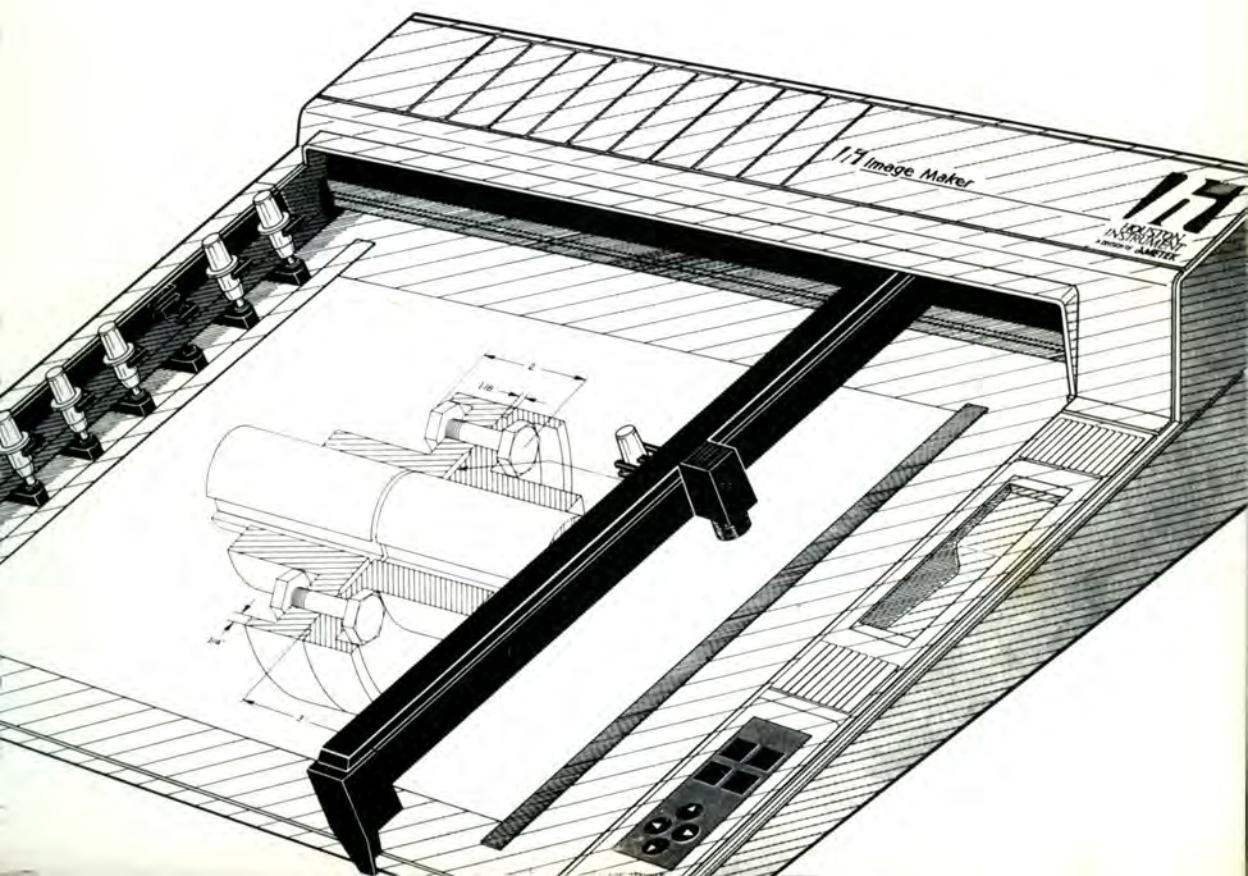


IT Image Maker™ Desktop CAD Plotter



HI IMAGE MAKER PLOTTER

OPERATION MANUAL



NOTICE

This equipment generates and uses low level radio frequency energy for timing and control purposes. If the equipment is not installed and used in strict accordance with the Operator's Manual, it could cause interference to radio and television reception. Sample units have been tested and found to comply with the limits for a Class B computing device, pursuant to Subpart J, Part 15 of FCC Rules. The limits were established to provide reasonable protection against such interference when this equipment is operated in a residential installation.

There is, however, no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception (determined by turning equipment off and on), the following may correct the interference:

1. Reorient the radio or television receiving antenna.
2. Move this equipment away from the radio or television receiver.
3. Plug this equipment into a different electrical outlet so that it and the radio or television receiver are on different branch circuits.
4. A qualified technician should ascertain that positive contact is achieved by all grounding screws and/or grounding connections to appropriate locations of the equipment enclosure.

If necessary, the user should consult the dealer or an experienced radio or television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio-TV Interference Problems*. This booklet is available at a nominal cost from the US Government Printing Office, Washington, D.C. 20402. It is listed under stock number 004-000-00345-4.

NOTICE

This plotter does not exceed the Class B limits for radio noise for digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

CAUTION

To assure FCC and CDC Class B compliance, you **must** use a shielded power cord and data cable with this plotter. For a parallel interface, use a braided shield and metal connector covers. For a serial interface, use braided and foil shields and metal connector covers. See Appendix B.

HOUSTON INSTRUMENT PRIORITY RESPONSE WARRANTY (USA ONLY)

I. Arrangements for Priority Response Warranty Service

Priority Response Warranty registration must be completed by you or your dealer at the time of purchase. Priority Response Warranty is not valid until registration is completed and accepted by Houston Instrument™. If you have not received written confirmation from Houston Instrument within 10 working days from date of purchase, contact Warranty Registration: 1-800-444-3425.

II. Failure To Register

Failure to register the unit under the Priority Response Warranty at the time of purchase will result in the end user receiving the Houston Instrument Standard One Year Depot Warranty. See Article V for details.

III. Priority Response Warranty Provisions

The Houston Instrument limited warranty is: products are guaranteed against defects in materials and workmanship for a period of one year from the date of purchase. Warranty registration is required at the time of purchase.

Liability is limited to the replacement of the defective unit within 48 business hours under the Warranty Provisions listed below.

Houston Instrument's hours of business are 8:00 a.m. to 5:00 p.m. (Central Time), Monday through Friday, excluding Houston Instrument holidays. Houston Instrument reserves the right to revise or change this program without obligation to notify any person(s) or organizations of such revisions or changes.

Houston Instrument's participation in this program will commence after the unit has been installed and becomes operational at the end user's site.

- A. The Priority Response Warranty will become effective after warranty validation by the Houston Instrument Service Department. Warranty registration must be completed by the user or the dealer at the time of purchase by sending in the Warranty Registration card enclosed with the instrument or by calling 1-800-444-3425.
- B. Defective instruments will be replaced by Houston Instrument's Austin factory within 48 business hours from technical notification. The warranty period is one year from the original purchase date. Warranty registration is required to participate in this program.
- C. There are no other warranties expressed or implied except as noted (see Article V). Houston Instrument will not be liable under any circumstances for consequential damage.
- D. Houston Instrument will not assume responsibility for any unit or accessories which have not been installed and operated in accordance with the Houston Instrument Operation Manual.

- E. The warranty is "VOID" if the unit has been damaged by accident, abuse, or misuse, or has been serviced or modified by anyone other than authorized Houston Instrument service personnel.
- F. Arrangements for the pickup of the defective unit with the designated express carrier is the sole responsibility of the end user. Arrangements for pickup of the defective unit will be initiated by the end user within 24 hours after the receipt of the Priority Response replacement unit. Houston Instrument will provide the end user with a completed prepaid express carrier airbill for the return of the defective unit.

If the defective unit is not received by Houston Instrument's Austin facility 72 hours after receipt of the Priority Response exchange unit, the end user will be invoiced the current list price for the Priority Response unit.
- G. No Houston Instrument distributor, dealer, agent, or employee is authorized to make any changes, modifications, extensions, or additions to any Houston Instrument Warranty either verbally or in writing.

IV. What To Do If Equipment Failure Occurs

- A. Run a self-test. Refer to the Operation Manual.
- B. Call 1-800-444-3425.
 - 1. Identify yourself as a Priority Response Warranty customer.
 - 2. Ask for Technical Support.
 - 3. Please be prepared to provide us with your Priority Response Warranty Validation Number, Model number, Serial number, and a brief description of the type of equipment failure you are experiencing.
- C. Houston Instrument will perform telephone technical support prior to authorizing shipment of any Priority Response units, as replacement of the end user's unit may not be necessary due to minor user adjustments, replaceable firmware, or unrelated external software and/or hardware problems.

If Houston Instrument is unable to resolve your unit's problem with telephone support, Houston Instrument will ship a Priority Response replacement unit to you that afternoon using the designated express carrier.

You will receive the Priority Response replacement unit within 48 hours or sooner. We ship to you first!

- D. After receiving the Priority Response unit, please follow these instructions carefully:
 - 1. Remove the Priority Response replacement unit from the box.
 - 2. Place the defective unit in the Houston Instrument shipping carton.
 - 3. Seal the shipping carton. Houston Instrument provides you with a prepaid completed express carrier airbill for the return of the defective unit.

- E. Call your local express carrier office and arrange for the pickup of the defective unit. Pickup should take place within 24 hours after receipt of the Priority Response unit. You will keep the Priority Response unit. Your original unit will not be returned to you.

V. Standard One Year Depot Warranty

Limited warranty extended to the purchaser is: products are guaranteed against defects in material and workmanship for a period of one year from the date of purchase by the end user. Liability under this warranty is limited to the repair or adjustment under the provisions listed.

Standard One Year Depot Warranty Provisions:

- A. Defective instruments will be returned to the Houston Instrument factory or a depot center where they will be repaired at no charge to the customer. Houston Instrument will be responsible for the freight charges only in returning the instrument to the customer.
- B. Houston Instrument reserves the right to cancel this warranty. There are no other warranties, expressed or implied. Houston Instrument will not be liable under any circumstances for consequential damage. Houston Instrument will not assume responsibility for an instrument or accessories which have not been installed or operated in accordance with the instrument's Operation Manual.
- C. Houston Instrument warranty will become effective after validation by Houston Instrument, 8500 Cameron Road, Austin, Texas, 78753. Proof of purchase and a completed warranty card are required for validation.

-
- D. This warranty is "VOID" if the product has been damaged by accident, abuse, or misuse, or has been serviced by anyone other than authorized Houston Instrument service personnel.
 - E. No Houston Instrument distributor, dealer, agent, or employee is authorized to make any changes, modification, extensions, or additions to any Houston Instrument warranty either verbally or in writing.

Arrangements for Standard One Year Depot Warranty:

- A. Equipment will be repaired at no charge during the one year warranty period. All warranty repair work will be performed at the Houston Instrument factory or at one of our depot centers. Houston Instrument will be responsible for freight charges only in returning the equipment to the customer.
- B. Proof of validated warranty must be available for warranty repair. If the warranty is not validated as described, the customer will be charged for all repairs.
- C. To return your equipment to a Houston Instrument Service Center, call 1-800-444-3425. Request a Return Authorization Number and the address of the nearest Houston Instrument depot repair center.
- D. Clearly mark your Return Authorization Number on the outside of your parcel.

OSHA CHEMICAL HAZARD COMMUNICATION STANDARD

Finished products manufactured and sold by Houston Instrument are not hazardous under the criteria identified per 29 CFR 1910.1200 (g) (2).

The writing pens used with this plotter are encapsulated in plastic and are considered an "article" under OSHA Chemical Hazard Communication "Employee Right To Know" standard 1910.1200 (c) (1) through (c) (1) (iii) and are not hazardous.

Material Safety Data Sheets (MSDS) are included in Appendix C as attachments for supporting documentation to the plotter owner. The MSDS are furnished in partial fulfillment as OSHA "Employees Right To Know," 29CFR 1910.1200.

DISCLAIMER OF USE

Houston Instrument HI Image Maker™ Plotters produce high-quality plots when used in accordance with the instruction manual. These plotters are not intended for any other use.

There are no customer serviceable parts in this instrument. All repairs are to be made by authorized Houston Instrument service personnel.

IMPORTANT SAFETY INSTRUCTIONS

1. Read all of these instructions.
2. Save these instructions for later use.
3. Follow all warnings and instructions marked on the plotter.
4. Unplug this unit from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
5. Do not use the plotter near or in water.
6. Do not place the plotter on an unstable cart, stand, or table. The unit may fall, causing serious damage.
7. Slots or openings in the cabinet and the back or bottom are provided for ventilation; to ensure reliable operation of the product and to protect it from overheating, these openings must not be blocked or covered. The openings should never be blocked by placing the unit on a bed, sofa, rug, or other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation unless proper ventilation is provided.
8. The plotter should be operated from the type of power source indicated on the marking label. If you are not sure of the type of power available, consult your dealer or local power company.
9. The plotter is equipped with a three-wire grounding type plug, which is a plug having a third (grounding) pin. This plug will fit only into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the purpose of the grounding-type plug.
10. Do not allow anything to rest on the power cord. Do not locate the plotter where persons will walk on the cord.

11. If an extension cord is used with the plotter, make sure that the total of the ampere ratings on the products plugged into the extension cord does not exceed the extension cord ampere rating. Also, make sure that the total of all products plugged into the wall outlet does not exceed 15 amperes.
12. Never push objects of any kind into the plotter through cabinet slots since they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock. Never spill liquid of any kind on the plotter.
13. Do not attempt to service the plotter yourself. Opening or removing those covers marked "Do Not Remove" may expose you to dangerous voltage points or other risks. Refer all servicing in those compartments to service personnel.
14. Unplug the plotter from the wall outlet and refer servicing to qualified personnel under the following conditions:
 - A. When the power cord or plug is damaged or frayed.
 - B. If liquid has been spilled into the plotter.
 - C. If the plotter has been exposed to rain or water.
 - D. If the plotter does not operate normally when operating instructions are followed. Adjust only those controls that are covered by the operating instructions since improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore this product to normal operation.
 - E. If the plotter has been dropped or the cabinet has been damaged.
 - F. If the plotter exhibits a distinct change in performance, indicating a need for service.

NOTICE

Houston Instrument reserves the right to change any information contained in this manual without notice. Unauthorized copying, modification, distribution, or display is prohibited. All rights reserved. Please address all questions, comments, or suggestions concerning this and other Houston Instrument manuals to:

Technical Publications
Houston Instrument
8500 Cameron Road
Austin, Texas 78753

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MANUAL REVISION HISTORY

DATE NOTES

FEB 89 Original issue.

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SECTION 1 QUICK START

1.1 INTRODUCTION

Congratulations on your purchase of a Houston Instrument HI Image Maker Plotter. We know that you will find this to be a useful graphics tool and that you will receive many years of service from it.

We also realize that most of us like to put our new computer accessories to work as soon as possible. The HI Image Maker Plotter has been carefully designed for both easy installation and easy use. That's what these instructions are all about. In most cases, you can use the following directions and have the plotter operating with your computer and plotting software very quickly. Although specific AutoCAD™ and VersaCAD® setup information is provided in this section, the concepts can be applied to any software package used with the plotter.

Please keep in mind that these directions are simply intended as a quick way to help you use your new plotter. If you have any difficulty, the directions refer you to other parts of this manual.

1.2 MANUAL ORGANIZATION

This manual is the *HI Image Maker Plotter Operation Manual*, part number MI-328. It contains all of the information needed for normal installation and operation of the plotter. For ease of reference, this manual is divided into sections and appendixes of related topics. There is a table of contents in the front of the manual that serves as an outline to these topics. Also, there is an index in the back of the manual to help you find specific information.

Section 1 is *Quick Start* information to help you set up your plotter and get it going as soon as possible. Section 2 contains *Operation* information to help you become familiar with the plotter. Section 3 is *Charts* and Section 4 is *Pens*. These sections explain the plotting materials used with your plotter. Section 5 contains *Maintenance* information for normal operator maintenance of the plotter. Section 6 contains *HPGL* programming information. Appendixes A through C are devoted to *General Information*, *Interface*, and *Material Safety Data Sheets*.

1.3 WHAT YOU WILL DO

Using this Quick Start Section, you will learn how to:

- Assemble and install the plotter,
- Set the chart size and load a chart,
- Install a pen,
- Verify plotter operation,
- Configure the plotter for use with your plotting software, including use with either AutoCAD or VersaCAD,
- See where to get help in case of hardware or software problems.

1.4 ASSEMBLY AND INSTALLATION

- Unpack the plotter and accessories from the shipping box. The box should contain the following items:

plotter, model HI-1117 or HI-1117E

power cord, part number 408-T55713 (HI-1117) or 408-T02869 (HI-1117E)

magnet, part number 408-T06487

sample package of eight pens, part number 408-T55742

sample package of five sheets DIN A3 paper, part number MC-3287

warranty card, part number MI-1154 (HI-1117) or MI-9179 (HI-1117E)

serial cable for IBM PC, PC/XT, or PS/2™, part number 408-102 (HI-1117)

Optional items that you may have ordered include:

cover, part number 408-T52629

chart supplies, see Section 3

pen supplies, see Section 4

serial cable for IBM AT™, part number 408-103

parallel cable for IBM PC, PC/XT, AT, or PS/2, part number 408-101

It is recommended that you save the packing material because it has been specially designed to protect the equipment for storage or shipment. (The packing material may be needed as evidence if filing a shipping damage claim.) In any case, be sure to save the packing material at least until operation of the plotter is verified.

- Find the power switch located on the rear panel and set it off. See Figure 1-1. Set rear panel switch SW1-9 to OFF (down); set all others to ON (up).
- The model number HI-1117 plotter is set at the factory for 100 to 120 Vac operating power, while the model number HI-1117E is set for 220 to 240 Vac. Be sure that the power available at your site matches the appropriate operating range. If it does not, contact your Houston Instrument product dealer.

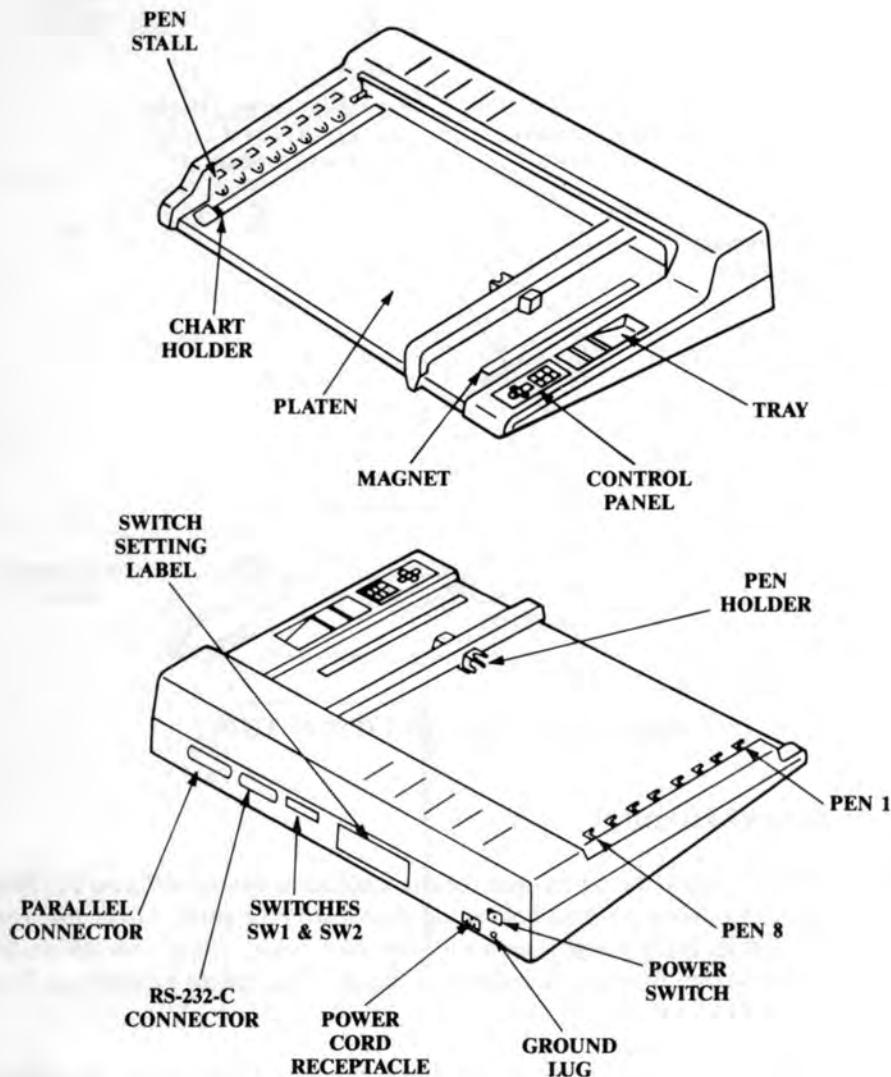
NOTE

Safety Ground Installation: An insulated grounding conductor that is identical in size, insulation material, and thickness to the grounded and ungrounded branch-circuit supply conductors except that it is green with or without one or more yellow stripes should be installed as part of the branch circuit that supplies power to the wall outlet.

The grounding conductor described above is to be grounded to earth at the electrical service equipment, or if supplied by a separately derived system, the grounding conductor should be at the supply transformer motor-generator set.

The attachment plug receptacles in the vicinity of the unit are all to be of a grounding type, and the grounding conductors serving these receptacles are to be connected to earth ground of the service equipment.

- Connect the power cord to the back of the plotter and to the power source. See Figure 1-1. The plotter's ground circuitry protects you from electrical shock. However, this protection is effective only if the ac outlet is properly grounded to earth. If the plotter is connected to a two-contact wall outlet, a 3/2 adaptor with grounding lug/wire may be used. This type of connection is illustrated in Figure 1-2. Be sure to read the important safety instructions in the front of this manual before operating the plotter. To assure FCC and CDC Class B compliance, you **MUST** use a shielded power cord (provided with the unit).

**FIGURE 1-1. CONTROLS**

QUICK START

1-6

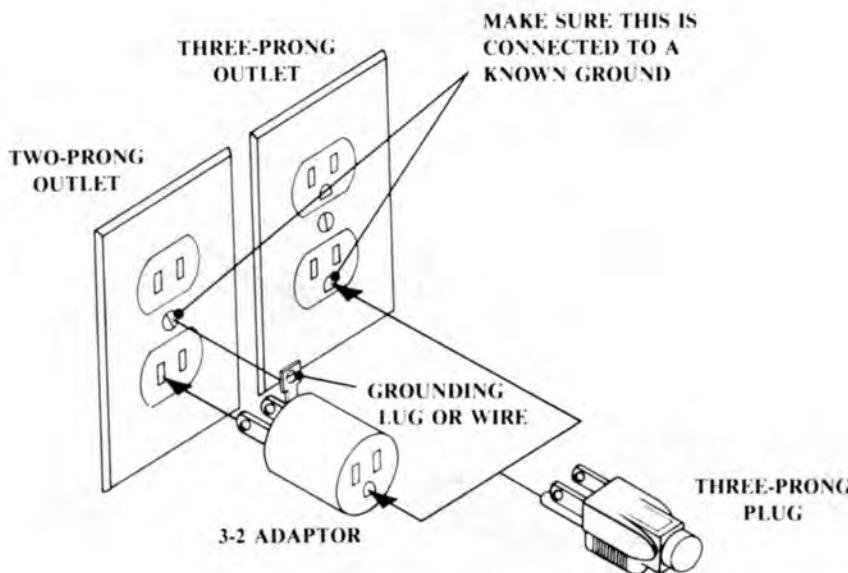


FIGURE 1-2. GROUND CONNECTION

1.5 CHART LOADING

- Press and hold the tab to open the chart holder as shown in Figure 1-3. Slide the chart under the chart holder and align it with the guide. Adjust the chart so that its bottom edge is even with the chart holder arrow, then release the chart holder. (For the procedures in this Section, use an Engineering B or DIN A3 size chart.)
- Smooth the chart to the right to flatten it on the platen. Place the magnet on the right edge of the chart.

If you had any difficulty with chart loading, refer to Section 3.

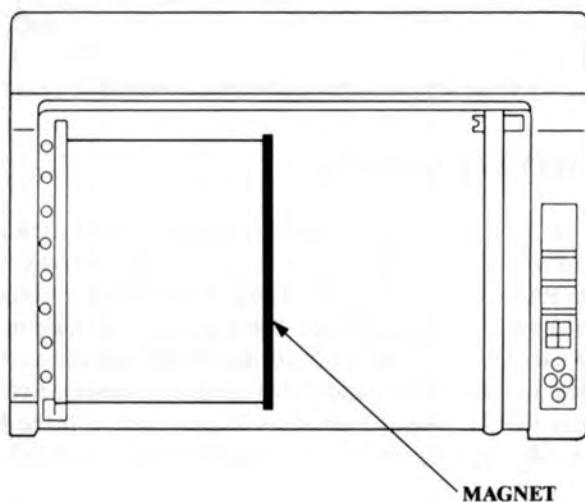
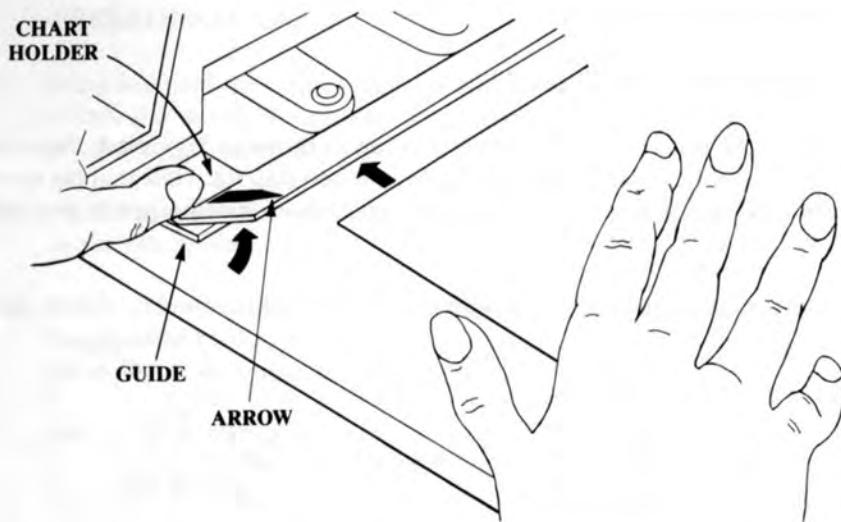


FIGURE 1-3. CHART LOADING

1.6 PEN INSTALLATION

- Remove the cap from the pen.
- Place the pen point in the plotter pen cap as shown in Figure 1-4. Press the pen down and slide the pen flange into the pen stall slit. Note that the lower body of the pen is held by the pen arm. At least install a pen in pen stall 1 (see Figure 1-1).

Refer to Section 4 for more information if you had any trouble with the pen.

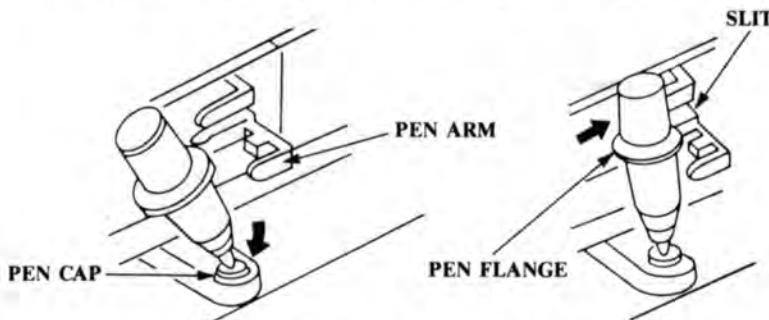


FIGURE 1-4. PEN INSTALLATION

1.7 DATA CABLE CONNECTION

- Connect the data cable to the appropriate data connector on the back of the plotter and to the host computer. If using a parallel interface and cable, use the plotter PARALLEL connector. If using an RS-232-C serial interface and cable, use the RS-232-C connector. See Figure 1-1. Be sure to use a shielded cable. For parallel, use a braided shield and metal connector covers. For serial, use braided and foil shields and metal connector covers. Refer to Appendix B. The part number 408-102 serial cable provided with the HI-1117 plotter is properly shielded for use with an IBM PC, XT, or PS/2 computer.

If you are making your own data cable, then refer to your plotting application software manual for any particular cabling requirements. Otherwise, refer to Appendix B for more cabling information. Connect your data cable to the plotter and the host computer.

1.8 OPERATIONAL CHECK

- Press and hold the control panel **◀** key. Set the power switch on (**●**), then release the **◀** key. Notice that the plotter repeatedly plots the self test plot as shown in Figure 1-5.
- Set the power switch off. Leave the same chart installed and leave the pen in the pen holder.
- Set the power switch on (**●**). Notice that after initialization the plotter blinks the ALARM LED to indicate that a pen is in the pen holder. Press the control panel **▼** key to return it to pen stall 1.
- Set the power switch off. Leave the same chart installed.
- Press and hold the control panel **▼** and **►** keys. Set the power switch on (**●**), then release the **▼** and **►** keys. The plotter plots the ROM (read only memory) revision level in the lower left corner of the test plot. Note that the revision level in your machine may vary from that shown in the Figure 1-5 example. Successful completion indicates that the plotter is operational.
- Set the power switch off. Remove the chart and save it for future reference.

QUICK START

1-10

SELF TEST

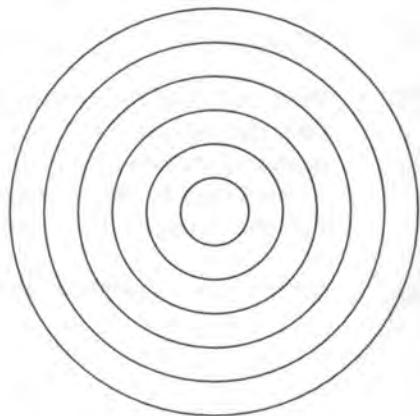
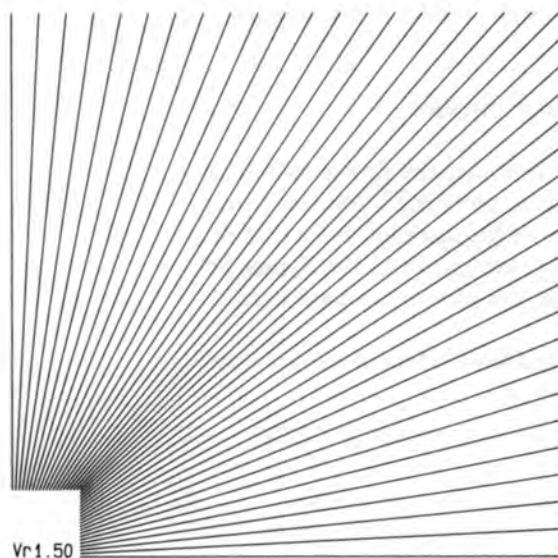


FIGURE 1-5. SELF TEST AND ROM REVISION PLOT

1.9 SWITCH SETTINGS

The plotter has two switch blocks on the rear panel to set the operating parameters. SW1 (switch 1) selects the RS-232-C serial communications parameters, buffer size, and the chart size. SW2 (switch 2) selects the default HPGL character set. SW1 has 10 switches (number 10 is not used) and SW2 has four switches, which are either set ON (up) or OFF (down).

CAUTION

Do not use a pencil to set these switches since graphite particles from the pencil can fall into the electronic circuitry, possibly resulting in severe damage to the plotter. Use a small screwdriver or ball-point pen point to set these switches.

NOTE

The plotter's factory switch settings work with many software packages. However, be sure to read your software manual to determine any software-specific setup requirements.

- Set SW1 switches 8 and 9 as shown in Table 1-1 to select the chart size that matches the chart size you are using. These switch settings must be changed and the plotter reset if you use another chart size.

TABLE 1-1. CHART SIZE

CHART SIZE	SW1-8	SW1-9
Engineering A (8.5×11 inches)	ON	ON
Engineering B (11×17 inches) †	ON	OFF
DIN A4 (210×297 mm)	OFF	ON
DIN A3 (297×420 mm) ‡	OFF	OFF

NOTES:

† Factory setting for model HI-1117.

‡ Factory setting for model HI-1117E.

- Set SW2 switches 1 through 4 as shown in Table 1-2 to select the default HPGL character set. Select the character set that matches your plotting software requirement. If in doubt, select Set 0, which is the same default character set as the HP™ 7475A plotter.

TABLE 1-2. DEFAULT CHARACTER SET

CHARACTER SET	SW2-1	SW2-2	SW2-3	SW2-4
Set 0 ANSI ASCII †	ON	ON	ON	ON
Set 6 JIS ASCII (NOT USED)	OFF	ON	ON	ON
Set 9 ISO International Reference Version	ON	OFF	ON	ON
Set 30 ISO Swedish	OFF	ON	OFF	ON
Set 31 ISO Swedish for names	ON	ON	OFF	ON
Set 32 ISO Norway Version 1	OFF	OFF	OFF	ON
Set 33 ISO German	ON	OFF	OFF	ON
Set 34 ISO French	OFF	ON	ON	OFF
Set 35 ISO United Kingdom	ON	ON	ON	OFF
Set 36 ISO Italian	OFF	OFF	ON	OFF
Set 37 ISO Spanish	ON	ON	ON	OFF
Set 38 ISO Portuguese	OFF	ON	OFF	OFF
Set 39 ISO Norway Version 2	ON	OFF	ON	OFF

NOTES:

† Factory setting.

- Set SW1 switch 7 as shown in Table 1-3 to select the default buffer size. The 1024 (1K) setting selects the 1024 bytes buffer, which is the same size as the HP 7475A plotter. The 5120 (5K) setting selects the 5120 bytes buffer for an extra 4096 bytes (4K) of buffer space.

TABLE 1-3. BUFFER SIZE

BUFFER SIZE	SW1-7
1024 BYTES †	OFF
5120 BYTES	ON

NOTES:

† Factory setting.

NOTE

The remaining switch settings only apply if you are using RS-232-C serial communications between the plotter and host computer. If using parallel communications, skip these steps and go to Paragraph 1.10.

- Set SW1 switches 1 through 3 as shown in Table 1-4 to select the RS-232-C serial communications baud rate. Select the baud rate that matches your plotting software requirement.

TABLE 1-4. BAUD RATE

BAUD RATE	SW1-1	SW1-2	SW1-3
150	ON	ON	ON
300	OFF	ON	ON
600	ON	OFF	ON
1200	OFF	OFF	ON
2400	ON	ON	OFF
4800	OFF	ON	OFF
9600 †	ON	OFF	OFF

NOTES:

† Factory setting.

QUICK START

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- Set SW1 switches 5 and 6 as shown in Table 1-5 to select the RS-232-C serial communications parity setting. Select the parity that matches your plotting software requirement.

TABLE 1-5. PARITY

PARITY	SW1-5	SW1-6
PARITY OFF †	OFF	ON or OFF
PARITY ON, EVEN PARITY	ON	ON
PARITY ON, ODD PARITY	ON	OFF

NOTES:

† Factory setting.

- Set SW1 switch 4 as shown in Table 1-6 to select the RS-232-C serial communications stop bit setting. Select the number of stop bits that matches your plotting software requirement.

TABLE 1-6. STOP BITS

STOP BITS	SW1-4
ONE STOP BIT †	OFF
TWO STOP BITS	ON

NOTES:

† Factory setting.

1.10 AUTOCAD AND VERSACAD SETUP INSTRUCTIONS

Paragraph 1.9 provides general setup instructions for your plotter. The following paragraphs provide specific instructions to set up the plotter for use with MS-DOS™ versions of AutoCAD or VersaCAD software packages.

1.10.1 Configuration

For AutoCAD, set the following configuration in the plotter:

BAUD RATE	9600
PARITY	EVEN
STOP BITS	1
INTERFACE	RS-232-C

For VersaCAD, set the following configuration in the plotter:

BAUD RATE	9600
PARITY	NONE
STOP BITS	1
INTERFACE	RS-232-C

Configure the computer serial port from the software. For AutoCAD, choose “Configure AutoCAD” from the main software menu. Select the serial port (COM1 or COM2) to which the plotter is connected. For VersaCAD, choose “Enviro” in the main software menu. Select the serial port (COM1 or COM2) to which the plotter is connected.

From the software, select either the Houston Instrument HI Image Maker driver or the Hewlett-Packard™ HP 7550A driver to use all eight pens, or the HP 7475A driver to use pens 1 through 6.

The following paragraphs provide operating considerations when using AutoCAD or VersaCAD.

1.10.2 Clipping

Clipping occurs when the drawing size is too large to fit on the available plot area. The plot area is typically less than the media size since the mechanism that holds the media prevents the plotter from drawing on that area. The available plot areas for each media size are listed in Section 3. Note that if you plot to scale and the scale you choose does not fit within the available plot area, the plot will be clipped.

AutoCAD lists standard media sizes rather than plot areas. To avoid clipping, set the “User” selection to the exact plot area available for the media size that you are using and select plot to “Fit”. This will prevent the plot from being clipped.

VersaCAD asks for the left border and the right border, and then queries the plotter and calculates the available plot area.

1.10.3 Pen Tip Width

If the pen tip width value in AutoCAD is not set correctly, pen drag can occur. The values for the pens are:

0.30 mm fiber tip pen tip width = 0.012 inch

0.35 mm stainless steel drafting pen tip width = 0.014 inch

The pen tip width in VersaCAD can be set in the “Enviro” section of the program.

1.10.4 Multi-Colored Plots

AutoCAD and VersaCAD must be told that this is a multi-pen plotter. Otherwise, multi-colored plots will be drawn with a single pen. In AutoCAD, choose “Layer” and specify PEN NUMBER for the pen color. In VersaCAD, choose “Properties” and then choose “Pen”.

1.10.5 Stray Lines

If your plot has stray or extraneous lines on it, follow the suggestions below.

- Run the plotter's self test to determine if the plotter has a mechanical problem.
- Inspect the interface cable by removing the screws (usually two) from the connector ends and visually inspect the cable to determine if a wire has become disconnected. If you have the appropriate equipment, check the continuity of the cable.
- Check the baud rate, stop bits, and parity selections to make sure they match your software requirements.
- Connect the plotter to another serial port on the computer, if available. If the plotter draws the plot successfully on another serial port, the first serial port is probably malfunctioning.

1.11 DONE

This completes the installation, check out, and minimal configuration of the plotter. Be sure to refer to Section 2 to familiarize yourself with the plotter. Refer to Sections 3 and 4 for more information about the plotting materials.

Also, refer to your plotting application software manual if additional configuration of the plotter is needed. Typically, the most important configuration items are the data cable and type of interface (parallel or serial). For the serial interface, baud rate, stop bits, and parity selections are important.

Load a chart and pens as previously described in Paragraphs 1.5 and 1.6, and you should be ready for plotting.

1.12 PRODUCT SUPPORT

Houston Instrument offers hardware and software support for all of its products. This help is only a telephone call away. Please have the following information available when calling Houston Instrument:

- The product model number and serial number, which are printed on the rear panel,
- The date of purchase,
- The type of maintenance agreement, if any,
- The reseller company name, contact name, and phone number,
- A brief description of the question or problem.

After preparing the information requested above, you can contact Houston Instrument toll free at 1-800-444-3425 for assistance. Your call will be received by the Call Center and routed to the Technical Support Hardware or Technical Support Software group depending on your question or problem type.

1.13 OTHER PRODUCTS

Information about other Houston Instrument products is available toll free from the Literature Department at 1-800-444-3425.

1.14 WARRANTY REGISTRATION

Remember to validate your **FREE** Priority Response Warranty by calling the HI Warranty Registration Department toll free at 1-800-444-3425 for immediate registration.

THANK YOU FOR SELECTING THIS HOUSTON INSTRUMENT PLOTTER!

SECTION 2 OPERATION

2.1 INTRODUCTION

This section contains operating information for the HI Image Maker Plotter. This includes general information, model identification, operator controls, the control panel, normal operation, and tests.

2.2 GENERAL INFORMATION

The Houston Instrument HI Image Maker Plotter is fast, accurate, reliable, versatile, and easy to use for your plotting applications. This plotter produces outstanding graphics using a wide variety of chart types and sizes, with many popular pen types and colors. Detailed machine specifications are listed in Appendix A. A few of the features you'll find on your plotter are:

- An eight-key control panel for easy and convenient operator control.
- HPGL 7475A emulation language which allows the HI Image Maker to emulate the Hewlett-Packard model 7475A plotter.
- Choice of serial RS-232-C communications or parallel communications with the host computer. The plotter automatically selects serial or parallel communications for the plotting session according to which is used first.
- Use of paper, vellum, or film cut sheet charts in Engineering A or B and DIN A4 or A3 sizes. See Section 3 for more information.
- Use of disposable fiber tip pens or refillable stainless steel tip drafting pens with several ink colors. See Section 4 for more information.

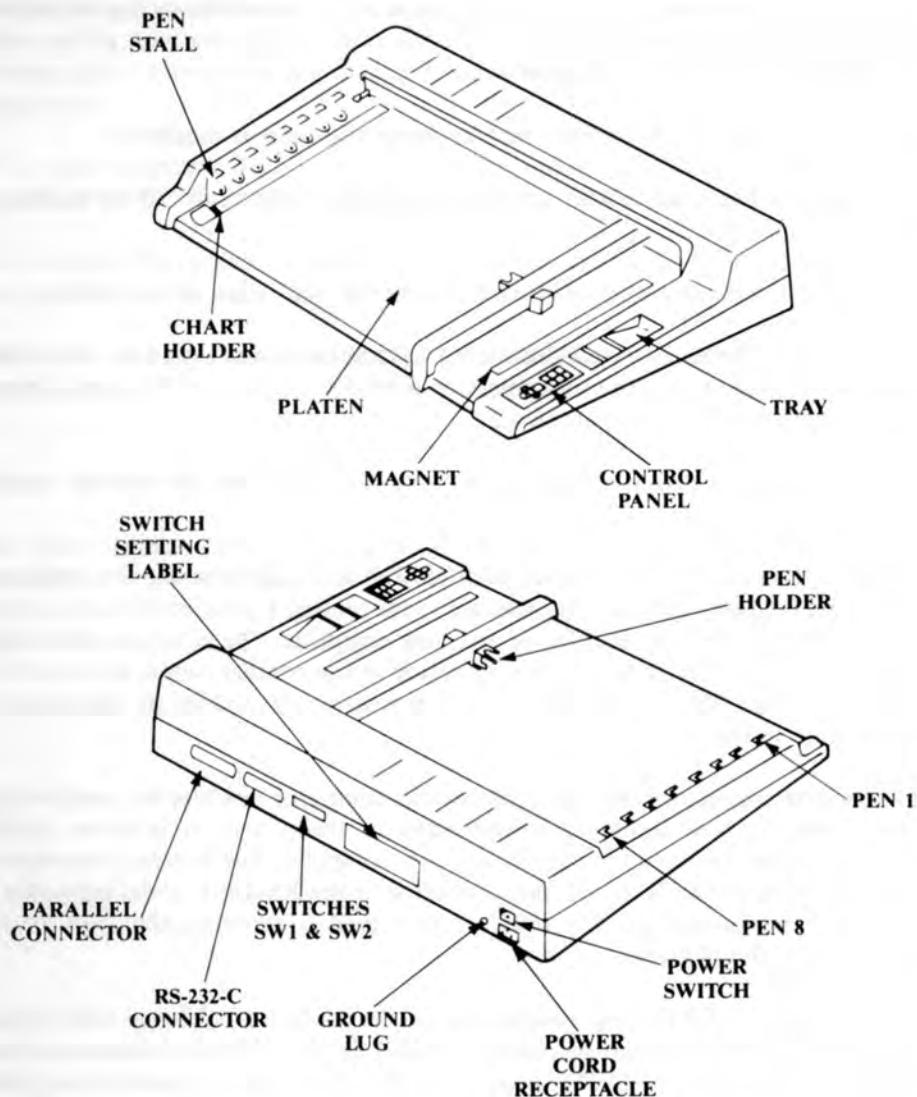
2.3 MODELS

At the time of this writing, there are two models of HI Image Maker plotter. The model HI-1117 is set at the factory for 100 to 120 Vac operating power. The model HI-1117E is set at the factory for 220 to 240 Vac operating power. These models are otherwise operationally identical.

This manual uses the term *plotter* when it provides general information about both models. The specific model term *HI-1117* or *HI-1117E* is used if information pertains only to that particular model.

2.4 CONTROLS

The plotter operator controls are shown in Figure 2-1. These are described in the following paragraphs.

**FIGURE 2-1. CONTROLS**

Pen stall. The plotter has eight self-capping pen stalls for pen storage during the plotting session. These are for pens 1 to 8 (as seen from the front to the back of the unit). Pen loading is explained in Section 4.

Platen. The platen is the plotting surface where the chart is mounted.

Chart holder. The chart holder grips the left edge of the chart. Chart loading is explained in Section 3.

Magnet. This moveable magnet is used to grip the right edge of the chart.

Control panel. The control panel has three LED indicators and eight keys. It provides status information and allows easy operator control of the plotter. The control panel is described in detail in Paragraph 2.5.

Tray. A tray is provided as a place to store the pen caps while the pens are used in the plotter.

RS-232-C data connector. This standard DB-25S connector is where the serial data cable from the host computer is connected to the plotter. It provides RS-232-C serial communications between the plotter and host computer. The interface instructions are given in Appendix B. Either this connector or the parallel connector is used for communications. The interface first used is automatically used for the remainder of the plotting session.

Parallel data connector. This standard parallel connector is where the parallel data cable from the host computer is connected to the plotter. It provides parallel communications between the plotter and host computer. The interface instructions are given in Appendix B. Either this connector or the RS-232-C serial connector is used for communications. The interface first used is automatically used for the remainder of the plotting session.

Switches SW1 and SW2. These switches are used to configure the plotter. Switch block SW1 is used to select the chart size, buffer size, and the RS-232-C serial communications parameters. Switch block SW2 is used to set the default HPGL character set. Refer to Paragraph 1.9.

Switch Setting Label. This label is a quick-reference for setting switches SW1 and SW2.

Ground lug. A ground lug is provided if your installation requires a chassis ground connection.

Power cord receptacle. This is where the power cord attaches to the plotter. Refer to Paragraph 5.3 for fuse replacement and operating voltage conversion.

Power switch. This rocker switch powers the plotter on or off. Power is applied when this switch is set on (●).

Pen holder. The pen holder is the mount for the pen. Pen loading is explained in Section 4.

2.5 CONTROL PANEL

The plotter control panel is shown in Figure 2-2. The LED indicators and control panel keys are explained in the following paragraphs.

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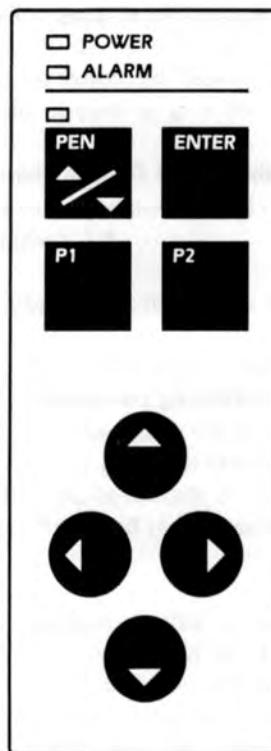


FIGURE 2-2. CONTROL PANEL

2.5.1 POWER Indicator

The **POWER** LED is on steadily when power is applied to the plotter. It is off when the power switch is set to off.

2.5.2 ALARM Indicator

The **ALARM** LED is used to indicate that operator attention is needed.

When on steadily, an HPGL error has occurred during a plotting session. The exact error can be retrieved and cleared by the plotting software with the Output Error *OE* command. (With serial interface only. See notes for Tables 6-1 and 6-2.) Pressing the **ENTER** key manually clears the error.

When blinking rapidly, the plotter has detected a pen in the pen holder during power on initialization. Pressing the appropriate key as described in Paragraph 2.6.3 returns the pen to its stall.

When blinking slowly, the plotter has received an HPGL Digitize Point *DP* command. (With serial interface only. See notes for Tables 6-1 and 6-2.) Pressing the **ENTER** key enters the point as described in Paragraph 2.6.7.

2.5.3 PEN Up/Down Indicator (**▲/▼**)

The **PEN ▲/▼** (up/down) LED is on when the plotter receives an HPGL Pen Down *PD* command or the operator presses the **PEN ▲/▼** key to lower the pen to the chart. The **PEN ▲/▼** LED is off when the plotter receives an HPGL Pen Up *PU* command or the operator presses the **PEN ▲/▼** key to raise the pen from the chart.

2.5.4 PEN Up/Down Key (**▲/▼**)

The **PEN ▲/▼** (up/down) key is used to manually lower and raise the pen. When pressed once, the pen is lowered to the chart and the **PEN ▲/▼** LED goes on. This is equivalent to the HPGL Pen Down *PD* command. When pressed again, the pen is raised from the chart and the **PEN ▲/▼** LED goes off. This is equivalent to the HPGL Pen Up *PU* command. The pen is automatically raised after approximately nine seconds of inactivity to prevent the pen from bleeding on the chart.

2.5.5 ENTER Key

The **ENTER** key is used with other keys to select various plotter operations. For a two-key operation, press and hold the **ENTER** key, press the other key, and then release both keys.

When used with the **PEN ▲/▼** key, the plotter is reset to its power on condition. See Paragraph 2.6.4. When used with the **P1** or **P2** key, the present pen location becomes the new P1 or P2 point. See Paragraph 2.6.6. When used with the **◀** key, a selected pen can be retrieved or returned. See Paragraph 2.6.3. When used with the **▶** key, the rotate P1/P2 90° feature is toggled on and off. See Paragraph 2.6.5.

When the **ENTER** key is pressed while the **ALARM** LED is on steadily, the HPGL error is manually cleared.

2.5.6 P1 And P2 Keys

The **P1** and **P2** keys are used with the P1 and P2 points described in Paragraph 3.4. When **P1** or **P2** is pressed, the pen holder goes to the present P1 or P2 point on the chart. The point can be changed by moving the pen holder and then by pressing the **ENTER** and **P1** or **P2** keys. See Paragraph 2.6.6.

2.5.7 Arrow Keys (**◀ ▶ ▲ ▼**)

The **◀** and **▶** keys are used to move the pen holder left or right on the chart. The **▼** and **▲** keys are used to move the pen holder in and out on the chart to indicate a specific point on the chart. See Paragraphs 2.6.2, 2.6.6, and 2.6.7. These keys are also used for manual pen selection as described in Paragraph 2.6.3.

2.6 NORMAL OPERATION

The term *normal operation* simply refers to using the plotter for plotting operations. This includes online and offline operation, manual operation, manual pen selection, manual reset, manual rotate, manual P1 and P2 point selection, and digitizer operation. These are explained in the following paragraphs.

2.6.1 Online And Offline Operation

Online operation occurs when the plotter is selected by the host computer for a plotting session. While online and plotting, the control panel keys are inhibited from use. When plotting stops, the control panel keys can be used.

In order to be online, the following conditions must be in effect:

- The plotter is powered on.
- A chart and pen(s) are installed as described in Paragraphs 1.5 and 1.6 (or Sections 3 and 4).
- The plotter is connected to the host computer as described in Paragraph 1.7 (or Appendix B).
- The plotter has been minimally configured for operation as described in Paragraphs 1.9 and 1.10.

The plotter is offline when it is not plotting. While offline, the control panel's keys are enabled for use.

2.6.2 Manual Operation

While offline, the plotter can be operated manually if so desired. This feature is used when setting new P1 or P2 points, digitizing, or simply to verify plotter operation.

Pressing the **◀** or **▶** key moves the pen holder left or right on the chart. Pressing the **▲** or **▼** key moves the pen holder in or out on the chart. Pressing adjacent arrow keys moves the pen holder 45° on the chart. For example, simultaneously pressing the **◀** and **▲** keys moves the pen holder diagonally up and left on the chart. Note that movement speed is slow for approximately 1.5 seconds to allow accurate positioning, then increases to four times faster.

Pressing the **PEN ▲/▼** key lowers the pen and pressing it again raises the pen while offline.

2.6.3 Manual Pen Selection

While offline, a pen can be selected during manual operation. Press and hold the **ENTER** key, then press the **◀** key. When the **ALARM** LED rapidly blinks, release both keys. Press a control panel key as shown in Figure 2-3 to select a given pen. For example, pressing the **▲** key selects pen 4. To return a pen to its stall, press the **ENTER** and **◀** keys and then the key used to select that pen. If a selected pen is not moved within approximately six seconds, it is automatically returned to its stall to prevent drying.

Also, if the plotter is powered on with a pen in the pen holder, the **ALARM** LED rapidly blinks. Press the appropriate key shown in Figure 2-3 to return it to its pen stall. **DO NOT** select an occupied stall, since this may result in a pen crash and possible damage to the plotter.

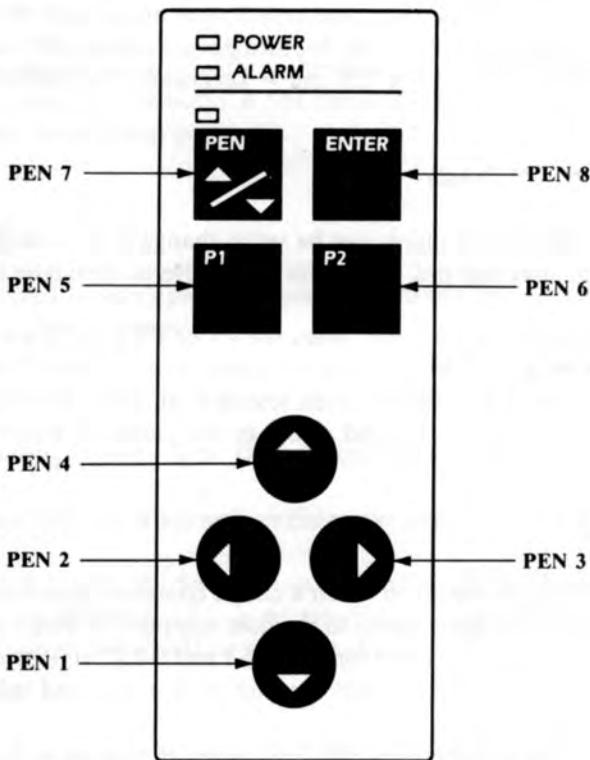


FIGURE 2-3. MANUAL PEN SELECTION

2.6.4 Manual Reset

While offline, the plotter can be manually reset. Press and hold the **ENTER** key, press the **PEN ▲/▼** key, then release both keys. The plotter is then reset to its power on condition. The plotter can also be reset by simply powering it off and on.

2.6.5 Manual Rotate

While offline, the plotting coordinate system can be rotated 90°. To rotate the P1/P2 points, press and hold the **ENTER** key, press the ► key, then release both keys. For an Engineering A or DIN A4 chart, the coordinates are rotated 90° clockwise. For an Engineering B or DIN A3 chart, the coordinates are rotated 90° counterclockwise. To cancel the rotation, press the **ENTER** and ► keys again. Also refer to Paragraph 3.4.

2.6.6 Manual P1/P2 Points

While offline, the P1 and P2 points can be set to change these scaling points for plot size, label direction, user unit size, and mirror image effects. Also refer to Paragraph 3.4.

To go to the present P1 or P2 point, press the **P1** or **P2** key. To set a new P1 or P2 point, use the ◀ ▶ ▲ and ▼ keys to move to the new location. Press and hold the **ENTER** key, press the **P1** or **P2** key, then release both keys. That location becomes the new P1 or P2 point until changed again, or the plotter is reset or powered off.

2.6.7 Digitizer

The plotter has a digitizer feature in which it can be commanded to transmit the present pen position and pen up/down status to the host computer during a plotting session. (With serial interface only. See notes for Tables 6-1 and 6-2.) This is selected by software control from the host computer while the plotter is online and selected.

The plotter slowly blinks the **ALARM** LED when it receives a Digitize Point *DP* command from the host computer. Use the ◀ ▶ ▲ and ▼ keys to position the pen holder to the desired location on the chart. Use the **PEN** ▲/▼ key to set the pen up or down. Press the **ENTER** key to enter the position and pen up/down status. The plotter then resumes normal operation. The plotting software then typically uses the Output Status *OS* command to see if the plotter has digitized data to report. The plotting software then reads the digitized information with the Output Digitized Point *OD* command.

2.7 TESTS

The plotter has several internal test routines to verify plotter operation. These include a self test, ROM test, slew test, and communications test, as explained in the following paragraphs.

At power on, the plotter automatically performs electrical and mechanical tests. This checks the ROM (read only memory), RAM (random access memory), microprocessor, drive motors, and mechanical parts.

2.7.1 Self Test

A self test is provided to verify plotter operation. It draws text, straight lines, diagonal lines, and circles. To run the self test:

1. Set the power switch off.
2. Load an Engineering B or DIN A4 chart. Install a pen in pen stall 1.
3. Press and hold the **◀** key and set the power switch on (●). Release the **◀** key.
4. The plotter repeatedly draws the test pattern shown in Figure 2-4. During the self test the **POWER** LED is on steadily and the **PEN ▲/▼** LED blinks. Set the power switch off to stop the test.

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SELF TEST

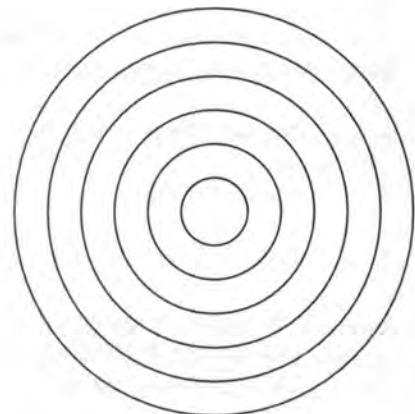
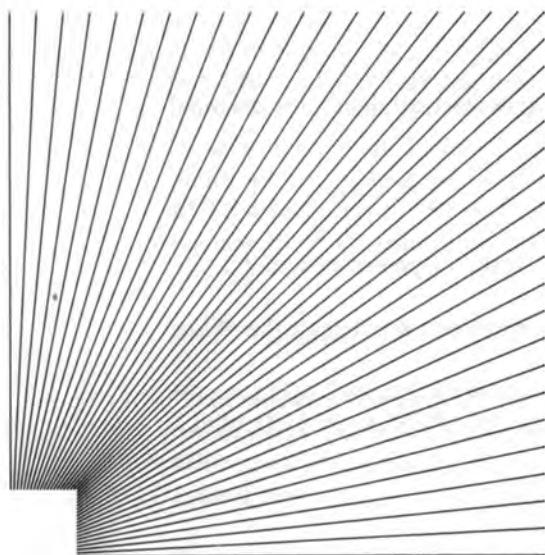


FIGURE 2-4. SELF TEST PLOT

2.7.2 ROM Test

A ROM (read only memory) test is provided to verify the revision level of plotter ROM. To run the ROM test:

1. Set the power switch off.
2. Load any size chart. Install a pen in pen stall 1.
3. Press and hold the ► and ▼ keys and set the power switch on (●). Release the ► and ▼ keys.
4. The plotter draws the ROM revision level. An example is shown in Figure 2-5. However, the revision level in your plotter may vary from this example.

Vr 1.50

FIGURE 2-5. ROM TEST PLOT

2.7.3 Slew Test

A slew test is provided to exercise the plotter to verify operation of the x-axis, y-axis, and pen up/down circuitry and mechanical parts. To run the slew test:

1. Set the power switch off.
2. Load an Engineering B or DIN A3 chart and install a pen in the pen holder, if desired.
3. Press and hold the **P1** and **P2** keys and set the power switch on (●). Release the P1 and P2 keys.
4. The plotter repeatedly slews between the Engineering B or DIN A3 size chart P1 and P2 points with the pen holder up, then down. Set the power switch off to stop the test.

2.7.4 Communications Test

A communications test is provided to verify communications between the host computer and plotter. To run the communications test:

1. Set the power switch off.
2. Load an Engineering B or DIN A3 chart. Install a pen in pen stall 1.
3. Press and hold the **▼** key and set the power switch on (●). Release the **▼** key.
4. The plotter draws the received plot code in hexadecimal. Compare the plot to the plot code sent to verify successful communications. An example is shown in Figure 2-6. However, your plot will vary from this example. If no plot is performed, check your cable.

For serial communications, check the host computer and plotter baud rate if no plot is performed. Check the host computer and plotter parity and stop bit settings if the plot does not match the plot code sent.

Set the power switch off to stop the test.

```
49 4E 3B 20 53 50 32 3B 20 50 41 31 30 30 30 2C 31 30 30 30 3B 20 50 44 3B 20 50 52 32 30  
30 2C 30 3B 20 50 52 30 2C 32 30 30 3B 20 50 52 2D 32 30 30 2C 30 20 50 52 30 2C 2D 32 30  
30 3B 20 50 55 3B 20 53 50 30 3B 1A
```

FIGURE 2-6. COMMUNICATIONS TEST PLOT

SECTION 3 CHARTS

3.1 INTRODUCTION

This section provides information for using charts with HI Image Maker Plotters. This includes chart size setting, chart loading, P1/P2 points and axes origin, supplies, and environmental considerations.

3.2 CHART SIZE SETTING

A particular chart size for the plotter is set with a switch block on the rear panel. These are set either set ON (up) or OFF (down).

CAUTION

Do not use a pencil to set these switches since graphite particles from the pencil can fall into the electronic circuitry, possibly resulting in severe damage to the plotter. Use a small screwdriver or ball-point pen point to set these switches.

Set rear panel SW1 switches 8 and 9 as shown in Table 3-1 to select the chart size. Select the chart size that matches the chart size you are using. These switch settings must be changed if you use another chart size. Table 3-2 lists the available plotting area for each chart size.

NOTE

Be sure to reset the plotter using the **ENTER** and **PEN ▲/▼** keys or power the plotter off and on when changing chart sizes.

TABLE 3-1. CHART SIZES

CHART SIZE	SW1-8	SW1-9
Engineering A (8.5×11 inches)	ON	ON
Engineering B (11×17 inches)	ON	OFF
DIN A4 (210×297 mm)	OFF	ON
DIN A3 (297×420 mm)	OFF	OFF

TABLE 3-2. MAXIMUM PLOTTING AREAS

CHART SIZE	PLOT AREA
Engineering A (8.5×11 inches)	7.84×10.5 inches
Engineering B (11×17 inches)	10.24×16.38 inches
DIN A4 (210×297 mm)	193×277 mm
DIN A3 (297×420 mm)	277×404 mm

3.3 CHART LOADING

The following steps explain how to load a chart for the plotter.

The charts for your plotter are packaged in airtight plastic wrapping. After removing a chart from the package, let it sit for at least 15 minutes before using. This allows the charts to stabilize to the surrounding humidity. If not allowed to stabilize to the environment before use, the resulting plot may have mismatched lines, line shifts, or offsets. This is a result of the chart expanding and contracting during plotting. For proper operation, do not use curled charts. Handle the chart by its edges only! Fingerprints leave a slight residue on the media which may cause the pens to skip over those areas.

1. Press and hold the tab to open the chart holder as shown in Figure 3-1. Slide the chart under the chart holder and align it with the guide. Adjust the chart so that its bottom edge is even with the chart holder arrow, then release the chart holder.

2. Smooth the chart to the right to flatten it on the platen. Place the magnet on the right edge of the chart.

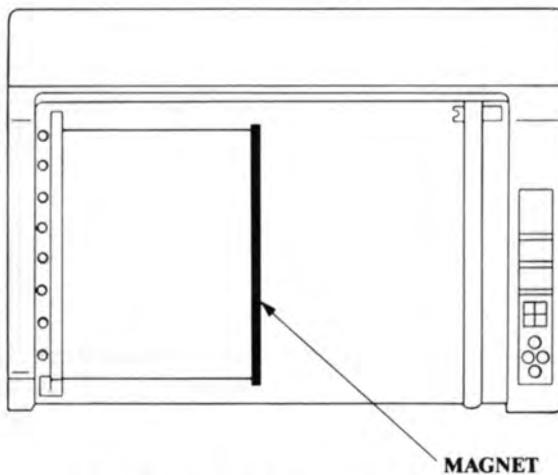
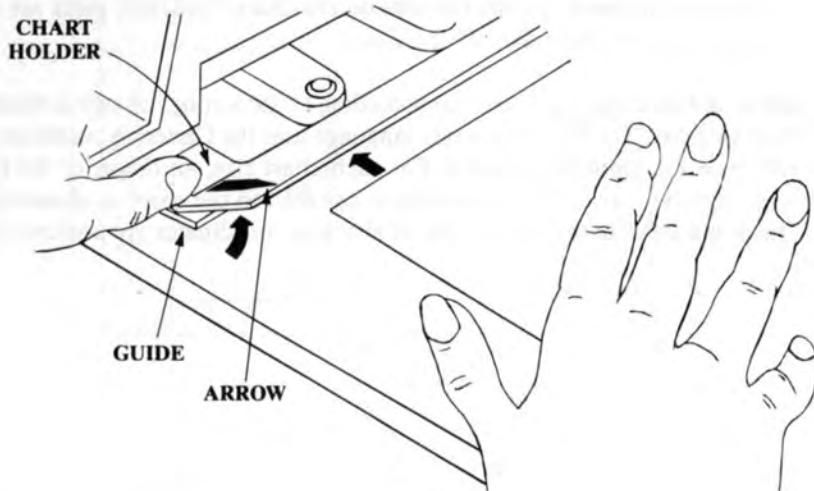
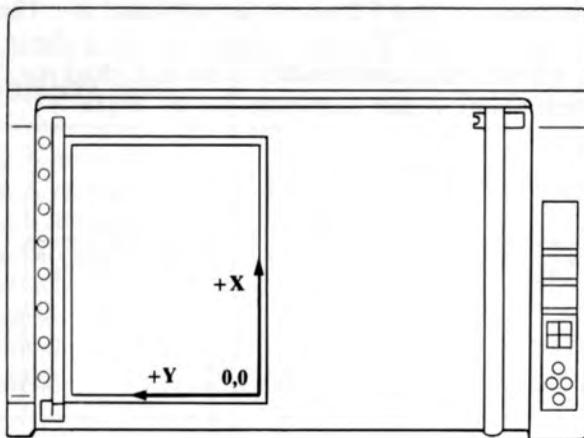
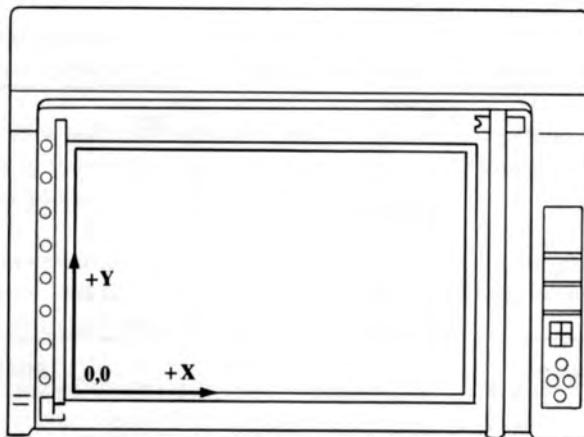


FIGURE 3-1. CHART LOADING

3.4 P1/P2 POINTS AND AXES ORIGIN

P1/P2 points and an axes origin are established when a chart is loaded. These determine how the plotting software orients the plot on the chart. Typically, plots are oriented left-to-right along the long axis of the chart.

The plotter automatically sizes a chart according to the settings of switch block SW1-8 and SW-9 switches. The HPGL plotting language uses the Cartesian coordinate system as a reference for plotting purposes. For each chart size, an origin of 0,0 is set for the x-axis and the y-axis. The axes origin is oriented to the chart as shown in Figure 3-2. The origin 0,0 is in the corner and all absolute coordinates are positive from that point.

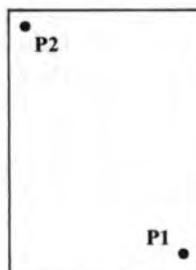
ENGINEERING A/DIN A4:**ENGINEERING B/DIN A3:****FIGURE 3-2. AXES ORIGIN**

CHARTS

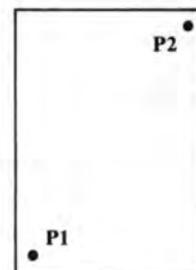
3-6

The plotter also establishes P1 and P2 points for each chart size. These points can also be rotated 90° using the **ENTER** and ► keys. Figure 3-3 shows the locations of these points for normal and rotated conditions for each chart size. Table 3-3 lists the locations of these points in user units from the 0,0 origin.

ENGINEERING A/DIN A4:

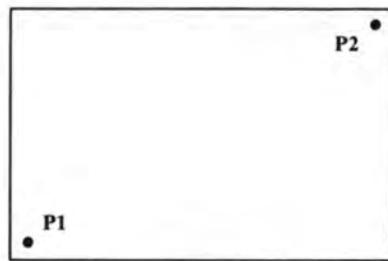


NORMAL

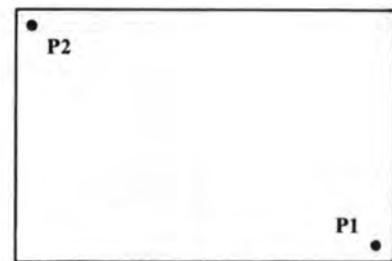


ROTATED

ENGINEERING B/DIN A3:



NORMAL



ROTATED

FIGURE 3-3. P1 AND P2 POINTS

TABLE 3-3. P1 AND P2 POINTS

CHART ORIENTATION	P1 POINT (USER UNITS)	P2 POINT (USER UNITS)
Engineering A normal	250,596	10250,7796
Engineering A rotated	154,244	7354,10244
Engineering B normal	522,259	15722,10259
Engineering B rotated	283,934	10283,16134
DIN A4 normal	603,521	10603,7721
DIN A4 rotated	0,610	7200,10610
DIN A3 normal	170,602	15370,10602
DIN A3 rotated	607,797	10607,15997

3.5 CHART SUPPLIES

Houston Instrument offers three basic types of charts for this plotter: film, vellum, and paper.

Film is a coated clear film (an acetate material). It is not subject to size changes due to temperature and humidity factors. Coated clear film is used for overhead projections.

Vellum is made of a resin impregnated cotton-based cloth material. It is subject to size changes due to temperature and humidity factors (see Paragraph 3.6). Vellum is suitable for final plots.

Paper includes presentation bond (high gloss finish) paper. It is subject to size changes due to temperature and humidity factors (see Paragraph 3.6). Presentation bond is used for check plots and business graphics.

Table 3-4 is a listing of the various chart types and sizes available for use with your plotter. Be sure to note the environmental and compatibility considerations listed in Paragraphs 3.6 and 4.5 before ordering or loading charts.

TABLE 3-4. CHART SUPPLIES

PART NUMBER	DESCRIPTION	QUANTITY
ENGINEERING A:		
MC-3244	Vellum †	50 sheets
MC-3230	Presentation Bond (HI Vintage)	50 sheets
MC-3229	Coated Clear Film	10 sheets
ENGINEERING B:		
MC-3245	Vellum †	50 sheets
MC-3231	Presentation Bond (HI Vintage)	50 sheets
DIN A3:		
MC-3287	Paper sample ‡	5 sheets

NOTES:

† This vellum is approved for use with any type of H.I.-approved drafting pen and may be plotted on both sides.

‡ Provided with the plotter.

3.6 ENVIRONMENTAL CONSIDERATIONS

Although the plotter's approved environmental operating range is 40° to 95° F (4.5° to 35° C) at 20% to 95% relative humidity, extreme high or low temperature and humidity conditions may cause the plotting media to expand or contract. Figure 3-4 shows the recommended operating range for all sizes of film, vellum, and paper charts.

It is important to remember that vellum and paper charts expand and contract with changes in humidity and temperature. This effect may be especially noticeable with larger chart sizes. For best results, remove each chart from the packaging and allow it to stabilize to the plotting environment for at least 15 minutes before use. Use of unstabilized charts may result in poor plot quality and repeatability, such as unmatched or shifted lines.

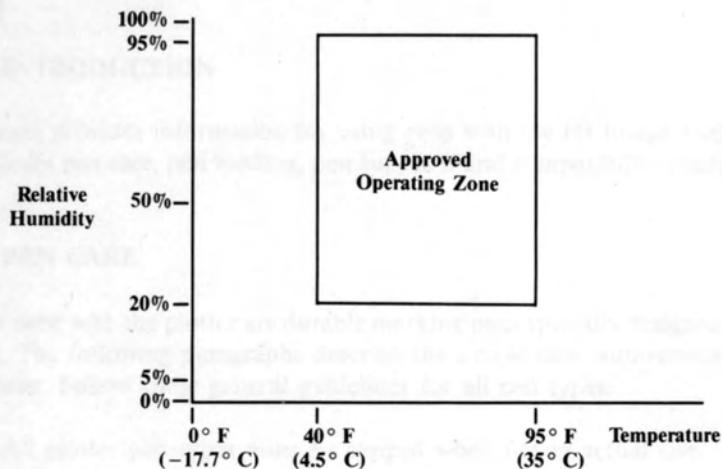


FIGURE 3-4. OPERATING RANGE FOR CHARTS

SECTION 4

PENS

4.1 INTRODUCTION

This section provides information for using pens with the HI Image Maker Plotter. This includes pen care, pen loading, pen supplies, and compatibility considerations.

4.2 PEN CARE

The pens used with the plotter are durable marking pens specially designed for plotter graphics. The following paragraphs describe the simple care requirements for these plotter pens. Follow these general guidelines for all pen types:

- All plotter pen types must be capped when not in actual use.
- Pens may be kept in the self-capping pen stalls for short-term storage.
- For long-term storage, store the pens by removing them from the plotter, capping them with the provided caps, and sealing them in a plastic bag.
- Drafting pens that have been unused for a few days should be checked for ink flow before use.

4.2.1 Fiber Tip Pen

Fiber tip pens with water-based ink are disposable pens that have no particular care requirements other than to keep them capped when not in actual use. Test the pen on a piece of scrap plotting material to verify operation. Refer to Figure 4-1.

Fiber tip pens are used with coated clear film for overhead projections or presentation bond paper for business graphics for check plots. The approximate expected plotting distance for these pens is 1200 feet (366 m). The pen tip width is 0.012 inch (0.30 mm) when new. However, the tip may widen slightly with use.

A fiber tip pen with dried ink can sometimes be saved by dipping the pen point in water, then rubbing the point on scrap paper to restart ink flow.

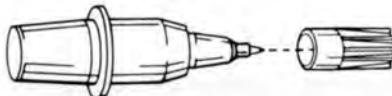


FIGURE 4-1. FIBER TIP PEN

4.2.2 Refillable Stainless Steel Pen

The refillable stainless steel pens are technical pens for plots on vellum. Refer to Figure 4-2. These pens should be capped when not in actual use. Like any technical drawing pen, these pens must be occasionally cleaned and filled with ink for proper operation.

To fill the pen, remove the pen reservoir and add ink, up to the fill line as shown in Figure 4-2. For best results, do not fill past this line. Also note that these pens should be refilled before the reservoir is $\frac{1}{3}$ empty. To start the flow of ink, turn the pen point downward and gently tap the top of the reservoir. Test the pen on a piece of scrap plotting material to verify operation.

CAUTION

If the pen tip is taken apart, be very careful not to bend the cleaning wire inside the tip.

For best results, remove the ink reservoir and thoroughly clean the pen tip after each use using an ultrasonic drafting pen cleaner and solution. Wash the reservoir in tap water. Then thoroughly dry the parts and reassemble the pen. Pen care products are available from any drafting supply store. Note that you should thoroughly clean a pen if you plan to use another ink color in it.

Refillable stainless steel tip drafting pens are used with vellum for final plots. The approximate expected plotting distance per refill for these pens is 2133 feet (650 m). The pen tip width is 0.014 inch (0.35 mm).

A stainless steel drafting pen with dried ink can sometimes be restarted by shaking the pen a few times with the tip pointing downward, or by holding the pen point upward and tapping the reservoir against a hard surface.

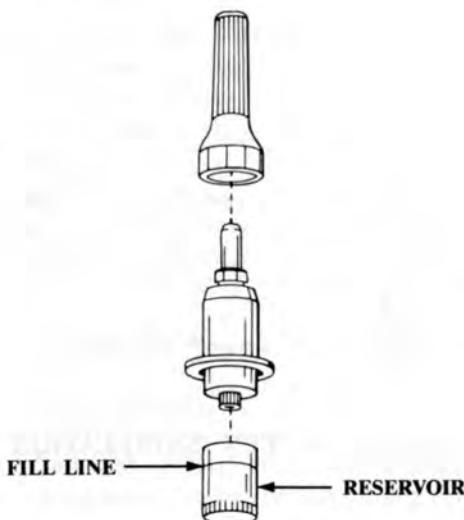


FIGURE 4-2. REFILLABLE STAINLESS STEEL PEN

4.3 PEN LOADING

The following steps explain how to load any type of pen into the plotter.

1. Remove the cap from the pen.
2. Place the pen point in the plotter pen cap as shown in Figure 4-3. Press the pen down and slide the pen flange into the pen stall slit. Note that the lower body of the pen is held by the pen arm.

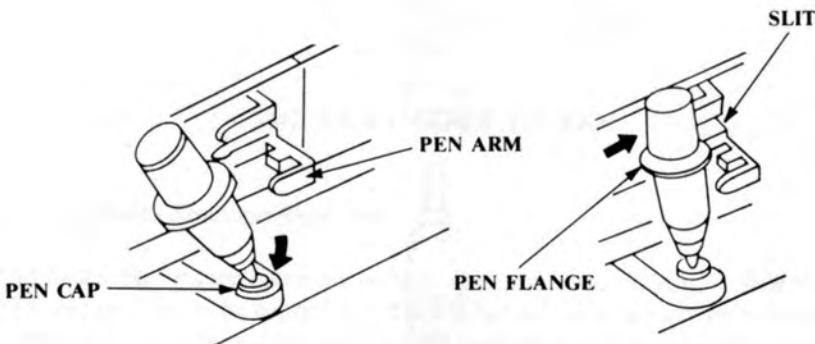


FIGURE 4-3. PEN INSTALLATION

4.4 PEN SUPPLIES

Tables 4-1 and 4-2 list the various pen types available for use with your plotter. Be sure to note the compatibility considerations given in Paragraph 4.5 before ordering or loading pens.

NOTE

HI Image Maker pens may also be used in the Model 695A PC Plotter. However, these pens are not used in other Houston Instrument plotters.

TABLE 4-1. REFILLABLE STAINLESS STEEL DRAFTING PENS

PART NUMBER	DESCRIPTION
PEN TIP:	
MP-815	Stainless steel drafting pen tip
CARTRIDGE:	
MA-17	Adaptor/cartridge/cap
INK IN 3/4 FLUID OUNCE (22 ml) BOTTLES:	
MI-117	Blue (slow drying)
MI-118	Red (slow drying)
MI-119	Green (slow drying)
MI-121	Blue (fast drying)
MI-122	Red (fast drying)
MI-123	Green (fast drying)
MI-288	Black (all purpose)

TABLE 4-2. FIBER TIP PENS

PART NUMBER	DESCRIPTION
KITS:	
MP-814	One each of black, red, blue, and green
408-104	One each of violet, brown, lime green, and orange
MP-816	Four each of black
MP-817	Four each of red
MP-818	Four each of blue
MP-819	Four each of green
408-108	Four each of violet
408-107	Four each of brown
408-106	Four each of lime green
408-105	Four each of orange
408-T55742	One each of black, red, blue, green, violet, brown, magenta, and orange †

NOTES:

† Provided with the plotter.

4.5 SUPPLY COMPATIBILITY

Houston Instrument offers a wide range of approved pens and plotting materials for your plotter. It is important to remember that use of any other plotting supplies is **NOT** recommended. Use of unapproved supplies may result in degraded plot quality, damage to the pen or chart, or possible damage to the plotter.

Please note that not all pens may be used with all plotting materials. For best plotting results, refer to Table 4-3 before ordering or loading plotting supplies to see which plotting materials are recommended for use with any given pen type. A star (★) in a table column means that a particular plotting material may be used with a given pen type.

TABLE 4-3. SUPPLY COMPATIBILITY

PLOTTING MATERIAL	PEN TYPE	
	STAINLESS STEEL	FIBER TIP
CLOTH: VELLUM	★	
FILM: COATED CLEAR FILM		★
PAPER: PRESENTATION BOND (HI VINTAGE)		★

SECTION 5 MAINTENANCE

5.1 INTRODUCTION

This section provides operator maintenance information for the HI Image Maker Plotter. This includes cleaning, troubleshooting, and service information.

5.2 CLEANING

The following paragraphs describe general cleaning and ink stains.

The plotter has several sliding surfaces. These are made of smooth metals and plastics so that they are essentially friction-free and require no lubricants. These may, however, collect dust and lint which may adversely affect the performance of the plotter. Keep the plotter as clean as possible by using a dust cover. When necessary, clean the unit with a soft lint-free cloth slightly dampened with isopropyl alcohol or mild detergent. **DO NOT** use abrasives.

For ink on plotter surfaces, use a clean cloth slightly dampened in a concentrated solution of soap and water. Squeeze out excess water and then scrub the affected surface. Be sure that no water drips into the plotter since this may cause electrical shorting of the internal components. **DO NOT** use any aerosol cleaners, such as TV contact cleaner, household wall cleaners, or anything containing a solvent since these may damage certain components.

5.3 TROUBLESHOOTING

The troubleshooting procedures are organized as a series of tables. The primary troubleshooting procedure is Table 5-1. If a fault is encountered, Table 5-1 lists corrective actions or refers you to another table if necessary. The main troubleshooting procedure for each table is in the left column. Subsequent procedures and corrective actions are listed in the right column.

MAINTENANCE

5-2

Corrective actions are listed in the order of most likely first. Therefore, if a problem has more than one possible solution, perform them one at a time in the order given until the fault is corrected.

Please keep in mind that these tables cannot cover **EVERY** possible failure that the unit might have. These procedures do take into consideration the **MOST LIKELY** failure mode of the major components.

TABLE 5-1. PRIMARY TROUBLESHOOTING PROCEDURES

PROCEDURE	CORRECTIVE ACTION
START ↓ Set power switch on (●). Unit powers on? YES NO → ↓ Load chart & pens. Loads correctly? YES NO → ↓ Press ← key. Press → key. Pen moves left & right? YES NO → ↓ Press ▲ key. Press ▼ key. Pen moves in & out? YES NO → ↓	<ul style="list-style-type: none">① Check ac power source.② Check power cord.③ Have unit serviced. <ul style="list-style-type: none">① Have unit serviced. <ul style="list-style-type: none">① Remove obstruction.② Have unit serviced. <ul style="list-style-type: none">① Remove obstruction.② Have unit serviced.

TABLE 5-1. PRIMARY TROUBLESHOOTING PROCEDURES (continued)

PROCEDURE	CORRECTIVE ACTION
Press PEN UP/DOWN key two times. Pen lowers and raises? YES NO → 	<ul style="list-style-type: none"> ① Remove obstruction. ② Have unit serviced.
Run self test plot. Plots self test plot? YES NO → 	<ul style="list-style-type: none"> ① Have unit serviced.
Plot is acceptable quality? YES NO → 	<ul style="list-style-type: none"> ① Check pen & chart. ② Have unit serviced.
Reset plotter. Unit resets? YES NO → 	<ul style="list-style-type: none"> ① Have unit serviced.
Connect data cable to unit & computer. Run plotting software. Plots correctly? YES NO → 	<ul style="list-style-type: none"> ① Go to Table 5-2. ② Have unit serviced.
FINISH	

MAINTENANCE

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TABLE 5-2. COMMUNICATIONS TROUBLESHOOTING

PROCEDURE	CORRECTIVE ACTION
START ↓ Plot does not start? NO YES ■ ↓ Plot starts then stops? NO YES ■ ↓ Stray lines on plot? NO YES ■ ↓ Software halts during plot? NO YES ■ ↓ Select communications test. Run plotting software. Correct hexadecimal plot code plotted? YES NO ■ ↓ FINISH	<ul style="list-style-type: none">① Check data cable.② Check BAUD RATE setting.③ Have unit serviced. <ul style="list-style-type: none">① Check data cable.② Check PARITY setting.③ Check START BITS setting.④ Have unit serviced. <ul style="list-style-type: none">① Check data cable.② Check BAUD RATE setting.③ Check PARITY setting.④ Check STOP BITS setting.⑤ Have unit serviced. <ul style="list-style-type: none">① Use serial interface.② Use 1K buffer setting.③ Have unit serviced. <ul style="list-style-type: none">① Check plotting software.② Check data cable.③ Check BAUD RATE setting.④ Check PARITY setting.⑤ Check STOP BITS setting.⑥ Have unit serviced.

5.4 SERVICE SUPPORT

If you need technical assistance or if you suspect a problem with your Houston Instrument equipment, contact Houston Instrument at 1-800-444-3425. Please have the following information available **BEFORE** contacting our support personnel:

- The plotter's model number and serial number, which are printed on the identification tag on the back of the unit,
- The type of computer with which the plotter is being used,
- The name and revision number of the plotting software package,
- The cable configuration between the plotter and the computer,
- A copy of the ROM test plot, which provides the plotter's ROM revision levels,
- The date of purchase,
- The type of maintenance agreement, if any,
- The name of the reseller, contact person, and phone number,
- A brief description of the problem.

SECTION 6 HPGL COMMANDS

NOTE

If you have purchased a plotting software package, you may skip this section since that program will correctly handle the plotter's HPGL 7475A emulation language (HPGL) inputs and outputs. You only need to read this section if you are developing your own plotting program. Please remember that the HPGL plotting language is not entirely transportable between all HPGL plotters. This particular emulation of HPGL is for HP 7475A software packages. Packages written for other HPGL plotters may not work correctly.

6.1 INTRODUCTION

This section describes the HPGL 7475A emulation language for the plotter. This language allows the Houston Instrument HI Image Maker Plotter to emulate the HP model 7475A plotter.

This section contains the information necessary to write plotter programs using Houston Instrument's HPGL 7475A emulation language. This includes general information for using HPGL and detailed descriptions of the various HPGL commands for your plotter.

6.2 COMMAND FORMAT

The general format of the HPGL RS-232-C device control functions is as follows:

ESC.SYMBOL parameter; (parameter);

- *ESC* is the ASCII “escape” character. It is typically obtained from an ESCAPE key on a terminal or as a character sent by the plotting software.
- A period (.) must follow the escape character.
- A *SYMBOL* must follow the period. It is a single ASCII character. The alphabetic symbols must be uppercase.
- The *parameter* or *(parameter)*, if any, follow the symbol. Some functions use parameters, while others do not. Some functions have optional parameters, which are indicated in this manual with parentheses. Multiple parameters must be separated by a semicolon (;). The last parameter must be followed by a colon (:). Note that any parameter not specified is set to the default value when a colon or semicolon is detected. It is important to note that the colon and semicolon are for use only with functions that have parameters. These must **NOT** be used with functions that do not have parameters. Otherwise, an error condition will result.

The general format of the HPGL plotting commands is:

MNEMONIC parameter, (parameter) terminator

- The *MNEMONIC* is the two-letter mnemonic (or abbreviation) of the command. The mnemonic can be sent as uppercase or lowercase alphabetic characters. (Uppercase mnemonics are used in this manual.)
- A space may follow the mnemonic and any parameter(s).

- The *parameter* or (*parameter*) is additional data required for some commands. Some commands do not require parameters, while others do. Optional parameters are indicated in this manual with parentheses. Unspecified optional parameters typically assume the previously specified value or the default value. At least one space or comma must separate multiple parameters. If all required parameters are omitted, the command is ignored.
- A *terminator* is used to denote the end of the command. The semicolon (;) is the only character recognized as a terminator. However, a following command can also be used as a terminator for a previous command. Therefore, only the last command in a string requires a specific terminator character. (In this manual, the semicolon is used as the terminator.)

A carriage return (CR) is ignored, except when used as a label character or as an output response terminator. Note that the Label *LB* command must be terminated with a specific label terminator character. The default value is the end of text (ETX) character. However, it can be changed with the Define Label Terminator *DT* command.

6.3 COMMAND ORGANIZATION

The HP 7475A HPGL commands and functions that your plotter supports are described in the Hewlett-Packard *HP 7475A Graphics Plotter Interfacing and Programming Manual*, part number 07475-90001, which is available from HP.

The RS-232-C functions that your plotter supports are listed in Table 6-1. The HPGL commands that your plotter supports are listed in Table 6-2. These are the instructions used to control overall operation of the plotter. Unless otherwise described in the NOTES column, all listed HPGL functions and commands are fully supported and operate exactly as described in the HP manual. Otherwise, be sure to observe the parameters given to ensure predictable operation of the plotter.

Note that these are the only HPGL instructions supported by your plotter. If the plotter receives an instruction that it does not support, the results cannot be predicted. Be sure to check this listing before running any software written for another HPGL-based plotter to ensure predictable operation.

Also note that your plotter does not support the General Purpose Interface Bus (GPIB or HP-IB, ANSI/IEEE 488-1978 standard) communications interface and protocol described in the HP manuals. Your plotter always uses the RS-232-C serial communications interface and protocol or parallel interface and protocol described in Appendix B.

TABLE 6-1. HPGL FUNCTION LISTING

NAME	FUNCTION	NOTES
SELECTION FUNCTIONS:		
Plotter On	ESC.Y or ESC.(See Paragraph 6.4.5.
Plotter Off	ESC.Z or ESC.)	See Paragraph 6.4.5.
CONFIGURATION FUNCTIONS:		
Plotter Configuration	ESC.@ (buffer);(mode):	See Paragraph 6.4.6.
Set Handshake Mode 1	ESC.H (block);(enquiry);(r1; ... r10):	See Paragraph 6.4.6.
Set Handshake Mode 2	ESC.I (block);(enquiry);(rl; ... r10):	See Paragraph 6.4.6.
Reset	ESC.R	Full support.
Set Output Mode	ESC.M (turnaround);(trigger);(echo); (terminator);(terminator);(initiator):	Full support.
Set Extended Output And Handshake Mode	ESC.N (delay);(t1; ... t10):	Full support.
OUTPUT FUNCTIONS:		
Output Buffer Space †	ESC.B	Full support.
Output Extended Error †	ESC.E	Full support.
Output Buffer Size †	ESC.L	See Paragraph 6.4.6.
Output Extended Status †	ESC.O	Full support.
ABORT FUNCTIONS:		
Abort Device Control	ESC.J	Full support.
Abort Graphic Control	ESC.K	Full support.

NOTES:

† This function produces no output from the plotter when the parallel interface is used. This is because the parallel interface is unidirectional from the computer to the plotter only. If the plotter receives this function, it may cause the software to halt while waiting for the plotter response.

HPGL COMMANDS

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TABLE 6-2. HPGL COMMAND LISTING

NAME	COMMAND	NOTES
CONFIGURATION COMMANDS:		
Initialize	IN;	See Paragraph 6.4.4.
Input Masks	IM; or IM (mask),(service),(poll);	See Paragraph 6.4.2.
Set Default Values	DF;	See Paragraph 6.4.4.
Input Window	IW xll,yll,xur,yur;	Full support.
Output Window †	OW;	Full support.
Input P1 And P2	IP Plx,Ply,(P2x,P2y);	Full support.
Output P1 And P2 †	OP;	Full support.
Scale	SC; or SC x1,x2,y1,y2;	Full support.
Rotate Coordinate System	RO; or RO angle;	Full support.
Paper Size	PS size;	Full support.
PEN COMMANDS:		
Pen Down	PD; or PD (x1,y1,x2,y2, ... xn,yn);	Full support.
Pen Up	PU; or PU (x1,y1,x2,y2, ... xn,yn);	Full support.
Select Pen	SP; or SP pen;	See Paragraph 6.4.3.
Plot Absolute	PA; or PA x1,y1,(x2,y2, ... xn,yn);	Full support.
Plot Relative	PR; or PR x1,y1,(x2,y2, ... xn,yn);	Full support.
Velocity Select	VS; or VS speed,(pen);	Full support.
Velocity Adaptive	VA;	NOP, nothing happens.
Velocity Normal	VN;	NOP, nothing happens.
Automatic Pen Pickup	AP;	NOP, nothing happens.
LINE COMMANDS:		
Designate Line	LT; or LT type,(length);	Full support.
Tick Length	TL positive,(negative);	Full support.
X-Axis Tick	XT;	Full support.
Y-Axis Tick	YT;	Full support.
CURVE COMMANDS:		
Circle	CI radius,(chord);	Full support.
Arc Absolute	AA x,y,angle,(chord);	Full support.
Arc Relative	AR x,y,angle,(chord);	Full support.

TABLE 6-2. HPGL COMMAND LISTING (continued)

NAME	COMMAND	NOTES
CHARACTER COMMANDS:		
Designate Standard Character Set	CS; or CS set;	See Paragraph 6.4.4.
Designate Alternate Character Set	CA; or CA set;	See Paragraph 6.4.4.
Select Standard Character Set	SS;	Full support.
Select Alternate Character Set	SA;	Full support.
Define Label Terminator	DT terminator;	Full support.
User Defined Character Symbol Mode	UC pc,x1,y1,(x2,y2),(pc), ... (pc),(xn,yn); SM; or SM symbol;	Full support.
Label	LB label,terminator;	Full support.
Absolute Character Size	SI; or SI width,height;	Full support.
Relative Character Size	SR; or SR width,height;	Full support.
Absolute Character Slant	SL angle;	Full support.
Character Plot	CP; or CP width,height;	Full support.
Absolute Direction	DI; or DI run,rise;	Full support.
Relative Direction	DR; or DR run,rise;	Full support.
DIGITIZING COMMANDS:		
Digitize Point	DP;	Full support.
Output Digitized Point †	OD;	Full support.
Digitize Clear	DC;	Full support.
STATUS COMMANDS:		
Output Identification †	OI;	See Paragraph 6.4.1.
Output Status †	OS;	Full support.
Output Factors †	OF;	Full support.
Output Error †	OE;	Full support.
Output Actual Position †	OA;	Full support.
Output Commanded Position †	OC;	Full support.
Output Options †	OO;	Full support.
Output Hard-Clip Limits †	OH;	Full support.

HPGL COMMANDS

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TABLE 6-2. HPGL COMMAND LISTING (continued)

NAME	COMMAND	NOTES
CHART COMMANDS: Advance Full Page Advance Half Page Enable Cut Line	AF; PG; or PGI; AH; EC; or EC1;	NOP, nothing happens. NOP, nothing happens. NOP, nothing happens.
POLYGON COMMANDS: Edge Rectangle Absolute Edge Rectangle Relative Edge Wedge Fill Type Pen Thickness Fill Rectangle Absolute Fill Rectangle Relative Fill Wedge	EA x,y,r; ER x,y,r; EW radius,angle,sweep,(chord); FT; or FT type,space,angle; PT; or PT width; RA x,y,r; RR x,y,r; WG radius,angle,sweep,(chord);	Full support. Full support. Full support. Full support. Full support. Full support. Full support. Full support.

NOTES:

† This command produces no output from the plotter when the parallel interface is used. This is because the parallel interface is unidirectional from the computer to the plotter only. If the plotter receives this command, it may cause the software to halt while waiting for the plotter response.

6.4 HPGL EXCEPTIONS

Except for the differences described in the following paragraphs, the HPGL functions and commands for your plotter operate exactly as described in the HP manuals.

6.4.1 Output Identification

OI;

To maintain software compatibility, a Houston Instrument plotter responds with an appropriate equivalent HP plotter model number as listed in Table 6-3.

TABLE 6-3. IDENTIFICATION RESPONSE

HOUSTON INSTRUMENT PLOTTER	HEWLETT-PACKARD PLOTTER (Identification Response)
HI Image Maker	7475A

6.4.2 Input Masks

IM; or *IM (mask),(service),(poll);*

The *service* and *poll* parameters are ignored since these only have meaning for the GPIB or HP-IB communications interface, which is not used with your plotter.

6.4.3 Select Pen

SP; or *SP pen;*

This plotter supports two additional Select Pen commands: *SP7* and *SP8* to select pens 7 and 8, respectively. To use these commands from your plotting software, select the HI Image Maker or HP 7550A plotter as the plotting device. The HP 7475A is a six-pen plotter and does not support these commands.

6.4.4 Initialize, Set Default Values, Designate Standard Character Set, And Designate Alternate Character Set

IN;
DF;
CS; or CS set;
CA; or CA set;

The Initialize *IN*, Set Default Values *DF*, Designate Standard Character Set *CS*, and Designate Alternate Character Set *CA* commands select the default character set based upon the rear panel switch block SW2 switch settings. See Table 1-2.

For the Designate Standard Character Set *CS*, and Designate Alternate Character Set *CA* commands, character set 8 (Katakana) is not available.

6.4.5 Plotter On And Plotter Off

ESC.Y or ESC./
ESC.Z or ESC.)

The Plotter On *ESC.Y or ESC./* and Plotter Off *ESC.Z or ESC.)* commands are ignored. At power on, this plotter is always in a programmed on state with hardware handshake enabled.

6.4.6 Plotter Configuration, Output Buffer Space, Output Buffer Size, Set Handshake Mode 1, And Set Handshake Mode 2,

ESC.@
ESC.B
ESC.L
ESC.H
ESC.I

The default plotter physical buffer size is 1024 bytes or 5120 bytes, as set with rear panel switch SW1. The plotter sets a default logical buffer size at power on to match the switch setting.

The Plotter Configuration *ESC.@* function can be used to set the logical buffer size to up to the physical buffer size (1024 or 5120 bytes).

The Output Buffer Space *ESC.B* function outputs the presently available buffer space (0 to 1024 bytes or 0 to 5120 bytes) as set with the Plotter Configuration *ESC.@* function.

The Output Buffer Size *ESC.L* function outputs the present buffer size (up to 1024 or 5120 bytes) as set with the Plotter Configuration *ESC.@* function.

The Set Handshake Mode 1 *ESC.H* and Set Handshake Mode 2 *ESC.I* functions are used to set the RS-232-C serial communications format for the plotter. The enquire/acknowledge block size can be set to up to 1024 or 5120 bytes, as set with the Plotter Configuration *ESC.@* function. The XOFF threshold level can be set to up to 1023 or 5119 bytes, as set with the Plotter Configuration *ESC.@* function. If the XOFF threshold is set to less than 1024 bytes, the XON level is set to half the designated buffer size. If the XOFF threshold is set to more than 1024 bytes, the XON level is set to 512 bytes to maintain software compatibility with the HP 7475A plotter.

It is possible that setting a larger buffer size may cause an error with some software. If this occurs, select the 1024 bytes buffer instead.

APPENDIX A GENERAL INFORMATION

A.1 INTRODUCTION

This appendix contains general information about the HI Image Maker Plotter, such as specifications.

A.2 SPECIFICATIONS

Table A-1 is a listing of the HI Image Maker Plotter specifications.

GENERAL INFORMATION

A-2

TABLE A-1. SPECIFICATIONS

ITEM	DESCRIPTION
WEIGHTS & DIMENSIONS:	
Height	4.9 inches (125 mm).
Width	24 inches (610 mm).
Depth	17.9 inches (455 mm).
Weight	15 pounds (6.8 kg).
PERFORMANCE:	
Accuracy	Less than $\pm 0.3\%$ of plotted distance or 0.004 inch (0.1 mm), whichever is greater.
Plotting Speed	15.7 inches (400 mm) per second each axis.
Resolution	0.001 inch (0.025 mm).
Repeatability (same pen)	0.004 inch (0.1 mm).
Repeatability (pen change)	0.008 inch (0.2 mm).
PLOTTING MATERIALS:	
Pen Types	Refillable stainless steel and fiber tip pens.
Number of Pens	Eight.
Chart Types	Vellum, coated clear film, & presentation bond.
Chart & Pen Combinations	Stainless steel pen with vellum.
Chart Sizes	Fiber tip pen with coated clear film & bond paper. Engineering A (8.5×11 inches), Engineering B (11×17 inches), DIN A4 (210×297 mm), DIN A3 (297×420 mm).
Maximum Plot Areas	Engineering A: 7.84×10.5 inches, Engineering B: 10.24×16.38 inches, DIN A4: 193×277 mm, DIN A3: 277×404 mm.

TABLE A-1. SPECIFICATIONS (continued)

ITEM	DESCRIPTION
INTERFACE:	
Type	Asynchronous serial RS-232-C & Centronics™ parallel.
Selection	Automatic selection of first used.
Serial Plotter I/O Connector	Rear panel RS-232-C DB-25S.
Parallel Plotter I/O Connector	Rear panel 57-40360.
Serial Cable Mating Connector	RS-232-C DB-25P.
Parallel Cable Mating Connector	57-30360.
Serial Baud Rate	150, 300, 600, 1200, 2400, 4800, or 9600.
Serial Parity	Even, Odd, or None.
Serial Stop Bits	1 or 2.
Buffer	1024 bytes or 5120 bytes.
Firmware	HPGL 7475A emulation.
ENVIRONMENTAL:	
Operating Temperature	40° to 95° F (4.5° to 35° C).
Operating Relative Humidity	20% to 95% (non-condensing).
Storage Temperature	-40° to 140° F (-40° to 60° C).
Storage Relative Humidity	5% to 95% (non-condensing).
POWER REQUIREMENTS:	
Voltage	HI-1117: 100/120 Vac. HI-1117E: 220/240 Vac.
Frequency	50 or 60 Hz.
Phase	Single phase.
Power	60 VA maximum.
Fuse	2 Amps Slo-Blo.

APPENDIX B INTERFACE

B.1 INTRODUCTION

This appendix describes the RS-232-C serial communications interface signal and eight-bit Centronics parallel interface signal connections for the HI Image Maker Plotter and the host computer.

The plotter may be used with either the serial or parallel port. The port first used on the plotter is automatically enabled. To connect the plotter to the host computer, always follow this priority:

1. Refer to the plotting application software documents for its recommended cabling specifications for the HI Image Maker plotter. It is important to note that cabling for other Houston Instrument plotters, such as the DMP-29, DMP-40, DMP-50, DMP-60, or PC Plotters **CANNOT** be used instead.
2. If your plotting software does not list required cabling, then use the Houston Instrument cable specifications recommended for your particular computer. These are listed in Paragraph B.2.
3. If you wish to make your own cable, then refer to Paragraphs B.3 and B.4. It lists the various plotter RS-232-C and parallel signals and how to connect them.

B.2 INTERFACE NOTES

The following paragraphs describe communication between a computer and plotter. These notes are arranged by computer configuration, and contain the following information, where pertinent.

- **Cable Specifications.** A cable specification is given. The exact pin-for-pin description is detailed, as well as the type of connector needed on each cable end. These cable definitions establish a communications link between the computer and plotter to provide hardware and software handshake capability. The cable specifications described are general purpose and work with most software packages.
- **System Setup.** Instructions may be given to set up the computer's serial or parallel port. This setup is necessary to run the plotter with the computer. Information about setting up serial communications baud rate, parity, and stop bits for the plotter are given in Section 1.
- **Communications And Handshaking.** A BASIC program may be given that draws 120 circles horizontally across the chart. The purpose of this program is to demonstrate the communications and handshaking abilities of the plotter and computer.

B.2.1 IBM And Compatible Computers

Cable Specifications:

For an IBM AT or compatible computer with a 9-pin serial port, see Figure B-1. For an IBM PC, IBM PC/XT, IBM PS/2, or compatible computer with a 25-pin serial port, see Figure B-2. For the IBM PC, IBM PC/XT, IBM AT, IBM PS/2, or compatible computer with a parallel port, see Figure B-3.

To assure FCC and CDC Class B compliance, you **must** use a shielded data cable with this plotter. For a parallel interface, use a braided shield and metal connector covers (HI cable 408-101 or Inmac® 740-0). For a serial interface, use braided and foil shields and metal connector covers (HI cable 408-102 for IBM PC, XT, and PS/2, 408-103 for IBM AT).

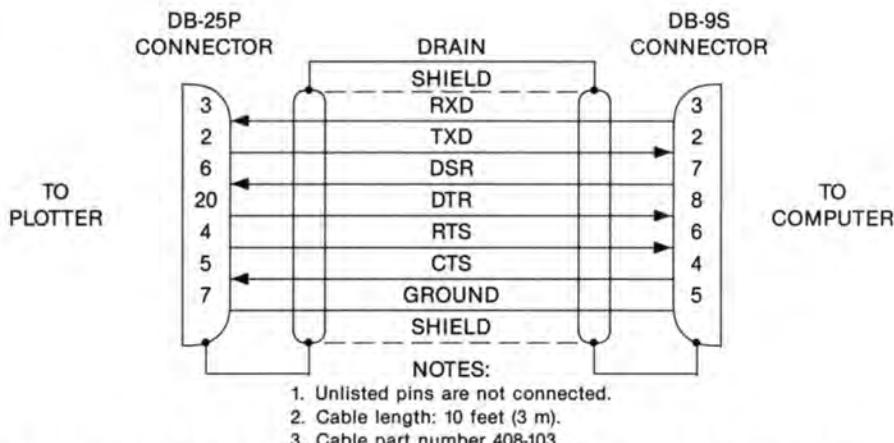


FIGURE B-1. IBM AT OR COMPATIBLE COMPUTER WITH A 9-PIN SERIAL PORT

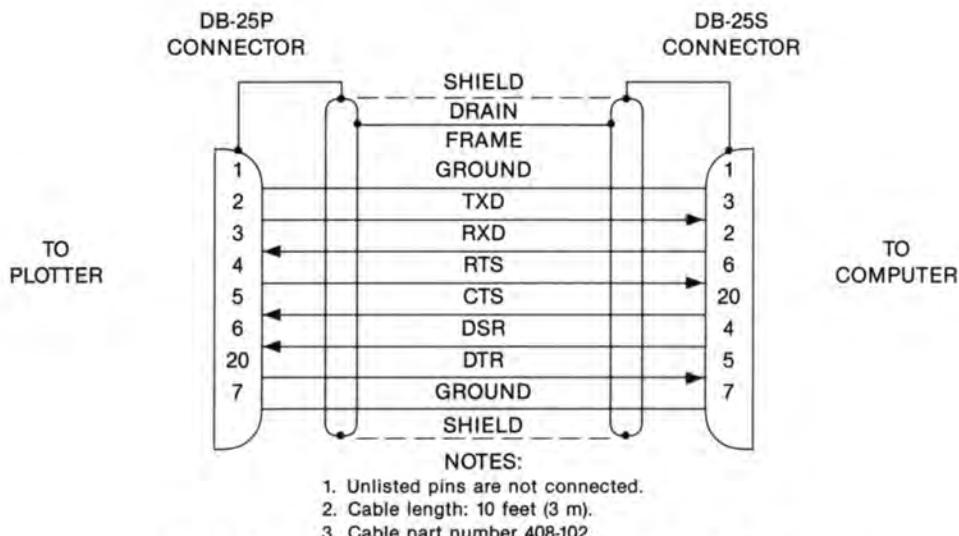


FIGURE B-2. IBM PC, IBM PC/XT, IBM PS/2, OR COMPATIBLE COMPUTER WITH A 25-PIN SERIAL PORT

INTERFACE

B-4

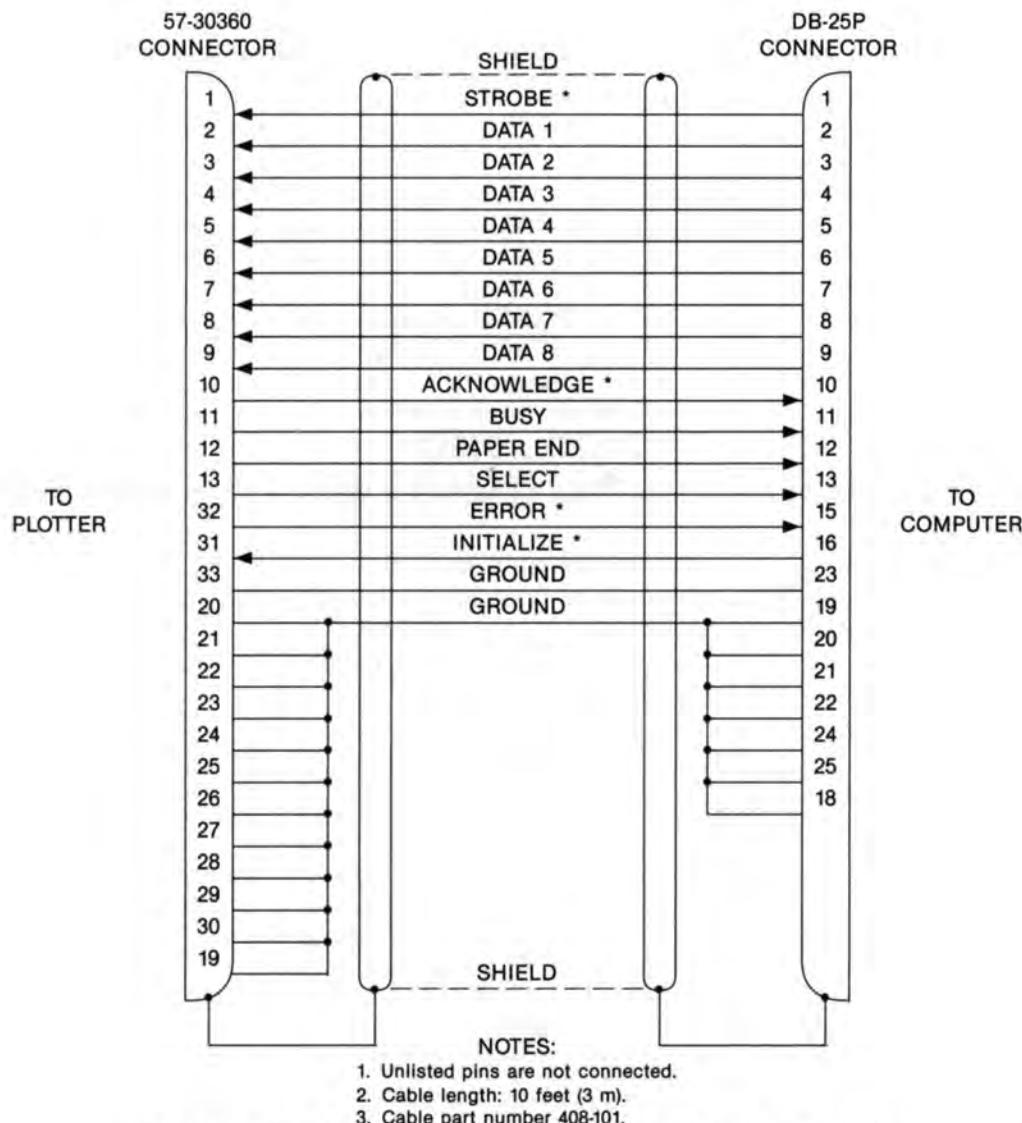


FIGURE B-3. IBM PC, IBM PC/XT, IBM AT, IBM PS/2, OR COMPATIBLE COMPUTER WITH A PARALLEL PORT

System Setup:**NOTE**

The following setup information assumes that you are using PC-DOS or MS-DOS.

1. Boot up the operating system.
2. For serial communications, issue the following command at the system prompt to configure the serial port: "MODE COM1:9600,N,8,1,P". Issue the following command to redirect output to the serial port: "MODE LPT1:=COM1:".

For parallel communications, issue the following command at the system prompt to prevent a time-out error: "MODE LPT1:,P".

3. For serial communications, the computer end of the serial cable must be connected to the serial port defined as COM1 and to the RS-232-C plotter connector. The plotter rear panel switches must be set for 9600 BAUD RATE, NO PARITY, and 1 STOP BIT.

For parallel communications, connect the parallel cable to the computer parallel port and to the PARALLEL plotter connector.

Communications And Handshaking:**NOTE**

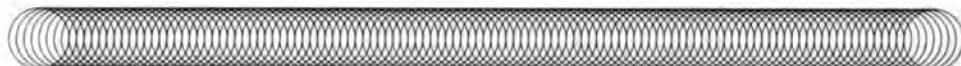
The following BASIC program assumes that you are using IBM BASICA or Microsoft GW-BASIC™.

1. After the system prompt, issue the command to load BASIC. For more information about loading BASIC, consult your computer documentation.
2. After loading BASIC, type in the program listing in Table B-1.

TABLE B-1. IBM SAMPLE PROGRAM

PROGRAM	COMMENTS
10 LPRINT "IN;SP1;" 20 FOR X = 600 TO 12500 STEP 100 30 LPRINT "PA"X, "4000;CI400;" 40 NEXT X 50 LPRINT "SP0;PA0,0;" 60 END	initializes the plotter & selects pen 1 defines x coordinate of center outputs series of 120 circles puts the pen away

3. To save the program, issue the following command: "SAVE "PLOTEST.BAS"."
4. You may now run the program. Issue the following command: "RUN". See Figure B-4.
5. To load and run the program at a later date, issue the following command: RUN "PLOTEST.BAS".

**FIGURE B-4. SAMPLE PLOT**

B.3 AVAILABLE SERIAL SIGNALS

There are eight signal connections available at the plotter 25-pin DB25S (socket) RS-232-C serial connector. These signals are explained in detail in the following paragraphs. All other connector pins are not used. The pin numbers and signal names listed below are at the plotter RS-232-C connector. Refer to Figure B-2.

- Pin 1, Frame Ground (FRAME GROUND). This chassis ground connection is provided for applications that require a frame-to-frame ground between the plotter and host computer. The signal ground is provided at pin 7.
- Pin 2, Transmit Data (TXD). This serial output line is used when the plotter sends data to the host computer. The plotter sends data on this line after receipt of operating commands requiring a response.
- Pin 3, Receive Data (RXD). This serial input line is used when the plotter receives data from the host computer. This is how the plotter receives its operating commands and plot data.
- Pin 4, Request To Send (RTS). This output may be used for hardware handshaking purposes to indicate the status of the plotter. The plotter sets RTS high to indicate when it is ready to accept data from the host computer.
- Pin 5, Clear To Send (CTS). This input may be used for hardware handshaking purposes to control operation of the plotter. To use it, the host computer sets CTS low to inhibit operation of the plotter. The host computer then sets CTS high to resume plotter operation.
- Pin 6, Data Set Ready (DSR). This input may be used for hardware handshaking purposes to control operation of the plotter. To use it, the host computer sets DSR low to inhibit operation of the plotter. The host computer then sets DSR high to resume plotter operation.
- Pin 7, Signal Ground (GROUND). This is a required ground connection between the host computer and the plotter. It provides a common reference for all signal connections.

- Pin 20, Data Terminal Ready (DTR). This output may be used for hardware handshaking purposes to indicate the status of the plotter. The plotter sets DTR low to indicate that it is not ready to accept data. The plotter sets DTR high to indicate when it is ready to accept data from the host computer.

Typically, only a few plotter pins need to be connected to the host computer if making your own serial cable. Cable length should be limited to less than 16 feet (4.8 m) for best results. Note that your computer or plotting software may also require additional loopback connections at its end of the data cable.

- Connect the computer transmit data TXD pin to plotter pin 3. Connect the computer receive data RXD pin to plotter pin 2.
- Connect the computer clear to send CTS pin to plotter pin 20. Connect the computer data terminal ready DTR pin to plotter pin 5.
- Connect the computer data set ready DSR pin to plotter pin 4. Connect the computer request to send RTS to plotter pin 6.
- Connect the computer ground GND pin to plotter pin 7.

B.4 AVAILABLE PARALLEL SIGNALS

There are 28 signal connections available at the plotter 36-pin 57-30360 (socket) PARALLEL connector. These signals are explained in detail in the following paragraphs. All other connector pins are not used. The pin numbers and signal names listed below are at the plotter PARALLEL connector. Refer to Figure B-3.

- Pin 1, STROBE*. The computer sets this signal active low to indicate that the information on the DATA 1 through DATA 8 pins is valid for use.
- Pins 2 through 9, DATA 1 through DATA 8. These pins carry the data from the host computer to the plotter.

- Pin 10, ACKNOWLEDGE*. The plotter sets this signal active low to indicate that the information has been read from the DATA 1 through DATA 8 pins in response to the previous STROBE* signal.
- Pin 11, BUSY. The plotter sets this signal active high to indicate that it cannot receive data because it is busy with other activities.
- Pin 12, PAPER END. The plotter always holds this signal inactive low to indicate that it always has a chart installed.
- Pin 13, SELECT. This active high signal indicates that the plotter is ready for operation with the host computer. The plotter always holds this signal active high.
- Pin 31, INITIALIZE*. This active low signal from the computer is not internally connected in the plotter and is ignored.
- Pin 32, ERROR*. The plotter sets this signal active low to indicate that it has an error condition.
- Pins 19 through 30, and 33, GROUND. These provide the required ground connection between the host computer and the plotter. It provides a common reference for all signal connections.

Typically, most of the plotter pins need to be connected to the host computer if making your own parallel cable. Cable length should be limited to less than 10 feet (3 m) for best results.

APPENDIX C

MSDS

C.1 INTRODUCTION

This appendix contains the MSDS (Material Safety Data Sheets) for the inks used in the refillable stainless steel drafting pens for this plotter. This information is provided for the plotter user in partial fulfillment as OSHA "Employee Right To Know," CFR 1910.1200.

MSDS

C-2

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

IDENTITY (As Used on Label and List)
3080 Drawing Ink

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

U.S. Department of Labor	
Occupational Safety and Health Administration (Non-Mandatory Form)	
Form Approved	
OMB No. 1218-0072	
Date Prepared September 16, 1986	
Signature Preparer <i>Mer Afor Arcieci</i>	

Section I — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity/ Common Name(s))	OSHA PEL	ACOSH TLV	Other Limits Recommended	% (optional)
Carbon Black	CAS #1333-86-4	N/A	7.2	
Ammonium Hydroxide	CAS #1336-21-6	50ppm (as NH ₃)	25ppm (as NH ₃)	1.2
Phenol	CAS # 108-93-7	5ppm	5ppm	0.45
Ethylene Glycol	CAS # 107-21-1		500ppm ceiling conc.	1.6
Water				75-85%

Section III — Physical/Chemical Characteristics

Boiling Point	215°F	Specific Gravity (H ₂ O = 1)	1.055
Vapor Pressure (mm Hg)	Like Water	Melting Point	25-28°F
Vapor Density (Air = 1)	Like Water	Evaporation Rate (Butyl Acetate = 1)	Like Water
Solubility in Water	Hmiscible		
Appearance and Odor	Black liquid, mild fuel oil odor		

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	171°F ASTM D56	Flammable Limits	None	LEL N/A	UEL N/A
Extinguishing Media					
This ink will not burn or support combustion					
Special Fire Fighting Procedures					
High temperatures will evaporate the water and the remaining residue will burn. Water is an adequate extinguishing medium.					
Unusual Fire and Explosion Hazards					
None					

Section V — Reactivity Data

Stability	Unstable	Conditions to Avoid
State	X	None

Incompatibility (Materials to Avoid) None

Hazardous Decomposition or Byproducts None Expected

Hazardous Polymerization	May Occur	Conditions to Avoid	None
	X		

Section VI — Health Hazard Data

Route of Entry: Ingestion? Skin? Inhalation? Unlikely Non-toxic LD₅₀ than 50/Rat greater than 500 mg/kg

Harmful Hazards (Acute and Chronic) None expected, the hazardous ingredients are either very dilute or bound such that exposure to any is rather unlikely.

Carcinogenicity: No NTP? IARC Monographs? OSHA Regulated?

Phenol is listed as an experimental mutagen.

Signs and Symptoms of Exposure Irritation of eyes, nose, throat. Coughing and vomiting are possible signs of exposure (from abuse).

Medical Conditions Generally Aggravated by Exposure None expected.

Emergency and First Aid Procedures: Flush eyes with large amounts of water for at least 15 min. Wash skin with soap and water. If ingested, drink one or two glasses of water to dilute. Consult physician or poison control center immediately.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled Wipe up as once. Dried ink can be soaked with soap solution and rinsed.

Waste Disposal Method: In accordance with Federal, state, and local regulations.

Precautions to Be Taken in Handling and Storing: Do not allow to freeze which could cause leakage.

Other Precautions: None

Section VIII — Control Measures

Respiratory Protection (Specify Type)	Not Needed	
Ventilation	Local Exhaust Not Needed	Special Not Needed
	Mechanical (General) Sufficient	Other Not Needed
Protective Gloves	Not necessary under normal usage	Eye Protection Recommended to avoid splashing into eyes
Other Protective Clothing or Equipment	None	

Work/Hygiene Practices: Wash hands thoroughly before eating, smoking or using toilet facilities.

Material Safety Data Sheet
May be used to comply with
OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

IDENTITY (As Used on Label and MSDS)
Drawing Ink HC66, colored

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name PELIZIAN AG	Emergency Telephone Number 511-6969214
Address (Number Street, City, State, and ZIP Code) Postfach 103	Telephone Number for Information 511-69691
D-3000 Hannover 1 Germany West	27-5-1986

Signature of Preparer (optional) *W. K. Rossow*

Dr. K. ROSSOW

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Names)	OSHA PEL	ACGIH TLV	Other Limit Recommended	% in mixture
1,2-ethanediol (107-11-1)	30ppm Ceiling		5 - 10	
ammonia (20 %) (7664-51-7)	50ppm	25ppm	1	
sodium tetraborate decahydrate (1303-96-4)	5mg/m		0.3 - 0.6	
phenol (108-93-2)	5ppm	5ppm	0.4	

Section III — Physical/Chemical Characteristics

Boiling Point	ca 100 °C	Specific Gravity (H ₂ O = 1)	1.03-1.05
Vapor Pressure (mm Hg)	ca 18	Melting Point	ca -2 °C
Vapor Density (Air = 1)	U	Evaporation Rate (Butyl Acetate = 1)	U

Solubility in Water miscible except pigments

Appearance and Odor liquids in 5 various shades, technical odor

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	n.s.	Flammability Limits	UEL n.s.	UEL n.s.
Extinguishing Media	n.s.			

Special Fire Fighting Procedures none

Unusual Fire and Explosion Hazards none

Section V — Reactivity Data

Stability	Unstable	Conditions to Avoid
	x	none

Incompatibility (Materials to Avoid) none

Hazardous Decomposition or Byproducts none

Hazardous Polymerization	May Occur	Conditions to Avoid
	x	none

Section VI — Health Hazard Data

Route of Entry:	Inhalation?	Skin?	Eye?	Ingestion?
	none	none		yes

Health Hazards (Acute and Chronic) kidney injury when repeated or in large amount drunk

Carcinogenicity: None NTP? IARC Monograph? OSHA Regulated?

Signs and Symptoms of Exposure U

Unusual Conditions Generally Aggravated by Exposure U

Emergency and First Aid Procedures eye contact: rinse with water
ingestion: provoke vomiting

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled spill away with water

Household Wastes according to local regulations

Precautions to Be Taken in Handling and Storing beware of frost

Other Precautions not required

Section VIII — Control Measures

Respiratory Protection (Specify Type) not required

Ventilation	Local Exhaust	not requ.	General	not requ.
	Mechanical (General)	not requ.		

Protective Gloves not requ. Eye Protection not requ.

Other Protective Clothing or Equipment not requ.

Hygienic Practices usual

MSDS

C-4

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

IDENTITY (As Used on Label and Lot#)

3084 RAPIDRAW INK

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name

Koh-I-Noor Rapidograph Inc.
Address Number, Street, City, State, and Zip Code
100 North Street

P. O. Box 68

Bloomsbury, New Jersey 08804-0068
Rapidograph Inc.

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (estimated)
Carbon Black (1333-86-4)	3.3mg/m ³	3.3mg/m ³	15	
Ethanol (64-17-5)	1000ppm	1000ppm	< 3	
isopropanol (67-63-0)	400ppm	400ppm	< 2	
1-butanol (71-36-3)	100ppm	50ppm	< 2	
Morpholine (110-91-8)	20ppm	20ppm	< 3	
Water			60-70	

Section III - Physical/Chemical Characteristics

Boiling Point	212°F	Specific Gravity (H ₂ O = 1)	1.095
Vapor Pressure (mm Hg)	Unknown	Melting Point	19-24°F
Vapor Density (Air = 1)	Unknown	Evaporation Rate (Butyl Acetate = 1)	Like Water

Solubility in Water: Miscible in all proportions

Appearance and Odor: Black liquid. Slight fuel oil odor.

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used)	146°F ASTM D56	Flammable Limits	N.A.	LEL	UEL
Extinguishing Media: This ink will not burn or support combustion.					
Special Fire Fighting Procedures: High temperatures will evaporate the liquid and the residue will burn. Water is an adequate extinguishing medium.					
Unusual Fire and Explosion Hazards: None					

(Reproduce locally)

Section V - Reactivity Data

Stability	Unstable	Conditions to Avoid
State	X	None
Incompatibility (Materials to Avoid)		
None		
Hazardous Polymerization	May Occur	Conditions to Avoid
	X	None

Section VI - Health Hazard Data

Routes of Entry:	Inhalation	Skin	Ingestion
	X	X	

Health Hazards (Acute and Chronic): May be irritating to skin, eyes, and respiratory system.

LD₅₀ (rats) greater than 5g/Kg

Carcinogenicity:	No	NIOSH	IARC Monographs?	OSHA Regulated?

Signs and Symptoms of Exposure: Unknown

Medical Conditions Generally Aggravated by Exposure: Unknown

Emergency and First Aid Procedures:
INHALATION: Remove to fresh air. SPLASH (eyes): Flush immediately with large amounts of water for 15 minutes. Seek medical attention. SPLASH (skin): Remove with soap and water. INGESTION: Drink 1 or 2 glasses of water to dilute. Get medical attention.

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled: Wash with soap and water.

Waste Disposal Method: In accordance with federal, state, and local regulations.

Precautions to Be Taken in Handling and Storing: Keep from freezing.

Other Precautions: Store at room temperature.

Section VIII - Control Measures

Respiratory Protection (Specify Type)	None required.		
Ventilation	Local Exhaust	Not needed	Special
	Mechanical (General)	Sufficient	Other
Protective Gloves	Not required		Eye Protection
Other Protective Clothing or Equipment		Not required	
Hygienic Practice	Wash hands before eating or smoking.		

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MI-328 0289

8500 Cameron Road, Austin, Texas 78753
Rochesterlaan 6, 8240 Gistel, Belgium

Printed in Japan

