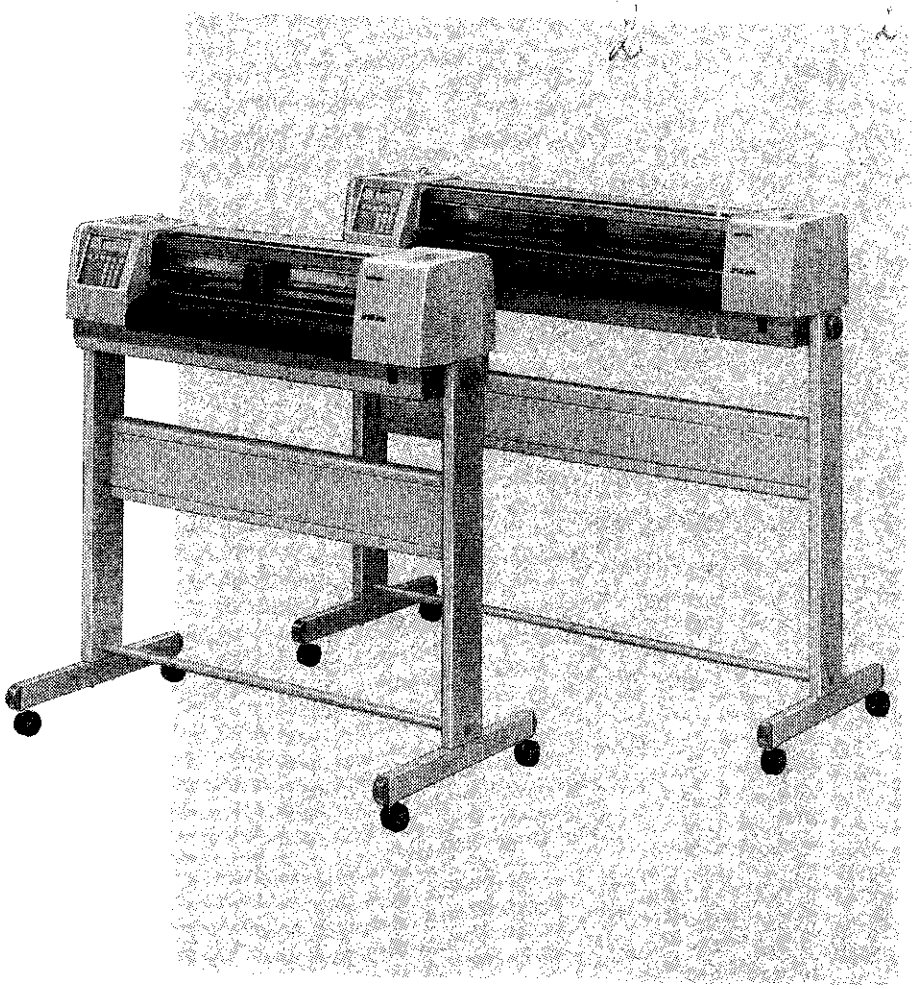
MUTOH

USER GUIDE

Intelligent Plotter

XP-500 Series

XP-510/XP-511



XP51EX-A-01

The MUTOH XP-500 Series Intelligent Plotter User Guide

MUTOH INDUSTRIES LTD.

FCC Warning

This equipment complies with the requirements for a Class A computing device in the FCC rules, part 15, subpart J.

Operation of this device in a residential area may interfere with television reception or operation of utilities.

Plotters generate weak radio signals and may interfere with television reception and utilities. If the plotter does interfere with radio or TV reception, try the following:

- Change the direction of your radio and TV reception antenna or feeder.
- Change the direction of the plotter.
- Move either the plotter or the receiving antenna so there is more distance between them.
- Be sure the plotter and the receiving antenna are on separate power lines.

Table of Contents

Chapter 3
Connecting the Plotter to Your Computer

Chapter 4
Getting to Know Your Plotter

Chapter 5
Plotting Media, Pens, and Pencils

Chapter 6
Using Menus and Plotter Modes

Chapter 7
Configuring the Plotter

Chapter 8
Plotter Control Parameters

8

Chapter 9
Pen Control Parameters

Chapter 10
Diagnostic and Verification Parameters

Chapter 11
Plotter Maintenance and Troubleshooting

Chapter 12
Error Messages

Chapter 13
Using Media Rolls

Appendix

Index

Chapter 1

Before You Start

Thank you for purchasing the MUTOH XP-570 or XP-511 Intelligent Plotter. These plotters work with your computer-aided design and drafting (CAD) program to give you high-quality, professional plotting results.

The two MUTOH XP–500 Series plotters differ only in the maximum size of plotting media used: The MUTOH XP-570 uses A0/Architectural E size and the MUTOH XP-511 uses A1/Architectural D size media.

The MUTOH XP–500 Series Intelligent Plotters offer you:

- ✗ **Convenient media dispenser**
- ✗ **High-resolution plotting**
- ✗ **Pencil plotting**
- ✗ **Advantages of using both pen and pencil on the same plot**
- ✗ **Full range of plotting media types and sizes**
- ✗ **Multiple plotting orientations**
- ✗ **Improved vector-sort and curve processing**

About This *User Guide*

This *User Guide* shows you how to set up, operate, and maintain your MUTOH XP–500 Series Intelligent Plotter. Always refer to this manual for instructions when changing the plotter configuration. Keep the manual readily available to answer questions you may have as you use the plotter.

This *User Guide* is designed so that information is easy to find.

- The Table of Contents lists all chapters and subsections
- Each chapter begins with a brief overview
- LCD flowcharts are included for parameters

Understanding the Symbols and Notations

Symbols and special notations are used throughout the manual to illustrate certain keys, actions, or status. Symbols are also used to set apart information requiring special emphasis.

These symbols and notations are used in this manual:

- When referred to in text, keys are in **BOLDFACE**.
  For example: To clear a numeric entry, press **CE**.
- Menu Scroll keys are indicated as **MENU** ▲ (scroll up or previous display) and **MENU** ▼ (scroll down or next display).
- Extra hints and information are indicated by a note symbol. For example:

Note:
For most effective plotting, use only recommended pens and pencils.

- Critical information, including safety information and operating warnings, is indicated by a caution symbol. For example:

CAUTION!

The MUTOH XP-500 Series Plotter is heavy. Unpacking and assembly requires at least two people.

- Cross-references to other sections of this *User Guide* are indicated by a cross-reference symbol. For example:

☞ *See the command tables in the Appendix for information about individual commands.*

Chapter 2

Setting Up Your Plotter

Your new MUTOH XP–500 Series Intelligent Plotter is packaged in two boxes: The plotter stand parts are in the smaller box; the plotter body and accessory box are in the larger box.

This chapter shows how to:

- ✗ **Select a place for the plotter**
- ✗ **Unpack the plotter**
- ✗ **Check that you have received all components**
- ✗ **Assemble the plotter**
- ✗ **Connect the plotter to the power supply**

Selecting a Place for the Plotter

The location of the plotter is important. When you select a place for the plotter, be sure it meets these conditions:

- Power supply of 110 to 120 VAC 50/60 Hz or 220 to 240 VAC 50/60 Hz
- Ambient Conditions

  Operating Environment

Temperature	5° to 40° C (41° to 104° F)
Humidity	35% to 75% non-condensing

  Recommended Environment

Temperature	Room temperature 16° to 32° C (61° to 90° F)
Humidity	50% to 65% non-condensing

  Variation Rate

Temperature	2° C per hour
Humidity	5% per hour

  Storage Environment

Temperature	0° to 50° C (32° to 122° F)
Humidity	10% to 90% non-condensing

- Protection from moisture, dust, drafts, and direct sunlight (away from open windows and air conditioners)
- Adequate space around the plotter so that ventilation is not obstructed

Figure 2.1 compares Models XP-510 and XP-511.

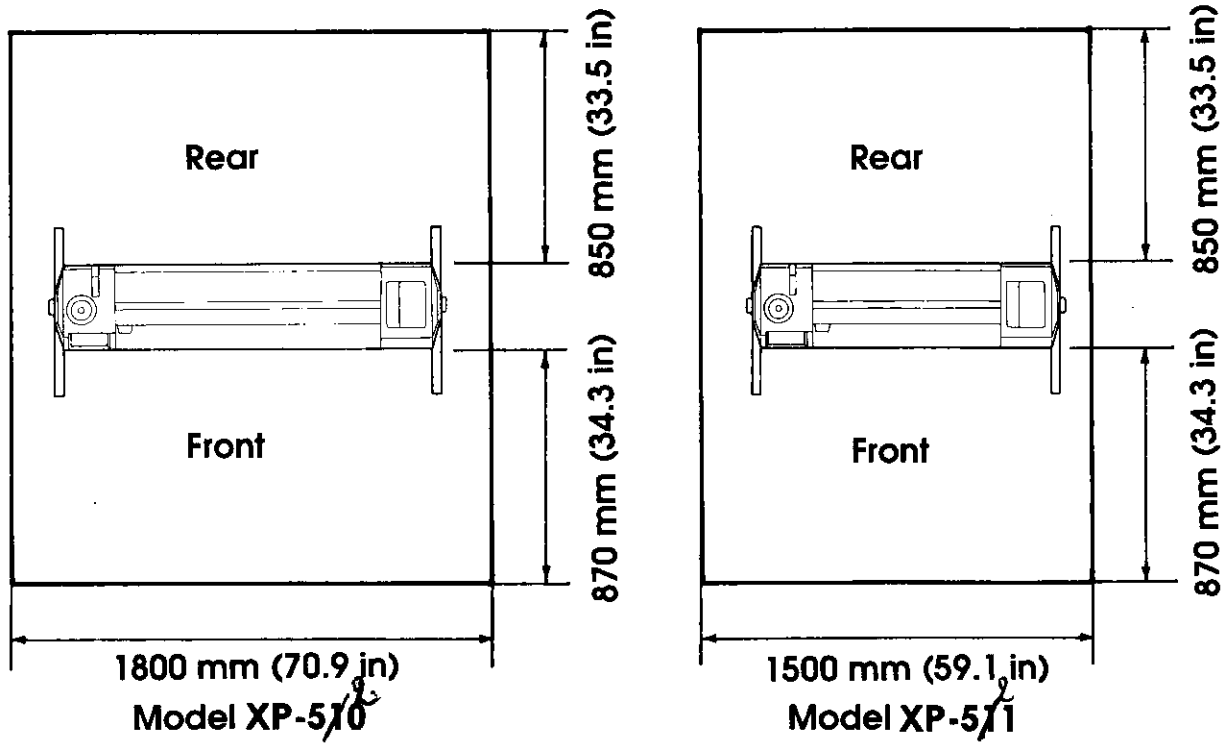


Figure 2.1 Overhead Views of XP–500 Series Model XP-510 (left) and Model XP-511 (right)

Unpacking the Plotter

CAUTION!

The MUTOH XP–500 Series Plotter is heavy. Unpacking and assembly requires at least two people.

Unpacking the Plotter Stand

Be sure that you have a clear space next to the box where you can set the plotter stand parts. To prevent scratching, put down a piece of cardboard or heavy paper.

Carefully remove the components from the box. Check the contents against the parts shown in Figure 2.2.

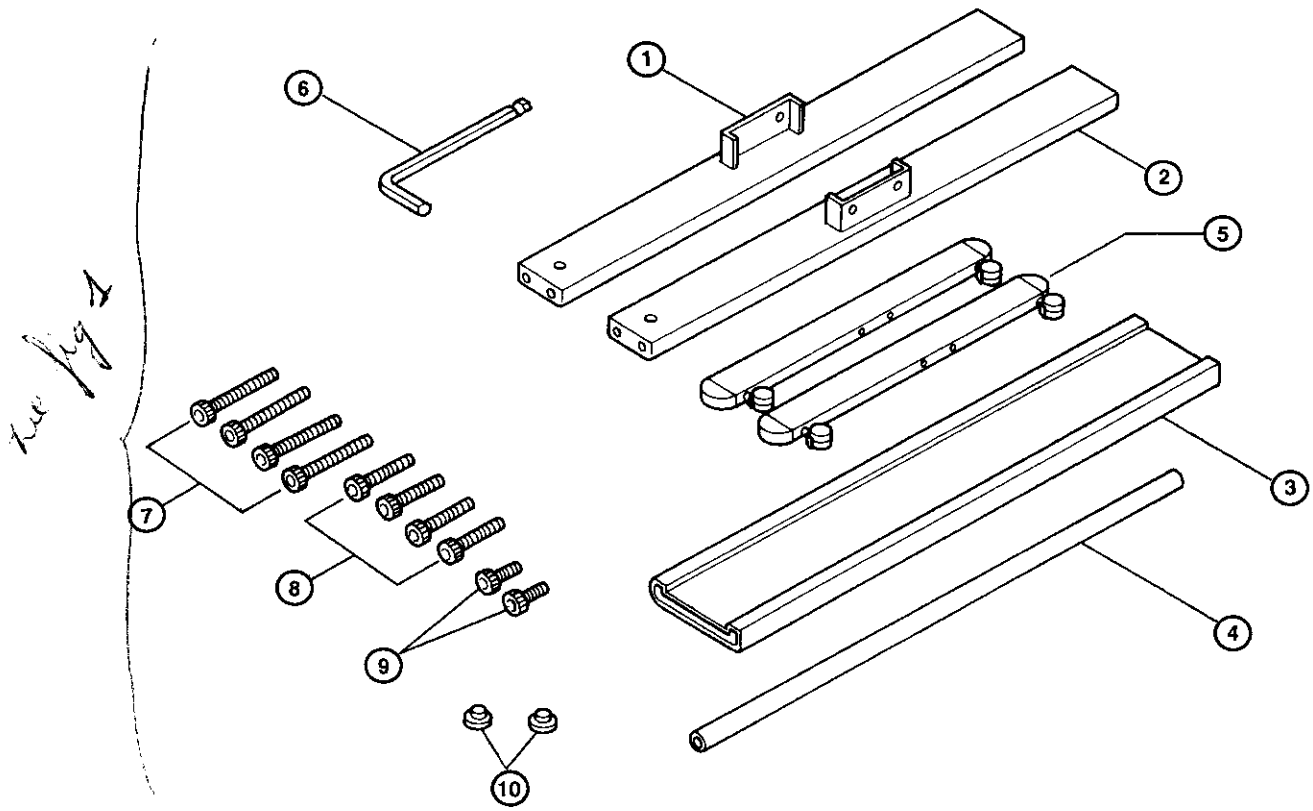


Figure 2.2 Contents of Smaller Box (Plotter Stand)

Item	Quantity
① Right support	1
② Left support	1
③ Side-stay (A)	1
④ Side-stay (B)	1
⑤ Bases with casters	2
⑥ Hex wrench	1
⑦ Long hex bolts	4
⑧ Mid-length hex bolts	4
⑨ Short hex bolts	2
⑩ Screw caps	2

Unpacking the Plotter Body

The plotter body, the stocker, the Accessory Box, and the *MUTOH XP–500 Series Intelligent Plotter User Guide* are packed in the larger box. The plotter body is wrapped in plastic sheeting, which must be opened before removing the plotter body from the box.

CAUTION!

The MUTOH XP–500 Series Plotter is heavy. Unpacking and assembly requires at least two people.

When you unpack the larger box, check the contents against the parts shown in Figure 2.3.

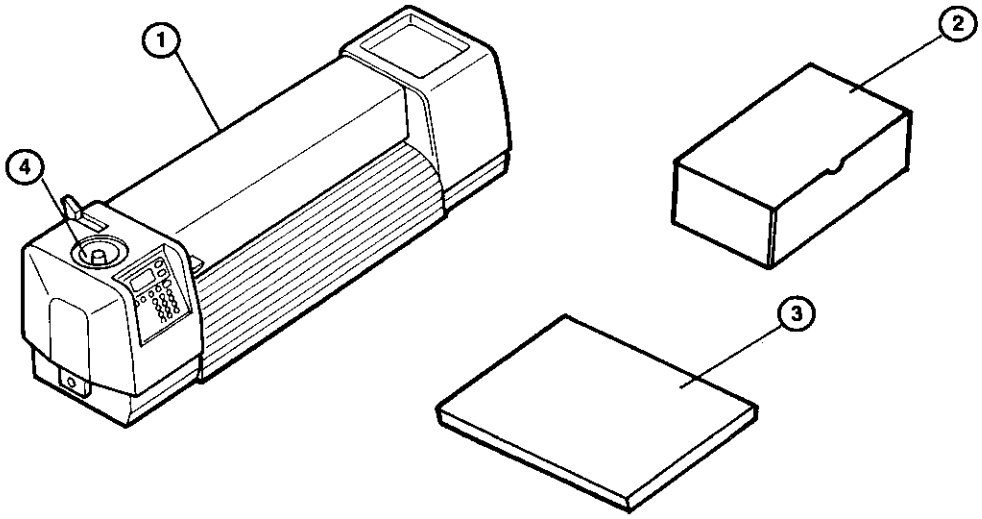


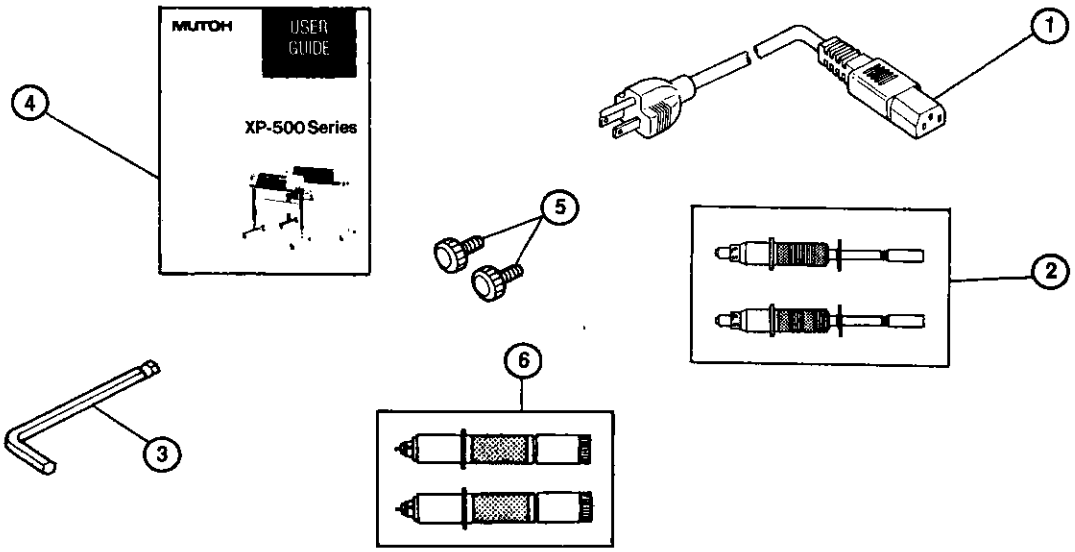
Figure 2.3 Contents of Larger Box (Plotter Body)

Item	**Quantity**
① Plotter body	1
② Accessory Box	1
③ Paper (KGP A3 size) ~~30~~ 2x15 sheets	1
④ Stocker (installed during shipping)	1

72

Accessory Box

Open the Accessory Box and check the contents against the parts shown below.



Item	Quantity
① Power supply cable	1
② Pencil set	1 (0.3 mm, 0.5 mm, [illegible] mm, one each)
③ Hex wrench	1
④ MUTOH XP-500 Series Intelligent Plotter User Guide	1
⑤ Mounting knobs	2
⑥ Disposable ink pen	1 (0.25 mm, 0.35 mm, one each)

CAUTION!

After unpacking the plotter, dispose of or safely store packing materials, such as cardboard and plastic sheeting, to prevent the possibility of personal injury.

Assembling the Plotter

The MUTOH XP–500 Series Intelligent Plotter requires some assembly. Before you start to assemble the plotter, check the parts in Figure 2.2 and Figure 2.3 again to be sure you have all the required components and tools.

CAUTION!

The MUTOH XP–500 Series Plotter is heavy. Unpacking and assembly requires at least two people.

Assembling the Plotter Stand

Step 1.

Lay the left and right supports on a flat, clean surface so that the side-stay mounting blocks are facing each other (see Figure 2.4).

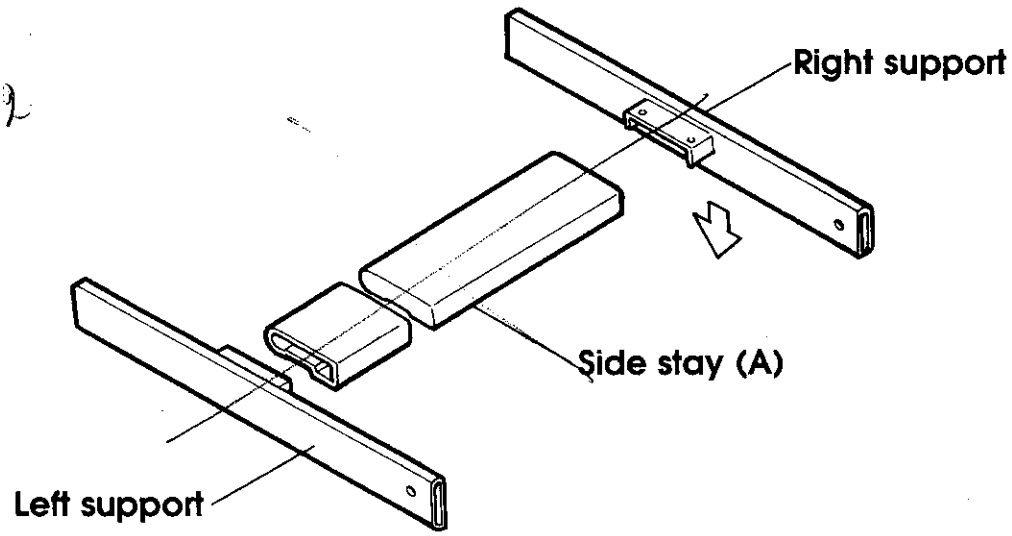


Figure 2.4 Plotter Stand Supports and Side-Stay Mounting Blocks

Step 2.
Push side-stay (A) into the side-stay mounting blocks in both the left and right supports. The two screw holes on each of the supports and side-stay mounting blocks should be aligned (see Figure 2.5).

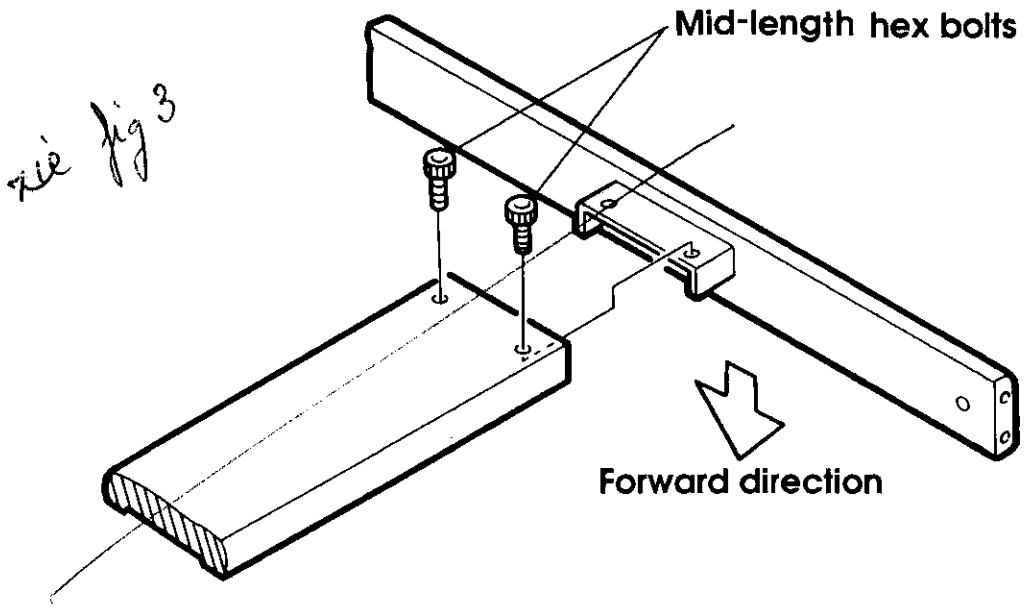


Figure 2.5 Alignment of Side-Stay (A)

Step 3.
Insert the mid-length bolts and gently tighten them to temporarily secure the assembly.

Step 4.
Position side-stay (B) between the left and right supports and align the screw holes as in Step 2 (Figure 2.6).

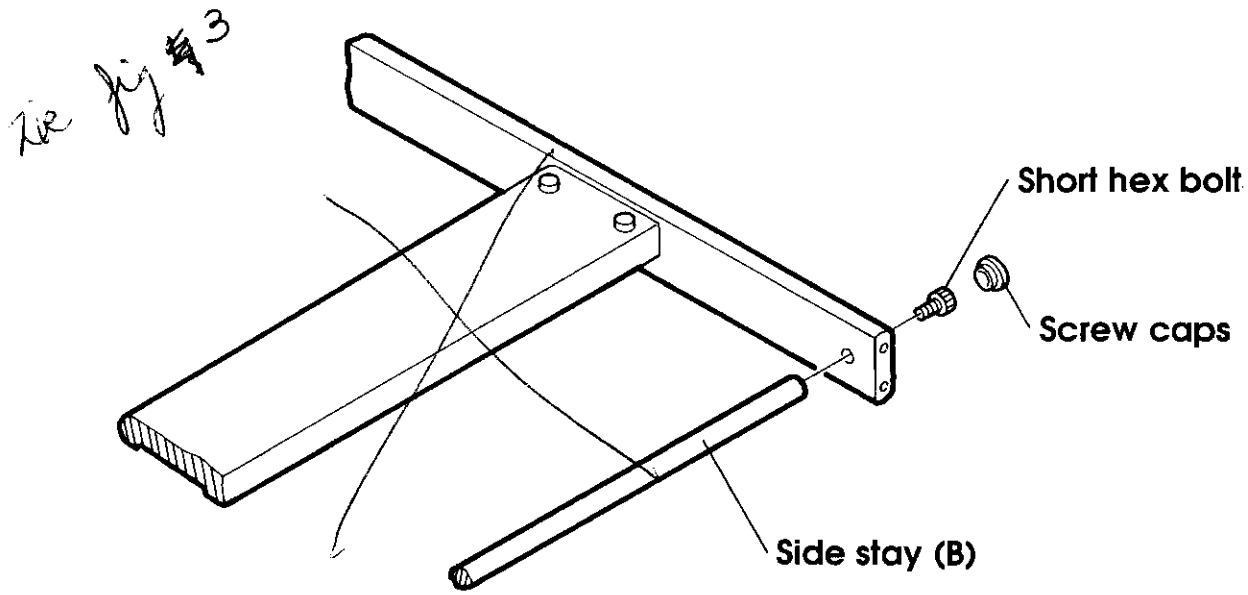


Figure 2.6 Alignment of Side-Stay (B)

Step 5.
Secure the side-stay (B) assembly with short bolts. Put screw caps on the right and left bolts.

Step 6.
Securely tighten the bolts already inserted in side-stay (A).

Step 7.
Use long bolts to firmly secure bases to the right and left supports (see Figure 2.7).

CAUTION!
When secure the Bases with casters to the Right and Left supports, make sure to much up the Bolt head (A) into the Hole (B).

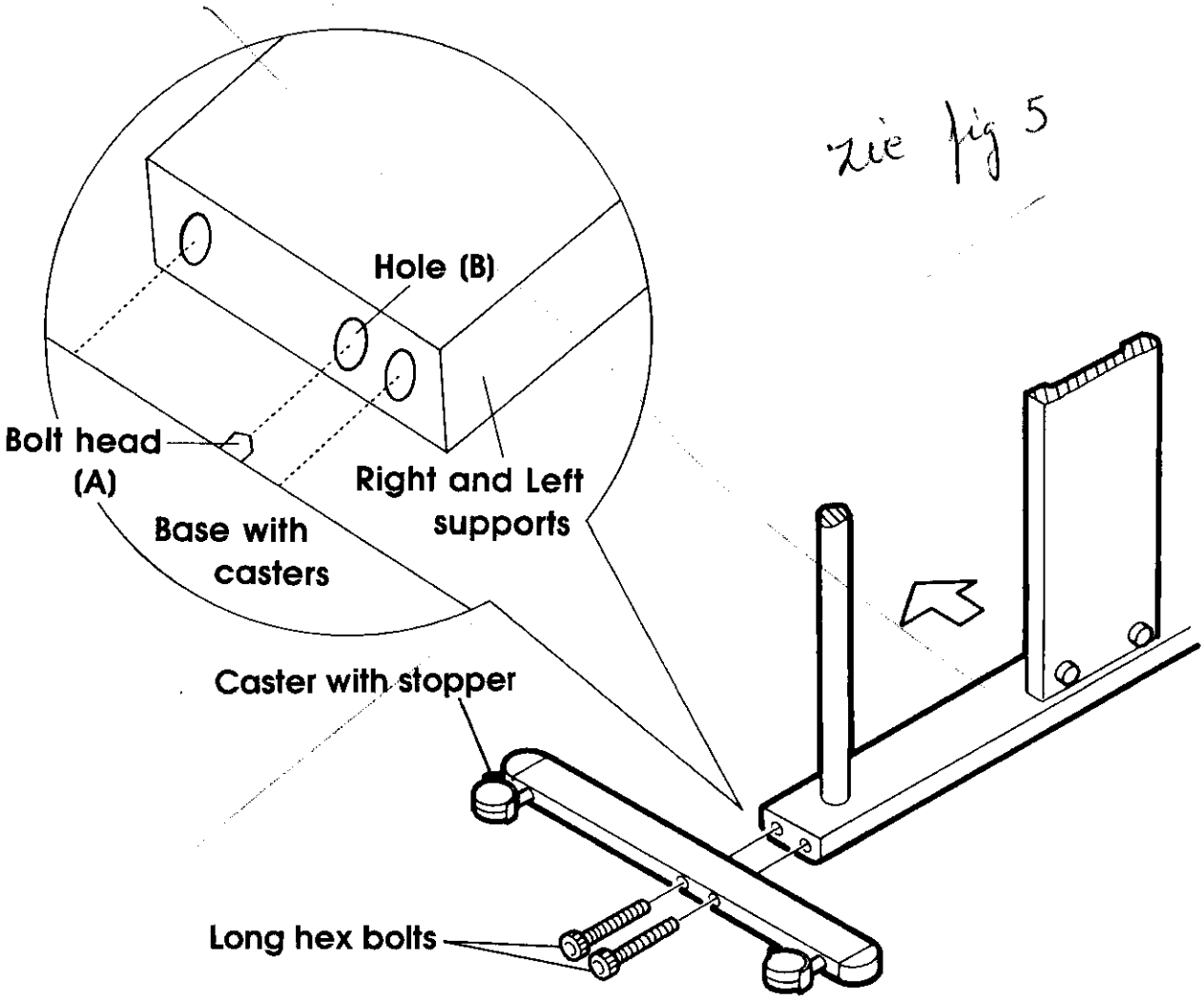


Figure 2.7 Bases with Casters Secured to the Right and Left Supports

Step 8.
Check that all bolts are tightened. Gently lift the assembled plotter stand upright.

Attaching the Plotter Body

The plotter body is shipped fully assembled and ready to be mounted on the assembled plotter stand.

Before attaching the plotter body to the stand, position the assembled stand with the longer sections of the bases at the front (see Figure 2.8).

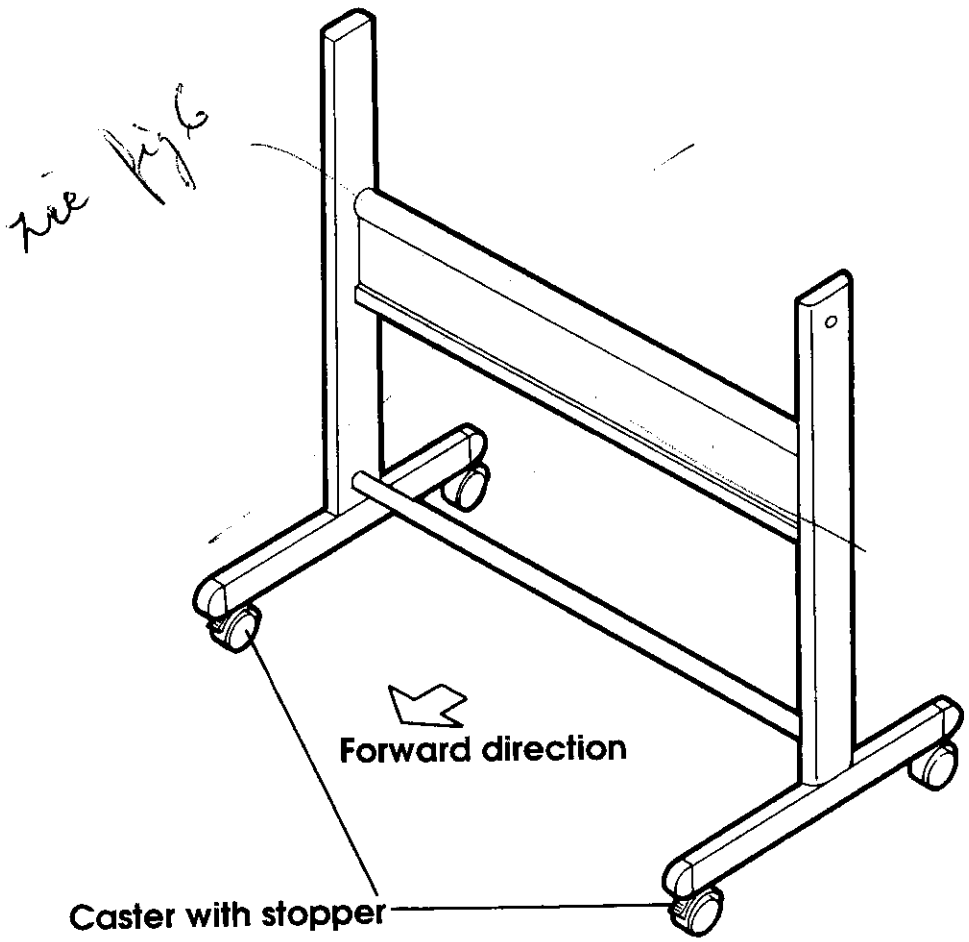


Figure 2.8 Positioning the Plotter Stand

CAUTION!

The MUTOH XP–500 Series Plotter is heavy. Unpacking and assembly requires at least two people.

Remove the vinyl wrapping from the plotter body to prevent slipping.

When you lift the plotter body, be sure you lift from the bottom of the plotter.

CAUTION!

Wheel the plotter to the desired location. Lock the front caster wheels by pressing one end of the switches on the front casters (see Figure 2.9).

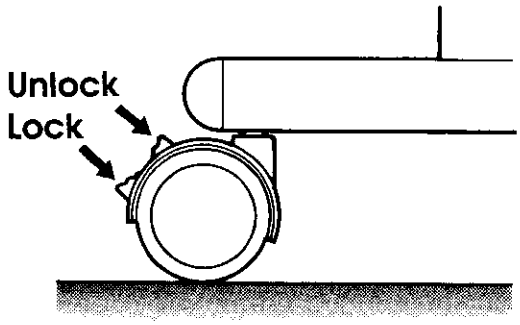


Figure 2.9 Locking the Casters

☞ *See Chapter 13: Using Media Rolls for details about installing the media dispenser.*

Step 1.

After opening the vinyl sheeting, use the grooves on the right and left sides of the foam packing to lift the plotter body from the box. One person should grasp the plotter body from each side (see Figure 2.10).

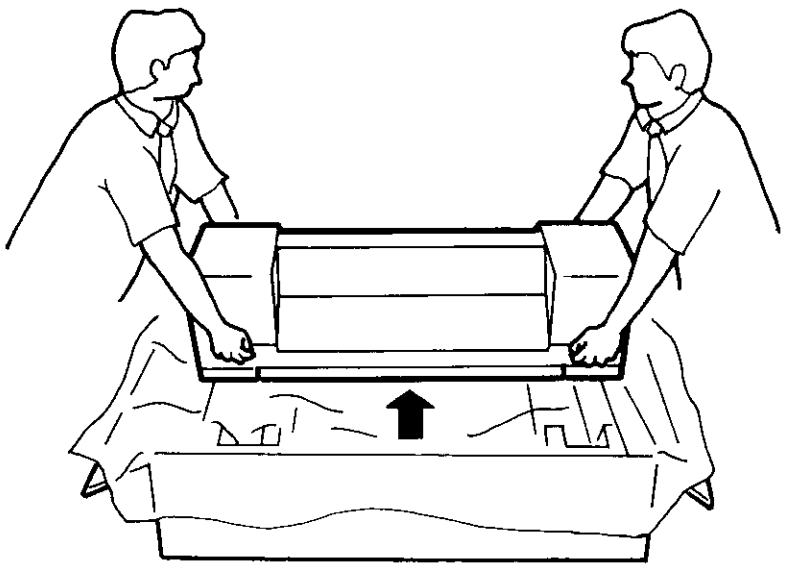


Figure 2.10 Lifting the Plotter Body

Step 2.
Change hand positions while briefly resting the plotter body on the box (see Figure 2.11).

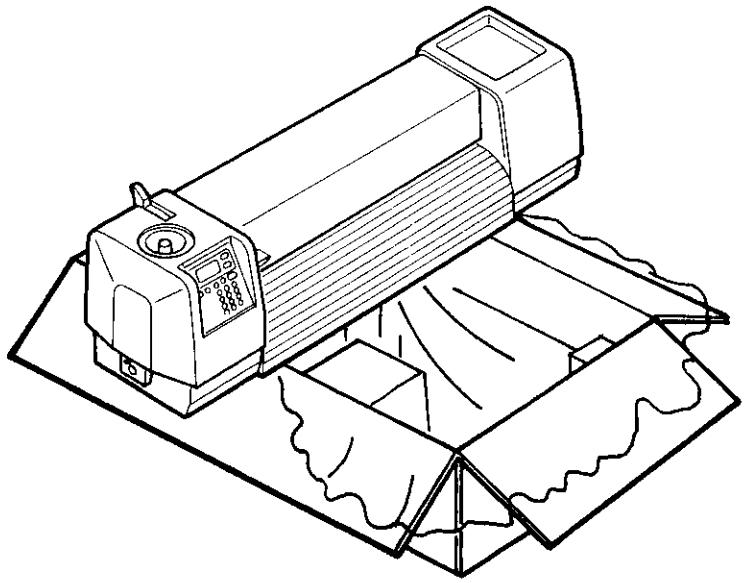


Figure 2.11 Position for Plotter Body While Changing Hand Positions

Step 3.
Attach the support mounting block (on the plotter body) to the support on the plotter stand. The Control Panel should face the front.

Step 4.
Insert the plotter body into the plotter stand. Secure the plotter body to the plotter stand by inserting the mounting knobs into the holes on each side of the plotter stand (see Figure 2.12).

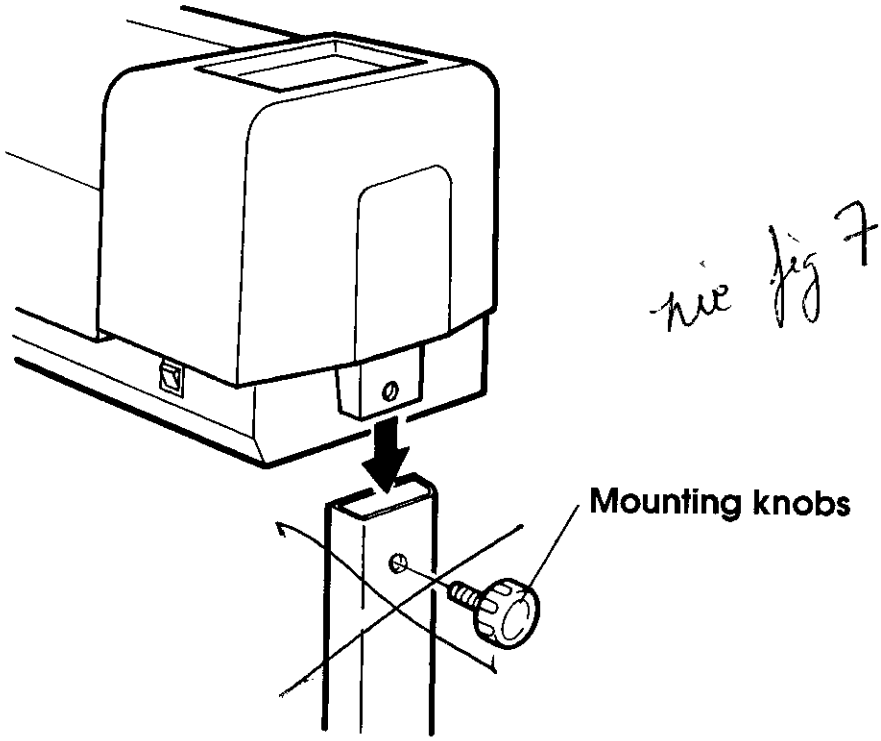


Figure 2.12 Using Mounting Knobs to Secure Plotter Assembly

Connecting the Power Cable

The power cable is packed in the Accessory Box.

CAUTION!

Be sure the power switch is in the OFF position before you plug the power cable into the electrical outlet. The power switch is on the right front of the plotter body.

Plug the plotter end of the power cable into the plotter and the outlet end into the electrical outlet (see Figure 2.13). Use a power cord adapter if necessary.

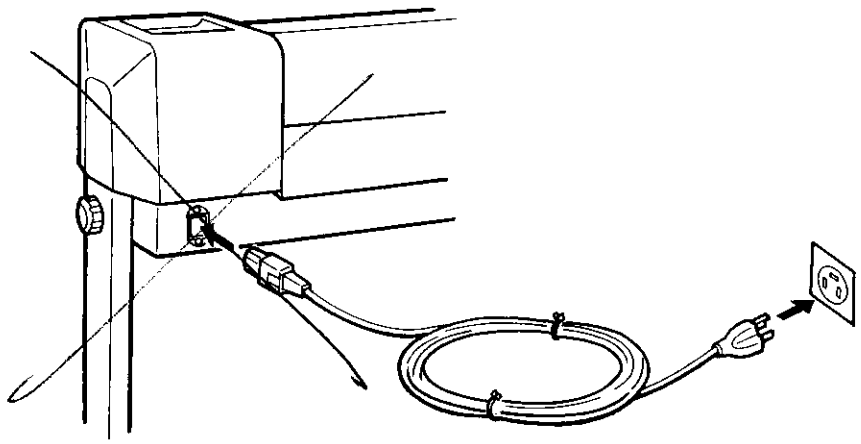


Figure 2.13 Location of Power Connector

Chapter 3

Connecting the Plotter to Your Computer

You can connect your MUTOH XP–500 Series Intelligent Plotter to a host computer. The host computer can be a personal computer (PC) or a mainframe.

This chapter shows how to:

- ✗ **Determine the type of connection for your plotter and computer**
- ✗ **Determine the type of interface**
- ✗ **Set the interface parameters**
- ✗ **Set the host computer command mode**

Determining the Type of Interface

The MUTOH XP-500 Series Plotter is classified as data terminal equipment (DTE). It transmits data on pin 2 and receives data on pin 3.

The plotter has two interface ports and supports four types of interfaces:

- RS-232C
- RS-422A (optional)
- GP-IB (optional)
- Centronics® (optional)

Figure 3.1 shows the locations of the interface ports.

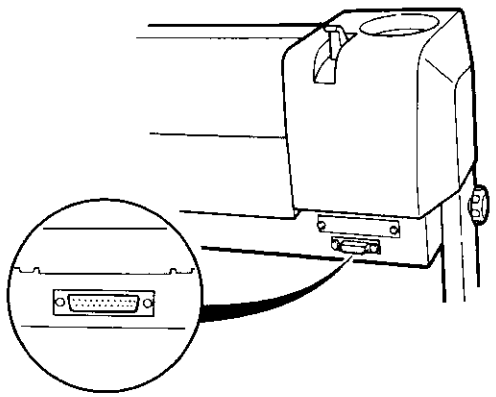


Figure 3.1 Plotter Interface Ports

The standard interface for a MUTOH XP-500 Series Plotter is RS-232C. RS-232C can also be used as an optional (second) interface.

RS–232C Interface

The RS–232C port on the plotter is a 25-pin female port. Table 3.1 shows the pin assignments for the plotter's RS–232C port.

Table 3.1 RS–232C Port Pin Assignments

Pin No.	Signal	Abbr.	Direction Plotter ↔ Host Computer
1	Frame ground	FG	—
2	Transmitted data	TXD	→
3	Received data	RXD	←
4	Request to send	RTS	→
5	Clear to send	CTS	←
6	Data set ready	DSR	←
7	Signal ground	SG	—
8	Carrier detect	CD	←
9–14	Unused		
15	Transmitter signal element timing	ST	←
16	Unused		
17	Receiver signal element timing	RT	←
18	Data terminal ready	DTR	→
19	Unused		
20	Data terminal ready	DTR	→
21–25	Unused		

You can use either a 9-pin to 25-pin cable or a 25-pin to 25-pin cable for your RS–232C connection. Figure 3.2 shows the cable configuration for a 9-pin to 25-pin cable. Figure 3.3 shows the configuration for a 25-pin to 25-pin cable.

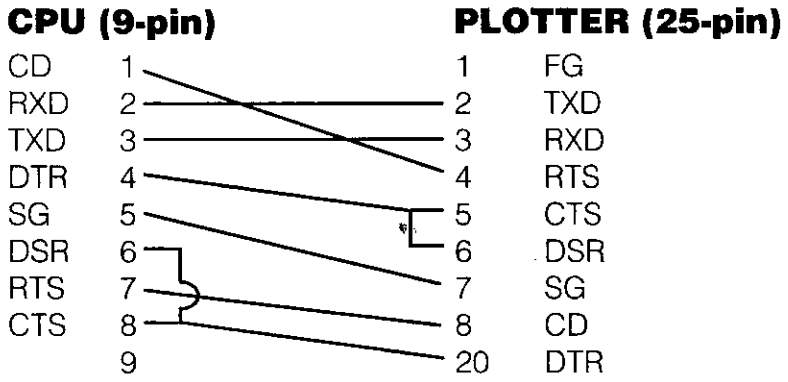


Figure 3.2 RS–232C 9-Pin to 25-Pin Cable Configuration

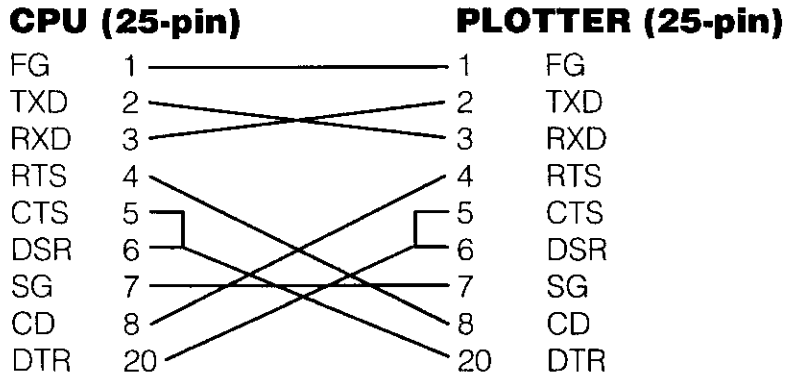


Figure 3.3 RS–232C 25-Pin to 25-Pin Cable Configuration

RS–422A Interface (Optional)

The RS–422A interface uses a 15-pin port. Figure 3.4 shows an RS–422A port. Table 3.2 shows RS–422A pin signals.

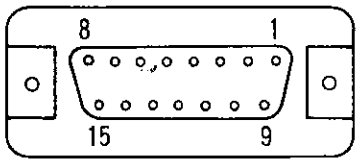


Figure 3.4 RS–422A Port

Table 3.2 RS–422A Pin Signals

Pin No.	Signal	Abbr.	Direction Plotter ↔ Mainframe
1	Frame ground	FG	—
2	Transmitted data	TXD	→
3	Received data	RXD	←
4	Request to send	RTS	→
5	Clear to send	CTS	←
6	Transmission signal element timing	ST	←
7	Data terminal ready	DTR	→
8	Receiver signal element timing	$\overline{RT}$	←
9	Transmitted data	$\overline{TXD}$	→
10	Received data	$\overline{RXD}$	←
11	Request to send	$\overline{RTS}$	→
12	Clear to send	$\overline{CTS}$	←
13	Transmission signal element timing	$\overline{ST}$	←
14	Data terminal ready	$\overline{DTR}$	→
15	Receiver signal element timing	$\overline{RT}$	←

GP-IB (IEEE-488) Interface (Optional)

Table 3.3 details the GP-IB interface connections.

Transfer system – Two-way
Data length – 8-bit parallel
Transmission control system – Handshake system
Signal level – Conforming to IEEE-488

Table 3.3 GP-IB Interface Connector Signals

Pin No.	Abbreviation	Name of Circuit in Connection	I/O for Signal Direction
1	DATA 1	Input Output Data	I/O
2	DATA 2	Input Output Data	I/O
3	DATA 3	Input Output Data	I/O
4	DATA 4	Input Output Data	I/O
5	EOI	End or Identity	I/O
6	DAV	Data Valid	I/O
7	NRFD	Not Ready for Data	I/O
8	NDAC	Not Data Accepted	I/O
9	IFC	Interface Clear	I/O
10	SRQ	Service Request	I/O
11	ATN	Attention	I/O
12	SHIELD	Shield (FG)	
13	DATA 5	Input Output Data	I/O
14	DATA 6	Input Output Data	I/O
15	DATA 7	Input Output Data	I/O
16	DATA 8	Input Output Data	I/O
17	REN	Remote Enable	I/O
18–19	SG	Signal Ground	

Centronics® Interface (Optional)

Table 3.4 details the Centronics® interface connections.

Transfer system – One-way (receiving only)
Data length – 8-bit parallel
Transmission control system – Handshake system
Signal level – TTL level
Transmission distance – Maximum 2 meters

Table 3.4 Centronics® Interface Connector Signals

Pin No.	Abbreviation	Name of Circuit in Connection	I/O for Signal Direction
1	STROBE*	Strobe Input	I
2–9	DATA 1~8	Parallel Data Input	I
10	ACK*	Acknowledge Output	O
11	BUSY	Busy	O
12	PAPER END	Paper End	O
13	SELECTED	Selected	O
16	SG	Signal Ground	
17	FG	Frame Ground	
18	HIGH	High Level	O
19–30	SG	Signal Ground	
31	Unused		
32	FAULT	Error	O
33	SG	Signal Ground	

Note: Other pins are put in NC (no contact) status.
Note: Asterisk (*) indicates negative logic.

40

Setting Interface Parameters

Read the manuals that come with your computer and the software for information about interface parameters and any settings required at the host computer.

Parameters for the standard interface are set at the factory for the RS–232C default settings. You will have to set interface values using the Setup parameter if you:

- ❒ Want different settings for the RS–232C interface
- ❒ Are using a different interface for port 1
- ❒ Are using both ports

Plotter parameters are set through the Setup parameter.

☞ *See "Setup Parameter" in Chapter 7 for details about setting interface values for this parameter.*

RS–232C and RS–422A Interface Parameters

Table 3.5 shows the parameters for the RS–232C interface and the possible settings for each parameter.

Table 3.5 RS–232C and RS–422A Interface Parameter Settings

Parameter	Settings
Baud rate	Ext 300 400 1200 2400 9600 19200 (bps)
Data length	7 bit 8 bit
Parity	None Even Odd
Stop bit	1 bit 2 bit
Handshake	Off ENQ/ACK Xon - Xoff
DTR Control	Always On Always Off 18-pin 20-pin
CTS Control	On Off
RTS Control	Always On Always Off Control

The RS–232C interface has five preprogrammed combinations. They are identified as USER1 to USER5.

☞ *See "User Parameter" in Chapter 7 for information on how to set or change the User parameter.*

The RS–422A interface uses the same parameters as the RS–232C (see Table 3.3). No default values are assigned for an RS–422A interface.

☞ *See the command tables in the Appendix for information about individual commands.*

GP–IB Interface Parameters

For a GP–IB interface, only two parameters must be specified: Address (0 to 30) and listen only (ON or OFF).

42

Centronics® Interface Parameters

No parameters need to be set up for a Centronics® interface. However, the port number and command mode must be specified.

Setting the Host Computer Command Mode

The host computer can be set up for MH–GL (emulates HP–GL) command mode.

☞ *See "Setup Parameter" in Chapter 7 for information on how to set the host computer command mode.*

☞ *See the command tables in the Appendix for information about individual commands.*

MH–GL Command Mode

When the host computer is in MH–GL command mode, set the parameters shown in Table 3.6.

Table 3.6 MH–GL Parameters

Parameter	Settings
Emulation	Off HP758X HP759X F-900
Program Step	0.025 mm 0.01 mm
VS, AS, FS Commands	Effective Ineffective
IN Command	Normal Restricted

Chapter 4

Getting to Know Your Plotter

Before you start to use the plotter, you should be familiar with all of the components and the controls and how to prepare the plotter for use.

This chapter shows how to:

- ✗ **Identify the plotter components**
- ✗ **Identify keys and indicator lights on the Control Panel**
- ✗ **Position the Control Panel for ease of use and readability**
- ✗ **Change the language used on the LCD**
- ✗ **Read the information on the LCD**

Plotter Components

Figure 4.1 identifies MUTOH XP–500 Series Plotter components.

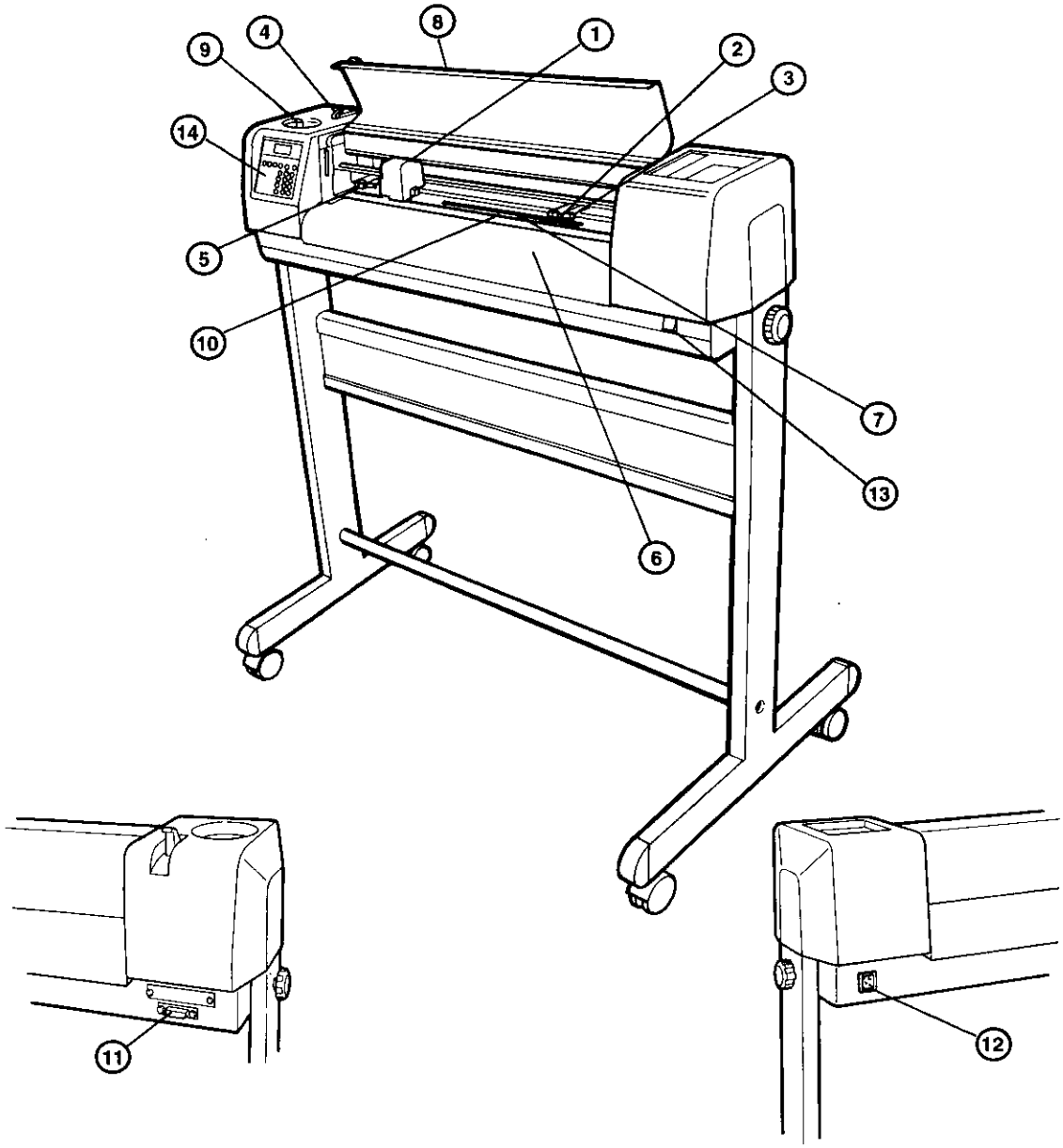


Figure 4.1 MUTOH XP–500 Series Intelligent Plotter

① **Pen Head/Scope**	Holds the specified pen or pencil during plotting. When a pen or pencil is needed, the pen head gets that pen or pencil from the stocker and locates the plotting position on the media. The pen head moves along the Y-axis on a steel belt to locate the plotting position. A scope reads the co-ordinate values on the media.
② **Drive Roller**	Moves the plotting media along the X-axis.
③ **Pressure Rollers**	Holds media against the drive roller during plotting. There are two pressure rollers. The position of the left pressure roller is fixed; the right pressure roller can be moved.
④ **Hold Lever**	Raises and lowers the pressure rollers. Lowering the hold lever holds the plotting media in place.
⑤ **Paper Set Fin**	Guides the media so it is loaded properly.
⑥ **Platen**	Supports the plotting media and guides the movement of media along the X-axis.
⑦ **Plotting Roller**	Prevents plotting media from moving or creasing, even during high-pressure plotting, by holding the media tight.
⑧ **Carriage Cover**	Keeps the plotting area clean and prevents anything from falling into the plotting area. For safety, the plotter will not work unless the cover is closed.
⑨ **Stocker Housing**	Holds the stocker and provides easy access for installation, removal, and loading.

⑩	**Media Cutting Groove**	A convenient guide to accurately cut media to the desired size.
⑪	**I/O Connector**	Serial communications connector, which connects the plotter to the host computer.
⑫	**Power Connector**	Connector for the power cord, which plugs into the main power supply for the plotter.
⑬	**Power Switch**	Turns the plotter ON and OFF.
⑭	**Control Panel**	Panel with LCD, function keys, operation keys, numeric keys, and indicator lights. Figure 4.2 shows a detailed illustration of the Control Panel.

Using the Control Panel

The Control Panel is used to enter menu options, display plotter status, and manually move the pen head/scope.

- LCD shows menu options, plotting coordinates, and current plotter status
- Function keys select plotting options displayed on the LCD
- Operation and numeric keys control plotting and set parameter values
- **JOG** keys position the pen or pencil and scope
- Indicator lights tell you the status of certain functions

Figure 4.2 shows the Control Panel.

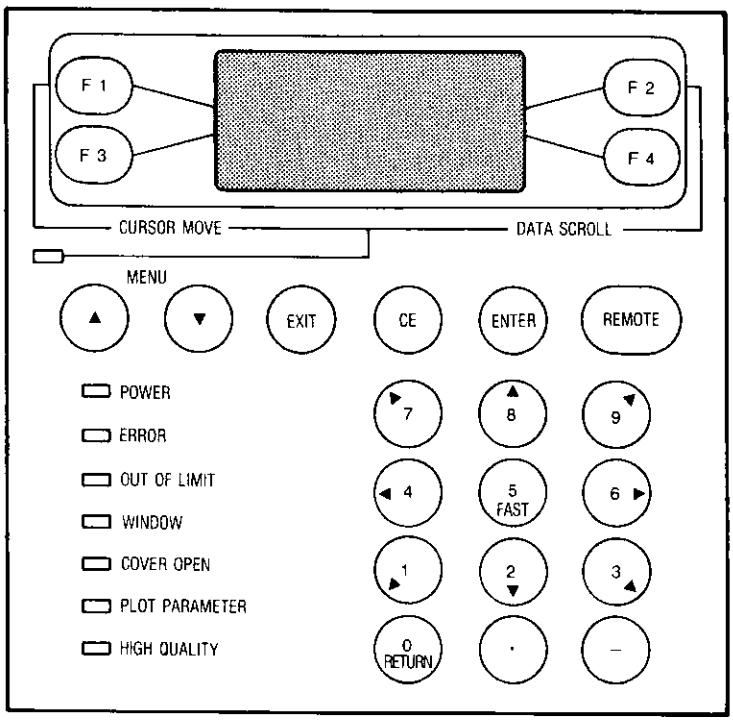


Figure 4.2 MUTOH XP-500 Series Plotter Control Panel

Reading the Indicator Lights

The Control Panel has indicator lights that show the current status of the plotter. Figure 4.2 shows the location of the indicator lights. Table 4.1 lists the indicator lights and plotter status when the light is ON.

Table 4.1 Control Panel Indicators

Indicator	Plotter Status When Light is ON
POWER	Power is ON.
ERROR	Error has occurred.
OUT OF LIMIT	Pen/pencil is out of plot area.
WINDOW	Window parameters have been set.
COVER OPEN	Plotter cover is open.
PLOT PARAMETER	One of these plot parameters is set up: SCALE MIRROR ROTATE ORIGIN ALIGNMENT COMPENSATION
HIGH QUALITY	Plotter is in High Quality mode.
CURSOR MOVE/ DATA SCROLL	Cursor is moving or there is a request to enter data.

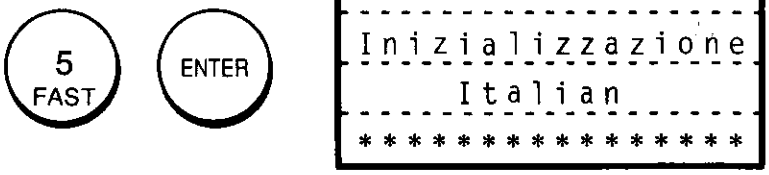
To select and save the language for messages and menus, follow these steps:

Step 1.
Turn the power switch OFF.

Step 2.
Turn the power switch ON while simultaneously pressing a numeric key and **ENTER**. The numeric key you press determines the language selected:

Language	Keys	
Japanese	0 RETURN, ENTER	
English	1, ENTER	
German	2, ENTER	
French	3, ENTER	
Spanish	4, ENTER	

Italian



Key Pad

The key pad has four function keys, six operation keys, and 12 numeric keys to set plotter parameters and control plotting functions. Eight of the numeric keys have more than one function, depending on the current plotter mode. Figure 4.7 shows the location of the key pad and arrangement of the keys.

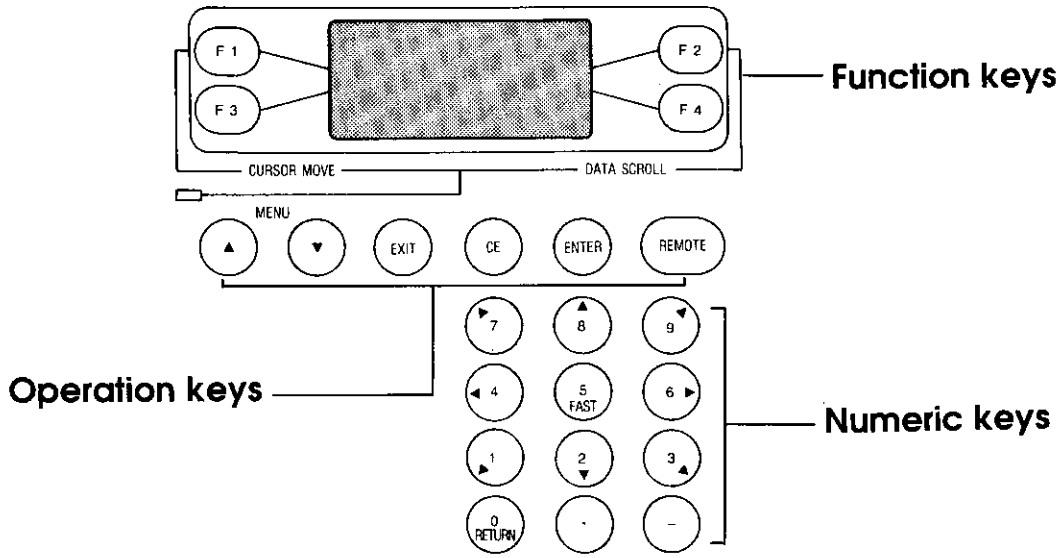


Figure 4.7 Arrangement of Key Pad

Function Keys

The four function keys (**F1** to **F4**) are used according to the current plotter mode and parameter function in use.

☞ *See the explanations of the plotter modes and parameters for details.*

Operation and Numeric Keys

The operation keys and numeric **JOG** keys and their functions are:

REMOTE — Switches the plotter between Remote Replot and Local modes. The mode currently selected is displayed in the lower right of the LCD.

▲ — Scrolls menu backward one page at a time.

▼ — Scrolls menu forward one page at a time.

CE — Erases a numeric entry. If a multiple-digit value has been entered and this key is pressed, the entered value is cleared.

Note:
The **CE** key is valid only when typing numbers in response to a prompt from the plotter.

EXIT — Returns to a previous menu.

- If **EXIT** is pressed when a submenu is displayed, the LCD returns to the mode menu.
- If **EXIT** is pressed when a mode menu is displayed, the LCD returns to the first page of that mode menu.

Accepts the current Control Panel entries.

to

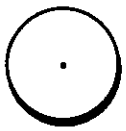
Enters a numeric value or moves the pen head/scope in the direction of the arrow.

- When responding to a prompt, these keys are used to enter a numeric value.
- When not responding to a prompt, the plotter is in Jog mode and pressing the **JOG** keys moves the pen head/scope in the direction of the arrow.

Note:

The pen head moves a small increment each time you press one of the **JOG** keys. To increase the speed of pen-head/scope movement, press and hold down the **5/FAST** key while pressing the **JOG** keys.

Enters the numeric value of 0 or returns a pen or pencil to the stocker.



or

Enters a decimal or negative value when used in numeric entries.

- When used as **JOG** keys, **Decimal (.)** moves the pen head/scope to the left the distance between the pen head and scope; **Minus (–)** moves the pen head/scope to the right the distance between the pen head and scope.

Note:
If the plotter is in Standby mode, the pen head/scope moves on the Y-axis only.

Chapter 5

Plotting Media, Pens, and Pencils

Your MUTOH XP–500 Series Intelligent Plotter can use many sizes of pre-cut media or media from the media dispenser and a variety of pens and pencils.

This chapter shows how to:

- ✗ **Select the best plotting media**
- ✗ **Combine media, pens, and pencils for best plotting results**
- ✗ **Prepare pens and pencils for use**
- ✗ **Load the stocker**
- ✗ **Care for your pens and pencils**

Plotting Media

It is important to use the right type of plotting media for your drawings. Select the type of media based on the type of drawing, how long you need to keep the drawing, and the cost and qualities of the media. Your MUTOH dealer can recommend the best media for your needs.

Note:

Maximum media size depends on the XP–500 Series Plotter model:

- ❒ Model XP–5X0 can use up to size A0/E media (841 x 1189 mm, 36 x 48 in)
- ❒ Model XP–5X1 can use up to size A1/D media (594 x 841 mm, 24 x 36 in)

CAUTION!

For best plotting results, use only recommended plotter supplies with your MUTOH plotter.

The MUTOH warranty covers problems that occur ONLY when you use media recommended by your MUTOH dealer.

MUTOH XP–500 Series Plotters can use these types of plotting media:

- ◆ High-gloss bond paper
- ◆ Tracing bond paper
- ◆ Double-matte polyester film

☞ *See Chapter 13 for information about using media rolls and the media dispenser.*

Plotting Media Types

High-Gloss Bond Paper

High-gloss bond paper is best for preliminary drawings. It is not recommended for drawings that will be reproduced using a wet-copy process.

Tracing Bond Paper

Tracing bond paper is recommended for preliminary drawings. The uncoated surface is good for wet-ink plotting and for drawings that will be reproduced using a wet-copy or photo-reproduction process.

Double-Matte Polyester Film

Double-matte polyester film is best for precision drawings and very complex plots. It is not affected by temperature or humidity changes and is recommended for overlay ink and final drawings that will be stored.

Note:
Be sure to use double-matte polyester film. Single-matte polyester film may cause media-feed problems.

Plotting Media Sizes

Table 5.1 and Table 5.2 show standard media sizes for the XP–500 Series Plotters.

Table 5.1 Model XP-500 Media Sizes

	Type A	Type B	Standard Media Size Width x Length
ANSI A	AA		228 x 304 mm (9 x 12 inches)
	AB		304 x 457 mm (12 x 18 inches)
	AC		457 x 610 mm (18 x 24 inches)
	AD		610 x 914 mm (24 x 36 inches)
	AE		914 x 1219 mm (36 x 48 inches)
ANSI E	EA		216 x 279 mm (8.5 x 11 inches)
	EB		279 x 432 mm (11 x 17 inches)
	EC		432 x 559 mm (17 x 22 inches)
	ED		559 x 864 mm (22 x 34 inches)
	EE		864 x 1118 mm (34 x 44 inches)
JIS A	A4	A4	210 x 297 mm
	A3	A3	297 x 420 mm
	A2	A2	420 x 594 mm
	A1	A1	594 x 841 mm
	A0	A0	841 x 1189 mm
DIN Oversize	A4	A4	240 x 330 mm
	A3	A3	330 x 450 mm
	A2	A2	450 x 625 mm
	A1	A1	625 x 880 mm
	A0	A0	880 x 1230 mm
Korea		B2	545 x 786 mm
		B1	786 x 1090 mm
Blue Print	BL		762 x 1067 mm
Australia B	B1		707 x 1000 mm

Table 5.2 Model XP-5~~X~~2 Media Sizes

	Type A	Type B	Standard Media Size Width x Length
ANSI A	AA		228 x 304 mm (9 x 12 inches)
	AB		304 x 457 mm (12 x 18 inches)
	AC		457 x 610 mm (18 x 24 inches)
	AD		610 x 914 mm (24 x 36 inches)
ANSI E	EA		216 x 279 mm (8.5 x 11 inches)
	EB		279 x 432 mm (11 x 17 inches)
	EC		432 x 559 mm (17 x 22 inches)
	ED		559 x 864 mm (22 x 34 inches)
JIS A	A4	A4	210 x 297 mm
	A3	A3	297 x 420 mm
	A2	A2	420 x 594 mm
	A1	A1	594 x 841 mm
DIN Oversize	A4	A4	240 x 330 mm
	A3	A3	330 x 450 mm
	A2	A2	450 x 625 mm
	A1	A1	625 x 880 mm
Korea		B2	545 x 786 mm

Handling the Plotting Media

Temperature and humidity can affect the plotting media. Media strength and rigidity decrease as temperature and humidity rise. As a result, the media may wrinkle, tear, slip, or stick to the pressure roller.

For best plotting results, keep the temperature and humidity constant. Table 5.3 shows the best temperature and humidity levels.

Table 5.3 Optimum Temperature and Humidity Levels

Temperature	Humidity
16°C to 32°C (recommended 23°C) 61°F to 90°F (recommended 73°F)	50% to 65% (recommended 60%)

Temperature and humidity changes can also cause changes in the size of the media. To reduce the effects of temperature and humidity changes, stabilize the media before using it by exposing it to the air near the plotter for about 30 minutes.

Table 5.4 shows how much the different media will stretch or shrink with a 1% change in humidity.

Table 5.4 Percent of Media Change with 1% Change in Humidity

Media Type	Percent of Change
High-gloss bond paper	0.018%
Tracing bond paper	0.027%
Double-matte polyester film	0.0012%

Greater humidity changes have even greater effect. For example, if the humidity increases by 5%, a piece of A0/E-size tracing bond paper can stretch as much as 1.13 mm in width.

Loading Media

The maximum media size depends on the MUTOH XP–500 Series Plotter model being used.

- Model XP-5[illegible]0 can use up to size A0/E media (841 x 1189 mm, 36 x 48 in)
- Model XP-5[illegible]1 can use up to size A1/D media (594 x 841 mm, 24 x 36 in)

Before loading plotting media, each pressure arm should be adjusted to the same pressure so that the plotting media is held properly during plotting. The XP–500 Series Plotter can be set to low (2.7 Kg) or high (3.5 Kg) pressure, according to the thickness of the plotting media being loaded.

Note:
Pressure is set to 2.7 Kg at the factory.

When loading media, you can select the direction of the media.

Step 1.
Close the plotter cover and turn the power switch ON. When the plotter comes ON:

❒ PLOTTER INITIAL is displayed on the LCD

❒ The pen head moves to the left end of the Y-axis

❒ The stocker rotates almost two full turns

❒ STANDBY is displayed on the LCD

Step 2.
Lift the hold lever.

Step 3.
Open the plotter cover and move the pressure roller so it lines up with the drive roller (see Figure 5.1).

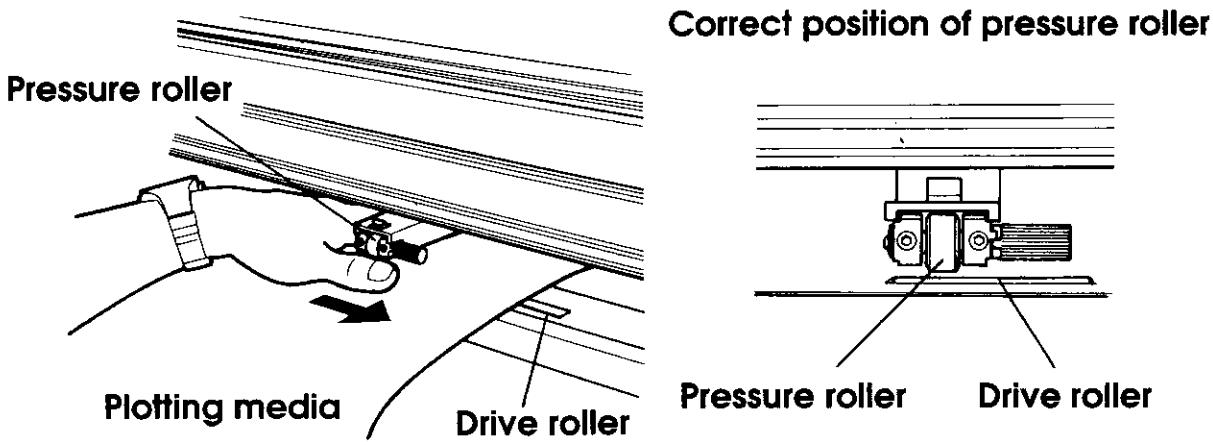


Figure 5.1 Aligning the Pressure Roller

CAUTION!
The entire pressure roller must rest on the drive roller. If the two rollers are not aligned, the plot may be distorted.

Step 4.
If necessary, use the pressure adjuster to change the pressure settings on each pressure arm to hold plotting media properly.

❒ For thick media, use high pressure

❒ For thin media, use low pressure

- ◆ On each pressure arm, loosen the two screws with a hex key (see Figure 5.2).

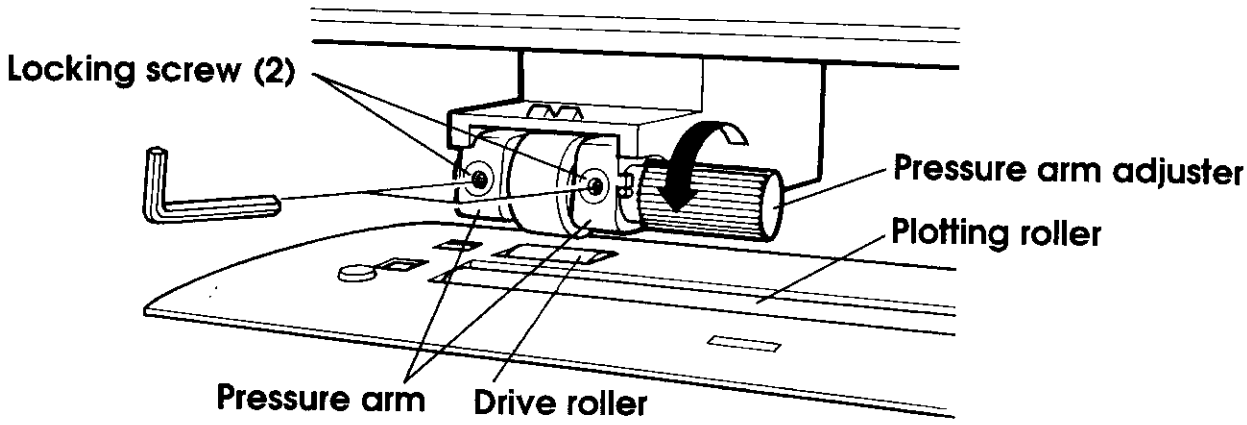


Figure 5.2 Adjusting the Pressure Roller

- Turn the pressure adjuster on each arm to the appropriate setting. The pressure roller moves up and down according to the pressure setting. When the pressure roller is up, pressure is low (2.7 Kg); when the pressure roller is down, pressure is high (3.5 Kg).
- When both pressure arms are set at the same pressure, use a hex key to tighten the two screws on each pressure arm.

CAUTION!

If the pressure settings of the pressure arms are different, media may not be held properly during plotting. Be sure that the pressure settings in the pressure arms match before you begin plotting.

Step 5.

Put the plotting media between the pressure roller and the drive roller. Position the media so half of the sheet hangs behind the plotter and half hangs in front of the plotter (see Figure 5.3).

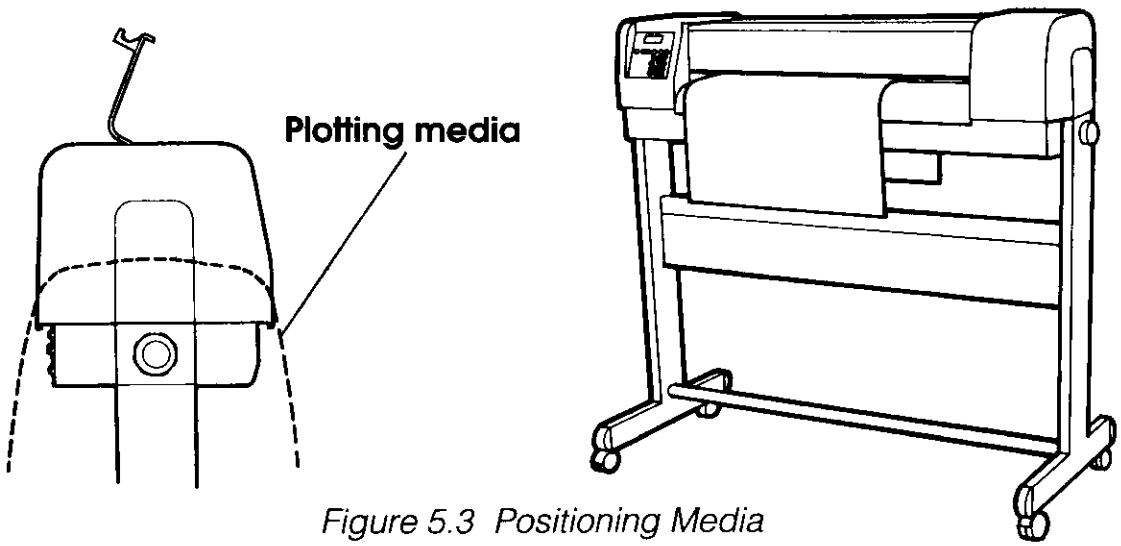


Figure 5.3 Positioning Media

Step 6.
Align the left edge of the media along the paper set fin (see Figure 5.4). Be sure both the left and right edges of the media are under the pressure rollers.

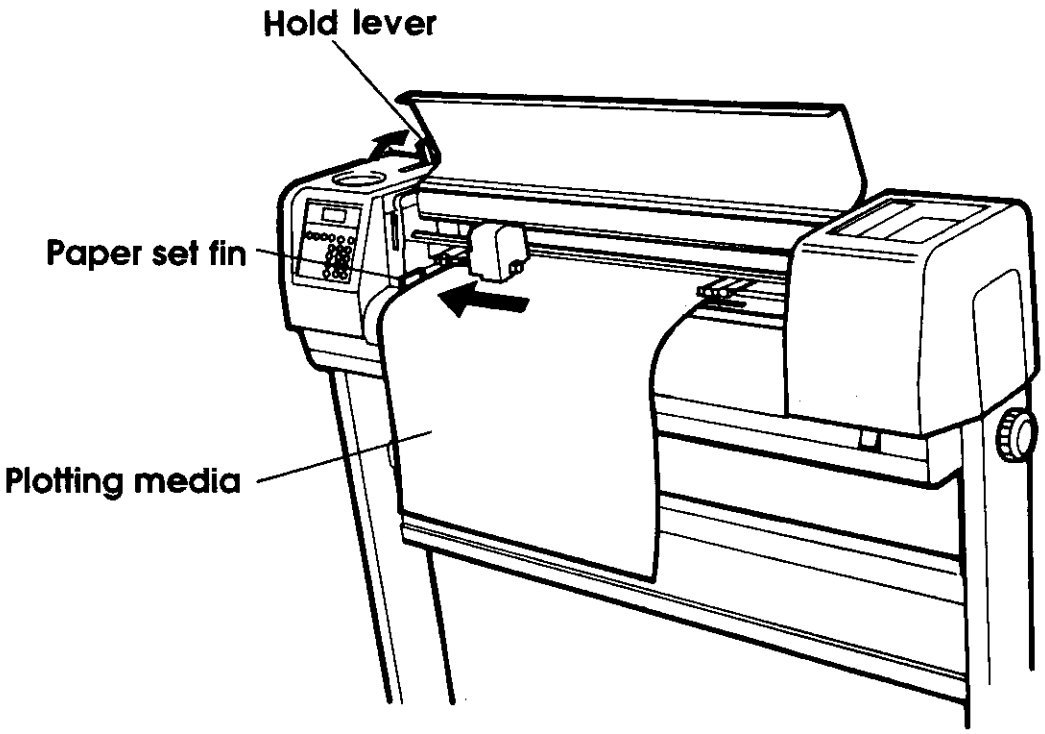


Figure 5.4 Aligning Media (Arrows Indicate the Hold Bar and the Paper Set Fin)

Step 7.
Lower the hold lever to hold the media in place (see Figure 5.4).

Step 8.
Close the plotter cover.

Note:
Do not put tape on the edge of the media or use media with taped, perforated, or folded edges.

Pens and Pencils

The MUTOH XP–500 Series Plotters use a variety of pens and pencils. The pens and pencils are described in Table 5.5.

Table 5.5 Pens and Pencils

Pen or Pencil Type	Features
Disposable ink pen	
Tip diameter	Various
Colors	Many available ink colors
Maximum plotting speed	40 cm/s (15.7 in/s)
Default plotting speed	30 cm/s (11.8 in/s)
Advantages	• Provides excellent line quality • Does not require cleaning or refilling
Disadvantages	• Points are easily clogged • Replacement pens must be kept available

68

Table 5.5 Pens and Pencils (cont'd)

Pen or Pencil Type	Features
Refillable ink pen	
Tip diameter	Various
Colors	Many available ink colors
Maximum plotting speed	40 cm/s (15.7 in/s)
Default plotting speed	30 cm/s (11.8 in/s)
Advantages	• Provides excellent line quality • Pens can be refilled and used again
Disadvantages	• Points are easily clogged • Ink must be available for refilling pens • Refilling pens requires removing pen from stocker before refilling • Pens require careful handling, cleaning, and storage
Ceramic-tip pen	
Tip diameter	0.25, 0.35, 0.5, 0.7 mm
Colors	Black, red, blue, green
Maximum plotting speed	40 cm/s (15.7 in/s)
Default plotting speed	30 cm/s (11.8 in/s)
Recommended for	Use on coated paper and polyester film
Advantages	• Provides line quality nearly equal to ink pens • Does not require cleaning or refilling

Table 5.5 Pens and Pencils (cont'd)

Pen or Pencil Type	Features
Ballpoint pen (water-based ink)	
Tip diameter	Various
Colors	Black, red, blue, green
Maximum plotting speed	90 cm/s (35.4 in/s)
Default plotting speed	90 cm/s (35.4 in/s)
Recommended for	Preliminary plots, multi-color plots, final plots
Advantages	• Provides good line quality • Does not require cleaning or refilling
Ballpoint pen (oil-based ink)	
Tip diameter	Various
Colors	Black, red, blue, green, yellow, violet, brown, orange
Maximum plotting speed	90 cm/s (35.4 in/s)
Default plotting speed	90 cm/s (35.4 in/s)
Recommended for	Preliminary plots, plots with long continuous lines, final plots
Advantages	• Provides good line quality • Does not require cleaning or refilling

10

Table 5.5 Pens and Pencils (cont'd)

Pen or Pencil Type	Features
Fiber-tip pen	
Tip diameter	Various
Colors	Black, red, blue, green, yellow, violet, brown, orange
Maximum plotting speed	40 cm/s (15.7 in/s)
Default plotting speed	10 cm/s (3.9 in/s)
Recommended for	Plotting business graphs
Advantages	• Provides good line quality • Easier to handle than other pens
Pencils	
Lead diameter	0.2, 0.3, 0.4, 0.5, 0.7 mm
Hardness	Various
Maximum plotting speed	127 cm/s (50.1 in/s)
Default plotting speed	127 cm/s (50.1 in/s)
Recommended for	Plots that may require erasures or corrections
Advantages	• Low cost • Trouble-free operation • Provides good line quality • Very fast plotting • Erasable • High contrast

Replacing Pens and Pencils

When you order replacement pens and pencils, be sure that you are getting pens (see Table 5.6) and pencils (see Table 5.7) that are recommended for your XP–500 Series plotter.

Table 5.6 Recommended Pens (Equivalent for Hewlett-Packard Compatible)

Pen Type	Manufacturer	Trade Name
Ink pen	Koh-I-Noor	63 Series
	Rotring-werks Riepe	MPP-2P series
Ballpoint pen	Pilot	CHP series (USA)
Fiber-tip pen	Staedtler Mars	31 HPO3K series, 32 HPO3K series
Ceramic-tip pen	Pentel	CHP2 series

Table 5.7 Recommended Pencils

	Manufacturer	Trade Name
Pencils	MUTOH	MUTOH
Lead	Pilot Pentel Mitsubishi Pencil	NEOX, NEOX S HIPOLYMER FOR PRO, HIPOLYMER SUPER HI–UNI GRCT

Note:
Pencil tips can be purchased separately. For more information, contact your MUTOH representative.

Preparing Pens and Pencils for Use

Some pen types come assembled and ready to load into the stocker. Other types of pens and pencils must be assembled before they can be used.

Note:
For all pen types, be sure the ink is flowing smoothly before you load the pen. To make sure that ink is flowing into the pen tip, draw a few strokes with the pen before loading the pen into the stocker.

Disposable Ink Pens

Disposable ink pens must be assembled before being loaded into the stocker. The holder is separate from the pen body.

When you are not using disposable ink pens, keep the cap on the pen tip to prevent the ink from drying. When you use a pen again, tap the end of the cartridge and then draw a few lines on paper to get the ink flowing.

To assemble a disposable ink pen:

Step 1.
Press the pen cap into the cartridge to break the seal (see Figure 5.5).

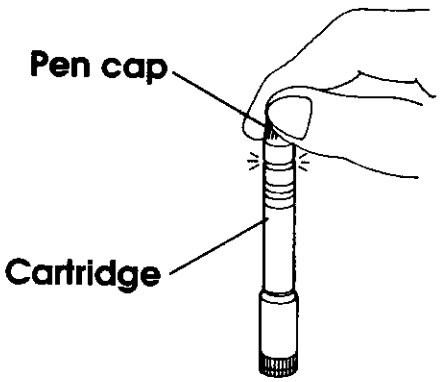


Figure 5.5 Breaking the Seal on a New Disposable Ink Pen

Step 2.
Gently shake the cartridge, and then draw on paper to get the ink flowing (see Figure 5.6).

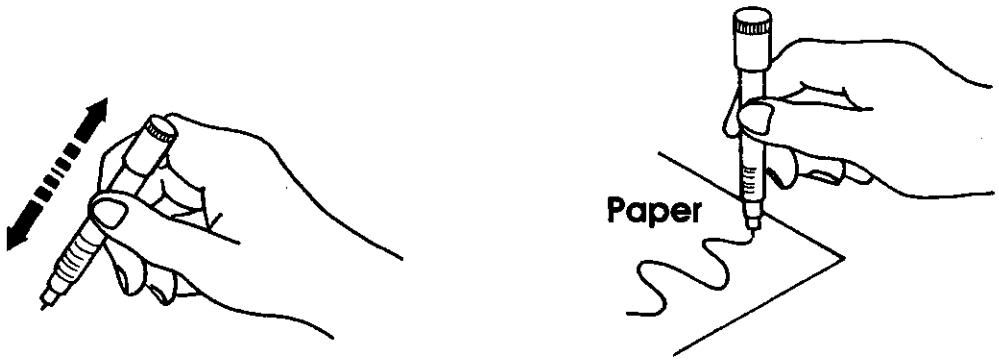


Figure 5.6 Verify that Ink is Flowing

Step 3.
Screw the cartridge into the pen holder (see Figure 5.7).

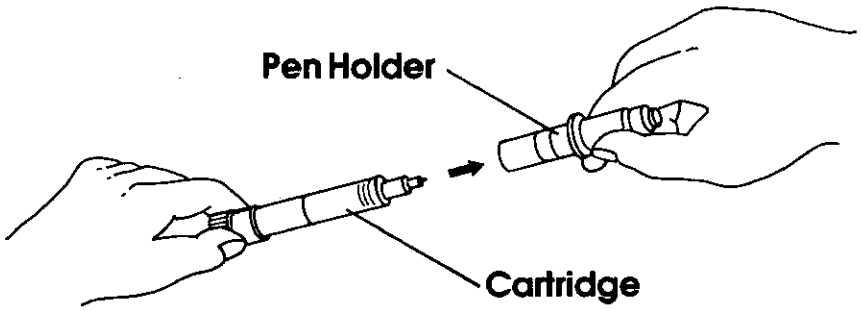


Figure 5.7 Assembling a Disposable Ink Pen

Note:
Disposable ink pens dry more quickly than other pens.

74

Step 4.
Insert the pen into the pen holder.

❒ Unscrew the pen holder from the end cap.

❒ Lower the pen holder onto the pen. Be sure the metal cylinder on the pen point goes through the slit at the tip of the pen holder.

❒ Put the end cap back on the pen holder.

Refillable Ink Pens

When you use refillable ink pens, you can select the combination of pen point and ink color you want. The pen points and ink tanks are re-usable.

Refillable ink pens should be disassembled and cleaned after each use. If not cleaned, the ink may dry and clog the point. Wash the pen parts with clean water and dry with a soft cloth.

To use a refillable pen, you must assemble the pen point and ink tank:

Step 1.
Select the desired pen point and a pen holder (see Figure 5.8).

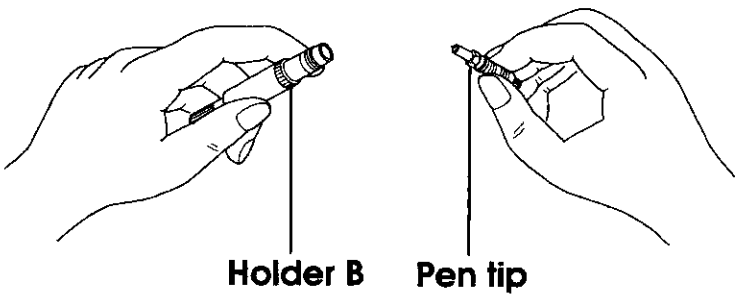


Figure 5.8 Refillable Ink Pen and Holder

Step 2.
Put the pen tip into the holder, tightening it by hand until secure (see Figure 5.9).

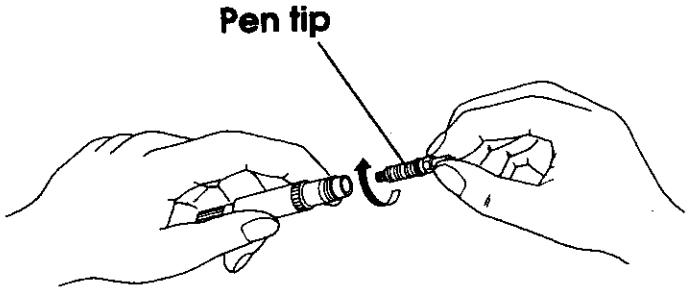


Figure 5.9 Assembling Refillable Ink Pen Tip and Holder

Step 3.
Fill the ink tank.

Step 4.
Press the ink tank into the bottom part of the pen holder and turn clockwise until it stops (see Figure 5.10).

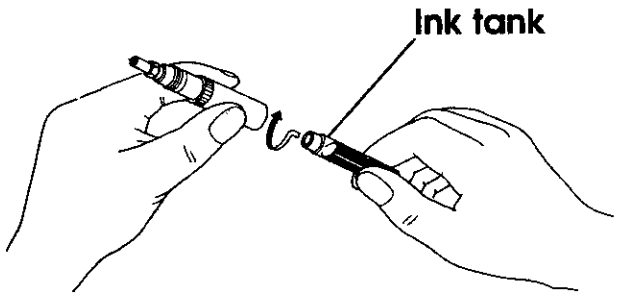


Figure 5.10 Inserting Ink Tank into a Refillable Ink Pen

Step 5.
Check to be sure ink flows smoothly out of the pen.

CAUTION!
If you shake the pen, ink may splash out of the air hole on the side. When checking for ink flow, shake the pen gently.

Step 6.
Put the top part of the pen holder over the rest of the assembled pen and holder (see Figure 5.11).

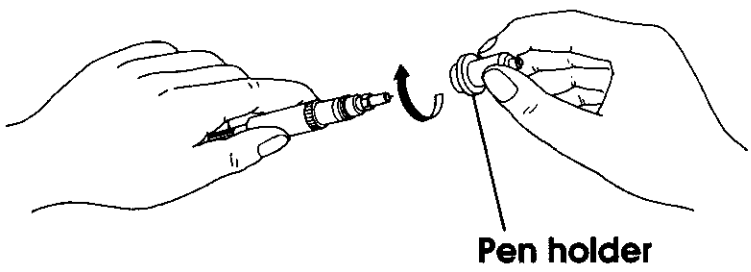


Figure 5.11 Installing Refillable Ink Pen Holder Top

Note:
Keep these pens capped so the ink does not dry and clog the pen point when not in immediate use.

Ceramic-Tip Pens and Water-Based Ballpoint Pens

Ceramic-tip pens and water-based ballpoint pens use replaceable ink cartridges. To use the pens, simply insert the cartridge and put on the back stopper.

Step 1.
Insert the ink cartridge into the holder (see Figure 5.12).

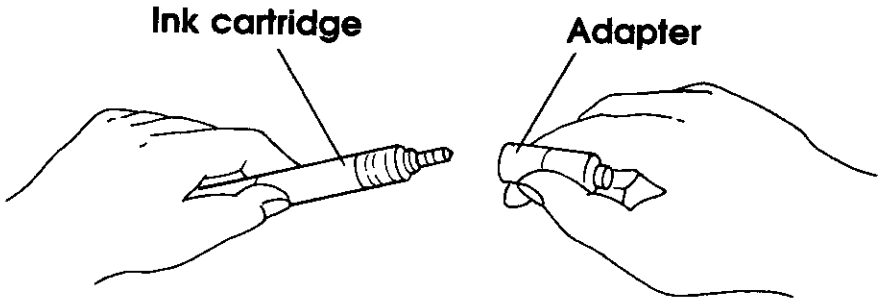


Figure 5.12 Installing an Ink Cartridge in a Ballpoint Pen

Step 2.
Put the back stopper on the adapter and tighten (see Figure 5.13).

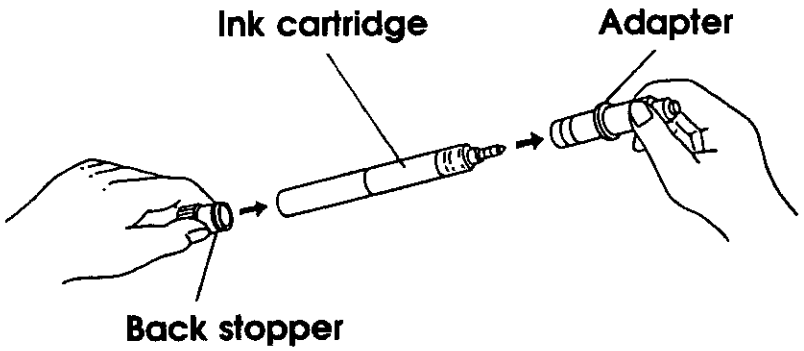


Figure 5.13 Attaching the Back Stopper

Note:
Check to be sure that the pen tip extends beyond the end of the pen holder.

Oil-Based Ballpoint Pens

Oil-based ballpoint pens can be replaced.

Step 1.

Insert the replacement pen into the adapter (see Figure 5.14).

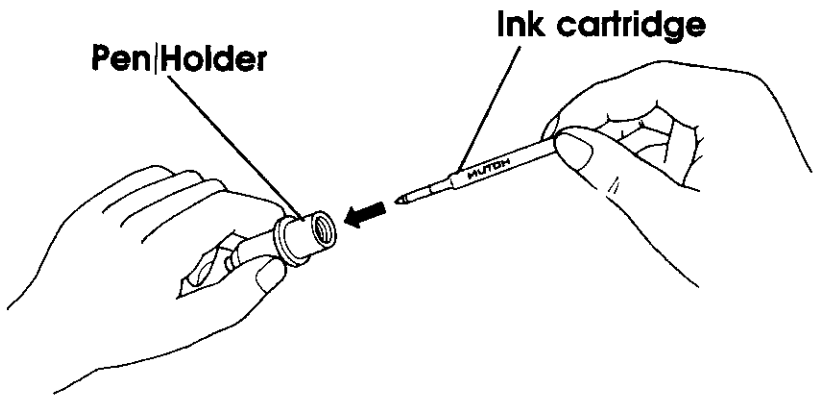


Figure 5.14 Inserting the Replacement Pen

Step 2.

When the point of the replacement pen appears at the tip of the adapter, put the back stopper on the adapter and tighten (see Figure 5.15).

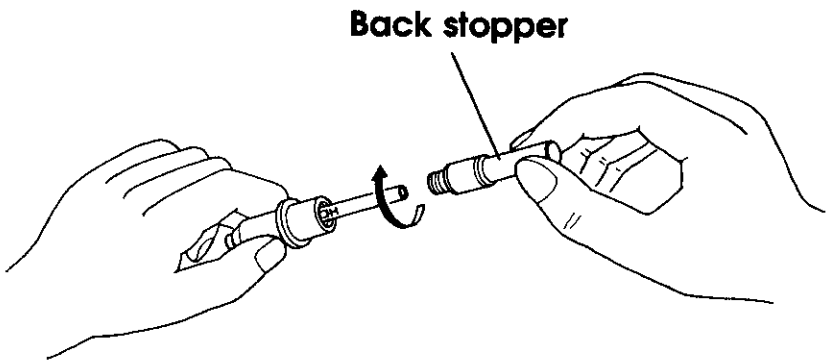


Figure 5.15 Replacing the Back Stopper

Fiber-Tip Pens

Fiber-tip pens come assembled and ready for loading into the stocker. Before inserting a fiber-tip pen into the stocker, remove the pen cap (see Figure 5.16) and make sure the ink is flowing smoothly by drawing a few practice strokes.

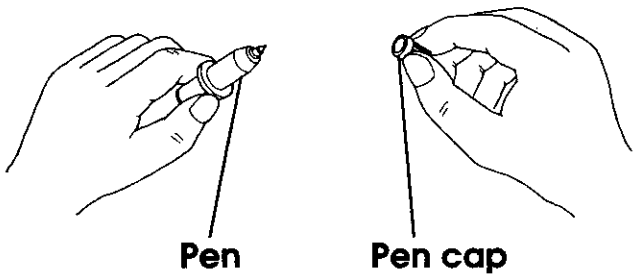


Figure 5.16 Removing Pen Cap

Pencils

The plotter uses a different pencil assembly for each lead size. A label at the end of the pencil tells you what size lead to use (see Figure 5.17).

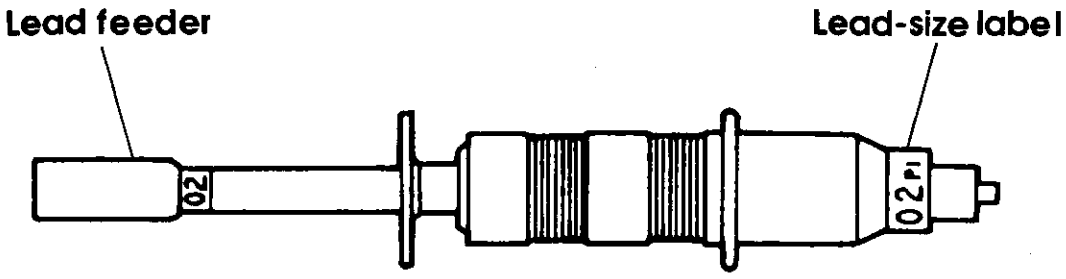


Figure 5.17 Pencils

The pencils used in this plotter feed lead automatically. Fill the pencils with spare leads beforehand.
The maximum number of spare leads a single pencil can hold is as listed below.

Lead Diameter	Maximum Capacity
0.2 mm	90 leads
0.3 mm	60 leads
0.4 mm	35 leads
0.5 mm	25 leads
0.7 mm	15 leads

To install pencil lead:
Because the pencils used in this plotter feed lead automatically, you should stock the pencils with spare leads beforehand. Restock the pencil with spare leads when the pencil becomes empty.

Restock the pencil with spare pencil leads (resupplying a pencil with no remaining lead inside) in the manner as follows.

Step 1.
Remove the knob and insert a pencil lead into the back hole of the pencil.

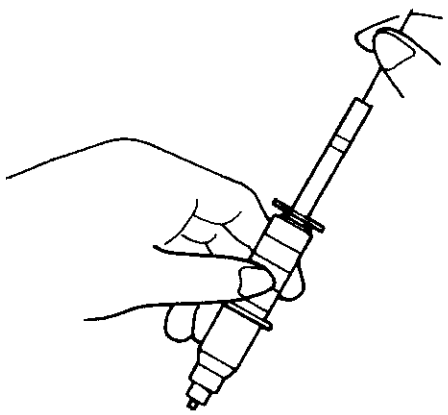


Figure 5.18 Inserting a New Pencil Lead

Step 2.

Press on either the knob or the knocking disk and press the center piece located at the tip of the pencil. Repeat this procedure several times until the lead protrudes from the tip of the pencil.

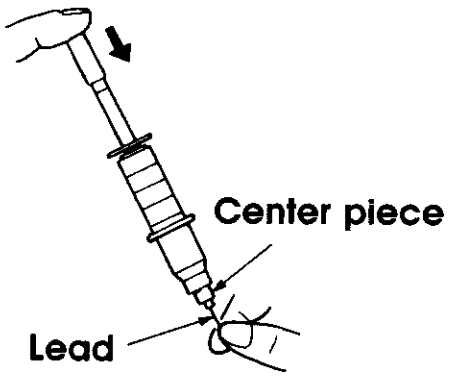


Figure 5.19 Extending the Pencil Lead

CAUTION!

Make sure to use leads of the appropriate lead diameter for the pencil. Using the wrong diameter may damage the pencil.

Note:

Push any excessive lead protruding from the tip back into the pencil as you push down the knob or the knocking disk.

Using a pencil with its knob or knocking disk pushed down may cause missing lines in the plotting and other unsatisfactory results.

87

Cleaning Pencils

After a certain amount of use, lead shavings build up inside and outside the pencil cartridge. This can cause distortions in your plots.

Clean pencil cartridges as needed.

Step 1.
Disassemble the pencil cartridge (see Figure 5.20).

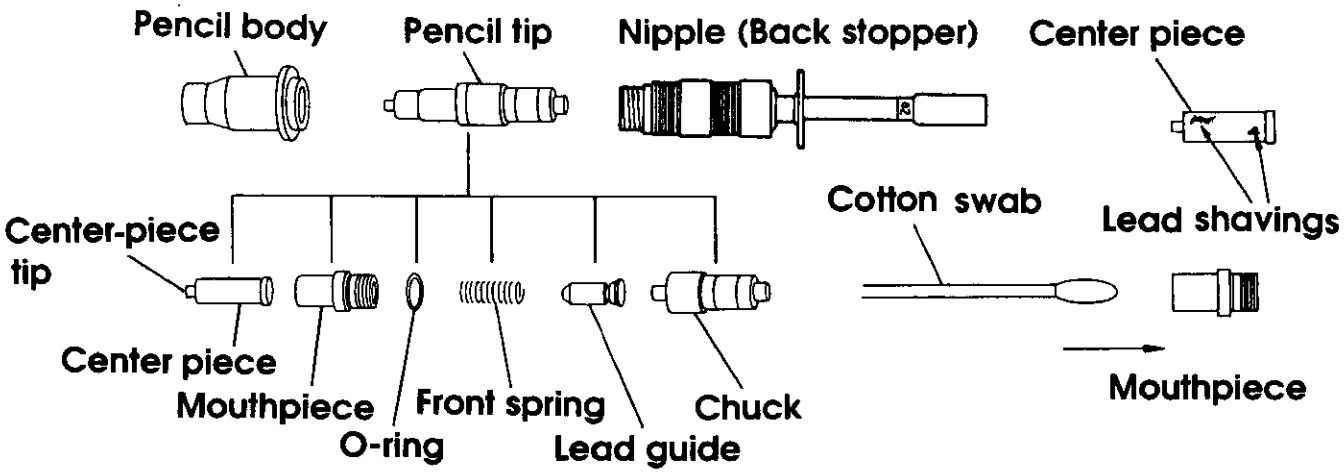


Figure 5.20 Disassembling the Pencil Cartridge

Step 2.
Clean the pencil tip by gently tapping it against a surface to knock out loose lead shavings.

Step 3.
If the pencil tip is clogged, use the cleaning wire provided to clean the tip (see Figure 5.21).

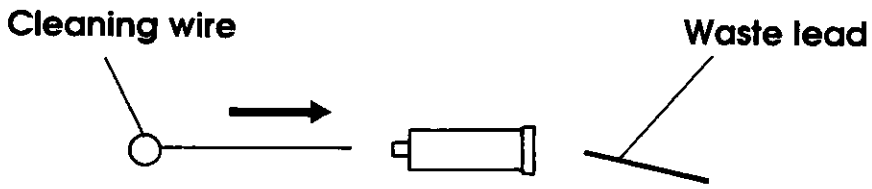


Figure 5.21 Cleaning the Pencil Tip

Step 4.
If the pencil chuck is clogged, gently push on the rear of the chuck with your finger, open the chuck, and remove the lead (see Figure 5.22).

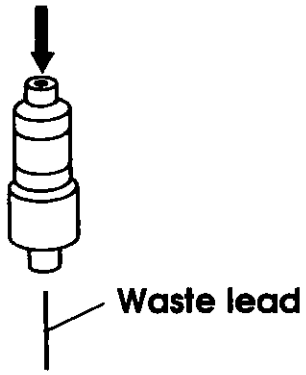


Figure 5.22 Removing Clogged Lead

CAUTION!
Do not poke at the chuck with the cleaning wire. If the chuck screw is damaged, it cannot be used.

Note:
The pencil tips are designed to withstand approximately 1,000,000 up/down cycles. If plotting problems are not solved by cleaning the pencil tip, replace the old pencil tip with a new one.

Pen and Pencil ID Marks

Ink pens (disposable and refillable) and pencils have Pen ID Marks that are used by the plotter to identify the pen or pencil type and to automatically set the parameters associated with that pen or pencil type.

The Pen ID Marks are silver and black bands at four positions on the pen or pencil (see Figure 5.23). Each Pen ID Mark has default values for the parameters. Parameters associated with the Pen ID Marks are speed, acceleration, and pressure.

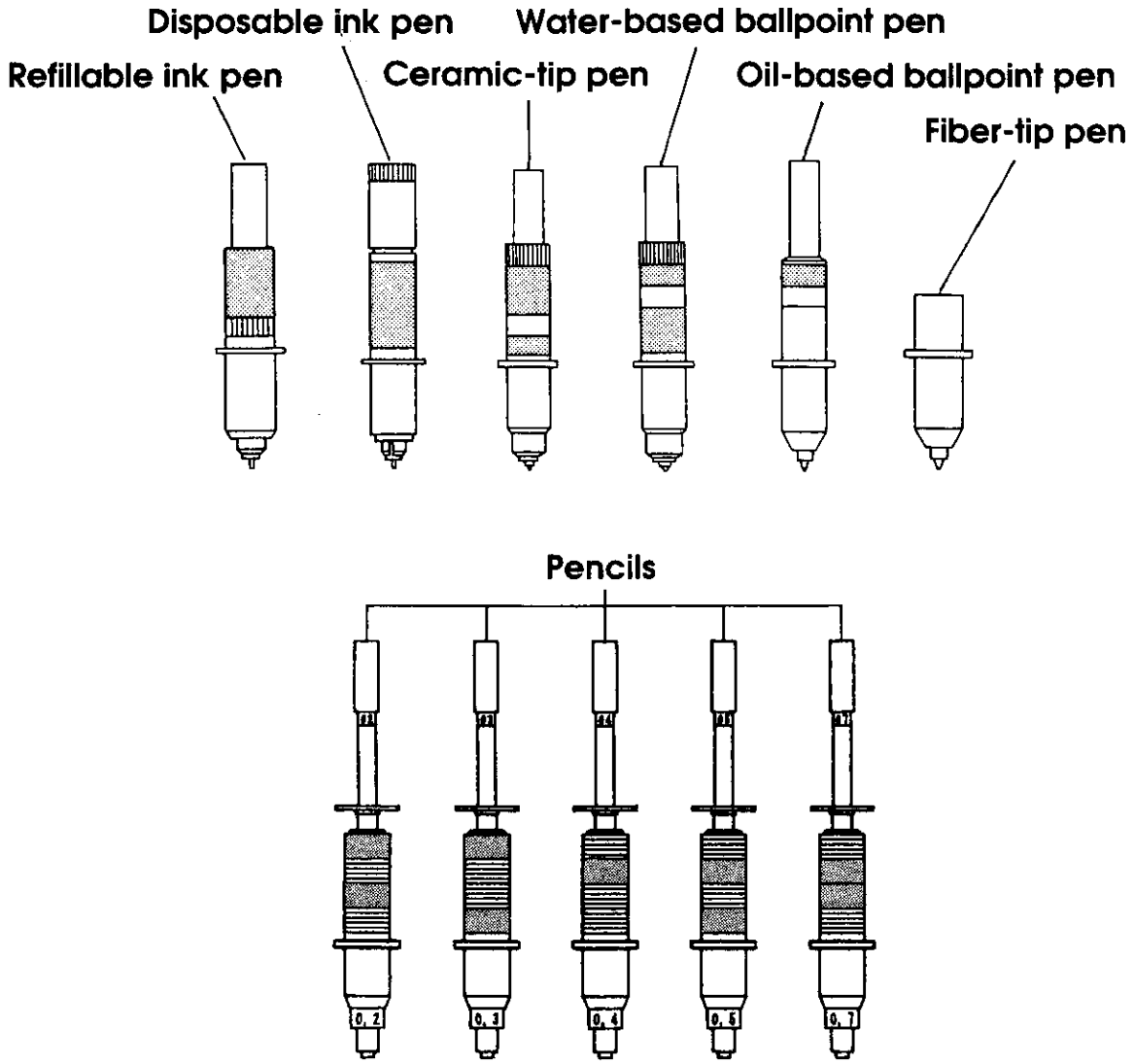


Figure 5.23 Pen and Pencil ID Marks. Shaded Areas Show Silver Pen ID Marks

Table 5.8 shows standard Pen and Pencil ID Marks.

If you use pens with a Pen ID Mark, be sure you are using pens recommended by MUTOH. Other pens with an ID mark may specify incorrect parameters.

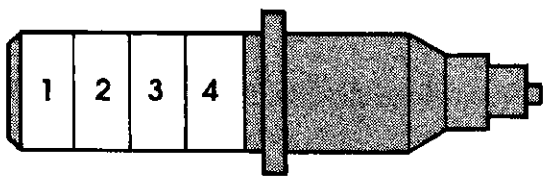
☞ *See "Replacing Pens and Pencils" in this chapter for pens and pencils recommended by MUTOH.*

Table 5.8 Pen and Pencil ID Marks

		Four ID Mark Positions			
		1 (Top)	2	3	4 (Bottom)
Ink pen	Disposable ink pen	●	●		
	Refillable ink pen	●	●	●	
	Disposable ink pen	●	●	●	●
Ceramic-tip pen		●	●		●
Water-based ballpoint pen		●		●	●
Oil-based ballpoint pen		●			
Pencil	0.2 mm	●		●	
	0.3 mm	●			●
	0.4 mm		●		
	0.5 mm		●		●
	0.7 mm		●	●	
Short Type *					

● Indicates silver ID mark

* "Short type" refers to generally available plotter pens without silver ID Marks



When using pens with Pen ID Marks, be sure that the Pen ID Mark switch at the bottom of the stocker is ON (see Figure 5.24). When the Pen ID Mark switch is OFF, the plotter will not read the Pen ID Mark.

☞ *See "Pen Type Setting" in Chapter 9 for more information about Pen ID Marks.*

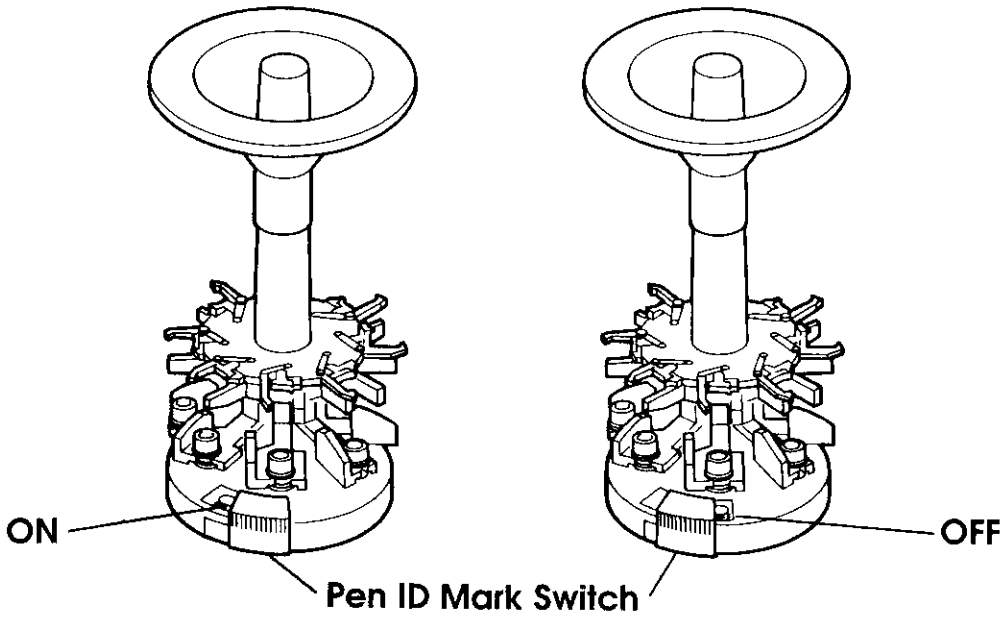


Figure 5.24 Pen ID Mark Switch

CAUTION!

If the Pen ID Mark is dirty or damaged, the plotter will not be able to read it. Clean the mark with a soft cloth. If necessary, clean it with a soft cloth and alcohol. If the mark is damaged, stop using that pen.

Changing Pen Parameters

You can change pen parameters; once parameters are set, they are saved until parameters are changed.

☞ *See "Pen Map" in Chapter 9 for information about pen parameters.*

Pen and Pencil Stocker

The pens or pencils used for plotting are held in the stocker.

When a pen or pencil is needed, the plotter takes it from the stocker. When plotting with that pen or pencil is complete, the plotter returns it to the stocker.

The stocker holds eight pens or pencils. Figure 5.25 shows the parts of the stocker.

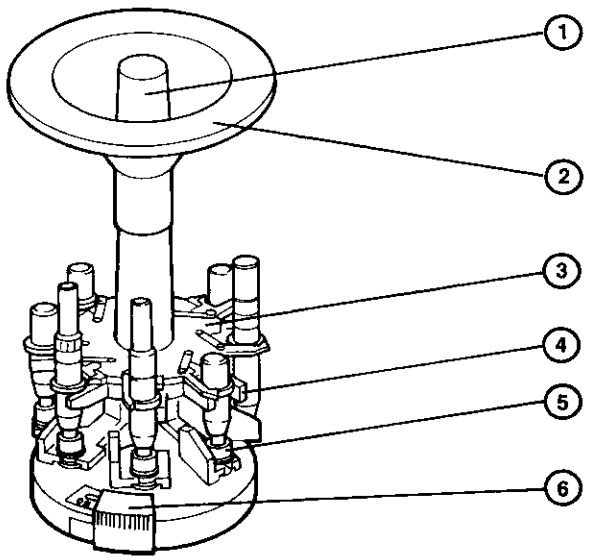


Figure 5.25 Pen/Pencil Stocker

① **Handle**	Hold the stocker by the handle when installing or removing it from the plotter.
② **Cover**	The cover keeps dirt from falling into the stocker when it is installed in the plotter.
③ **Disk**	The disk supports the pens and pencils when they are installed in the stocker.
④ **Stall**	There are eight numbered stalls. Each stall has a spring-loaded clip that holds a pen or pencil.
⑤ **Pen Cap**	There is a pen cap below each pen stall to help keep pen tips from drying out.
⑥ **Pen ID Mark Switch**	This switch indicates whether you are using pens or pencils with ID marks. Be sure the switch is ON for pens or pencils with Pen ID Marks and OFF for pens or pencils without Pen ID Marks.

Loading the Stocker

Before you load pens into the stocker, be sure they are correctly assembled and that the ink flows smoothly. If you are loading pencils, be sure the pencils have lead and that the lead extends slightly beyond the pencil tip.

Step 1.
With one hand, press down on one of the pen caps (see Figure 5.26).

Step 2.
With the other hand, gently push the pen or pencil into the spring-loaded clip in the stall. Be sure the pen collar is below the disk (see Figure 5.26).

Step 3.
Release the pen cap.

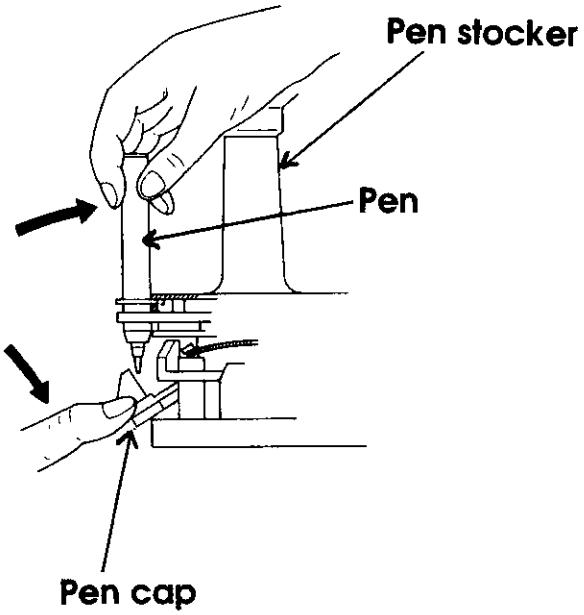


Figure 5.26 Loading the Stocker

Check to be sure the pens or pencils are loaded correctly. If a pen or pencil is not loaded correctly, the plotter may not be able to replace it during plotting.

When loaded correctly, the pen or pencil is held securely, it is straight, and the tip is inside the pen cap. Figure 5.27 shows examples of correctly and incorrectly loaded pens.

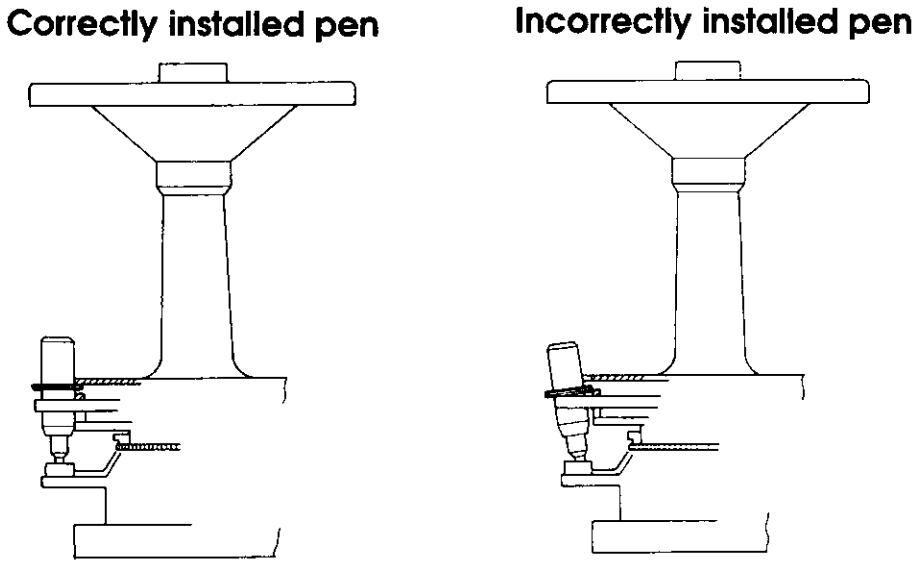


Figure 5.27 Correctly and Incorrectly Loaded Pens

90

Installing the Stocker

The stocker fits into a housing on the left side of the plotter. Refer to NO TAG in Chapter 4 for the location of the stocker housing.

Step 1.

Hold the stocker by the handle and slide it over the spindle in the housing. Be sure the notch on the bottom of the stocker (below stall #1) is lined up with the pin on the spindle (see Figure 5.28).

Note:

You can rotate the stocker if necessary until the pin and notch line up. To rotate the stocker, the power switch on the plotter must be OFF.

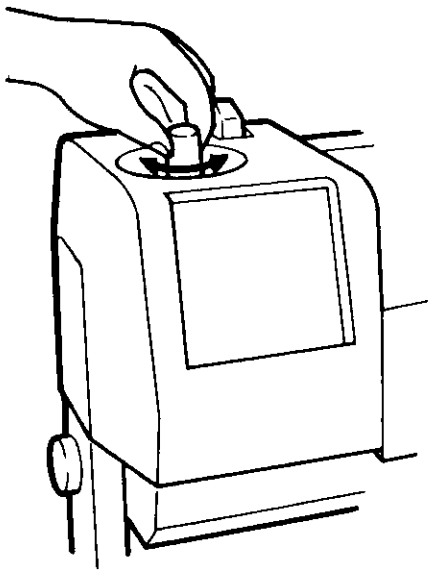


Figure 5.28 Installing the Stocker

Step 2.

To remove the stocker, lift the stocker straight off the spindle.

Combinations of Plotting Media, Pens, and Pencils

Plotting results depend on the combination of plotting media and pens or pencils. Table 5.9 shows the most effective combinations of media, pens, and pencils.

Table 5.9 Most Effective Media, Pen, and Pencil Combinations

		Double-Matte Polyester Film	Tracing Bond Paper	High-Gloss Bond Paper	Features
Ink	Ink for paper	No	Best	Usable	• Fine quality • Handle with care
	Ink for film	Best	Usable	Usable	• Fine quality • Handle with care
Ceramic-tip pens		No	Usable	Usable	• Easy to handle
Ballpoint pens (water-based)		No	No	Best	• Easy to handle • High-speed plotting
Ballpoint pens (oil-based)		Usable	No	Usable	• Easy to handle • High-speed plotting
Fiber-tip pens		No	Usable	Usable	• Easy to handle
Pencils		Best	Best	Best	• Low cost • Trouble-free • Erasable • High-speed plotting

92

Chapter 6

Using Menus and Plotter Modes

Plotter control and operation parameters are selected from menus that are displayed on the LCD. The menus displayed are determined by the operating mode that you select.

This chapter shows how to:

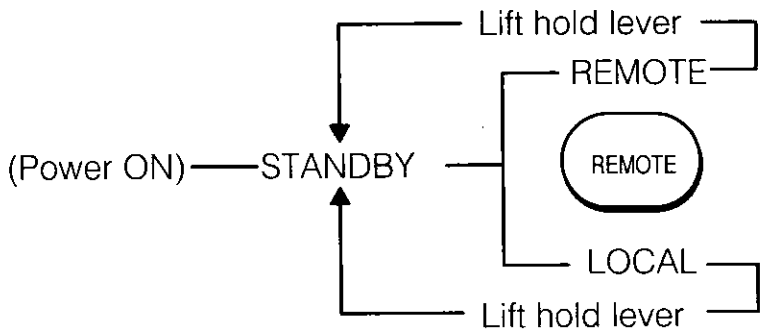
- ✗ **Use different levels of menus**
- ✗ **Display menu pages**
- ✗ **Select menu options**
- ✗ **Change parameter values**
- ✗ **Enter numeric values for parameters**
- ✗ **Use plotter modes**

Menu Structure

The MUTOH XP-510 Intelligent Plotter menu structure has three levels:

❒ Mode menus

Lists options for an operating mode. The Standby menu is displayed when the plotter is turned ON. The Local or Remote menus are selected by closing the plotter cover and pressing **REMOTE** until the desired menu is displayed.



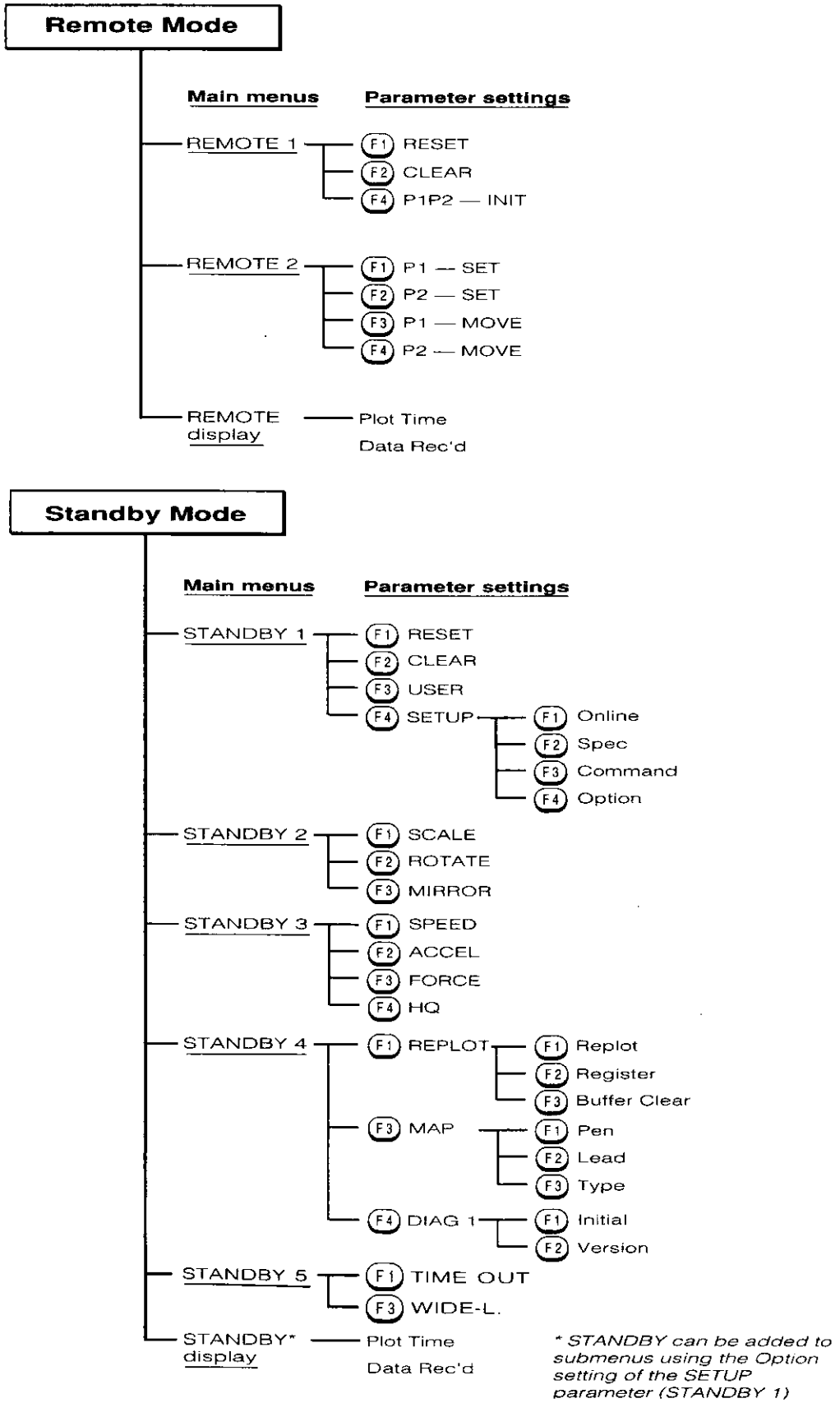
❒ Main menus

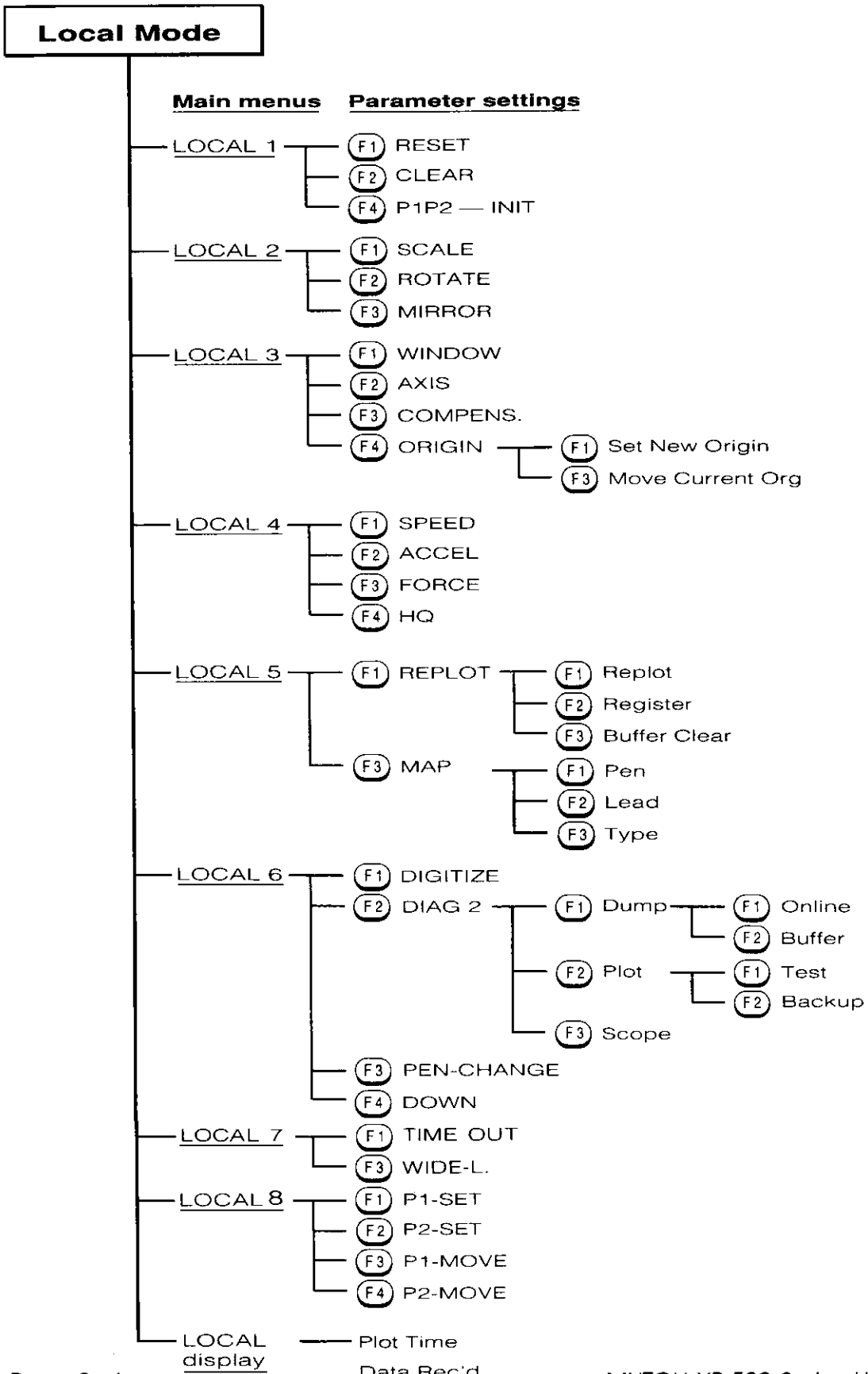
Lists additional items that appear if the function selected from a mode menu has additional options.

❒ Parameter settings

Shows settings or values for the option selected from a mode menu or main menu.

☞ *See the "MUTOH XP-500 Series LCD Flowcharts" included with parameter descriptions for details about menu structure and flow.*


Remote Mode
Main menus
Parameter settings
REMOTE 1
F1 RESET
F2 CLEAR
F4 P1P2 — INIT
REMOTE 2
F1 P1 — SET
F2 P2 — SET
F3 P1 — MOVE
F4 P2 — MOVE
REMOTE display
Plot Time
Data Rec'd
Standby Mode
Main menus
Parameter settings
STANDBY 1
F1 RESET
F2 CLEAR
F3 USER
F4 SETUP
F1 Online
F2 Spec
F3 Command
F4 Option
STANDBY 2
F1 SCALE
F2 ROTATE
F3 MIRROR
STANDBY 3
F1 SPEED
F2 ACCEL
F3 FORCE
F4 HQ
STANDBY 4
F1 REPLOT
F1 Replot
F2 Register
F3 Buffer Clear
F3 MAP
F1 Pen
F2 Lead
F3 Type
F4 DIAG 1
F1 Initial
F2 Version
STANDBY 5
F1 TIME OUT
F3 WIDE-L.
STANDBY* display
Plot Time
Data Rec'd
* STANDBY can be added to submenus using the Option setting of the SETUP parameter (STANDBY 1)

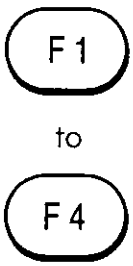

Local Mode
Main menus
Parameter settings
LOCAL 1
F1 RESET
F2 CLEAR
F4 P1P2 — INIT
LOCAL 2
F1 SCALE
F2 ROTATE
F3 MIRROR
LOCAL 3
F1 WINDOW
F2 AXIS
F3 COMPENS.
F4 ORIGIN
F1 Set New Origin
F3 Move Current Org
LOCAL 4
F1 SPEED
F2 ACCEL
F3 FORCE
F4 HQ
LOCAL 5
F1 REPLOT
F1 Replot
F2 Register
F3 Buffer Clear
F3 MAP
F1 Pen
F2 Lead
F3 Type
LOCAL 6
F1 DIGITIZE
F2 DIAG 2
F1 Dump
F1 Online
F2 Buffer
F2 Plot
F1 Test
F2 Backup
F3 Scope
F3 PEN-CHANGE
F4 DOWN
LOCAL 7
F1 TIME OUT
F3 WIDE-L.
LOCAL 8
F1 P1-SET
F2 P2-SET
F3 P1-MOVE
F4 P2-MOVE
LOCAL display
Plot Time
Data Rec'd

Mode Menus

Each of the mode menus has several pages. However, only one page of the menu is displayed on the LCD at a time. To display previous or next pages, use the menu scroll keys.

Displays the next page. If the last page is displayed, pressing this key displays the first page of the menu.

Displays the previous page. If the first page of the menu is displayed, pressing this key displays the last page of the menu.



When the menu option that you want is displayed on the LCD, press the function key that selects that option.

Main Menus

Some mode menu options have additional options. When you select one of those items, a main menu is displayed.

Main menus may also have several pages. Like the mode menu, each page is displayed on the LCD in sequential order. To display the previous or next pages, use **MENU ▲** and **MENU ▼**.

Select the item you want from the main menu by pressing the function key that selects that item.

Selecting and Setting Parameters

There are three ways to select parameters and enter information:

- Blinking items
- Numeric value entry
- Reference point setup

Blinking Items

When you select an operation parameter from the parameter list, the options for the parameter are displayed on the LCD, with one option blinking. To select a different setting or value for that parameter, use the four function keys as follows:

F 1 Moves the blinking selection left or up

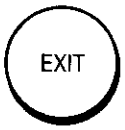
F 3 Moves the blinking selection right or down

F 2 Increases the blinking value

F 4 Decreases the blinking value

98

When the option you want is blinking, press **ENTER** to set the new parameter.



Press **EXIT** to return to the mode menu without changing the current setting.

Figure 6.1 shows how **F1** and **F3** are used to move the blinking selection.

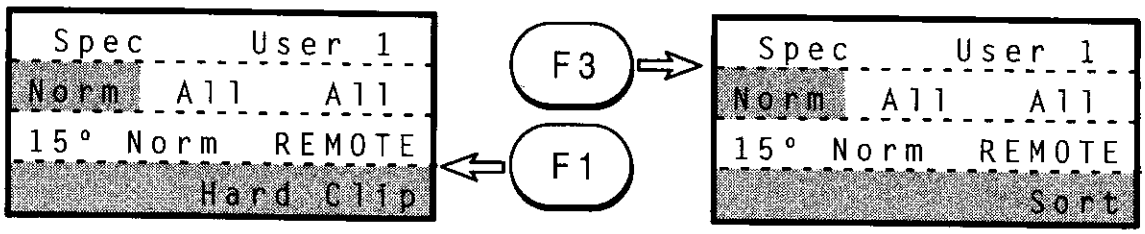


Figure 6.1 Moving the Blinking Selection

Figure 6.2 shows how **F2** and **F4** are used to select the setting. The example that follows shows how to use the blinking selections to set up a parameter value.

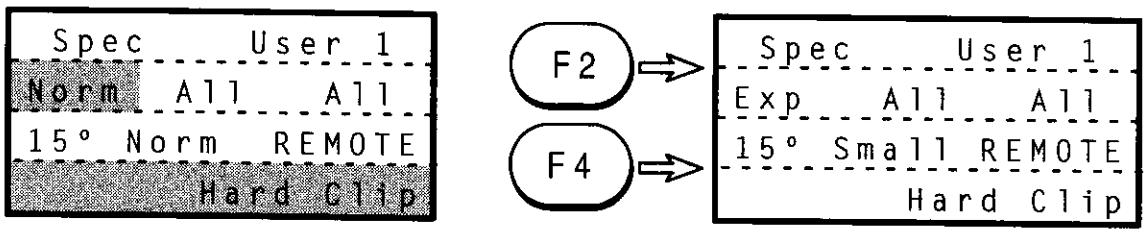


Figure 6.2 Changing a Parameter Value

Numeric Value Entry

Some parameters are set by entering values with the numeric keys. There are two types of value entry operations:

- Multi-digit entry for setting scale or compensation distances
- One-digit entry for pen replacement or replotting

Multi-Digit Entry

In multi-digit entry mode, the current value or default value for a parameter is displayed on the LCD. The cursor is at the left side of the value and blinking.

To change the value, use the numeric keys including **Decimal (.)** and **Minus (–)**. The entered value replaces the current value. Figure 6.3 shows a current value and the new value.

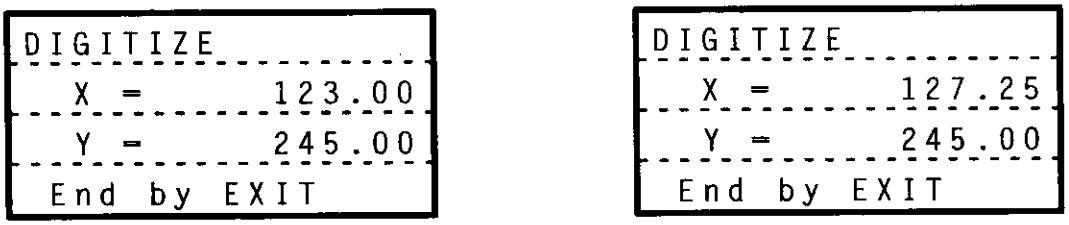


Figure 6.3 Replacing a Parameter Value

Note:

If you enter the wrong number, press **CE** *before* you press **ENTER**. The number you entered is cleared, you can enter the value you want, and then press **ENTER**.

One-Digit Entry

One-digit entry is used to select a different pen or pencil or select a file to replot. The currently selected pen or pencil number or file number is indicated by the blinking cursor to the right of the value.

To change the pen or pencil selection, type the number for the new pen or pencil using the numeric keys on the keypad. The new value is displayed next to the blinking cursor.

Note:

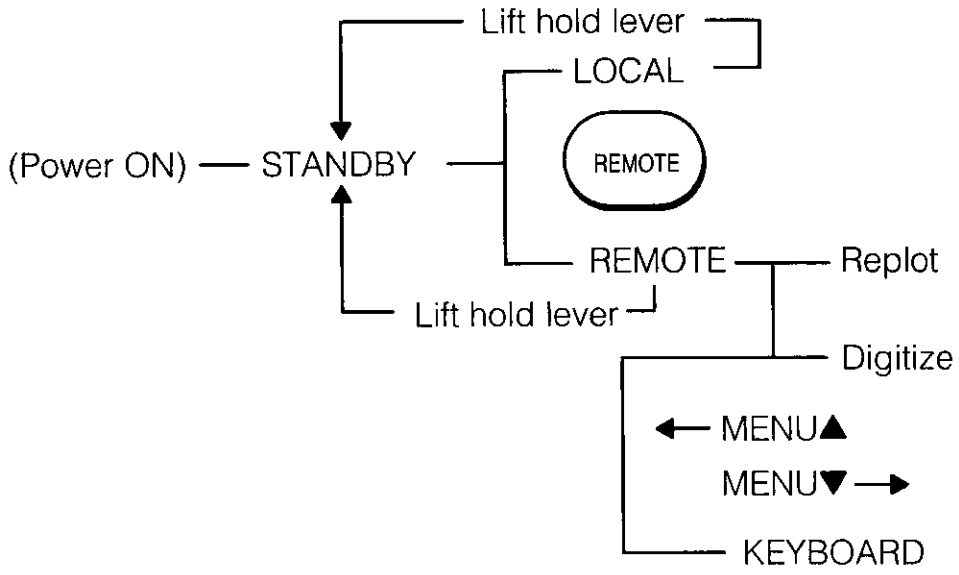
The **CE** key is not valid for one-digit entry. If you enter the wrong number, enter the correct one by typing over the wrong value.

When you have entered the value you want, press **ENTER**.

Plotter Modes

Plotter operations and the parameters available are determined by plotter mode. The XP–500 Series Plotter has three basic operation modes: Standby, Local, and Remote.

There are three additional modes for special functions: Replot, Digitize, and Keyboard.



Standby Mode

In Standby mode, the power switch is turned ON, but plotting media is not detected.

The plotter also goes into Standby mode when you raise the hold lever, causing the pressure roller to go up.

Local Mode

In Local mode, media is loaded and detected by the plotter and the plotter is waiting to receive data from the Control Panel.

Remote Mode

In Remote mode, the plotter is ready to receive data from the host computer or is processing plotting data. In this mode, the plotter is controlled by the host computer and only minimal Control Panel operation is allowed.

Note:
Before you use Remote mode, be sure the host computer command mode is defined.

☞ *See "Setting the Host Computer Command Mode" in Chapter 3 and "Setup Parameter" in Chapter 7 for details about command modes.*

When the plotter is in Remote mode, you can switch to Replot or Digitize modes either through the Control Panel or through an online command from the host computer. To select from the Control Panel, press **Remote** to select Remote mode and the **MENU ▲** or **MENU ▼** keys to select the STANDBY or LOCAL menu. Then select Replot or Digitize.

Keyboard mode can only be selected through an online computer command.

☞ *See the command tables in the Appendix for details about computer commands.*

Replot Mode

In Replot mode, a plot stored in the buffer can be repeated. In this mode, the host computer does not send new plotting data to the plotter.

Up to eight files can be stored in the buffer. Each of those files is assigned a file number. Any of the stored files can be plotted by requesting the file number.

As soon as the replot is complete, the plotter returns to Local or Remote mode, depending on which file is selected to replot, and continues plotting.

Note:
The Replot menu appears in the display. Some menu items are displayed only if the host computer is in MH–GL mode.

Digitize Mode

In Digitize mode, the coordinates on the media are read by the scope position of the pen head. The coordinate values are stored in the plotter and sent to the host computer. Cancel Digitize mode as soon as the coordinates are read. The plotter returns to Remote mode and continues plotting.

Note:
Digitize mode is only effective when the plotter is in MH–GL command mode.

Keyboard Mode

In Keyboard mode, the plotter assigns functions to the function keys and displays information on the LCD, based on instructions from the host computer.

Keyboard mode can only be selected through an online computer command.

Note:
Keyboard mode is only effective when the plotter is in MH–GL command mode.

Figure 6.4 shows an example of Keyboard mode.

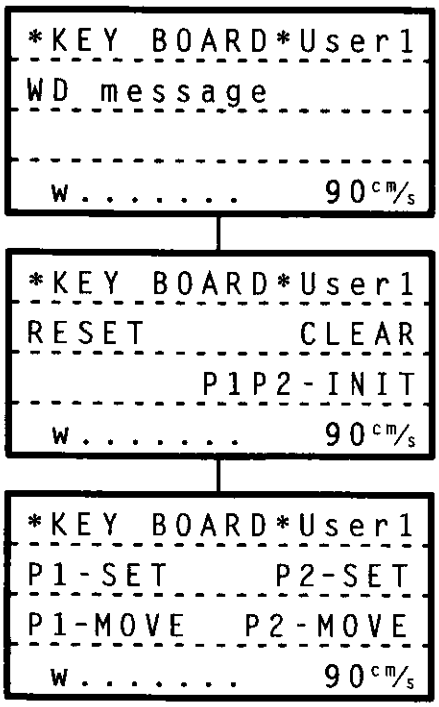


Figure 6.4 Sample Keyboard Mode LCD Flow

Chapter 7

Configuring the Plotter

The XP–500 Series Intelligent Plotter can be set up to use a variety of configurations. These configurations can be selected at any time using the Control Panel.

This chapter shows how to:

- ✗ **Set up the interface parameters**
- ✗ **Define the computer command mode**
- ✗ **Specify operation conditions**
- ✗ **Define a group of settings for an interface**
- ✗ **Enter parameter settings**
  - **Setup**
  - **User**
  - **Wide Line**
  - **Time Out**

Guidelines for Setting Setup and User Parameters

- ❒ The plotter power switch must be ON.
- ❒ The plotter cover must be closed.
- ❒ Plotting media does not have to be loaded.
- ❒ Press **ENTER** to accept the current value displayed after you select the parameter. The plotter automatically returns to the menu.
- ❒ If you want to cancel the values, press **EXIT** and continue specifying the values you want.
- ❒ Press **ENTER** to accept the settings when you have entered all of the information for a parameter. The plotter automatically returns to the menu.
- ❒ For the User and Setup parameters, press **CE** to clear the entry and then type the correct value if you make a mistake typing a numeric value or change your mind.
- ❒ The plotter must be in Standby mode to set the User and Setup parameters.
- ❒ Be sure your parameter settings are appropriate for the CAD/CAM software being used. Check your software documentation or talk to the software manufacturer to verify parameter settings.

Setup Parameter

The Setup parameter defines three types of information necessary for the plotter to operate:

- Online information
- Environment information
- Command information

Once the Setup parameters are defined, they can be associated with a user number through the User parameter. After being set up and associated with a user number, the parameters become effective when the user number is specified.

Online Settings

The XP–500 Series has a multiple interface configuration. Therefore, there is no need to set the port number for on-line operation. During on-line operation, the ports will be selected automatically in the order it receives incoming data, and will be used until the data is interrupted for an extended amount of time.

☞ *See the requirements in Chapter 3 for each type of interface.*

Figure 7.1 shows the Setup/Online parameter LCD flow.

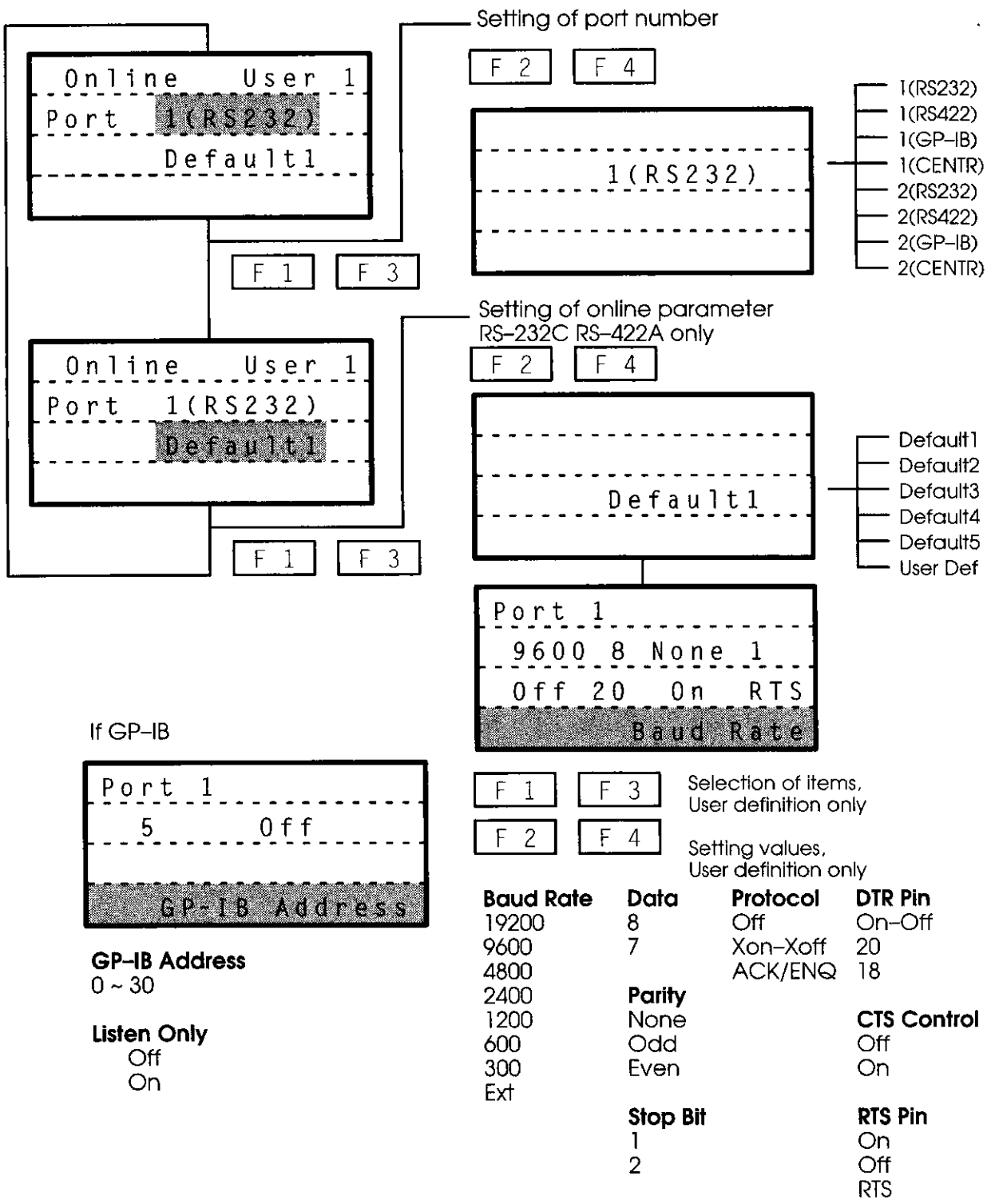
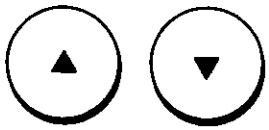
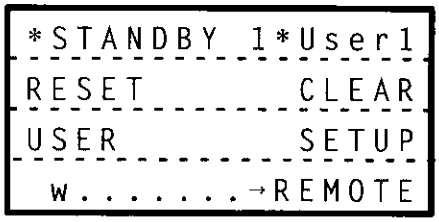


Figure 7.1 Setup/Online Parameter LCD Flow

Step 1.

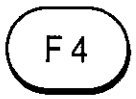
Press **MENU ▲** or **MENU ▼** until STANDBY 1 is displayed on the LCD.

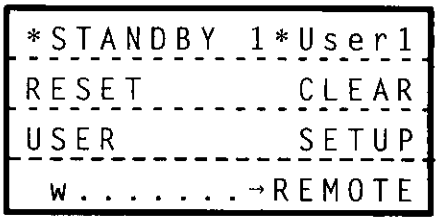




Step 2.

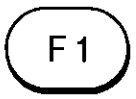
Press **F4** to select SETUP.

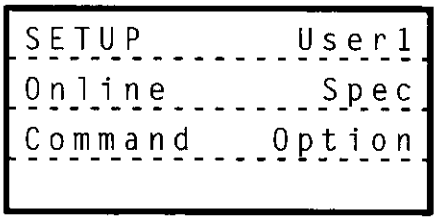




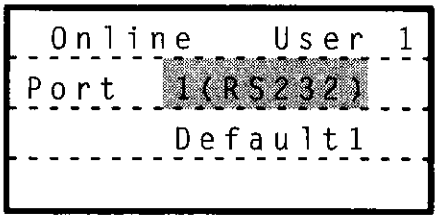
Step 3.

Press **F1** to select ONLINE.



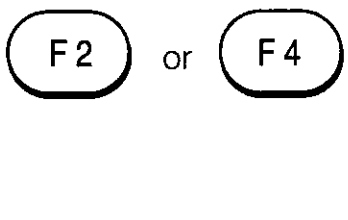


❒ The port number being set up blinks. The type of interface board mounted and the port number are also displayed.



Note:
If there is no interface board in the plotter, the plotter assumes that there is no port. No port number is displayed on the LCD.

Step 4.
Press **F2** or **F4** until the port number that you want is displayed on the LCD.



If 2 is in the display, press **F2** to change the display to 1. If 1 is in the display, press **F4** to change the display to 2.

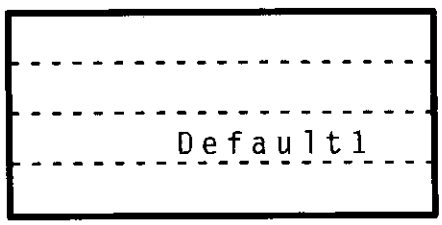
The default settings of the interface for that port are displayed.

Step 5.
Specify the communications settings for the type of interface.

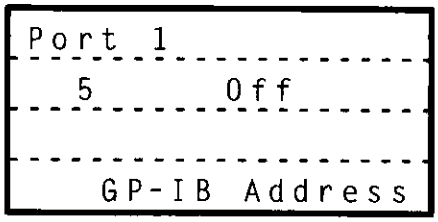
☞ *See Chapter 3 for parameters to be set for each type of interface.*

Step 6.
Continue, based on the type of interface being set up:

❒ For RS–232C or RS–422A, select a default or enter the setting.



❒ For GP–IB, accept or change the values.



❒ For Centronics®, no additional setup is required.

RS–232C or RS–422A Interface Settings

If you have an RS–232C or RS–422A interface, you can select one of the five preprogrammed default setups or you can set up other communications conditions.

Table 7.1 shows settings for the five preprogrammed default setups.

Table 7.1 RS–232C and RS–422A Default Settings

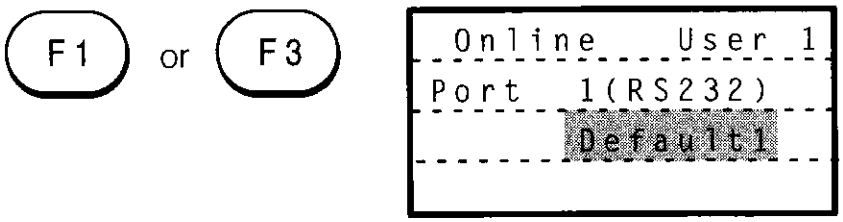
	Default 1	Default 2	Default 3	Default 4	Default 5
Baud rate	9600	9600	9600	9600	9600
Data	7	8	7	8	8
Parity	Even	None	Even	None	Even
Stop Bit	1	1	1	1	2
Handshake	Off	Off	Xon	Xon	Off
DTR terminal	20	20	On	On	20
CTS control	Off	Off	Off	Off	Off
RTS terminal	On	On	On	On	On

After completing Steps 1 through 5 for Online settings, continue with these steps:

Select Defaults

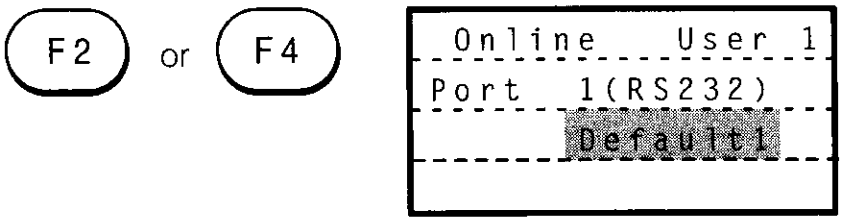
Step 1.

Press **F1** or **F3** until DEFAULT1 blinks.



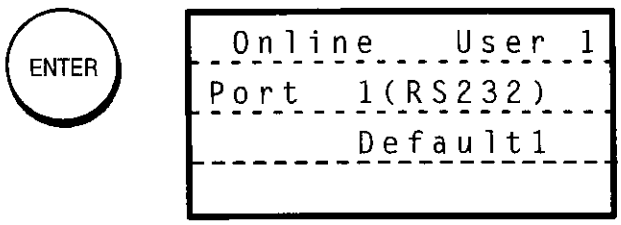
Step 2.

Press **F2** or **F4** until the default setup number that you want is displayed in the blinking section of the LCD. There are five preprogrammed default setups. DEFAULT1 through DEFAULT5 are displayed.



Step 3.

Press **ENTER** to accept the default setup selected. The setup conditions are displayed for 2 seconds before the LCD returns to the menu.

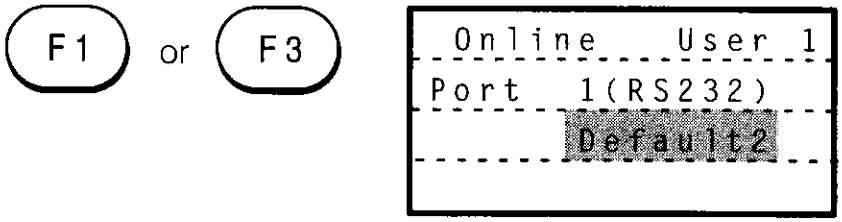


Enter Communications Settings

If you do not want to use one of the preprogrammed default setups, specific communication conditions must be defined.

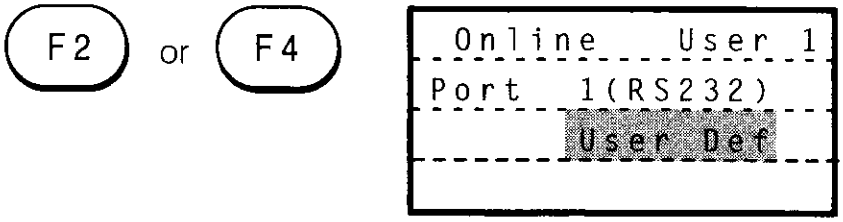
Step 1.

Press **F1** or **F3** until DEFAULT2 is blinking.



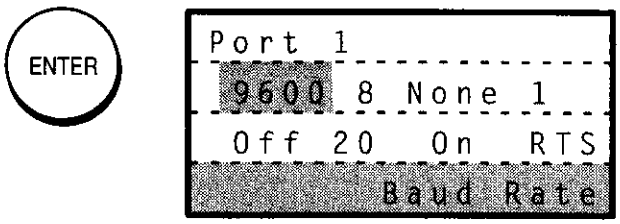
Step 2.

Press **F2** or **F4** until USER DEFINITION is displayed in the blinking section of the LCD.



Step 3.

Press **ENTER** to display the current settings for communications.



Step 4.

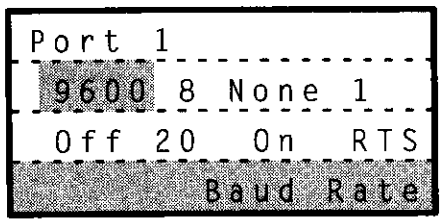
Press **ENTER** to accept the current settings or **EXIT** if you want to change settings.

ENTER — If you press **ENTER**, the Setup parameter conditions are displayed for 2 seconds before the LCD returns to the menu.

EXIT — If you press **EXIT**, continue with the following steps.

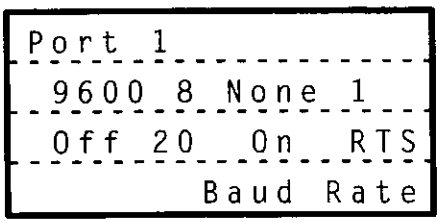
❒ Press **F1** or **F3** until the setting you want is blinking. The parameter name is displayed in the lower right of the LCD.

F1 or F3



❒ Press **F2** or **F4** until the setting you want for the parameter is displayed.

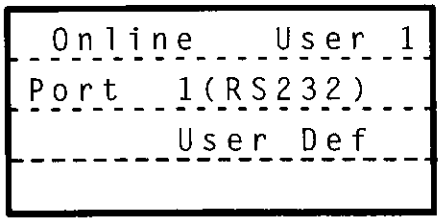
F2 or F4



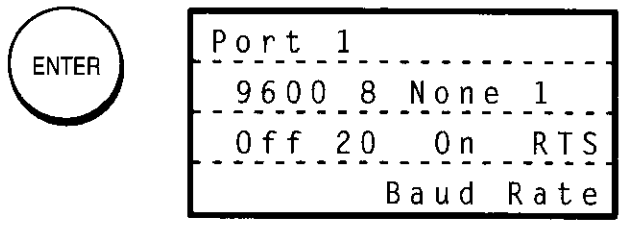
Step 5.

Repeat Steps 2 through 4 for all Online settings you want to change.

F2 or F4



Step 6.
Press **ENTER**. The Setup parameter conditions are displayed for 2 seconds before the plotter returns to the menu.

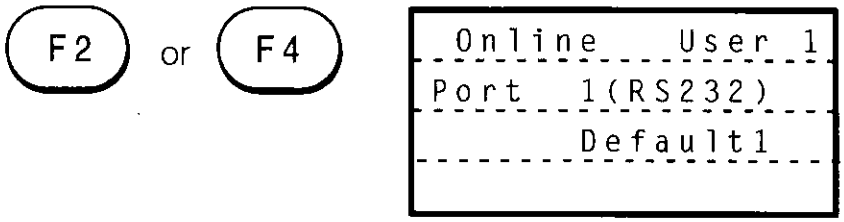


After completing Steps 1 through 5 for Online settings, continue with these steps to set up the communications conditions.

GP-IB Interface Settings

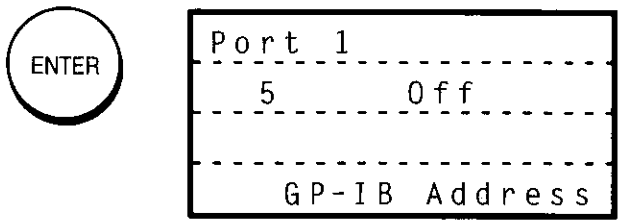
☞ *See Chapter 3 for parameter options for a GP-IB interface.*

Step 1.
Press **F2** or **F4** to display the port number with the GP-IB interface.



If 2 is displayed, press **F2** to change the display to 1. If 1 is displayed, press **F4** to change the display to 2.

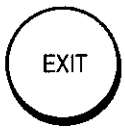
Step 2.
Press **ENTER** to display the communications conditions for the GP-IB interface.



Step 3.

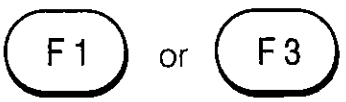
Press **ENTER** to accept the current settings or **EXIT** if you want to change the settings.

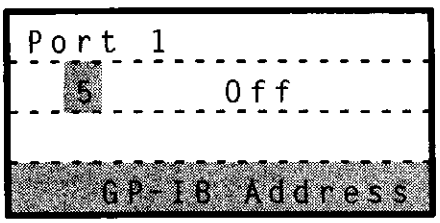
If you press **ENTER**, the Setup parameter conditions are displayed for 2 seconds before the LCD returns to the menu.



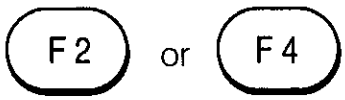
If you press **EXIT**, continue with the following steps.

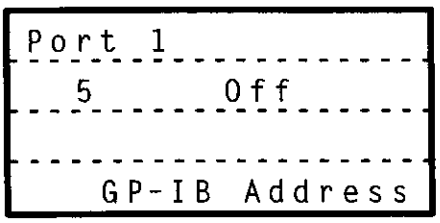
❒ Press **F1** or **F3** until the setting you want is blinking. The parameter name is displayed in the lower right of the LCD.





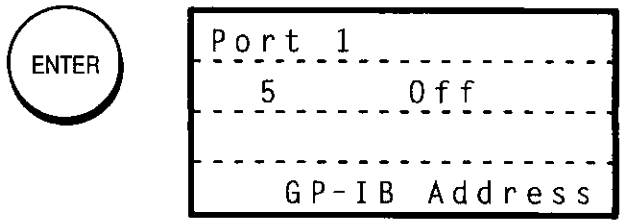
❒ Press **F2** or **F4** until the setting you want is displayed.





Step 4.

Press **ENTER**. The Setup parameter conditions are displayed for 2 seconds before the LCD returns to the menu.



Centronics® Interface Settings

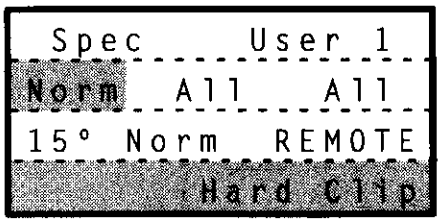
No parameters need to be set up for a Centronics® interface. If Centronics® is displayed as the type of interface, you can continue to set up Command or Environment parameters.

Environment Settings

The Environment settings control how the plotter responds to you, the amount of memory in the buffer, and the hard clip area.

You can specify certain plotter operation features and restrictions using the Environment settings. Environment settings are done on the Control Panel through the Setup parameter.

Figure 7.2 shows Setup/Environment parameter LCD flow.



F 1 F 3 Selection of items

F 2 F 4 Setting values

Hard Clip	Sort	Buzzer Switch	Smoothing	Buffer Size	Next Mode
Norm	Off	Off	Off	Norm	REMOTE
Exp	Pen	Error	5°	Small	LOCAL
Type 1	All	Key	10°		
Type 3		All	15°		
			20°		
			25°		
			30°		

Figure 7.2 Setup/Environment Parameter LCD Flow

The Environment settings control how the plotter responds as you are plotting or preparing for a plot.

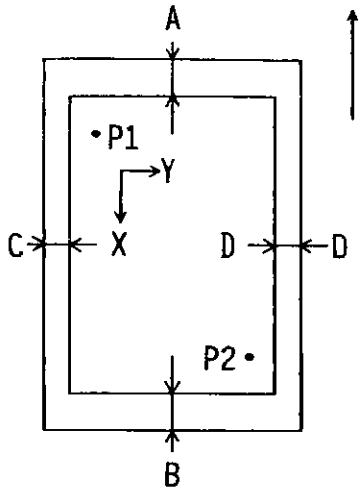
❒ Window (Hard Clip Area)

- ◆ NORMAL — The plotter uses a standard hard clip area.
- ◆ EXPANSION — The plotter uses an expanded hard clip area.
- ◆ TYPE 1 — The plotter uses a Type 1 hard clip area.
- ◆ TYPE 3 — The plotter uses a Type 3 hard clip area.

☞ *See the General Specifications table in the Appendix for details about the hard clip area.*

170

Figure 7.3 details the three Window (Hard Clip Area) settings.



Direction of media movement

		Ⓐ	Ⓑ	Ⓒ	Ⓓ
Hard Clip Area (mm)	Norm	35±1	15±1	15±1	15±1
	Exp	25±1	5±1	5±1	5±1
	Type 1	25±1	5±1	11±1	11±1
	Type 3	25±1	10±1	10±1	10±1

Figure 7.3 Hard Clip Area Settings
(P1 and P2 are 15 mm Inside the Hard Clip Area)

❒ Sorting

- ◆ OFF — Data is plotted as received from the computer or Control Panel.
- ◆ PEN — Data is sorted for efficient pen or pencil selection.
- ◆ ALL — Data is sorted both for efficient pen and pencil selection and for efficient head movement.

❒ Buzzer

- ◆ OFF — The buzzer does not sound.
- ◆ ERROR — The buzzer sounds only if an error is detected.
- ◆ KEY — The buzzer sounds only when an invalid key is pressed.
- ◆ ALL — The buzzer sounds for all errors detected and when an invalid key is pressed.

❒ Smoothing

- ◆ If the angle between the current line and the next line to be plotted is greater than the degree specified, the plotter will slow down and plot a sharp corner.
- ◆ If the angle between the lines is less than the degree specified, the plotter will maintain high plotting speed and plot a rounded corner.

OFF	20°
5°	25°
10°	30°
15°	

❒ Buffer size

- ◆ NORMAL — Internal memory is 1 Mbyte (1 million bytes)
- ◆ SMALL — Internal memory is 1 Kbyte (1000 bytes)

❒ Initial mode

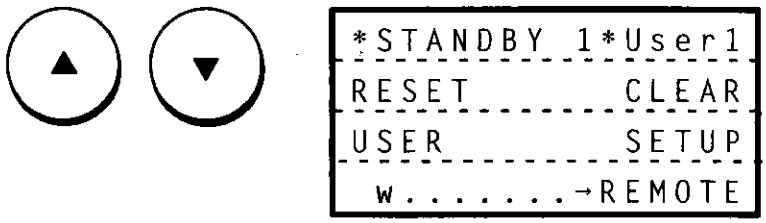
- ◆ Specifies the mode after Paper Initial mode and after reset from Replot, Digitize, or Keyboard modes.

LOCAL

REMOTE

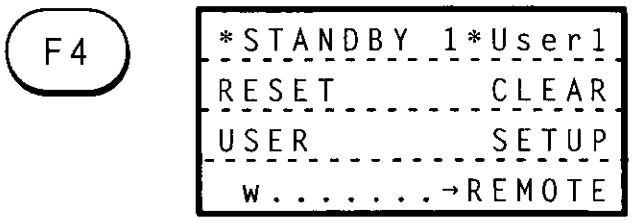
Step 1.

Press **MENU ▲** or **MENU ▼** until STANDBY 1 is displayed on the LCD.



Step 2.

Press **F4** to select SETUP.

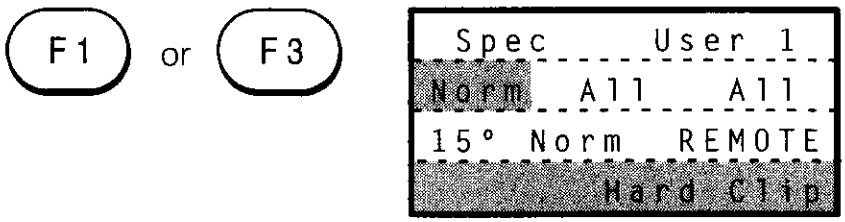


Step 3.

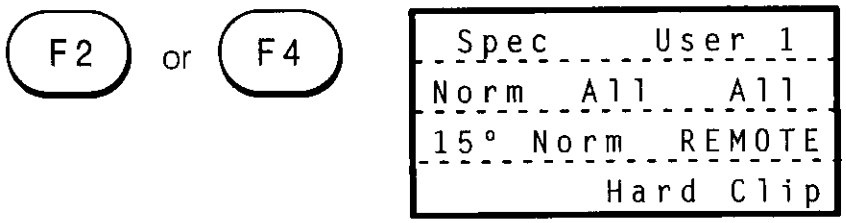
Press **F2** to select SPEC. The current Environment settings are displayed, with one setting blinking.

Step 4.

Press **F1** or **F3** to move the blinking cursor until the Environment setting you want is blinking. The parameter name is displayed in the lower right of the LCD.

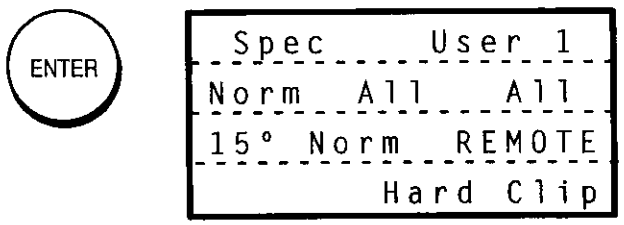


Step 5.
Press **F2** or **F4** until the setting you want is displayed in the lower right of the LCD.



Step 6.
Repeat Steps 4 and 5 for each Environment setting you want to set.

Step 7.
Press **ENTER** to accept the Environment settings and return to the menu.



Command Mode Setting

The standard Command mode used to interpret host computer commands is MH–GL (emulates HP–GL).

Figure 7.4 shows Setup/Command parameter LCD flow.

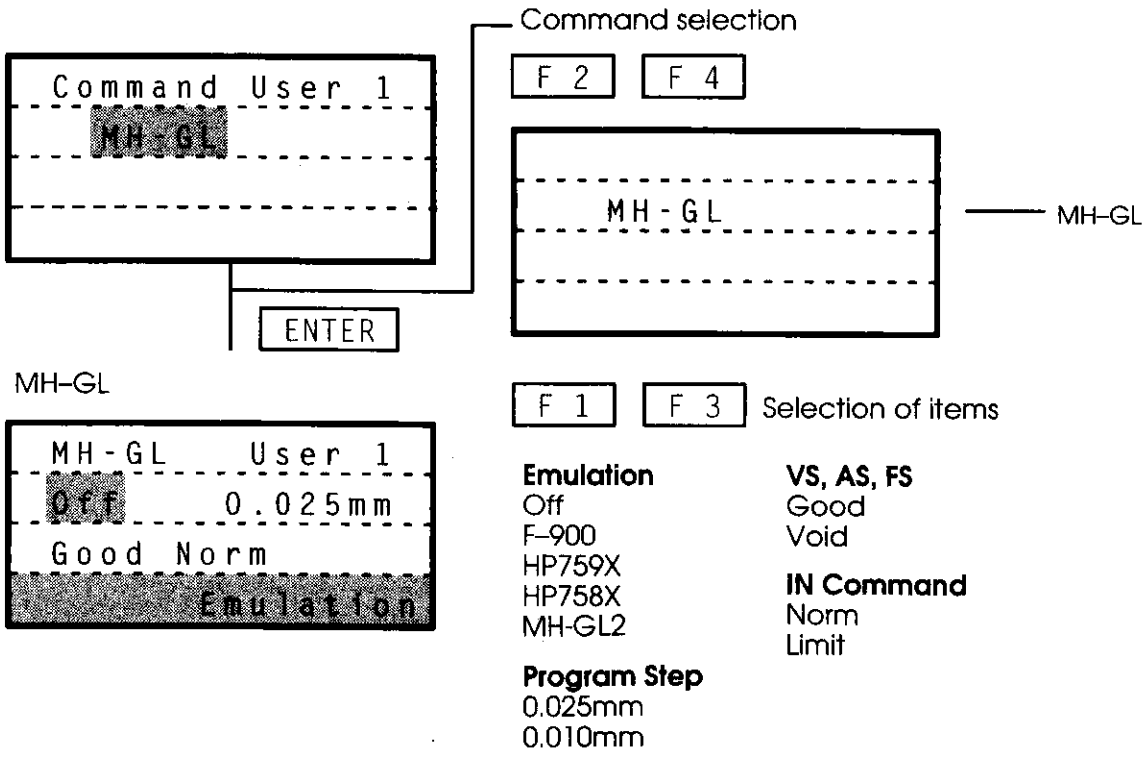
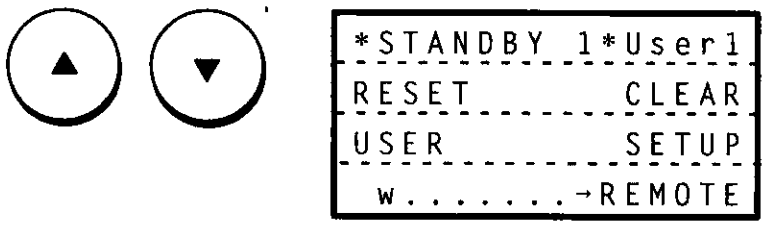


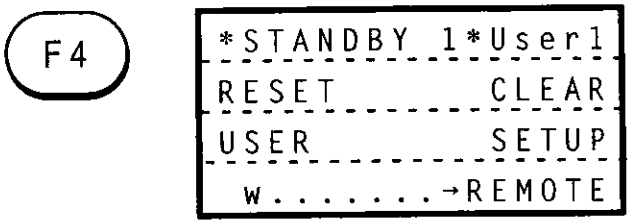
Figure 7.4 Setup/Command Parameter LCD Flow

Step 1.

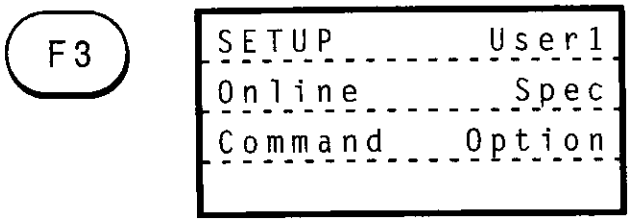
Press **MENU ▲** or **MENU ▼** until STANDBY 1 is displayed on the LCD.



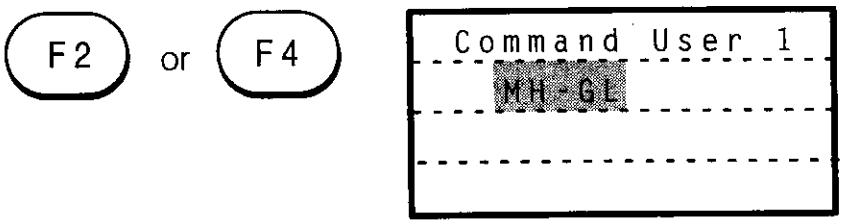
Step 2.
Press **F4** to select SETUP.



Step 3.
Press **F3** to select COMMAND.

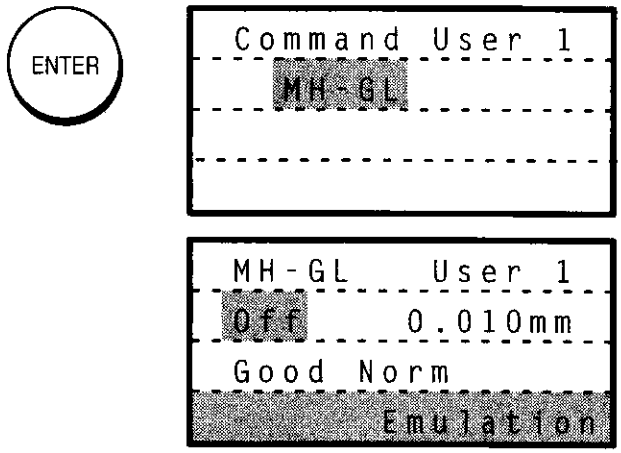


Step 4.
Press **F2** or **F4** until the Command mode you want is blinking.



Step 5.

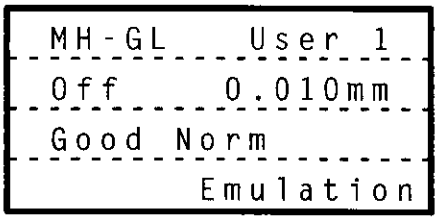
Press **ENTER** to stop the blinking and display the settings selected in Step 4.

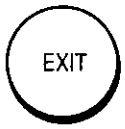


Step 6.

Press **ENTER** to accept the settings displayed or **EXIT** to change the Command mode settings.

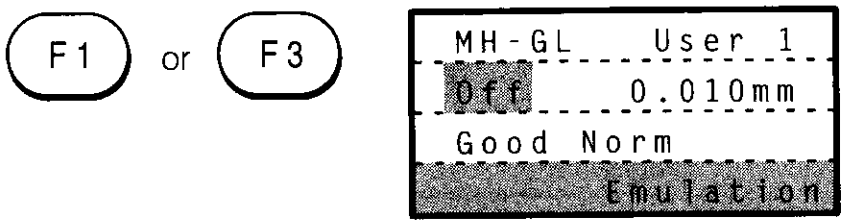
If you press **ENTER**, the Command mode settings are displayed for 2 seconds before the LCD returns to the menu.



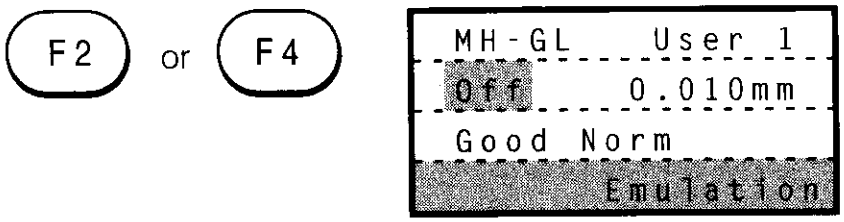


If you press **EXIT**, continue with the following steps.

❒ Press **F1** or **F3** until the Command mode setting you want is blinking. The parameter name is displayed in the lower right of the LCD.

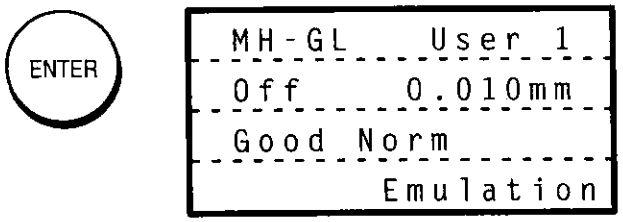


❒ Press **F2** or **F4** until the Command mode setting you want for the parameter is displayed.

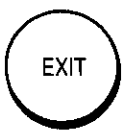


Step 7.
Press **ENTER** or **EXIT**.

❒ Press **ENTER** to accept the setting. The Command mode settings are displayed for 2 seconds before the LCD returns to the menu.



❒ Press **EXIT** to continue with data transmission from your computer.



User Parameter

The User parameter allows you to designate and register groups of settings that define:

- Command mode

A user number is assigned to the group of parameter settings. Once the settings have been defined and registered, the parameters and settings associated with the user number are automatically initialized for plotting.

Once designated, user numbers and the associated settings are saved by the plotter, even when power is turned OFF.

Figure 7.5 shows User LCD flow.

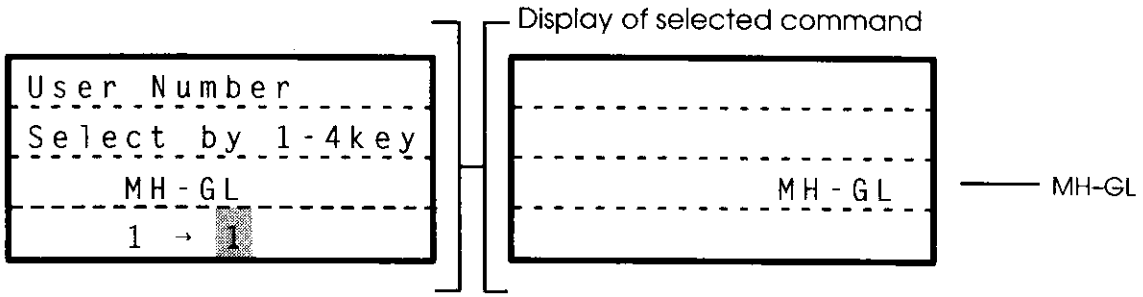


Figure 7.5 User LCD Flow

Step 1.

Press **MENU ▼** or **MENU ▲** until STANDBY 1 is displayed on the LCD.

```
*STANDBY 1*User1
RESET        CLEAR
USER         SETUP
 w.......→REMOTE
```

Step 2.

Press **F3** to select USER and display the User menu. The user number being set up blinks. The type of interface, Command mode, and port number that correspond to that user number are displayed.

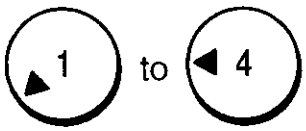

```
SETUP        User 1
Online         Spec
Command    Option
```

Note:

The port number displayed is the port this interface is using. Type of interface and Command mode settings are defined through the Setup parameter.

Step 3.

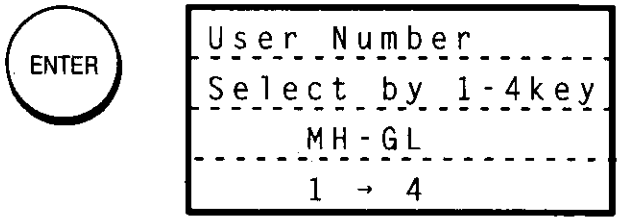
Specify the user number you want by typing a single-digit number. Type over the blinking number.




```
User Number
Select by 1-4key
     MH-GL
     1 → 1
```

Step 4.

Press **ENTER** to accept the user number.



Wide Line

Wide Line mode enables the plotter to plot efficiently under wide line commands from MH-GL/2.

This mode may be used only if MH-GL/2 emulation is set and the plotter is operating under MH-GL command mode.

Wide Line Settings

Wide Line mode may be used only if the below two conditions are satisfied.

- The on-line data consists of MH-GL/2 commands.
- The MH-GL command mode is selected through the Setup Command setting, and the emulation is set to MH-GL/2.

CAUTION!

If the plotter should receive any on-line data other than MH-GL/2 commands when the emulation is set to MH-GL/2, errors may occur and plotting will be impossible.

Wide Line: Sets the Wide Line processing mode On/Off.

Either the On or Off setting stored in the EEPROM will be displayed initially.

On: Wide Line mode is On.

The plotter will operate in Wide Line processing mode under Wide Line commands.

Off: Wide Line mode is Off.

The plotter will not operate in Wide Line processing mode even if it receives Wide Line commands through on-line data.

Pen No.: Selects data numbers for pens whose pen widths are set.

All: Pen width will be set for all data pens No. 1—8.
1 : The pen width will be set for data pen No.1.
⋮ ⋮
8 : The pen width will be set for data pen No.8.

Thickness: Determines the pen width with which Wide Line processing mode plotting will be conducted.

The pen widths currently set for all data pen numbers will be displayed initially.

Def. : Sets the pen width to the default value.
0.20 mm: Sets the pen width to 0.20 mm.
0.25 mm: Sets the pen width to 0.25 mm.
0.30 mm: Sets the pen width to 0.30 mm.
0.35 mm: Sets the pen width to 0.35 mm.
0.40 mm: Sets the pen width to 0.40 mm.
0.50 mm: Sets the pen width to 0.50 mm.
0.70 mm: Sets the pen width to 0.70 mm.
1.00 mm: Sets the pen width to 1.00 mm.

If anything other than default is selected, Wide Line processing mode plotting will be conducted with the designated pen width no matter what kind of pen is used.

If default is selected, the pen width will be determined according to the kind of pen being use.

Ink pen	: 0.35 mm
Ceramic-tip pen	: 0.30 mm
Water-based ballpoint pen	: 0.30 mm
Oil-based ballpoint pen	: 0.30 mm
Pencil 0.2	: 0.20 mm
Pencil 0.3	: 0.30 mm
Pencil 0.4	: 0.40 mm
Pencil 0.5	: 0.50 mm
Pencil 0.7	: 0.70 mm

Default may be selected for the pen width during pencil plotting. However, when using an ink pen with a pen width other than 0.35 mm, define the pen width according to the pen width of that ink pen.

The pen number used to define the pen width is the data pen number. The data pen number and the stocker pen number will be related according to the pen map.

Store: Determines whether to keep a backup record of the new settings.

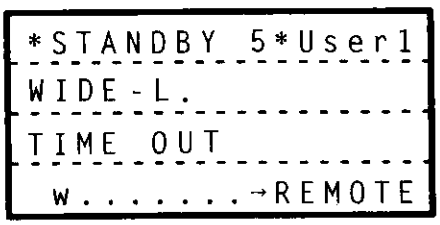
On: A backup record of the new parameters will be made.
A backup record of the On/Off of Wide Line mode and the pen width designated to each data pen number will be kept.

Off: Backup record of the new parameters will not made.

(_____indicates initial parameter.)

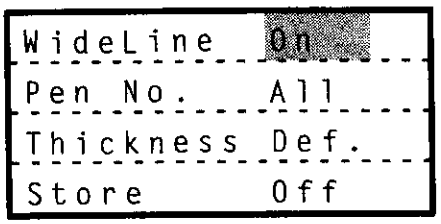
Step 1.

Press **MENU▼** or **MENU▲** until STANDBY 5 is displayed on the LCD.



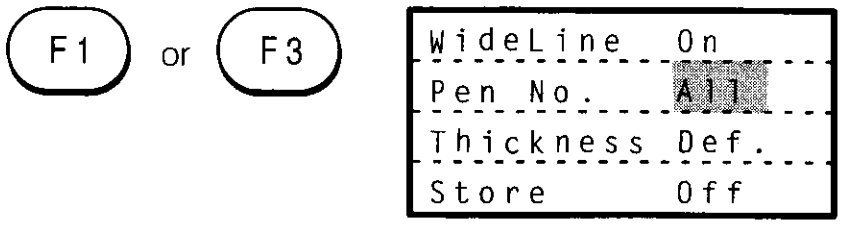
Step 2.

Press **F1** to select Wide Line.



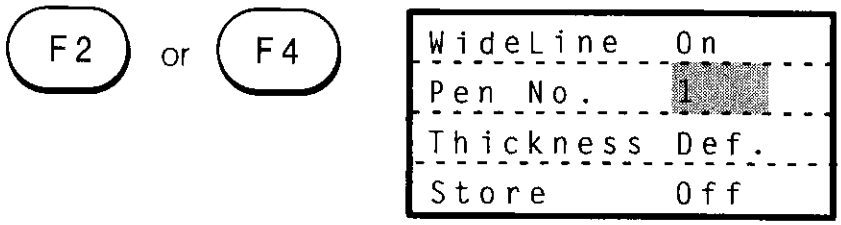
Step 3.

Press **F1** or **F3** until the setting you want (On/Off of Wide Line processing mode, data pen number, thickness, and On/Off of backup record) is blinking.



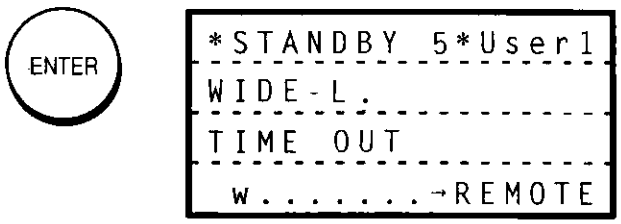
Step 4.

Press **F2** or **F4** until the value you want is blinking.



Step 5.

Press **ENTER** to accept the setting and return the LCD to the menu.



Time Out

Time Out determines the optimal timing for the on-line interface.

Time Out Settings

Data Time Out: Sets the Time Out parameter.

Up to two on-line interfaces may be installed in a single plotter. When more than one interface is installed in a plotter, the interface that first receives an incoming on-line data will be automatically activated (data reception standby mode). While one interface is activated, the other interfaces will be deactivated.

All interfaces are in a standby mode if the plotter has not received any on-line data.

All data received by a deactivated interface will be void.

The Time Out parameter defines the time interval until all interfaces are returned to standby mode once an activated interface completes data transmission.

If on-line data should be interrupted after the time interval defined by the Time Out parameter is up, all interfaces will be returned to standby mode.

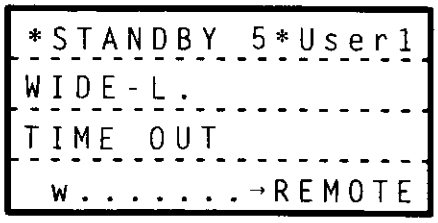
Determine the Time Out parameter in accordance with the performance rate of your host computer.

Off : Time Out parameter will not be set.
10 sec: Time Out interval is set at 10 seconds.
30 sec: Time Out interval is set at 30 seconds.
1 min : Time Out interval is set at 1 minute.
3 min : Time Out interval is set at 3 minutes.
5 min : Time Out interval is set at 5 minutes.
10 min: Time Out interval is set at 10 minutes.
30 min: Time Out interval is set at 30 minutes.

(_____ indicates initial parameter.)

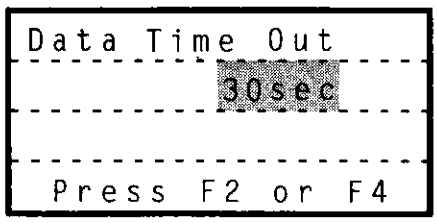
Step 1.

Press **MENU ▼** or **MENU ▲** until STANDBY 5 is displayed on the LCD.



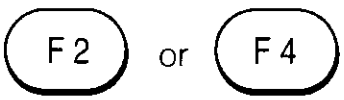
Step 2.

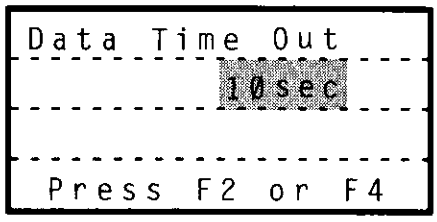
Press **F3** to select Time Out.



Step 3.

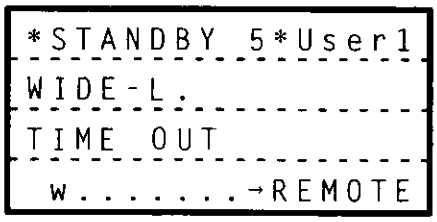
Press **F2** or **F4** until the value you want is blinking.





Step 4.

Press **ENTER** to accept the setting and return the LCD to the menu.



Chapter 8

Plotter Control Parameters

The MUTOH XP–500 Series Intelligent Plotter uses parameters to control plotting operations.

This chapter shows how to:

- ✗ **Select the parameter you want to set**
- ✗ **Enter parameter settings**

Origin	**Compensation**
Scale	**High Quality**
Rotate	**Replot**
Mirror	**P1/P2 Initialization**
Window	**P1 Set/P2 Set**
Alignment	**P1 Move/P2 Move**

Guidelines for Setting Plotter Control Parameters

- ❒ The plotter must be turned ON.
- ❒ The plotter cover must be closed.
- ❒ Plotting media must not be loaded.
- ❒ For all parameters, if you want to accept the current value displayed after you select the parameter, press **ENTER** to accept the settings and return to the menu.
- ❒ Press **ENTER** when you have entered all of the information for a parameter. The LCD automatically returns to the menu.
- ❒ For all parameters, you can press **CE** to clear a numeric entry if you make a mistake or you change your mind. When you press **CE**, the previously entered value is cleared and you can type the correct value.
- ❒ The plotter must be in Standby or Local mode.
- ❒ Be sure your parameter settings are appropriate for the CAD/CAM software being used. Check your software documentation or talk to the software manufacturer to verify parameter settings.

Origin

The Origin parameter sets the zero point of the X- and Y-coordinates. The Origin point is used with the Scale, Rotate, Mirror, Alignment, and Compensation parameters.

The default Origin parameter setting sets the center of the clip area at X=0, Y=0.

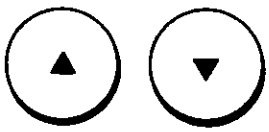
Note:

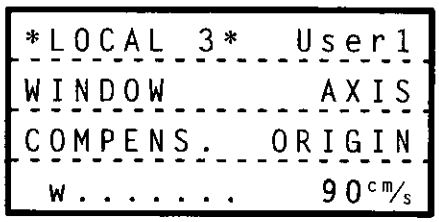
X- and Y-coordinates can be set in two ways:

- Moving the pen head/scope to the desired position
- Entering the numeric coordinates

Step 1.

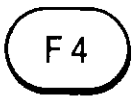
Press **MENU** ▲ or **MENU** ▼ until LOCAL 3 is displayed.

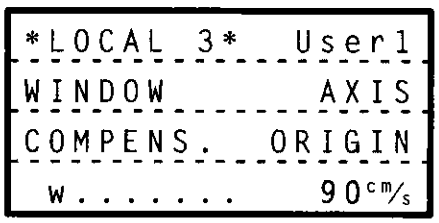




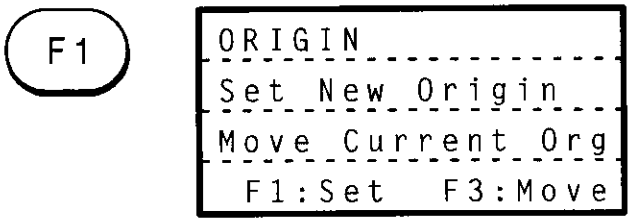
Step 2.

Press **F4** to select ORIGIN.

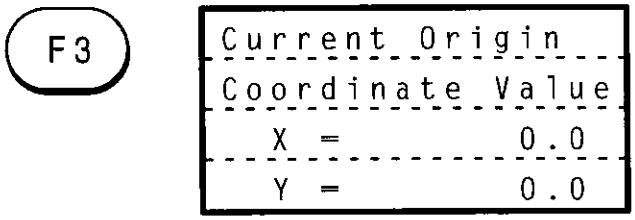




Step 3.
Press **F1** to select SET NEW ORIGIN.

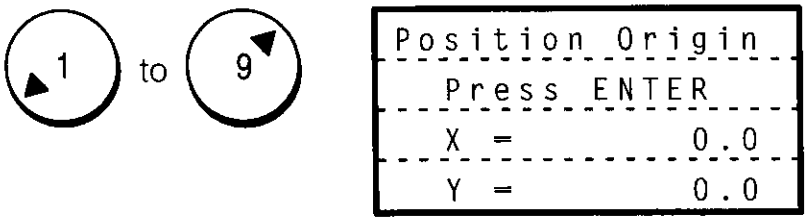


Step 4.
If desired, press **F3** to move the pen head/scope to the previously specified point. The coordinates for that point are displayed for 2 seconds before returning to the menu.



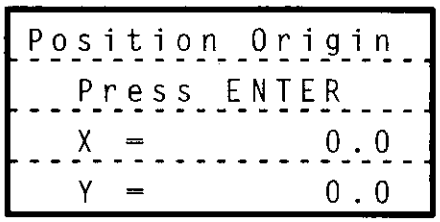
Step 5.
You can set the Origin point by moving the pen head/scope to the desired X- and Y-coordinates or by entering the values for the X- and Y-coordinates.

❒ Press the **JOG** keys to move the pen head/scope to the position you want. The coordinates for the current position are displayed.

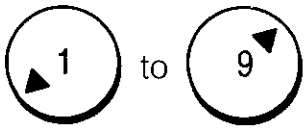


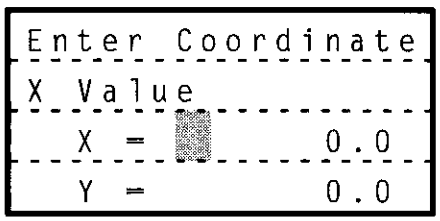
142

◆ Press **ENTER** to accept the coordinates and return to the menu.

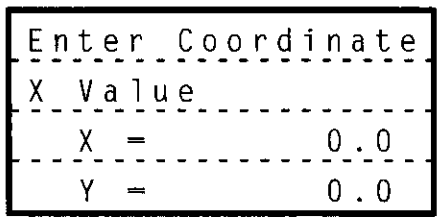


❒ Use the numeric keys to enter the value for the X-coordinate.

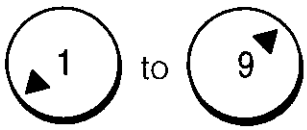


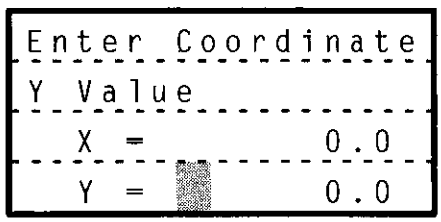


Step 6.
Press **ENTER** to accept the new X-coordinate.



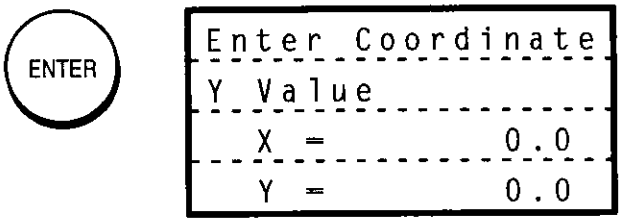
Step 7.
Use the numeric keys to enter the value for the Y-coordinate.





Step 8.

Press **ENTER** to accept the new Y-coordinate.



Scale

The Scale parameter lets you enlarge or reduce the size of the plot. The default scale value is 1.000. When you use a scale factor other than 1.000, the plot is enlarged or reduced. The starting point on the plot for enlargement or reduction depends on the Command mode setting (Setup parameter) from the host computer and whether plot origin (Origin parameter) has been defined.

The scale factor is a decimal value in the format 999.999. For example, to reduce a drawing 75%, enter 0.750, or to enlarge a drawing 1.5%, enter 1.500.

The plotter must be in Standby or Local mode when you set the Scale parameter.

Note:

The Scale parameter cannot be set at 000.000.

The enlargement or reduction is limited by the media width and the position of the pressure roller.

- If a coordinate point has been defined by the Origin parameter, the enlargement or reduction starts at that point.
- If the plotter is in MH–GL command mode, the enlargement or reduction point is the center of the clip area, regardless of whether Origin has been defined.

Figure 8.1 shows the default plot size and reduced plot size.

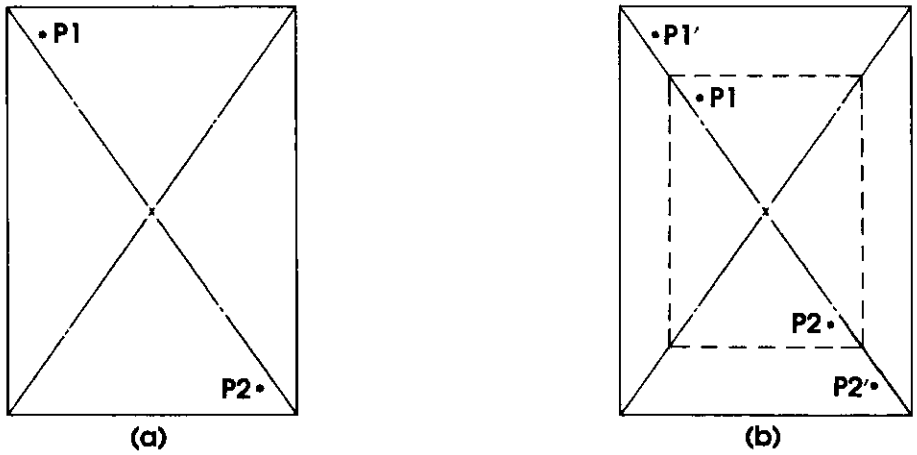


Figure 8.1 Plot Size Changed by the Scale Parameter

Figure 8.2 shows the default plot size and enlarged plot size when the host computer command mode is MH–GL. The scale factor is 1.025.

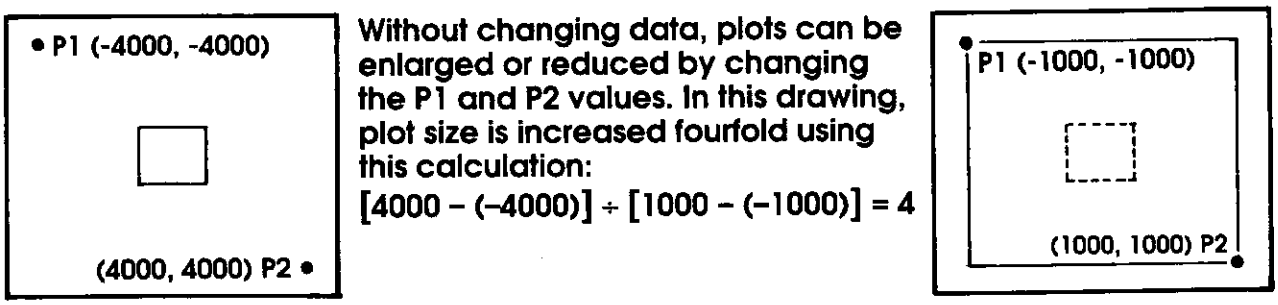
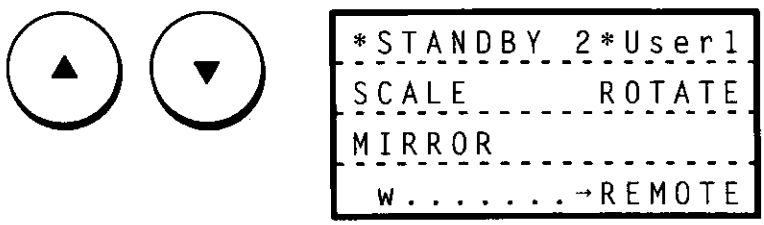


Figure 8.2 Plot Size Changed by the Scale Parameter in MH–GL Mode

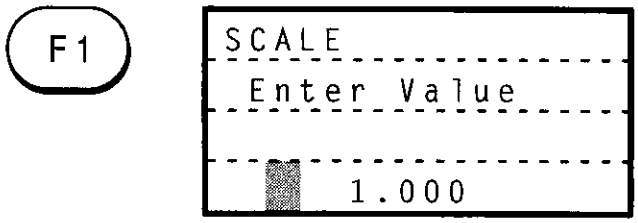
Step 1.

Press **MENU ▲** or **MENU ▼** until STANDBY 2 or LOCAL 2 is displayed.

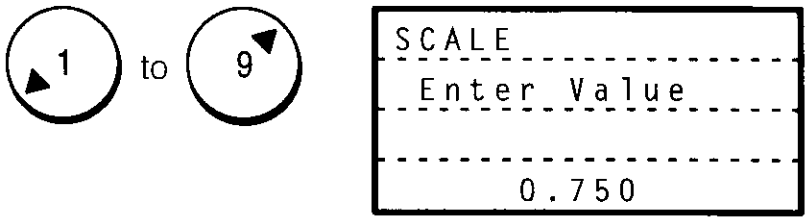


146

Step 2.
Press **F1** to select SCALE. The current value is displayed on the LCD.

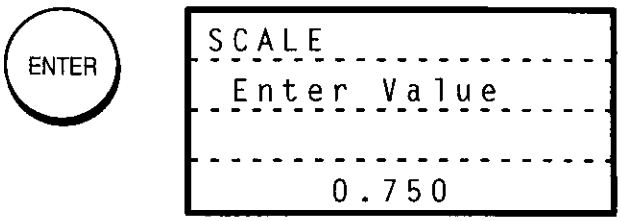


Step 3.
Use the numeric and **Decimal (.)** keys to enter the enlargement or reduction factor.



Note:
You must type the decimal and three digits after the decimal.

Step 4.
Press **ENTER** to accept the new Scale factor value.



Rotate

The Rotate parameter lets you change the direction of your plot counterclockwise by 0° to 90°. The plotter must be in Standby or Local mode when you set the Rotate parameter.

To rotate more than 90°, you must use both the Rotate and Mirror parameters and online computer commands. With the combination of parameters, you can rotate the plot by 0°, 90°, 180°, or 270° (see Table 8.1).

The center of the rotation depends on whether a point of origin has been set:

- If an Origin point has been set, the center of the rotation is the Origin point (X,Y).
- If an Origin point has not been set, the center of the rotation is the center of the clip area.

Figure 8.3 shows a plot with the default rotation (0°) and rotated 90°.

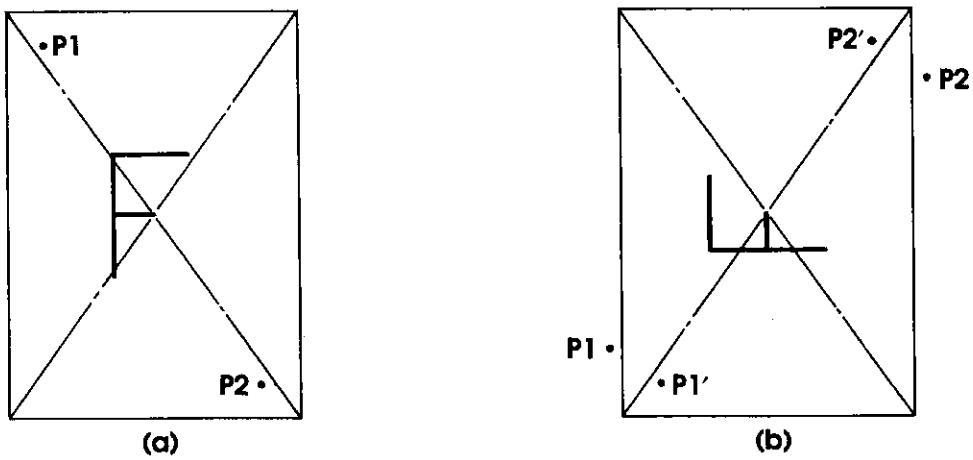


Figure 8.3 Plots with Default Orientation and with 90° Rotation

Note:
The Rotate parameter setting does not change when media is changed. However, when the plotter is turned OFF, the Rotate setting returns to the default value of 0°.

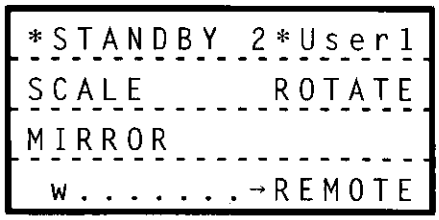
118

To rotate the plot by more than 90°, use both the Rotate and Mirror parameters. Table 8.1 shows how to combine the two parameters to get rotations of 0°, 90°, 180°, and 270°.

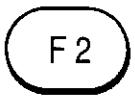
Table 8.1 Rotation Angles

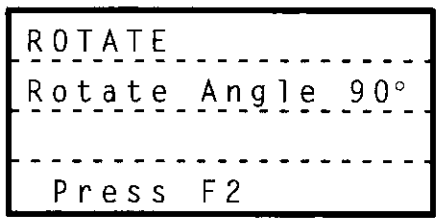
Degree of Rotation	Mirror Parameter	Rotate Parameter
0°	X = OFF, Y = OFF	0°
90°	X = OFF, Y = OFF	90°
180°	X = ON, Y = ON	0°
270°	X = ON, Y = ON	90°

Step 1.
Press **MENU ▲** or **MENU ▼** until STANDBY 2 or LOCAL 2 is displayed on the LCD.

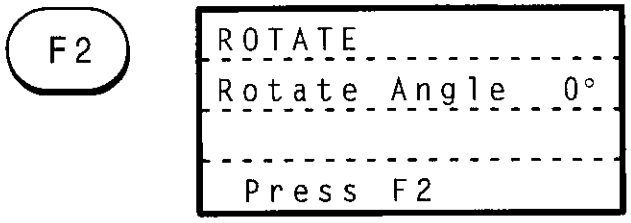


Step 2.
Press **F2** to select ROTATE. The current setting is displayed on the LCD.

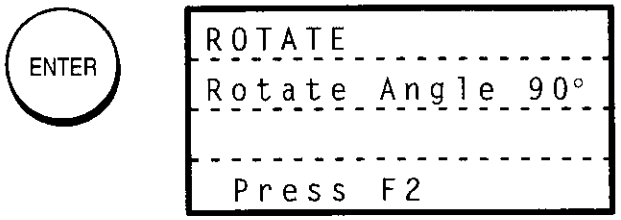




Step 3.
Press **F2** to display 0° or 90°. Pressing **F2** switches between these two values.



Step 4.
Press **ENTER** to accept the selected setting.



Mirror

The Mirror parameter lets you change the vertical or horizontal orientation of the plot. The orientation of the plot is changed by mirroring either the X-axis, the Y-axis, or both. If you mirror both axes, the plot rotates by 180°.

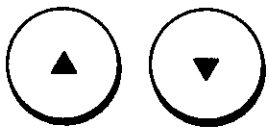
You can also use the Mirror parameter together with the Rotate parameter to rotate the plot by 0°, 90°, 180°, or 270°. Table 8.1 in the Rotate section shows how to use the two parameters together to rotate a plot.

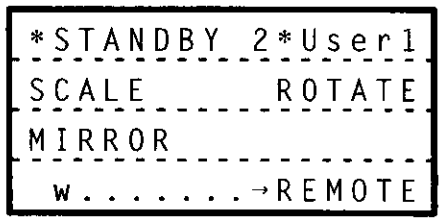
The center of the plot for mirroring depends on whether an origin point has been set (Origin parameter) and whether the host computer is in MH–GL command mode.

- If the Origin point has been set, the axis for mirroring is the Origin point.
- If the plotter is in MH–GL command mode, the axis for mirroring is the center of the hard clip area.

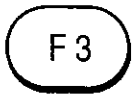
The plotter must be in Standby or Local mode when you set the Mirror parameter.

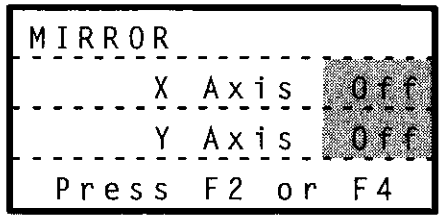
Step 1.
Press the **MENU ▲** or **MENU ▼** key until STANDBY 2 or LOCAL 2 is displayed on the LCD.



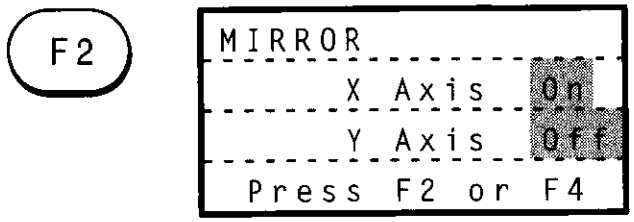


Step 2.
Press **F3** to select MIRROR. The current value is displayed on the LCD.

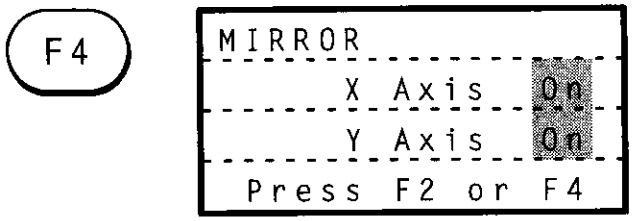




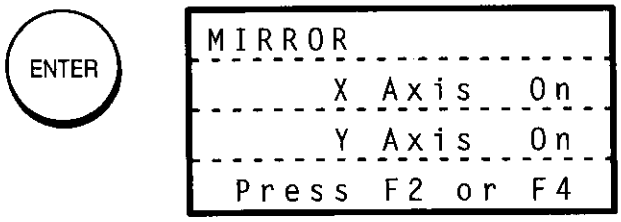
Step 3.
Press **F2** to select whether the X-axis is to be ON (mirrored) or OFF (not mirrored).



Step 4.
Press **F4** to select whether the Y-axis is to be ON (mirrored) or OFF (not mirrored).



Step 5.
Press **ENTER** to accept the settings.



Window (Plotting Range)

The Window (Plotting Range) parameter is used to set up the hard clip area. The plotter must be in Local mode when you set the Window parameter.

To set the plotting range, you can specify two reference points – WL (lower left of the plotting range) and WR (upper right of the plotting range). Lines running through those two points define the hard clip area. The lines are parallel to the machine axes unless you have set up the Compensation or Alignment parameters. If those parameters have been set up, the hard clip area is parallel to the coordinates defined by those parameters.

Figure 8.4 shows a plotting range set with just the Window parameter, and a hard clip area set with both the Window and Compensation parameters.

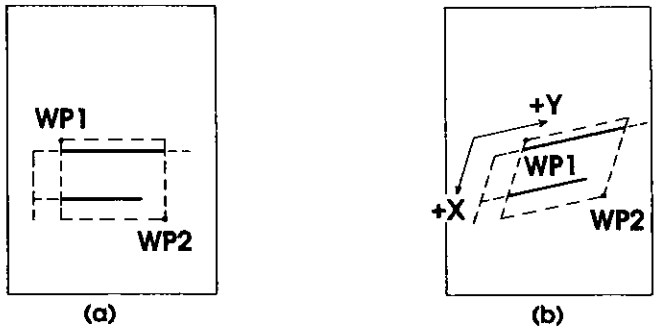


Figure 8.4 Plotting Range Set with Window Parameter (a, left) and Plotting Range Set with Window and Compensation Parameters (b, right)

Note:

If points WL and WR are the same, the Window parameter is canceled (see Figure 8.5).

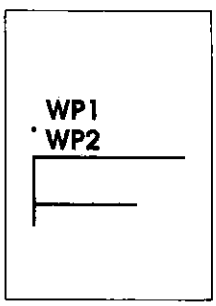


Figure 8.5 WL and WR Points Set at the Same Point

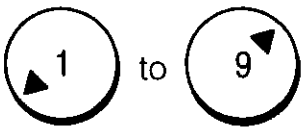
Step 1.
Press **MENU ▲** or **MENU ▼** until LOCAL 3 is displayed on the LCD.

```
*LOCAL 3*   User1
WINDOW          AXIS
COMPENS.    ORIGIN
 w.......    90cm/s
```

Step 2.
Press **F1** to select WINDOW. The current WL value is displayed on the LCD.

```
*LOCAL 3*   User1
WINDOW          AXIS
COMPENS.    ORIGIN
 w.......    90cm/s
```

Step 3.
Press the **JOG** keys to set the pen head/scope to the desired WL point.



```
WINDOW WL
Position New WL
Press ENTER
 Current WL   :F4
```

Step 4.
If desired, press **F4** to move the pen head/scope to the current WL point setting.

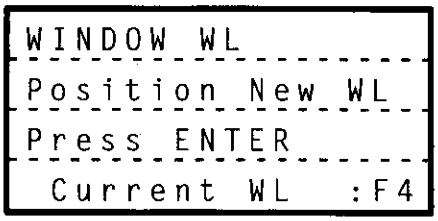
```
WINDOW WL
Position New WL
Press ENTER
 Current WL   :F4
```

CAUTION!

When you press **F4**, the pen head/scope moves to that position, if the WL point is within the acceptable range. If the WL point is outside the acceptable range, the pen head/scope will move to the previous WL point setting. If you want to change that position, press the **Minus (–)** Pen Scope Movement key to move the pen.

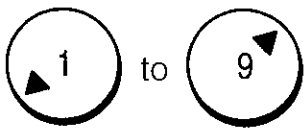
Step 5.

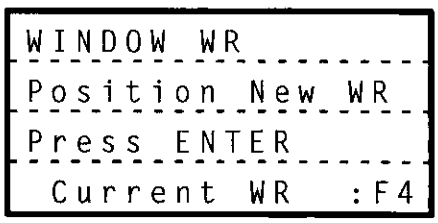
Press **ENTER** to accept the new WL point.



Step 6.

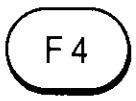
Press the **JOG** keys to set the pen head/scope to the desired WR point.

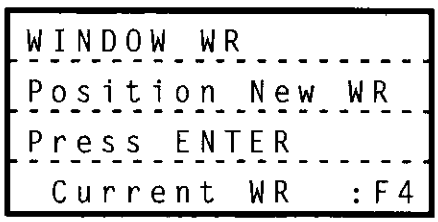




Step 7.

If desired, press **F4** to move the pen head/scope to the current WR point setting.



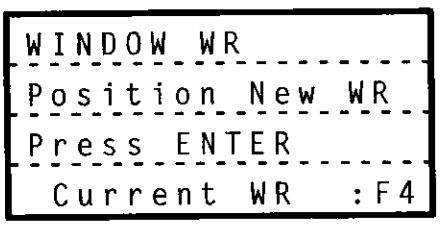


CAUTION!

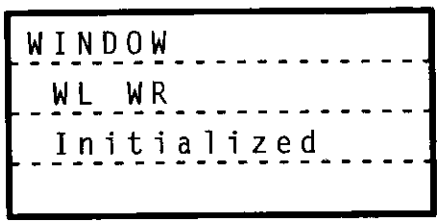
When you press **F4**, the pen head/scope moves to that position, if the WR point is within the acceptable range. If the WR point is outside the acceptable range, the pen head/scope will move to the previous WR point setting. If you want to change that position, press the **Minus (–)** Pen Scope Movement key to move the pen.

Step 8.

Press **ENTER** to accept the new WR point.



A message is displayed indicating that the WL and WR points are initialized.



Note:

If WL and WR are the same, the plotter cancels the Window parameter settings and displays a message for 2 seconds. The LCD then returns to the mode menu.

Alignment

The Alignment parameter is used to adjust the angle of the plot so it conforms to the coordinates of the media. The plotter assumes that the X- and Y-axes of the media are at 90° angles.

When you set the Alignment parameters, the values for the plotter axes do not change; the media coordinates are converted to right angles.

☞ *See "Compensation" in this chapter for information about adjusting other X- and Y-axis angles.*

To align the media axes, set up two points of a frame line for the media that is parallel to the X-axis. The points are the AL point (–X direction) and AR point (+X direction). After alignment, the X- and Y-coordinates are always at right angles.

Note:
You cannot use both the Alignment and Compensation parameters. If you set up Alignment after Compensation has been set, the Compensation parameter value is automatically canceled.

Once set up, this parameter remains effective, even when the power switch is turned OFF.

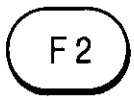
The center of the plotting range (Window parameter) is used as a basis for Alignment:

- ❒ If the plotter is in MH–GL mode, the center is the center of the hard clip area.
- ❒ If the plotter is not in MH–GL mode and the Origin point has been set using the Origin parameter, the center is the point set up for the Origin parameter.
- ❒ When you use Alignment, the hard clip area is reduced.

Step 1.
Press **MENU ▲** or **MENU ▼** until LOCAL 3 is displayed on the LCD.

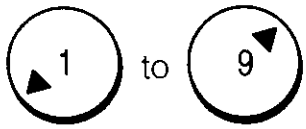
```
*LOCAL 3*   User1
WINDOW        AXIS
COMPENS.   ORIGIN
 w.......    90cm/s
```

Step 2.
Press **F2** to select AXIS.




```
*LOCAL 3*   User1
WINDOW        AXIS
COMPENS.   ORIGIN
 w.......    90cm/s
```

Step 3.
Press the **JOG** keys to set the pen head/scope to the desired AL point.




```
AXIS AL
Position New AL
Press ENTER
 Current AL   :F4
```

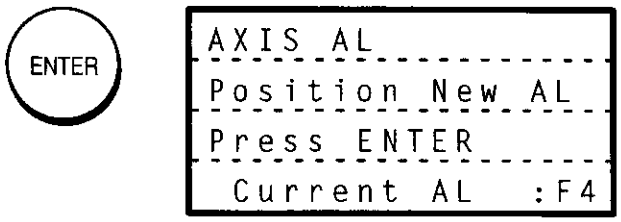
Step 4.
If desired, press **F4** to move the pen head/scope to the current AL point setting.


```
AXIS AL
Position New AL
Press ENTER
 Current AL   :F4
```

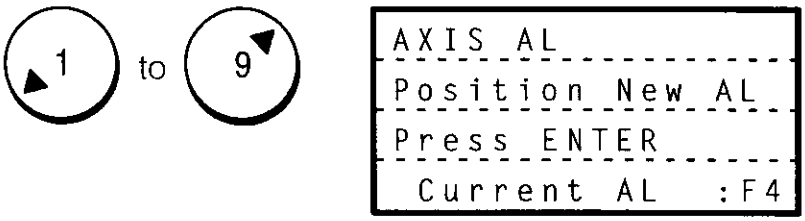
CAUTION!

When you press **F4**, the pen head/scope moves to that position, if the AL point is within the acceptable range. If the AL point is outside the acceptable range, the pen head/scope will move to the previous AL point setting. If you want to change that position, press the **Minus (–)** Pen Scope Movement key to move the pen.

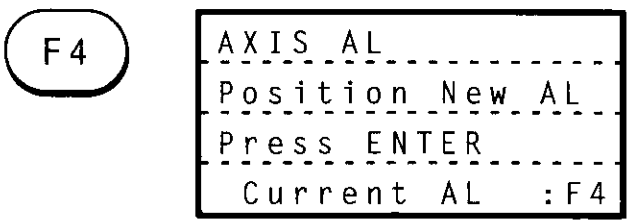
Step 5.
Press **ENTER** to accept the new AL point.



Step 6.
Press the **JOG** keys to set the pen head/scope to the desired AR point.



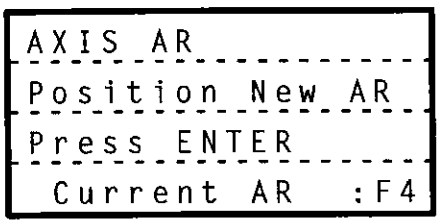
Step 7.
If desired, press **F4** to move the pen head/scope to the current AR point setting.



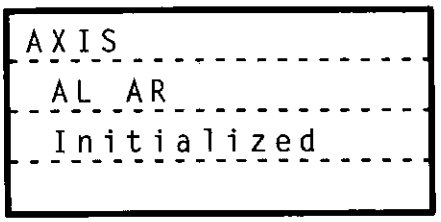
CAUTION!

When you press **F4**, the pen head/scope moves to that position, if the AR point is within the acceptable range. If the AR point is outside the acceptable range, the pen head/scope will move to the previous AR point setting. If you want to change that position, press the **Minus (–)** Pen Scope Movement key to move the pen.

Step 8.
Press **ENTER** to accept the new AR point.



A message that the axis AL and AR points have been initialized is displayed.



Note:

If the AL and AR points are the same, the plotter cancels the Alignment parameter settings and displays a message for 2 seconds. The LCD then returns to the menu.

Compensation

The Compensation parameter redefines the plotting coordinates and adjusts them to the plotting media. Use the Compensation parameter when the plotting media X- and Y-axes are not at right angles. To use the Compensation parameter, you define three points (C1, C2, and C3) on the media and the distances between points C1 and C2 and between C2 and C3. The distance between the points is compensated.

Note:

If any two of the three points are the same, Compensation is automatically canceled.

You cannot use both the Alignment and Compensation parameters. If you set up Alignment after Compensation has been set, the Compensation parameter value is automatically canceled.

Figure 8.6 shows examples of how the three points might be grouped.

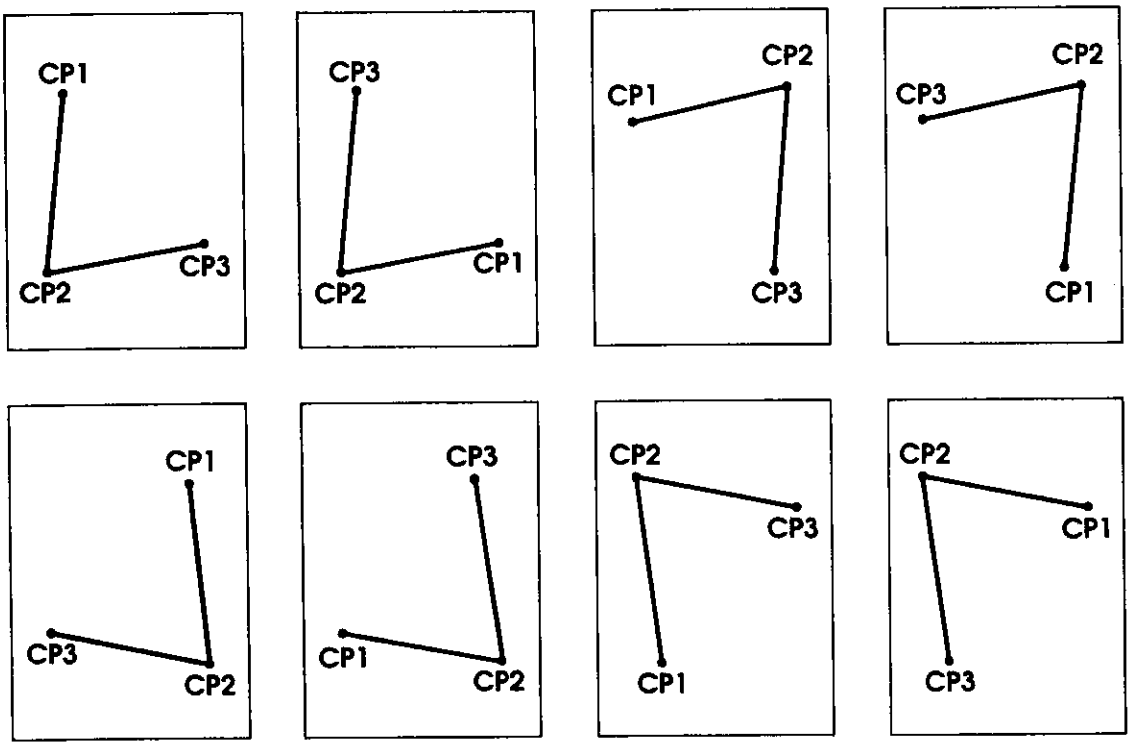


Figure 8.6 Examples of Compensation Parameter Settings

Figure 8.7 shows the relationship between Compensation settings and the X- and Y-axes.

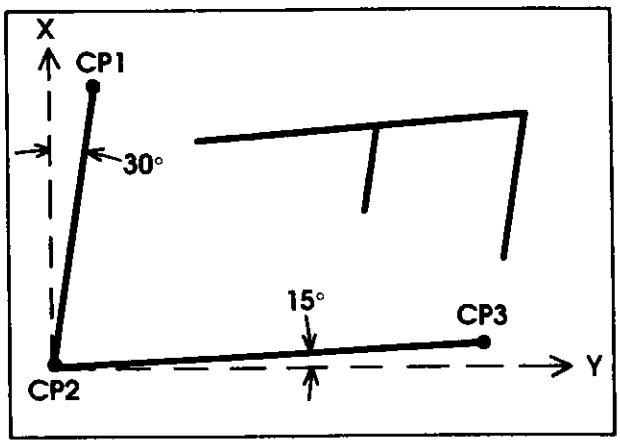


Figure 8.7 Compensation Parameter Settings in Relation to X- and Y-Axes

When you set the Compensation parameter, the plotting range (Window parameter) is reduced. Figure 8.8 shows how the clip area is reduced when Compensation is set up.

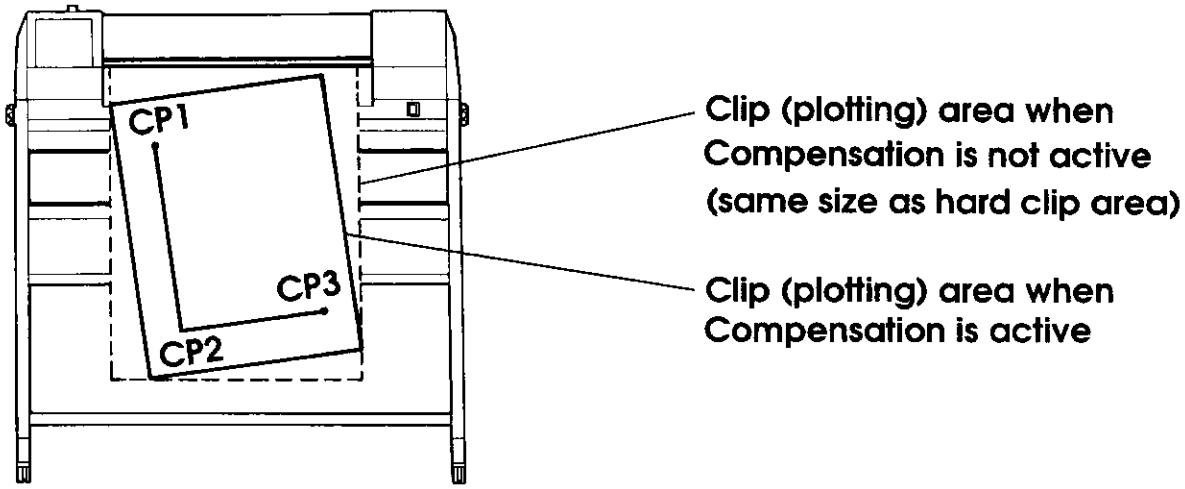
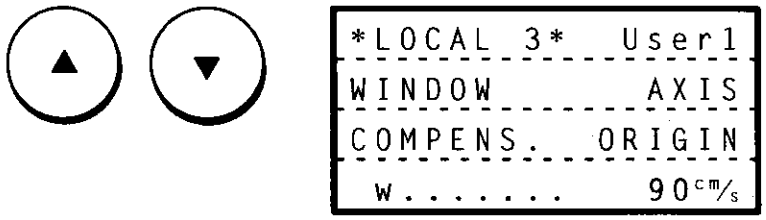


Figure 8.8 Clip Area Affected by Compensation Parameter Settings

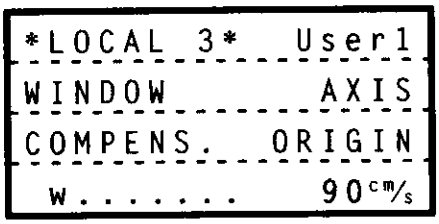
After being defined, Compensation parameter settings remain effective, even when plotter power is turned OFF.

Step 1.

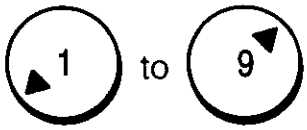
Press **MENU ▲** or **MENU ▼** until LOCAL 3 is displayed on the LCD.

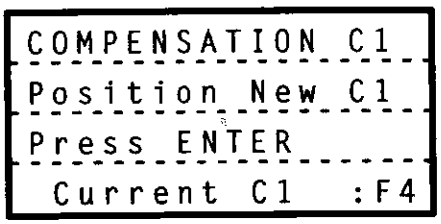


Step 2.
Press **F3** to select COMPENS.

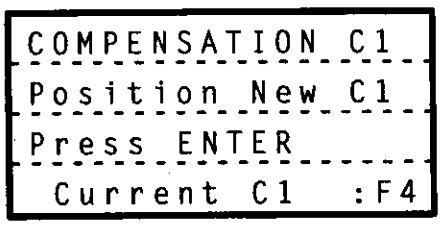


Step 3.
Press the **JOG** keys to set the pen head/scope to the desired C1 point.





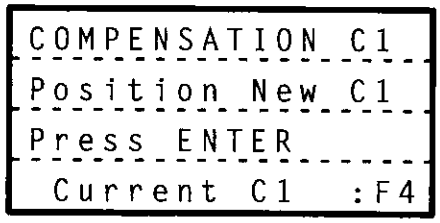
Step 4.
If desired, press **F4** to move the pen head/scope to the current Compensation point setting.



CAUTION!

When you press **F4**, the pen head/scope moves to that position, if the Compensation point is within the acceptable range. If the Compensation point is outside the acceptable range, the pen head/scope will move to the previous Compensation point setting. If you want to change that position, press the **Minus (-)** Pen Scope Movement key to move the pen.

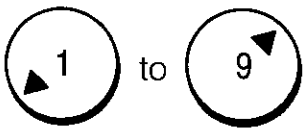
Step 5.
Press **ENTER** to accept the new C1 point.

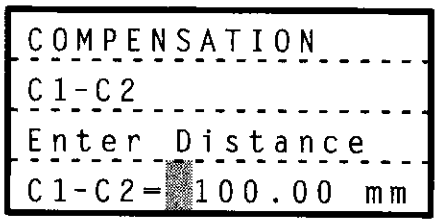


Step 6.
Repeat Steps 3, 4, and 5 for C2 and C3 points.

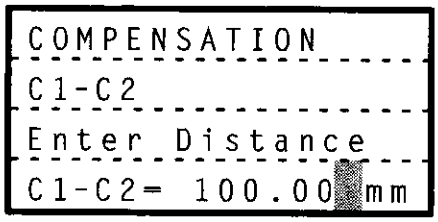
Note:
If the relationships between the C1, C2, and C3 points are not valid, an error message is displayed and the LCD returns to the menu.

Step 7.
Use the numeric keys to enter the distance from C1 to C2, in millimeters.

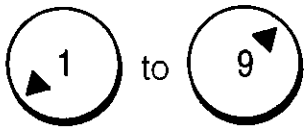


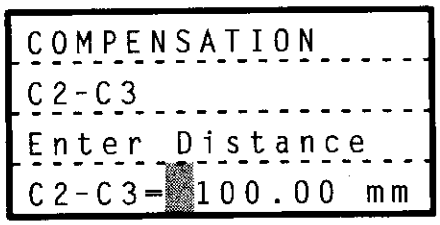


Step 8.
Press **ENTER** to accept the distance between C1 and C2.

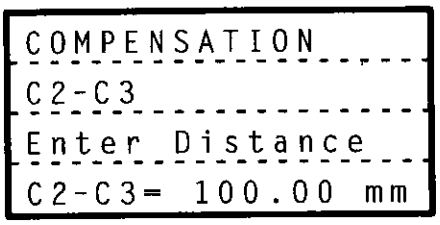


Step 9.
Use the numeric keys to enter the distance from C2 to C3, in millimeters.

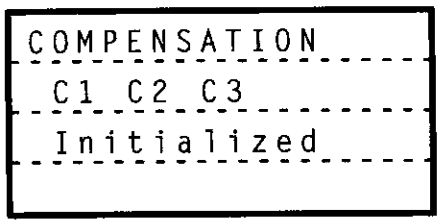




Step 10.
Press **ENTER** to accept the distance between C2 and C3.



A message that Compensation points C1, C2, and C3 have been initialized is displayed.



Note:
An error occurs and the LCD returns to the menu under these conditions:

- ❒ If any two of the three reference points are the same value
- ❒ If the distance specified between any two points is greater than the mechanical range of the plotter

High Quality

The High Quality parameter lets you specify if you want the quality of your plots to be enhanced.

When the High Quality parameter is ON, these conditions apply:

- The Sorting parameter is changed to minimize damage to the media
- Preset values are not changed but Plotting Speed and Acceleration are reduced by 50%; Pen Speed and Acceleration are not affected

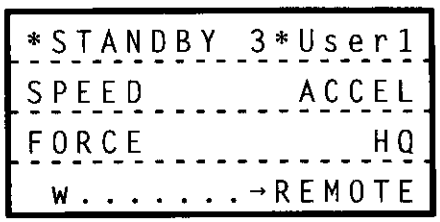
When High Quality is OFF, the plotter returns to the previous parameter settings.

CAUTION!

If you are using High Quality, lower the Pen Pressure (Force) setting. If pressure is too high, pencil leads may break.

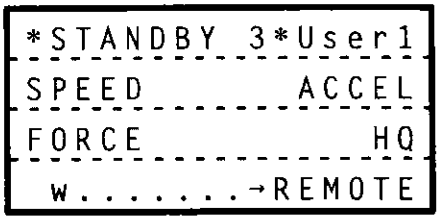
Step 1.

Press **MENU** ▲ or **MENU** ▼ until STANDBY 3 or LOCAL 4 is displayed on the LCD.

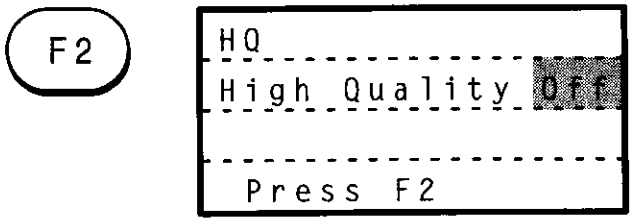


Step 2.

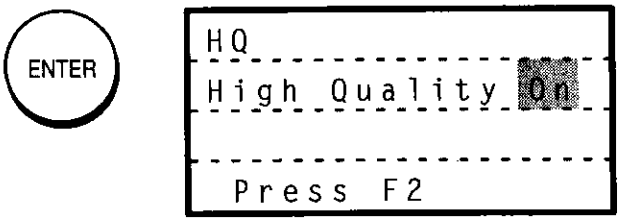
Press **F4** to select HQ.



Step 3.
Pressing **F2** switches the display between **ON** and **OFF**.



Step 4.
Press **ENTER** to accept the new HQ setting.



Replot

Plotting data from the host computer can be registered and replotted, or the most recent plot can be replotted from the internal buffer. A file can be cleared from the buffer memory.

Plots can be stored in memory with replot file numbers 1 through 8. The plotter recognizes the computer screen image as a file and can register up to eight plots when you assign file numbers. You can select a file to replot by specifying the file number.

The data currently in the buffer can also be replotted. It is not stored with a file number but can be selected by specifying File 0.

- If you want to repeat the same drawing, the plotter replots the current data. Select Replot mode and specify File 0.
- If you have encountered a problem and want to start again, wait until all of the data is transmitted from the host computer, select Replot mode, and specify File 0.

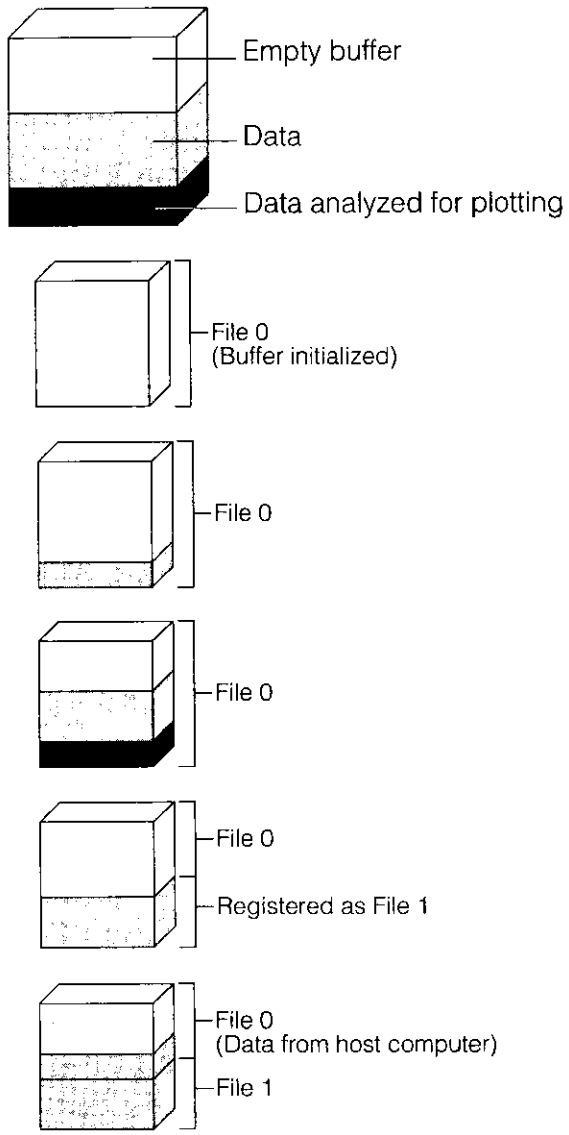
CAUTION!

If there is data from previous plots in the buffer, that data will also replot when you select File 0. You should clear the plotter buffer using the Clear parameter each time you start a new plot.

You can replot a registered file as often as you want during the current plotting session.

☞ *See Chapter 6 for more information about replotting.*

Figure 8.9 shows the input buffer.



Up to eight files can be registered. File 0 data should be registered one by one.

Figure 8.9 Input Buffer Processes

Note:
When the size of File 0 is less than 32 KB, the data cannot be registered.

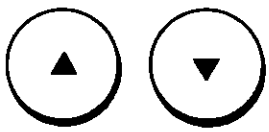
CAUTION!

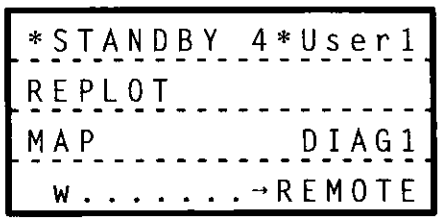
Remember these guidelines about the registered files:

- Registered files are cleared when the plotter is turned OFF
- Registered files are not cleared when you use Clear or Reset
- Data communications between the plotter and the host computer can continue during replotting

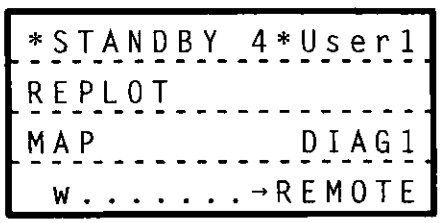
Register a File

Step 1.
Press **MENU ▲** or **MENU ▼** until STANDBY 4 or LOCAL 5 is displayed on the LCD.

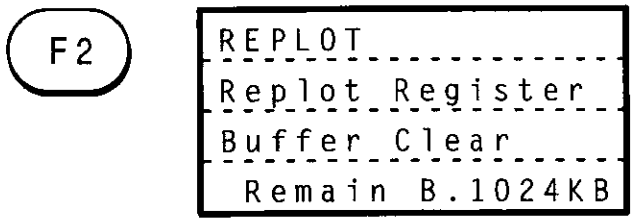




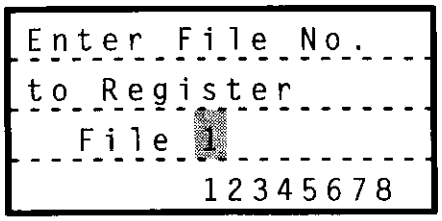
Step 2.
Press **F1** to select REPLOT.



Step 3.
Press **F2** to select REGISTER.

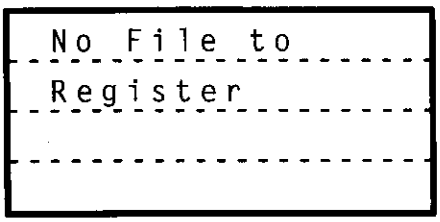


Step 4.
File numbers that are available for registration are displayed in the lower right corner of the LCD.

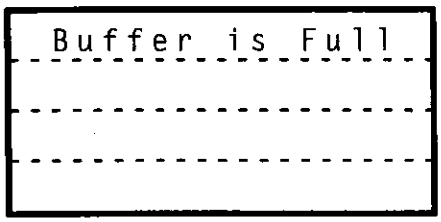


A message is displayed for 2 seconds and the LCD returns to the menu if:

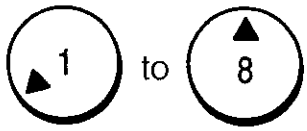
- There is no data in the buffer

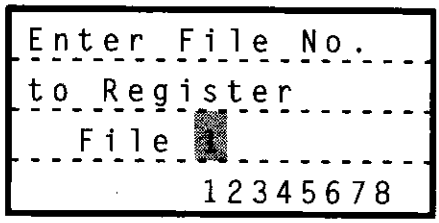


- The remaining memory in the buffer is 32 Kbytes or less

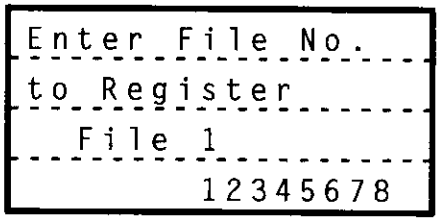


Step 5.
Use a numeric key to type one of the available file numbers for the data currently in the buffer.





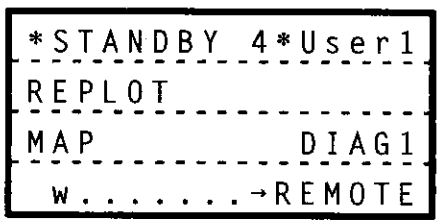
Step 6.
Press **ENTER** to register the file with the assigned file number.



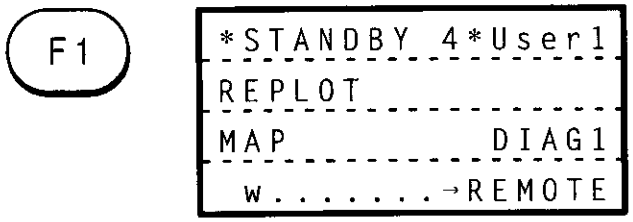
Delete a File

Note:
To clear File 0, use the Clear parameter.

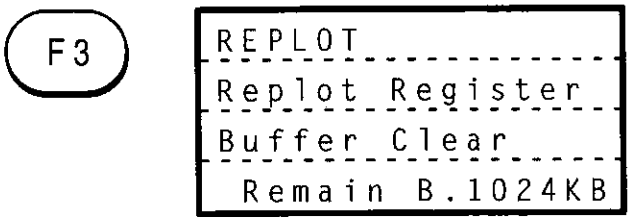
Step 1.
Press **MENU** ▲ or **MENU** ▼ until STANDBY 4 or LOCAL 5 is displayed on the LCD.



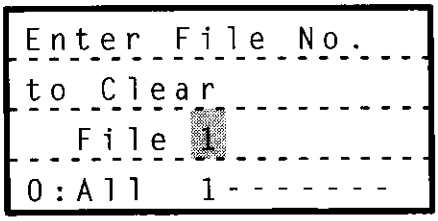
Step 2.
Press **F1** to select REPLOT.



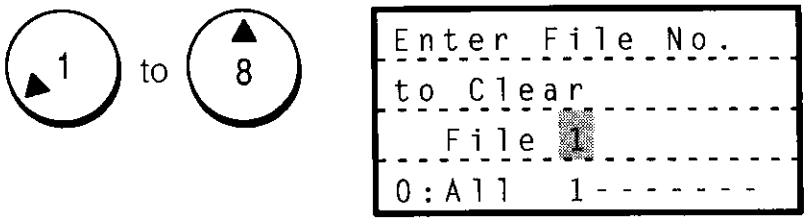
Step 3.
Press **F3** to select BUFFER CLEAR.



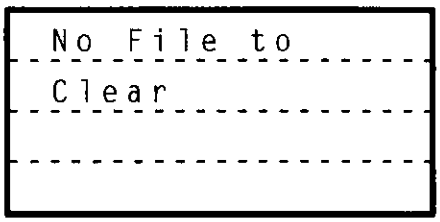
Step 4.
Registered file numbers are displayed in the lower right corner of the LCD.



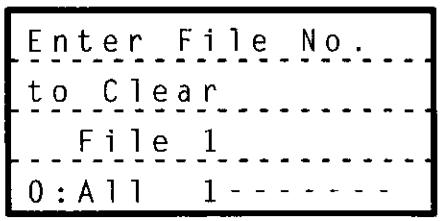
Step 5.
Specify the file to delete. Use a numeric key to type the file number you want to delete. The file must be 1 through 8.



An error message is displayed for 2 seconds and the LCD returns to the menu if there is no data in the file.

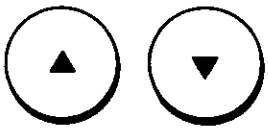


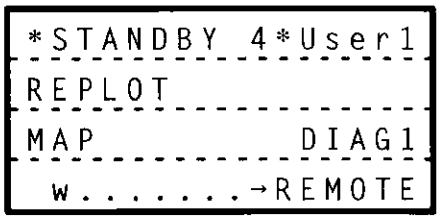
Step 6.
Press **ENTER** to delete the file.



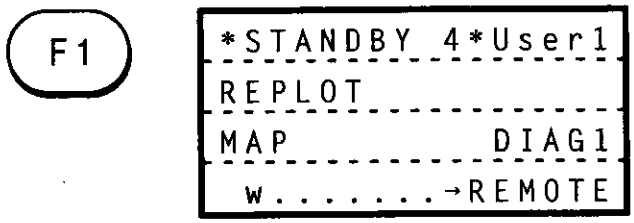
Replot a Registered File

Step 1.
Press **MENU** ▲ or **MENU** ▼ until STANDBY 4 or LOCAL 5 is displayed on the LCD.

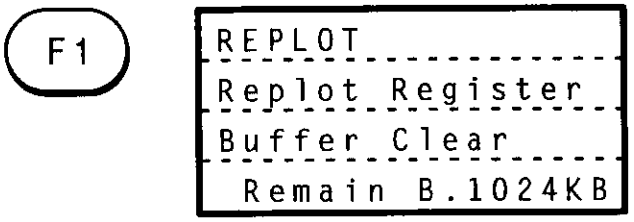




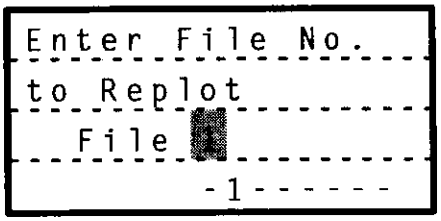
Step 2.
Press **F1** to select REPLOT.



Step 3.
Press **F1** to select REPLOT.



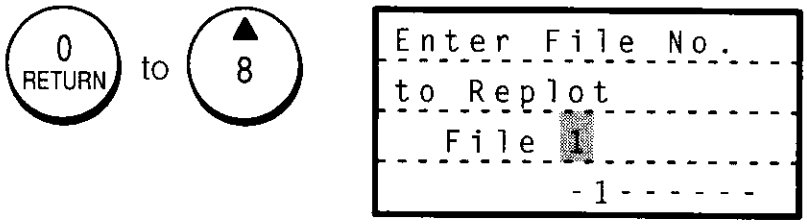
Step 4.
File numbers available for replotting are displayed in the lower right corner of the LCD.



An error message is displayed for 2 seconds and the LCD returns to the menu if there are no registered files and there is nothing in the buffer.

Step 5.

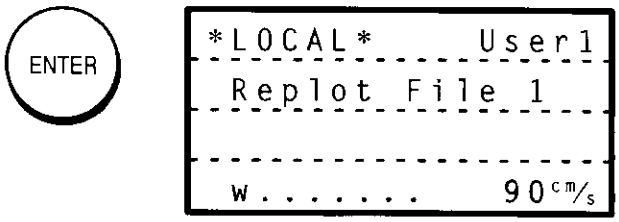
Specify the file to replot. Use the numeric keys to type the file number you want to delete. The file number must be 0 through 8.



Step 6.

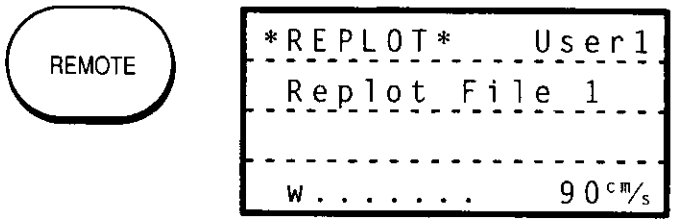
Press **ENTER** to accept the selection.

- If you select File 1 through 8, the file replots and the plotter returns to Local mode.
- If you select File 0, the file replots and the plotter returns to Remote mode.



Step 7.

Press **REMOTE** to start replotting.



P1/P2 Initialization

The P1/P2 Initialization parameter is used to set new P1 and P2 points for the hard clip area:

- P1 is a point 15 mm from the left bottom edge and the left side of the hard clip area.
- P2 is a point 15 mm from the top right edge and the right side of the hard clip area.

Note:
The +X direction is right; the +Y direction is up.

Figure 8.10 shows P1 and P2 reference points.

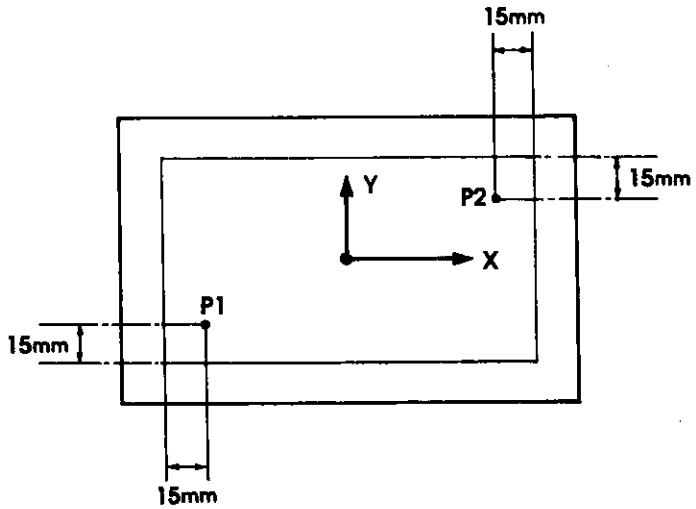
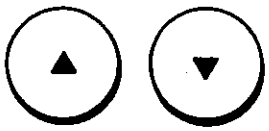
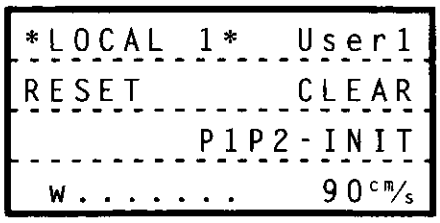


Figure 8.10 P1 and P2 Reference Points

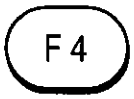
Note:
New reference points cannot be set during plotting.

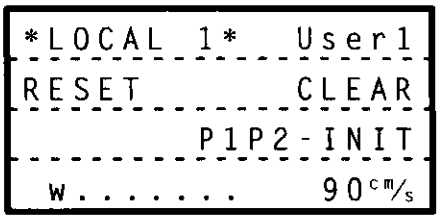
Step 1.
Press **MENU ▲** or **MENU ▼** until LOCAL 1 or REMOTE 1 is displayed on the LCD.





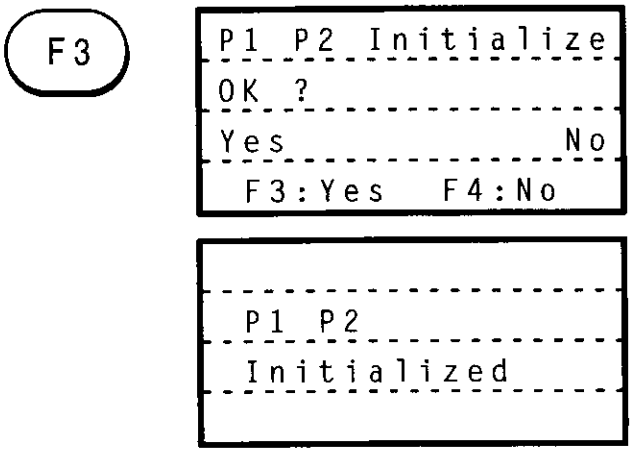
Step 2.
Press **F4** to select P1P2 INIT.



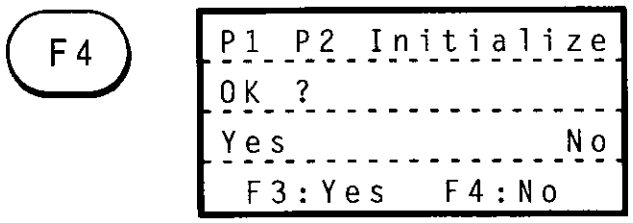


Step 3.
Initialize the P1 and P2 points.

❒ Press **F3** to select YES and initialize the points. A message that P1 and P2 are initialized is displayed.



❒ Press **F4** to select NO and return to the menu.



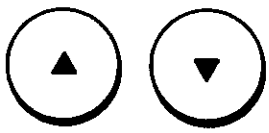
P1 Set

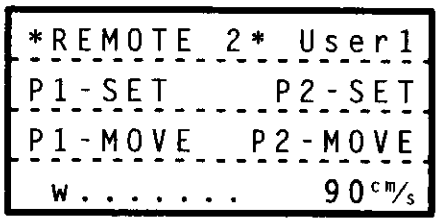
The P1 Set parameter is used to set new coordinates for both reference points P1 and P2. If you change P1, P2 is automatically changed also.

The P1 Set parameter can only be used when the plotter is in MH–GL command mode.

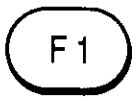
Note:
If you use an online computer command to adjust this parameter, you can enlarge or reduce the size of the drawings or move the plotting position.

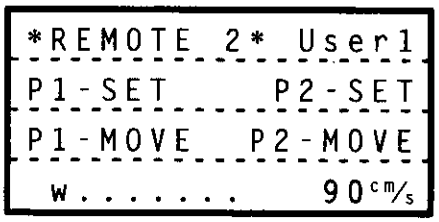
Step 1.
Press **MENU ▲** or **MENU ▼** until LOCAL 8 or REMOTE 2 is displayed on the LCD.



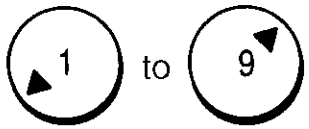


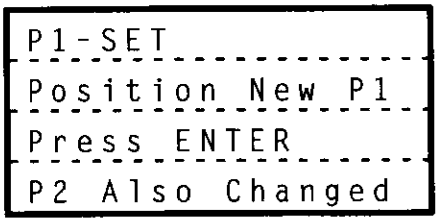
Step 2.
Press **F1** to select P1 SET.



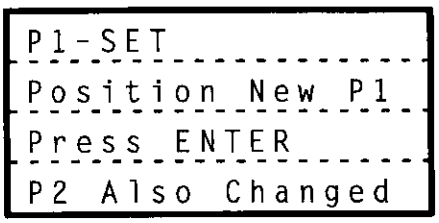


Step 3.
Use the **JOG** keys to move the pen head/scope to the desired position for P1.





Step 4.
Press **ENTER** to accept the new P1 point.



111

P2 Set

The P2 Set parameter lets you set new coordinates for reference point P2.

The P2 Set parameter can only be used when the plotter is in MH-GL command mode.

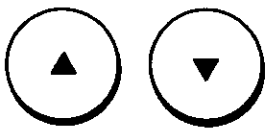
☞ *See Chapter 3 for information about setting up the command mode.*

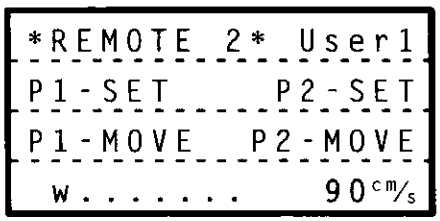
Note:

If you use an online computer command to adjust this parameter, you can enlarge or reduce the size of the plot or move the plotting position.

Step 1.

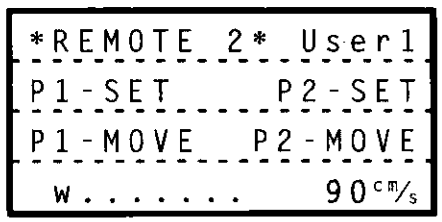
Press **MENU ▲** or **MENU ▼** until LOCAL 8 or REMOTE 2 is displayed on the LCD.





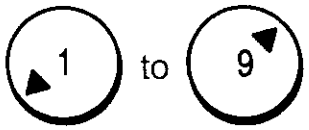
Step 2.

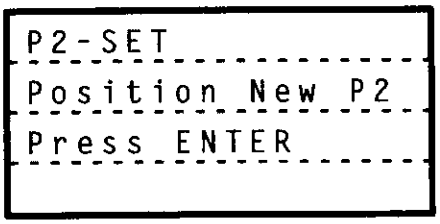
Press **F2** to select P2 SET.



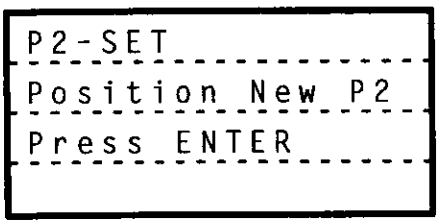
183

Step 3.
Use the **JOG** keys to move the pen head/scope to the desired position for P2.





Step 4.
Press **ENTER** to accept the new P2 point.



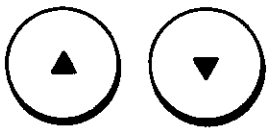
P1 Move

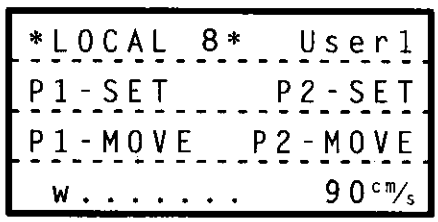
The P1 Move parameter is used to confirm the new coordinates for both reference points P1 and P2.

Note:
You must have used P1 Set before you use P1 Move.

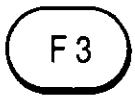
The P1 Move parameter can only be used when the plotter is in MH–GL command mode.

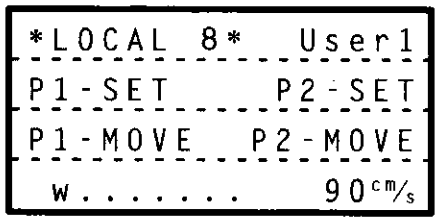
Step 1.
Press **MENU ▲** or **MENU ▼** until LOCAL 8 or REMOTE 3 is displayed on the LCD.





Step 2.
Press **F3** to select P1 MOVE. The pen head/scope moves to the current P1 point.





Note:
If you want to specify this point as the current pen position, press the **Decimal (.)** or **Minus (–)** Pen Scope Offset keys. The pen moves to this position.

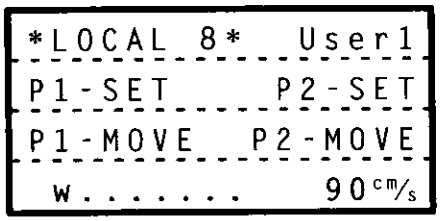
P2 Move

The P2 Move parameter is used to confirm the new coordinates for reference point P2.

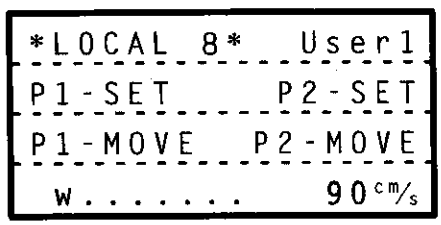
Note:
You must have used P2 Set before you use P2 Move.

The P2 Move parameter can only be used when the plotter is in MH-GL command mode.

Step 1.
Press **MENU** ▲ or **MENU** ▼ until LOCAL 8 or REMOTE 2 is displayed on the LCD.



Step 2.
Press **F4** to select P2 MOVE. The pen head/scope moves to the current P2 point.



Note:
If you want to specify this point as the current pen position, press the **Decimal (.)** or **Minus (-)** Pen Scope Offset keys. The pen scope moves to this position.

186

Chapter 9

Pen Control Parameters

The MUTOH XP–500 Series Intelligent Plotter uses parameters to control the plotting pens and pencils:

This chapter shows how to:

- ✗ **Select the pen control parameter you want to set**
- ✗ **Enter parameter settings**

Pen Map	**Pen Force (Pressure)**
Pen Change	**Pen Speed**
Pen Up/Pen Down	**Plotting and Pen Acceleration**

Guidelines for Setting Pen Control Parameters

- ❒ The plotter must be turned ON.
- ❒ The plotter cover must be closed.
- ❒ Plotting media must be loaded.
- ❒ Press **ENTER** if you want to accept the current value displayed after you select the parameter.
- ❒ When you press **ENTER** after entering all of the information for a parameter, the LCD automatically returns to the menu.
- ❒ Press **CE** to clear the entry if you make a mistake in typing a numeric value or you change your mind. The typed value is cleared and you can enter the correct value.
- ❒ The plotter must be in Local or Remote mode to set the pen control parameters.
- ❒ Be sure your parameter settings are appropriate for the CAD/CAM software being used. Check your software documentation or talk to the software manufacturer to verify parameter settings.

Pen Map

Pen and Pencil Lead Map parameters are used to define the pen or pencil type that is associated with each pen number in the stocker. Pencil Lead Map parameters are used to define the lead hardness for each pen number in the stocker.

Once set up, the values are saved even after the power switch is turned OFF. The pen numbers are used by the plotter when pens are selected for plotting.

Different lead hardnesses can be used to plot in different line darknesses. When the plotter cannot continue to plot because lead runs out or slips, the plotter automatically retrieves a pencil with the same lead hardness and continues plotting. This automatic pencil change feature will use the same lead hardness, as well as the same lead thickness.

Note:

When lead runs out or slips occur, and the plotter cannot find the same lead-hardness pencil with the same thickness, plotting will stop and display a Pencil End message.

To set the Pen Map parameters, you must specify:

- Pen Type
- Pencil Lead Map

Table 9.1 shows the codes displayed for pen types.

CAUTION!

If the type of pen or pencil installed in the stocker is different from the type specified by the Pen Map parameter, the pen, pencil, or the plotter could be damaged.

Table 9.1 Pen Type Codes

Pen Type	Code Displayed
Ink pen	i
Ceramic-tip pen	c
Water-based ballpoint	w
Oil-based ballpoint	o
Pencil	p

The Pen Map parameters are also used to tell the plotter which pens to use when the Pen ID Mark switch is set to OFF.

Note:
The Pen ID Mark switch on the stocker must be OFF when the Pen Map parameters are set up.

Pencil-lead thickness is defined according to the pencil loaded into the stocker, lead hardness is defined by setting the Pencil Lead Map.

Table 9.2 shows the codes displayed for lead hardness.

Table 9.2 Lead-Hardness Code Example

Lead Hardness	Code Displayed
Lead hardness A	a
Lead hardness B	b
Lead hardness C	c

When different lead hardnesses (such as H, HB, and B) are used for the same pencil-lead thickness, the different pencils can be coded according to lead hardness. Lead hardness can be assigned code **a**, **b**, or **c**.

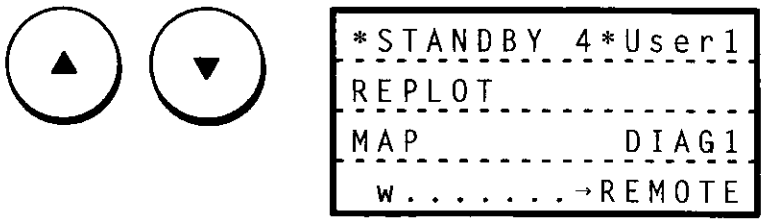
Table 9.3 shows how differing lead hardnesses can be coded for the same pencil-lead thickness.

Table 9.3 Lead-Hardness Code Example

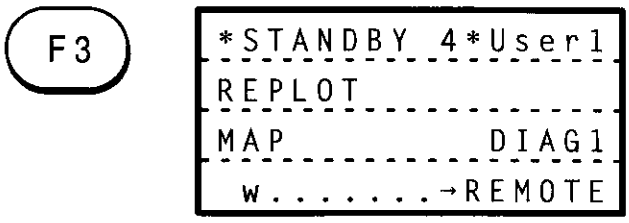
Lead Hardness	Code Displayed
0.3 mm H	a
0.3 mm B	b
0.3 mm HB	c

Stocker Pen Settings

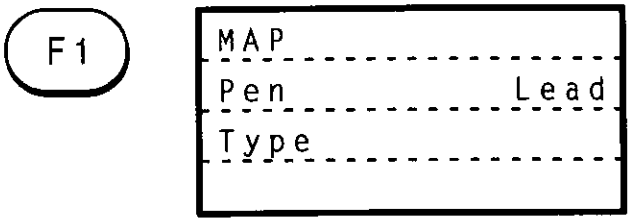
Step 1.
Press **MENU ▼** or **MENU ▲** until STANDBY 4 or LOCAL 5 is displayed on the LCD.



Step 2.
Press **F3** to select MAP.

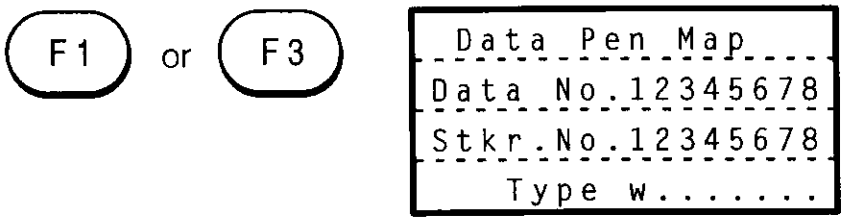


Step 3.
Press **F1** to select PEN.

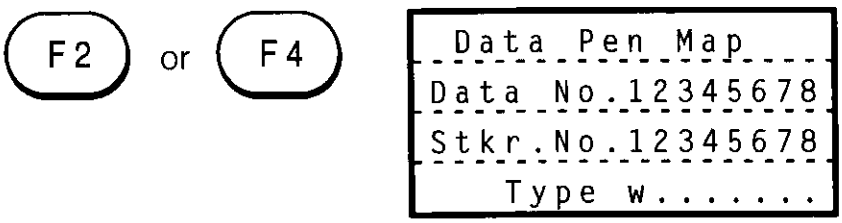


Note:
TYPE is not displayed if the Pen ID Mark switch is ON.

Step 4.
Press **F1** or **F3** until the stocker (STKR) pen number you want is blinking.

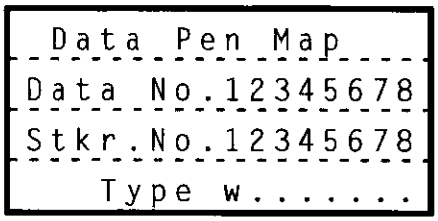


Step 5.
Press **F2** or **F4** until the value you want is blinking.



Step 6.

Press **ENTER** to accept the information and return to the menu.



Pen Type Settings

Figure 9.1 shows the Pen Map/Type parameter LCD flow.

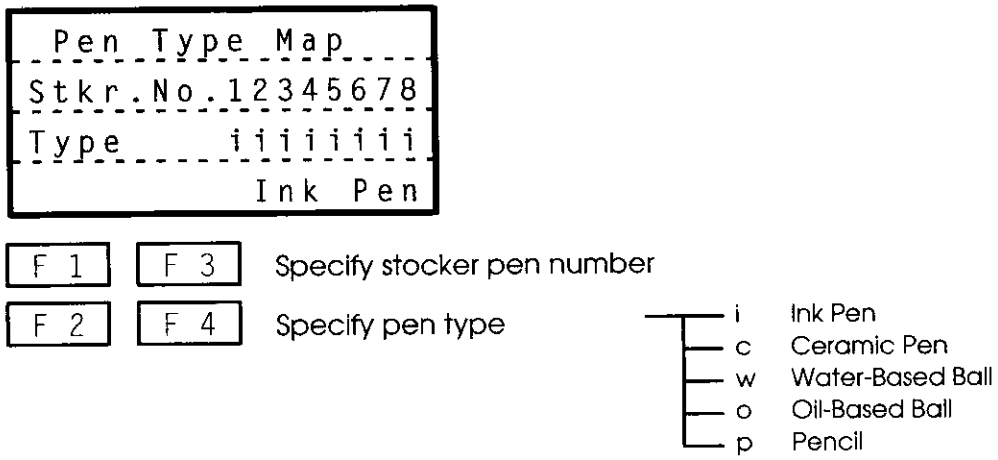
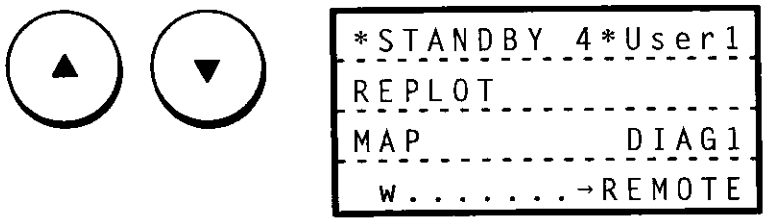
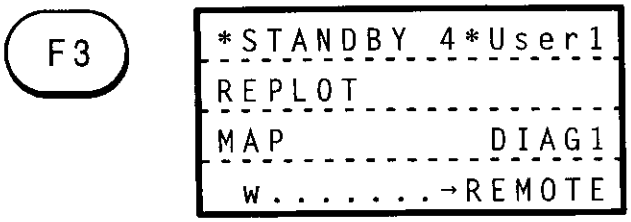


Figure 9.1 Pen Map/Type Parameter LCD Flow

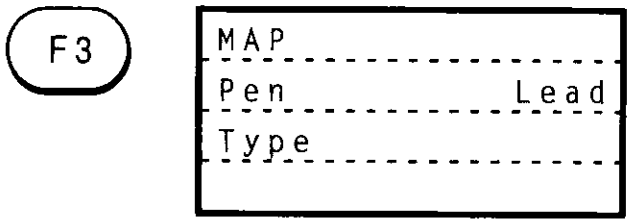
Step 1.
Press **MENU ▼** or **MENU ▲** until STANDBY 4 or LOCAL 5 is displayed on the LCD.



Step 2.
Press **F3** to select MAP.

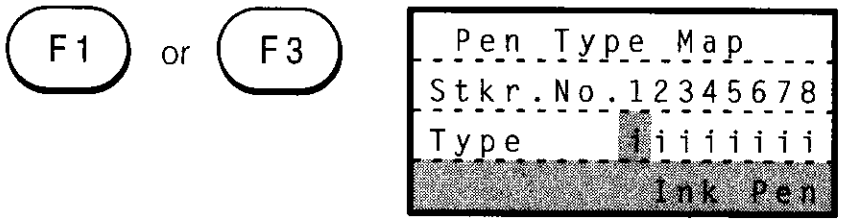


Step 3.
Press **F3** to select PEN TYPE.

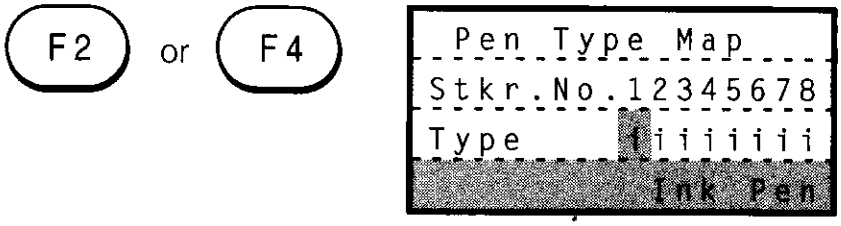


Note:
TYPE is not displayed if the Pen ID Mark switch is ON.

Step 4.
Press **F1** or **F3** until the pen type number that corresponds to the number you want is blinking.

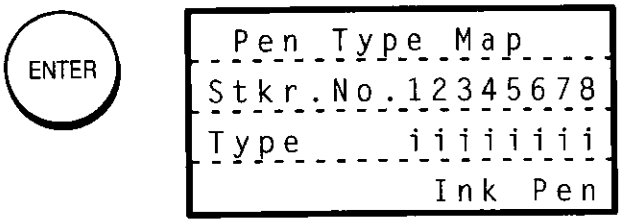


Step 5.
Press **F2** or **F4** to change the pen type displayed in the lower right corner.



Step 6.

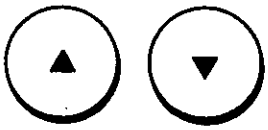
Press **ENTER** to accept the new Pen Type setting and return to the menu.

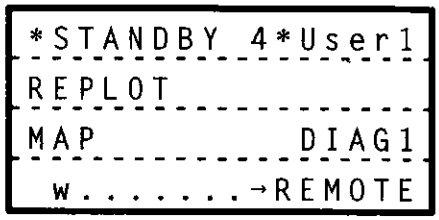


Pencil Lead Map Settings

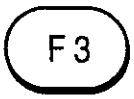
Note:
The 0.7 pencil requires B leads or harder.

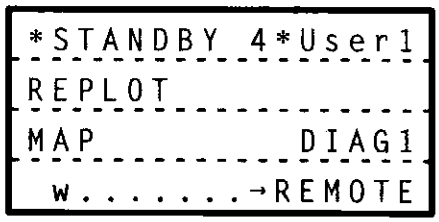
Step 1.
Press **MENU ▼** or **MENU ▲** until STANDBY 4 or LOCAL 5 is displayed on the LCD.



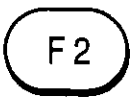


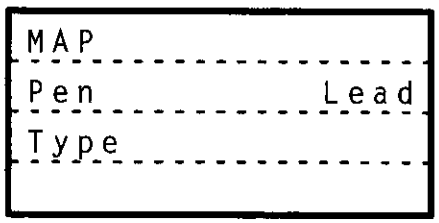
Step 2.
Press **F3** to select MAP.





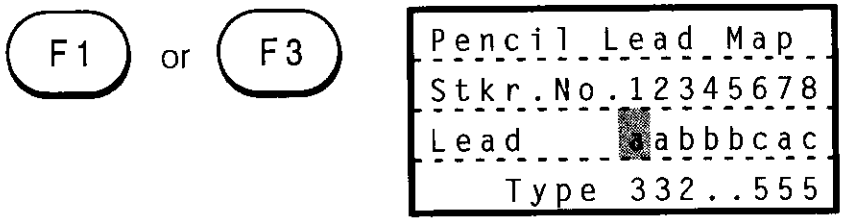
Step 3.
Press **F2** to select LEAD.



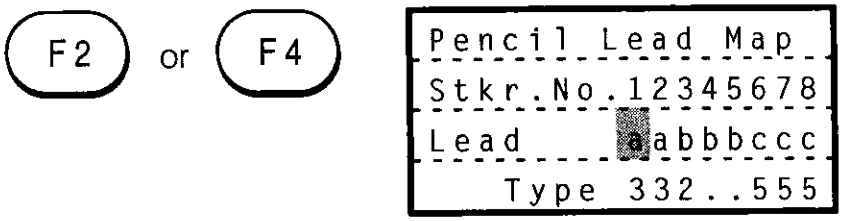


Note:
TYPE is not displayed if the Pen ID Mark switch is ON.

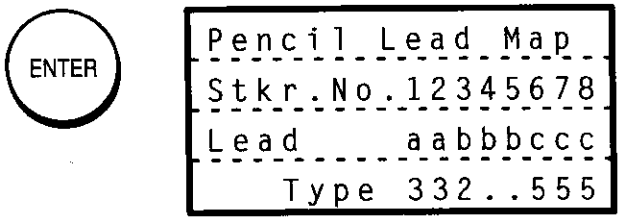
Step 4.
Press **F1** or **F3** until the lead type you want is blinking.



Step 5.
Press **F2** or **F4** until the Lead Hardness code you want is blinking.



Step 6.
Press **ENTER** to accept the Pencil Lead Map setting and return to the menu.



198

Pen Change

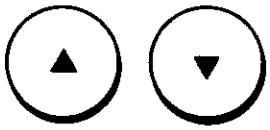
The Pen Change parameter is used to change pens for a plot. You must interrupt the plot by putting the plotter in Local mode to make the change.

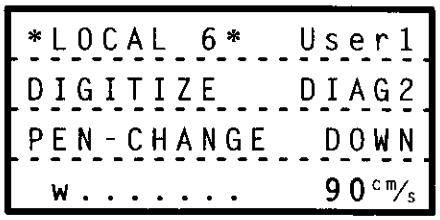
When you specify a pen:

- If a pen is already in the pen head, the plotter returns the pen to the stocker and then selects the specified pen.
- If there is no pen in the pen head, the specified pen is taken from the stocker.

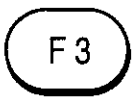
Note:
When Pen 0 is selected, the stocker returns the pen. This is equivalent to the JO instruction (pen is not installed when pen is selected) in MH–GL command mode.

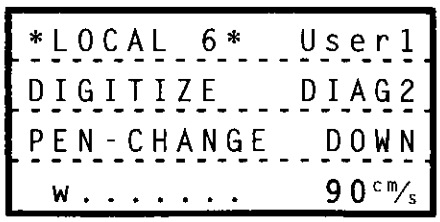
Step 1.
Press **MENU ▼** or **MENU ▲** until LOCAL 6 is displayed on the LCD.



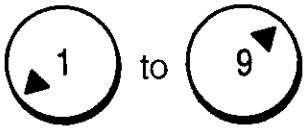


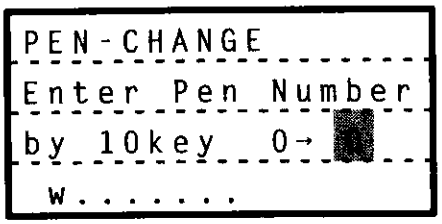
Step 2.
Press **F3** to select PEN CHANGE.



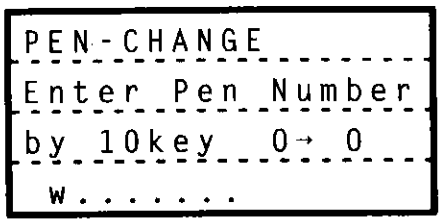


Step 3.
Use the numeric keys to enter the new stocker pen number. The current stocker pen number blinks on the LCD.





Step 4.
Press **ENTER** to accept the new pen number.



CAUTION!

Be sure the pen number you enter matches the pen number displayed on the stocker.

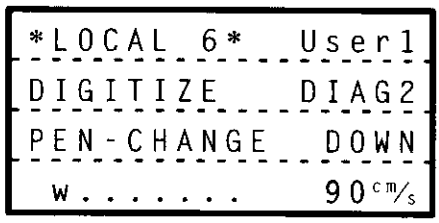
Pen Up/Pen Down

The Pen Up/Pen Down parameter lets you switch between Pen Up and Pen Down position. When this parameter is selected, the pen goes to UP if it was DOWN and DOWN if it was UP.

You can use the Pen Up/Pen Down parameter during plotting.

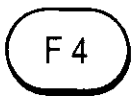
Step 1.

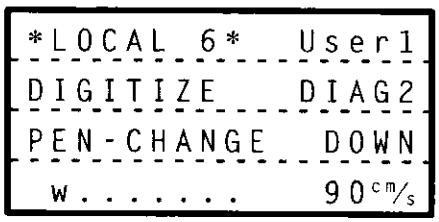
Press **MENU** ▼ or **MENU** ▲ until LOCAL 6 is displayed on the LCD.



Step 2.

Press **F4** to select UP/DOWN. Each time you press **F4**, the value changes from UP to DOWN or DOWN to UP.





Step 3.

Resume plotting operations.

Pen Force (Pressure)

The Pen Force (Pressure) parameter sets plotting pressure in Pen Down status.

Setting proper pen force (pressure) is important and must be appropriate to the pen being used. Pen life is affected by pen force.

Note:
If the plotter is set for High Quality, set the pressure a little low. If pressure is too high, pencil leads may break.

To set plotting pressure, you must specify:

- Pen type
- Setup value, if the maximum speed is classified into eight stages
- Whether to register the setup. If the setup is registered, the information is treated as an initial value. It is saved even if the plotter power is turned OFF

Table 9.4 shows an example of values that can be set up for pen numbers and pen types.

207

Table 9.4 Pen Force (Pressure) Setup Example

		Min.	Max.	Setup Value for Each Pen Number 1	2	3	4	5	6	7	8	Initial Value
Pen Type and Range of Plotting Pressure (G Maximum/ G Minimum))	Ink Pen	15	50	1	1	1	1	1	1	1	1	1 (15 g)
	Ceramic-tip pen	15	50	2	2	2	2	2	2	2	2	2 (20 g)
	Water-based ballpoint ~~point~~ pen	40	180	4	4	4	4	4	4	4	4	4 (100 g)
	Oil-based ballpoint pen	90	300	3	3	3	3	3	3	3	3	3 (150 g)
	Pencil 0.2	100	240	6	6	6	6	6	6	6	6	6 (200 g)
	Pencil 0.3	100	~~450~~ 300	5	5	5	5	5	5	5	5	5 (~~300~~ g)
	Pencil 0.4	100	450	8	8	8	8	8	8	8	8	6 (350 g)
	Pencil 0.5	100	450	8	8	8	8	8	8	8	8	8 (450 g)
	Pencil 0.7	100	450	8	8	8	8	8	8	8	8	8 (450 g)

☞ *See "Backup" on pages 10–20 and 10–21 for default settings.*

Plotting pressure is determined by the following formula:

F = Fmin + (PF–1) x {(Fmin/Fmax) / 7}

Where F = Actual plotting pressure

Fmin/Fmax = Pressure setup range for an installed pen type (in g)

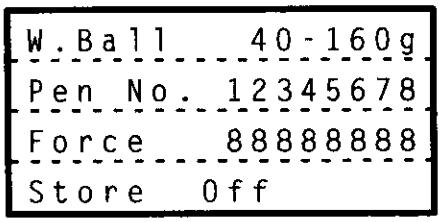
PF = Plotting pressure setup value

For example, if a 0.3 mm pencil is pen 4, the plotting pressure is:

F = 100 + (5–1) x {(450–100) / 7}

F = 300 g

Figure 9.2 shows the Pen Force (Pressure) parameter LCD flow.



F 1 F 3 Selection of items

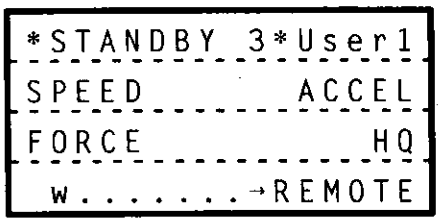
F 2 F 4 Setting values

Pen Type	**Plotting Pressure**	**Force**	**Registration**
Pencil2	15 ~ 450	1 ~ 8	Off
Pencil3	in units of 5 g		On
Pencil4			
Pencil5			
Pencil7			
Ink			
Ceramic			
W.Ball			
O.Ball			
Pen-Up			

Figure 9.2 Pen Force (Pressure) Parameter LCD Flow

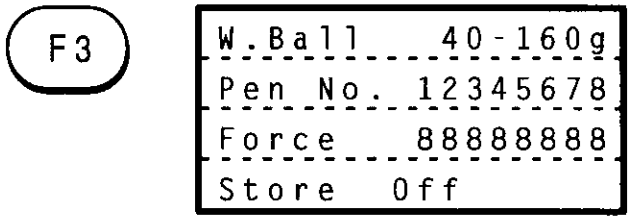
Step 1.

Press **MENU** ▲ or **MENU** ▼ until STANDBY 3 or LOCAL 4 is displayed on the LCD.



704

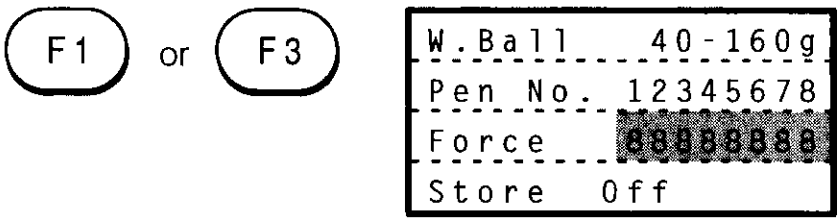
Step 2.
Press **F3** to select FORCE. The pen type currently being identified and the Force range are displayed on the LCD.



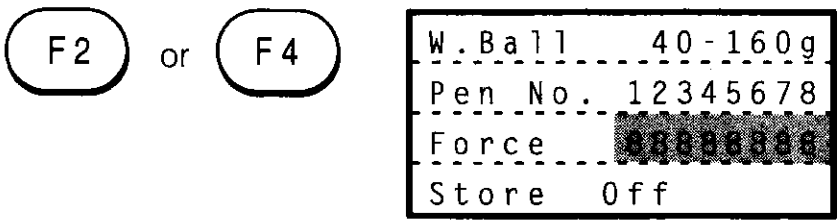
Note:
If the pen type displayed is different from the pen type you have set up, specify a different pen type and change the parameter value. To change the pen type, press **F2** or **F4** until the pen type you want is displayed.

Step 3.
Press **F1** or **F3** until the pen number you want is blinking.

Step 4.
Press **F1** or **F3** until FORCE is blinking.



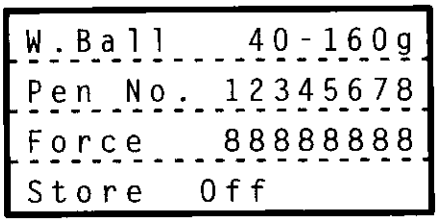
Step 5.
Press **F2** or **F4** until the Force you want for this pen is displayed.



The number you select sets the Pen Force parameter to that value. Table 9.4 lists Pen Force values.

Note:
If multiple pens are blinking, you can set up the Force parameters for all blinking pens at the same time.

Step 6.
Press **ENTER** to accept the new Force value.



Pen Speed

The Pen Speed parameter sets plotting and pen movement speed. Plotting speed can be set for pen type and pen number. To set plotting speed, you must specify:

- Pen type
- Setup value, if the maximum speed is classified into eight stages
- Whether to register the Pen Speed setup. If the Pen Speed setup is registered, the information is treated as an initial value. It is saved even if the plotter power is turned OFF

Pen speed applies to all pen types and pen numbers. Table 9.5 shows an example of values that can be set up for pen numbers and pen types.

Table 9.5 Pen-Movement Speed Setup Example

			Setup Value for Each Pen Number								Initial Value
		Max. (cm/s)	1	2	3	4	5	6	7	8	
Pen Type and Maximum Plotting Speed	Ink Pen	40	4	4	4	4	8	8	8	8	2 (10 cm/s)
	Ceramic-tip pen	40	8	8	8	8	8	8	8	8	2 (10 cm/s)
	Water-based ballpoint pen	90	6	6	6	6	6	6	6	6	8 (90 cm/s)
	Oil-based ballpoint pen	90	8	8	6	6	8	8	8	8	8 (90 cm/s)
	Pencil 0.2	90	8	8	8	8	6	6	6	6	8 (90 cm/s)
	Pencil 0.3	90	6	6	6	6	6	6	6	6	8 (90 cm/s)
	Pencil 0.4	90	8	8	8	8	8	8	8	8	8 (90 cm/s)
	Pencil 0.5	90	8	8	8	8	8	8	8	8	8 (90 cm/s)
	Pencil 0.7	90	8	8	8	8	8	8	8	8	8 (90 cm/s)
	Pen up	90	8								8 (90 cm/s)

☞ *See "Backup" on pages 10–20 and 10–21 for default settings.*

Plotting speed is determined by the following formula:

V = PV x Vmax ÷ 8

where V = Actual plotting speed

PV = Pen Speed setup value based on type of pen and pen number in cm/sec

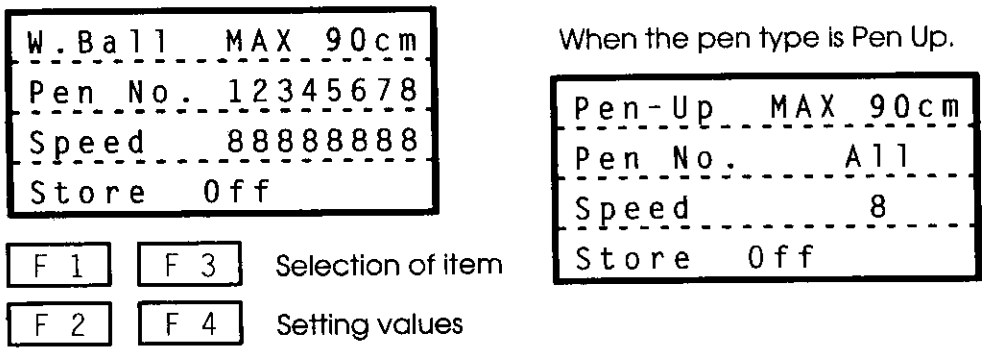
Vmax = Maximum plotting speed limit value

For example, if an oil-based ballpoint pen is pen number 3, with a plotting speed setup value of 6 classified into eight stages, the plotting speed is:

V = 6 x 90 ÷ 8

V = 67.5 cm/sec

Figure 9.3 shows the Pen Speed parameter LCD flow.

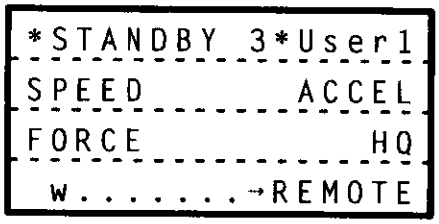


Pen Type	**Maximum Speed**	**Pen Speed**	**Registration**
Pencil2	5 ~ 90	1 ~ 8	Off
Pencil3	in units of 5 cm		On
Pencil4			
Pencil5			
Pencil7			
Ink			
Ceramic			
W.Ball			
O.Ball			
Pen-Up			

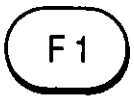
Figure 9.3 Pen Speed Parameter LCD Flow

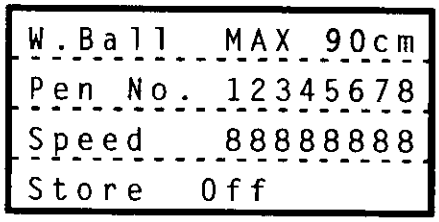
208

Step 1.
Press **MENU ▲** or **MENU ▼** until STANDBY 3 or LOCAL 4 is displayed on the LCD.



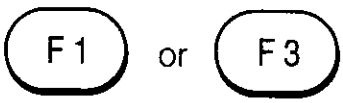
Step 2.
Press **F1** to select Pen SPEED. The pen type currently being identified is displayed on the LCD.

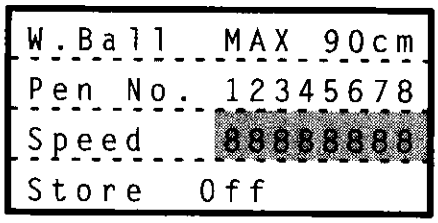




Note:
If the pen type displayed is different from the pen type you have set up, specify a different pen type and change the parameter value. To change the pen type, press **F2** or **F4** until the pen type you want is displayed.

Step 3.
Press **F1** or **F3** until the setting you want is blinking. Settings are MAX (maximum speed), PEN NO., SPEED, and STORE.





CAUTION!

Pen Speed blinks first. If you want to change the Pen Type setting, select Pen Type before you select a setting.

Step 4.
Press **F2** or **F4** until the value you want is blinking.

F2 or F4

```
W.Ball  MAX 90cm
Pen No. 12345678
Speed   88888888
Store   Off
```

Note:
When multiple pens are blinking, you can change parameters for all blinking pens in one step.

Step 5.
Register the settings, if desired. Press **F1** or **F3** to select STORE.

F1 or F3

```
W.Ball  MAX 90cm
Pen No. 12345678
Speed   88888888
Store   Off
```

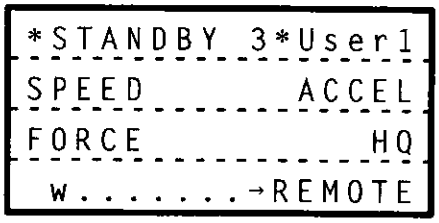
Step 6.
Press **F2** or **F4** until STORE ON is displayed.

F2 or F4

```
W.Ball  MAX 90cm
Pen No. 12345678
Speed   88888888
Store   On
```

Step 7.

Press **ENTER** to accept the setting and return the LCD to the menu.



Pen Acceleration

The Pen Acceleration parameter sets plotting and pen acceleration.

Plotting acceleration can be set for pen type and pen number. To set plotting acceleration, you must specify:

- Pen type
- Setup value, if the maximum speed is classified into eight stages
- Whether to register the setup. If the setup is registered, the information is treated as an initial value. It is saved even when the plotter power is turned OFF

Figure 9.4 shows Pen Acceleration parameter LCD flow.

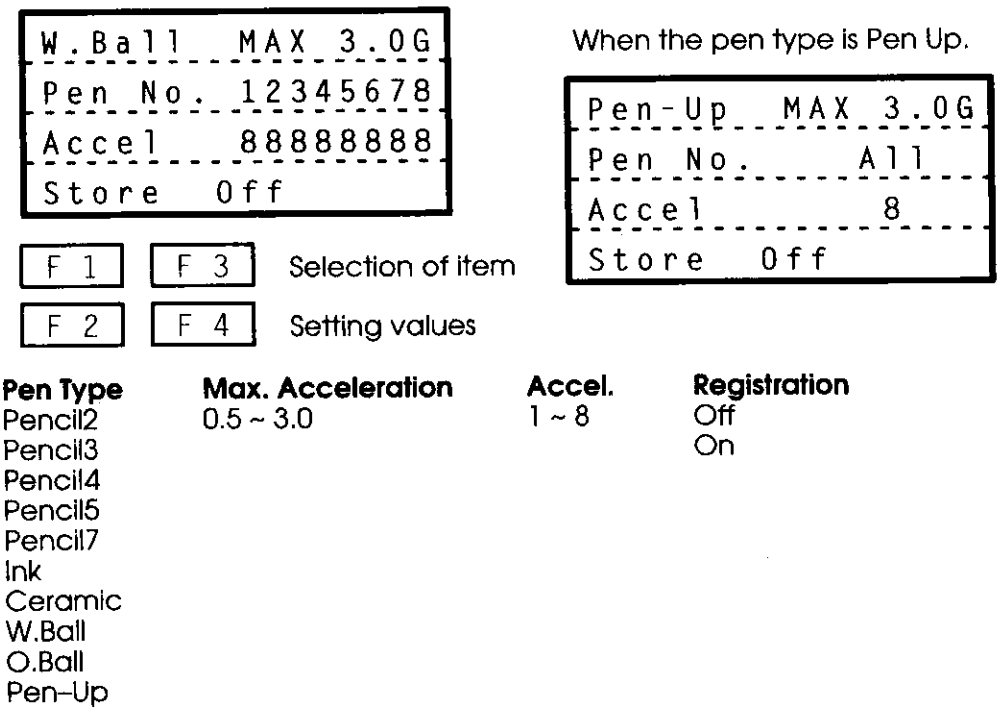


Figure 9.4 Pen Acceleration Parameter LCD Flow

Pen acceleration, when the plotter is in Pen Up status, applies to all pen types and pen numbers.

212

Table 9.6 shows an example of values that can be set up for pen numbers and pen types.

Table 9.6 Plotting Acceleration Value Setup Example

			Setup Value for Each Pen Number								Initial Value
			1	2	3	4	5	6	7	8	
Pen Type and Maximum Plotting Acceleration (G)	Ink Pen	3.0	4	4	4	4	5	5	5	5	8 (3.0 G)
	Ceramic-tip pen	3.0	8	8	8	8	6	6	6	6	8 (3.0 G)
	Water-based ballpoint pen	3.0	8	8	6	6	4	4	4	4	8 (3.0 G)
	Oil-based ballpoint pen	3.0	8	8	8	8	8	8	8	8	8 (3.0 G)
	Pencil 0.2	3.0	2	2	4	4	5	5	6	6	8 (3.0 G)
	Pencil 0.3	3.0	4	4	4	6	6	8	8	8	8 (3.0 G)
	Pencil 0.4	3.0	8	8	8	8	8	8	8	8	8 (3.0 G)
	Pencil 0.5	3.0	8	8	8	8	8	4	4	4	8 (3.0 G)
	Pencil 0.7	3.0	8	8	8	8	8	8	8	8	8 (3.0 G)
	Pen up	3.0	8								8 (3.0 G)

☞ *See "Backup" on pages 10–20 and 10–21 for default settings.*

Plotting acceleration is determined by the following formula:

A = PA x Amax ÷ 8

where A = Actual plotting acceleration

PA = Pen Acceleration value based on type of pen and pen number (in G)

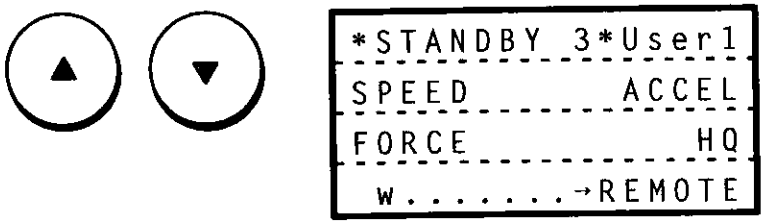
Amax = Maximum plotting acceleration value

For example, if an ink pen is pen 5, with a plotting acceleration value of 6 classified into eight stages, plotting acceleration is:

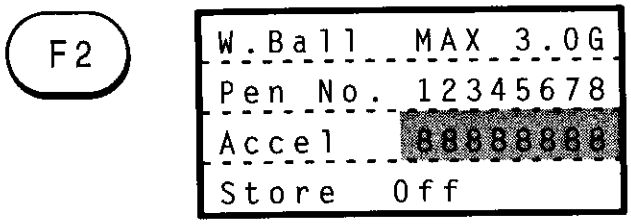
A = 5 x 3 ÷ 8

A = 1.9 G

Step 1.
Press **MENU** ▲ or **MENU** ▼ until STANDBY 3 or LOCAL 4 is displayed on the LCD.

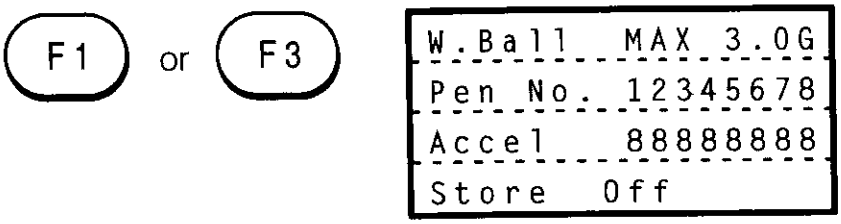


Step 2.
Press **F2** to select ACCEL. The pen type currently being identified is displayed on the LCD.



Note:
If the pen type displayed is different from the pen type you have set up, specify a different pen type and change the parameter value. To change the pen type, press **F2** or **F4** until the pen type you want is displayed.

Step 3.
Press **F1** or **F3** until the parameter you want to set up is blinking. Parameters are MAX (maximum acceleration), PEN NO., ACCEL, and STORE.



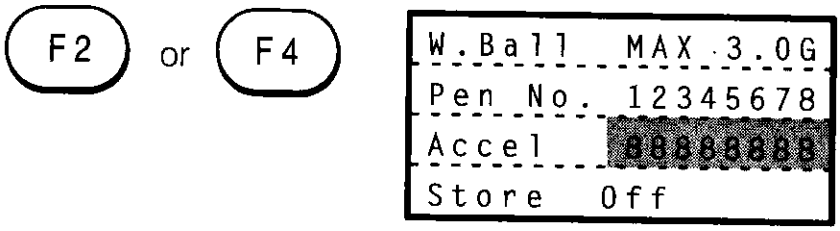
214

CAUTION!

Pen acceleration blinks first. If you want to change the Pen Type parameter, select Pen Type before you select a parameter value.

Step 4.

Press **F2** or **F4** until the setting you want is blinking.

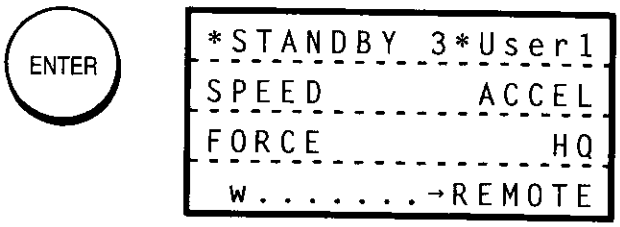


Note:

When multiple pens are blinking, you can change parameters for all blinking pens in one step.

Step 5.

Press **ENTER** to accept the setting and return the LCD to the menu.



Chapter 10

Diagnostic and Verification Parameters

The MUTOH XP-500 Series Intelligent Plotter has diagnostic and data verification parameters to check plotter functions and clear error conditions.

This chapter shows how to:

- ✗ **Clear the internal memory buffer**
- ✗ **Reset Backup parameters and create a plotted listing of the Backup parameters**
- ✗ **Display EEPROM and PROM versions**
- ✗ **Verify data sent to and from the host computer**
- ✗ **Transmit pen position to the host computer**
- ✗ **Compensate for Pen Scope Offset**
- ✗ **Create a test plot**
- ✗ **Use the diagnostic and verification parameters**

Clear
Reset
Diagnosis1
Diagnosis2
Digitize

Guidelines for Using Diagnostic and Verification Parameters

- ❒ The plotter must be turned ON.
- ❒ The plotter cover must be closed.
- ❒ Plotting media must be loaded.
- ❒ Press **ENTER** to accept the current value displayed after you select the parameter.
- ❒ Press **ENTER** when you have entered all of the information for a parameter. The LCD automatically returns to the mode menu.
- ❒ Be sure your parameter settings are appropriate for the CAD/CAM software being used. Check your software documentation or talk to the software manufacturer to verify parameter settings.

Clear

The Clear parameter is used to initialize some internal parameters and clear the internal memory buffer. The Clear parameter can be used through the Control Panel or through an online computer command from the host computer.

When you use the Clear parameter:

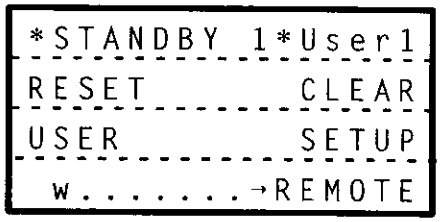
- All data stored in the plotter, EXCEPT registered replot files, is cleared. Data that is not yet plotted is also cleared
- Command errors and I/O errors are cleared
- Some parameters are initialized through an online computer command

You can Clear the plotter when it is in any mode. However, if you use the Clear parameter while the plotter is in Replot, Digitize, or Keyboard mode, the mode is canceled and the plotter returns to Local or Remote mode.

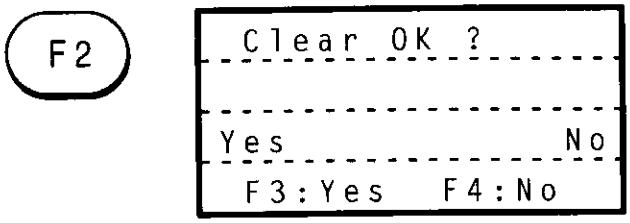
Control Panel Clear

Step 1.
Press **MENU** ▲ or **MENU** ▼ until the current mode is displayed on the LCD. The display shows the name of the current mode and the number 1.

For example, if the plotter is in Remote mode, the display will be REMOTE 1; if the plotter is in Standby mode, the display will be STANDBY 1.

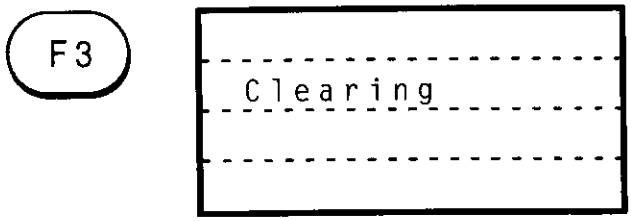


Step 2.
Press **F2** to select CLEAR.

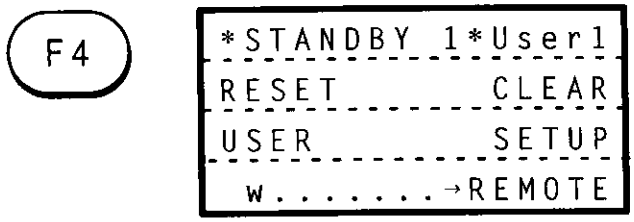


Step 3.
Determine whether to continue.

❒ Press **F3** to select YES. As the plotter buffer is cleared, CLEARING is displayed on the LCD. When clearing is complete, the LCD returns to the menu.



❒ Press **F4** to select NO. The plotter buffer is not cleared, and the LCD returns to the menu.



Command Code Clear

If the host computer command mode is MH-GL, the Clear parameter can be used through online computer commands:

- Clears all data in the plotter except registered replot files. Data that is not yet plotted is also cleared (equivalent to the ESC.K command)
- Initializes some parameters and sets up initial values (equivalent to the DF [Default] command)

Reset

The Reset parameter is used to initialize the plotter through the Control Panel or through an online computer command from the host computer.

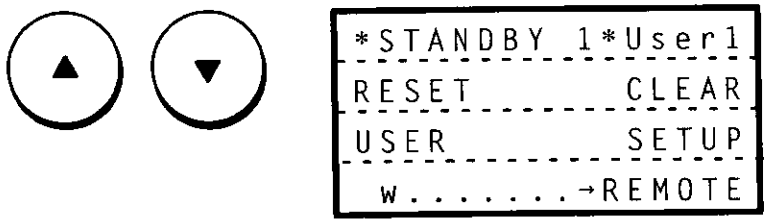
When you use the Reset parameter:

- Backup parameters are re-initialized
- All data stored in the plotter, EXCEPT registered replot files, is cleared. Data that is not yet plotted is also cleared
- Command errors and I/O errors are cleared

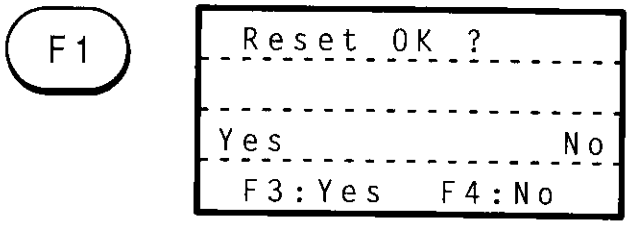
You can reset the plotter when it is in any mode. However, if you reset while the plotter is in Replot, Digitize, or Keyboard mode, the mode is canceled and the plotter returns to Local or Remote mode.

Control Panel Reset

Step 1.
Press **MENU ▲** or **MENU ▼** until the current mode is displayed on the LCD. The display will be the name of the current mode and the number 1. For example, if the plotter is in Remote mode, the display will be REMOTE 1; if the plotter is in Standby mode, the display will be STANDBY 1.

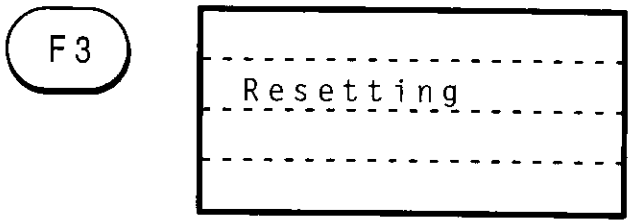


Step 2.
Press **F1** to select RESET.

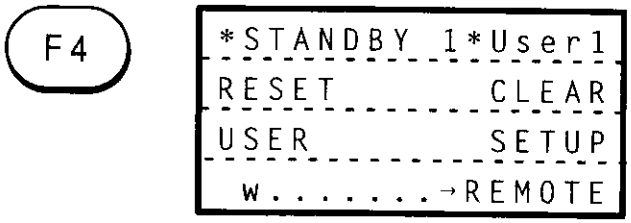


Step 3.
Determine whether to continue.

❒ Press **F3** to select YES. As the plotter is reset, RESETTING is displayed on the LCD. When resetting is complete, the LCD returns to the menu.



❒ Press **F4** to select NO. The plotter is not reset, and the LCD returns to the menu.



Command Code Reset

If the host computer command mode is MH–GL, the Reset parameter can be used through online computer commands:

- Initializes setup values (equivalent to the IN command)
- Clears all data in the plotter except registered replot files. Analyzed data that is not yet plotted is also cleared (equivalent to the ESC.K command)

Diagnosis1 (DIAG1)

The DIAG1 parameter is used to:

- Initialize the Backup parameters (EEPROM)
- Display the Backup parameter version and program ROM (PROM) version

EEPROM is displayed as a hexadecimal value; PROM is displayed as a 1-digit integer and 2-digit fraction.

Initialize Backup Parameters (EEPROM)

Figure 10.1 shows the Backup parameter LCD flow.

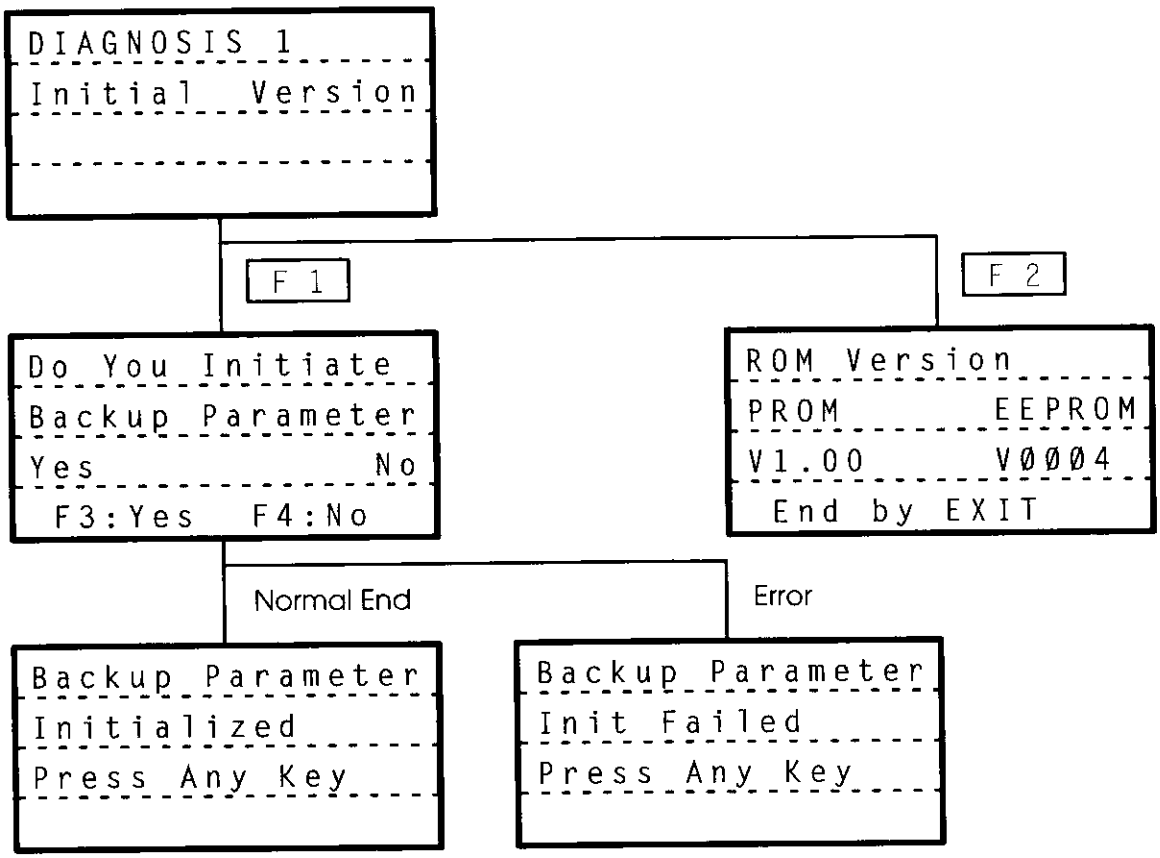
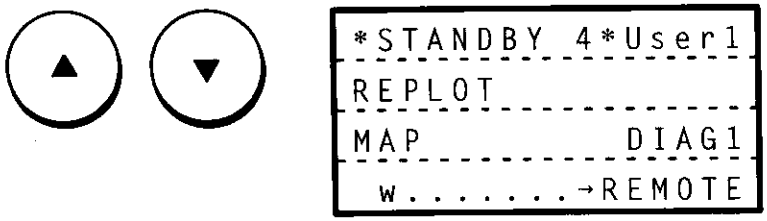


Figure 10.1 Backup Parameter LCD Flow

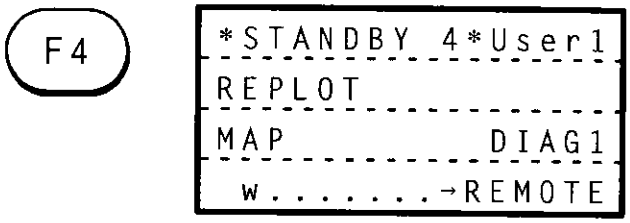
Step 1.

Press **MENU ▲** or **MENU ▼** until STANDBY 4 is displayed on the LCD.

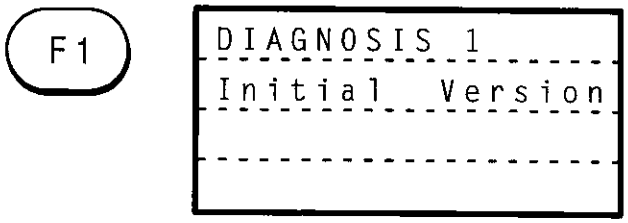


276

Step 2.
Press **F4** to select DIAG1.

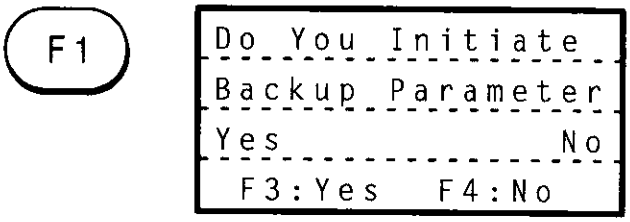


Step 3.
Press **F1** to select INITIAL (Initialization).

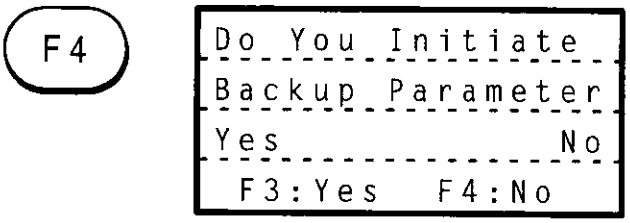


Step 4.
Select whether to initialize the Backup parameters.

❒ Press **F1** to select YES.



❒ Press **F4** to select NO.



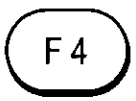
Step 5.
A message is displayed telling you whether the initialization was successful or failed. Press any key to return to Standby mode and continue plotting.

Display PROM

Step 1.
Press **MENU ▲** or **MENU ▼** until STANDBY 4 is displayed on the LCD.

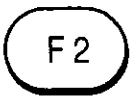
```
*STANDBY 4*User1
REPLOT
MAP          DIAG1
 w.......→REMOTE
```

Step 2.
Press **F4** to select DIAG1.




```
*STANDBY 4*User1
REPLOT
MAP          DIAG1
 w.......→REMOTE
```

Step 3.
Press **F2** to select VERSION and display the PROM and EEPROM versions.

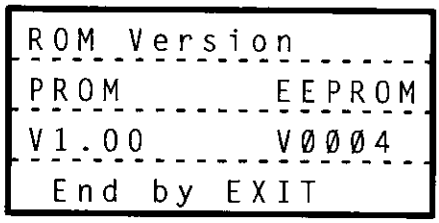



```
DIAGNOSIS 1
Initial  Version
```


278

Step 4.

Verify the information displayed. PROM version is displayed in the LCD as a 1-digit integer. EEPROM version is displayed as a hexadecimal value. Press **EXIT** to return to the menu.



Diagnosis2 (DIAG2)

The Diagnosis2 (DIAG2) parameter is used to confirm that the data is transferred from the host computer to the plotter accurately, create a test plot to confirm that the plotter is operating normally, check Backup parameter settings (EEPROM), and compensate for pen scope offset.

Use the Diagnosis2 parameter to:

- Diagnose the online data or data in the buffer
- Plot a test pattern
- Plot Backup parameters
- Set the pen scope offset compensation

Dump Diagnosis

Dump diagnosis checks to determine if data is transferred accurately from the host computer. There are two dump functions:

- Online dump contains both data and commands
- Buffer dump contains commands only

Online Dump

Data received and data to be sent are plotted as blocks of characters. When plotting an online dump, the plotter divides the media into frames and plots in each frame. The plotting is done across the frame and the frames are plotted in sequence (1 to 4; see Figure 10.2).

Note:
Commands such as GP-IB Clear are not cleared.

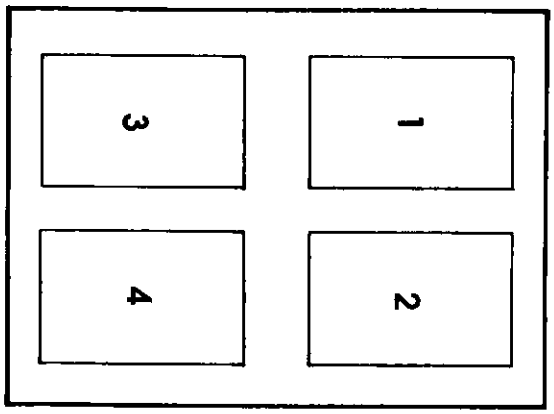


Figure 10.2 Plotting Frames

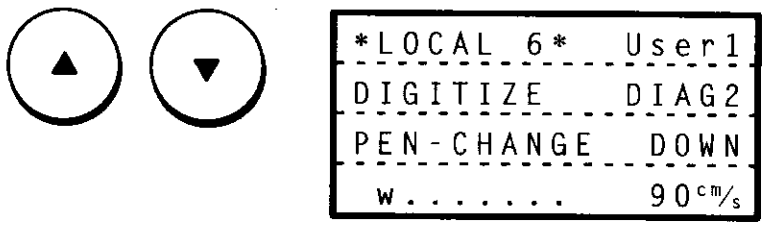
Buffer Dump

The buffer dump plots consecutive commands that are entered into the input buffer. Responses are not plotted.

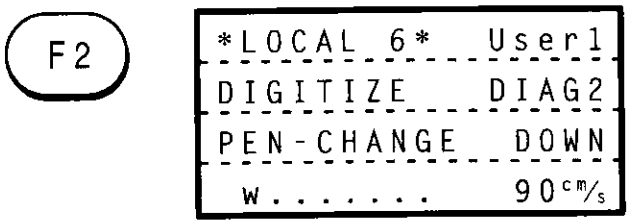
When plotting a buffer dump, the plotter divides the media into frames and plots in each frame. The plotting is done across the frame and the frames are plotted in sequence (1 to 4; see Figure 10.2). Plotting can continue if more media is loaded.

Step 1.

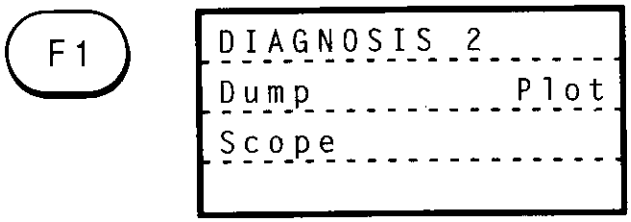
Press **MENU** ▼ or **MENU** ▲ until LOCAL 6 is displayed on the LCD.



Step 2.
Press **F2** to select DIAG2.

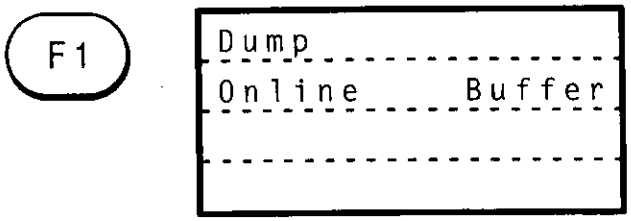


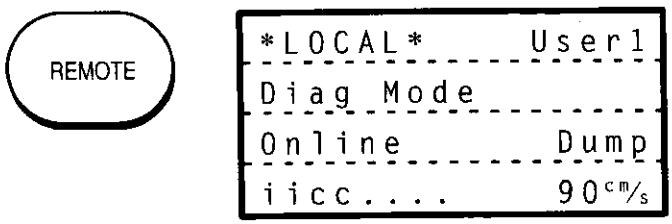
Step 3.
Press **F1** to select DUMP.



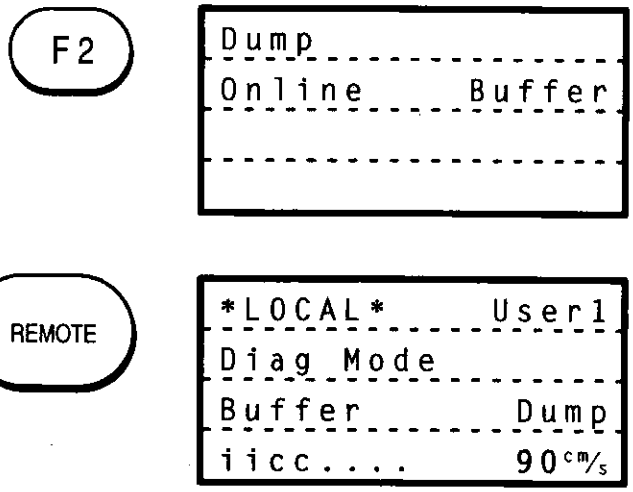
Step 4.
Select the type of test plot you want.

❒ Press **F1** to select ONLINE, then press **REMOTE** to begin plotting.





❒ Press **F2** to select BUFFER, then press **REMOTE** to begin plotting.



Test Pattern Plotting

Test pattern plotting is used to test and confirm the current line quality of the plotter:

- Pen type is identified by the Pen ID Mark or the Pen Map parameter
- Plotting acceleration is displayed in units of 0.1 G
- Plotting time (in seconds) is displayed, calculated from when the plotter draws the first mark to when the first mark is redrawn

Note:
The test pattern is always the same size, regardless of the media size. Use A3 media or larger.

Figure 10.3 shows a sample test pattern plot.

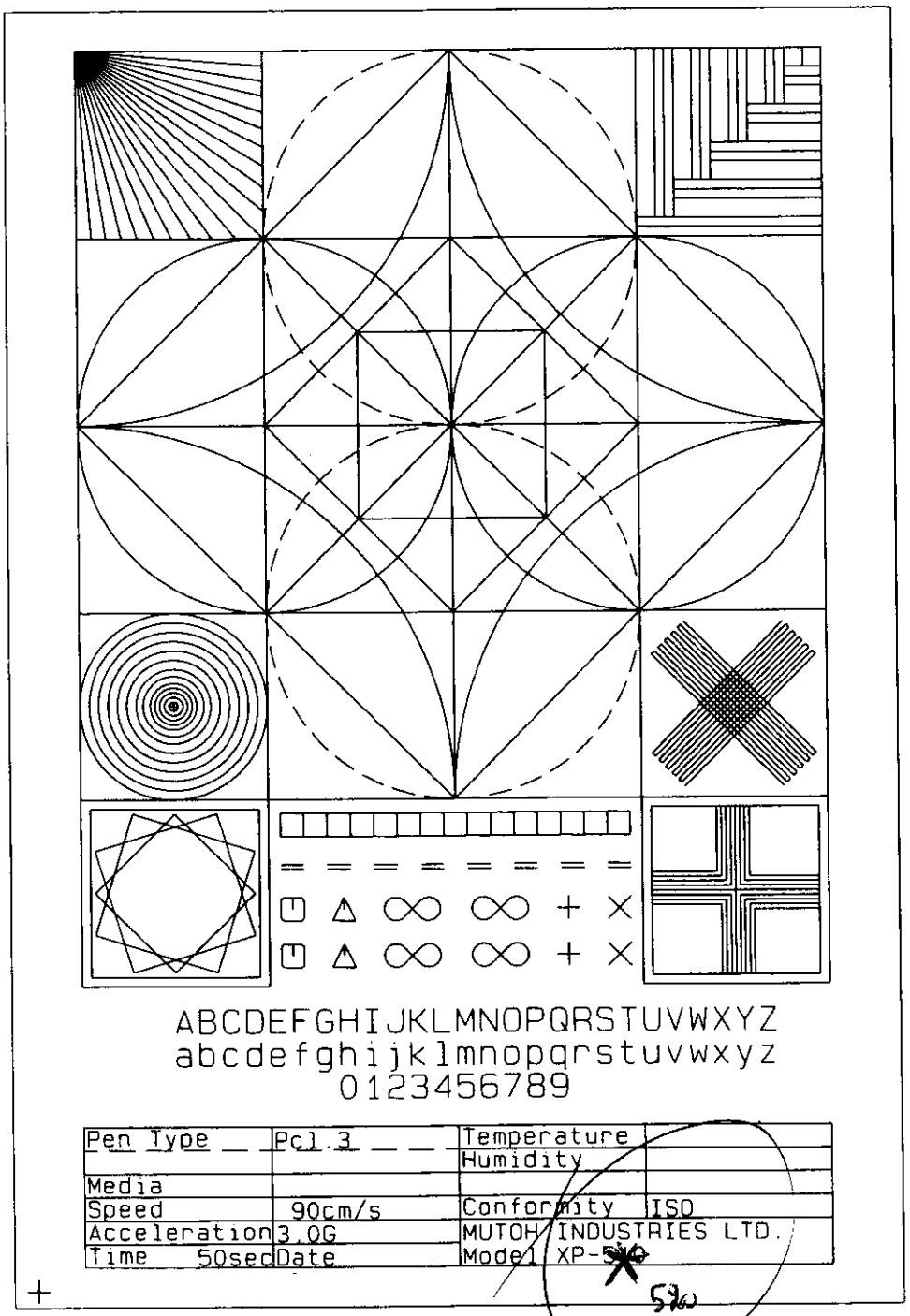
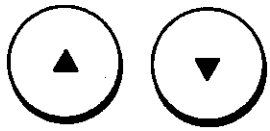


Figure 10.3 Sample Test Pattern Plot

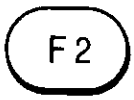
234

Step 1.
Press **MENU ▼** or **MENU ▲** until LOCAL 6 is displayed on the LCD.



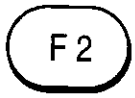
```
*LOCAL 6*   User1
DIGITIZE    DIAG2
PEN-CHANGE  DOWN
 w.....     90cm/s
```

Step 2.
Press **F2** to select DIAG2.



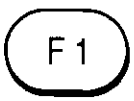

```
*LOCAL 6*   User1
DIGITIZE    DIAG2
PEN-CHANGE  DOWN
 w.....     90cm/s
```

Step 3.
Press **F2** to select PLOT.



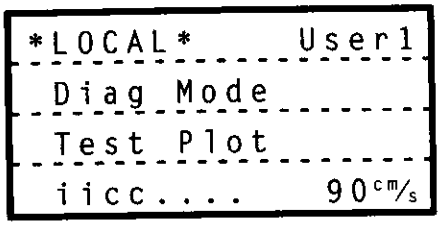

```
DIAGNOSIS 2
Dump        Plot
Scope
```

Step 4.
Press **F1** to select TEST PLOTTING. The LCD displays plotting speed and plot type.




```
Plot
Test        Backup
```

Step 5.
Press **REMOTE** to start drawing the test plot.



Backup Parameter and Initial Value Plotting

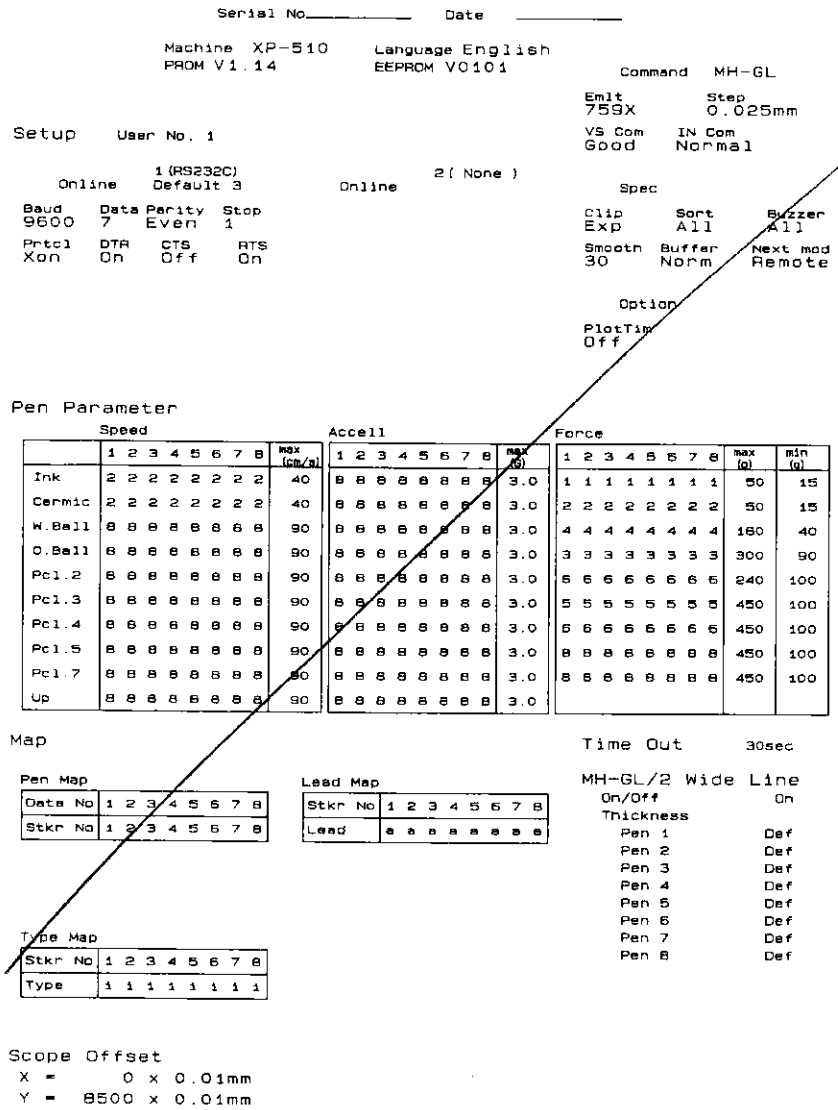
You can plot settings for parameters that are set up and maintained by the plotter, even when the power switch is turned OFF. These settings are stored in EEPROM.

The Backup parameter plot includes:

- Plotter name
- LCD language
- ROM version (both PROM and EEPROM)
- Setup parameters (Online, Command, and Environment)
- Interface status
- Pen parameters (Speed, Acceleration, and Pen Pressure)
- Pen map and pen type map (if Pen ID Mark switch is OFF)
- Pen Scope Offset

Note:
Backup parameter plotting is set up for A3-size media. If you use another size media, the size of the plot is changed accordingly.

Figure 10.4 shows an example of a Backup parameter plot.



Serial No_____ Date _____

Machine XP-510 Language English
PROM V1.14 EEPROM V0101

Command MH-GL

Emlt 759X | Step 0.025mm
VS Com Good | IN Com Normal

Setup User No. 1

1 (RS232C) Online | Default 3
Baud 9600 | Data 7 | Parity Even | Stop 1
Prtcl Xon | DTR On | CTS Off | RTS On

2(None) Online

Spec
Clip Exp | Sort All | Buzzer All
Smooth 30 | Buffer Norm | Next mod Remote

Option
PlotTim Off

Pen Parameter

	Speed 1 2 3 4 5 6 7 8	max (cm/s)	Accell 1 2 3 4 5 6 7 8	max (G)	Force 1 2 3 4 5 6 7 8	max (g)	min (g)
Ink	2 2 2 2 2 2 2 2	40	8 8 8 8 8 8 8 8	3.0	1 1 1 1 1 1 1 1	50	15
Cermic	2 2 2 2 2 2 2 2	40	8 8 8 8 8 8 8 8	3.0	2 2 2 2 2 2 2 2	50	15
W.Ball	8 8 8 8 8 8 8 8	90	8 8 8 8 8 8 8 8	3.0	4 4 4 4 4 4 4 4	160	40
O.Ball	8 8 8 8 8 8 8 8	90	8 8 8 8 8 8 8 8	3.0	3 3 3 3 3 3 3 3	300	90
Pcl.2	8 8 8 8 8 8 8 8	90	8 8 8 8 8 8 8 8	3.0	6 6 6 6 6 6 6 6	240	100
Pcl.3	8 8 8 8 8 8 8 8	90	8 8 8 8 8 8 8 8	3.0	5 5 5 5 5 5 5 5	450	100
Pcl.4	8 8 8 8 8 8 8 8	90	8 8 8 8 8 8 8 8	3.0	6 6 6 6 6 6 6 6	450	100
Pcl.5	8 8 8 8 8 8 8 8	90	8 8 8 8 8 8 8 8	3.0	8 8 8 8 8 8 8 8	450	100
Pcl.7	8 8 8 8 8 8 8 8	90	8 8 8 8 8 8 8 8	3.0	8 8 8 8 8 8 8 8	450	100
Up	8 8 8 8 8 8 8 8	90	8 8 8 8 8 8 8 8	3.0			

Map

Pen Map

Data No	1	2	3	4	5	6	7	8
Stkr No	1	2	3	4	5	6	7	8

Lead Map

Stkr No	1	2	3	4	5	6	7	8
Lead	a	a	a	a	a	a	a	a

Type Map

Stkr No	1	2	3	4	5	6	7	8
Type	1	1	1	1	1	1	1	1

Time Out 30sec

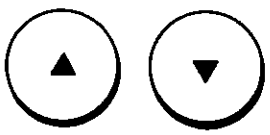
MH-GL/2 Wide Line
On/Off On
Thickness
Pen 1 Def
Pen 2 Def
Pen 3 Def
Pen 4 Def
Pen 5 Def
Pen 6 Def
Pen 7 Def
Pen 8 Def

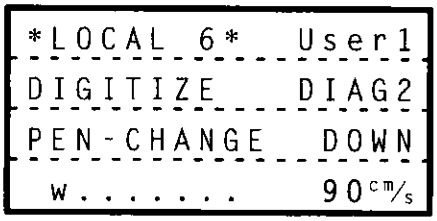
Scope Offset
X = 0 x 0.01mm
Y = 8500 x 0.01mm

Figure 10.4 Backup Parameter Plot

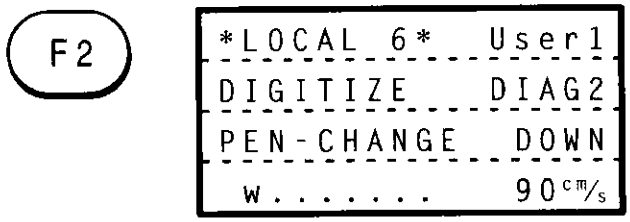
Step 1.

Press **MENU ▼** or **MENU ▲** until LOCAL 6 is displayed on the LCD.

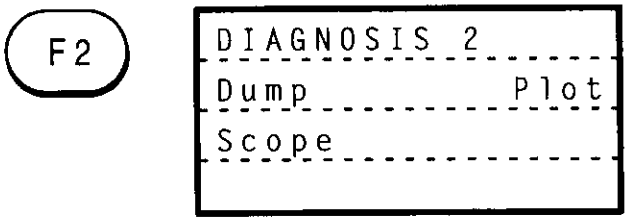




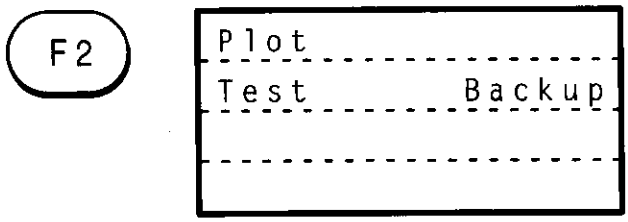
Step 2.
Press **F2** to select DIAG2.



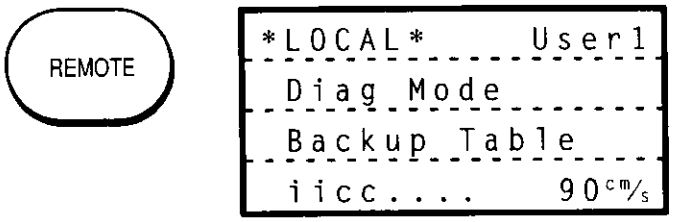
Step 3.
Press **F2** to select PLOT.



Step 4.
Press **F2** to select BACKUP. Check the LCD, which displays plotting speed and plot type.



Step 5.
Press **REMOTE**. The plotter switches to Remote mode and starts drawing the plot.



238

Pen Scope Offset Compensation

The Pen Scope Offset function compensates for the distance between the pen scope and the pen point. It is important to compensate for this distance because P1 and P2 reference points are set by the pen scope position. If the internal pen coordinates of the plotter do not match the calculated scope position, the difference must be compensated (see Figure 10.5).

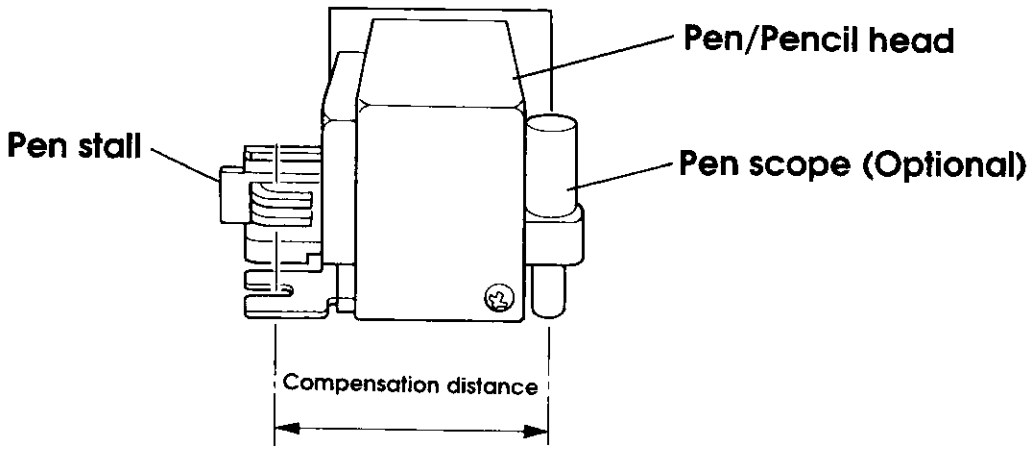
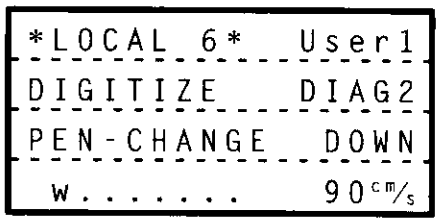
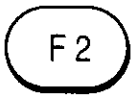


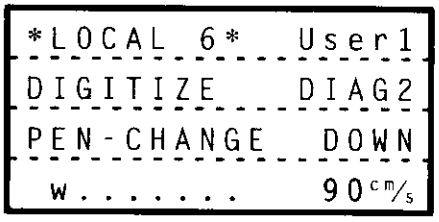
Figure 10.5 Compensation Distance

Step 1.
Press **MENU ▼** or **MENU ▲** until LOCAL 6 is displayed on the LCD.

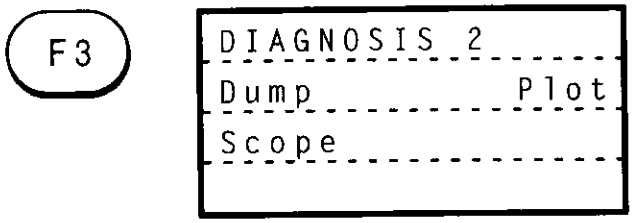


Step 2.
Press **F2** to select DIAG2.

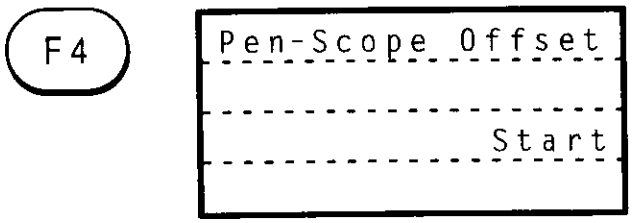




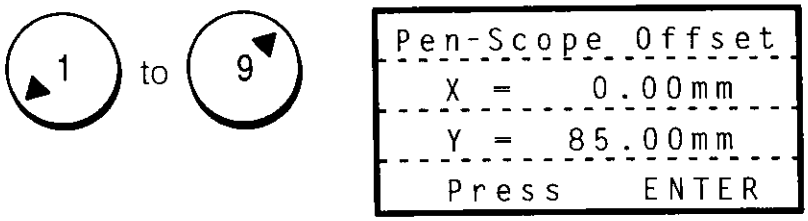
Step 3.
Press **F3** to select SCOPE.



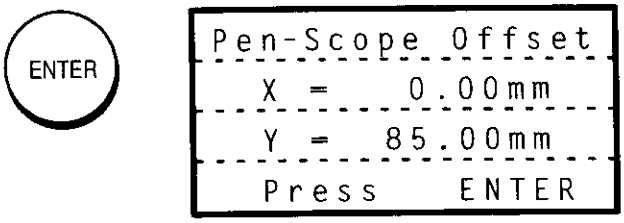
Step 4.
Press **F4** to select START. The plotter draws a cross mark.



Step 5.
Use the **JOG** keys to move the scope so that the center of the scope is on the cross mark. The display shows the current position.

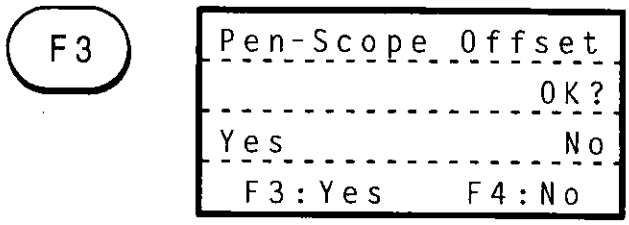


Step 6.
Press **ENTER**.

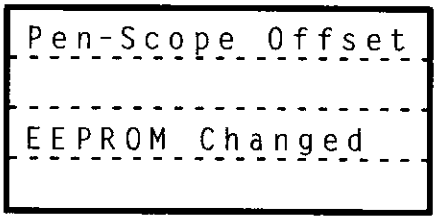


Step 7.
Accept or cancel the offset value.

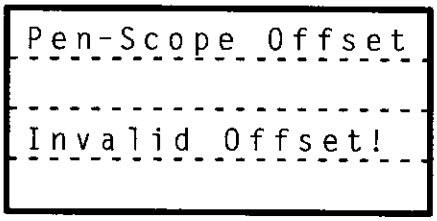
❒ Press **F3** to select YES and accept the offset.



If the offset is within the allowable range, EEPROM CHANGED is displayed on the LCD.



If the offset point is outside the allowable range, INVALID OFFSET is displayed on the LCD.



❒ Press **F4** to select NO and cancel the offset.

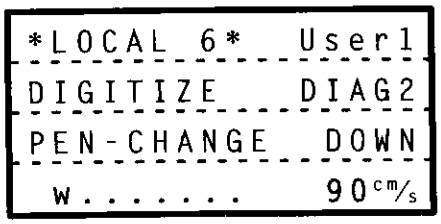
Digitize

The Digitize parameter is used to digitize the pen position displayed on the LCD and send that information to the host computer. When you use the Digitize parameter, the plotter goes to the Digitize mode. As soon as the coordinates are read and transmitted, you should exit Digitize mode.

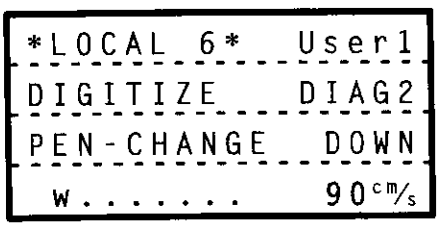
You can use the Digitize parameter while you are plotting.

Note:
If you are in MH-GL mode, the plotter reads the coordinates, but does not transfer them to the host computer. You must move the pen scope to the current position using the **JOG** keys.

Step 1.
Press **MENU** ▼ or **MENU** ▲ until LOCAL 6 is displayed on the LCD.



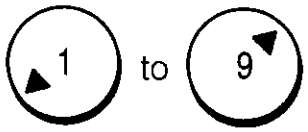
Step 2.
Press **F1** to select DIGITIZE.

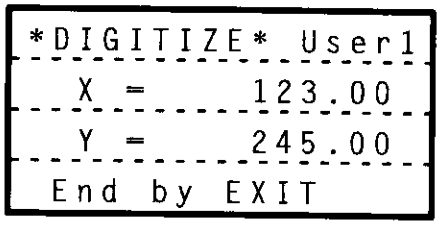


242

Step 3.

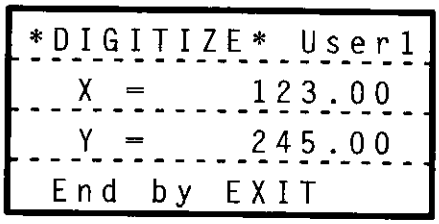
Use the **JOG** keys to enter pen position coordinates.





Step 4.

After the coordinates are read, press **EXIT** to cancel Digitize mode.



Chapter 11

Plotter Maintenance and Troubleshooting

Proper care of your plotter includes keeping it clean, doing regular maintenance, and troubleshooting in case of problems.

This chapter shows how to:

- ✗ **Clean those parts of the plotter that require regular cleaning**
- ✗ **Do regular maintenance to prevent problems**
- ✗ **Check out problems that may occur**

Cleaning and Daily Maintenance

Your plotter, pens, and pencils will work better and last longer if you keep them clean and perform some simple daily maintenance tasks.

Figure 11.1 shows the parts of the plotter that you can clean.

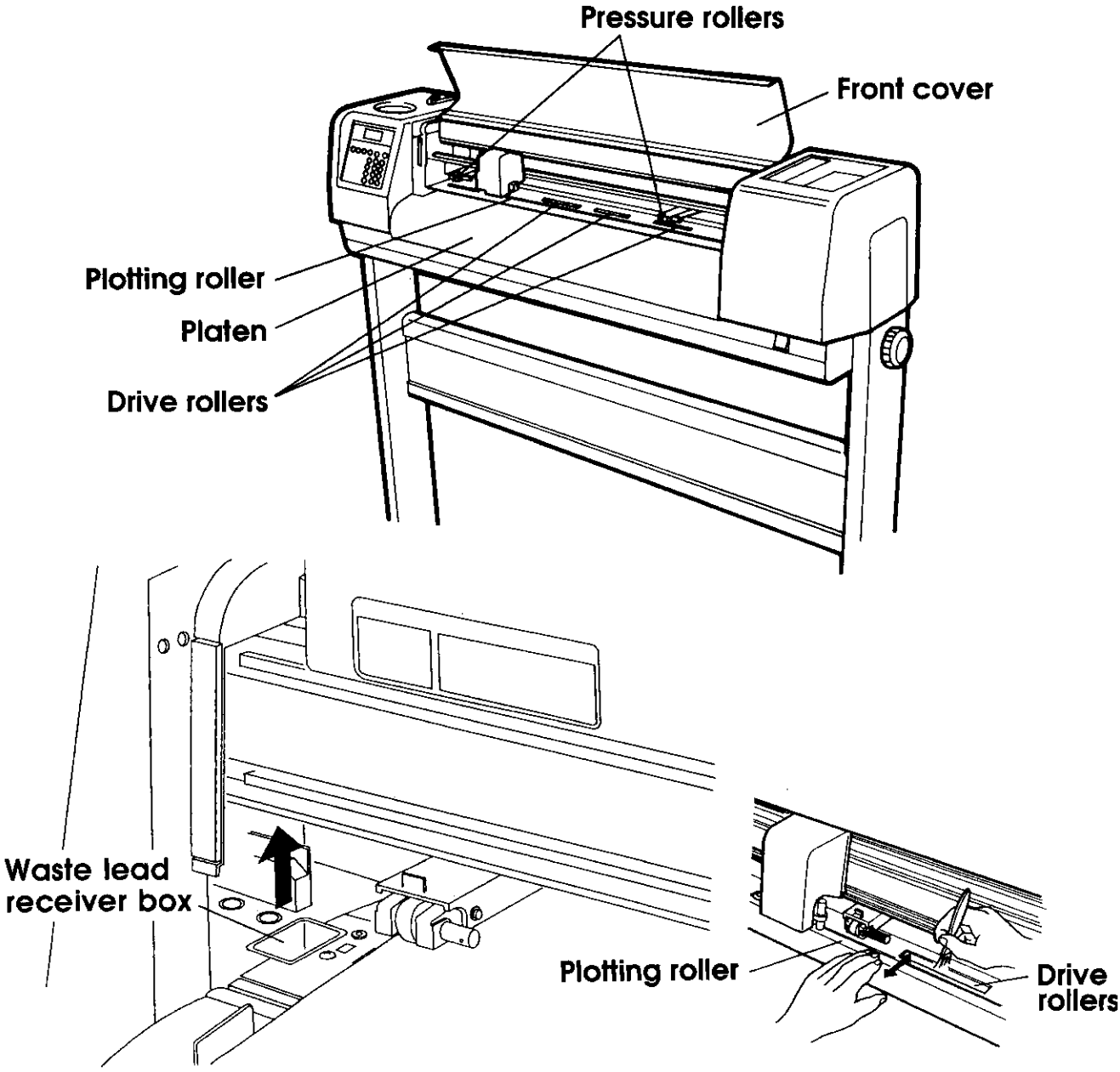


Figure 11.1 Plotter Parts Requiring Cleaning

Cleaning the Plotter

- Use a soft cloth to clean paper dust and particles off all rollers, and to clean dust off the plotter cover.
- Use one of the cotton swabs to clean the sensor.
- Use the brush to clean the drive roller.
  Rotate the drive roller by hand to be sure that it is cleaned thoroughly.

Note:
Check the inside of the waste lead receiver box for accumulated waste leads. The waste lead receiver box should be cleaned out regularly.

Cleaning the Pens

Pens should not be left in the stocker for long periods of time. At the end of a plotting session, remove pens from the stocker. Cap the pens as shown in Figure 11.2. Store the pens in a clean area where they are protected from damage.

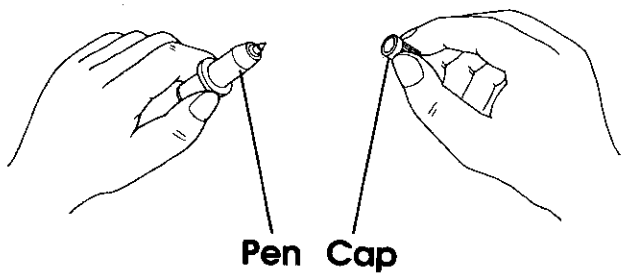


Figure 11.2 Capping Pens When Not in Use

Step 1.
Clean the Pen ID Mark before loading the pen into the stocker. If the Pen ID Mark is dirty, the plotter may be unable to identify the pen correctly.

Step 2.
After storing a pen, perform a test plot before using it for plotting.

CAUTION!
Do not use a pen with a dried-out tip. It may tear the media and damage the plotting roller.

Cleaning the Pencils

The pencil parts are shown in Figure 11.3.

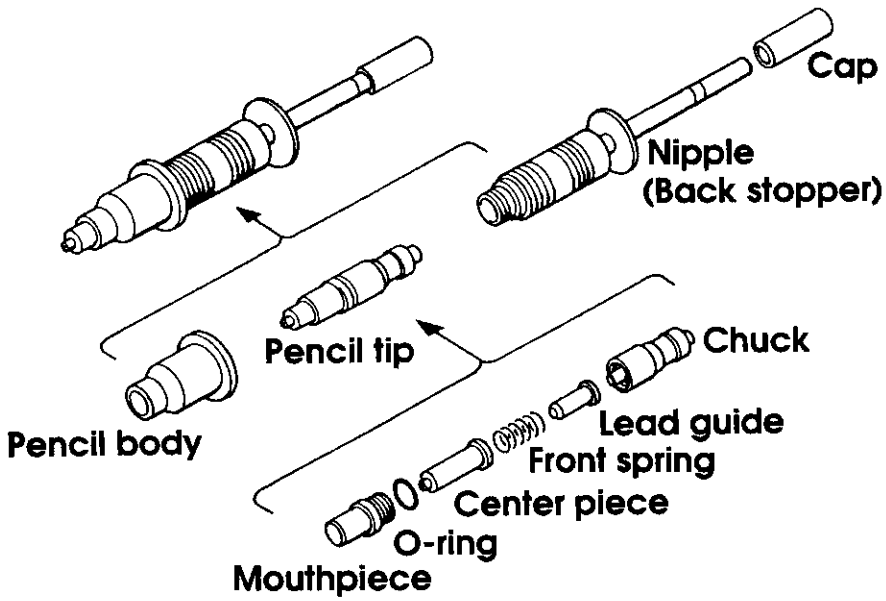


Figure 11.3 Pencil Parts

Note:
Pencil tips can wear out. When slipping begins to occur with a pencil tip, replace it with a new one.

Replacing Pencil Lead

The pencil lead can be replaced with a new one as follows:

Step 1.
Gently press the pencil tip a few times to extend the used lead as much as possible (see Figure 11.4).

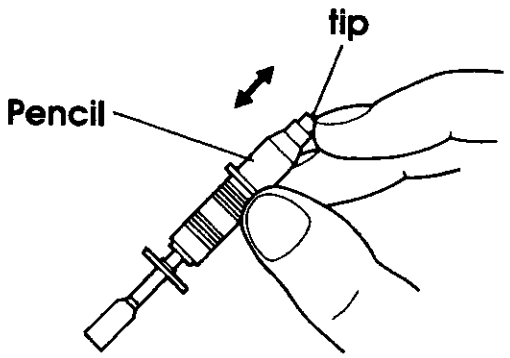


Figure 11.4 Extending a Used Lead

Step 2.
Grasp the end of the pencil lead. Gently pull the lead straight out through the pencil tip.

Note:
If the used lead is too short to be removed, install a new lead into the pencil. The new lead will push the used lead out of the pencil.

Disassembling Pencils

If a lead gets stuck in the pencil, it may be removed by disassembling the pencil (see Figure 11.5).

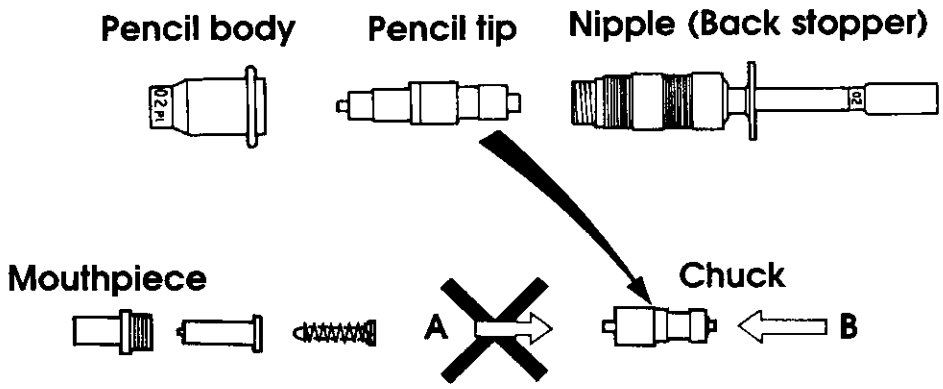


Figure 11.5 Pencil Components

Step 1.
Twist the pencil tip counter-clockwise. Then remove the pencil tip.

Step 2.
If necessary, disassemble the pencil tip by unthreading the nipple. Keep all parts in order to reassemble correctly.

Step 3.
Carefully push out the lead that is stuck by inserting a new lead along direction B, as shown in Figure 11.5.

CAUTION!
Do not attempt to remove lead by pushing in Direction A (Figure 11.5). This could damage pencil parts.

Step 4.
Reassemble the pencil.

250

CAUTION!

Disassemble only one pencil at a time. Do not interchange parts among pencils.

Cleaning Pen and Pencil ID Marks

Clean the mark, when necessary, by wiping with a soft cloth. If the mark is extremely soiled, wipe it gently with alcohol.

Note:

If the mark begins to peel or is otherwise damaged, that pen or pencil should not be used in the plotter.

Troubleshooting

This section identifies problems that may occur during day-to-day use of your plotter and tells you how to determine the cause of the problem.

If you encounter problems not identified in this section, contact your MUTOH service representative.

Power switch is turned ON but the plotter does not operate.

- ❒ Is the plotter cover closed?
- ❒ Is the power cable connected properly?
- ❒ Is the plotter connected to a power source with the specified voltage?

Media is loaded, but the plotter does not operate.

- ❒ Is the plotter cover closed?
- ❒ Is the hold lever lowered?
- ❒ Is the media loaded properly?
- ❒ Is there dust on the paper sensor?

Data is sent from the computer, but the plotter does not operate.

- ❒ Is the interface cable connected properly?
- ❒ Is the plotter in Remote mode?

An error occurred when data was sent from the computer and the plotter does not operate.

- ❒ Is the correct plotter type specified on the host computer?
- ❒ Do the interface conditions set on the host computer match those set on the plotter?
- ❒ Does the command mode set on the host computer match the command mode set on the plotter?

Some parts of the drawing cannot be plotted.

- ❒ Is the pressure roller in the proper position for the media size?
- ❒ Is there dust on the sensor?
- ❒ Is the media bent or curled?

Plotting lines go off the edges of the media.

- ❒ Is the pressure roller lined up with the drive roller?
- ❒ Are paper particles stuck to the drive roller?
- ❒ Are the temperature and humidity levels too high or too low for the plotter?
- ❒ Is the plotting media shrinking or stretching? Before using the media, expose it to the air in the same room with the plotter for 30 minutes.
- ❒ Are there tears, folds, perforations, or tape on the edge of the plotting media?

☞ *See "Error Messages" in the Appendix for details about messages displayed on the LCD.*

Plotting media slips or tears during plotting

- ❒ Is the pen tip too dry?
- ❒ Is the pencil tip worn?
- ❒ Is the pressure roller adjusted to the same height on both pressure arms?
- ❒ Is the pressure roller set to the appropriate height for the thickness of the media?

The pencil does not feed itself smoothly.

- ❒ Are the leads clogged inside the pencil?
- ❒ Are the leads having the same diameter as indicated on the pencil holder put into the pencil?
- ❒ Is there any difference between the pencil type displayed on the LCD and the one currently being used?

Chapter 12

Error Messages

Errors may occur during day-to-day operation of the plotter. Error types are classified as recoverable and nonrecoverable.

This chapter shows how to:

- ✗ **Identify types of errors**
- ✗ **Identify the cause of an error**
- ✗ **Correct error conditions**

Recoverable Errors

A recoverable error is an error that does not automatically shut off the plotter. You can correct the error and continue with the plot.

When a recoverable error occurs, a message is displayed on the LCD. An alphanumeric error code appears in the rightmost positions of the message.

Note:
The format of the error code is XNN, with *X* as the error type code, and *nn* as the error number.

Error type codes are:

S Operation error

I Online computer error

E Data error

Operation Errors

When an operation error occurs, plotting may stop or it may continue.

- If plotting stops, check the LCD to find the error code and number, and correct the error condition to restart the plotting.

CAUTION!
If plotting stops and you correct the error, when you restart and continue plotting, you may not get the results you want or expect.

Table 12.1 lists operation errors, possible causes, and how to correct them.

Table 12.1 Operation Errors

Error Message	Possible Cause	Suggested Action
PAPER DETECT ERROR (S05)	The sensors cannot detect media width.	There may be too much or too little light, incorrect pressure roller position, or media that is 5,000 mm or longer. Be sure you have the right media size and load media again.
PENCIL END 0.2a (S10)	The pencil lead ran out while a pencil was in use. The plotter cannot use that pencil group until the pencil has lead.	Replace lead and reinstall the stocker. Restart the plotter.
NONE STOCKER (S11)	There is no stocker installed.	Install the stocker.
STOCKER DETECT ERROR (S12)	An installation error was detected.	Remove the stocker and reinstall it. If the error occurs again when the stocker is correctly installed, contact your MUTOH service representative.

Table 12.1 Operation Errors (cont'd)

Error Message	Possible Cause	Suggested Action
STOCKER FULL (S15)	The plotter cannot return a pen to the stocker because all stalls are full. The plotter will continue plotting without changing the pen.	Install an empty stocker and press 0 to return the pen to the stocker. Resume plotting.
LEAD SENSOR ERROR (S17)	The pencil lead cannot be detected because of interference from an outside light source.	Plotting will continue after the plotter replaces the pencil with another one of the same type from the stocker. However, the same error will occur when the disturbance light prevents the plotter from identifying the pencil type. Please reinstall the stocker so that the plotter is not exposed to intense light.

Online Errors

Online errors are caused by a problem in communication between the plotter and the host computer. Online errors are classified as:

- Errors related to communications conditions
- Errors due to a defective handshake (connection between the host computer and the plotter)
- Command format errors in the ESCAPE sequence

Note:
Most ESCAPE sequence errors occur when the host computer is in MH–GL command mode. When the host computer is in MH–GL mode, the number for an online error is the same as the output value of the ESC.E command and the number for a data error is the same as the output value of the OE command. If an ESCAPE sequence error occurs, the command code is displayed in brackets ([ ]).

Table 12.2 lists online errors.

Table 12.2 Online Errors

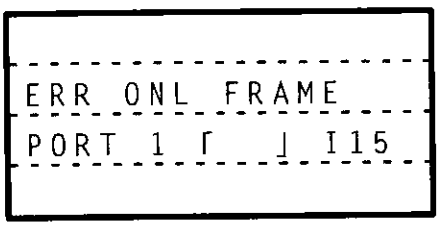
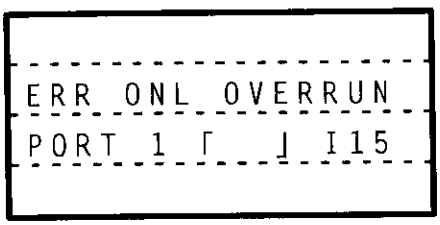
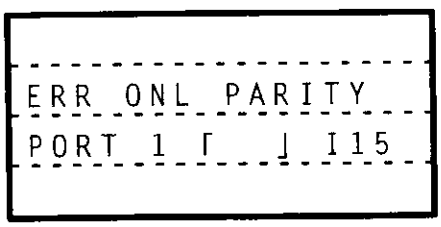
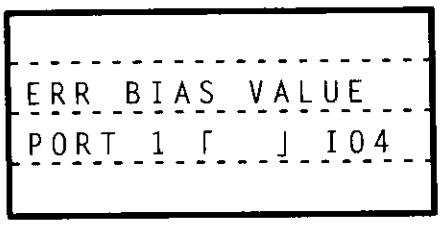
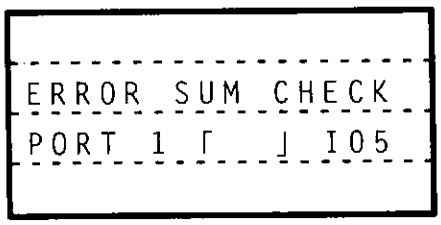
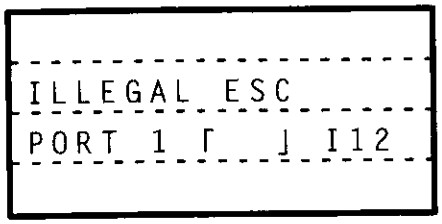
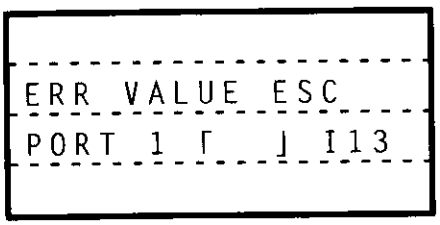
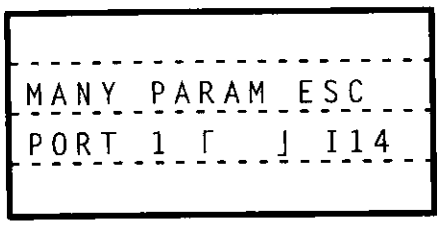
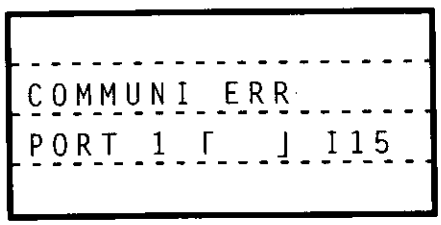
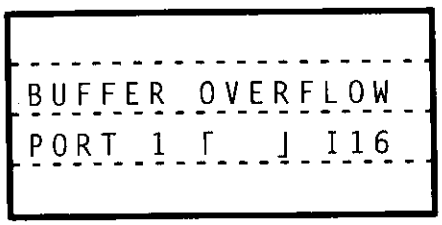
Error Message	Possible Cause	Suggested Action
	A framing error occurred in an RS-232C port.	Check the communications setup. If the same error occurs when setup is correct, contact your MUTOH service representative.
	An overrun error occurred in an RS-232C port.	
	A parity error occurred in an RS-232C port.	
	The bias value is less than the EOB code.	
	When sum check is used, the sum value transferred from the host computer is different from the value calculated by the plotter.	

Table 12.2 Online Errors (cont'd)

Error Message	Possible Cause	Suggested Action
ERR DATA BLOCK PORT 1 [ ] I06	Data put between the bias and the EOB code is more than 3 Kbyte.	Check the communications setup. If the same error occurs when setup is correct, contact your MUTOH service representative.
FEW PARAM ESC PORT 1 [ ] I07	There are not enough ESCAPE parameters. While an ESCAPE command is being analyzed, the EOB code is received.	
COMMUNI BUSY PORT 1 [ ] I10	When the host computer requests the plotter to transmit a status by using an MH-GL command or ESCAPE sequence, the host computer requests another status before receiving the status.	Change the program of the host computer to prevent the plotter from returning double data to the host computer.
UNDEFINED ESC PORT 1 [ ] I11	The ESCAPE sequence command is undefined.	Check the ESCAPE command setup using the Setup parameter. If the same error occurs when setup is correct, contact your MUTOH service representative.

Table 12.2 Online Errors (cont'd)

Error Message	Possible Cause	Suggested Action
	An illegal character was used for the ESCAPE sequence parameter in MH-GL command.	Check the ESCAPE command setup using the Setup parameter. If the same error occurs when setup is correct, contact your MUTOH service representative.
	An illegal character is included in an ESCAPE sequence parameter.	
	Too many ESCAPE sequence parameters in MH-GL command.	
	Communication error occurred.	Reset the plotter and then restart the plotter.
	The buffer for PORT 1 has overflowed.	

Data Errors

Data errors occur when command data entered from the host computer does not match the data format of the command mode currently set up using the Setup parameter.

A data error may result if:

- The type of command sent from the host computer is different from the type of setup command for the plotter
- The command data sent from the host computer includes a syntax error

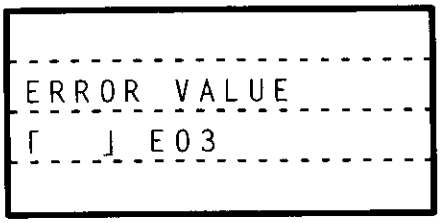
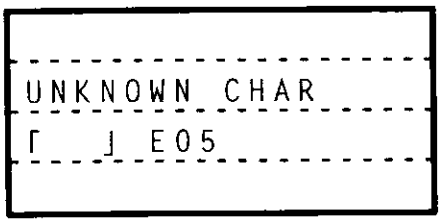
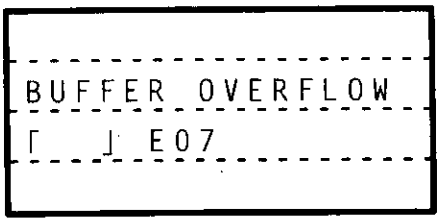
When a data error occurs, the error command is displayed in brackets ([ ]) on the LCD. Because a data error may happen at the same time as an online error, communication conditions must also be checked.

Table 12.3 lists data errors for command modes.

Table 12.3 Command Mode Data Errors

Error Message	Possible Cause	Suggested Action
UNDEFINED [ ] E01	A command in MH-GL is undefined.	Confirm the type of command data being transmitted from the host computer, and then set the backup parameter to match. If the same error occurs, check to see if there was a syntax error in the command data transmitted from the host computer.
ERROR PARAMETER [ ] E02	There is an incorrect number of parameters.	

Table 12.3 Command Mode Data Errors (cont'd)

Error Message	Possible Cause	Suggested Action
	Parameter is out of the range allowed.	Confirm the type of command data being transmitted from the host computer, and then set the backup parameter to match. If the same error occurs, check to see if there was a syntax error in the command data transmitted from the host computer.
	A character set in MH–GL is undefined.	
	The polygon buffer and download character buffer have overflowed.	
	Data format error.	

Nonrecoverable Errors

A nonrecoverable error occurs when the plotter encounters a fatal problem during CPU or pen drive operations. If a nonrecoverable error happens:

- Plotter power is automatically turned OFF
- The LCD displays a message indicating the type of error
- All indicator lights except POWER blink
- The buzzer sounds intermittently

To continue plotting, you must correct the error and restart the plotter.

Table 12.4 lists nonrecoverable error messages and possible causes and recommended solutions.

Table 12.4 Nonrecoverable Error Messages

Error Message	Possible Cause	Suggested Action
TIMER FAIL	An error occurred in the timer.	Turn the plotter power switch ON again. If the error occurs again after the power switch is turned ON, contact your MUTOH service representative.
BUS TRAP ERROR	An error occurred on the bus trap.	

Table 12.4 Nonrecoverable Error Messages (cont'd)

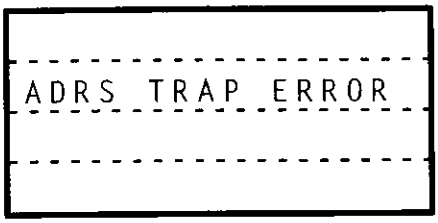
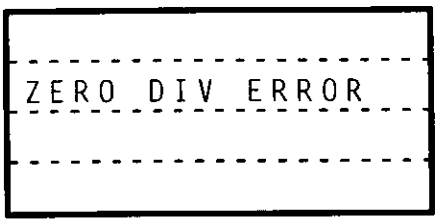
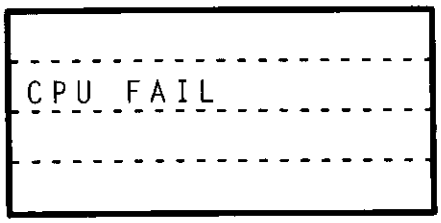
Error Message	Possible Cause	Suggested Action
	An error occurred on the address trap.	Turn the plotter power switch ON again. If the error occurs again after the power switch is turned ON, contact your MUTOH service representative.
	An error occurred in the CPU instruction.	
	A zero division error occurred.	
	An error detected in the CPU.	
	An error detected in the CPU.	

Table 12.4 Nonrecoverable Error Messages (cont'd)

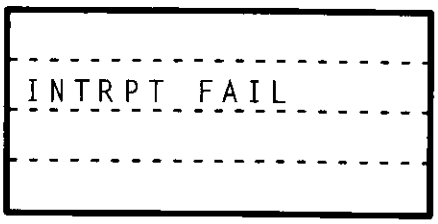
Error Message	Possible Cause	Suggested Action
	An error detected in the CPU.	Turn the plotter power switch ON again. If the error occurs again after the power switch is turned ON, contact your MUTOH service representative.
	An error detected in the Control Program ROM.	
	An error detected in the SRAM.	
	A buffer error occurred in the DRAM.	
	An interruption error occurred in the CPU.	

Table 12.4 Nonrecoverable Error Messages (cont'd)

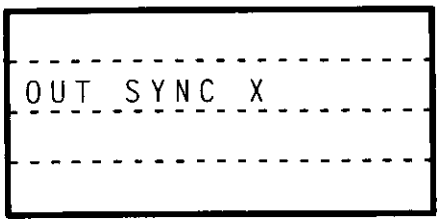
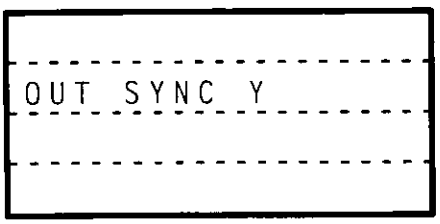
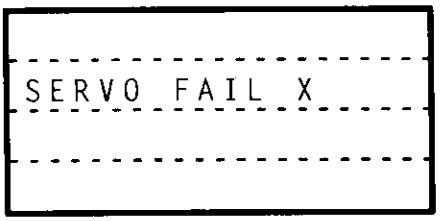
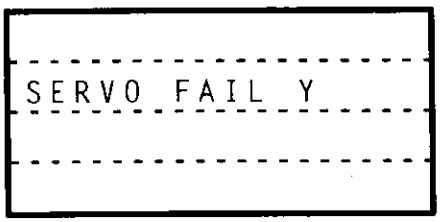
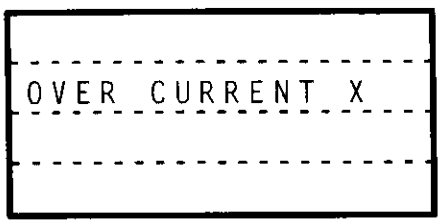
Error Message	Possible Cause	Suggested Action
	There is a synchronous stall in the X-axis motor.	XY-drive system error is detected on the plotter. Make sure there is nothing obstructing the drive block and turn the power switch ON again. If the error occurs again, contact your MUTOH service representative.
	There is a synchronous stall in the Y-axis motor.	
	An error occurred in the X-axis servo motor.	
	An error occurred in the Y-axis servo motor.	
	There is a power surge to the X-axis motor.	

Table 12.4 Nonrecoverable Error Messages (cont'd)

Error Message	Possible Cause	Suggested Action
OVER CURRENT Y	There is a power surge to the Y-axis motor.	XY-drive system error is detected on the plotter. Make sure there is nothing obstructing the drive block and turn the power switch ON again. If the error occurs again, contact your MUTOH service representative.
ENCODER FAIL	There is an error in the X-axis or Y-axis encoder.	
P TIMEOUT MC	Pen up/pen down position time-out.	Pen drive system error is detected on the plotter. Make sure there is nothing obstructing the drive block and turn the power switch ON again. If the error occurs again, contact your MUTOH service representative.
OVER FORCE MC	Pen up/pen down plotting pressure error.	
A/D FAIL MC	Pen up/pen down A/D converter error.	

Table 12.4 Nonrecoverable Error Messages (cont'd)

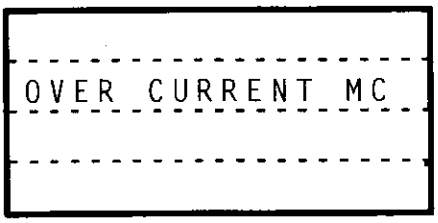
Error Message	Possible Cause	Suggested Action
	Pen up/pen down power ~~current~~ time-out.	Pen drive system error is detected on the plotter. Make sure there is nothing obstructing the drive block and turn the power switch ON again. If the error occurs again, contact your MUTOH service representative.
	Pen up/pen down power surge.	
	An error occurred in the power supply.	Turn the power switch OFF. Then contact your MUTOH service representative.
	The driver has overheated.	
	An error occurred in the fan motor.	

Table 12.4 Nonrecoverable Error Messages (cont'd)

Error Message	Possible Cause	Suggested Action
ORIGIN NOT FOUND	There is a Y-axis origin point detection error.	Turn the power switch OFF. Then contact your MUTOH service representative.
LOST HEAD	There is an error in the pen drive system.	
PAPER BROKEN	The plotting media is torn or has slipped off the plotter.	Replace the media. Make sure the drive roller and pressure roller are properly aligned, the plotting media is the right size, and the media is loaded properly.

212

Chapter 13

Using Media Rolls

The MUTOH XP-500 Series Plotter provides the convenience of a media dispenser and the precision of a special media cutting groove.

This chapter shows how to:

- ✗ **Install the media dispenser**
- ✗ **Load a roll of media**
- ✗ **Cut media**

Installing the Roll Media Dispenser and Roll Media

Your MUTOH XP–500 Series Plotter can use wide roll media. The roll can be up to 7 inches in diameter.

CAUTION!
Installing the dispenser hooks and loading the media roll requires two people.

Step 1.
Unwrap the media but do not remove the tape until the media is installed.

Step 2.
Insert the flanges into both ends of the media roll core. The smaller end of the flange goes into the core (see Figure 13.1).

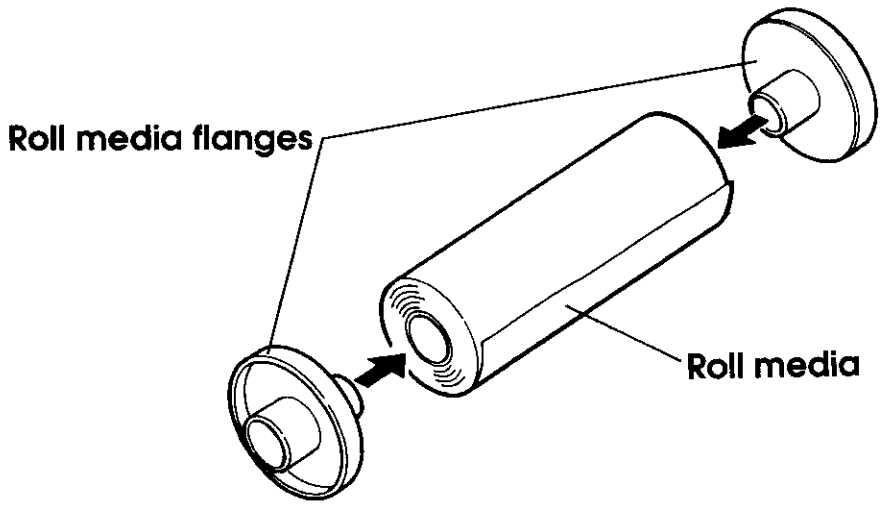


Figure 13.1 Inserting Flanges into Media Roll Core

Step 3.
Attach each dispenser hook to the plotter as shown in Figure 13.2.

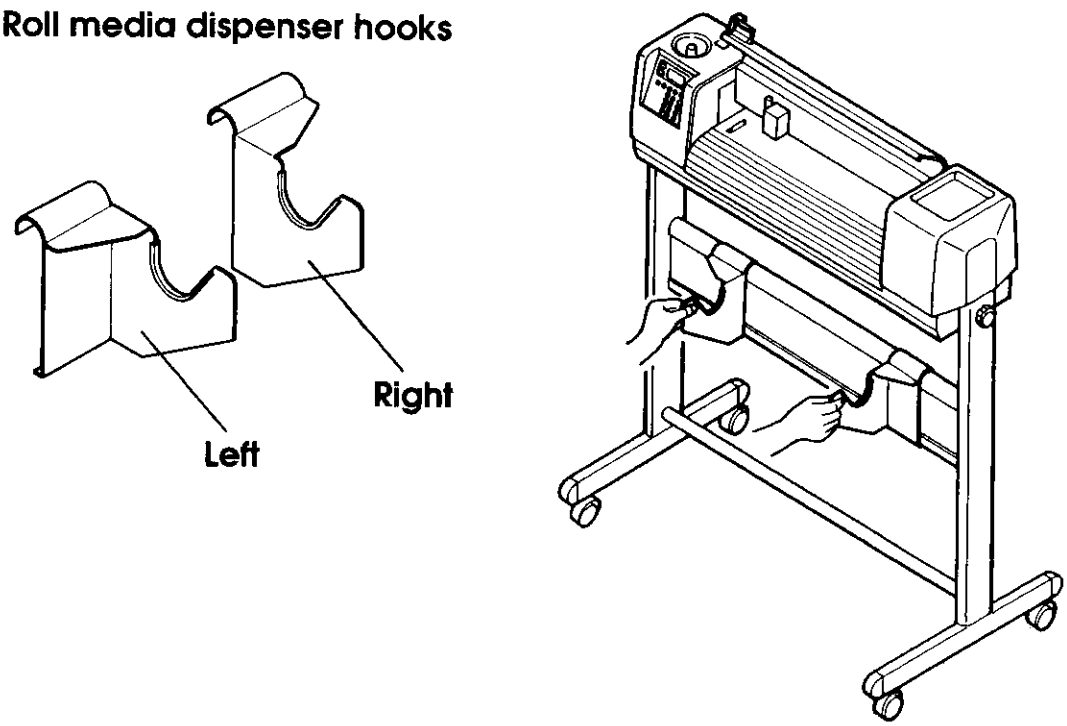


Figure 13.2 Correctly Installed Dispenser Hooks

Step 4.
Move the dispenser hooks so the distance between them is ~~2 inches~~ 50 mm wider than the width of the media roll.

Step 5.
Grasp the media roll by the flanges inserted into the core. Place the roll so the flanges fit into the dispenser hooks (see Figure 13.3).

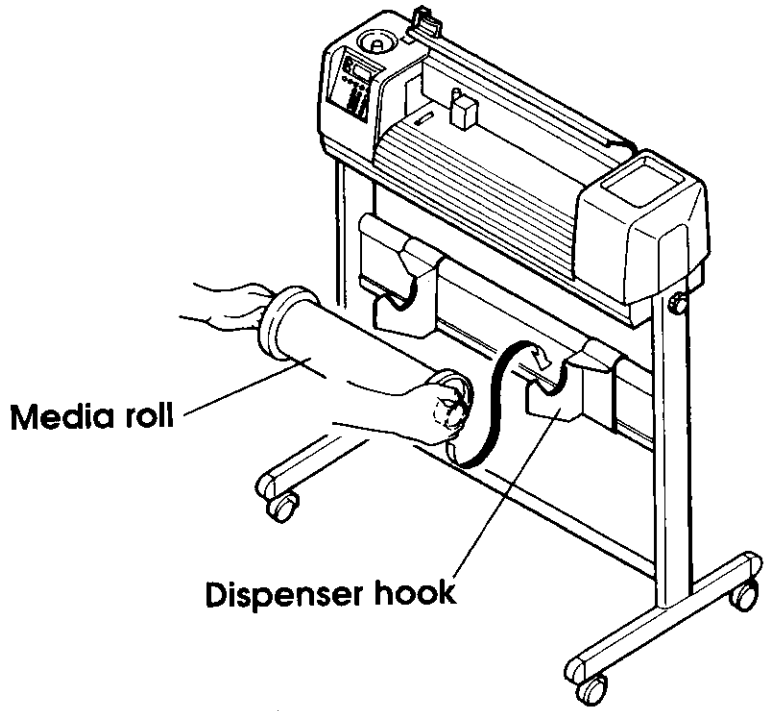


Figure 13.3 Loading Roll Media

Step 6.
Pull some of the media from the roll and position the media edge against the paper set fin. If the media does not line up with the edge of the paper set fin, adjust the position of the roll by moving the dispenser hooks (see Figure 13.4).

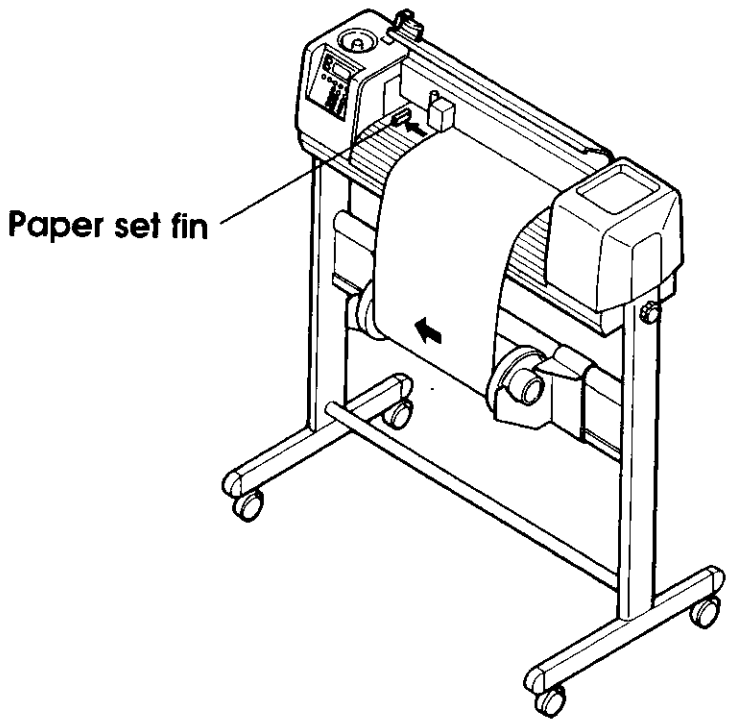


Figure 13.4 Aligning the Media Roll with the Paper Set Fin

Cutting Media

Manually pull out media and determine the desired length of the media by aligning it with the media cutting groove on your plotter. Cut the media manually into the size that you need. Use the media as pre-cut sheets.

CAUTION!

The XP-511 and XP-510 plotters do not provide functions for automatic roll feed of roll media and joint plotting.

☞ *See Chapter 5: Pens, Pencils, and Plotting Media for details about media sizes.*

Appendix

In addition to the procedures and information included in this User Guide, use the tables and flowcharts for quick reference.

This appendix includes:

- **XP-510 General Specifications**
- **RS-232C Specifications**
- **MH-GL Command Table**
- **ESCAPE Sequence Command Table**
- **Glossary**

General Specifications

MUTOH XP-500 Series Intelligent Plotter	
Maximum Plotting Speed	1272 mm/s (50.1 in/s) (along X-axis or Y-axis: 900 mm/s, 35.4 in/s)
Maximum Acceleration	4.2 G (along X-axis or Y-axis: 3 G)
Mechanical Resolution	0.005 mm per step
Software Resolution	0.1/0.05/0.025/0.0125/0.01 mm per step
XY Drive System	DC motor driving by full software servo
Repeatability Precision	±0.1 mm
Distance Precision	±0.1% of movement or ±0.25 mm, whichever is greater, using double-matte polyester film (#300)
Pen Up/Down Drive System	Moving coil using full software servo
Pen Up/Down Response Speed	80 operations/s (each operation of 1 up/1 down)
Pen Force (Pressure)	15 to 450 g using either manual plotting pressure setup or auto plotting pressure setup
Pen Types	Ink pen, disposable ink pen, ceramic-tip pen, liquid fiber-tip pen, oil-based fiber-tip pen, water-based ballpoint pen, oil-based ballpoint pen, and pencils (0.2, 0.3, 0.4, 0.5, and 0.7). The 0.7 pencil requires B leads or harder
Stocker	Up to 8 pens and/or pencils installed
Hard Clip Area (mm)	Normal X=35,15 Y=15,15 Expanded X=25,5 Y=5,5 Type 1 X=25,5 Y=11,11 Type 3 X=25,10 Y=10 ,10
Types of Media	Tracing bond paper, high-gloss paper, polyester film, normal paper
Control Panel Display and Operation	16-character, 4-line LCD display 8-element lamp LED 22-key operation switch
Standard Command Mode	MH–GL (HP–GL)

MUTOH XP-500 Series Intelligent Plotter (cont'd)	
Power Consumption	120 VA
Power Supply	110 to 120 VAC/220 to 240 VAC (50/60 Hz)
Ambient Conditions	
Operating Environment	
Temperature	5° to 40° C (41° to 104° F)
Humidity	35% to 75% non-condensing
Recommended Environment	
Temperature	Room temperature 16° to 32° C (61° to 90° F)
Humidity	50% to 65% non-condensing
Variation Rate	
Temperature	2° C per hour
Humidity	5% per hour
Storage Environment	
Temperature	0° to 50° C (32° to 122° F)
Humidity	10% to 90% non-condensing
Packing Shape	Plotter Body/Stand packed separately
Height	XP-510 1,279 mm (50.4 inches) XP-511 1,279 mm (50.4 inches)
Width	XP-510 1,446 mm (56.9 inches) XP-511 1,159 mm (45.6 inches)
Depth	XP-510 604 mm (23.8 inches) XP-511 604 mm (23.8 inches)
Weight	XP-510 55 Kg (121 lb) XP-511 46 Kg (101 lb)
Plotter Body Package	XP-510 45 Kg (99 lb) XP-511 34 Kg (75 lb)
Plotter Stand Package	XP-510 20 Kg (44 lb) XP-511 17 Kg (37 lb)
Options	Centronics® interface (optional) GP–IB interface (optional) RS–422A interface (optional) RS–232C interface (optional, but standard equipment) Roll media dispenser (optional)

Interface Specifications

MUTOH XP-500 Series Intelligent Plotter	
Standard RS–232C Interface	
Baud Rate	300 to 19200 and EXT
Format	ASCII
Synchronization	Start-stop synchronization
Communication	Full duplex
Data Length	7, 8 bits
Stop Bits	1, 2 bits
Parity	Even parity, Odd parity, None
Input Buffer	1 MB

MH-GL Commands

COMMAND	CODE	DATA FORMAT	FUNCTION
Straight Line Movement Commands			
PLOT ABSOLUTE	PA	PA X_1, Y_1 (, X_2, Y_2 ····) ;	Move the pen head in the absolute coordinate.
PEN DOWN	PD	PD X_1, Y_1 (, X_2, Y_2 ····) ;	Set pen on plotting media.
PLOT RELATIVE	PR	PR X_1, Y_1 (, X_2, Y_2 ····) ;	Move the pen head in the relative coordinate.
PEN UP	PU	PU X_1, Y_1 (, X_2, Y_2 ····) ;	Lift pen from plotting media.
SELECT PEN	SP	SP Pen number ;	Select pen.
Circle/Rectangle/Polygon Commands			
ARC ABSOLUTE	AA	AA x, y, angle (, chord tolerance) ;	Draw a circle at angle (θ1) and an arc (θ2) at division angle, considering the absolute coordinate (X, Y) as the center coordinate.
ARC RELATIVE	AR	AR x, y, angle (, chord tolerance) ;	Draw a circle at angle (θ1) and an arc (θ2) at division angle, with the relative coordinate (X, Y) as the center coordinate.
CIRCLE	CI	CI radius (, chord tolerance) ;	Draw a complete circle.
EDGE RECTANGLE ABSOLUTE	EA	EA x, y ;	Draw the perimeter of the rectangle in the absolute coordinate.
EDGE POLYGON	EP	EP ;	Draw the perimeter of the polygon registered in the polygon buffer.
EDGE RECTANGLE RELATIVE	ER	ER x, y ;	Draw the perimeter of the rectangle in in the relative coordinate.
EDGE WEDGE	EW	EW radius, start angle, sweep angle (, chord tolerance) ;	Draw the circumference of the wedge centering at the current position.
FILL POLYGON	FP	FP ;	Fill the polygon registered in the polygon buffer.
POLYGON MODE	PM	PM n ;	Register the polygon in the polygon buffer.
FILL RECTANGLE ABSOLUTE	RA	RA x, y ;	Fill the rectangle in the absolute coordinate.

COMMAND	CODE	DATA FORMAT	FUNCTION
Circle/Rectangle/Polygon Commands (cont'd)			
FILL RECTANGLE RELATIVE	RR	RR x, y ;	Fill the rectangle in the relative coordinate.
FILL WEDGE	WG	WG radius, start angle, sweep angle (, chord tolerance) ;	Fill the wedge centering at the current position.
Other Polygon Drawing Commands			
SYMBOL MODE	SM	SM character (character) ;	Symbol mode ON/OFF.
X - TICK	XT	XT ;	Draw a straight line vertical to the X axis.
Y - TICK	YT	YT ;	Draw a straight line vertical to the Y axis.
Character Drawing Commands			
BUFFERED LABEL STRING	BL	BL (ccc···c) term	Register the specified character string in the character buffer.
ALTERNATE CHARACTER SET	CA	CA set ;	Set the alternate character set.
CHARACTER CHORD ANGLE	CC	CC chord angle ;	Specify the character chord angle.
CHARACTER SELECTION MODE	CM	CM switch mode (, fallback mode) ;	Specify the character set selection mode.
CHARACTER PLOT	CP	CP space, line ;	Move the pen by the specified number of character cells.
STANDARD CHARACTER SET	CS	CS set ;	Set the standard character set.
ABSOLUTE DIRECTION	DI	DI run, rise ;	Specify the slant of the character string to be plotted.
DOWNLOAD-ABLE CHARACTER	DL	DL character number (,pen control) , x-coordinate (,···,) (pen control) (,···,) ;	Define the user character set (character set–1).
RELATIVE DIRECTION	DR	DR run, rise ;	Define the slant of the character string.
DESIGNATE CHARACTER SET INTO SLOT	DS	DS slot, set ;	Set the character set at the slot.
DEFINE TERMINATOR	DT	DT term ;	Set the LB, BL, WD command terminators.
DIRECTION VERTICAL	DV	DV n ;	Specify whether the character string is to be plotted horizontally or vertically.

COMMAND	CODE	DATA FORMAT	FUNCTION
Character Drawing Commands (cont'd)			
EXTRA SPACE	ES	ES space (, line) ;	Specify character space and line space.
INVOKE CHARACTER SLOT	IV	IV slot (, left) ;	Assign slots to GL or GR.
BUFFERED KANJI LABEL STRING	KB	KB JIS code (,···) ;	Register kanji in the character buffer.
KANJI LABEL	KL	KL JIS code (,···) ;	Draw kanji.
LABEL	LB	LB (ccc···c) term	Draw character.
LABEL ORIGIN	LO	LO position number ;	Specify the plot origin of the character string.
OUTPUT LABEL LENGTH	OL	OL ;	Output information about the character string in the character buffer.
PRINT BUFFERED LABEL	PB	PB ;	Plot the character string registered in the character buffer.
SELECT ALTERNATE SET	SA	SA ;	Select the auxiliary character set.
ABSOLUTE CHARACTER SIZE	SI	SI width, height ;	Specify the character width and character height.
CHARACTER SLANT	SL	SL tangent ;	Specify the slant of the character.
RELATIVE CHARACTER SIZE	SR	SR width, height ;	Specify the character width and character height.
SELECT STANDARD SET	SS	SS ;	Select the standard character set.
USER-DEFINED CHARACTER	UC	UC (pen control,) x-increment, y-increment (, ···) (,pen control) (, ···) ;	Draw the user-defined character.
Drawing Commands			
CHORD TOLERANCE	CT	CT n ;	Set the polygon approximation for the arc.
FILL TYPE	FT	FT type (, spacing (, angle)) ;	Specify fill type.

COMMAND	CODE	DATA FORMAT	FUNCTION
Drawing Commands (cont'd)			
LINE TYPE	LT	LT n (, p) ; LT –7, 1, dt1, ut ; LT –7, 2, dt1, ut, dt2 ; LT –7, 3, dt1, ut, dt2 ;	Specify the type of drawing line.
PEN THICKNESS	PT	PT thickness ;	Specify the spacing of thick lines for filling.
TICK LENGTH	TL	TL tp (, tn) ;	Specify the length of a straight line to be drawn by the XT or YT command.
USER-DEFINED FILL TYPE	UF	UF gap1 (, gap2···, gap20) ;	Specify the user-defined fill pattern.
Plotter Control Commands			
AUTOMATIC PEN OPERATIONS	AP	AP n ;	Set pen control functions.
ACCELERATION SELECT	AS	AS acceleration (, pen number) ;	Specify drawing acceleration.
CURVED LINE GENERATOR	CV	CV n (, delay) ;	Specify on/off for smoothing.
DEFAULT	DF	DF ;	Set the plotter to default status.
FORCE SELECT	FS	FS force (, pen number) ;	Specify the plotting pressure for drawing.
GRAPHICS MEMORY	GM	GM polygon buffer [, downloadable character buffer (, 0, dummy1 (, dummy2))] ;	Change buffer sizes except for the input buffer.
GROUP PEN	GP	GP group number [, pen number (,number of pens (, length))] ;	Group pens in the stocker.
INITIALIZE	IN	IN ; IN -1 ;	Set the plotter to Initial status.
NOT READY	NR	NR ;	Set the plotter to Local status.
SELECT PEN GROUP	SG	SG group number ;	Select pen groups set by the GP command.
VELOCITY SELECT	VS	VS velocity (, pen number) ;	Specify the speed for drawing.
Coordinate Commands			
INPUT P1 and P2	IP	IP P1x, P1y (, P2x, P2y) ;	Set scaling points P1 and P2.
INPUT WINDOW	IW	IW X1, Y1, X2, Y2 ;	Set plotting window area.

COMMAND	CODE	DATA FORMAT	FUNCTION
Coordinate Commands (cont'd)			
OUTPUT HARD-CLIP LIMITS	OH	OH ;	Output lower left and upper right coordinate values in the hard clip area.
OUTPUT P1 and P2	OP	OP ;	Output coordinate values of scaling points P1 and P2.
OUTPUT WINDOW	OW	OW ;	Outputs lower left and upper right coordinate values in the plotting area.
ROTATE COORD-INATE SYSTEM	RO	RO n ;	Rotate the plotting coordinate system 69° or cancel the rotation.
SCALE	SC	SC Xmin, Xmax, Ymin, Ymax [, type (, left, bottom)] ; Xmin, Xfactor, Ymin, Yfactor type ;	User-defined coordinate system ON/OFF.
DIGITIZE CLEAR	DC	DC ;	Cancel Digitize mode.
DIGITIZE POINT	DP	DP ;	Set the plotter to Digitize mode.
OUTPUT DIGITIZED POINT	OD	OD ;	Output digitize data.
Keyboard Mode Commands			
GROUP COUNT	GC	GC count ;	Specify group number.
DEFINE KEY	KY	KY key (, function) ;	Assign functions to F1 to F4 keys on the Control Panel.
OUTPUT GROUP COUNT	OG	OG ;	Output group count and escape status.
OUTPUT KEY	OK	OK ;	Output whether a Control Panel key in Keyboard mode has been pressed.
WRITE TO DISPLAY	WD	WD (ccc···c) term	Display the character string and switch to Keyboard mode.
Plotter Information Inquiry Commands			
INPUT MASK	IM	IM E-mask [, S-mask (, P-mask)] ;	Set error mask, serial pole mask and parallel pole mask.
OUTPUT ACTUAL POSITION	OA	OA ;	Output the current position and pen up/down status.
OUTPUT COMMANDED POSITION	OC	OC ;	Output the current pen position and pen up/down status given by the MH-GL command.
OUTPUT ERROR	OE	OE ;	Inquire whether an error has occurred due to the MH-GL command. In addition, if an error has occurred, output the error type.

COMMAND	CODE	DATA FORMAT	FUNCTION
Plotter Information Inquiry Commands (cont'd)			
OUTPUT FACTORS	OF	OF ;	Output 1–mm length in the plotter unit.
OUTPUT IDENTIFICATION	OI	OI ;	Output plotter type.
OUTPUT OPTIONS	OO	OO ;	Output plotter option status.
OUTPUT STATUS	OS	OS ;	Output plotter status.
OUTPUT TYPE STOCKER	OT	OT ;	Output stocker type and whether a pen is installed in the stocker.

Escape Sequence Commands

COMMAND	CODE	DATA FORMAT	FUNCTION
Plotter Management Commands			
OUTPUT IDENTIFICATION	ESC. A	ESC. A	Output the plotter name.
OUTPUT BUFFER SPACE	ESC. B	ESC. B	Output the logical input buffer space.
OUTPUT EXTENDED ERROR	ESC. E	ESC. E	Inquire whether an error has occurred due to the escape sequence or online data communication. In addition, if an error has occurred, output the error type.
ABORT DEVICE CONTROL	ESC. J	ESC. J	Suspend the output operation being executed.
ABORT GRAPHICS	ESC. K	ESC. K	Suspend the MH–GL analysis being executed.
OUTPUT BUFFER SIZE WHEN EMPTY	ESC. L	ESC. L	Output the logical input buffer space after processing the MH–GL commands being executed.
OUTPUT EXTENDED STATUS	ESC. O	ESC. O	Output the current plotter operation status.
SET MONITOR MODE	ESC. Q	ESC. Q n :	Set Monitor mode.
RESET	ESC. R	ESC. R	Return the procedure and status of communication with the host computer to initial status after the power is turned ON.
OUTPUT CONFIGURABLE MEMORY SIZE	ESC. S	ESC. S n :	Output the size allocated to each buffer.
ALLOCATE CONFIGURABLE MEMORY	ESC. T	ESC. T (physical I/O buffer) ; (polygon buffer) ; (downloadable character buffer) ; 0 ; (vector buffer) ; (pen sort buffer) :	Change the size of each buffer.
END FLUSH MODE	ESC. U	ESC. U	Cancel flush mode.
PLOTTER ON	ESC. Y ESC. (	ESC. Y ESC. (	Set the plotter to program ON status.

COMMAND	CODE	DATA FORMAT	FUNCTION
Plotter Management Commands (cont'd)			
PLOTTER OFF	ESC. Z ESC.)	ESC. Z ESC.)	Set the plotter to program OFF status.
SET PLOTTER CONFIGURATION	ESC. @	ESC. @ (logical I/O buffer size) ; (I/O conditions) :	Set the logical input buffer size and plotter I/O function.
Handshake Function Setting Command			
SET HANDSHAKE MODE 1	ESC. H	ESC. H (data block size) ; (enquiry-character) ; (acknowledge-ment string) :	Select the ENQ/ACK handshake and set the parameter.
SET HANDSHAKE MODE 2	ESC. I	ESC. I (Xoff threshold level) ; (omitted) ; (Yon trigger character(s)) :	Select the XON–XOFF or ENQ/ACK handshake and set the parameter.
SET OUTPUT MODE	ESC. M	ESC. M (turnaround delay) ; (output trigger) ; (echo terminator) ; (output initiator) ;	Select the parameter for output of data from the plotter.
SET EXTENDED OUTPUT AND HANDSHAKE MODE	ESC. N	ESC. N (intercharacter delay) ; (handshake-dependent parameter) :	Set the extended parameter for output of data from the handshake and the plotter.
SET HANDSHAKE PROTOCOL	ESC. P	ESC. P handshake :	Select one of the three types of standard handshake.

Glossary

Acceleration — Rate that a pen or pencil increases its velocity, measured in mm/sec.

Baud rate — Data transmission rate between a computer and the plotter. The data transmission rate must agree with the rate specified by the CAD system.

Bit — The smallest piece of data stored or transmitted by a computer. Usually represented by a 0 or 1.

Buzzer — A tone that can sound when you press an invalid key or when an error occurs.

Byte — Eight bits taken together as a unit of data. The numeric value of the bits, interpreted as a binary number, often corresponds to a member of a character set.

CTS Control — Controls the plotter using the RS–232C signaling line so the plotter can generate a response when the host computer can receive it. Used with a CTS terminal.

Clip area — The maximum plotting range. It is initially determined from the media size.

Control mode — The current plotter control mode determines the functions that the plotter can perform. The plotter may be in Local, Remote, or Standby mode. Other control modes are Replot, Digitize, Keyboard, and Paper Initial.

Control Panel — The LCD and key pad used to control the plotter.

DTR Control — Investigates the plotter's reception buffer status and sends the result to the host computer. Used with a DTR terminal.

Data — Information stored or processed by the computer and plotter.

Data Length — Bit length for transmitting one character when data communication is provided between a computer and the plotter.

Default — The initial value of parameter when the plotter is first turned ON, or reset.

Diagnostic test — A procedure performed to determine whether the plotter is operating correctly.

Digitize — Translating the physical location of a point on the plotting media into coordinates understood by the plotter.

EXT — One of the baud rate options for RS–232C interface. Sets a bit transmission rate according to a synchronous signal sent from the computer.

LCD — A liquid crystal display on the Control Panel. Menus, messages, plotter status, and entries appear on the LCD.

Drive rollers — Parts of the plotter that move the plotting media back and forth along the X-axis during plotting.

Eavesdrop — An arrangement in which the plotter is connected between the host computer and the terminal. The computer and terminal can bypass the plotter and communicate directly with each other.

Escape sequence — Used to determine the communication instructions between the computer and plotter. It also informs the computer of the plotter's status.

Handshake — Data transmission protocol when using an RS–232C interface.

High Quality — When High Quality is ON, the speed and acceleration of the pen (or pencil) is reduced by half. This results in smoother, clearer, higher quality plots.

Hold lever — Part of the plotter that, in its lowered position, fastens media in place. When it is raised, media can be loaded or removed.

Initialize — Reset the plotter's parameters to their initial values.

Interface — A connection between two electronic devices.

I/O error — An error in data transmission between the computer and plotter; for example, mismatched baud rate or parity.

Key pad — Used to enter numbers, move the pen head manually, and set plotter parameters.

Local Mode — This is the mode in which it is possible to receive data while plotting is suspended.

Media — Vellum, tracing bond, overhead transparency film, or polyester film loaded into the plotter and on which the plotter draws.

Mode — The particular functioning condition of the plotter at any given time. Being in a specific mode implies that the plotter can perform certain functions but not others.

On-line data — The plotting instructions that the computer sends to the plotter. This data travels between the computer and plotter by way of the cable that connects them and is in numeric format. The plotter translates it into actions that create a plot.

Overflow — Exceeding the capacity of the memory buffer. The excess data is lost.

P1, P2 — The names given to the two reference points used by the plotter.

Paper set fin guides — Part of the plotter used to align the media's left edge when loading media.

Paper sensors — The sensors are located on the left side of the platen. They detect whether media is loaded and determine the size of the media.

Parameter — A value that characterizes one aspect of the plotter. If you want to use the default values, you can change the plotter's parameters.

Parity — An error-checking method that uses one bit of every transmitted byte to confirm that an odd or even number of I-bits were transmitted in that byte.

Pen ID Mark — Each pen and pencil has a silver and/or black identification mark on it. The plotter reads this mark to identify the pen or pencil type and size.

Pen/pencil head — The part of the plotter that grasps and holds a pen or pencil during plotting.

Pen stocker — A rotating storage unit that holds the pens or pencils when they are not in use.

Platen — Part of the plotter that supports the plotting media and guides the X-axis movement.

Plotting roller — Part of the plotter that supports the plotting media, allows wrinkle-free movement, and provides a surface for drawing.

Pressure rollers — Parts of the plotter that hold the media in contact with the drive rollers so the media can be moved without slipping or wrinkling. The left roller is fixed while the right roller can be adjusted to the media size.

Remote mode A condition of the plotter in which it receives and processes commands sent to it by the on-line computer.

Replot mode In replot mode, the plotter repeats its most recent plot using data recorded in its internal memory.

RS-232C A serial communications interface standardized by the Electronic Industries Association.

RTS Control Controls the plotter using the RS–232C signaling line so the plotter can generate a response when the host computer can receive it. Used with an RTS terminal.

Sorting The plotter can store, rearrange, and then perform the instructions that it receives to achieve efficient pen/pencil selection and movement.

Stop bit One or two bits used by the RS–232 interface to signal the end of a transmitted byte.

Version A number that identifies the instructions that have been built into the plotter.

Index

A

B

C

D

E

F

G

H

I

J

K

L

M

N, O

P

300

Q, R

S

T

U

V

W, X, Y, Z

MUTOH

MUTOH INDUSTRIES LTD.
Tel.:81-(0)3-5486-7145
Fax:81-(0)3-5486-7163
E-mail:ibd@mutoh.co.jp
http://www.mutoh.co.jp

MUTOH AMERICA INC.
Tel.:1-602-4144613
Fax:1-602-4144645
E-mail:sales@mutoh.com
http://www.mutoh.com

MUTOH EUROPE N.V.
Tel.:32-(0)59-561400
Fax:32-(0)59-807117
E-mail:mutoh@mutoh.be
http://www.mutoh.be

MUTOH DEUTSCHLAND GmbH.
Tel.:49-(0)2159-913430
Fax:49-(0)2159-913456
E-mail:Mutoh-Sales@t-online.de