X'8D0A0A'
                                   806 PL9C     DC    H'0',X'8D0A',C' N JOBNAME   DATE    TIME   NO. OF PLOTS X
0018AE 00008D0A40D540D1                               INCR. VECT. ',X'8D0A0A'
0018EA 00008D0A0AC5D5C4            807 PL11C    DC    H'0',X'8D0A0A',C'END OF STEP',X'8D0A0A00'
0018FE 000040404040D7C5            808 PL12C    DC    H'0',C'    PERCENT SPOOL UTILISATION ',X'8D0A'
001920 8D0AD9C5D7D3E840            809 PL13C    DC    X'8D0A',C'REPLY Y,N OR E:',X'8D0A0A'
001934                             810 PL14C    EQU   *
                                   811 *
001934 9500 DD38       00D48       812 PL1X     CLI   PL1A,0                    COMPARE WITH CHAR 1
001938 9500 DD39       00D49       813 PL2X     CLI   PL2A,0                    COMPARE WITH CHAR 2
                                   814 *
00193C                             815          DS    0F
00193C 42000000                    816 PLIOB    DC    X'42',AL3(0)              IOB
001940 0000195C                    817          DC    A(PLECB)                  ECB ADDRESS
001944 0000000000000000            818 PLCSW    DC    A(0,0)                    CSW
00194C 00001960                    819          DC    A(PLCCW)                  CAW
001950 0000197C                    820          DC    A(PL1D)                   DCB ADDRESS
001954 00000000                    821          DC    A(0)                      RESTART ADDRESS
001958 00010000                    822          DC    AL2(1,0)                  BLOCK COUNT INCREMENT
                                   823 *
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

00195C 00000000                    824 PLECB    DC    A(0)                    ECB
                                   825 *
001960 0300000020000001            826 PLCCW    CCW   3,0,X'20',1             CCW
                                   827 *
                                   828          READ  DSDECB,SF,PL4D,PL2B-2,'S',MF=L READ (LIST FORM)
001968 00000000                    829+DSDECB   DC    F'0' EVENT CONTROL BLOCK
00196C 80                          830+         DC    X'80' TYPE FIELD
00196D 80                          831+         DC    X'80' TYPE FIELD
00196E 0000                        832+         DC    AL2(0) LENGTH
001970 00001A68                    833+         DC    A(PL4D) DCB ADDRESS
001974 00000FA2                    834+         DC    A(PL2B-2) AREA ADDRESS
001978 00000000                    835+         DC    A(0) RECORD POINTER WORD
                                   836          PRINT NOGEN
                                   837 PL1D     DCB   DSORG=PS,MACRF=E,DDNAME=DISPLAY,IOBAD=PLIOB
                                   869 PL2D     DCB   DSORG=PO,MACRF=W,DDNAME=SYSUT2
                                   920 PL3D     DCB   DSORG=PS,MACRF=GM,DDNAME=SYSUT1,EODAD=PL45,EXLST=PLX
                                   974 PL4D     DCB   DSORG=PO,MACRF=(R,W),DDNAME=SYSUT2
                                  1025 PL5D     DCB   DSORG=PO,MACRF=R,DDNAME=SYSUT2
001B18 87001B1C                   1076 PLX      DC    X'87',AL3(PLJ)
001B1C 0000000000000000           1077 PLJ      DC    44A(0)                  JFCB
                                  1078          END
```

RELOCATION DICTIONARY

POS.ID	REL.ID	FLAGS	ADDRESS
01	01	08	000079
01	01	08	00007D
01	01	08	000089
01	01	08	00008D
01	01	08	0000DD
01	01	08	0000E1
01	01	08	0000E5
01	01	08	0000F1
01	01	08	0000F5
01	01	08	000131
01	01	08	000185
01	01	0C	0001F0
01	01	0C	0001F4
01	01	0C	000238
01	01	0C	00023C
01	01	08	00029D
01	01	0C	000654
01	01	0C	000658
01	01	0C	0006C4
01	01	0C	0006C8
01	01	0C	000AD0
01	01	0C	000AD4
01	01	0C	000CDC
01	01	0C	000CE0
01	01	0C	001948
01	01	0C	00194C
01	01	0C	001950
01	01	0C	001970
01	01	0C	001974
01	01	0C	001998
01	01	08	001A29
01	01	08	001A2D
01	01	03	001B19

SYMBOL	LEN	VALUE	DEFN	REFERENCES
AENVPLT1	00001	000000	00009	0018 0021
DSDEC8	00004	001968	00829	0604 0610 0620 0626
DS10	00004	0001E8	00144	0155
DS20	00004	00022C	00170	0138
DS30	00004	000230	00171	0182
IHB0004A	00002	0000D0	00052	0048
JB10	00004	00031C	00243	0236
JB20	00004	00033C	00252	0289
JB30	00006	000362	00260	0258
JB35	00004	0003D6	00287	0280
JB38	00004	0003FA	00297	0294
JB40	00004	00043A	00317	
JB5	00004	0002D4	00223	0190
JB50	00006	000444	00320	0222 0242 0358
JB60	00004	00045A	00325	0334 0341
PLB	00004	00062E	00449	0393 0404 0550 0649 0657 0694
PLB1D	00004	0006D0	00495	0453 0454 0463 0476 0492 0551 0555 0564 0577
PLB1P	00004	0006C4	00492	0450 0477 0489 0553 0578
PLB1R	00006	00068C	00478	0452
PLB2D	00001	0009F0	00496	0453 0493
PLB2P	00004	0006C8	00493	0451
PLB2R	00004	0006A8	00484	0482
PLB3R	00004	000688	00488	0485
PLB5	00004	00064C	00458	0469
PLC	00004	0009F0	00500	0374 0390 0397 0412 0420 0426 0524 0539 0643 0647 0651 0655 0668 0680 0682
PLCCW	00008	001960	00826	0714 0715 0717 0721 0731 0735 0819
PLCSW	00004	001944	00818	0730
PLC1C	00002	000CBC	00700	0531
PLC1P	00004	000CDC	00709	0369 0500 0512 0515 0521 0642 0666 0671 0689
PLC100	00004	000A8A	00541	0526 0528
PLC102	00004	000AB2	00551	0045 0548 0692 0695 0697
PLC104	00004	000AC8	00559	0570
PLC106	00006	000908	00579	0554
PLC110	00006	000BCC	00636	0545
PLC120	00004	000BEC	00644	0542
PLC130	00004	000C0C	00652	0645
PLC140	00004	000C2C	00660	0653
PLC150	00004	000C76	00681	0661
PLC2P	00004	000CE0	00710	0371 0501 0514 0667
PLC2R	00004	000A36	00519	0502
PLC200	00004	000CB0	00696	0510
PLD	00004	000CE4	00714	0082 0097 0102 0131 0195 0200 0232 0241 0249 0285 0296 0316 0328 0333 0357 0439 0444
PLD1R	00004	000D00	00721	0719
PLD2R	00004	000D08	00724	0741
PLD3R	00004	000D40	00741	0732 0734
PLECB	00004	00195C	00824	0727 0733 0817
PLIOB	00001	00193C	00816	0724 0854
PLJ	00004	001B1C	01077	0202 1076
PLX	00001	001B18	01076	0944
PL1A	00001	000D48	00744	0375 0384 0391 0401 0812
PL1B	00004	000DA0	00765	0100 0104 0106 0198 0202 0223 0224 0224 0225 0226 0227 0230 0250 0278 0283 0286 0291 0292 0308 0309 0310 0331 0335 0337 0339 0737 0738
PL1C	00002	001808	00798	0110 0110 0129 0130
PL1D	00004	00197C	00841	0026 0038 0059 0820

CROSS-REFERENCE

SYMBOL	LEN	VALUE	DEFN	REFERENCES														
PL1P	00004	000D80	00760	0372	0372	0449	0478	0479	0636	0636								
PL1T	00002	2015E8	00771	0110	0111	0112	0113	0114	0115	0116	0117	0118	0119	0120	0273	0311	0322	
PL1X	00004	001934	00812	0381	0398	0413	0421	0427										
PL10	00004	0000B4	00048	0039	0041	0043	0210											
PL10A	00008	000D54	00752	0579	0586	0592	0595											
PL100	00006	00050A	00372	0635														
PL11A	00008	000D60	00753	0254	0255	0255	0256	0262	0264	0266	0268	0270	0272	0307	0309	0584	0585	0585
				0586	0590	0591	0591	0592										
PL11C	00002	3018EA	00807	0117	0118	0118	0248	0442	0443									
PL12A	00008	000D68	00754	0134	0161	0165	0600											
PL12C	00002	0018FE	00808	0118	0119	0119	0310	0311	0314	0315	0443							
PL13A	00001	000D74	00755	0263	0267	0271	0308											
PL13C	00002	001920	00809	0119	0120	0120												
PL130	00004	000514	00374	0659														
PL14C	00001	001934	00810	0120	0315													
PL140	00004	00051C	00376	0394														
PL15A	00001	000D7A	00756	0221	0323	0364												
PL150	00004	000524	00378	0382														
PL16A	00001	000D7B	00757	0084	0543	0683	0696											
PL160	00004	000532	00381	0409														
PL17A	00001	000D7C	00758	0083	0086	0630												
PL170	00004	000556	00391	0416	0418	0433												
PL180	00006	000566	00395	0388	0390													
PL190	00004	00057C	00400	0422														
PL2A	00001	000D49	00745	0396	0400	0402	0408	0813										
PL2B	00004	000FA4	00767	0140	0149	0176	0186	0187	0188	0233	0244	0317	0580	0615	0618	0834		
PL2C	00002	001818	00799	0110	0111	0111	0130	0193	0194									
PL2D	00004	0019B0	00873	0028	0044	0061	0148	0160	0462	0563	0594							
PL2P	00004	000D88	00761	0379	0392	0403	0405	0411	0425									
PL2T	00002	0016E8	00789	0737														
PL2X	00004	001938	00813	0417														
PL20	00004	0000D2	00054	0742														
PL200	00004	0005A6	00410	0399	0414													
PL210	00004	0005C2	00417	0431	0434													
PL230	00004	0005E0	00424	0428														
PL3A	00001	000D4A	00746	0373	0481	0538	0547	0646	0650	0654	0658	0691						
PL3B	00004	0012C8	00769	0213	0219	0320	0321	0322	0326	0345	0351	0362	0368	0505	0511	0674	0709	0710
PL3C	00002	001830	00800	0111	0112	0112	0194	0437	0438									
PL3D	00004	001A08	00924	0063	0091	0125	0207	0209	0212	0217	0299	0344	0349	0360	0370	0504	0509	0513
				0633	0673													
PL3P	00004	000090	00762	0395	0405	0419												
PL30	00004	0000D8	00057	0445														
PL4A	00001	000D4B	00747	0342	0484	0487	0544	0637	0684									
PL4C	00004	001840	00801	0112	0321	0438												
PL4D	00004	001A68	00978	0034	0040	0069	0599	0833										
PL4J	00004	0017E8	00797	0597	0614													
PL4P	00004	000D98	00763	0379	0395	0411	0419	0425	0532	0534	0535	0537	0546	0648	0656	0690		
PL40	00004	000106	00076	0054														
PL45	00004	00010C	00079	0942														
PL47	00004	000128	00086	0336	0631													
PL48	00004	000136	00094	0103	0108													
PL5A	00002	000D4C	00748	0387	0432													
PL5C	00002	001844	00802	0080	0081	0113	0113											
PL5D	00004	001AC0	01029	0036	0042	0071	0133	0164	0175									
PL52	00002	00016E	00109	0045														

CROSS-REFERENCE

```
SYMBOL    LEN  VALUE  DEFN     REFERENCES

PL6A      00002 000D4E 00749    0389
PL6C      00002 001854 00803    0081  0113  0114  0114  0355  0356
PL60      00004 00026E 00192    0105  0201
PL600     00004 00060A 00436    0319
PL610     00004 00061A 00441    0107
PL7A      00002 000D50 00750    0549  0693
PL7C      00002 00186A 00804    0095  0096  0114  0115  0115  0356
PL8C      00002 00188E 00805    0096  0115  0116  0116  0239  0240
PL80      00004 0002AA 00212    0218  0220  0340
PL82      00004 0002C4 00219    0634  0698
PL84      00004 00049A 00342    0338
PL9C      00002 0018AE 00806    0116  0117  0117  0240  0247  0248
PL90      00004 00049E 00344    0352  0361  0363
PL95      00004 0004D4 00359    0350

NO STATEMENTS FLAGGED IN THIS ASSEMBLY
*STATISTICS*      SOURCE RECORDS (SYSIN) =   588       SOURCE RECORDS (SYSLIB) =  4028
*OPTIONS IN EFFECT*   LIST, NODECK, LOAD, NORENT, XREF, NOTEST, ALGN, OS, NOTERM, LINECNT =  55
 1051 PRINTED LINES

IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS1.MACLIB                                        KEPT
IEF285I   VOL SER NOS= AAE001.
IEF285I   AAE.MACLIB                                         KEPT
IEF285I   VOL SER NOS= AAE002.
IEF285I   SYS73053.T171242.RV008.INIT.OBJ                    PASSED
IEF285I   VOL SER NOS= AAE014.
IEF285I   SYS73053.T171242.RV008.INIT.UT1                    KEPT
IEF285I   VOL SER NOS= AAE008.
IEF285I   SYS73053.T171242.RV008.INIT.UT2                    KEPT
IEF285I   VOL SER NOS= AAE012.
IEF285I   SYS73053.T173144.RV000.RPB.UT3                     DELETED
IEF285I   VOL SER NOS= AAE013.
IEF285I   SYS73053.T173144.SV000.RPB.R0000001                SYSOUT
IEF285I   VOL SER NOS= AAE012.
IEF373I STEP /ASM      / START 73053.1732
IEF374I STEP /ASM      / STOP  73053.1738 CPU   1MIN 21.60SEC MAIN  60K LCS   0K
*** CONDITION CODE =  000(HEX)
XXLKED   EXEC  PGM=IEWL,PARM=(XREF,LIST),REGION=96K,                    00000160
XX             COND=(8,LT,ASM)                                          00000170
XXSYSLIN   DD  DSN=&&OBJ,DISP=(OLD,PASS)                                00000180
XX         DD  DDNAME=SYSIN                                             00000190
//LKED.SYSLMOD DD DSN=RPB.ASM,DISP=SHR
X/SYSLMOD  DD  DSN=&AAEC(USERSPGM),UNIT=SYSDA,SPACE=(1024,(50,20,1)),   00000200
XX             DISP=(MOD,PASS)                                          00000210
XXSYSUT1   DD  DSN=&&UT1,UNIT=SYSDA,                                    00000220
XX             SPACE=(1700,(50,100))                                    00000230
//LKED.SYSPRINT DD SYSOUT=D
X/SYSPRINT DD  SYSOUT=A                                                 00000240
//LKED.SYSIN DD $
//
IEF236I ALLOC. FOR RPB      LKED     AENVPLT1
IEF237I 134   ALLOCATED TO SYSLIN
IEF237I 313   ALLOCATED TO
IEF237I 120   ALLOCATED TO SYSLMOD
IEF237I 135   ALLOCATED TO SYSUT1
IEF237I 135   ALLOCATED TO SYSPRINT
```

```
 F88-LEVEL LINKAGE EDITOR OPTIONS SPECIFIED XREF,LIST
          DEFAULT OPTION(S) USED -  SIZE=(90112,6144)
IEW0000      NAME AENVPLT1(R)


                                                CROSS REFERENCE TABLE

  CONTROL SECTION                          ENTRY

    NAME     ORIGIN  LENGTH                  NAME   LOCATION     NAME   LOCATION     NAME   LOCATION     NAME   LOCATION

  AENVPLT1       00    18CC


  LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION            LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION


 ENTRY ADDRESS       00
 TOTAL LENGTH      1800

****AENVPLT1  NOW REPLACED IN DATA SET


IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS73053.T171242.RV008.INIT.OBJ              PASSED
IEF285I   VOL SER NOS= AAE014.
IEF285I   RPB,ASM                                      KEPT
IEF285I   VOL SER NOS= AAE023.
IEF285I   SYS73053.T171242.RV008.INIT.UT1              KEPT
IEF285I   VOL SER NOS= AAE008.
IEF285I   SYS73053.T173144.SV000.RPB.R0000004          SYSOUT
IEF285I   VOL SER NOS= AAE008.
IEF373I STEP /LKED     / START 73053.1738
IEF374I STEP /LKED     / STOP  73053.1739 CPU    0MIN 02.74SEC MAIN  96K LCS    0K
*** CONDITION CODE =  000(HEX)
IEF285I   SYS73053.T171242.RV008.INIT.OBJ              KEPT
IEF285I   VOL SER NOS= AAE014.
IEF375I  JOB /RPB      / START 73053.1732
IEF376I  JOB /RPB      / STOP  73053.1739 CPU    1MIN 24.34SEC
HIGHEST CONDN CODE =  000(HEX)
*********************************************************************************************************************************
```

C21.

APPENDIX D

LISTING OF THE AENVPLT2 PROGRAM

```
//RPB       JOB (C1B18937,B1),R.P.BACKSTROM,                              JOB 179
//            MSGCLASS=D,
//            CLASS=A,TIME=3
//AENVPLT2 EXEC ASMFCL,PARM.ASM='NODECK,LOAD'
XXASM     EXEC  PGM=IFUASM,PARM='LOAD',REGION=50K                         00000010
XXSYSLIB    DD  DSN=SYS1.MACLIB,DISP=SHR                                  00000020
XX              DSNAME=AAE.MACLIB,DISP=SHR                                00000030
XXSYSGO     DD  DSN=&&OBJ,UNIT=SYSDA,DISP=(,PASS),                        00000040
XX              DCB=(RECFM=FB,BLKSIZE=800,LRECL=80),                      00000050
XX              SPACE=(3200,(20,40))                                      00000060
XXSYSUT1    DD  DSN=&&UT1,UNIT=(SYSDA,SEP=SYSGO),                         00000070
XX              SPACE=(1700,(50,100))                                     00000080
XXSYSUT2    DD  DSN=&&UT2,UNIT=(SYSDA,SEP=(SYSUT1,SYSGO)),                00000090
XX              SPACE=(1700,(50,100))                                     00000100
XXSYSUT3    DD  DSN=&&UT3,UNIT=(SYSDA,SEP=(SYSUT1,SYSUT2,SYSGO)),         00000110
XX              SPACE=(1700,(50,100))                                     00000120
//ASM.SYSPRINT DD SYSOUT=D
X/SYSPRINT DD   SYSOUT=A,                                                 00000130
XX              DCB=(BLKSIZE=1210,LRECL=121,RECFM=FBSM)                   00000140
XXSYSPUNCH DD   SYSOUT=B,DCB=BLKSIZE=800                                  00000150
//ASM.SYSIN DD *
IEF236I ALLOC. FOR RPB       ASM       AENVPLT2
IEF237I 137    ALLOCATED TO SYSLIB
IEF237I 136    ALLOCATED TO
IEF237I 135    ALLOCATED TO SYSGO
IEF237I 124    ALLOCATED TO SYSUT1
IEF237I 125    ALLOCATED TO SYSUT2
IEF237I 134    ALLOCATED TO SYSUT3
IEF237I 135    ALLOCATED TO SYSPRINT
IEF237I 330    ALLOCATED TO SYSPUNCH
IEF237I 315    ALLOCATED TO SYSIN
```

EXTERNAL SYMBOL DICTIONARY

```
SYMBOL    TYPE ID  ADDR   LENGTH LD ID

AENVPLT2  SD   01 000000 001D28
```

```
 LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

                                   1          MACRO
                                   2 &NAME    DISPLAY &CMD,&ADR,&LEN
                                   3 &NAME    LA     0,&CMD
                                   4          LA     1,&ADR
                                   5          LA     2,&LEN
                                   6          BAL    14,PLD
                                   7          MEND
                                   8 AENVPLT2 STBR   N=2                    SET 2 BASE REGISTERS
000000                             9+AENVPLT2 CSECT
000000 47F0 F058           00058  10+        B      88(0,15)
000004 0AC1C5D5E5D7D3E3           11+        DC     AL1(8),CL11'AENVPLT2'
000010                            12+        DS     18F
000058 90EC D00C           0000C  13+        STM    14,12,12(13)
00005C 50D0 F014           00014  14+        ST     13,20(0,15)
000060 18CD                       15+        LR     12,13
000062 41D0 F010           00010  16+        LA     13,16(0,15)
000066 50D0 C008           00008  17+        ST     13,8(0,12)
001010                            18+        USING AENVPLT2+16,13
00006A 41C0 D800           00800  19+        LA     12,2048(0,13)
00006E 41C0 C800           00800  20+        LA     12,2048(0,12)
001010                            21+        USING AENVPLT2+4112,12
0003DE                            22 XMAX    EQU    990
0002E4                            23 YMAX    EQU    740
                                  24         OPEN   (PL1D,,PL2D,,PL3D,UPDAT,PL4D,OUTPUT) OPEN DATA SETS
000072 0700                       25+        CNOP   0,4
000074 4510 D078           00088  26+        BAL    1,*+20 LOAD REG1 W/LIST ADDR.
000078 80                         27+        DC     AL1(0) OPTION BYTE
000079 0013A4                     28+        DC     AL3(PL1D) DCB ADDRESS
00007C 00                         29+        DC     AL1(0) OPTION BYTE
00007D 0013D8                     30+        DC     AL3(PL2D) DCB ADDRESS
000080 04                         31+        DC     AL1(4) OPTION BYTE
000081 001430                     32+        DC     AL3(PL3D) DCB ADDRESS
000084 8F                         33+        DC     AL1(143) OPTION BYTE
000085 001488                     34+        DC     AL3(PL4D) DCB ADDRESS
000088 0A13                       35+        SVC    19 ISSUE OPEN SVC
00008A 9110 C3C4       013D4      36         TM     PL1D+48,X'10'            TEST DISPLAY
00008E 47E0 D09C           000AC  37         BNO    PL10                     OPEN
000092 9110 C3F8       01408      38         TM     PL2D+48,X'10'            TEST PDS
000096 47E0 D09C           000AC  39         BNO    PL10                     OPEN
00009A 9110 C450       01460      40         TM     PL3D+48,X'10'            TEST PDS FOR UPDAT
00009E 47E0 D09C           000AC  41         BNO    PL10                     OPEN
0000A2 9110 C4A8       014B8      42         TM     PL4D+48,X'10'            TEST PDS FOR OUTPUT
0000A6 4710 D0E8           000F8  43         BO     PL50                     OPEN
                                  44 PL10    WTO    'AENVPLOT OPEN ERROR'    WRITE TO OPERATOR
0000AA 0700                       45+        CNOP   0,4
0000AC 4510 D0B8           000C8  46+PL10     BAL    1,IHB0003A BRANCH AROUND MESSAGE
0000B0 0017                       47+        DC     AL2(23) TEXT LENGTH
0000B2 0000                       48+        DC     B'0000000000000000' MCS FLAGS
0000B4 C1C5D5E5D7D3D6E3           49+        DC     C'AENVPLOT OPEN ERROR'
0000C8                            50+IHB0003A DS    0H
0000C8 0A23                       51+        SVC    35
0000CA 9204 D0E5       000F5      52 PL20    MVI    PL40+3,4                 SET NON-ZERO RETURN CODE
                                  53 PL30    CLOSE (PL1D,,PL2D,,PL3D,,PL4D) CLOSE ALL DATA SETS
0000CE 0700                       54+        CNOP   0,4
0000D0 4510 D0D4           000E4  55+PL30     BAL    1,*+20 BRANCH AROUND LIST
```

```
  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

0000D4 00                           56+         DC    AL1(0) OPTION BYTE
0000D5 0013A4                       57+         DC    AL3(PL1D) DCB ADDRESS
0000D8 00                           58+         DC    AL1(0) OPTION BYTE
0000D9 0013D8                       59+         DC    AL3(PL2D) DCB ADDRESS
0000DC 00                           60+         DC    AL1(0) OPTION BYTE
0000DD 001430                       61+         DC    AL3(PL3D) DCB ADDRESS
0000E0 80                           62+         DC    AL1(128) OPTION BYTE
0000E1 001488                       63+         DC    AL3(PL4D) DCB ADDRESS
0000E4 0A14                         64+         SVC   20 ISSUE CLOSE SVC
0000E6 58D0 D004            00004   65          L     13,4(0,13)              RESTORE
0000EA 98EC D00C            0000C   66          LM    14,12,12(13)            REGISTERS
0000EE 92FF D00C      0000C         67          MVI   12(13),255              INDICATE RETURN
0000F2 41F0 0000            00000   68 PL40     LA    15,0                    LOAD RETURN CODE
0000F6 07FE                         69          BR    14                      EXIT
0000F8                              70 PL50     DS    0H                      TRANSLATE DISPLAY MESSAGES
0000F8 DC0A DE20 C03C 00E30 0104C   71          TR    PL1C+4(PL2C-PL1C-7),PL1T
0000FE DC34 DE30 C03C 00E40 0104C   72          TR    PL2C+2(PL4C-PL2C-5),PL1T
000104 DC13 DE6C C03C 00E7C 0104C   73          TR    PL4C+4(PL5C-PL4C-4),PL1T
00010A DC09 DE84 C03C 00E94 0104C   74          TR    PL5C+4(PL6C-PL5C-4),PL1T
000110 DC09 DE90 C03C 00EA0 0104C   75          TR    PL6C+2(PL7C-PL6C-2),PL1T
000116 DC13 DE9E C03C 00EAE 0104C   76          TR    PL7C+4(PL8C-PL7C-4),PL1T
00011C DC08 DEB8 C03C 00EC8 0104C   77          TR    PL8C+6(PL9C-PL8C-6),PL1T
000122 DC10 DEC4 C03C 00ED4 0104C   78          TR    PL9C+3(PL10C-PL9C-3),PL1T
000128 DC20 DEE4 C03C 00EF4 0104C   79          TR    PL10C+2(PL11C-PL10C-2),PL1T
00012E DC16 DF07 C03C 00F17 0104C   80          TR    PL11C+2(PL12C-PL11C-2),PL1T
000134 DC0C DF20 C03C 00F30 0104C   81          TR    PL12C+2(PL13C-PL12C-4),PL1T
00013A DC16 DF35 C03C 00F45 0104C   82          TR    PL20C+5(PL21C-PL20C-5),PL1T
000140 DC1D DF4E C03C 00F5E 0104C   83          TR    PL21C+2(PL22C-PL21C-4),PL1T
000146 DC01 DF7E C03C 00F8E 0104C   84          TR    PL23C+8(PL24C-PL23C-10),PL1T
00014C DC1F DF88 C03C 00F98 0104C   85          TR    PL24C+6(PL25C-PL24C-6),PL1T
000152 DC0F DFAC C03C 00FBC 0104C   86          TR    PL25C+4(PL26C-PL25C-6),PL1T
000158 DC20 DFC3 C03C 00FD3 0104C   87          TR    PL26C+5(PL27C-PL26C-5),PL1T
00015E DC10 DFE9 C03C 00FF9 0104C   88          TR    PL27C+5(PL28C-PL27C-5),PL1T
000164 DC10 DFFD C03C 01000 0104C   89          TR    PL28C+3(PL29C-PL28C-5),PL1T
00016A DC10 C015 C03C 01025 0104C   90          TR    PL29C+5(PL30C-PL29C-7),PL1T
                                    91          TIME  BIN                     SET YEAR
000170 4110 0001            00001   92+         LA    1,1(0,0) LOAD 1 TO SPECIFY UNIT
000174 0A0B                         93+         SVC   11 ISSUE TIME SVC
000176 5010 0DA8            00DB8   94          ST    1,PL12A                 AND DAY
00017A F342 0DE4 0DA9 00DF4 00D89   95          UNPK  PL24A+10(5),PL12A+1(3)  INTO PASSWORD
                                    96          FIND  PL2D,PL10A,D            FIND DIRECTORY MEMBER
000180 4110 C3C8            013D8   97+         LA    1,PL2D LOAD PARAMETER REG 1
000184 4100 0D90            00DA0   98+         LA    0,PL10A LOAD PARAMETER REG 0
000188 1311                         99+         LCR   1,1 INDICATE TYPE D
00018A 0A12                        100+         SVC   18 ISSUE FIND SVC
00018C 12FF                        101          LTR   15,15                   EXIT IF
00018E 4770 0878            00888  102          BNZ   PL235                   NOT FOUND
                                   103          READ  PL55,SF,PL2D,PL38-2,'S' READ RECORD
000192 0700                        104+         CNOP  0,4
000194 4510 D19C            001AC  105+         BAL   1,*+24 LOAD DECB ADDRESS
000198 00000000                    106+PL55     DC    F'0' EVENT CONTROL BLOCK
00019C 80                          107+         DC    X'80' TYPE FIELD
00019D 80                          108+         DC    X'80' TYPE FIELD
00019E 0000                        109+         DC    AL2(0) LENGTH
0001A0 000013D8                    110+         DC    A(PL2D) DCB ADDRESS
```

```
  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

0001A4 00001A06                   111+         DC    A(PL3B-2) AREA ADDRESS
0001A8 00000000                   112+         DC    A(0) RECORD POINTER WORD
0001AC 58F1 0008            00008 113+         L     15,8(1,0) LOAD DCB ADDRESS
0001B0 58F0 F030            00030 114+         L     15,48(0,15) LOAD RDWR ROUTINE ADDR
0001B4 05EF                       115+         BALR  14,15 LINK TO RDWR ROUTINE
                                  116          CHECK PL55                      WAIT
0001B6 4110 D188            00198 117+         LA    1,PL55 LOAD PARAMETER REG 1
0001BA 58E0 1008            00008 118+         L     14,8(0,1) PICK UP DCB ADDRESS
0001BE 58F0 E034            00034 119+         L     15,52(0,14) LOAD CHECK ROUT. ADDR.
0001C2 05EF                       120+         BALR  14,15 LINK TO CHECK ROUTINE
0001C4 4A70 C9F6            01A06 121          LH    7,PL3B-2                  CALCULATE
0001C8 8A70 0005            00005 122          SRA   7,5                       DIRECTORY TOTAL
0001CC 4780 D878            00888 123          BZ    PL235                     EXIT IF NONE
0001D0 9200 C7F4      01804       124 PL60     MVI   PL2B,0                    CLEAR OUTPUT
0001D4 D2FE C7F5 C7F4 01805 01804 125          MVC   PL2B+1(255),PL2B          BUFFER
0001DA 9218 C7F6      01806       126          MVI   PL2B+2,X'18'              CANCEL
0001DE 929F C8F2      01902       127          MVI   PL2B+254,X'9F'            US
0001E2 9281 C8F3      01903       128          MVI   PL2B+255,X'81'            AND HOME CHARACTER
                                  129          DISPLAY 1,PL2B,254              CLEAR DISPLAY SCREEN
0001E6 4100 0001            00001 130+         LA    0,1
0001EA 4110 C7F4            01804 131+         LA    1,PL2B
0001EE 4120 00FE            000FE 132+         LA    2,254
0001F2 45E0 DC0C            00C1C 133+         BAL   14,PL0
0001F6 4160 0001            00001 134          LA    6,1                       INITIALISE COUNTER
0001FA 4870 C9F6            01A06 135          LH    7,PL3B-2                  LOAD DIRECTORY
0001FE 8A70 0005            00005 136          SRA   7,5                       COUNT
000202 4780 D878            00888 137          BZ    PL235                     EXIT IF ZERO
000206 4180 C9F8            01A08 138          LA    8,PL3B                    SET POINTER
                                  139          DISPLAY 1,PL2C,PL4C-PL2C-2      WRITE HEADING
00020A 4100 0001            00001 140+         LA    0,1
00020E 4110 DE2E            00E3E 141+         LA    1,PL2C
000212 4120 0038            00038 142+         LA    2,PL4C-PL2C-2
000216 45E0 DC0C            00C1C 143+         BAL   14,PL0
00021A 4130 C7F6            01806 144          LA    3,PL2R+2                  INITIALISE OUTPUT POINTER
00021E 4140 0000            00000 145          LA    4,0                       CLEAR RECORD TOTAL
000222 9240 3000      00000       146 PL62     MVI   0(3),C' '                 CLEAR
000226 D232 3001 3000 00001 00000 147          MVC   1(51,3),0(3)              MESSAGE
00022C 4E60 DDA6            00DB8 148          CVD   6,PL12A                   CONVERT NUMBER TO DEC.
000230 F342 DDA8 DDAE 00DB8 00DBE 149          UNPK  PL12A(5),PL12A+6(3)       SET UP
000236 D201 3000 DDA9 00000 00DB9 150          MVC   0(2,3),PL12A+1            TWO DIGIT
00023C 95F0 3000      00000       151          CLI   0(3),C'0'                 NUMBER
000240 4770 D238            00248 152          BNE   PL64                      SUPPRESS
000244 9240 3000      00000       153          MVI   0(3),C' '                 LEADING ZERO
000248 D217 3003 8000 00003 00000 154 PL64     MVC   3(24,3),0(8)              SET UP JOBNAME
00024E 4850 8018            00018 155          LH    5,24(0,8)                 SET UP
000252 4E50 DDA8            00DB8 156          CVD   5,PL12A                   NUMBER
000256 D205 301D 0DB0 00010 00DC0 157          MVC   29(6,3),PL13A             OF
00025C DE05 301D 0DAD 00010 00DBD 158          ED    29(6,3),PL12A+5           PLOTS
000262 4850 801A            0001A 159          LH    5,26(0,8)                 SET UP
000266 4E50 DDA8            00DB8 160          CVD   5,PL12A                   NUMBER
00026A D205 3027 0DB0 00027 00DC0 161          MVC   39(6,3),PL13A             OF INPUT
000270 DE05 3027 0DAD 00027 00DBD 162          ED    39(6,3),PL12A+5           RECORDS
000276 4850 801C            0001C 163          LH    5,28(0,8)                 SET UP
00027A 4E50 DDA8            00DB8 164          CVD   5,PL12A                   NUMBER
00027E D205 302D 0DB0 00020 00DC0 165          MVC   45(6,3),PL13A             OF OUTPUT
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000284 DE05 3020 DDAD 0002D 00DB0   166          ED    45(6,3),PL12A+5          RECORDS
00028A DC33 3000 C03C 00000 0104C   167          TR    0(52,3),PL1T             TRANSLATE TO ASCII
000290 9280 3034      00034         168          MVI   52(3),X'8D'              SEND CR
000294 920A 3035      00035         169          MVI   53(3),X'0A'              AND LF
000298 1A45                         170          AR    4,5                      ADD TO TOTAL
00029A 4130 3036            00036   171          LA    3,54(0,3)                UPDATE OUTPUT POINTER
00029E 4110 C9DC            019EC   172          LA    1,PL2B+2+9*54            TEST FOR
0002A2 1913                         173          CR    1,3                      END OF BUFFER
0002A4 4720 02AC            002BC   174          BH    PL65                     BRANCH IF NOT FULL
                                    175          DISPLAY 1,PL2B,9*54            SEND BUFFER TO NOVA
0002A8 4100 0001            00001   176+         LA    0,1
0002AC 4110 C7F4            01804   177+         LA    1,PL2B
0002B0 4120 01E6            001E6   178+         LA    2,9*54
000284 45E0 DC0C            00C1C   179+         BAL   14,PLD
000288 4130 C7F6            01806   180          LA    3,PL2B+2                 RESET OUTPUT POINTER
0002BC 4160 6001            00001   181 PL65     LA    6,1(0,6)                 UPDATE
0002C0 4180 8020            00020   182          LA    8,32(0,8)                VALUES
0002C4 4670 D212            00222   183          BCT   7,PL62                   LOOP N TIMES
0002C8 4100 0001            00001   184          LA    0,1                      SET WRITE COMMAND
0002CC 4110 C7F4            01804   185          LA    1,PL2B                   SET OUTPUT POINTER
0002D0 4120 C7F6            01806   186          LA    2,PL2B+2                 CALCULATE
0002D4 1B32                         187          SR    3,2                      SIZE OF BUFFER SO FAR
0002D6 4780 02D0            002E0   188          BZ    PL655                    BRANCH IF EMPTY
0002DA 1823                         189          LR    2,3                      LOAD BUFFER LENGTH
0002DC 45E0 DC0C            00C1C   190          BAL   14,PLD                   SEND RESIDUAL RECORD
0002E0 4130 0064            00064   191 PL655    LA    3,100                    MULTIPLY THE RECORD COUNT
0002E4 1C24                         192          MR    2,4                      BY 100
0002E6 5840 C3F4            01404   193          L     4,PL2D+44                LOAD DEB ADDRESS
0002EA 4840 402E            0002F   194          LH    4,46(0,4)                LOAD NO OF TRACKS IN 1ST EXTENT
0002EE 1D24                         195          DR    2,4                      DIVIDE BY TRACK NUMBER
0002F0 8830 0003            00003   196          SRL   3,3                      DIVIDE BY NO OF RECORDS/TRACK
                                    197 *
                                    198 *        NOTE: THIS ASSUMES 8 RECORDS (802 BYTES) PER TRACK
                                    199 *              I.E. 2314 DISK DRIVE CAPACITY.
                                    200 *
0002F4 4E30 DDA8            00DB8   201          CVD   3,PL12A                  CONVERT
0002F8 D205 C7F4 DD80 01804 00DC0   202          MVC   PL2B(6),PL13A            PERCENT
0002FE DE05 C7F4 DDAD 01804 00DB0   203          ED    PL2B(6),PL12A+5          TO
000304 D202 DF4E C7F7 00F5E 01807   204          MVC   PL21C+2(3),PL2B+3        DECIMAL
00030A DC02 DF4E C03C 00F5E 0104C   205          TR    PL21C+2(3),PL1T          TRANSLATE TO ASCII
                                    206          DISPLAY 1,PL21C,PL22C-PL21C-2  PRINT PERCENT UTILISATION
000310 4100 0001            00001   207+         LA    0,1
000314 4110 DF4C            00F5C   208+         LA    1,PL21C
000318 4120 0020            00020   209+         LA    2,PL22C-PL21C-2
00031C 45E0 DC0C            00C1C   210+         BAL   14,PLD
000320 9563 0DD4      00DE4         211          CLI   PL20A,99                 IS IT A DELETE
000324 4780 09BA            009CA   212          BE    PL300                    REQUEST ?
                                    213 PL66     DISPLAY 5,PL4C,PL5C-PL4C-2     REQUEST
000328 4100 0005            00005   214+PL66     LA    0,5
00032C 4110 DE68            00E78   215+         LA    1,PL4C
000330 4120 0016            00016   216+         LA    2,PL5C-PL4C-2
000334 45E0 DC0C            00C1C   217+         BAL   14,PLD
                                    218          DISPLAY 2,PL1B,80              JOB NUMBER
000338 4100 0002            00002   219+         LA    0,2
00033C 4110 C4D4            014E4   220+         LA    1,PL1R
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000340 4120 0050            00050   221+         LA    2,80
000344 45E0 DC0C            00C1C   222+         BAL   14,PLD
000348 4780 D318            00328   223          BZ    PL66                REPEAT IF ZERO BYTE COUNT
00034C 4110 C4D6            014E6   224          LA    1,PL1B+2            LOAD DECIMAL
000350 45E0 DC86            00C96   225          BAL   14,PLE              NUMBER
000354 1213                         226          LTR   1,3                 RETRY
000356 4780 D318            00328   227          BZ    PL66                IF ZERO
00035A 4820 C9F6            01A06   228          LH    2,PL3B-2            COMPARE
00035E 8820 0005            00005   229          SRL   2,5                 WITH
000362 1912                         230          CR    1,2                 PRESENT
000364 4720 D318            00328   231          BH    PL66                DIRECTORY COUNT
000368 4E10 DDA8            00DB8   232          CVD   1,PL12A             CONVERT TO
00036C F342 DDA8 DDAE 00DB8 00DBE   233          UNPK  PL12A(5),PL12A+6(3) DECIMAL
000372 D201 DD9B DDA9 00DAB 00DB9   234          MVC   PL11A+3(2),PL12A+1  SET IN NUMBER
000378 8910 0005            00005   235          SLL   1,5                 POINT TO
00037C 4191 C9D8            019E8   236          LA    9,PL3B-32(1)        MEMBER INFORMATION
000380 D202 DD98 9000 00DA8 00000   237          MVC   PL11A(3),0(9)       SET UP MEMBER NAME
000386 5090 DDB8            00DC8   238          ST    9,PL14A             STORE DIRECTORY POINTER
00038A 5890 DDB8            00DC8   239 PL67     L     9,PL14A             RELOAD DIRECTORY POINTER
00038E 7800 DE00            00E10   240          LE    0,PL31A             RESET PRIMARY
000392 7000 DD6C            00D7C   241          STE   0,PL1A              X AND Y
000396 7000 DD70            00D80   242          STE   0,PL2A              SCALE
00039A 4110 0001            00001   243          LA    1,1                 DO NOT REQUEST
00039E 4910 9018            00018   244          CH    1,24(0,9)           PLOT NUMBER
0003A2 4780 D3D0            003E0   245          BE    PL675               IF ONLY ONE
                                    246          DISPLAY 5,PL7C,PL8C-PL7C-2  REQUEST
0003A6 4100 0005            00005   247+         LA    0,5
0003AA 4110 DE9A            00EAA   248+         LA    1,PL7C
0003AE 4120 0016            00016   249+         LA    2,PL8C-PL7C-2
0003B2 45E0 DC0C            00C1C   250+         BAL   14,PLD
                                    251          DISPLAY 2,PL1B,80           PLOT NUMBER
0003B6 4100 0002            00002   252+         LA    0,2
0003BA 4110 C4D4            014E4   253+         LA    1,PL1B
0003BE 4120 0050            00050   254+         LA    2,80
0003C2 45E0 DC0C            00C1C   255+         BAL   14,PLD
0003C6 4780 D37A            0038A   256          BZ    PL67                REPEAT IF ZERO BYTE COUNT
0003CA 4110 C4D6            014E6   257          LA    1,PL1B+2            CONVERT
0003CE 45E0 DC86            00C96   258          BAL   14,PLE              TO BINARY
0003D2 1213                         259          LTR   1,3                 RETRY
0003D4 4780 D37A            0038A   260          BZ    PL67                IF ZERO
0003D8 4910 9018            00018   261          CH    1,24(0,9)           RETRY IF
0003DC 4720 D37A            0038A   262          BH    PL67                TOO HIGH
0003E0 4E10 DDA8            00DB8   263 PL675    CVD   1,PL12A             CONVERT TO
0003E4 F342 DDA8 DDAE 00DB8 00DBE   264          UNPK  PL12A(5),PL12A+6(3) DECIMAL
0003EA D202 DD9D DDA8 00DAD 00DB8   265          MVC   PL11A+5(3),PL12A    COMPLETE MEMBER NAME
0003F0 47F0 D79C            007AC   266          B     PL220               REQUEST SCALING
                                    267 PL68     FIND  PL2D,PL11A,D        FIND PARTICULAR MEMBER
0003F4 4110 C3C8            013D8   268+PL68     LA    1,PL2D LOAD PARAMETER REG 1
0003F8 4100 DD98            00DA8   269+         LA    0,PL11A LOAD PARAMETER REG 0
0003FC 1311                         270+         LCR   1,1 INDICATE TYPE D
0003FE 0A12                         271+         SVC   18 ISSUE FIND SVC
000400 12FF                         272          LTR   15,15               DISPLAY OPTION LIST
000402 4770 D6F2            00702   273          BNZ   PL211               AGAIN IF NOT FOUND
000406 9200 C7F4      01804         274          MVI   PL2B,0              CLEAR
00040A D2FE C7F5 C7F4 01805 01804   275          MVC   PL2B+1(255),PL2B    BUFFER
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 LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

000410 9218 C7F6    01806         276          MVI   PL2B+2,X'18'            CLEAR
                                  277          DISPLAY 1,PL2B,254            SCREEN
000414 4100 0001          00001   278+         LA    0,1
000418 4110 C7F4          01804   279+         LA    1,PL2B
00041C 4120 00FE          000FE   280+         LA    2,254
000420 45E0 DC0C          00C1C   281+         BAL   14,PLD
                                  282          DISPLAY 1,PL30C,PL31C-PL30C-2 DRAW SCREEN BOUNDARY
000424 4100 0001          00001   283+         LA    0,1
000428 4110 C028          01038   284+         LA    1,PL30C
00042C 4120 0012          00012   285+         LA    2,PL31C-PL30C-2
000430 45E0 DC0C          00C1C   286+         BAL   14,PLD
000434 4110 0001          00001   287          LA    1,1                     INITIALISE
000438 1311                       288          LCR   1,1                     THE
00043A 5010 DD74          00D84   289          ST    1,PL3A                  X AND Y
00043E 5010 DD78          00D88   290          ST    1,PL4A                  CO-ORDINATE
000442 7800 DDFC          00E0C   291          LE    0,PL30A                 VALUES
000446 7000 DD80          00D90   292          STE   0,PL8A                  TO FLOATING
00044A 7000 DD84          00D94   293          STE   0,PL8A+4                POINT
00044E 4170 C7F6          01806   294          LA    7,PL2B+2                SET OUTPUT
000452 4180 C9F4          01A04   295          LA    8,PL2B+512              POINTERS
                                  296 PL70     READ  PL75,SF,PL2D,PL1B-2,'S' READ RECORD
000456 0700                       297+         CNOP  0,4
000458 4510 D460          00470   298+PL70     BAL   1,*+24 LOAD DECB ADDRESS
00045C 00000000                   299+PL75     DC    F'0' EVENT CONTROL BLOCK
000460 80                         300+         DC    X'80' TYPE FIELD
000461 80                         301+         DC    X'80' TYPE FIELD
000462 0000                       302+         DC    AL2(0) LENGTH
000464 00001308                   303+         DC    A(PL2D) DCB ADDRESS
000468 000014E2                   304+         DC    A(PL1B-2) AREA ADDRESS
00046C 00000000                   305+         DC    A(0) RECORD POINTER WORD
000470 58F1 0008          00008   306+         L     15,8(1,0) LOAD DCB ADDRESS
000474 58F0 F030          00030   307+         L     15,48(0,15) LOAD RDWR ROUTINE ADDR
000478 05EF                       308+         BALR  14,15 LINK TO RDWR ROUTINE
                                  309          CHECK PL75                    WAIT
00047A 4110 D44C          0045C   310+         LA    1,PL75 LOAD PARAMETER REG 1
00047E 58E0 1008          00008   311+         L     14,8(0,1) PICK UP DCB ADDRESS
000482 58F0 E034          00034   312+         L     15,52(0,14) LOAD CHECK ROUT. ADDR.
000486 05EF                       313+         BALR  14,15 LINK TO CHECK ROUTINE
000488 4190 C4D4          014E4   314          LA    9,PL1B                  SET UP
00048C 18A9                       315          LR    10,9                    START AND
00048E 4AA0 C4D2          014E2   316          AH    10,PL1B-2               END ADDRESS
000492 199A                       317 PL80     CR    9,10                    CHECK FOR END
000494 4780 D448          00458   318          BNL   PL70                    OF BUFFER
000498 4830 9002          00002   319          LH    3,2(0,9)                LOAD Y CO-ORD
00049C 5430 DD7C          00D8C   320          N     3,PL5A                  ISOLATE Y VALUE
0004A0 4030 DE0A          00E1A   321          STH   3,PL33A+2               CONVERT TO
0004A4 7840 DE08          00E18   322          LE    4,PL33A                 FLOATING POINT
0004A8 7B40 DDD0          00DE0   323          SE    4,PL19A+4               SUBTRACT ORIGIN
0004AC 7C40 DE18          00E28   324          ME    4,PL37A                 MULTIPLY BY COMBINED SCALE
0004B0 7040 DD8C          00D9C   325          STE   4,PL9A+4                STORE NEXT Y CO-ORD
0004B4 4120 000C          0000C   326          LA    2,12                    SET Y INDICATOR
0004B8 3244                       327          LTER  4,4                     CHECK IF
0004BA 4740 D4BE          004CE   328          BL    PL92                    Y ZERO
0004BE 4120 0006          00006   329          LA    2,6                     RESET VALUE
0004C2 7940 DE10          00E20   330          CE    4,PL35A                 COMPARE
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

0004C6 47D0 D4BE            004CE   331          BNH   PL92              WITH YMAX
0004CA 4120 0000            00000   332          LA    2,0               RESET VALUE
0004CE 4830 9000            00000   333 PL92     LH    3,0(0,9)          LOAD X VALUE
0004D2 4030 DE0A            00E1A   334          STH   3,PL33A+2          CONVERT TO
0004D6 7820 DE08            00E18   335          LE    2,PL33A           FLOATING POINT
0004DA 7820 0DCC            00D0C   336          SE    2,PL19A           SUBTRACT ORIGIN
0004DE 7C20 DE14            00E24   337          ME    2,PL36A           MULTIPLY BY COMBINED SCALE
0004E2 7020 DD88            00D98   338          STE   2,PL9A            STORE NEXT X CO-ORD
0004E6 D507 DD80 DD88 00D90 00D98   339          CLC   PL8A(8),PL9A      IGNORE IF NO
0004EC 4780 D6A6            006B6   340          BE    PL190             MOVEMENT
0004F0 4110 0002            00002   341          LA    1,2               SET X INDICATOR
0004F4 3222                         342          LTER  2,2               CHECK IF
0004F6 4740 D4FA            0050A   343          BL    PL94              X ZERO
0004FA 4110 0004            00004   344          LA    1,4               RESET VALUE
0004FE 7920 DE0C            00E1C   345          CE    2,PL34A           COMPARE
000502 47D0 D4FA            0050A   346          BNH   PL94              WITH XMAX
000506 4110 0006            00006   347          LA    1,6               RESET VALUE
00050A 4111 2000            00000   348 PL94     LA    1,0(1,2)          COMBINE VALUES
00050E 4010 DDD8            00DE8   349          STH   1,PL23A           SAVE NEW AREA CODE
000512 9180 9002      00002         350          TM    2(9),X'80'        TEST FOR
000516 47E0 D51E            0052E   351          BNO   PL96              PEN UP
00051A 950A 0DD9      00DE9         352          CLI   PL23A+1,10        CHECK IF NEW POINT
00051E 4770 D69A            006AA   353          BNE   PL180             INSIDE REGION
000522 4140 001D            0001D   354          LA    4,X'1D'           ADD 'GS' TO OUTPUT
000526 4580 DB8C            00B9C   355          BAL   11,PLB            BUFFER
00052A 47F0 D67E            0068E   356          B     PL170             ADD NEW POINT TO OUTPUT
00052E 4820 DDD6            00DE6   357 PL96     LH    2,PL22A           LOAD OLD AREA CODE
000532 8920 0004            00004   358          SLL   2,4               CALCULATE ADDRESS
000536 1A21                         359          AR    2,1               OF TABLE
000538 4122 C21A            0122A   360          LA    2,PL3T-34(2)      ELEMENT
00053C 95FF 2000      00000         361          CLI   0(2),255          CONTINUE IF
000540 4780 D67E            0068E   362          BE    PL170             5-5 TRANSITION
000544 4140 0DEC            00DFC   363          LA    4,PL26A           INITIALISE SOLUTION POINTER
000548 9500 2000      00000         364          CLI   0(2),0            CHECK IF NO
00054C 4780 D69A            006AA   365          BE    PL180             SOLUTION POSSIBLE
000550 7820 DD80            00D90   366          SE    2,PL8A            FORM X2-X1
000554 7840 DD84            00D94   367          SE    4,PL8A+4          FORM Y2-Y1
000558 91F0 2000      00000         368          TM    0(2),X'F0'        TEST FOR
00055C 47E0 D580            00590   369          BNO   PL100             PRIME TYPE
000560 4330 2000            00000   370          IC    3,0(0,2)          INSERT EQUATION NUMBER
000564 45B0 DCCC            00CDC   371          BAL   11,PLN            ATTEMPT SOLUTION
000568 1233                         372          LTR   3,3               CHECK IF PRIME
00056A 4770 D69A            006AA   373          BNZ   PL180             SOLUTION EXISTS
00056E 4330 2001            00001   374          IC    3,1(0,2)          LOAD BYTE TWO
000572 8830 0004            00004   375          SRL   3,4               ISOLATE EQUATION NUMBER
000576 4140 4004            00004   376          LA    4,4(0,4)          MOVE SOLUTION POINTER
00057A 45B0 DCCC            00CDC   377          BAL   11,PLN            ATTEMPT SOLUTION
00057E 1233                         378          LTR   3,3               CHECK IF 2ND
000580 4780 D636            00646   379          BZ    PL150             SOLUTION EXISTS
000584 4330 2001            00001   380          IC    3,1(0,2)          SOLVE
000588 45B0 DCCC            00CDC   381          BAL   11,PLN            3RD EQUATION
00058C 47F0 D636            00646   382          B     PL150             SET UP DISPLAY OUTPUT
000590 9180 2000      00000         383 PL100    TM    0(2),X'80'        BRANCH IF
000594 47E0 D614            00624   384          BNO   PL140             NOT PRIME OR SKIP
000598 9170 2000      00000         385          TM    0(2),X'70'        BRANCH IF
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

00059C 4780 D5D8            005E8   386          BZ    PL120          PRIME WITH SWAP
0005A0 4330 2000            00000   387          IC    3,0(0,2)       LOAD
0005A4 8830 0004            00004   388          SRL   3,4            EQUATION NUMBER
0005A8 45B0 DCCC            00CDC   389          BAL   11,PLN         ATTEMPT SOLUTION
0005AC 1233                         390          LTR   3,3            BRANCH IF
0005AE 4780 D5B0            005C0   391          BZ    PL110          SOLUTION FOUND
0005B2 4330 2000            00000   392          IC    3,0(0,2)       TEST
0005B6 45B0 DCCC            00CDC   393          BAL   11,PLN         FOR
0005BA 1233                         394          LTR   3,3            ALTERNATE
0005BC 4770 D69A            006AA   395          BNZ   PL180          1ST SOLUTION
0005C0 4140 4004            00004   396 PL110    LA    4,4(0,4)       UPDATE SOLUTION POINTER
0005C4 4330 2001            00001   397          IC    3,1(0,2)       LOAD
0005C8 8830 0004            00004   398          SRL   3,4            3RD DIGIT
0005CC 1233                         399          LTR   3,3            CHECK IF
0005CE 4780 D656            00666   400          BZ    PL160          ONLY ONE SOLN WANTED
0005D2 45B0 DCCC            00CDC   401          BAL   11,PLN         ATTEMPT 2ND SOLUTION
0005D6 1233                         402          LTR   3,3            CHECK IF
0005D8 4780 D636            00646   403          BZ    PL150          2ND SOLUTION FOUND
0005DC 4330 2001            00001   404          IC    3,1(0,2)       MUST
0005E0 45B0 DCCC            00CDC   405          BAL   11,PLN         BE LAST
0005F4 47F0 D636            00646   406          B     PL150          SOLUTION
0005E8 4330 2000            00000   407 PL120    IC    3,0(0,2)       ATTEMPT
0005EC 45B0 DCCC            00CDC   408          BAL   11,PLN         PRIME SOLUTION
0005F0 1233                         409          LTR   3,3            CHECK IF
0005F2 4770 D69A            006AA   410          BNZ   PL180          NO SOLUTION POSSIBLE
0005F6 4140 4004            00004   411          LA    4,4(0,4)       UPDATE SOLUTION POINTER
0005FA 4330 2001            00001   412          IC    3,1(0,2)       ATTEMPT
0005FE 8830 0004            00004   413          SRL   3,4            2ND
000602 45B0 DCCC            00CDC   414          BAL   11,PLN         SOLUTION
000606 1233                         415          LTR   3,3            BRANCH IF
000608 4780 D604            00614   416          BZ    PL130          FOUND
00060C 4330 2001            00001   417          IC    3,1(0,2)       MUST BE
000610 45B0 DCCC            00CDC   418          BAL   11,PLN         2ND SOLUTION
000614 9801 0DEC            00DFC   419 PL130    LM    0,1,PL26A      REVERSE
000618 5010 0DEC            00DFC   420          ST    1,PL26A        SOLUTION
00061C 5000 0DF0            00E00   421          ST    0,PL26A+4      VALUES
000620 47F0 D636            00646   422          B     PL150          SET UP DISPLAY OUTPUT
000624 4330 2000            00000   423 PL140    IC    3,0(0,2)       SOLVE
000628 8830 0004            00004   424          SRL   3,4            FIRST
00062C 45B0 DCCC            00CDC   425          BAL   11,PLN         LINE
000630 4330 2000            00000   426          IC    3,0(0,2)       TEST FOR
000634 4110 0007            00007   427          LA    1,7            SECOND
000638 1431                         428          NR    3,1            SOLUTION
00063A 4780 D656            00666   429          BZ    PL160          ONLY ONE SOLUTION REQUIRED
00063E 4140 4004            00004   430          LA    4,4(0,4)       MUST BE TWO
000642 45B0 DCCC            00CDC   431          BAL   11,PLN         SOLUTIONS
000646 4140 001D            0001D   432 PL150    LA    4,X'1D'        ADD 'GS' TO
00064A 45B0 DB8C            00B9C   433          BAL   11,PL8         OUTPUT BUFFER
00064E 4860 0DEC            00DFC   434          LH    6,PL26A        LOAD X AND Y
000652 4840 0DEE            00DFE   435          LH    4,PL26A+2      FOR 1ST SOLUTION
000656 4530 0B80            00BC0   436          BAL   3,PLC          ADD TO OUTPUT BUFFER
00065A 4860 0DF0            00E00   437          LH    6,PL26A+4      LOAD X AND Y
00065E 4840 0DF2            00E02   438          LH    4,PL26A+6      FOR 2ND SOLUTION
000662 47F0 D696            006A6   439          B     PL175          UPDATE AREA CODE
000666 4860 0DEC            00DFC   440 PL160    LH    6,PL26A        LOAD X AND Y
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 LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

00066A 4840 0DEE            00DFE   441          LH    4,PL26A+2          FOR 1ST SOLUTION
00066E 950A 0DD7      00DE7         442          CLI   PL22A+1,10         CHECK IF LAST POINT
000672 4780 0696            006A6   443          BE    PL175              INSIDE REGION
000676 4140 001D            0001D   444          LA    4,X'1D'            ADD 'GS' TO
00067A 45B0 0B8C            00B9C   445          BAL   11,PL8             OUTPUT BUFFER
00067E 4840 0DEE            00DFE   446          LH    4,PL26A+2          RELOAD Y CO-ORD
000682 4530 0B80            00BC0   447          BAL   3,PLC              ADD TO OUTPUT BUFFER
000686 7820 0D86            00D98   448          LE    2,PL9A             LOAD CO-ORDS OF
00068A 7840 0D8C            00D9C   449          LE    4,PL9A+4           NEW POINT
00068E 7E20 0DF4            00E04   450 PL170    AU    2,PL28A            CONVERT X
000692 7020 0DF8            00F08   451          STE   2,PL29A            CO-ORD TO
000696 4860 0DFA            00F0A   452          LH    6,PL29A+2          INTEGER
00069A 7E40 0DF4            00E04   453          AU    4,PL28A            CONVERT Y
00069E 7040 0DF8            00E08   454          STE   4,PL29A            CO-ORD TO
0006A2 4840 0DFA            00E0A   455          LH    4,PL29A+2          INTEGER
0006A6 4530 0B80            00BC0   456 PL175    BAL   3,PLC              ADD TO OUTPUT BUFFER
0006AA D201 0DD6 0DD8 00DE6 00DE8   457 PL180    MVC   PL22A(2),PL23A     UPDATE OLD AREA CODE
0006B0 D207 0D80 0D88 00D90 00D98   458          MVC   PL8A(8),PL9A       UPDATE COORDINATES
0006B6 4190 9004            00004   459 PL190    LA    9,4(0,9)           UPDATE POINTER
0006BA 47F0 D482            00492   460          B     PL80               CONTINUE
0006BE 4120 C7F6            01806   461 PL200    LA    2,PL2B+2           CALCULATE
0006C2 1B27                         462          SR    2,7                RESIDUAL
0006C4 4780 D6C6            006D6   463          BZ    PL210              IN OUTPUT
0006C8 4100 0001            00001   464          LA    0,1                BUFFER
0006CC 4110 C7F4            01804   465          LA    1,PL2B             WRITE
0006D0 1322                         466          LCR   2,2                LAST
0006D2 45E0 DC0C            00C1C   467          BAL   14,PLD             RECORD
                                    468 PL210    DISPLAY 5,PL8C,4         ACTIVATE
0006D6 4100 0005            00005   469+PL210    LA    0,5
0006DA 4110 DEB2            00EC2   470+         LA    1,PL8C
0006DE 4120 0004            00004   471+         LA    2,4
0006E2 45E0 DC0C            00C1C   472+         BAL   14,PLD
                                    473          DISPLAY 2,PL1B,80        'JIGGER' ONLY
0006E6 4100 0002            00002   474+         LA    0,2
0006EA 4110 C4D4            014E4   475+         LA    1,PL1B
0006EE 4120 0050            00050   476+         LA    2,80
0006F2 45E0 DC0C            00C1C   477+         BAL   14,PLD
0006F6 4780 D6F2            00702   478          BZ    PL211              ACCEPT CR ONLY
0006FA 95C3 C4D6      014E6         479          CLI   PL1B+2,C'C'        IS CURSOR
0006FE 4780 D8AC            008BC   480          BE    PL250              REQUIRED ?
000702 7800 0DFC            00E0C   481 PL211    LE    0,PL30A            RESET
000706 7000 0DCC            00DDC   482          STE   0,PL19A            THE
00070A 7000 0DD0            00DE0   483          STE   0,PL19A+4          ORIGIN
00070E 4110 000A            0000A   484          LA    1,10               SET CURRENT
000712 4010 0DD6            00DE6   485          STH   1,PL22A            AREA CODE TO 10
000716 9200 C7F4      01804         486          MVI   PL2B,0             CLEAR OUTPUT
00071A D2FE C7F5 C7F4 01805 01804   487          MVC   PL2B+1(255),PL2B   BUFFER
000720 9218 C7F6      01806         488          MVI   PL2B+2,X'18'       CANCEL
000724 929F C8F2      01902         489          MVI   PL2B+254,X'9F'     US
000728 9281 C8F3      01903         490          MVI   PL2B+255,X'81'     AND HOME CHARACTER
                                    491          DISPLAY 1,PL2B,254       CLEAR DISPLAY SCREEN
00072C 4100 0001            00001   492+         LA    0,1
000730 4110 C7F4            01804   493+         LA    1,PL2B
000734 4120 00FE            000FE   494+         LA    2,254
000738 45E0 DC0C            00C1C   495+         BAL   14,PLD
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

                                    496          DISPLAY 1,PL8C,PL13C-PL8C-2   TYPE OPTION LIST
00073C 4100 0001                    00001   497+         LA    0,1
000740 4110 DEB2                    00EC2   498+         LA    1,PL8C
000744 4120 007B                    0007B   499+         LA    2,PL13C-PL8C-2
000748 45E0 DC0C                    00C1C   500+         BAL   14,PLD
                                            501 PL212    DISPLAY 5,PL20C,PL21C-PL20C-2 REQUEST
00074C 4100 0005                    00005   502+PL212    LA    0,5
000750 4110 DF30                    00F40   503+         LA    1,PL20C
000754 4120 001A                    0001A   504+         LA    2,PL21C-PL20C-2
000758 45E0 DC0C                    00C1C   505+         BAL   14,PLD
                                            506          DISPLAY 2,PL1B,80             OPTION NUMBER
00075C 4100 0002                    00002   507+         LA    0,2
000760 4110 C4D4                    014E4   508+         LA    1,PL1B
000764 4120 0050                    00050   509+         LA    2,80
000768 45E0 DC0C                    00C1C   510+         BAL   14,PLD
00076C 4780 D73C                    0074C   511          BZ    PL212                   REPEAT IF ZERO BYTE COUNT
000770 4110 C4D6                    014E6   512          LA    1,PL1B+2                CONVERT
000774 45E0 DC86                    00C96   513          BAL   14,PLE                  TO BINARY
000778 1233                                 514          LTR   3,3                     RETRY IF
00077A 47D0 D73C                    0074C   515          BNH   PL212                   NOT POSITIVE
00077E 4230 DDD4                    00DE4   516          STC   3,PL20A                 STORE OPTION NUMBER
000782 9563 DDD4            00DE4           517          CLI   PL20A,99                TEST FOR
000786 4780 D1C0                    001D0   518          BE    PL60                    'DELETE' OPTION
00078A 4120 0004                    00004   519          LA    2,4                     COMPARE
00078E 1932                                 520          CR    3,2                     WITH 4
000790 4720 D73C                    0074C   521          BH    PL212                   RETRY IF HIGH
000794 8930 0002                    00002   522          SLL   3,2                     MULTIPLY BY 4
000798 47F3 D788                    00798   523          B     *(3)                    TAKE ACTION
00079C 47F0 D79C                    007AC   524          B     PL220                 1 NEW SCALE
0007A0 47F0 D37A                    0038A   525          B     PL67                  2 NEW PLOT
0007A4 47F0 D1C0                    001D0   526          B     PL60                  3 NEW JOB
0007A8 47F0 D888                    00898   527          B     PL240                 4 END OF RUN
                                            528 PL220    DISPLAY 5,PL5C,PL6C-PL5C-2    REQUEST
0007AC 4100 0005                    00005   529+PL220    LA    0,5
0007B0 4110 DE80                    00E90   530+         LA    1,PL5C
0007B4 4120 000C                    0000C   531+         LA    2,PL6C-PL5C-2
0007B8 45E0 DC0C                    00C1C   532+         BAL   14,PLD
                                            533          DISPLAY 2,PL1B,80             X SCALE
0007BC 4100 0002                    00002   534+         LA    0,2
0007C0 4110 C4D4                    014E4   535+         LA    1,PL1B
0007C4 4120 0050                    00050   536+         LA    2,80
0007C8 45E0 DC0C                    00C1C   537+         BAL   14,PLD
0007CC 7800 DD6C                    00D7C   538          LE    0,PL1A                  LOAD OLD X SCALE
0007D0 4780 D804                    00814   539          BZ    PL227                   NO X CHANGE IF ZERO BYTE COUNT
0007D4 4110 C4D6                    014E6   540          LA    1,PL1B+2                EXTRACT 1ST
0007D8 45E0 DC86                    00C96   541          BAL   14,PLE                  NUMBER
0007DC 4030 DE0A                    00E1A   542          STH   3,PL33A+2               STORE VALUE
0007E0 7800 DE08                    00E18   543          LE    0,PL33A                 LOAD NUMERATOR
0007E4 4130 0002                    00002   544          LA    3,2                     SET DIVISOR
0007E8 4030 DE0A                    00E1A   545          STH   3,PL33A+2               TO 2
0007EC 9561 1000            00000           546          CLI   0(1),C'/'               TEST FOR
0007F0 4770 D7FC                    0080C   547          BNE   PL225                   SECOND NUMBER
0007F4 4110 1001                    00001   548          LA    1,1(0,1)                UPDATE POINTER
0007F8 0620                                 549          BCTR  2,0                     DECREMENT BYTE COUNT
0007FA 45E0 DC86                    00C96   550          BAL   14,PLE                  EXTRACT 2ND NUMBER
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 LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

0007FE 1233                      551          LTR   3,3                     RESPECIFY
000800 4780 D79C           007AC 552          BZ    PL220                   IF ZERO
000804 8930 0001           00001 553          SLL   3,1                     MULTIPLY BY 2
000808 4030 DE0A           00E1A 554          STH   3,PL33A+2               STORE VALUE
00080C 7D00 DE08           00F18 555 PL225    DE    0,PL33A                 FORM QUOTIENT
000810 7000 DD6C           00D7C 556          STE   0,PL1A                  STORE RESULT
000814 7000 DE14           00E24 557 PL227    STE   0,PL36A                 STORE COMBINED MULTIPLIER
                                 558 PL230    DISPLAY 5,PL6C,PL7C-PL6C-2    REQUEST
000818 4100 0005           00005 559+PL230    LA    0,5
00081C 4110 DE8E           00E9E 560+         LA    1,PL6C
000820 4120 000A           0000A 561+         LA    2,PL7C-PL6C-2
000824 45E0 DC0C           00C1C 562+         BAL   14,PLD
                                 563          DISPLAY 2,PL1B,80             Y SCALE
000828 4100 0002           00002 564+         LA    0,2
00082C 4110 C4D4           014E4 565+         LA    1,PL1B
000830 4120 0050           00050 566+         LA    2,80
000834 45E0 DC0C           00C1C 567+         BAL   14,PLD
000838 7800 DD70           00D80 568          LE    0,PL2A                  LOAD OLD Y SCALE
00083C 4780 D870           00880 569          BZ    PL234                   NO Y CHANGE IF ZERO BYTE COUNT
000840 4110 C4D6           014E6 570          LA    1,PL1B+2                EXTRACT 1ST
000844 45E0 DC86           00C96 571          BAL   14,PLE                  NUMBER
000848 4030 DE0A           00E1A 572          STH   3,PL33A+2               STORE RESULT
00084C 7800 DE08           00E18 573          LE    0,PL33A                 LOAD VALUE
000850 4130 0002           00002 574          LA    3,2                     SET DIVISOR
000854 4030 DE0A           00E1A 575          STH   3,PL33A+2               TO 2
000858 9561 1000     00000       576          CLI   0(1),C'/'               SECOND
00085C 4770 D868           00878 577          BNE   PL232                   NUMBER ?
000860 4110 1001           00001 578          LA    1,1(0,1)                UPDATE POINTER
000864 0620                      579          BCTR  2,0                     DECREMENT BYTE COUNT
000866 45E0 DC86           00C96 580          BAL   14,PLE                  EXTRACT 2ND NO
00086A 1233                      581          LTR   3,3                     TEST VALUE
00086C 4780 D808           00818 582          BZ    PL230                   RESPECIFY IF ZERO
000870 8930 0001           00001 583          SLL   3,1                     MULTIPLY BY 2
000874 4030 DE0A           00E1A 584          STH   3,PL33A+2               STORE VALUE
000878 7D00 DE08           00E18 585 PL232    DE    0,PL33A                 FORM QUOTIENT
00087C 7000 DD70           00D80 586          STE   0,PL2A                  STORE RESULT
000880 7000 DE18           00E28 587 PL234    STE   0,PL37A                 STORE COMBINED MULTIPLIER
000884 47F0 D3E4           003F4 588          B     PL68                    CONTINUE
                                 589 PL235    DISPLAY 1,PL25C,PL26C-PL25C-2 TYPE 'DIRECTORY EMPTY'
000888 4100 0001           00001 590+PL235    LA    0,1
00088C 4110 DFA8           00F88 591+         LA    1,PL25C
000890 4120 0014           00014 592+         LA    2,PL26C-PL25C-2
000894 45E0 DC0C           00C1C 593+         BAL   14,PLD
                                 594 PL240    DISPLAY 1,PL1C,PL2C-PL1C-2    TYPE 'END OF RUN'
000898 4100 0001           00001 595+PL240    LA    0,1
00089C 4110 DE1C           00E2C 596+         LA    1,PL1C
0008A0 4120 0010           00010 597+         LA    2,PL2C-PL1C-2
0008A4 45E0 DC0C           00C1C 598+         BAL   14,PLD
0008A8 47F0 D0C0           00DD0 599          B     PL30                    EXIT
                                 600 PL245    DISPLAY 1,PL24C,PL25C-PL24C-2 RESPECIFY BOTH POINTS
0008AC 4100 0001           00001 601+PL245    LA    0,1
0008B0 4110 DF82           00F92 602+         LA    1,PL24C
0008B4 4120 0024           00024 603+         LA    2,PL25C-PL24C-2
0008B8 45E0 DC0C           00C1C 604+         BAL   14,PLD
0008BC 4170 DDBC           00DCC 605 PL250    LA    7,PL15A                 REQUEST
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

0008C0 4140 0002            00002   606          LA    4,2                       2 CURSOR POSITIONS
                                    607 PL260    DISPLAY 9,PL22C,PL23C-PL22C-2 ENABLE CURSOR
0008C4 4100 0009            00009   608+PL260    LA    0,9
0008C8 4110 DF6E            00F7E   609+         LA    1,PL22C
0008CC 4120 0006            00006   610+         LA    2,PL23C-PL22C-2
0008D0 45E0 DC0C            00C1C   611+         BAL   14,PLD
                                    612          DISPLAY 10,PL1B,80              READ CO-ORDINATES
0008D4 4100 000A            0000A   613+         LA    0,10
0008D8 4110 C4D4            014E4   614+         LA    1,PL1B
0008DC 4120 0050            00050   615+         LA    2,80
0008E0 45E0 DC0C            00C1C   616+         BAL   14,PLD
0008E4 4110 0005            00005   617          LA    1,5                       RETRY UNLESS EXACTLY
0008E8 1912                         618          CR    1,2                       5 CHARACTERS
0008EA 4770 D8B4            008C4   619          BNE   PL260                     RECEIVED
                                    620          DISPLAY 1,PL23C,PL24C-PL23C-2 ACKNOWLEDGE CURSOR
0008EE 4100 0001            00001   621+         LA    0,1
0008F2 4110 DF76            00F86   622+         LA    1,PL23C
0008F6 4120 000A            0000A   623+         LA    2,PL24C-PL23C-2
0008FA 45E0 DC0C            00C1C   624+         BAL   14,PLD
0008FE 4110 001F            0001F   625          LA    1,31                      LOAD MASK
000902 4320 C4D8            014E8   626          IC    2,PL1B+4                  CONSTRUCT
000906 8C20 0005            00005   627          SRDL  2,5                       THE
00090A 4320 C4D7            014E7   628          IC    2,PL1B+3                  X
00090E 1421                         629          NR    2,1                       CO-ORDINATE
000910 8D20 0005            00005   630          SLDL  2,5                       FROM HIGH
000914 4020 DE0A            00E1A   631          STH   2,PL33A+2                 AND LOW
000918 D203 7000 DE08 00000 00E18   632          MVC   0(4,7),PL33A              PARTS
00091E 4320 C4DA            014EA   633          IC    2,PL1B+6                  CONSTRUCT
000922 8C20 0005            00005   634          SRDL  2,5                       THE
000926 4320 C4D9            014E9   635          IC    2,PL1B+5                  Y
00092A 1421                         636          NR    2,1                       CO-ORDINATE
00092C 8D20 0005            00005   637          SLDL  2,5                       FROM HIGH
000930 4020 DE0A            00E1A   638          STH   2,PL33A+2                 AND LOW
000934 D203 7004 DE08 00004 00E18   639          MVC   4(4,7),PL33A              PARTS
00093A 4170 7008            00008   640          LA    7,8(0,7)                  UPDATE POINTER
00093E 4640 08B4            008C4   641          BCT   4,PL260                   LOOP TWICE
000942 9814 DD8C            00DCC   642          LM    1,4,PL15A                 LOAD X AND Y CO-ORDS
000946 1913                         643          CR    1,3                       REJECT IF
000948 4780 D89C            008AC   644          BE    PL245                     X1=X2
00094C 95E2 C4D6      014E6         645          CLI   PL1B+2,C'S'               TEST FOR
000950 4780 D952            00962   646          BE    PL270                     POSSIBLE PICTURE
000954 1913                         647          CR    1,3                       REFLECTION
000956 4740 D952            00962   648          BL    PL270                     CHECK IF
00095A 5010 DDC4            00DD4   649          ST    1,PL16A                   X-COORDS TO BE
00095E 5030 DD8C            00DCC   650          ST    3,PL15A                   SWAPPED
000962 1924                         651 PL270    CR    2,4                       REJECT IF
000964 4780 D89C            008AC   652          BE    PL245                     Y1=Y2
000968 95E2 C4D6      014E6         653          CLI   PL1B+2,C'S'               TEST FOR
00096C 4780 D96E            0097E   654          BE    PL280                     POSSIBLE PICTURE
000970 1924                         655          CR    2,4                       REFLECTION
000972 4740 D96E            0097E   656          BL    PL280                     CHECK IF
000976 5020 DDC8            00DD8   657          ST    2,PL16A+4                 Y-COORDS TO BE
00097A 5040 DDC0            00DD0   658          ST    4,PL15A+4                 SWAPPED
00097E 7800 DDBC            00DCC   659 PL280    LE    0,PL15A                   CALCULATE
000982 7820 DE14            00E24   660          LF    2,PL36A                   X CO-ORD
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 LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

000986 3D02                        661          DER   0,2                              OF
000988 7A00 DDCC             000DC 662          AE    0,PL19A                          ORIGIN
00098C 7003 DDCC             000DC 663          STE   0,PL19A                          ADJUSTMENT
000990 7800 DDC0             000D0 664          LE    0,PL15A+4                        CALCULATE
000994 7840 DE18             00E28 665          LE    4,PL37A                          Y CO-ORD
000998 3D04                        666          DER   0,4                              OF
00099A 7A00 DDD0             00DE0 667          AE    0,PL19A+4                        ORIGIN
00099E 7000 DDD0             00DE0 668          STE   0,PL19A+4                        ADJUSTMENT
0009A2 7C20 DE0C             00E1C 669          ME    2,PL34A                          CALCULATE
0009A6 7860 DDC4             000D4 670          LE    6,PL16A                          THE
0009AA 7B60 DDBC             000CC 671          SE    6,PL15A                          NEW
0009AE 3D26                        672          DER   2,6                              COMBINED X
0009B0 7020 DE14             00E24 673          STE   2,PL36A                          FACTOR
0009B4 7C40 DE10             00E20 674          ME    4,PL35A                          CALCULATE
0009B8 7860 DDC8             000D8 675          LE    6,PL16A+4                        THE
0009BC 7B60 DDC0             000D0 676          SE    6,PL15A+4                        NEW
0009C0 3D46                        677          DER   4,6                              COMBINED Y
0009C2 7040 DE18             00E28 678          STE   4,PL37A                          FACTOR
0009C6 47F0 D3E4             003F4 679          B     PL68                             RE-DRAW GRAPH
                                   680 PL300    DISPLAY 5,PL26C,PL27C-PL26C-2 REQUEST
0009CA 4100 0005             00005 681+PL300    LA    0,5
0009CE 4110 DFBE             00FCE 682+         LA    1,PL26C
0009D2 4120 0024             00024 683+         LA    2,PL27C-PL26C-2
0009D6 45E0 DC0C             00C1C 684+         BAL   14,PLD
                                   685          DISPLAY 2,PL1B,80              JOB NO. TO DELETE
0009DA 4100 0002             00002 686+         LA    0,2
0009DE 4110 C4D4             014E4 687+         LA    1,PL1B
0009E2 4120 0050             00050 688+         LA    2,80
0009E6 45E0 DC0C             00C1C 689+         BAL   14,PLD
0009EA 4780 D6F2             00702 690          BZ    PL211                            RE-OFFER OPTIONS IF ZERO BYTE CT
0009EE 4110 C4D6             014E6 691          LA    1,PL1B+2                         ASSEMBLE
0009F2 45E0 DC86             00C96 692          BAL   14,PLE                           DECIMAL NUMBER
0009F6 1233                        693          LTR   3,3                              TEST FOR
0009F8 4780 D6F2             00702 694          BZ    PL211                            ZERO
0009FC 4820 C9F6             01A06 695          LH    2,PL3B-2                         COMPARE WITH
000A00 8820 0005             00005 696          SRL   2,5                              DIRECTORY
000A04 1932                        697          CR    3,2                              COUNT
000A06 4720 D6F2             00702 698          BH    PL211                            REJECT IF HIGH
                                   699          DISPLAY 9,PL27C,PL28C-PL27C-2 REQUEST NON-ECHOING
000A0A 4100 0009             00009 700+         LA    0,9
000A0E 4110 DFE4             00FF4 701+         LA    1,PL27C
000A12 4120 0014             00014 702+         LA    2,PL28C-PL27C-2
000A16 45E0 DC0C             00C1C 703+         BAL   14,PLD
                                   704          DISPLAY 10,PL1B,80             PASSWORD
000A1A 4100 000A             0000A 705+         LA    0,10
000A1E 4110 C4D4             014E4 706+         LA    1,PL1B
000A22 4120 0050             00050 707+         LA    2,80
000A26 45E0 DC0C             00C1C 708+         BAL   14,PLD
000A2A DC0B C4D7 C13C 014E7 0114C  709          TR    PL1B+3(12),PL2T                  TRANSLATE TO EBCDIC
000A30 D50E C4D4 DDDA 014E4 00DEA  710          CLC   PL1B(15),PL24A                   COMPARE WITH
000A36 4780 DA54             00A64 711          BE    PL305                            VALID PASSWORD
000A3A 9200 C7F4       01804       712          MVI   PL28,0                           CLEAR
000A3E D2FE C7F5 C7F4 01805 01804  713          MVC   PL28+1(255),PL28                 OUTPUT
000A44 D2FF C8F4 C7F4 01904 01804  714          MVC   PL28+256(256),PL28               BUFFER
000A4A D215 C7F6 DFFA 01806 0100A  715          MVC   PL28+2(PL29C-PL28C),PL28C REJECT
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

                                    716          DISPLAY 1,PL2B,510            IF PASSWORD
000A50 4130 0001                00001   717+         LA    0,1
000A54 4110 C7F4                01804   718+         LA    1,PL2B
000A58 4120 01FE                001FE   719+         LA    2,510
000A5C 45E0 DC0C                00C1C   720+         BAL   14,PLD
000A60 47F0 D6F2                00702   721          B     PL211                   NOT SATISFACTORY
                                    722 PL305    DISPLAY 1,PL29C,PL30C-PL29C-2 WRITE 'PASSWORD ACCEPTED'
000A64 4100 0001                00001   723+PL305    LA    0,1
000A68 4110 C010                01020   724+         LA    1,PL29C
000A6C 4120 0016                00016   725+         LA    2,PL30C-PL29C-2
000A70 45E0 DC0C                00C1C   726+         BAL   14,PLD
000A74 4E30 DDA8                00DB8   727          CVD   3,PL12A                 CONVERT TO DECIMAL
000A78 F342 DDA8 DDAE 00DB8     00DBE   728          UNPK  PL12A(5),PL12A+6(3)     SET INTO
000A7E D201 DD98 DDA9 00DAB     00DB9   729          MVC   PL11A+3(2),PL12A+1      MEMBER NAME
000A84 8930 0005                00005   730          SLL   3,5                     POINT TO
000A88 4133 C9D8                019E8   731          LA    3,PL38-32(3)            DIRECTORY ENTRY
000A8C D202 DD98 3000 00DA8     00000   732          MVC   PL11A(3),0(3)           SET UP 3 LETTER START
000A92 4840 3018                00018   733          LH    4,24(0,3)               LOAD TOTAL PLOT COUNT
000A96 4120 0001                00001   734          LA    2,1                     INITIALISE MEMBER NUMBER
000A9A 4E20 DDA8                00DB8   735 PL310    CVD   2,PL12A                 COMPLETE
000A9E F342 DDA8 DDAE 00DB8     00DBE   736          UNPK  PL12A(5),PL12A+6(3)     MEMBER
000AA4 D202 DD9D DDA8 00DAD     00DB8   737          MVC   PL11A+5(3),PL12A        NAME
                                    738          STOW  PL4D,PL11A,D            DELETE MEMBER FROM PDS DIRECTORY
000AAA 4110 C478                01488   739+         LA    1,PL4D LOAD PARAMETER REG 1
000AAE 4100 DD98                00DA8   740+         LA    0,PL11A LOAD PARAMETER REG 0
000AB2 1300                             741+         LCR   0,0 INDICATE TYPE D
000AB4 0A15                             742+         SVC   21 ISSUE STOW SVC
000AB6 4120 2001                00001   743          LA    2,1(0,2)                UPDATE PLOT NUMBER
000ABA 4640 DA8A                00A9A   744          BCT   4,PL310                 LOOP N TIMES
                                    745          FIND  PL3D,PL10A,D            FIND DIRECTORY MEMBER
000ABE 4110 C420                01430   746+         LA    1,PL3D LOAD PARAMETER REG 1
000AC2 4100 DD90                00DA0   747+         LA    0,PL10A LOAD PARAMETER REG 0
000AC6 1311                             748+         LCR   1,1 INDICATE TYPE D
000AC8 0A12                             749+         SVC   18 ISSUE FIND SVC
                                    750          READ  DECB,SF,MF=E            READ INTO CORE
000ACA 4110 C380                01390   751+         LA    1,DECB LOAD DECB ADDRESS
000ACE 9280 1005        00005           752+         MVI   5(1),X'80' SET TYPE FIELD
000AD2 58F1 0008                00008   753+         L     15,8(1,0) LOAD DCB ADDRESS
000AD6 58F0 F030                00030   754+         L     15,48(0,15) LOAD RDWR ROUTINE ADDR
000ADA 05EF                             755+         BALR  14,15 LINK TO RDWR ROUTINE
                                    756          CHECK DECB                    CHECK I/O
000ADC 4110 C380                01390   757+         LA    1,DECB LOAD PARAMETER REG 1
000AE0 58E0 1008                00008   758+         L     14,8(0,1) PICK UP DCB ADDRESS
000AF4 58F0 E034                00034   759+         L     15,52(0,14) LOAD CHECK ROUT. ADDR.
000AE8 05EF                             760+         BALR  14,15 LINK TO CHECK ROUTINE
000AEA 4810 C9F6                01A06   761          LH    1,PL38-2                MOVE LAST DIRECTORY
000AEE 4191 C9D8                019E8   762          LA    9,PL38-32(1)            ENTRY INTO
000AF2 D21F 3000 9000 00000     00000   763          MVC   0(32,3),0(9)            VACANT SPOT
000AF8 4120 0020                00020   764          LA    2,32                    REDUCE
000AFC 1B12                             765          SR    1,2                     BYTE
000AFE 4010 C9F6                01A06   766          STH   1,PL38-2                COUNT
                                    767          WRITE DECB,SF,MF=E            RE-WRITE
000B02 4110 C390                01390   768+         LA    1,DECB LOAD DECB ADDRESS
000B06 9220 1005        00005           769+         MVI   5(1),X'20' SET TYPE FIELD
000B0A 58F1 0008                00008   770+         L     15,8(1,0) LOAD DCB ADDRESS
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

000B0E 58F0 F030            00030  771+         L     15,48(0,15) LOAD RDWR ROUTINE ADDR
000B12 05EF                        772+         BALR  14,15 LINK TO RDWR ROUTINE
                                   773          CHECK DECB                      DIRECTORY MEMBER
000B14 4110 C380            01390  774+         LA    1,DECB LOAD PARAMETER REG 1
000B18 58E0 1008            00008  775+         L     14,8(0,1) PICK UP DCB ADDRESS
000B1C 58F0 E034            00034  776+         L     15,52(0,14) LOAD CHECK ROUT. ADDR.
000B20 05EF                        777+         BALR  14,15 LINK TO CHECK ROUTINE
000B22 1939                        778          CR    3,9                       BYPASS RE-NAMING IF
000B24 4770 DB26            00B36  779          BNE   PL315                     LAST ENTRY OF LIST DELETED
000B28 4810 C9F6            01A06  780          LH    1,PL38-2                  EXIT IF
000B2C 1211                        781          LTR   1,1                       NO MORE
000B2E 4780 D878            00888  782          BZ    PL235                     PLOTS HELD
000B32 47F0 D6F2            00702  783          B     PL211                     OTHERWISE, LIST OPTIONS AGAIN
000B36 D202 DD98 3000 00DA8 00000  784 PL315     MVC   PL11A(3),0(3)           SET UP 3 LETTERS
000B3C D202 DDA0 3000 00DB0 00000  785          MVC   PL11A+8(3),0(3)         OF MEMBER NAMES
000B42 D201 DDA3 DD9B 00DB3 00DA8  786          MVC   PL11A+11(2),PL11A+3     SET UP NEW JOB NUMBER
000B48 4810 C9F6            01A06  787          LH    1,PL38-2                  RECONSTRUCT
000B4C 8810 0005            00005  788          SRL   1,5                       FORMER
000B50 4110 1001            00001  789          LA    1,1(0,1)                  JOB NUMBER
000B54 4E10 DDA8            00DB8  790          CVD   1,PL12A                   SET
000B58 F342 DDA8 DDAE 00DB8 00DBE  791          UNPK  PL12A(5),PL12A+6(3)     INTO
000B5E D201 DD9B DDA9 00DAB 00DB9  792          MVC   PL11A+3(2),PL12A+1      MEMBER NAME
000B64 4840 3018            00018  793          LH    4,24(0,3)                 LOAD PLOT COUNT
000B68 4120 0001            00001  794          LA    2,1                       INITIALISE MEMBER NUMBER
000B6C 4E20 DDA8            00DB8  795 PL320     CVD   2,PL12A                   COMPLETE
000B70 F342 DBA8 DDAE 00DB8 00DBE  796          UNPK  PL12A(5),PL12A+6(3)     OLD AND NEW
000B76 D202 DD9D DDA8 00DAD 00DB8  797          MVC   PL11A+5(3),PL12A        MEMBER
000B7C D202 DDA5 DDA8 00DB5 00DB8  798          MVC   PL11A+13(3),PL12A       NAMES
                                   799          STOW  PL4D,PL11A,C            CHANGE,MEMBER NAME
000B82 4110 C478            01488  800+         LA    1,PL4D LOAD PARAMETER REG 1
000B86 4100 DD98            00DA8  801+         LA    0,PL11A LOAD PARAMETER REG 0
000B8A 1311                        802+         LCR   1,1 INDICATE TYPE C
000B8C 1300                        803+         LCR   0,0
000B8E 0A15                        804+         SVC   21 ISSUE STOW SVC
000B90 4120 2001            00001  805          LA    2,1(0,2)                  UPDATE PLOT NUMBER
000B94 4640 DB5C            00B6C  806          BCT   4,PL320                   LOOP N TIMES
000B98 47F0 D6F2            00702  807          B     PL211                     LIST OPTIONS AGAIN
                                   808 *
                                   809 *        ADD DISPLAY CHARACTER TO OUTPUT BUFFER
                                   810 *
000B9C 1978                        811 PLB      CR    7,8                       TEST FOR
000B9E 4740 D8A6            00BB6  812          BL    PL810                     BUFFER FULL
                                   813          DISPLAY 1,PL28,510              SEND BUFFER
000BA2 4100 0001            00001  814+         LA    0,1
000BA6 4110 C7F4            01804  815+         LA    1,PL28
000BAA 4120 01FE            001FE  816+         LA    2,510
000BAE 45E0 DC0C            00C1C  817+         BAL   14,PLD
000BB2 4170 C7F6            01806  818          LA    7,PL28+2                  RESET POINTER
000BB6 4240 7000            00000  819 PLB10    STC   4,0(0,7)                  STORE IN BUFFER
000BBA 4170 7001            00001  820          LA    7,1(0,7)                  UPDATE POINTER
000BBE 07FB                        821          BR    11                        RETURN
                                   822 *
                                   823 *        ADD X AND Y CO-ORDINATES TO OUTPUT BUFFER
                                   824 *
000BC0 8C40 0005            00005  825 PLC      SRDL  4,5                       ISOLATE HIGH Y
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 LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000BC4 4940 DD78            00D88   826          CH    4,PL4A                  CHECK IF
000BC8 4780 DBC8            00BD8   827          BE    PLC10                   SAME AS BEFORE
000BCC 4040 DD78            00D88   828          STH   4,PL4A                  REPLACE HIGH Y
000BD0 4140 4020            00020   829          LA    4,32(0,4)               ADD 'HIGH Y' BITS
000BD4 45B0 DB8C            00B9C   830          BAL   11,PLB                  ADD THIS TO OUTPUT
000BD8 4140 0000            00000   831 PLC10    LA    4,0                     CLEAR REGISTER 4
000BDC 8D40 0005            00005   832          SLDL  4,5                     RESTORE LOW Y
000BE0 4040 DD7A            00D8A   833          STH   4,PL4A+2                RFPLACE LOW Y
000BE4 4140 4060            00060   834          LA    4,96(0,4)               ADD 'LOW Y' BITS
000BE8 45B0 DB8C            00B9C   835          BAL   11,PLB                  ADD THIS TO OUTPUT BUFFER
000BEC 1846                         836          LR    4,6                     LOAD X VALUE
000BEE 8C40 0005            00005   837          SRDL  4,5                     ISOLATE HIGH X
000BF2 4940 DD74            00D84   838          CH    4,PL3A                  CHECK IF
000BF6 4780 DBF6            00C06   839          BE    PLC20                   SAME AS BEFORE
000BFA 4040 DD74            00D84   840          STH   4,PL3A                  REPLACE HIGH X
000BFE 4140 4020            00020   841          LA    4,32(0,4)               ADD 'HIGH X' BITS
000C02 45B0 DB8C            00B9C   842          BAL   11,PLB                  ADD THIS TO OUTPUT BUFFER
000C06 4140 0000            00000   843 PLC20    LA    4,0                     CLEAR REGISTER 4
000C0A 8D40 0005            00005   844          SLDL  4,5                     RESTORE LOW X
000C0E 4040 DD76            00D86   845          STH   4,PL3A+2                REPLACE LOW X
000C12 4140 4040            00040   846          LA    4,64(0,4)               ADD 'LOW X' BITS
000C16 45B0 DB8C            00B9C   847          BAL   11,PLB                  ADD TO OUTPUT BUFFER
000C1A 07F3                         848          BR    3                       RETURN
                                    849 *
                                    850 *        DISPLAY I/O ON TEKTRONIX
                                    851 *
000C1C 5010 C378            01388   852 PLD      ST    1,PLCCW                 CONSTRUCT
000C20 4200 C378            01388   853          STC   0,PLCCW                 THE CCW
000C24 4020 1000            00000   854          STH   2,0(0,1)                SET NOVA BYTE COUNT
000C28 9101 C378      01388         855          TM    PLCCW,1                 TEST FOR
000C2C 4120 0200            00200   856          LA    2,512                   WRITE COMMAND
000C30 4710 DC28            00C38   857          BO    PLD10                   BRANCH IF SO
000C34 4120 0050            00050   858          LA    2,80                    RESET CCW
000C38 4020 C37E            0138E   859 PLD10    STH   2,PLCCW+6               BYTE COUNT
000C3C 4120 0003            00003   860          LA    2,3                     SET RETRY COUNTER
                                    861 PLD20    EXCP  PLIOB                   PERFORM I/O
000C40 4110 C350            01360   862+PLD20    LA    1,PLIOB LOAD PARAMETER REG 1
000C44 0A00                         863+         SVC   0 ISSUE SVC FOR EXCP
                                    864          WAIT  ECB=PLECB               WAIT
000C46 4110 C370            01380   865+         LA    1,PLECB LOAD PARAMETER REG 1
000C4A 4100 0001            00001   866+         LA    0,1(0,0) COUNT OMITTED,1 USED
000C4E 0A01                         867+         SVC   1 LINK TO WAIT ROUTINE
000C50 4810 C35E            0136E   868          LH    1,PLCSW+6               TEST FOR
000C54 4910 C37E            0138E   869          CH    1,PLCCW+6               ZERO DATA
000C58 4780 DC7E            00C8E   870          BE    PLD40                   TRANSFER
000C5C 957F C370      01380         871          CLI   PLECB,X'7F'             TEST FOR
000C60 4770 DC76            00C86   872          BNE   PLD30                   ERRORS
000C64 9101 C378      01388         873          TM    PLCCW,1                 RETURN
000C68 071E                         874          BCR   1,14                    IF WRITE
000C6A DC00 C4D6 C13C 014E6 0114C   875          TR    PL1B+2(1),PL2T          TRANSLATE 1ST CHARACTER
000C70 950A C378      01388         876          CLI   PLCCW,10                SKIP IF READ
000C74 4780 DC6E            00C7E   877          BE    PLD25                   WITHOUT ECHO
000C78 DC4C C4D7 C13C 014E7 0114C   878          TR    PL1B+3(77),PL2T         TRANSLATE ASCII TO EBCDIC
000C7E 4820 C4D4            014E4   879 PLD25    LH    2,PL1B                  LOAD AND TEST
000C82 1222                         880          LTR   2,2                     BYTE COUNT
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000C84 07FE                        881          BR    14                RETURN
000C86 9101 C35C      0136C        882 PLD30    TM    PLCSW+4,1         UNIT
000C8A 4710 D6C6            006D6  883          BO    PL210             EXCEPTION ?
000C8E 4620 DC30            00C40  884 PLD40    BCT   2,PLD20           TRY AGAIN
000C92 47F0 D0BA            000CA  885          B     PL20              TAKE ERROR EXIT
                                   886 *
                                   887 *        CONVERT TO BINARY
                                   888 *
000C96 4130 0000            00000  889 PLE      LA    3,0               CLEAR TOTAL
000C9A 1222                        890          LTR   2,2               TEST BYTE COUNT
000C9C 07DE                        891          BCR   13,14             RETURN IF NOT POSITIVE
000C9E 4180 0005            00005  892          LA    8,5               SET COUNTER TO 5
000CA2 95F0 1000      00000        893 PLE10    CLI   0(1),C'0'         EXIT
000CA6 074E                        894          BCR   4,14              IF LOW
000CA8 95F9 1000      00000        895          CLI   0(1),C'9'         EXIT
000CAC 072E                        896          BCR   2,14              IF HIGH
000CAE 4350 1000            00000  897          IC    5,0(0,1)          ISOLATE
000CB2 4160 000F            0000F  898          LA    6,15              DECIMAL
000CB6 1456                        899          NR    5,6               DIGIT
000CB8 4133 3000            00000  900          LA    3,0(3,3)          FORM 2N
000CBC 4163 3000            00000  901          LA    6,0(3,3)          FORM 4N
000CC0 4166 6000            00000  902          LA    6,0(6,6)          FORM 8N
000CC4 4133 6000            00000  903          LA    3,0(3,6)          FORM 10N
000CC8 4133 5000            00000  904          LA    3,0(3,5)          FORM 10N+D
000CCC 4110 1001            00001  905          LA    1,1(0,1)          UPDATE POINTER
000CD0 4620 DCC6            00CD6  906          BCT   2,PLE20           TEST BYTE
000CD4 07FE                        907          BR    14                COUNT
000CD6 4680 DC92            00CA2  908 PLE20     BCT   8,PLE10           NO MORE THAN
000CDA 07FE                        909          BR    14                5 DIGITS
                                   910 *
                                   911 *        SOLVE PARTICULAR EQUATION
                                   912 *
000CDC 4110 0007            00007  913 PLN      LA    1,7               ISOLATE EQUATION
000CE0 1431                        914          NR    3,1               NUMBER
000CE2 8930 0002            00002  915          SLL   3,2               TAKE INDEXED
000CE6 47F3 DCD6            00CE6  916          B     *(3)              BRANCH
000CEA 47F0 DD5E            00D6E  917          B     PLN60             1 LINE X=0
000CEE 47F0 DD30            00D40  918          B     PLN40             2 LINE=XMAX
000CF2 47F0 DD20            00D30  919          B     PLN30             3 LINE=YMAX
000CF6 4110 0000            00000  920          LA    1,0               4 LINE Y=0
000CFA 7800 DD84            00D94  921          LE    0,PL8A+4          LOAD Y1
000CFE 3244                        922 PLN10    LTER  4,4               NO SOLUTION IF
000D00 078B                        923          BCR   8,11              Y2-Y1=0
000D02 3C02                        924          MER   0,2               MULTIPLY BY X2-X1
000D04 3D04                        925          DER   0,4               DIVIDE BY Y2-Y1
000D06 7B00 DD80            00D90  926          SE    0,PL8A            SUBTRACT X1
000D0A 072B                        927          BCR   2,11              NO SOLUTION IF RESULT NEGATIVE
000D0C 3300                        928          LCER  0,0               COMPLEMENT
000D0E 7900 DE0C            00E1C  929          CE    0,PL34A           OR HIGHER
000D12 072B                        930          BCR   2,11              THAN XMAX
000D14 4010 4002            00002  931          STH   1,2(0,4)          STORE Y SOLUTION
000D18 4130 4000            00000  932          LA    3,0(0,4)          POINT TO SOLUTION AREA
000D1C 7E00 DDF4            00E04  933 PLN20     AU    0,PL28A           CONVERT
000D20 7000 DDF8            00E0R  934          STE   0,PL29A           TO
000D24 D201 3000 DDFA 00002 00E0A  935          MVC   0(2,3),PL29A+2    INTEGER
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000D2A 4130 0000             00000   936          LA    3,0                INDICATE SOLUTION
000D2E 07FB                          937          BR    11                 FOUND
000D30 4110 02E4             002E4   938 PLN30    LA    1,YMAX             INDICATE Y=YMAX
000D34 7800 DD84             00D94   939          LE    0,PL8A+4           LOAD Y1
000D38 7B00 DE10             00E20   940          SE    0,PL35A            FORM Y1-YMAX
000D3C 47F0 DCEE             00CFE   941          B     PLN10              CALCULATE SOLUTION
000D40 4110 03DE             003DE   942 PLN40    LA    1,XMAX             INDICATE X=XMAX
000D44 7800 DD80             00D90   943          LE    0,PL8A             LOAD X1
000D48 7B00 DE0C             00E1C   944          SE    0,PL34A            FORM X1-XMAX
000D4C 3222                          945 PLN50    LTER  2,2                NO SOLUTION IF
000D4E 078B                          946          BCR   8,11               X2-X1=0
000D50 3C04                          947          MER   0,4                MULTIPLY BY Y2-Y1
000D52 3D02                          948          DER   0,2                DIVIDE BY X2-X1
000D54 7B00 DD84             00D94   949          SE    0,PL8A+4           SUBTRACT Y1
000D58 0728                          950          BCR   2,11               NO SOLUTION IF RESULT NEGATIVE
000D5A 3300                          951          LCER  0,0                COMPLEMENT VALUE
000D5C 7900 DE10             00E20   952          CE    0,PL35A            OR HIGHER
000D60 072B                          953          BCR   2,11               THAN YMAX
000D62 4010 4000             00000   954          STH   1,0(0,4)           STORE X SOLUTION
000D66 4130 4002             00002   955          LA    3,2(0,4)           POINT TO SOLUTION AREA
000D6A 47F0 DD0C             00D1C   956          B     PLN20              EXIT
000D6E 4110 0000             00000   957 PLN60    LA    1,0                INDICATE X=0
000D72 7800 DD80             00D90   958          LE    0,PL8A             LOAD X1
000D76 47F0 DD3C             00D4C   959          B     PLN50              CALCULATE SOLUTION
                                     960 *
000D7A 0000
000D7C 40800000                      961 PL1A     DC    E'0.5'             X SCALE FACTOR
000D80 40800000                      962 PL2A     DC    E'0.5'             Y SCALE FACTOR
000D84 00000000                      963 PL3A     DC    A(0)               HIGH, LOW CURRENT X CO-ORDS
000D88 00000000                      964 PL4A     DC    A(0)               HIGH, LOW CURRENT Y CO-ORDS
000D8C 00001FFF                      965 PL5A     DC    X'00001FFF'        Y MASK
000D90 0000000000000000              966 PL8A     DC    E'0.,0.'           CURRENT X,Y CO-ORDS
000D98 0000000000000000              967 PL9A     DC    E'0.,0.'           NEXT X,Y CO-ORDS
000DA0                               968          DS    0D
000DA0 C4C9E2D7D3C1E840              969 PL10A    DC    C'DISPLAY '        DIRECTORY MEMBER
000DA8 D1D1D1D5D5D4D4D4              970 PL11A    DC    C'JJJNNMMM',C'JJJNNMMM'
000DB8                               971 PL12A    DS    D                  WORK AREA
000DC0 402020202120                  972 PL13A    DC    C' ',X'2020202120' EDIT PATTERN
000DC8                               973 PL14A    DS    A                  DIRECTORY POINTER
000DCC 0000000000000000              974 PL15A    DC    E'0.,0.'           X,Y CURSOR 1 CO-ORDS
000DD4 0000000000000000              975 PL16A    DC    E'0.,0.'           X,Y CURSOR 2 CO-ORDS
000DDC 0000000000000000              976 PL19A    DC    E'0.,0.'           ORIGIN
000DE4 00                            977 PL20A    DC    AL1(0)             OPTION NUMBER
000DE5 00                            978 PL21A    DC    AL1(0)
000DE6 000A                          979 PL22A    DC    AL2(10)            CURRENT AREA CODE
000DE8 0000                          980 PL23A    DC    AL2(0)             NEXT AREA CODE
000DEA 000DC1C5D5E5D7C1              981 PL24A    DC    H'13',C'AENVPASS
000DF9 000000
000DFC 0000000000000000              982 PL26A    DC    2A(0)              SOLUTION AREA
000E04 46000000                      983 PL28A    DC    X'46000000'        UNNORMALISED ZERO
000E08                               984 PL29A    DS    F                  WORK AREA
000E0C 00000000                      985 PL30A    DC    E'0.0'             ZERO
000E10 40800000                      986 PL31A    DC    E'0.5'             0.5
000E14 41100000                      987 PL32A    DC    E'1.0'             1.0
000E18 46000000                      988 PL33A    DC    X'46000000'        WORK AREA
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT

000E1C 433DE000                     989 PL34A    DC    E'990.'                 XMAX IN FLOATING POINT
000E20 432E4000                     990 PL35A    DC    E'740.'                 YMAX IN FLOATING POINT
000E24 00000000                     991 PL36A    DC    E'0.0'
000E28 00000000                     992 PL37A    DC    E'0.0'
                                    993 *
000E2C 00008D0AC5D5C440             994 PL1C     DC    H'0',X'8D0A',C'END OF RUN ',X'8D0A0A'
                                    995 PL2C     DC    H'0',C' N JOBNAME   DATE    TIME   NO. OF PLOTS INCR. VEX
000E3E 000040D540D1D6C2                               CT. ',X'8D0A0A'
000E78 00008D0AE2C5D3C5             996 PL4C     DC    H'0',X'8D0A',C'SELECT JOB NUMBER:  '
000E90 00008D0AE740E2C3             997 PL5C     DC    H'0',X'8D0A',C'X SCALE = '
000E9E 0000E840E2C3C1D3             998 PL6C     DC    H'0',C'Y SCALE = '
000EAA 00008D0AE2C5D3C5             999 PL7C     DC    H'0',X'8D0A',C'SELECT PLOT NUMBER: '
000EC2 00009F818D0A40D5            1000 PL8C     DC    H'0',X'9F818D0A',C' N OPTION'
000ED1 8D0A0A40F140D9C5            1001 PL9C     DC    X'8D0A0A',C' 1 RESET SCALE OF CURRENT PLOT'
000EF2 8D0A40F240C3C8D6            1002 PL10C    DC    X'8D0A',C' 2 CHOOSE NEW PLOT IN CURRENT JOB'
000F15 8D0A40F340E2D7C5            1003 PL11C    DC    X'8D0A',C' 3 SPECIFY NEW PLOT JOB'
000F2E 8D0A40F440C5D5C4            1004 PL12C    DC    X'8D0A',C' 4 END OF RUN',X'8D0A'
000F3F                             1005 PL13C    EQU   *
000F3F 00
000F40 00008D0A00E2C5D3            1006 PL20C    DC    H'0',X'8D0A00',C'SELECT OPTION NUMBER:  '
000F5C 0003404040407D7C5           1007 PL21C    DC    H'0',C'    PERCENT SPOOL UTILISATION ',X'8D0A'
000F7E 00009F1100000000            1008 PL22C    DC    H'0',X'9F1100000000'
000F86 00009F818D0A0A00            1009 PL23C    DC    H'0',X'9F818D0A0A00',C'OK',X'8D0A'
000F92 00009F818D0A4040            1010 PL24C    DC    H'0',X'9F818D0A',C'   RESPECIFY BOTH CURSOR POINTS '
000FB8 00008D0AC4C9D9C5            1011 PL25C    DC    H'0',X'8D0A',C'DIRECTORY EMPTY ',X'8D0A'
000FCE 00008D0A00E2C5D3            1012 PL26C    DC    H'0',X'8D0A00',C'SELECT JOB NUMBER FOR DELETION:  '
000FF4 00008D0A00C5D5E3            1013 PL27C    DC    H'0',X'8D0A00',C'ENTER PASSWORD:  '
00100A 8D0A0AD7C1E2E2E6            1014 PL28C    DC    X'8D0A0A',C'PASSWORD REJECTED',X'8D0A'
001020 00008D0A0AD7C1E2            1015 PL29C    DC    H'0',X'8D0A0A',C'PASSWORD ACCEPTED',X'8D0A'
00003E                             1016 HX       EQU   XMAX/32+32
00005E                             1017 LX       EQU   XMAX-(HX-32)*32+64
000037                             1018 HY       EQU   YMAX/32+32
000064                             1019 LY       EQU   YMAX-(HY-32)*32+96
                                   1020 *
                                   1021 *        DATA FOR DRAWING BOUNDARY ON THE DISPLAY SCREEN
                                   1022 *
001038 00001D00A060A0C0            1023 PL30C    DC    H'0',X'1D00A060A0C060'
001041 3E5E37645E64                1024          DC    AL1(HX,LX,HY,LY,LX,LY)
001047 A0C0A060C0                  1025          DC    X'A0C0A060C0'
00104C                             1026 PL31C    EQU   *
                                   1027 *
00104C                             1028 PL1T     DS    0H                        TRANSLATE EBCDIC TO ASCII
00104C A0A0A0A0A0A0A0A0            1029          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          000-015
00105C A0A0A0A0A0A0A0A0            1030          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          016-031
00106C A0A0A0A0A0A0A0A0            1031          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          032-047
00107C A0A0A0A0A0A0A0A0            1032          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          048-063
00108C A0A0A0A0A0A0A0A0            1033          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          064-079
00109C A6A0A0A0A0A0A0A0            1034          DC    X'A6A0A0A0A0A0A0A0A0A02124AAA9BB5F'          080-095
0010AC 2DAFA0A0A0A0A0A0            1035          DC    X'2DAFA0A0A0A0A0A0A0A0ACA50ABE3F'          096-111
0010BC A0A0A0A0A0A0A0A0            1036          DC    X'A0A0A0A0A0A0A0A0A0A0A03AA3C0278D22'          112-127
0010CC A0A0A0A0A0A0A0A0            1037          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          128-143
0010DC A0A0A0A0A0A0A0A0            1038          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          144-159
0010EC A0A0A0A0A0A0A0A0            1039          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          160-175
0010FC A0A0A0A0A0A0A0A0            1040          DC    X'A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0'          176-191
00110C A04142C344C5C647            1041          DC    X'A04142C344C5C64748C9A0A0A0A0A0A0'          192-207
```

```
  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

00111C A0CA4BCC4D4ECF50            1042          DC    X'A0CA4BCC4D4ECF50D1D2A0A0A0A0A0A0'          208-223
00112C A0A053D45556D7D8            1043          DC    X'A0A053D45556D7D8595AA0A0A0A0A0A0'          224-239
00113C 30B1B23384353687            1044          DC    X'30B1B233843536B7B839A0A0A0A0A0A0'          240-255
                                   1045 *
00114C                             1046 PL2T     DS    0H                          TRANSLATE ASCII TO EBCDIC
00114C 4040404040404040            1047          DC    33C' ',C'!"#$%&&''()*+,-./0123456789:;<=>?@'
00118D C1C2C3C4C5C6C7C8            1048          DC    C'ABCDEFGHIJKLMNOPQRSTUVWXYZ      '
0011AC 4040404040404040            1049          DC    32C' '
0011CC 4040404040404040            1050          DC    33C' ',C'!"#$%&&''()*+,-./0123456789::<=>?@'
00120D C1C2C3C4C5C6C7C8            1051          DC    C'ABCDEFGHIJKLMNOPQRSTUVWXYZ      '
00122C 4040404040404040            1052          DC    32C' '
                                   1053 *
00124C                             1054 PL3T     DS    0H                          TABLE OF POSSIBLE SOLUTIONS
00124C 0000000000000000            1055          DC    X'00000000000000009300829300000849393A4'                1
00125E 0000000000000000            1056          DC    7H'0'
00126C 0030000000000F310           1057          DC    X'000000000000F3103000F320F3943400F3A4'                 2
00127E 0000000000000000            1058          DC    7H'0'
00128C 000000000000081A3           1059          DC    X'00000000000081A3A3000000A39484A30000'                 3
00129E 0000000000000000            1060          DC    7H'0'
0012AC 0300F130F1A30000            1061          DC    X'0000F130F1A300001000120000000F140F1A4'                4
0012BE 0000000000000000            1062          DC    7H'0'
0012CC 93003000A3001000            1063          DC    X'93003000A3001000FFFF2000940040000A400'                5
0012DE 0000000000000000            1064          DC    7H'0'
0012EC F2B1F23000002100            1065          DC    X'F2B1F2300000210022000000F294F2400000'                 6
0012FE 0000000000000000            1066          DC    7H'0'
00130C 0000839494A30000            1067          DC    X'0000839494A3000094000829400000000000'                 7
00131E 0000000000000000            1068          DC    7H'0'
00132C F4934300F4A3F410            1069          DC    X'F4934300F4A3F4104000F42000000000000'                  8
00133E 0000000000000000            1070          DC    7H'0'
00134C C29383A4000081A4            1071          DC    X'C29383A4000081A4A4000000000000000000'                 9
                                   1072 *
001360                             1073          DS    0F
001360 42000000                    1074 PLIOB    DC    X'42',AL3(0)                IOB
001364 00001380                    1075          DC    A(PLECB)                    ECB ADDRESS
001368 0000000000000000            1076 PLCSW    DC    A(0,0)                      CSW
001370 00001388                    1077          DC    A(PLCCW)                    CAW
001374 000013A4                    1078          DC    A(PL1D)                     DCB ADDRESS
001378 00000000                    1079          DC    A(0)                        RESTART ADDRESS
00137C 00010000                    1080          DC    AL2(1,0)                    BLOCK COUNT INCREMENT
                                   1081 *
001380 00000000                    1082 PLECB    DC    A(0)                        ECB
                                   1083 *
001384 00000000
001388 0300000020000001            1084 PLCCW    CCW   3,0,X'20',1                 CCW
                                   1085 *
                                   1086          PRINT NOGEN
                                   1087          READ  DECB,SF,PL3D,PL3B-2,'S',MF=L READ (LIST FORM)
                                   1095 PL1D     DCB   DSORG=PS,MACRF=E,DDNAME=DISPLAY,IOBAD=PLIOB
                                   1127 PL2D     DCB   DSORG=PO,MACRF=R,DDNAME=SYSUT1,EODAD=PL200
                                   1178 PL3D     DCB   DSORG=PO,MACRF=(R,W),DDNAME=SYSUT1
                                   1229 PL4D     DCB   DSORG=PO,MACRF=W,DDNAME=SYSUT1
0014E0                             1280          DS    F                           BLKSIZE
0014E4                             1281 PL1B     DS    200F                        DISK AND DISPLAY INPUT BUFFER
001804                             1282 PL2B     DS    128F                        DISPLAY OUTPUT BUFFER
001A04                             1283          DS    F                           DIRECTORY COUNT
```

```
  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT

001A08                            1284 PL3B     DS    200F                DIRECTORY BLOCK
                                  1285          END
```

RELOCATION DICTIONARY

POS.ID	REL.ID	FLAGS	ADDRESS
01	01	08	000079
01	01	08	00007D
01	01	08	000081
01	01	08	000085
01	01	08	0000D5
01	01	08	0000D9
01	01	08	0000DD
01	01	08	0000E1
01	01	0C	0001A0
01	01	0C	0001A4
01	01	0C	000464
01	01	0C	000468
01	01	0C	001364
01	01	0C	001370
01	01	0C	001374
01	01	0C	001398
01	01	0C	00139C
01	01	0C	0013C0
01	01	08	0013F9

CROSS-REFERENCE

SYMBOL	LEN	VALUE	DEFN	REFERENCES
AENVPLT2	00001	000000	00009	0018 0021
DECB	00004	001390	01088	0751 0757 0768 0774
HX	00001	00003E	01016	1017 1024
HY	00001	000037	01018	1019 1024
IHA0003A	00002	0000C8	00050	0046
LX	00001	00005E	01017	1024 1024
LY	00001	000064	01019	1024 1024
PLB	00002	000B9C	00811	0355 0433 0445 0830 0835 0842 0847
PLB10	00004	000BB6	00819	0812
PLC	00004	000BC0	00825	0436 0447 0456
PLCCW	00008	001388	01084	0852 0853 0855 0859 0869 0873 0876 1077
PLCSW	00004	001368	01076	0868 0882
PLC10	00004	000BD8	00831	0827
PLC20	00004	000C06	00843	0839
PLD	00004	000C1C	00852	0133 0143 0179 0190 0210 0217 0222 0250 0255 0281 0286 0467 0472 0477 0495 0500 0505 0510 0532 0537 0562 0567 0593 0598 0604 0611 0616 0624 0684 0689 0703 0708 0720 0726 0817
PLD10	00004	000C38	00859	0857
PLD20	00004	000C40	00862	0884
PLD25	00004	000C7E	00879	0877
PLD30	00004	000C86	00882	0872
PLD40	00004	000C8E	00884	0870
PLE	00004	000C96	00889	0225 0258 0513 0541 0550 0571 0580 0692
PLECB	00004	001380	01082	0865 0871 1075
PLE10	00004	000CA2	00893	0908
PLE20	00004	000CD6	00908	0906
PLIOB	00001	001360	01074	0862 1112
PLN	00004	000CDC	00913	0371 0377 0381 0389 0393 0401 0405 0408 0414 0418 0425 0431
PLN10	00002	000CFE	00922	0941
PLN20	00004	000D1C	00933	0956
PLN30	00004	000D30	00938	0919
PLN40	00004	000D40	00942	0918
PLN50	00002	000D4C	00945	0959
PLN60	00004	000D6E	00957	0917
PL1A	00004	000D7C	00961	0241 0538 0556
PL1B	00004	0014E4	01281	0220 0224 0253 0257 0304 0314 0316 0475 0479 0508 0512 0535 0540 0565 0570 0614 0626 0628 0633 0635 0645 0653 0687 0691 0706 0709 0710 0875 0878 0879
PL1C	00002	000E2C	00994	0071 0071 0596 0597
PL1D	00004	0013A4	01099	0028 0036 0057 1078
PL1T	00002	00104C	01028	0071 0072 0073 0074 0075 0076 0077 0078 0079 0080 0081 0082 0083 0084 0085 0086 0087 0088 0089 0090 0167 0205
PL10	00004	0000AC	00046	0037 0039 0041
PL10A	00008	000DA0	00969	0098 0747
PL10C	00002	000EF2	01002	0078 0079 0079
PL100	00004	000590	00383	0369
PL11A	00008	000DA8	00970	0234 0237 0265 0269 0729 0732 0737 0740 0784 0785 0786 0786 0792 0797 0798 0801
PL11C	00002	000F15	01003	0079 0080 0080
PL110	00004	0005C0	00396	0391
PL12A	00008	000D88	00971	0094 0095 0148 0149 0149 0150 0156 0158 0160 0162 0164 0166 0201 0203 0232 0233 0233 0234 0263 0264 0264 0265 0727 0728 0728 0729 0735 0736 0736 0737 0790 0791 0791 0792 0795 0796 0796 0797 0798
PL12C	00002	000F2E	01004	0080 0081 0081
PL120	00004	0005E8	00407	0386
PL13A	00001	000DC0	00972	0157 0161 0165 0202

SYMBOL	LEN	VALUE	DEFN	REFERENCES													
PL13C	00001	000F3F	01005	0081	0499												
PL130	00004	000614	00419	0416													
PL14A	00004	000DC8	00973	0238	0239												
PL140	00004	000624	00423	0384													
PL15A	00004	000DCC	00974	0605	0642	0650	0658	0659	0664	0671	0676						
PL150	00004	000646	00432	0379	0382	0403	0406	0422									
PL16A	00004	000DD4	00975	0649	0657	0670	0675										
PL160	00004	000666	00440	0400	0429												
PL170	00004	00068E	00450	0356	0362												
PL175	00004	0006A6	00456	0439	0443												
PL180	00006	0006AA	00457	0353	0365	0373	0395	0410									
PL19A	00004	000DDC	00976	0323	0336	0482	0483	0662	0663	0667	0668						
PL190	00004	0006B6	00459	0340													
PL2A	00004	000D80	00962	0242	0568	0586											
PL2B	00004	001804	01282	0124	0125	0125	0126	0127	0128	0131	0144	0172	0177	0180	0185	0186	0202	0203
				0204	0274	0275	0275	0276	0279	0294	0295	0461	0465	0486	0487	0487	0488	0489
				0490	0493	0712	0713	0713	0714	0714	0715	0718	0815	0818				
PL2C	00002	000E3E	00995	0071	0072	0072	0141	0142	0597									
PL2D	00004	0013D8	01131	0030	0038	0059	0097	0110	0193	0268	0303							
PL2T	00002	00114C	01046	0709	0875	0878												
PL20	00004	0000CA	00052	0885														
PL20A	00001	000DE4	00977	0211	0516	0517												
PL20C	00002	000F40	01006	0082	0082	0503	0504											
PL200	00004	00068E	00461	1149														
PL21A	00001	000DE5	00978															
PL21C	00002	000F5C	01007	0082	0083	0083	0204	0205	0208	0209	0504							
PL210	00004	0006D6	00469	0463	0883													
PL211	00004	000702	00481	0273	0478	0690	0694	0698	0721	0783	0807							
PL212	00004	00074C	00502	0511	0515	0521												
PL22A	00002	000DE6	00979	0357	0442	0457	0485											
PL22C	00002	000F7E	01008	0083	0209	0609	0610											
PL220	00004	0007AC	00529	0266	0524	0552												
PL225	00004	00080C	00555	0547														
PL227	00004	000814	00557	0539														
PL23A	00002	000DE8	00980	0349	0352	0457												
PL23C	00002	000F86	01009	0084	0084	0610	0622	0623										
PL230	00004	000818	00559	0582														
PL232	00004	000878	00585	0577														
PL234	00004	000880	00587	0569														
PL235	00004	000888	00590	0102	0123	0137	0782											
PL24A	00002	000DEA	00981	0095	0710													
PL24C	00002	000F92	01010	0084	0085	0085	0602	0603	0623									
PL240	00004	000898	00595	0527														
PL245	00004	0008AC	00601	0644	0652													
PL25C	00002	000F88	01011	0085	0086	0086	0591	0592	0603									
PL250	00004	0008BC	00605	0480														
PL26A	00004	000DFC	00982	0363	0419	0420	0421	0434	0435	0437	0438	0440	0441	0446				
PL26C	00002	000FCE	01012	0086	0087	0087	0592	0682	0683									
PL260	00004	0008C4	00608	0619	0641													
PL27C	00002	000FF4	01013	0087	0088	0088	0683	0701	0702									
PL270	00002	000962	00651	0646	0648													
PL28A	00004	000E04	00983	0450	0453	0933												
PL28C	00003	00100A	01014	0088	0089	0702	0715	0715										
PL280	00004	00097E	00659	0654	0656													
PL29A	00004	000E08	00984	0451	0452	0454	0455	0934	0935									

CROSS-REFERENCE

SYMBOL	LEN	VALUE	DEFN	REFERENCES
PL29C	00002	001020	01015	0089 0090 0090 0715 0724 0725
PL3A	00004	000D84	00963	0289 0838 0840 0845
PL3B	00004	001A08	01284	0111 0121 0135 0138 0228 0236 0695 0731 0761 0762 0766 0780 0787 1093
PL3D	00004	001430	01182	0032 0040 0061 0746 1092
PL3T	00002	00124C	01054	0360
PL30	00004	0000D0	00055	0599
PL30A	00004	000E0C	00985	0291 0481
PL30C	00002	001038	01023	0090 0284 0285 0725
PL300	00004	0009CA	00681	0212
PL305	00004	000A64	00723	0711
PL31A	00004	000E10	00986	0240
PL31C	00001	00104C	01026	0285
PL310	00004	000A9A	00735	0744
PL315	00006	000B36	00784	0779
PL32A	00004	000E14	00987	
PL320	00004	000B6C	00795	0806
PL33A	00004	000E18	00988	0321 0322 0334 0335 0542 0543 0545 0554 0555 0572 0573 0575 0584 0585 0631 0632 0638 0639
PL34A	00004	000E1C	00989	0345 0669 0929 0944
PL35A	00004	000E20	00990	0330 0674 0940 0952
PL36A	00004	000E24	00991	0337 0557 0660 0673
PL37A	00004	000E28	00992	0324 0587 0665 0678
PL4A	00004	000D88	00964	0290 0826 0828 0833
PL4C	00002	000E78	00996	0072 0073 0073 0142 0215 0216
PL4D	00004	001488	01233	0034 0042 0063 0739 0800
PL40	00004	0000F2	00068	0052
PL5A	00004	000D8C	00965	0320
PL5C	00002	000E90	00997	0073 0074 0074 0216 0530 0531
PL50	00002	0000F8	00070	0043
PL55	00004	000198	00106	0117
PL6C	00002	000E9E	00998	0074 0075 0075 0531 0560 0561
PL60	00004	0001D0	00124	0518 0526
PL62	00004	000222	00146	0183
PL64	00006	000248	00154	0152
PL65	00004	0002BC	00181	0174
PL655	00004	0002E0	00191	0188
PL66	00004	000328	00214	0223 0227 0231
PL67	00004	00038A	00239	0256 0260 0262 0525
PL675	00004	0003E0	00263	0245
PL68	00004	0003F4	00268	0588 0679
PL7C	00002	000EAA	00999	0075 0076 0076 0248 0249 0561
PL70	00004	000458	00298	0318
PL75	00004	00045C	00299	0310
PL8A	00004	000D90	00966	0292 0293 0339 0366 0367 0458 0921 0926 0939 0943 0949 0958
PL8C	00002	000EC2	01000	0076 0077 0077 0249 0470 0498 0499
PL80	00002	000492	00317	0460
PL9A	00004	000D98	00967	0325 0338 0339 0448 0449 0458
PL9C	00003	000ED1	01001	0077 0078 0078
PL92	00004	0004CE	00333	0328 0331
PL94	00004	00050A	00348	0343 0346
PL96	00004	00052E	00357	0351
XMAX	00001	0003DE	00022	0942 1016 1017
YMAX	00001	0002E4	00023	0938 1018 1019

```
NO STATEMENTS FLAGGED IN THIS ASSEMBLY
*STATISTICS*     SOURCE RECORDS (SYSIN) =   846      SOURCE RECORDS (SYSLIB) =  4039
*OPTIONS IN EFFECT*   LIST, NODECK, LOAD, NORENT, XREF, NOTEST, ALGN, OS, NOTERM, LINECNT =  55
 1343 PRINTED LINES



IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS1.MACLIB                                    KEPT
IEF285I   VOL SER NOS= AAE001.
IEF285I   AAE.MACLIB                                     KEPT
IEF285I   VOL SER NOS= AAE002.
IEF285I   SYS73053.T115715.RV031.INIT.OBJ                PASSED
IEF285I   VOL SER NOS= AAE008.
IEF285I   SYS73053.T115715.RV031.INIT.UT1                KEPT
IEF285I   VOL SER NOS= AAE012.
IEF285I   SYS73053.T115715.RV031.INIT.UT2                KEPT
IEF285I   VOL SER NOS= AAE013.
IEF285I   SYS73053.T142338.RV000.RPB.UT3                 DELETED
IEF285I   VOL SER NOS= AAE014.
IEF285I   SYS73053.T142338.SV000.RPB.R0000001            SYSOUT
IEF285I   VOL SER NOS= AAE008.
IEF373I STEP /ASM      / START 73053.1424
IEF374I STEP /ASM      / STOP  73053.1429 CPU   1MIN 24.64SEC MAIN  60K LCS   0K
*** CONDITION CODE =  000(HEX)
XXLKED   EXEC  PGM=IEWL,PARM=(XREF,LIST),REGION=96K,                    00000160
XX             COND=(8,LT,ASM)                                          00000170
XXSYSLIN   DD  DSN=&&OBJ,DISP=(OLD,PASS)                                00000180
XX         DD  DDNAME=SYSIN                                             00000190
//LKED.SYSLMOD DD DSN=RPB.ASM,DISP=SHR
X/SYSLMOD  DD  DSN=&AAEC(USERSPGM),UNIT=SYSDA,SPACE=(1024,(50,20,1)),   00000200
XX             DISP=(MOD,PASS)                                          00000210
XXSYSUT1   DD  DSN=&&UT1,UNIT=SYSDA,                                    00000220
XX             SPACE=(1700,(50,100))                                    00000230
//LKED.SYSPRINT DD SYSOUT=D
X/SYSPRINT DD  SYSOUT=A                                                 00000240
//LKED.SYSIN DD *
//
IEF236I ALLOC. FOR RPB      LKED     AENVPLT2
IEF237I 135   ALLOCATED TO SYSLIN
IEF237I 316   ALLOCATED TO
IEF237I 120   ALLOCATED TO SYSLMOD
IEF237I 124   ALLOCATED TO SYSUT1
IEF237I 134   ALLOCATED TO SYSPRINT
```

```
 F88-LEVEL LINKAGE EDITOR OPTIONS SPECIFIED XREF,LIST
          DEFAULT OPTION(S) USED -  SIZE=(90112,6144)
IEW0000      NAME AENVPLT2(R)


                                                CROSS REFERENCE TABLE

  CONTROL SECTION                          ENTRY

    NAME     ORIGIN  LENGTH                  NAME   LOCATION     NAME   LOCATION     NAME   LOCATION     NAME   LOCATION

  AENVPLT2       00    1D28


  LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION            LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION

 ENTRY ADDRESS       00
 TOTAL LENGTH      1D28

****AENVPLT2  NOW REPLACED IN DATA SET


 IEF142I - STEP WAS EXECUTED - COND CODE 0000
 IEF285I   SYS73053.T115715.RV031.INIT.OBJ              PASSED
 IEF285I   VOL SER NOS= AAE008.
 IEF285I   RPB.ASM                                     KEPT
 IEF285I   VOL SER NOS= AAE023.
 IEF285I   SYS73053.T115715.RV031.INIT.UT1              KEPT
 IEF285I   VOL SER NOS= AAE012.
 IEF285I   SYS73053.T142338.SV000.RPB.R0000004          SYSOUT
 IEF285I   VOL SER NOS= AAE014.
 IEF373I STEP /LKED     / START 73053.1429
 IEF374I STEP /LKED     / STOP  73053.1429 CPU   0MIN 02.58SEC MAIN  96K LCS   0K
 *** CONDITION CODE =  000(HEX)
 IEF285I   SYS73053.T115715.RV031.INIT.OBJ              KEPT
 IEF285I   VOL SER NOS= AAE008.
 IEF375I  JOB /RPB      / START 73053.1424
 IEF376I  JOB /RPB      / STOP  73053.1429 CPU   1MIN 27.22SEC
HIGHEST CONDN CODE =  000(HEX)
```