GENERAL INFORMATION MANUAL

The HP 2685A PRINT STATION:

A Successful Stand Alone Printing Solution.

5953-7126

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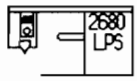

And printed on an HP 2685 Print Station

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PREFACE

With the costs of running a business today, you can't afford to have inefficient methods of printing and storing your paperwork -- whether it's correspondence, documentation, or program listings. As your business grows and more and more paper is generated, the necessity for Hewlett-Packard's 2685 Print Station becomes even more important. By using manageable, letter-sized paper instead of cumbersome line printer paper, both storage space and paper costs are significantly reduced. High quality originals can replace hard-to-read photocopies. Office productivity is greatly increased when documents can be entered into the computer system once, edited as needed by simply retyping the changed portions, and printed on HP's laser printer.

In addition to providing productivity and quality gains, the laser printer can provide users with the reliability that is so necessary in printers.

This General Information Manual introduces you to the many capabilities of Hewlett-Packard's 2685 Print Station. It contains nine major sections, which contain the following information.

Section I introduces you to HP's 2685 Print Station in general, dealing with such things as the advantages of choosing HP as a vendor, a general description of the print station, and the advantages of using HP's 2685 Print Station as a printing solution.

Section II presents the 2685 as a line printer, dealing with such issues as the advantages of using the 2685 in place of a line printer; the ease with which existing applications can be switched over to print on the 2685; and the 2685's capabilities to do routine line printer functions such as forms, multiple character fonts, etc. It also covers support services.

Section III deals with the economics of laser printing. Paper, maintenance, postprocessing, and other cost savings which are realized when using the 2685 Print Station are covered in this section.

Section IV takes the 2685 Print Station one step further -- into the applications beyond routine line printing. Special papers, such as labels and carbonless paper, as well as extended capabilities, such as printing logos, bar codes, signatures, and graphics are outlined.

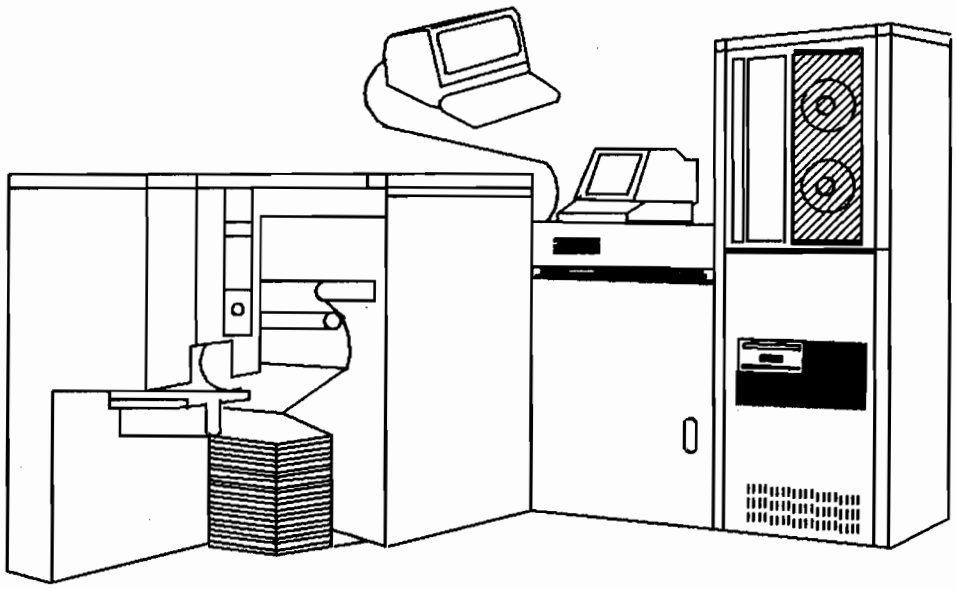


Figure 1. 2685 LASER PRINT STATION (Opt. 052, 7914TD shown)

Section V deals with how the 2685 receives data from the host, and discusses the 2685 as an RJE/MRJE remote print station.

Section VI presents the 2685 as a remote print station, and discusses general cost savings and advantages of using the 2685 in remote settings.

Stand alone features of the 2685 are discussed in Section VII.

Section VIII discusses implementation of the 2685. It answers questions such as: How are electronic forms requested from the host? How are multiple copies printed? How can more than one character set be specified from the host? And how much disc space is needed on the 2685 for spooling?

Section IX covers data communications considerations including datacom line throughput.

A glossary and appendices are also included.

Hewlett-Packard's 2685 Print Station can open new doors to productivity and quality in your organization. What you'll find in this manual is only an introduction to its many

capabilities. To really understand this revolutionary approach to printing, call your local HP sales representative for a demonstration on what the 2685 can do in your organization.

SECTION I.
AN INTRODUCTION TO THE 2685 PRINT STATION

In keeping with Hewlett-Packard's commitment to providing system solutions, HP has introduced the 2685: a printing system that includes tape drive, controller, console, graphics terminal, disc drive, and laser printer. This system enables users of most any other system to purchase HP's 2685 Print Station and use it with their system -- be it via direct connect, modem, or tape transfer. A complete stand alone system, the 2685 can be used as an intelligent remote print station or to off-load your data center's printers and computers.

In addition to its flexible printing features, the 2685 Laser Print Station carries Hewlett-Packard's tradition of reliability and service. At its heart is HP's 2680 Laser Printer, which has a proven track record as being among the most reliable laser printers.

Why consider non-impact printers for your printing needs?

Print Quality

One of the most common reasons people choose non-impact printing is for its ability to provide cost effective, high volume output with high print quality. HP's laser printer can provide the quality of printing appropriate for many types of printing -- documentation, reports which merge graphics and text, business graphics, correspondence, and routine line printer applications can all be produced on the laser printer in a quality unparalleled by impact printers.

Throughput

The HP laser printer's ability to print at 45 pages per minute enables users to have printouts made quickly and easily. And, by reducing two or four pages of information

onto one page, the effective speed and throughput of the printer is significantly increased while reducing bulky printouts to manageable size.

Cost Effectiveness

The low cost of ownership -- coupled with other cost savings such as less expensive and more manageable-sized paper, reduction capabilities which require less paper, elimination of preprinted forms, document preparation, and printing easy to read originals instead of more expensive, hard-to-read photocopies -- makes HP's laser printer a cost effective printer. Using the 2685 results in both cost savings and productivity and quality gains.

Flexibility

Another reason people choose non-impact printing is for its flexibility. Because of its design, HP's laser printer is capable of printing multiple character sets, bar codes, logos, signatures, illustrations, business graphics, and special character sets. In fact, the technology includes software which allows for any character set to be designed. These unique printing capabilities enable the laser printer to print reports, correspondence, manuals, and other documentation in addition to routine line printer applications. For example, this manual was produced using the 2685 Print Station and associated software.

Reliability

The HP 2685 Print Station's reliability is among the best in the laser printer market and as a result, the printer maintenance costs are also among the lowest for laser printers. When you purchase a laser printer for its high speed and other capabilities, you'll be able to use them -- day after day. In total cost of ownership, the 2685's reliability adds up to a notable savings for the user.

Easy to Use

HP's laser printer is easy to use, as well. The transition from impact to non-impact printing can be done with little or no programming effort, and routine line printer applications can be almost immediately transferred to the laser printer. As the user

gains expertise and becomes familiar with the many capabilities of the laser printer, new applications can be implemented to take advantage of the extended capabilities. Built-in convenience features minimize the operator intervention when doing day-to-day operations. Paper loading is simple, and output is automatically stacked in the power stacker. No special alignment is necessary, as data is electronically positioned on the page. No forms loading is required when using computer-stored forms. Internal diagnostics detect printer failures and instruct the operator on how to correct the specific problem.

Electronic Forms

Especially useful is the laser printer's capabilities for printing forms. Instead of loading preprinted forms onto a printer, the laser printer can actually print the form and the variable data simultaneously. Forms can be stored on the 2685 disc, then be printed as needed -- complete with the appropriate data. This eliminates the need for carrying large inventories of preprinted forms, as well as reducing the waste that occurs when preprinted forms are obsoleted. Updating forms can be done in a matter of minutes, instead of waiting for the long production time when forms are typeset, pasted up, then printed by a conventional printing vendor.

Laser Printing -- How does it work?

The 2685's non-impact page printer employs the latest in printer technology and was designed from the ground up to be a high volume, high reliability printer. This printer, using laser scan electrophotographic technology, not only provides the ultimate in print flexibility but, at the same time, provides excellent print quality at high speeds. Delivering a print resolution of 180 dots per inch, the laser printer can create almost any conceivable character or form on the printed page. In addition, the control features of the printer allow a high degree of flexibility.

The heart of the printer is a rotating photosensitive drum. Various processing stations around the drum aid in the creation of printed output (see figure 2).

Data received by the printer is translated into "dot" image patterns to form print information. The dots used by laser printers can be of several different shapes. These include round, oblong and four-sided concave. The 2685 laser printer uses round dots which enable the same character design to be used horizontally or

vertically. In addition the round dots give a clearer image. The dot data turns on the laser beam which is focused onto the drum to form a concise spot of light. The laser beam scans the drum's horizontal axis and creates a raster line of dots and no dots which corresponds to the print data. As the drum rotates, the next raster scan line of dots is written on the drum's surface. This process continues until the entire recordable surface of the drum has been encoded with data. As the drum rotates, the recorded area passes through the developer station where toner (a powdery dry black ink) is attracted to the laser exposed areas. Attraction occurs due to the opposite electrical charge of the toner and encoded surface of the drum. Once the drum passes through this station, a visible print image is formed on the drum's surface.

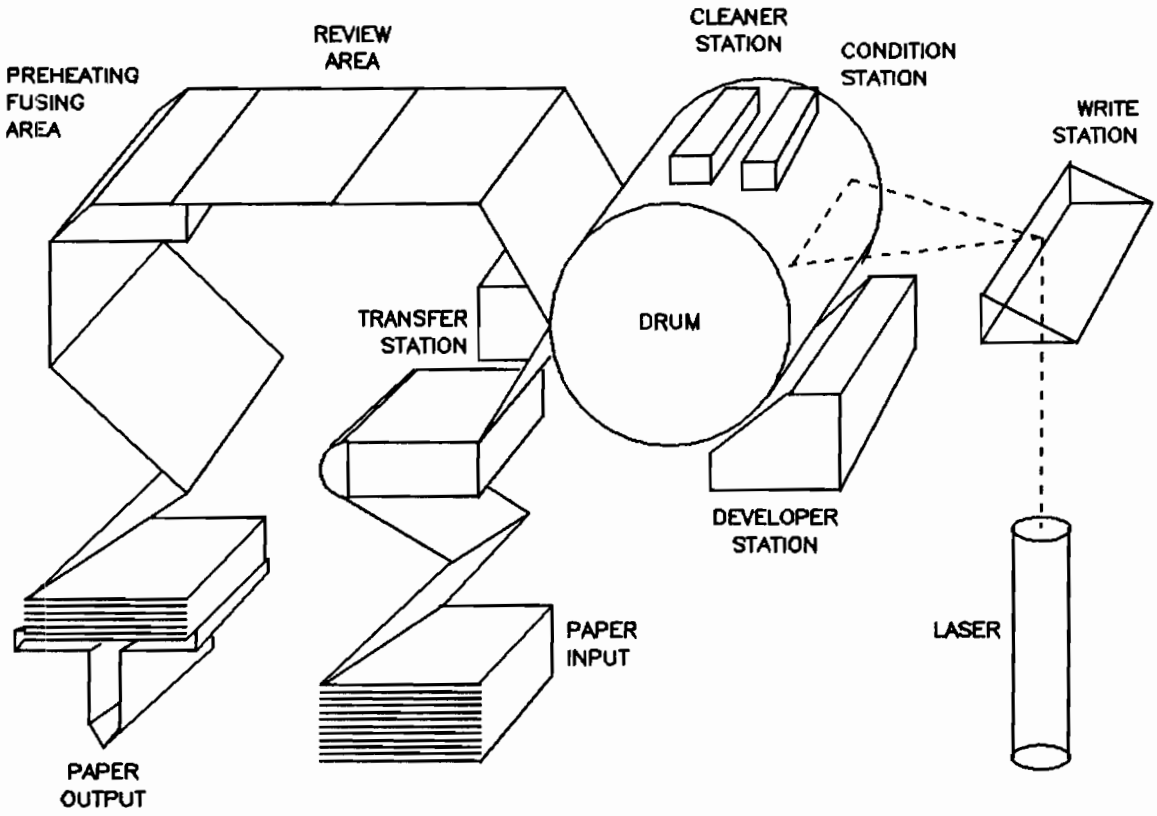


Figure 2. THE 2685 PRINTING PROCESS

The printer's paper movement is precisely synchronized with the drum's rotation. When the developed image on the drum is in the correct position, a negative charge is applied to the rear surface of the paper. This causes the toner image from the drum to be transferred to the paper. At this time, the toner image is held to the paper only by its charge and can be easily smeared.

The paper is then moved past the review area onto the preheater and fuser. The preheater heats the paper so that it may be more easily fused. The fuser is a high intensity quartz lamp which heats the toner enough to physically cause the toner to bond with the paper. The laser printer was designed to perform the fusing process without the use of conventional heated pressure rollers. Instead, the 2685 uses a non-contact fuser to prevent any possible transfer of toner onto the rollers and subsequent pages. This approach also makes the printer more reliable.

Following the fusing process, the paper is moved through the output tractors into the power paper stacker. The paper stacker automatically adjusts to accommodate the height of the paper being stacked.

The 2685 laser printer has extensive built-in diagnostic capabilities which maintain excellent print quality over time and avoid repeated service calls. When service is necessary the built-in diagnostics pinpoint failures and allow the problem to be repaired quickly.

The 2685 printing process is described in more detail in Appendix B.

SECTION II.
THE 2685 AS A LINE PRINTER

What is involved in making existing applications print on the 2685?

The 2685 Print Station was designed to be backward compatible with existing line printer applications. The 2685 has many advanced printer features (such as multiple character sets and graphics) but is designed so that it can immediately be put to use as a standard line printer. If special preprinted forms are currently being used, then they can be either converted to electronic forms on the 2685, or the 2685 can print on single part preprinted forms. The default character set which is resident in the 2685 printer is a line printer character set which will allow printing of the standard 132 columns by 60 lines on an 8.5 by 11 inch page. To use other character sets, the user builds what is known as an environment file using the IFS2680 interactive software on the 2685 Print Station. The environment contains information describing the character sets, forms, and the page dimensions for a given print job. When a print job requiring a special form is sent from the host, the appropriate environment file is downloaded from the 2685 controller to the laser printer to load the character sets and the forms into the printer. Provision is made in the environment file to handle Vertical Forms Control (VFC) so that applications that use a special VFC to provide application specific spacing can be easily converted to the 2685.

What are the advantages of using the 2685 in place of a line printer?

With the print quality of the 2685 printer and smaller, more manageable paper size, end-user satisfaction and productivity increase. New applications that previously could not be done due to poor print quality and large unmanageable paper size are easily implemented with the flexibility of the 2685.

The 2685 is a high volume printer which was designed to handle peak demand and high throughput applications.

By using the electronic forms capability of the 2685 instead of conventional forms, increased flexibility is gained when quick changes are needed. Operator intervention is not required to change forms since the electronic form is sent to the printer, from the controller, to be printed simultaneously with the variable data. Cost savings associated with using electronic forms on regular bond paper rather than using preprinted forms can be significant. Use of electronic forms also eliminates scrappage of obsolete forms and reduces paper storage requirements since there is no longer any need to keep an inventory of different forms.

How does the 2685 handle special forms?

The 2685 has the capability to print electronic forms on regular continuous bond paper at the same time the variable data is printed without degrading the throughput of the printer. The form is designed on a graphics terminal connected to the 2685 controller using interactive, menu-driven software called IDS/FORM. Forms design can take place concurrently with 2685 printer operation. Even with special forms no program modifications are necessary. Because the software for designing electronic forms uses a friendly menu-driven approach, it can be used by individuals who do not have computer programming knowledge.

As an alternative to designing your own forms, HP offers the Output Design Service (ODS) for those customers who prefer to have their forms created for them by HP.

For those who would prefer to design their own forms and character sets, classes are available to provide instruction in the use of IDS/3000 (IDS/3000 consists of two modules: IDS/FORM and IDS/CHAR) and IFS/2680. Ask your sales representative about scheduling attendance.

What about multi-part forms?

The 2685 electronically designed forms also have the capability to simulate conventional multi-part forms. Actually, each copy is printed as an original but can be varied to designate which copy it is. For example, on a multi-part purchase order form, the first copy would be marked "ORIGINAL COPY," the next copy would be marked "VENDOR COPY" and so on. The traditional problem of poor legibility on carbon copies is eliminated since each copy printed on the 2685 is an original. Note also that even though each copy is printed separately, all copies for a given page can be printed one after the other on the 2685 so that all copies of the form will be together after printing or alternatively all number one copies can be printed first, followed by all number two copies, etc. Another advantage of the way the 2685 prints multi-part forms is that information can be blanked off selected copies so that confidential information is not given to the wrong party.

Does the 2685 have the flexibility to print complex forms?

The forms capability of the 2685 is designed to handle conversion of most any preprinted form. Multiple character sets can be used on the form and the characters can be printed in any one of four orientations (0, 90, 180 and 270 degrees). Several levels of shading are available for highlighting areas of the form, and logos designed with IDS/CHAR can be included.

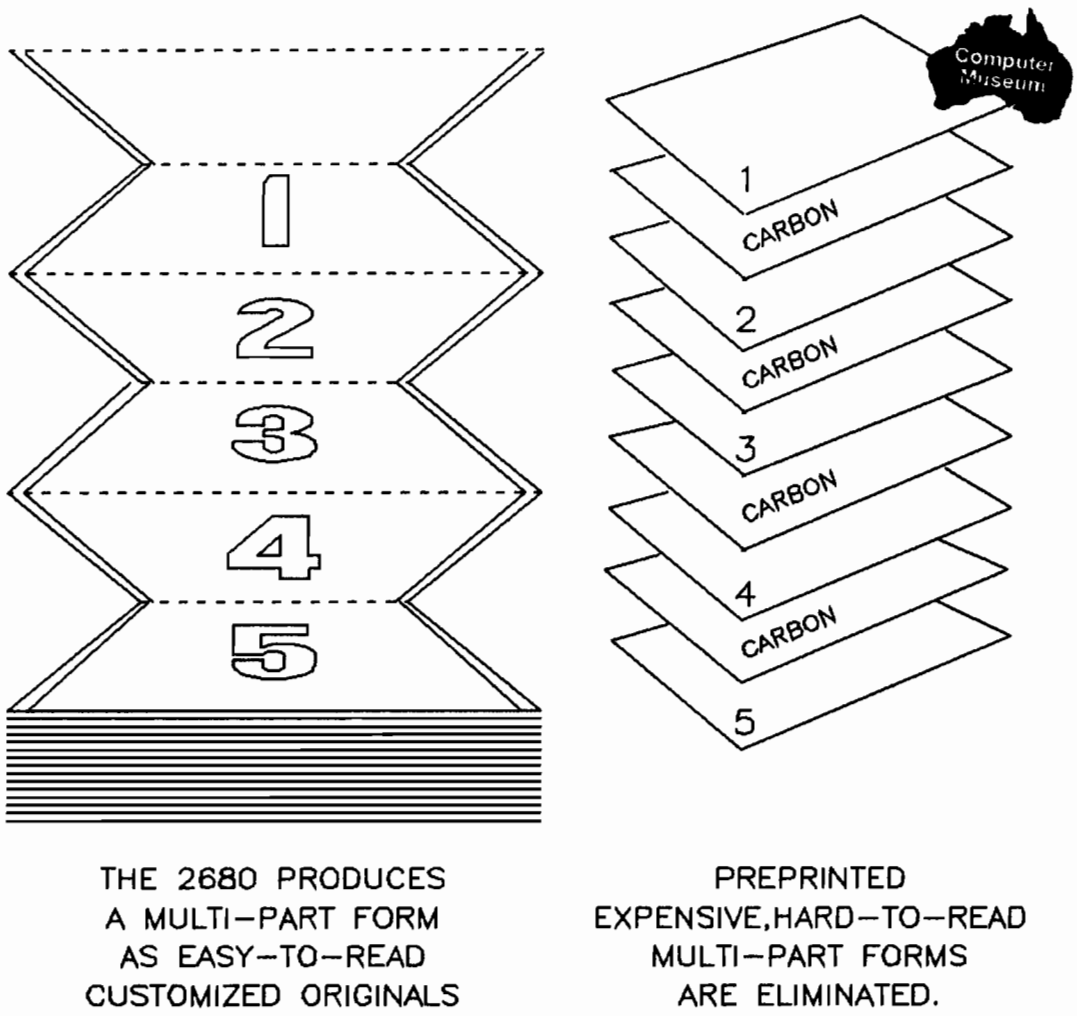


Figure 3. EXAMPLE OF MULTI-PART FORMS ON THE 2685.

Does the 2685 require special paper?

The 2685 prints on commonly available non-impact, continuous fanfold paper. The paper used is not unique to the 2685 and is readily available from most computer paper suppliers. The most popular size paper for the 2685 is 8.5 by 11 inches (8.5 by 12 inches before tractor strips are removed) which makes printed output easy to work with. The 2685 can also print on paper between 3 and 17 inches long (direction of paper movement) and between 6.5 and 12.7 inches in width. This allows for use of European near A-4 size paper. A power stacker on the 2685 automatically stacks

output for paper sizes between 6 and 12 inches. The 2685 can print on a range of paper stock weights (16 to 24 pounds is recommended, though other paper weights may be used with some limitations). The *2680 Laser Printing System Paper Specifications* (part number 5953-7110) should be consulted for a more detailed description of recommended paper.

The two biggest advantages of continuous fanfold paper are the associated paper path reliability and ease of postprocessing. Continuous fanfold paper allows the printer to be designed with a simpler, more reliable paper path. In addition, with fanfold paper, sheets don't get misplaced or out of order. Each document is printed in its entirety; and no portion can be lost or separated since they are connected. Also continuous paper does not require postprocessing to assemble and staple the output. For those printouts which need single sheet appearance, HP also supports special paper which can be easily burst and trimmed to leave a clean "cut-sheet" type edge. Additionally, a conventional burster, trimmer, stacker can be used with 2685 output just like a line printer.

Customer specified special papers can also be used on the 2685 Print Station provided that they meet the specifications established in the *2680 Laser Printing System Paper Specifications*.

Hewlett-Packard supports 3M's Tartan® carbonless paper for use with the 2685. 3M Tartan® paper is currently manufactured for high temperature applications, and meets paper size and weight specifications for HP's laser printer.

Adhesive labels, in a variety of sizes, can also be used with the laser printer; again, these are supported when the specifications comply with HP's paper specifications as published in the guide mentioned above.

2685 Hardware Support

The 2685 is covered under a support services agreement. All the necessary parts and labor for remedial maintenance are included. The following two service programs are available for HP computer systems and peripherals, including the 2685.

®Tartan is a Reg. TM of 3M Company

Standard System Maintenance Service

This agreement provides a high level of service with the quickest response. It provides a choice of nine different coverage periods: 13, 16 or 24 hours per day, five, six or seven days per week -- offered to meet the specific needs of your operation. The following features are included:

- Same-day response, typically within four hours on all service requests placed during normal working hours, at sites within 100 miles of a Service Responsible Office.
- Site environmental surveys performed periodically to assure a sound operating environment.
- Scheduled preventive maintenance to identify potential problems before they occur.
- Work will continue even after your coverage period has ended once on-site work on a remedial repair has commenced and progress is being made.
- Installation services for HP computer system products added to your system already covered by this maintenance service are included at no additional charge.
- Warranty services will be extended to match the coverage provided under this maintenance service at no extra charge.

Basic System Maintenance Service

This service offers all the features of the Standard System Maintenance Service, but with a lower response for a reduced cost. Next-day response, Monday through Friday, to service requests for sites within 100 miles of an HP Service Responsible Office is provided. Other response times are specified for service beyond 100 miles.

Extended coverage is also available for customers who operate outside normal business hours, Monday through Friday. Coverage extensions are billed as an uplift to the monthly maintenance charge.

SECTION III.
HP2685 - AN ECONOMICAL PRINTING SOLUTION

The 2685 Print Station has a number of characteristics which can lower operating costs over traditional line printer applications. The actual amount of savings that can be achieved varies, of course, depending on the application. Listed below are some of the major areas where savings can be realized.

Paper Costs -- The cost of paper is generally the largest variable cost associated with printers and therefore plays a very important part in any cost analysis.

Though paper costs vary regionally and depend upon the volume ordered, typically up to a 40% savings can be realized by using the smaller letter sized paper the 2685 uses rather than the common 11 by 14 3/4 inch printer paper utilized by impact line printers.

Forms Costs -- Depending on the number of applications that require special forms, this area can contribute a great deal to savings. The 2685 prints electronic forms, along with the variable data, on regular bond paper, saving the cost of expensive preprinted forms.

Reduction -- The 2685 has the capability to print either two or four page images on each physical page. For those applications that are printed using the reduction capability of the 2685, paper costs and maintenance costs are reduced by 50% or 75% (for 2:1 reduction and 4:1 reduction, respectively). An added benefit is that throughput is also increased so that rather than printing at 45 pages per minute, the effective throughput is 90 or 180 pages per minute when reduction is used (Note that if datacommunication lines are being used to communicate data to the 2685 the increased printer throughput achievable with reduction will be dependent on the datacommunication lines being able to pass the data to the printer at the higher rate).

Print Quality and Paper Size -- There is a direct benefit to users in the enhanced print quality and smaller paper size.

The benefit results from making computer printed information easier to locate and read. Paper size contributes to the easy access of the data because the output can be stored in a normal file or bookcase.

Another benefit of the 2685's print quality is that it is considered camera ready copy for volume printing. Copy can be developed on your system, printed on the 2685 and delivered to the printing shop.

Photocopying -- Many organizations photocopy substantial amounts of computer output, either to reduce regular large output reports down to more manageable letter sized paper or to make additional copies of reports.

The 2685's output is already on letter sized paper, and multiple report copies are printed at 45 pages per minute, typically for less cost per page.

Operator Productivity -- The 2685 has the ability to download electronic forms to the printer without operator intervention. Typically this means freeing 25% or more of the operator's time to manage the system - not the printers. In addition, the operator no longer has to spend time aligning the data to fit perfectly with the form. Alignment is done at the time the form is designed, and since the form is printed with the data, there is no longer a need to check alignment at the beginning of each special form print job.

Elimination of Outside Printing -- Many organizations contract printing out to service bureaus because of end of the month peak volumes or for higher quality output. The laser printer can easily eliminate the need for outside printing. One of the biggest benefits of the 2685 is the ability to print regular computer output as well as high quality reports and large volumes of correspondence quality output. The savings in bringing this printing in-house can be substantial.

Postage Savings -- For those users with the need to ship computer output or printed material through the mail, the 2685 can save 50% or more in postage costs. Using 2:1 or 4:1 reduction or just using a smaller character font so you can put more information on a page will reduce the number of pages to be mailed. By using 2:1 reduction, weight is cut by 50%. By using 4:1 reduction, weight is cut by 75%.

Forms Management Costs -- Savings are realized here in inventory carrying costs, inventory control costs, ordering costs and storage costs. Because the 2685 prints forms on regular bond paper, there is no need to stock large quantities of

various different forms. In addition, obsolescence costs are eliminated since forms can be printed as needed.

Reliability -- The 2685 laser printer is one of the most reliable printers on the market today. The printer monthly maintenance prices attest to that. The 2685 laser printer has several microprocessors monitoring the system during operation. If a failure is imminent, these microprocessors will advise the operator of the problem via the display on the printer's keypad. The printer also advises the operator when to add consumables, and when to schedule preventive maintenance.

SECTION IV. APPLICATIONS BEYOND LINE PRINTING

Even though the 2685 was designed to be completely compatible with existing line printer applications and is very effective as a line printer, it has a number of very powerful features that enable you to go beyond conventional line printing.

Some of the 2685 Print Station's advanced features that separate it from conventional line printers are:

- Correspondence (word processing) quality print.
- The ability to use multiple character sets on a printed page, including bar code and optical character recognition (OCR) character sets.
- The ability to merge graphics with text and print them simultaneously.
- The ability to customize or design entirely new character sets or logos through software running on the host system.

How does the 2685 print bar codes?

Several of the more common bar code character sets are included with the 2685. For example, to print a line of data using the popular 3 of 9 bar code, one would simply send the normal ASCII alpha and numeric characters to the printer, but specify that they should be printed using the 3 of 9 character set. Other lines on the page (or even characters on the same line) can be printed in conventional (non-bar code) character sets. When sending data from the host, two character sets can be can be dynamically selected. For applications than run on the 2685 controller up to 32 character sets can be downloaded to the printer and dynamically selected.

For other barcode applications the IDS/CHAR software can be used to design specialized bar code character sets. IDS/CHAR is a program which runs on the 2685 controller and can be used to create new character sets or modify existing ones. In addition to the over 100 character sets provided, IDS/CHAR gives the user the ability to create his or her own additional ones. Like IDS/FORM, IDS/CHAR is an interactive program that does not require the user to have programming experience. See appendix B for more information on IDS/3000.

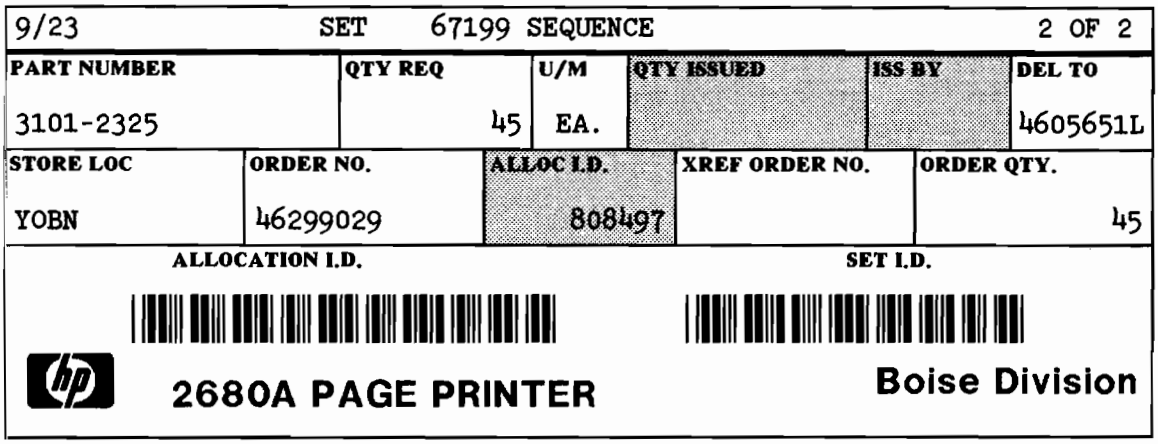


Figure 4. EXAMPLE OF A FORM WITH USE OF BAR CODE CHARACTER SET

Because of its superior print quality and consistent print density, the 2685 produces bar code output which meets the requirements for most bar code applications.

Can the 2685 print on labels?

The 2685 can also print bar codes or information, such as addresses, on sticky back label stock. In fact, electronic forms, data and bar codes can all be printed on labels using the 2685. Refer to the *2680 Laser Printing System Paper Specifications* (part number 5953-7110) for specific information on what types of labels to use.

What about logos and signatures?

Often, in designing a form or a letterhead, a company logo is included (see figure 5, next page). The IDS/CHAR software that is used for designing new character sets can also be used to design logos or even digitize signatures. IDS/CHAR allows the user to make quick changes and to preview the logo or signature before it is finalized. For those who prefer not to design their own logos, HP can do it for you through the Output Design Service (ODS).

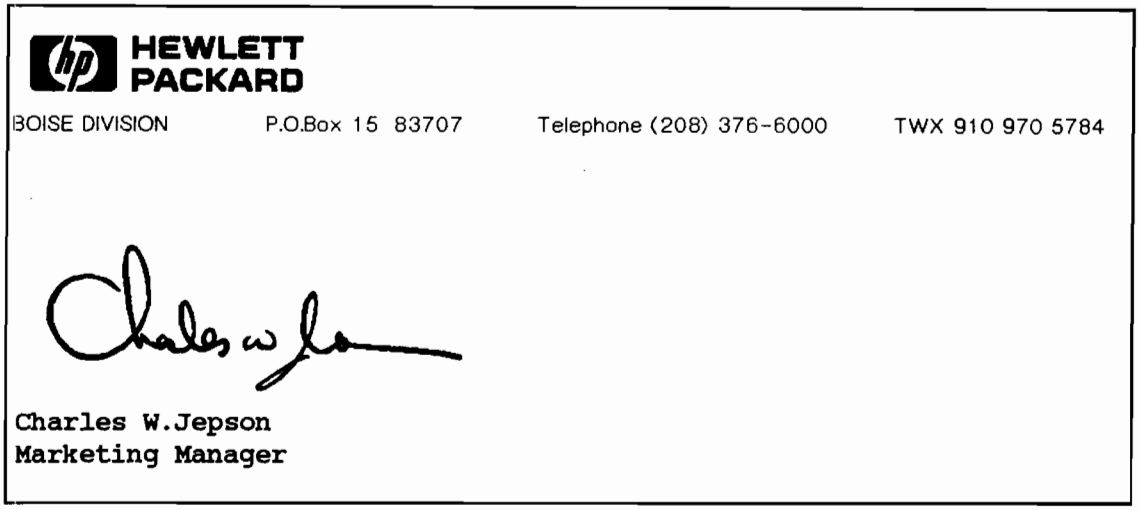


Figure 5. EXAMPLE OF A LOGO AND SIGNATURE CREATED WITH IDS/CHAR

Can the 2685 print on carbonless paper?

The 2685 can print on single-part carbonless paper. Certain applications require multi-part carbonless paper so that, after being printed, a user can write on the top copy of the form and have the writing carry through to all other copies. With conventional impact printers, multi-part carbonless forms are preprinted (optionally) and then the data is printed on all copies at once, which results in decreasing print quality the more copies there are. This is because an impact printer actually prints only on the first copy, and subsequent copies rely on the impact to carry the image through. On the 2685 printer, each copy is printed as an original (the electronic form as well as the data) and the different copies are then collated together after printing. The advantage of the 2685 is that each copy is an original, and therefore, all copies have excellent readability. In addition, there is no need to stock multiple form sets that have different numbers of copies since with the 2685, all that is needed is blank, single-part carbonless paper. Operator time is also substantially reduced with the 2685 since multiple carbonless paper print jobs can be printed without changing paper. This is due to the fact that the electronic form is printed along with the data (as opposed to having the form preprinted on the carbonless sheet). Once the forms have been printed they can be collated together using standard (non-HP) post processing equipment.

Can the 2685 print graphics?

The 2685 can be ordered with the graphics option (a field upgrade is also available) which allows the user to print merged text and graphics. The combination of high print quality and graphics makes the 2685 a particularly flexible tool for printing manuals, reports, business letters with graphics included, electronic mail output, and Computer Aided Design (CAD) output.

How can I create graphics for printing on the 2685?

There are several friendly, interactive software packages available for creating graphics on the 2685 controller.

HPEASYCHART

Allows any office user to produce line charts, bar charts, pie charts, etc., interactively within five to ten minutes. No computer background is necessary. Ask your sales representative for data sheet 5953-7451 for more information.

HPDRAW

Also an interactive graphics software package which allows a user with no computer knowledge to quickly create slides of text and figures. For more information see data sheet 5953-7450.

DSG/3000

Allows the user to interactively create graphs similar to those that HPEASYCHART can produce, but DSG/3000 gives the user additional flexibility in chart design, data file access and also allows application program access. See data sheet 5953-7453 for more information.

Graphics created by any of the above software packages can be saved as a "figure file" (on the 2685) which can then be included in text files to be printed on the 2685 laser printer. The 2685 can also print graphics files created on the host mainframe such as Computer Aided Design (CAD) systems or raster files from such sources as a digital camera. A simple, user-written, vector format conversion program may be needed when interfacing to other (non-HP) graphics systems. The graphics files would be transferred to the 2685 by tape and then merged with text at print time.

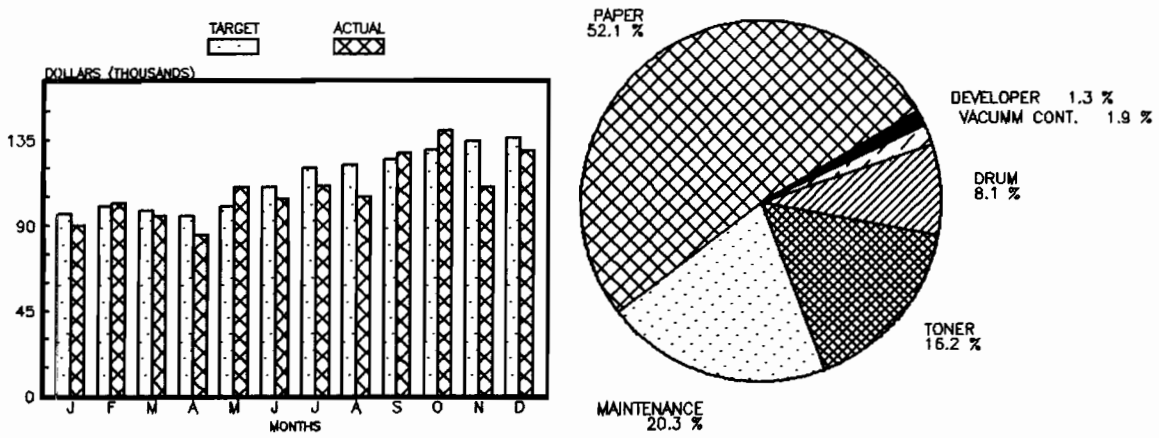


Figure 6. EXAMPLES OF GRAPHICS ON THE 2685 USING DSG AND HPDRAW

How are documents formatted using multiple fonts, forms and graphics?

Text and Document Processor/3000 (TDP/3000) is a text editing and formatting system which can run on the 2685 controller. TDP/3000 allows the user to format printed output for the 2685 using the full capabilities and flexibility of the 2685. Multiple character fonts can be specified (up to 32) and figure files, that have been created and saved on the 2685, can be included. For example, this manual was formatted using TDP/3000 and printed on the 2685 printer. The text was entered and updated using the TDP editor. The different character fonts for headings, etc., were specified by imbedded commands, and the illustrations were included by referencing figure files that were created using graphics software. For additional information on TDP/3000, refer to data sheet 5953-0599.

HPWORD is a software package oriented toward the word processing user. It runs on the 2685 controller and can also merge text and graphics for printing on the 2685 printer. Additional information on HPWORD can be found by referring to the data sheet (part number 5953-7459).

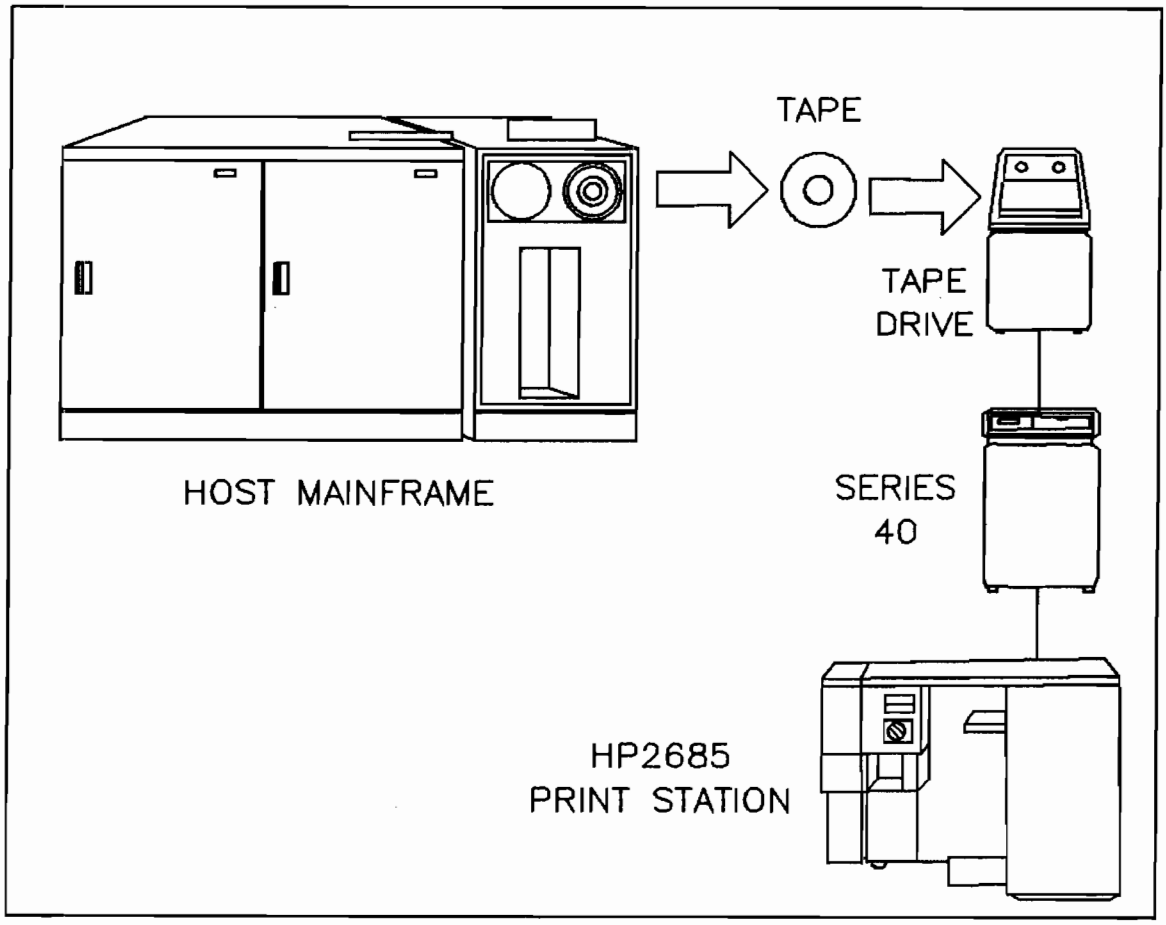
HP Interpreter is a program supplied with IFS2680 which runs on the 2685 controller and allows the user to use the full capabilities of the 2685 including multiple character sets, graphics and forms, as well as allowing the user the move the "pen" to absolute and relative locations on the page before writing text.

SECTION V. HOW DOES THE 2685 INTERFACE WITH THE HOST?

The 2685 Print Station is a stand alone printing system which can accept data in two ways to be printed from the host:

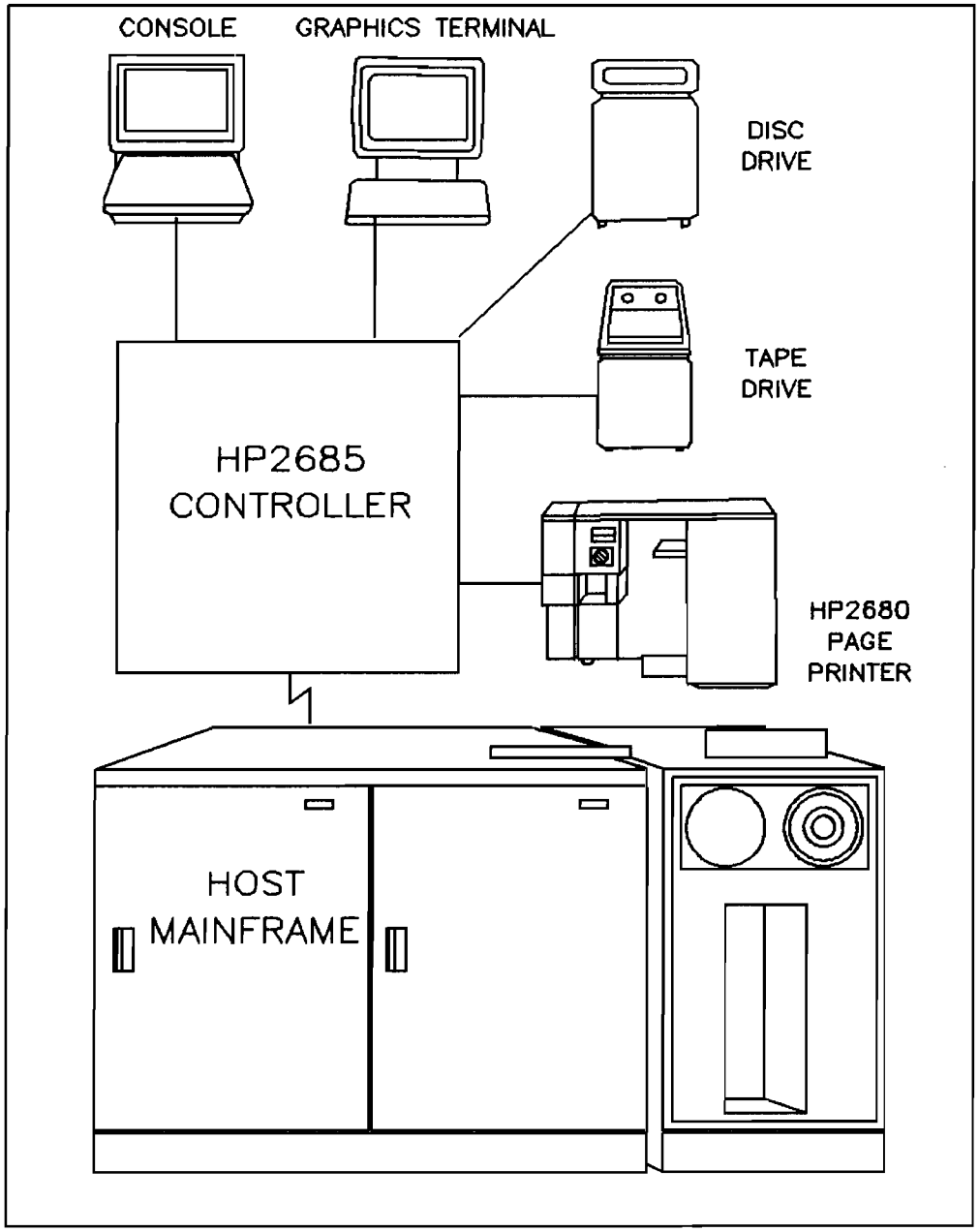
A) Tape Input

The 2685 Print Station includes a 9 track, 1600 bpi (6250 bpi optional), ANSI-compatible tape drive which can read fixed block length ASCII and EBCDIC files. When using tape input there is no direct connection between the host mainframe and the 2685 Print Station. Conversion from EBCDIC to ASCII can be performed on the 2685. A straight-forward user-written, conversion program may be required to convert differences in Vertical Format Control (VFC).



B) HP 2685-to-Mainframe Data Communication

An alternative way to send information from the mainframe to the 2685 Print station is to use the optional data communications software products available from HP. With this approach, software running on the 2685 emulates a remote device with which the mainframe is compatible (e.g., IBM 2780/3780 remote job entry station).



The link between the host mainframe and the 2685 is made over data communications lines which may be as short as 50 feet or as long as thousands of miles. As print files are completed and become ready for printing, the host mainframe routes the print files to the 2685 over the data communications lines.

Do I have to make program changes on my mainframe to use the 2685?

By emulating existing, supported remote workstations, the 2685 is able to interface with the host using supported software configurations on the host mainframe. Provided the host has the data communications hardware and software to support Remote Job Entry (RJE - IBM 2780/3780) or Multileaving Remote Job Entry (MRJE - HASP multileaving) workstations, there are no special requirements or application program changes needed for the host in order to send standard print jobs to the 2685.

Which remote workstations does the 2685 emulate?

As mentioned above, there are two types of remote workstations that the 2685 can emulate: RJE and multileaving (MRJE) workstations. For each of these there is a software product which runs on the 2685 to handle communications between the 2685 and the host mainframe.

DSN/RJE Remote Job Entry:

RJE/3000 is a software product which will allow the 2685 to communicate with a host mainframe by emulating an IBM 2780 or 3780 remote job entry station.

DSN/MRJE Multileaving Remote Job Entry:

MRJE/3000 (the software which runs on the 2685) also allows the 2685 to communicate easily with a host mainframe. With MRJE, the 2685 emulates an IBM 360 Model 30 (360/30) multileaving workstation, also known as a HASP workstation.

How do I decide whether to use RJE or MRJE?

Both approaches have their advantages depending upon your particular application. Covered below are some of the considerations and tradeoffs which should help you decide which is best for your particular application.

MRJE Strengths:

- Multileaving -- When only one data communication line is used between the host and the 2685, multileaving allows small print jobs to be sent concurrently with larger print jobs.

  Multileaving allows a job to be submitted from the 2685 for processing on the host without waiting until the line is free of jobs being sent down from the host.

  Multileaving will allow up to 21 concurrent data streams per communication line, as opposed to only one data stream for a single line without multileaving (RJE).

  Note, however, that if multiple lines between the 2685 and the host are used, then multileaving is not as important since the different lines can be designated for different sized print jobs on the host system. For example, one line would be dedicated to small jobs, one would be given only large jobs and perhaps another would be open to any size print job.

- Communications lines to the host need not be up when jobs are submitted -- Jobs to be run on the host can be submitted on the 2685 for later transmission to the host when the communication line is up. For example, a job can be submitted in the day, even though the communication line will not be available until evening. When the line is available, the 2685 will transmit the job to the host.

- Ability to send commands to the host from the 2685 console -- A convenient feature to check on status of jobs submitted to host for processing

- Character compression -- Full character compression is performed on data being sent to an MRJE workstation. RJE workstations emulate either an IBM 2780 or an IBM 3780. For 2780 workstations, no character compression is performed; for 3780 workstations, blanks are compressed.

RJE Strengths:

- Lower overhead on the 2685 -- Because MRJE/3000 performs more functions than RJE, it also has more overhead (on the 2685) associated with it. This may be a consideration in applications where very high throughput data communications lines are being used to send data to the 2685 or when concurrent applications development is to be performed on the 2685.

Choosing between RJE and MRJE is application-dependent. Generally, if more than one communication line is to be used, RJE would be advantageous since it has lower overhead on the 2685 controller. If only one communication line is to be used and it is unacceptable for a large print job to tie up the communication line, preventing smaller jobs from printing immediately then MRJE may be the proper choice. Your HP sales representative will work with you to help you determine which is better for your particular application.

SECTION IX. DATA COMMUNICATIONS CONSIDERATIONS.

How many data communications lines do I need?

To determine how many datacommunication lines to have between the 2685 and the host, one should consider the economic tradeoffs listed below and the functional requirements of a particular application. High speed data communications lines are generally rated at 9.6, 19.2 or 56 kilobaud/sec (Kb) throughput. The capacity needed to keep a 2685 busy varies depending on the amount of data (characters) per page and the number of printers, so each installation needs to be evaluated individually. However, it has been found that, in general, the following three configurations (or multiples thereof) will keep the 2680(s) running at speed assuming an average of 45 lines/page and 90 characters/line:

Data Communications Line(s) Rating (quantity)	Number Data Comunications Lines	Number of 2680s Printing
9.6 Kb (3)	3	1
19.2 Kb (1) + 9.6 Kb (1)	2	1
56.0 Kb (1)	1	2

Prices for communications lines vary by geographical location, distance covered and by throughput rating. Data communications line prices can be obtained from your local telephone representative. As a rule, a premium is paid for higher speed lines since additional line conditioning becomes necessary to preserve data integrity.

An advantage to having multiple lines is that if RJE/3000 is used (which is not multileaving) small jobs can be transmitted on one line, while a large job is being transmitted on another. In other words, large jobs do not delay smaller print jobs as they would if there were only one communication line. Another advantage would be redundancy (or backup). In the event one line goes down, there will still be data sent to

the printer over the other(s), albeit at a slower rate. With a single line, if it goes down, only print jobs already sent to the 2685 and awaiting print will be available for printing until the line comes back up.

An advantage to a single line, on the other hand, is that it is somewhat easier to manage and generally requires less hardware, both on the host and the 2685.

What load will the data communications line put on the 2685 controller?

The demand, or load placed on the 2685 controller at any given time, can be broken into four categories:

1) The spooler which controls and sends data to the laser printer.
2) The software managing the data communications lines (RJE or MRJE).
3) Character and forms design taking place on the 2685 (if any).
4) Other user-written applications being executed on the 2685 controller to generate printed output from the 2685 rather than the host (if any).

Typically, with standard line printer output, the spooler will require only about 2% of the available processing power of the 2685 controller per printer. The amount of overhead consumed by RJE and MRJE varies by line speed and the number of communications lines. In all cases RJE will consume less than MRJE for equivalent line setups. The 2685 controller is powerful enough to keep two printers running using MRJE or RJE provided no other major applications are running concurrently on the 2685 (item #4 above). In general, if forms design and data communication transmission are taking place while printing, printer throughput should not be impacted. Writing and running user-written applications on the 2685 (see #4 above) is optional. The impact of any such applications would depend entirely on what tasks the user-written application was to perform. In most cases the 2685 controller would have the extra capacity to perform some user-written application processing.

APPENDICES

A. Interactive Software For The 2685 Print Station

To realize the full flexibility and intelligence of the 2685, HP provides high level tools that enable a user to take advantage of special features of the printer, such as downloadable character fonts, electronic forms, logical pages, and electronic vertical format control.

This needed high-level support of the 2685 is provided by two specially developed software products: IDS/3000 (Interactive Design System) and IFS/3000 (Interactive Formatting System) which are both provided with the standard print station.

Figure 10 diagrams the HP 2685 Laser Printing System. The primary components of the 2685 are shown, along with the communications links between them. The printer support package consists of two modules: Interactive Design System/3000 (IDS/3000) and Interative Formatting System (IFS2680).

IDS/3000 consists of two programs: IDS/CHAR and IDS/FORM. These programs are used during the design phase of the output production process. IFS/3000 consists of a program named IFS2680, a set of user-callable intrinsics (routines), over 50 HP-supplied environment files, and over 48 HP-supplied character font files. These font files actually include over 100 different character fonts. IFS/3000 is used during the formatting phase of the output production process.

IDS/CHAR

IDS/CHAR, an interactive, menu-driven program which runs on the 2685 controller, enables the user to design character fonts and logos. This is done by creating and modifying individual characters. A character, represented internally by a bit per dot, is a dot pattern in a fixed-sized grid. This pattern describes an alphabetic character, a numeral, a special symbol, a company logo, or business artwork. A character font is a complete set of characters, one for each of the ASCII character codes. A special type of character font, called a logo, consists of exactly one character. To allow for scaling, all sizes of a given character font are contained in one character font file. Similarly, a logo file contains multiple sizes of a given logo.

Although many character font files are provided by Hewlett-Packard, users may add to or modify these fonts, create their own specialty character fonts, and design artwork, such as company logos. These character font files are saved on the 2685 system disc(s).

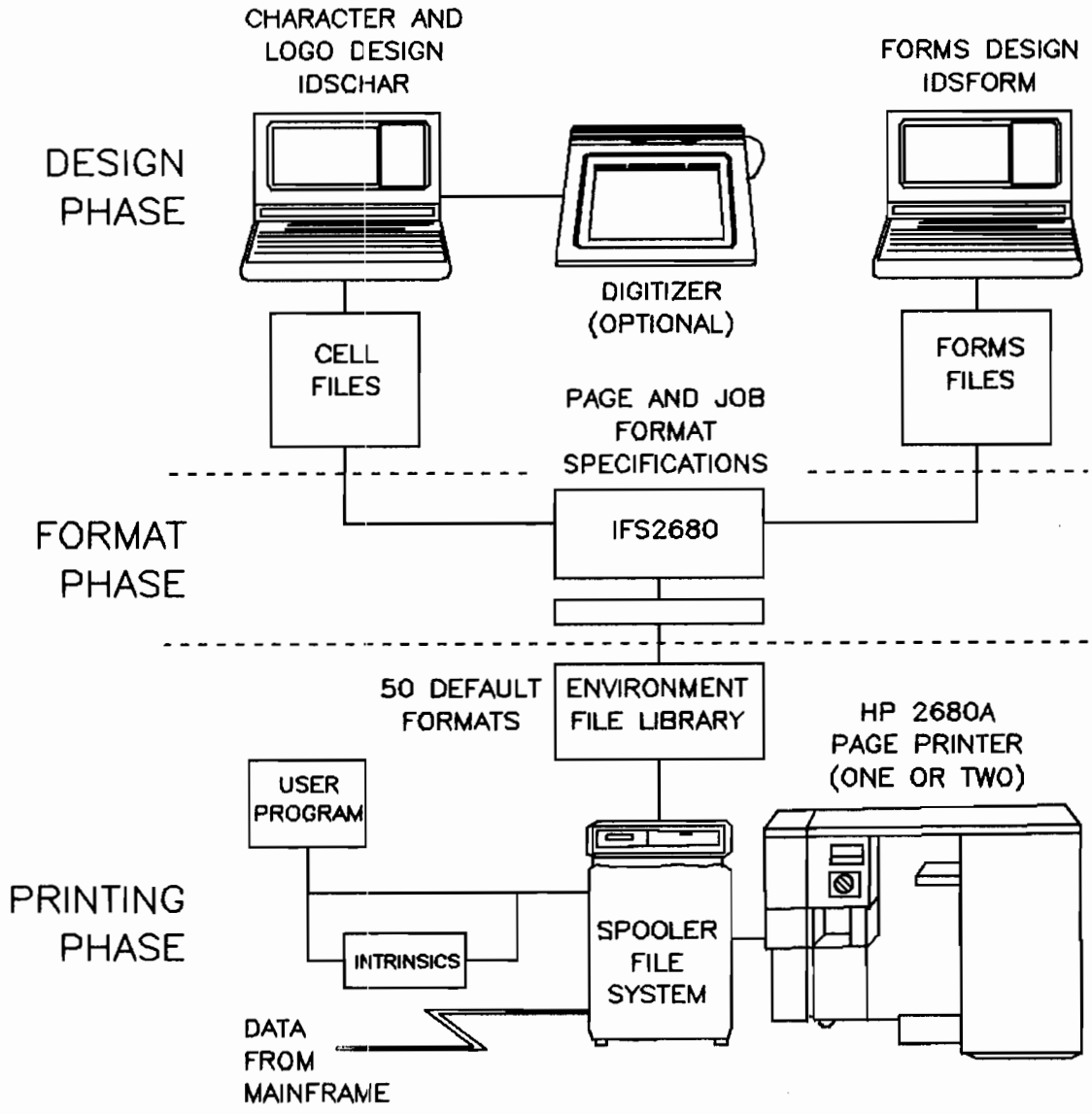


Figure 10. THE 2685 LASER PRINTING SYSTEM

IDS/FORM

IDS/FORM, an interactive, menu-driven program like IDS/CHAR, enables a user to design and modify forms on the 2685. A form is defined as the fixed, static, non-data portion of a document. It can range in complexity from a simple letterhead to an elaborate customer invoice. Forms can contain both characters and simple graphics. Some kinds of graphics created by IDS/FORM are lines, boxes, and shaded areas. One or more forms can be grouped together in a forms file; these forms can be related or unrelated. IDS/FORM allows forms to be designed in a modular manner so that forms can be easily modified and updated. Sections of a form can be altered without affecting the rest of the form.

IDS/FORM uses HP's graphics terminals to represent the actual appearance of the form that is being designed, allowing users to see exactly what will be printed.

Two methods of filling in forms are supported by IDS/FORM. Print-and-space is the conventional method, already used in applications where output is directed to a line printer. Symbolic access, a method particular to applications written to run on the 2685 controller, eliminates the user's need to count lines and spaces and to change the application program when the form is changed. If the forms designer gives a name to each data field on a form, the user can invoke a special intrinsic to cause data to be written to that named field, leaving the computation of the exact position to the IFS software.

To use a form in a document to be printed on the 2685, a user selects that form during the formatting phase using IFS2680.

IFS2680

IFS2680, also an interactive, menu-driven program, enables a user to control the format of documents to be printed by the 2685. With IFS2680, a user combines desired character fonts and forms with device-specific printing information. This information includes a physical page definition, logical page definition, and vertical forms control specification. The physical page definition specifies the dimensions of the actual physical piece of paper that will be printed on, whereas the logical page defines a portion of the physical page which can be located anywhere on the physical page. All of the user's formatting instructions are compiled into an environment file which is stored on the 2685 system disc. Thus, an environment file contains device-specific instructions for printing a document or an application job. Typically, one environment file represents one application.

Character font sizes for text in forms are selected from the previously specified character font file. Although character fonts can be designed for specific orientations, IFS2680 automatically rotates character fonts if a specific orientation is needed, but has not been defined.

IFS/3000 includes a set of the most commonly used environments. Using HP-supplied environments, output can resemble a pica typewriter, an elite typewriter, a regular line printer, or a Times Roman document. 2:1 and 4:1 reductions of these environments are also available.

INTRINSICS

Intrinsics are system program procedures which can be called by application programs running on the 2685 controller to perform certain functions that are common to many applications. IFS/3000 includes a set of user-callable intrinsics to allow application programs that are written to run on the 2685 controller to modify the format of their output dynamically. Users can select character fonts, forms, and logical pages, acquire information such as the state of the printer, the length of a given character string, or the text of an error message, and direct data to a particular field on a form.

COMPATIBILITY

The most important design consideration for the IDS/IFS software was compatibility. It is crucial that existing application programs be able to use the 2685 with as little conversion effort as possible. This conversion process actually takes place in two steps, with a third (optional) step provided for applications that are written to run on the 2685 controller.

Suppose an application program already exists whose output is printed on a conventional line printer. That application can be converted to use the 2685 as a line printer replacement. Conversion on this first level is straight forward: no changes to existing applications are required, but the full feature set of the 2685 is not used.

In this case, only the standard line printer character set resident in the 2685 printer is available.

A level-two conversion effort is required by an existing application program that prints its output on a preprinted form. In the pre-2685 world, the preprinted form is on special paper that an operator mounts before the application's output is printed. To make the conversion, no programming is required. Rather, the individual uses

IDS/FORM, running on the 2685 controller, to design an electronic form that looks like the existing preprinted form. Then, the individual creates an environment file, using IFS2680, that contains that form. The environment file resides on the 2685 disc and is downloaded to the printer at the beginning of the print job. For applications that are created and run on the 2685 controller there is a third level which allows the user to access additional laser printer features.

Historically, application programmers cause data to be placed in specific locations on the printed page by using print-and-space techniques. The programmer needs to specify the exact row and column location of each data item on the page. Application programs that can be converted on levels one and two use this technique.

The third level of conversion actually involves a new technique for positioning data on the printed page. This technique is known as symbolic access and can be used for new application print programs running on the 2685 controller. To make this possible, first the IDS/FORM user gives a name to each field on the form; a field is defined as an area on a form where data can be placed. Then, rather than using the print-and-space method, the user invokes the IFS2680 intrinsics to cause data to be written to a named field. The intrinsics calculate the precise location of each data item, relieving the user of that chore. An additional benefit of the symbolic access method is low overhead when modifying forms: if a field needs to be moved to a different location on a form, as long as the name of the field is not changed, the program does not need to be modified.

B. Laser Printing -- A Technical Perspective

Printing on the laser printer is a combination of several processes. The Data Control System (DCS), located within the printer, receives data from the controller. This system accepts, stores, and manipulates data from the controller and translates it into electrical impulses. As the laser scans the paper, the electrical impulses turn the laser on and off at the appropriate time. An image of the data is created on the drum's surface and will eventually facilitate the transfer of toner to paper.

The drum is the heart of the 2685's laser printer. The drum has three layers, each of which plays a different role in the printing process: the aluminum layer, which is the grounded base; the cadmium sulfide layer (CdS), a conductor in the presence of light and an insulator during darkness; and the Mylar layer, which stores charge on the drum.

During the printing process, the drum rotates through five different stations: clean, condition, write, develop, and transfer (see figure 2).

The drum begins its rotation by passing through the cleaner station which consists of a rubber blade and vacuum trough. The rubber blade wipes the drum surface and loosens the contaminant which is vacuumed away through the trough. The drum is now physically clean.

At the condition station, a field of ions is generated by a thin wire called a corona. As the drum rotates under this corona, a uniform charge is left on the drum's surface. The drum is now electrically clean.

At the write station, the drum rotates past the beam of a low power (five milliwatt) helium-neon laser. Dots of light strike the surface of the drum. The surface areas that are not exposed to the laser retain their charge. On the drum's surface, there is now an electrostatic image of the data that is to be printed on the paper.

Next, the drum rotates to the developer station where a cloud of toner or dry ink is created by a rotating magnetic brush. The toner is made of small plastic beads, about the size of dust particles, which have an inherent charge. As the electrically encoded drum passes through the toner cloud, the charged toner is attracted to the exposed areas of the drum. The toner beads are repelled from the areas of the drum that have not been struck by the laser. An image corresponding to actual data is formed on the drum's surface.

As the drum moves through the transfer station, paper contacts the drum. A negative charge, generated by a corona, is applied to the rear surface of the paper. This causes the toner to be pulled from the drum onto the paper. At this point, the toner is only statically held to the paper's surface and can be easily smeared.

The paper then moves past the review window where it can be viewed before stacking. As it passes the preheater, the paper is conditioned so that toner can be easily fused into it. It then passes the fuser which is a high intensity lamp (no pressure roller is used) that heats the toner, physically melting it into the paper. Following the fusing process, the paper is moved into the paper stacker.

When combined, these processes allow the 2685 Print Station to provide great flexibility and high quality output that can be tailored to the needs of each user.

C. Documentation

For more detailed information, the literature listed below is available. Data sheets are available from your local Hewlett-Packard sales office; reference manuals can be ordered through your Hewlett-Packard sales representative.

- *Using the HP 2685 Print Station* (26804-90901)
- *IDS/3000 Character Design Reference Manual* (36581-90001)
- *IDS/3000 Forms Design Reference Manual* (36581-90002)
- *IFS/3000 Reference Manual* (36580-90001)
- *Operator's Preventive Maintenance Manual* (02682-90912)
- *HP 3000 Computer Systems General Information* (5953-7462)
- *2680 Laser Printing System Paper Specifications* (5953-7110)
- *DSG/3000 Data Sheet* (5953-7453)
- *DSG/3000 Quick Reference Guide* (32250-90002)
- *DSG/3000 Reference Manual* (32250-90001)
- *HPDRAW Reference Guide* (32108-90001)
- *HPDRAW Data Sheet* (5953-7450)
- *HPEASYCHART Reference Guide* (32109-90001)
- *HPEASYCHART Data Sheet* (5953-7451)
- *TDP/3000 Data Sheet* (5953-0599)
- *TDP/3000 Reference Manual* (36578-90001)
- *TDP/3000 Quick Reference Guide* (36578-90003)

- *HPWORD Reference Manual* (32120-90001)

- *HPWORD Data Sheet* (5953-7459)

- *HPWORD Quick Reference Guide* (32120-90002)

- ***Application Note #413-1:*** Printing on Paper Greater Than 90 g/m squared (24-pound) Using A 2680A Laser Printer (5953-7118)

- ***Application Note #413-2:*** Post Processing Equipment For the 2680 (5953-7119)

D. Customer Training

Printer operator training is provided at installation. Also, course number 22838A, a four-day session on the use of IDS/3000 and IFS/3000 is available. This course covers the design of custom formats using IDS/3000 and IFS/3000, managing forms conversion, and an overview of the page printer.

In addition, the following software training classes are available:

Using DSG/3000	22833A
TDP/3000	36579A
Using HPWORD	22839A
System Operator Training	22807A
System Management	22802C

E. Related Software Products

The following software which runs on the 2685 controller is available for use with the 2685 print station (but is not included in the standard print station):

36583A: Software supporting graphics file output to the 2685. Includes vector to raster conversion.

36584A: Printer Support Package. Includes:
- 36580A: IFS/3000
- 36581A: IDS/3000
- 36583A: 2685 graphics software support

36578A: TDP/3000. Text and Document Processor/3000 is a text editing and document formatting system which can be used to create letters, memos, manuals, tabular reports, and computer programs.

32110A: HP 3000 Business Graphics Package. Includes:

- 32108A: HPDRAW
- 32109A: HPEASYCHART
- 32250A: DSG/3000

32120A: HPWORD. Word processing software designed for secretarial, clerical, administrative personnel, or others who use word processing as a part of their jobs.

F. Related Hardware Products

2647 Graphics Terminal

9111 Tablet Digitizer

G. Accessories

26080A 256 Kb memory extension kit (for field installation).

26086A Graphics Hardware. Field installation of graphics hardware. A minimum of one megabyte of printer memory is recommended.

26085A Memory Expansion. Adds one megabyte for field installation. Possible memory configurations:

256 Kb	512 Kb
1 Mb	1-1/4 Mb
2 Mb	

Requires option #060 or accessory 26086A.

36581-60001 Extra IDS/3000 templates for HP 2647 terminal.
36581-60002 Extra IDS/3000 templates for HP 2648 terminal.

GLOSSARY

***CHARACTER DESIGN SUBSYSTEM:** A menu-guided software package used for designing, modifying, and storing characters, logos, special symbols, signatures, etc.

***CHARACTER FONT:** A character font is a collection of characters, each the same size. All characters in a character font are usually of the same typeface (style). A character font contains up to 127 characters, including upper and lower case letters, the numbers 0 thru 9, punctuation marks and the most commonly used special characters.

***CONTROLLER:** A processor (an HP 3000 CPU) which manages the various components of the print station and executes software to handle interfacing to the host as well as character and forms design software. Can also support user-written application print programs written to run on the 2685 (as opposed to the host mainframe).

***CORONA:** An electrical charge device which consists of one or more fine wires held at a potential high enough to ionize the air nearby. The corona produces the charges used to make the electrostatic image on the drum and to attract toner to the paper.

***CPU (Central Processing Unit):** The part of a computing system that contains the circuits which control the interpretation and execution of instructions (programs).

***DCS:** Data Control System: That part of the 2685 printer electronics which accepts, formats and manages the data to be printed.

***DIGITAL CAMERA:** An electronic camera designed to scan an image and represent the image as a stream of digital data which can then be stored by and used by a computer.

***DIGITIZE:** The process by which an image is converted to digital data which can then be stored, manipulated and printed by a computer. A common method of digitizing is to use an electronic pen to trace the outline of a drawing. See also DIGITAL CAMERA.

***DOWNLOAD:** The process whereby environment files (containing character sets and forms) as well as graphics images are sent from the 2685 controller to the memory of the printer for subsequent use by the printer.

***ENVIRONMENT:** A set of parameters which defines the character sets, forms, data orientation, and format for a print job to be printed on the 2685 laser printer.

***FORMS:** Non-data portions of output which are designed with forms design software, stored in forms files on disc, and printed simultaneously with data.

***FORMS DESIGN SUBSYSTEM:** A menu-driven program for designing, modifying, and storing forms.

***FUSER:** The mechanism in a laser printer which preheats and subsequently melts or "fuses" the toner images onto the paper. The 2685 printer uses a non-contact fuser. The paper temperature may reach up to 160 degrees celsius.

***IDS/3000:** A two-part interactive software package consisting of the Character Design and Forms Design subsystems.

***IFS2680:** A menu-driven program for defining page formats which incorporate forms, characters, logos, etc., for use on the 2685.

***INTERACTIVE:** A mode of executing a program on a computer where the user is prompted and then responds (the user "converses" with the computer). The program execution is controlled by the responses the user supplies, and the prompts can vary based on the replies the user gives. Programs that are not interactive are run in a "batch" mode and require that all questions be anticipated.

***LANDSCAPE:** A printing orientation where pages are printed across the long dimension of the paper. Similar in concept to the layout of landscape paintings. See also PORTRAIT.

***LOGICAL PAGE:** An electronically defined portion of a physical page, locatable anywhere on the page.

***MCP (Machine Control Processor):** That part of the 2685 printer electronics which monitors print quality and all electro-mechanical activity and makes adjustments as necessary.

***MPE (Multi-Programming Executive operating system):** The system manager program, for the 2685 print station, which schedules, monitors, and controls processing; and a complete set of software subsystems for data management, data entry and other capabilities needed in business processing applications.

***MENU:** The screen display of an interactive program which displays choices and prompts the user to fill in certain highlighted fields on the screen.

***PHYSICAL PAGE:** The actual piece of paper to be printed on. The physical page dimensions can be defined in the environment file using IFS2680. See also LOGICAL PAGE.

***PORTRAIT:** A printing orientation where the pages are printed across the short dimension as in the pages of a book. Similar to a portrait in orientation (e.g., this page is printed with a portrait orientation). See also LANDSCAPE.

***PREHEATER:** The portion of the 2685 printer fusing system which brings the paper up to proper temperature for effective fusing.

***PRINT-AND-SPACE:** A traditional technique for an applications program to format data on a page or form. Each print space on the page is formatted in the program. See also SYMBOLIC ACCESS.

***RASTER:** A method of storing or representing an image (e.g.,characters) by a series of dots; as opposed to vector, where an image is represented by a series of lines between defined points. The 2685 printer uses raster graphics.

***REDUCTION:** The ability to print two or four page images on one actual physical page. Reduction also increases the effective print speed by two or four times.

***ROTATION:** A means of printing characters, logical pages and graphics in one of four orientations: 0, 90, 180, or 270 degrees. This page is printed using 90 degree rotation.

***SCALING:** Digitized images can be made smaller or larger by using a program to manipulate the digital data representing the image. The enlarging or shrinking of a character or image is called scaling. Scaling routines are available for use with the 2685. A typical use would be to make a picture fill a certain predefined space on a page. Some software packages such as TDP/3000 will perform scaling automatically, making the process transparent to the user.

***SCAN LINE:** The 2685 printer uses a laser in forming images on a photosensitive drum as part of the printing process. The laser beam is scanned across the drum for each row of dots. There are 180 dots per inch, or 180 scan lines per inch with the 2685 printer. Characters and images are formed from many rows of dots (the actual number varies depending on the size of the characters or image).

***SPOOLER:** A utility program which is part of the controller operating system. It manages print files awaiting actual printing and allows applications programs to write to a "virtual" printer on disc. By writing to a virtual printer, print programs are not limited by the speed and number of actual printers. Once the print file is formatted on disc it is prioritized and sent to an actual printer based on priority and availability of the printer.

***SUBFORMS:** Sections of electronic forms which can be manipulated and placed on the form as required.

***SYMBOLIC ACCESS:** A feature offered with the 2685 as an alternative to print-and-space, whereby the application program references an area on a form by name rather than by location. Symbolic access allows fields to be moved on a form without modifying the associated application program. Symbolic access applies only to applications written for, and running on the 2685 controller.

***TONER:** Small, black, electrically charged particles which adhere to the charged areas of the drum and generate a visible image on the paper (a dry ink).

***VECTOR:** A means of describing a line by the coordinates of two end points. Digital images are generally either represented as raster data or vector data. Vector data represents the image as a series of points between which lines are to be drawn. Raster data, on the other hand, represents an image as a matrix of dots and blanks. The 2685 printer accepts raster graphic images. When vector graphics created by programs like HPDRAW are to be printed on the 2685, a conversion is performed by the controller to create a raster image.

VFC (Vertical Format Control): A set of predefined locations on a page to which the printer can quickly advance. Allows a printer to quickly skip a predefined number of lines that are not to be printed on. Used primarily with impact printers, however, the 2685 does have 16 channel VFC to provide backward compatibility with line printers.

GENERAL INFORMATION MANUAL

HEWLETT PACKARD