

# **SIGNMAKER IVB USER'S MANUAL**

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Scientific Products

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**Document No. P25883A  
Revision B**



# DOCUMENT HISTORY

**DOCUMENT NAME:** SIGNMAKER IVB USER'S MANUAL

**DOCUMENT NUMBER:** P25883A

**FIRST PRINTING DATE:** December 1983

CHANGE NUMBER	CHANGE DATE	CHANGE DESCRIPTION	PRINTING DATE
1	10/15/86	Comprehensive stylistic editing; changed format.	OCT 86
2	06/15/87	Added MODE keycap label.	JUN 87
3	01/01/88	Added Dual Channel Pounce Wheel.	JAN 88

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**Figure 1**



## I. INTRODUCTION

Welcome to the world of advanced automatic text generation! The original Gerber Signmaker III, first introduced in 1982, brought microprocessor technology to the art of graphic layout and production. Its many features made it an instant success in the industry. The Signmaker IVB retains all Signmaker III capabilities and expands on them with the addition of new features to simplify use and increase the variety of graphic effects which can be created. The most important of these features is AUTO-KERN, a proprietary computer algorithm which automatically computes aesthetic spacing for every letter pair. This feature not only kerns all special letter pairs such as AV and LT, but it also calculates and applies a special correction for all open letter pairs such as AA and TT. The manual KERN EDIT feature used on Signmaker III is still present in a slightly modified form to allow the operator to selectively override the AUTO-KERN calculated spacing to produce special effects.

The Signmaker System includes an ARC/ROTATE feature for creating arched text at an operator-specified radius and for rotating straight line text to any angle. The Multiline feature allows you to input a complete layout (up to 99 lines) before drawing, pouncing, or cutting. The SCALE FACTOR function provides for the production of reduced size verification copies of large Multiline graphics. The AUTO NUMBER feature produces series of numbers for applications such as directories or room numbers. Finally, the HALF FONT feature lets you create letters and numbers from any standard font in a top and bottom half, thus expanding the range of LETTER HEIGHT values to a maximum of 26 inches on the standard 15-inch plotter. Best of all, these new features are all available as a retrofit package to present Signmaker III owners.

The GSP Signmaker System combines a precision electromechanical drawing device with state-of-the-art microprocessor control technology to yield a brand new system for drawing, pouncing, and cutting a broad range of graphics. Up to nine fonts (twenty-one with the optional font extender) can be installed in the system at one time, and unlike fixed die-cutting systems, each font can be manipulated by the computer to produce a wide variety of effects including:

- ... Any size from 1/2 to 13 inches, or to up 26 inches with the HALF FONT feature.
- ... Any slant from -45 to +45 degrees.
- ... Spacing adjustment ranging from no space between characters to ten times the normal spacing.
- ... Unlimited text compression, or expansion up to twice the normal length.
- ... Optional drawing in reverse (mirror image).
- ... Arched text to any amount of curvature up to 180 degrees of arc.
- ... Rotated text at any angle from -90 to +90 degrees.

With these capabilities, a single computer-stored font style can produce the letters or text required for any application with or without special effects.

The tools supplied with each Signmaker System include ball point pens, a pounce wheel, and knives for cutting vinyl films and other materials. Sample quantities of drawing/pouncing paper and adhesive vinyls are packed with each system.

Please read this manual carefully before proceeding with assembly and operation. Section II gives detailed instructions on unpacking and installing the system. Follow these directions carefully to minimize any chance of damage to the system. System operation is described in Section III, and in Section IV where you will find detailed explanations of all system features, operating instructions, and exercises to give you your first experience at constructing computer generated text.

## II. UNPACKING AND INSTALLATION

### A. UNPACKING

As you unpack your Signmaker IVB, please inspect all items for damage that may have occurred during shipping. Report any damage to your dealer at once. Save all packaging materials in case you wish to transport your system at a future date or ever need to return it to the factory for repair.

The Signmaker IVB is packed in four boxes. The contents of each is listed below. If you have purchased any optional character fonts, replacement tools, or accessories, these will be packaged separately.

#### Box 1:

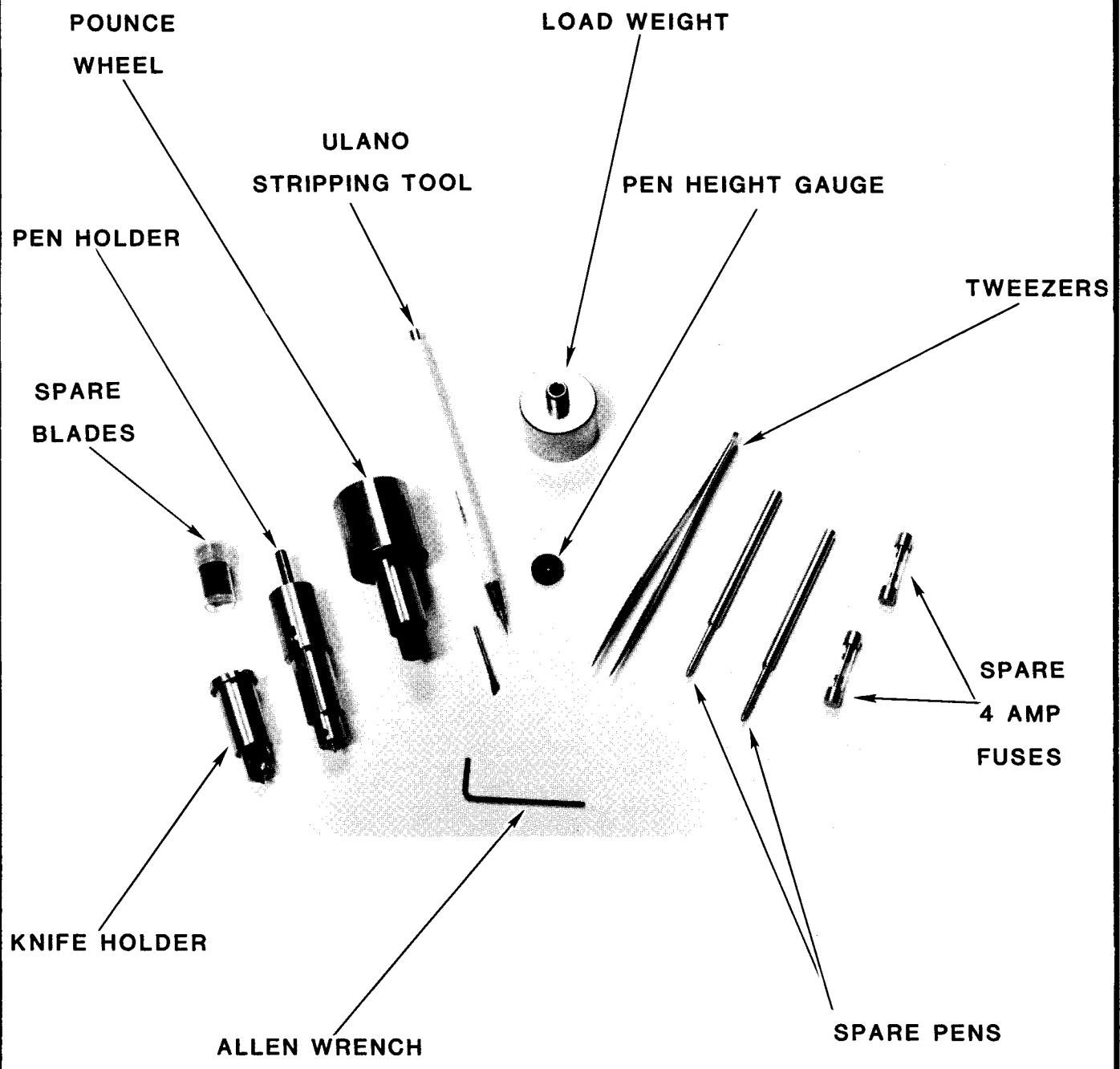
- (1) Signmaker IVB Console Assembly
- (1) User's Manual
- (1) Dust Cover

#### Box 2:

- |   |                |
|---|----------------|
| (1) Plotter Assembly                                    | (1) Tool Rack  |
| (2) Slotted Pan Head Screws<br>(for mounting Tool Rack) | (1) Dust Cover |

- (1) Accessory Kit (see Figure 2) which includes:

- |                         |                                       |
|-------------------------|---------------------------------------|
| (1) #1 Weight           | (1) Pair Tweezers                     |
| (1) #2 Weight           | (1) Ulano <sup>R</sup> Stripping Tool |
| (1) #3 Weight           | (1) Spare Red Pen                     |
| (2) #4 Weights          | (1) Spare Blue Pen                    |
| (1) #5 Weight           | (1) Capsule Containing                |
| (1) Pen Holder          | (2) Spare Knife Blades                |
| (1) Knife Blade Holder  | (1) Spare Pounce Wheel                |
| (1) Pounce Wheel Holder | Space for (2) Spare Fuses             |
| (1) Pen Height Gauge    | (taped to power cord)                 |
| (1) .050" Allen Wrench  | (1) Vinyl Letter Squeegee             |



**Figure 2**

Box 3:

10 yds High Performance Black Vinyl

Box 4:

10 yds 20 Pound Paper for Drawing and Pouncing

**B. CONSOLE INSTALLATION**

Remove the protective poly bag from the console and place the console assembly on your work table. The unit should be oriented with the keyboard facing the operator.

*CAUTION: Do not plug the unit into any power outlet at this time.*

Never make any electrical connections with the console power turned on. To prevent damage to your system, all electrical connections *must* be made with the power cord disconnected from the wall outlet.

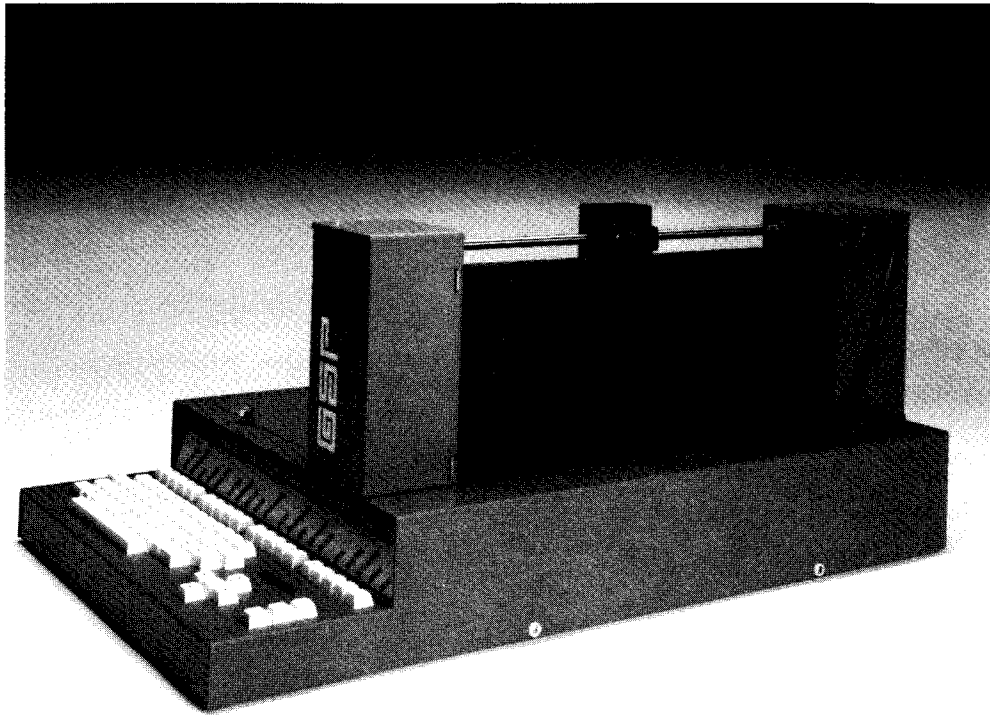
### C. PLOTTER INSTALLATION

Carefully lift the plotter from its shipping carton and remove the protective poly bag. Remove all protective shipping materials from the plotter cable. Notice that the plotter cable is connected to the bottom surface of the plotter. Never set the plotter down on top of the cable. Either place the plotter at the edge of a table so the cable hangs down freely, or rest the plotter on its side as seen in Figure 3.

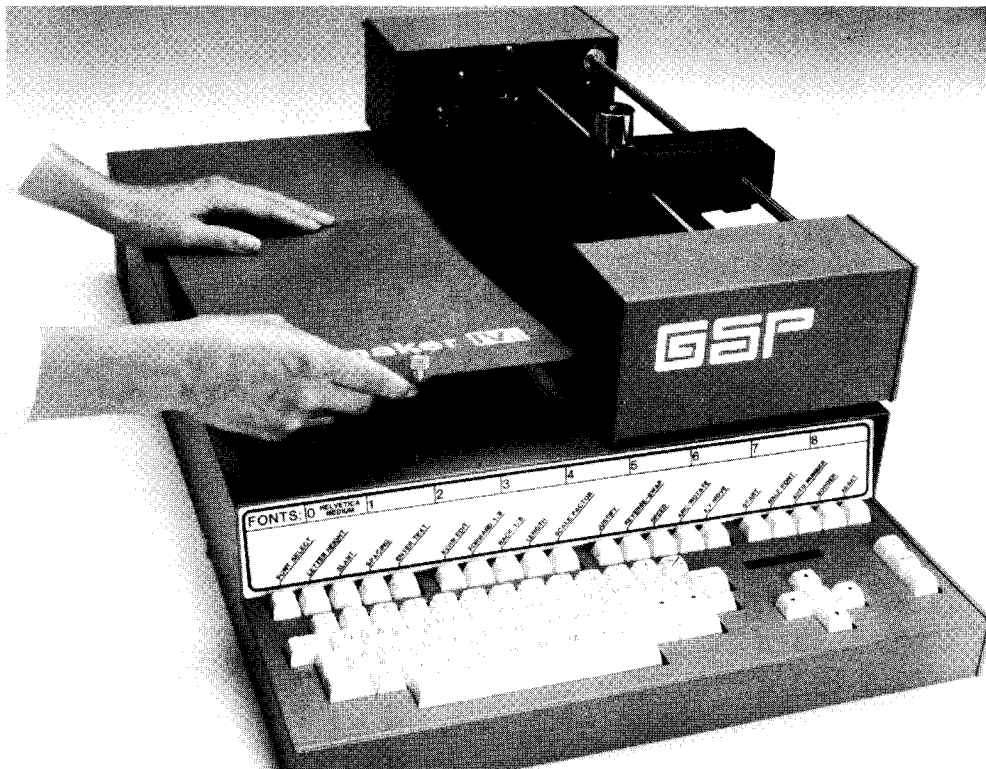
Place the plotter on its side on top of the system console as shown in Figure 3. Make sure the plotter is not resting on the console access hatch cover. Remove the console access hatch cover. This cover is labeled with the Signmaker IVB logo and is located on the top left hand side of the console (see Figure 4). To remove, loosen the single thumbscrew knob and lift the front of the cover about half an inch. Slide the cover toward the front of the unit and set it aside.

Look into the console access hatch. The large printed circuit board is the main control board. Be careful not to drop anything down onto this board. The best way to keep things out of the console is always to replace the cover after installing equipment or fonts.

Static electricity is a serious threat to modern integrated circuits. We have all experienced the static shock of touching a metal object after shuffling across a carpet in dry weather. These static charges can reach thousands of volts! Today's electronic technicians wear grounded wrist straps when building, testing or repairing equipment like the Signmaker Systems. Before touching any part of the Signmaker System, it is vitally important to ground yourself by touching any bare metal of the chassis. This will discharge any potentially harmful static charges you may be carrying. The bare metal adjacent to the Main Power Switch at the rear of the console is an excellent grounding point, as are the two screw heads on either side of the console. Start now and get in the habit of *always* touching one of these points before touching any Signmaker internal component.



**Figure 3**



**Figure 4**

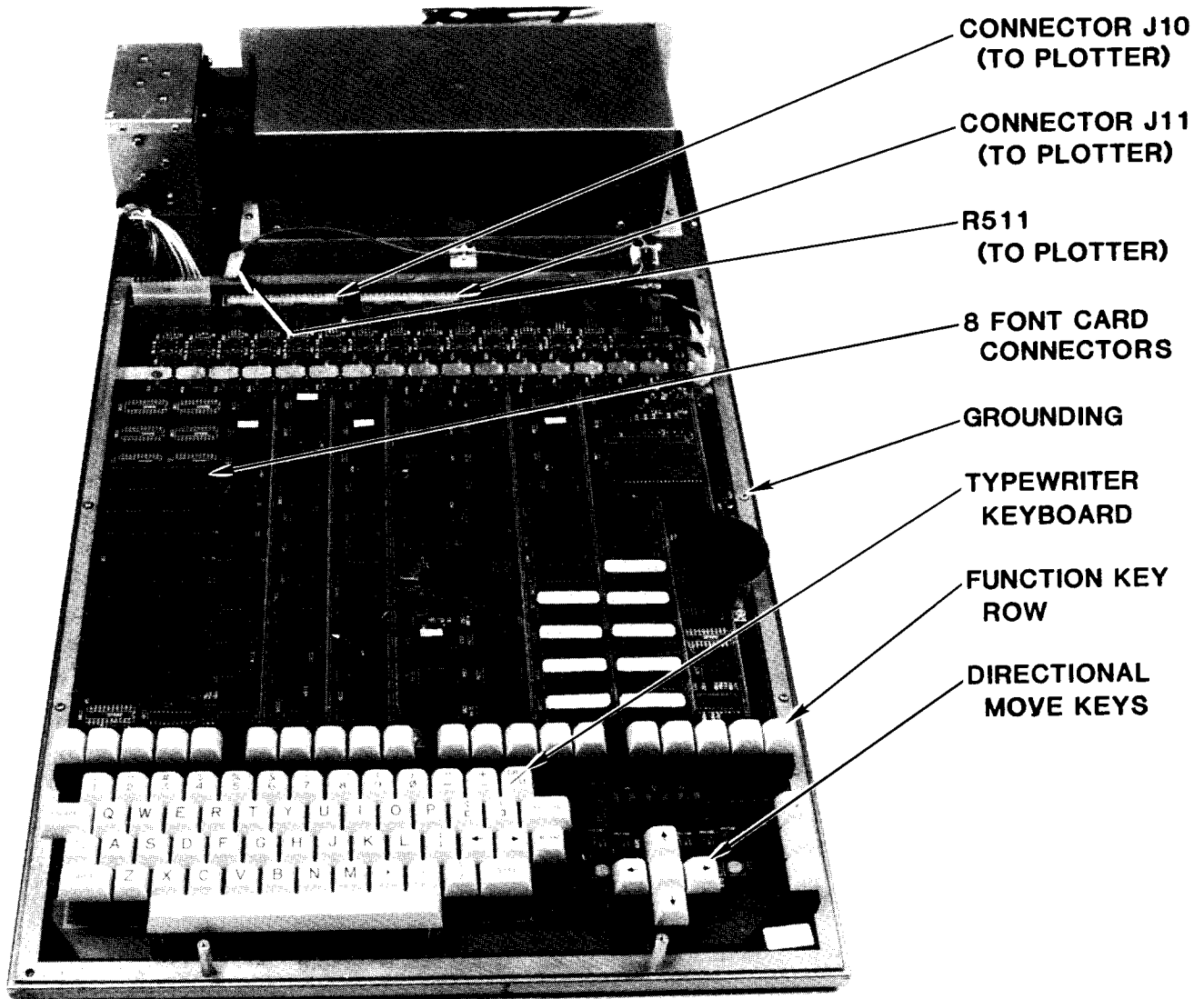
To remove the small cable slot cover located near the right rear corner of the console cover, remove the two screws which hold it in place. Slide the cable slot cover about one inch toward the back of the console, then lift to remove it. After installing the plotter, you will *not* reinstall the cable slot cover. The cable slot cover and screws should be saved with the original packaging material in case you ever decide in the future to install a different plotter with your system.

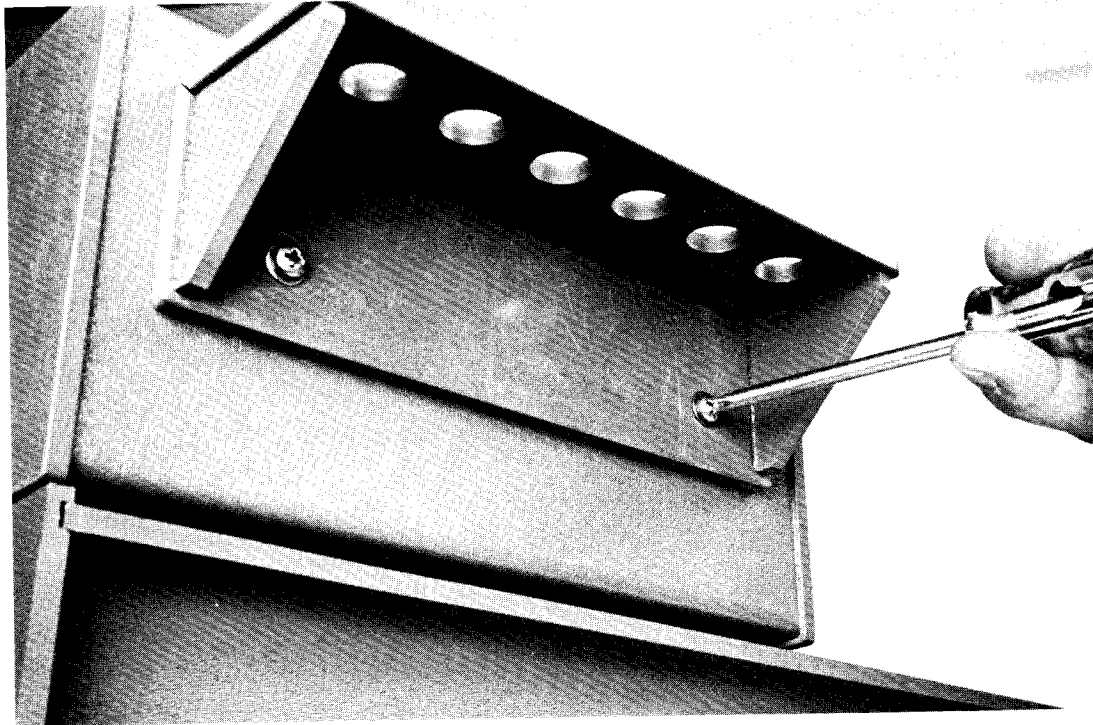
Carefully feed the plotter cable into the console cover cable slot and through the cable trough on the underside of the console cover. Feed the cable forward until its end extends out through the end of the cable trough above the circuit board. Reach into the console through the access hatch and carefully pull the cable into the console. Do *NOT* pull the connectors or the individual wires at the end of the cable. Pull only on the black cable jacket. When no slack remains in the cable outside the console, place the plotter upright on top of the console. Locate the plotter against the right edge of the console cover, as shown in Figure 1, so that the plotter covers the cable slot. Grip the plotter cable from inside the console and carefully pull the cable until no slack remains.

Be sure to ground yourself before reaching into the access hatch of the console to connect the plotter cable. At the end of the cable are three connectors. The smallest is the ground connector labeled P511 which should be installed *first*. Insert it into receptacle R511 located on the single wire near the rear of the circuit board as seen in Figure 5. The other two connectors are labeled J10 and J11. Each has a label which reads **THIS SIDE TOWARD KEYBOARD**. Keeping both connectors oriented with the labels forward, position them near the headers on the rear of the main control board. Insert connector J10 into header J10 and connector J11 into header J11. Be sure to insert the connectors straight down over the pins and make sure the labels **THIS SIDE TOWARD KEYBOARD** face forward.

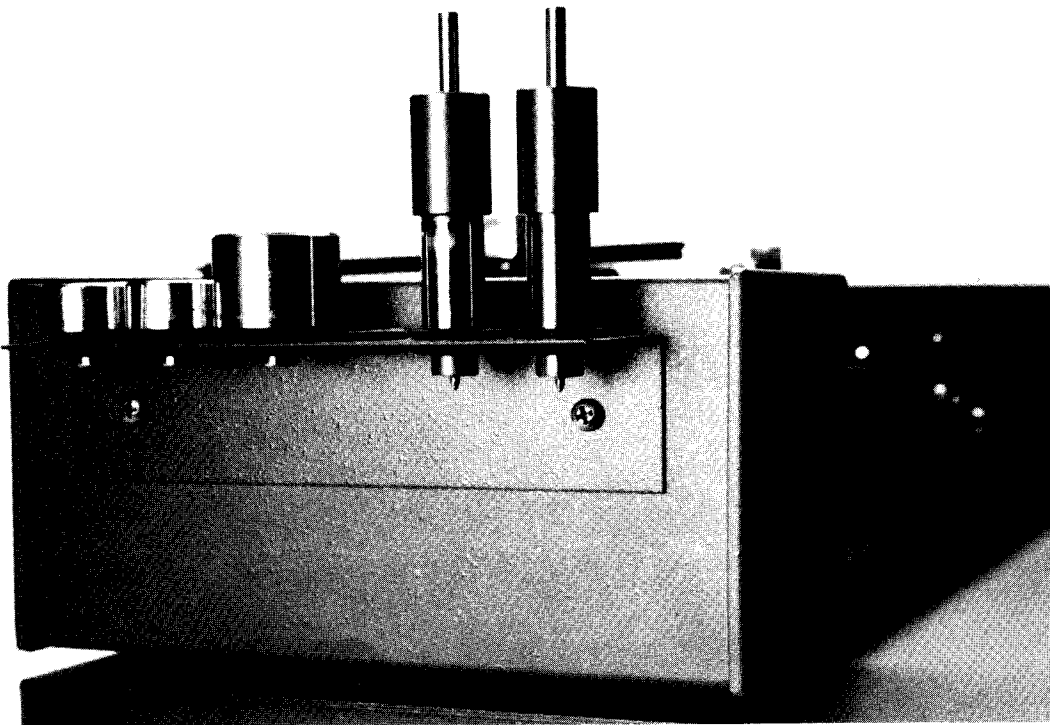
The plotter tool rack provides convenient storage and access to the plotter's pen, knife, pounce wheel, and weights. Mount the tool rack on the back of the plotter. You will find screws in the two mounting holes intended for mounting the tool rack. Install the two slotted pan head screws through the holes in the tool rack into the holes in the plotter cover to hold the tool rack securely in place. The proper installation of the tool rack is shown in Figures 6 and 7.







**Figure 6**



**Figure 7**

#### D. FONT CARD INSTALLATION

The Signmaker IVB System has a standard character font built right in which is Helvetica Medium, Auto-Kern. The Auto-Kern notation indicates that the system will automatically calculate a spacing correction for each character pair. Additional fonts may be purchased and added to your system in the form of individual font cards. The Auto-Kern feature operates on all fonts designated by the words AUTO-KERN or by a small circular label marked AK on the font label. Font cards purchased for the Signmaker IV System prior to June 1984 will work in the Signmaker IVB, but the system will not make automatic spacing adjustments unless the Auto-Kern designation is present on the font.

If you have purchased additional fonts for your system, this is the best time to install them. Remember to ground yourself before handling the font cards. Also remember that the console power *must* be turned off before you insert or remove font cards. Failure to turn off the power will result in irreparable damage to the font card and possibly to the console.

All font cards are packaged in special protective antistatic foam inside individual boxes. The box and foam should be saved for storage of your font cards when they are not installed inside the system console. It is important not to touch the gold edge connectors at the bottom edge of the board, as seen in Figure 8. Handle font cards only by the gray plastic handle on the top of the board or by the side edges.

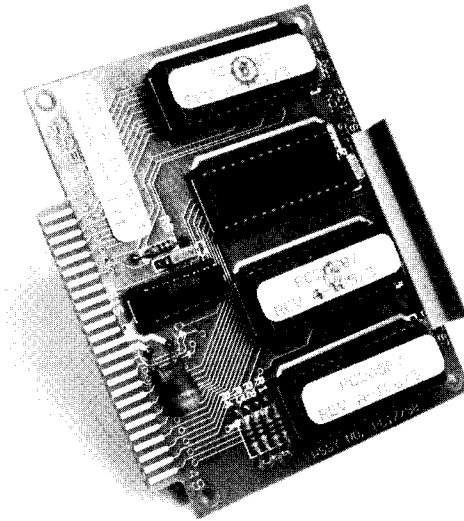
While the console access hatch is still open, look inside the console at the main control board, as seen in Figure 5. Notice the row of eight parallel black connectors along the front left side of the board. These are font card connectors, called font slots, labeled from 1 to 8. This numerical designation refers to the position recognized by the computer for each font card. It is not necessary to install font cards in any particular order, but it is good practice to fill the row of font slots in order, starting with the lowest numbers at the front of the board. This increases their immunity to stray electrical noise. When you use the system, you will direct the computer to select each font by specifying its connector location, or font slot number (1-8). The adhesive-backed label supplied with each font card should be applied to the top of the Function Key Overlay next to the number corresponding to

the font slot where the font card is installed. These labels provide a convenient reference to remind you which font is in which slot when the access hatch cover is reinstalled.

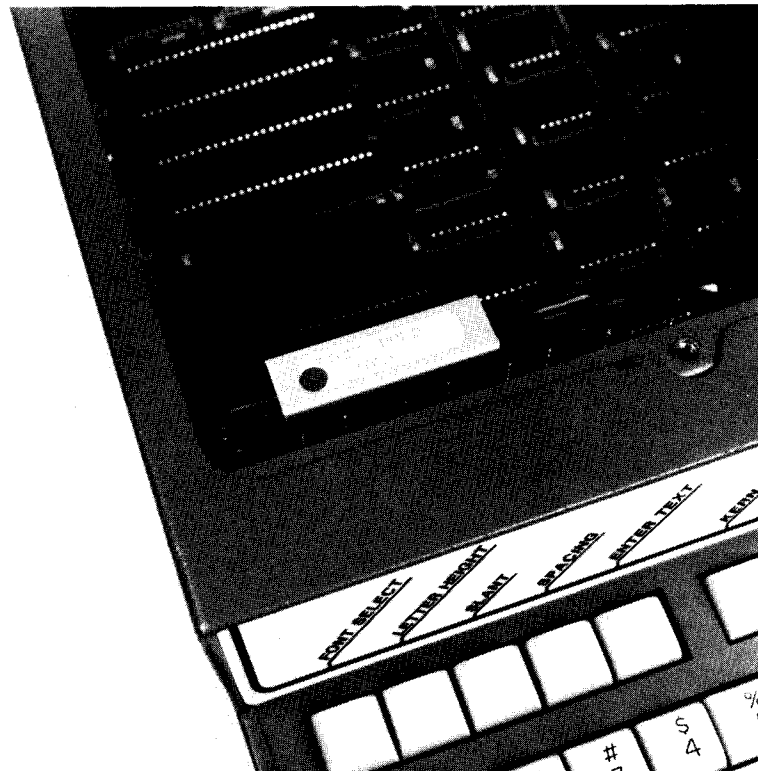
The standard character font built into your Signmaker System, Helvetica Medium AK, is located at font address 0. There is no font slot for Font 0 since it is part of the system's program. With the addition of eight fonts, installed in the eight font slots, a total of nine different fonts may be selected for use. More fonts can be used by removing font cards and installing different fonts in their place. If you change font cards inside the console, remember to change the labels on the Function Key Overlay. An optional Font Extender Box is also available from your dealer. The Font Extender expands the system's font capacity to twenty-one.

Before installing font cards, remember to turn off the console power and ground yourself. Remove the first font card from its box and unwrap and protective foam. Position the card over a font slot connector so that the label on the gray plastic handle faces the console keyboard and the electronic components face away from you. The cards are designed to fit into the font slots in only one way. Align the gold edge connectors with the nearest empty font slot. Press the card firmly into place until it is seated at the bottom of the connector as seen in Figure 9. The card will enter the connector with some friction, but do not force it into place. If the card refuses to enter the font slot, you may have it too far to one side or turned around facing the wrong way. Use this procedure for each font card you install.

The gold edge connectors of the font card should be clean and shiny. If they are tarnished or not shiny, clean them before installing the card in the console. To clean the edge connectors, hold the card firmly by the side edges and use a gum eraser to rub over the gold surface. Always rub the eraser along the length of the gold stripes from end to end. Do not rub very hard. Be sure to keep the eraser dust away from all of your Signmaker equipment.



**Figure 8**



**Figure 9**

When all of your font cards are in place, you are ready to reinstall the console access hatch cover. Rest the back edge of the access hatch cover on the lip of the opening in the console cover. Lower the front edge of the access hatch cover and slide it back into place over the access hatch opening. When the access hatch cover is seated over the opening, push down on the thumbscrew knob until the screw threads engage. Turn the knob until it is "finger tight." This completes the installation of your Signmaker IVB and prepares you to proceed to System Operation.

### III. SYSTEM OPERATION

#### A. PLOTTER OPERATION

To make the best use of this manual, read it while seated at the Signmaker System console. Try each function as you read about it and practice until you have mastered it. Operation of the Signmaker System is very straightforward. Do not be intimidated by the keyboard and the array of Function Keys; you cannot hurt the machine from the keyboard. An operator error may scrap the design being cut on the plotter but will not cause any damage to the system.

For all of our training exercises, we will load paper into the plotter and draw our tests with a ball point pen. Later we will learn to cut vinyl. It is *always* best to draw a design on paper before attempting to cut vinyl. Paper proofs can be drawn at their full size or scaled down. Only when you are thoroughly familiar with the system and its operation should you try to start directly with vinyl.

Before loading material into your plotter, make sure the tool carriage is not located at either extreme end of its travel. If it is, move it gently toward the center of the travel. Handle the tool carriage with great care. Move it slowly and firmly by gripping the right end of the carriage. Do *NOT* apply pressure to the tool spindle to move the carriage.

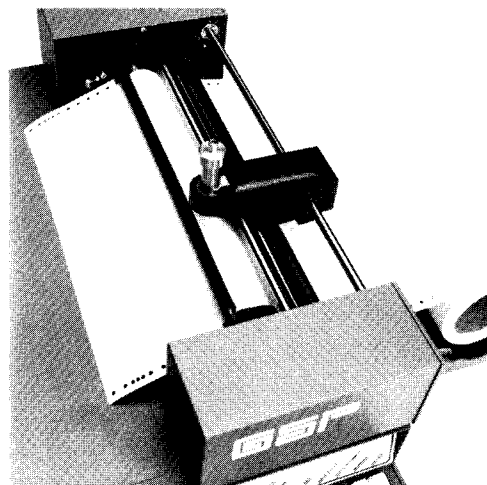
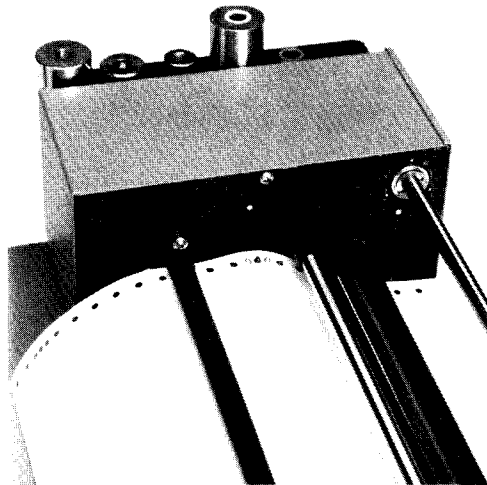
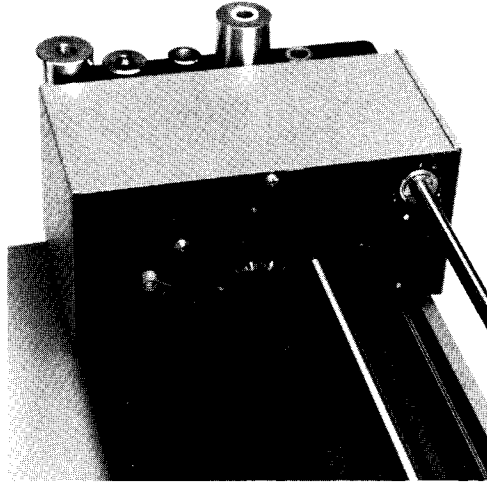
Place material for the plotter to the right side of the system console. If you have the optional roll holder, place the roll holder to the right of the system console, aligned with the plotter, and place the material on top of the roll holder. The plotter is able to pull material freely from the roll when a roll holder is used. However, if you do not have a roll holder and the material must sit directly on the table, you will have to unroll the material yourself. The Signmaker IVB plotter is not designed to pull material from a roll unless it is mounted on a roll holder. If the plotter is forced to pull material from the roll by itself, the tension may stall the plotter or tear the sprocket holes of the material.

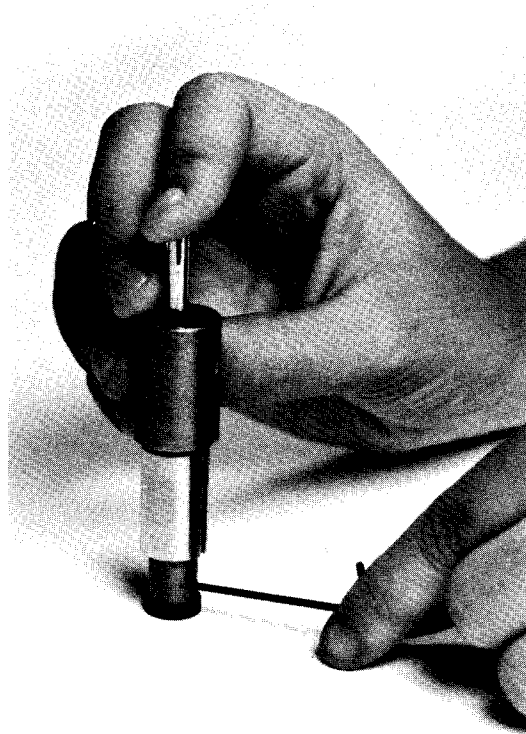
To load material, open the bail arms at either end of the drum by pulling them away from the drum. Feed the paper under the black bar and over the rubber drum. Seat the sprocket holes over the sprockets. Notice the special pattern of holes at the material edges. Be sure to align the three closely spaced holes over the closely spaced sprocket pins. This will ensure that the material is properly mounted and not skewed at one end or the other. Close the bail arms at the front end of the plotter first. The sprockets at the far end of the plotter, shown in Figure 10, can be moved slightly forward or back to allow for variations in material widths. This ensures that the sprockets match the sprocket holes exactly. Make sure the bail arms are centered over the sprockets before closing the bails. Both bails should close securely.

To install the pen, simply select the penholder from the tool rack and drop it into the tool carriage. There is a slot, or keyway, in the side of the penholder which ensures that the tool is properly oriented. If the penholder does not drop easily into the carriage, rotate the penholder until it drops in easily. The penholder is shipped with a pen installed. Additional pens are available. To replace a pen, or to install a pen of a different color, use the hex wrench supplied with the accessory kit to loosen the hex head set screw located near the pen tip. Withdraw the pen through the top of the holder. Insert a new pen tip first into the top (large end) of the holder. The pen height gauge included with the accessory kit is a washer 1/8 inch thick. Place the pen height gauge on a smooth, hard surface (such as a table top), then place the lower (smaller) end of the penholder on the gauge. Push down on the upper end of the pen until the pen point just touches the table surface. This procedure is shown in Figure 11. Do not overtighten the set screw or you will crush the pen. The pens supplied by GSP are Fisher Pressurized Ball Pens and may be purchased from GSP, your Signmaker dealer, or from many local stationery stores.

If your pen does not make a clear dark line, you may wish to add weight to the penholder. Experiment with different weight loads to achieve the most satisfactory results with your particular system, tools, and materials. After successfully loading the paper and installing the pen, you are ready to learn to operate the system.







## B. CONSOLE OPERATION

Before switching on the Signmaker System, make sure the power cord is connected to a grounded 110V, 60 Hz outlet. (On export models, the power requirement is identified next to the power switch.) Turn on the power switch located on the back panel of the console adjacent to the power cable. When you turn on the power, the system automatically performs several self-diagnostic tests, described more fully in Section VI. You will hear an audible beep upon the successful completion of each test. Next, the system tests each font installed. During these font tests, the font slot number of the font being tested will appear in the display window located above the four directional arrow keys, or slew keys, on the console. After the last font test, the display will briefly show 16 if, and only if, there is a font installed in font slot 8. After all tests have been successfully completed, the display will read GSPS. If the GSPS message does not appear within 10 or 20 seconds after turning on your system, refer to Section VI.

After the GSPS message appears, test the movement of the tool carriage and drum. To test the plotter, press the four directional arrow keys (slew keys) at the right side of the console keyboard to move the tool carriage and plotter drum, making sure they move in the directions of the keys you use. If the plotter fails to operate correctly, turn off the power to both the plotter and the console, open the hatch access cover, and check all connections made during installation.

The keyboard of your Signmaker System is arranged in three basic groups. The central group of keys looks like a standard typewriter keyboard. Some keys may be unfamiliar to you, such as ESCAPE, CR/LF, CAPS LOCK, and ACCENT. The operation of most of these keys is fully described in Section IV. The ACCENT key is only used to access special characters and accent marks in non-English languages. When you purchase fonts with special characters or symbols, a notation is included with the font to indicate which key should be pressed while holding the ACCENT key down to produce each character. For non-English languages, special accented keyboards are available which show which accented character is produced by pressing each key with the ACCENT key held down.

Two keys of special interest in the main keyboard are the left and right arrow keys. These are used to scroll the text display back and forth in the display window. These two keys do not operate the plotter in any way.

To the right of the main keyboard is a group of five keys, four of which also have arrows on them. These are the directional arrow keys, or slew keys. These keys control the plotter by moving either the tool carriage or the plotter drum. They do not affect the text displayed in the console display window. In the center of this group is a key which has no function at this time.

The remaining keys are arranged in a row along the top of the console and in a small group of keys near the righthand edge of the console. These are all Function Keys. These keys control all of the graphic capabilities of the Signmaker System. The labels for the top row of Function Keys are on the Function Key Overlay. All Function Keys have an initial value which is preset by the system when you turn on the power. The initial value of each Function Key will appear in the display window when you press the key. The User's Reference Card at the back of this manual lists each Function Key and its initial value. For example, the initial setting of FONT SELECT is 0 for Font 0, which is Helvetica Medium, AK. Helvetica Medium, Auto-kern, is the font built into every Signmaker System.

The Auto-Kern feature is a special passive feature which operates without the use of any Function Key or operator interaction. This is the most important advancement offered by the Signmaker IV System. The Auto-Kern feature automatically provides correctly spaced lettering by calculating a spacing adjustment between every pair of characters you enter. The system microprocessor uses data contained in each character of the font itself to perform two calculations for spacing correction. One calculation kerns characters where necessary to reduce the distance between letter pairs such as AV and LT. The other calculation adjusts the spacing of "open" pairs such as AA and TT. However, the Signmaker Auto-Kern feature is not limited to only a few obvious cases but is applied to *every* combination of upper or lowercase letters. Some examples of words executed with and without the Auto-Kern feature are shown in Figure 12. To allow you the fullest range of flexibility, however, a KERN EDIT capability and a SPACING function are provided in the Signmaker System. These features, described in Section IV, allow the operator to

override the spacing calculated by the system, either for individual character pairs or for entire lines of text, to achieve any spacing effects you desire.

Let us draw a simple message leaving all of the functions at their initial settings. The FONT SELECT setting, as mentioned before, is 0 for HELVETICA Medium. The LETTER HEIGHT value is 1 for 1 inch. SLANT and SPACING are both set at 0, which means there is no adjustment being added. The JUSTIFY setting is NONE which means that the tool will start at the left end of the message and stop at the right end, which would result in unjustified text if you were drawing a multiple line message. The REVERSE/SWAP function is set to NORMAL, as opposed to mirror image text. The SPEED setting is 100 for 100% of the normal operating speed. When you press the LINE # key, the display will show 00/00 for Line 0. This is the single line mode, as opposed to Multiline. For those experienced with the Signmaker III System, the single line mode resembles the operation of the Signmaker III. We will work in single line for all of our initial training.

To draw a simple message with all of these initial parameter settings, press the Function Key labeled ENTER TEXT. Enter any message using the standard keyboard keys. Notice that the message scrolls across the display window as you enter it. Correction of typing errors will be discussed later. Next press the START Function Key. The Signmaker System will immediately start to draw your message in 1-inch high Helvetica Medium letters. Notice that the pen lifts and rotates at every sharp corner and always points in the direction of motion. Obviously, this is not necessary for a ball point pen, but this is a vital feature when using a pounce wheel or knife blade. The tool rotation feature can be suppressed when you draw with the pen resulting in faster execution of your message. To operate without the tool rotation, press either SHIFT key and hold it down while you press the START key. *CAUTION: Only use SHIFT/START when drawing with the pen! Using SHIFT/START with the pounce wheel or knife blade can damage these tools!* Experiment with different messages using the four directional slew keys to move the tool to a fresh section of the paper before starting each new message. Once you are comfortable with these simple operations, you are ready to learn how to use all the Function Keys.

**AUTO-KERN  
AUTOMOBILE  
wallpaper  
oxen  
HALT  
AWAY  
New York**

**UNKERNED  
AUTOMOBILE  
wallpaper  
oxen  
HALT  
AWAY  
New York**

#### IV. FUNCTION KEY DESCRIPTIONS

The Signmaker Function Keys are laid out so that logical operation proceeds from left to right. Functions need not be entered in this order, but we will use it in presenting detailed descriptions of each Function Key. In the back of this manual you will find a summary Reference Card with a brief outline of each function and a list of Error Codes.

The ESCAPE key can be used at any time to escape from the presently selected function without changing the previous setting of that function. This is true even if you have selected a function and started to change its value. Pressing RETURN or any other Function Key will close out the previous function and set it to the newly entered value. Pressing ESCAPE, however, will close out the function with no change to its previous setting. This is a very useful feature if you change your mind after starting to enter new data.

The ESCAPE key is also used to clear error conditions. The system is programmed to detect and identify various operator errors. When one of these errors occurs, the system beeps to alert you and displays the word **ERROR** followed by the error code number. The Error Code listing at the back of this manual explains what each error code means. *NOTE: When an error code is displayed, the operator must press the ESCAPE key in order to continue.* If pressing ESCAPE once does not clear the error, simply press ESCAPE twice instead.

TABLE I

## FUNCTION KEYS

FONT SELECT

LETTER HEIGHT

SLANT

SPACING

ENTER TEXT

KERN EDIT

FORWARD 1/8

BACK 1/8

LENGTH

SCALE FACTOR

JUSTIFY

REVERSE/SWAP

SPEED

ARC/ROTATE

X,Y MOVE

START

HALF FONT

AUTO NUMBER

BORDER

RESET

LINE #



## 1. FONT SELECT

The first Function Key on the left is FONT SELECT. When you first turn on your Signmaker System, the font selection will be initialized at Font 0, which is Helvetica Medium. Other fonts are packaged separately on font cards which must be installed inside the console before turning on the system. If during setup of your system you installed additional font cards, you should try selecting and drawing with these now. Labels indicating which fonts are in which number slot should be in place at the top of the Function Key Menu. To select a font, press the FONT SELECT key and enter the font number, 0 thru 8. Try selecting a font number which is not installed. If you attempt to select an empty font slot, the system will "beep" and display an ERROR 01. Referring to the Error Code List at the back of this manual, you will find that this indicates the selected font was not installed in the machine. Should this happen, press ESCAPE, press FONT SELECT again, and enter a valid font number.

This key also provides an additional means for identifying individual fonts. After pressing FONT SELECT, press the left pointing arrow located on the right side of the keyboard. (This is not one of the directional move keys at the far right. It is part of the main keyboard, just below the RETURN key. The display will scroll to the left, displaying the name and revision level of the currently selected font. You can use this feature to check any installed font. First, press FONT SELECT and enter any valid font number. Press FONT SELECT again, then scroll the display to read the font name. When you are through looking at a font name in this manner, you must use ESCAPE or RETURN to get out of the font preview mode or you will get an ERROR 01 (which you must cancel with ESCAPE).

## 2. LETTER HEIGHT

The second Function Key from the left is LETTER HEIGHT. The initial condition for this function is 1.00 (for 1 inch). When you press LETTER HEIGHT, the display will read 1.00. As a shortcut, you can always use the keyboard RETURN key to accept this current value without change. Enter any desired character size after the LETTER HEIGHT key and the system will draw at that height. Any height can be used from .01 inch to 48 inches. Attempting to enter a height greater than 48 inches will give ERROR 07. The list of Error Codes at the back of this manual explains that this error code indicates that the letter height entered is too big. The ESCAPE key will clear the error condition. The Signmaker System can only draw letters up to 13 inches high in normal operation (with REVERSE/SWAP in the NORMAL mode). When we discuss the HALF FONT and AXIS-SWAP operations, we will examine methods for handling heights larger than 13 inches.

The LETTER HEIGHT is measured from the "baseline" of a font to its "heightline." The baseline is the imaginary line on which all letters sit. The heightline is measured at the top of straight uppercase characters, such as the uppercase H. Some characters may contain shapes which extend above or below the heightline and baseline of the font you are using. In addition, most fonts have lower case letters which descend below the baseline such as g and j. This means that the actual character dimensions may be larger than the nominal letter height of the font. Consequently, you cannot always plot characters at the maximum LETTER HEIGHT value of 13 inches. When using characters which extend beyond their own heightline and baselines, you must exercise caution, being sure to limit the LETTER HEIGHT to allow the whole character to be plotted. In normal use, the system will draw or cut a 13 inch maximum size character. The LETTER HEIGHT Function Key is used to specify the size of straight line capital letters without regard for lower case descenders or the oversized design of circular letters.

The resolution of LETTER HEIGHT values is two decimal places, or 1/100th of an inch for values up to 9.99 inches. For values between 10 inches and 48 inches, the resolution is only one decimal place, or 1/10th of an inch.

### 3. SLANT

The SLANT function is used to control the angle at which characters are drawn or cut. This feature allows the creation of italics and other special effects. The initial value of SLANT 0.00 indicates no slant. The range provided is from +45 degrees to -45 degrees. Positive slant angles give forward leaning letters with the top of the letters to the right. Negative slant angles produce a backslant with the top of the characters to the left. As with all Signmaker entries, there is no need to enter a plus sign (+) since a positive value is assumed. The minus sign (-) is the key to the right of the 0 key in the top keyboard row.

To set a SLANT angle, press the SLANT key until SLANT 0.00 is displayed, and enter an angle, either plus (no sign required) or minus (preceded by a minus sign). Do not enter a degree sign (<sup>o</sup>). Now press ENTER TEXT and input a text message. Press START and observe the effect of your slant angle. Change the SLANT angle and draw again, either with the same text or with a newly entered message. If you enter a value greater than plus or minus 45, you will get ERROR 13 indicating that the SLANT angle is too large. Figure 13 illustrates various SLANT settings.

#### 4. SPACING

This function is used to control the overall spacing between characters. The value entered will affect all character and word spaces uniformly. Spacing adjustment of specific letter pairs is controlled by the Automatic AUTOKERN calculation and can be adjusted with the KERN EDIT function to be described later in this manual. Overall interletter spacing is adjusted with the SPACING Function Key. SPACING values are expressed as a percentage of the normal spacing. The initial condition is 0 spacing adjustment, displayed as SPACE 0.00 when the SPACING key is first pressed. This does not mean no space between characters; it means no adjustment to normal spacing. You may enter any adjustment value from -100 to +999 percent. Entering values outside this range will produce the warning tone and an ERROR 15 message indicating an out-of-range spacing entry. Press ESCAPE and enter a valid spacing value.

SPACING values affect intercharacter space by adding or subtracting the specified percentage of the precalculated intercharacter space. Thus, an entry of 100 adds 100 percent of the normal space to every character pair, which doubles the space between them. The percent sign (%) is also assumed for all SPACING values. An entry of -50 reduces the space by half. The maximum value of 999 effectively multiplies all intercharacter spaces by 10. SPACING values may be entered in increments of 1 percent and remain in effect until you change them or turn off the power. Figure 14 shows samples of this kind of SPACING.

## Slant Examples

**NO SLANT**

***PLUS OR FORWARD SLANT  
30 DEGREES***

**MINUS OR BACK SLANT  
30 DEGREES**

**Figure 13**

## Spacing Examples

**NORMAL SPACING**

**-100%**

**100%**

**5 0 0 %**

**-50%**

**Figure 14**

## 5. ENTER TEXT

The ENTER TEXT function sets up the system to accept keyboard entry of the characters you wish to plot. After pressing this key, you may type in text messages with up to 250 valid characters per line. This number includes all letters, numbers, kerns, and punctuation marks. You will be warned by a beep when you have entered 240 characters, and entry of 10 more characters will be allowed. When you have entered 250 characters, the system will beep again. Characters in excess of 250 will not be accepted. Text entry can be terminated with the RETURN key or by pressing any other Function Key. After a text message is drawn, it will remain in the system memory and can be redrawn any number of times. You can even change parameters, such as height, slant, and spacing, and redraw it without having to retype the message.

When you press the ENTER TEXT key, no previously stored text is lost. However, as soon as you press any keyboard key to start entering new text, the stored message will be lost. It is necessary for the system to erase the old message before you can enter a new one. Note that the message is only lost when you start to type a new message. If you press ENTER TEXT but do not want to lose your stored message, you can exit the text entry mode by pressing the ESCAPE key and no stored text will be lost. Even if you have already started to enter new text, pressing the ESCAPE key will exit text entry, ignore the new text, and restore the previous message.

Text messages are checked during entry, character by character, to be sure each character is present in the selected font. When a character is not available, the system will beep to warn you. If a new font is selected after text has been entered, the new font is checked to see that it contains all of the characters used in the message. If a required character is missing from the newly selected font, **ERROR 05** will be displayed and the text cannot be drawn. You should correct the message by entering new text or by selecting a font which contains all the characters used in the message.

As you type a text message, the last twelve characters entered are displayed for verification. The letters scroll from right to left as you type. The entire message can be scrolled back and forth whenever you are in text entry mode by using the two keyboard arrow keys. This scrolling capability also permits some editing of typing errors. The next character to be entered is always immediately to the right of the displayed characters. Should you type a single character incorrectly, scroll the message until this character is just off the right edge of the screen and type the correction. Scroll left and you will see that the correct character has replaced the offending one. With errors of more than one character, you can not simply delete, add, expand, or close up the message. (It is possible to accomplish this kind of change by using the KERN EDIT feature. For a description of this editing procedure, see the Function Key discussion of KERN CONTROL.) You can, however, scroll the correct portion of the text to the left and reenter the rest of the message. *CAUTION: When you leave text entry mode by using the RETURN key or any other Function Key, any portion of the message to the right of the display will be lost!* When you have finished reviewing and/or editing your message, always scroll it all the way to the left with the left-pointing keyboard arrow. The display will automatically stop scrolling when you reach the end of the message. When the entire message has been scrolled to the left, press RETURN to store it.

When plotting in standard Signmaker fonts, the CAPS LOCK key is also helpful. It is located at the extreme left edge of the keyboard, next to a red indicator light. Alternately pressing this button will turn the "All Capital Letter" mode on and off. "On" is indicated by the red light. With CAPS LOCK on, all letter keys will enter capital letters. This is not quite the same as a typewriter SHIFT LOCK function because it does not shift all keys to the uppercase, only the letters. The normal SHIFT key must be depressed and held down to produce lowercase letters. All other keys work normally. With CAPS LOCK off, operation works as usual on a normal typewriter.

## 6. KERN CONTROL

The three keys marked KERN EDIT, FORWARD 1/8, and BACK 1/8 provide a wide range of control over the spacing of individual letter pairs. We have already discussed the SPACING Function Key which is used to specify the desired spacing for *all* letters in a text message. The three KERN keys allow you to adjust *individual* letter combinations. These keys are used to modify the spacing calculated by the system for specific letter pairs. The KERN EDIT key allows you to insert Kern amounts between specified letter combinations in text messages which have already been entered. The other two keys allow you to enter Kern commands along with the text during text entry. The FORWARD 1/8 key opens the spacing of a specified letter pair by 1/8 of a normal interletter space. The BACK 1/8 key closes the space between a letter pair by the same amount. You may use as many KERN adjustments as desired between any character pairs in your text. Just remember that each KERN adjustment counts as a character in your limit of 250 characters per line.

We will discuss Kerning a text message during text entry before examining Kern Editing after the message is stored. Figure 15A shows the word WAVE drawn by a Signmaker System in Helvetica Medium, Auto-Kern, with no spacing adjustment. The Auto-Kern notation indicates that the system will automatically calculate a spacing correction for each character pair. This reduces the space between all character pairs which would be too far apart if characters were placed with a constant distance between their extreme edges. To produce this example on your own system, press SELECT FONT. Enter 0 to select Helvetica Medium, Auto-Kern. If the display already shows 0, you may simply press RETURN or the next Function Key. Press LETTER HEIGHT and enter 1.0. SLANT and SPACING values should both be 0. Press ENTER TEXT and type the word WAVE all in capital letters. Press START. The result should look like Figure 15A.

Notice that there is very little distance between the W and the A and between the A and the V. Space can be added between these letter pairs by adding KERN adjustments at the time of text entry. To see this effect, press ENTER TEXT again. Enter the W, then press FORWARD 1/8 two times. Each time you press FORWARD 1/8, a small 8 will appear in the display. Enter the A and press FORWARD 1/8 two more times. Then enter VE. When you press START this time, the result should look like Figure 15B.



Negative KERN adjustments can be added to a text message in the same way. Pressing BACK 1/8 will produce the same 8 in the display with a bar over it to indicate a minus KERN. The KERN characters allow you to verify how many positive and negative KERN adjustments have been entered as you scroll through the message. You may use as many KERN adjustments as desired between any character pairs in your text. Just remember that each counts as a character toward the limit of 250 characters per line. Adding KERN adjustments at the time of text entry allows you to insert *different* KERN adjustments for different occurrences of the same letter pair at different places in the text message. Experiment with the effects of adding FORWARD 1/8 and BACK 1/8 adjustments until you are familiar with the results they produce.

You may find that you are not pleased with the spacing between character pairs in a message you have drawn, but you do not wish to reenter the entire message with the necessary KERN adjustments. The KERN EDIT key allows you to add or subtract KERN adjustments between any pair of characters after the text has already been entered. To experiment with this feature, turn off the system console's power switch to clear all parameters to their initial conditions. Turn the system on again. When the READY message appears, press ENTER TEXT. Enter WAVE again. Do not enter any KERN adjustments. It is not necessary to draw this message again. Looking at this word, as shown in Figure 15A, you may decide to increase the space between the W and A and between the A and V by 1/8 of the existing space. To add these KERN adjustments, press KERN EDIT. A dot will appear in the lower left corner of the display prompting you to enter the letter pair you wish to adjust. Enter WA and press RETURN. At this point, the system will search the message stored in its memory until it finds the character pair you have specified. Be sure to enter the characters with the proper upper or lowercase. The system will not find the WA in your text message if you enter wa after pressing KERN EDIT. If the system does not find the character pair you have specified, it will beep and display an ERROR 08 message to alert you. If the system *does* find the character pair you have specified, it will display any KERN adjustments already existing between them. Since WAVE was entered without any KERN adjustments, the display will show only the prompt character. Any number of FORWARD 1/8 or BACK 1/8 adjustments may be entered. For our example, press FORWARD 1/8 once, and press RETURN. Press KERN EDIT again, enter AV, and press RETURN. Press FORWARD 1/8 once and

press RETURN. When you press START again, the result should look like Figure 15C.

When you press KERN EDIT, enter a pair of letters, and press RETURN, the system will wait for you to enter Kern characters. If you enter any other kind of character, the system will display an **ERROR 11** message. When you press ESCAPE, the system will display the prompt character expecting you to enter a pair of letters. If you wish to exit the KERN EDIT mode altogether, you must press ESCAPE again.

KERN adjustments made using the KERN EDIT key will apply to *all* occurrences of that character pair in the message. Adding KERN adjustments at the time of text entry allows you to add *different* KERN adjustments to different occurrences of the same character pair; using the KERN EDIT key does not.

The KERN EDIT key can be used to check the KERN adjustments used between any specified character pair. Press KERN EDIT, enter the letter pair, and press RETURN. The display will show the KERN adjustments between the first occurrence of that letter pair within the text message. To leave the KERN adjustments the same, press ESCAPE. Do *not* press RETURN. Pressing RETURN will cancel all KERN adjustments present. To change the KERN adjustments, enter the *complete* new set of KERN adjustments and press RETURN. Remember that entering KERN adjustments with the KERN EDIT key will apply the new set of adjustments to *ALL* occurrences of that character pair. For example, suppose you enter a large text message with different KERN adjustments for three occurrences of WA, then use KERN EDIT to change the adjustments on the first WA. When you draw the message, you will find that all three occurrences of WA have been changed to the new set of adjustments.

Kern adjustments apply only to the specific message for which they are entered. If you adjust WA in a message, then enter a new message with WA in it, you must enter any KERN adjustments from the beginning.

Although it is not possible to add or delete characters in the middle of a message when you use ENTER TEXT, it is possible to accomplish this kind of text editing by using the KERN EDIT feature. KERN characters can be added to text

messages or deleted from them. In addition, KERN characters can be edited into text characters, and text characters can be edited into KERN characters in the text entry mode. By taking advantage of these two capabilities, you can add text in the middle of a message by inserting KERN characters and then editing them into text characters. Likewise, text can be deleted by editing the text characters into KERN characters and then using KERN EDIT to delete them.

Text insertion can be illustrated by the word GERBR, from which the E was omitted between the B and the R. To insert the E, press KERN EDIT. Enter BR and press RETURN. Press FORWARD 1/8 once to insert a KERN character, then press RETURN. Next press ENTER TEXT. Use the left arrow key to scroll through the message until the B is in the rightmost position of the display. The KERN character is now the first character beyond the display. Enter the E and scroll to the end of the message. Notice that the E has replaced the KERN character. Press RETURN to exit the text entry mode, and the message is now correct.

Text deletion can be illustrated by the word GEERBER which has an extra E. Press ENTER TEXT and scroll until the G appears in the display. Press FORWARD 1/8 to replace the next character, E, with a KERN character. Scroll to the end of the message and press RETURN. Next press KERN EDIT, enter GE, and press RETURN. The KERN character will appear in the display. To delete the KERN character, simply press RETURN, and the message is now correct.

*NOTE: When using Signmaker III non AUTO-KERN fonts in a Signmaker System, the KERN operation functions as follows:*

Signmaker III fonts, which do not contain AUTO- KERN data, will work with the Signmaker System. When these font cards are installed and selected, the KERN EDIT function will operate exactly as on a Signmaker III. All KERNS will be backward or closeup moves. FORWARD 1/8 will produce a BACK 1/4 KERN move. BACK 1/8 will be unchanged. The display will show a 4 and an 8, each with a minus sign above it when these keys are used. No forward KERNS can be entered when using Signmaker III NON-AUTOKERNED fonts. Forward adjustments can be achieved by using the SPACE BAR in combination with a number of back KERNS to obtain the desired results.

## Kern Examples

WAVE (AUTO-KERN) A

WAVE (W88A88VE) B

WAVE (W8A8VE) C

## 7. LENGTH

The LENGTH key provides a third means of sign length specification. We have already discussed the two other methods, SPACING and KERN. While SPACING and KERN adjustments allow control of intercharacter spacing, the LENGTH function provides for forcing the overall message size by proportionally compressing or expanding the characters as well as the spaces. SPACING, KERN, and LENGTH adjustments can all be used in the same text message. The LENGTH feature can best be visualized by imagining the sign printed on a rubber sheet being pulled or pushed to the desired length.

Two methods of length control are included. The first provides for input of the absolute desired length of a sign, called the FORCED LENGTH. The second allows you to enter the percentage length adjustment desired. In addition, the term FREE LENGTH is the length of a sign message without any LENGTH adjustment. The FREE LENGTH reflects calculations such as the SPACING, KERN, and LETTER HEIGHT settings and will be recalculated whenever any of these are changed.

The LENGTH key is used to select and display the present mode of length control. Press this button once, and the display will read FREE = X.XX where X.XX is the free or unadjusted length of the current text message. Press again, and the display will show FORCE = X.XX. This value will be the same as the FREE LENGTH until a new value is entered. Press LENGTH a third time, and the display will show % = X.XX. This value will be the percentage adjustment between the FREE LENGTH and the FORCED LENGTH.

To see the effect of FORCED LENGTH on horizontal text, select FONT 0, HEIGHT 1, SLANT 0, SPACING 0, and enter the text message LENGTH TEST (all in caps). Now press LENGTH until FREE appears with the base or unadjusted length of the message. The FREE LENGTH value represents the distance from the left edge of the first character of a message to the right edge of the last. No additional space is included at either end.

Press **LENGTH** again until the display shows **FORCE**. Enter any desired length for the text message from as little as practically zero up to two times the **FREE LENGTH**. Close out with **RETURN** and press **SHIFT/START** to see the drawn result. Expanded messages more than twice the **FREE LENGTH** will result in an **ERROR 20** message. When you press **ESCAPE**, the system will automatically set the **FORCED LENGTH** value to its previous value, even if that value is not equal to the **FREE LENGTH**. Figure 16 shows our text message drawn at its **FREE LENGTH**, compressed to a **FORCED LENGTH** of 6 inches, and expanded to a length of 18 inches. You can always check the unadjusted length of a message at current character height, spacing, etc., by using **LENGTH** to select **FREE**. Switching the **LENGTH** to **FORCE** will allow display and entry of any other desired length for the message.

A second method of controlling compression or expansion of a sign's length is the **% LENGTH** mode. Like **FREE** and **FORCED**, this is accessed by repeated actuation of the **LENGTH** key. Enter any message with **ENTER TEXT**, then press **LENGTH**, toggling through **FREE** and **FORCE** until **%** appears in the display. The value will be 100% indicating that no length adjustment has been made. To make a percentage length adjustment, enter the desired percent of the **FREE LENGTH** and press **RETURN**. Entering 80 will draw a message 80% of its **FREE LENGTH**. Entering 160 will draw a message 60% longer than its **FREE LENGTH**. The range for % adjustment is from 1% to 200% of the **FREE LENGTH**. Values greater than 200 will produce an **ERROR 20** message.

After a percentage value has been entered, you can toggle to **FREE** and still read out the **FREE LENGTH**. You can also toggle to **FORCE** to see what the message length will be in inches when expanded or reduced by the specified percentage.

This latter feature also works in reverse. You can input a message, force its **LENGTH** to a desired value, and read out the percentage expansion or reduction. This is extremely useful when making Multiline signs with fixed margins where each line varies in length, but you want every line compressed by the same amount so that all the text will look alike. To accomplish this, enter the longest line first, read its **FREE LENGTH**, and set its **FORCED LENGTH** equal to your allowable width. Read the % reduction calculated by the system for this line and enter the same %

for all other lines. The longest line will fit your margins, and all the other lines will be compressed by the same amount in order to look identical.

When other parameters affecting message length are changed, the FREE LENGTH is immediately recalculated, ready to be displayed upon request. To test this feature, put in any message at a LETTER HEIGHT of 1 inch and check its FREE LENGTH. Now change the LETTER HEIGHT to .5 inch and again check the FREE LENGTH. FORCED LENGTH, once entered, is not changed by other parameter changes unless the new FORCED LENGTH would exceed twice the new FREE LENGTH. The philosophy here is that if you have specified a FORCED LENGTH of 22 inches for a sign, you want it to be 22 inches. As you vary the size, spacing, or kerning, the FREE LENGTH changes, but if you entered a FORCED LENGTH, it will remain unchanged. The exception to this is when using ENTER TEXT. Scrolling the current message across the display will cause the FORCED LENGTH to change and revert to the value of the FREE LENGTH. Any length adjustment entered will be canceled when a new text entry is made. After new text is entered, the FORCED LENGTH will be reset to the new FREE LENGTH value and the % adjustment will show 100.

The Signmaker microprocessor will round FORCED LENGTH values to the nearest 1/10 of 1%. This means that the overall message length may vary by .1% from the FORCED LENGTH values entered. Over a distance of 10 inches, this can result in a .01 inch error. For a 100-inch sign, the maximum roundoff error is .1 inch.

If you are using the SLANT function, condensing or extending the LENGTH of a message will change the slant of a character since the entire message including spacing, kerning, and slant will be proportionally condensed or extended.

In summary, the LENGTH key is used to control expansion or contraction of the entire text message after SPACING and KERN adjustments have been made. Provision is included for checking the unadjusted or FREE LENGTH at any time even after it has been altered. Both absolute length and percentage adjustment modes are provided. The maximum adjustment range is from 1% to 200% of the FREE LENGTH.

The LENGTH function of your system has an additional valuable use. It can act as a length calculator for text messages in any of the available fonts, in any desired character size. Simply select the font, enter the message, set the desired height, and the FREE LENGTH key will give an instant readout of the length. This can be used to quickly estimate lengths of words or messages even when you do not intend to draw or cut them on your system. This instant length calculation can be invaluable for estimating jobs or planning graphic layouts.



# Length Examples



## 8. SCALE FACTOR

The SCALE FACTOR feature provides for drawing any copy at reduced overall size, primarily for verification purposes. When the scale is reduced, all other parameters remain as set and the result is an exact scaled down replica of the finished graphics. This feature is particularly valuable in the Multiline mode for producing a reduced version of the complete Multiline layout. Scale selection is made by repeatedly pressing the SCALE FACTOR key to cycle through the scale options 1/1, 3/4, 1/2, 1/4, and 1/8.

The SCALE FACTOR key can be used for the design and layout of very large Multiline graphics, up to nearly 8 feet in height (at 1/8 scale). Enter all parameters as they are to be on the finished job, LETTER HEIGHT values, X,Y MOVE, etc. Then draw the total design at a reduced scale factor to fit the 13-inch plotter width. These reduced, exact scale layouts can be submitted for customer approval, avoiding waste of execution time and costly materials. Major projects can then be cut or pounced on the Signmaker System and stripped together to form the complete large area artwork.

## 9. JUSTIFY

The JUSTIFY Function Key allows the user to control the format of multiple line layouts in both single line and Multiline modes. The JUSTIFY function can also be used to position a message on your material. This is also a toggling key and works in a manner similar to that of the LENGTH function by advancing to the next mode with each actuation. The five JUSTIFY functions, in order of appearance, are NONE, RIGHT, CENTER, LEFT and TYPE. To select a JUSTIFY mode, press the JUSTIFY key repeatedly until the desired mode appears in the display, then press RETURN. The JUSTIFY mode selected will remain in effect until you change it, edit lines in Multiline, or until the power is turned off. The initial condition is NONE which means no JUSTIFY mode is enabled.

Use RIGHT for Right Justified text (right edge aligned), CENTER for Center Justified text, and LEFT for Left Justified text (left edge aligned). The starting and ending positions of the tool are controlled by the JUSTIFY setting. When NONE or TYPE is selected, the tool will start at the left end of the baseline of your text and end at the right end of the baseline. In CENTER Justification, the tool will start and end at the middle of the baseline. In RIGHT Justification, the tool will start and end at the right end of the baseline, and in LEFT Justification, the tool starts and ends at the left end of the baseline. These options allow the production of any desired multiple line text message.

Toggle the JUSTIFY mode to LEFT, position the tool carriage near the top of its travel (allowing room for the selected letter height), and enter a line of text. When you draw the message, you will see the tool return to the left edge starting position upon completion of the text line. If you move the tool down using the directional arrow keys (the slew keys) and enter new text, the left edge of the second line will be perfectly aligned to the left edge of the first. Later in this manual, we will explain how to space lines exactly to any desired spacing with the X,Y MOVE Function Key.

Now toggle the JUSTIFY Function Key until the display reads CENTER. With this setting, all messages will be drawn with their midpoint at the current tool position. When the START button is pressed, the system will feed the material to the

right for 1/2 the message length before beginning. Upon completion of the message, the tool will again move 1/2 the line length before beginning, thus center justifying this new line. *NOTE: Whenever you use CENTER Justification, you must allow enough material to the left of the tool for at least 1/2 of the length of the longest line to be drawn. Otherwise, when the machine moves the material out 1/2 the line length to the right, it will feed the material completely out of the right side of the plotter. To determine how much material to allow, type in the longest line at the selected size and check the FORCED LENGTH. You must allow for at least 1/2 of this amount.*

The next JUSTIFY mode is RIGHT. Toggle the JUSTIFY key until the display reads RIGHT. The tool starting and ending position is now at the extreme right edge of the message. With CENTER Justification, you must allow enough material to the left of the tool for at least 1/2 the length of the longest line. With RIGHT Justification, you must allow enough material for the entire longest line. Again, if you forget, the system will remind you by feeding the material out the right side of the plotter.

These JUSTIFY modes can be used to register single line text messages with respect to their own starting points. Because these three modes return the tool to the starting point after executing a single line message, it is possible to redraw, recut, or repounce a line of text in exactly the same place. Even if the JUSTIFY mode is NONE, it is possible to register the text line for a second execution. In the NONE mode, the starting point is at the left end of the text line, and the ending point is at the right. To execute the message again in the same place, you need to have the starting point at the right end of the message, which can be accomplished by setting the JUSTIFY mode to RIGHT. These JUSTIFY modes can also be used to register the starting points of arched or rotated text or with other Signmaker features, such as SLANT or X,Y MOVE to produce a multitude of special graphic effects. Figure 17 illustrates the LEFT, RIGHT, and CENTER JUSTIFY modes.

The last JUSTIFY mode is TYPE. Press the JUSTIFY Function Key until the display reads TYPE. In TYPE or typewriter mode, the system will automatically left justify all lines and space each line below the previous one. Once you have selected the TYPE mode, simply press ENTER TEXT and type in your text. Use the CR/LF

key (the rightmost key in the top row of the keyboard) to indicate the beginning of each new line. Do not use the X,Y MOVE or Multiline features. The TYPE feature only functions in single line mode.

In TYPE mode, the entire text message is treated by the system as a single line. This means that you must observe the limit of 250 characters per line. Remember that each Kern adjustment and CR/LF counts toward that limit. Notice that a small CR/LF character appears in the display each time you press the CR/LF key.

When you press START, the first character will begin at the tool's present location. When the system encounters the first CR/LF, the tool will automatically return to the left edge of the text and space down to start the next line leaving a minimum amount of material between the lines. The space between lines will be proportional to the LETTER HEIGHT value. When lower case characters with descenders (such as j, g, and y) occur in a line, the space between the lines will automatically be increased to accommodate them. The amount of space left between lines is calculated to use the least amount of material possible, not to produce an aesthetically pleasing layout. The TYPE mode is designed to produce large quantities of text, using a minimum quantity of material. For precise graphic layouts, you must use the LEFT, RIGHT, or CENTER Justification modes, together with the X,Y MOVE function, in the Multiline mode. A sample of text produced in the TYPE mode is shown in Figure 18.

The ARC/ROTATE feature will not operate in TYPE mode.

After using any JUSTIFY mode, it is a good idea to return the JUSTIFY selection to NONE. By doing so, you will not be surprised by any unexpected tool or material moves when you start to execute another line of text.

## Justify Mode

This text is  
left justified  
or left  
edge aligned

This text is  
right justified  
or right  
edge aligned

This  
is  
center  
justified

## Type Feature

**This text was  
produced with  
the “TYPE”  
mode for  
optimum line  
packing**

## 10. REPEAT

Multiple copies of text messages can be produced in the TYPE mode. This REPEAT feature is activated by using multiple CR/LF characters in the text message. When more than two or more consecutive CR/LF characters are encountered by the system, all text preceding the first CR/LF will be repeated once for every CR/LF character in the series. For example, press JUSTIFY and select the TYPE mode. Press ENTER TEXT and enter TEST CR/LF CR/LF CR/LF. (Do not enter any space characters.) When you press START, the word TEST will be drawn three times, one above the other, as shown in Figure 19. Messages with more than one line can also be repeated in this manner. Press ENTER TEXT and enter MULTI-LINE CR/LF TEST CR/LF CR/LF CR/LF. When you press START, the results will look like the second example in Figure 19.

Once the system has detected two or more consecutive CR/LF characters, it will not accept any additional text. Any additional characters will be interpreted as further CR/LF characters. For example, entering TEST CR/LF CR/LF TYPE will produce six copies of the word TEST because each letter in the word TYPE is interpreted by the system as an additional CR/LF character, adding up to six CR/LF characters in the entry. Therefore, if you are using the CR/LF REPEAT feature, you must enter all text to be repeated *before* the first set of two or more CR/LF characters.

In order to conserve material, the last CR/LF character used in the TYPE mode will not cause the tool to return to the left edge and move down for a line space. Therefore, when executing a message followed by only one CR/LF (a message not being repeated using the CR/LF REPEAT feature), the tool will stop at the end of the last character exactly as if the JUSTIFY mode were set to NONE.



## **Repeat Feature**

**TEST  
TEST  
TEST**

**MULTI-LINE  
TEST  
MULTI-LINE  
TEST  
MULTI-LINE  
TEST**

## 11. REVERSE/SWAP

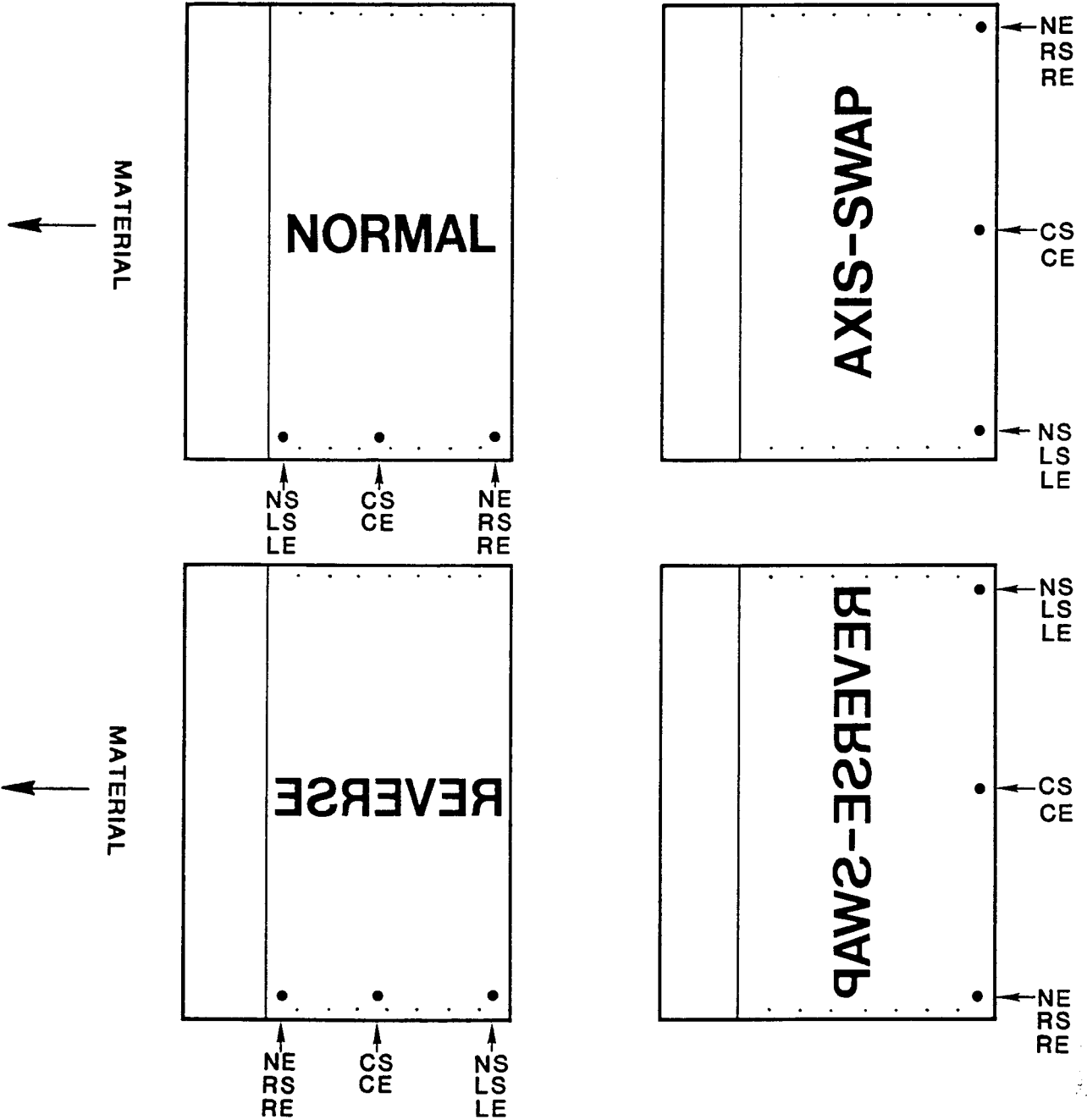
The REVERSE/SWAP Function Key provides selection of normal or reversed (mirror image) drawing or cutting. This function also allows the selection of an axis interchange, or SWAP mode, which allows writing across the width of the material rather than along its length. This Function Key cycles through four modes, each shown in the display upon successive depressions of the key. These modes are: NORMAL, REVERSE, AXIS-SWAP, and REVERSE/SWAP. The NORMAL drawing mode will automatically be selected upon powering up the system. This implies normal drawing or cutting of letters from left to right and with JUSTIFY modes operating as described in the previous section. Pressing the REVERSE/SWAP key once will display NORMAL. Pressing it again will display REVERSE. In REVERSE mode characters will be drawn in reverse so as to read correctly when viewed in a mirror or when placed on a glass door or window to be viewed from the opposite side.

When using the REVERSE mode, be sure to position the paper or vinyl material to the left of the tool since the message will draw from right to left, just the opposite of the way it would be drawn in NORMAL mode. The LEFT and RIGHT Justification modes will also appear to be backwards in REVERSE mode, but they are, in fact, correct since the artwork is being created backwards. In LEFT Justification mode, the tool returns to the left edge of each line and thus aligns all lines on their left edge. In a reversed message, the left edge is really the right when the text is installed, and therefore LEFT Justification will align the right side of the text as drawn. Another way to visualize this is that LEFT Justification aligns the beginning edge of text messages, and in REVERSE mode the beginning of left aligned messages is on the right. RIGHT Justification aligns messages at their end and is similarly reversed by the REVERSE mode. CENTER Justified text is unaffected by both the NORMAL and REVERSE settings.

The next REVERSE/SWAP mode is AXIS-SWAP. This selection swaps the plotter axes so that each line entered is rotated 90 degrees. Text will be written across the width of the material. Text strings up to 13 inches in length can be produced in this manner. In the AXIS-SWAP mode, you can create many characters, logos, and symbols taller than the 13-inch letter height permitted in the NORMAL mode. For example, using the General Symbols font, rectangular boxes can be created up to 13

inches in length. Remember that the JUSTIFY mode selected will affect the starting point of your job. You must remember to locate the tool accordingly before executing the job. Text strings with JUSTIFY settings of either LEFT or NONE will start at the near edge of the material and proceed toward the far end of the plotter. For CENTER Justified text messages, the tool should be moved away from the near edge of the material by 1/2 the length of the text string; for RIGHT Justified text, the tool must be pre-positioned away from the near edge by a distance equal to the message length. The final mode of this Function Key is REVERSE/SWAP. In this mode, axes are swapped *and* characters are reversed. Remember to think carefully about the starting position of the tool before executing any message. When the JUSTIFY mode selected is NONE or LEFT, the starting point will be at the near end of the plotter. The starting point for text Justified in the RIGHT mode will be at the far end of the plotter. Figure 20 illustrates the various REVERSE/SWAP modes.

# Reverse/Swap Examples



NS-NONE JUSTIFY START  
 LS-LEFT JUSTIFY START  
 CS-CENTER JUSTIFY START  
 RS-RIGHT JUSTIFY START

NE-NONE JUSTIFY END  
 LE-LEFT JUSTIFY END  
 CE-CENTER JUSTIFY END  
 RE-RIGHT JUSTIFY END

## 12. SPEED

The SPEED Function Key controls the tool speed over the material. The initial value of this function upon power-up is 100, indicating 100% plotter velocity. This speed is used for nearly all Signmaker System operations. The range of SPEED settings is from 10% to 100%. The only effect of the SPEED function is to reduce the tool speed. Drawing with ballpoint pen, pouncing, and cutting adhesive-backed vinyls are all done at 100% speed. Signmaker accessories for drawing with felt tipped pens and wet ink drafting pens require reduced speed for the best quality. Lower speeds may also be required for certain difficult-to-cut materials.

### 13. ARC/ROTATE

The ARC/ROTATE feature is another powerful capability found in the Signmaker System. This feature provides for the creation of arc lettering at an operator specified radius and for straight line lettering rotated to any angle from -180 degrees to 180 degrees. The first time this Function Key is pressed, the display will show RADIUS 0.00. You may enter any desired radius for an arc about which the text message will be constructed. Positive values will raise the center of the text line and negative radius values will lower it. With positive values the text baseline will be on the arc. With negative values the top of uppercase characters will be on the arc. Refer to the examples of Figure 21. Arc characters are created with the base of each character tangent to the arc (the top of characters for negative radius arcs). Individual characters are not distorted to conform to the arc. Straight characters such as the Helvetica "H" will retain their parallel vertical legs.

The arc length may not exceed 180 degrees. This constraint defines a minimum radius for each text line dependent on the text length. This can readily be calculated by the formula:  $R \text{ (minimum)} = \text{FORCED LENGTH} \text{ divided by } 3.14 \text{ (pi)}$ . Attempts to enter a radius less than the FORCED LENGTH divided by 3.14 will generate an ERROR 09 indicating too small a radius. Reenter a radius at least equal to FORCED LENGTH divided by 3.14. The maximum radius which can be entered is 99999. FREE LENGTH and FORCED LENGTH work normally in ARC mode except that the length is now measured along the arc.

When you press the ARC/ROTATE key a second time, ROTATE X.XX will be displayed. The ROTATE mode allows straight line text to be rotated to any desired angle from -90 degrees to +90 degrees. Positive rotation angles will be counter-clockwise; negative angles clockwise. The point around which the message is rotated is always the start of the first letter. LEFT, CENTER, and RIGHT Multiline Justification modes continue to work "on axis" and will align messages as though they were not rotated. See Figure 22 for ROTATE examples.

ARC and ROTATE functions cannot be used on the same text message. Repeatedly pressing the ARC/ROTATE Function Key alternates between these two features. As soon as you enter an ARC radius, any previously entered ROTATE angle is cleared. Likewise, entering an angle when ROTATE is displayed will clear any arc radius previously entered.

The ARC/ROTATE feature is not operative when you are using the HALF FONT, TYPE, or AUTO NUMBER features. No error is generated when you attempt to enter an ARC or ROTATE value in one of these inactive modes, but the radius or rotation angle will be ignored and reset to 0.

# ARC EXAMPLES

POSITIVE ARC

NEGATIVE ARC



## Rotate Examples

**ROTATE**

**0°**

**ROTATE**

**+45°**

**ROTATE**

**-20°**

14. X,Y MOVE

The X,Y MOVE key provides for keyboard input of exact distance moves. The primary use of this key is for precise spacing of Multiline messages. This key is also useful for moving the tool or material, or both, any specified distance. Provision is included for making these moves with the tool up or down so that this feature allows for the construction of simple shapes and designs. X,Y MOVE can also be used to position the tool before executing messages to minimize material waste.

In single line mode (LINE # key displays LINE 00/00), any X,Y MOVE entry will be executed immediately upon pressing RETURN or any other Function Key. After pressing the X,Y MOVE key, enter X or Y, a minus sign for negative moves, and the distance to be moved. Enter an upper or lower case "D" if the pen is to be down. Then press RETURN to execute the move. Remember that the X or Y *must* precede the numerical value. X commands move the material; Y commands move the tool carriage. Negative values move the material away from you and the tool to the right. Positive values move the material toward you and the tool to the left. Plus signs are assumed and do not need to be entered. REVERSE/ SWAP modes have no effect on the direction of X,Y MOVE values in the single line mode.

To observe the operation of X,Y MOVE commands in the single line mode, try the following entries:

FUNCTION KEY:	ENTER:	PRESS:
1. X,Y MOVE	X3.5	RETURN
2. X,Y MOVE	Y1.75D	RETURN
3. X,Y MOVE	X-2	RETURN
4. X,Y MOVE	X10.5 Y2.8	RETURN

Notice in the last command that both X and Y moves can be entered in one string and both will be executed simultaneously, drawing a sloped line, when RETURN is pressed.

Unlike the single line mode in which X,Y MOVE commands are executed immediately, in the Multiline mode of your Signmaker System, the execution of X,Y MOVE commands is deferred. When operating in Multiline mode, each line may have an X,Y MOVE associated with it, but none will be executed until the entire Multiline sign is drawn. The primary use of the X,Y MOVE function is to space one line of text below another in the Multiline mode. This application is discussed in the LINE # Function Key description. When spacing between lines, the Y value should be equal to the desired blank space between the lines *plus* the LETTER HEIGHT value of the second line. Remember that the Y value will be negative to move down from one line to another. You can also use a series of X,Y MOVES in the Multiline mode of your Signmaker System to create any simple shape, box, or rectangle to an exact size. It is not necessary to enter any text with these moves. The tool can be directed to move in the "down" position to draw, cut, or pounce line segments of any specified length.

Let's attempt to duplicate the frame in Figure 23. Starting from the lower left hand corner, the pen will draw a 5-inch line to the right, then move up the paper 4 inches and will continue drawing until it meets the original starting point, creating a box. Next, the pen will lift and move, without drawing, .5 inch to the right and .5 inch upward to the starting point for the inside box. It will then draw an inside box 4 inches long and 3 inches high.

PRESS FUNCTION KEY:ENTER:PRESS:

1. LINE #	1	RETURN
2. X,Y MOVE	X5D	RETURN
3. LINE #	2	RETURN
4. X,Y MOVE	Y4D	RETURN
5. LINE #	3	RETURN
6. X,Y MOVE	X-5D	RETURN
7. LINE #	4	RETURN
8. X,Y MOVE	Y-4D	RETURN
9. LINE #	5	RETURN

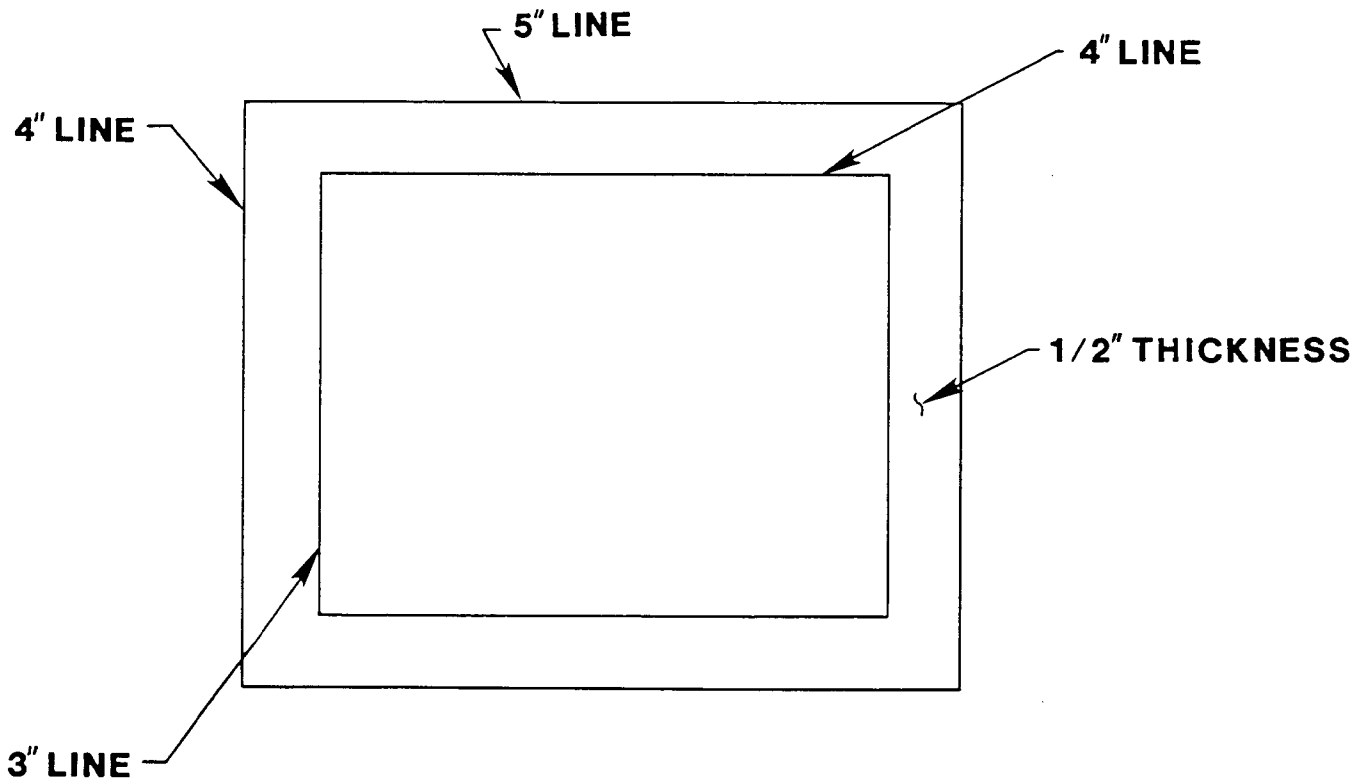
10.	X,Y MOVE	X.5 Y.5	RETURN
11.	LINE #	6	RETURN
12.	X,Y MOVE	X4D	RETURN
13.	LINE #	7	RETURN
14.	X,Y MOVE	Y3D	RETURN
15.	LINE #	8	RETURN
16.	X,Y MOVE	X-4D	RETURN
17.	LINE #	9	RETURN
18.	X,Y MOVE	Y-3D	RETURN

Note that in Step #10 no D was entered. This move simply moves the tool from the corner of the outside box to the corner of the inside box. Press SHIFT/START to draw or start to cut your completed figure. If an error was made in any entry, correct it by selecting that line with the LINE # key and entering the correct value. Your example should look like Figure 23. No text was entered.

You may also enter text and then use the X,Y MOVE feature to produce an underline beneath the text message. In addition, this feature is useful for designing special shapes and graphics. It is particularly useful for making your own tape and pinstriping. These can be cut to the exact length required. Tape segments can be combined to produce frames to border a sign, a page of artwork, or text and symbols. Special graphic effects can be created, such as zig-zagged and diagonal lines for use on charts, signs, and printed artwork. Pinstripes can be made for cars, trucks and vans, windows and doorways. Whatever the application, you can cut it with your system.

The resolution of X,Y MOVE values is two decimal places (1/100 inch) for moves up to 9.99 inch and one decimal place (1/10 inch) for moves of 10 inches or more. More digits can be entered, but such entries will be truncated to the 1/100 or 1/10 inch resolution. No error will be generated. X axis moves up to 9999 inches are permitted. Y axis moves are limited by the starting location of the tool carriage. There are 13 inches of total travel, but care should be taken to prevent commanding the carriage to crash at either end. Such crashes will not damage the machine but will cause a loss of position.

# X, Y Move Examples



## 15. START

The START Function Key is the one we have been using to start the drawing of all our tests to this point. Remember that *only when pen drawing* you can inhibit the rotary motion of tool drive by holding down either SHIFT key when you press START. *Do not* use this method when cutting or pouncing as the cutting and pouncing tools, due to their directional nature, require the rotational movement.

When the knife or pounce wheel is installed in the plotter carriage, the START Function Key *must* be used without the SHIFT key to start operation. The START Function Key starts plotter operation with the tool rotation feature enabled. Tool rotation, a feature unique to the Signmaker System, always keeps the knife blade or pounce wheel aimed in the direction of travel. On smooth contours, the knife is rotated as cutting or pouncing progresses. For sharper angles (approximately 30 degrees) motion stops, the tool is raised, rotated to the new direction, and then lowered. The tool rotation feature makes pouncing possible on the Signmaker System and dramatically improves corner quality over other systems.

Always stop and think before using the START Function Key. Do not press START with SHIFT when the knife or pounce wheel is installed! This mode does not provide the rotation needed by these tools to keep them pointing in the direction of travel. Moving the knife or pounce wheel sideways will damage the vinyl or paper and may damage the tool or even score the rubber drive roll surface. As soon as you realize you have started incorrectly, cancel execution at once by pressing the rightmost Function Key marked RESET. It is not harmful to use the tool rotation mode with the ballpoint pen. The rotation feature does reduce operating speed, however, so it is more efficient to use SHIFT/START when the pen is installed.

If you are working in Line 0, pressing the START key when no text has been entered will result in the **ERROR 02** message. This, like all error messages, must be canceled with the ESCAPE key. If you have changed fonts after entering text and the newly selected font does not contain all the characters used in the text message, you will get an **ERROR 05**. After clearing this error with the ESCAPE key, none of the text you entered will be saved. If you then press START, you will get an **ERROR 02** because no text is entered.

## 16. HALF FONT

The HALF FONT feature allows you to split any message in any font through its horizontal centerline and draw only the top or bottom half. These half messages may then be stripped together to produce drawn, pounced, or cut characters or messages up to 26 inches in height.

The first time you press the HALF FONT Function Key, the display will read OFF indicating that this mode is turned off. Press it again and the display will show BOTTOM HALF. Another actuation will display TOP HALF, and yet another, TOP OVERLAP. One final push will return to OFF. When HALF FONT is in use, the LETTER HEIGHT value must be the full letter height desired. For a test, enter a LETTER HEIGHT of 20 inches, enter the text BIG and then press the HALF FONT key until BOTTOM HALF is displayed. Position the tool near the right edge of the material and press SHIFT/START and the bottom half of the word BIG will be drawn. Move to a fresh area of paper by using the directional move keys or an X,Y MOVE. Be sure the tool is still near the right edge of the material. Press the HALF FONT key until TOP HALF is displayed, then press SHIFT/START. This will produce the top of your 20-inch characters. Now you can take the two parts of the word BIG out of the machine, trim the excess width off one of them, and tape or paste them together. You have just produced 20-inch characters, prespaced and accurate, on your 13-inch Signmaker plotter.

The final HALF FONT mode, displayed as TOP OVERLAP, also produces the top half of a text message. However, instead of ending at the character's horizontal centerline, it extends the top half below the split line to overlap the bottom half. The amount of overlap varies with character height and is equal to .5% of the total height. When cutting large vinyl letters in the HALF FONT mode, this overlap eliminates the butt joint on the centerline which could open up if the vinyl were to shrink due to age or weathering.

When HALF FONT is used in pen mode, without tool rotation (SHIFT/START), the centerline of each half is not drawn. When tool rotation is used (START key alone), after completing each half of the text message, a line will be drawn,

pounced, or cut along the full length of the centerline. In TOP OVERLAP mode, this line will be located below the split line on the top half of the text.

The split line will always fall halfway between the baseline and heightline of your characters. However, this does not necessarily result in a split line halfway between the upper and lower extremities of your message. Remember that some characters extend beyond the baseline and heightline, such as lowercase letters with descenders and uppercase letters with accent marks. The system will execute these characters completely, but you must select a LETTER HEIGHT value and a tool starting position which will allow your message to fit on the material.

When using the HALF FONT mode, the following features are not available: ARC/ROTATE, REVERSE/SWAP, and SCALE FACTOR. No error will be generated if you attempt to use these features, but any values entered will be ignored. The JUSTIFY mode will be NONE. No other JUSTIFY modes are available for selection when using HALF FONT. If you attempt to use HALF FONT in Multiline, you will get an ERROR 04. You must be in Line 0 to use HALF FONT.

After completing HALF FONT drawing, you must toggle back until the display shows OFF to return to normal full-character execution.



## 17. AUTO NUMBER

When creating directories or doing architectural work such as room numbers, it is often necessary to produce extensive series of consecutive numbers in a uniform format. The AUTO NUMBER feature allows you to generate such numerical series automatically, using only a few keystrokes. You can specify any series between 0 and 999999 in any desired increments. This means you can produce series of even numbers, odd numbers, series progressing by fives, or tens, or by whatever increment you desire.

To use the AUTO NUMBER feature, press the AUTO NUMBER Function Key. The display will read START 000000. Enter the first number of your series. Press AUTO NUMBER again, to see END 000000. Enter the last number of your series. Press AUTO NUMBER one more time, and the display will read INC 000001. The INCREMENT value is preset to 1, which will produce consecutive numbers. You may enter any increment up to 999999. For example, if you want to produce all the even numbers from 20 to 50, your entries would be START 20, END 50, and INC 2. After entering the AUTO NUMBER values, specify any other parameters you want to define, such as FONT, LETTER HEIGHT, and SLANT.

When you press START, the numbers of your series will be executed in a vertical column, one below the other, moving toward the right end of the plotter. Be sure to position the tool near the left end of the plotter to allow for the height of the column. If the column of numbers is longer than 13 inches, which is the width limit of the plotter, you may wish to separate the series into shorter sets of numbers. For example, if you want to produce all of the numbers between 1 and 100, you could specify separate series of 1-25, 26-50, 51-75, and 76-100. You can use an X,Y MOVE to position each column for maximum material conservation. An alternative way to accommodate long series which exceed the width of the plotter is to use the AXIS-SWAP mode of the REVERSE/SWAP function. This allows you to produce as long a series as you desire without being limited by the 13-inch plotter width.

All of the REVERSE/SWAP modes function normally with AUTO NUMBER. You can also specify the LEFT, RIGHT, or CENTER Justification modes. However, the TYPE mode will not operate with the AUTO NUMBER feature. Other functions which will not operate with AUTO NUMBER are HALF FONT, ARC/ROTATE, and SCALE FACTOR. Every number executed by the AUTO NUMBER function will automatically have its own individual border.

The maximum value allowed for an AUTO NUMBER series is 999999. If you do not specify a START number or if you specify a START number which includes leading zeros, *all* numbers produced will be six places long with leading zeros included. For example, if you do not specify any START number, the first number in your series will be 000001. If you specify a series starting with 003, the first number will be 000003. To suppress leading zeros, be sure to enter a START number which does not include any leading zeros. If you specify a START number larger than the END number, the system will not warn you with an error message, but no numbers will be generated when you press START.

## 18. BORDER

The next Function Key is the BORDER key. The BORDER feature generates a rectangular border box around your entire text message, so that when you cut vinyl, the "weed" or scrap can easily be lifted from around the text. The border is always located .1 inch away from each side of the text message. When lowercase characters have descenders which extend below the baseline, or when characters or their accent marks extend above the heightline, the size of the border box is automatically increased accordingly. If you want to draw or cut a border, you *must* do so after executing your text message *before* moving the tool or material in any way. It is not possible to execute a border once the tool or material has been moved, whether you use an X,Y MOVE or press any of the directional arrow keys (the slew keys). The ERROR 06 message indicates that the system cannot execute a border because the tool has been moved away from the border reference point.

When working in single line mode, the border will enclose the entire line of text. If you select the TYPE Justification mode, the border will enclose the entire resulting block of text. When working in Multiline mode, the border will also enclose the entire resulting block of text. If text is rotated, the border will not rotate but will become taller to enclose the text.

**19. RESET**

The last Function Key in the top row, the one farthest to the right, is the RESET key. This is like an emergency stop switch and should be used whenever you have a problem. Press this key and hold it down until the plotter stops and the tool is raised. Using this button does not erase your entered text nor clear the other Function Key settings. However, it is not possible to restart the text message at the point where it was stopped. You must correct the problem, reposition the tool to a new start point, and execute the job again from the beginning.

The RESET key has an additional use in the Multiline mode. When you have finished executing a Multiline sign, you can press RESET while holding down either SHIFT key to clear all text and parameter settings for all lines. After pressing SHIFT/RESET, all parameters will be set to their initial conditions except that if you press SHIFT/RESET while in Multiline mode, you will remain in Multiline mode, returning to line 1. Pressing SHIFT/RESET in Line 0 has no effect on text or parameters.

## 20. LINE #

The LINE # feature of your Signmaker System allows the creation of multiple line graphic layouts. Each line can have its own settings for all of the various Signmaker parameters--such as FONT, LETTER HEIGHT, SLANT, SPACING, and even JUSTIFY. Once a Multiline job is entered, it can be drawn at its full size or at a reduced size by using the SCALE FACTOR key. Any feature of a Multiline graphic layout can be edited. Spelling mistakes can be corrected. The spacing calculated by the system can be modified; alternate fonts can be tried; the radius of any arc text can be altered, etc. Only when you are satisfied with every aspect of the final layout should you install vinyl or silk screen film in the plotter to cut the complete job.

In operation, the Signmaker System has two basic modes, single line and Multiline. When first powered up, your system will be in single line mode. Press the LINE # key located to the right of the four directional move keys, and the display will show LINE # 00/00. The first two digits indicate the line number you are working on currently. When this number is zero, you are in single line mode. The second two digits show the number of lines currently stored in Multiline mode. This number should be zero since we have not yet stored any lines.

In single line mode (Line 0), the parameter settings are not stored for later execution. The line is entered; it is drawn, pounced, or cut; and then the next line is entered. X,Y MOVE commands are executed as soon as RETURN or any other Function Key is pressed. The HALF FONT and AUTO NUMBER features will only operate in Line 0. Jobs executed in Line 0 cannot be stored using the JOB SAVE function.

In Multiline mode, all commands are stored in computer memory until you have entered all desired lines, when a single push of the START key will draw, pounce, or cut the entire job. Remember the basic rule: If the LINE # button displays 00 in the first two digits, you are in the single line mode. Any other number indicates that you are storing data for that line of a Multiline job. The Signmaker System will accept up to 99 lines. Each line can contain up to 250 characters. The total system storage available for Multiline text is 3,000 characters. The system itself

uses 25 characters for each line stored. Therefore, you can store  $3,000 - (25 \times N)$  characters where N equals the number of lines stored. As an example, on a 12-line sign you could use  $3,000 - (25 \times 12)$  or 2700 characters with not more than 250 characters in any one line. You will find that you seldom, if ever, reach these limits.

Line numbers can be selected any time the display shows the line number message **LINE # XX/XX**. To enter data for line 1, press **LINE #** and with the display showing **LINE # 00/00**, press 1, then press **RETURN** or any other Function Key. The display will show **READY**, awaiting text or parameter data for line 1. You can check what line number you are working on at any time simply by pressing the **LINE #** key. Select a font for line 1, enter a height, set any other parameters you wish, and then enter text for line 1. Now press the **LINE #** key followed by 2 and **RETURN**. You are now working in line 2 of 2. If you are not sure, press **LINE #**, and the display will show **LINE # 02/02**. You may now enter the text and parameters for line 2. Continue as above, entering each line of your Multiline job in sequence. You must enter lines sequentially. The system will display **ERROR 17** if you attempt to enter a line number out of sequence.

Each line contains a font selection, a height, text, etc., and can contain one **X,Y MOVE**. The **X,Y MOVE** function locates each line with respect to the previous line on the Multiline layout. Each line must contain an **X,Y MOVE**, or it will start wherever the previous line ends. Each line's **X,Y MOVE** is executed before the generation of its text. The **JUSTIFY** feature operates normally in Multiline mode. Using **LEFT**, **CENTER**, or **RIGHT** Justification to locate lines horizontally and an **X,Y MOVE** command with only a Y value to space lines vertically, is an efficient way to use the Multiline feature.

Parameters set in the first line will remain effective in each succeeding line until changed. A **LETTER HEIGHT** selected for the first line will be selected for all following lines until you change it. Once changed, it will remain as changed. An exception to this rule is the **ARC** feature. This feature can be used in Multiline, but **ARC** radius values entered for one line are not carried forward to other lines. Some features apply to the entire sign and should be specified before pressing **LINE #**. These include **SCALE** and **REVERSE/SWAP**.

Let us create the Multiline sign shown in Figure 24. Turn off the Signmaker System and, after a few seconds, turn it on again. This will clear all parameters to their initial conditions. Enter the Multiline mode by pressing LINE # and entering the number 1. Notice that there is no X,Y MOVE at the beginning of our sign because we will simply use the four direction move keys to locate the tool at the sign's starting point. It is certainly allowable to enter an X,Y MOVE to pre-position the tool if you so desire. To specify the sign shown in Figure 26, follow these steps:

<u>PRESS FUNCTION KEY:</u>	<u>ENTER (OR SELECT):</u>	<u>PRESS:</u>
1. LINE #	1	RETURN
2. FONT SELECT	0	RETURN
3. LETTER HEIGHT	1	RETURN
4. ENTER TEXT	MULTILINE	RETURN
5. JUSTIFY	CENTER	RETURN
6. ARC/ROTATE, Radius	12	RETURN
7. LINE #	2	RETURN
8. LETTER HEIGHT	.8	RETURN
9. ENTER TEXT	COMPLEX GRAPHICS	RETURN
10. X,Y MOVE	Y-2.5	RETURN
11. LINE #	3	RETURN
12.* ENTER TEXT	MADE EADY	RETURN
13. X,Y MOVE	Y-1	RETURN
14. LINE #	4	RETURN
15. LETTER HEIGHT	1.5	RETURN
16. ENTER TEXT	DEMONSTRATION	RETURN
17. X,Y MOVE	Y-4.0	RETURN
18. ARC/ROTATE, Radius	-12	RETURN

Position the tool about 1 inch from the top edge of the material and press SHIFT/START. The result should look like the example in Figure 24. Notice that each X,Y MOVE value is equal to the blank space between a pair of lines *plus* the LETTER HEIGHT value of the second line of the pair.

\* The EADY spelling error is intentional so that later we can show how these errors are corrected.

This is not bad for a first attempt, but the layout could certainly be improved (not to mention the spelling). The real advantage of the Signmaker System's Multiline mode now becomes apparent: editing.

Any line of a Multiline layout can have any or all of its parameters and text changed at will. To edit, select the line number, change one or more items in that line, and either redraw or move to the next line to be edited. When entering a *new* job in Multiline, you must proceed sequentially line by line starting with line 1. No such restriction applies once the lines are entered and you wish to edit them. You can select any previously entered line. If you select the line number following the highest number saved, you are adding a new line to the job. Select a line number higher than that and you will get an **ERROR 17**. Also, when you first enter a Multiline job, the parameters you set for the first line, such as **FONT**, **HEIGHT**, and **SLANT**, will retain those settings for each succeeding line until you change them. When editing, this rule does not apply, so you can change a parameter on one line without having it changed on all succeeding lines.

The Multiline layout of Figure 24 can be greatly improved by using these editing capabilities. Let us correct the spelling error in line 3 first. Press the **LINE #** key, enter 3, and press **RETURN**. Press **ENTER TEXT**. Use the keyboard key with the left arrow on it to scroll the text message left until the display reads **MADE EA**. If you scroll too far, use the right arrow keyboard key to go back the other way. Enter an **S**. This will overwrite the **D** which was entered before. Then either scroll left to display the **Y**, or reenter it. When the full message is visible in the display, press **RETURN** to complete your first edit.

Next we will try to improve the overall layout. We will move **COMPLEX GRAPHICS** down 1.5 inches, increase the space between the second and third lines by 3/4 inch, and reduce the amount of curvature in the word **DEMONSTRATION**. Press the **LINE #** key and enter 2. Press the **X,Y MOVE** key. You will see the present entry **X0Y-2.5** in the display. Enter **Y-4.0**. When editing **X,Y MOVE** values, it is only necessary to enter the value you wish to change since the other value, when there is one, will remain the same. Then press the **LINE #** key and enter 3. Press the **X,Y MOVE** key. The display will read **X0Y-1**. Enter **Y-1.75** to replace the **Y MOVE** of **Y-1**. Press the **LINE #** key one last time, and enter 4. Press **ARC/**



ROTATE. The display will read **RADIUS = -12**. To decrease the curvature, we need a *larger* radius. We will enter **-20**. Remember to include the minus sign since this is a negative arc. Press **RETURN**. Now we can draw our edited version of the layout. To save time and paper, we can draw it at a reduced size using the **SCALE FACTOR** key. Press **SCALE FACTOR** until **1/2** shows in the display and press **RETURN**. Now press **SHIFT/START**. The result should look like Figure 25. We may decide that even though it looks better, the word **DEMONSTRATION** is still too low. Select line 4 and press the **X,Y MOVE** key. The display will show our original entry of **X0Y-4**. Enter a new **Y MOVE** value of **Y-2**. This will produce the final result shown in Figure 26.

After a Multiline layout like the one just created has been entered into memory, you can revert to single line mode, use all of the machine features, and return to the stored Multiline job. When you select **Line 0**, the currently selected line of the Multiline job will be transferred into the single line memory. You may use this feature to select and draw individual lines from a Multiline job. Press the **LINE #** Function Key followed by the line number you wish to draw. Press **RETURN**. Now press **LINE #** again followed by **0** and **RETURN**. This sequence will copy the selected line into the single line memory. You can now draw it individually with **START** or **SHIFT/START**. The contents of the Multiline job have not been altered. You have merely copied one line from the Multiline job. You can edit the **Line 0** copy as desired, but you cannot copy an edited version back into your Multiline job. Instead, you must select the original line number and reenter the edits. From single line mode, you can select any valid line number in the stored Multiline text to return to the Multiline job. The text in **Line 0** will be lost when you return to the Multiline mode.

Lines stored in Multiline mode do not need to be spaced downward sequentially as in this example. This is controlled by the **X,Y MOVE** used. For instance, you could enter the word **DEMONSTRATION** on line 2, **COMPLEX GRAPHICS** as line 3, and **MADE EASY** as line 4 by using appropriate **X,Y MOVES**. In addition, Multiline mode can be used to enter more than one job at a time. Having completed the layout of Figure 26, we could add a new sign to the same job. On line 5, enter an **X,Y MOVE** value to position the tool at the beginning of the next sign, then proceed with the new sign's specifications.

When you have finished with a Multiline layout, you can clear it from the memory and reset all of the parameters to their initial conditions by pressing RESET while holding down either SHIFT key. If you fail to do this and begin work on a new Multiline layout, the system will think you are still editing the old one. Worse yet, if your new job has fewer lines than the previous one, the higher numbered lines from the first job will be added to your new job which is certainly not what you intend. Therefore, use SHIFT/RESET to flush out the old job before starting a new one. In special cases where you wish to create several similar, but slightly different jobs, you may wish to edit one job in order to create the next, entering only the changes, instead of clearing each job and entering the next one entirely from scratch.

**MULTI-LINE**  
**COMPLEX GRAPHICS**  
**MADE EADY**  
**DEMONSTRATION**

**Figure 24**

**MULTI-LINE**  
**COMPLEX GRAPHICS**  
**MADE EASY**  
**DEMONSTRATION**

**Figure 25**

**MULTI-LINE**  
**COMPLEX GRAPHICS**  
**MADE EASY**  
**DEMONSTRATION**

**4.22. MODE**

The key immediately below LINE NUMBER is active only when a GDS (Graphix Design Station) digitizing system is installed. The Signmaker IVB is fully compatible with this optional system. Refer to the standard GDS manuals for instructions on the use of this key. **ERROR 04** is displayed if this key is pressed without a GDS System installed.

**4.23. JOB SAVE**

At the bottom of the right-hand array of three Function Keys is the JOB SAVE key. This function is reserved for use with the GDS/JOB SAVE and DSRM/JOB SAVE options. GSP SPRINT JOB SAVE Disks are not interchangeable with GSP SIGNMAKER/GRAPHIX JOB SAVE Disks even when they are created on the same GDS or DSRM option. Jobs saved using the GSP Signmaker/Graphix System can only be recalled into that system. The operation of this Function Key is explained in the manuals for these options. **ERROR 04** is displayed if neither a GDS or DSRM is installed.

This completes our detailed description of the Signmaker System Function Keys. The next section will discuss techniques for pouncing and for cutting vinyl.

At the back of this manual, you will find a printed Reference Card with a brief description of each key and a list of Error Codes. If you have a problem, we suggest you refer to this card before resorting to the detailed Function Key descriptions. Many users find it helpful to remove the Reference Card and keep it handy at the machine.

## V. POUNCING AND VINYL CUTTING

The versatility of the Signmaker System allows you to perforate paper patterns (pouncing) and to cut text messages in a wide variety of self-adhesive materials. So far in this manual we have limited our testing to ball point pen on paper. Now we will pounce patterns and then cut vinyl letters.

### A. POUNCING

Remove the ball point pen holder. Return the pen to the tool storage rack and select the pounce wheel. The pounce wheel is designed to allow you to pounce paper with the wheel either perfectly aligned in the direction of travel or at 11 degrees to the direction of travel. Using the pounce wheel in the straight position produces small holes best suited for pouncing lightweight paper or for light dusting applications. Using the pounce wheel in the angled position causes the points to drag slightly as the wheel moves forward, producing larger, slightly elongated holes, well suited for pouncing heavy or clay-coated paper and for bold dusting applications. In the straight position, the wheel works best at reduced plotting speeds, while the angled wheel position produces distinct holes at any plotting rate up to full speed.

The pounce wheel has two keyway slots on the barrel. One keyway holds the wheel in the straight position in the tool carriage, and the other holds the tool at eleven degrees to the direction of travel. When you wish to use the pounce wheel, examine the base of the tool to determine which keyway corresponds to the position you wish to use. The straight position keyway is located at ninety degrees to the direction of the tool, and the angled keyway is located off center on the opposite side of the barrel. Hold the pounce wheel upright over the tool carriage and rotate it until the keyway is oriented above the protruding key inside the tool carriage. Lower the pounce wheel into the tool carriage. Check the tool position by looking under the carriage to make sure the wheel is oriented at the desired angle.

An initial weight is built into the pounce wheel since pouncing pressures are generally higher than drawing or cutting. You may also wish to add additional weight, depending on the thickness of paper being used. You may need to make a new test runs with your own materials and pounce wheels. Stackable tool weights, shown in Figure 27, are provided for this purpose. Use one or two of these as required with heavier papers to obtain crisp pounced holes.

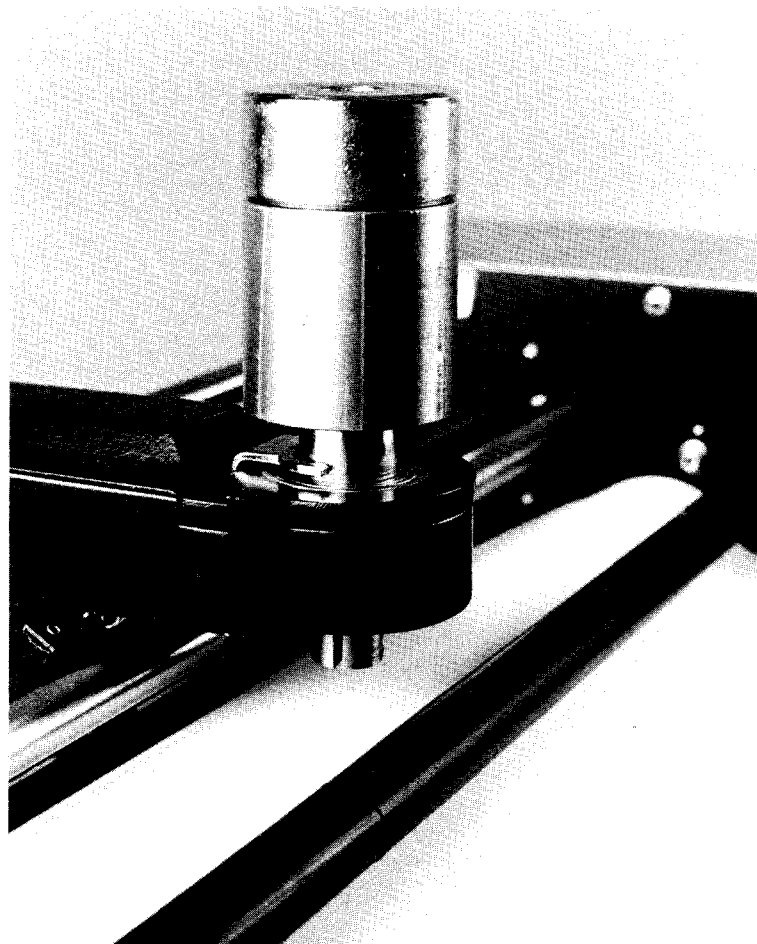


With the wheel installed at the desired angle and the weight load adjusted, enter some text and press START. Do *not* press SHIFT and START as you have been doing for drawing with the pen. This will move the pounce wheel sideways rather than always rotating it to point in the direction of motion. Remove the sheet of pounced text from the machine and inspect the holes. Try a test using a sample job.

You may want to try pouncing the text in reverse with the AXIS SWAP Function. Then turn the pattern over before locating it on the sign. This gives you a much smoother surface against the sign face. All the tiny mounds raised by the pounce wheel teeth are now facing up instead of holding the pattern off the work surface. You may wish to use sandpaper to remove the tiny mounds to give you a smoother surface on both sides of the material.

The Signmaker System can also draw and pounce the same message to produce a pounced sign pattern which is also easy to read. Always draw first, then pounce. Otherwise the ball pen will close up the holes. With the JUSTIFY mode set to RIGHT, CENTER, or LEFT, a single text line can be repeated in exact registration each time it is plotted. First install the pen and draw your text line. Then install the pounce wheel, add load weights as desired, and START again. The pounced line will be executed exactly over the drawn line.

One pounce wheel is supplied installed in a tool holder, and a spare wheel is included in the Accessory Kit. New wheels are easily installed by removing the shoulder screw which serves as the wheel's axle. Position the new wheel and replace the axle screw.

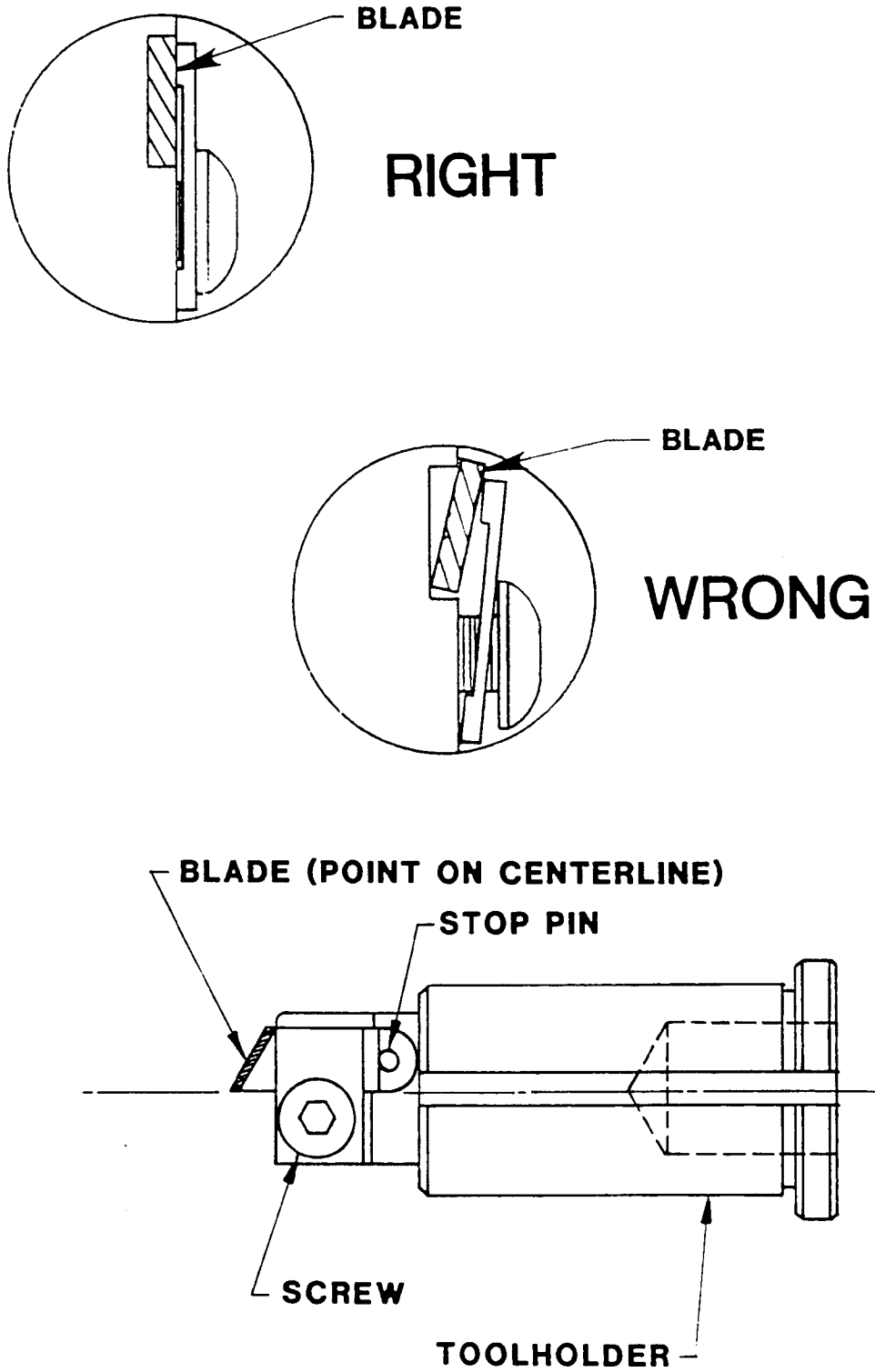


## B. KNIFE CUTTING

Each Signmaker System comes with a sample length of adhesive-backed vinyl. In addition to reflective and metallic materials, both cast and calendered vinyls are available from your dealer in a wide range of colors. They are supplied in 10-yard and 50-yard rolls. Always insist on genuine GSP authorized Signmaker films as only these products have been specially formulated to produce the highest quality output from your system. Depending on your vinyl lettering application, you may select GSP High Performance cast material or our intermediate grade, lower cost, calendered films. When cutting small letters with heights below 1 inch, always use the higher quality cast film to assure trouble-free operation. With small letter heights, the difference in material cost is insignificant, and you will find that the GSP High Performance film produces superior results.

Three carbide knife blades are included with your Signmaker System, one installed in the knife tool holder and two spares. Additional blades are available from your dealer. These blades are extremely wear resistant. Over 10,000 one-inch letters have been cut using a single blade before testing was discontinued with the blade still cutting satisfactorily. However, although they have a long cutting life, these carbide blades are very brittle and will be ruined by the slightest chip on the cutting tip. Therefore, use extreme care not to drop the blade or bump the tip while handling. When installing the knife tool holder, *carefully* lower it into place. **DO NOT STRIKE THE TIP AGAINST THE BARREL OF THE TOOL HOLDER DURING INSTALLATION.** A chipped blade will not cut cleanly. Knife blades can not be resharpened because they are ground to a controlled length. When a blade no longer produces satisfactory cutting, it must be discarded.

To change a blade, loosen the clamp screw with the Allen wrench (cross tip wrench) provided and pull out the old blade. The same wrench is used for changing pens. Slide in the replacement blade being sure that the point of the blade is turned toward the center of the tool holder as shown in Figure 28. Be sure the blade is seated in the slot provided and not riding up on either edge. Also, make sure the blade rests firmly against the stop pin. This pin is precisely located with respect to the shoulder at the bottom of the tool holder. Since the blade length is closely controlled, no other adjustment is required. When the blade is properly installed, retighten the clamp screw.



To cut vinyl, start by removing the paper you have been using for drawing and pouncing from the plotter. Cut off any used portion of the paper and run the remainder out of the machine by using the directional move keys or the X,Y MOVE command. Open the bail arms and mount the vinyl in the plotter following the procedure in Section IIIA. After mounting the vinyl, remove the pen or pounce wheel from the tool holder and *carefully* install the knife. Rotate the tool holder until it falls easily into the carriage.

Before cutting vinyl, determine the proper tool weight load for the material you wish to use. The proper weight load is critical to cutting quality. Too much weight will cause the knife to cut through the backing material. If the weight is not sufficient, the letters will not be cut completely and the "weed" will not pull away cleanly. The best weight for any given material must be determined experimentally. To avoid wasting material, be sure to test each new material to determine the proper weight loads. Cast vinyls require less pressure (try weight number 3) than calendered vinyls. Reflective vinyls require considerably more weight. Reducing the cutting speed by using the SPEED key can also help with hard-to-cut materials.

At the factory, the word TEST is cut at a height of 1 inch in Font 0 as a standard test. This uses only a small amount of material and provides a good test of cutting quality. Place weight number 3 on top of the knife holder. Use the slew keys to locate the tool about one inch from the right end stop of the plotter. Select Font 0 and specify a LETTER HEIGHT value of 1. Press ENTER TEXT and enter the word TEST. Press the JUSTIFY key until LEFT appears in the display. Press the REVERSE/SWAP key until AXIS SWAP appears in the display. Then press START. Immediately after the plotter finishes cutting, press the BORDER key. Do not touch the slew keys before executing the border. After the border has been cut, press the X,Y MOVE key and enter a Y value of Y20. Press START to cut the word TEST again. Press BORDER immediately.

After the border has been cut, use the directional keys to feed the material to the left until the bordered words are free of the plotter. Using the tweezers supplied with the accessory kit, grasp a corner of the "weed" and slowly, carefully peel it up, leaving the letters on the backing paper. Pulling from right to left usually works best because many letters such as E and F are oriented with projections to

the rights. Some letters such as S have fingers of weed coming from both directions and require special care. Some users prefer to remove the weed from top to bottom.

Should you have difficulty lifting the weed cleanly, without lifting letters, increase the cutting pressure by adding more weight. When the weight is adjusted correctly, the weed should strip off cleanly without lifting any letters, and the backing should not be cut through. Characters smaller than 1 inch in height may require a little more weight than large characters. Larger letters have enough surface area to grip the backing more securely so the weed pulls cleanly over a much wider range of weight settings. For this reason, we recommend testing cutting pressures with a test word at about 1 inch in height. If you expect to cut small letters most of the time, you may want to test cutting weights with smaller letters. If you experience difficulty in weeding Multiline messages, you may wish to use a razor blade or knife to cut the vinyl between the lines. This will create a separate weed area for each line enabling you to weed one line at a time.

Once the correct weight load combination has been established, you should not need to change it for thousands of characters. We recommend keeping a log book of the weight loads for each kind of material with a new knife blade. After cutting many thousands of characters, the knife blade will dull slightly. You will have to add more weight to maintain the same cutting quality. If you notice a sudden decline in cutting quality, the knife blade is probably chipped. Adjusting the weight load may help, but you will probably have to change the blade. Blade wear, unlike blade damage, is always a very gradual process which only requires weight correction over a period of many days or even weeks of use. Spare blades are included with your accessory kit.

After you cut a sign and have removed the weed, apply prespacing or application tape. These tapes are available from Gerber Scientific Products in a variety of widths. The narrowest width, 1 1/4 inch, is a high tack application tape designed for the small surface area of letters 1 inch or less in height. Intermediate widths are available in widths of 2 1/4, 3 1/4, and 4 1/4 inches designed to apply conveniently over letters of 2, 3, and 4 inches in height. These widths of "ST" grade prespacing tape have a medium tack intended for use with these letter heights. "CT" application tapes are stocked in widths of 6 1/2, 8 1/2, 10 1/2, 12 1/2, and 14 inches

and have a lower tack adhesive compatible with the larger surface areas of larger letters. Because of this graduation of adhesive strengths, it is not advisable to purchase only the wider tape and cut it down for use with smaller letter sizes.

After applying the lifting tape to the letter surface, use the plastic squeegee supplied with each Signmaker System to press the tape firmly against the letter surface. Then lift the tape and letters together from the backing paper either by lifting the tape at a very shallow angle or by removing the material from the plotter, turning it upside down, and peeling up the backing paper at a very sharp angle. Once the backing has been removed, you may apply the prespaced text directly to the final surface, or you may apply a clear release film to protect the adhesive for application at a later time. These release films are stocked by GSP in widths of 2, 4, 6, 10, and 14 inches. For a special reverse effect, you can lift out the letters themselves, press the application tape to the remaining "surround," and transfer the surround to the finished sign.

For very small letters, below 1/2 inch in height, there is an alternative transfer procedure preferred by many operators. We suggest trying both systems and choosing the one you prefer. After cutting your text letters on the Signmaker System, do not use the BORDER operation. Pull the centers from the "O's," "P's," etc. Then apply the lifting tape directly over the cut letters, squeegee it down, and lift the letters out of the surround. For this technique, you may need a more aggressive lifting tape such as "Scotch" brand #230 Drafting Tape which is locally available at any drafting supply dealer. This technique eliminates the need to remove the weed from around small letters since only the letter centers need to be picked out.

A useful variation of this technique is to use ordinary transparent tape such as "Scotch" brand #810 or #600 (clear) for the lifting tape. Apply the letters and tape to the final surface and leave the transparent tape as a permanent protective shield over the letters. This method is particularly useful in graphic arts and engineering graphics applications.

This section offers some basic vinyl cutting techniques together with a few hints or tricks we recommend. As you use your Signmaker System, you will soon develop your own methods and shortcuts for your particular materials and jobs.



## VI. SERVICE AND MAINTENANCE

### 1. SELF-TEST MODES

Every time you turn on power to the Signmaker System, it will automatically perform a number of diagnostic self tests. The system will beep upon the successful completion of each test section. After successfully completing all three of the control tests, the system will proceed to testing fonts. During font testing, the font slot number currently being tested will be displayed. Following testing of the last font, the system will issue one final beep, and the program name and copyright notice will scroll across the display. The system will conclude its self-test mode with the **READY** message in the display, indicating that the unit is now ready for use.

With a properly functioning system, every time you switch the power on you will hear three beeps in quick succession. If the machine fails to produce this normal beep pattern, you probably have a system logic failure. Before you call for service, try to determine which test is failing by counting the number of beeps you hear when you turn the system off and on again. If one of the three control tests fails, the system will attempt the test indefinitely, never generating a beep, and the scrolling message will never appear in the display. If this happens, contact your dealer or call 1-800-5406. In the Connecticut 203 area code, call 643-1515. If a font test fails, the display will show **FEn** with *n* being the number of the defective font. You may commence normal operation, exclusive of this font, by pressing **ESCAPE**.

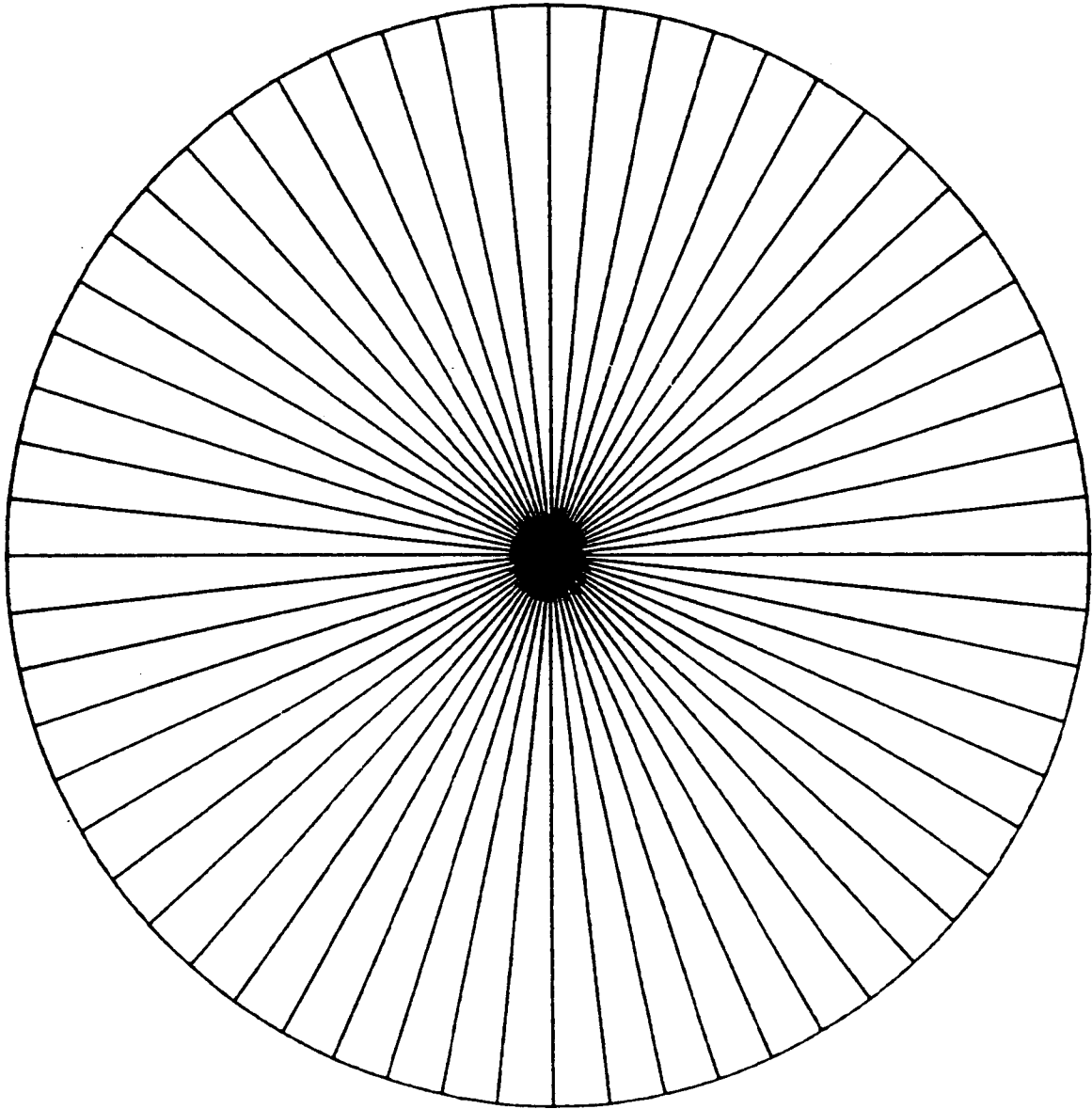
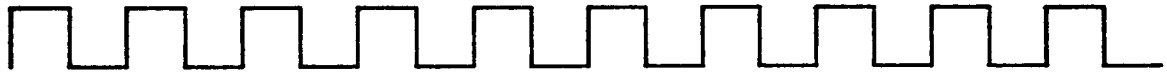
In addition to the self-tests run by the system, there is a separate set of operator-specified diagnostic tests included in the Signmaker System. Tests are provided for the LED display, for the keyboard, and for the fonts. These operator tests can be accessed whenever the initial power-up **READY** message shows in the display. With **READY** displayed, press the **RESET** Function Key. First the system will test the display by alternately turning all dots of each character on and off. Next, the display will read **KEY** indicating that the system is ready for keyboard testing. You may test any or all of the keyboard keys by pressing each in turn and listening for a beep indicating that the key is working. When you wish to terminate keyboard testing, press **ESCAPE**, and the display will show **T A** telling you that you are in the

operator test mode. At this point you may enter a number from the following list to select the test you wish to run.

- 1 Display Test
- 2 Keyboard Test
- 3 Font Test

After entering the number, press RETURN. The display and keyboard tests have already been described and may be run again. The Font Test is the same as that run by the system upon power up, which tests each font installed while displaying its number and signals each successful test with a beep. As before, if a font fails, the display will tell you the number of the defective font with the FEn error message. Press RETURN to resume testing with the next font. If you press ESCAPE, font testing will be discontinued and the system will offer other test selections by displaying the T A message. To terminate the testing mode, press ESCAPE when the T A is in the display. The system will indicate that it is ready for normal operation by showing READY in the display.

There is also a separate test routine which is a self-contained test pattern to be drawn on the plotter. This test pattern is contained in Font 0 so you must always select Font 0 and the display must read READY before attempting to run it. To execute this test, press ENTER TEXT. Then hold down the ACCENT key located just below RETURN and press the period (.) key. The display will show a solid block character. Press START to cut the test pattern shown in Figure 29. Use SHIFT/START to draw the pattern without knife rotation. The height, slant, and length of the test pattern may be changed by using the appropriate Function Keys. When these parameters are set to their initial values, the test pattern will be approximately 1.1 inch wide and 1 inch high. The starting point is at the lower left corner so be sure to pre-position the pen to allow enough room to draw the test.



## 2. SERVICE AND MAINTENANCE

Wherever possible in this manual, we have included suggestions to help you efficiently produce artwork of the highest quality. During the lifetime of a Signmaker System, it may be necessary to make small adjustments in the field. Field adjustments can save a lot of time and money and allow you to use your Signmaker equipment to its fullest capacity. Do not be afraid to do service procedures yourself. You will be assured of continued satisfaction with your Signmaker System. As new service techniques and procedures are developed and new operating hints and suggestions arise, factory-registered owners will receive them through the mail in the form of Service Bulletins.

Often what appears to be a system failure is merely the result of a power surge to the microprocessor memory. This condition is usually indicated by a failure of the system to respond normally to keyboard commands by an unusual display of information or by the plotter halting in the middle of executing a message. To remedy the situation, turn off the system power at the main power on the rear of the console. Wait five or ten seconds, then turn the power back on. Each time you turn on the main power, the system will automatically clear and reload its memory and execute the self-diagnostic tests described in Section 1. This simple procedure will often "fix" an apparent system failure.

Keep your tool spindle clean by wiping it with a soft, lint-free cloth and spraying it with a silicon lubricant. Dust, hair, and other debris can greatly affect tool performance and letter quality.

In the unlikely event that you should require major service, contact the Field Service Department for assistance. Tell the operator that you are a Signmaker owner and need Field Service assistance.

Before contacting the factory, write down your problem. You should know what steps preceded the problem and what function selections you were trying to use at the time. The Field Service technician will talk you through a trouble-shooting procedure to determine the extent of your problem. The technician may recommend

adjustments for you to make 'yourself' or may request that you return all or part of your Signmaker System to the factory for service.

*NOTE: ONLY SHIP SIGNMAKER EQUIPMENT IN THE ORIGINAL SHIPPING CARTONS. ALL FONT CARDS AND PROGRAM MODULES MUST BE REMOVED BEFORE SHIPMENT.*

If it is determined that your main computer control board is faulty, the board alone may be returned to the factory for service. In this case, the technician will instruct you to remove the main control board from the console and ship it to the factory. The circuit board must be shipped in a special protective mailer, or it may sustain further damage in shipping. Special mailing cartons are available from your dealer or from the factory on request. Packing instructions come with the mailers. *NOTE: DO NOT SHIP ANY COMPONENTS BACK TO THE FACTORY WITHOUT SPECIFIC INSTRUCTIONS FROM A FACTORY-AUTHORIZED TECHNICIAN. DO NOT SHIP CONTROL BOARDS BACK WITHOUT PACKING THEM IN THE SPECIAL PROTECTIVE MAILERS!*

To remove the main control board from the console, turn off the system power and unplug the main power cord. Open the console access hatch cover and disconnect the three plotter cable connectors, J10, J11, and P511. Refer to the Plotter Installation instructions in Section II for the location of these connectors. Remove the plotter cable from the console by feeding it out through the cable trough and out through the cable slot at the back corner of the console cover. Remove the plotter from the top of the console and set it aside. Be sure to rest the plotter on its side or on a table edge, *not* on the plotter cable. Remove the console cover from its frame by removing the two screws on each side of the console. Hold the cover at the front and back and lift it straight up. Be careful when handling the console cover. It is large and flexible, and you can damage it if you only lift it on one side or treat it roughly. Set the cover aside.

Touch the steel frame of the console to ground yourself, then remove any fonts in stalled in the font slots. Carefully return them to their original antistatic packaging material. *NOTE: DO NOT TOUCH THE GOLD EDGE CONNECTORS.*

Three additional connectors, shown in Figure 30, must be disconnected before removing the control board. First, remove connector J9 located in the back left corner of the control board. There is a locking clip on the front side of the connector which must be held forward in order to remove the connector. Use two or three fingers of one hand to hold the locking clip forward while gripping the connector, NOT the wires, with the other hand. Lift the connector straight up to remove it. There are two small connectors, J12 and J13, at the right edge of the board which should be removed next. Each of these connectors has a locking clip. Squeeze the open end of the locking clip to release the mating connector. DO NOT pull on the connector wires. Only grip the connectors themselves.

After removing the three connectors, remove the ten screws which hold the control board on the console frame. If you drop a screw, FIND IT! If you try to operate the system with loose hardware below or on top of the control board, your console could be seriously damaged. Also remove the two hex standoffs at the front edge of the board. These can be removed with a wrench. Keep all the screws and the standoffs together so you can remount the board when it returns from the factory.

The board can now be removed from the frame. Always hold the board securely with two hands. *CAUTION: DO NOT flex the board.* Lift it straight up and carefully pack it in the mailer supplied to you by your dealer or the factory. Be sure to follow the packing and shipping instructions included with the mailer.

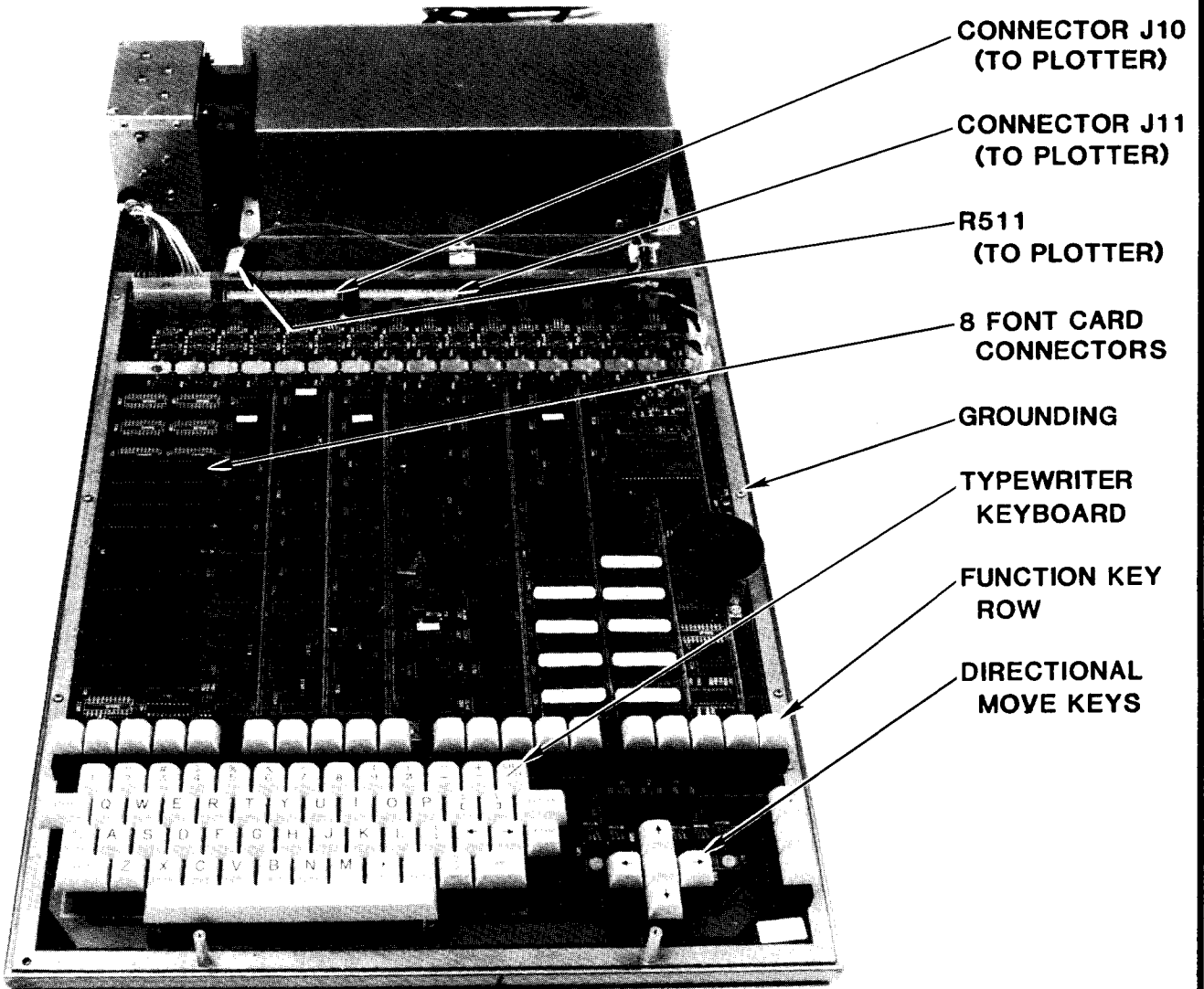
After the control board has been serviced and returns from the factory, remember to ground yourself before removing it from the factory shipping container. Place the board on the console frame. LOOSELY reinstall all ten screws and the two hex standoffs. DO NOT tighten the screws and standoffs at this time. DO NOT connect the system power cord or reinstall any connectors on the board. The control board must be properly positioned inside the console before making any further connections.

While the control board is still loosely mounted, install the console cover. Securely install the two screws on each side of the console to hold the cover in place. *NOTE: The console keyboard MUST clear the console cover. EVERY key MUST move freely or the console will not function.* Remove the console access hatch cover. Reach inside the access hatch and shift the control board until all keys clear the cutouts in the cover without sticking in any way.

Only when the console keys move freely, reach inside the access hatch with a long screwdriver and tighten any two control board mounting screws to hold the control board securely in place. Remove the four console cover screws and lift the console cover from the console frame. Tighten the two hex standoffs and the remaining eight control board mounting screws. Place the console cover over the frame and loosely insert the four mounting screws to make sure the console keys still move freely.

When the control board is properly positioned, remove the console cover and reinstall connectors J9, J12, and J13, shown in Figure 30. Install connector J9 first. Although there is a locking clip on the front side of this connector, it is not necessary to move the locking clip to install the connector. Simply position the mating connector with the side marked J9 forward and press it firmly into place. The two small connectors on the right edge of the board, J12 and J13, can be reinstalled in the same way. Their locking clips will open when you press the mating connectors into place. Connectors J12 and J13 are different sizes so can only be connected to their correct mating connector.

Last, reinstall the console cover and its four mounting screws. Check the keyboard again to make sure every key is free to function properly. Check the Function Keys, the directional move keys (the slew keys), and the three keys at the right edge of the console as well as the main keyboard. Refer to Section II for instructions for reinstalling the plotter. *CAUTION: DO NOT connect the system power cord until after reinstalling the plotter connectors and all font cards.* Remember to use the same precautions you observed when your system was new; it essentially is!





### 3. PLOTTER CLEANING AND LUBRICATION

This section includes instructions for routine cleaning and lubrication of your Signmaker IVB. Procedures for checking the factory set adjustments are also included. If the plotter is not functioning properly, first clean and lubricate it according to the instructions which follow. If the plotter still does not function correctly, refer to the section for trouble-shooting and adjustment procedures, which describes how to check certain adjustments. **DO NOT ATTEMPT TO MAKE ANY CORRECTIONS IF DISCREPANCIES ARE FOUND. CALL THE GSP FIELD SERVICE DEPARTMENT FOR ASSISTANCE AT 800-828-5406.**

#### 3.1 CLEANING

The pen, knife, and pounce wheel tool holders fit the plotter spindle bore with an extremely tight tolerance. Any dirt or lubricant build-up on the bore or on the tool holders can produce erratic cutting by restricting the tool's free motion up and down. Clean the spindle bore and tool holders with alcohol using a lint-free cloth on the tool holders and a cotton swab in the bore. Lubricate with a small amount of silicon spray. *DO NOT USE OIL TO LUBRICATE THE TOOL HOLDER.*

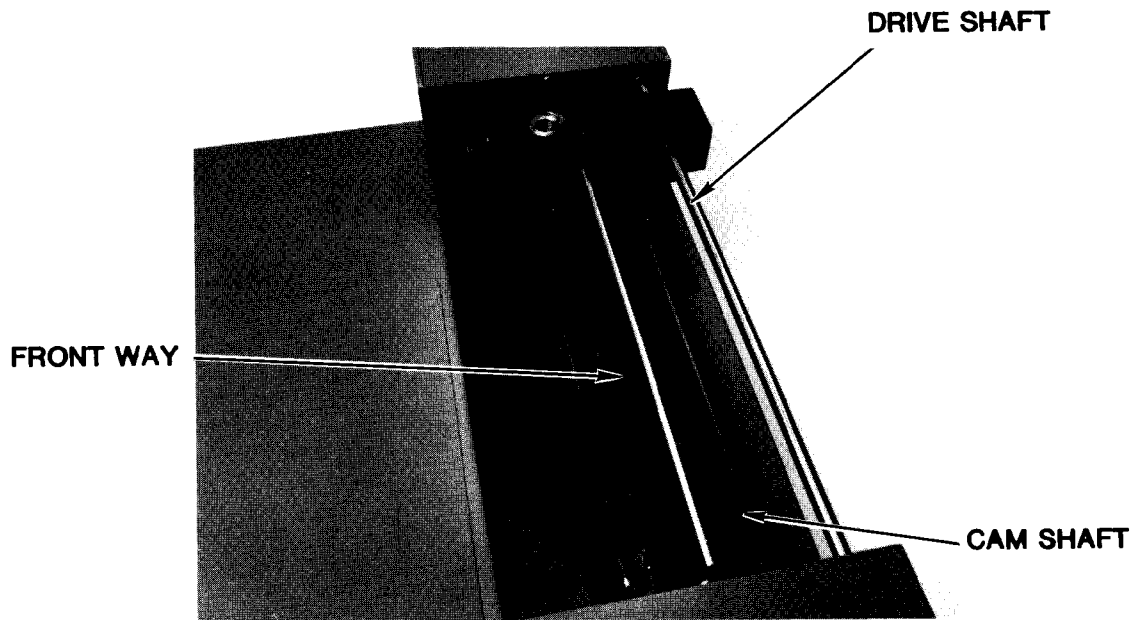
Using a lint-free cloth, wipe any dust or debris from the drive shaft, front way, and cam shaft shown in Figure 31. Move the carriage manually to gain access to the entire length of these shafts. Visually inspect for any vinyl pieces which may be adhered to these components. Alcohol may be used to clean excessively dirty parts. *NOTE: If alcohol is used, parts must be lubricated immediately to prevent corrosion as described in Section 3.2.*

When using vinyl films, adhesive tends to build up around the teeth of the drum sprockets. If the accumulation becomes excessive, the sprockets must be cleaned or tracking problems will result. A small stiff brush, such as a toothbrush, dipped in alcohol works well as shown in Figure 32. Dry the sprockets and the drum using a lint-free cloth immediately after using alcohol to clean them.

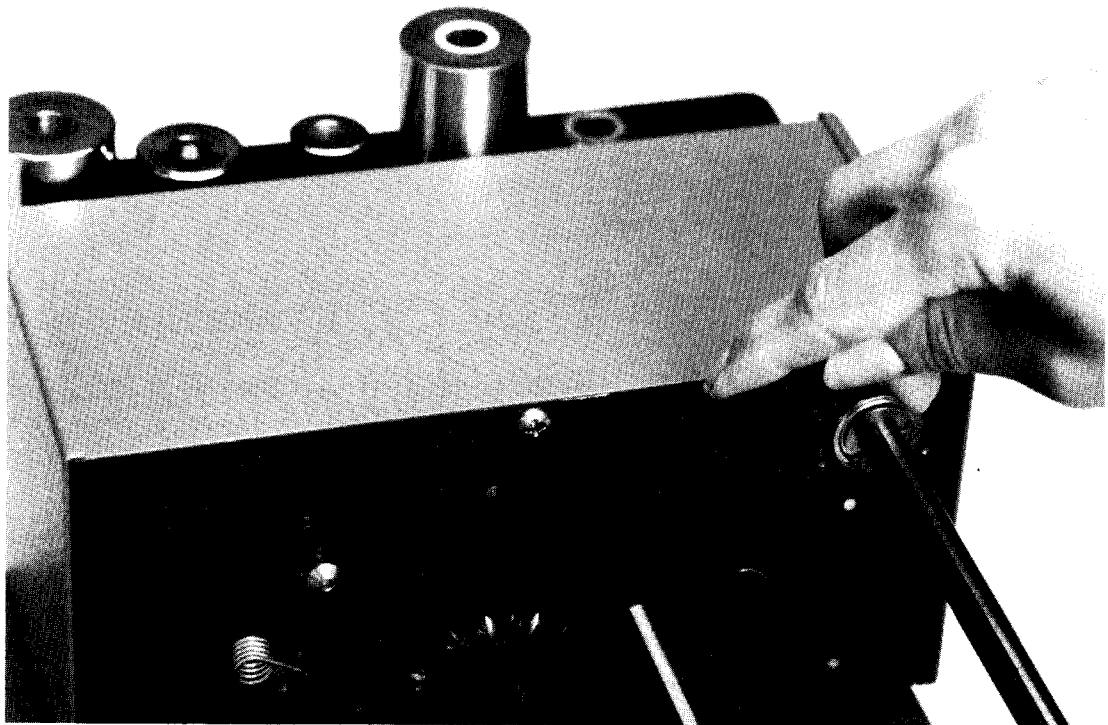
### 3.2 LUBRICATION

*NOTE: All lubrication should be done with a light oil such as 3-in-1 household oil.*

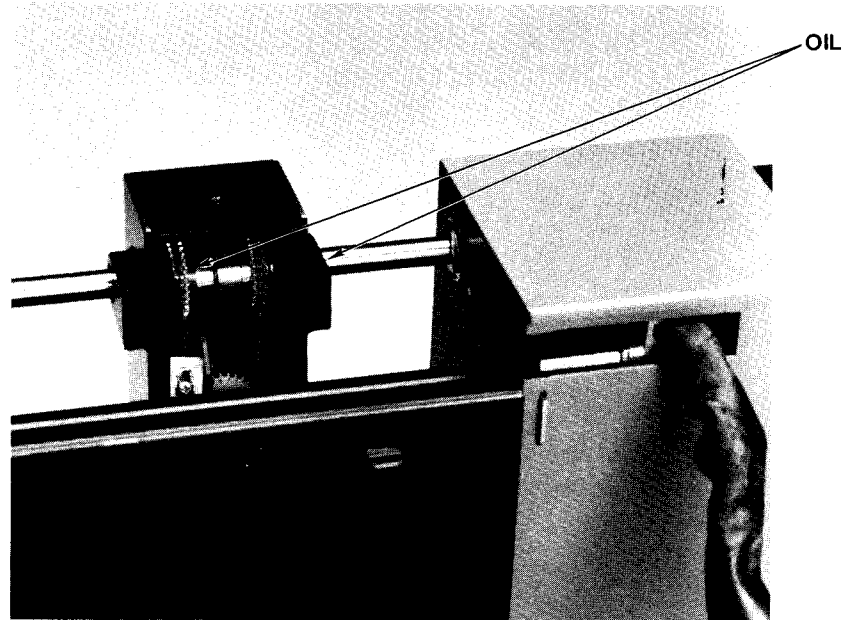
The rear way, front way, and cam shaft shown in Figure 31 should be given a light coat of oil. This is best done by applying it with a lint-free cloth. Tip the plotter on its side. Place one or two drops of oil on each side of the ball bushing as shown in Figure 33. Place one drop of oil in each pin of the sliding sprocket shown in Figure 33. Slide the sprocket back and forth to work the oil into bushings. Oil the bail arm pins as shown in Figure 34. *DO NOT OVER OIL!*



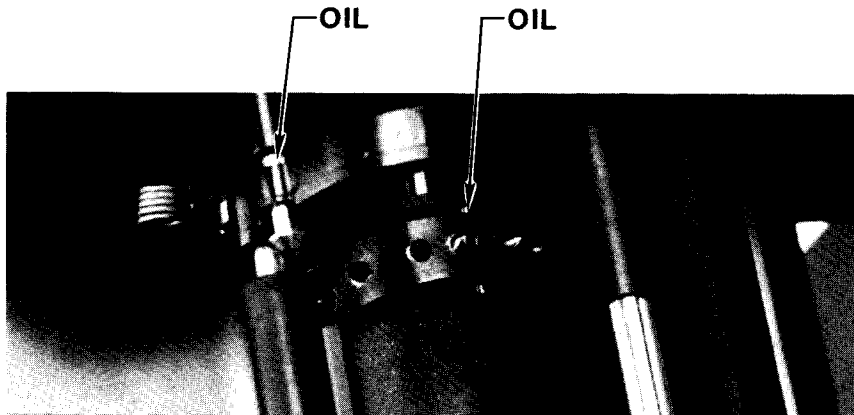
**Figure 31**



**Figure 32**



**Figure 33**



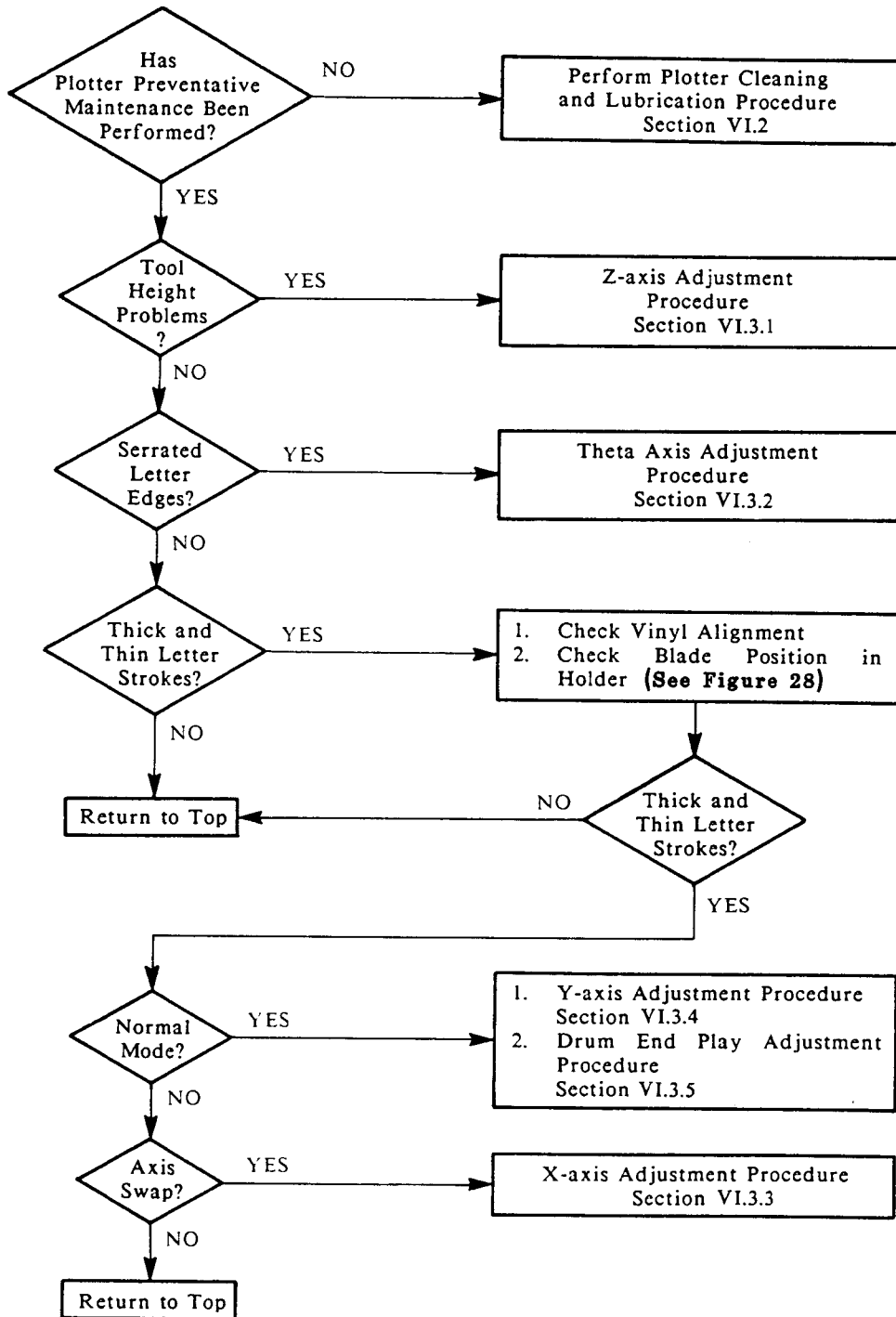
#### 4. PLOTTER ADJUSTMENT PROCEDURES

This trouble-shooting guide will help you to identify your possible problem according to the symptoms displayed by your system, to verify the problem by following a check procedure, and to remedy the problem by following an adjustment procedure. *CAUTION: Please read each procedure completely BEFORE performing the procedure.* If you have any questions before or during execution of the procedure, contact GSP Field Service at 1-800-828-5406.

**WARNING:** GSP warranties do not cover unauthorized repair on Signmaker IVB equipment. Some service procedures require delicate adjustment of Signmaker IVB plotter parts. If damage to your Signmaker IVB equipment results from improper unauthorized service, repair will NOT be covered by any GSP warranty.

Table II is a chart of symptoms designed to help you identify the possible problem and to direct you to the most probable adjustment procedure.

**TABLE II  
PLOTTER PROBLEM SYMPTOMS**



#### 4.1 Z AXIS (TOOL HEIGHT) ADJUSTMENT

##### SYMPTOMS:

1. The tool does not touch the material or touches only between characters.
2. The knife does not cut deeply enough.
3. The tool height changes in the middle of a job.

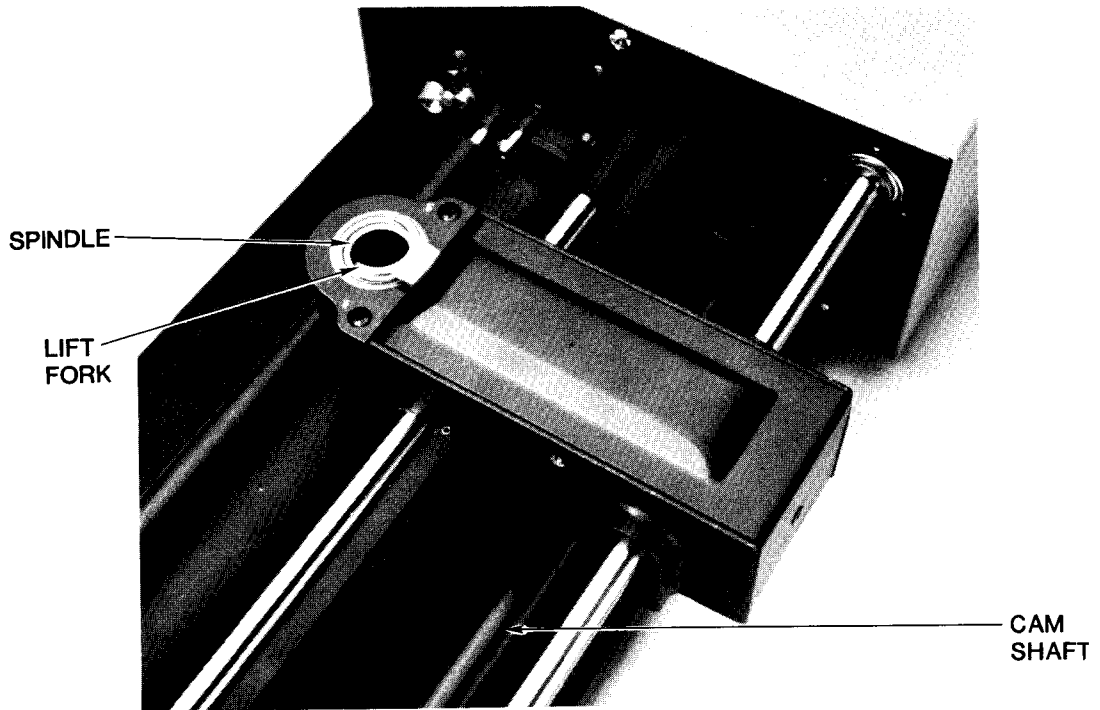
##### CAMSHAFT CHECK PROCEDURE:

1. Load paper in the plotter. Install the ball point pen.
2. Turn the system on.
3. After the plotter initializes, use the directional move keys (slew keys) to move the carriage to the far end of its travel at the back of the plotter.
4. Check to see if the tool is at its highest point. To do so, rotate the cam shaft by hand counterclockwise. The tool should *only* travel downward.
5. Turn the power off, then on again.
6. After the plotter initializes, rotate the cam shaft by hand clockwise. Again, the tool should *only* travel downward.
7. Turn off the power and repeat steps 2 through 6, moving the carriage to the near end of its travel at the front of the plotter in step 3.
8. If you detect any upward movement of the tool when you begin to rotate the cam shaft at either carriage location, the Z Axis requires factory adjustment. Contact the GSP Field Service Department at 1-800-828-5406. Otherwise proceed to the Tool Height Procedure.

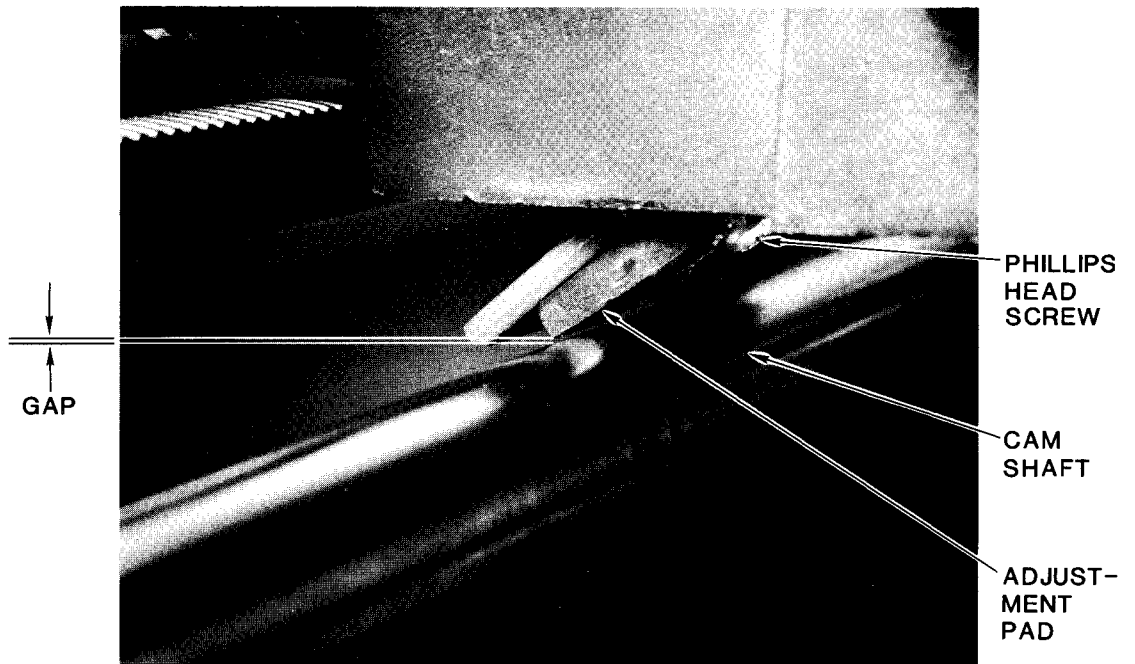
## TOOL HEIGHT ADJUSTMENT PROCEDURE:

1. Adjust the pen as shown in Section 3, Figure 11.
2. Install the pen in the tool carriage.
3. Turn the system on.
4. Refer to Figure 35. Rotate the cam shaft by hand counterclockwise until the bottom of the lift fork touches the top of the spindle.
5. Refer to Figure 36 to locate the adjustment pad. There should be a gap of .003" to .010", about the thickness of a piece of paper, between the pad and the cam shaft. If so, proceed to step 6. If not, proceed to step 11.
6. Remove the rear plotter cover (the cover with the tool rack attached to it). To do so, remove the Phillips head screw in the center of the top edge of the plotter end plate as shown in Figure 37. Lift the back end of the plotter about an inch and pivot the top of the cover away from the plotter. Press the cover downward to disengage the latch at the bottom edge.
7. Refer to Figure 38 to locate the Z motor collar clamp between the sensor disk and the drive motor at the end of the cam shaft. Use a 7/64 Allen key to ensure that the set screw in the collar clamp is tightened securely.
8. Reinstall the rear plotter cover.
9. Load paper in the plotter. Run a multiple line test plot.
10. If symptoms persist, proceed to step 11.

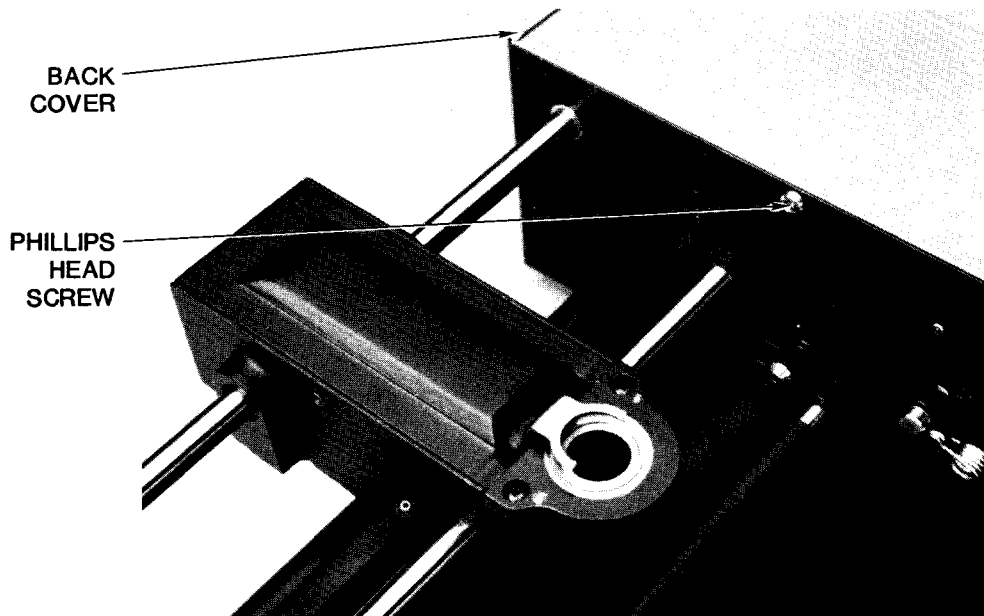




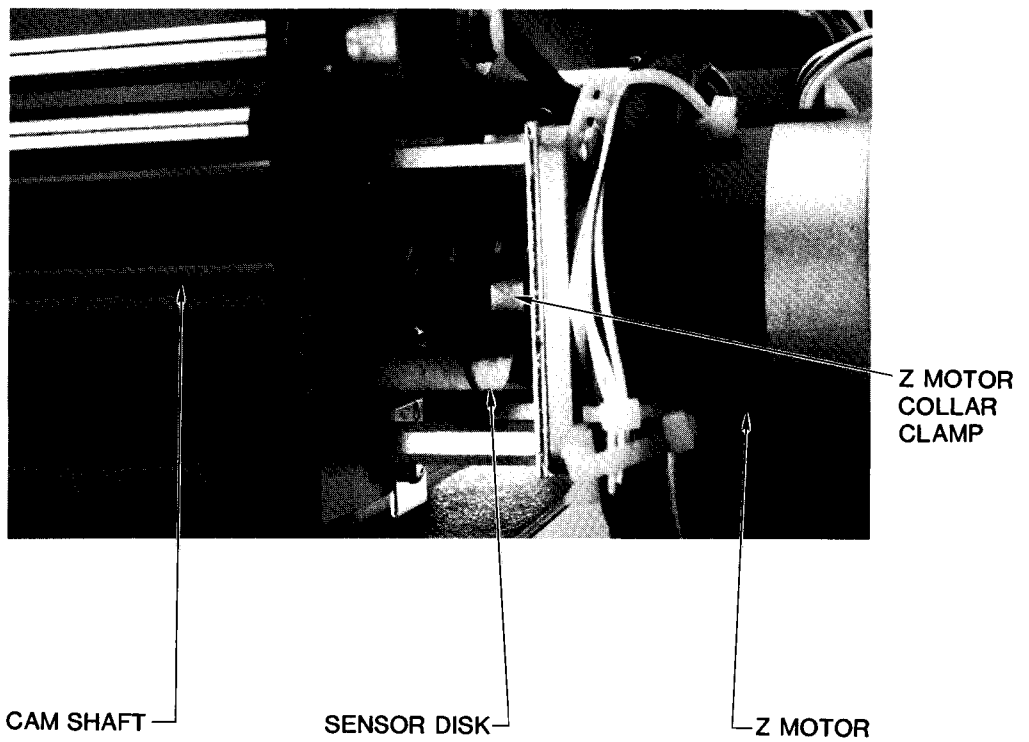
**Figure 35**



**Figure 36**



**Figure 37**



**Figure 38**

11. Turn the system power off.
12. Rotate the cam shaft by hand until the lift fork is at its lowest position. If the lift fork touches the top of the spindle, continue to rotate the cam in the same direction until the lift fork lifts up from the top of the spindle again. Then rotate the cam shaft back until it is approximately halfway between the positions where the lift fork first touched the spindle and where it lifted up again.
13. Refer to Figure 36 to locate the Phillips head screw in the center of the adjustment pad.
14. After locating the lift fork's lowest position, slowly rotate the cam in each direction. At its lowest position, the lift fork should touch the top of the spindle. If the lift fork fails to touch the top of the spindle, or if it remains touching the spindle while you rotate the cam to either side, proceed to step 15. If the lift fork appears to be adjusted correctly, proceed to step 17.
15. Loosen the adjustment pad screw. If the lift fork does not touch the top of the spindle, slide the adjustment pad upward. If the lift fork remains touching the spindle while you rotate the cam shaft in either direction from its lowest position, slide the adjustment pad downward.
16. Retighten the adjustment pad screw.
17. Load vinyl in the plotter and cut a test plot.
18. If symptoms persist, return to step 1 and the Tool Height Adjustment Procedure as required.

## 4.2 THETA AXIS (TOOL ROTATION) ADJUSTMENT

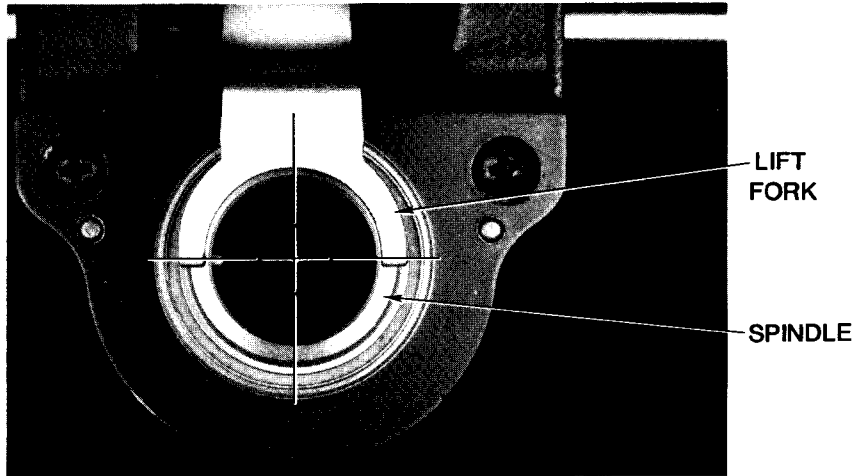
### SYMPTOMS:

1. Letters have serrated edges.
2. Letters have closure problems of less than 1/32".
3. The tool loses position in the middle of a job.

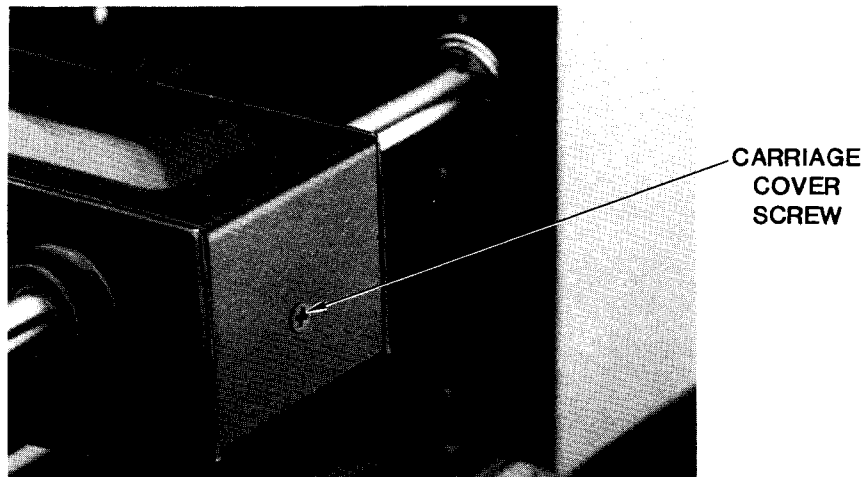
### THETA AXIS ADJUSTMENT PROCEDURE:

1. Remove any tool from the plotter spindle.
2. Turn on the system power.
3. After the spindle initializes, look down at the lift fork and spindle from directly above. The half circle of the lift fork should be centered with respect to the spindle as shown in Figure 39. If it is, proceed to step 12. If the lift fork is not centered, continue to step 4.
4. Refer to Figure 40 to locate the carriage cover screw. Remove the screw and remove the carriage cover.
5. Rotate the cam shaft by hand until the lift fork rests on the spindle.
6. Refer to Figure 41 to locate the two screws which hold the lift fork in place. Loosen these screws but do not remove them.
7. Move the lift fork until it is correctly aligned as shown in Figure 39.
8. Tighten the two screws.
9. After tightening the screws, make sure the lift fork is correctly aligned. If it is, proceed to step 10. If it is not, return to step 6.

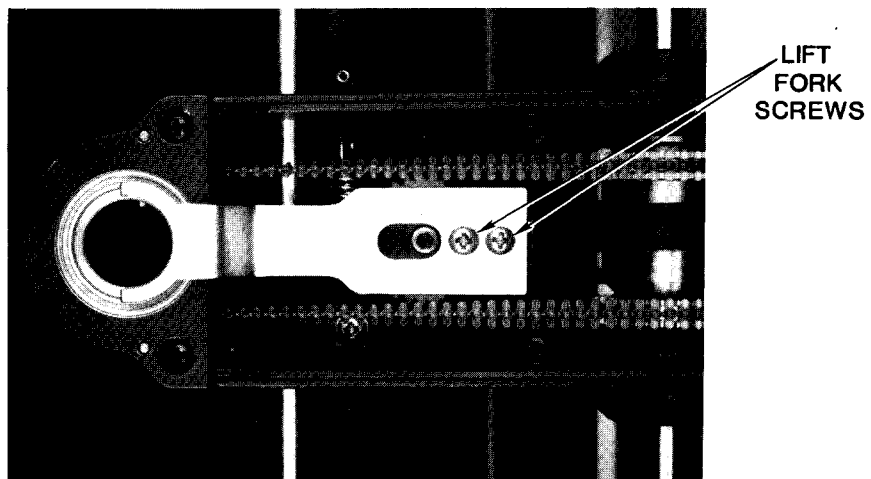
10. Replace the carriage cover.
11. Load vinyl in the plotter. Select **AXIS SWAP** and cut a test plot. If symptoms persist, proceed to step 12.
12. Turn the system power off.
13. Install the knife in the plotter spindle.
14. Turn on the system power.
15. After the spindle initializes, note the position of the slot or keyway in the side of the tool holder. The edge of the keyway, as shown in Figure 42, should be aligned with the end of the tool lift fork. If the tool is aligned correctly, proceed to step 26. If the tool is not aligned correctly, proceed to step 16.
16. Turn the system power off.
17. Remove all tools and materials from the plotter.
18. Remove the rear plotter cover. To do so, remove the Phillips head screw in the center of the top edge of the plotter end plate as shown in Figure 37. Lift the back end of the plotter about an inch and pivot the top of the cover away from the plotter. Press the cover downward to disengage the latch at the bottom edge.
19. Refer to Figure 43 to locate the theta motor collar clamp. Use a 7/64 Allen key to ensure that the set screw in the collar clamp is tightened securely.
20. Hold the **RESET** key down and turn on the system power. After the word **KEY** appears, press **ESCAPE**. This places the system in the operator test mode.
21. When **T G** appears in the display, press **5** to access the theta lock test. This electrically locks the theta motor in its initialized position.



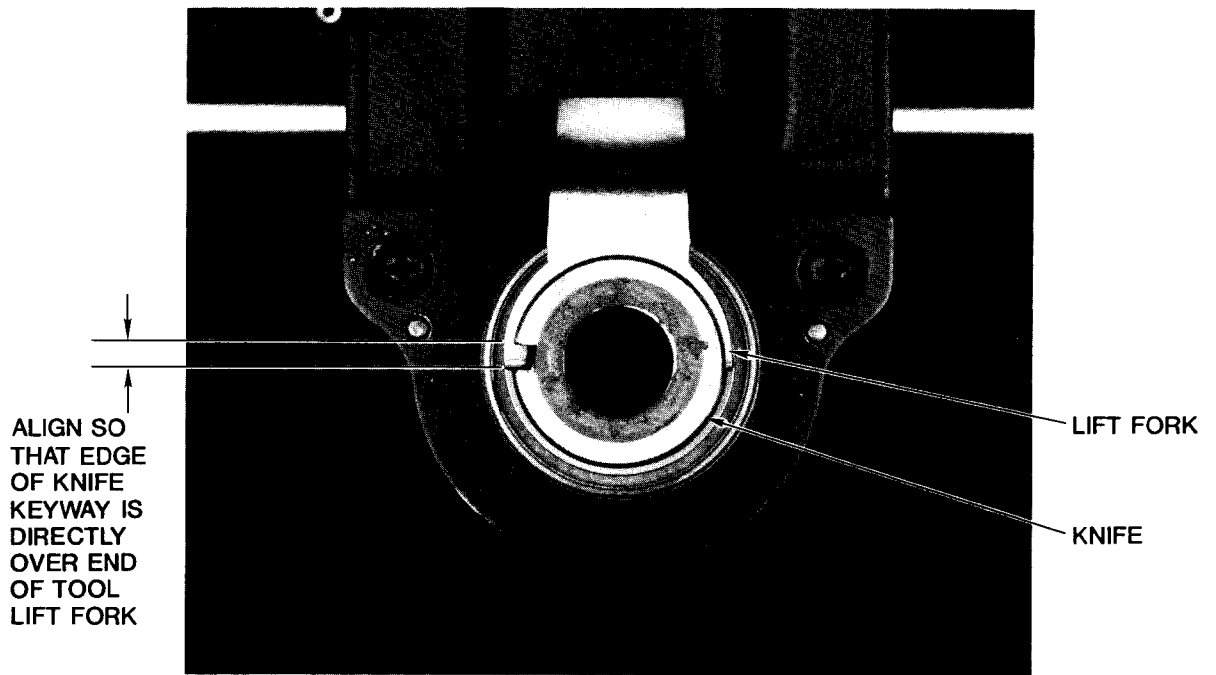
**Figure 39**



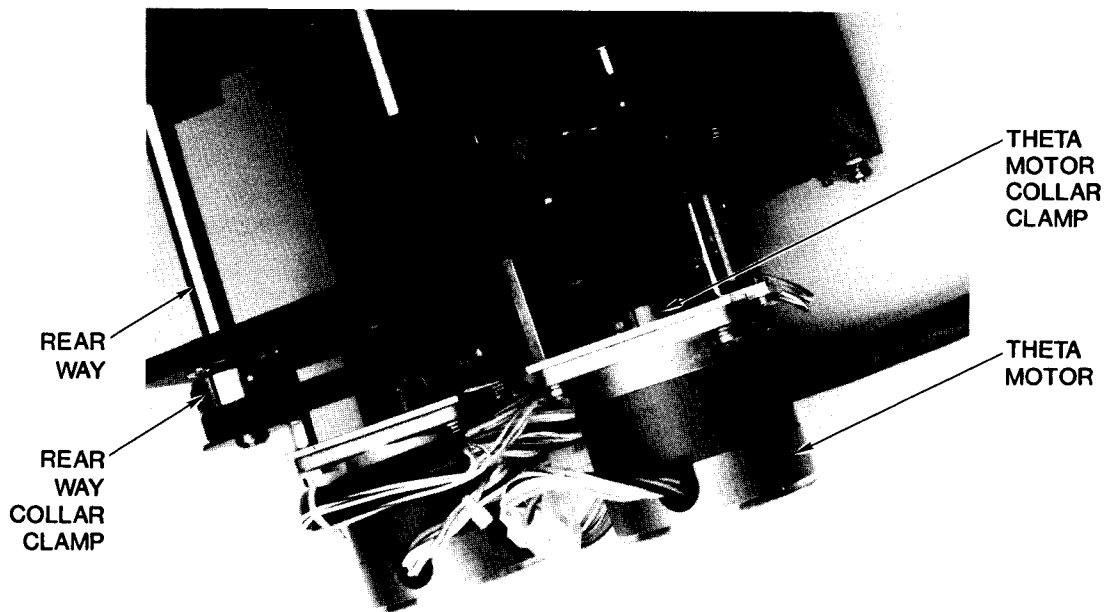
**Figure 40**



**Figure 41**



**Figure 42**



**Figure 43**

22. Refer to Figure 43 to locate the rear way collar clamp. Use a 7/64 Allen key to loosen the collar clamp.
23. Rotate the knife by hand until it is properly aligned as shown in Figure 42. Tighten the clamp.
24. Press ESCAPE to release the lock on the theta motor.
25. Turn the knife out of alignment, then press the number 3 key. The knife should return to the correct alignment. If the knife does not align correctly, return to step 20. When the knife is correctly adjusted, proceed to step 26.

*NOTE: You may need to be repeat steps 20 through 25 several times to obtain correct alignment.*

26. Press ESCAPE to release the lock on the theta motor. Press ESCAPE again to exit the operator test mode.
27. Load vinyl in the plotter and cut a test plot. If symptoms persist, contact your dealer or GSP Field Service.



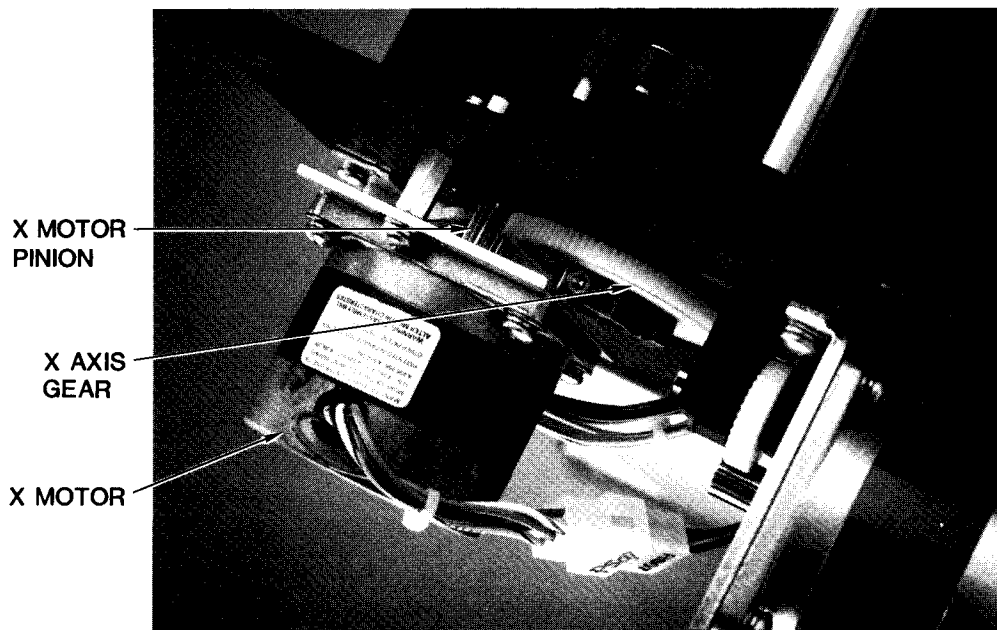
### 4.3 X AXIS BACKLASH ADJUSTMENT

#### SYMPTOMS:

Text cut in AXIS SWAP has closure problems.

#### X AXIS ADJUSTMENT PROCEDURE:

1. Turn the system power off.
2. Remove all tools and material from the plotter.
3. Open the bail arms.
4. Remove the front plotter cover. To do so, remove the Phillips head screw in the center of the top edge of the plotter end plate as shown in Figure 44. Lift the back end of the plotter about an inch and pivot the top of the cover away from the plotter. Press the cover downward to disengage the latch at the bottom edge.
5. Hold the RESET key down and turn on the system power. After the word KEY appears, press ESCAPE. This places the system in the operator test mode.
6. When T G appears in the display, press 5 to access the theta lock test. This electrically locks all four motors in their initialized positions.
7. Refer to Figure 45 to locate the X axis gear and the X motor pinion. These two gears are meshed together. Gently push back and forth on the drum in the direction the material normally moves. Notice if the X axis gear moves while the pinion remains stationary. If the pinion remains stationary (i.e., if there is backlash), proceed to step 8. If the pinion moves with the X axis gear (i.e., if there is no backlash), proceed to the section for Y Axis Backlash Adjustment.

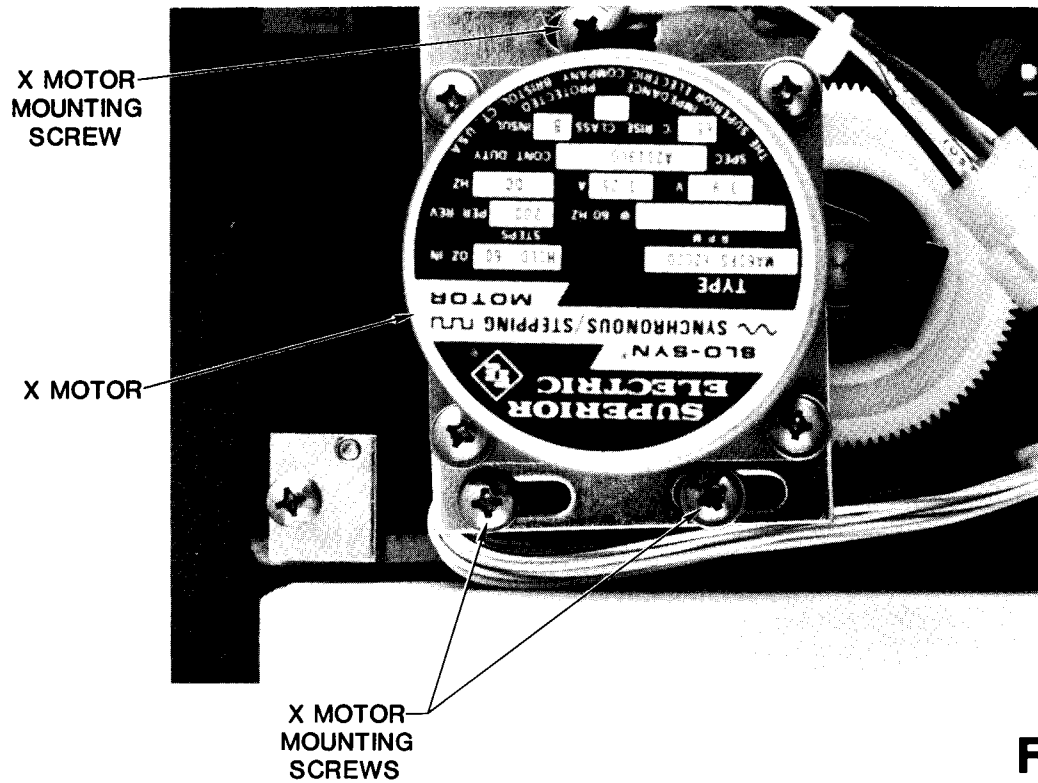
**Figure 44****Figure 45**

8. Refer to Figure 46 to locate the three Phillips head screws which hold the X motor bracket against the standoffs on the side plate. Loosen these screws.
9. Apply light pressure to the right to tighten the mesh of the X axis gear and the X motor pinion.

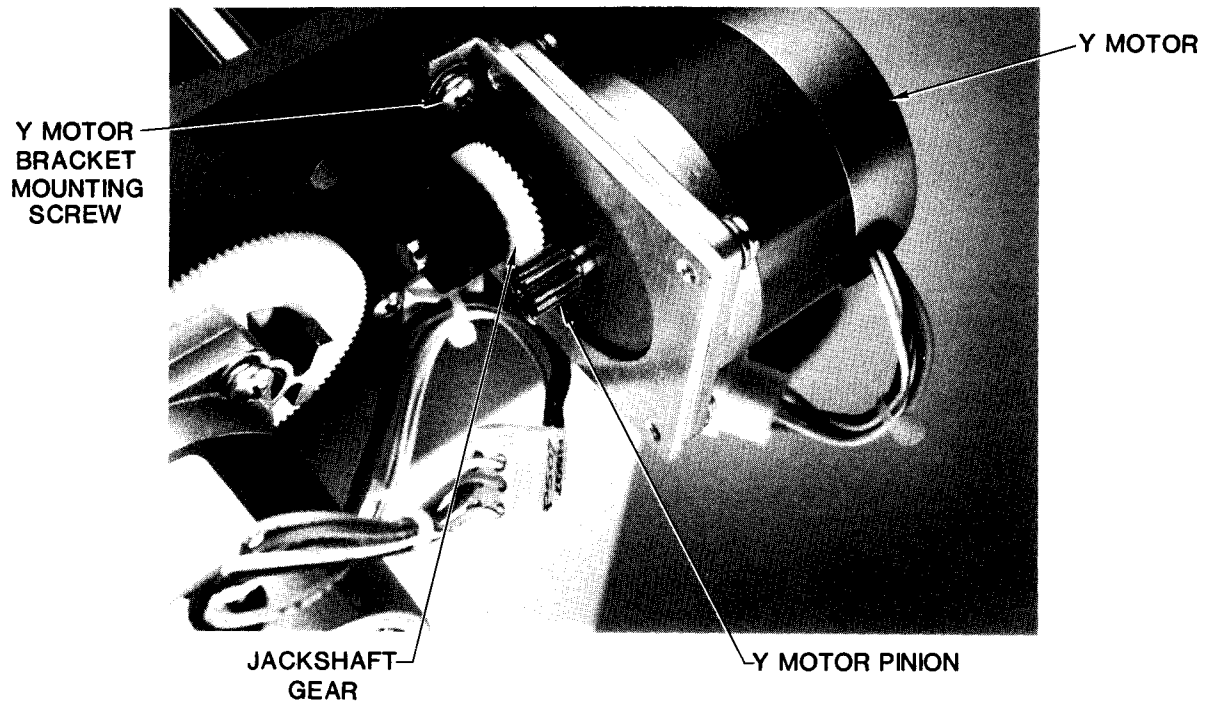
*CAUTION: Forcing the X axis gear and X motor pinion to mesh too tightly can cause the X axis gear to wear prematurely.*

If you adjust the mesh too loosely, poor letter quality will result. However, it is safer to tighten the mesh gradually, cut a test plot, then tighten again than to adjust the mesh too tightly.

10. While applying pressure, tighten the three screws.
11. Press the ESCAPE key twice to unlock the motors. Press ESCAPE again to exit the operator test mode.
12. Replace the plotter front cover.
13. Load vinyl in the plotter. Select AXIS SWAP and cut a test plot.
14. If symptoms persist, repeat the Adjustment Procedure.



**Figure 46**



**Figure 47**

#### 4.4 Y AXIS BACKLASH ADJUSTMENT

##### SYMPTOMS:

Text cut in NORMAL has closure problems.

##### Y AXIS ADJUSTMENT PROCEDURE:

1. Turn the system power off.
2. Remove all tools and material from the plotter.
3. Open the bail arms.
4. Remove the front plotter cover. To do so, remove the Phillips head screw in the center of the top edge of the plotter end plate as shown in Figure 44. Lift the back end of the plotter about an inch and pivot the top of the cover away from the plotter. Press the cover downward to disengage the latch at the bottom edge.
5. Hold the RESET key down and turn on the system power. After the word KEY appears, press ESCAPE. This places the system in the operator test mode.
6. When T G appears in the display, press 5 to access the theta lock test. This electrically locks all four motors in their initialized positions.
7. Refer to Figure 47 to locate the jackshaft gear and the Y motor pinion. These two gears are meshed together. Gently attempt to rotate the jackshaft gear. With one finger on the motor pinion, notice if the jackshaft gear moves while the pinion remains stationary. If the pinion remains stationary, proceed to step 8. If the pinion moves with the jackshaft gear, proceed to the section for Drum End Play Adjustment.
8. Refer to Figure 47 to locate the two Phillips head screws which hold the Y motor bracket against the side plate. (Only one screw is visible in Figure 47.) Loosen these screws.

9. Apply light pressure upward to tighten the mesh of the jackshaft gear and the Y motor pinion.

*CAUTION: Forcing the jackshaft gear and Y motor pinion to mesh too tightly can cause the jackshaft gear to wear prematurely.*

If you adjust the mesh too loosely, poor letter quality will result. However, it is safer to tighten the mesh gradually, cut a test plot, then tighten again than to adjust the mesh too tightly.

10. While holding the motor bracket in place, tighten the two bracket screws.
11. Press the ESCAPE key to unlock the motors. Press ESCAPE again to exit the operator test mode.
12. Replace the plotter front cover.
13. Load vinyl in the plotter. Select the NORMAL mode of the REVERSE/SWAP function and cut a test plot.
14. If symptoms persist, return to step 1.

#### 4.5 DRUM END PLAY ADJUSTMENT

##### SYMPTOMS:

1. Text cut in NORMAL mode has closure problems.
2. Y axis backlash check procedure shows no problem.

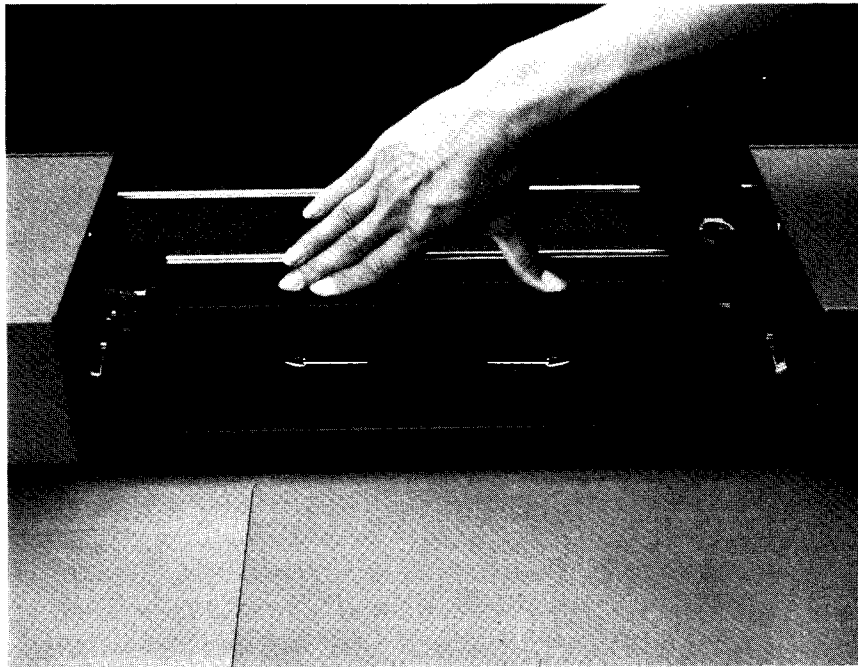
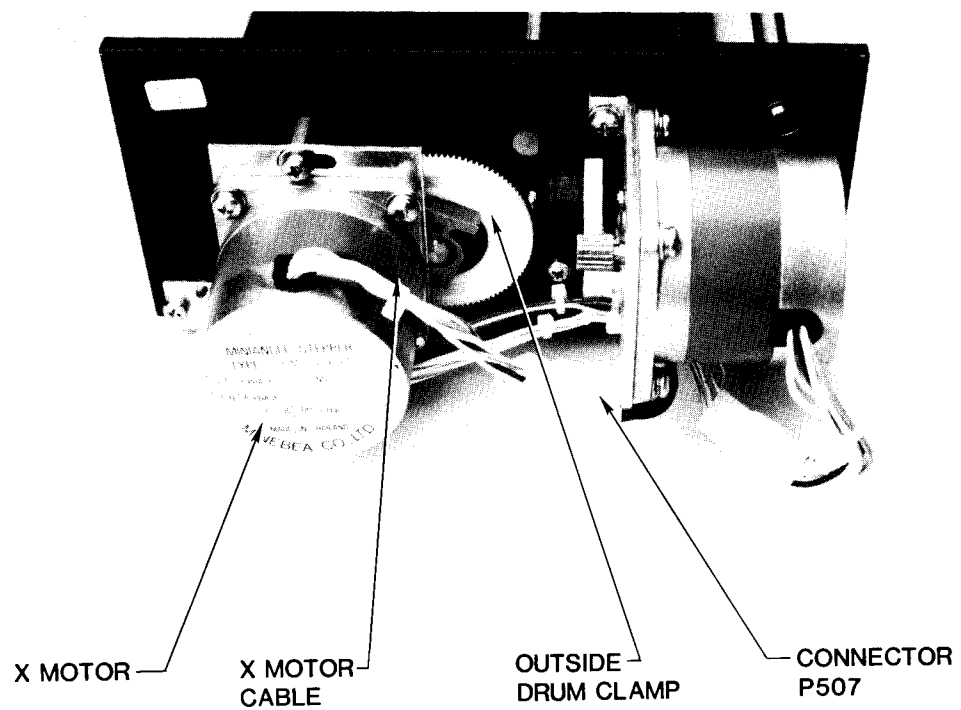
##### DRUM END PLAY ADJUSTMENT PROCEDURE:

**OBJECTIVE:** To slide the plotter drum and X Axis gear toward each other and clamp them in position to remove end play; to make sure the drum still rotates without binding.

1. Turn the system power off.
2. Remove all tools and material from the plotter.
3. Open the bail arms.
4. Gently try to push the drum from end to end as shown in Figure 48. If the plotter has a serial number below 91450 and there is any play, proceed to step 5. If there is no play and all check procedures in Section 6 have failed to reveal the cause of your system's symptoms, contact your dealer or GSP Field Service.

If the plotter has a serial number above 91449, there should be end play of about .003 to .005 inch. This play exists because the ball bearing has a flexible race. If there is more than .003 to .005 inch of play, proceed to step 5. If the amount of play does not exceed .005 inch and all check procedures in Section 6 have failed to reveal the cause of your system's symptoms, contact your dealer or GSP Field Service.

5. Remove the front plotter cover. To do so, remove the Phillips head screw in the center of the top edge of the plotter end plate as shown in Figure 44. Lift back end of the plotter about an inch and pivot the top of the cover away

**Figure 48****Figure 49**



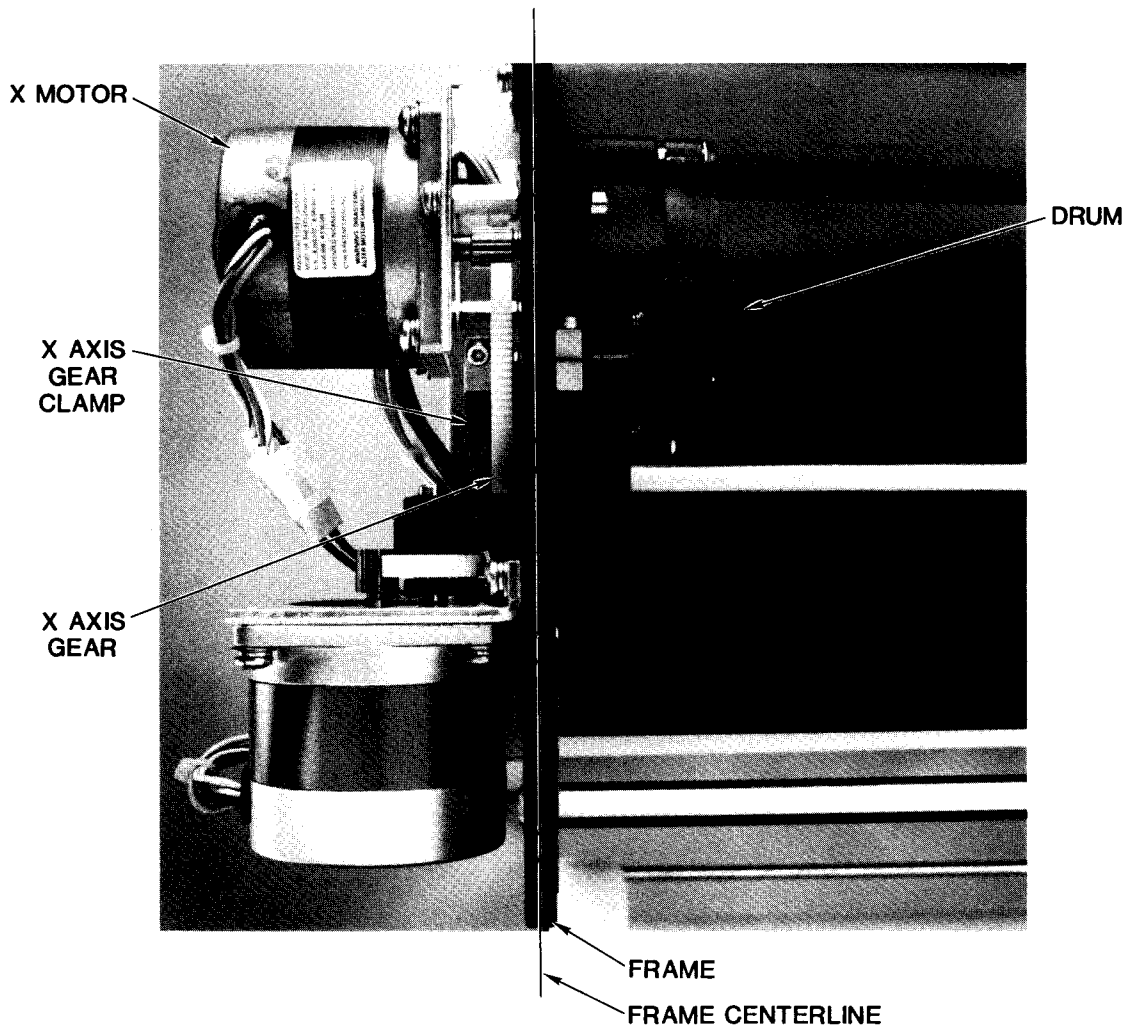
- from the plotter. Press the cover downward to disengage the latch at the bottom edge.
6. Refer to Figure 49 to locate connector P507 at the end of the X motor cable. Disconnect connector P507.
  7. Refer to Figure 46 to locate the three Phillips head screws which hold the X motor bracket against the standoffs on the side plate.. Remove these screws.
  8. Remove the X motor.
  9. Refer to Figure 49 to locate the outside drum clamp on the X axis gear. Use a 7/64" Allen key to loosen the clamp.
  10. Refer to Figure 50 to locate the centerline of the frame. Gently push the X axis gear toward the center line of the frame. While pushing, slowly rotate the X axis gear two revolutions.
  11. After rotating the X axis gear two revolutions, hold the drum stationary and rotate the X axis gear a quarter turn in the opposite direction.
  12. Tighten the X gear clamp.
  13. Gently try to push the drum from end to end. If the adjustment is correct, there will be no end play in plotters with serial numbers below 91450, and the play will be between .003 and .005 inch in plotters with serial numbers above 91449.
  14. Spin the drum. If the adjustment is correct, the drum will spin without binding.
  15. If the tests in either step 13 or 14 fail, repeat steps 9 through 12 until the drum spins without binding *and* there is no end play. *NOTE: You may need to repeat this procedure several times to obtain correct adjustment.*

16. After the adjustment is correct, reinstall the X motor. To do so, place the X motor on its standoff. Make sure the cable extends upward toward the ceiling.
17. Loosely install the three screws removed in step 3. These are 8-32 x 1/2" screws. Each must have a #8 lock washer and #8 flat washer. The lock washer must be closest to the screw head.
18. Examine the mesh of the X axis gear and the X motor pinion. Apply slight pressure on the X axis gear to the right to make it mesh with the X motor pinion.

*CAUTION: Forcing the X axis gear and X motor pinion to mesh too tightly can cause the X axis gear to wear prematurely.*

If you adjust the mesh too loosely, poor letter quality will result. However, it is safer to tighten the mesh gradually, cut a test plot, then tighten again than to adjust the mesh too tightly.

19. While applying pressure, tighten the three screws.
20. Turn on power to the system.
21. Load vinyl in the plotter and cut a test plot. If closure problems persist, repeat the Adjustment Procedure from step 1. If no closure problem appears, proceed to step 22.
22. Load vinyl in the plotter and select AXIS SWAP. Cut a test plot. If closure problems persist, repeat the X Axis Backlash Adjustment Procedure. If no closure problem appears, proceed to step 23.
23. Reinstall the plotter cover.



**SIGNMAKER IVB USER REFERENCE CARD  
FUNCTION KEYS**

KEY NAME	USE	INITIAL SETTING
FONT SELECT	Selects font by number 0-8 (0-20 with optional Font Extender). 0 = Helvetica Medium.	0(Helvetica)
LETTER HEIGHT	Specifies nominal (uppercase) letter height between 0 and 48 inches.	1 (inch)
SLANT	SLANT: Italicizes characters forward or back between -45 and 45 degrees.	0 (No Slant)
SPACING	SPACING: Specifies intercharacter spacing as a percent of the normal space calculated by the system.	0 (Normal)
ENTER TEXT	Accepts direct keyboard entry of characters in job message (250 character maximum).	—
KERN EDIT	Specifies letter pair for revision of KERN adjustments between them.	—
FORWARD %	Adds % of the intercharacter spacing calculated by the system for the specified character pair.	—
BACK %	Subtracts % of the intercharacter spacing calculated by the system for the specified character pair.	—
LENGTH	FREE LENGTH: Displays actual message length in inches. FORCED LENGTH: Specifies desired length of message in inches up to twice the actual message length. % LENGTH: Specifies desired length of message as a percentage of the actual message length between 1 and 200%.	0 Equal to FREE LENGTH 100 (%)
SCALE FACTOR	Selects scale of job execution as a ratio of plotted size to actual size with options of 1/1, 3/4, 1/2, 1/4 and 1/8.	1/1
JUSTIFY	Selects one of four Justification modes. NONE: Starts each text line at end point of previous text line (after executing any X,Y MOVE entered) RIGHT: Aligns text lines to their right edge (at their end points). CENTER: Aligns text lines to the center points of their baselines. LEFT: Aligns text lines at their left edge (to their starting points).	CENTER
REVERSE/SWAP	Selects one of four job orientation modes. NORMAL: Plots message as it would normally appear on paper. REVERSE: Plots message as it would appear in a mirror. AXIS/SWAP: Rotates message 90° counter-clockwise. REVERSE/SWAP: Plots message as it would appear in a mirror <b>and</b> rotates 90° counterclockwise.	NORMAL
SPEED	Selects plotter speed as a percentage of normal operating speed between 10% and 100%.	100%
ARC/ROTATE	Selects between ARC and ROTATE modes: ARC: Specifies the radius of a circular arc around which the text line will be constructed. Must be at least the line's actual length divided by 3.14. ROTATE: Specifies the angle to which the text line baseline will be tilted with respect to the horizontal between -90 and 90 degrees.	0 (inches) 0 (degrees)
X,Y MOVE	In Line 0, specifies distance in inches for the tool to move upon pressing RETURN. (X=horizontal; Y=vertical) The addition of <b>D</b> after the number will place the tool down against the material for drawing, cutting or pouncing. In Multiline X,Y MOVE values represent the distance to be moved after completion of a text line before beginning a new line.	X0Y0
START	Initializes job execution with tool rotation. With the SHIFT key held down, initializes job execution without tool rotation.	—
HALF FONT	Selects one of three modes in Line 0 only. OFF: Plots whole characters. BOTTOM HALF: Plots or cuts the top half of the next line. TOP HALF: Plots or cuts the top half of the text line. TOP OVERLAP: Plots or cuts the top half of the text line plus an additional overlap below the horizontal centerline of .5% of the LETTER HEIGHT.	OFF
AUTO NUMBER	Produces a series of numbers in a vertical column. START: Specifies the first number of the series. END: Specifies the last number of the series. INC: Specifies the increment from one number to the next within the series.	0.00 0.00 1
BORDER	After executing a job, produces a box around the job at a distance of .1 inch on each side. MUST be executed <b>before</b> moving the tool in any way.	—
RESET	RESET: Stops plotter operation without affecting message content or parameter settings. SHIFT/RESET: In Multiline, erases a line of text and resets all its parameters to their initial settings.	—
LINE #	Selects Line 0 (single line mode) or line number of job in Multiline mode.	00/00
RETURN	Causes system to accept current text entry or parameter setting. Pressing any active Function Key implies RETURN before activation of the new function.	—
ESCAPE	Clears ERROR messages. Cancels any change being made to text or parameter settings.	—
CR/LF	In ENTER TEXT, deletes all text between current cursor position and end of line.	—
SHIFT	In ENTER TEXT, capitalizes letters and accesses other "uppercase" characters. With Function Key, specifies their second function (marked in parenthesis).	—
CAPS LOCK	Capitalizes letters only. Use SHIFT to access lower case letters. Other symbols are not affected.	—



## SIGNMAKER IVB ERROR CODES

CODE	DESCRIPTION
01	Font not loaded.
02	Text not entered. Press Function Key marked ENTER TEXT, enter text to be printed, and continue.
03	Kern character exceeds limit of 250 characters per line. KERN EDIT will not be executed.
04	JOB SAVE or SHIFT/RESET (CLEAR) pressed in Line 0; HALF FONT or AUTONUMBER pressed in Multiline mode; or MODE or JOB SAVE pressed without GerberScanner, GDS, or DSRM installed. Press an active Function Key.
05	Character not contained in the selected font. You may continue to enter text, or load a new font and reenter text.
06	BORDER function cannot be executed. Directional arrow keys used or X,Y MOVE executed after completion of text and before execution of border.
07	LETTER HEIGHT out of limits. Letter height must be less than 48 inches or greater than 0 inches. Enter valid height.
08	Character pair not found in KERN EDIT selection. Enter new pair of characters.
09	ARC radius out of limits. Enter a larger radius.
10	Not a valid character. The last character typed was not valid for the Function Key being used. Enter valid parameter.
11	Not a valid KERN EDIT character. Enter FORWARD 1/8 or BACK 1/8 characters only.
12	ROTATION angle out of limits. Enter a number between -180 and 180 degrees.
13	SLANT angle out of limits. Enter slant between -45 and 45 degrees.
14	Pen lift axis unable to find its home position due to mechanical/electrical failure, or S/750 is not turned on.
15	SPACING parameter out of limits. Enter a value between -100% and 999%.
16	Pen rotation unable to find its home position due to mechanical/electrical failure.
17	Line number entered does not exist in the current multiline buffer.
18	Multiline buffer full. Current line of text cannot be saved.
19	AUTO NUMBER function cannot be executed. Selected font does not have all numbers 0-9.
20	FORCED LENGTH out of limits. Must be between .01 and 2 times FREE LENGTH. Enter a valid FORCED LENGTH value.
FEn	Font error. The diagnostic program has found an error in the font number n. Press RETURN to continue the test or ESCAPE to abort further font tests.