

# FC4500/4510

## CUTTING PRO

# USER'S MANUAL

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MANUAL NO.FC4500-UM-151



# GRAPHTEC

## TO ENSURE SAFE AND CORRECT USE

- To ensure safe and correct use of your plotter, read this Manual thoroughly before use.
- After having read this Manual, keep it in a handy location for quick reference as needed.
- Do not permit small children to touch the plotter.
- The following describes important points for safe operation. Please be sure to observe them strictly.

### Conventions Used in This Manual

To promote safe and accurate use of the plotter as well as to prevent human injury and property damage, safety precautions provided in this manual are ranked into the three categories described below. Be sure you understand the difference between each of the categories.



#### **DANGER**

This category provides information that, if ignored, is highly likely to cause fatal or serious injury to the operator.



#### **WARNING**

This category provides information that, if ignored, is likely to cause fatal or serious injury to the operator.





#### **CAUTION**

This category provides information that, if ignored, could cause injury to the operator or physical damage to the plotter.



### Description of Safety Symbols





The  symbol indicates information that requires careful attention (which includes warnings).

The point requiring attention is described by an illustration or text within or next to the  symbol.



The  symbol indicates action that is prohibited. Such prohibited action is described by an illustration or text within or next to the  symbol.



The  symbol indicates action that must be performed. Such imperative action is described by an illustration or text within or next to the  symbol.

## Safety Precautions

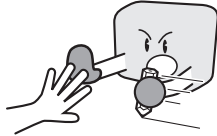
### ⚠ WARNING

**During a plotting or cutting operation, do not touch the writing panel, carriage, and other moving parts.**

- Such action may cause human injury.



No touching

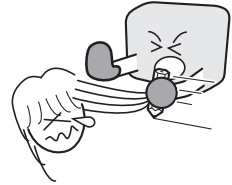


**During a plotting or cutting operation, be sure to keep your hands, hair, and so forth away from the writing panel, carriage, and other moving parts.**

- Such action may cause human injury.



No touching

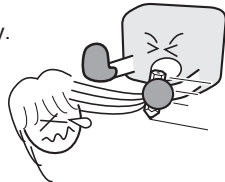


**Even when the plotter is stopped, it may suddenly start operating if it receives data, so be sure to keep your hands, hair, and so forth away from the vicinity of the plotter's writing panel and moving parts such as the tool carriage.**

- Such action may cause human injury.



No touching

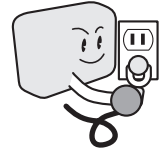


**Make sure that the plotter is grounded.**

- If the plotter is not grounded, the operator could suffer an electrical shock in case of current leakage.



Ground the Plotter

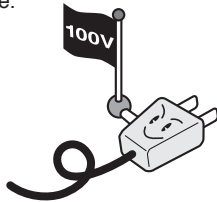


**Do not connect the plotter to a non-rated power supply.**

- Use of a different supply voltage may result in electrical shock or a fire hazard due to current leakage.



Use prohibited



**Do not use the plotter in a location where it will be exposed to water, rain or snow.**

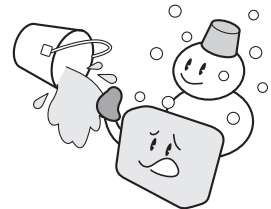
- Such location may cause electrical shock or a fire hazard due to current leakage.



Avoid water



Beware of electrical shock

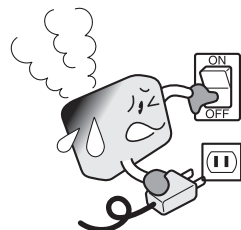


**If the plotter generates smoke, is too hot, emits strange odor, or otherwise functions abnormally, do not continue using it. Turn off its power and unplug its power cord from the electrical socket.**

- Use of the plotter in such status may result in a fire hazard or electrical shock.
- After confirming that smoke is no longer being generated, contact your sales representative or nearest Graphtec vendor to request repair.
- Never try to perform repair yourself. Repair work by inexperienced personnel is extremely dangerous.



Prohibited



**Do not disassemble, repair, or remodel the plotter.**

- Such action may cause electrical shock or a fire hazard due to current leakage.
- Contact with the high-voltage parts within the plotter may cause electrical shock.
- If the plotter requires repair, contact your sales representative or nearest Graphtec vendor.



No disassembly



## Safety Precautions

### ! WARNING

#### Do not allow dust or metallic matter to adhere to the power plug.

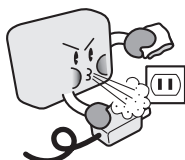
- A dirty power plug may result in electrical shock or a fire hazard due to current leakage.



Prohibited



Beware of electrical shock



#### Do not use the power cord if it is damaged.

- Use of a damaged cord may result in electrical shock or a fire hazard due to current leakage.
- Replace the power cord with a new one.



Unplug the power cord from the socket



#### Avoid direct contact with the cutter blade.

- Touching the blade with your bare hand may cause injury.
- During a cutting operation, keep away from the cutter blade.



No touching



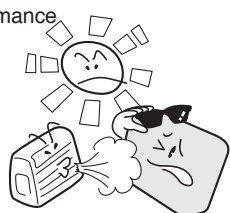
### ! CAUTION

#### Do not use or store the plotter in a location exposed to direct sunlight or the direct draft of an air conditioner or heater.

- Such location may impair the performance of the plotter.



Prohibited



#### Do not use or store the plotter in an excessively dusty or humid location.

- Such location may impair the performance of the plotter.



Prohibited



#### Do not place a coffee cup or any other receptacle containing water or other fluid on top of the plotter.

- Fluid falling inside the plotter may cause electrical shock or a fire hazard due to current leakage.



Avoid water



Beware of electrical shock

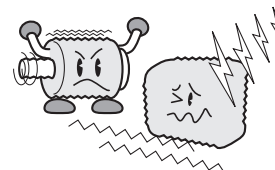


#### Do not install, use, or store the plotter in a location subject to excessive mechanical vibration or electrical noise.

- Such location may impair the performance of the plotter.



Prohibited



# Safety Precautions

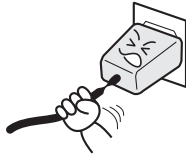
## ⚠ CAUTION

**When disconnecting the power cord or an interface cable, do not pull on the cord/cable.**

- Such action will damage the cord/cable, resulting in a fire hazard or electrical shock. Be sure to hold the power cord's plug or the interface cable's connector.



Prohibited

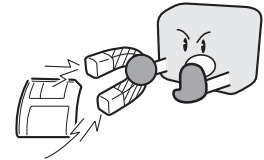


**Do not place magnetic cards, diskettes or similar in the vicinity of the tool carriage.**

- The magnetic force may destroy the data on the magnetic cards or diskettes.



Prohibited

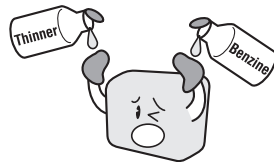


**Do not clean the plotter using a volatile solvent (such as thinner or benzine).**

- Such action may impair its performance.



Prohibited



**Do not attempt to lubricate the plotter's mechanisms.**

- Such action may cause it to break down.



Prohibited

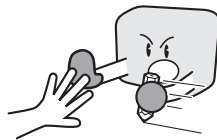


**Provide sufficient space around the plotter so that the media does not strike any objects in the plotter's vicinity during cutting or plotting.**

- Such contact may cause cutting or plotting to go out of alignment.



No touching

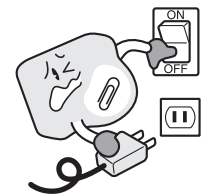


**If water or foreign matter enters inside the plotter, do not continue using it. Turn off its power and unplug its power cord from the electrical socket.**

- Use of the plotter in such status may result in electrical shock or a fire hazard due to current leakage.
- Contact your sales representative or nearest Graphtec vendor to request repair.

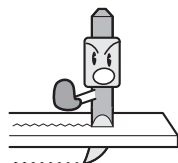


Unplug the power cord from the socket



**When using the cutter pen, take care not to extend the cutter blade excessively.**

- An excessive blade length will damage the cutting mat and impair the plotter's cutting quality.



**Move the tool carriage slowly when moving it manually in order to load the medium or for other reasons.**

- Moving it quickly may damage the plotter.



## Safety Precautions

### CAUTION

**When using indoor illumination such as a fluorescent lamp or a floor lamp, make sure that such illumination is positioned at least one meter away from the plotter.**

- Insufficient distance may cause the sensors to malfunction and prevent correct detection of the loaded medium.



**If an edge of the loaded medium comes loose, secure it with drafting tape or a similar means.**

- The cutter's blade may break if its tip gets caught on a loose edge of the medium.



**Before cutting a medium when you are uncertain of its optimum cutting conditions, run a test cut in advance.**

- A cutting operation based on unsuitably specified cutting conditions will place a heavy load on the blade and plotter, causing the blade to break or the plotter to break down.



## PREFACE

Thank you for purchasing an FC4500/4510 Cutting Plotter. This plotter incorporates a digital servo drive to perform cutting and plotting operations at high speed and high precision. Besides being used to cut marking film and other media, your plotter can also be used as a pen plotter. To ensure optimum use of the plotter's various functions, be sure to read this manual thoroughly before use. This product is manufactured and sold pursuant to a license under Gerber Scientific International, Inc.'s U.S. Patent No. 5,537,135 and its foreign counterparts.

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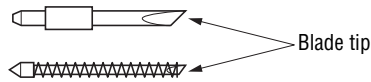
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## **⚠ Precautions on the Handling of Cutter Pens**

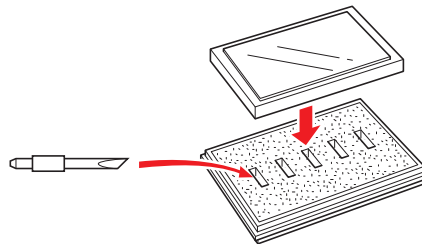
This product uses a cutting blade. To prevent injuries (when replacing the cutter blade, installing the cutter pen, etc.), take the following precautions when handling the cutter blade.

### **Cutter Blade**

The blades are sharp. Be careful not to cut your fingers or prick yourself when handling the cutter pen.

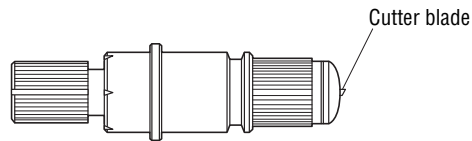


Return used blades to the accessory cutter blade case and throw them all out together when the whole case has been filled.



### **Cutter Pen**

The tip consists of a sharp blade. Do not extend it too far.



The methods for extending the blade and replacing it are described in Chapter 3 of this manual.

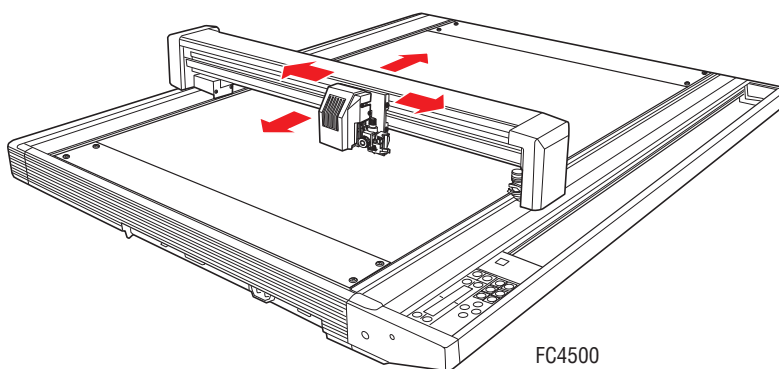
### **After Mounting the Cutter Pen**

After the power has been turned on, and during operation, do not touch the pen tip. It is dangerous.



## Precautions After Turning on the Plotter

During operations, immediately after completion of operations, and when setting cutting plotter functions, the tool carriage, Y bar, and other parts which are not fixed, may move suddenly. Do not let your hands, hair, or clothing get too close to the moving parts or within their range of movement. Do not place any foreign objects in or near these areas either. If your hands, hair, clothing, or the like get caught in, or wrapped around moving parts, you may be injured and the machine may be damaged.



## The Warning Label

The warning label shown below is attached to the outside of your plotter's cover. Be sure to strictly observe the precaution indicated on the label.



## Adhesive Mat

The FC4510-60 plotter comes equipped with an adhesive mat as an accessory.

Before loading media for creasing/scoring use, paste this adhesive mat to the writing panel. The adhesive mat is a consumable.

When using a creasing/scoring tool, make sure that the adhesive mat has been affixed to the writing panel before loading the material for creasing/scoring.

### Using the adhesive mat

The adhesive mat has different adhesive strengths on the surface and reverse side. Use the side with high adhesive strength for pasting the adhesive mat to the writing panel, and the side with low adhesive strength for fixing the media in place. The protective film pasted on the surface and reverse side of the adhesive mat is reused for the storage of the removed adhesive mat. Therefore, do not discard it.

#### **Pasting the adhesive mat**

When pasting the adhesive mat, follow the procedure described below. (When removing the adhesive mat, follow the procedure in reverse and keep the removed adhesive mat in storage.)

- (1) Remove the protective film from the reverse side of the adhesive mat.
- (2) Paste the adhesive mat to the plotter's writing-panel surface, taking care to prevent the formation of bubbles.
- (3) Remove the protective film from the surface of the adhesive mat.

#### **Precautions on use of the adhesive mat**

When cutting general media (e.g. marking film or self-adhesive paper), remove the adhesive mat and paste an adhesive sheet in its place before cutting. For some media (e.g. those with a smooth surface), the adhesive mat may be excessively sticky, making it difficult to remove the medium from the mat. When attaching such a medium, make sure that only the circumference of the medium is pasted onto the adhesive mat. (If the middle part of the medium is warped, lightly press on that part to paste it to the adhesive mat.) Conversely, some media may not become fully pasted onto the adhesive mat. In such a case, fix the medium in place using, for example, drafting tape.

#### **CHECKPOINT**

If the cut medium rises up from the surface during cutting, switch to perforation mode before proceeding.  
(For details on the perforation mode, see Section 3.7, "Setting the Cutting Conditions" for details on Perforation Settings and Section 5.10, "Assigning Perforation Cutting".)

#### **If the adhesive mat has lost its adhesive strength**

Remove the adhesive mat from the writing panel and wash it with water. When it is dry, it will become sticky again.

#### **Amount of protrusion of the cutter blade when the adhesive mat is used**

Adjust the amount of blade protrusion to the thickness of the medium to be cut, plus an additional 0.1 mm to 0.2 mm. (For details on adjusting the amount of blade protrusion, see Section 2.4, "Adjusting the Blade Length".)

## Adhesive Sheet

Your plotter comes equipped with an adhesive sheet as an accessory. Before loading general media (e.g. marking film or self-adhesive paper) in place, paste this adhesive sheet to the writing panel. The adhesive sheet is a consumable.

### Using the adhesive sheet

The adhesive sheet has different adhesive strengths on the surface and reverse side. Use the side with high adhesive strength for pasting the sheet to the writing panel, and the side with low adhesive strength for fixing the media in place.

#### **Pasting the adhesive sheet**

When pasting the adhesive sheet, follow the procedure described below.

- (1) Remove the protective film from the white side of the adhesive sheet.
- (2) Paste the adhesive sheet to the plotter's writing-panel surface, taking care to prevent the formation of bubbles.
- (3) Remove the protective film from the yellow side of the adhesive sheet.

#### **Precautions on use of the adhesive sheet**

When loading media for creasing/scoring, remove the adhesive sheet and paste the adhesive mat in its place.

For some media (e.g. those with a smooth surface), the adhesive sheet may be excessively sticky, making it difficult to remove the medium from the sheet. When attaching such a medium, make sure that only the circumference of the medium is pasted to the adhesive sheet. (If the middle part of the medium is warped, lightly press on that part to paste it to the adhesive sheet.)

Conversely, some media may not become fully pasted onto the adhesive sheet. In such a case, fix the medium in place with, for example, drafting tape.

#### **If the adhesive sheet has lost its adhesive strength**

Remove the adhesive sheet from the writing panel and replace it with a new adhesive sheet.

#### **Amount of protrusion of the cutter blade when the adhesive sheet is used**

For details on adjusting the amount of blade protrusion, see Section 2.4, "Adjusting the Blade Length".

## Daily Maintenance and Storage

During daily maintenance, pay particular attention to the following points.

- (1) Do not lubricate the plotter mechanisms.
- (2) To clean the plotter's metal parts, either wipe the soiled areas with a dry cloth or with a cloth that has been dampened with a neutral detergent diluted with water.

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**⚠ CAUTION**

Do not use paint thinner, benzene, alcohol, or similar solvents as they may damage the casing's finish.

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- (3) If the writing panel surface is soiled, wipe it with a dry cloth. If the surface is extremely dirty, wipe the surface with a cloth that has been dampened with alcohol or a neutral detergent diluted with water. Make sure that the cloth has been well wrung out.

---

**⚠ CAUTION**

- Do not use antistatic cleaners or cloths treated with an antistatic agent to clean an electrostatic writing panel. Antistatic agents will adversely affect the electrostatic adhesion of the panel.
  - Do not use benzene, thinners, or similar solvents to clean the writing panel. They will damage the surface.
  - Electrostatic adhesion writing panels tend to attract airborne dust and dirt. Clean off any dust or dirt that adheres to the writing panel.
  - During periods of high humidity, the adhesion force of electrostatic adhesion panels may drop slightly.
- 

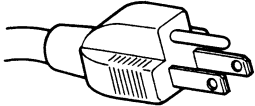
When the plotter is not in use, follow the instructions listed below.

- (1) Remove the pen from the tool carriage and store it with the pen cap on.
- (2) Cover the plotter with the soft cover supplied or a cloth to keep dust off.
- (3) Store the plotter in a location which is not subject to either direct sunlight or high humidity.

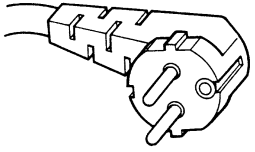
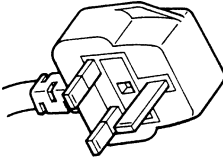
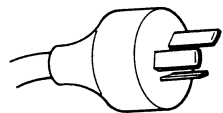
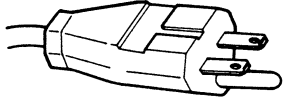
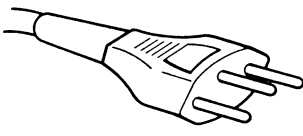
## Selecting a Power Cable

Be sure to refer to the following tables if you wish to use a cable other than the one supplied as an accessory.

**Table 1. 100 V to 120 V Power Supply Voltage Range**

Plug Configuration	Plug Type	Supply Voltage Selector Settings	Reference Standards	Power Cable
	North America 125 V 10 A	100/120 V	ANSI C73.11 NEMA 5-15 UL498/817/62 CSA22.2 NO.42/21/49	UL Listed  Type SJT No.18AWG × 3 300 V, 10 A

**Table 2. 200 V to 240 V Power Supply Voltage Range**

Plug Configuration	Plug Type	Supply Voltage Selector Settings	Reference Standards	Power Cable
	Europe 250 V 10 A	200 V	CEE(7)VII IEC320 CEE13	TYPE: H05VV-F 3 × 1.0 mm <sup>2</sup>
	UK 250 V 5 A	200 V	BS1363 BS4491 BS6500	TYPE: H05VV-F 3 × 1.0 mm <sup>2</sup>
	Australia 250 V 10 A	200 V	AS3112 AS3109 AS3191	TYPE: OD3CFC 3 × 1.0 mm <sup>2</sup>
	North America 250 V 15 A	200 V	ANSI C73.20 NEMA 6-15 UL 198.6	UL Listed Type SJT No.18AWG × 3 300 V, 10 A
	Switzerland 250 V 6 A	200 V	SEV1011 SEV1004 SEV1012	TYPE: H05VV-F 3 × 0.75 mm <sup>2</sup>

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# CHAPTER 1

---

## ***PRODUCT SUMMARY***

### **PRODUCT SUMMARY**

- 1.1 Model Names and Basic Specifications*
- 1.2 Standard Accessories*
- 1.3 Plotter Nomenclature*
- 1.4 Control Panel*

## 1.1 Model Names and Basic Specifications

The FC2250 series comprises the following models.

Model	Media hold-down method	Cutting area
FC4500-50	Electrostatic adhesion	590 x 430 mm
FC4500-60	Adhesive mat/Application sheet	910 x 610 mm
FC4510-50	Adhesive mat/Application sheet	860 x 600 mm

## 1.2 Standard Accessories

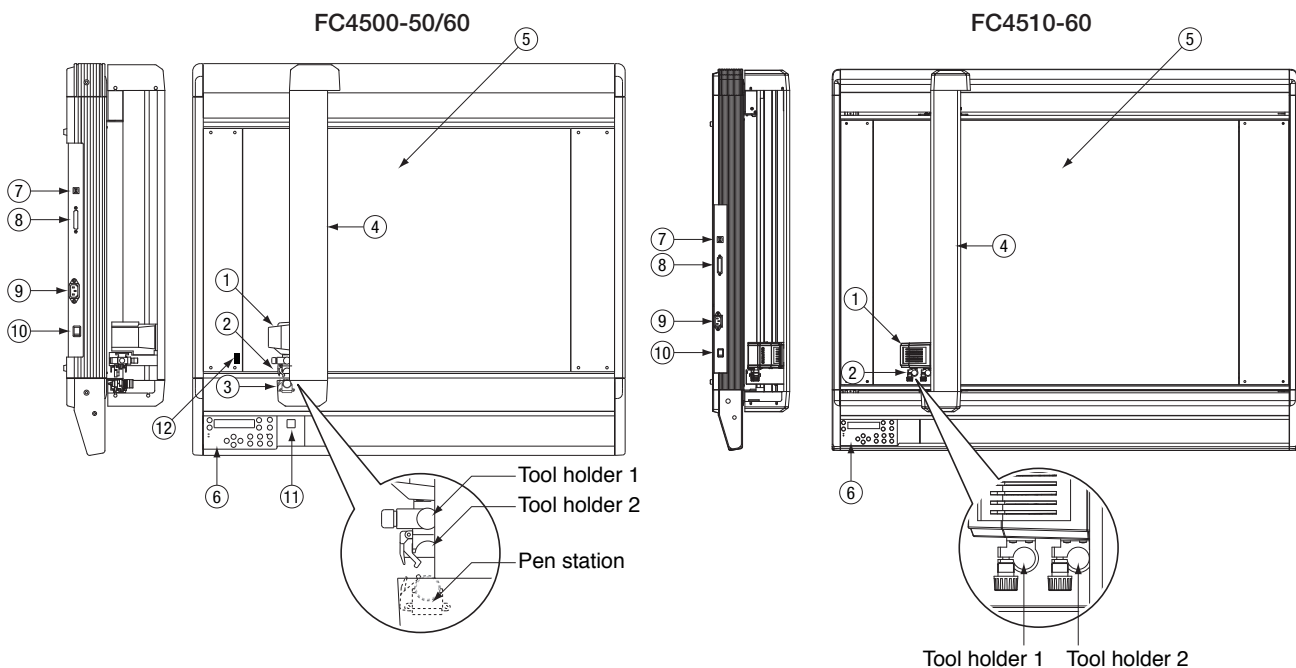
Item	Description	Q'ty
Power cable		1
Cutter pen set	PHP32-CB15N-HS, CB15U-2	1 set
Water based fiber-tip pen	KF552-BK	1
CP-001	Creasing/scoring tool (FC4510-60 only)	1
CM-0002	Adhesive mat (FC4510-60 only)	2
CM-0003	Adhesive sheet	2
Origin point alignment guides	10 x 200 mm	2
USB cable		1
CD-ROM	User's manual, driver, other software	1
Quick Manual		1
Usage Precautions		1

### CAUTION

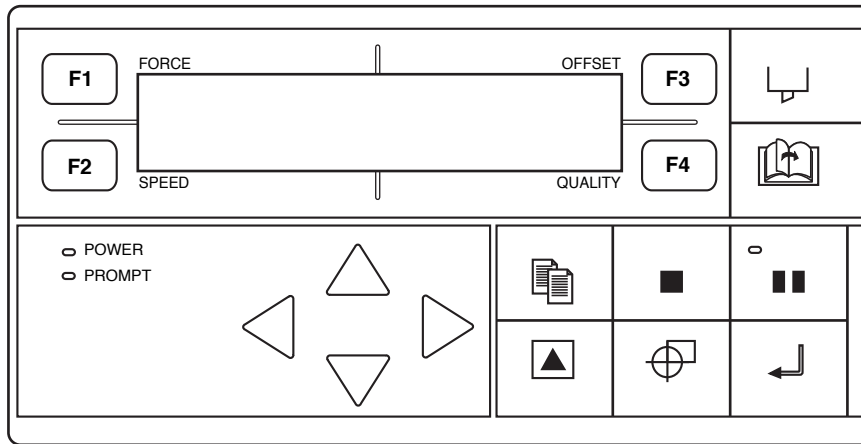
- The vacuum pump itself is an option. It is not provided with the VC models.
- Make sure that the vacuum pump used with a VC model is affixed with either a label showing compliance with the relevant safety standard or with the CE marking.

## 1.3 Plotter Nomenclature

- (1) Tool carriage ..... Drives the cutter pen/pen/creasing tool to the forward/backward.
- (2) Tool holder ..... Holds the cutter pen/pen/creasing tool and drives it up/down.
- (3) Pen station ..... Holds a pen.
- (4) Y bar ..... Holds the tool carriage; moves left/right.
- (5) Writing panel ..... Cutting/plotting/creasing is performed here.
- (6) Control panel ..... Used to set and use the plotter's various functions.
- (7) USB interface connector  
..... Used to connect the plotter to a computer via the USB interface.
- (8) RS-232C interface connector  
..... Used to connect the plotter to a computer via the RS-232C interface.
- (9) AC line inlet ..... Connect one end of the power cable here and the other end to an electrical socket.
- (10) Power switch ..... Controls the on/off status of the power supply to the plotter.
- (11) CHART HOLD key .. Used to hold the medium (FC4500-50 only).
- (12) Pen-sensing rubber strip  
..... Judgment of whether or not a pen is mounted is performed on this strip (FC4500-50/60 only).



## 1.4 Control Panel



### Indicator Lamps

- **POWER** ..... The POWER lamp remains lit (green) while the plotter is on.
- **PROMPT** ..... The PROMPT lamp lights (red) when the plotter receives data that will cause the pen carriage to move outside the effective cutting area or receives the Prompt Light command (T) from the computer.

CHART HOLD



(FC4500-50 only)

..... Press the **[CHART HOLD]** key to enable the electrostatic adhesion function (the key's lamp lights). Press it again to cancel the electrostatic adhesion function (the lamp goes off).

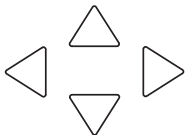
### Panel Keys



..... **[FUNCTION] keys**

Depending on the setting screen being displayed, these keys are used to:

- Load a group of cutting conditions retained in the plotter's memory;
- Shift the blinking display in a conditions setting screen;
- Select the desired submenu in a menu screen.



..... **[POSITION] keys**

Depending on the plotter's operating status, these keys are used to:

- Move the tool carriage;
- Move the blinking display in a conditions setting screen; (**[<]** and **[>]** keys)
- Raise or lower the numeric value of a setting; (**[Δ]** and **[∇]** keys)
- Change the pen type. (**[<]** and **[>]** keys)
- Press the **[Δ]** key and the **[ENTER]** key concurrently to move the tool carriage to the upper right position. To move the tool carriage to the origin position, press the **[∇]** key and the **[ENTER]** key concurrently.



..... **[PAUSE] key**

Press the **[PAUSE]** key to select PAUSE mode (its green lamp lights).

Press it again to cancel PAUSE mode (the lamp goes off).

Depending on the plotter's operating status, this key is used to:

- Temporarily suspend a cutting or plotting operation.
- Set functions at the control panel.
- Temporarily store data received from the computer in the plotter's buffer.



..... **[ENTER] key**

After setting a function or condition at the control panel, press the **[ENTER] key** to register your setting.

To reset the plotter, concurrently press the **[ENTER]** and **[ORIGIN] keys**. (Key reset function)



..... **[ORIGIN] key**

Used to move the origin point.

Press this key to initiate the respective function when "MARKS" or "AXIS" has been selected for the registration mark mode.

To reset the plotter, concurrently press the **[ENTER]** and **[ORIGIN] keys**. (Key reset function)



..... **[COPY] key**

Used to output a copy of the data in the plotter's receive buffer.



..... **[CONDITIONS] key**

Used to change the currently displayed cutting conditions.



..... **[TEST] key**

Runs a cutting test to check whether the currently selected cutting conditions are compatible with the medium loaded.



..... **[NEXT] key**

Used to select the desired menu screen for setting a function at the control panel when the plotter is in PAUSE mode.



..... **[STOP/VIEW] key**

During a cutting/plotting/creasing operation, press this key to immediately stop cutting/plotting/creasing. While the Ready message is being shown on the plotter's display panel, press this key to move the tool carriage to the outer limit of the maximum cutting/plotting area. To return the tool carriage to its original position, press this key once again.

# CHAPTER 2

---

## ***CUTTER BLADES, CUTTER PENS AND PENS***







### **PRODUCT SUMMARY**

- 2.1 Types of Cutter Blades and Their Features*
- 2.2 Cutter Pen Nomenclature*
- 2.3 Replacing the Cutter Blade*
- 2.4 Adjusting the Blade Length*
- 2.5 Pen Types and Their Features*

## 2.1 Types of Cutter Blades and Their Features

**CAUTION**

Handle cutter blades with care!

Blade shape and part no.	Blade diameter	Compatible cutter pen	Applications and Features
CB09UA 	φ 0.9 mm	PHP32-CB09N-HS PHP31-CB09-HS	Standard blade for cutting color adhesive film. Suitable for cutting media up to 0.25 mm thick. Maximum cutting distance: Approx. 4000 m.
CB15U 	φ 1.5 mm	PHP32-CB15N-HS	For cutting high-intensity reflective film.
CB15UA 	φ 1.5 mm	PHP32-CB15N-HS	For cutting media which are too thick for the CB09UA blade to handle. Suitable for cutting media from 0.25 to 0.5 mm thick.
CB15UB 	φ 1.5 mm	PHP32-CB15N-HS	For cutting small text less than 10 mm in height on color adhesive film.
CB15U-K30 	φ 1.5 mm	PHP32-CB15N-HS	For thick media. The sharply angled tip provides a longer cutting edge. Suitable for cutting media from 0.5 to 1.5 mm thick.
CB15U-K20-SP 	φ 1.5 mm	PHP31-CB15B-HS	For cutting sandblast rubber.

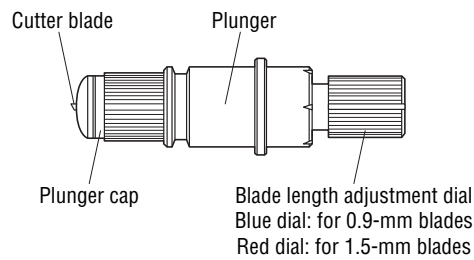
## 2.2 Cutter Pen Nomenclature

### **CAUTION**

When handling cutter blades, be careful to avoid cutting your fingers or other parts of your body.

With this plotter, the cutter blade is mounted into its corresponding cutter plunger for use. There are two types of cutter plungers available, which vary according to the diameter of the blade to be mounted (the  $\phi$ 1.5-mm cutter plunger is provided as a standard accessory). Be sure to mount the cutter blade in a cutter plunger that is compatible with the diameter of the cutter blade.

#### PHP32-CB15N-HS



### **CHECKPOINT**

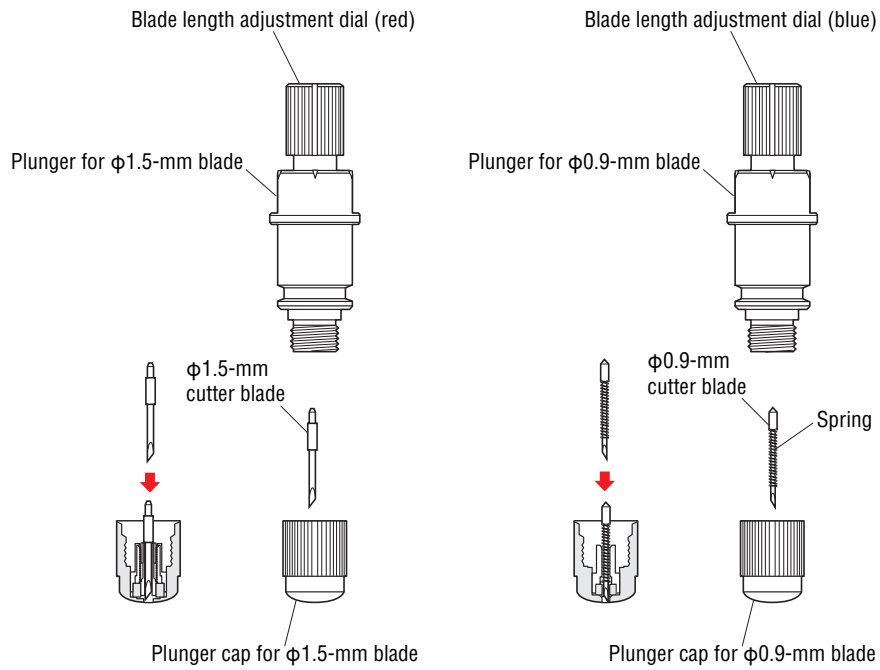
Only the PHP31-CB09-HS cutter pen can be mounted in the FC4500-50/60 tool holder 2. Please see the user's manual provided with the PHP31-CB09-HS cutter pen for a description of the cutter pen itself.



## 2.3 Replacing the Cutter Blade

**CAUTION**

Handle cutter blades with care!



- (1) Turn the blade length adjustment dial to retract the blade inside the plunger.
- (2) Turn the plunger cap in the counter-clockwise direction to unscrew it from the plunger.
- (3) Remove the blade inside the plunger cap.
- (4) Take a new blade and insert it into the opening in the plunger cap.
- (5) With the blade inserted into the plunger cap, attach the plunger from above.

## 2.4 Adjusting the Blade Length

### ⚠ CAUTION

Be sure to correctly adjust the blade length. If the blade length is too long for the thickness of the medium being used, you may damage the writing panel and/or the cutter blade.

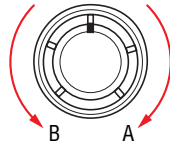
### Adjusting the Blade Length

(1) The blade length is adjusted by turning the blade adjustment knob (blue, red, green or silver).

- To extend the cutter blade, turn the knob in the A direction.
- To retract the cutter blade, turn the knob in the B direction.

Use the scale on the plunger cap to determine how far to move the cutter blade.

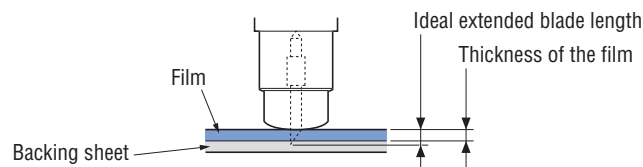
- When the knob is turned the distance of one scale unit, the cutter blade moves 0.1 mm.
- When it is given one full turn, the cutter blade moves 0.5 mm.



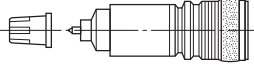
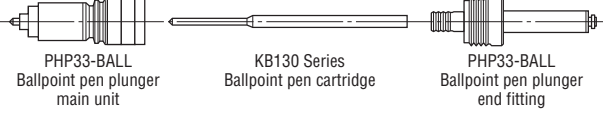
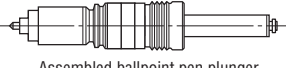

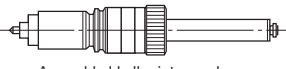
(2) Align the cutter blade tip with the tip of the cutter pen, and then extend the cutter blade tip to suit the thickness of the medium being used.

### Obtaining the Correct Blade Length

(1) Gradually increase the blade length to suit the thickness of the medium being used. The ideal blade length is a length that is slightly less than the combined thickness of the film and its backing sheet, but greater than the thickness of the film itself. Adjust the blade length so that only traces of the blade appear on the backing sheet when a cutting test is performed. If the blade cuts right through the backing sheet, decrease the blade length. If the blade does not cut the film cleanly, increase the blade length.



## 2.5 Pen Types and Their Features

Pen types	Pen features
<p><b>Water based fiber-tip pens (KF550 Series)</b></p>  <p>Recommended media: coated paper, measurement paper</p>	<ul style="list-style-type: none"> <li>• 8 colors are available</li> <li>• Line width ranges from 0.3 to 0.7 mm</li> <li>• Easier to handle than other pen types</li> <li>• Maximum plotting distance: approx. 1000 m</li> </ul>
<p><b>Oil-based ballpoint pens (KB130 Series)</b></p>  <p>PHP33-BALL Ballpoint pen plunger main unit      KB130 Series Ballpoint pen cartridge      PHP33-BALL Ballpoint pen plunger end fitting</p>  <p>Assembled ballpoint pen plunger</p> <p>Recommended media: coated (glossy) paper</p>  <p>PHP32-BALL Ballpoint pen plunger main unit      KB130 Series Ballpoint pen cartridge      PHP32-BALL Ballpoint pen plunger end fitting</p>  <p>Assembled ballpoint pen plunger</p> <p>Recommended media: coated (glossy) paper</p>	<ul style="list-style-type: none"> <li>• Suitable for plotting detailed text and images.</li> <li>• The tip will dry up if the pen is left unused for a long period of time. Check that the ink is flowing well before using the pen.</li> <li>• The maximum pen speed is 64 cm/s (40 cm/s when using an FC4500/4510 cutting plotter).</li> <li>• A ballpoint pen plunger is required (PHP33-BALL/PHP32-BALL)</li> <li>• Consistent line width (0.2 to 0.3 mm)</li> </ul> <p><b>Assembling the pen</b></p> <ol style="list-style-type: none"> <li>1. Insert the KB130 series ballpoint pen cartridge into the PHP33-BALL or PHP32-BALL plunger main unit, and then screw on the plunger end fitting.</li> <li>2. If the pen is left unused for a long period of time, the pen tip will dry out. Test the pen on some scrap paper to check that the ink is flowing well before using it in the plotter.</li> </ol> <p><b>Usage precautions</b></p> <p>The ballpoint pen's inherent characteristics may cause scratchy plotted lines. Please follow the guidelines below.</p> <ol style="list-style-type: none"> <li>1. Use coated (glossy) paper only. Scratching occurs more easily on tracing paper or polyester film.</li> <li>2. If scratching does occur, reduce the plotting speed to around 20 cm/s.</li> <li>3. Avoid replotting over the same line. Paper fibers may become caught in the pen tip and cause scratchy plotting.</li> <li>4. Use only KB130 series ballpoint pens.</li> <li>5. Clean out the plunger regularly. Dust or dirt will affect the up/down movement of the pen, and adversely affect the plotted results.</li> </ol>

# CHAPTER 3

---

## ***PREPARATIONS FOR CUTTING/PLOTTING***

### **PRODUCT SUMMARY**

- 3.1 Basic Operational Flow*
- 3.2 Connecting to a Computer*
- 3.3 Mounting the Tools*
- 3.4 Turning on the Plotter and Initialization*
- 3.5 Loading the Medium*
- 3.6 Attaching the origin point alignment guides*
- 3.7 Setting the Cutting Conditions  
(Setting Conditions)*
- 3.8 Running a Cutting Test*
- 3.9 Achieving Optimum Cutting Results*
- 3.10 Setting the Cutting Origin*
- 3.11 Using the Copy Function*
- 3.12 Using the Hold Function*

## 3.1 Basic Operational Flow

For smooth operation, please follow the steps outlined below and make the appropriate settings explained in the relevant sections.

- (1) Before turning on the power supply, make sure that the plotter is connected to your computer and to any other peripheral devices as required.  
→ 3.2 Connecting to a Compute
- (2) Mount a cutter pen and a plotting pen.  
→ 3.3 Mounting the Tools

---

 **CAUTION**

The cutter pen tip is very sharp. Before handling a cutter pen, be sure to read the sections 'To Ensure Safe and Correct Use' and 'Precautions on the Handling of Cutter Pens' at the front of this manual.

---

- (3) Turn on the power supply to the plotter and the peripheral devices.  
→ 3.4 Turning on the Power and Initialization

---

 **CAUTION**

The moment you turn on the power, the plotter's Y bar and tool carriage will start to move. Do not put your hands or place any objects on the writing panel. Such actions are dangerous.

---

- (4) Load the medium.  
→ 3.5 Loading the Medium
- (5) Make the following settings at your computer and the plotter.  
→ 3.7 Setting the Cutting Conditions  
→ 3.8 Running a Cutting Test  
→ 5.4 Setting the Transmission Conditions  
→ 5.5 Setting the Data Format to be Received

- (6) Send the cutting data from your computer to the plotter to start the cutting operation.

---

 **CAUTION**

The Y bar and tool carriage will start to move as soon as data is sent from the computer, or shortly thereafter. Do not put your hands or place any objects on the writing panel. Such actions are dangerous.

---

## 3.2 Connecting to your Computer

Either the USB or the RS-232C interface may be used to connect the plotter to your computer. Select which interface to use according to the requirements of your application software and/or which of your computer's interface ports are available for use.

Use a USB cable or an RS-232C cable in accordance with the interface chosen. Obtain a Graphtec-approved interface cable that is compatible with your computer.

### USB connection

To use the USB interface, A USB driver must be installed in your computer. Please refer to the CD-ROM provided with your plotter for instructions on how to install the USB driver.

### Applicable operating systems

- Windows 2000 Professional, Windows XP, Windows Vista

**Note: Windows 3.1/95/Me and Windows NT are not supported.**

**Note: 64bit OS is not supported.**

Operation cannot be guaranteed in the following cases:

- When connection has been made to a USB hub or an add-on USB board
- When you are using a custom-built computer or one that you have modified
- When a driver other than the one provided was used

Be sure to observe the following:

- Do not connect or disconnect the USB cable while you are installing the USB driver
- Do not connect or disconnect the USB cable while starting up the computer or the plotter
- Do not disconnect the USB cable within a 5-second period of connecting it
- Do not connect or disconnect the USB cable while data is being transferred
- Do not connect multiple plotters to a single computer

### RS-232C connection

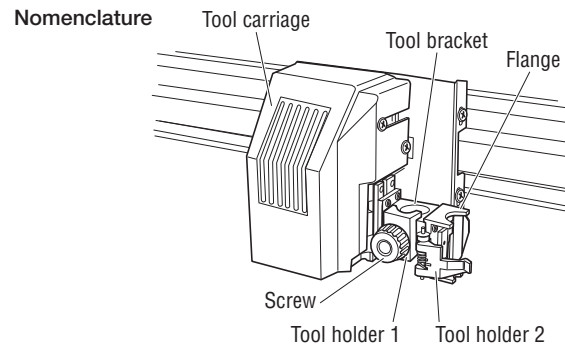
Set the transmission conditions and format for receiving data when you use the RS-232C interface to connect the plotter to your computer. (Please see Sections 5.4, "Setting the Communication Conditions" and 5.5 "Setting the Data Format to be Received" for further details.)

## 3.3 Mounting the Tools

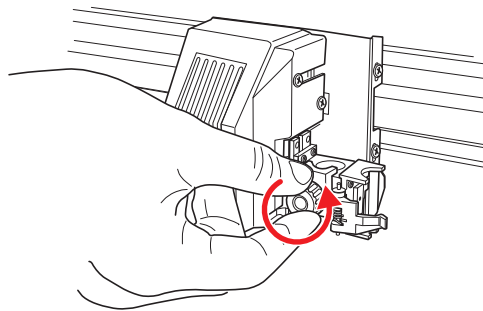
*If your plotter is the FC4500-50 or FC4500-60 model*

### Mounting a plotting pen in the tool carriage

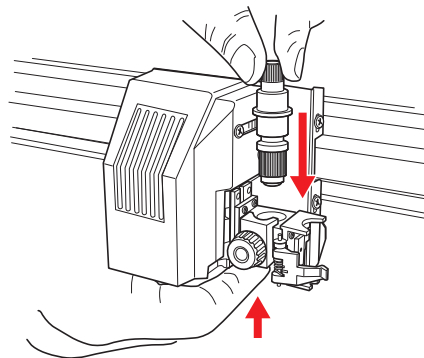
When mounting a cutter pen in the plotter, push the pen all the way into the tool holder until it contacts the upper part of the tool holder as shown in the figure below and then tighten the screw firmly to hold it in place.



- (1) Loosen the tool holder screw sufficiently to enable a cutter pen to be inserted up to its flange.



- (2) While pushing the tool holder in the upward direction, push the cutter pen all the way into the holder until it contacts the upper part of the tool holder.



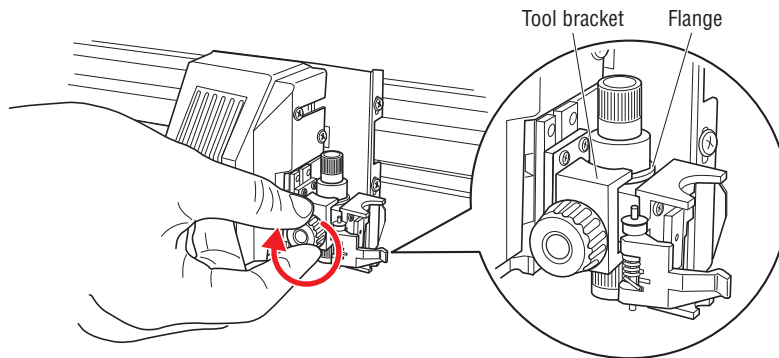
---

**CAUTION**

When you push the tool holder up with your fingers, take care not to touch the cutter blade.

---

- (3) Make sure that tool bracket is engaged on the cutter pen's flange, and then tighten the screw.



**CHECKPOINT**

Make sure that the upper part of the tool bracket is engaged on the cutter pen's flange before tightening the screw.

**Mounting a plotting pen in the pen station**

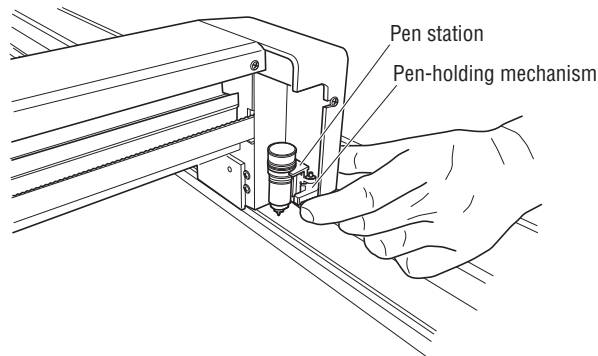
When a plotting pen has been mounted in your plotter's pen station, a plotting pen and a cutter pen can be used at the same time.

Follow the procedure below to mount a plotting pen in the pen station. Take care not to touch the pen when the power is turned on or while the plotter is operating. Such actions are dangerous.

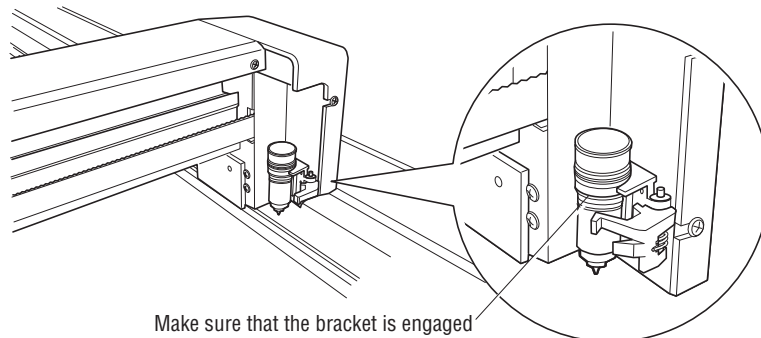
**CAUTION**

If you wish to mount a cutter pen instead of a plotting pen in the pen station, use the PHP31-CB09-HS cutter plunger and the CB09UA-5 blade that are sold separately.

- (1) Use your fingers to open the pen-holding mechanism on the pen station, and then mount a pen.



- (2) Close the pen-holding mechanism on the pen station to hold the pen in place.



**CHECKPOINT**

Make sure that the upper part of the pen station bracket is engaged in the upper groove of the pen.



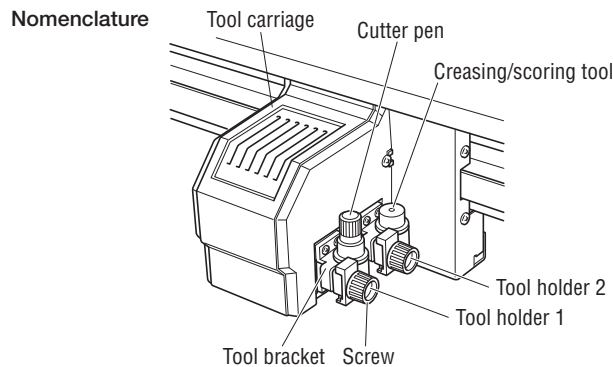
### If your plotter is the FC4510-60 model

When mounting a cutter pen or creasing/scoring tool in the plotter, push the pen or tool all the way into the tool holder until it contacts the upper part of the holder as shown in the figure below and then tighten the screw firmly to hold it in place.

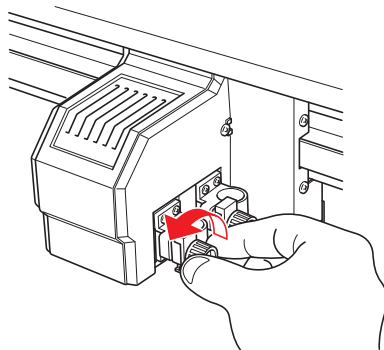
Take care not to touch the pen or tool tip when the power is turned on or while the plotter is operating. Such actions are dangerous.

Be sure to mount the creasing/scoring tool in tool holder 2 on the Y bar.

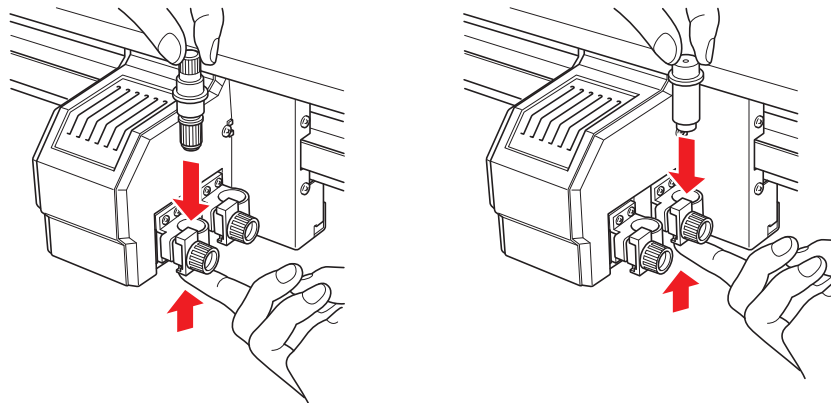
#### **Mounting a plotting pen in the tool carriage**



- (1) Loosen the tool holder screw sufficiently to enable a cutter pen or creasing/scoring tool to be inserted up to its flange.



- (2) While pushing the tool holder in the upward direction, push the cutter pen or creasing/scoring tool all the way into the holder until it contacts the upper part of the tool holder.



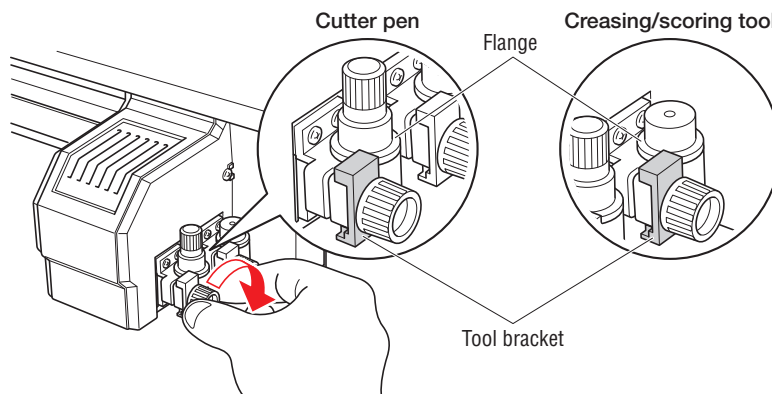
---

**CAUTION**

When you push the tool holder up with your fingers, take care not to touch the cutter blade.

---

- (3) Make sure that tool bracket is engaged on the cutter pen or creasing/scoring tool's flange, and then tighten the screw.



---

**CHECKPOINT** 

Make sure that the upper part of the tool bracket is engaged on the cutter pen's flange as shown in Step 3 before tightening the screw.

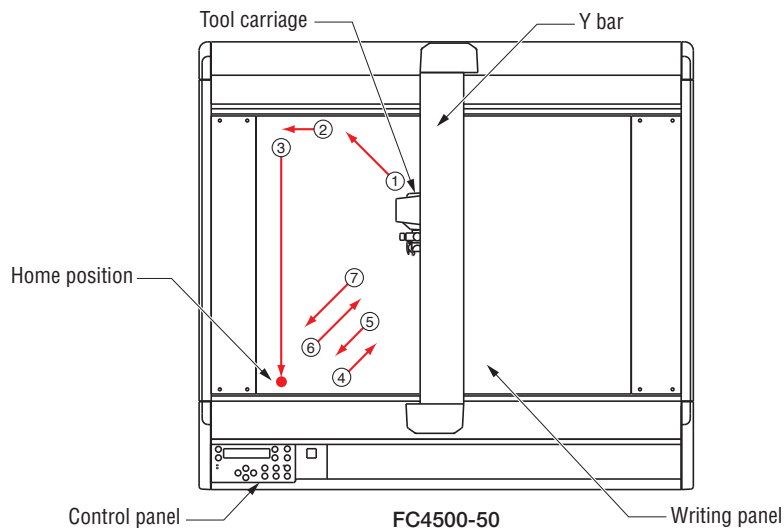
---

## 3.4 Turning on the Plotter and Initialization

### ⚠ CAUTION

The moment you turn on the power, the plotter's Y bar and tool carriage will start to move. Do not put your hands or other objects on the writing panel. Such actions are dangerous.

- (1) Make sure the power is turned off.
- (2) Securely plug the connector end of the power cord into the plotter's power inlet.
- (3) Securely plug the other end of the power cord into an electrical outlet of the specified voltage.
- (4) Turn on the power.
- (5) The green power lamp on the control panel will light, and the Y bar and tool carriage will start to move as shown in the figure below. These operations are part of the initialization process.  
The figure below shows what the plotter does when the power is turned on. The tool carriage returns to the Home position, and then moves back and forth twice at a 45° angle from the origin point to determine the friction coefficient of the plotter mechanisms.





- (6) When the initialization process is complete, the plotter is ready to begin plotting or cutting.

## 3.5 Loading the Medium

### CHECKPOINT

- If air gets in between the writing panel and the medium during loading, force out the air and ensure that the medium is securely attached to the writing panel before cutting.
- When loading a medium that doesn't come with a backing sheet, spread a vinyl backing sheet or something similar on the panel before cutting.
- When loading a medium that cannot be securely attached using the normal hold-down method, reinforce adhesion by using tape on all four sides.
- Common spray glue is often used for this purpose. However, since the spray glue remover contains an anti-static agent, do not use it directly on the writing panel of models which feature electrostatic media hold-down.
- The blade length (b) should be greater than the thickness of the medium (a), but should be less than the combined thickness of the medium and its backing sheet (c). (See Section 4.8, "Setting the Registration Mark Detection Judgment Level".)
- In the case of the FC4500-50/60 models, ensure that the medium does not cover the pen-sensing rubber strip.

- (1) To facilitate the loading of a medium, move the tool carriage to the upper-right position. Press the  [STOP/VIEW] key to move the tool carriage to the upper-right position. When the medium has been loaded, press the  [STOP/VIEW] key once again to return the tool carriage to its original position.

### If your plotter is the FC4500-50 model

- (2) Place the medium on the writing panel.
- (3) Press the [CHART HOLD] key that is located next to the control panel.
- (4) The green [CHART HOLD] key lamp lights to indicate that the medium is being held by electrostatic adhesion. If there is any air trapped between the medium and the writing panel, force it out.

### CHECKPOINT

Press the [CHART HOLD] key again to release the electrostatic adhesion and extinguish the green lamp. After the medium has been held for a while by electrostatic adhesion, it may become charged with static electricity and therefore be harder to remove from the writing panel. There is nothing abnormal about this phenomenon.

### If your plotter is the FC4500-60 or FC4510-60 model

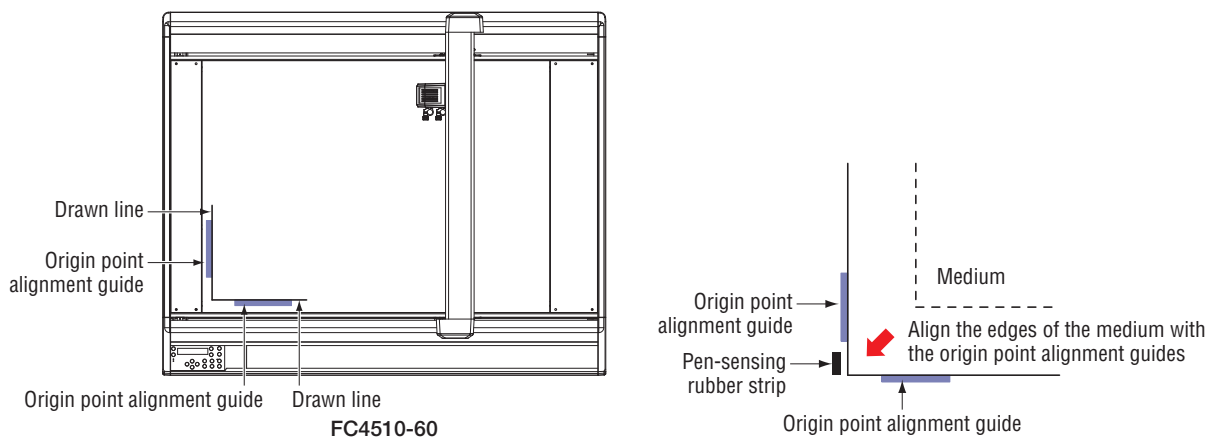
- (2) Place the medium on the writing panel.
- (3) Use tape or a similar means to secure the edges of the medium. Be sure to select areas that are outside the cutting/plotting area.

### CAUTION

If an edge of the loaded medium comes loose, secure it with drafting tape or a similar means. The cutter blade tip or pen tip will be damaged if it gets caught on a loose edge of the medium.

## 3.6 Attaching the origin point alignment guides

Two origin point alignment guides (strips of black tape) are provided as standard accessories with your plotter. Affix these guides to the L-shaped origin point guidelines drawn by your plotter at the lower left of the writing panel. Aligning the edges of the medium with these guides facilitates media loading.

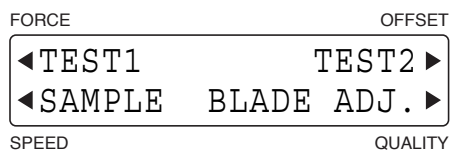


**CAUTION**  
Do not use a cutter pen to draw the lines.

### CHECKPOINT

- The L-shape can only be used for the lower-left origin position. (Do not use it for the HP-GL center origin position.)
- If you will be using your plotter for a perf cut (cut thru) application, be sure to paste the adhesive mat to the writing panel before starting your cutting operation. Please see Section 3.5, "Loading the Medium" for further details.
- The lines will be drawn at the standard lower-left origin position. If you wish to change the position. Please see Section 3.10 "Setting the Cutting Origin" for further details.
- When affixing the guides to the FC4500-50 or FC4500-60 plotter, make sure that they do not touch the pen-sensing rubber strip (the rectangular rubber strip near the origin point).
- This function does not guarantee the position alignment precision.

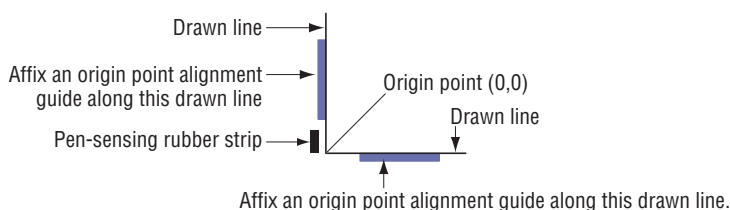
- (1) Mount a plotting pen in the selected tool holder.
- (2) Press the [TEST] key to display the following menu.



- (3) Press the [NEXT] key repeatedly until the following screen is displayed.



- (4) Press the [F1] key (ORIGIN GUIDE) to draw two 250-mm lines that form an L-shape at the standard lower-left origin position. (If the lines are faint, press the [F1] key once again to draw the lines again.)
- (5) Affix the origin point alignment guides along the drawn lines.



- (6) Press the [PAUSE] key to cancel PAUSE mode.

## 3.7 Setting the Cutting Conditions (Setting Conditions)

This plotter lets you register eight different groups of cutting conditions in the plotter's memory. The cutting conditions stored in memory are referred to as setting conditions. Specify each group of setting conditions to match a particular media type.

The setting conditions can also be freely changed as required. Use the **[F1]** through **[F4]** keys on the control panel to move through the eight groups of setting conditions that are stored in memory until you locate the one that is suitable for the media type you will be using. Two groups of setting conditions are assigned to each of the four keys, and each of the eight groups is labeled with a CONDITION (COND) number to enable easy identification.

### CHECKPOINT

Set the cutting conditions after you have performed tool number assignment. Please see Section 5.9, "Assigning Tool Numbers" for further details.

In this section, we will describe the setting procedures for the cutting force (pen force, creasing force), speed, cutter blade type/offset, creaser, quality, Thick Mode and the perforation length.

- Cutting force (pen force, creasing force): **FORCE**
- Speed: **SPEED**
- Cutter blade type/offset: **OFFSET**
- Creaser
- Quality: **QUALITY**
- Setting the thick mode
- Setting the perforation length

With the plotter in Ready status, press the **[F1]** through **[F4]** key corresponding to the setting condition number for which you wish to make settings.

Setting condition numbers 1 and 5 are assigned to **[F1]**, 2 and 6 to **[F2]**, 3 and 7 to **[F3]**, and 4 and 8 to **[F4]**.

For example, if the **[F1]** key is pressed when COND 1 has been selected, the display changes to COND 5. If a condition number other than 1 was selected, COND 1 will be displayed when the **[F1]** key is pressed. In the same way, press **[F2]** to select COND 2 and 6, **[F3]** to select COND 3 and 7, and **[F4]** to select COND 4 and 8.

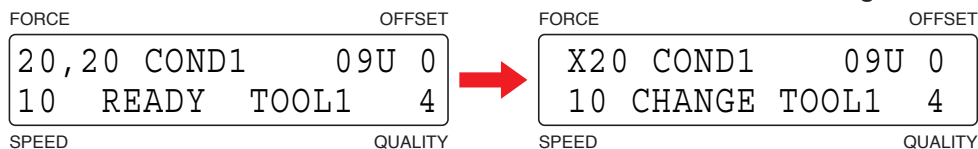
### CHECKPOINT

When you wish to set different cutting forces for the X and Y directions, select **ENABLED** for the **SWITCHING XY FORCE** setting. (See Section 5.28, "Special Functions".)

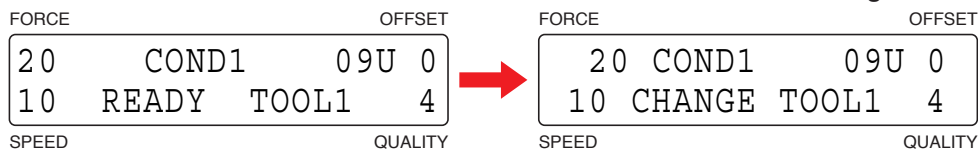
- (1) Press the  **[CONDITIONS]** key.

The lower row of the display changes from "READY TOOL 1" to "CHANGE TOOL 1". (The display will differ according to the setting conditions that have been made.)

<When **ENABLED** has been selected for the **SWITCHING XY FORCE** setting >

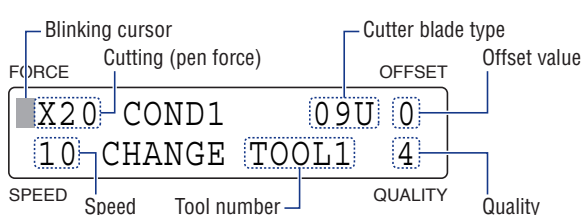


<When **DISABLED** has been selected for the **SWITCHING XY FORCE** setting >

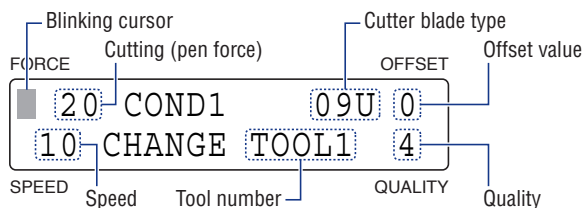


- (2) The setting condition parameters are displayed as shown below.

<When **ENABLED** has been selected for the **SWITCHING XY FORCE** setting >



<When DISABLED has been selected for the SWITCHING XY FORCE setting>



The values that can be set for each parameter are shown in the following tables.

<FC4500-50/60>

Parameter	Value that can be set	Remarks														
Cutting force (FORCE)	Tool holder 1: 1 to 48 Tool holder 2: 1 to 30	48 steps 30 steps														
Cutter blade type/offset (OFFSET)	<Tool holder 1> <table border="1"> <thead> <tr> <th>Cutter blade type</th> <th>Offset</th> </tr> </thead> <tbody> <tr> <td>09U, 15U, 15UK30, 15UK20, 15UB</td> <td>-5 to +5 (*1)</td> </tr> <tr> <td>OTHER</td> <td>1 to 99</td> </tr> <tr> <td>CP001 (Creaser), PEN</td> <td>-</td> </tr> </tbody> </table> <Tool holder 2> <table border="1"> <thead> <tr> <th>Cutter blade type</th> <th>Offset</th> </tr> </thead> <tbody> <tr> <td>09U</td> <td>-5 to +5 (*1)</td> </tr> <tr> <td>PEN</td> <td>-</td> </tr> </tbody> </table>	Cutter blade type	Offset	09U, 15U, 15UK30, 15UK20, 15UB	-5 to +5 (*1)	OTHER	1 to 99	CP001 (Creaser), PEN	-	Cutter blade type	Offset	09U	-5 to +5 (*1)	PEN	-	(*1) Choose 0 for automatic setting of the optimum offset for the selected blade type.
Cutter blade type	Offset															
09U, 15U, 15UK30, 15UK20, 15UB	-5 to +5 (*1)															
OTHER	1 to 99															
CP001 (Creaser), PEN	-															
Cutter blade type	Offset															
09U	-5 to +5 (*1)															
PEN	-															
Speed (SPEED)	Tool holder 1: 1 to 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75 Tool holder 2: 1 to 10, 15, 20, 25, 30	Unit: cm/s														
Quality (QUALITY)	Tool holder 1: 1 to 10 Tool holder 2: 1 to 6	The lower the number, the higher the cutting quality.														
Tool No.	1, 2	Please see Section 5.9, "Assigning Tool Numbers".														

<FC4510-60>

Parameter	Value that can be set	Remarks								
Cutting force (FORCE)	Tool holder 1: 1 to 48 Tool holder 2: 1 to 48	48 steps 48 steps								
Cutter blade type/offset (OFFSET)	<table border="1"> <thead> <tr> <th>Cutter blade type</th> <th>Offset</th> </tr> </thead> <tbody> <tr> <td>09U, 15U, 15UK30, 15UK20, 15UB</td> <td>-5 to +5 (*1)</td> </tr> <tr> <td>OTHER</td> <td>1 to 99</td> </tr> <tr> <td>CP001 (Creaser), PEN</td> <td>-</td> </tr> </tbody> </table>	Cutter blade type	Offset	09U, 15U, 15UK30, 15UK20, 15UB	-5 to +5 (*1)	OTHER	1 to 99	CP001 (Creaser), PEN	-	(*1) Choose 0 for automatic setting of the optimum offset for the selected blade type.
Cutter blade type	Offset									
09U, 15U, 15UK30, 15UK20, 15UB	-5 to +5 (*1)									
OTHER	1 to 99									
CP001 (Creaser), PEN	-									
Speed (SPEED)	1 to 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75	Unit: cm/s								
Quality (QUALITY)	1 to 10	The lower the number, the higher the cutting quality.								
Tool No.	1, 2	Please see Section 5.9, "Assigning Tool Numbers".								

- (3) Press a key from [F1] to [F4] to move the blinking cursor to the parameter that you wish to set.
- (4) Change the setting value of the parameter that you wish to set.
- (5) Press the [ENTER] key to register the setting conditions in the plotter's internal memory. To cancel your settings, press the [NEXT] key.
- (6) Press the [TEST] key to perform test cutting. Make any adjustments required by changing the settings to suit the media type and thickness.

**CHECKPOINT**

If your plotter is the FC4500-50 or FC4500-60 model and the cutter pen mounted in tool holder 2 is used to perform cutting, the type of medium that is being cut may cause the cutter pen to drop down during the cutting operation. If this happens, lower the cutting force setting.


## Setting the Cutting Force (Pen Force, Creaser Force) [FORCE]

This setting determines the cutting force for a cutting operation, the pen force for a plotting operation and the creasing force for a creasing operation. Please see Section 3.9, "Media and Cutting Conditions" for further details on the setting values.

### CHECKPOINT

- When cutting card, cardboard or similar media the cutting force that will be required changes according to the cutting direction.
- When you wish to set different cutting forces for the X and Y directions, select ENABLED for the SWITCHING XY FORCE setting. (See Section 5.28, "Special Functions".)

#### <When ENABLED has been selected for the SWITCHING XY FORCE setting>

- (1) With the plotter in Ready status, press a key from [F1] to [F4] to select the COND No. that you wish to change.
- (2) Press the  [CONDITIONS] key to display the following screen. (The display will differ according to the setting conditions that have been made.)

FORCE	OFFSET
X23 COND1 09U 0	
30 CHANGE TOOL1 4	
SPEED	QUALITY

- (3) Press the [F1] key to move the blinking cursor to the FORCE parameter.

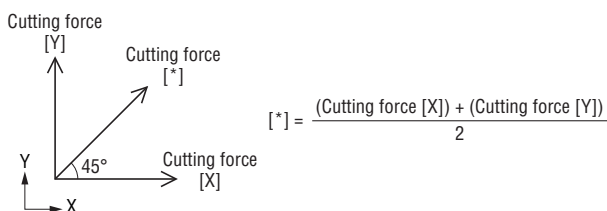
FORCE	OFFSET
X23 COND1 09U 0	
30 CHANGE TOOL1 4	
SPEED	QUALITY

- (4) Use the [◀] or [▶] key to toggle between X and Y (but not when "PEN" has been selected for the cutter blade type). When the direction that you wish to set the value for is displayed, use the [△] or [▽] key to change the value.

**Setting range (for both X and Y) for the FC4500-50/60 models: Tool holder 1: 1 to 48, Tool holder 2: 1 to 30**


**Setting range (for both X and Y) for the FC4510-60 model: Tool holder 1: 1 to 48, Tool holder 2: 1 to 48**

If different values have been set for X and Y, the cutting force in the diagonal direction will be a value between the X and Y values, and will vary according to the angle.



- (5) When the displayed settings are correct, press the  [ENTER] key. To cancel your settings, press the  [NEXT] key.

#### <When DISABLED has been selected for the SWITCHING XY FORCE setting>

- (1) With the plotter in Ready status, press a key from [F1] to [F4] to select the COND No. that you wish to change.
- (2) Press the  [CONDITIONS] key to display the following screen. (The display will differ according to the setting conditions that have been made.)

FORCE	OFFSET
23 COND1 09U 0	
30 CHANGE TOOL1 4	
SPEED	QUALITY



- (3) Press the **[F1]** key to move the blinking cursor to the FORCE parameter.

FORCE	OFFSET
█ 23 COND1	09U 0
30 CHANGE TOOL1	4
SPEED	QUALITY

- (4) Use the **[Δ]** or **[▽]** key to change the value.

**Setting range for the FC4500-50/60 models: Tool holder 1: 1 to 48, Tool holder 2: 1 to 30**

**Setting range for the FC4510-60 model: Tool holder 1: 1 to 48, Tool holder 2: 1 to 48**

- (5) When the displayed settings are correct, press the **[↵]** **[ENTER]** key. To cancel your settings, press the **[NEXT]** key.

### Setting the Speed [SPEED]

This setting determines the tool speed for a plotting operation. Please see Section 3.9, "Media and Cutting Conditions" for further details on the setting values.

- (1) With the plotter in Ready status, press a key from **[F1]** to **[F4]** to select the COND No. that you wish to change.

- (2) Press the **[CONDITIONS]** key to display the following screen. (The display will differ according to the setting conditions that have been made.)

FORCE	OFFSET
█ X23 COND1	09U 0
30 CHANGE TOOL1	4
SPEED	QUALITY

- (3) Press the **[F2]** key to move the blinking cursor to the SPEED parameter.

FORCE	OFFSET
X20 COND1	09U 0
█ 30 CHANGE TOOL1	4
SPEED	QUALITY

- (4) Use the **[Δ]** or **[▽]** key to change the value.

**<FC4500-50/60>**

**[Tool holder 1] setting range: 1 to 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75 (cm/s)**

**[Tool holder 2] setting range: 1 to 10, 15, 20, 25, 30 (cm/s)**

**<FC4510-60>**

**Setting range: 1 to 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75 (cm/s)**

- (5) When the displayed settings are correct, press the **[↵]** **[ENTER]** key. To cancel your settings, press the **[NEXT]** key.


### Setting the Cutter Blade Type and Offset [OFFSET]

This setting enables you to select the type of cutter blade (pen, creasing tool) that you plan to use and then determines the required amount of offset if you selected a cutter blade. Your plotter comes with a preset offset value for each cutter blade type, and therefore the appropriate offset value is set automatically when you select a blade name (09U, 15U, etc.). Further fine adjustment of the offset can also be performed if required.

#### **CHECKPOINT**


**Offset is the value that is used to compensate for the difference in position between the tip of the cutter blade mounted in the cutter plunger and the center point of the cutter pen.**

- (1) With the plotter in Ready status, press a key from **[F1]** to **[F4]** to select the COND No. that you wish to change.

- (2) Press the  **[CONDITIONS]** key to display the following screen. (The display will differ according to the setting conditions that have been made.)

FORCE	OFFSET
X23 COND1	09U 0
30 CHANGE TOOL1	4
SPEED	QUALITY


- (3) Press the **[F3]** key to move the blinking cursor to the OFFSET parameter.

FORCE	OFFSET
X20 COND1	09U 0 
30 CHANGE TOOL1	4
SPEED	QUALITY

- (4) Use the **[<]** or **[>]** key to cycle through the setting parameters. Select the desired cutter blade or tool.

**Parameters that can be selected: 09U, 15U, 15UK30, 15UK20, 15UB, OTHER, CP001 (pen-type creaser), PEN**

Select "OTHER" when you plan to use a cutter blade other than those registered or when a cutting operation using a thick or otherwise difficult-to-cut medium produces unsatisfactory results. Select "PEN" when you plan to use a plotting pen.

If you select "CP001" and then press the  **[ENTER]** key, the Creaser Settings screen will be displayed. If Thick Mode has been enabled, the Thick Mode Settings screen will be displayed.

- (5) When a blade name (09U, 15U) or "Other" has been selected, fine adjustment of the offset can be performed. Use the **[Δ]** or **[▽]** key to adjust the offset value.

**Setting range: Blade name: -5 to +5; Other: 1-99**


- (6) When the displayed settings are correct, press the  **[ENTER]** key. To cancel your settings, press the  **[NEXT]** key.

## Creaser Settings

The creaser settings enable you to specify the creasing mode, the spacing between creases, the number of creasing operations and the creasing start and end points.

### CHECKPOINT

Only straight lines can be creased. Curved-line data cannot be creased.

- (1) The following Creaser Settings screen is displayed when "CP001" was selected as the cutter blade type and the  **[ENTER]** key pressed.

FORCE	OFFSET
MODE1	COUNT1
SPC - . - - mm	STR0.00mm
SPEED	QUALITY

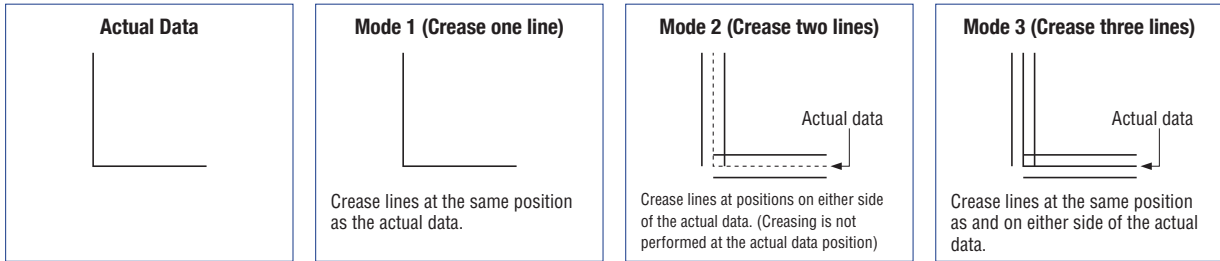
### Setting the Creasing Mode

- (2) Press the **[F2]** key to move the blinking cursor to the position shown in the following screen.

FORCE	OFFSET
MODE1	COUNT1
SPC - . - - mm	STR0.00mm
SPEED	QUALITY

- (3) The number displayed next to "MODE" is the number of the mode that is currently selected. Use the **[Δ]** or **[▽]** key to select your desired mode.

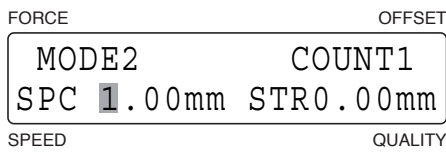
Selectable parameters: MODE 1, MODE 2, MODE 3



Modes 2 and 3 enable thick media to be bent easily.

**Setting the Spacing**

(4) Press the [F2] key to move the blinking cursor to the position shown in the following screen.

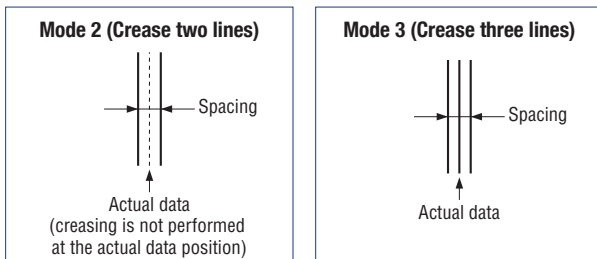


**CHECKPOINT**

The spacing parameter is only enabled for Modes 2 and 3. The blinking cursor does not move when Mode 1 has been selected.

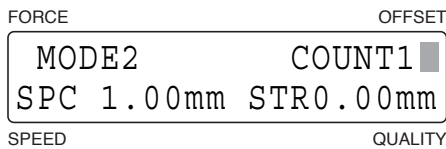
(5) Use the [◀] or [▶] key to move the position of the blinking cursor, and the [△] or [▽] key to select the value.

Setting range: 0.01 to 9.99 mm



**Setting the Number of Creasing Operations**

(6) Press the [F3] key to move the blinking cursor to the position shown in the following screen.

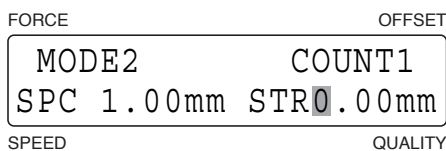


(7) This setting determines how many times creasing should be repeated for each line segment. Use the [△] or [▽] key to select the value. Increase the number if the crease is faint after one creasing operation.

Setting range: 1 to 9 (times)

**Setting the Start and End Positions**


(8) Press the [F4] key to move the blinking cursor to the position shown in the following screen.





## Setting the Quality [QUALITY]

This setting determines the quality of the cut or plotted results. Please see Section 3.9, "Media and Cutting Conditions" for further details on the setting values.

- (1) With the plotter in Ready status, press a key from [F1] to [F4] to select the COND No. that you wish to change.
- (2) Press the  [CONDITIONS] key to display the following screen. (The display will differ according to the setting conditions that have been made.)

FORCE	OFFSET
X23 COND1 09U 0	
30 CHANGE TOOL1 4	
SPEED	QUALITY

- (3) Press the [F4] key to move the blinking cursor to the QUALITY parameter.

FORCE	OFFSET
X20 COND1 09U 0	
30 CHANGE TOOL1 4	
SPEED	QUALITY

- (4) Use the [ $\Delta$ ] or [ $\nabla$ ] key to change the value.

<FC4500-50/60>

[Tool holder 1] setting range: 1 to 10 [Tool holder 2] setting range: 1 to 6

<FC4510-60>

Setting range: 1 to 10

The smaller the number, the higher the quality

- (5) When the displayed settings are correct, press the  [ENTER] key. To cancel your settings, press the  [NEXT] key.

## Thick Mode Settings

The Thick Mode is used for cutting thick media such as rubber for sandblasting masks and thick paper for garment patterns as well as hard media such as acrylic film. This setting is only enabled for the COND Nos. to which THICK mode has been assigned.

### CAUTION


Cutting the media referred to above when THICK Mode has not been selected may cause the cutter blade to break or damage the plotter.

### CHECKPOINT


- Thick Mode is not enabled when "PEN" or "CP001" has been selected as the cutter blade type.
- Please see Section 5.6, "Assigning THICK Mode" for further details.

- (1) When Thick Mode has been specified, the blinking cursor is displayed located over the Tool No. when the plotter is in Ready status.

FORCE	OFFSET
20,20 COND1 09U 0	
30 READY+ TOOL1 4	
SPEED	QUALITY

- (2) Press the  [CONDITIONS] key to display the following screen. (The display will differ according to the setting conditions that have been made.)

FORCE	OFFSET
X23 COND1 09U 0	
30 CHANGE TOOL1 4	
SPEED	QUALITY

- (3) Press the  [ENTER] key to display the Thick Mode mode selection screen (only when thick mode assignment has been performed).

FORCE	OFFSET
●MODE1 THICK MODE2	
STR.=0.0mm END=0.0mm	
SPEED	QUALITY



- (4) The active mode is indicated by the [●] mark. Press the [F1] and [F3] key to move the [●] mark between Mode 1 and Mode 2 and select the desired mode.

**Mode 1:** Perform overcutting for the cutting start and end points and for corners with acute angles to prevent uncut areas. Since the blade tip is raised up to the surface of the medium when blade rotation is large, it is not affected by thick or hard media. Compared with Mode 2, this mode supports finer cutting and cutting of thicker media.

**Mode 2 :** Perform overcutting for the cutting start and end points only. Compared with Mode 1, this mode supports faster cutting, since less cutter blade control is required.

- (5) Use the [F2] key to move the blinking cursor to the Start point parameter and the [F4] key to move it to the End point parameter. Use the [△] or [▽] key to change the value.

**Setting range: 0 to 3.0 mm**

- (6) When the displayed settings are correct, press the  [ENTER] key. The display will change to the screen for setting the perforation length. To cancel your settings, press the  [NEXT] key.

### Perforation Settings


This setting determines the cut and uncut lengths of a perforated line. This setting is only enabled for the COND Nos. to which the perforation mode has been assigned.

#### **CHECKPOINT**


- The perforation settings are disabled when "PEN", "CP001" has been selected as the cutter blade type.
- Please see Section 5.10, "Assigning Perforation Cutting" for further details.

- (1) When perforation cutting has been specified, "M" is displayed next to the Tool No. when the plotter is in Ready status.


FORCE	OFFSET
20,20 COND1 09U 0	
30 READY+ TOOL1M 4	
SPEED	QUALITY

- (2) Press the  [CONDITIONS] key to display the following screen. (The display will differ according to the setting conditions that have been made.)





FORCE	OFFSET
■X23 COND1 09U 0	
30 CHANGE TOOL1 4	
SPEED	QUALITY

- (3) Press the  [ENTER] key to display the Thick Mode mode selection screen (only when Thick Mode assignment has been performed).

FORCE	OFFSET
●MODE1 THICK MODE2	
STR.=0.0mm END=0.0mm	
SPEED	QUALITY

- (4) Press the  [ENTER] key to display the screen for setting the Perforation Mode values.

FORCE	OFFSET
C LINE PAT. UP=10	
C=00.00mm U=00.00mm	
SPEED	QUALITY

- (5) "C" represents the cut length, "U" represents the uncut length, and "UP" represents the force when the tool is in the tool-up status. Use the [] or [] key to move the blinking cursor to the parameter that you wish to change, and the [] or [] key to change the value.

**[C, U] setting range: 0 to 99.99 (mm)**

**[UP] Setting range: 0 to 48 (0 raises the tool)**

- (6) When the displayed settings are correct, press the  [ENTER] key. To cancel your settings, press the  [NEXT] key.

## 3.8 Running a Cutting Test


A cutting test is performed to check whether the specified cutting conditions are suitable for the tool and media being used. Perform the test that is appropriate for the tool that you are using.

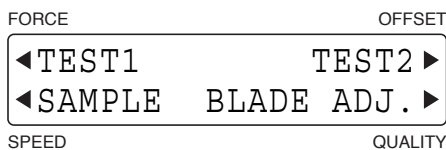
### CAUTION

The tool carriage starts moving as soon as a cutting test is selected. To avoid injury to yourself or damage to the plotter, keep your hands, face and other obstacles out of the vicinity of any moving parts.

### Cutter Pen Test

This test allows you to check the suitability of your cutting conditions before you actually begin cutting. If the medium is not cut cleanly or the corners are rounded, adjust the settings as described in Section 3.9, "Media and Cutting Conditions".

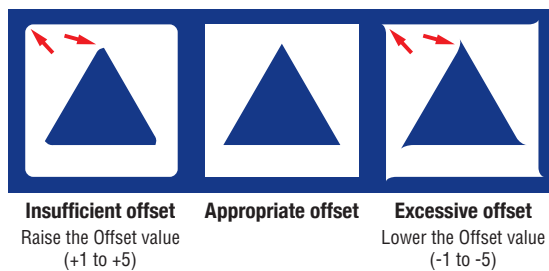
- (1) Load a medium for the cutting test.
- (2) Mount a cutter pen.
- (3) With the plotter in Ready status, press a key from [F1] to [F4] to select the COND No. for the cutting test.
- (4) Use the [◀] [▶] [△] [▽] keys to move the tool carriage (the tip of the tool selected by the current setting) to the starting position for the cutting test.
- (5) Press the  [TEST] key to display the cutting test selection screen.






- (6) Press the [F1] key (TEST1) or [F3] key (TEST2) to cut a test pattern.

**TEST1:** Press the [F1] key to cut a single test pattern.

**TEST2:** Press the [F3] key to cut three test patterns (the first triangle is cut with the specified force -1, the second triangle is cut with the specified force, and the third triangle is cut with the specified force +1).



Check the cut test pattern(s). If the corners of the triangles or the squares are rounded, the offset setting is too low. Conversely, if the corners are too pointed, the offset setting is too high.

- (7) Press the  [CONDITIONS] key and adjust your settings.
- (8) Repeat Steps (4) to (7) until you achieve the desired results.
- (9) When the results are satisfactory, press the  [ENTER] key or the  [NEXT] key.

### Creasing Tool Test

This test allows you to check the suitability of the creasing force. Check the depth of the creases and adjust the creasing force as required.

- (1) Load a medium for the creasing tool test.
- (2) Mount the creasing tool.





- (7) Press the **[F4]** key (OTHER) key.




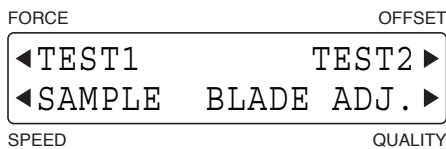
- (8) Check the condition of the cut samples.

### CHECKPOINT

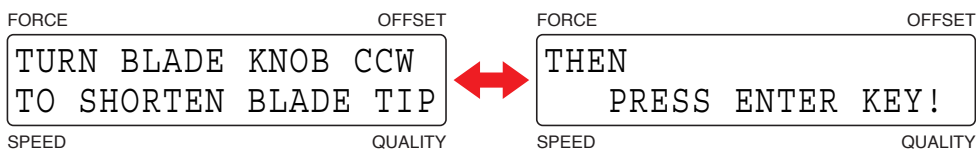
When a sample cut is performed, the command set, step size and HP-GL origin settings will change to match the data.


## Blade Length Adjustment

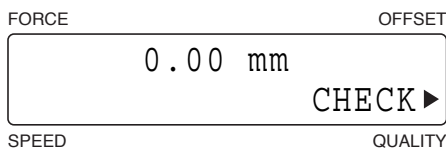
- (1) With the plotter in Ready status, press a key from **[F1]** to **[F4]** to select the COND No. for blade length adjustment.  
 (2) Press the  **[TEST]** key to display the cutting test selection screen.



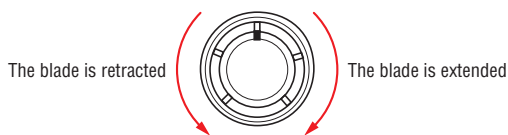
- (3) Press the **[F4]** key (BLAD ADJ.). The tool carriage will move to the blade length adjustment position, and the display will alternate between the following two screens.



- (4) After you have fully retracted the blade tip, press the  **[ENTER]** key to display the following screen.



- (5) Turn the blade length adjustment knob in the clockwise direction to extend the blade tip. Press the **[F4]** key (CHECK) to display the currently extended length of the blade. Adjust this amount to suit the thickness of the medium.



When the knob is given one full turn, the blade retracts or extends 0.5 mm.

- (6) When blade length adjustment has been completed, press the  **[ENTER]** key or the  **[NEXT]** key.

### CAUTION

- If a check is performed repeatedly at the same location, the blade tip may stick in the medium, making it difficult to obtain an accurate value.
- This parameter is not displayed when "PEN" or "CP001" has been selected as the tool.

## 3.9 Media and Cutting Conditions

### Amount of blade protrusion

Use the thickness given for each media type in the following table as a reference when setting the amount of blade protrusion (blade length). For details on how to adjust the blade length, see Section 2.4, "Adjusting the Blade Length" and the "Blade Length Adjustment" sub-section in Section 3.9, "Running a Cutting Test".

### FORCE, SPEED, QUALITY

Use the following table as a guideline to set these conditions. Please see Section 3.7, "Setting the Cutting Conditions", for the setting procedures.

### OFFSET

The offset varies according to the type of blade being used. Use the following table as a guideline to set this condition. Please see Section 3.7, "Setting the Cutting Conditions", for the setting procedures.

### Cutting conditions for each media type

Cutting medium		Thickness (mm)	Blade type	FORCE	SPEED	QUALITY
Marking film	Indoor	0.1	Supersteel blade • CB09UA • CB15U	14 to 17	Up to 30	3
	Outdoor	0.05 to 0.1		10 to 14	Up to 30	3
Fluorescent film		0.2 to 0.25	• CB15U-SP	16 to 20	Up to 30	3
Masking film for block copy production		0.01 to 0.1	CB15U-K30 CB15U-K30-SP	5 to 7	5 to 20	2
Masking rubber for sandblasting		Up to 1		21 to 34	Up to 10	1
Thick paper		Up to 0.5		28 to 38	3 to 13	1

### Blade Model Names and the Cutter Blade Type and Offset Displayed

Cutter blade type	Cutter blade number	LCD panel		
		Screen display	OFFSET	
			Default	Setting range
Supersteel	CB09UA	09U	0	±5
	CB15U	15U	0	±5
	CB15UB	15UB	0	±5
	CB15U-SP	15U	0	±5
	CB15U-K30	15U-K30	0	±5
	CB15U-K30-SP	15U-K30	0	±5
	CB15U-K20	15U-K20	0	±5
Other		OTHER	18	1 to 99

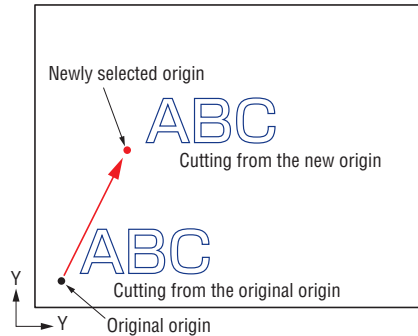
Select "OTHER" when using a blade type that is not listed in the table above or when a cutting operation using a thick or otherwise difficult-to-cut medium produces unsatisfactory results, and then alternately adjust the OFFSET value and run a cutting test until the desired results are achieved.

The table below lists the guideline OFFSET settings when the blade type is set to OTHER.

Model name of the cutter blade used	OFFSET
CB09UA	17
CB15U	28
CB15UB	5
CB15U-SP	28
CB15U-K30	28
CB15U-K30-SP	28
CB15U-K20	28

## 3.10 Setting the Cutting Origin

This function allows you to move the starting point of cutting to the desired position as shown in the figure below.




- (1) Use the [ $\triangleleft$ ] [ $\triangleright$ ] [ $\triangle$ ] [ $\nabla$ ] keys to move the tool carriage (the tip of the tool selected by the current setting) to the desired new origin point.
- (2) Press the  $\oplus$  [ORIGIN] key. The beeper sounds to indicate that the new origin has become effective. When the  $\oplus$  [ORIGIN] key is held down, the beeper sounds. When you remove your finger from the  $\oplus$  [ORIGIN] key, the beeper sounds again and the new origin becomes effective. If the coordinates are rotated or the MIRROR mode selected or cancelled after the origin has been moved, the origin is reset to its default position. However, if the  $\oplus$  [ORIGIN] key is held down, the origin is not reset to its default position even when the ROTATE or MIRROR mode is cancelled. To reset the newly registered origin point to its default position, move the cutter pen in the direction towards the lower left point until it stops, and then either hold down the  $\oplus$  [ORIGIN] key or turn on the power while pressing the  $\oplus$  [ORIGIN] key. If you intend to use the ORIGIN function in combination with the ROTATE or MIRROR function, be sure to set the ORIGIN function after setting the ROTATE or MIRROR function.

### CHECKPOINT



- The ORIGIN point setting becomes invalid when the Registration Mark mode is specified.
- After a new origin has been set, the coordinates being displayed on the LCD represent the distances along the X and Y axes from the new origin.
- Please see Chapter 4, "REGISTRATION MARK SETTINGS AND DETECTION" for the origin position after the automatic registration mark reading function has been used.

## 3.11 Using the Copy Function

This function allows you to automatically cut duplicates of the data sent from the computer. Once the data has been stored in the plotter's receive buffer, it can be repeatedly cut.

- (1) Send data to the plotter and then perform a cutting operation to enable the data to be stored in the plotter's buffer.
- (2) Set the COPY origin. Use the [◀][▶][△][▽] keys to move the tool carriage (the tip of the tool selected by the current setting) to the desired starting position for cutting copies.
- (3) Press the  [COPY] key to select COPY mode. The following screen for setting the number of copies appears.

FORCE	OFFSET
COPY MODE	
COUNT 1	
SPEED	QUALITY



- (4) Use the [△] or [▽] key to set the desired number of copies to be made. Be sure to set the number of copies no higher than the maximum number of copies that can be cut out of the currently loaded medium.
- (5) Press the  [ENTER] key to start making copies.
- (6) If you wish to set the spacing between copies, press the  [COPY] key again. The following screen for setting the spacing between copies appears.

FORCE	OFFSET
COPY SPACE	
1 mm	
SPEED	QUALITY

- (7) Use the [△] or [▽] key to set the spacing between copies.

**Setting range: 1 to 10 (mm) [Default value: 1]**

Your COPY SPACE setting is registered in the plotter's internal memory and retained even while the plotter is turned off.

- (8) Press the  [ENTER] key to register your COPY SPACE setting and return to the display shown in Step 3.
- (9) The "COPY" message is displayed and the plotter begins cutting the specified number of copies.
- (10) If you wish to continue cutting more copies, reload a cutting medium and press the  [COPY] key to start over again from setting the number of copies.
- (11) If the data to be copied will not fit within the effective cutting area, the message below appears.

FORCE	OFFSET
CANNOT COPY!	
SPEED	QUALITY

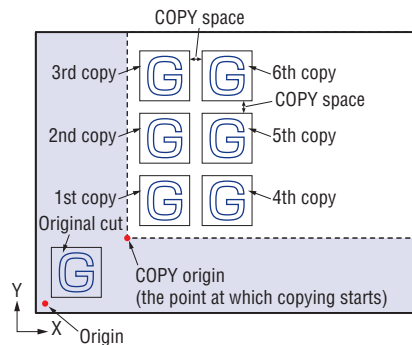
- (12) In this case, use the [◀][▶][△][▽] keys to move the starting position for cutting copies origin or replace the loaded medium with a larger sheet.

### CHECKPOINT

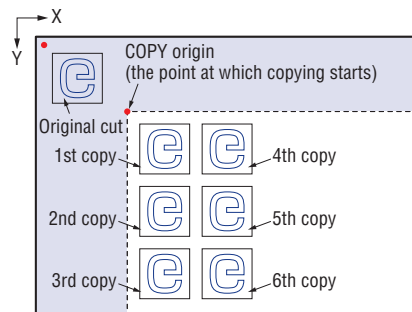
If the Registration Mark mode has been specified, the registration marks are detected and only one copy is made.

The following figures illustrate the sequence in which copies are cut, with the shaded areas representing the parts of the medium that are not cut.

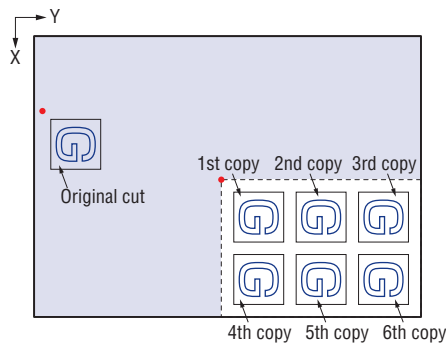
Copies are normally cut in the sequence shown below.



When MIRROR mode is selected, copies are cut as follows.




When ROTATE mode is selected, copies are cut as follows.



### CHECKPOINT


- Selection of the MIRROR or ROTATE mode remains valid even after the cutting medium is reloaded.
- While a copy operation is in progress, do not send new data to the plotter.
- Be sure to specify the position of the original cut as close to the software origin point as possible. If the position of the original cut is specified at too great a distance from the software origin point, the distance between the original cut and the first copy will also be too great.
- If there is an interval of 10 seconds or greater between the end of a copy operation and when the next data is sent, the previous data is cleared.
- Data which exceeds 2 Mbytes cannot be stored in the buffer, and therefore cannot be copied.
- When using the Copy mode, make sure that cutting does not extend past the edges of the cutting medium and onto the panel itself.

**When the data includes registration mark commands (but excluding multiple registration marks)**

- (1) Send the data that you wish to copy to the plotter and then perform a cutting operation to enable the data to be stored in the plotter's buffer.
- (2) Set the COPY origin. Use the [**<**][**>**][**△**][**▽**] **keys** to move the tool carriage (the tip of the tool/pen selected by the current setting) to the desired starting position for cutting copies.
- (3) Press the  [**COPY**] **key** to select COPY mode. The following screen for setting the number of copies appears.

```

FORCE                                OFFSET
┌───────────────────────────────────┐
│ COPY MODE                          │
│ COUNT  1 █                         │
└───────────────────────────────────┘
SPEED                                QUALITY
  
```


- (4) Use the [**△**] or [**▽**] **key** to set the desired number of copies to be made. Be sure to set the number of copies no higher than the maximum number of copies that can be cut out of the currently loaded medium.
- (5) Press the  [**ENTER**] **key** to start making copies.
- (6) The following message is displayed after one copy has been made.

```

FORCE                                OFFSET
┌───────────────────────────────────┐
│ MOVE TO ADJ. POINT                 │
│ PRESS ENTER KEY!                   │
└───────────────────────────────────┘
SPEED                                QUALITY
  
```


- (7) If you wish to make another copy, press the  [**ENTER**] **key**.

**When the data includes registration mark commands (including multiple registration marks)**


- (1) Send the data that you wish to copy to the plotter and then perform a cutting operation to enable the data to be stored in the plotter's buffer.
- (2) Press the  [**COPY**] **key** to select COPY mode. The following screen appears.

```

FORCE                                OFFSET
┌───────────────────────────────────┐
│ MOVE TO ADJ. POINT                 │
│ PRESS ENTER KEY!                   │
└───────────────────────────────────┘
SPEED                                QUALITY
  
```

- (3) Set the COPY origin. Use the [**<**][**>**][**△**][**▽**] **keys** to move the tool carriage (the tip of the tool/pen selected by the current setting) to the desired starting position for cutting copies.
- (4) Press the  [**ENTER**] **key** if you wish to make a copy.

## 3.12 Using the Hold Function

Press the  **[STOP/VIEW]** key during a cutting or plotting operation to temporarily suspend the cutting or plotting operation.

When the plotter is paused, an operation selection menu appears. Select whether to continue or quit the suspended cutting or plotting operation.

- (1) Press the  **[STOP/VIEW]** key during a plotting or cutting operation.

FORCE	OFFSET
JOB IS INTERRUPTED	
◀CONTINUE	QUIT▶
SPEED	QUALITY

- (2) Press the **[F2]** key (CONTINUE) to continue the suspended cutting or plotting operation.

If the **[F4]** key (QUIT) is pressed, the BUFFER CLEAR OK? menu shown below appears.

FORCE	OFFSET	→	FORCE	OFFSET
CONFIRM DATA FROM HOST STOPPED.			BUFFER CLEAR OK?	
◀CLEAR	CANCEL▶		SPEED	QUALITY
SPEED	QUALITY		SPEED	QUALITY

Press the **[F2]** key to select CLEAR and clear the buffer memory. If you do not wish to clear the buffer memory, press the **[F4]** key to select CANCEL and return to the menu displayed in Step 1.

- (3) If the **[F2]** key was pressed to select CLEAR, the display changes as shown below and the buffer memory is cleared.

FORCE	OFFSET
CLEARING BUFFER!	
PLEASE WAIT	
SPEED	QUALITY

- (4) The plotter returns to Ready status.



# CHAPTER 4

## ***REGISTRATION MARK SETTINGS AND DETECTION***

### **PRODUCT SUMMARY**

- 4.1 Outline of the Registration Mark Function*
- 4.2 Setting the Registration Mark Mode*
- 4.3 Setting the Registration Mark Pattern*
- 4.4 Registration Mark Distance Adjustment*
- 4.5 Setting the Registration Mark Size*
- 4.6 Setting the Registration Mark Offset*
- 4.7 Adjusting the Registration Mark Sensor*
- 4.8 Setting the Registration Mark Detection Judgment Level*
- 4.9 Setting the Registration Mark Detection Speed*
- 4.10 Setting the Number of Detection Operations*
- 4.11 Setting the Sensing Interval*
- 4.12 Axis Adjustment*
- 4.13 Registration Mark Detection*
- 4.14 Setting the Registration Mark Cutting Function*
- 4.15 Setting the Registration Mark Detection Start Position*

## 4.1 Outline of the Registration Mark Function

The registration mark function allows you to align the orientation of the plotter's X and Y axes with the coordinate axes on a medium that is pre-printed with registration marks or other marks. The plotter uses a sensor to read the registration marks printed on the media, and then adjusts the axes to match the coordinate data so that cutting can be performed on pre-printed media without any shift between the print and cut data.

- Registration marks are the L-shaped marks that are positioned to enclose a printed image. They are generally used for trimming printed material or for the alignment of color separations for printing. With this plotter, however, they are used to align the printed data and the position of the medium.
- For automatic recognition of registration marks, their line width must range from 0.5 to 1.0 mm.
- The plotter may not be able to accurately read registration marks in the following cases if:
  - A color other than black was used for the registration marks.
  - The registration mark line is blurred.
  - There is dust or other foreign matter in the reading area.
  - The medium floats up from the writing panel.
- When using a medium that is not suitable for automatic registration mark detection, use manual registration mark detection instead.

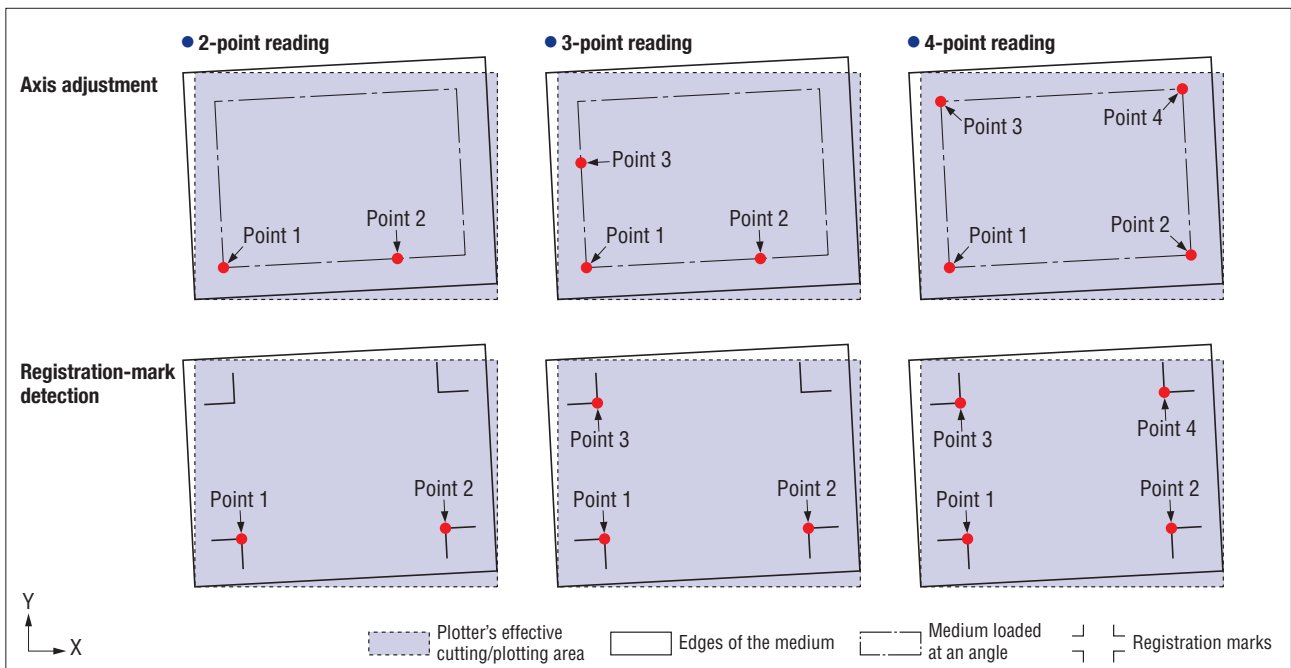
## 4.2 Setting the Registration Mark Mode

This mode is used to specify the angle and distance adjustment methods, as well as to specify the distance between registration marks for skipping by the sensor during registration mark detection.

**2-point reading:** The plotter performs adjustment between points 1-2 and of a single axis (angle adjustment).

**3-point reading:** The plotter performs adjustment between points 1-2 and points 1-3, adjusts the angle of both coordinate axes and then performs distance adjustment. If the same point was specified for both points 2 and 3, only coordinate axis angle adjustment is performed.

**4-point reading:** The plotter performs adjustment between points 1-2 and points 1-3, adjusts the angle of both coordinate axes and then performs distance adjustment. The addition of the coordinate values of point 4 enables even more precise coordinate axis angle and distance adjustment.



(1) With the plotter in Ready status, press the **[PAUSE]** key to select PAUSE mode.

(2) Press the **[NEXT]** key repeatedly until the following menu is displayed.

```

FORCE                                OFFSET
◀MARK          TOOL U/D▶
◀BUFFER CLR.
SPEED                                QUALITY

```

(3) Press the **[F1]** key (MARK) to display the registration mark functions selection menu.

```

FORCE                                OFFSET
◀MODE          DIST ADJ▶
◀TYPE  OTHER SETUPS▶
SPEED                                QUALITY

```

(4) Press the **[F1]** key (MODE) to display the menu for setting the registration mark mode.

```

FORCE                                OFFSET
MARK SENSING  OFF
AXIS          MARKS●
SPEED                                QUALITY

```

The currently selected setting is indicated by a black dot [●].

If you do not wish to perform axis adjustment, press the **[F3]** key (OFF).

To perform manual axis adjustment using a pre-printed frame or other marks on the medium as reference points, press the **[F2] key (AXIS)**.

To perform automatic or manual detection of the registration marks, press the **[F4] key (MARKS)**.

When the displayed setting is satisfactory, press the **[ENTER] key** to confirm your selection.

- (5) When the **[F2] key (AXIS)** or **[F4] key (MARKS)** is pressed, the axis adjustment menu is displayed.

FORCE	OFFSET
2 POINT	3 POINT
	4 POINT●
SPEED	QUALITY

Press the **[F2]**, **[F3]** or **[F4] key** to display the black dot next to your desired mode and then press the **[ENTER] key** to confirm your selection. If AXIS was selected for the registration mark mode the plotter returns to Ready status.

- (6) If MARKS was selected for the registration mark mode, the MARK MOVE No. menu is displayed.

FORCE	OFFSET
MARK MOVE No.	
No. = 1■	
SPEED	QUALITY

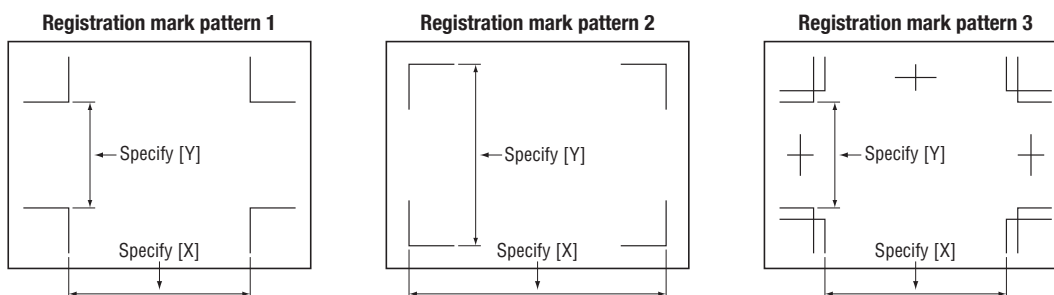
By specifying the distance between registration marks and not performing scanning in the areas where there are no registration marks, this function enables a reduction in the time required to read registration marks and also prevents the misreading of dirt or other foreign matter on the medium as a registration mark. Up to three settings can be registered.

Use the **[△]** or **[▽]** key to move through the selections "1", "2," and "3". Select the number that you wish to register and then press the **[ENTER] key**.

- (7) Next, the MARK MOVE DIST. menu is displayed.

FORCE	OFFSET
MARK MOVE DIST.	
X=0000mm	Y=0000mm
SPEED	QUALITY

Use the **[◀]** or **[▶]** key to move the blinking cursor, and the **[△]** or **[▽]** key to change the numeric value. Press the **[ENTER] key** to confirm your selections.



If there is no need to skip reading between registration marks, specify X = 0, Y = 0 (the default values). If 0 mm is specified for the spacing, the plotter will not skip reading between registration marks. It will continue searching until the next registration mark is found.

**CHECKPOINT**

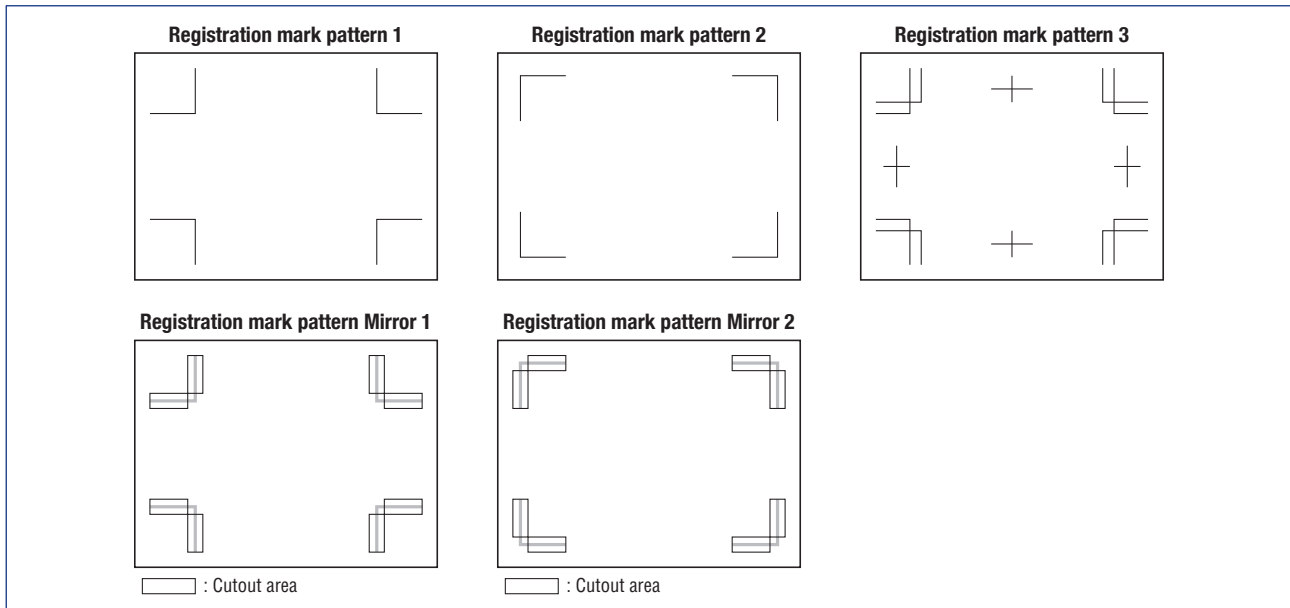
If 2-point reading has been selected, the Y numeric value is disregarded.



## 4.3 Setting the Registration Mark Pattern

Your plotter can read five registration mark patterns: 1, 2, 3, Mirror 1 and Mirror 2. If pattern 3, Mirror 1 or Mirror 2 has been selected, this function allows you to set the spacing between the registration mark line segments.

### CHECKPOINT

Registration mark pattern 3 can only be selected on the FC4510-60 model.



- Press the  **[PAUSE]** key to select PAUSE mode.
- Press the  **[NEXT]** key repeatedly until the following menu is displayed.

```

FORCE                                OFFSET
◀MARK      TOOL U/D▶
◀BUFFER CLR.
SPEED                                QUALITY

```

- Press the **[F1]** key (MARK) to display the registration mark functions selection menu.

```

FORCE                                OFFSET
◀MODE      DIST ADJ▶
◀TYPE     OTHER SETUPS▶
SPEED                                QUALITY

```

- Press the **[F1]** key (TYPE) to display the menu for setting the registration mark pattern.

```

FORCE                                OFFSET
●1   MARK TYPE      3
2   MIRROR
SPEED                                QUALITY

```

The currently selected setting is indicated by a black dot [●].

To read registration mark pattern 1, press the **[F1]** key (1).

To read registration mark pattern 2, press the **[F2]** key (2).

To read registration mark pattern 3, press the **[F3]** key (3).

When cutting will be performed from the reverse side, press the registration mark pattern **[F1]** key (1), **[F2]** key (2) or **[F3]** key (3) together with the **[F4]** key (MIRROR).

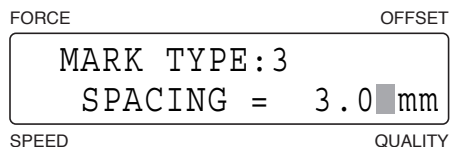
**An example of the MIRROR setting**



When the displayed setting is satisfactory, press the [ENTER] key to confirm your selection.

**Setting the Registration Mark Spacing (FC4510-60 only)**

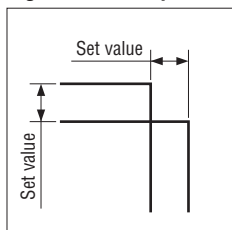
(1) If registration mark 3 has been selected, the menu for setting the registration mark pattern spacing is displayed.



Use the or key to change the numeric value. When the displayed setting is satisfactory, press the [ENTER] key to confirm your selection.

**Setting range: 0 to 9.9 (mm) [Default value: 3]**

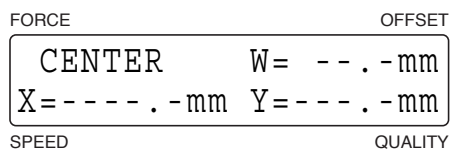
Registration mark pattern 3



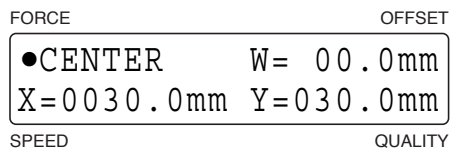
**Setting the Center Registration Mark (FC4510-60 only)**

The center registration mark can only be read when three-point reading has been selected for the registration mark mode, and when "3" has been selected for MARK TYPE and "USER" for the registration mark distance adjustment function.

(1) When registration mark pattern 3 has been selected and the [ENTER] key pressed, the menu for setting the center registration mark is displayed.

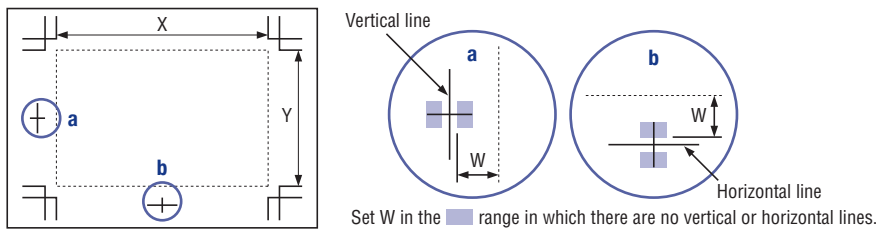


(2) To perform plotting with the center registration mark as the reference point, press the **[F1] key** (CENTER) to affix the black dot next to CENTER and display the following menu. If you do not wish to perform plotting with the center registration mark as the reference point, press the [F1] key once again to remove the black dot and then press the [ENTER] key.



To perform plotting with the center registration mark as the reference point, press the **[F2], [F3] or [F4] key** to move the blinking cursor to X (X-axis length), W (center registration mark reading position) or Y (Y-axis length) respectively. Use the or key to move the blinking cursor, the or key to change the numeric value and the [ENTER] key to confirm your selections.



Setting range: [X/Y] 0 to 999.9 (mm), [W] -99.9 to +99.9 (mm)



(3) Press the  [PAUSE] key to cancel PAUSE mode.

## 4.4 Registration Mark Distance Adjustment

The distance between registration marks can be adjusted automatically. If 5 mm was selected for CUSTOM, for example, and the distance between registration marks was read as 312 mm, any distance less than 5 mm is rounded off to the nearest whole number. In this case, the distance between the registration marks is assumed to be 310 mm and distance adjustment is performed accordingly.

- Press the  **[PAUSE]** key to select PAUSE mode.
- Press the  **[NEXT]** key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀MARK	TOOL U/D▶
◀BUFFER CLR.	
SPEED	QUALITY

- Press the **[F1]** key (MARK) to display the registration mark functions selection menu.

FORCE	OFFSET
◀MODE	DIST ADJ▶
◀TYPE	OTHER SETUPS▶
SPEED	QUALITY

- Press the **[F3]** key (DIST ADJ) to display the registration mark distance adjustment menu.

FORCE	OFFSET
●USER	CUSTOM
	STANDARD
SPEED	QUALITY

The currently selected setting is indicated by a black dot [●].


For manual distance adjustment, press the **[F2]** key (USER).


For custom distance adjustment, press the **[F3]** key (CUSTOM).

For automatic distance adjustment, press the **[F4]** key (STANDARD). The distance adjustment value is rounded up or down to the nearest 5 mm, 10 mm, or 50 mm according to the registration mark distance setting.

### USER (Manual Input)

- Perform registration mark detection. (See Section 4.13, "Registration Mark Detection".)
- After detection of the number of points set in the registration mark mode has been performed, the menu shown below is displayed.

FORCE	OFFSET
1 - 2M	00499.8 mm
S	00500.0  mm
SPEED	QUALITY

The display's first line (M) shows the distance between points 1 and 2 as read by the plotter. Input the actual distance (the data distance) in the second line (S). Use the **[Δ]** or **[▽]** key to change the numeric value. When the displayed setting is satisfactory, press the  **[ENTER]** key.

If the value you input is exceedingly large (1.5 times or greater) or very small (0.5 times or less), or if the angle of tilt with respect to the original axis tilt is 45° or greater, the following prompt is displayed. In this case, please re-input the value.

FORCE	OFFSET
DISTANCE ADJUSTMENT	
ERROR. SET AGAIN!	
SPEED	QUALITY



- (3) If the registration mark mode setting was 3-point reading or 4-point reading, the menu for adjusting the distance between points 1 and 3 will be displayed. Make the settings in the same way as for the distance between points 1 and 2.
- (4) When adjustment has been completed, the plotter returns to Ready status.

## CUSTOM

- (1) Press the **[F3] key** (CUSTOM) in the registration mark distance adjustment menu.

FORCE	OFFSET
5 mm	10 mm ●
	50 mm
SPEED	QUALITY

The currently selected setting is indicated by a black dot [●].

To select the 5 mm distance adjustment divisor value, press the **[F2] key**.

To select the 10 mm distance adjustment divisor value, press the **[F3] key**.

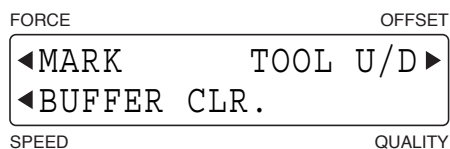
To select the 50 mm distance adjustment divisor value, press the **[F2] key**.

When the displayed setting is satisfactory, press the  **[ENTER] key**.

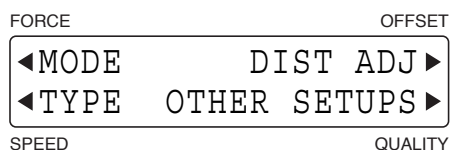
## 4.5 Setting the Registration Mark Size

This function allows you to specify the size of the registration marks drawn on the medium.

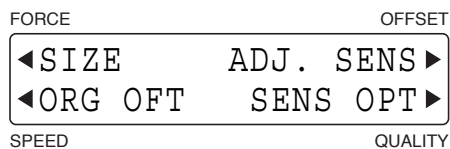
- Press the **[PAUSE]** key to select PAUSE mode.
- Press the **[NEXT]** key repeatedly until the following menu is displayed.



- Press the **[F1]** key (MARK) to display the registration mark functions selection menu.



- Press the **[F4]** key (OTHER SETUPS) to display the menu shown below.



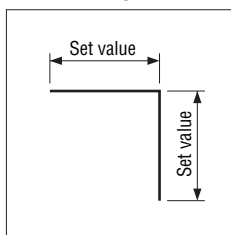
- Press the **[F1]** key (SIZE) to display the menu for setting the registration mark size.



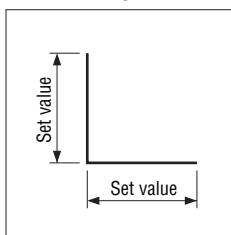
Use the **[Δ]** or **[▽]** key to change the numeric value, and then press the **[ENTER]** key to confirm your selection.

**Setting range: 5 to 20 (mm) [Default value: 20]**

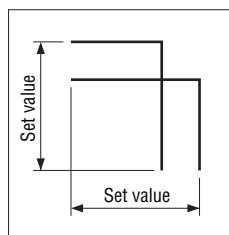
Registration mark pattern 1,  
Mirror 1



Registration mark pattern 2,  
Mirror 2



Registration mark pattern 3



- Press the **[PAUSE]** key to cancel PAUSE mode.

## 4.6 Setting the Registration Mark Offset

The default position of the origin point is the lower left corner of the cutting/plotting area. Use this function whenever you wish to move the registration mark origin point.

- Press the **[PAUSE]** key to select PAUSE mode.
- Press the **[NEXT]** key repeatedly until the following menu is displayed.

```

FORCE                                OFFSET
┌ MARK          TOOL U/D ──▶
│ ◀ BUFFER CLR.
└──────────────────────────
SPEED                                QUALITY

```

- Press the **[F1]** key (MARK) to display the registration mark functions selection menu.

```

FORCE                                OFFSET
┌ MODE          DIST ADJ ──▶
│ ◀ TYPE  OTHER SETUPS ──▶
└──────────────────────────
SPEED                                QUALITY

```

- Press the **[F4]** key (OTHER SETUPS) to display the menu shown below.

```

FORCE                                OFFSET
┌ SIZE          ADJ. SENS ──▶
│ ◀ ORG OPT    SENS OPT ──▶
└──────────────────────────
SPEED                                QUALITY

```

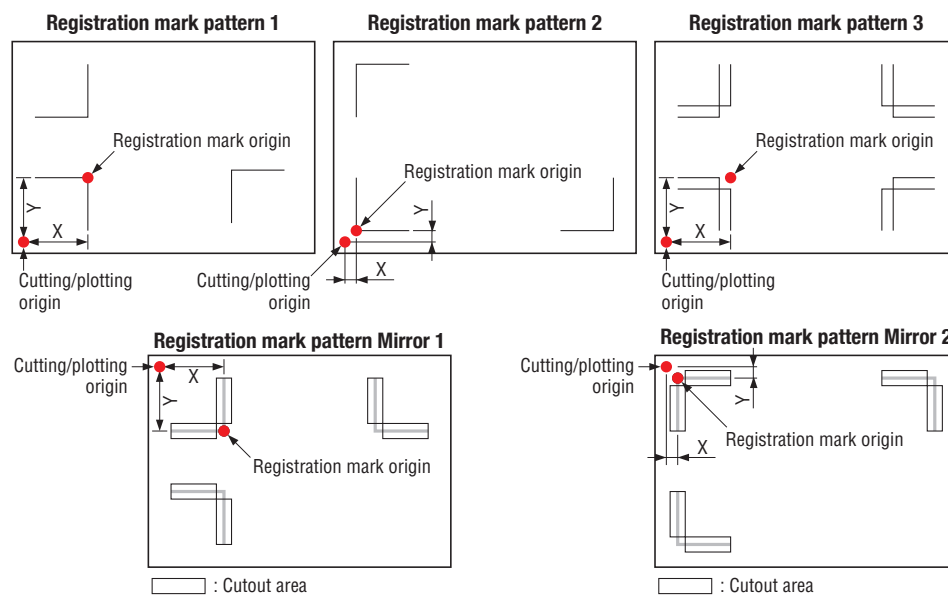
- Press the **[F2]** key (ORG OPT) to display the menu for setting the registration mark offset.

```

FORCE                                OFFSET
OFFSET (mm)
X= 0000.0  Y= 0000.0
└──────────────────────────
SPEED                                QUALITY

```

Use the **[◀]** or **[▶]** key to move the blinking cursor, and the **[△]** or **[▽]** key to change the numeric value. When the displayed settings are satisfactory, press the **[ENTER]** key to confirm your selections.



- Press the **[PAUSE]** key to cancel PAUSE mode.

## 4.7 Adjusting the Registration Mark Sensor




This function allows you to adjust the registration mark sensor. Two adjustment methods are provided—use the one that best suits your requirements.

### *Adjusting the Registration Mark Sensor by Using a Pre-printed Cross Symbol and a Plotted Cross Symbol*

This function allows you to adjust the registration mark sensor by reading a pre-printed cross symbol, and then plotting another cross symbol for use in adjustment. The sensor's precision is adjusted by inputting the difference in the values of these two cross symbols.

#### **CHECKPOINT**

Perform this adjustment after the registration mark detection level and registration mark detection speed settings have been made.

- (1) Load a medium with a pre-printed cross symbol in the plotter.
- (2) Mount a plotting pen in tool holder 1.
- (3) Press the  **[CONDITION]** key to display a condition settings screen, and then use the **[F1]** to **[F4]** keys to select a COND No. where "PEN" has been selected as the cutter blade type.
- (4) Press the  **[PAUSE]** key to select PAUSE mode.
- (5) Press the  **[NEXT]** key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀MARK	TOOL U/D▶
◀BUFFER CLR.	
SPEED	QUALITY

- (6) Press the **[F1]** key (MARK) to display the registration mark functions selection menu.

FORCE	OFFSET
◀MODE	DIST ADJ▶
◀TYPE	OTHER SETUPS▶
SPEED	QUALITY

- (7) Press the **[F4]** key (OTHER SETUPS) to display the menu shown below.

FORCE	OFFSET
◀SIZE	ADJ. SENS▶
◀ORG OFT	SENS OPT▶
SPEED	QUALITY

- (8) Press the **[F3]** key (ADJ. SENS) to display the menu shown below.

FORCE	OFFSET
ADJUST SENSOR	
◀POSITION	LEVEL▶
SPEED	QUALITY

- (9) Press the **[F2]** key (POSITION) to display the menu shown below.

<FC4500-50/60>

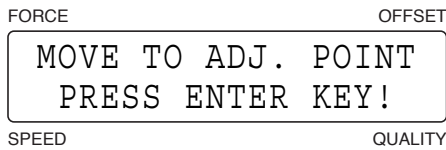
FORCE	OFFSET
ADJ. SENS POS	
◀ADJ.	ADJ. +▶
SPEED	QUALITY

<FC4510-60>

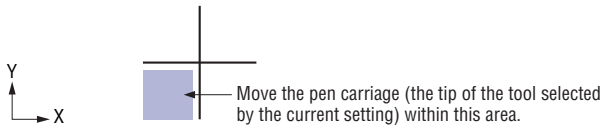
FORCE	OFFSET
◀X ADJ. SENS. POS Y▶	
◀X+	Y+▶
SPEED	QUALITY

(10) **FC4500-50/60:** Press the **[F2]** key (ADJ.) to adjust the sensors.

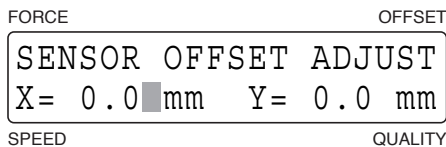
**FC4510-60:** Press the **[F1]** key (X) to adjust the X-axis sensor, and the **[F3]** key (Y) to adjust the Y-axis sensor.



(11) Use the **[<] [>] [Δ] [∇]** keys to move the tool carriage (the tip of the tool selected by the current setting) to the area under the cross symbol indicated in the diagram below) and then press the **[ENTER]** key. The sensor will read the cross symbol.



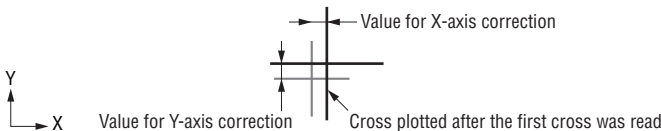
(12) After the sensor reads the cross symbol, a cross symbol for use in adjustment is plotted using the pen in tool holder 1 and then the menu below is displayed.



Input the distance that you wish to move the second cross with respect to the first cross. If the second cross does not need to be moved, simply press the **[ENTER]** key.

Press the **[F2]** or **[F4]** key to move the blinking cursor to X or Y, and then use the **[Δ]** or **[∇]** key to change the numeric value. When the displayed setting is satisfactory, press the **[ENTER]** key to confirm your selection.

**Setting range: -9.9 to +9.9 (mm)**



(13) Press the **[PAUSE]** key to cancel PAUSE mode.

### Adjusting the Registration Mark Sensor by Using One Plotted and One Cut Cross Symbol

The plotter plots a cross symbol, reads it, and then uses the cutter pen to cut a second cross symbol. The sensor's precision is adjusted by inputting the difference in the values of these two cross symbols.

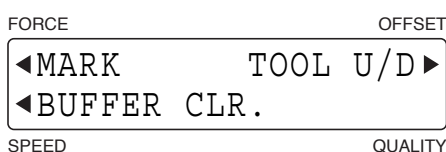
#### **CHECKPOINT**

Perform this adjustment after the registration mark detection level and registration mark detection speed settings have been made.

(1) Load a medium for the sensor adjustment procedure.

(2) Press the **[PAUSE]** key to select PAUSE mode.

(3) Press the **[NEXT]** key repeatedly until the following menu is displayed.



- (4) Press the **[F1] key** (MARK) to display the registration mark functions selection menu.

```

FORCE                                OFFSET
┌───────────┐
│◀MODE      DIST ADJ▶│
│◀TYPE  OTHER SETUPS▶│
└───────────┘
SPEED                                QUALITY
    
```

- (5) Press the **[F4] key** (OTHER SETUPS) to display the menu shown below.

```

FORCE                                OFFSET
┌───────────┐
│◀SIZE      ADJ. SENS▶│
│◀ORG OFT   SENS OPT▶│
└───────────┘
SPEED                                QUALITY
    
```

- (6) Press the **[F3] key** (ADJ. SENS) to display the menu shown below.

```

FORCE                                OFFSET
┌───────────┐
│  ADJUST SENSOR  │
│◀POSITION      LEVEL▶│
└───────────┘
SPEED                                QUALITY
    
```

- (7) Press the **[F2] key** (POSITION) to display the menu shown below.

<FC4500-50/60>

```

FORCE                                OFFSET
┌───────────┐
│  ADJ. SENS POS  │
│◀ADJ.            ADJ.+▶│
└───────────┘
SPEED                                QUALITY
    
```

<FC4510-60>

```


FORCE                                OFFSET
┌───────────┐
│◀X ADJ. SENS. POS Y▶│
│◀X+                Y+▶│
└───────────┘
SPEED                                QUALITY
    
```


- (8) **FC4500-50/60**: Press the **[F4] key** (ADJ.+). The prompt shown below is displayed.  
**FC4510-60**: Press the **[F2] key** (X+) to adjust the X-axis sensor, and the **[F4] key** (Y+) to adjust the Y-axis sensor. The prompt shown below is displayed.

```

FORCE                                OFFSET
┌───────────┐
│  CHANGE TOOL    │
│  PRESS ENTER KEY!│
└───────────┘
SPEED                                QUALITY
    
```

- (9) Mount a plotting pen in tool holder 1.



- (10) Press the  **[CONDITION] key** to display a condition settings screen, and then use the **[F1] to [F4] keys** to select a COND No. where "PEN" has been selected as the cutter blade type.

- (11) Use the **[◀][▶][△][▽] keys** to move the pen carriage (the tip of the tool selected by the current setting) to the position where you want to plot the cross symbol and then press the  **[ENTER] key**. The plotter plots a cross symbol, and then the prompt shown below is displayed.

```


FORCE                                OFFSET
┌───────────┐
│  CHANGE TOOL    │
│  PRESS ENTER KEY!│
└───────────┘
SPEED                                QUALITY
    
```


- (12) Replace the plotting pen with a cutter pen.

- (13) Press the  **[CONDITION] key** to display a condition settings screen, and then use the **[F1] to [F4] keys** to select a COND No. where a cutter blade has been selected as the cutter blade type. Press the  **[ENTER] key**. The sensor reads the plotted cross symbol, and then cuts a second cross symbol. After the second cross symbol has been cut, the screen shown below is displayed.

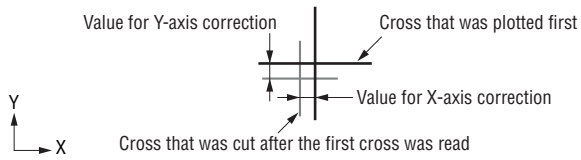
```

FORCE                                OFFSET
┌───────────┐
│  SENSOR OFFSET ADJUST  │
│  X= 0.0 mm  Y= 0.0 mm │
└───────────┘
SPEED                                QUALITY
    
```

Input the distance that you wish to move the second cross with respect to the first cross. If the second cross does not need to be moved, simply press the  **[ENTER]** key.

Press the **[F2]** or **[F4]** key to move the blinking cursor to X or Y, and then use the **[△]** or **[▽]** key to change the numeric value. When the displayed setting is satisfactory, press the  **[ENTER]** key to confirm your selection.



**Setting range: -9.9 to +9.9 (mm)**



(14) Press the  **[PAUSE]** key to cancel PAUSE mode.

## 4.8 Setting the Registration Mark Detection Judgment Level

This function sets the color density judgment level of the line segments that are read during a registration mark detection operation. This judgment level determines the existence of a line segment by a change in density of the specified percentage from an area where there are no line segments (white area). This function sets the judgment level for the currently specified registration mark pattern.

- (1) Load a medium in the plotter.
- (2) Press the  [PAUSE] key to select PAUSE mode.
- (3) Press the  [NEXT] key repeatedly until the following menu is displayed.

```

FORCE                                OFFSET
┌ MARK          TOOL U/D ──┐
│ ◀ BUFFER CLR. ──▶       │
└──────────────────────────┘
SPEED                                QUALITY
  
```

- (4) Press the [F1] key (MARK) to display the registration mark functions selection menu.

```

FORCE                                OFFSET
┌ MODE          DIST ADJ ──┐
│ ◀ TYPE OTHER SETUPS ──▶ │
└──────────────────────────┘
SPEED                                QUALITY
  
```

- (5) Press the [F4] key (OTHER SETUPS) to display the menu shown below.

```

FORCE                                OFFSET
┌ SIZE          ADJ. SENS ──┐
│ ◀ ORG OFT    SENS OPT ──▶ │
└──────────────────────────┘
SPEED                                QUALITY
  
```

- (6) Press the [F3] key (ADJ. SENS) to display the menu shown below.

```

FORCE                                OFFSET
┌ ADJUST SENSOR ──┐
│ ◀ POSITION      LEVEL ──▶ │
└──────────────────────────┘
SPEED                                QUALITY
  
```

- (7) Press the [F4] key (LEVEL) to display the menu shown below.

```

FORCE                                OFFSET
┌ SENSITIVITY ADJUST ──┐
│ ● DEFAULT      USER ──▶ │
└──────────────────────────┘
SPEED                                QUALITY
  
```

To select the default value, press the [F2] key (DEFAULT) and then press the  [ENTER] key.

To set the sensitivity of the sensor, press the [F4] key (USER) and then press the  [ENTER] key.

- (8) If the [F4] key (USER) was pressed, the sensor judgment value screen is displayed.

```

FORCE                                OFFSET
┌ AUTO ──▶ ──┐
│ ◀ VALUE SENSITIVITY ──▶ │
└──────────────────────────┘
SPEED                                QUALITY
  
```


- (9) Press the [F2] key (VALUE) to display the menu for setting the sensor level.

```

FORCE                                OFFSET
┌ DEFAULT ──▶ ──┐
│ █ X=70%      Y=70% ──▶ │
└──────────────────────────┘
SPEED                                QUALITY
  
```

Use the [F2] or [F4] key to move the blinking cursor to X or Y, and the [Δ] or [▽] key to change the numeric value.





When the displayed settings are satisfactory, press the  [ENTER] key to confirm your selections.  
If the [F3] key (DEFAULT) was pressed, the values become the default values.

**Setting range: 1 to 99% [Default value: Registration mark pattern 1, 2 and MIRROR: X = 70, Y = 70;  
Registration mark pattern 3: X = 85, Y = 85]**

Select a numeric value that is appropriate for the difference between blank areas of the medium (areas where there is no drawing) and the density of the registration marks. Setting a higher value enables higher sensitivity (faint registration marks can be detected) but the floating up of the medium from the surface of the plotter or dirt on the medium may cause erroneous detection.

Make settings for registration mark pattern 3 and MIRROR in the same way.

### Automatic Adjustment of the Sensitivity of the Registration Mark Sensor

- (1) Press the  [PAUSE] key to select PAUSE mode.
- (2) Load a medium on the plotter.
- (3) Press the  [NEXT] key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀ MARK	TOOL U/D ▶
◀ BUFFER CLR.	
SPEED	QUALITY

- (4) Press the [F1] key (MARK) to display the registration mark functions selection menu.

FORCE	OFFSET
◀ MODE	DIST ADJ ▶
◀ TYPE OTHER SETUPS ▶	
SPEED	QUALITY

- (5) Press the [F4] key (OTHER SETUPS) to display the menu shown below.

FORCE	OFFSET
◀ SIZE	ADJ. SENS ▶
◀ ORG OFT SENS OPT ▶	
SPEED	QUALITY

- (6) Press the [F3] key (ADJ. SENS) to display the menu shown below.

FORCE	OFFSET
ADJUST SENSOR	
◀ POSITION	LEVEL ▶
SPEED	QUALITY

- (7) Press the [F4] key (LEVEL) to display the menu shown below.

FORCE	OFFSET
SENSITIVITY ADJUST	
● DEFAULT	USER
SPEED	QUALITY

To select the default value, press the [F2] key (DEFAULT) and then press the  [ENTER] key.

To set the sensitivity of the sensor, press the [F4] key (USER) and then press the  [ENTER] key.

- (8) If the [F4] key (USER) was pressed, the sensor judgment value screen is displayed.

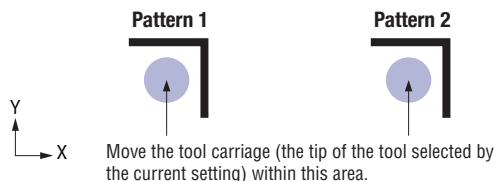
FORCE	OFFSET
AUTO ▶	
◀ VALUE	SENSITIVITY ▶
SPEED	QUALITY

- (9) Press the **[F3] key (AUTO)** to display the screen for automatic adjustment of the sensitivity of the sensor.

```

FORCE                                OFFSET
┌───────────────────────────────────┐
│ MOVE TO ADJ. POINT                │
│ PRESS ENTER KEY!                  │
└───────────────────────────────────┘
SPEED                                QUALITY
    
```

- (10) Use the **[◀][▶][△][▽]** keys to move the tool carriage (the tip of the tool selected by the current setting) to the position shown in the figures below and then press the **[↵]** **[ENTER] key**. The registration mark sensor reads the mark.



**CHECKPOINT**

It may not be possible to make the settings correctly in cases such as when the medium is not flat. Depending on the color of the medium and the color of the registration mark line, it may not be possible to perform automatic adjustment. In this case, make the adjustment manually.

The following prompt is displayed when adjustment has been completed.

```

FORCE                                OFFSET
┌───────────────────────────────────┐
│ VALUE/SENSITIVITY                │
│ SET COMPLETION                    │
└───────────────────────────────────┘
SPEED                                QUALITY
    
```

**Adjusting the Sensitivity of the Registration Mark Sensor**

**CHECKPOINT**

If you have changed the medium to a different type, we recommend that you perform this procedure.

- (1) Press the **[⏸]** **[PAUSE] key** to select until the following menu is displayed.

```

FORCE                                OFFSET
┌───────────────────────────────────┐
│ ◀MARK          TOOL U/D▶          │
│ ◀BUFFER CLR.          │
└───────────────────────────────────┘
SPEED                                QUALITY
    
```

- (4) Press the **[F1] key (MARK)** to display the registration mark functions selection menu.

```

FORCE                                OFFSET
┌───────────────────────────────────┐
│ ◀MODE          DIST ADJ▶          │
│ ◀TYPE          OTHER SETUPS▶      │
└───────────────────────────────────┘
SPEED                                QUALITY
    
```

- (5) Press the **[F4] key (OTHER SETUPS)** to display the menu shown below.

```

FORCE                                OFFSET
┌───────────────────────────────────┐
│ ◀SIZE          ADJ. SENS▶          │
│ ◀ORG OFT          SENS OPT▶      │
└───────────────────────────────────┘
SPEED                                QUALITY
    
```

- (6) Press the **[F3] key (ADJ. SENS)** to display the menu shown below.

```

FORCE                                OFFSET
┌───────────────────────────────────┐
│ ADJUST SENSOR                    │
│ ◀POSITION          LEVEL▶          │
└───────────────────────────────────┘
SPEED                                QUALITY
    
```

- (7) Press the **[F4] key** (LEVEL) to display the menu shown below.



To select the default value, press the **[F2] key** (DEFAULT) and then press the  **[ENTER] key**.

To set the sensitivity of the sensor, press the **[F4] key** (USER) and then press the  **[ENTER] key**.

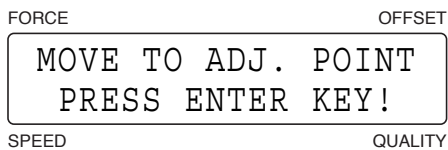
- (8) If the **[F4] key** (USER) was pressed, the sensor judgment value screen is displayed.




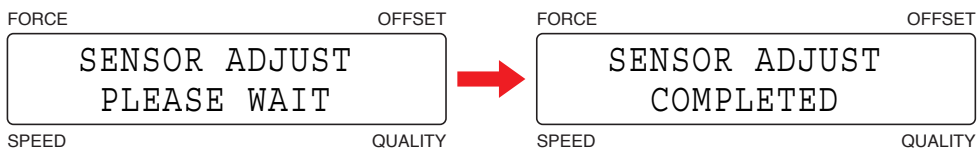
- (9) Press the **[F4] key** (SENSITIVITY) to display the menu for adjusting the sensitivity of the sensor.



- (10) To adjust the sensitivity value, press the **[F4] key** (ADJUST) to display the following prompt. To select the default value, press the **[F2] key** (DEFAULT).





- (11) Use the **[◀][▶][△][▽]** keys to move the tool carriage (the tip of the tool selected by the current setting) to a blank area of the medium (an area where there is no drawing) and then press the  **[ENTER] key**. The prompt shown at the left is displayed during the adjustment process, and the prompt shown at the right is displayed when adjustment has been completed.



## 4.9 Setting the Registration Mark Detection Speed

This function sets the speed of the tool carriage at the time when registration mark lines are detected. Change the speed setting if registration marks cannot be detected due to the type of media used or the thickness of the registration mark lines.

- Press the  [PAUSE] key to select PAUSE mode.
- Press the  [NEXT] key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀MARK	TOOL U/D▶
◀BUFFER CLR.	
SPEED	QUALITY

- Press the [F1] key (MARK) to display the registration mark functions selection menu.

FORCE	OFFSET
◀MODE	DIST ADJ▶
◀TYPE	OTHER SETUPS▶
SPEED	QUALITY


- Press the [F4] key (OTHER SETUPS) to display the menu shown below.


FORCE	OFFSET
◀SIZE	ADJ. SENS▶
◀ORG OPT	SENS OPT▶
SPEED	QUALITY

- Press the [F4] key (SENS OPT) to display the menu shown below.

FORCE	OFFSET
◀FREQUENCY	
◀SENS SPD	SENS STEP▶
SPEED	QUALITY

- Press the [F2] key (SENS SPD) to display the menu shown below.

FORCE	OFFSET
SENSING SPEED	
SPEED = 5  cm/s	
SPEED	QUALITY

Use the [△] or [▽] key to change the numeric value, and then press the  [ENTER] key to confirm your selection.

**Setting range: 1 to 20 (cm/s) [Default value: 5]**

Setting a slower speed (a smaller value) enables registration marks to be detected more easily.

- Press the  [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

Fine registration mark lines may not be detected if the detection speed is increased.

## 4.10 Setting the Number of Detection Operations

This function sets the number of registration mark detection operations. If "SIMPLE" or "HI-SPEED" is selected, detection is performed at one location. If "NORMAL" is selected, detection is performed at three locations.

### CHECKPOINT

- If a detection error occurs when "SIMPLE" or "HI-SPEED" has been selected, change your selection to "NORMAL".
- The "HI-SPEED" setting is only enabled for registration mark patterns 1 and 2. If the registration mark pattern is 3 or MIRROR, the "SIMPLE" setting takes effect.
- Faint or fine lines may not be detected when "HI-SPEED" has been selected. Moreover, the precision may be lower than that provided by the "NORMAL" setting. In such cases, change your selection to "NORMAL".

(1) Press the  [PAUSE] key to select PAUSE mode.

(2) Press the  [NEXT] key repeatedly until the following menu is displayed.

```

FORCE                                OFFSET
┌───────────┐ ┌───────────┐
│◀MARK      TOOL U/D▶│
│◀BUFFER CLR.│
└───────────┘ └───────────┘
SPEED                                QUALITY
  
```

(3) Press the [F1] key (MARK) to display the registration mark functions selection menu.

```

FORCE                                OFFSET
┌───────────┐ ┌───────────┐
│◀MODE      DIST ADJ▶│
│◀TYPE     OTHER SETUPS▶│
└───────────┘ └───────────┘
SPEED                                QUALITY
  
```

(4) Press the [F4] key (OTHER SETUPS) to display the menu shown below.

```

FORCE                                OFFSET
┌───────────┐ ┌───────────┐
│◀SIZE      ADJ. SENS▶│
│◀ORG OFT   SENS OPT▶│
└───────────┘ └───────────┘
SPEED                                QUALITY
  
```

(5) Press the [F4] key (SENS OPT) to display the menu shown below.

```


FORCE                                OFFSET
┌───────────┐ ┌───────────┐
│◀FREQUENCY│
│◀SENS SPD SENS STEP▶│
└───────────┘ └───────────┘
SPEED                                QUALITY
  
```


(6) Press the [F1] key (FREQUENCY) to display the menu shown below.

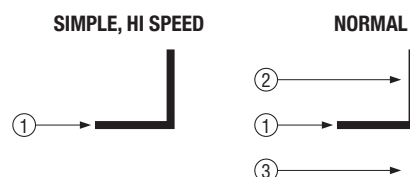
```

FORCE                                OFFSET
┌───────────┐ ┌───────────┐
│              HI SPEED│
│SIMPLE      NORMAL●│
└───────────┘ └───────────┘
SPEED                                QUALITY
  
```

To select the simple detection operation, press the [F2] key (SIMPLE) and then press the  [ENTER] key.

To select the high-speed detection operation, press the [F3] key (HI SPEED) and then press the  [ENTER] key.

To select the normal detection operation, press the [F4] key (NORMAL) and then press the  [ENTER] key.



If **SIMPLE** or **HI SPEED** was selected, line ① may be detected in error.

If **NORMAL** was selected and line ① was detected, ② is detected correctly after a comparison has been made with ② and ③.

Selecting **SIMPLE** shortens the detection time, whereas selecting **NORMAL** enables more accurate detection to be performed.



(7) Press the  **[PAUSE]** key to cancel PAUSE mode.

## 4.11 Setting the Sensing Interval

If the line segments are fine, registration marks may not be detected even when the slowest registration mark detection speed has been set. If the interval has been set to 0, the registration marks are detected through sampling during movement. If the interval is set to 5, 10 or 15 $\mu$ , registration marks are sensed at the specified interval. (FC4510-60 only)

### CHECKPOINT

The sensing interval setting is only enabled for registration mark pattern 3.

- Press the  [PAUSE] key to select PAUSE mode.
- Press the  [NEXT] key repeatedly until the following menu is displayed.

```

FORCE                                OFFSET
┌ MARK          TOOL U/D ──┐
│ ──< MARK          TOOL U/D ──> │
│ ──< BUFFER CLR.          ──> │
└──────────────────────────┘
SPEED                                QUALITY

```

- Press the [F1] key (MARK) to display the registration mark functions selection menu.

```

FORCE                                OFFSET
┌ MODE          DIST ADJ ──┐
│ ──< MODE          DIST ADJ ──> │
│ ──< TYPE OTHER SETUPS ──> │
└──────────────────────────┘
SPEED                                QUALITY

```

- Press the [F4] key (OTHER SETUPS) to display the menu shown below.

```

FORCE                                OFFSET
┌ SIZE          ADJ. SENS ──┐
│ ──< SIZE          ADJ. SENS ──> │
│ ──< ORG OPT     SENS OPT ──> │
└──────────────────────────┘
SPEED                                QUALITY

```

- Press the [F4] key (SENS OPT) to display the menu shown below.

```

FORCE                                OFFSET
┌ FREQUENCY ───────────┐
│ ──< FREQUENCY ───────────> │
│ ──< SENS SPD SENS STEP ──> │
└──────────────────────────┘
SPEED                                QUALITY


```

- Press the [F4] key (SENS STEP) to display the menu shown below.

```

FORCE                                OFFSET
┌ TYPE 3 SENSING INTVL ──┐
│ ──< TYPE 3 SENSING INTVL ──> │
│ ──< NO. OF STEPS= 5 ──>um │
└──────────────────────────┘
SPEED                                QUALITY

```

Use the [ $\leftarrow$ ] or [ $\rightarrow$ ] key to move the blinking cursor, and the [ $\Delta$ ] or [ $\nabla$ ] key to change the numeric value. When the displayed setting is satisfactory, press the  [ENTER] key to confirm your selection.

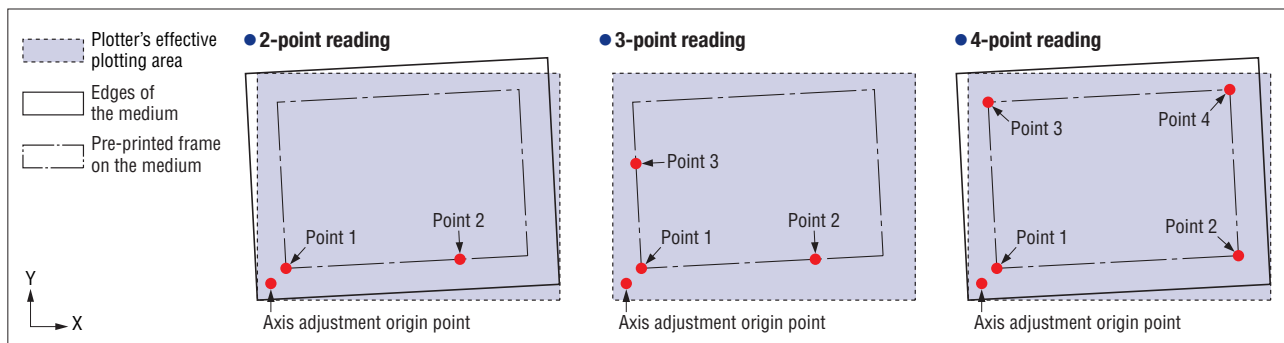
**Setting range: 0, 5, 10, 15 ( $\mu$ m) [Default value: 0]**

Setting a lower value enables sensing to be performed more easily. If 0 has been selected, registration mark sensing is performed continuously.

- Press the  [PAUSE] key to cancel PAUSE mode.

## 4.12 Axis Adjustment

When AXIS has been selected for the registration mark mode, axis adjustment is performed manually. If 2, 3, or 4 points are specified on the X and Y axes, adjustment is performed for the angle of the coordinate axes (X-axis and Y-axis tilt) and the distance (line segment length).



**Axis adjustment origin point:** This is the center point of axial eccentricity. The X and Y axes are tilted from this point.

**Point 1:** This is the reference point used for axis adjustment. For 3-point and 4-point reading, position this point at the intersection of the X and Y axes of points 2 and 3.

**Point 2:** Using point 1 as a reference, position this point on the X or Y axis.

**Point 3:** Using point 1 as a reference, position this point on the X or Y axis.

**Point 4:** Position this point diagonally opposite point 1, at the intersection of the X and Y axes of points 2 and 3.

(1) Select AXIS as the registration mark mode, and then select the number of points for reading. (See Section 4.2, "Setting the Registration Mark Mode".)

(2) With the plotter in Ready status, press the [ORIGIN] key to display the menu shown below.

```

FORCE                                OFFSET
  AXIS POINT 1
X=      0      Y=      0
SPEED                                QUALITY
    
```

Use the [] [] [] [] keys to move the tool carriage (the tip of the tool or pen selected by the current setting) to the position for setting point 1, and then press the [ENTER] key. If 2-axis adjustment has been performed previously, the tool carriage will move automatically to the previously set reference point. In this case, use the [] [] [] [] keys to make any adjustments required.

(3) The prompts for setting point 2, point 3 and point 4 will be displayed in succession. Make the settings in the same way as for point 1.

```

FORCE                                OFFSET
  AXIS POINT 2
X=      0      Y=      0
SPEED                                QUALITY
    
```

(4) When all the points have been set, the following menu for distance adjustment between points 1 and 2 is displayed.

```

FORCE                                OFFSET
1 - 2M      00499.8 mm
  S          00500.0 mm
SPEED                                QUALITY
    
```

The display's first line (M) shows the distance between the first and second points as read by the plotter. Input the actual distance (the data distance) in the second line (S). Use the [] [] key to change the numeric value, and then press the [ENTER] key. The plotter returns to Ready status.



If the value you input is exceedingly large (1.5 times or greater) or very small (0.5 times or less), or if the angle of tilt with respect to the original axis tilt is 45° or greater, the following prompt is displayed. In this case, please re-input the value.

FORCE	OFFSET
DISTANCE ADJUSTMENT ERROR. SET AGAIN!	
SPEED	QUALITY

- (5) If 3-point or 4-point adjustment has been selected, the menu for adjusting the distance between points 1 and 3 will be displayed. Make the settings in the same way as for the distance between points 1 and 2.
- (6) When the distances between all the points have been adjusted, the following menu for setting the axis adjustment origin is displayed. (This menu is not displayed when 4-point reading has been selected.)

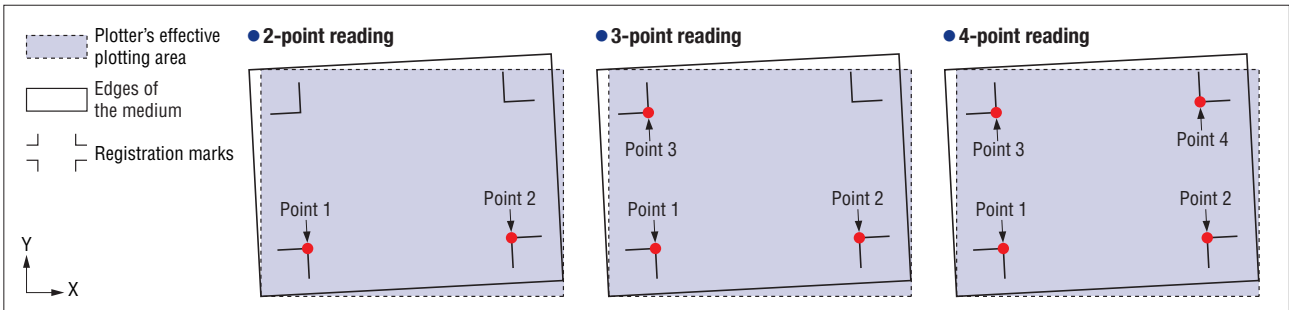
FORCE	OFFSET		
AXIS ORIGIN POINT			
X=	0	Y=	0
SPEED	QUALITY		

Use the [**◀**][**▶**][**△**][**▽**] **keys** to move the tool carriage (the tip of the tool or pen selected by the current setting) to the position for setting the axis adjustment origin, and then press the [**↵**] [**ENTER**] **key**. If 2-axis adjustment has been performed previously, the tool carriage will move automatically to the previously set reference point. In this case, use the [**◀**][**▶**][**△**][**▽**] **keys** to make any adjustments required.

- (7) When all the adjustments have been completed, the plotter returns to Ready status.

## 4.13 Registration Mark Detection

When MARKS has been selected for the registration mark mode, the plotter detects the registration marks printed on the medium and adjusts the angle of the coordinate axes (X-axis and Y-axis tilt) and the distance (line segment length). Detection of the registration marks can be performed either automatically or manually.



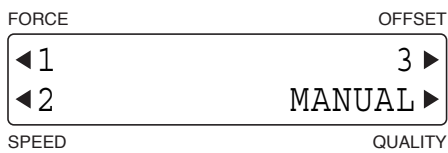
**2-point reading:** The plotter reads two registration marks in the X-axis direction (points 1-2) and corrects the tilt in the X-axis.

**3-point reading:** The plotter reads the points at the right angles of three registration marks (points 1-2 and points 1-3), corrects the tilt in both coordinate axes and then performs distance adjustment.

**4-point reading:** The plotter reads the points at the right angles of three registration marks (points 1-2 and points 1-3), corrects the tilt in both coordinate axes and then performs distance adjustment. The addition of the coordinate values of point 4 enables even more precise axial tilt correction and distance adjustment.

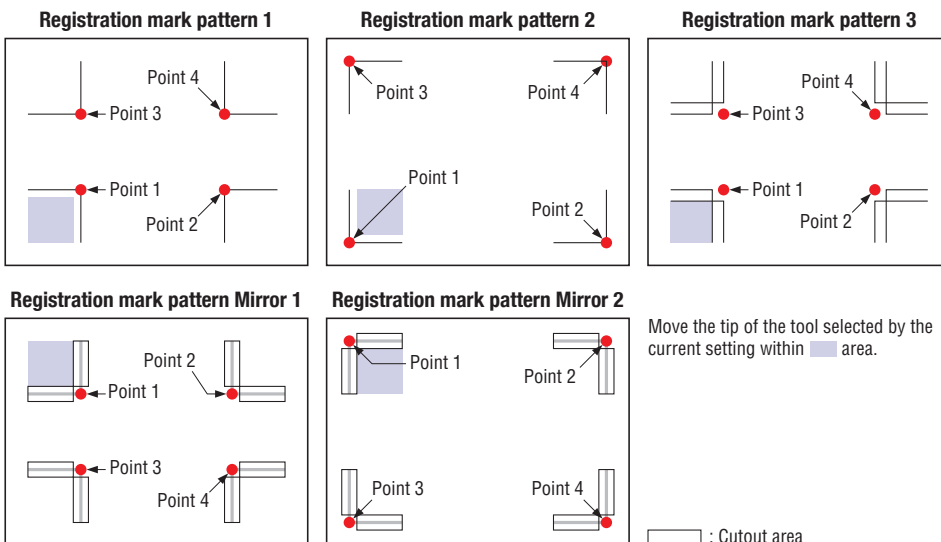
(1) Select MARKS as the registration mark mode, and then select the number of points for reading. (See Section 4.2, "Setting the Registration Mark Mode".)

(2) With the plotter in Ready status, press the [ORIGIN] key to display the menu shown below.



The numbers 1, 2, and 3 displayed on this menu are the MARK MOVE No. settings. (See Section 4.2, "Setting the Registration Mark Mode".)

(3) Use the [◀] [▶] [△] [▽] keys to move the tool carriage (the tip of the tool selected by the current setting) to the point 1 area.



- (4) Press the **[F1]**, **[F2]** or **[F3]** key to select the corresponding number for the Mark Move No. setting. The following prompt is displayed while the plotter detects the adjustment points.

FORCE	OFFSET
ARMS IS OPERATING WAIT....	
SPEED	QUALITY

- (5) When the points have been read, the following menu for distance adjustment between points 1 and 2 is displayed.

FORCE	OFFSET
1 - 2M	00260.0 mm
S	00260.0 mm
SPEED	QUALITY

The display's first line (M) shows the distance between the first and second points as read by the plotter. Input the actual distance (the data distance) in the second line (S). Use the **[△]** or **[▽]** key to change the numeric value, and then press the **[↵]** **[ENTER]** key.

### CHECKPOINT

If **CUSTOM** or **STANDARD** has been selected on the Registration Mark Distance Adjustment menu, the value is adjusted automatically and the menu for inputting the adjustment value is not displayed.

If the value you input is exceedingly large (1.5 times or greater) or very small (0.5 times or less), or if the angle of tilt with respect to the original axis tilt is 45° or greater, the following prompt is displayed. In this case, please re-input the value.

FORCE	OFFSET
DISTANCE ADJUSTMENT ERROR. SET AGAIN!	
SPEED	QUALITY

- (6) If 3-point or 4-point adjustment has been selected, the menu for adjusting the distance between points 1 and 3 will be displayed. Make the settings in the same way as for the distance between points 1 and 2.
- (7) When all the adjustments have been completed, the plotter returns to Ready status.

## Manual Detection

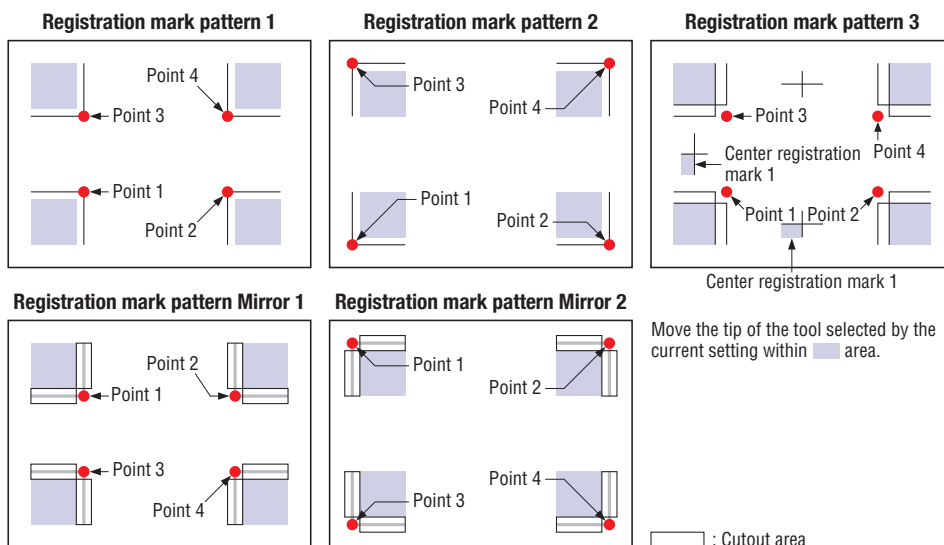
- (1) Select **MARKS** as the registration mark mode. (See Section 4.2, "Setting the Registration Mark Mode".)
- (2) With the plotter in Ready status, press the **[⊕]** **[ORIGIN]** key to display the menu shown below.

FORCE	OFFSET
◀1	3▶
◀2	MANUAL▶
SPEED	QUALITY

- (3) Press the **[F4]** key (**MANUAL**) to display the menu shown below.

FORCE	OFFSET
DISTANCE ADJUSTMENT ERROR. SET AGAIN!	
SPEED	QUALITY

- (4) Use the [**◀**] [**▶**] [**▲**] [**▼**] keys to move the tool carriage (the tip of the tool selected by the current setting) to the first point position ( point 1 area) and then press the [**↵**] [**ENTER**] key. The plotter detects point 1.



- (5) The prompts for setting point 2, point 3 and point 4 that were set in the registration mark mode will be displayed in succession. Make the settings in the same way as for point 1.
- (6) When all the points have been detected, the prompts for setting the second point position, the third point position and the fourth point position will be displayed in succession. Make the settings in the same way as for the first point position.
- (7) When all the point positions have been set, the menu shown below is displayed.

FORCE	OFFSET
1 - 2M	00499.8 mm
S	00500.0 mm
SPEED	QUALITY

The display's first line (M) shows the distance between the first and second points as read by the plotter. Input the actual distance (the data distance) in the second line (S). Use the [**▲**] or [**▼**] key to change the numeric value, and then press the [**↵**] [**ENTER**] key. The plotter returns to Ready status.

### CHECKPOINT

If CUSTOM or STANDARD has been selected on the Registration Mark Distance Adjustment menu, the value is adjusted automatically and the menu for inputting the adjustment value is not displayed.


If the value you input is exceedingly large (1.5 times or greater) or very small (0.5 times or less), or if the angle of tilt with respect to the original axis tilt is 45° or greater, the following prompt is displayed. In this case, please re-input the value.

FORCE	OFFSET
DISTANCE ADJUSTMENT ERROR. SET AGAIN!	
SPEED	QUALITY

- (8) If 3-point or 4-point adjustment has been selected, the menu for adjusting the distance between points 1 and 3 will be displayed. Make the settings in the same way as for the distance between points 1 and 2.
- (9) When all the adjustments have been completed, the plotter returns to Ready status.

## 4.14 Setting the Registration Mark Cutting Function

If your registration mark pattern is Mirror 1 or Mirror 2, the registration marks can be cut after they have been detected.

- (1) Select MARKS for the registration mark mode (see Section 4.2, "Setting the Registration Mark Mode".)
- (2) Select "MIRROR" for the registration mark pattern (see Section 4.3, "Setting the Registration Mark Pattern").
- (3) With the plotter in Ready status, press the  [ORIGIN] key to display the following menu.

```

FORCE                                OFFSET
┌──────────┬──────────┐
│◀1          3▶│
│◀2          MANUAL▶│
└──────────┴──────────┘
SPEED                                QUALITY
  
```

- (4) Press the [NEXT] key to display the following menu.

```

FORCE                                OFFSET
┌──────────┬──────────┐
│◀MIRROR MARKS▶│
│◀START POS LEV. ADJ▶│
└──────────┴──────────┘
SPEED                                QUALITY
  
```

- (5) Press the [F1] key (MIRROR MARKS) to display the menu for cutting mirror marks.


```

FORCE                                OFFSET
┌──────────┬──────────┐
│CUT MIRROR MARKS│
│ON           OFF●│
└──────────┴──────────┘
SPEED                                QUALITY
  
```

The currently selected setting is indicated by a black dot [●].

To cut a registration mark, press the [F2] key (ON).


If you do not wish to cut a registration mark, press the [F4] key (OFF).

When the displayed setting is satisfactory, press the  [ENTER] key to confirm your selection.

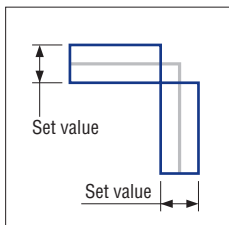
- (6) When ON has been selected, a menu for setting the spacing for the selected registration mark mirror pattern is displayed.

```

FORCE                                OFFSET
┌──────────┬──────────┐
│MARK TYPE:MIRROR│
│SPACING = 3.0■mm│
└──────────┴──────────┘
SPEED                                QUALITY
  
```

Use the [△] or [▽] key to change the numeric value, and then press the  [ENTER] key to confirm your selection.

**Setting range: 0 to 9.9 (mm) [Default value: 3]**



- (7) After the registration mark has been detected, the following menu is displayed. (See Section 4.13, "Registration Mark Detection".)

```

FORCE                                OFFSET
┌──────────┬──────────┐
│CUT MIRROR MARKS?│
│◀YES          NO▶│
└──────────┴──────────┘
SPEED                                QUALITY
  
```

Press the **[F2]** key (YES) to perform cutting of the detected registration mark.




If OFF has been selected for CUT MIRROR MARKS, the Y coordinate for cutting mirror marks is inverted.


---

## 4.15 Setting the Registration Mark Detection Start Position

This function sets the start position for registration mark detection.

- (1) Select either AXIS or MARKS for the registration mark mode (see Section 4.2, "Setting the Registration Mark Mode").
- (2) With the plotter in Ready status, press the  **[ORIGIN]** key to display the following menu.

FORCE	OFFSET
◀1	3▶
◀2	MANUAL▶
SPEED	QUALITY

- (3) Press the  **[NEXT]** key to display the following menu.

FORCE	OFFSET
◀MIRROR MARKS	
◀START POS LEV. ADJ▶	
SPEED	QUALITY

- (4) Press the **[F2]** key (START POS) to display the menu for setting the start position for the reading of registration marks.

FORCE	OFFSET
●SAVE POS	ORG POS
CURRENT POS	AUTO●
SPEED	QUALITY


The currently selected setting is indicated by a black dot [●].

To save the current position and use it as the start position for the next registration mark detection operation, press the **[F1]** key (SAVE POS).

To start registration mark detection from the current tool carriage position, press the **[F2]** key (CURRENT POS).

To start registration mark detection from the origin point, press the **[F3]** key (ORG POS).

If the **[F4]** key (AUTO) is pressed, the sensor performs detection while moving in a diagonal direction if the first registration mark (the registration mark at the lower left position) is not detected from the current start position.

When the displayed setting is satisfactory, press the  **[ENTER]** key to confirm your selection.

# CHAPTER 5

## FUNCTION SETTINGS AND OPERATIONS

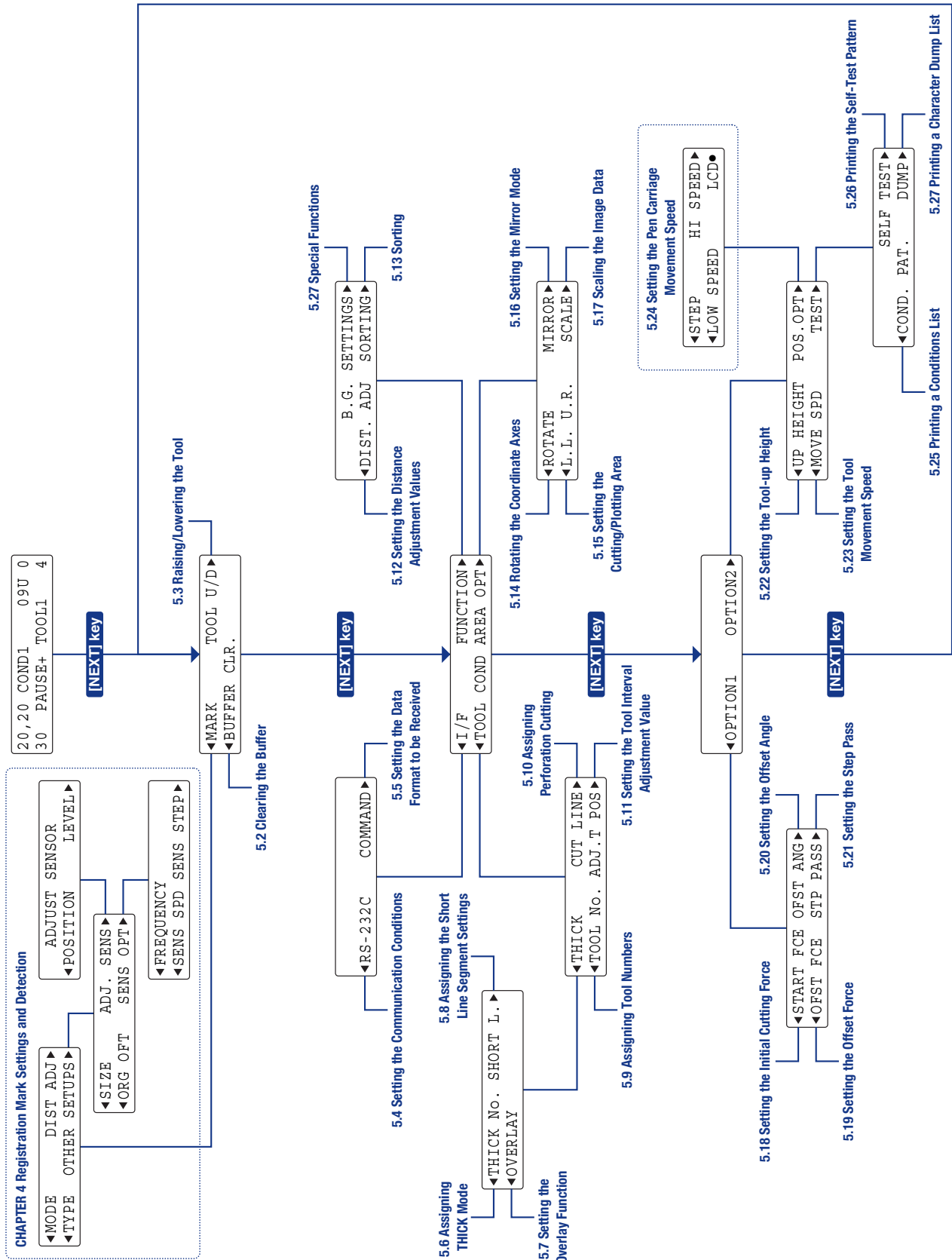
### PRODUCT SUMMARY

- 5.1 PAUSE Menu Configuration
- 5.2 Clearing the Buffer
- 5.3 Raising/Lowering the Tool
- 5.4 Setting the Communication Conditions
- 5.5 Setting the Data Format to be Received
- 5.6 Assigning THICK Mode
- 5.7 Setting the Overlay Function
- 5.8 Assigning the Short Line Segment Settings
- 5.9 Assigning Tool Numbers
- 5.10 Assigning Perforation Cutting
- 5.11 Setting the Tool Interval Adjustment Value
- 5.12 Setting the Distance Adjustment Values
- 5.13 Sorting
- 5.14 Rotating the Coordinate Axes
- 5.15 Setting the Cutting/Plotting Area
- 5.16 Setting the Mirror Mode
- 5.17 Scaling the Image Data
- 5.18 Setting the Initial Cutting Force
- 5.19 Setting the Offset Force
- 5.20 Setting the Offset Angle
- 5.21 Setting the Step Pass
- 5.22 Setting the Tool-up Height
- 5.23 Setting the Tool Movement Speed
- 5.24 Setting the Pen Carriage Movement Speed
- 5.25 Printing a Conditions List
- 5.26 Printing the Self-Test Pattern
- 5.27 Printing a Character Dump List
- 5.28 Special Functions





## 5.1 PAUSE Menu Configuration

When the plotter is in PAUSE mode, each of the functions listed below can be accessed by pressing the [NEXT] key until the desired menu appears and then pressing function key [F1] [F2] [F3] or [F4] to select the desired menu parameter.



## 5.2 Clearing the Buffer

This function allows you to clear all the output data in the plotter's buffer.

- (1) Press the  [PAUSE] key to select PAUSE mode.
- (2) Press the  [NEXT] key repeatedly until the following menu is displayed.


```

FORCE                                OFFSET
┌ MARK          TOOL U/D ──▶
│ ◀ BUFFER CLR.
└──────────────────────────
SPEED                                QUALITY
  
```

- (3) Press the [F2] key (BUFFER CLR.). The prompt message shown below is displayed for several seconds, followed by the BUFFER CLEAR OK? screen.


```

FORCE                                OFFSET
┌ CONFIRM DATA FROM
│   HOST STOPPED.
└──────────────────────────
SPEED                                QUALITY
  
```



```

FORCE                                OFFSET
┌ BUFFER CLEAR OK?
│ ◀ CLEAR          CANCEL ▶
└──────────────────────────
SPEED                                QUALITY
  
```

- (4) To clear all the data in the plotter's buffer, press the [F2] key (CLEAR).  
To retain the data in the plotter's buffer, press the [F4] key (CANCEL).
- (5) Press the  [PAUSE] key to cancel PAUSE mode.

### CAUTION



Do not execute the BUFFER CLEAR function until the computer has completed data output. If you clear the buffer while the computer is still sending data to the plotter, the data received up to the time that PAUSE mode was selected is cleared but the computer resumes sending subsequent data which remains in the buffer. When the [PAUSE] key is pressed to cancel PAUSE mode, that data is cut/plotted. At such time, the pen carriage may suddenly start moving so be sure to keep your hands, face, and other obstacles out of the vicinity of the pen carriage and Y bar.

### CHECKPOINT


If you selected CANCEL on the BUFFER CLEAR OK? screen, cutting/plotting resumes as soon as the [PAUSE] key is pressed to cancel PAUSE mode.

## 5.3 Raising/Lowering the Tool

This function allows you to raise or lower the tool from the control panel.

- (1) Press the  [PAUSE] key to select PAUSE mode.
- (2) Press the  [NEXT] key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀ MARK	TOOL U/D ▶
◀ BUFFER CLR.	
SPEED	QUALITY

- (3) Press the [F3] key (TOOL U/D) to raise or lower the tool. Each time the [F3] key is pressed, the tool is alternately raised and lowered.
- (4) Press the  [PAUSE] key to cancel PAUSE mode.

---



 **CAUTION**

While using this function, keep your hands out of the vicinity of the tool carriage.

---

## 5.4 Setting the Communication Conditions

When your plotter is connected via an RS-232C cable to a computer, be sure to set identical communication conditions in the software and OS communication settings for the data transfer rate (baud rate), data length, and parity. This section describes the settings on the plotter side. For setting instructions for the software and OS side, consult the respective user's manuals. Three groups of communication settings can be completed, allowing you to switch to a different group of settings in a single operation.

- Press the  **[PAUSE]** key to select PAUSE mode.
- Press the  **[NEXT]** key repeatedly until the following menu is displayed.

FORCE		OFFSET
◀ I / F	FUNCTION ▶	
◀ TOOL COND AREA OPT ▶		
SPEED		QUALITY

- Press the **[F1]** key (INTERFACE) to display the menu shown below.

FORCE		OFFSET
◀ RS - 232 C	COMMAND ▶	
SPEED		QUALITY

- Press the **[F2]** key (RS-232C) to display the menu for selection of the communication settings group.

FORCE		OFFSET
RS - 232 C COND No .		
No . = 1 ■		
SPEED		QUALITY

- The group numbers are displayed in the bottom row. Use the **[△]** or **[▽]** key to select a group.

**Setting range: 1, 2, or 3**

- After selecting the desired group No., press the  **[ENTER]** key to confirm your choice. The communication conditions settings are displayed.

FORCE		OFFSET
■ 9600	RS - 1	N
8 BITS		H
SPEED		QUALITY



- [F1]** shows the transfer rate (baud rate), **[F2]** the data length, **[F3]** the parity, and **[F4]** the handshake setting values that are currently selected. Use the **[F1]** to **[F4]** keys to select the desired parameter, then use the **[△]** or **[▽]** key to select the parameter details (see below). Make sure the setting details at your plotter are identical with the software or OS settings.

**Baud rate: 19200, 9600, 4800, 2400, 1200, 600, 300 (bps)**

**Parity: N (None), E (Even), O (Odd)**

**Data length: 7 BITS, 8 BITS**



**Handshake: H (Hardwire), X (X-on/X-off), E (ENQ/ACK; selectable in HP-GL command mode only)**

After completing each setting item, press the  **[ENTER]** key to confirm your selection. To cancel your selection, press the  **[NEXT]** key.

- Press the  **[PAUSE]** key to cancel PAUSE mode.

## 5.5 Setting the Data Format to be Received

Before data is sent from the computer, your plotter must be set to recognize the data format (command mode) sent by the software. Your plotter supports two data formats (command modes): GP-GL (Graphtec commands) and HP-GL commands. Select the command mode best suited for your application.

- Press the  **[PAUSE]** key to select PAUSE mode.
- Press the  **[NEXT]** key repeatedly until the following menu is displayed.

```

FORCE                                OFFSET
┌──────────┬──────────┬──────────┬──────────┐
│◀ I / F    │          │FUNCTION▶ │          │
│◀ TOOL COND│ AREA OPT▶│          │          │
└──────────┴──────────┴──────────┴──────────┘
SPEED                                QUALITY
  
```

- Press the **[F1]** key (INTERFACE) to display the menu shown below.

```

FORCE                                OFFSET
┌──────────┬──────────┬──────────┬──────────┐
│◀ RS - 232C│          │COMMAND▶ │          │
└──────────┴──────────┴──────────┴──────────┘
SPEED                                QUALITY
  
```

- Press the **[F4]** key (COMMAND) to display the command setting screen.

### When HP-GL has been selected

```

FORCE                                OFFSET
┌──────────┬──────────┬──────────┬──────────┐
│● HP - GL  │          │GP - GL  │          │
│ORIGIN POINT=│ CENTER■ │          │          │
└──────────┴──────────┴──────────┴──────────┘
SPEED                                QUALITY
  
```

### When GP-GL has been selected

```

FORCE                                OFFSET
┌──────────┬──────────┬──────────┬──────────┐
│HP - GL    │          │GP - GL● │          │
│STEP SIZE=0.100■ mm│          │          │          │
└──────────┴──────────┴──────────┴──────────┘
SPEED                                QUALITY
  
```

The current setting is indicated by a black dot [●].


Press the **[F1]** key to select the HP-GL command mode.

Press the **[F3]** key to select the GP-GL command mode.

#### • HP-GL



Specify the origin point.

Use the **[△]** or **[▽]** key to toggle the display between CENTER (center of the plotting area) and L.L. (lower left).

After selecting the desired origin point, press the  **[ENTER]** key to confirm your selection.

#### • GP-GL



Specify the step size.

Use the **[△]** or **[▽]** key to cycle through the 0.100, 0.050, 0.025, and 0.010 mm values. After selecting the desired value, press the  **[ENTER]** key to confirm your selection. To cancel your selection, press the  **[NEXT]** key.

- Press the  **[PAUSE]** key to cancel PAUSE mode.

## 5.6 Assigning THICK Mode

This function allows you to assign the THICK mode to COND Nos. 1 to 8. THICK mode is used for cutting thick media such as masking rubber for sandblasting, thick pattern paper for apparel design as well as for hard media such as acrylic film.

- Press the  **[PAUSE]** key to select PAUSE mode.
- Press the  **[NEXT]** key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀ I / F	FUNCTION ▶
◀ TOOL COND AREA OPT ▶	
SPEED	QUALITY

- Press the **[F2]** key (TOOL COND) to display the menu shown below.

FORCE	OFFSET
◀ THICK	CUT LINE ▶
◀ TOOL No. ADJ.T POS ▶	
SPEED	QUALITY

- Press the **[F1]** key (THICK) to display the menu shown below.

FORCE	OFFSET
◀ THICK No. SHORT L. ▶	
◀ OVERLAY	
SPEED	QUALITY

- Press the **[F2]** key (THICK No.) to display the THICK mode assignment setting screen.


FORCE	OFFSET
COND. No. 1 2 3 4 5 6 7 8	
THICK	✓
SPEED	QUALITY

Blinking cursor

The upper row of the display represents the cutting condition COND Nos. A check mark [✓] is displayed for any of the COND. Nos. to which THICK mode has been assigned.

Use the [**◀**] or [**▶**] key to move the blinking cursor to the COND. No. that you want to assign THICK mode to, and the [**△**] or [**▽**] key to display or hide the check mark [✓].

Press the  **[ENTER]** key to confirm your selection.

- Press the  **[PAUSE]** key to cancel PAUSE status.
- When THICK mode has been assigned to a condition number, the blinking cursor appears over the Tool No. when the plotter is in Ready status.

FORCE	OFFSET
20,20 COND1	09U 0
30 READY+ TOOL1	4
SPEED	QUALITY

### CHECKPOINT

- THICK mode is disabled when "PEN" or "CP-001" has been selected as the cutter blade type.
- Please see Section 3.7, "Setting the Cutting Conditions" for details on THICK mode settings.

## 5.7 Setting the Overlay Function

The Overlay function enables repeated cutting to be performed on a medium that cannot be cut with one cutting operation. A cutting force that is lighter than the specified FORCE value can be used to leave cutting trace marks on the medium in the first cutting operation, and then the specified FORCE value used for the second and subsequent cutting operations.

### • ALL mode

Overlay cutting is performed on all of the cutting data as one block.

Overlay cutting using the copy mode cannot be performed on data that exceeds the plotter's buffer size.

If there are no delimiter commands (such as F0 or PG), the plotter waits for a timeout (approx. 10 s) and then starts the second cutting operation. In this case, "PREPARING TO RECUT" is displayed on the screen and operations such as changing the COND No., making PAUSE menu settings and setting the origin cannot be performed until 10 seconds have elapsed.

### • BLOCK mode

Overlay cutting is performed of the continuous line segments from one tool down operation until the next tool up operation.

Overlay cutting can be performed even of data that exceeds the plotter's buffer size.

If the number of continuous line segments exceeds the block buffer capacity, the block buffer is handled as one block and overlay cutting is performed in separate blocks. The number of blade rotation operations at the start point may therefore increase.

(1) Press the  [PAUSE] key to select PAUSE mode.

(2) Press the  [NEXT] key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀ I / F	FUNCTION ▶
◀ TOOL COND AREA OPT ▶	
SPEED	QUALITY

(3) Press the [F2] key (TOOL COND) to display the menu shown below.

FORCE	OFFSET
◀ THICK	CUT LINE ▶
◀ TOOL No. ADJ.T POS ▶	
SPEED	QUALITY

(4) Press the [F1] key (THICK) to display the menu shown below.

FORCE	OFFSET
◀ THICK No. SHORT L. ▶	
◀ OVERLAY	
SPEED	QUALITY

(5) Press the [F2] key (OVERLAY) to display the overlay mode settings screen.

FORCE	OFFSET
OVERRLAY CUT MODE	
● ALL	BLOCK
SPEED	QUALITY

The black dot [●] indicates the currently selected parameter.

To select the ALL parameter, press the [F1] key. To deselect the ALL parameter, press the [F1] key once again.

To select the BLOCK parameter, press the [F3] key. To deselect the BLOCK parameter, press the [F3] key once again.

- (6) Press the **[F2]** key (OVERLAY) to display the overlay settings screen.

FORCE	1 2 3 4 5 6 7 8	OFFSET
COND No.	1 2 3 4 5 6 7 8	
OVERLAY	- 9 - 7 - 6 - 4	
SPEED	Blinking cursor	QUALITY

The upper row of the display represents the cutting condition COND Nos. The lower row of the display indicates the number of overlay operations that has been specified for each COND No.

Use the **[<]** or **[>]** key to move the blinking cursor to the COND. No. for which you want to specify the Overlay function, and the **[Δ]** or **[▽]** key to select the number of overlay operations.

**Setting range: – (Off), 2 to 9 (times)**

Press the **[↵]** **[ENTER]** key to confirm your selection.

- (7) When the **[↵]** **[ENTER]** key is pressed, the screen for setting the COND Nos. for one overlay cutting operation only is displayed.

FORCE	1 2 3 4 5 6 7 8	OFFSET
COND No.	1 2 3 4 5 6 7 8	
FIRST No.	- 2 - 4 - 6 7 -	
SPEED	Blinking cursor	QUALITY

The upper row of the display represents the cutting condition COND Nos. The lower row of the display indicates the COND Nos. for which overlay cutting has been specified.

Use the **[<]** or **[>]** key to move the blinking cursor to the COND. No. to which you wish to assign the first overlay cutting operation only, and the **[Δ]** or **[▽]** key to make your selection.

**Setting range: - (Off), 1 to 8 (each COND No.) (On)**

**[Example]**

Specify overlay cutting for COND No. 1 and COND No. 2. Specify the usual FORCE value for COND. No. 1, and then specify a FORCE value that is lower than the COND No. 1 value for COND No. 2.

FORCE	1 2 3 4 5 6 7 8	OFFSET
COND No.	1 2 3 4 5 6 7 8	
FIRST No.	2 2 - - - - -	
SPEED		QUALITY

If COND No. 1 is selected to perform cutting in this status, the first cutting operation will be performed at the low FORCE value specified for COND No.2, and the second and subsequent cutting operations will be performed at the usual FORCE value specified for COND No. 1.

Press the **[↵]** **[ENTER]** key to confirm your selections.

- (8) Press the **[⏸]** **[PAUSE]** key to cancel PAUSE mode.

**CHECKPOINT**



- These settings are retained in the plotter's internal memory even while the plotter is turned off.
- If the AUTO mode has been selected and there are no data delimiter commands (such as F0 or PG), the plotter waits for a timeout (approx. 10 seconds) and then starts the second cutting operation.
- Once the overlay cutting operation has started, operations such as changing the COND No., making Pause menu settings and setting the origin cannot be performed until approximately 10 seconds have elapsed after all the cutting operations have been completed. (The following screen appears if any of these keys are pressed during the overlay cutting operation.)

FORCE	PREPARING TO RECUT	OFFSET
SPEED		QUALITY



## 5.8 Assigning the Short Line Segment Settings

This function allows you to assign the short line segment settings to COND Nos. 1 to 8. Use this function to shorten the overall cutting time through short line segment settings that specify a fast cutting speed for long straight lines and a slower cutting speed for rounded corners and so forth.

- Press the  **[PAUSE]** key to select PAUSE mode.
- Press the  **[NEXT]** key repeatedly until the following menu is displayed.

```

FORCE                                OFFSET
┌──────────┬──────────┬──────────┬──────────┐
│◀ I / F    │          │FUNCTION▶ │          │
│◀ TOOL COND│ AREA OPT │          │          │
└──────────┴──────────┴──────────┴──────────┘
SPEED                                QUALITY

```

- Press the **[F2]** key (TOOL COND) to display the menu shown below.

```

FORCE                                OFFSET
┌──────────┬──────────┬──────────┬──────────┐
│◀ THICK    │          │CUT LINE▶ │          │
│◀ TOOL No. │ ADJ.T POS│          │          │
└──────────┴──────────┴──────────┴──────────┘
SPEED                                QUALITY

```

- Press the **[F1]** key (THICK) to display the menu shown below.

```

FORCE                                OFFSET
┌──────────┬──────────┬──────────┬──────────┐
│◀ THICK No.│ SHORT L.▶ │          │          │
│◀ OVERLAY  │          │          │          │
└──────────┴──────────┴──────────┴──────────┘
SPEED                                QUALITY

```

- Press the **[F3]** key (SHORT L.) to display the menu shown below.

```

FORCE                                OFFSET
┌──────────┬──────────┬──────────┬──────────┐
│COND No.   │ 1 2 3 4 5 6 7 8│          │          │
│SHORT L.   │ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ │          │          │
└──────────┴──────────┴──────────┴──────────┘
SPEED  Blinking cursor ───┬─── QUALITY

```

The upper row of the display represents the cutting condition COND Nos. A check mark [✓] is displayed under each of the COND. Nos. to which the short line segment settings have been assigned.

Use the [**◀**] or [**▶**] key to move the blinking cursor to the COND. No. that you wish to assign the short line segment settings to, and the [**△**] or [**▽**] key to display or hide the check mark [✓].

Press the  **[ENTER]** key to confirm your selections.

- Press the  **[PAUSE]** key to cancel PAUSE mode.

### CHECKPOINT



- The short line segment settings are disabled when "PEN" or "CP001" has been selected as the cutter blade type.
- Please see the subsection "Short Line Segment Settings" in Section 3.7, "Setting the Cutting Conditions" for details on how to make the short line segment settings.

## 5.9 Assigning Tool Numbers

This function enables you to assign tool holder 1 and tool holder to COND Nos. 1 to 8.

### CHECKPOINT

If the application software is used to perform pen exchange operations, "ENABLED" must be selected for the "Tool Exchange Commands" setting (see Section 5.28, "Special Functions").

- (1) Press the  [PAUSE] key to select PAUSE mode.
- (2) Press the  [NEXT] key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀ I / F	FUNCTION ▶
◀ TOOL COND AREA OPT ▶	
SPEED	QUALITY

- (3) Press the [F2] key (TOOL COND) to display the menu shown below.


FORCE	OFFSET
◀ THICK	CUT LINE ▶
◀ TOOL No. ADJ.T POS ▶	
SPEED	QUALITY

- (4) Press the [F2] key (TOOL No.) to display the tool number assignment setting screen.

FORCE	OFFSET
COND No. 1 2 3 4 5 6 7 8	
TOOL No. 1 1 1 1 2 2 2 2	
SPEED	QUALITY

The upper row of the display represents the cutting condition COND Nos. Use the [◀] or [▶] key to move the blinking cursor underneath the CONDITION No. for which you wish to change the current tool assignment, and then use the [△] or [▽] key to toggle the tool number between 1 and 2.

The factory default settings are those shown in the above screen.

Press the  [ENTER] key to confirm your selections.



- (5) Press the  [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

These settings are retained in the plotter's internal memory even while the plotter is turned off.

## 5.10 Assigning Perforation Cutting

This function allows you to assign the perforation cutting operation to COND Nos. 1 to 8.

- (1) Press the  [PAUSE] key to select PAUSE mode.
- (2) Press the  [NEXT] key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀ I / F	FUNCTION ▶
◀ TOOL COND AREA OPT ▶	
SPEED	QUALITY

- (3) Press the [F2] key (TOOL COND) to display the menu shown below.

FORCE	OFFSET
◀ THICK	CUT LINE ▶
◀ TOOL No. ADJ.T POS ▶	
SPEED	QUALITY

- (4) Press the [F3] key (CUT LINE) to display the perforation cutting operation assignment setting screen.

FORCE	OFFSET
COND. No. 1 2 3 4 5 6 7 8	
CUT LINE	✓
SPEED	QUALITY

Blinking cursor

The upper row of the display represents the cutting condition COND Nos. A check mark [✓] is displayed for any of the COND. Nos. to which the perforation cutting operation has been assigned.

Use the [◀] or [▶] key to move the blinking cursor to the COND. No. that you want to assign the perforation cutting operation to, and the [△] or [▽] key to display or hide the check mark [✓].

Press the  [ENTER] key to confirm your selections.



- (5) Press the  [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

- These settings are retained in the plotter's internal memory even while the plotter is turned off.
- Please see Section 3.7, "Setting the Cutting Conditions" for details on perforation settings.

## 5.11 Setting the Tool Interval Adjustment Value

This function allows you to make adjustments for any deviation between the initial drawing/cutting positions of tool holder 1 and tool holder 2. Use plotting pens to draw the lines for this adjustment and specify the same plotting conditions for tool holder 1 and tool holder 2. The lowest assigned condition setting number (COND No.) will be used for each tool holder (see Section 5.9, "Assigning Tool Numbers" for further details).

- (1) Load a medium that is suitable for plotting.
- (2) Mount a plotting pen in both tool holder 1 and tool holder 2.
- (3) Press the  [PAUSE] key to select PAUSE mode.
- (4) Press the  [NEXT] key repeatedly until the following menu is displayed.

```

FORCE                                OFFSET
┌───┬───┬───┬───┬───┬───┬───┬───┬───┬───┐
│◀ I / F           FUNCTION ▶│
│◀ TOOL COND AREA OPT ▶│
└───┴───┴───┴───┴───┴───┴───┴───┴───┴───┘
SPEED                                QUALITY
  
```

- (5) Press the [F2] key (TOOL COND) to display the menu shown below.


```

FORCE                                OFFSET
┌───┬───┬───┬───┬───┬───┬───┬───┬───┬───┐
│◀ THICK           CUT LINE ▶│
│◀ TOOL No. ADJ.T POS ▶│
└───┴───┴───┴───┴───┴───┴───┴───┴───┴───┘
SPEED                                QUALITY
  
```

- (6) Press the [F4] key (ADJ.T POS) to display the tool interval adjustment setting screen.


```

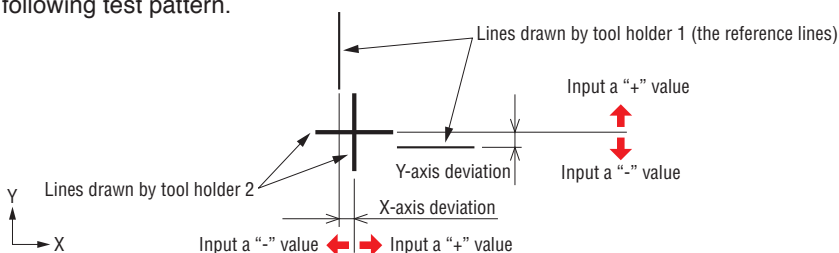
FORCE                                OFFSET
┌───┬───┬───┬───┬───┬───┬───┬───┬───┬───┐
│          TOOL WIDTH ADJ.          │
│ X= 0.0mm  Y= 0.0mm              │
└───┴───┴───┴───┴───┴───┴───┴───┴───┴───┘
SPEED                                QUALITY
  
```

- (7) Press the  [TEST] key to display the menu shown below.

```

FORCE                                OFFSET
┌───┬───┬───┬───┬───┬───┬───┬───┬───┬───┐
│          SELECT PLOT POINT          │
│          PRESS ENTER KEY!          │
└───┴───┴───┴───┴───┴───┴───┴───┴───┴───┘
SPEED                                QUALITY
  
```

Use the [ $\leftarrow$ ] [ $\rightarrow$ ] [ $\Delta$ ] [ $\nabla$ ] keys to move the tool carriage (the tip of the tool selected by the current setting) to the position where you want to draw the test pattern. Press the  [ENTER] key. The plotter will start drawing the following test pattern.



Adjust the deviation of tool holder 2 based on the lines drawn by tool holder 1.

To adjust the X-axis deviation, press the [F2] key and then use the [ $\Delta$ ] or [ $\nabla$ ] key to adjust the numeric value.

To adjust the Y-axis deviation, press the [F4] key and then use the [ $\Delta$ ] or [ $\nabla$ ] key to adjust the numeric value.

**Setting range: -8.0 to +8.0 (mm)**

In the case of the above figure, input a "-" value for both X= and Y=.



- (8) Press the  [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

This setting is retained in the plotter's internal memory even while the plotter is turned off.

## 5.12 Setting the Distance Adjustment Values

This function is used to correct any discrepancies in the lengths of the cut or plotted line segments. If, for example, the DISTANCE ADJUST setting is specified as 0.05%, and the distance of the cut is 500 mm, the cut distance is increased by  $500 \times 0.05\%$  (= 0.25 mm), which means that the total cut distance is 500.25 mm.

- Press the  [PAUSE] key to select PAUSE mode.
- Press the  [NEXT] key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀ I / F	FUNCTION ▶
◀ TOOL COND AREA OPT ▶	
SPEED	QUALITY

- Press the [F3] key (FUNCTION) to display the menu shown below.

FORCE	OFFSET
	B . G . SETTINGS ▶
◀ DIST . ADJ	SORTING ▶
SPEED	QUALITY

- Press the [F2] key (DIST ADJ.) to display the distance adjustment values setting screen.

FORCE	OFFSET
	DISTANCE ADJUST
■ X = 0.00%	Y = 0.00%
SPEED	QUALITY

Press the [F2] key to move the blinking cursor to the X= parameter or the [F4] key to move the blinking cursor to the Y= parameter, and then use the [Δ] or [▽] key to change the respective numeric value.

Press the  [ENTER] key to confirm your selections.

**Setting range: -0.25 to +0.25(%) , in 0.05(%) increments**



- Press the  [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

These settings are retained in the plotter's internal memory even while the plotter is turned off.

## 5.13 Sorting

Sorting helps prevent wasted time in tool changes and reduces the time required for a cutting/plotting operation. When sorted data from the software is received, less time is required for processing than when sorting is performed on your plotter. In such cases, switching off sorting can speed up processing.


- (1) Press the  **[PAUSE]** key to select PAUSE mode.
- (2) Press the  **[NEXT]** key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀ I / F	FUNCTION ▶
◀ TOOL COND AREA OPT ▶	
SPEED	QUALITY

- (3) Press the **[F3]** key (FUNCTION) to display the menu shown below.

FORCE	OFFSET
	B . G . SETTINGS ▶
◀ DIST . ADJ	SORTING ▶
SPEED	QUALITY



- (4) Press the **[F4]** key (SORTING) to display the Sorting settings screen.

FORCE	OFFSET
SORT	= OFF 
SPEED	QUALITY

The currently selected mode is shown at the right. Use the **[△]** or **[▽]** key to cycle through OFF, 1, and 2, and to select the mode.

**OFF:** Sorting is deactivated.

- 1: In the data received, all data plotted by the same tool is grouped to minimize the number of tool changes and reduce the tool-changing time.
- 2: Additional settings are applied to "1" above so that work done by the cutter pen comes last.

After selecting the mode, confirm your selection by pressing the  **[ENTER]** key. To cancel your selection, press the  **[NEXT]** key.

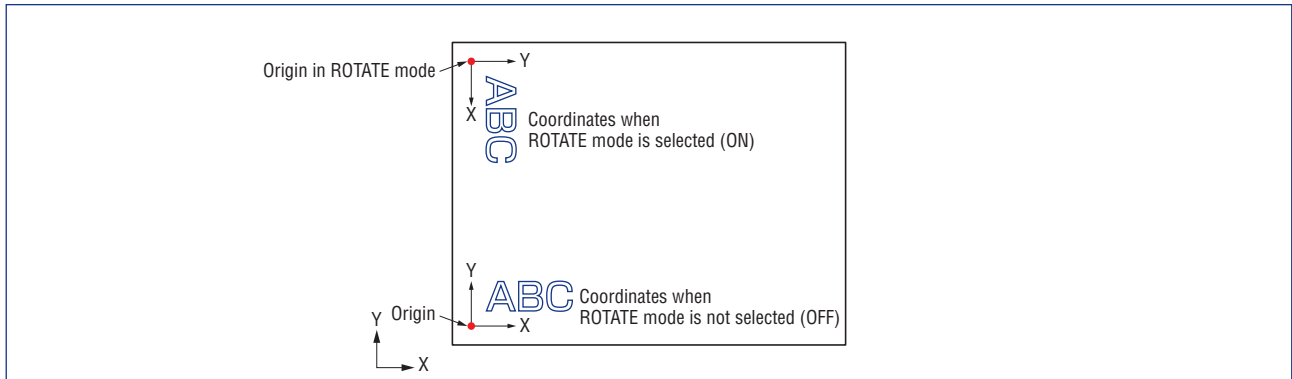
- (5) Press the  **[PAUSE]** key to cancel PAUSE mode.

### CHECKPOINT

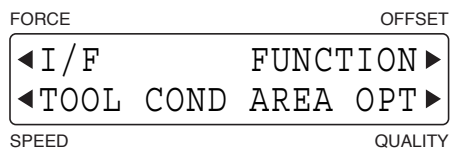
- Data is stored in the plotter's buffer for sorting processing, and so it may take a moment for cutting to begin.
- Complete the settings for COND Nos. 1 to 8 in advance for the tools to be used in sorting. See Section 3.7, "Setting the Cutting Conditions", for further details.

## 5.14 Rotating the Coordinate Axes

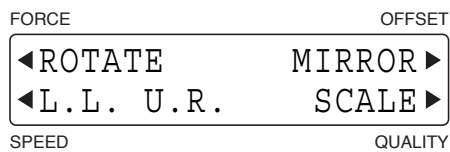
This function is used to move the origin and rotate the coordinate axes by 90° as shown in the figure below.



- (1) Press the [PAUSE] key to select PAUSE mode.
- (2) Press the [NEXT] key repeatedly until the following menu is displayed.



- (3) Press the [F4] key (AREA OPT) to display the menu shown below.



- (4) Press the [F1] key (ROTATE) to display the coordinate rotation setting screen.



The current setting is indicated by a black dot [●].

To select ROTATE mode, press the [F2] key (ON).

To cancel ROTATE mode, press the [F4] key (OFF).

After you have selected the desired parameter, press the [ENTER] key to confirm your selection.

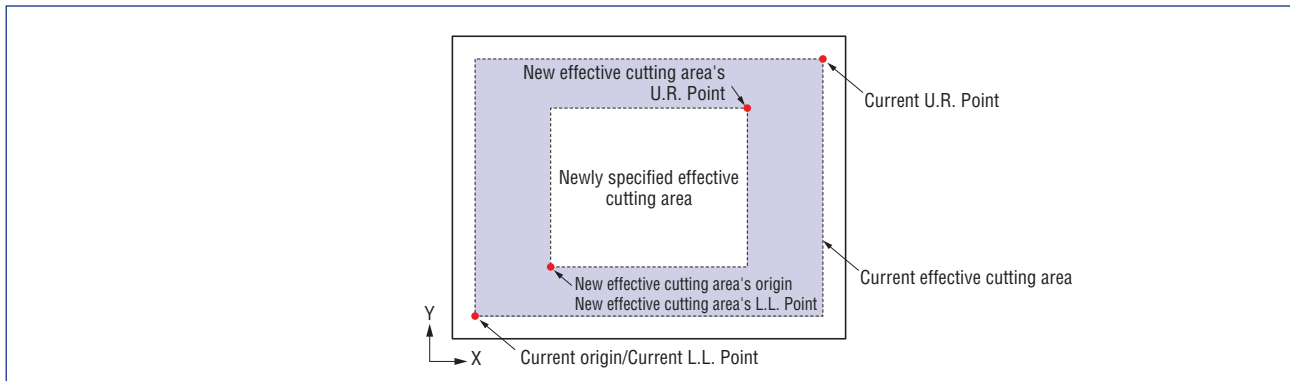
- (5) Press the [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

This setting is retained in the plotter's internal memory even while the plotter is turned off.

## 5.15 Setting the Cutting/Plotting Area

The U.R. (Upper Right) and L.L. (Lower Left) functions are used to specify the effective cutting area of the plotter so that any data specifying coordinate positions outside of the effective cutting area is disregarded. The origin moves together with the new cutting area.



### CAUTION

As soon as both the L.L. and U.R. points are set, the tool carriage moves to the new origin. To avoid injury, keep your hands and other obstacles out of the vicinity of the pen carriage and Y bar.

- Press the [PAUSE] key to select PAUSE mode.
- Press the [NEXT] key repeatedly until the following menu is displayed.

```

FORCE                                OFFSET
◀ I / F          FUNCTION ▶
◀ TOOL COND AREA OPT ▶
SPEED                                QUALITY

```

- Press the [F4] key (AREA OPT) to display the menu shown below.

```

FORCE                                OFFSET
◀ ROTATE          MIRROR ▶
◀ L.L. U.R.       SCALE ▶
SPEED                                QUALITY

```

- Press the [F2] key (L.L. U.R.) to display the screen for setting the L.L. point of the effective cutting area.

```

FORCE                                OFFSET
SET L.L.          DEFAULT ▶
X=      0      Y=      0
SPEED                                QUALITY

```

Use the [][][][] keys to move the tool carriage (the tip of the tool selected by the current setting) to the desired new L.L. point (origin) and then press the [ENTER] key. At such time, the X= and Y= coordinate values respectively represent the current tool carriage position as X- and Y-axis displacements from the original origin.

To select the default L.L. point, press the [F3] key (DEFAULT). You do not need to press the [ENTER] key if the default L.L. point was selected.

- When the effective cutting area's L.L. point has been specified, the screen for setting the U.R. point is displayed.

```

FORCE                                OFFSET
SET U.R.          DEFAULT ▶
X=      0      Y=      0
SPEED                                QUALITY

```



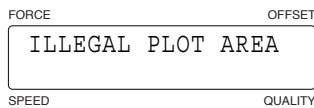
Use the [◀] [▶] [△] [▽] keys to move the tool carriage (the tip of the tool selected by the current setting) to the desired new U.R. point and then press the [↵] [ENTER] key. At such time, the X= and Y= coordinate values respectively represent the current tool carriage position as X- and Y-axis displacements from the original origin. To select the default U.R. point, press the [F3] key (DEFAULT). You do not need to press the [↵] [ENTER] key if the default U.R. point was selected.

(6) Press the [⏸] [PAUSE] key to cancel PAUSE mode.

---

### CHECKPOINT

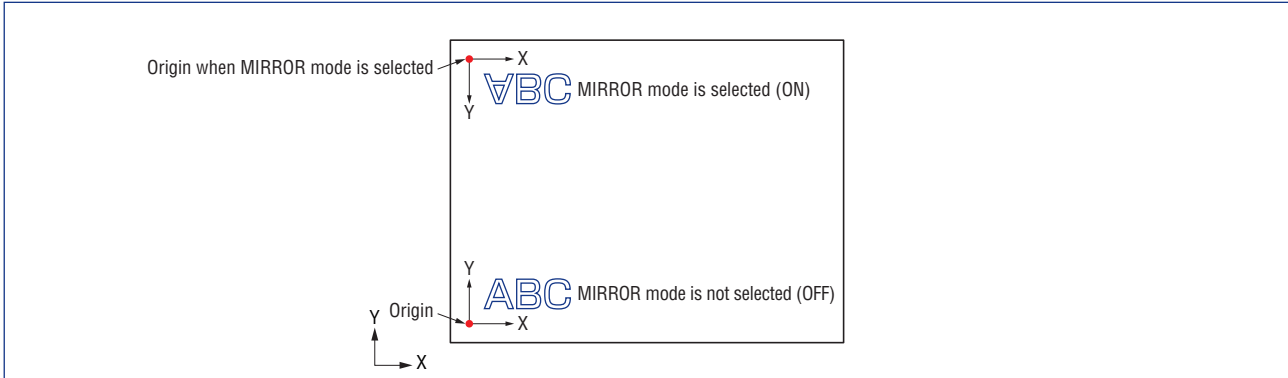
- This setting returns to its default status when the power is turned off.
- After this setting has been made, the origin moves to the same position as the lower left position
- The L.L. and U.R. positions cannot be specified outside of the actual area of the loaded cutting medium.
- The effective cutting area can only be set by specifying the lower left and upper right points. If the effective cutting area is incorrectly specified (by, for example, specifying the upper left or lower right point or specifying lower left and upper right points that are less than 5 mm apart in either the X or the Y axis, the message below appears for several seconds. In this case, set the effective cutting area over again.



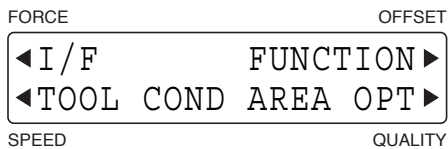
- When the ROTATE or MIRROR mode is selected or cancelled after specifying new L.L. and U.R. positions, your L.L. and U.R. settings are initialized to their default positions (the lower left and upper right corners of the maximum effective cutting area).
-

## 5.16 Setting the Mirror Mode

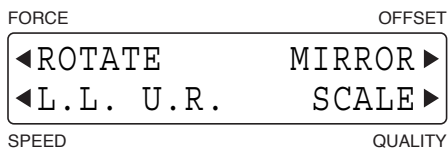
When MIRROR mode is selected using this function, the origin and coordinate axes are inverted as shown in the figure below.



- Press the [PAUSE] key to select PAUSE mode.
- Press the [NEXT] key repeatedly until the following menu is displayed.



- Press the [F4] key (AREA OPT) to display the menu shown below.



- Press the [F3] key (MIRROR) to display the MIRROR mode setting screen.



The current setting is indicated by a black dot [●].

To select MIRROR mode, press the [F2] key (ON).

To cancel MIRROR mode, press the [F4] key (OFF).

After you have selected the desired parameter, press the [ENTER] key to confirm your selection.



- Press the [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

- When the plotter is turned off, the MIRROR mode returns to its default setting (OFF).
- The MIRROR mode is set to OFF when MARK TYPE 3 is selected.

## 5.17 Scaling the Image Data

This function is used to expand or reduce the image data using the program origin as the starting point.

- Press the  [PAUSE] key to select PAUSE mode.
- Press the  [NEXT] key repeatedly until the following menu is displayed.


FORCE	OFFSET
◀ I / F	FUNCTION ▶
◀ TOOL COND AREA OPT ▶	
SPEED	QUALITY

- Press the [F4] key (AREA OPT) to display the menu shown below.

FORCE	OFFSET
◀ ROTATE	MIRROR ▶
◀ L.L. U.R.	SCALE ▶
SPEED	QUALITY

- Press the [F4] key (SCALE) to display the scaling factor setting screen.

FORCE	OFFSET
SCALE	
SCALE = 1 ■	
SPEED	QUALITY

Use the [ $\Delta$ ] or [ $\nabla$ ] key to change the numeric value, and then press the  [ENTER] key to confirm your selection.

### Scaling factors: 1 to 8, 1/8, 1/4, 1/2 (times)

The scaling factor value is increased by one increment by pressing the [ $\Delta$ ] key, or is decreased by one increment in the sequence below by pressing the [ $\nabla$ ] key.

→ 1 ←→ 2 ←·····→ 7 ←→ 8 ←→ 1/8 ←→ 1/4 ←→ 1/2 ←



- Press the  [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

- This setting returns to SCALE =1 when the plotter is turned off.
- When expansion was specified and the data values are too high, the data outside the plotting area is not cut and the red PROMPT lamp on the control panel lights. In that case, either reduce the data values or lower the scaling factor.

## 5.18 Setting the Initial Cutting Force

This function is effective in THICK mode, the mode used mainly to cut thick media. When a thick medium is cut, more time than usual may be required for the blade to reach the base of the medium even if a suitable cutting force has been specified. If this happens, the cutting operation may start before the blade has reached the base and the medium may not be cut through at the start point. Specifying the START CUT FORCE adds the START CUT FORCE value to the specified FORCE value that becomes effective immediately after the pen down operation, thereby enabling the blade to reach the base of the medium in a shorter period of time. (If, for example, 25 has been specified for the FORCE value and 4 is specified for the START CUT FORCE value, the cutting force after the pen down operation temporarily becomes 29.)


- (1) Press the  [PAUSE] key to select PAUSE mode.
- (2) Press the  [NEXT] key repeatedly until the following menu is displayed.


FORCE	OFFSET
◀OPTION1      OPTION2▶	
SPEED	QUALITY

- (3) Press the [F2] key (OPTION1) to display the menu shown below.

FORCE	OFFSET
◀START FCE OFST ANG▶	
◀OFST FCE STP PASS▶	
SPEED	QUALITY

- (4) Press the [F1] key (START FCE) to display the START CUT FORCE setting screen.

FORCE	OFFSET
START CUT FORCE	
FORCE = 2 	
SPEED	QUALITY

Use the [△] or [▽] key to change the numeric value, and then press the  [ENTER] key to confirm your selection.

**Setting range: 1 to 20 (default value: 2), and the screen**

▶ 1 ◀ ◀ 2 ◀ 3 ◀ ..... 18 ◀ 19 ◀ 20 ◀
--------------------------------------



- (5) Press the  [PAUSE] key to cancel PAUSE mode.

### **CHECKPOINT**

This setting is retained in the plotter's internal memory even while the plotter is turned off.

## 5.19 Setting the Offset Force

Since the direction in which the blade tip is facing cannot be determined during initialization of the plotter, initial blade control must be performed. The Offset Force function is used to specify the force applied during initial blade control. It is also used to specify the force applied during blade tip rotation in THICK mode.

- Press the  [PAUSE] key to select PAUSE mode.
- Press the  [NEXT] key repeatedly until the following menu is displayed.


FORCE	OFFSET
◀ OPTION1      OPTION2 ▶	
SPEED	QUALITY

- Press the [F2] key (OPTION1) to display the menu shown below.

FORCE	OFFSET
◀ START FCE OFST ANG ▶	
◀ OFST FCE STP PASS ▶	
SPEED	QUALITY

- Press the [F2] key (OFST FCE) to display the offset force setting screen.

FORCE	OFFSET
OFFSET FORCE	
FORCE = 4 █	
SPEED	QUALITY

Use the [△] or [▽] key to change the numeric value, and then press the  [ENTER] key to confirm your selection.

**Setting range: 1 to 48 [Default value: 4]**

▶ 1	↔ 2	↔ 3	←.....→ 46	↔ 47	↔ 48	◀
-----	-----	-----	------------	------	------	---



- Press the  [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

- This setting is retained in the plotter's internal memory even while the plotter is turned off.
- The OFFSET FORCE function is used to specify the cutting force when performing the initial blade control operation or when performing blade rotation control in THICK mode. It is not used to specify the cutting force that is used when cutting output data.
- The values 31 to 48 can be specified for tool holder 2 in the FC4500-50/60 models, but 30 will be the effective value.

## 5.20 Setting the Offset Angle

Your plotter rotates the blade tip according to the initial angle of rotation required by each line segment defined in the data sent from the computer. This operation is called "initial blade control". The OFFSET ANGLE function specifies the reference blade offset angle for determining whether or not to perform initial blade control. Setting a higher OFFSET ANGLE setting reduces the overall cutting time but the drawback is less precise blade control.

- (1) Press the  [PAUSE] key to select PAUSE mode.
- (2) Press the  [NEXT] key repeatedly until the following menu is displayed.

```

FORCE                                OFFSET
┌───────────────────────────────────┐
│◀OPTION1      OPTION2▶│
└───────────────────────────────────┘
SPEED                                QUALITY
  
```

- (3) Press the [F2] key (OPTION1) to display the menu shown below.


```

FORCE                                OFFSET
┌───────────────────────────────────┐
│◀START FCE OFST ANG▶│
│◀OFST FCE  STP PASS▶│
└───────────────────────────────────┘
SPEED                                QUALITY
  
```

- (4) Press the [F3] key (OFST ANG) to display the offset angle setting screen.

```

FORCE                                OFFSET
┌───────────────────────────────────┐
│      OFFSET ANGLE      │
│      ANGLE = 30█      │
└───────────────────────────────────┘
SPEED                                QUALITY
  
```

Use the [△] or [▽] key to change the numeric value, and then press the  [ENTER] key to confirm your selection.

**Setting range: 0 to 60 (degrees) [Default value: 30]**

```

┌───────────────────────────────────┐
│▶ 0 ◀◀ 1 ◀◀ 2 ◀-----▶ 58 ◀◀ 59 ◀◀ 60 ◀│
└───────────────────────────────────┘
  
```

If the OFFSET ANGLE is set too high, the cut shape may become deformed. Conversely, if it is set too low, curved lines may become jagged.

- (5) Press the  [PAUSE] key to cancel PAUSE mode.

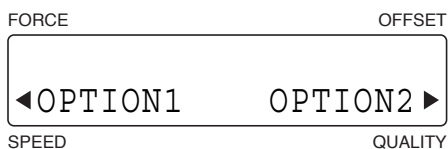
### CHECKPOINT

This setting is retained in the plotter's internal memory even while the plotter is turned off.

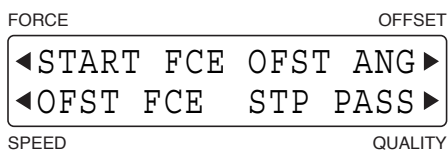
## 5.21 Setting the Step Pass

Use this function when you intend to cut extremely detailed data. The cutting data sent from the computer will be processed in blocks corresponding to the number of steps specified by the STEP PASS function, thereby ensuring consistent blade control and higher cutting quality.

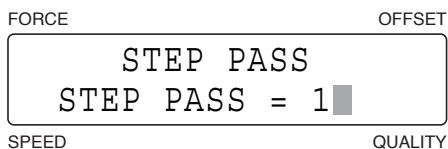
- Press the **[PAUSE]** key to select PAUSE mode.
- Press the **[NEXT]** key repeatedly until the following menu is displayed.



- Press the **[F2]** key (OPTION1) to display the menu shown below.

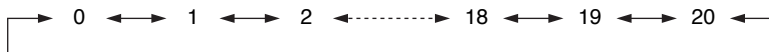


- Press the **[F4]** key (STP PASS) to display the step pass setting screen.



Use the **[△]** or **[▽]** key to change the numeric value, and then press the **[ENTER]** key to confirm your selection.

**Setting range: 0 to 20 [Default value: 1]**



If the STEP PASS setting is set too high, the cut shapes may become deformed. The recommended STEP PASS setting is "STEP PASS= 1".



- Press the **[PAUSE]** key to cancel PAUSE mode.

### CHECKPOINT

This setting is retained in the plotter's internal memory even while the plotter is turned off.

## 5.22 Setting the Tool-up Height

Lowering the tool-up height setting value enables a reduction in the cutting time. When making this setting, make sure that the tool does not catch in the medium when the tool carriage is being moved.


- (1) Press the  [PAUSE] key to select PAUSE mode.
- (2) Press the  [NEXT] key repeatedly until the following menu is displayed.


FORCE	OFFSET
◀OPTION1      OPTION2▶	
SPEED	QUALITY

- (3) Press the [F4] key (OPTION2) to display the menu shown below.

FORCE	OFFSET
◀UP HEIGHT    POS.OPT▶	
◀MOVE SPD      TEST▶	
SPEED	QUALITY

- (4) Press the [F1] key (UP HEIGHT) to display the screen for setting the tool-up height.

FORCE	OFFSET
TOOL UP HEIGHT	
H = 0.0  mm	
SPEED	QUALITY

Use the [△] or [▽] key to change the numeric value, and then press the  [ENTER] key to confirm your selection.

**Setting range: 0.0 to -3.0 [Default value: 0.0]**

- (5) Press the  [PAUSE] key to cancel PAUSE mode.



### CHECKPOINT

This setting is retained in the plotter's internal memory even while the plotter is turned off.



## 5.23 Setting the Tool Movement Speed

This function allows you set the movement speed of the tool in raised status separately from the cutting/plotting speed. A tool movement that is faster than the cutting/plotting speed enables a reduction in the overall cutting/plotting time.

- (1) Press the  **[PAUSE]** key to select PAUSE mode.
- (2) Press the  **[NEXT]** key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀OPTION1	OPTION2▶
SPEED	QUALITY

- (3) Press the **[F4]** key (OPTION2) to display the menu shown below.


FORCE	OFFSET
◀UP HEIGHT	POS.OPT▶
◀MOVE SPD	TEST▶
SPEED	QUALITY

- (4) Press the **[F2]** key (MOVE SPD) to display the menu shown below.

FORCE	OFFSET
TOOL MOVE ACCEL=AUTO	
SPEED	QUALITY
	SPEED=AUTO

To change the ACCEL value, press the **[F3]** key.

To change the SPEED value, press the **[F4]** key.

Use the **[Δ]** or **[▽]** key to change the numeric value, and then press the  **[ENTER]** key to confirm your selection.

**[ACCEL]** setting range: AUTO, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 [Default value: AUTO]

**[SPEED]** setting range: AUTO, 10, 20, 30, 40, 50, 60, 70, 75 (cm/s) [Default value: AUTO]

When AUTO is selected, the pen movement speed is set to match the current cutting/plotting speed.

- (5) Press the  **[PAUSE]** key to cancel PAUSE mode.

### CHECKPOINT

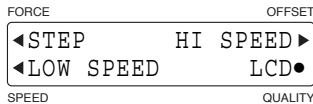
This setting is retained in the plotter's internal memory even while the plotter is turned off.

## 5.24 Setting the Pen Carriage Movement Speed

This setting determines how far and how fast the tool carriage moves when the [ $\triangleleft$ ] [ $\triangleright$ ] [ $\triangle$ ] [ $\nabla$ ] keys are used to move it. When one of the [ $\triangleleft$ ] [ $\triangleright$ ] [ $\triangle$ ] [ $\nabla$ ] keys is pressed initially, the tool carriage moves only the specified distance. If the key is held down, the pen carriage moves slowly, but then moves more quickly after moving the specified length (distance).

### CHECKPOINT



- When the LCD parameter in the menu shown below is marked with a black dot [●], the coordinates during movement are displayed on the LCD when the [ $\triangleleft$ ] [ $\triangleright$ ] [ $\triangle$ ] [ $\nabla$ ] keys are used. Press the [F4] key to activate or deactivate this function.

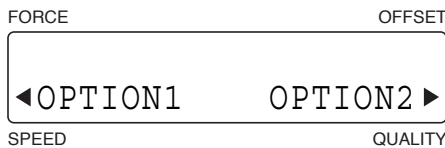


- Pressing the [NEXT] key while using the [ $\triangleleft$ ] [ $\triangleright$ ] [ $\triangle$ ] [ $\nabla$ ] keys to move the tool carriage toggles the speed between low speed and high speed. Use this function for more accurate positioning of the tool carriage.

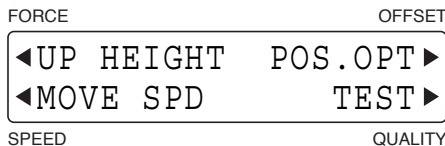
### Setting the Step Movement Distance

This setting determines the distance the tool head moves each time one of the keys is pressed. The setting distance is an approximate measure of the distance actually moved.

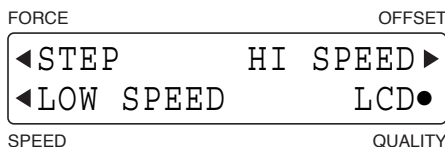
- Press the  [PAUSE] key to select PAUSE mode.
- Press the  [NEXT] key repeatedly until the following menu is displayed.



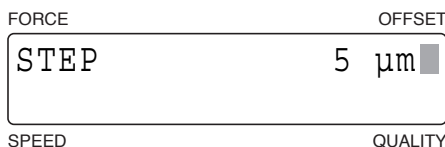
- Press the [F4] key (OPTION2) to display the menu shown below.





- Press the [F3] key (POS. OPT) to display the menu shown below.



- Press the [F1] key (STEP) to display the step movement setting screen.



Use the [ $\triangle$ ] or [ $\nabla$ ] key to change the numeric value, and then press the  [ENTER] key to confirm your selection. To cancel your selection, press the  [NEXT] key.

**Setting range: 5, 10, 25, 50, 100 ( $\mu\text{m}$ ) [Default value: 5]**



- Press the  [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

This setting is retained in the plotter's internal memory even while the plotter is turned off.

## Setting the Low Movement Speed

This setting determines the slower speed when one of the [◀][▶][△][▽] keys is initially pressed, and the length (distance) before faster movement begins.

- Press the  [PAUSE] key to select PAUSE mode.
- Press the  [NEXT] key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀OPTION1	OPTION2▶
SPEED	QUALITY

- Press the [F4] key (OPTION2) to display the menu shown below.



FORCE	OFFSET
◀UP HEIGHT	POS.OPT▶
◀MOVE SPD	TEST▶
SPEED	QUALITY

- Press the [F3] key (POS. OPT) to display the menu shown below.


FORCE	OFFSET
◀STEP	HI SPEED▶
◀LOW SPEED	LCD●
SPEED	QUALITY


- Press the [F2] key (LOW SPEED) to display the low-speed setting screen.

FORCE	OFFSET
LOW SPEED	2 cm/s ■
LENG	5 cm
SPEED	QUALITY

Press the [F3] key (LOW SPEED) to specify the speed for low-speed movement. Press the [F4] key (LENG) to specify the length (distance) moved before the low-speed movement changes to high-speed movement begins. Use the [△] or [▽] key to change the numeric value and then press the  [ENTER] key to confirm your selections. To cancel your selections, press the  [NEXT] key.

**Setting range: [LOW SPEED] 1 to 30 (cm/s) [Default value: 2]  
[LENG] 0 to 30 (cm/s), MAX [Default value: 10]**

If 0 was selected for the LENG parameter, the pen carriage starts moving at the high speed. If the  [NEXT] key is held down, however, the pen carriage moves at the low speed.

If MAX was selected for the LENG parameter, the pen carriage moves at the low speed without switching to the high speed. If the  [NEXT] key is pressed during pen carriage movement, however, the pen carriage switches to the high speed.

(Default values: LOW-SPEED: 2 cm/s; LENG: 2 cm)



- Press the  [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

This setting is retained in the plotter's internal memory even while the plotter is turned off.

## Setting the High Movement Speed

This setting determines the high speed setting when one of the [◀] [▶] [△] [▽] keys is held down.

- (1) Press the  [PAUSE] key to select PAUSE mode.
- (2) Press the  [NEXT] key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀OPTION1	OPTION2▶
SPEED	QUALITY

- (3) Press the [F4] key (OPTION2) to display the menu shown below.



FORCE	OFFSET
◀UP HEIGHT	POS.OPT▶
◀MOVE SPD	TEST▶
SPEED	QUALITY

- (4) Press the [F3] key (POS. OPT) to display the menu shown below.

FORCE	OFFSET
◀STEP	HI SPEED▶
◀LOW SPEED	LCD●
SPEED	QUALITY

- (5) Press the [F3] key (HI SPEED) to display the high-speed setting screen.

FORCE	OFFSET
HI SPEED	20 cm/s■
SPEED	QUALITY

Use the [△] or [▽] key to change the numeric value and then press the  [ENTER] key to confirm your selections. To cancel your selections, press the  [NEXT] key.

**Setting range: 1 to 30 (cm/s) [Default value: 20]**

- (6) Press the  [PAUSE] key to cancel PAUSE mode.

### CHECKPOINT

This setting is retained in the plotter's internal memory even while the plotter is turned off.

## 5.25 Printing a Conditions List

This function allows you to print a list of the current cutting/plotting settings (conditions).

### ⚠ CAUTION

The tool carriage starts moving as soon as this function has been selected. To avoid injury to yourself or damage to the plotter, keep your hands and other obstacles out of the vicinity of any moving parts.

- (1) If you want to print out the list of cutting/plotting conditions of one sheet of paper, load a sheet of paper that is A3 size or larger in the plotter.  
If you want to print out the list on two sheets of paper, load an A4-size sheet of paper in the plotter.

- (2) Mount a plotting pen.

- (3) Press the  [PAUSE] key to select PAUSE mode.

- (4) Press the  [NEXT] key repeatedly until the following menu is displayed.





FORCE	OFFSET
◀OPTION1	OPTION2▶
SPEED	QUALITY

- (5) Press the [F4] key (OPTION2) to display the following menu.

FORCE	OFFSET
◀UP HEIGHT	POS.OPT▶
◀MOVE SPD	TEST▶
SPEED	QUALITY

- (6) Press the [F4] key (TEST) to display the following menu.




FORCE	OFFSET
◀COND. PAT.	SELF TEST▶
SPEED	QUALITY


- (7) Use the [][][][] keys to move the tool carriage (the tip of the tool selected by the current setting) to the position where you want to print the list. Next, press the [F2] key (COND. PAT.). The following message appears on the LCD and the plotter begins printing "Condition Settings Page 1".

FORCE	OFFSET
PRINT CONDITIONS	
SPEED	QUALITY

- (8) When this page has been printed, the following message appears on the LCD.

FORCE	OFFSET
LOAD PAPER !!	
PRESS ENTER KEY	
SPEED	QUALITY

Replace the medium if required or use the [][][][] keys to move the tool carriage (the tip of the tool selected by the current setting) to the position where you want to print the second list.

Press the  [ENTER] key to print "Condition Settings Page 2"

- (9) When all of the conditions have been printed, the READY message reappears.

Cutting/Plotting Conditions List

FC4510 CONDITIONS PAGE 2

MARK MODE	OFF
MARK TYPE	2
MARK SIZE	20mm
MARK DIST. ADJ.	USER
MOVE POSITION	1 0.0mm, 0.0mm
	2 0.0mm, 0.0mm
	3 0.0mm, 0.0mm
MARK OFFSET	0.0mm, 0.0mm
MARK SENSOR ADJ. X:	0.0mm, 0.0mm
Y:	0.0mm, 0.0mm
SENSITIVITY ADJ. 1,2	: DEFAULT
3	: DEFAULT
MIRROR:	DEFAULT
SENSING SPEED	5 cm/s
FREQUENCY	NORMAL
T. 3 SENS. INTVL	0 um
;,: COMMAND	ENABLED
MODEL EMULATED	7595
TOOL SELECT	ENABLED
TOOL UP MOVE	DISABLED
BEEPER	ENABLED
TOOL SEL. WAIT	DISABLED
SWITCHING XY F.	DISABLED
BEEPER VIEW	OFF
VIEW TIME	OFF
ROM VERSION	**.**

FC4510 CONDITIONS PAGE 1

COND. FORCE SPEED	TOOL	OFFSET ACCEL	TOOL No.
*1 12 20	PEN	0 3	1
2 14 30	09U	0 3	1
3 17 20	15U	0 3	1
4 12 20	PEN	0 3	1
5 50 5	15U	0 1	2
6 30 10	15U	0 3	2
7 30 10	15U	0 3	2
8 30 5	15U	0 1	2

RS-232C BAUD RATE PARITY DATA BIT HANDSHAKE

*1 9600	N	8	H
2 9600	E	7	H
3 9600	E	8	H

COMMAND HP-GL HP-GL ORIGIN CENTER

TOOL UP SPEED	AUTO	STEP PASS	1
TOOL UP ACCLE	AUTO	OFFSET ANGLE	30
ROTATE	OFF	SCALE	1
DISPLAY UNIT	mm	SORT	OFF
INIT. DOWN FORCE	2 4 4 4 4 4 4		
DISTANCE ADJUST	0.00, 0.00		
TOOL UP HEIGHT	0.00mm		

COND. THICKMODE OVERCUT1 OVERCUT2 OVERLAY CUT L. PAT.



1	OFF	1	0.2mm	1	OFF
2	OFF	1	0.2mm	1	OFF
3	OFF	1	0.2mm	1	OFF
4	OFF	1	0.2mm	1	OFF
5	OFF	1	0.2mm	1	OFF
6	OFF	1	0.2mm	1	OFF
7	OFF	1	0.2mm	1	OFF
8	OFF	1	0.2mm	1	OFF

## 5.26 Printing the Self-Test Pattern

The self-test function enables the plotter to check its own functions by drawing a self-test pattern.

### ⚠ CAUTION

The tool carriage starts moving as soon as the SELF TEST mode has been selected. To avoid any injury to yourself or damage to the plotter, keep your hands and other obstacles out of the vicinity of any moving parts.

- (1) Load a medium in the plotter.
- (2) Mount a plotting pen.
- (3) Press the  [PAUSE] key to select PAUSE mode.
- (4) Press the  [NEXT] key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀OPTION1	OPTION2▶
SPEED	QUALITY

- (5) Press the [F4] key (OPTION2) to display the following menu.

FORCE	OFFSET
◀UP HEIGHT	POS.OPT▶
◀MOVE SPD	TEST▶
SPEED	QUALITY

- (6) Press the [F4] key (TEST) to display the following menu.

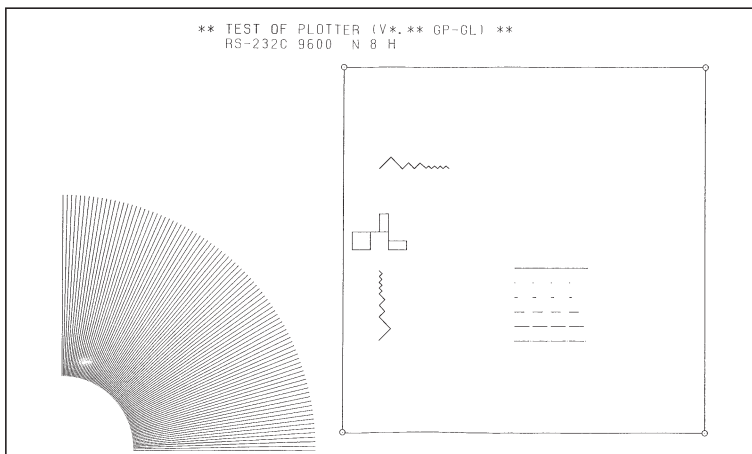
FORCE	OFFSET
	SELF TEST▶
◀COND. PAT.	DUMP▶
SPEED	QUALITY

- (7) Press the [F3] key (SELF TEST) to display the test pattern menu.

FORCE	OFFSET
	SELF TEST
◀YES	NO▶
SPEED	QUALITY

Press the [F2] key (YES) to initiate plotting of the self-test pattern.

Press the [F4] key (NO) to return to the OPTION selection menu shown in Step (4).





- (8) When you have finished plotting the self-test pattern, turn off the plotter to cancel SELF TEST mode. The self-test pattern is repeatedly plotted until the plotter is turned off. To discontinue plotting even if a pattern is not completely plotted, simply turn off the plotter.

## 5.27 Printing a Character Dump List

This mode enables you to check whether data is being transferred correctly from the computer to the plotter. If the output data and the program data are different, check the transmission conditions and the cable connections.

### CAUTION

The tool carriage starts moving as soon as the DUMP mode has been selected. To avoid any injury to yourself or damage to the plotter, keep your hands and other obstacles out of the vicinity of any moving parts.

- (1) Load a medium in the plotter.
- (2) Mount a plotting pen.
- (3) Press the  [PAUSE] key to select PAUSE mode.
- (4) Press the  [NEXT] key repeatedly until the following menu is displayed.

FORCE	OFFSET
◀OPTION1	OPTION2▶
SPEED	QUALITY

- (5) Press the [F4] key (OPTION2) to display the following menu.

FORCE	OFFSET
◀UP HEIGHT	POS.OPT▶
◀MOVE SPD	TEST▶
SPEED	QUALITY

- (6) Press the [F4] key (TEST) to display the following menu.

FORCE	OFFSET
	SELF TEST▶
◀COND. PAT.	DUMP▶
SPEED	QUALITY


- (7) Press the [F4] key (DUMP) to display the character dump menu.

FORCE	OFFSET
	DUMP
ON	OFF●
SPEED	QUALITY

The currently selected setting is indicated by a black dot [●].

To select DUMP mode, press the [F2] key to shift the black dot next to ON.

If you decide not to select DUMP mode, press the [F4] key to shift the black dot next to OFF.

- (8) Press the  [ENTER] key. If DUMP mode has been selected, DUMP appears on the display to indicate that the plotter has entered DUMP mode.
- (9) Transmit the data from the computer. A character dump list is printed.
- (10) When all of the data has been printed, turn off the plotter to cancel DUMP mode.

### CHECKPOINT

- The character data is printed as ASCII codes. Data that is not in the ASCII code charts is plotted as two-digit hexadecimal values.
- When the plotter receives READ commands that instruct it to output data, it will output dummy data (except in the case of READ commands that request the output of the plotter's status).



## 5.28 Special Functions

- **Setting the Display Language (LANGUAGE SELECTION) [Default setting: ENGLISH]**

This function determines the language used on the display panel.

- **Setting the Length Unit (LENGTH UNIT) [Default setting: mm]**

This function enables the display unit shown on the LCD panel to be changed.

If "mm" is selected, the values are displayed in millimeter units.

If "inch" is selected, the values are displayed in inch units.

- **Enabling or Disabling the ":" and ";" Commands (,:,;COMMAND) [Default value: ENABLED]**

When the GP-GL command mode is selected, this function enables or disables the recognition of ":" and ";" commands sent from the computer. If the first part of the transmitted data is missing, the problem might be attributable to these commands. In such cases, set this function to DISABLED.

- **Moving the Tool in the Raised or Lowered Status after the "W" Command is Sent (W COMMAND) [Default setting: TOOL UP]**

When a GP-GL "W" command specifying the creation of a circle or arc is sent from the computer, this function determines whether to move the tool to the starting position for cutting in the raised status or whether to leave it in the status it was in prior to receipt of the command.

When TOOL DOWN is selected, the tool is moved to the starting position in the status (raised or lowered) it was in before receipt of the "W" command.

When TOOL UP is selected, the tool is raised before moving to the starting position.

These settings are effective in the cutting mode only.

- **Model No. Response (MODEL EMULATET) [Default setting: 7595]**

When the HP-GL™ command mode is selected, this function determines the plotter's response to an "OI" request sent from the computer.

When 7550 is selected, the plotter's response is 7550B.

When 7595 is selected, the plotter's response is 7595A.

- **Setting the Condition Priority (CONDITION PRIORITY) [Default setting: PROGRAM]**

This function determines whether to place priority on the programmed cutting conditions sent as commands from the computer or on the cutting conditions that have been manually specified at the plotter's control panel.

When MANUAL is selected, commands specifying cutting conditions sent from the computer are ignored, and the cutting conditions can only be specified or changed at the plotter's control panel. The specified cutting conditions are retained in the plotter's memory even while the plotter is turned off.

When PROGRAM is selected, the plotter will assume the latest cutting conditions that have been specified either at its control panel or by command input. When the plotter is turned off, only the cutting conditions that were specified at the control panel will be retained, while any cutting conditions specified by command input will be lost.

- **Tool Exchange (Condition Selection) Commands (SP, J) (TOOL SELECT) [Default setting: ENABLED]**

If MANUAL was selected for CONDITION PRIORITY, tool exchange commands are also ignored, but the tool exchange command (SP, J COMMAND) itself can be specified as ENABLED or DISABLED.

- **Setting the Blade-tip Initial Position (INIT. BLADE CONTROL) [Default setting: 2mm BELOW]**

After the plotter is turned on or the Condition settings are changed, the cutter pen blade is positioned on the medium to adjust the blade tip orientation. This action is referred to as "initial blade control." Thus, this function specifies the position for initial blade control.

When 2mm BELOW is selected, initial blade control is performed 2 mm below the starting point of cutting.

When OUTSIDE is selected, initial blade control is performed outside the effective cutting area.

- **Enabling or Disabling Tool Up Movement (TOOL UP MOVE) [Default setting: DISABLED]**

When the plotter receives commands that specify consecutive tool movements in raised status, this function determines whether to move the tool to each coordinate point or to move the tool directly to the final coordinate point.

When ENABLED is selected, the tool moves to each coordinate point in sequence.

When DISABLED is selected, the tool moves directly to the final coordinate point.

- **Enabling or Disabling Checking of the Presence or Absence of a Tool (TOOL CHECK) [Default setting: ENABLED] FC4500-50/60 only**

This function determines whether or not to check whether tools have been mounted in the tool holders.

When ENABLED is selected, a check is made of whether pens 1 and 2 are actually mounted in the pen holders whenever a pen exchange operation is performed.

When DISABLED is selected, operation is performed on the assumption that pens 1 and 2 are mounted in the pen holders. Pen 2 must be mounted in its pen holder when the plotter is turned on.

- **Enabling or Disabling the Beeper (BEEPER) [Default setting: ENABLED]**

This function determines whether or not the beeper sounds each time a key on the control panel is pressed.

When ENABLED is selected, the beeper sounds

When DISABLED is selected, the beeper doesn't sound.

- **Enabling or Disabling the [ENTER] Key when a Tool Exchange Command is Received (TOOL SELECT WAIT) [Default setting: DISABLED]**

This function determines whether or not to use the [ENTER] key when a tool exchange command is received.

When ENABLED is selected, a tool exchange operation is not performed until the [ENTER] key is pressed. Select this setting when you only want to use tool holder 1.

When DISABLED is selected, a tool exchange operation is performed automatically.

- **Circle Command Resolution Setting (CIRCLE RESOLUTION) [Default setting: DEFAULT]**

When the HP-GL command mode is selected, this function determines whether the resolution is automatically set or fixed at the default value of 5 degrees when a circle command for a pen plotter is output.

- **Enabling or Disabling the Prevention of Media Lifting (LIFTING PREVENTION) [Default setting: DISABLED]**

When the plotter is cutting media such as a rubber mat, the medium may be lifted up together with the blade when the tool is raised. This function determines whether or not to prevent media lifting.

**ENABLED** : Media lifting is prevented.

**DISABLED** : Media lifting is not prevented.

- **Enabling or Disabling Toggling between the X and Y Cutting Forces (SWITCHING XY FORCE) [Default setting: DISABLED]**

This function determines whether to enable cutting force settings to be made independently for the X and Y directions when cutting materials such as card or cardboard.

**ENABLED**: The cutting force is set independently for the X and Y directions.

**DISABLED**: The same cutting force is set for both the X and Y directions.

This setting is disabled when the tool is a pen.

- **Setting the VIEW beeper/time until VIEW (BEEPER VIEW/VIEW TIME)**  
**[Default settings: 60 min/30 sec]**

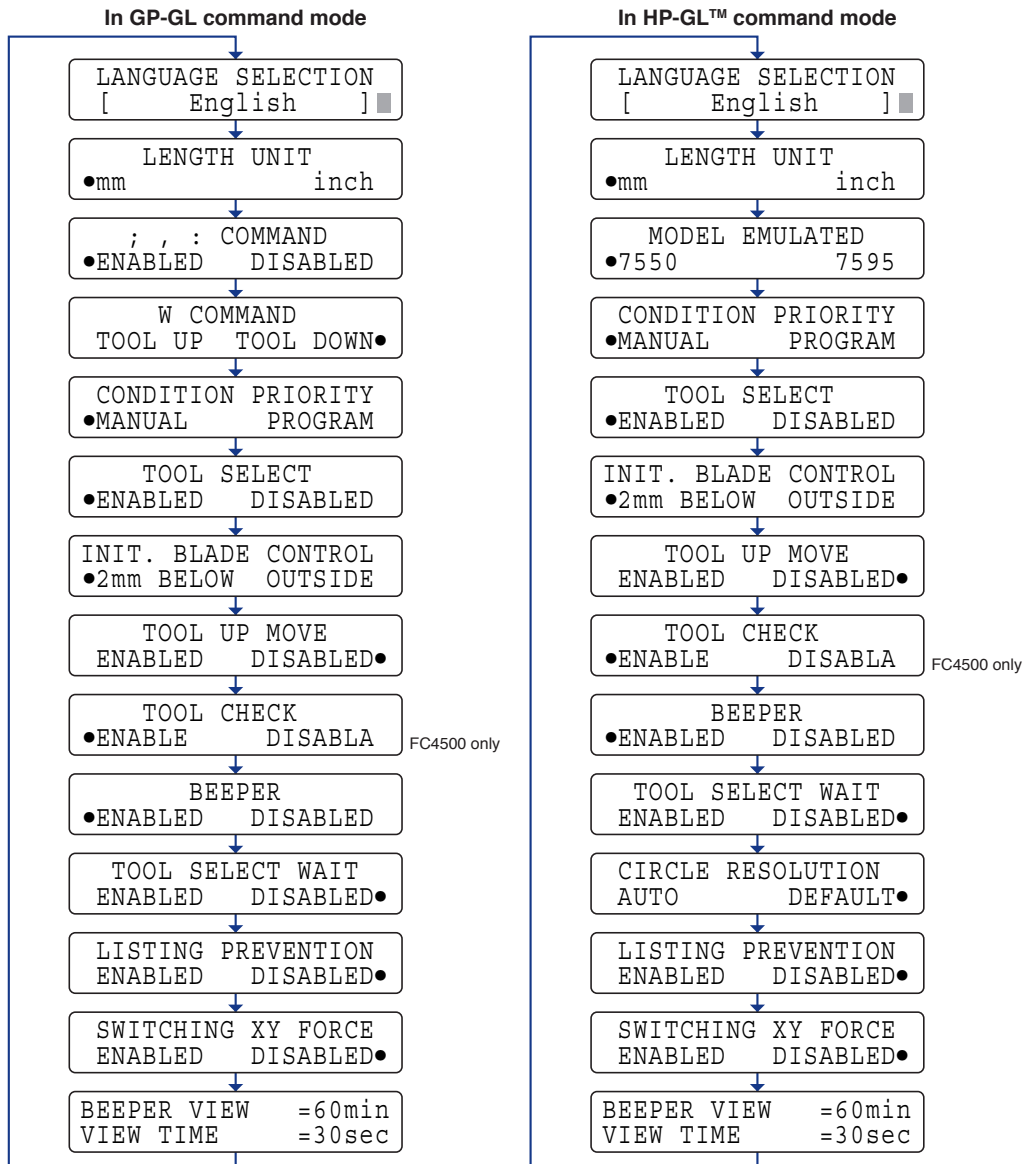
**BEEPER VIEW:** This parameter enables command specification of the length of time that the beeper sounds while the plotter is in the VIEW status. The selections are OFF, 1, 5, 10, 30, and 60 (min).

**VIEW TIME:** This parameter sets the length of time between the Ready status and the VIEW status. The selections are OFF, 10, 20, 30 and 60 (sec).

Use the **[F3]** and **[F4]** keys to move the blinking cursor ( ■ ).

**Procedure**

Turn on the plotter while holding down the [▽] key to display the special functions menu on the LCD.



Press the [NEXT] key to cycle through the menus.

The currently selected setting is indicated by a black dot [●].

Press the [F2] or [F4] key to change the setting as required, and then press the [ENTER] key. To cancel your selection and proceed to the next menu, press the [NEXT] key.

If a black square (■) is displayed, use the [△] or [▽] key to change the numeric value and then press the [ENTER] key to confirm your selection.

When you have finished setting all of the special functions, turn off the plotter.

**CHECKPOINT**

- Your settings are registered in the plotter's internal memory and retained even while the plotter is turned off.
- The special functions can also be set by selecting "Function">"Special Functions" in the PAUSE menu.

# CHAPTER 6

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## TROUBLESHOOTING

### **PRODUCT SUMMARY**

6.1 *Troubleshooting*

6.2 *Error Messages*

## 6.1 Troubleshooting

### The Plotter is Turned On But Doesn't Operate

Symptom	Cause	Solution
<ul style="list-style-type: none"> <li>The control panel's POWER lamp does not light.</li> <li>Nothing appears on the LCD panel.</li> </ul>	The plotter is not being supplied with power.	Check that the power cord is securely connected to the plotter's AC line inlet and to the electrical outlet.
	The plotter is defective.	Contact your sales representative or nearest Graphtec dealer.

### The Cutting/Plotting Results are Unsatisfactory (1/2)

Symptom	Cause	Solution
<ul style="list-style-type: none"> <li>The cut corners are rounded or too pointed.</li> </ul>	The OFFSET is incompatible with the cutter blade being used.	Adjust the OFFSET value. <ul style="list-style-type: none"> <li>If it is too low, the corners become rounded.</li> <li>If it is too high, the corners are too pointed.</li> </ul>
	<ul style="list-style-type: none"> <li>The cut line starts out crooked.</li> </ul>	The cutter blade does not rotate smoothly.
The Offset Cut Pressure is too low.		Raise the Offset Cut Pressure setting. <b>* The Offset Cut Pressure is separate from the cutting FORCE</b>
The spring has come loose from the cutter blade. (CB09UA, CB15U-SP)		Replace the cutter blade with a new one fitted with a spring.
The cutter blade has fallen out. (Cutter blades excluding CB09UA and CB15U-SP)		Grease the cutter blade and holder.
<ul style="list-style-type: none"> <li>The blade skips and does not completely cut lines that should be solid.</li> <li>Solid lines are not cut at a constant depth. (Slight skipping of the blade)</li> </ul>	The cutter blade is extended too far.	Adjust the blade length.
	The cutting SPEED is too high.	Lower the SPEED setting.
<ul style="list-style-type: none"> <li>Coarse resolution of curved lines.</li> </ul>	The output data resolution is too low.	Increase the output data resolution.
	The blade offset angle is too small.	Increase the blade offset angle.
<ul style="list-style-type: none"> <li>The cutting medium curls up at the corners.</li> <li>The cutting medium peels away from the backing sheet when cutting small characters.</li> </ul>	The cutter blade is extended too far.	Adjust the blade length.
	The OFFSET is incompatible with the cutter blade being used.	Adjust the OFFSET value.
	The cutting SPEED is too high.	Lower the cutting SPEED setting.
	The blade is dull.	Replace the cutter blade.
	The QUALITY setting is too high.	Lower the QUALITY setting.
<ul style="list-style-type: none"> <li>The cutter blade is cutting into the backing sheet.</li> </ul>	The cutter blade is extended too far.	Adjust the blade length.
	The cutting FORCE is too high.	Lower the FORCE setting.
<ul style="list-style-type: none"> <li>The cutter blade falls out of the cutter plunger.</li> </ul>	The cutter blade is the incorrect diameter for the plunger.	Use a cutter blade that matches the plunger's diameter.
	Insufficient grease. (CB15U)	Grease the cutter blade and holder.
<ul style="list-style-type: none"> <li>The medium can be cut but is hard to weed afterward.</li> <li>The cut medium cannot be picked up using a transfer sheet.</li> </ul>	The transfer sheet is not sufficiently adhesive.	Switch to a transfer sheet with greater adhesion.
	The medium gets entangled during cutting.	Reduce the blade length.
Lower the cutting FORCE.		
<ul style="list-style-type: none"> <li>Abnormal noise generated by the cutter pen during cutting.</li> <li>The medium is discolored where the cutter blade has passed.</li> </ul>	Weeding of the cut medium was postponed too long.	Promptly weed the cut medium.
	The medium is stuck in the tip of the plunger.	Adjust the blade length and the cutting FORCE setting.

### The Cutting/Plotting Results are Unsatisfactory (2/2)

Symptom	Cause	Solution
<ul style="list-style-type: none"> <li>The cutting results differ from the specified size.</li> <li>When the plotter is receiving data, the PROMPT lamp lights. (an offscale error occurs)</li> <li>Some parts of the medium cannot be cut.</li> </ul>	The programmable resolution (STEP SIZE) has been set differently at the plotter and the software application.	Set both the plotter and software to the same programmable resolution.
	Scaling has been specified at the computer.	Check whether scaling has been specified.
	The computer sent coordinate data that exceeds the specified effective cutting area.	Set the effective cutting area to a larger area. Reduce the size of the data.
<ul style="list-style-type: none"> <li>The currently selected cutting conditions cannot be stored or changed.</li> </ul>	The Condition Priority setting is set to Program.	Change the Condition Priority setting (Special Functions menu) to Manual.
	The [ENTER] key was not pressed after a setting was changed.	Make sure you are setting the conditions correctly.
<ul style="list-style-type: none"> <li>Text or lines are deformed during pen plotting.</li> </ul>	The plotter is in Cutting or Creasing mode.	Select "PEN" for the cutter blade type in the setting conditions.
<ul style="list-style-type: none"> <li>The specified length is not plotted or cut. (slight distance error)</li> </ul>	The distance correction value is not appropriate.	Specify the appropriate distance correction value.
<ul style="list-style-type: none"> <li>Text is deformed.</li> <li>Complex images are deformed.</li> </ul>	The Step Pass value is too high.	Lower the Step Pass setting.
<ul style="list-style-type: none"> <li>The starting and end points do not match.</li> </ul>	The data is not connected.	Plot the data with a pen and then make the corrections required.
	The Offset Cut Pressure is too low.	Raise the Offset Cut Pressure setting.
	The medium is too flimsy.	Switch to a stronger medium.
	Cutter blade rotation is not smooth.	Remove any foreign matter adhering to the inside of the holder.
<ul style="list-style-type: none"> <li>An unintentional L-shape is cut.</li> </ul>	"2 mm BELOW" has been selected for the Init. Blade Control position.	Select "OUTSIDE" for the Init. Blade Control position. (Special Functions menu)

### Registration mark reading failed

Symptom	Cause	Solution
<ul style="list-style-type: none"> <li>The registration marks cannot be read correctly. (A scan error occurs.)</li> </ul>	The registration mark lines are too fine.	Use a registration mark line width of between 0.5 to 1.0 mm.
	The registration marks are blurred.	Make sure that the registration marks are clarified.
	There is dust or dirt in the registration mark reading range.	Remove any dust or dirt.
	The medium is not flat.	Make sure that the medium stays flat.
	The registration mark color is not black.	Perform the registration mark sensor sensitivity adjustment procedure. If the registration marks still cannot be read, use black registration marks.

## 6.2 Error Messages

Symptom/Error message	Cause	Solution
<ul style="list-style-type: none"> <li>The beeper sounds.</li> <li>The POWER lamp lights.</li> </ul> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;">OVER CURRENT POWER OFF THEN ON</div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;">POSITION ALARM POWER OFF THEN ON</div>	<p>Excessive load is causing the current to the motor to exceed the rated value.</p> <ul style="list-style-type: none"> <li>The cutting conditions do not suit the cutting medium.</li> </ul>	<p>Turn off the plotter, remove the obstacle, and then turn the plotter back on.</p> <p>Turn off the plotter, remove the obstacle, and then turn the plotter back on.</p>
	<ul style="list-style-type: none"> <li>Movement of the pen carriage is being obstructed.</li> <li>The pen carriage was subjected to external pressure during cutting.</li> <li>Scraps of the medium in the plotter's moving parts are impeding operation.</li> </ul>	<p>Turn off the plotter, remove the scraps, and then turn the plotter back on.</p>
	<ul style="list-style-type: none"> <li>The writing panel was in a tilted position when a key reset operation was performed (the [ENTER] and [ORIGIN] keys were held down simultaneously).</li> </ul>	<p>Move the pen carriage to its lowermost position, and then turn the plotter off and back on again.</p>
<ul style="list-style-type: none"> <li>The beeper sounds.</li> <li>The POWER lamp lights.</li> </ul> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;">SPEED ALARM POWER OFF THEN ON</div>	<ul style="list-style-type: none"> <li>Immediately after turning on the plotter, excessive force was used to manually move the pen carriage.</li> <li>The internal speed control is faulty.</li> </ul>	<p>Turn the plotter off then back on again.</p> <p>Turn the plotter off then back on again.</p> <p><b>* If the error occurs frequently, contact your sales representative or nearest Graphtec dealer.</b></p>



## GP-GL Command Mode Error Messages

If any of the following error messages are displayed, one of the following reasons is like to be the cause:

- (1) The software's output or interface settings have been changed.
  - Configure the software for output by this plotter.
  - Ensure that the software's interface settings are correctly set.
- (2) The plotter's interface settings have been changed.
  - Ensure that the plotter's interface settings are correctly set.

Error message	Cause	Solution
ERROR 1 COMMAND ERROR !	The plotter received an unrecognizable command. <ul style="list-style-type: none"> <li>• The software's output or interface settings have been changed.</li> </ul>	Configure the software for output by this plotter. Ensure that the software's interface settings are correctly set.
	<ul style="list-style-type: none"> <li>• The plotter's interface settings have been changed.</li> </ul>	Ensure that the plotter's interface settings are correctly set.
ERROR 4 PARAMETER OVERFLOW	A command containing a numeric parameter that exceeds that command's permissible range was received. <ul style="list-style-type: none"> <li>• The software's output or interface settings have been changed.</li> </ul>	Configure the software for output by this plotter. Ensure that the software's interface settings are correctly set.
	<ul style="list-style-type: none"> <li>• The plotter's interface settings have been changed.</li> </ul>	Ensure that the plotter's interface settings are correctly set.
ERROR 5 I/O ERROR !	An interface-related error occurred during data transfer.	Configure the software for output by this plotter.
	<ul style="list-style-type: none"> <li>• The software's output or interface settings have been changed.</li> </ul>	Configure the software for output by this plotter. Ensure that the software's interface settings are correctly set.
	<ul style="list-style-type: none"> <li>• The plotter's interface settings have been changed.</li> </ul>	Ensure that the plotter's interface settings are correctly set.

## HP-GL™ Command Mode Error Messages

Error message	Cause	Solution
ERROR 1 Instruction not recognized	An unrecognizable instruction was executed.	Execute a recognizable command.
	Noise was input to the plotter upon execution of the software application.	Press the [ENTER] key.
	The software's output settings have been changed.	Configure the software for output by this plotter. Ensure that the software's interface settings are correctly set.
	The plotter's interface settings have been changed.	Ensure that the plotter's interface settings are correctly set.
ERROR 2 Wrong number of parameters	A command was executed with the wrong number of parameters.	Execute the command with the correct number of parameters.
ERROR 3 Out of range parameters	A command containing an unusable parameter was specified.	Execute the command with its parameters specified within their permissible ranges.
ERROR 5 Unknown character set	An unrecognizable character set was specified.	Specify a recognizable character set.
ERROR 6 Position overflow	A command was executed with coordinate data that exceeds the effective cutting/plotting area.	Execute the command with its coordinate data specified within the effective cutting/plotting area.
ERROR 7 Buffer overflow	The data being input exceeded the capacity of the plotter's downloadable character buffer, polygon buffer, etc.	Increase the buffer size.
ERROR 10 Invalid I/O output request	During execution of an output command, another output command was executed.	Check the program.
ERROR 11 Invalid byte following ESC.	The ESC character was followed by an invalid byte.	Check the program.
ERROR 12 Invalid byte in I/O Control	A device control command containing an invalid byte was received.	Check the program.
ERROR 13 Out of range I/O parameter	A parameter outside of the permissible numeric range was specified.	Check the program.
ERROR 14 Too many I/O parameters	Too many interface-related command parameters were received.	Check the program.
ERROR 15 Error in I/O transmission	A framing error, parity error or overrun error occurred.	Change the RS-232C transmission conditions.
ERROR 16 I/O buffer overflow	The interface buffer overflowed.	Change the RS-232C transmission conditions.

# CHAPTER 7

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## **SPECIFICATIONS**

### **PRODUCT SUMMARY**

7.1 *Main Specifications*

7.2 *External Dimensions*

## 7.1 Main Specifications

Item	FC4500-50	FC4500-60	FC4510-60
Configuration	Flatbed		
Effective cutting area	590 x 430 mm	910 x 610 mm	860 x 600 mm
Media hold-down method	Electrostatic adhesion	Adhesive mat/Application sheet	
Loadable media width	500 mm	666 mm	
Maximum operating speed	75 cm/s		
Settable speeds	<FC4500> Tool holder 1: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75 cm/s Tool holder 2: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30 cm/s <FC4510> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75 cm/s		
Cutting force	Tool holder 1: 0.10 to 5.88 N (10 to 600 gf) Tool holder 2: 0.10 to 2.94 N (10 to 300 gf)		0.10 to 5.88 N (10 to 600 gf)
Minimum character size	Approximately 5 mm for alphanumeric characters (varies depending on the media and fonts used)		
Mechanical resolution	0.005 mm		
Programmable resolution	GP-GL mode: 0.1/0.05/0.025/0.01 mm, HP-GL™ mode: 0.025 mm*1		
Distance accuracy*2	Within ±0.2% of the distance moved or ±0.1 mm, whichever is larger		
Perpendicularity	Within 0.3/430 mm	Within 0.4/610 mm	Within 0.4/600 mm
Repeatability	Within 0.1 mm (excluding media expansion/contraction)		
Registration mark reading accuracy*3	Within 0.3 mm		Within 0.2 mm
Number of tools	2		
Pen types	Water-based fiber-tip pen, Oil-based ballpoint pens		
Cutting media	Marking film (vinyl, fluorescent, reflective) Paper up to 0.5 mm thick (pattern paper, oilboard)*4 Compressed foam sheets up to 0.8 mm thick *5 Sandblast rubber sheets up to 1.0 mm thick *5 F and G flute Sheets for creating clear packages High-intensity reflective film*6		
Interfaces	RS-232C, USB 2.0 (full speed)		
Buffer size	2 MB		
Command sets	GP-GL, HP-GL™ emulation (menu-selectable)		
LCD panel	20 characters x 2 lines		
Rated power supply	100 to 120 VAC/200 to 240 VAC, 50/60 Hz		
Operating environment	10 to 35°C, 35 to 75% RH (non-condensing)		
Guaranteed precision operating environment	16 to 32°C, 35 to 70% RH (non-condensing)		
External dimensions (W x D x H)	Approx. 857 x 780 x 200 mm	Approx. 1172 x 962 x 200 mm	Approx. 1172 x 962 x 200 mm
Weight	Approx. 19 kg	Approx. 26 kg	Approx. 27 kg

\*1: HP-GL is a registered trademark of Hewlett-Packard Company in the US.

\*2: When Graphtec-specified media and conditions are used.

\*3: When the pen provided as a standard accessory is used with Graphtec-specified plotting paper; the accuracy of reading the patterns provided with these plotters

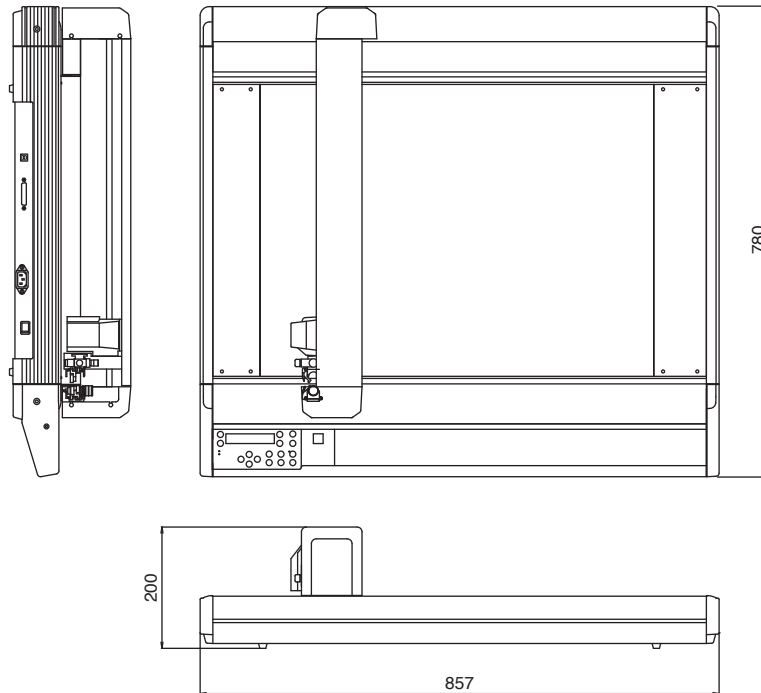
\*4 When the CB15U or CB15U-K30 cutter blade is used

\*5 When the CB15U-K30 cutter blade is used

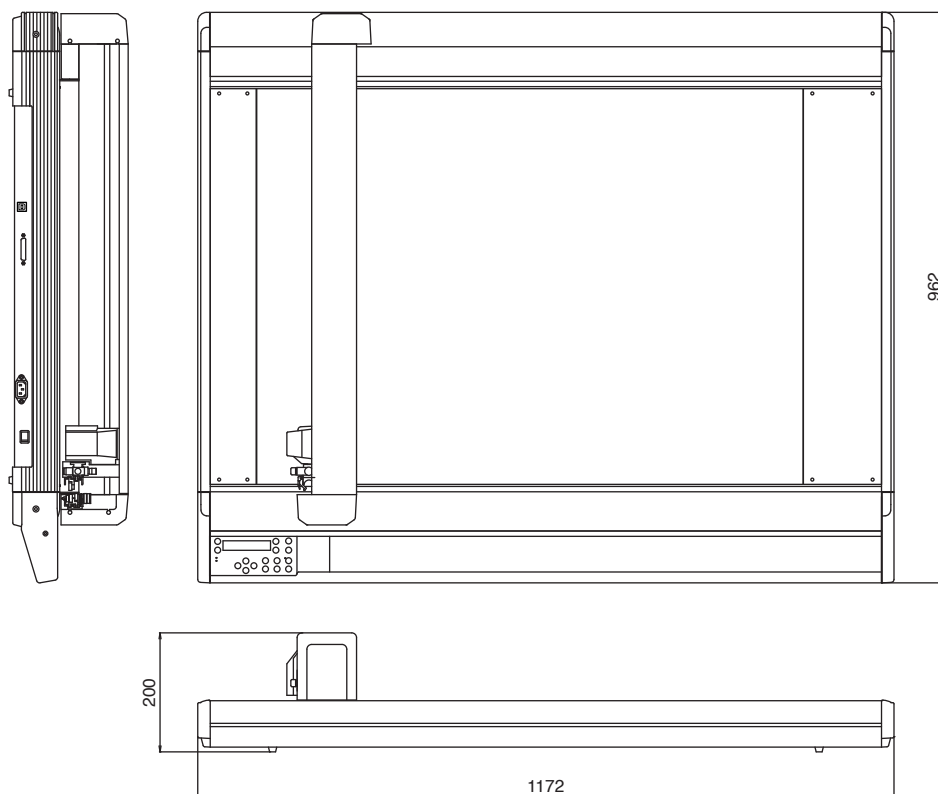
\*6 When the CB15UA cutter blade is used

## 7.2 External Dimensions

### FC4500-50

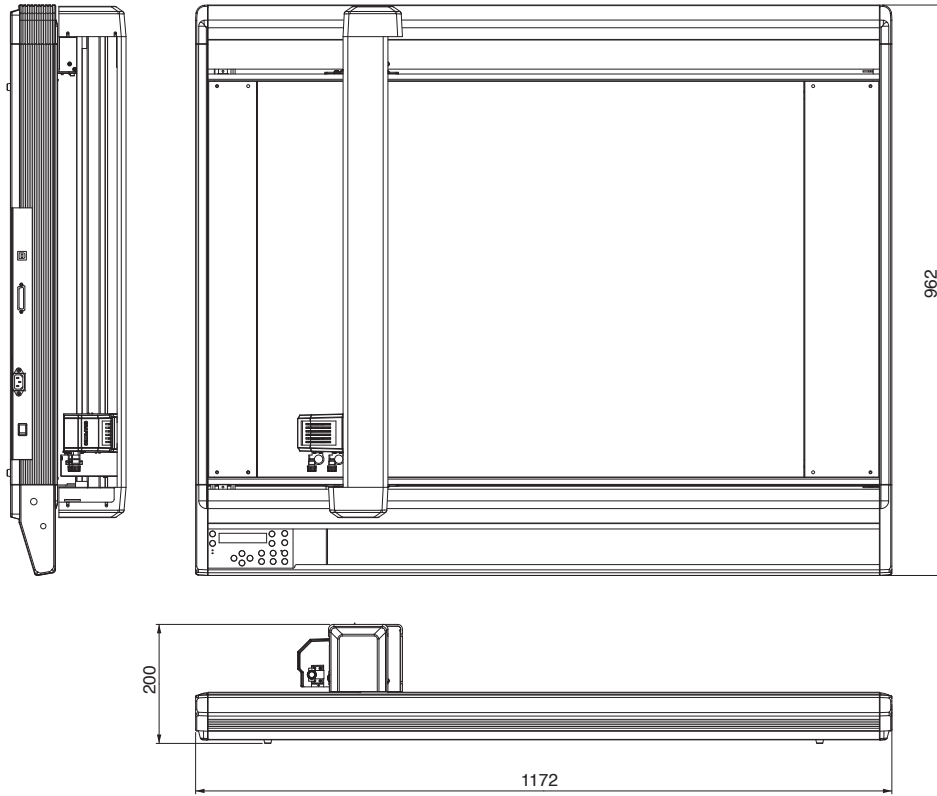


### FC4500-60



Unit: mm  
Dimensional accuracy:  $\pm 5$  mm

FC4510-60



Unit: mm  
Dimensional accuracy:  $\pm 5$  mm

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Specifications are subject to change without notice.

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FC4500/4510 User's Manual  
FC4500-UM-151  
February 2, 2009 1st edition-01

**GRAPTEC CORPORATION**

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