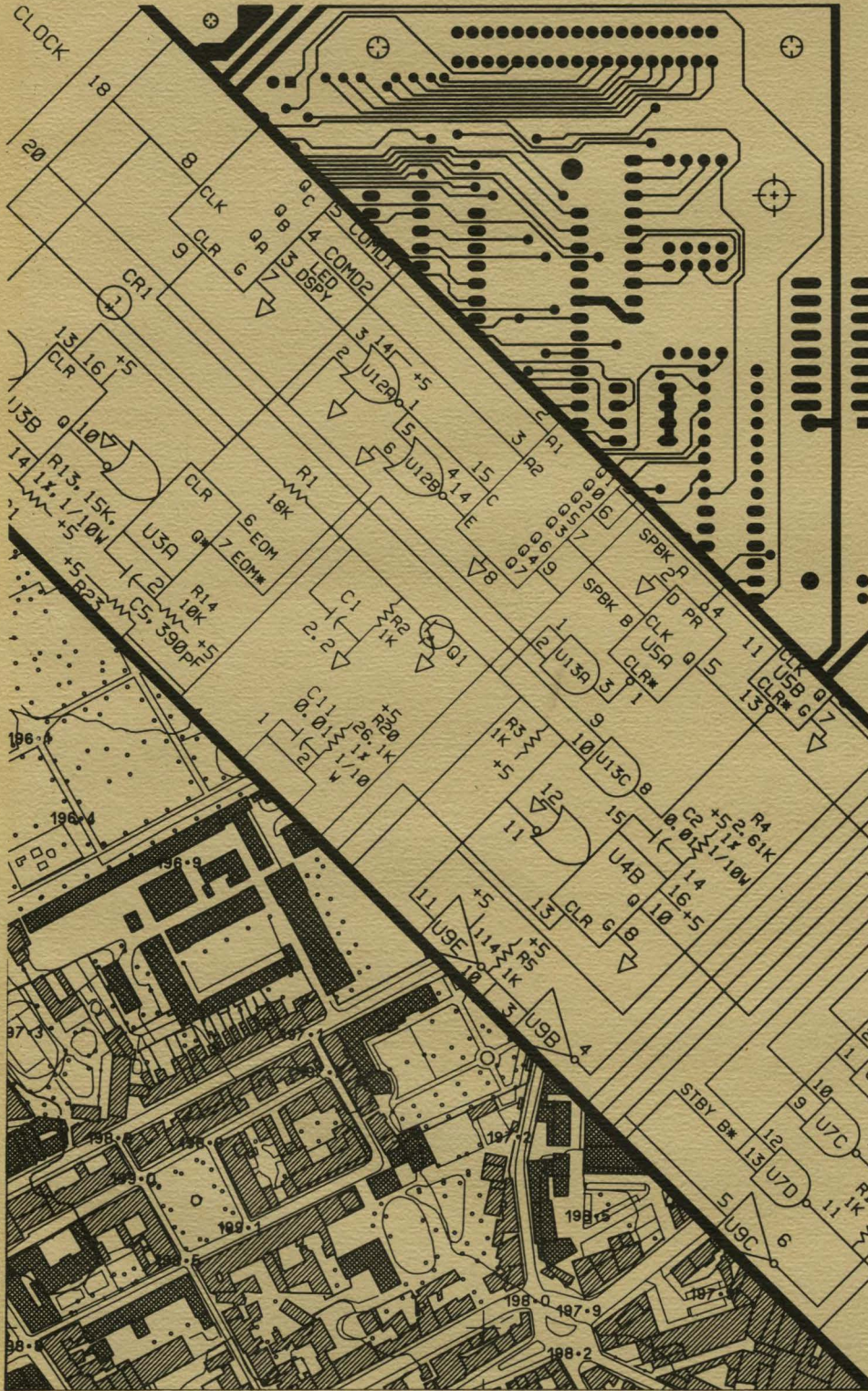


3100 MODEL



USERS GUIDE

PLOTTER CONTROL

**MODEL 3100 PLOTTER CONTROL
USER'S GUIDE**

Document Number: 3100-000-UG-000

October 28, 1983



The Gerber Scientific Instrument Company

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SECTION 1 INTRODUCTION

This document provides instructions for the use of the GSI Model 3100 Plotter Control. These instructions include power-on and power-off procedures, program loading, and data entry and controls.

The remainder of this document is organized as follows:

Section 2 GENERAL DESCRIPTION	Provides an overall description of the plotting system.
Section 3 PLOTTER CONTROL OPERATION	Provides step-by-step instructions for operating the system from start-up through shut-down.
Appendix A DATA FORMATS	Describes plot data formats that are recognized by the control.
Appendix B PROGRAMMING EXAMPLES	Provides programming examples for the various plot data formats and illustrates the resulting plot.

SECTION 2 GENERAL DESCRIPTION

This section describes the purpose of the Model 3100 Plotter Control and the plotting system of which it is a part. The section also provides a physical description of the system.

2.1 PURPOSE OF SYSTEM

The purpose of a Model 3100 Plotter Control-based plotting system is to automate the drafting process. The control has a memory, into which is read and stored system software or programs. The control receives previously created plot data or commands from magnetic tape, perforated tape, or on line from a computer. You can also enter plot commands directly from the terminal keyboard.

Plot data can be in EIA RS-274-D, Series 500 or Extended Binary Format. EIA RS-274-D data can be in ASCII, EBCDIC, BCD, ISO-ASCII, or EIA code.

As it is loaded, the plot data is stored in an input buffer in the control. How the data is processed depends upon parameters that you can specify or that are part of the plot data. As output, the Model 3100 Plotter Control produces signals which are used by other components of the system to produce plots of the data on a plotter.

2.2 PHYSICAL DESCRIPTION

A Model 3100 Plotter Control-based plotting system consists of the following hardware items:

1. Model 3100 Plotter Control with portable control box, Model 116 Video Display Terminal, and Model 373 Floppy Disk Drive.
2. Plot data input device.
3. Plotter

Each of these items is described in the following paragraphs:

2.2.1 Model 3100 Plotter Control

The plotter control consists of the control itself which also houses a Model 373 Floppy Disk Drive, as shown in Figure 2-1.

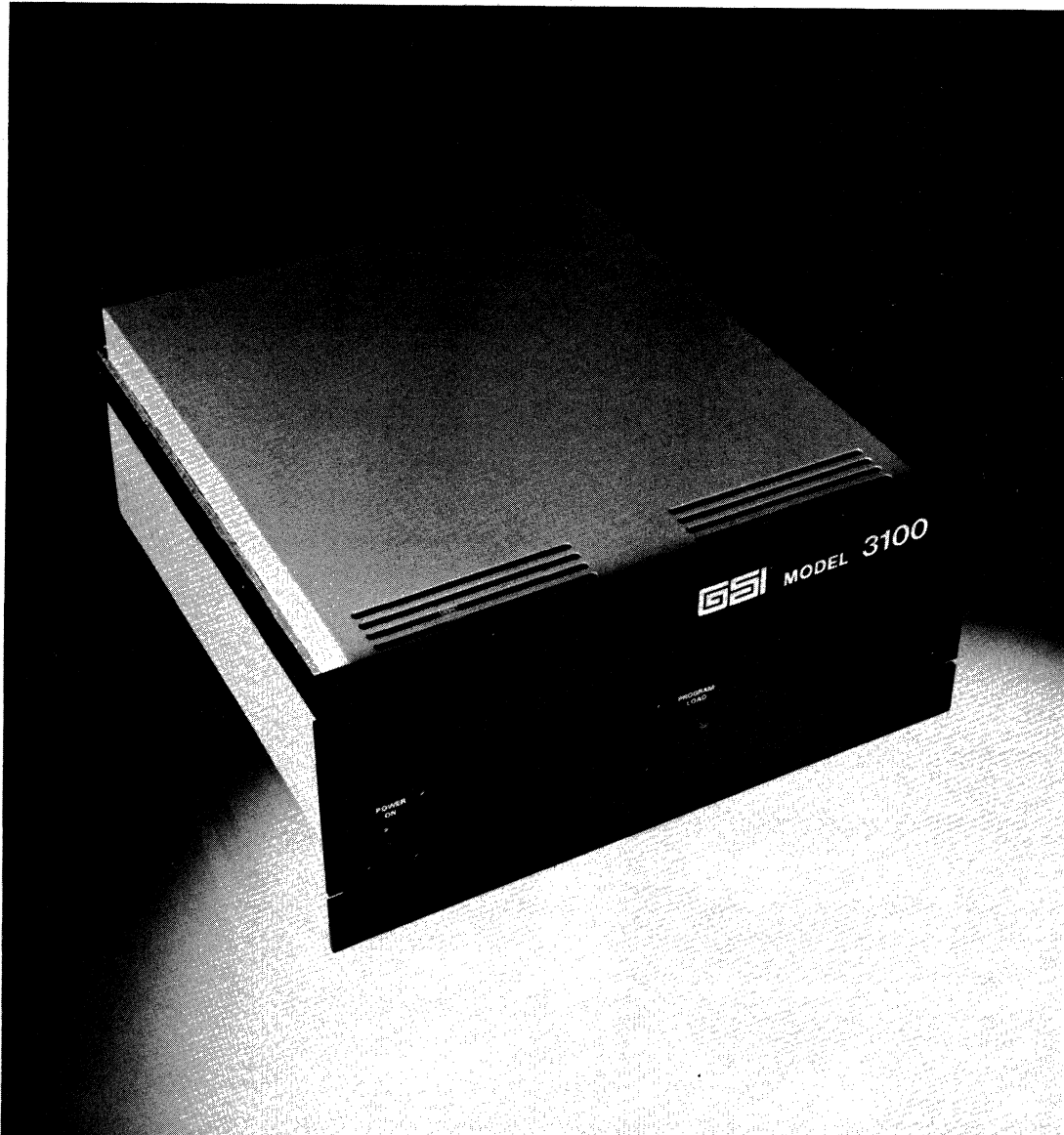


Figure 2-1 MODEL 3100 PLOTTER CONTROL

Also a part of the control but not shown are a portable control box and a Model 116 Video Display Terminal.

System software is read into the control by the floppy disk drive. The control accepts plot data from an input device (Paragraph 2.2.2) and, using the system software and control hardware, converts it to a form that is acceptable to the plotter.

The portable control box contains pushbutton controls and indicators which allow a certain amount of plotter control and indicate plotter status. The controls and indicators are listed and described in Table 2-1.

Table 2-1 CONTROL BOX CONTROLS AND INDICATORS

Control or Indicator	Function
<p>HALT/CONTINUE Pushbutton</p>	<p>Pressing HALT immediately stops the plotter. Pressing HALT again restarts plotting, however, the plot may not be accurate.</p> <p>The pushbutton should not be used for a routine stop procedure.</p>
<p>SLEW Pushbuttons</p>	<p>The four SLEW pushbuttons move the drafting head relative to the plotting medium.</p> <p>↑ causes motion in the +Y direction ↓ causes motion in the -Y direction → causes motion in the +X direction ← causes motion in the -X direction</p> <p>NOTE: The SLEW pushbuttons function only when the control is in SIT mode; that is, not processing data.</p>
<p>START Pushbutton</p>	<p>Pressing START causes the indicator to illuminate. The control begins accepting plot data and plotting begins.</p> <p>Pressing START again extinguishes the indicator and plotting stops.</p>
<p>ERROR Indicator</p>	<p>Illuminates when an error is detected during program loading or during the plotting process.</p> <p>Certain errors are accompanied by an error message on the terminal.</p>
<p>HALT Indicator</p>	<p>Illuminates when the plotter is halted either by pressing the HALT pushbutton or by actuating a safety device.</p>
<p>START Indicator</p>	<p>Illuminates when the plotter is started by way of the START pushbutton.</p>

The video display terminal allows bidirectional communication between you and the plotter control. The terminal has a screen, upon which requests for information and error messages are shown. The terminal also has a typewriter-like keyboard, through which you enter information into the control.

The majority of the plotting operation is controlled from the video display terminal.

2.2.2 Plot Data Input Device

The plotter control must be provided with plot data upon which it operates to produce a finished plot.

The data can be stored on magnetic tape, in which case it is read into the control by a magnetic tape reader. Data can also be received directly from a computer or it can exist on perforated tape, in which case a perforated tape reader is the input device.

2.2.3 Plotter

The plotter consists of the plotter itself and its associated power supply bay. The plotter provides a rendition of the plot data on the appropriate medium. The rendition can be a pen plot, photoplot, scribe, or cutting operation. The power supply bay may be a separate cabinet or it may be mounted in the plotter base. It receives processed data from the plotter control and converts it into signals capable of driving the plotter.

SECTION 3 PLOTTER CONTROL OPERATION

This section provides step-by-step instructions on how to operate a Model 3100-based plotting system.

This section is organized as follows:

- **Paragraph 3.1, System Power Up and Power Down**, describes how to apply power and remove power from the system in an orderly manner.
- **Paragraph 3.2, Program Loading**, describes how to load the control software into the control.
- **Paragraph 3.3, Entering Parameters**, describes how to specify parameters, if necessary, that alter the incoming plot data.
- **Paragraph 3.4, Plotter Utilities**, describes how to specify certain utility, or auxiliary, functions.
- **Paragraph 3.5, Plotter Functions**, describes how to control certain plotter functions.
- **Paragraph 3.6, Console Plot**, describes how to enter plot commands from the terminal.
- **Paragraph 3.7, Symbol Mode**, describes how to control symbol plotting and how to create symbols of your own design.
- **Paragraph 3.8, Making a Plot**, describes how to load the plot data and begin plotting.

Before proceeding with the remainder of this section, consult the instruction manual for the appropriate input device, plotter, and drafting head for set up and operating instructions. These are not included in this manual.

After verifying that all system components are in proper operating condition, follow the instructions provided in the remainder of this section.

3.1 SYSTEM POWER UP AND POWER DOWN

3.1.1 System Power Up

Perform the following to apply power to the system:

1. For systems with a power supply cabinet, ensure the cabinet rear door is closed securely.
2. Ensure that the main circuit breaker, which is at the rear of the power supply cabinet, or in the plotter base, is in the ON position.
3. Power to most system devices is interlocked to the POWER pushbutton on the plotter.

Press the pushbutton and verify that power is applied to all devices. All device power pushbuttons or switches should be left in the ON position so that power to the devices is controlled by the plotter POWER pushbutton.

Once the system has been powered up go to Paragraph 3.2, Program Loading.

3.1.2 System Power Down

The plotting system is not normally completely powered down. To deactivate the system, proceed as follows:

1. Ensure that all drafting operations have been completed before beginning any power down operation.
2. Press the POWER pushbutton on the plotter. This removes power from the system.
3. Power down all devices still under power such as plotter vacuum pumps with separate primary power supplies.
4. Do not turn off the main circuit breaker except in an emergency.

3.2 PROGRAM LOADING

The Model 3100 Plotter Control Software must be read, or loaded into the Model 3100 Plotter Control for the system to operate.

The software, which is stored on floppy disk, provides overall control of the plotting system.

Perform the following:

1. If the system-software disk is already in the disk drive, the system software was read when the system was powered up. Go to Step 3.

2. If the system-software disk is not already in the disk drive or if a new disk is to be read, install the disk in the disk drive and press the PROGRAM LOAD button. Continue with Step 3.
3. When loading is complete, the red light on the disk drive should go out, and the ERROR indicator on the control box should be lit. The terminal shows the current parameter values.

```

>
99
PP      0.00000      0.00000
TP      0.00000      0.00000
IC      RS274D      ASCII
DS      Magnetic Tape
VL      100
AL      100
DL
WI      AL 0.00000      AU 20.00000      BL 0.00000      BU 16.00000
SF      1.0000      1.0000
AS      A X      B Y
MI      A OFF      B OFF
FS      L A N 4      X 44      Y 44      Z 43
OF      0.00000      0.00000
MO      english
ID      D G J K M N W X Y Z
NS      0      NF      9999
BD      OFF
OP      OFF
EB      *
SM      A OFF      B OFF
SS      M50 10.0000      M51 25.0000      M52 50.0000      M53 75.0000      M54 100.0000

```

NOTE

Not all parameters are shown. Not all parameter shown are applicable, depending on the plot data format. Such parameters can be specified but they will have no effect.

4. Press the RETURN key on the terminal. The terminal shows the following menu, termed the Control Mode menu.

```

1      Run The Plotter
2      Parameter Edit
3      Plotter Utilities
4      Console Plot
5      Plotter Functions
99     Exit

```

Please enter menu choice

>

The Control Mode menu choices are described as follows:

<u>Selection Number</u>	<u>Title</u>	<u>Function</u>
1	Run The Plotter	Functions as a plotter start switch. When 1 is typed, the control accepts plot data from the current input device and drives the plotter, using that data. The plotter must be initialized first, as described in Paragraph 3.5.
2	Parameter Edit	Enters the Parameter Edit mode described in Paragraph 3.3. This allows parameters to be entered.
3	Plotter Utilities	Enters 3100 Utilities mode described in Paragraph 3.4. Utilities allow you to perform the following operations: <ul style="list-style-type: none">• Multiple files processing• Load user defined symbols• Dump program• Format floppy diskette• Aperture selection
4	Console Plot	Allows you to enter plot commands directly from the terminal as described in Paragraph 3.6.
5	Plotter Functions	Allows you to set up the plotter as described in Paragraph 3.5. This includes the following operations: <ul style="list-style-type: none">• Initialize plotter• Set origin• Specify single step or continuous mode• Specify pen control• Clear input data buffer• Magnetic tape file search• Specify photo or pen head

If the plot data is known to be good and no parameter changes are necessary, type 5, followed by RETURN, and go to Paragraph 3.5 to initialize the plotter. Otherwise, type one of the Control Mode menu selection numbers, followed by RETURN, and go to the referenced paragraph.

3.2.1 Menus and Parameters

Prior to plotting, you will control certain parts of system operation by specifying parameters. The terminal will show a list of items, each associated with a number. This list is called a menu. Typing one of the numbers shown, followed by RETURN,

causes the terminal either to display another menu or a parameter. A parameter is a displayed statement that requires a value you will specify.

Model 3100 Plotter Control menus and parameters are described as required in the remainder of this section.

3.3 ENTERING PARAMETERS

Parameters are values that are used in conjunction with the plot data to control system operation.

There are two methods of entering parameters - mass parameter input and terminal parameter input. With mass parameter input, parameters are part of the plot data. With terminal parameter input, parameters are entered by means of the terminal keyboard during a dialog between you and the terminal.

The remainder of this paragraph is organized as follows:

- Paragraph 3.3.1 provides a basic description of mass parameter input.
- Paragraph 3.3.2 provides a basic description of terminal parameter input.
- Paragraph 3.3.3 provides a detailed description of parameter formats for both methods of parameter input.

3.3.1 Mass Parameter Input

This paragraph provides a basic description of how to enter parameters from the plot data input device.

Step-by-step instructions and parameter descriptions are provided in Paragraph 3.3.3.

Parameters consist of a two-letter mnemonic followed by a variable that you specify.

Parameters can be entered with the plot data any time during a plot. They can be loaded separately, at the beginning of the plot data, or interspersed with plot data.

1. Every parameter must be terminated by an EOB (end of block) character. A parameter flag (For example: an "%" character) must precede and follow each set of one or more parameters.

For example,

```
%  
SF A1 B1*  
AS AX BY*  
%
```

Table 3-1 shows the default character for each code.

Table 3-1 SPECIAL CHARACTER CODES

Character	Code				
	ASCII	EBCDIC	BCD	EIA	ISO ASCII
EOB	*	*	*	CR (CARRIAGE RET)	LF (LINE FEED)
PARAMETER FLAG	%	%	%	LC (LOWER CASE)	%

2. Entering Parameters Prior to Plotting

- The first character in any plot data must be one of the end of block characters shown in Table 3-1.
- With the parameters available to the control and the control in SIT mode, (SIT mode when the control is not processing data) press the START pushbutton. The control will read leader (perforated tape only) to the first EOB character and then will start processing the data. Since the first character it sees is a parameter flag character, it immediately goes to parameter mode to process the parameters. All parameters are shown on the display as they are read into the control. After the closing parameter flag character has been read, the control will continue to process data. For perforated tape only, if there is plotting data on the same tape, there should be no sprocket holes between the closing parameter flag character of the parameters and the beginning of the first block of plotting data. BLANK TAPE WILL BE INTERPRETED BY THE CONTROL AS AN END OF FILE AND IT WILL RETURN TO THE SIT MODE.

3. Entering Parameters During a Plot

- Parameters may be entered at any time during a plot. The parameter flag character should immediately follow the EOB that closed out the preceding block or data. When the control program encounters the parameter flag character, it will run any data that has been previously set up and enter the parameter mode. Parameters will then be processed normally and displayed as read. Upon leaving parameter mode, the control returns to the START mode, and continues plotting.
- One restriction on parameter entry during a plot concerns changing the format from absolute to incremental while changing scale factor at the same time. When this occurs, the format statement (FS) should be entered first, then the new scale factor (SF).
- If standard parameter entry tapes that are separate from plotting tapes are to be used regularly, the following procedures will simplify parameter entry:

Following the closing parameter flag character on the tape, put an M02 block, as shown here: `*%SFA1B1*ASAXBY*%G01M02*`

When the parameter program has processed the closing parameter flag character, the drafting program will read and process the M02 and clear the input buffer. The next data can then be sent to the control.

Available Mass Parameters are listed in Table 3-2.

3.3.2 Terminal Parameter Input

This paragraph provides a basic description of how to enter parameters through the terminal keyboard.

Step-by-step instructions and parameter descriptions are provided in Paragraph 3.3.3.

The remainder of this paragraph illustrates all available menus and parameters. Comments to the right of these should be self-explanatory. Basically, all that is required to select a menu or enter a parameter is to type the number of the desired item and then to press the terminal RETURN key.

Typing 99 and pressing the RETURN key returns you to the calling menu.

For some parameters, you will enter numerical values.

If a non-numeric value is specified, zero is returned as the entered value.

If a numeric value, followed by a non-numeric value, +, -, or space, is specified only the numeric values up to the first non-numeric value are accepted.

Numeric values can only be preceded by +, -, or space.

Terminal Parameters are listed in Table 3-3.

3.3.3 Detailed Parameter Descriptions

This paragraph provides detailed parameter descriptions, including mass parameter input examples, and step-by-step instructions for terminal parameter input.

Throughout this paragraph the name of the parameter being described on a particular page appears in the upper corner of the page. For mass parameters, the mnemonic and name of the parameter are given. For terminal parameters, the parameter selection number and name of the parameter are given. Parameter names are not identical in all cases.

The following applies to the mass parameter input description:

1. The longer plotter axis is usually considered the A axis; the shorter plotter axis is considered the B axis.

2. $\left\{ \begin{matrix} A \\ B \\ C \end{matrix} \right\}$ indicates that one and only one of the variables enclosed by the brackets may be used.
3. (A,B,C) indicates that any or all of the variables in the parentheses may be used.
4. (A) indicates the variable or parameter is optional and may be omitted.
5. m or n indicates that a number must be entered. The format of the number may vary and will be specified in the description.
6. The format of a number is specified in terms of integer and fractional places. This is expressed as "n.m" where "n" is the number of integer places, and "m" is the number of fractional places. For example, the number "98765" would be interpreted as "98.765" in 2.3 format; as "987.65" in 3.2 format.

This type of notation applies to plotting coordinates, or positional data.

The following parameters require real numbers, that is, integers, decimal fractions, and a decimal point. However, if the decimal fraction is zero, the fraction and decimal point can be omitted.

Aperture Offset
Dash Line
Initialize Distance
Offsets
Scale Factor
Symbol Scale
Table Window

The following parameters require integers only. Decimal fractions can be entered but only the integer portion is accepted.

Acceleration Limit
Aperture Velocity
Circular Resolution
RS232
Sequence Number Start
Sequence Number Stop
Table Delays
Velocity Limit

Table 3-2 MASS PARAMETERS

Parameter	Format	Default Value
STANDARD PARAMETERS		
LOAD SYMBOL	LS $\begin{Bmatrix} 0 \\ 1 \\ 2 \end{Bmatrix}$ I $\begin{Bmatrix} 0 \\ 1 \\ 2 \end{Bmatrix}$	none
OFFSET	OF A \pm n B \pm n	OF A0.00000 B0.00000
FORMAT STATEMENT	FS $\begin{Bmatrix} L \\ T \\ I \end{Bmatrix}$ A (Nn)(Xn)(Yn)(Zn)(Gn)(Dn)(Mn)	FS TA N4 X43 Y43 Z43
SCALE FACTOR	SF An Bn	SF A1.00000 B1.00000
AXIS SELECT	AS A $\begin{Bmatrix} X \\ Y \\ Z \end{Bmatrix}$ B $\begin{Bmatrix} X \\ Y \\ Z \end{Bmatrix}$	AS AX BY
STARTING NUMBER	NS n	NS none
FINISHING NUMBER	NF n	NF none
VELOCITY	VL $\begin{Bmatrix} 0 \\ : \\ 100 \end{Bmatrix}$	VL 100
DASH LINE	DL (D4n/m)(D6n/m)(D7n/m)	DL D4 0.50/0.50 D6 0.50/0.50 D7 0.50/0.50
INPUT DISPLAY	ID (N,G,M,D,X,Y)	ID none
MIRROR IMAGE	MI A $\begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$ B $\begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$	MI A0 B0
BLOCK DELETE	BD $\begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$	BD 0
OPTIONAL STOP	OP $\begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$	OP 0
SYMBOL MIRROR	SM A $\begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$ B $\begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$	SM A0 B0
SYMBOL SCALE	SS (M50n)(M51n)(M52n) (M53n)(M54n)	SS M50 10.00 M51 25.00 M52 50.00 M53 75.00 M54 100.00
MODE	MO $\begin{Bmatrix} IN \\ MM \end{Bmatrix}$	MO IN
WINDOW	WI (ALn)(AUn)(BLn)(BUn)	Depends on plotter size

Table 3-3 **TERMINAL PARAMETERS**

Menu or Parameter	Comments
Control Mode	
1 Run The Plotter	Control Mode Menu
2 Parameter Edit	
3 Plotter Utilities	
4 Console Plot	
5 Plotter Functions	
99 Exit Control Mode	
Please enter menu choice	
>	
99	
PP 0.00000 0.00000	
TP 0.00000 0.00000	
IC RS274D ASCII	
DS Magnetic Tape	
VL 100	
AL 100	
DL	
WI AL 0.00000 AU 20.00000 BL 0.00000 BU 16.00000	The terminal shows the previously specified parameters. These are described in Paragraph 3.3.3.
SF 1.0000 1.0000	
AS A X B Y	
MI A OFF B OFF	
FS L A N 4 X 44 Y 44 Z 43	
OF 0.00000 0.00000	
M0 english	
ID D G I J K M N W X Y Z	
NX 0 NF 9999	
BD OFF	
OP OFF	
EB *	
SM A OFF B OFF	
SS M50 10.0000 M51 25.0000 M52 50.0000 M53 75.0000 M54 100.0000	
Control Mode	
1 Run The Plotter	
2 Parameter Edit	
3 Plotter Utilities	
4 Console Plot	
5 Plotter Functions	
99 Exit Control Mode	
Please enter menu choice	
>	
>1	
Control Mode	
****You may not plot until plotter is initialized.	
1 Run The Plotter	Type 1, followed by RETURN, to start the plotter. The plotter must first be initialized as described in Paragraph 3.8.2.
2 Parameter Edit	
3 Plotter Utilities	
4 Console Plot	
5 Plotter Functions	
99 Exit Control Mode	
Please enter menu choice	
>	

(Continued on next page)

Table 3-3 **TERMINAL PARAMETERS (Cont.)**

Menu or Parameter	Comments		
<p>>2 Parameter Edit</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>1 Input Data Formats 3 Scale Factor 5 Dashed Line 7 Velocity Limit 9 Plotter Delays 11 Aperture Velocity 13 Initialize Distance 15 Format Statement 17 Offset 19 Sequence Number Start 21 Block Delete 23 Symbol Mirror 25 End of Block Character 27 RS232 Menu 29 Stop on Parameter Error</p> </td> <td style="width: 50%; vertical-align: top;"> <p>2 Input Device 4 Axis Select 6 Mirror Image 8 Acceleration Limit 10 Table Window 12 Aperture Offset 14 Circular Resolution 16 Input Data Display 18 Input Data Mode 20 Sequence Number End 22 Optional Stop 24 Symbol Scale 26 Parameter Delimiter 28 Stop on Error</p> </td> </tr> </table> <p>99 Exit</p> <p>Please enter menu choice ></p>		<p>1 Input Data Formats 3 Scale Factor 5 Dashed Line 7 Velocity Limit 9 Plotter Delays 11 Aperture Velocity 13 Initialize Distance 15 Format Statement 17 Offset 19 Sequence Number Start 21 Block Delete 23 Symbol Mirror 25 End of Block Character 27 RS232 Menu 29 Stop on Parameter Error</p>	<p>2 Input Device 4 Axis Select 6 Mirror Image 8 Acceleration Limit 10 Table Window 12 Aperture Offset 14 Circular Resolution 16 Input Data Display 18 Input Data Mode 20 Sequence Number End 22 Optional Stop 24 Symbol Scale 26 Parameter Delimiter 28 Stop on Error</p>
<p>1 Input Data Formats 3 Scale Factor 5 Dashed Line 7 Velocity Limit 9 Plotter Delays 11 Aperture Velocity 13 Initialize Distance 15 Format Statement 17 Offset 19 Sequence Number Start 21 Block Delete 23 Symbol Mirror 25 End of Block Character 27 RS232 Menu 29 Stop on Parameter Error</p>	<p>2 Input Device 4 Axis Select 6 Mirror Image 8 Acceleration Limit 10 Table Window 12 Aperture Offset 14 Circular Resolution 16 Input Data Display 18 Input Data Mode 20 Sequence Number End 22 Optional Stop 24 Symbol Scale 26 Parameter Delimiter 28 Stop on Error</p>		
<p>>1 Input Data Format</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>1 Series 500 2 Extended Binary 3 RS-274-D 4 ASCII 5 EBCDIC 6 BCD 7 ISO-ASCII 8 EIA 99 Exit</p> </td> <td style="width: 50%; vertical-align: top;"> <p># #</p> </td> </tr> </table> <p>Please enter menu choice ></p>		<p>1 Series 500 2 Extended Binary 3 RS-274-D 4 ASCII 5 EBCDIC 6 BCD 7 ISO-ASCII 8 EIA 99 Exit</p>	<p># #</p>
<p>1 Series 500 2 Extended Binary 3 RS-274-D 4 ASCII 5 EBCDIC 6 BCD 7 ISO-ASCII 8 EIA 99 Exit</p>	<p># #</p>		
<p>f2 Input Device Menu</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>1 Magnetic Tape 2 Block mode RS-232 3 Buffered mode RS-232 4 Parallel Interface 5 Series 1 Interface 6 Plot management system 99 Exit</p> </td> <td style="width: 50%; vertical-align: top;"> <p>#</p> </td> </tr> </table> <p>Please enter menu choice ></p>		<p>1 Magnetic Tape 2 Block mode RS-232 3 Buffered mode RS-232 4 Parallel Interface 5 Series 1 Interface 6 Plot management system 99 Exit</p>	<p>#</p>
<p>1 Magnetic Tape 2 Block mode RS-232 3 Buffered mode RS-232 4 Parallel Interface 5 Series 1 Interface 6 Plot management system 99 Exit</p>	<p>#</p>		
<p>>3 Scale Factor</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>1 Specify A axis scale factor 2 Specify B axis scale factor 99 Exit</p> </td> <td style="width: 50%; vertical-align: top;"> <p>1.0000 1.0000</p> </td> </tr> </table> <p>Please enter menu choice ></p>		<p>1 Specify A axis scale factor 2 Specify B axis scale factor 99 Exit</p>	<p>1.0000 1.0000</p>
<p>1 Specify A axis scale factor 2 Specify B axis scale factor 99 Exit</p>	<p>1.0000 1.0000</p>		

Type 2, followed by RETURN, to enter terminal parameter input mode.

The terminal shows the parameter list.

To specify the parameter to be entered, type the number associated with the desired parameter, followed by RETURN.

Following is the complete terminal parameter input dialog.

Each parameter is terminated by:

Please enter menu choice
>

Enter the desired parameter value, followed by RETURN.

The terminal will show either a number sign (#) next to the specified parameter, or the value entered.

After the values for a particular parameter have been specified, type 99, followed by RETURN, and return to the Parameter Edit Menu.

After all parameters have been specified and the Parameter Edit Menu is being displayed, type 99, followed by RETURN, to display the Control Mode Menu.

Paragraph 3.3.3 provides step-by-step instructions on how to enter parameters and detailed descriptions of the parameters.

(Continued on next page)

Table 3-3 **TERMINAL PARAMETERS** (Cont.)

Menu or Parameter		Comments
>4		
Axis Select		
1	A : X	B : Y #
2	A : X	B : Z
3	A : Y	B : X
4	A : Y	B : Z
5	A : Z	B : X
6	A : Z	B : Y
99	Exit	
Please enter menu choice		
>		
>5		
Dashed Lines Menu		
1	Specify D4 dashed line type	0.50 0.50
2	Specify D6 dashed line type	1.00 0.50
3	Specify D7 dashed line type	0.50 0.50
99	Exit	
Please enter menu choice		
>		
>6		
Mirror Image Menu		
1	A axis is NORMAL	#
2	A axis is MIRRORED	
3	B axis is NORMAL	#
4	B axis is MIRRORED	
99	Exit	
Please enter menu choice		
>		
>7		
Velocity Limit Menu		
1	Specify Velocity Limit	100
99	Exit	
Please enter menu choice		
>		
>8		
Acceleration Limit Menu		
1	Specify Acceleration Limit	100
99	Exit	
Please enter menu choice		
>		
>9		
Table Delays		
1	Shutter Open	20 ms
2	Shutter Close	20 ms
3	New Line	20 ms
4	Flash	20 ms
5	Pen Down	20 ms
6	Pen Up	20 ms
99	Exit	
Please enter menu choice		
>		

(Continued on next page)

Table 3-3 TERMINAL PARAMETERS (Cont.)

Menu or Parameter		Comments
<hr/>		
>10		
Table Window Menu		
1	Specify A lower window value	0.0000
2	Specify A upper window value	20.0000
3	Specify B lower window value	0.0000
4	Specify B upper window value	16.0000
99	Exit	
Please enter menu choice		
>		
>11		
Aperture Velocity Menu		
1	100	13 100
2	100	14 100
3	100	15 100
4	100	16 100
5	100	17 100
6	100	18 100
7	100	19 100
8	100	20 100
9	100	21 100
10	100	22 100
11	100	23 100
12	100	24 100
99	Exit	
Please enter menu choice		
>		
>12		
Aperture Offset Menu		
1	0.0000 0.0000	13 0.2000 0.2000
2	0.1000 0.1000	14 0.2000 0.2000
3	0.2000 0.2000	15 0.2000 0.2000
4	0.2000 0.2000	16 0.2000 0.2000
5	0.2000 0.2000	17 0.2000 0.2000
6	0.2000 0.2000	18 0.2000 0.2000
7	0.2000 0.2000	19 0.2000 0.2000
8	0.2000 0.2000	20 0.2000 0.2000
9	0.2000 0.2000	21 0.2000 0.2000
10	0.2000 0.2000	22 0.2000 0.2000
11	0.2000 0.2000	23 0.2000 0.2000
12	0.2000 0.2000	24 0.2000 0.2000
99	Exit	
Please enter menu choice		
>		
>13		
Initialize Distance		
1	Specify A axis offset	0.25000
2	Specify B axis offset	0.25000
99	Exit	
Please enter menu choice		
>		

(Continued on next page)

Table 3-3 **TERMINAL PARAMETERS (Cont.)**

Menu or Parameter	Comments
<p>>14 Circular Resolution Menu</p>	
1	Specify circular resolution value
2	Use default according to radius #
99	Exit
<p>Please enter menu choice ></p>	
<p>>15 Format Statement Menu</p>	
1	Leading zeros omitted #
2	Trailing zeros omitted
3	Absolute data #
4	Incremental data
5	Specify D format 2
6	Specify G format 2
7	Specify M format 2
8	Specify N format 4
9	Specify X format 4 3
10	Specify Y format 4 3
11	Specify Z format 4 3
99	Exit
<p>Please enter menu choice ></p>	
<p>>16 Data Identification Menu</p>	
<p>Current data being identified are : D G I J K M N W X Y Z</p>	
1	Specify data to be identified
99	Exit
<p>Please enter menu choice ></p>	
<p>>17 Global Offsets</p>	
1	Specify A axis offset 0.00000
2	Specify B axis offset 0.00000
99	Exit
<p>Please enter menu choice ></p>	
<p>>18 Data Mode Menu</p>	
1	Use english units #
2	Use metric units
99	Exit
<p>Please enter menu choice ></p>	
<p>>19 Sequence Number Start Menu</p>	
1	Specify sequence number start 0
99	Exit
<p>Please enter menu choice ></p>	

(Continued on next page)

Table 3-3 **TERMINAL PARAMETERS** (Cont.)

Menu or Parameter	Comments
>20 Sequence Number End Menu	
1 Specify sequence number end 9999 99 Exit sequence number end menu	
Please enter menu choice	
>	
>21 Block Delete Menu	
1 Block delete is OFF # 2 Block delete is ON 99 Exit	
Please enter menu choice	
>	
>22 Optional Stop Menu	
1 Optional stop is OFF # 2 Optional stop is ON 99 Exit	
Please enter menu choice	
>	
>23 Symbol Mirror Image Menu	
1 A axis is NORMAL # 2 A axis is MIRRORED 3 B axis is NORMAL 4 B axis is MIRRORED # 99 Exit	
Please enter menu choice	
>	
>24 Symbol Scale Menu	
1 Specify scale for M50 10.0000 2 Specify scale for M51 25.0000 3 Specify scale for M52 50.0000 4 Specify scale for M53 75.0000 5 Specify scale for M54 100.0000 99 Exit	
Please enter menu choice	
>	
>25 End Of Block Character Menu	
1 Specify new end of block character * 2 Specify ASCII decimal equivalent 99 Exit	
Please enter menu choice	
>	

(Continued on next page)

Table 3-3 **TERMINAL PARAMETERS (Cont.)**

Menu or Parameter	Comments
> 26	
Parameter Delimiter Menu	
1	Specify new end of parameter delimiter %
2	Specify ASCII decimal equivalent
99	Exit
Please enter menu choice	
>	
> 27	
RS232 Parameters Menu	
1	Local mode #
2	Remote mode
3	Number of retries 7
4	Timeout value 10 seconds
5	Buffer size 1024 characters
6	Baud rate 9600
7	Stop bits 1
8	Bits per character 7
9	Parity even
99	Exit
Please enter menu choice	
>	
> 28	
Stop On Error Menu	
1	Do not stop on error #
2	Stop on error
99	Exit
Please enter menu choice	
>	
> 29	
Stop On Parameter Error Menu	
1	Do not stop on parameter error #
2	Stop on parameter error
99	Exit
Please enter menu choice	
>	

(Continued on next page)

Table 3-3 TERMINAL PARAMETERS (Cont.)

Menu or Parameter		Comments
f99		
>2		
Parameter Edit		
1	Input Data Formats	2 Input Device
3	Scale Factor	4 Axis Select
5	Dashed Line	6 Mirror Image
7	Velocity Limit	8 Acceleration Limit
9	Plotter Delays	10 Table Window
11	Aperture Velocity	12 Aperture Offset
13	Initialize Distance	14 Circular Resolution
15	Format Statement	16 Input Data Display
17	Offset	18 Input Data Mode
19	Sequence Number Start	20 Sequence Number End
21	Block Delete	22 Optional Stop
23	Symbol Mirror	24 Symbol Scale
25	End of Block Character	26 Parameter Delimiter
27	RS232 Menu	28 Stop on Error
29	Stop on Parameter Error	
99	Exit	
Please enter menu choice		
>		
>99		
Control Mode		
1	Run the plotter	
2	Parameter edit	
3	Plotter utilities	
4	Console plot	
5	Plotter functions	
99	Exit control mode	
Please enter menu choice		
>		
>99		
99		
PP	0.00000 0.00000	
TP	0.00000 0.00000	
IC	RS274D ASCII	
DS	Magnetic tape	
VL	100	
AL	100	
DL		
WI	AL 0.00000 AU 20.00000 BL 0.00000 BU 16.00000	
SF	1.0000 1.0000	
AS	A X B Y	
MI	A OFF B OFF	
FS	L A N 4 X 44 Y 44 Z 43	
OF	0.00000 0.00000	
MO	english	
ID	D G I J K M N W X Y Z	
NX	0 NF 9999	
BD	OFF	
OP	OFF	
EB	*	
SM	A OFF B OFF	
SS	M50 10.0000 M51 25.0000 M52 50.0000 M53 75.0000 M54 100.0000	

(Continued on next page)

Table 3-3 **TERMINAL PARAMETERS** (Cont.)

Menu or Parameter	Comments
Control Mode	
1	Run the plotter
2	Parameter edit
3	Plotter utilities
4	Console plot
5	Plotter functions
99	Exit control mode
Please enter menu choice	
>	
>3	
Utilities	
1	Multiple files processing
2	Load user defined symbols
3	Dump program
4	Format floppy diskette
5	Aperture selection
99	Exit
Please enter menu choice	
>	
>1	
Multiple Files Processing	
1	Queue table
2	Offset table
3	Options
4	Activate queue #
5	Deactivate queue
99	Exit
Please enter menu choice	
>	
>2	
Symbol Load	
1	Replace entire table
2	Add to existing table
3	Replace all but standard set
99	Exit symbol load
Select symbol load choice	
Input Device	
1	Keyboard
2	Current input data source
99	Exit from symbol menu
>3	
Program Dump	
>4	
Format Floppy Diskette	
Do you really want to initialize the diskette?	

(Continued on next page)

Table 3-3 **TERMINAL PARAMETERS (Cont.)**

Menu or Parameter	Comments
>5 Aperture Selection	
Control Mode	
1 Run the plotter	
2 Parameter edit	
3 Plotter utilities	
4 Console plot	
5 Plotter functions	
99 Exit control mode	
Please enter menu choice	
>4 Console Plot	
Control Mode	
1 Run the plotter	
2 Parameter edit	
3 Plotter utilities	
4 Console plot	
5 Plotter functions	
99 Exit control mode	
Please enter menu choice	
>	
>5 Plotter Functions	
1 Initialize	
2 Set origin	
3 Single step mode	
4 Continuous plot mode	#
5 Pen controlled by data	#
6 Force pen up	
7 Force pen down	
8 Clear input data buffer	
9 Magnetic tape file search	
10 Photo head installed	#
11 Pen head installed	
99 Exit	
Please enter menu choice	
>	

MASS PARAMETER INPUT:

Not Applicable

TERMINAL PARAMETER INPUT:

1 Input Data Format

PURPOSE:

Specifies data input code and data input format.

TERMINAL PARAMETER INPUT:

NOTE

This paragraph describes all data formats acceptable to the control. Series 500 Format and Extended Binary Format are options. If they were not purchased but are specified from the terminal, the terminal will show NOT AVAILABLE.

1. With the Parameter Edit menu displayed, type 1, followed by RETURN.
2. The terminal shows one of the following, depending upon the previously specified input data format.

Input Data Format

```
1 Series 500
2 Extended Binary
3 RS-274-D #
  4 ASCII # Display A
  5 EBCDIC
  6 BCD
  7 ISO-ASCII
  8 EIA
99 Exit
```

Please enter menu choice
>

>1
Input Data Format

```
1 Series 500 #
2 Extended Binary Display B
3 RS-274-D
99 Exit
```

Please enter menu choice
>

>1

Input Data Format

1	Series 500	#	
2	Extended Binary		Display B
3	RS-274-D		
99	Exit		

Please enter menu choice

>

Display A shown if RS-274-D format was previously specified. Display B is shown if Series 500 or Extended Binary Format was previously specified.

Display A

3. If RS-274-D is the format of the incoming plot data, type 4, 5, 6, 7, or 8, followed by RETURN, to change the plot data code, if necessary. The number symbol (#) will move to the specified line.
4. Type 99, followed by RETURN, to return to the Parameter Edit menu as shown:

>2

Parameter Edit

1	Input Data Formats	2	Input Device
3	Scale Factor	4	Axis Select
5	Dashed Line	6	Mirror Image
7	Velocity Limit	8	Acceleration Limit
9	Plotter Delays	10	Table Window
11	Aperture Velocity	12	Aperture Offset
13	Initialize Distance	14	Circular Resolution
15	Format Statement	16	Input Data Display
17	Offset	18	Input Data Mode
19	Sequence Number Start	20	Sequence Number End
21	Block Delete	22	Optional Stop
23	Symbol Mirror	24	Symbol Scale
25	End of Block Character	26	Parameter Delimiter
27	RS232 Menu	28	Stop on Error
29	Stop on Parameter Error		
99	Exit		

Please enter menu choice

>

Type one of the selection numbers, followed by RETURN, to change any of the parameters. Step-by-step instructions on how to do this are provided in the remainder of this paragraph.

Type 99, followed by RETURN, to return to the Control Mode menu.

5. If Series 500 or Extended Binary format is the format of the plot data, type 1 or 2, respectively, followed by RETURN. Display B is shown, with the number symbol on the specified line.
6. Type 99, followed by RETURN, to return to Parameter Edit menu as shown:

>2

Parameter Edit

1	Input Data Formats	2	Input Device
3	Scale Factor	4	Axis Select
5	Dashed Line	6	Mirror Image
7	Velocity Limit	8	Acceleration Limit
9	Plotter Delays	10	Table Window
11	Aperture Velocity	12	Aperture Offset
13	Initialize Distance	14	Circular Resolution
15	Format Statement	16	Input Data Display
17	Offset	18	Input Data Mode
19	Sequence Number Start	20	Sequence Number End
21	Block Delete	22	Optional Stop
23	Symbol Mirror	24	Symbol Scale
25	End of Block Character	26	Parameter Delimiter
27	RS232 Menu	28	Stop on Error
29	Stop on Parameter Error		
99	Exit		

Please enter menu choice

>

Type one of the selection numbers, followed by RETURN, to change any of the parameters. Step-by-step instructions on how to do this are provided in the remainder of this paragraph.

NOTE

Not all of these parameters are applicable for Series 500 or Extended Binary Format. Such parameters can be specified but they will have no effect.

Type 99, followed by RETURN, to return to the main menu.

Display B

7. If RS-274-D is the format of the incoming plot data, type 3, followed by RETURN, and return to the Display A description.
8. If Series 500 or Extended Binary format is the format of the plot data, return to Step 5.

MASS PARAMETER INPUT:
DS (Data Source)

TERMINAL PARAMETER INPUT:
2 Input Device

PURPOSE:

Specifies the mass input device to be used for loading input data.

MASS PARAMETER INPUT:

where

DS	$\left\{ \begin{array}{l} \text{MT} \\ \text{PT} \\ \text{PM} \\ \text{RS} \\ \text{SI} \end{array} \right\} *$	MT specifies magnetic tape input
		PT specifies perforated tape input
		PM specifies PMS-7000 input
		RS specifies remote host (serial or parallel on-line)
		SI specifies Series 1 interface

Example: DSMT*

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 2, followed by RETURN.

2. The terminal shows:

Input Device Menu

```
1 Magnetic tape #
2 Block mode RS-232
3 Buffered mode RS-232
4 Parallel interface
5 Series 1 interface
6 Plot management system
99 Exit
```

Please enter menu choice
>

3. Type the selection number associated with the desired input device, followed by RETURN.

4. The number symbol (#) moves to the selected line. Return to Step 2.

MASS PARAMETER INPUT:

SF (Scale Factor)

TERMINAL PARAMETER INPUT:

3 Scale Factor

PURPOSE:

Multiplies the plot data by any value between 0.00001 and 999.99999. Axes can be scaled independently.

MASS PARAMETER INPUT:

SF An Bn *

where

An = scale factor for the plotter A (long) axis data
(maximum accuracy of 3 integer and 5
fractional places)

Bn = scale factor of the plotter B (short) axis data
(maximum accuracy of 3 integer and 5
fractional places)

Example: SF A.5B3*

multiplies the A axis data by 0.5 and the B axis data by 3.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 3, followed by RETURN.

2. The terminal shows:

>3

Scale Factor

1 Specify A axis scale factor XXX.XXXXX

2 Specify B axis scale factor XXX.XXXXX

99 Exit

Please enter menu choice

>

where XXX.XXXXX is the last specified scale factor value.

3. Type 1 or 2, followed by RETURN. The display shows either of the following, depending on the value entered:

Specify A scale factor

>

Specify B scale factor

>

Enter the desired scale factor, followed by RETURN.

4. Return to Step 2 to specify the remaining scale factor or to return to the Parameter Edit menu.

NOTE: If an out-of-range parameter is specified, the terminal shows:

**** Scale factor must be positive and less than 999.99999

>

**MASS PARAMETER INPUT:
AS (Axis Select)**

**TERMINAL PARAMETER INPUT:
4 Axis Select**

PURPOSE:

The plotter has two axes, A and B, with the A axis being the longer of the two. The incoming plot data can contain X, Y, and Z coordinate information.

This parameter allows you to assign any two plot data coordinates to the two plotter axes.

MASS PARAMETER INPUT:

$$AS A \begin{Bmatrix} X \\ Y \\ Z \end{Bmatrix} B \begin{Bmatrix} X \\ Y \\ Z \end{Bmatrix} *$$

where

A $\begin{Bmatrix} X \\ Y \\ Z \end{Bmatrix}$ assigns X, Y, or Z data to the plotter A axis

B $\begin{Bmatrix} X \\ Y \\ Z \end{Bmatrix}$ assigns X, Y, or Z data to the plotter B axis

Example: ASAYBX*

specifies that Y axis data should be plotted along the plotter A axis and X axis data should be plotted along the plotter B axis.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 4, followed by RETURN.
2. The terminal shows:

```
>4
Axis Select

1      A : X      B : Y      #
2      A : X      B : Z
3      A : Y      B : X
4      A : Y      B : Z
5      A : Z      B : X
6      A : Z      B : Y
99     Exit
```

Please enter menu choice
>

3. Type the number that corresponds to the desired plotter axis to input data axis correlation, followed by RETURN.
4. The number symbol (#) moves to the selected line. Return to Step 2.

**MASS PARAMETER INPUT:
DL (Dashed Line)**

**TERMINAL PARAMETER INPUT:
5 Dashed Line**

PURPOSE:

Specifies the dash and space length of three different dash lines. The three lines are selected by D4, D6, and D7 codes.

MASS PARAMETER INPUT:

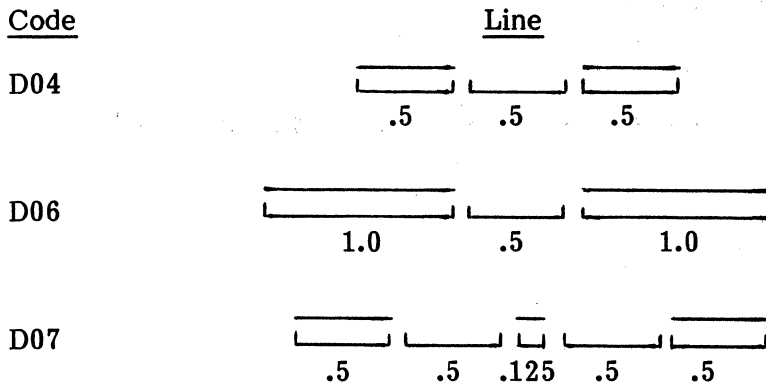
DL (D4 n/m) (D6 n/m) (D7 n/m) *

where

- D4 n/m defines the dashed line drawn by the D04 code
n specifies the length of the dash (3.2 format).
m specifies the length of the space (3.2 format).
- D6 n/m defines the dashed line drawn by the D06 code
(same format as above)
- D7 n/m defines the center line drawn by the D07 code.
The center line is 1/8 inch in length (same format as above).

Example:

DL D4 0.50/0.50 D6 1.00/0.50 D7 0.50/0.50 *



TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 5, followed by RETURN.

2. The terminal shows:

```
>5
Dashed Lines Menu

  1  Specify D4 dashed line type  X.XX   Y.YY
  2  Specify D6 dashed line type  X.XX   Y.YY
  3  Specify D7 dashed line type  X.XX   Y.YY
99  Exit
```

Please enter menu choice
>

3. Type 1, 2, or 3, followed by RETURN. The display shows either of the following, depending on the value entered:

```
Specify dash length for D4
>
Specify dash length for D6
>
Specify dash length for D7
>
```

Enter the desired dash length, followed by RETURN.

4. The terminal shows:

```
Specify space length
>
```

Enter the space length, followed by RETURN, for the dashed line selected in Step 3.

5. Repeat Steps 3 and 4 for the remaining dashed line types or type 99 followed by RETURN, to return to the Parameter Edit menu.

NOTES:

1. If an out-of-range parameter is specified, the terminal shows:

```
**** Segments must be positive and less than 1000
>
```

2. Dash lines are plotted at 25% maximum velocity.

3. Dash line lengths are scaled by the Scale Factor parameter. However, dash and space length are not.

MASS PARAMETER INPUT:

MI (Mirror Image)

TERMINAL PARAMETER INPUT:

6 Mirror Image

PURPOSE:

Enables or disables plot mirror imaging about either plotter axis.

MASS PARAMETER INPUT:

$$MI A \begin{Bmatrix} 0 \\ 1 \end{Bmatrix} B \begin{Bmatrix} 0 \\ 1 \end{Bmatrix} *$$

where

"0" disables the mirror

"1" enables the mirror

A $\begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$ Controls the mirror feature for data on the plotter A axis.

B $\begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$ Controls the mirror feature for data on the plotter B axis.

For example: MI A0 B1*

causes B data to be inverted, thus reflecting data about the A axis.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 6, followed by RETURN.

2. The terminal shows:

```
>6
Mirror Image Menu

 1  A axis is NORMAL      #
 2  A axis is MIRRORED
 3  B axis is NORMAL      #
 4  B axis is MIRRORED
99  Exit
```

Please enter menu choice

>

3. Type 1 or 2, followed by RETURN, to turn A axis mirroring off or on. Type 3 or 4 to turn B axis mirroring off or on, followed by RETURN. The number symbol (#) moves to the selected lines. Return to Step 2.

NOTE: Symbols are not mirrored by this parameter. Refer to the SM (Symbol Mirror) parameter.

**MASS PARAMETER INPUT:
VL (Velocity Limit)**

**TERMINAL PARAMETER INPUT:
7 Velocity Limit**

PURPOSE:

Specifies the limit of the maximum velocity at which the plotting table can travel. The velocity limit is expressed as a percentage of the maximum velocity of which the plotting table is capable. It is not, however, a straight percentage but a normalized percentage of a velocity level. The percentage you enter will result in a slightly smaller percent limit. The actual velocity is calculated from the following equation:

$$\frac{n}{100} \times \text{ABSOLUTE MAXIMUM VELOCITY}$$

where n is the entered velocity limit

The value is truncated.

MASS PARAMETER INPUT:

VLn*

where

n is a number from 1 to 100 representing the percent of the absolute maximum velocity that is permitted.

Example: VL95*

causes the maximum velocity to be limited to approximately 93% of the absolute maximum velocity.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 7, followed by RETURN.
2. The terminal shows:

```
>7
Velocity Limit Menu

 1 Specify velocity limit   XXX
99 Exit

Please enter menu choice
>
```

where XXX is the velocity limit.

3. Type 1 followed by RETURN. The terminal shows:

Specify new velocity limit
>

Type the desired value, between 1 and 100, followed by RETURN, and return to Step 2. The new value is displayed.

NOTE: If an out-of-range parameter is specified, the terminal shows:

**** Value must be between 1 and 100
>

MASS PARAMETER INPUT:
Not Applicable

TERMINAL PARAMETER INPUT:
8 Acceleration Limit

PURPOSE:

Specifies the maximum rate at which the plotter can accelerate.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 8, followed by RETURN.

2. The terminal shows:

```
>8
Acceleration Limit Menu

1 Specify acceleration limit   XXX
99 Exit

Please enter menu choice
>
```

where XXX is the acceleration limit.

3. Type 1, followed by RETURN. The terminal shows:

```
Specify new acceleration limit
>
```

Type the desired value, between 1 and 100, followed by RETURN, and return to Step 2. The new value is displayed.

NOTE: If an out-of-range parameter is specified, the terminal shows:

```
**** Value must be between 1 and 100
>
```

MASS PARAMETER INPUT:

Not Applicable

TERMINAL PARAMETER INPUT:

9 Plotter Delays

PURPOSE:

Allows you to change certain plotting system internal delays to compensate for differences between pen and photoplotting and differences in film characteristics when photoplotting.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 9, followed by RETURN.

2. The terminal shows:

>9

Table Delays

1	Shutter open	20 ms
2	Shutter close	20 ms
3	New line	20 ms
4	Flash	20 ms
5	Pen down	20 ms
6	Pen up	20 ms
99	Exit	

Please enter menu choice

>

3. Type one of the numbers shown, followed by RETURN.

4. The terminal shows:

Please specify XXX delay in milliseconds

>

where XXX is the name of the specified delay.

5. Enter the appropriate value, between 0 and 900, followed by RETURN, and return to Step 2. The new value is displayed.

NOTE: If an out-of-range value is specified, the terminal shows:

Table Delays

**** Delay must be between 0 and 900

>

MASS PARAMETER INPUT:
WI (Window)

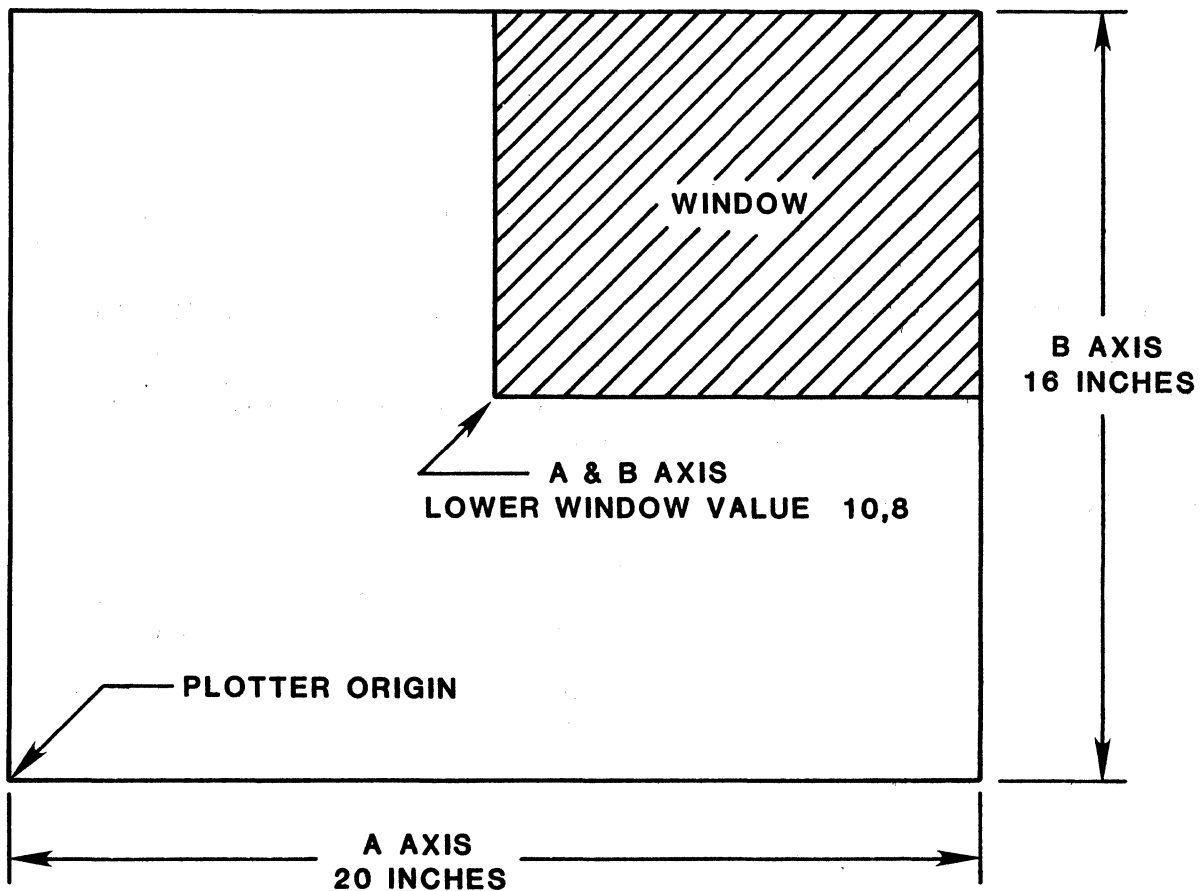
TERMINAL PARAMETER INPUT:
10 Table Window

PURPOSE:

Restricts plotting to the dimensions of a rectangle, on the plotter platen, that you specify. Rectangle dimensions are in terms of the plotter A and B axes. Lower and upper values are specified, allowing the window to be placed anywhere on the plotting surface. The A and B axis lower limits specify the coordinates of the rectangle corner nearest the plotter origin. If the entire platen area is to be used, the maximum plotting area of the plotter is specified.

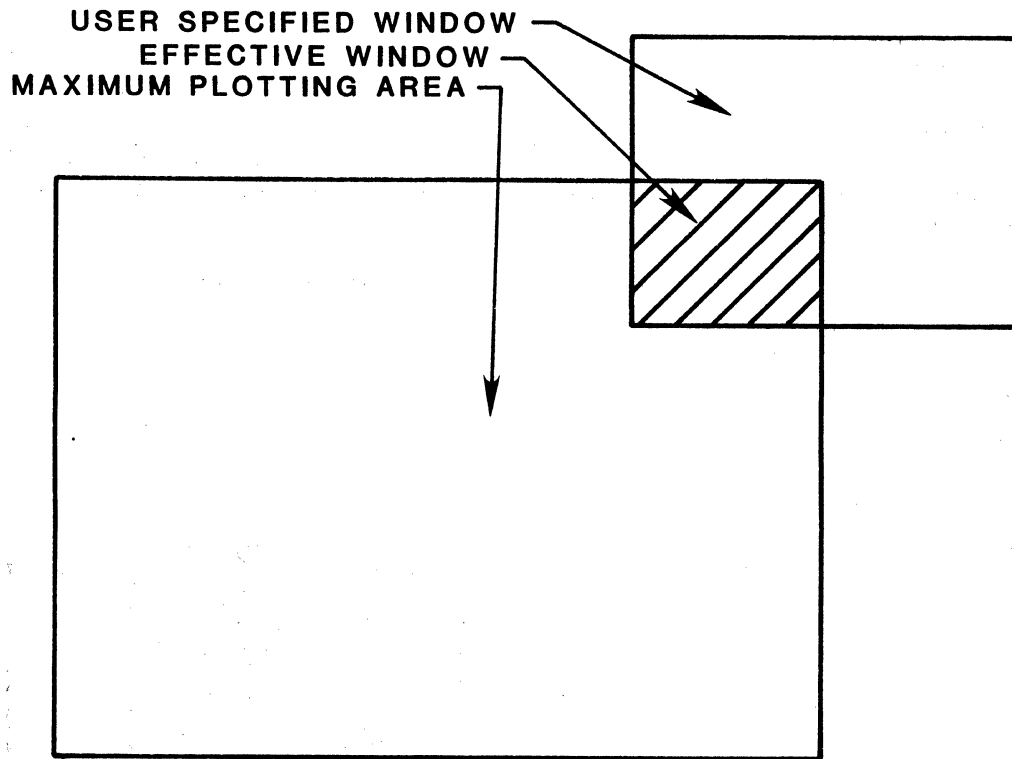
For example, assume the system plotter has an active plotting area of 16 x 20 inches and the following window values are specified:

A lower 10
A upper 20
B lower 8
B upper 16



Plotting is limited to the window area shown.

The actual plotting window is the area common to the window you specify and maximum plotting area of the plotter as shown in the following illustration.



If the window you specify is completely off of the plotter no plotting will take place.

The window values shown on the terminal are for the user specified window and not the effective window.

MASS PARAMETER INPUT:

WIALmAU_nBLrBU_s*

where:

m = the table A axis lower limit (4.3 format for inches, 5.4 for metric, DECIMAL POINT INCLUDED).

n = A axis upper limit

r = B axis lower limit

s = B axis upper limit

Any of the four limits may be omitted from the parameter block and the program will use the current limit.

Example: WI AL10.000 AU20.000 BL8.000 BU16.000
limits plotting to the area shown in the previous example.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 10, followed by RETURN.
2. The terminal shows:

```
>10
Table Window Menu

  1  Specify A lower window value   XX.XXXX
  2  Specify A upper window value   XX.XXXX
  3  Specify B lower window value   XX.XXXX
  4  Specify B upper window value   XX.XXXX
99  Exit
```

```
Please enter menu choice
>
```

where XX.XXXX is the window value.

3. Type 1, 2, 3, or 4, followed by RETURN. The terminal shows:

```
Specify XX window value
>
```

where XX is the window parameter specified in Step 2.

4. Enter the appropriate window value, followed by RETURN. The value is displayed. Return to Step 2.

NOTES:

1. If the lower window value is larger than its associated upper window value, the terminal shows:

```
**** Lower value must be less than upper value
>
```
2. The maximum upper window value is 99999.99999999.
3. The control software does not check for illogical window values. Therefore, you should know the maximum plotting area of the system plotter and enter appropriate values.

MASS PARAMETER INPUT:

AV (Aperture Velocity)

TERMINAL PARAMETER INPUT:

11 Aperture Velocity

PURPOSE:

When a photoplotter with an OEH-C or OEH-F Optical Exposure Head is included in a system, the aperture velocity (AV) parameter is used to select the appropriate plotting velocity for each aperture on the aperture bar. The AV parameter defines the velocity upper limit for each aperture as a percentage of maximum photoplotting velocity.

MASS PARAMETER INPUT:

AV a/mmm*

where

a = the aperture number (1 to 24) for which velocity is to be defined.

mmm = the 3-digit integer defining the velocity upper limit as a percentage of maximum plotting velocity.

Example: AV 2/100

specifies that all photoplotting with aperture 2 is to be performed at maximum velocity.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 11, followed by RETURN.
2. The terminal shows:

>11

Aperture Velocity Menu

1	XXX	13	XXX
2	XXX	14	XXX
3	XXX	15	XXX
4	XXX	16	XXX
5	XXX	17	XXX
6	XXX	18	XXX
7	XXX	19	XXX
8	XXX	20	XXX
9	XXX	21	XXX
10	XXX	22	XXX
11	XXX	23	XXX
12	XXX	24	XXX
99	Exit		

Please enter menu choice

>

where XXX is the current aperture velocity.

3. Enter the number of an aperture whose velocity is to be specified.
4. The terminal shows:

```
>n  
Type in new velocity for aperture n  
>
```

where n is the number entered in Step 3.

Enter a value between 1 and 100, followed by RETURN. The value is displayed. Return to Step 2.

NOTE: If an out-of-range value is specified, the terminal shows:

```
Aperture Velocity Menu
```

```
**** Data must be between 1 and 100  
>
```

MASS PARAMETER INPUT:

AP (Aperture Offset)

TERMINAL PARAMETER INPUT:

12 Aperture Offset

PURPOSE:

When an OEH-C or OEH-F Optical Exposure Head is included in a system, the aperture offset (AP) parameter is used for aperture selection and precise positioning of aperture centers. The AP parameter precisely centers any given aperture by specifying its distance from Aperture 1.

MASS PARAMETER INPUT:

AP a/±.m/±.n*

where

a = the aperture number (2 to 24) to be centered.

±.m = the distance along the plotter A axis from the center of Aperture 1.

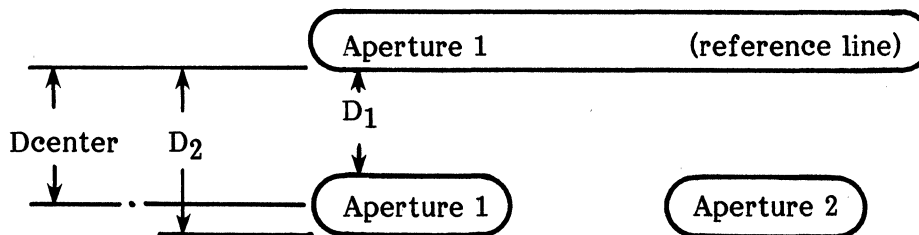
±.n = the distance along the plotter B axis from the center of Aperture 1.

The distance is always expressed as a positive or negative decimal fraction of up to 4 places (±0.9999).

To determine the appropriate compensatory offsets, a test plot is run, consisting of a reference line drawn parallel to the A axis with Aperture 1 and a parallel line about 0.050 to 0.10 inch away, composed of successive flashes from each of the system's 24 apertures, including Aperture 1. The actual distance from the reference line is then measured for each aperture flash, by measuring the distance from the reference line to the rear edge of the aperture flash and the distance from the reference line to the far edge of the aperture flash, and taking their average. The calculations are as follows:

$$D_{center} = \frac{D_1 + D_2}{2}$$

where D_{center} is the distance from the reference line to the center of the aperture flash.



The distance of each aperture flash from the reference line is then compared with the distance for Aperture 1. This figure is the deviation, or center offset, of the aperture in question with respect to Aperture 1.

After the measurements have been completed for all apertures, the test plot is repeated with the reference line drawn parallel to the Y axis, and the aperture offsets are again measured and recorded. The result of this is a table of offset measurements, or Aperture Offset Table, consisting of 46 centers, or two (one in X and one in Y) for each of 23 apertures.

Note that offsets are not entered for Aperture 1 because Aperture 1 is the reference aperture. All other offsets are positive or negative distances from the center of Aperture 1 to the center of the specified aperture. The offset values must always be fractional.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 12, followed by RETURN.
2. The terminal shows:

```
>12
Aperture Offset Menu

 1      X.XXXX   X.XXXX   13      X.XXXX   X.XXXX
 2      X.XXXX   X.XXXX   14      X.XXXX   X.XXXX
 3      X.XXXX   X.XXXX   15      X.XXXX   X.XXXX
 4      X.XXXX   X.XXXX   16      X.XXXX   X.XXXX
 5      X.XXXX   X.XXXX   17      X.XXXX   X.XXXX
 6      X.XXXX   X.XXXX   18      X.XXXX   X.XXXX
 7      X.XXXX   X.XXXX   19      X.XXXX   X.XXXX
 8      X.XXXX   X.XXXX   20      X.XXXX   X.XXXX
 9      X.XXXX   X.XXXX   21      X.XXXX   X.XXXX
10      X.XXXX   X.XXXX   22      X.XXXX   X.XXXX
11      X.XXXX   X.XXXX   23      X.XXXX   X.XXXX
12      X.XXXX   X.XXXX   24      X.XXXX   X.XXXX
99      Exit
```

```
Please enter menu choice
>
```

where X.XXXX is the current offset value.

3. Type the number of the aperture whose offset is to be specified.
4. The terminal shows:

```
>n
Type in a new offset for aperture n
>
```

where n is the aperture number typed in Step 3.

5. The terminal shows:

Type in new A offset for aperture n
>

Type a value, between 0 and 0.9999, followed by RETURN.

6. The terminal shows:

Type in a new B offset
>

Type a value, between 0 and 0.9999, followed by RETURN. The terminal shows the new offset values for the specified aperture. Return to Step 2.

NOTES:

1. Aperture 1 is never selected because it is used as the reference aperture.
2. If an out-of-range offset value is typed, the terminal shows:

**** Data must be greater than -1 and less than 1.

MASS PARAMETER INPUT:
Not Applicable

TERMINAL PARAMETER INPUT:
13 Initialize Distance

PURPOSE:

When a plotter is initialized, the carriage and/or table move to the plotter origin until they actuate limit switches. They then move away from the switches approximately 1/4 inch.

This parameter allows the distance to be changed.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 13, followed by RETURN.
2. The terminal shows:

```
>13
Initialize Distance

  1  Specify A axis offset   X.XXXXX
  2  Specify B axis offset   X.XXXXX
99  Exit
```

Please enter menu choice
>

where X.XXXXX is the current initialize distance.

3. Type 1 or 2, followed by RETURN, and enter an A axis or B axis value, respectively, followed by RETURN. Trailing fractional zeros need not be entered. The value is displayed. Return to Step 2.

NOTE: If an out-of-range value is specified, the terminal shows:

```
**** Offset value must be positive and less than 999.99999
>
```

MASS PARAMETER INPUT:

Not Applicable

TERMINAL PARAMETER INPUT:

14 Circular Resolution

PURPOSE:

Allows rapid verification of the presence and position of arcs and circles by quickly plotting long line segments rather than the final shape.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 14, followed by RETURN.

2. The terminal shows:

```
>14
Circular Resolution Menu

  1  Specify circular resolution value      X
  2  Use default according to radius
99  Exit

Please enter menu choice
>
```

where X is the current circular resolution value.

3. Type one of the numbers shown, followed by RETURN.

4. If 1 is typed, the terminal shows:

```
Specify new circular resolution value
>
```

Enter the value between 4 and 9999, followed by RETURN. The value typed in will appear on that line. Return to Step 2.

The plotter will approximate the circular plot data with the number of straight-line segments specified.

For example, if commands to plot a circle are encountered and if 4 is specified, a square will be plotted, which is inscribed by the circle, in the location on the plot where the final circle will appear.

5. If 2 is typed, circular plot data will be plotted in its entirety. The number symbol (#) will move to that line. Return to Step 2.

**MASS PARAMETER INPUT:
FS (Format Statement)**

**TERMINAL PARAMETER INPUT:
15 Format Statement**

PURPOSE:

Defines the input data format so that the control can interpret it properly.

MASS PARAMETER INPUT:

FS $\left\{ \begin{matrix} L \\ T \end{matrix} \right\}$ $\left\{ \begin{matrix} A \\ I \end{matrix} \right\}$ (Nn) (Gn) (Xa) (Yb) (Zc) (Dn) (Mn)*

where

L = Leading zeros omitted

T = Trailing zeros omitted

A = Absolute mode

I = Incremental mode

Nn = Sequence numbers included, where n is the number of digits*

Gn = Preparatory function code*

Xa

Xb

Zc } = format of the position information in the input data (5.5 maximum)

Dn = Draft code*

Mn = Miscellaneous code*

Example: FSTIN2X45Y45* indicates that the input data is in the following format:

Trailing zeros may be omitted (T)

Data is incremental notation (I)

Data contains sequence numbers with 2 digit numbers (N2)

X-coordinate values are in 4.5 format (X45)

Y-coordinate values are in 4.5 format (Y45)

*Refer to Appendix A for more detail.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 15, followed by RETURN.
2. The terminal shows:

```
>15
Format Statement Menu

  1  Leading zeros omitted      #
  2  Trailing zeros omitted

  3  Absolute data              #
  4  Incremental data

  5  Specify D format          2
  6  Specify G format          2
  7  Specify M format          2
  8  Specify N format          4
  9  Specify X format          4 3
 10  Specify Y format          4 3
 11  Specify Z format          4 3
 99  Exit
```

Please enter menu choice
>

3. Type 1, followed by RETURN, to specify leading zero omission or 2, followed by RETURN, to specify trailing zero omission.

The number symbol (#) will be on the selected line.

4. Type 3, followed by RETURN, to specify absolute input data or 4, followed by RETURN, to specify incremental input data.

The number symbol will be on the selected line.

5. Type 5, 6, 7, or 8 to specify D, G, M, or N format, respectively. The terminal shows:

```
Specify number of digits for n
>
```

where n is the specified word address.

For N, enter a value between 1 and 5, followed by RETURN. For D, G, or M, enter 1 or 2, followed by RETURN. The terminal shows the new value.

6. Type 9, followed by RETURN, to specify X format. The terminal shows:

```
Specify number of integer digits for X (max. 5)
>
```

Type in a value, followed by RETURN. The terminal shows:

```
Specify number of fractional digits (max. 5)  
>
```

Type in a value, followed by RETURN. The terminal shows the new X value.

7. Type 10, followed by RETURN, to specify Y format. The terminal shows:

```
Specify number of integer digits for Y (max. 5)  
>
```

Type in a value, followed by RETURN. The terminal shows:

```
Specify number of fractional digits (max. 5)  
>
```

Type in a value, followed by RETURN. The terminal shows the new Y value.

8. Type 11, followed by RETURN, to specify Z format. The terminal shows:

```
Specify number of integer digits for Z (max. 5)  
>
```

Type in a value, followed by RETURN. The terminal shows:

```
Specify number of fractional digits (max. 5)  
>
```

Type in a value, followed by RETURN. The terminal shows the new Z value.

NOTES:

1. If a selection number other than those shown on the menu is typed, the menu is redisplayed.

2. If an out-of-range value is entered, the terminal shows:

```
**** INPUT DATA ERROR *** XXXX  
>
```

where XXXX is the invalid entry that was made.

3. Leading or trailing zero omission applies to all numeric values in the data block.

4. If an out-of-range value is entered for N, the terminal shows:

```
**** Values must be between 1 and 5  
>
```

If an out-of-range value is entered for X, Y, or Z, the terminal shows:

```
**** Values must be between 0 and 5
```

```
>
```

If an out-of-range value is entered for D, G, or M, the terminal shows:

```
**** Values must be 1 or 2
```

```
>
```

MASS PARAMETER INPUT:

ID (Input Display)

TERMINAL PARAMETER INPUT:

16 Input Data Display

PURPOSE:

Causes the specified RS-274-D format command codes to be displayed as they are encountered in the plot data.

MASS PARAMETER INPUT:

ID (codes)*

where the codes can be one or more of the following:

N, G, M, D, X, Y, Z, I, J, K, W

Example: ID NGD*

causes every N, G, and D code to be displayed as it is processed. ID ALL* causes all codes to be displayed.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 16, followed by RETURN.

2. The terminal shows:

```
>16
Data Identification Menu

Current Data Being Identified Are:   n

  1  Specify data to be identified
 99  Exit

Please enter menu choice
>
```

where n represents the currently selected RS-274-D command codes.

3. Type 1, followed by RETURN, to specify the command codes to be displayed. N, G, M, D, X, Y, Z, I, J, K, W, and M are allowed. Type A, followed by RETURN, to display all command codes.

4. Type the appropriate letters, followed by RETURN, and return to Step 2.

NOTE: If an unrecognized code is entered, the terminal shows:

```
**** Illegal choice X
>
```

where X is the value entered.

Return to Step 2.

MASS PARAMETER INPUT:

OF (Offset)

TERMINAL PARAMETER INPUT:

17 Offset

PURPOSE:

Defines the displacement between the zero position in the input data and the plotter zero. This shifts the entire plot by some amount. The OF parameter is used only in absolute mode, and using the OF parameter in incremental mode causes an error message. If the mode is changed from absolute to incremental, the OF value is saved and is reinstated as soon as the mode returns to absolute. To define an offset in incremental mode, slew the plotter carriages to the desired zero point before starting the plot.

The plotter A and B axes are offset independently. Offset values must be positive.

MASS PARAMETER INPUT:

OF A+m B+n*

where:

+m is the A axis offset in 5.5 format

+n is the B axis offset in 5.5 format

Example: OF A0.00025 B0.00025*

moves the beginning of the plot to 0.00025 inches from plotter 0,0 in both the A and B axes.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 17, followed by RETURN.
2. The terminal shows:

>17

Table Offsets

1	Specify A axis offset	XXXXX.XXXXX
2	Specify B axis offset	XXXXX.XXXXX
99	Exit	

Please enter menu choice

>

where XXXXX.XXXXX is the current offset value.

3. Type 1 or 2, followed by RETURN. The terminal shows one of the following:

Specify A offset value

>

Specify B offset value

>

4. Enter the appropriate value, followed by RETURN. Trailing fractional zeros need not be entered. The value is displayed. Return to Step 2.

NOTE: If an out-of-range value is specified, the terminal shows:

```
**** Offset value must be positive and less than 99999.99999.  
>
```

Return to Step 2.

MASS PARAMETER INPUT:

MO (Mode)

TERMINAL PARAMETER INPUT:

18 Input Data Mode

PURPOSE:

Specifies the units of the plot data - English units in inches or metric units in millimeters. Format can range from 0.1 to 5.5.

MASS PARAMETER INPUT:

MO $\left\{ \begin{array}{l} \text{IN} \\ \text{MM} \end{array} \right\}^*$

where

MOIN* specifies English units

MOMM* specifies metric units

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 18, followed by RETURN.
2. The terminal shows:

>18

Data Mode Menu

```
 1  Use English units      #
 2  Use metric units
99  Exit
```

Please enter menu choice

>

3. Type 1, followed by RETURN, to specify that the plot data is in English (inch) units, or type 2, followed by RETURN, to specify that the plot data is in metric (millimeter) units.

The number symbol will be on the selected line. Return to Step 2.

NOTE: If the plot data is in English units and the metric parameter is specified, the system software will convert the data and values in millimeters will be displayed.

If the plot data is in metric units and the English parameter is specified, the system software will convert the data and values in inches will be displayed.

**MASS PARAMETER INPUT:
NS (Sequence Number Start)**

**TERMINAL PARAMETER INPUT:
19 Sequence Number Start**

PURPOSE:

Specifies the sequence number in the plot data where processing should begin. This parameter applies only to RS-274-D format plot data.

MASS PARAMETER INPUT:

NSn^*

where:

n is the starting sequence number.

Example: $NS26^*$
causes processing to begin at sequence number 26.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 19, followed by RETURN.
2. The terminal shows:

```
>19
Sequence Number Start Menu
1 Specify sequence number start      X
99 Exit
Please enter menu choice
>
```

where X is the current starting sequence number.

3. Type 1, followed by RETURN, to specify a new starting sequence number.
4. The terminal shows:

```
Specify new sequence number start
>
```

Enter a value, between 0 and up to 99999, depending on the value of Nn of the Format Statement, followed by RETURN, and return to Step 2.

NOTES:

1. Sequence numbers are read with leading zeros omitted.
2. For mass parameter input, NS^* disables the NS parameter.

3. If an out-of-range value is specified, or if the starting sequence number is greater than the ending sequence number, the terminal shows:

```
**** Value must be between 0 and end value 9999  
>
```

In this case the Nn value of the Format Statement is 4, thus 9999 is the maximum value allowed.

Return to Step 2.

**MASS PARAMETER INPUT:
NF (Sequence Number Finish)**

**TERMINAL PARAMETER INPUT:
20 Sequence Number End**

PURPOSE:

Specifies the sequence number in the plot data where processing should stop. This parameter applies only to RS-274-D format plot data.

MASS PARAMETER INPUT:

NFn*

where:

n is the ending sequence number.

Example: NF999*
causes processing to stop at sequence number 999.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 20, followed by RETURN.
2. The terminal shows:

```
>20
Sequence Number End Menu

 1 Specify sequence number end   X
99 Exit

Please enter menu choice
>
```

where X is the current ending sequence number.

3. Type 1, followed by RETURN, to specify a new ending sequence number.
4. The terminal shows:

```
Specify new sequence number end
>
```

Enter a value greater than the starting sequence number but less than the maximum value specified by the Nn value of the Format Statement, followed by RETURN, and return to Step 2.

NOTES:

1. Sequence numbers are read with leading zeros omitted.
2. For mass parameter input, NS* disables the NS parameter.

3. If an out-of-range value is specified, or if the ending sequence number is less than the starting sequence number, the terminal shows:

```
**** Value must be greater than start value X
      and less than the maximum value 9999
>
```

In this case the Nn value of the Format Statement is 4, thus 9999 is the maximum value allowed.

where X is the current starting sequence number.

**MASS PARAMETER INPUT:
BD (Block Delete)**

**TERMINAL PARAMETER INPUT:
21 Block Delete**

PURPOSE:

Enables or disables the function that deletes all data blocks in the input data containing a slash character (/).

MASS PARAMETER INPUT:

BD $\begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$ *

where:

BD0 disables the block delete function

BD1 enables the block delete function

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 21, followed by RETURN.
2. The display shows:

>21

Block Delete Menu

```
1  Block delete is OFF      #
2  Block delete is ON
99 Exit
```

Please enter menu choice

>

3. Type 1 or 2, followed by RETURN, to turn block delete off or on, respectively. The number symbol (#) moves to the selected line. Return to Step 2.

MASS PARAMETER INPUT:

OP (Optional Stop)

TERMINAL PARAMETER INPUT:

22 Optional Stop

PURPOSE:

Enables or disables the function that stops program when an M01 code in the input data is encountered.

MASS PARAMETER INPUT:

OP $\begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$ *

where:

OP0 disables the optional stop function

OP1 enables the optional stop function

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 22, followed by RETURN.

2. The terminal shows:

>22

Optional Stop Menu

```
 1  Optional stop is OFF  #
 2  Optional stop is ON
99  Exit
```

Please enter menu value

>

3. Type 1 or 2, followed by RETURN, to turn optional stop off or on, respectively. The number symbol (#) moves to the selected line. Return to Step 2.

MASS PARAMETER INPUT:

SM (Symbol Mirror)

TERMINAL PARAMETER INPUT:

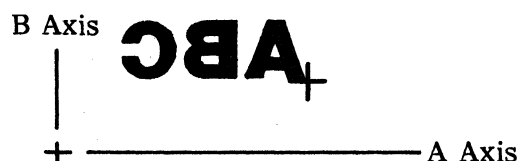
23 Symbol Mirror

PURPOSE:

Enables or disables the mirror function for symbols only. The function causes symbols to be plotted as mirror images of themselves, independently reflected about either or both axes.

Examples of symbol mirroring are as follows:

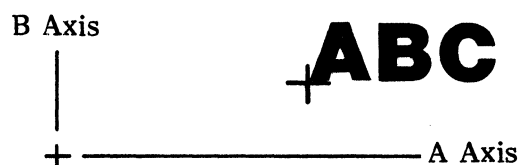
A axis mirrored
B axis normal



A and B axis mirrored



Neither axis mirrored



MASS PARAMETER INPUT:

$$SM \ A \ \begin{Bmatrix} 0 \\ 1 \end{Bmatrix} \quad B \ \begin{Bmatrix} 0 \\ 1 \end{Bmatrix} \quad *$$

$A \begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$ Controls the mirror feature for A axis data
0 = normal (mirror off)
1 = mirrored

$B \begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$ Controls the mirror feature for B axis data
0 = normal (mirror off)
1 = mirrored

Example: SMA1B0*
causes all A axis symbol data to be inverted, thereby flipping the symbol about the B axis.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 23, followed by RETURN.

2. The terminal shows:

```
>23
Symbol Mirror Image Menu

  1  A axis is NORMAL      #
  2  A axis is MIRRORED
  3  B axis is NORMAL
  4  B axis is MIRRORED   #
99  Exit
```

Please enter menu choice

>

3. Type 1 or 2, followed by RETURN, to turn off or on mirroring in the A axis. Type 3 or 4, followed by RETURN, to turn off or on mirroring in the B axis. The number symbol (#) moves to the selected lines. Return to Step 2.

**MASS PARAMETER INPUT:
SS (Symbol Scale)**

**TERMINAL PARAMETER INPUT:
24 Symbol Scale**

PURPOSE:

Most symbols are enclosed in a 0.015 x 0.015 inch (or 1.5 x 1.5 mm) matrix or box. This matrix represents the basic symbol size and provides a sufficient margin for proper spacing between symbols. When a symbol scale factor is defined, the entire matrix is scaled rather than the symbol coordinates.

Symbol scale is controlled by five miscellaneous codes: M50, M51, M52, M53 and M54 where each code represents a scale factor to be applied the basic symbol matrix.

Symbol scale factors are fixed with mass parameter input and can be changed with terminal parameter input.

MASS PARAMETER INPUT:

SS(M50n) (M51n) (M52n) (M53n) (M54n)* where
n in each case is the scale factor that
will be used when the associated code is
recognized Format is 3.2

For example: SS M50 10.00 M51 25.00 M52 50.00 M53 75.00 M54 100.00 *
causes each symbol scale code to be interpreted as follows:

<u>CODE</u>	<u>SCALE FACTOR</u>	<u>SYMBOL SIZE</u>	
		(Inches)	(MM)
M50	10	.15 x .15	15 x 15
M51	25	.375 x .375	37.5 x 37.5
M52	50	.75 x .75	75 x 75
M53	75	1.125 x 1.125	112.5 x 112.5
M54	100	1.5 x 1.5	150 x 150

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 24, followed by RETURN.

2. The terminal shows:

```
>24
Symbol Scale Menu

  1 Specify scale for M50   XXX.XXXX
  2 Specify scale for M51   XXX.XXXX
  3 Specify scale for M52   XXX.XXXX
  4 Specify scale for M53   XXX.XXXX
  5 Specify scale for M54   XXX.XXXX
99 Exit
```

Please enter menu choice

>

where XXX.XXXX is the current scale factor.

3. Type one of the numbers shown, which corresponds to the M code to be changed, followed by RETURN.
4. The terminal shows:

```
Specify new scale for (n)
>
```

where n is the M code being changed.

Enter a scale factor between 0.0001 and 999.9999, followed by RETURN.

The value is displayed. Return to Step 2.

NOTES:

1. If an out-of-range value is specified, the terminal shows:

```
**** Value must be positive and less than 999.9999
>
```

2. All symbols are scaled by the system scale factor defined by the SF (Scale Factor) parameter in addition to the symbol scale parameter. Thus, if the SF parameter is 0.5 and the SS parameter is 10, the formula for the resultant symbol size is $(0.015 \times 0.015 \text{ inch}) \times 10 \times 0.5 = 0.075 \times 0.075 \text{ inch}$.

MASS PARAMETER INPUT:
Not Applicable

TERMINAL PARAMETER INPUT:
25 End of Block Character

PURPOSE:

Allows you to indicate to the control the end of block character of the incoming plot data.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 25, followed by RETURN.
2. The terminal shows:

```
>25
End of Block Character Menu

  1  Specify new end of block character      *
  2  Specify ASCII decimal equivalent
99  Exit
```

Please enter menu choice

>

where * is the current end of block character.

3. Type 1 or 2, followed by RETURN, to specify a new end of block character.
4. If 1 is entered the terminal shows:

```
Specify new end of block character
```

>

Type an end of block character, followed by RETURN.

The character is displayed. Return to Step 2.

5. If 2 is entered the terminal shows:

```
Type in ASCII equivalent of the new character
```

>

If the ASCII code of a non-printing character is entered, that code is displayed. For example, if 13 is entered the display will show <13>.

If the ASCII code for a printing character is entered, the character is displayed.

MASS PARAMETER INPUT:
Not Applicable

TERMINAL PARAMETER INPUT:
26 Parameter Delimiter

PURPOSE:

Allows you to indicate to the control the parameter delimiter character of the incoming plot data.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 26, followed by RETURN.
2. The terminal shows:

```
>26
Parameter Delimiter Menu

  1  Specify new end of parameter delimiter      %
  2  Specify ASCII decimal equivalent
 99  Exit parameter delimiter menu

Please enter menu choice
>
```

where % is the current parameter delimiter character.

3. Type 1 or 2, followed by RETURN, to specify a new parameter delimiter character.
4. If 1 is entered the terminal shows:

```
Specify new end of parameter delimiter
>
```

Type a parameter delimiter character, followed by RETURN. The character is displayed. Return to Step 2.

5. If 2 is entered the terminal shows:

Type in ASCII equivalent of the new character

If the ASCII code of a non-printing character is entered, that code is displayed. For example, if 13 is entered the display will show <13>

If the ASCII code for a printing character is entered, the character is displayed.

**MASS PARAMETER INPUT:
Not Applicable**

**TERMINAL PARAMETER INPUT:
27 RS232 Menu**

PURPOSE:

Allows you to specify various RS-232-C asynchronous communications interface parameters.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 27, followed by RETURN.
2. The terminal shows:

```
>27
RS232 Parameters Menu

 1 Local mode          #
 2 Remote mode

 3 Number of retries   7
 4 Timeout value      10 seconds
 5 Buffer size         1024 characters

 6 Baud rate          9600
 7 Stop bits          1
 8 Bits per character  7
 9 Parity             even
99 Exit
```

Please enter menu choice
>

The current parameter values are shown.

3. Type 1 or 2, followed by RETURN, to specify local or remote mode, respectively. The number symbol (#) moves to the selected line. Local mode indicates the 3100 control is directly connected to a control computer by a 50 foot (maximum) cable.

Remote mode indicates the 3100 control is connected to a computer by way of a modem.

Type 99, followed by RETURN, and return to Step 2.

4. Type 3, followed by RETURN, to specify the number of retries. The value indicates the number of times the control will attempt to establish communications with the computer.

5. Type 4, followed by RETURN, to specify timeout value. The value indicates the length of time the control will wait for a response from the computer. Type 99, followed by RETURN, and return to Step 2.

If an out-of-range value is entered, the terminal shows:

```
**** Timeout value must be between 1 and 255
>
```

6. Type 5, followed by RETURN, to specify buffer size. The value indicates the maximum number of 8-bit characters that can be sent to the control as one block of data. Type 99, followed by RETURN, and return to Step 2.

If an out-of-range value is entered, the terminal shows:

```
**** Buffer size must be between 1 and 1024
>
```

7. Type 6, followed by RETURN, to specify baud rate. This value indicates the rate, in bits per second, that data is sent to the control.

The terminal shows:

```
>6
Baud Rate Menu

 1  9600      #
 2  4800
 3  2400
 4  1200
 5   300
99  Exit
```

```
Please enter menu choice
>
```

Type the appropriate number, followed by RETURN. The number symbol moves to that line. Type 99, followed by RETURN, and return to Step 2.

8. Type 7, followed by RETURN, to specify the number of stop bits in the character. The terminal shows:

```
>7
Stop Bits Menu

 1  1 stop bit      #
 2  2 stop bits
99  Exit
```

```
Please enter menu choice
>
```

MASS PARAMETER INPUT:

Not Applicable

TERMINAL PARAMETER INPUT:

28 Stop On Error

PURPOSE:

Enables or disables the function that halts plotting upon detection of a plot data error. For example, two same-letter address characters in the same RS-274-D data block is an error.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 28, followed by RETURN.

2. The display shows:

```
>28
Stop On Error Menu

 1 Do not stop on error      #
 2 Stop on error
99 Exit                      .

Please enter menu choice
>
```

3. Type 1 or 2, followed by RETURN, to turn the stop on error function off or on, respectively. The number symbol (#) moves to the selected line. Return to Step 2.

Type the appropriate number followed, by RETURN. The number symbol moves to that line. Type 99, followed by RETURN, and return to Step 2.

9. Type 8, followed by RETURN, to specify the number of bits that constitute the character. The terminal shows:

```
>8
Bits Per Character Menu
```

```
 1  5 bits
 2  6 bits
 3  7 bits      #
 4  8 bits
99  Exit
```

```
Please enter menu choice
>
```

Type the appropriate number, followed by RETURN. The number symbol moves to that line. Type 99, followed by RETURN, and return to Step 2.

NOTE: Regardless of the value entered, the character is considered to be 8 bits long with regard to buffer size.

10. Type 9, followed by RETURN, to specify no, even, or odd parity. The terminal shows:

```
>9
Parity Menu
```

```
 1  No parity
 2  Even parity      #
 3  Odd parity
99  Exit
```

```
Please enter menu choice
>
```

Type the appropriate number, followed by RETURN. The number symbol moves to that line. Type 99, followed by RETURN, and return to Step 2.

With even parity the sum of the ones and the parity bit of the character is even. With odd parity, the sum is odd.

**MASS PARAMETER INPUT:
Not Applicable**

**TERMINAL PARAMETER INPUT:
29 Stop On Parameter Error**

PURPOSE:

Enables or disables the function that halts plotting upon detection of an illogical parameter. For example, specifying a negative scale factor or assigning plot X axis data to both the plotter A and B axes are errors.

TERMINAL PARAMETER INPUT:

1. With the Parameter Edit menu displayed, type 29, followed by RETURN.

2. The display shows:

>29

Stop On Parameter Error Menu

```
1 Do not stop on parameter error #
2 Stop on parameter error
99 Exit
```

Please enter menu choice

>

3. Type 1 or 2, followed by RETURN, to turn the stop on parameter error off or on, respectively. The number symbol (#) moves to the selected line. Return to Step 2.

3.4 PLOTTER UTILITIES

Plotter Utilities are auxiliary functions that can be performed by the control.

1. With the Control Mode menu displayed, type 3, followed by RETURN.
2. The terminal shows:

```
>3
Utilities

  1  Multiple files processing
  2  Load user defined symbols
  3  Dump program
  4  Format floppy diskette
  5  Aperture selection
 99  Exit
```

```
Please enter menu choice
>
```

3. Type 1, 2, 3, 4, or 5, followed by RETURN to select the desired utility, or type 99, followed by RETURN, to return to the Parameter Edit menu.

Multiple Files Processing, described in Paragraph 3.4.1, indicates to the control that incoming plot data is for multiple plots. This eliminates the need for loading new plot data for each plot.

Load User Defined Symbols, described in Paragraph 3.7.4, lets you add symbols to or replace symbols in the standard symbol table. The standard symbol table is described in Paragraph 3.7.

Dump Program, described in Paragraph 3.4.2, lets you store the 3100 system software and current parameters on a floppy disk.

Format Floppy Diskette, described in Paragraph 3.4.3, lets you format a floppy diskette. This must be done to a new diskette.

Aperture Selection, described in Paragraph 3.4.4, lets you use multiple aperture wheels for photoplotting.

3.4.1 Multiple Files Processing

The optional Multiple File Processing utility allows you to sequentially process up to 16 magnetic tape files without intervention. The utility operates by using a Queue Table and an associated Offset Table that you will create. File numbers are entered into the Queue Table and associated offsets are entered into an Offset Table. The offset value defines the plot origin. All files referenced in the Queue Table must be terminated with an M-code or its equivalent. An M-code, or equivalent stop bits, will cause processing to continue with the next queue entry. Processing of files continues until the queue is exhausted, the queue stop entry is reached, or by operator intervention.

The files to be selected must be in a format acceptable to the system software. All of the files in the Queue Table must be of the same format type; that is, they all must be Series 500 Format, all Extended Binary Format or all RS-274-D Format. When all of the files are in RS-272-D Format all files must be in the same code (ASCII, EBCDIC, EIA. etc.). The plot data can be in absolute or incremental mode, however, the control will process offsets the same as it does in absolute mode.

This option is available only when the system is equipped with magnetic tape input.

The remainder of this paragraph describes Multiple Files Processing operation.

1. With the Plotter Utilities menu displayed, type 1, followed by RETURN.
2. The terminal shows:

```
>1
Multiple Files Processing
```

```
  1  Queue table
  2  Offset table
  3  Options
  4  Activate queue      #
  5  Deactivate queue
99  Exit
```

```
Please enter menu choice
>
```

3. Type the selection number associated with the desired operation, followed by RETURN. Type 99, followed by RETURN, to return to the Utilities menu.
4. Queue Table Menu

Type 1, followed by RETURN, to display, create, or modify the Queue Table. The Queue Table is a list of up to 16 magnetic tape file numbers and their related A and B offsets.

The terminal shows:

```
>1
Queue Table
```

```
  1  Display queue table
  2  Queue clear
99  Exit
```

```
Please enter menu choice
>
```

Display queue table

Type 1, followed by RETURN, to display the Queue Table.. The terminal shows:

>1
Queue Table

Queue Entry	File #	A Ref. #	B Ref. #
1	35	11	2
2	1	1	3
3			
4			
5	105	1	1
6	77	16	13
7	1	13	5
8			
9			
10	36	7	9
11			
12			
13	59	16	9
14	36	13	5
15			
16	110	7	7

99 Exit

Please enter menu choice
>

To enter or change a file number and/or A and B Offset Reference, type the appropriate Queue Entry number followed by RETURN.

The terminal shows:

Enter file number
>

Enter a file number between 0 and 9999, followed by RETURN. The new value is shown.

The terminal shows:

Enter associated A offset reference
>

Enter an A offset value, followed by RETURN. The value is shown.

The terminal shows:

Enter associated B offset reference
>

Enter a B offset value, followed by RETURN. The new value is shown.

After all Queue Table values have been entered, type 99, followed by RETURN to return to the Multiple File Processing menu.

Queue Clear

Type 2, followed by RETURN, to clear a selected Queue Entry.

The terminal shows:

```
Clear entry # (or 17 to clear the entire queue)
>
```

Enter the number of the queue entry to be cleared followed by RETURN.

Enter 17 followed by RETURN, to clear the entire queue.

5. Offset Table Menu

Type 2, followed by RETURN, to display, create, or modify the Offset Table. The Offset Table is a list of up to 16 A and B offset pairs.

The terminal shows:

```
>
Offset Table

 1  Display offset table
 2  Offset clear
99  Exit
```

Please enter menu choice

```
>
```

Display Offset Table Menu

Type 1, followed by RETURN, to display the Offset Table. The terminal shows:

>1

Offset Table

Reference #	A Offset	B Offset
1	35.00000	59.00000
2	10.00000	15.00000
3		12.00075
4	1.00000	11.00000
5		75.57500
6		
7	15.00550	53.19650
8		
9		57.95123
10		
11		
12		
13	17.57500	27.95000
14		
15		
16	35.50000	
99	Exit	

Please enter menu choice

>

To enter or change A offset and B offset values type the appropriate Reference #, followed by RETURN.

The terminal shows:

Enter associated A-offset

>

Enter an A-axis offset value, followed by RETURN.

The maximum value is 99999.99999.

The terminal shows:

Enter associated B-offset

>

Enter a B-axis offset value, followed by RETURN.

The maximum value is 99999.99999.

The Offset Table is displayed with the new values upon completion of this entry.

Offset Clear

Type 2, followed by RETURN, to clear a selected Offset entry.

The terminal shows:

```
Clear entry # (or 17 to clear the entire table)
>
```

Enter the Reference # associated with the A and B offsets to be cleared, followed by RETURN.

Enter 17, followed by RETURN to clear the entire queue.

Type 99, followed by RETURN, to return to the Offset Table menu.

6. Options Menu

Type 3, followed by RETURN, to select the Options menu.

The terminal shows:

```
>3
```

```
Options
```

1	Queue start entry	1
2	Queue stop entry	1
3	Stop on M00	#
4	Do not stop on M00	
5	Stop on error	
6	Do not stop on error	#
99	Exit	

```
Please enter menu choice
```

```
>
```

Type the selection number associated with the desired operation, followed by RETURN. Type 99, followed by RETURN, to return to the Multiple Files Processing menu.

The operations are described as follows:

Queue start entry 1

Plotting normally begins with the first queue entry in the Queue Table. This option allows you to start plotting at a queue entry number you specify.

Type 1, followed by RETURN.

The terminal shows:

```
Enter a queue start entry number
```

```
>
```

Enter the Queue Entry number at which plotting is to start, followed by RETURN.

The Options menu is displayed with the new value.

Queue stop entry

Unless stopped by operator intervention, plotting normally stops when the Queue Table is exhausted.

This option allows you to stop plotting when a Queue Entry number you specify is reached.

Type 2, followed by RETURN.

The terminal shows:

Enter queue stop entry number.
>

Enter the Queue Entry number at which plotting is to stop.

Stop on M00

This option stops plotting such as for operator intervention, when an M00 (Program Stop) code in plot data is recognized.

The option is selected by typing 3, followed by RETURN.

Do not stop on M00

This option ignores M00 codes in the plot data. In this case data files must be terminated with other than M00, such as M02 or M30.

The option is selected by typing 4, followed by RETURN.

Stop on error

This option causes queue processing to stop when a data error causes a plot file to abort. That is, if a file aborts and the option is selected, plotting stops. A file will abort only if either the Stop On Error or the Stop On Parameter parameter is enabled. If neither parameter is enabled, the file will be plotted regardless of the error.

The option is selected by typing 5, followed by RETURN.

Do not stop on error

This option causes queue processing to continue regardless of errors. That is, if a file aborts and the option is selected, plotting will continue with the next entry in the Queue Table. A file will abort only if either the Stop On Error or the Stop On Parameter parameter is enabled. If neither parameter is enabled, the file will be plotted regardless of the error.

The option is selected by typing 6, followed by RETURN.

7. Activate Queue

Type 4, followed by RETURN, to activate the queue.

Once the queue is activated, press the control START pushbutton or select from the Control Mode menu, to start plotting.

Plotting continues according to the current Queue Table.

8. Deactivate Queue

Type 5, followed by RETURN to deactivate the queue.

If the control START pushbutton is pressed, or if 1 is selected from the Control Mode menu, the control functions without queue processing.

3.4.2 Dump Program

With the Plotter Utilities menu displayed, type 3, followed by RETURN, and the dump will take place.

3.4.3 Format Floppy Diskette

1. With the Plotter Utilities menu displayed, type 4, followed by RETURN.

2. The terminal shows:

```
DO YOU REALLY WANT TO INITIALIZE THE DISKETTE?  
>
```

Type YES, followed by RETURN, and the diskette will be formatted. Any entry other than YES will abort floppy disk formatting.

3.4.4 Aperture Selection

The Aperture Selection Utility is for future expansion and is not available at this time.

3.5 PLOTTER FUNCTIONS

This menu lets you set up the plotter prior to plotting. These are generally the last parameters specified prior to plotting.

After the parameters are specified, type 99, followed by RETURN, to return to the Control Mode menu. The Run the Plotter parameter, 1, is specified to start plotting.

The following can be specified by the Plotter Functions menu:

- Plotter initialization and origin specification
- Single step or continuous plotting
- Pen up, down, or plot-data-controlled operation
- Clear input data buffer
- Magnetic tape file search

Perform the following:

1. With the Control Mode menu displayed, type 5, followed by RETURN.
2. The terminal shows:

```
>5
Plotter Functions

 1  Initialize
 2  Set origin

 3  Single step mode
 4  Continuous plot mode      #

 5  Pen controlled by data    #
 6  Force pen up
 7  Force pen down

 8  Clear input data buffer
 9  Magnetic tape file search

10  Photo head installed      #
11  Pen head installed
99  Exit
```

```
Please enter menu choice
>
```

3. Plotter initialization

Type 1, followed by RETURN, to initialize the plotter. Go to Paragraph 3.8.2.

4. Set origin

Typing 2, followed by RETURN, indicates to the control that the current plotting head position is the zero reference point on the plotter. The head can be driven to any position on the plotter by the Control Box SLEW pushbuttons.

NOTE: The SLEW pushbuttons function only when the control is in SIT mode; that is, not processing data.

5. Single step or Continuous plotting

With Single Step mode, a single block of plot data is plotted each time either 1, Run the Plotter, is specified from the Control Mode menu or the START pushbutton is pressed. With Continuous Plot mode, plotting begins and continues until one of the events described in Paragraph 3.8.4 occurs.

Type 3 or 4, followed by RETURN, to select Single Step mode or Continuous Plot mode. The number symbol moves to the specified line.

6. Pen up, down, or automatic operation

With Pen Up mode, the plotter pen is always up or the OEH shutter is closed. This is the non-plotting position. With Pen Down mode, the plotter pen is always down or the OEH shutter is open. This is the plotting position. With Pen Controlled by Data mode, the pen is raised and lowered or the OEH shutter is opened and closed by plot data commands.

Type 5, 6, or 7, followed by RETURN, to specify the appropriate pen mode. The number symbol moves to the specified line.

7. Clear input data buffer

Before plot data for a new plot can be read into the control, you must clear the control input buffer. If the input buffer is not cleared, any data remaining in the buffer will be plotted with the new data.

Type 8, followed by RETURN, to clear the input data buffer.

8. Magnetic tape file search

Magnetic tape can be searched for a specified plot file. The tape will move to the beginning of the specified file and stop.

Type 9, followed by RETURN.

The terminal shows:

```
>9  
Specify a file mark to search for (0-9999)  
>
```

Type the appropriate value, followed by RETURN.

9. Photo head or Pen head

Plotters can accommodate a photo head or a pen head. Additionally, some photo heads can accommodate a single pen.

The parameter lets you specify if photoplotting or pen plotting is to be performed.

Type 10 or 11, followed by RETURN, to specify photoplotting or pen plotting, respectively.

After the plotter functions are specified, type 99, followed by RETURN to return to the Control Mode menu.

3.6 CONSOLE PLOT

Console Plot mode allows you to simulate incoming plot data by typing RS-274-D type plot data. The data can be plotted in the same manner as incoming plot data.

RS-274-D format is described in Appendix A. Programming examples are provided in Appendix B.

Perform the following:

1. With the Control Mode menu displayed, type 4, followed by RETURN.
2. Type the RS-274-D data blocks that constitute the desired plot and terminate each data block by RETURN. The data must conform to the previously specified input data format parameters.

The plotter executes the data block when RETURN is typed.

3. After all data blocks have been entered, type M, followed by RETURN to exit from Control Plot mode. The terminal shows the Control Mode menu.

3.7 SYMBOL MODE

The Model 3100 Control has a standard symbol set which is read into the control when the control software is loaded. The symbol table is stored in the control's symbol table. The symbol set consists of predefined sets of linear and circular interpolation strokes that form symbols and alphanumeric characters.

3.7.1 Symbol Calls

One data block specifies symbol mode, calls, rotation, and scale factor.

Data Block Format

G D##A M *

G56, G57, or G58 selects symbol mode.

The D code call label (D##A) consists of address character D, followed by a two-digit number, ##, ranging from 10-99, that specifies one of 90 symbol sets. The alphanumeric character, A, identifies a unique character in the specified set.

D10 specifies the standard symbol set which consists of the following characters and symbols:

- space
- letters A through Z
- numerals 0 through 9
- slash /
- plus sign +
- minus sign -
- comma ,
- period .

For the D10 symbol set, the alphanumeric character is the symbol to be drawn. For example, D10A specifies the letter A.

The D10 label can be followed by up to 50 characters for text generation. For example:

G56D10 THIS IS THE 3100 plots the character string THIS IS THE 3100.

Note that spaces in the symbol call will call the space character.

Additional symbol sets can be loaded into the control to replace symbols in or add symbols to the standard symbol set. The standard D10 symbol set and operator-generated symbols can be assigned to any two-digit number between 10-99.

The M code of the data block specifies a symbol scale factor.

3.7.2 Symbol Scale

All symbols are contained within a 0.015 x 0.015 inch or 1.5 x 1.5 mm matrix or square. This matrix is the basic symbol size and provides sufficient margins for proper spacing between symbols. The symbol scale parameter, described in the Symbol Scale Codes description of Table A-1, scales the entire matrix.

3.7.3 Symbol Rotation

Symbols can be rotated about their lower left (0,0) point by the use of a W code as described in Paragraph A.1.

3.7.4 Loading User Defined Symbols

This paragraph provides instructions on how to create symbols and store them in the symbol table.

Perform the following:

1. With the Plotter Utilities menu displayed, type 2, followed by RETURN.

- The terminal shows the following:

```

>2
Symbol Load
 1  Replace entire table
 2  Add to existing table
 3  Replace all but standard set
99  Exit symbol load
Select symbol load choice
>

```

- Type the selection number associated with the desired operation, followed by RETURN.

- If 1, 2 or 3 is typed, the terminal shows the following. If 99 is typed, the terminal shows the Utilities menu.

```

Input Device
 1  Keyboard
 2  Current input data source
99  Exit from symbol menu

```

- Type the selection number associated with the desired input device, followed by RETURN.

Symbols are defined by typing a series of commands that specify plotter strokes, or moves, that constitute the symbol. Command format is shown in Figure 3-1 and listed in Table 3-4.

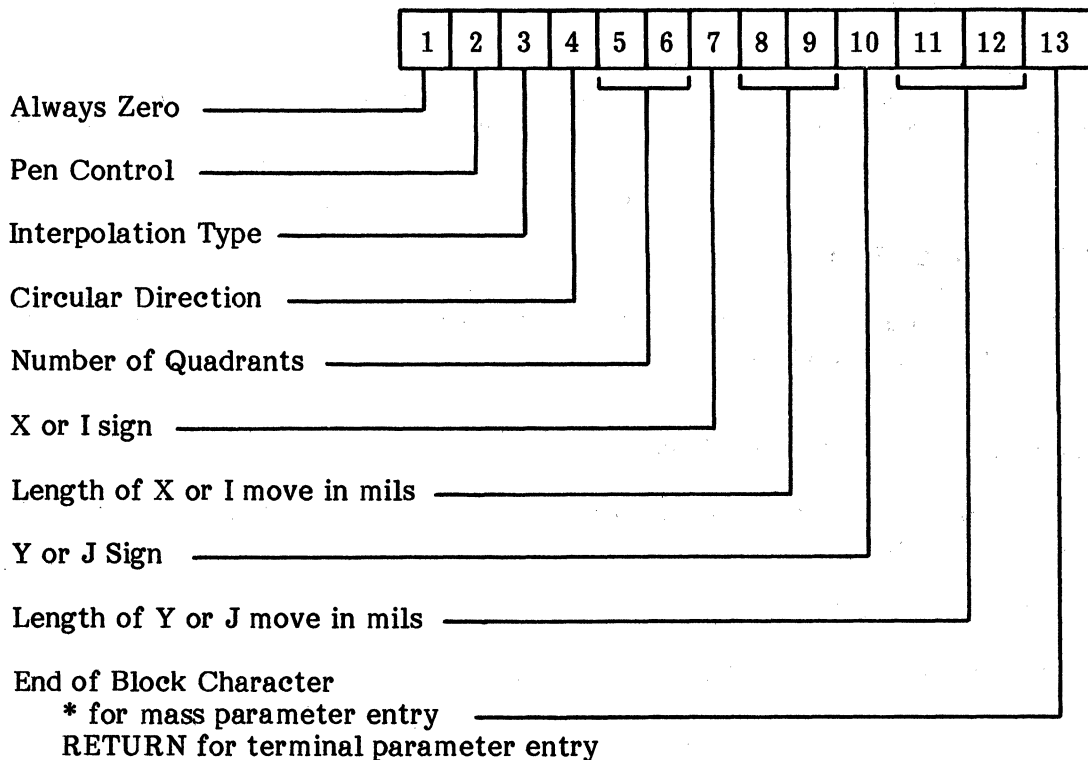


Figure 3-1 SYMBOL WORD BIT CONFIGURATION

Table 3-4 **SYMBOL WORD BIT FUNCTIONS**

Bit	Function
1	Always Zero
2	<p>Pen Control</p> <p>Controls raising or lowering of the drafting head pen or closing or opening of the optical exposure head shutter.</p> <p>0 = pen is raised or shutter is closed 1 = pen is lowered or shutter is opened</p>
3	<p>Interpolation Type</p> <p>Specifies whether this command describes a straight line (linear interpolation) or arc-shaped (circular interpolation) move.</p> <p>0 = linear interpolation 1 = circular interpolation</p>
4	<p>Circular Direction</p> <p>Applicable only if character 3=1. Only clockwise circular interpolation is allowed</p> <p>0 = linear interpolation 1 = clockwise circular interpolation</p>
5-6	<p>Number of Quadrants</p> <p>Used with circular interpolation to specify the number of quadrants the arc is to be plotted in. Thus, a single command can specify a complete circle.</p> <p>00 = 1 quadrant 01 = 2 quadrants 10 = 3 quadrants 11 = 4 quadrants</p>
7	<p>X or I Sign, + or -</p> <p>With linear interpolation, X specifies the direction of the drafting head move, along the plotter X axis, from the present position to the new position specified by this command.</p> <p>With circular interpolation, I specifies the distance from the arc start point to the arc center measured parallel to the plotter X axis.</p>

(Continued on next page)

Table 3-4 **SYMBOL WORD BIT FUNCTIONS** (Cont.)

Bit	Function
8-9	<p>Length of X or I move</p> <p>Specifies the units, between 0 and 15 mils, of the dimension specified by character 7.</p>
10	<p>Y or J Sign, + or -</p> <p>With linear interpolation, Y specifies the direction of the drafting head move, along the plotter Y axis, from the present position to the new position specified by this command.</p> <p>With circular interpolation, J specifies the distance from the arc start point to the arc center measured parallel to the plotter Y axis.</p>
11-12	<p>Length of Y or J move</p> <p>Specifies the units, between 0 and 15 mils, of the dimension specified by character 10.</p>
13	<p>End of Block Character</p> <p>Specifies the end of a symbol command.</p> <p>Always an asterisk (*) for mass parameter entry or RETURN for terminal parameter entry.</p>

User defined symbol commands are in incremental mode. That is, the coordinate a move command is referenced to the present drafting head position.

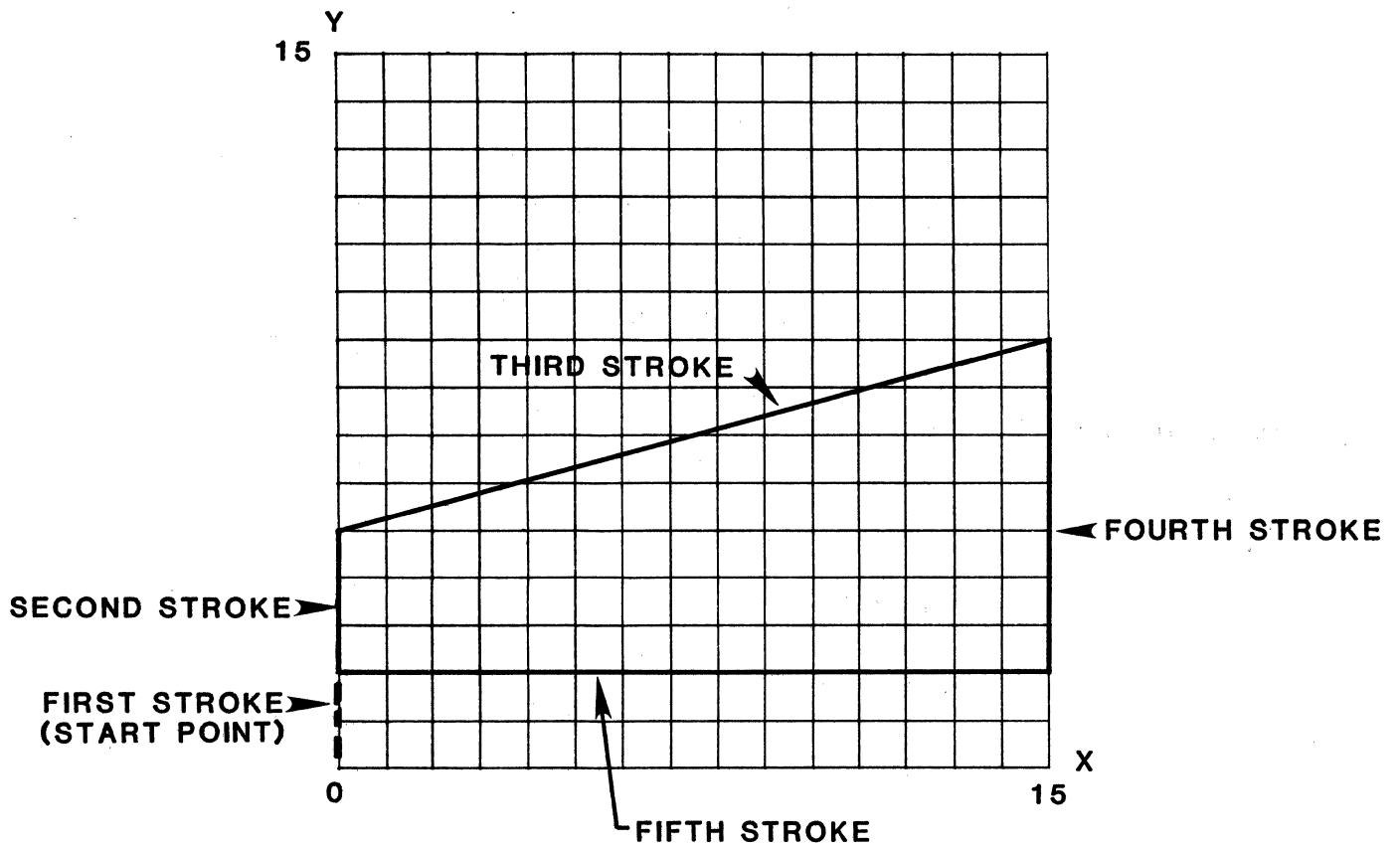
Symbols are always plotted along the plotter A, or longest, axis.

Symbols are contained within a 15 mil by 15 mil square. Their plotted size is controlled by the Symbol Scale parameter.

The following two examples illustrate symbol programming and the resulting plot.

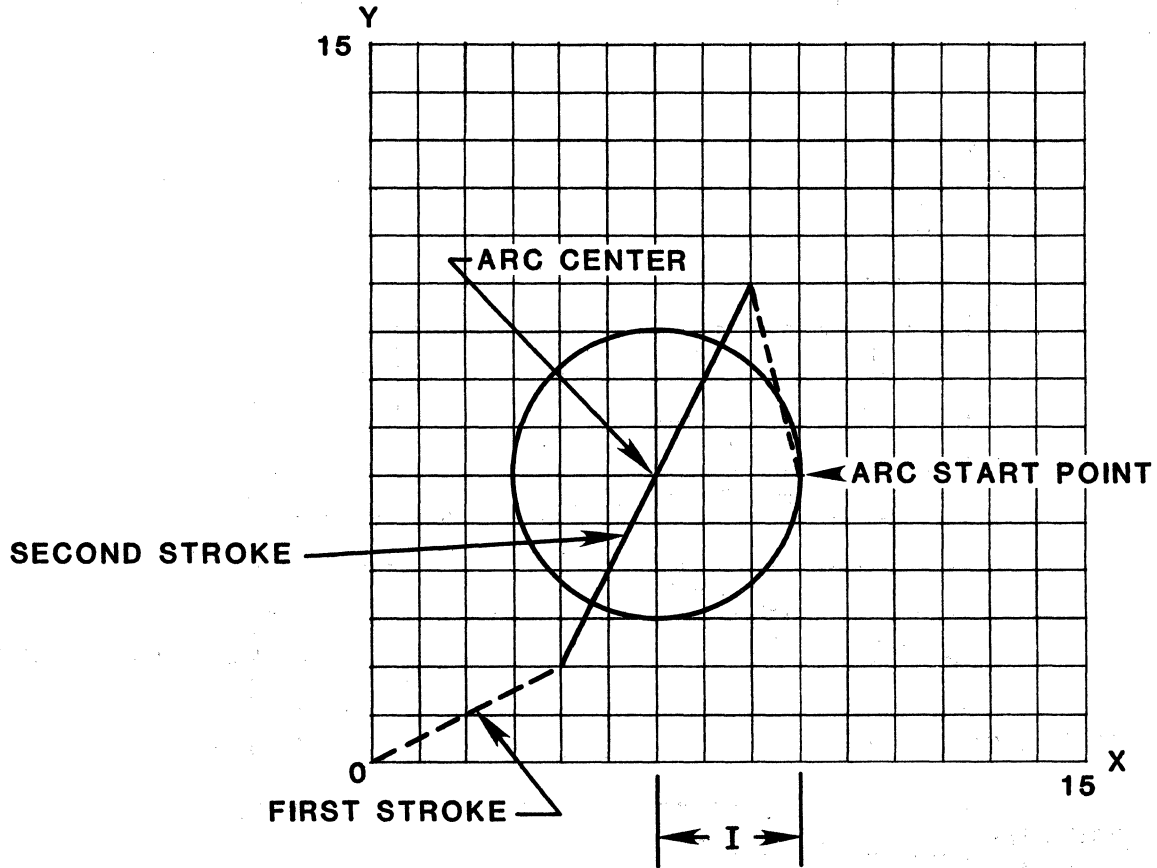
EXAMPLE 1

1	2	3	4	5	6	7	8	9	10	11	12	13	
0	0	0	0	0	0	+	0	0	+	0	2	*	FIRST STROKE
0	1	0	0	0	0	+	0	0	+	0	3	*	SECOND STROKE
0	1	0	0	0	0	+	1	5	+	0	4	*	THIRD STROKE
0	1	0	0	0	0	+	0	0	-	0	7	*	FOURTH STROKE
0	1	0	0	0	0	-	1	5	+	0	0	*	FIFTH STROKE
0	0	0	0	0	0	+	0	0	+	0	0	*	RAISE PEN AT END



EXAMPLE 2

1	2	3	4	5	6	7	8	9	10	11	12	13	
0	0	0	0	0	0	+	0	4	+	0	2	*	FIRST STROKE
0	1	0	0	0	0	+	0	4	+	0	8	*	SECOND STROKE
0	1	1	1	1	1	+	0	3	+	0	0	*	DRAW CIRCLE
0	0	0	0	0	0	+	0	0	+	0	0	*	RAISE PEN AT END



3.8 MAKING A PLOT

You are ready to plot after all required parameters have been specified.

The following operations now need to be performed:

- Mount the plotting medium
- Initialize the plotter
- Load the plot data
- Start plotting

These steps are described in detail in the remainder of this paragraph.

3.8.1 Mount the Plotting Medium

Mount the drafting medium on the plotter surface as described in the appropriate plotter user's guide. If the material has been stored in roll form, mount it so the edges curl down onto rather than up from the platen of the plotter. Do not allow drafting material to extend beyond the vacuum holes at the outer edges of the platen. Smooth the drafting material and turn on the vacuum.

3.8.2 Plotter Initialization

The plotter must be initialized before plotting. Initialization is the process whereby the plotter carriages are driven to a known absolute zero position. This position provides the basis for calculation of all other positions, and the control program maintains position internally thereafter.

Perform the following:

1. With the main menu displayed, type 5, followed by RETURN.
2. The terminal shows:

```
>5
Plotter Functions

 1 Initialize
 2 Set origin
 3 Single step mode
 4 Continuous plot mode #
 5 Pen controlled by data #
 6 Force pen up
 7 Force pen down
 8 Clear input data buffer
 9 Magnetic tape file search
10 Photo head installed #
11 Pen head installed
99 Exit

Please enter menu choice
>
```

3. Type 1, followed by RETURN and the plotter will initialize.

3.8.3 Load the Plot Data

The plot data contains the positional, or coordinate, information and codes that describe the final plot. The data can also contain parameters.

The device being used for plot data input must be specified by the input device parameter described in Paragraph 3.3.3.

Load the plot data as follows:

3.8.3.1 Perforated Tape Input

1. Set the tape reader control selector to LOAD.
2. Lift the cover of the reader and insert the tape into the reader slot with the sprocket holes closest to the back of the reader. The leader should be on the left and the bulk of the tape on the right.
3. Thread the tape on the handler, then turn the handler on.
4. Set the tape control to RUN.

3.8.3.2 Magnetic Tape Input

1. Write-protect the magnetic tape reel by removing the colored "write-ring" from the back of the reel.
2. Mount the reel on the bottom spool with the tape wound clockwise.
3. Thread the tape through the reader and onto the take-up reel by following the diagram printed on the face of the transport. Turn the take-up reel 2 or 3 turns by hand to firmly seat the tape.
4. Turn the unit on if it is not already on.
5. On the control panel near the top of the unit, press the LOAD switch.
6. If the magnetic tape is to be advanced to a particular file, use the magnetic Tape File Search function described in Paragraph 3.5.

3.8.3.3 RS232 Input

1. Select the RS232 menu and specify the required parameters.
2. Specify the appropriate DS (Data Source) parameters:

RS for mass parameter input

Block mode RS232 or Buffered mode RS232 for keyboard parameter input

3.8.4 Starting the Plot

Plotting can be begun by either of two means:

Control Box Start - Press the START pushbutton on the control box and plotting will begin.

Menu Start - With the main menu displayed, type 1, followed by RETURN and plotting will begin.

If Continuous Plot Mode was previously specified, plotting will continue uninterrupted until one of the following events occurs.

1. A program stop command (M00) is encountered. The control returns to SIT mode.
2. An optional stop command (M01) is recognized, with the optional parameter set (OP1). Operation stops and returns control to the SIT mode. Resume by depressing the control panel START button or by typing 1.
3. An end-of-program code (M02) is recognized, causing the input buffer to be cleared. Control then reverts to the SIT mode.
4. An end-of-tape code (M30) is recognized causing the input buffer to be cleared and the input tape rewind. Control reverts to the SIT mode.
5. An error is detected in a block of data causing an error message to be displayed on the terminal. All data blocks preceding the error block are processed. The block containing the error is displayed.

Depending on the Stop parameter that is specified, plotting will stop or continue upon detection of an error.

6. An end-of-file mark (or trailer for paper tape) is encountered. All prior data is processed and control reverts to the SIT mode.
7. The control panel STOP pushbutton is pressed.
8. The HALT/CONTINUE pushbutton or safety switch is tripped.

NOTE

HALT should not be used for a routine stop. Pressing HALT prevents any system control by way of the terminal until the HALT condition is cleared and the plot is completed. One of the other methods listed in this paragraph must be used to stop the plotter.

3.8.5 Stopping the Plot

Pressing the Control Box START pushbutton halts the reading of subsequent plot data. After plot data in the control input buffer is plotted, plotting stops.

Pressing the START pushbutton again resumes plotting.

3.8.6 Plotting Additional Data

Before you can plot additional data you must clear, or empty, the control input buffer. The buffer provides temporary storage for plot data awaiting processing.

If the input buffer is not cleared, any data remaining in the buffer will be plotted with the new data. The buffer can be cleared by an M code in the plot data or through the terminal.

M Code Buffer Clearing

Either an end-of-program (M02) code or, if magnetic tape is the input device, an end-of-tape (M30) code will clear the buffer.

Terminal Parameter Input Clearing

1. With the Control Mode menu displayed, type 5, followed by RETURN.
2. With the Plotter Functions menu displayed, type 8, followed by RETURN. The buffer will be cleared.

The control can now accept new parameters and plot data. The plotter need not be reinitialized unless the system is powered down.

APPENDIX A DATA FORMATS

The Model 3100 Plotter Control accepts incoming plot data in any of the following formats:

- RS-274-D Variable Block Word Address
- Series 500
- Extended Binary

Each is described in detail in this appendix.

A.1 RS-274-D VARIABLE BLOCK WORD ADDRESS FORMAT

RS-274-D Variable Block Word Address Format, hereafter referred to as RS-274-D format, is a standard input-data format that is used by a number of numerically-controlled-machine (NC) manufacturers. The Model 3100 Control was designed to accept this input-data format because it is widely used and because a plotting system is essentially a three-axis N/C machine.

RS-274-D data format hierarchy is illustrated in Figure A-1.

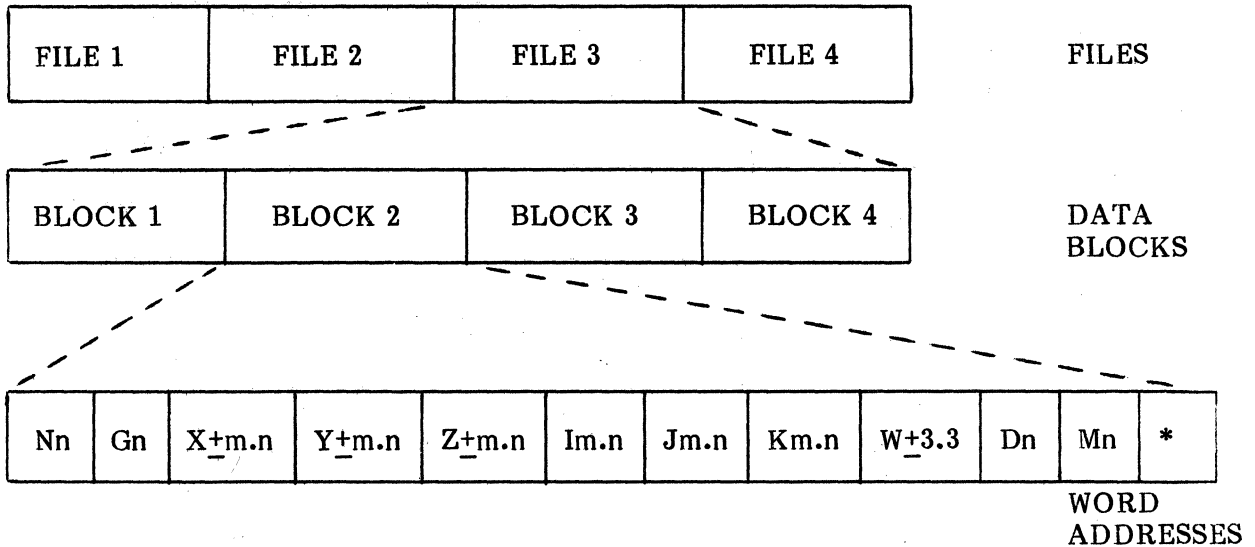


Figure A-1 **RS-274-D DATA FORMAT HIERARCHY**

Data from the input device is organized into one or more files. A file contains all of the data for one complete plot.

Each file consists of a number of blocks. A block specifies a plotter operation, such as draw a straight line from the current drafting head location to a new location of the drawing.

Each block consists of a number of RS-274-D word addresses. The addresses instruct the plotting system to perform a particular operation.

A.1.1 RS-274-D Word Addresses

Table A-1 lists word addresses recognized by the Model 3100 Plotter Control.

Table A-1 **MODEL 3100 PLOTTER CONTROL WORD ADDRESSES**

Word Address	Function
Nn	Sequence number, or data block identification number, consisting of address character N followed by up to five digits (0000-99999) depending on the Nn value of the Format Statement.
Gn	<p>Preparatory function, consisting of address character G followed by two digits, that defines how the entire data block is processed. Recognized codes are as follows:</p> <p>Plotting Codes:</p> <p>G01 Linear Interpolation, 1x scale</p> <p>G02, G20, G21 Circular Interpolation, clockwise</p> <p>G03, G30, G31 Circular Interpolation, counterclockwise</p> <p>G04 Ignore current data block. Revert to G01 if no valid code appears in next block.</p> <p>G74 Turn off 360° Circular Interpolation. Reverts to G01.</p> <p>G75 360° Circular Interpolation signed I,J,K.</p>

(Continued on next page)

Table A-1 **MODEL 3100 PLOTTER CONTROL WORD ADDRESSES (Cont.)**

Word Address	Function
Coordinate Scale Codes:	
G10	Linear Interpolation, 10x scale
G11	Linear Interpolation, 0.1x scale
G12	Linear Interpolation, 0.01x scale
G60	Linear Interpolation, 100x scale
Tool Select Codes:	
G54	Tool Select
G55	Photo Expose Mode Plots an X if pen is selected.
Symbol Select Codes:	
G56	Plot symbol referenced by the D code of this data block.
G57	Display on the terminal the symbol referenced by the D code of this data block.
G58	Plot and display the symbol referenced by the D code of this data block.
Unit Conversion Codes:	
G70	Current and subsequent data block coordinates are in inches.
G71	Current and subsequent data block coordinates are in millimeters.
NOTES	
1. Default values are G01, G70, G74.	
2. All G codes are modal except G04 and G54. This means that the current G code, except G04 or G54, remains in effect until another G code is specified.	
3. Leading zeros can be omitted. G01 is interpreted as G1.	
4. Any G code other than those listed will be interpreted as G01, linear interpolation.	

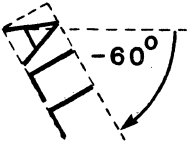
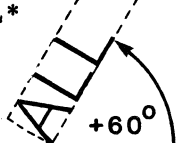
(Continued on next page)

Table A-1 **MODEL 3100 PLOTTER CONTROL WORD ADDRESSES** (Cont.)

Word Address	Function
<p>X+m.n Y+m.n Z+m.n</p>	<p>Coordinate Commands:</p> <p>X, Y, Z coordinate commands define the point to which the drafting tool must be moved with reference to either an absolute 0,0 point (absolute data) or the present tool position (incremental data). Coordinate commands can be in English or metric units with leading or trailing zero omission.</p> <p>Any two X, Y, Z address characters can be assigned to the plotter A (long) and B (short) axis. The numeric value can be preceded by a + (default value) or - sign. The numeric value is always in an "m.n" format, where m is the number of integer digits and n is the number of decimal places.</p> <p>Maximum "m.n" format is 0.1 to 5.5.</p> <p>Refer to Paragraph A.2, for more detail.</p>
<p>Im.n Jm.n Km.n</p>	<p>Arc Center Coordinate Commands:</p> <p>I, J, K coordinate commands define the arc start point to arc center distance measured parallel to the plotter X, Y, Z axes. These commands are always in the same "m.n" format as the respective X, Y, Z commands.</p> <p>Depending on the G code, these commands can be signed or unsigned. G75 allows signed values. The other circular interpolation G codes allow unsigned values only.</p> <p>Refer to Paragraph A.2, for more detail.</p>
<p>W+3.3</p>	<p>Symbol Rotation:</p> <p>Rotates the symbol or symbols specified by the D code of this data block.</p> <p>All stored symbols are contained within a square or matrix. The lower left corner of the matrix is the origin and the point from which symbol drawing begins regardless of the number of characters to be plotted.</p>

(Continued on next page)

Table A-1 MODEL 3100 PLOTTER CONTROL WORD ADDRESSES (Cont.)

Word Address	Function
<p>W+3.3 (Cont.)</p>	<p>Address character W, followed by + or - and a value in 3.3 format, rotates the symbol or symbols +999.999 degrees. A + sign specifies counterclockwise rotation and is the default value. A - sign specifies clockwise rotation. The 3.3 format is fixed. Leading or trailing zeros can be omitted in accordance with the Format Statement parameter.</p> <p>The origin of rotation is the tool position when the W code is read.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>-60°</p> <p>Clockwise</p> </div> <div style="text-align: center;"> <p>G56W-060000D10ALL*</p> </div> <div style="text-align: center;">  <p>+60°</p> <p>Counterclockwise</p> </div> <div style="text-align: center;"> <p>G56W060000D10ALL*</p> </div> </div>
<p>Dn</p>	<p>Draft code, consisting of address character D followed by two digits, that selects and controls tools, and selects dash lines and symbols.</p> <p>Pen/Shutter Codes:</p> <p>D01 Pen down/shutter open. The control lowers the pen or opens the photo-head shutter on the current and subsequent motion blocks.*</p> <p>D02 Pen up/shutter closed. The control will attempt to pick the pen up or close the photo-head shutter for the current and subsequent motion blocks.*</p> <p>D03 Photo Flash. This D Code will draw a Cross Symbol when in Pen mode.*</p> <p>Default Value = D02</p> <p>*The PEN OVERRIDE function will force the pen into the mode selected. D01-D03 are activated when the PEN OVERRIDE is in AUTO. D03 will still cause a photoflash when PEN DOWN mode is selected.</p>

(Continued on next page)

Table A-1 **MODEL 3100 PLOTTER CONTROL WORD ADDRESSES** (Cont.)

Word Address	Function
Dn (Cont.)	Pen/Aperture Select Codes:
	D10-D15 In pen mode, these codes will select corresponding pen 1-6.**
	D10-D19 In photo mode, these codes select corresponding aperture 1-10.**
	D70-D71 In photo mode, these codes select corresponding aperture 11 or 12.**
	D20-D29 In photo mode, these codes select corresponding aperture 13-22.**
	D72-D73 In photo mode, these codes select corresponding aperture 23 or 24.**
	**A pen or aperture can be selected by one of the Pen/Aperture Select Codes only. These codes can also be preceded by a G54 (tool Select) code.
	Initial Value = D10, other values generate an error.
	Symbol Set Select Codes:
	D10-D99 In photo or pen mode, and preceded by G56, G57 or G58 code, these codes select corresponding symbol from sets 10-99. Supplied set is D10. Sets 10-99 may be user defined.
	Dashed Line Select Codes:
	D04 Plot a Dashed Line. Default lengths are Dashed = 1/8 inch (3 mm) and Space = 1/8 inch (3 mm).
	D05 Turn the Dashed Line Feature Off.
	D06 Plot a Dashed Line. Default lengths are Dashed = 1/4 inch (6 mm) and space = 1/8 inch (3 mm).
	D07 Plot a Dashed Center Line. The center line = 1/8 inch (3 mm). Default length are Dashed = 1/2 inch (13 mm), space = 1/2 inch (13 mm).

(Continued on next page)

Table A-1 **MODEL 3100 PLOTTER CONTROL WORD ADDRESSES (Cont.)**

Word Address	Function
Dn (Cont.)	<p>D codes D04, D06, D07 may be user defined via the terminal or in a data stream.</p> <p>Default Value = D05</p>
Mn	<p>Miscellaneous code, consisting of address character M followed by up to five digits, depending on the Mn value of the Format Statement, that specifies program stop codes and symbol scale codes.</p> <p>Program Stop Codes:</p> <p>M00 Program Stop. The control stops after execution of this block.</p> <p>M01 Optional Stop under parameter control. When the OP parameter is set an M01 acts as an M00; otherwise it is ignored.</p> <p>M02 End of Program. The control stops after execution of this block and resets to start condition. No data to follow from input source.</p> <p>M30 Stop/Rewind. The control stops after execution of this block. If the input device is mag tape or perforated tape, the tape is rewound to the beginning. The control is reset to start condition. No data follows from the input source. For input sources other than mag tape or perforated tape, an M30 is processed as an M02 (End of Program).</p> <p>Symbol Scale Codes:</p> <p>M50 Plot the specified symbol at scale defined by the following SS parameter in the data stream or as defined in the Menu. Defaults to 10x or 10 times enlargement.</p> <p>M51 Plot the specified symbol at scale defined by the following SS parameter in the data stream or as defined in the Menu. Defaults to 25x or 25 times enlargement.</p>

(Continued on next page)

Table A-1 **MODEL 3100 PLOTTER CONTROL WORD ADDRESSES (Cont.)**

Word Address	Function
Mn (Cont.)	<p>M52 Plot the specified symbol at scale defined by the following SS parameter in the data stream or as defined in the Menu. Defaults to 50x or 50 times enlargement.</p>
	<p>M53 Plot the specified symbol at scale defined by the following SS parameter in the data stream or as defined in the Menu. Defaults to 100x or 100 times enlargement.</p>
	<p style="text-align: center;">NOTE</p> <p>All symbols are scaled by the coordinate scale factor the System Scale Factor in addition to the symbol scale. Therefore, if the Scale Factor is 0.5 and the Symbol Scale is 10, the resultant symbol size will be:</p> <p style="text-align: center;">(0.015 by 0.015) x 10 x 0.5 = 0.075 by 0.075</p> <p>Offset Codes:</p> <p>M64 Establish current plotter position as new offset, set offset, and continue plotting.</p>

A.2 RS-274-D PLOTTING FUNCTIONS

RS-274-D format provides the following observable plotting functions:

- Linear Interpolation
- Circular Interpolation
- Parabolic Interpolation
- Cubic Interpolation

A.2.1 Linear Interpolation (G01, G10, G11, G12, G60)

Linear interpolation plots a straight line from the present tool position to the X,Y,Z coordinate specified by the data block.

Data Block Format

G __ X+m.n Y+m.n Z+m.n D __ *

The preparatory code specifies linear interpolation and a scaling factor. X,Y,Z commands define the line end point.

Examples are shown in Figure A-2.

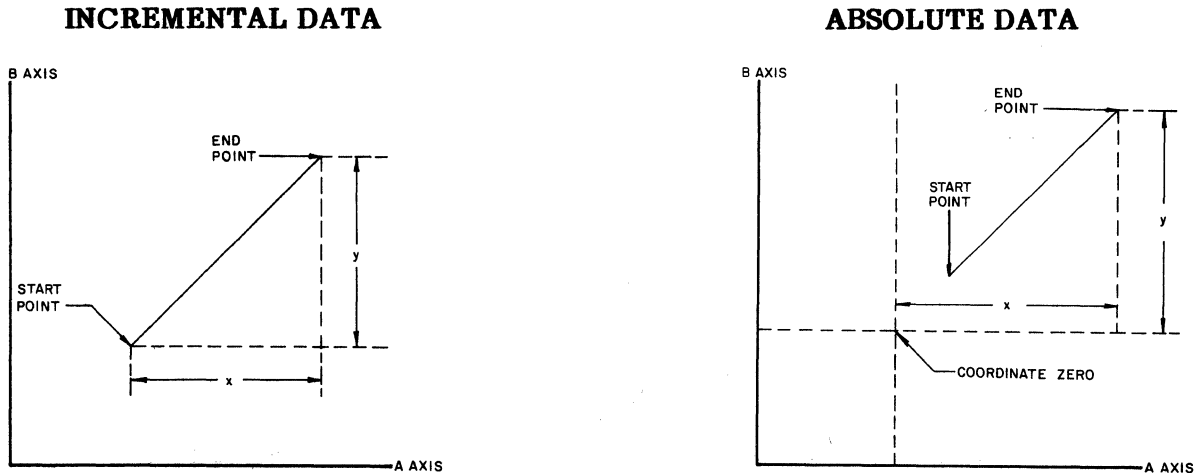


Figure A-2 **LINEAR INTERPOLATION**

A.2.2 Circular Interpolation (G02, G20, G21, G03, G30, G31, G74, G75)

G02,G20,G21,G03,G30,G31 Codes

Circular interpolation plots an arc with one data block.

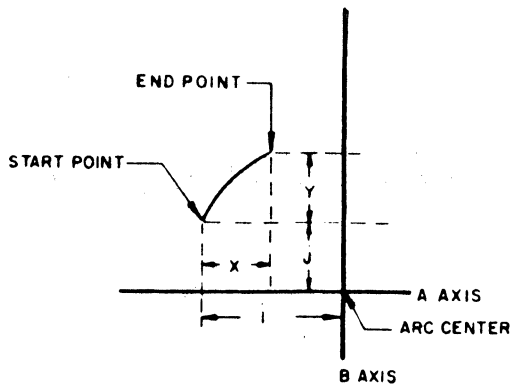
Data Block Format

G __ X+m.n Y+m.n Z+m.n Im.n Jm.n Km.n D __ *

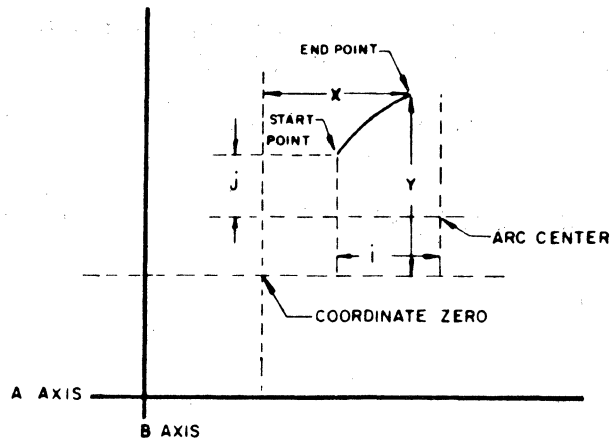
The preparatory command specifies circular interpolation and interpolation direction. X,Y,Z commands define the arc end point. I,J,K commands define the arc start point to center distance measured parallel to the X,Y,Z axes, respectively. These commands are always absolute for 90° circular interpolation, meaning no sign allowed, and in the same "m.n" format as the respective X,Y,Z commands.

Examples are shown in Figure A-3.

INCREMENTAL DATA



ABSOLUTE DATA



NOTE

Arcs are limited to the quadrant in which they begin. A data block is required for each quadrant entered. A minimum of four data blocks is required to define a circle.

Figure A-3 CIRCULAR INTERPOLATION - 90°

G74, G75 Codes

A data block containing only a G75 code specifies 360° circular interpolation which allows plotting arcs in more than one quadrant with one data block.

Data Block Format

G75 *

G __ X+m.n Y+m.n Z+m.n I+m.n J+m.n K+m.n D __ *

G74 *

The first data block turns on 360° circular interpolation. The second data block is identical to a 90° circular interpolation data block except that the I, J, K commands must be preceded by a + (default value) or a - sign.

Every data block following the G75 command is interpreted as 360° circular interpolation. That is, I, J, and K will be considered as being signed. If no - sign is present, the circle will be interpreted as though the center point is in the positive direction from the start point.

Refer to Figure A-4 for the following description.

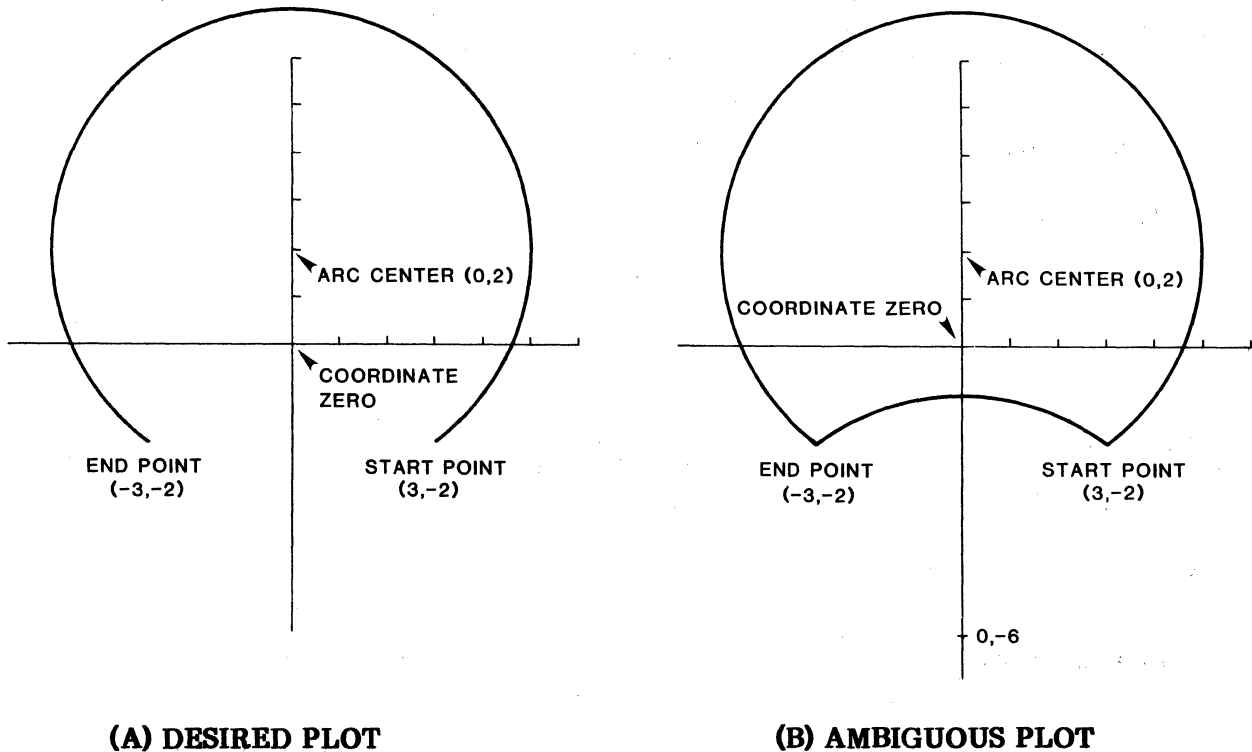


Figure A-4 CIRCULAR INTERPOLATION - 360°

With a format statement of LAX43Y43* and a present tool position of (3, -2), the following data block will plot the arc shown in Figure A-4(A).

G3X-3000Y-2000I-3000J-4000*

Signed I, J, and K commands are required. If the following data block is issued, with only the distance to the arc center for each coordinate, it is not possible to distinguish between the two arcs shown in Figure A-4(B).

G3X-3000Y-2000I-3000J-4000*

Both arcs are plotted with counterclockwise interpolation, have the same start and end coordinates, and have the same magnitudes for I and J.

The following data blocks with signed I and J commands are required to plot the smaller arcs shown in Figure A-4(B).

G3X-3000Y-2000I-3000J-4000*

The last data block turns off 360° circular interpolation. The control reverts back to G01.

A.2.3 Parabolic Interpolation (G06)

Optional parabolic interpolation plots a parabola through three points - start point, vertex and end point. The start point is the present commanded position. The vertex and end point are each specified by a data block containing X,Y,Z commands.

Data Block Format

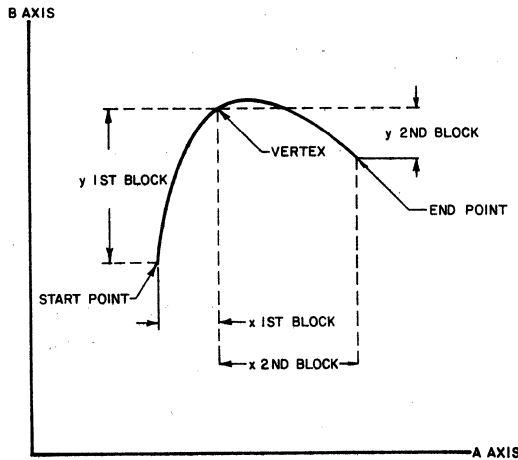
G06 X+m.n Y+m.n Z+m.n D __ * First Data Block Specifies Vertex

X+m.n Y+m.n Z+m.n * Second Data Block Specifies End Point. Note G and D codes are modal.

Preparatory code G06 specifies parabolic interpolation. The code is modal, thus the data block following the end point data block must contain other than a G06 code; otherwise it will initiate another parabola.

Examples are shown in Figure A-5.

INCREMENTAL DATA



ABSOLUTE DATA

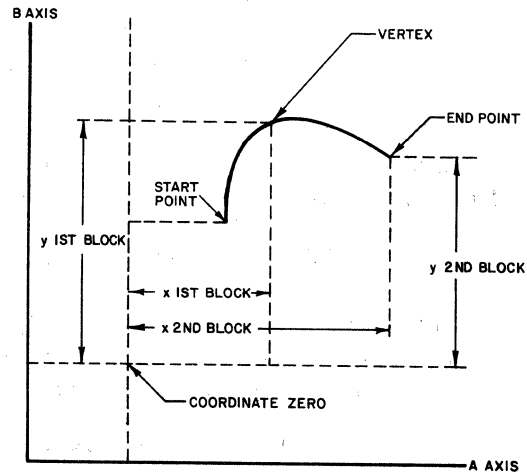


Figure A-5 PARABOLIC INTERPOLATION

A.2.4 Cubic Interpolation (G07)

Optional cubic interpolation plots a smooth curve through four or more points - start point (present tool position) and three or more additional points, each specified by a data block containing X,Y,Z coordinate commands. The method of curve fitting consists of implementing parabolic interpolation and combining common areas of two parabolas to generate a third order curve, as shown in Figure A-6.

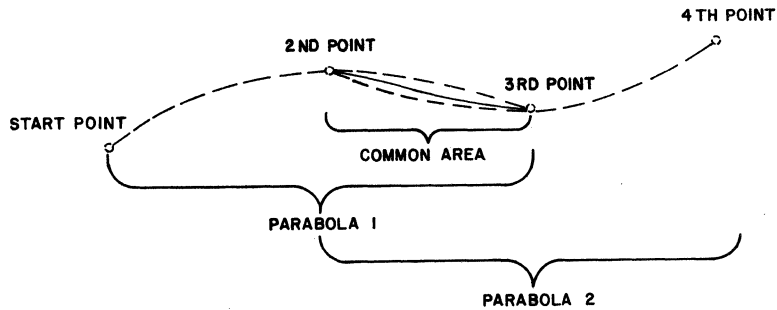


Figure A-6 BASIC CUBIC INTERPOLATION

If a fifth point (data block) is specified, another parabola is calculated between points 3,4 and 5 and another common area is available between points 3 and 4. The procedure continues until the G code changes.

Data Block Format

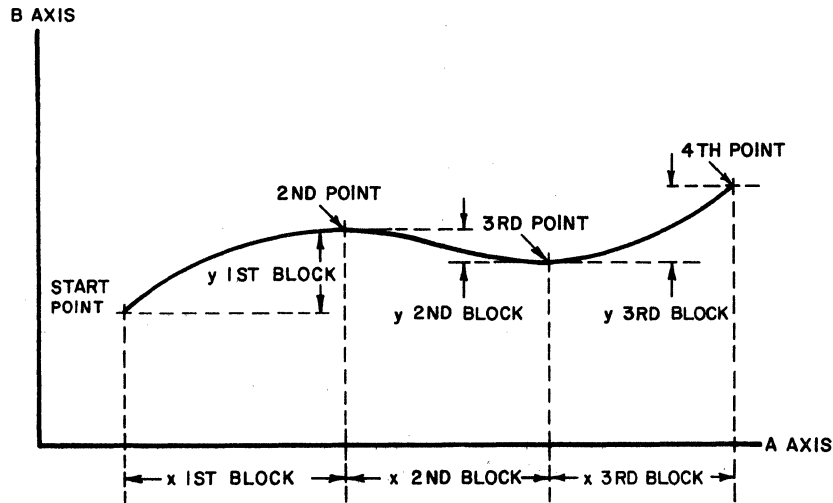
G07	X _{+m.n}	Y _{+m.n}	Z _{+m.n}	D __	*	First Data Block specifies 2nd point.
	X _{+m.n}	Y _{+m.n}	Z _{+m.n}		*	Second through Nth blocks specify 3rd through Nth points. Note G and D code are modal.

Preparatory code G07 specifies cubic interpolation. The code is modal, thus the data block following the last point data block must contain other than a G07 code; otherwise it will be interpreted as a new second point on a new curve with the end point of the last curve being the start point of the new curve.

X,Y,Z commands define the 2nd through Nth point.

Examples are shown in Figure A-7.

INCREMENTAL DATA



ABSOLUTE DATA

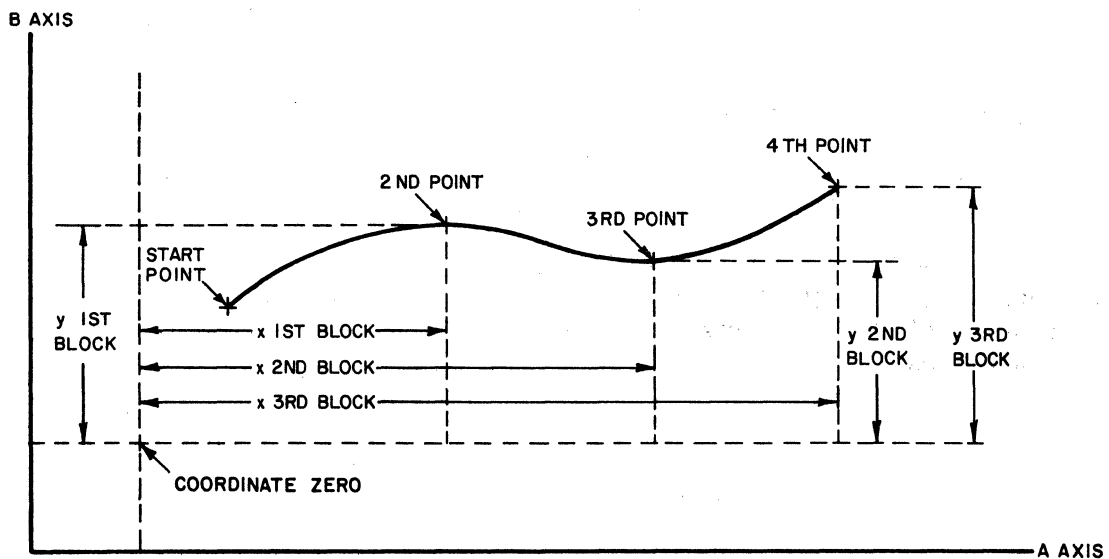


Figure A-7 DETAILED CUBIC INTERPOLATION

A.3 SERIES 500 FORMAT

Series 500 Format is generally used to interface the control to an IBM computer.

The format provides linear interpolation, tool and aperture selection and control, and dash line generation.

Data is packed into records consisting of three 16-bit words. Each record contains X, Y, and M words. Coordinate data is incremental only. Sign is specified by the M word.

X, Y Axis Data (Coordinate Words)

The first two words of each record are axis data words. The first word is the magnitude of X-axis movement; the second word is the magnitude of Y-axis movement.

The value of the least significant bit (LSB) of each word equals the resolution of the plotter to which the control is interfaced.

Examples: Resolution of a GSI Model 42 Plotter is 0.0005 inch. Each binary bit of the coordinate word, therefore, represents 0.0005 inch of travel, allowing a maximum axial coordinate command of 32.767 inches per word ($2^{16} - 1$) x (0.0005 inch).

Resolution on a Model 32 Photoplotter is 0.0001 inch. The least significant bit is, therefore, equal to 0.0001 inch of travel, allowing a maximum axial coordinate command of 6.5535 inches per word ($2^{16} - 1$) x (0.0001 inch).

Miscellaneous Control Functions (M word)

The third word of the record is the Miscellaneous Control Function Word (M word). It provides bit configurations for all functions that can be executed by the control. Bit designation is provided in the following table. Bit 0 is the LSB.

M-Word bit configuration is shown in Figure A-8. Table A-2 lists bit functions.

If a bit does not apply it should be zero.

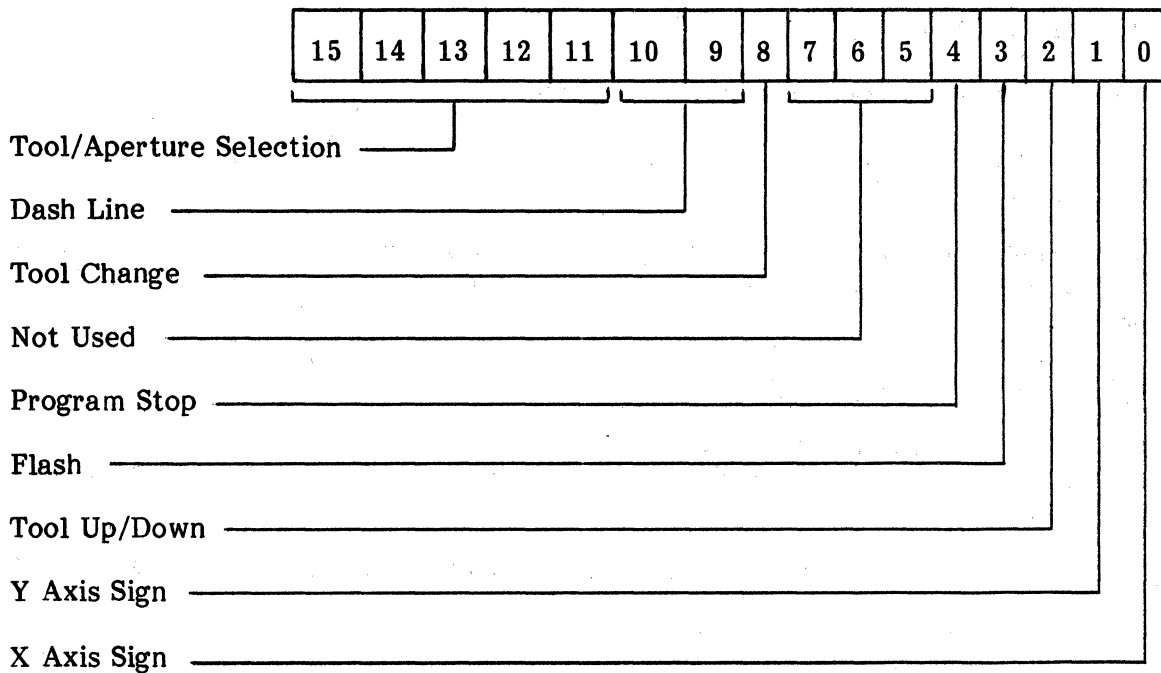


Figure A-8 SERIES 500 FORMAT M WORD BIT CONFIGURATION

Table A-2 SERIES 500 FORMAT M WORD FUNCTIONS

Bit	Function					
15-11	Tool/Aperture Select Code					
	BITS				TOOL/APERTURE NUMBER	
	15	14	13	12	11=0	11=1
	0	0	0	0	1	13
	0	0	0	1	2	14
	0	0	1	0	3	15
	0	0	1	1	4	16
	0	1	0	0	5	17
	0	1	0	1	6	18
	0	1	1	0	7	19
	0	1	1	1	8	20
	1	0	0	0	9	21
	1	0	0	1	10	22
	1	0	1	0	11	23
	1	0	1	1	12	24

(Continued on next page)

Table A-2 SERIES 500 FORMAT M WORD FUNCTIONS
(Continued)

10-9	Dash Line				MEANING
	BITS				
	10	9	3	2	
	X*	X	0	0	Tool up (dash line off)
	X	X	0	1	Tool down (dash line off)
	X	X	1	0	Photo Flash
	0	0	1	1	Dash line type 1 on
	0	1	1	1	Dash line type 2 on
	1	0	1	1	Dash line type 3 (center line) on
	1	1	1	1	Dash line off
8	Tool Change 0 = No new tool 1 = New tool select				
7-5	Not Used. Must be set to zero.				
4	Program Stop 0 = No Stop 1 = Stop				
3	Flash 0 = No Flash 1 = Flash				
2	Tool Up/Down 0 = Raise Tool 1 = Lower Tool				
1	Y Axis Sign 0 = + 1 = -				
0	X Axis Sign 0 = + 1 = -				

X* - This is a "do not care" function, meaning it can be 1 or 0.

A.4 EXTENDED BINARY FORMAT

Extended Binary Format is used to interface a 3100 control to a host computer by way of a 16-bit parallel interface. The format provides linear interpolation, tool and aperture selection and control, and dash line generation.

Data is packed into data blocks consisting of three through six 16-bit words. A data block is a group of words which constitute a data command. The length of the block is determined by the type of data it contains. All blocks contain M, X, and Y words. This M Word is not to be confused with the word address format M code.

Words are transferred in the following order:

M1 Word
M2 Word*
X Coordinate Word
X Coordinate Word*
Y Coordinate Word
Y Coordinate Word*

*Depends on M1 Word

A.4.1 M Word Formats

The M Word is always the first data in the block. A second M Word follows the first if bit 15 of the first word equals 1.

The M Words describe the type of data within the block as well as aperture selection, dash line generation, length of dimensional data (X,Y), and whether dimensional data is absolute or incremental.

M1 Word

The M1 Word contains the following information:

1. Number of M Words in the block
2. Length (number of bits) of the dimensional data
3. Dash line type
4. Tool or aperture selection

The M1 Word bit configuration is shown in Figure A-9. Table A-3 lists bit functions.

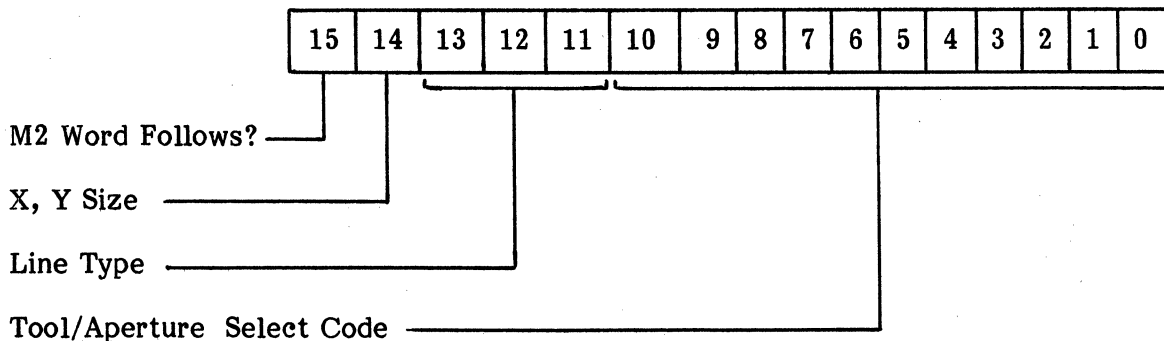


Figure A-9 EXTENDED BINARY FORMAT M1 WORD BIT CONFIGURATION

Table A-3 EXTENDED BINARY FORMAT M1 WORD FUNCTIONS

Bit	Function																																								
15	Number of M Words in Block 0 = No M2 Word following. 1 = M2 Word follows M1 Word.																																								
14	X,Y Word Size 0 = X and Y are 16-bit signed integers. (Negative numbers are two's complement) 1 = X and Y are 32-bit signed integers. (Two 16-bit words) (Negative numbers are two's complement)																																								
13-11	Line Type <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="3" style="text-align: center;">BIT</th> <th style="text-align: left;">EXPLANATION</th> </tr> <tr> <th style="text-align: center;"><u>13</u></th> <th style="text-align: center;"><u>12</u></th> <th style="text-align: center;"><u>11</u></th> <th></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>Rapid Traverse</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>Line Draw</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>Photo Flash</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>Line Draw Type 2 (used with special photoheads)</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>Not Used</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>Dash Line Type 1 RS 274-D defaults</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>Dash Line Type 2</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>Dash Line Type 3 (centerline)</td> </tr> </tbody> </table>	BIT			EXPLANATION	<u>13</u>	<u>12</u>	<u>11</u>		0	0	0	Rapid Traverse	0	0	1	Line Draw	0	1	0	Photo Flash	0	1	1	Line Draw Type 2 (used with special photoheads)	1	0	0	Not Used	1	0	1	Dash Line Type 1 RS 274-D defaults	1	1	0	Dash Line Type 2	1	1	1	Dash Line Type 3 (centerline)
BIT			EXPLANATION																																						
<u>13</u>	<u>12</u>	<u>11</u>																																							
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1	1	0	Dash Line Type 2																																						
1	1	1	Dash Line Type 3 (centerline)																																						
10-0	Tool Select Code These bits represent the binary encoded tool or aperture number. The tool or aperture selected depends on the position of the plotter pen/photo switch. In pen mode pens are selected. In photo mode apertures are selected. A flash command in pen mode draws an X at the center of the flash.																																								

M2 Word

The M2 Word contains the following information:

1. Type of data - absolute or incremental
2. Wait for operator intervention
3. Begin job and end job commands

The M2 Word bit configuration is shown in Figure A-10. Table A-4 lists bit functions.

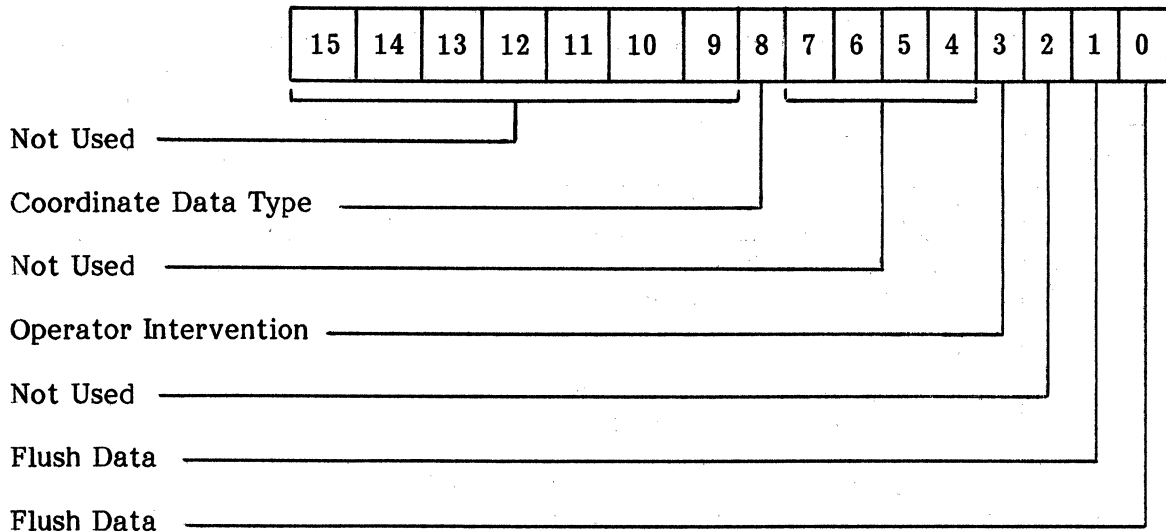


Figure A-10 EXTENDED BINARY FORMAT M2 WORD BIT CONFIGURATION

NOTE: Several bits are reserved for future expansion of the control capabilities. These reserved bits should always be set to zero.

Table A-4 EXTENDED BINARY FORMAT M2 WORD FUNCTIONS

Bit	Function
15-9	Not Used. Must be set to zero.
8	Coordinate Data Type 0 = X, Y data is incremental. 1 = X, Y data is absolute.
7-4	Not Used. Must be set to zero.
3	Operator Intervention 0 = Continue. 1 = Stop and wait for operator intervention. (M00)
2	Not Used. Must be set to zero.
1	Flush data. 0 = Continue 1 = End of job (M02)
0	Flush data. 0 = Continue 1 = Begin new job (M64)

NOTE: If a bit does not apply it should be zero. Inclusion of a bit in the data format does not imply that capability for any particular plotting system. Capabilities of any given system are defined in the system specification.

A.4.2 X, Y Data Formats

The X and Y data follows the M data in every data block record. X and Y are 32-bit or 16-bit integers depending on bit 14 of M1 word. Negative numbers are represented by two's complement binary integers. X and Y represent absolute or incremental position depending on bit 8 of M2 word.

The value of the least significant bit equals the resolution of the plotter to which the control is interfaced. Refer to Paragraph 3.1.

**APPENDIX B
PROGRAMMING EXAMPLE**

This appendix provides an example of input data and the resulting drawing.

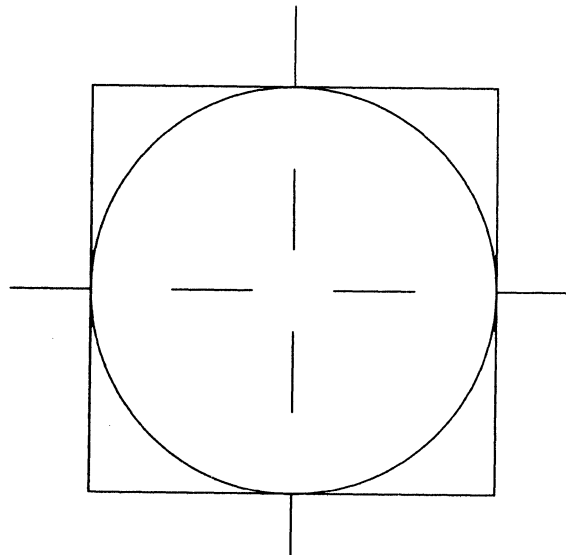
The example illustrates programming of linear and circular interpolation, dash line, and text generation.

DATA BLOCK CONTENTS

COMMENTS

X025Y-025J025*	Draw second quadrant of circle. I = 0 for same reason as above.
X-025Y-025I025* X-025Y025J025*	Draw third and fourth quadrants.
G01X-01Y00D02*	Move pen to horizontal dash line start point with pen up.
X07Y00D04*	Draw dash line type 1.
X-035Y035D02*	Move pen to vertical dash line start point with pen up.
X00Y-07D04*	Draw dash line type 1.
X-025Y-01D02*	Move pen to text origin with pen up.
G56M50D10 3100 SAMPLE PLOT*	Draw 3100 SAMPLE PLOT with 0.15 x 0.15 inch characters.
G01X01Y00D02M02*	Move pen off drawing with pen up and end program.

RESULTING PLOT



3100 SAMPLE PLOT

GLOSSARY

- Baud** - A unit of measurement that denotes the number of discrete signal element (e.g. bits) that can be transmitted per second. For example, a device transmitting 250 bits per second is also said to be transmitting at 250 baud.
- Buffer** - An storage area which temporarily holds data being transferred from one device to another.
- Control - (or Controller)** - A device that controls the operation of another device or system.
- Data Block** - A block containing information about a file stored in the computer.
- Delimiter** - A special character designating the end of a field, record or string.
A special character (e.g. #, *) used to separate items, that is, strings of data.
- Edit** - To make changes, additions or deletions in a file.
- End of Block Character** - see Delimiter
- File** - A collection of related records dealt with as a unit.
- Flag** - A variable used in a program to indicate whether a condition has or has not occurred.
- Initialization** - The process of setting variables in a program to their starting value.
- Menu** - A displayed list of the various functions an operator can select to perform on a terminal.
- Parameter** - A variable or constant that is transferred to and from a subroutine (or subprogram) and a main program.
- Software** - Programs and routines that control the operations of a computer in solving problems.
- Stop Bits** - A bit that signals the end of the data being transmitted.
- Utility Program** - A program that performs a task needed by many programs common to one system.

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