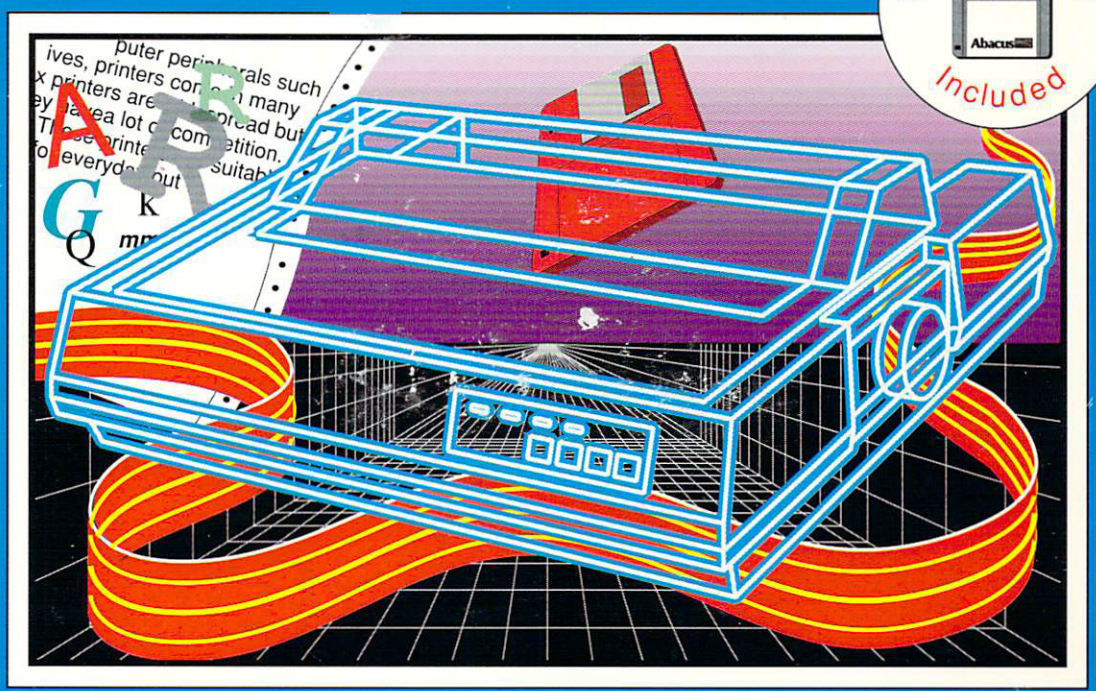
Includes WORKBENCH 2.0 Printer info

Amiga® Printers Inside & Out

Understanding and using your printer more effectively

by Ralf Ockenfelds



Abacus
A Data Becker Book

Amiga Printers Inside & Out

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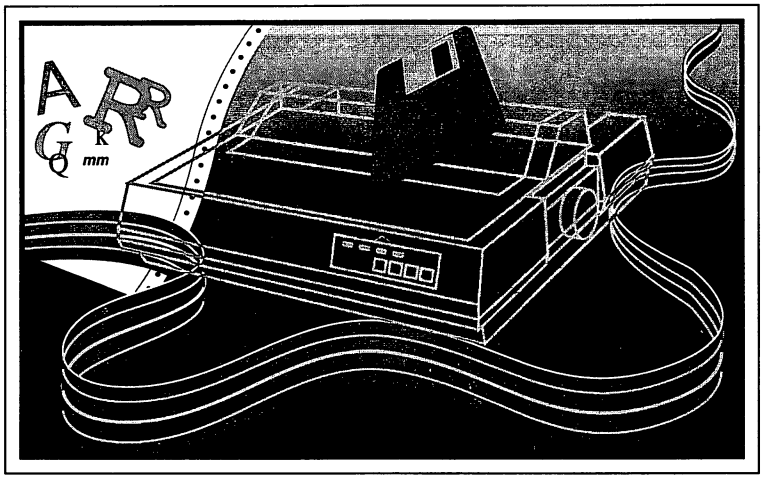

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Foreword

The title of this book tells you our objective: We wrote this book to guide you through many of the problems that may arise during everyday work with your Amiga and printer.

We viewed printer operation from the productivity angle, giving you brief and detailed explanations, practical applications, suggestions for writing printer control programs (printer drivers) and practical answers to many printing problems. Many of the examples in this book can be applied to most of the printers currently on the market. Most of the examples can be adapted to other computer languages, provided you have a working knowledge of the languages used in this book and your computer language of expertise.

What this book doesn't contain is a lot of technical terms and data tables. We also avoided including special software data that depends on certain printer drivers. You can find all of this information in your own printer and software manuals. We didn't include this information because it alone won't help you learn how to use your printer.

We tried to make this book informative for both the beginner as well as the experienced user. The chapters are organized in a logical order, but we designed them so that you can read the chapters in an independent fashion. This means that you can skip earlier chapters for information contained in later chapters.

We attempted to write this book as "non-technically" as possible. However, you'll occasionally find standard computer terms in this book, to avoid unnecessary repetition. Appendix A contains a glossary of computer terms.

I would like to acknowledge the contributions of Mr. Renfordt from C. Itoh Electronics; Mr. Burger from NEC Germany; Rolf Meussel; and Prof. E. Dittmar.

Also, I would like to thank Fran Thrun and Thomas Jungbluth for their assistance in making this book as comprehensive as possible. I would also like to thank Morris Bluml for his assistance with the graphics programs. Thanks also to the technicians from the Epson company for supplying me with information and to the Epson and NEC companies for providing me with printers.

Ralf Ockenfelds


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Chapter 1
Dot Matrix Printers

The type of printer you'll see most often in stores is the *dot matrix printer*. The dot matrix printer has been popular with users for years because of its high printing speed and relatively low price. Most dot matrix printers can print at over 100 characters per second (CPS).

Short Definition—Dot Matrix Printer

We'll explain this printer's workings in more detail in the following sections. For the moment, though, all you need to know is that a dot matrix printer has a head containing a number of wires or *pins*. These pins are driven against an inked ribbon which then strikes a sheet of paper. These pins press against the ribbon in different patterns, creating different characters on the paper. The number of pins varies with each printer, but the more the pins, the better quality the printout.

The best results are produced from 24 pin printers, which include a *letter quality* (or LQ) mode. As the name implies, letter quality (LQ) mode prints characters as clearly as those entered on a typewriter. Most other dot matrix printers use 9 pins to generate printed characters. These 9 pin printers feature a *near letter quality* (or NLQ) mode, which produces acceptable print, but the quality isn't as good as LQ printing.

When Buying a Dot Matrix Printer

If you're shopping for a dot matrix printer, there are a number of factors to consider. Check out how many pins it has, and make sure that the printer is *Epson-compatible*. An Epson compatible printer accepts printing information from a computer based on a standard created by the Epson corporation, a giant of the printer industry.

Paper Feed

Another important factor in printing is the paper, and the forms of paper accepted by the printer. Flexible dot matrix printers should be able to handle both *tractor feed* paper (perforated, continuous paper with tear-off perforated margins) and single sheets of paper. These printers are said to have both *single sheet feed* and *continuous feed* (tractor) capability. Try to buy a printer that does both.

Noise

The biggest disadvantage to a dot matrix printer is the amount of noise it makes when printing. If you can find specifications for noise factors when shopping for printers, try to find a printer with a noise level at or below 53 decibels (dB). This is especially important if you plan to use the printer in a business situation.

Inside Your Printer

A printer has two main parts: the *central processing unit* (CPU), which converts the information sent from the computer into printable data, and the *printhead*, which contains the pins that create the graphics or text on paper, based on the information received from the CPU.

First let's look at how the CPU operates. Like the CPU in a computer, the printer CPU is an integrated circuit which accepts and obeys specific instructions, either from itself or a computer. The printer communicates with the computer through an *interface cable*. One end of the cable is connected to the printer, while the other is connected to an interface on the computer. For now, let's assume that your printer and computer are properly connected.

Buffer

The computer sends character information to the printer. As the information travels from the computer to the printer, it's temporarily stored in an area of memory in the printer's CPU called a *buffer*. All the information stays in the buffer until the buffer is full or until the computer sends information that empties the buffer. Buffers vary in size from computer to computer. The larger the buffer, the more information can be sent to the printer in a group.

The printhead contains the pins mentioned at the beginning of this chapter. When the printer processes the character information from the computer, the CPU instructs the printhead to press a specific number of pins against an inked ribbon and the paper.

The *resolution* (or print density) refers to the maximum number of dots that can be printed per inch or per line. Please refer to your printer manual for more information about the resolution available for your printer.

In addition to information that can be sent to the printer from your computer, most printers include their own onboard controls. Either on the main circuit board or on the case of your printer you'll find a number of tiny switches. These *dip* (Dual In-line Package) *switches* control print types, print quality and other functions. You should consult your software or printer manual for the proper settings.

Data Flow

If it was possible to see the flow of data in a printer, you would be able to see how characters are generated and how information is transferred from the computer and how control codes are inserted. You would also see the results of certain limitations and errors in data flow.

As was previously mentioned, the CPU temporarily stores information from the computer in a buffer prior to printing. The CPU reads this information and then splits it into two different types of information: print data and control codes.

Print Data

The print data contains a number that corresponds to a character in the standard mode character set, ASCII character set or another character set. See your printer's manual for information on which character sets your printer has available.

In addition to the character sets, the dot matrix printer also contains certain *algorithms* (instructions) which allow it to print pictures, charts and other graphic designs called *bit images*. The individual characters are defined through *character strings*. These character strings move over the CPU in the image buffer where the bit image is constructed from the character strings for each character. Since a printer may have its own bit imaging, you should consult your printer or software manual for the proper character strings.

Control Codes

The *control codes* instruct the printer to print specific characters or an entire text in a specific way. Many dot matrix printers can change their style of print to *italics*, **bold**, superscript and more. In addition, these control codes can also handle other tasks such as printing speed and paper size definition. We'll discuss these control codes in more detail later in this book. Until then, check your printer manual to get an idea of the control codes available to your printer.

Printer Sensors

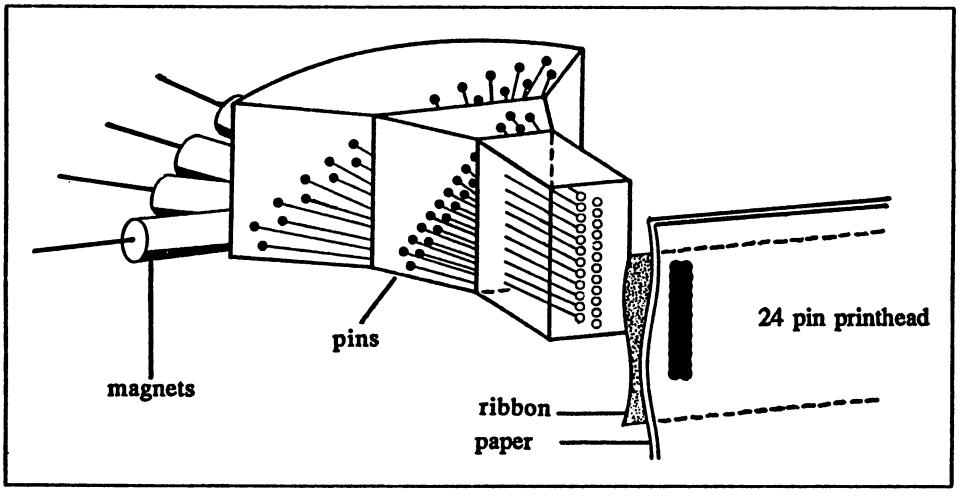
To eliminate certain errors, a printer contains multiple *sensors* which inform the user whether printing is possible. An example of this is the "out of paper" error. If the sensor cannot detect paper in the printer, the printer usually stops printing, turns on a warning light and beeps. The printer will then wait until you insert more paper and instruct it to continue.

Another sensor controls the *printer timing signal* (PT signal) which is needed for pin movement in a dot matrix printer. This sensor is influenced by the temperature and stresses that occur in the *step motor*, which controls printhead movement. For example, the PT signal is reduced by high stresses in the step motor (i.e., increasing temperatures). The high temperature weakens the integrity of the printhead's pins, and decreases the printing speed. Printing slows down in any printer after extended periods of use.

The Printhead

As you already know, the printer timing signal controls the individual pins. These pins are arranged either in one row (for a 9 pin printer) or in two rows (for an 18 pin or a 24 pin printer). The two rows are placed vertically in the 18 and 24 pin printers.

The following illustration shows that the pins move through three "masks" into position, instead of going "direct" to the paper. Note how the vertical rows are offset from one another.



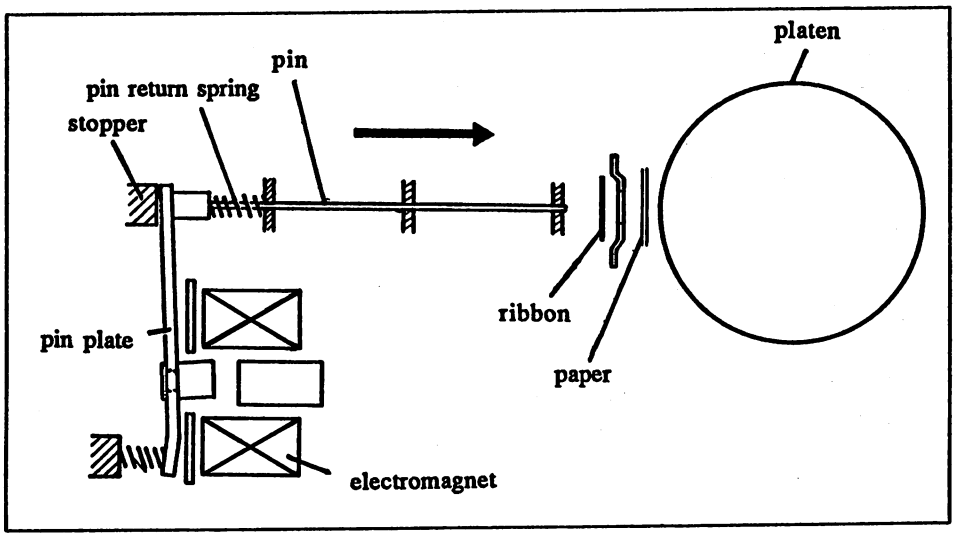
Structure of a 24-pin printhead

To fire the pins, the printer timing signal activates an *electromagnet*, which pushes the pin outward. The pin connects with a ribbon, which in turn presses against the paper, creating the desired character. A small spring returns the pin to its starting position.

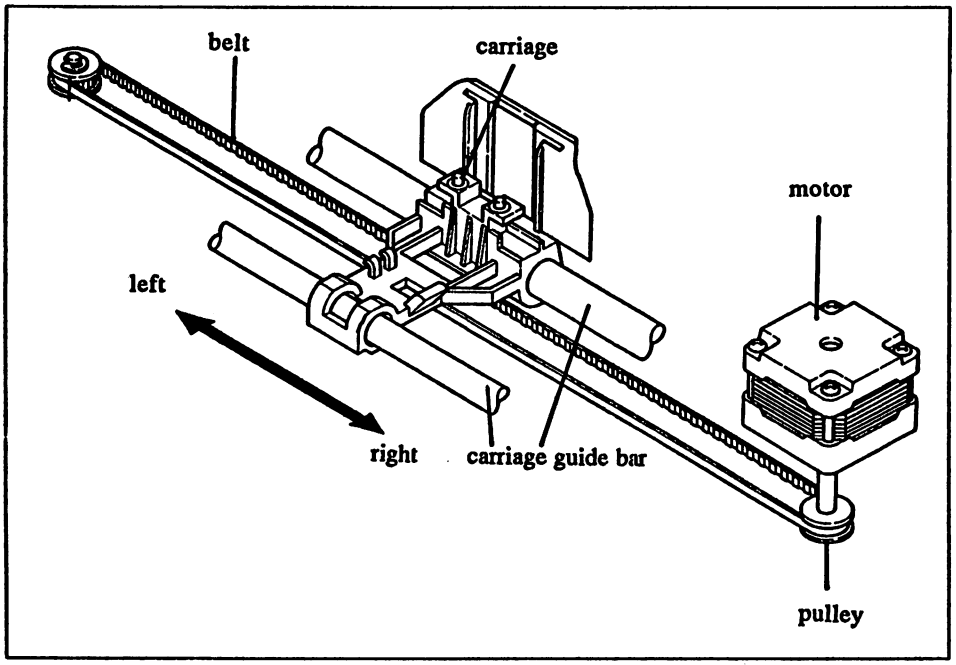
The printhead is mounted to a *carriage*. This carriage slides horizontally on *carriage guide bars*, a pair of low-friction parallel rails. The step

motor, which we mentioned earlier, is connected to the printhead's carriage through a rubber belt. This step motor ensures that the printhead moves in 1/240-inch increments for a 9 pin printer, or 1/360-inch increments for a 24 pin printer.

A pin can only be fired every other increment. This guarantees a certain amount of rest time for the pins.



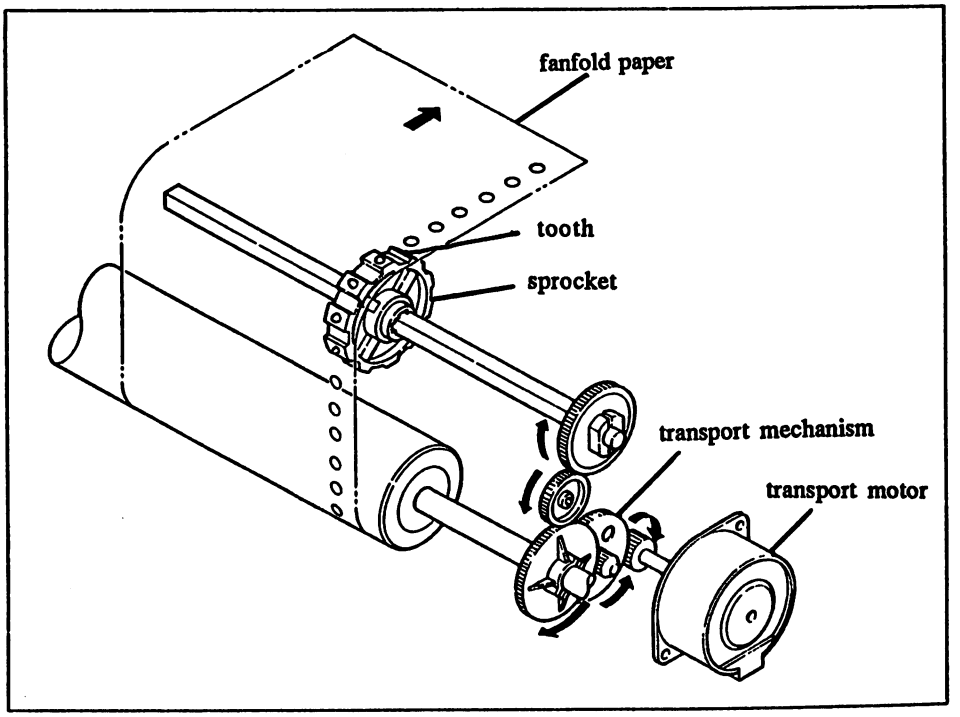
Printhead pin device



Printhead carriage

Transport

A second step motor controls the *transport mechanism* (the equipment which moves the paper through the printer). This transport mechanism usually operates with either *friction feed* (for individual sheets) or *tractor feed* (for perforated continuous feed paper). The friction feed operates through a *platen* similar to the platen found on a typewriter. Tractor feed requires special equipment to move the paper through the printer which involves perforations in the margins of the paper and gears to advance the paper through these perforations.



Paper Transport

Interfaces

Each computer system has its own unique way of connecting to a printer. The term interface describes the way a computer receives data from and sends data to the printer. Therefore, you need the correct interface in order to properly transfer the information between the printer and computer. Some computers only need a *printer cable* but others require both a cable and an expansion board.

Printer control from Amigas involves one of two interfaces: the *parallel interface* or the *serial interface*. You must make sure that the correct printer cable is connected to the correct interface, as the two interfaces handle data very differently from one another.

The Parallel Interface

The parallel interface is the most popular method of sending information to a dot matrix printer because it's the fastest method. Data is sent from the computer to the printer eight bits at a time. This results in a faster speed for transferring data.

Another advantage of using a parallel interface is that, because it's a standard that has been accepted by most printer manufacturers, you don't need any special attachments or boards. Simply go to your local dealer and ask for a parallel printer cable to connect to the Amiga and the printer you're using.

If you own an Amiga 1000, be sure you have the cable specifically designed for the Amiga 1000. A normal Amiga 500, Amiga 2000 or IBM printer cable won't work on the Amiga 1000.

Almost all parallel printers use a *Centronics* connector that attaches to a printer cable. The Centronics interface is the standard for parallel printers. When you ask your dealer for a parallel printer cable, odds are good that he'll sell you a Centronics parallel printer cable. The two ends of the parallel printer cable are distinctive enough that you'll have no trouble knowing which end goes to the printer and which end goes to the computer.

The Printer Cable Transfers The Data

The interface enables the computer to inform the printer when it has data to send, and also enables the printer to inform the computer when it's ready to receive data. This information exchange operation is called a *handshake*. There are three *lines* through which a handshake is possible with the parallel interface: *Acknowledge*, *Busy* and *Strobe*.

Acknowledge The printer informs the computer that it has received a byte of data.

Busy The printer informs the computer that the printer is processing data.

Strobe The printer informs the computer that the printer is inactive.

INIT The INIT line isn't necessary for handshaking but it can be useful. The INIT line automatically resets the printer to the condition the printer should be in when switched on. This *initialization* occurs when the computer is reset or when the printer is switched on.

See the Appendices of this book for diagrams of a parallel printer cable and the Centronics interface, as well as descriptions of the Centronics pin layout and line signals.

The Serial Interface

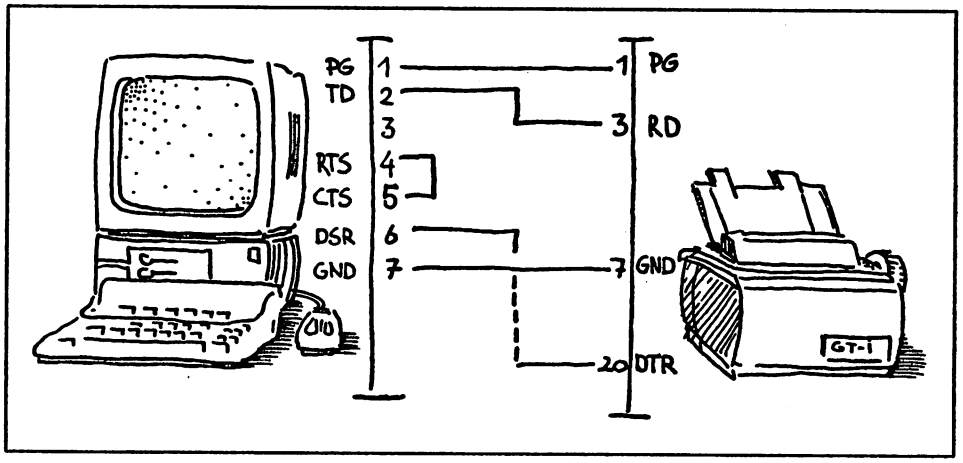
Unlike the parallel interface, which has a standard pin arrangement, the RS-232C *serial interface* varies from printer to printer. The serial interface was originally designed for use with a *modem*. As the computer industry grew, manufacturers adapted some printers to operate in conjunction with the serial interface. However, standards varied between manufacturers, resulting in incompatibilities among printers.

Serial interfaces have a number of advantages over the parallel interface. For example, a serial interface allows the use of much longer cables than a parallel interface.

How Does a Serial Interface Work?

With a serial interface, the data transfer is performed one bit at a time (remember that the parallel interface transfers data one byte, or eight bits, at a time) at a certain *baud rate*. In the minimum configuration, only two connections are needed for the serial data transfer: send and receive. There are two types of protocols used for synchronizing the signals between printer and computer: Software handshake (i.e., synchronization through XON and XOFF) and hardware handshake (letting the cables control the synchronization).

You may have to create your own cable for this serial/printer interface. Check your computer and printer manuals for interface information, and if you don't have the expertise to make the cable, get someone else to do it. The following diagram shows a cable layout that will satisfy most (not all) applications for hardware handshaking:



The computer sends data to the printer over the TD (Transmit Data) line. The printer receives this data through the RD (Receive Data) line. The computer's DSR (Data Send Request) line receives information from the printer's DTR (Data Terminal Ready) line which indicates that the printer is ready to receive information, thus preventing data overflow. The computer's RTS (Request to Send) and CTS (Clear to Send) lines are bridged to ensure that the computer is ready to receive data. Most Amigas need this control signal, but not all printers are capable of sending it. The line running from DSR to DTR also protect from data overflow. The connections between PG and GND complete the interface.

See the Appendices for illustrations of serial interfaces, serial pin layout and sample cable diagrams for hardware handshaking and software handshaking.

Protocols

The printer and the computer must operate under the same protocols (rules for data transfer). We'll take a closer look at these protocols in the next chapter.

Chapter 2
Installing Your Printer

Trying to correctly install your printer can be one of the most frustrating tasks you may ever face in computing. This chapter leads you through interfacing your printer to your Amiga, and shows you how to make sure that your printer and computer are communicating with one another.

Parallel Interface

First turn off both the printer and computer. Take the parallel printer cable we instructed you to buy in Chapter 1. Look at each end of the cable. Now look at the connection that appears along one edge of the printer. Plug the end of the cable that appears to match the printer connection into that printer connection.

Now look at the back or side of your Amiga. The connection you want should be marked `Parallel port`. If you own an Amiga 1000, be sure you have the cable specifically designed for the Amiga 1000. A normal Amiga 500, Amiga 2000 or IBM printer cable won't work on the Amiga 1000.

If it's not marked, look for the connection into which the free end of the printer cable will fit. If no such connection seems to exist, check with your local dealer.

Once the printer and computer are connected, it's time to try them out. Turn on your Amiga. Once it has finished booting, turn on the printer. The printer should make a noise and move the printhead to the left side of the carriage. If nothing happens, the printer may not be plugged in. Make sure it's plugged into a working electrical outlet.

Serial Interface

With the parallel interface so popular, you may wonder about the practicality of adapting your serial interface to run a printer. Many powerful printers will only operate serially through an Amiga (e.g., laser printers). In addition, the maximum length (50 feet) of a serial cable that can be used to drive a serial printer is much longer than the maximum length allowed for a parallel printer cable (ten feet). In many ways, the advantages outweigh the disadvantages.

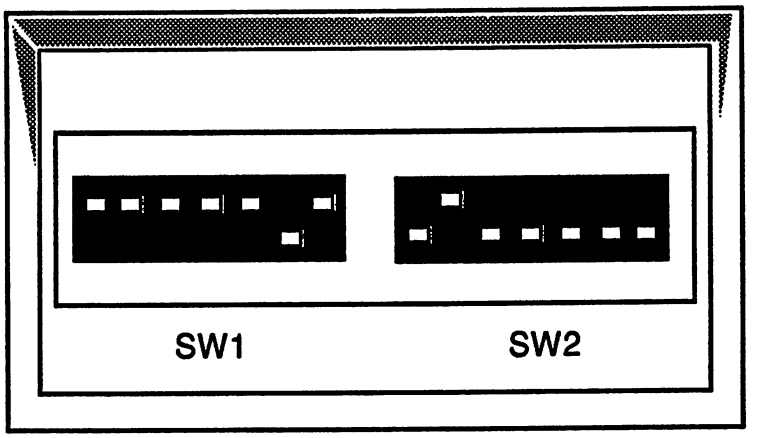
The serial interface requires more detailed configuration because serial printer interfacing changes from manufacturer to manufacturer. Even though this interface offers the advantage of long-distance data transfer, the user still has to configure the settings for a serial cable.

Like the parallel interface, the serial interface must be configured using Preferences.

NOTE: Timing and synchronization errors can occur between the computer and the printer, owing to incompatibilities. If you run into problems, try to install your printer at a lower baud rate. Also, make sure that your computer and printer are configured for the same protocol. For example, if your serial printer has adjustments for baud rate, make sure its baud rate matches your computer's baud rate.

DIP Switches

The most important instruments for adjusting a printer are the DIP switches. DIP switches enable you to set certain operating conditions in the printer. For example, one switch specifies the paper length, while another controls *line feeds* (movement to the next line), etc. Here is a typical set of DIP switches:



Set of DIP Switches

Many printing errors are caused by one or more incorrect switch settings.

The following tables show the DIP switch layout of a typical dot matrix printer. The switch functions in the table are the same for many other printers, although their numbers may differ. You may need to refer to your printer manual to find the actual functions.

NOTE: Before resetting your DIP switches, write down the default settings. This is helpful, since it's too easy to forget what the original settings were after a while. Also, when certain DIP switch settings are needed for a particular application (e.g., graphic printing), write these settings down for later reference.

DIP Switch Block 1

Switch #	Function	ON	OFF
1-1	print width	condensed	normal
1-2	zero slash	on	off
1-3	Epson:character set	graphic	italics
	IBM:character set	IBM2	IBM1
1-4	printer commands	IBM mode	Epson mode
1-5	print quality	NLQ	draft
1-6	international character set		
1-7	international character set		
1-8	international character set		

DIP Switch Block 2

Switch #	Function	ON	OFF
2-1	page length	12 inches	11 inches
2-2	automatic single page feed	enabled	disabled
2-3	perforation skip	enabled	disabled
2-4	line feed after carriage return	CR + LF	CR only

Always turn the printer power off before setting DIP switches. The current DIP switch settings become active every time you turn the printer on. If you reset switches when the printer is turned on, the printer may ignore these settings until you switch the printer off and on again.

Here are detailed descriptions of each DIP switch.

Switch 1-1: This switch controls printing in either normal mode or condensed mode. When the switch is enabled, printing appears in condensed (narrow text) *pitch* (width). You can fit more text on a line in condensed mode than in normal (*pica*) mode.

Switch 1-2: This switch allows you to change the form of zero so it can appear as an uppercase letter O, or as a numeral with a slash through it. This makes program listings, for example, much easier to read.

Switches 1-3 and 1-4:
These switches control the printer mode and character set. The most common printer modes are standard IBM mode and ESC/P mode. The difference between these modes is in the command set. For example, if your printer is set into IBM mode and the printer receives ESCape command "4", this specifies the beginning of the page (more about ESCape commands later). In the ESC/P mode, this command instructs the printer to print italic text.

Since switch 1-3 works differently for each mode, it allows you to select either an italics character set or graphic character set when ESC/P mode is active (switch 1-4 OFF). Switch 1-3 alternates between IBM character set 1 and 2 when IBM mode is active (switch 1-4 ON).

Switch 1-5: Controls the print quality. This will either be NLQ/LQ or draft mode, depending on your printer model. This setting can be changed either with the DIP switch or through software.

Switches 1-6 through 1-8:

Depending on your printer, these three switch settings can enable a number of international character sets. Selecting a different international character set doesn't give you a completely new character set of 256 different characters. However, an international character set provides you with a limited number of characters containing specific letters and symbols for individual countries (see the Appendices).

If you select one of these international character sets, switches 1-3 and 1-4 provide additional changes to the complete character sets. For example, IBM character set 2 contains braces and a vertical bar as character numbers 123, 124 and 125. If you choose the German character set, these three characters are replaced by the umlauted characters ä, ö and ü.

Follow these guidelines for choosing the proper character sets and the correct mode:

- ESC/P mode generally gives the best results.
- The ESC/P mode graphic character set is almost identical to the IBM character set, including graphic and international characters.
- Selecting the German character set may prohibit you from accessing more frequently used characters because the umlaut is doubled.

See Chapter 4 for more detailed information on character sets.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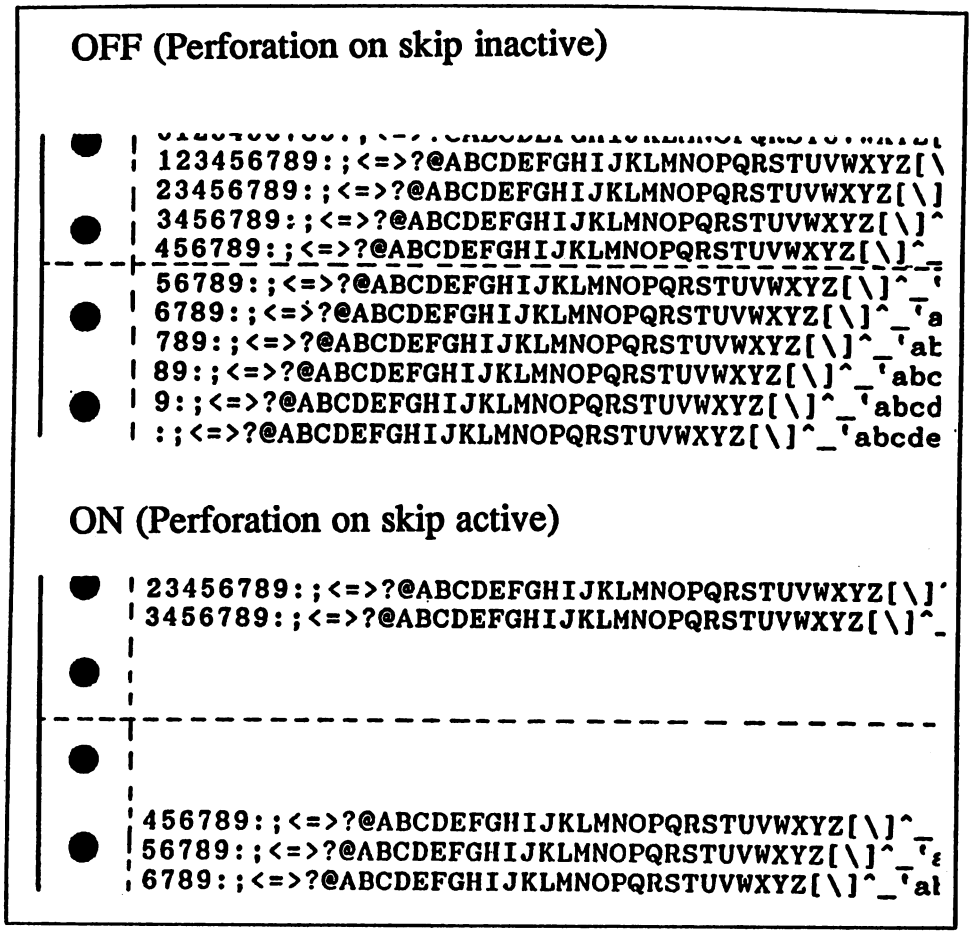
Switch 2-1: This switch sets the proper page length. The default (OFF) setting for this switch specifies a page length of 11 inches. This ensures that the printer always moves properly to the next page in continuous feed paper. If successive pages in a document print in the wrong position on the paper, check this DIP switch.

The ON setting for DIP switch 2-1 usually specifies a page length of 12 inches. This is useful for unusual page sizes such as those used in Europe.

Switch 2-2: This switch can be used only by those who have an automatic single sheet feeder. When enabled, DIP switch 2-2 instructs the printer to take a sheet from the feeder and continue printing. When disabled, switch 2-2 instructs the printer to wait for the insertion of a new sheet of paper.

Switch 2-3: This is the "perforation skip" option, which is used when the page format doesn't have to be changed (e.g., as in printing a BASIC program listing). This option tells the printer to stop before the perforation or to continue over the perforation. If the perforation skip is activated, approximately one inch at the end of the first page and at the beginning of the following page is left blank. The following figure illustrates this.

Switch 2-4: This switch instructs the printer to advance to the next line. This is done after the *line end character* (carriage return, or CR) has been received. Otherwise, it waits for the computer to send a line feed (LF) command, then adds a carriage return (CR) to the line feed (LF).



Perforation Skip

The correct setting may also depend on the software that is being used. Most software will allow you to set the line feed of the printer but others execute their own line feed commands.

NOTE: The setting CR + LF is generally correct. If text is printed in a single line without advancing the paper, the printer must execute the line feed automatically. In this case the DIP switch 2-4 would be ON.

If the printer places a blank line between each line of text, it may be executing more than one carriage return. In this case the DIP switch 2-4 would be set to OFF.

Since some printer models have additional features (paper park function, additional serial interfaces, etc.), they may include one or more DIP switches for these additional functions (see the following table).

Switch	Function	UP	DOWN
2-1	paper out sensor	activated	deactivated
2-2	not used		
2-3	interface/parity	see following tables	
2-4	baud rate	see following tables	
2-5			
2-6			
2-7	not used		
2-8	not used		

Switch 2-1: This is the paper out sensor, which forces the printer to stop printing when the paper has run out. Most manufacturers insert the paper sensor following the tractor mechanism. Even though this is a good location for most uses, it can create problems when you want to print envelopes or something of a similar size. Therefore, the printer cannot print because the envelope does not cover the paper sensor.

You can set this DIP switch OFF to disable the paper out sensor. However, you should turn this sensor back on before printing with regular size or continuous form paper.

On newer printers, the paper sensor is located in front of the tractor so that you don't have to change the DIP switch for the paper out sensor.

Switches 2-3 and 2-4:

Earlier in this chapter we mentioned that a serial port and the printer must use the same protocols, or forms of communication. Switches 2-3 and 2-4 help establish this communication (see the following table). It is very important that the computer's serial settings agree with the printer's settings. The easiest route is often configuring serial protocols through software. If your software is not powerful, these DIP switches can help.

If the printer has two interfaces (serial and parallel), you must decide between the two. If you're using a parallel interface you don't have to set the parity.

2-3	2-4	Interface	Parity
OFF	OFF	Parallel	
OFF	ON	Serial	odd
ON	OFF	Serial	even
ON	ON	Serial	none

2-5	2-6	baud rate
OFF	OFF	9600 bits/s
OFF	ON	4800 bits/s
ON	OFF	1200 bits/s
ON	ON	300 bits/s

Check out the dip switches set to "on"

Switches 2-5 and 2-6:

These switches control the baud rate, which is the speed at which data transfer occurs, measured approximately in bits per second. This rate needs to be set only when a serial interface is used.

To avoid errors with higher baud rates (from the cable or through timing problems between the computer and printer) you should begin with the lowest rate (300) in order to check the function of the cable and possible timing problems. You may also want to refer to Chapter 1 for more details.

Paper

Paper is another important part of printing. Without paper, you wear out your printhead and platen by printing against the platen.

There are many different types of computer paper available, but you must know which type of paper your own printer can handle. For example, you may be limited by the thickness and size of the paper. Also, certain printers cannot print on or feed through multipart paper (multi-layered paper used for printing receipts, invoices, etc.).

The different paper types that can be purchased include:

- continuous form feed paper, also known as fanfold paper
- single sheet paper
- continuous feed labels
- individual labels
- multipart (carbonless) paper (usually up to 4 parts)

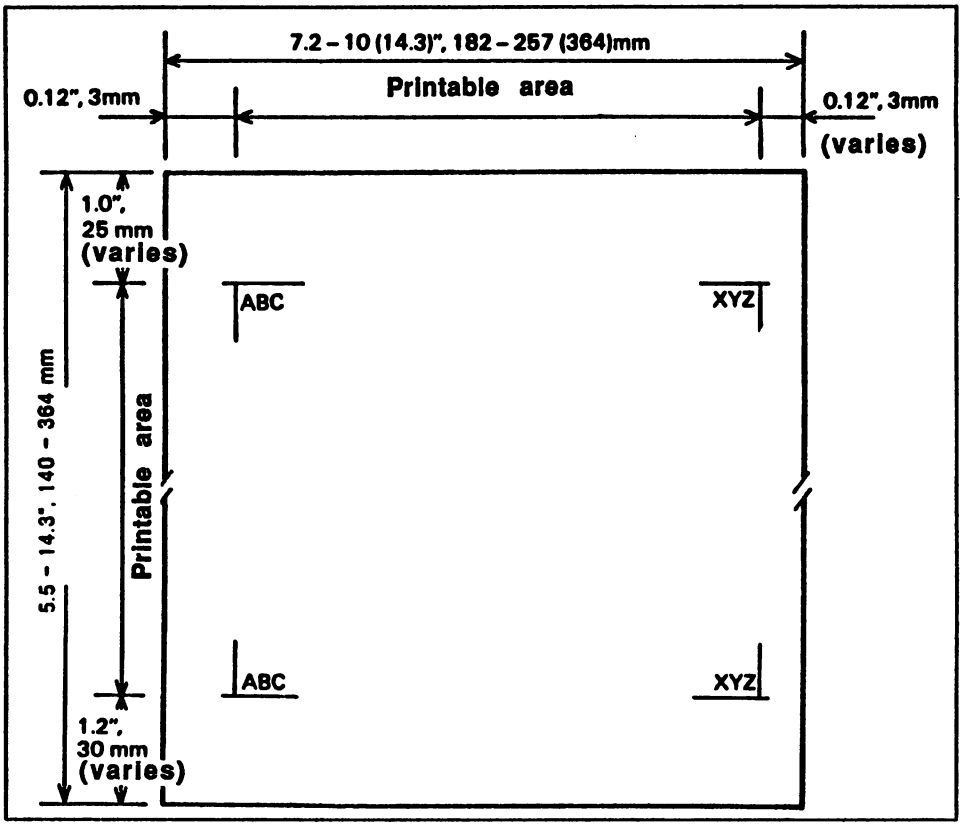
Each of these paper types comes in different sizes. The most common size for single sheets is the standard size 8.5 x 11 inch paper. For continuous feed paper, you'll find that the 9.5 x 11 inch size is the standard. When the edge pieces are torn off, the sheet appears as a standard 8.5 x 11 sheet. The edge pieces contain the sprocket holes in the paper, used by the tractor feed mechanism for advancing the paper.

As an example, the following two figures show the paper measurements most often used with the Epson LQ series of printers.

The width of a single sheet usually ranges from 4 to 11.7 inches. A narrower width may not cover the paper out sensor. Since the paper out sensor cannot be turned off in some printers, this can severely limit the selection of paper sizes. The width of the tractor feed mechanism

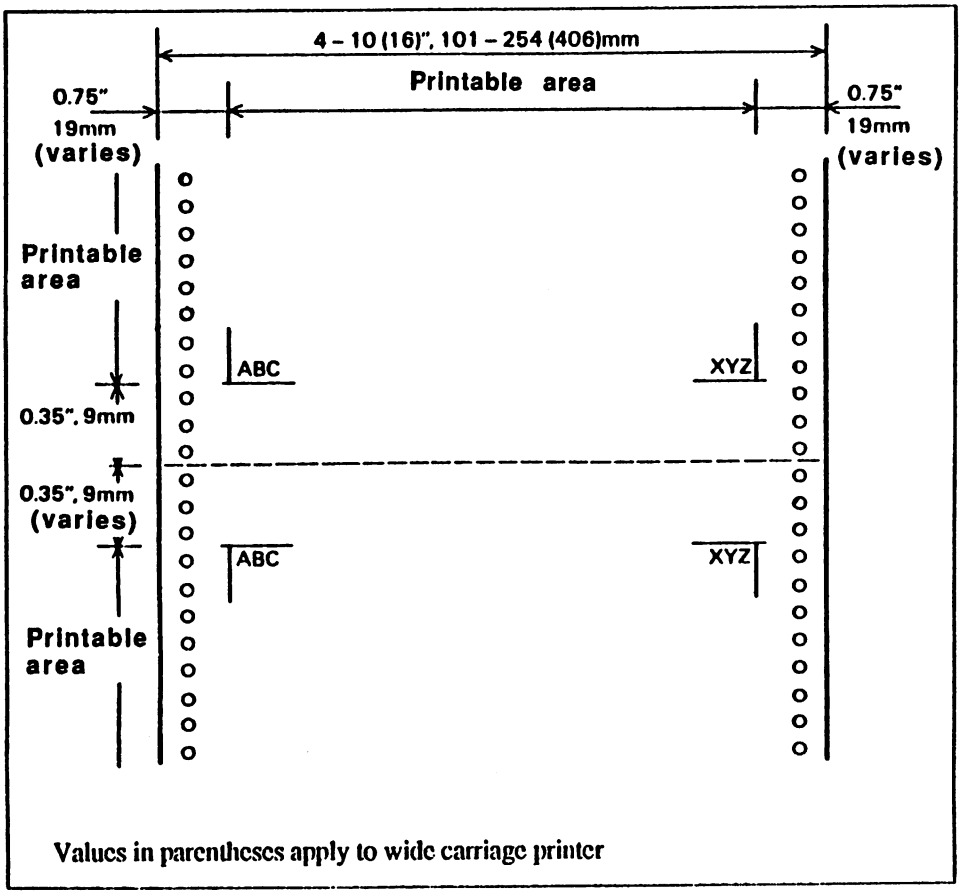
restricts the size of continuous feed paper used by some printers. "Safe" continuous feed paper widths range from 4 inches to 10 inches.

Tractor feeds require the top portion of the sheet as a guide for the remainder of the page. Therefore, the printer cannot print on the full surface of single sheet paper. The bottom few lines of the sheet cannot be used for printing because the tractor may not hold the sheet steady.



Printable area for single sheets

See your printer's manual for recommended paper sizes, and any information concerning tractor feed paper and the paper out sensor.

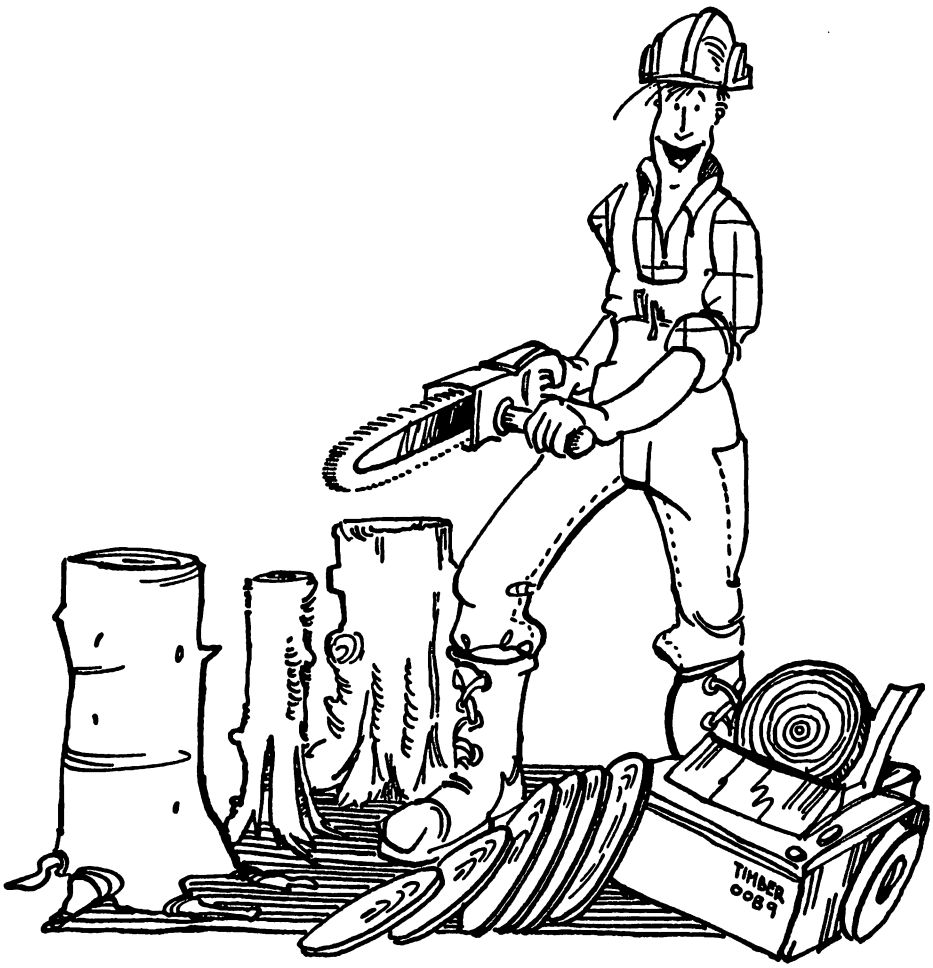


Printable area for continuous feed paper

When inserting paper in your printer, adjust the paper so that the printhead lies just under the perforation.

NOTE: When activating the *perforation skip*, the printer automatically leaves a half-inch space at the top and bottom of each page. This keeps the Amiga from printing listings and other unformatted printouts on the perforation, so the text remains readable. When using software (such as a word processor) that controls text formatting, the perforation skip should be switched off since the usual settings are no longer applicable.

Besides the differences in paper size, there are also differences in paper thickness. The maximum allowable thickness is usually 0.013 inch (0.32 mm) thick. This usually represents the thickness of a sheet of multipart paper (four pages, sometimes including carbon, if used). The number of multipart pages a printer can use also depends on the power driving the individual pins.



Yeah, my printer has trouble with this paper thickness, but I always have this stuff in stock!

If you buy boxes of printer paper, a weight in pounds may be listed instead of a thickness measurement. To insure optimum print quality, we recommend that you use a weight between 16 and 22 lbs per 500 sheets.

NOTE: Paper with a weight of less than 16 lbs per 500 sheets tends to be too thin and transparent, causing the text to "bleed" through to the other side. For this reason, we don't recommend you use this paper for important letters.

Paper Quality The thickness of the paper is one important criterion for selecting paper. Another is the appearance of the paper itself. Some paper surfaces are more attractive than others. Some paper manufacturers sell professional looking bond paper specifically for printers. This is the best paper to use for important correspondence, resumes, etc. For draft letters and simple printouts, standard bulk printer paper should be sufficient.

If a high quality appearance is important, you should use *micro-perforations* because the perforations are much easier to tear and the small tears around the perforation aren't very noticeable. However, this is more expensive than normal paper. If you use it at all, use it sparingly.

Tractor Feeds

A tractor feed has two sprockets which fit into the holes of the continuous feed paper. The tractor moves the paper. There are two different types of tractor feeds: the *push tractor* and the *pull tractor*. The difference between the two is their placement in the printer. While a push tractor is in front of the platen, a pull tractor is placed behind the platen.

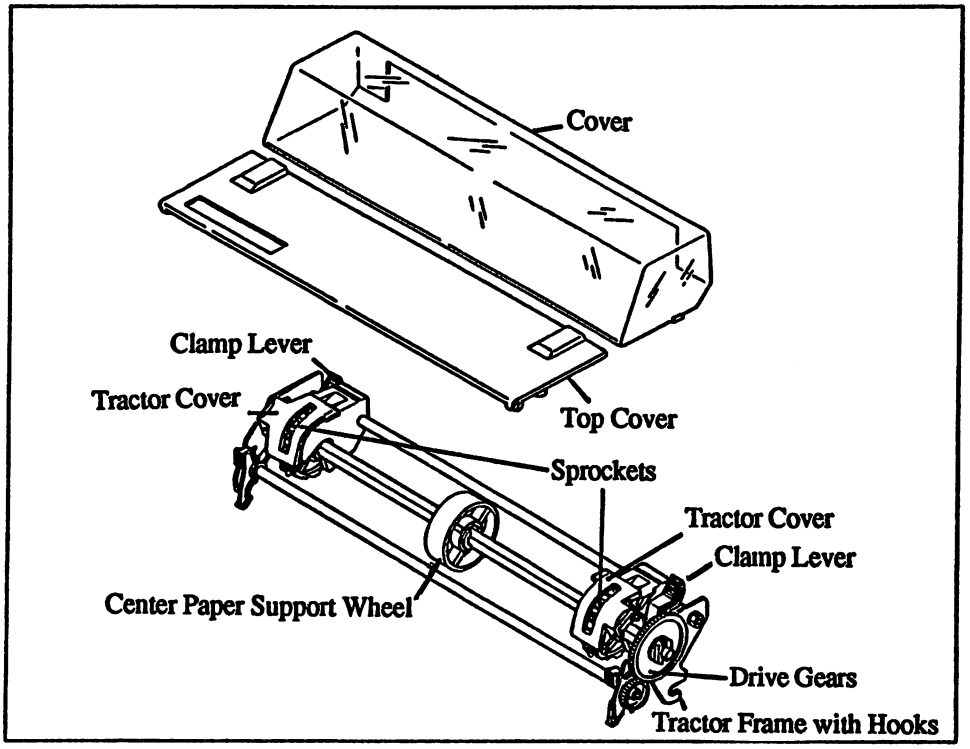
Push Tractor

With a push tractor, the paper is first pushed by the sprockets to the platen, and moved in front of the printhead. Usually when you are printing a single page, it's better to use the push tractor. The paper can be separated behind the tractor covers so you don't have to advance a blank sheet each time a single page is printed.

Pull Tractor

A pull tractor, which is mounted in front of or above the platen, pulls the paper over the platen and printhead. The tractor mechanism handles the paper after it has been printed on. The pull tractor should be used instead of the push tractor when you need professional-looking printing or when the printhead must strike the same area many times over (called *multiple strike printing*).

If you already have a push tractor, a pull tractor can easily be added. If a pull tractor exists, it can be exchanged for another pull tractor or an automatic single sheet feeder. The following figure illustrates a pull tractor.

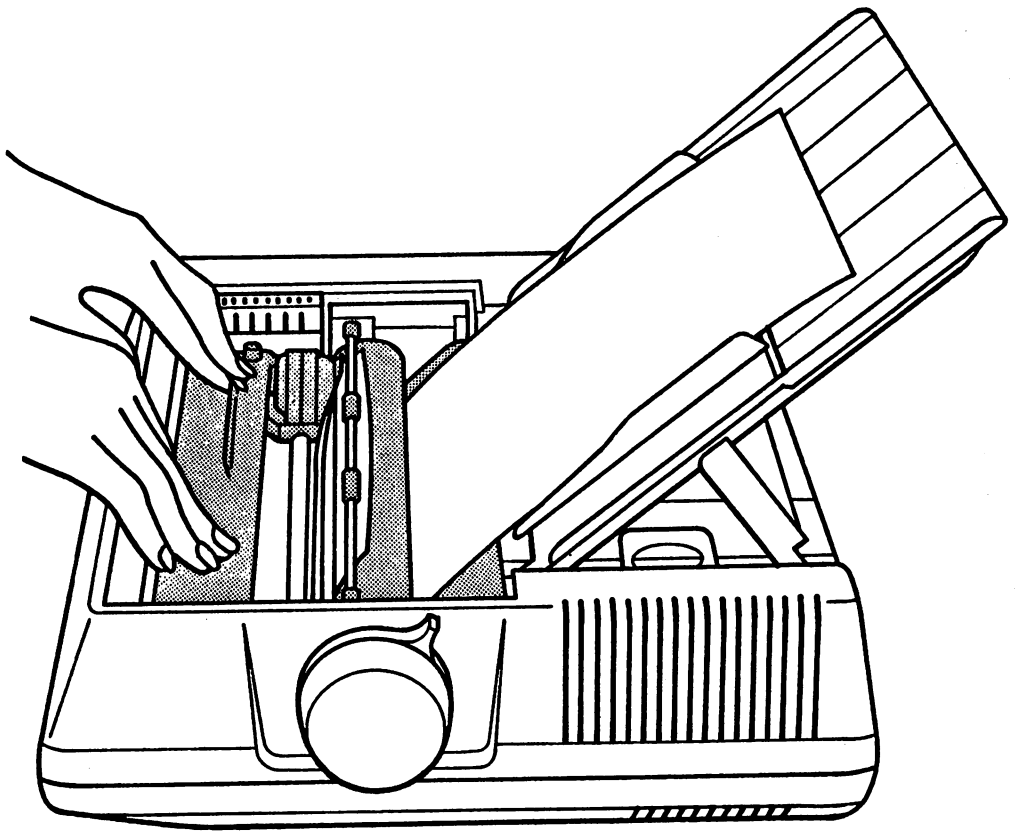


Pull Tractor

Automatic Single Sheet Feeder

A single sheet feeder can often accept one sheet of paper. Most better quality dot matrix printers include a single sheet feeder as standard equipment.

Some printers have a device called a cut sheet feeder available, which can accept up to 50 sheets of paper. Some higher quality cut sheet feeders can be electronically interfaced with the printer, making the two interactive. Some cut sheet feeders allow the user to send printed paper down two or more chutes for sorting and collation.

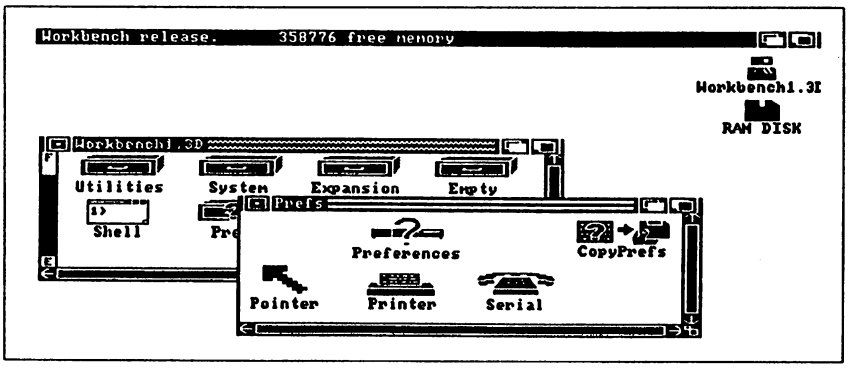


Sheet Feeder

Preferences Printer Installation—Workbench 1.3

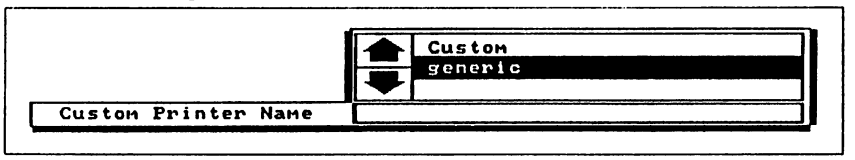
After switching on the printer and setting the DIP switches to the correct positions, switch on the computer and insert the Workbench diskette when prompted. Click on the Workbench diskette icon when it appears on the screen. This opens the Workbench window. The Utilities icon is located in this window. Double-click on this icon and another window will open. In this window you'll see the InstallPrinter icon. Double-click on the InstallPrinter icon and another window will appear. A requester will ask you to insert the Extras 1.3 diskette. If only one disk drive is present, the requester will ask for several exchanges of Workbench 1.3 and Extras 1.3. If two or more disk drives are present, insert Extras 1.3 into the second disk drive.

The printer program lists the available printer drivers. Enter the name of your printer. If your printer's name doesn't appear on the list, enter EpsonQ (we'll need to edit this driver, but more on this later) and press the <Return> key. After selecting a printer driver, a prompt to exchange the Workbench and Extras disks will appear if only one disk drive is present. If the Workbench diskette is write protected, a System Request informs you of this. You must remove the Workbench 1.3 diskette and move the write protect tab to write enable status. Insert the Workbench 1.3 diskette and click on the Retry gadget. The program copies the selected printer driver into the Devs/Printer drawer of the Workbench. After the copying process is completed, the program will prompt you to select a suitable printer driver the next time using Preferences. When the Workbench window reappears, double-click on the Prefs icon, then on the Printer icon.



Printer icon

Select the printer driver by clicking on the up or down arrow of the printer driver gadget until the appropriate printer driver is highlighted (see the following figure). Other printer characteristics can also be changed in this window.



Printer Driver Gadget

If the printer is connected to the parallel port, select the Parallel gadget. If the serial port is used, select the Serial gadget. The selected gadget will be enclosed in a box.

Parallel/Serial Gadgets

Select the paper size with the Paper Size gadgets. The following options are available:

U.S. Letter Standard letter size (8.5 x 11 inches).

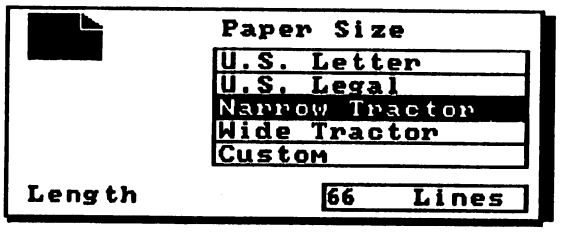
U.S. Legal Legal size (8.5 x 14 inches).

Narrow Tractor Continuous form (9.5 x 11 inches).

Wide Tractor Continuous form (14.875 x 11 inches).

Custom

Custom paper size as entered in the Length, Left Margin and Right Margin gadgets. Press <left Amiga><X> to delete the current entry. Enter the number of lines for the custom form, in which the number of lines equal form length multiplies by 6. For instance, if the form length is 5 inches, the number of lines would be equal to 30. The Custom gadget remains highlighted.

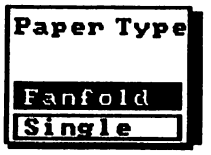


Paper Size Gadgets

Click on the Left Margin gadget to specify the left margin, and the Right Margin gadget to specify the right margin. Enter the number of characters from the edge of the page. For example, if the Left Margin gadget is "5 chars", then the text will begin 5 character positions to the right of the left edge of the page. The number in the Right Margin gadget must be greater than that in the Left Margin gadget, and is also counted from the left edge of the page.

Left Margin and Right Margin Gadgets

Use the Paper Type gadget to select continuous or single sheet paper. Click on Fanfold for continuous feed paper and Single for single sheet paper. The selection chosen will be highlighted.



Paper Type Gadget

Click on one of the Pitch gadgets to select the pitch (the number of characters per inch) you want. The following pitches are available:

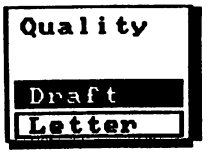
10-Pica Pica (10 characters per inch).

12-Elite Elite (12 characters per inch).

15-Fine Fine (15 characters per inch).

Pitch Gadget

Click on one of the Quality gadgets to select the print quality you want. The Draft selection provides faster printing but lower quality. The Letter selection provides slower printing but higher quality.

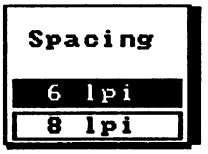


Quality Gadget

The Spacing gadgets allow you to select the number of lines per inch (lpi). These gadgets affect the page length. The following spacings are available:

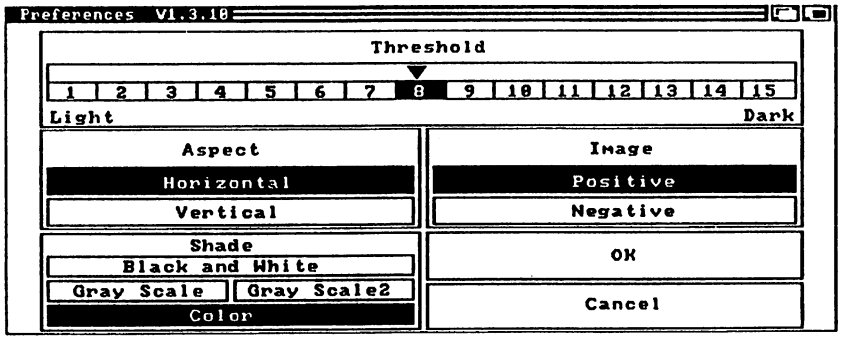
6 lpi Equivalent to standard typewriter spacing.

8 lpi Almost 1.5 times as many lines per inch as 6 lpi.



Spacing Gadget

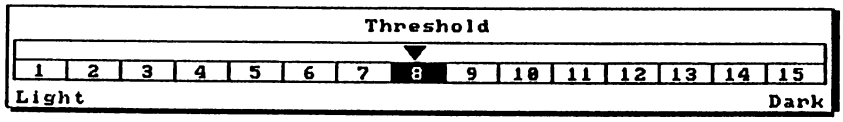
The Graphic 1 and Graphic 2 gadgets can assist you in setting parameters for graphics printing. Another menu appears when you click on the Graphic 1 gadget. These graphic gadgets are only applicable to a printer capable of printing graphics, such as a dot matrix or laser printer.



Graphic 1 Menu

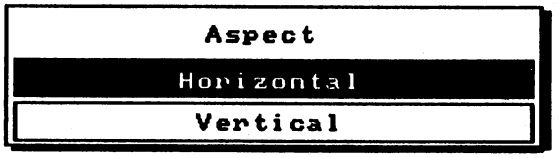
The Threshold gadget enables you to set the black and white contrast, and to determine which colors are printed in black and which ones are white. Moving the arrow or clicking the mouse on a number will select a value to set the contrast. For example, if the Image gadget (explained in a following section) is set to Positive and the Threshold number is 1, only the darkest colors in the picture will be printed in black. By increasing the Threshold number, more colors will be printed in black.

If the Image gadget is set on Negative, however, then the lighter colors will be printed in black, according to the value set.



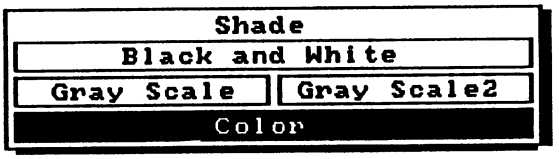
Threshold Gadget

The Aspect gadgets specify the aspect (orientation) of the printed page. The Horizontal setting prints graphics as they appear on the screen. The Vertical setting prints graphics at a 90 degree counterclockwise angle from the Horizontal setting.



Aspect Gadgets

The Shade gadgets control printer shading. The following options are available:



Shade Gadgets

Black and White Shading in black and white (no grays).

Gray Scale Shades of gray simulating color.

Gray Scale2 Similar to Gray Scale, but supporting seven shades of gray.

Color Printing in color (color printers only).

The Image gadget controls the appearance of the printed image. Click until this gadget displays Positive to print the image as it appears on the screen. Click until this gadget displays Negative to print black images as white and white images as black.

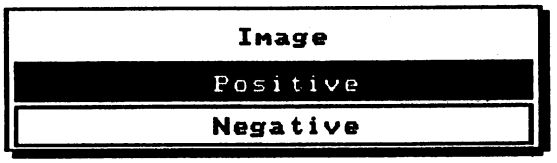


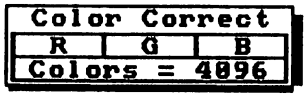
Image Gadget

Click on OK to keep the changes or Cancel to exit without changing the Graphic 1 parameters. The first printer menu reappears. Now click on the Graphic 2 gadget. The second graphics menu will appear and is described as followed:

When clicked ON, the Smoothing gadget smooths out some lines that may normally print with jagged edges (e.g., diagonal lines). The active gadget (ON or OFF) is highlighted.

Smoothing Gadget

The three Color Correct gadgets (R, G and B) offers some correction for color printers. Some color printers cannot reproduce all 4096 colors available on the Amiga.



Color Correct Gadget

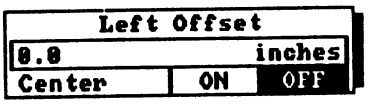
The Width Limit gadget specifies the graphic width in inches.

Width Limit Gadget

The Height Limit gadget specifies the graphic height in inches.

Height Limit Gadget

The Left Offset gadget specifies the left horizontal position of the image to be printed. Numbers are entered in 1/10ths of an inch. Selecting the Center Picture: gadget overrides the Left Offset gadget.



Left Offset Gadget

The Center Picture: gadget specifies the centered horizontal position of the image to be printed. Clicking the gadget ON centers the picture, while clicking the gadget OFF enables Left Offset mode.

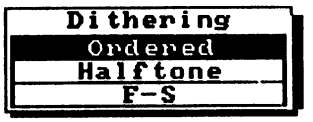
Center Gadget

The Dithering gadget allows you to specify the type of dithering sent to the printer. Dithering performs some smoothing between shades of gray or between colors. Three different dithering functions are available:

Ordered The color intensity is calculated using an ordered method. This produces shades using ordered patterns of dots.

Halftone The color intensity is calculated by the halftone method, which is similar to the technique used in printing newspapers and comic books. This method produces the best results with a printer that uses high print density (i.e., more than 150 dots per inch).

F/S The color intensity is calculated according to the "Floyd-Steinberg" method. This form of dithering slows the printer speed in a 2:1 ratio, because every dot is analyzed before it is printed. This function overrides all other forms of dithering.



Dithering Gadget

The Limits gadgets determine the maximum height and width of the graphic. The following options are available:

Ignore Ignores maximum height and width. The printable size of the printed image is calculated as follows:

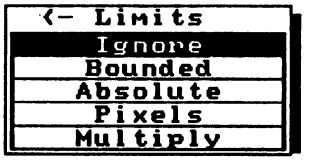
```
Width  = (right_margin - left_margin + 1)/chars_per_inch
Height = lines_per_page/lines_per_inch
```

Bounded Sets printable size within the values specified in the Width Limit and Height Limit parameters. Width Limit defaults to 6" while Height Limit defaults to 9". Although the printed image may not go beyond these default values, it can be made smaller than these defaults.

Absolute Specifies the values of Width Limit and Height Limit as absolute. The printed image will be the exact size as determined in Width Limit and Height Limit. For example, the image to be printed is to be 6 x 8 inches. Give Width Limit the value 6.0 and Height Limit the value 8.0. Activate the Absolute gadget. If the ratio of the print is not correct, you can correct this by setting one of the values (either Width Limit or Height Limit) to 0. For example, if Width Limit is set to 0, then the length will be computed to provide the correct aspect ratio. If both values are set to zero the image will be printed as high and wide as possible for the printer to create the correct aspect ratio.

Pixels Specifies the height and width of the printable page in pixels rather than inches.

Multiply This gadget specifies multiples of the values contained in the Width Limit and Height Limit gadgets. If Width Limit contains 2 and Height Limit contains 4, then the width of the printed image is multiplied by 2 and the height by 4. If the image has the dimensions of 320x200 pixels, it will be printed as 640x800 pixels.

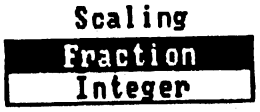


Limits Gadgets

The Density gadget specifies the printing density of the graphics. Densities between 1 and 7 may be selected by clicking on the gadget containing the desired number. The lower the density you select, the faster the printing executes.

Density Gadget

The Scaling gadget specifies the method of scaling. Fraction is normal, and results in a normally scaled graphic. Integer bases its scaling on the printed dots. Integer may cause distortion in a printed graphic, but will print fonts in their proper scaling.



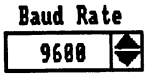
Scaling Gadget

Click on OK to retain the changes or Cancel to exit without keeping the changes. You will be returned to the main printer menu. Click on the OK gadget of this menu to return to the Preferences window.

If a serial printer is being used, click on the Serial icon in the Prefs window. This invokes the Serial Preferences window, which contains a number of gadgets controlling serial port communication:

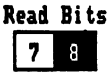
- Baud Rate
- Read Bits
- Stop Bits
- Handshaking
- Buffer Size
- Write Bits
- Parity

Baud Rate The Baud Rate arrow gadget controls the baud rate (serial transfer speed in bits per second). The default baud rate is 9600 baud.



Baud Rate Gadget

Read Bits These gadgets specify the number of bits necessary in order to read a character, 7 or 8 bits. Click the 7 gadget or 8 gadget.



Read Bits Gadget

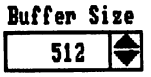
Stop Bits This gadget specifies the number of bits following a character transfer. This parameter is necessary for both reading and writing data. Click on either 1 or 2.

Stop Bits Gadget

Handshaking This area specifies the type of data flow used in serial communication. The three options are XON/XOFF (software/modem), RTS/CTS (Request To Send/Clear To Send - hardware/printers) and None. Click on the desired gadget.

Handshaking Gadget

Buffer Size This gadget specifies the size of the buffer used for serial transfer. The default size is 512 bytes, which can be changed by clicking on the up or down arrows.

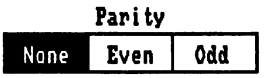


Buffer Size Gadget

Write Bits These gadgets specify the number of bits (7 or 8) necessary in order to write a character. Click the 7 gadget or 8 gadget.

Write Bits Gadget

Parity Parity checks for errors during data transmission. The options are None (no parity check), Even (even parity) and Odd (odd parity). Click on the desired gadget to select parity.



Parity Gadget

The most frequently used settings for serial communication are:

```
Baud Rate   = 9600
Read Bits   = 8
Stop Bits   = 1
Write Bits  = 8
Parity      = None
```

Click Save to save the changes permanently, Use to use the changes during the current session only and Cancel to cancel changes made during this session.

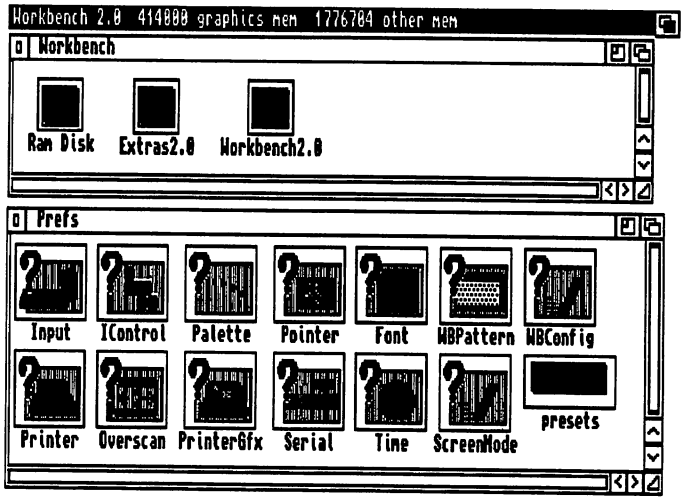
Preferences Printer Installation—Workbench 2.0

After switching on the printer and setting the DIP switches to the correct positions, switch on the computer and get to the Workbench 2.0 screen by whatever means you use.

Follow the instructions in your Amiga documentation for copying the printer driver(s) you need to the Devs/Printers drawer of your hard disk or boot diskette.

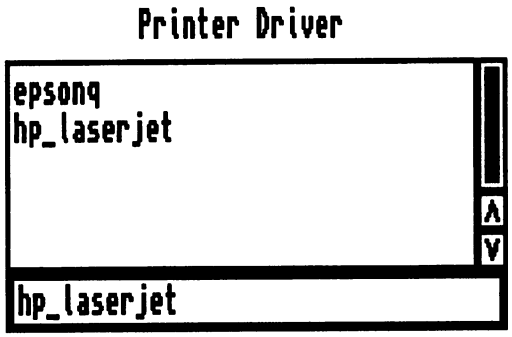
Printer Editor

Boot your system. Click on the Workbench diskette icon when it appears on the screen. This opens the Workbench window. The Prefs icon is located in this window. Double-click on the Prefs icon and another window will open. In this window you'll see two icons which control printer configuration: the Printer icon and the PrinterGfx icon. Double-click on the Printer icon and the Printer Preferences window will appear.



Printer Icons

The Printer Driver scroll gadget lists the available printer drivers. Scroll through the list using the scroll arrows or scroll bar, and click on the name of the printer you're using.



Printer Driver Scroll Gadget

If the printer is connected to the parallel port, click on the Printer Port: cycle gadget until it displays the word Parallel. If the serial port is used, click on the Printer Port: cycle gadget until it displays the word Serial.

NOTE: If you select Serial in the Printer Port: cycle gadget, you'll need to adjust the serial interface parameters from the Serial program, also included in the Prefs directory.

Printer Port: Cycle Gadget

Click on the Paper Type: cycle gadget until it displays the proper paper type your printer currently uses (either Single or Fanfold). Single denotes single sheet feed, while Fanfold indicates continuous feed paper.

Paper Type Gadget

Click on the Paper Size: cycle gadget until it displays the paper size currently in use in your printer. The following options are available:

U.S. Letter Standard letter size (8.5 x 11 inches).

U.S. Legal Legal size (8.5 x 14 inches).

Narrow Tractor Continuous form (9.5 x 11 inches).

Wide Tractor Continuous form (14.875 x 11 inches).

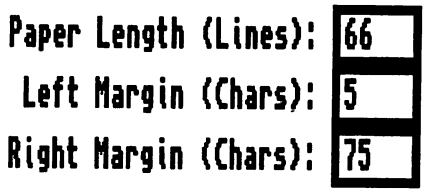
Custom Custom paper size as entered in the Paper Length (Lines):, Left Margin (Chars): and Right Margin (Chars): gadgets.

Paper Size: Cycle Gadget

The Paper Length (Lines): gadget lets you specify the length of the printed page in lines (default is 66).

The Left Margin (Chars): gadget lets you specify the left margin of the custom printed page in characters (default is 5).

The Right Margin (Chars): gadget lets you specify the right margin of the custom printed page in characters (default is 75).



Paper Length:, Left Margin: and Right Margin: Gadgets

Click on the Print Pitch: cycle gadget until it displays the pitch (the number of characters per inch) you want. The following pitches are available:

10-Pica Pica (10 characters per inch).

12-Elite Elite (12 characters per inch).

15-Fine Fine (15 characters per inch).

Print Pitch: Cycle Gadget

The Print Spacing: gadget allows you to select the number of lines per inch (lpi). Changing this gadget affects the page length. The following spacings are available:

6 lpi Equivalent to standard typewriter spacing.

8 lpi Almost 1.5 times as many lines per inch as 6 lpi.

Print Spacing: Cycle Gadget

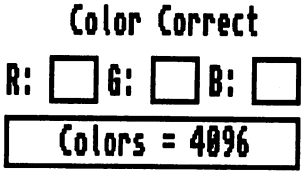
Click on the Print Quality: cycle gadget until it displays the print quality you want. The Draft selection provides faster printing but lower quality. The Letter selection provides slower printing but higher quality.

Print Quality: Cycle Gadget

Once you have selected these parameters you can click on Save to save this information for later Workbench sessions, Use to use this information for this Workbench session only or Cancel to exit without saving or using this information.

Printer Graphic Editor

Once Printer ends and returns to the Workbench, click on the PrinterGfx icon. The PrinterGfx Preferences window opens. The three Color Correct gadgets (R:, G: and B:) offers some correction for color printers. Some color printers cannot reproduce all 4096 colors available on the Amiga.



Color Correct Gadgets

The Dithering: cycle gadget allows you to specify the type of dithering sent to the printer. Dithering performs some smoothing between shades of gray or between colors. Three different dithering functions are available:

Ordered The color intensity is calculated using an ordered method. This produces shades using ordered patterns of dots.

Halftone The color intensity is calculated by the halftone method, which is similar to the technique used in printing newspapers and comic books. This method produces the best results with a printer that uses high print density (i.e., more than 150 dots per inch).

F/S The color intensity is calculated according to the "Floyd-Steinberg" method. This form of dithering slows the printer speed in a 2:1 ratio, because every dot is analyzed before it is printed. This function overrides all other forms of dithering.

Dithering: Cycle Gadget

The Scaling gadget specifies the method of scaling. Fraction is normal, and results in a normally scaled graphic. Integer bases its scaling on the printed dots. Integer may cause distortion in a printed graphic, but will print fonts in their proper scaling.

Scaling: Cycle Gadget

The Image: cycle gadget controls the appearance of the printed image. (see the following figure). Click until this gadget displays Positive to print the image as it appears on the screen. Click until this gadget displays Negative to print black images as white and white images as black.

Image: Cycle Gadget

The Aspect: cycle gadget specifies the aspect (orientation) of the printed page. The Horizontal setting prints graphics as they appear on the screen. The Vertical setting prints graphics at a 90 degree counterclockwise angle from the Horizontal setting.

Aspect: Cycle Gadget

The Shade: cycle gadget controls printer shading. The following types of shading are available:

Black & White Shading in black and white (no greys).

Grey Scale 1 Shades of grey simulating color.

Grey Scale 2 Similar to Grey Scale 1, but supporting four shades of grey and the Amiga 2024 monitor (which supports 7 grey scales).

Color Printing in color (color printers only).

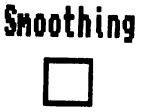
Shade: Cycle Gadget

The Threshold slider gadget specifies the amount of black and white contrast, and determines which colors are printed in black and which ones are printed in white. Dragging the slider changes the threshold number. For example, if the Image: cycle gadget is set to Positive and the Threshold number is 1, only the darkest colors in the picture will be printed in black. By increasing the Threshold number, more colors will be printed in black.

If the Image gadget is set on Negative, however, then the lighter colors will be printed in black, according to the value set.

Threshold: Gadget

When clicked on, the Smoothing gadget smooths out some lines that may normally print with jagged edges (e.g., diagonal lines).



Smoothing Gadget

The Left Offset gadget specifies the left horizontal position of the image to be printed. Numbers are entered in 1/10ths of an inch. Selecting the Center Picture: gadget overrides the Left Offset gadget.

Left Offset Gadgets

The Center Picture: gadget specifies the centered horizontal position of the image to be printed. Clicking the gadget on centers the picture, while clicking the gadget off enables Left offset mode.

Center Picture: Gadget

The gadgets in the Limits category determine the maximum height and width of the graphic. The Type: cycle gadget makes the following options available:

Ignore Ignores maximum height and width. The printable size of the printed image is calculated as follows:

```
Width  = (right_margin - left_margin + 1)/chars_per_inch
Height = lines_per_page/lines_per_inch
```

Bounded Sets printable size within the values specified in the Width and Height parameters. Width defaults to 6" while Height defaults to 9". Although the printed image may not go beyond these default values, it can be made smaller than these defaults.

Absolute Specifies the values of Width and Height as absolute. The printed image will be the exact size as determined in Width and Height. For example, the image to be printed is to be 6.0x8.0 inches. Give Width the value 60 and Height the value 80. Activate the Absolute gadget. If the ratio of the print is not correct, you can correct this by setting one of the values (either Width or Height) to 0. For example, if Width is set to 0, then the length will be computed to provide the correct aspect ratio. If both values are set to zero the image will be printed as high and wide as possible for the printer to create the correct aspect ratio.

Pixels Specifies the height and width of the printable page in pixels rather than inches.

Multiply This gadget specifies multiples of the values contained in the Width: and Height: gadgets. If Width: contains 2 and Height: contains 4, then the width of the printed image is multiplied by 2 and the height by 4. If the image has the dimensions of 320x200 pixels, it will be printed as 640x800 pixels.

Type: Cycle Gadget

The Width: gadget specifies the graphic width in inches, pixels or multiples.

Width: Gadget

The Height: gadget specifies the graphic height in inches, pixels or multiples.

Height: Gadget

The Density: slider gadget specifies the printing density of the graphics. Densities between 1 and 7 may be selected by dragging the slider to change the density number. The smaller the density you select, the faster the printing executes.

Density: Slider Gadget

After selecting the desired values leave this menu by clicking on OK. You will be returned to the first printer menu. Click on the OK Gadget of this menu and you will be returned to the Preferences Window.

Click Save to save the changes permanently, Use to use the changes during the current session only and Cancel to cancel changes made during this session.

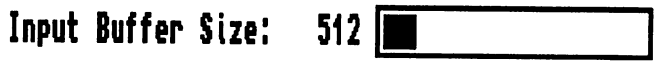
If a serial printer is being used, click on the Serial icon in the Prefs window. This invokes the Serial Preferences window, which contains a number of gadgets controlling serial port communication:

- Input Buffer Size
- Handshaking
- Parity
- Bits / Char
- Stop Bits

BAUD Rate The BAUD Rate slider gadget controls the baud rate (serial transfer speed in bits per second). The default baud rate is 9600 baud.

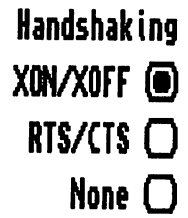
Baud Rate Slider Gadget

Input Buffer Size This gadget specifies the size of the buffer used for serial transfer. The default size is 512 bytes, which can be changed by dragging the slider.



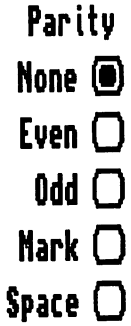
Input Buffer Size Slider Gadget

Handshaking This area specifies the type of data flow used in serial communication. The three options are XON/XOFF (software/modem), RTS/CTS (Request To Send/Clear To Send - hardware/printers) and None. Click on the desired gadget to send.



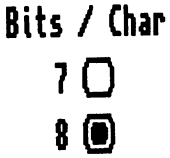
Handshaking Gadget

Parity Parity checks for errors during data transmission. The options are None (no parity check), Even (even parity), Odd (odd parity), Mark (eighth bit always active) and Space (eight bit always inactive). Click on the desired gadget to select parity.



Parity Gadget

Bits / Char These gadgets specify the number of bits necessary in order to read a character, 7 or 8 bits. Click the 7 gadget or 8 gadget.



Bits / Char Gadgets

Stop Bits These gadgets specify the number of bits following a character transfer. This parameter is necessary for both reading and writing data. Click on either 1 or 2.

Stop Bits Gadget

The most frequently used settings for serial communication are:

```
Baud Rate   = 9600
Parity      = None
Bits / Char = 8
Stop Bits   = 1
```

Click Save to save the changes permanently, Use to use the changes during the current session only and Cancel to cancel changes made during this session.

Chapter 3
Printer Control

After successfully connecting the printer to the computer, you should then set the controls. Switch on the printer and the computer, and boot the system. Within a short time the printer comes to life by positioning the printhead. This process is called *initialization*, which happens automatically every time the printer is switched on.

NOTE: During initialization, all printer settings return to their default values. This means that all previous settings made on the printer's control panel (e.g., printer font) revert to their defaults as defined by the printer's internal system or the DIP switches.

This hardware initialization occurs through the INIT line, found in parallel printer interfaces. The INIT line isn't needed for parallel printer operation, and serial connectors do not include this line.

Switching the printer off and on also initializes the printer. You can also initialize the printer through software. This last method is used in most programs at the beginning of a printing session.

Any previously active control panel settings are displaced on software initialization. However, downloaded fonts and the contents of the print buffer are retained.

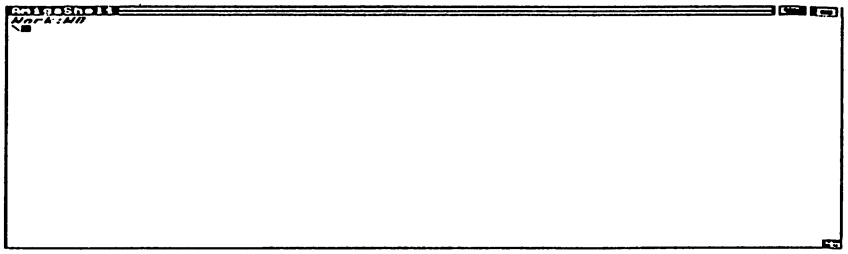
Chapters 4 and 5 describe software control in detail.

AmigaDOS Control

The Amiga is able to communicate with the printer through AmigaDOS with the help of the Shell, sometimes also called the CLI (Command Line Interpreter). The Shell is a window into which you may enter commands from the keyboard. The Shell commands are programs located in the C directory of the Workbench diskette. These programs are executed by entering their name on the Shell's command line. The Shell is similar to the MS-DOS command line found on MS-DOS based computers. Activate the Shell by double-clicking on the Shell icon.


Printer
Not
Responding
Repair Kit

The AmigaShell window appears after you double-click the Shell icon. This window contains a prompt and a cursor. The Shell is now active and ready to receive whatever commands you enter.



Shell Window

Only five Shell commands directly access the printer. These Shell commands are:

- ECHO
- COPY
- TYPE
- DIR
- LIST

Normally the COPY command is used to copy data, but can also redirect data from the screen to the printer. Switch on the printer and enter the following in the Shell command line:

```
COPY S:STARTUP-SEQUENCE TO PRT:
```

End the line by pressing <Return>. The computer will copy the STARTUP-SEQUENCE file on the Workbench diskette to the printer.

This file can also be printed using the TYPE command. TYPE outputs ASCII data. Enter the following to TYPE the file to the printer:

```
TYPE S:STARTUP-SEQUENCE TO PRT:
```

The DIR command lists the current directory.

The LIST command also lists the current directory, but includes the program length and creation date of each file.

Redirection

Entering the DIR and LIST commands without arguments displays the current directory on the screen. Adding the > redirection character and the PRT: device name redirects this information to the printer instead of the screen. The following sends the current directory to the printer:

```
DIR >PRT:
```

The following redirects the LIST command to the printer:

```
LIST >PRT:
```

The output may be sent through the interface itself. This ensures that control code sequences within a file are retained. The following sends the current directory to the parallel interface PAR: without accessing the printer driver:

```
DIR >PAR:
```

The following sends the current directory through the serial interface SER:

```
DIR >SER:
```

Now try the following command:

```
ECHO "Hello, User"
```

The words Hello, User appear on the screen. Enter the following to redirect the words Hello, Printer to the printer:

```
ECHO >PRT: "Hello, Printer"
```

The ECHO command allows you to send text and printer control codes to the printer. For example, to change the output to bold text on most printers, the following command is used:

```
ECHO >PAR: "*eE Bold on"
```

The "*e" sign has the same effect as pressing the <Esc> key. Instead of pressing <*><e>, you can also just press the <Esc> key. The sentence "Bold on" will be printed in bold letters. To disable the above bold style enter the following ECHO command:

```
ECHO >PAR: "*eF Bold off"
```

The Shell also enables you to execute ALIAS commands. These commands are simply ASCII lines containing Shell commands which are stored in the S:SHELL-STARTUP file. Enter the following:

```
ED S:SHELL-STARTUP
```

This invokes the ED editor and loads the SHELL-STARTUP file from the S: directory. Move the cursor to the end of the file and enter the following:

```
alias PDir dir >prt:
alias PList list >prt:
alias Boldon echo >par: "*eE"
alias Boldoff echo >par: "*eF"
alias DoubleOn echo >par: "*eG"
alias DoubleOff echo >par: "*eH"
```

Press <Esc><X><Enter> to save the file and exit ED.

Enter the following to start a new Shell window:

```
NEWSHELL
```

You now have several new Shell commands available.

PDir	Prints the current directory.
PList	Prints the data list of the current directory.
BoldOn	Enables bold print.
BoldOff	Disables bold print.
DoubleOn	Enables double strike print.
DoubleOff	Disables double strike print.

This script file is included on the companion diskette for this book.

Printer Control from AmigaBASIC

AmigaBASIC offers the user some control over the printer from within AmigaBASIC. The printer in AmigaBASIC is called LPT1: and may be opened with the OPEN command. If the printer is controlled with LPT1:BIN, then the data is sent to the printer in binary form without sending spaces or carriage returns. It's also possible to address the

parallel port directly through the PAR: device. This method retains control codes.

Let's look at an AmigaBASIC program for printer control:

```
Loop: CLS
INPUT "Control code";s$
INPUT "Text        ";Tx$
seq$=CHR$(27)+s$
OPEN "PAR:" FOR OUTPUT AS #2
PRINT#2,seq$;
PRINT#2,Tx$
CLOSE #2
INPUT "Do you want to enter another control code
      (y/n)";again$
IF again$ <> "y" THEN END ELSE Loop
```

When you run this program, it prompts you for a printer control code. Enter one of the following codes and press <Return>:

Controls	Function
E	Bold on
F	Bold off
G	Double strike on
H	Double strike off
-	Underline on
_	Underline off
4	Italics on
5	Italics off

The program then prompts you for a text. Enter a text and press <Return>. The program prints the text on your printer in the style you selected.

Now let's look at the program in more detail:

```
Loop: CLS
```

Specifies the Loop: label and clears the screen.

```
INPUT "Control code";s$
```

Prompts for control code input and stores this entry as a string variable (s$).

```
INPUT "Text        ";Tx$
```

Prompts for string input and stores this entry as a string variable (Tx$).

```
seq$=CHR$(27)+s$
```

Places the values CHR$(27) (ESC) and control code s$ in the variable seq$.

```
OPEN "PAR:" FOR OUTPUT AS #2
```

Opens channel 2 for output to the parallel port (PAR:).

```
PRINT#2,seq$;
```

Sends ESC and control code to parallel port.

```
PRINT#2,Tx$
```

Sends text string Tx$ to parallel port.

```
CLOSE #2
```

Closes output channel 2.

```
INPUT "Do you want to send another control code (y/n) ";again$
```

Asks if the user would like to send another code and text.

```
If again$ <> "y" then END ELSE Loop
```

Repeat the loop if the user enters <y><Return>. End program if user enters any other input other than <y><Return>.

Chapter 4
Software Commands

After your printer is correctly connected through either a parallel or serial interface and you know how to control the printer using AmigaDOS commands, the next step is to program the printer with software commands.

In addition to the AmigaDOS commands discussed in Chapter 3, the printer can also be addressed and controlled with software commands.

The following list illustrates the different types of printer commands:

- configuration
- mechanical printer control
- text formatting
- text types
- text size
- special effects
- character sets
- graphics

The computer activates the individual commands by sending an ESCape code (decimal 27) or, with some printers, a code of FS (decimal 28). If the printer receives a character which isn't preceded by an ESC code, the character is automatically understood as a printable character (for example, 65 = A).

The decimal codes 0 through 32 are reserved for *command characters* and are identified as such by the printer (ESC or decimal 27 is one example).

If your printer follows the ESC/P standard (such as an Epson or Epson-compatible), you shouldn't encounter any problems while executing the commands in this chapter. Check your printer manual if you're not sure whether your printer is compatible with the ESC/P command set. Most manufacturers include information on how to make their printers compatible with the ESC/P command standard.

Often the ESC/P command set is also called the standard command set. In the following pages we will use the term *standard* for ESC/P.

If you're using an IBM or IBM-compatible printer, all of the standard commands have the same function. Commands with just one label (IBM or standard) can be used only with that command set.

To get the fast execution technique of dot matrix calculation, new 9 and 24 pin printers include other functions. Because of this, some commands were added to the ESC/P command set. In the following sections, these additional commands are called the *expanded ESC/P command set.*

The individual commands can be used in three different notations: the *decimal* syntax, *hexadecimal* syntax and *ASCII* form. The software used determines which of these three formats can be used since the printer must understand the given value.

PrinterTool

Since it's impossible to send the software commands directly to the printer under AmigaDOS, we've included a printer utility that makes it easier to send printer commands in decimal or hexadecimal notation. This utility can be found on the companion diskette available for this book, and in source code form at the back of this book. The PrinterTool program converts control codes into information that the printer can understand.

Printer Control

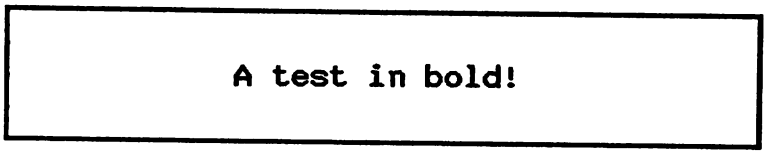
To use PrinterTool, you'll need the program itself from the companion diskette. If you type the program in from the listing in the back of this book, you'll also need AmigaBASIC to run the program. Once you run PrinterTool, you can enter printer commands. For example, enter the following at the prompt in PrinterTool to print the words **A test in bold** in bold letters on your printer:

```
27,69,"A test in bold!",13,10
```

The numbers in this example, 27 and 69, are decimal numbers. The 27 stands for ESC, which signals that a command will follow, and the 69 enables bold type.

If the numbers are preceded with a $, they would be handled as hexadecimal numbers. $1B, $45 are the hexadecimal equivalents of 27,69.

This command produces the following result on your printer:



The CR (carriage return) code is 13 and the LF (line feed) code is 10. They aren't needed for command transmission (for example transmitting the text type), but they are needed when text is printed. The CR ends a line while LF inserts a line at the specified locations.

Before continuing with additional text make sure that the bold print mode is inactive. You can switch this mode off with 27,70.

The PrinterTool program also allows you to enter printer control codes as keywords. For example, entering one of the following strings has the same effect as entering 27,69:

```
BoldOn
Bold On
```

Keyword entry must be done separately from the text you want printed. To print a text in italics, you must first enter the following at the Control code prompt, pressing <Return> at the end of the line:

```
ItalicOn
```

Then enter the text in quotes, followed by the 13,10 code:

```
"A test in italics",13,10
```

Different Syntax

You can also use the decimal syntax or the hexadecimal syntax with this example. The command line could then look like the following:

```
Hexadecimal: $1B,$45,"A test in bold!",$0C,$0A
ASCII:       BoldOn
             "A test in bold!",13,10
```

NOTE: Some printers will insert a page feed instead of a carriage return in response to $0C,$0A. Check your printer manual for details.

As you can see, a combination of the individual notations is possible. All three syntax forms can occur in a command sequence:

```
BoldOn
"A test in bold!",$0C,$0A
```

We'll cover PrinterTool in more detail in Chapter 10. For now, however, here are a few ground rules for testing out your printer's command set using PrinterTool. First, make sure that PrinterTool and AmigaBASIC are accessible from diskette. If you're using the compiled program PRINTER.RUN, you won't need AmigaBASIC. Compare the printer command syntax in this chapter with the equivalent command in your printer manual to see which command set your printer supports

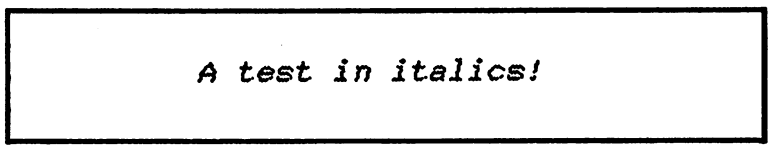
(standard, IBM, expanded ESC/P). Each command listed in the next section of this chapter lists the printer command set for which it is intended.

Here are a few other examples. Enter the following:

```
27,52,"A test in italics!",13,10
```

Since Epson's standards have changed over the years, the above may not work for you. Consult your manual.

The end result should look like this:



NOTE: If your printer doesn't print correctly while you are typing an example, another command could be active. If this happens, enter `27,64` or `RESET` and try again.

Here are two more examples.

```
RESET
27,83,1,"subscript",13,10
```

Finally, try this, which generates superscript text:

```
RESET
27,83,0,"superscript",13,10
```

We listed these commands using the same syntax for each. Each command begins with a bar containing the command name and the command set to which the command applies. Next follows a brief description of the command's purpose. Next follows command syntaxes in ASCII (useful in AmigaBASIC programming), decimal notation and hexadecimal notation. Examples using the PrinterTool program are listed where applicable, followed by a more detailed explanation of the command.

Configuration

NOTE: These commands correspond to the most recent ESC/P command set available. Your printer may not respond to some of these commands. Check the command type and consult your printer manual for more information.

ESC@ — Standard

Function: Initializes printer.

Format:

ASCII:	ESC	"@"
Decimal:	27	64
Hexadecimal:	$1B	$40

Example:

```
27,64
```

Explanation: Returns most settings to default status and clears the printer buffer.

DC1 — Standard, IBM Mode

Function: Switches printer on-line.

Format:

ASCII:	DC1
Decimal:	17
Hexadecimal:	$11

Example: See DC3.

Explanation: Switches a printer on-line which was taken off-line using the DC3 code. This command has no effect on the printer's control panel.

DC3 — Standard

Function: Switches printer off-line.

Format

ASCII:	DC3
Decimal:	19
Hexadecimal	$13

Example:

```
19
"My printer won't respond...",13,10
17
"...until now!",13,10
```

Explanation: Switches the printer off-line until a DC1 code is received. The printer cannot be switched on line by pressing the "on-line" key on the control panel.

ESC i **Standard**

Function: Switches typewriter mode on/off.

Format:

ASCII:	ESC	"i"	n
Decimal:	27	105	n
Hexadecimal:	$1B	$69	n

Parameter: n=1: typewriter mode activated
n=0: printer returns to the normal print mode

Explanation: In the typewriter mode, each character is printed as it is typed.

ESC s **Standard**

Function: Cuts the speed in half.

Format:

ASCII:	ESC	s	n
Decimal:	27	115	n
Hexadecimal:	$1B	$73	n

Parameter: n=1: cuts the speed in half
n=0: full speed

Example:

```
27,115,1
"slowslowslowslowslow",13,10
"slowslowslowslowslow",13,10
"slowslowslowslowslow",13,10
"slowslowslowslowslow",13,10
27,115,0
"fastfastfastfastfast",13,10
"fastfastfastfastfast",13,10
"fastfastfastfastfast",13,10
"fastfastfastfastfast",13,10
```

Explanation: All of the lines are printed only from left to right, which is called the *unidirectional* mode. This mode is useful for high resolution printouts or other quality printouts. The print speed is half that of the bidirectional mode. But the unidirectional mode is a quieter method of printing.

ESC < — Standard

Function: Selects unidirectional printing for a line.

Format:

ASCII:	ESC	"<"
Decimal:	27	60
Hexadecimal:	$1B	$3C

Example:

```
27,60
"Unidirectional",13,10
27,60
"is in one direction",13,10
```

Explanation: Only a single line is printed unidirectionally with this command.

ESC U — Standard, IBM mode

Function: Selects unidirectional print.

Format:

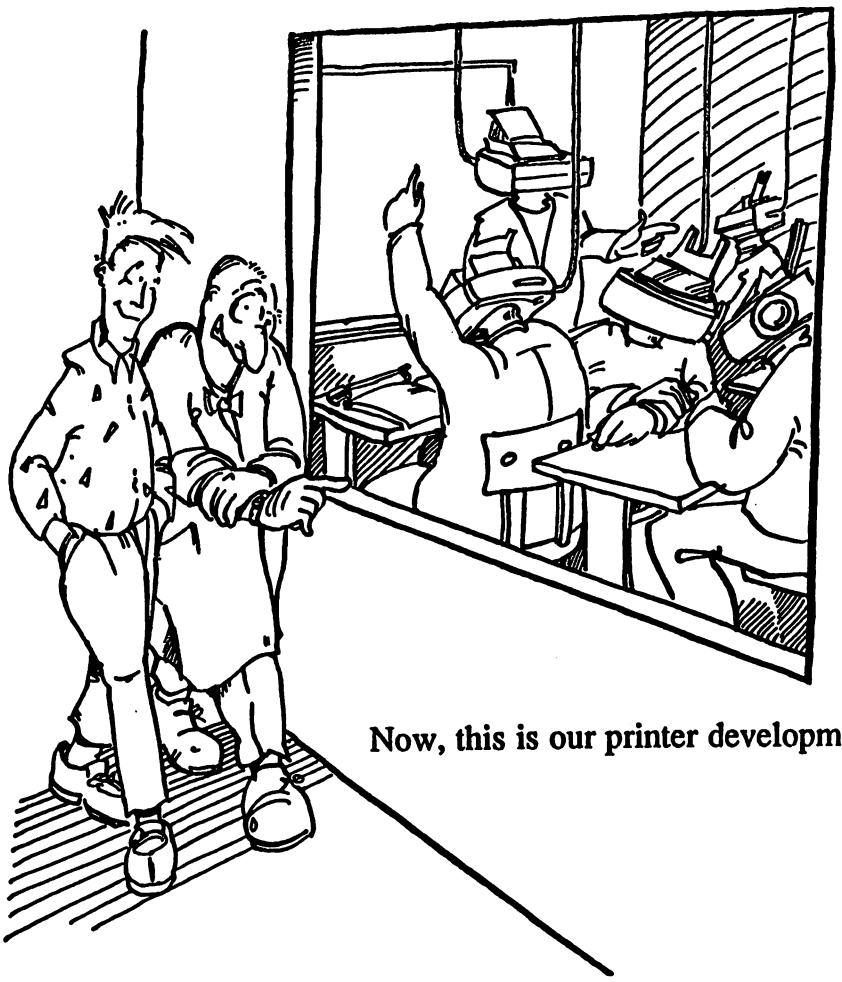
ASCII:	ESC	"U"	n
Decimal:	27	85	n
Hexadecimal:	$1B	$55	n

Parameter:
n=1: unidirectional print
n=0: bidirectional print

Example:

```
27,85,1
"Unidirectional",13,10
"is in one direction",13,10
27,85,0
"Bidirectional",13,10
"is in both directions",13,10
```

Explanation: Prints each line from left to right for a precisely positioned printout.


Now, this is our printer development team

ESC > — Standard

Function: Sets the entry data at 8 bits.

Format:

ASCII:	ESC	">"
Decimal:	27	62
Hexadecimal:	$1B	$3E

Explanation: This command is for computers that can transfer data 7 bits at a time. The eight bit is set to one, which means that, generally, only italics can be printed. You can also create italics with the ESC 4 command.

ESC = — Standard

Function: Sets the eighth bit of the file to 0.

Format:

ASCII:	ESC	"="
Decimal:	27	61
Hexadecimal:	$1B	$3D

Explanation: The eighth bit of the file is set to 0 with this command. If your computer sends data with the eight bit set (value of 1), this is set to zero. A common sign that an eight bit is incorrectly set is when it prints italics or graphic characters. This error can be fixed with the ESC = command.

ESC # — Standard

Function: Controls the eighth bit.

Format:

ASCII:	ESC	"#"
Decimal:	27	35
Hexadecimal:	$1B	$23

Explanation: The control of the eighth bit can be accomplished with this command.

ESC C — Standard, IBM mode

Function: Determines the page length in lines.

Format:

ASCII:	ESC	"C"	n
Decimal:	27	67	n
Hexadecimal:	$1B	$43	n

Parameter: n is a value between 1 and 127. It can be set with a command character or keyboard character.

Example:
```
27,67,80
FORMFEED
```

Explanation: You can set the page length with this command but be aware of the line spacing (ESC ?). The standard value for 11 inch continuous feed paper is 66 lines with a spacing of 1/6 inch. The line at which the printhead is found is the page's starting position. The bottom position, which is defined with the ESC N command and the skip perforation command, which is set through the DIP switches, are deleted.

ESC C NUL — **Standard, IBM mode**

Function: Determines the page length in inches.

Format:

ASCII:	ESC	"C"	NUL	n
Decimal:	27	67	0	n
Hexadecimal:	$1B	$43	$00	n

Parameter: n is a value between 1 and 22 and determines the page length in inches.

Example:
```
27,67,0,18
FORMFEED
27,67,0,11
FORMFEED
```

Explanation: The page length is determined here. This is the start position where the printhead is located on the page. As with the ESC C command, the bottom margin and the skip perforation commands are ignored.

ESC EM — **Expanded ESC/P command set**

Function: Activates/deactivates single sheet feed.

Format:

ASCII:	ESC	EM	n
Decimal:	27	25	n
Hexadecimal:	$1B	$19	n

Example:
```
27,25,1
"A new page is fed",13,10
```

Parameters:
n=4: enables this mode
n=0: disables this mode
n=1: pulls a sheet from tray 1
n=2: pulls a sheet from tray 2

Explanation: This command enables you to use an automatic single sheet feeder. The parameters n=1 and n=2 can be set to use two sheet feeders. The advancement of the paper is determined with either a form feed (FF) or a line feed (LF) at the end of the page.

ESC 4 — IBM mode

Function: Sets the start of the page.

Format:

ASCII:	ESC	"4"
Decimal:	27	52
Hexadecimal:	$1B	$34

Example:
```
27,52
```

Explanation: Sets the current position of the printhead as the starting position of the page.

ESC 8 — Standard, IBM mode

Function: Deactivates the paper out sensor.

Format:

ASCII:	ESC	"8"
Decimal:	27	56
Hexadecimal:	$1B	$38

Example:
```
27,56
```

Explanation: Disables paper out sensor, regardless of the current DIP switch setting.

ESC 9 — Standard, IBM mode

Function: Activates the paper out sensor.

Format:

ASCII:	ESC	"9"
Decimal:	27	57
Hexadecimal:	$1B	$39

Example:
```
27,57
```

Explanation: This cancels the ESC 8 command. A tone sounds when the paper runs out and the setting of the DIP switch is deactivated.

Mechanical Printer Control

NOTE: These commands correspond to the most recent ESC/P command set available. Your printer may not respond to some of these commands. Check the command type and consult your printer manual for more information.

BEL — Standard, IBM mode

Function: Signal tone.

Format:
ASCII: BEL
Decimal: 7
Hexadecimal: $07

Explanation: The tone sounds briefly.

BS — Standard, IBM mode

Function: Backspace.

Format:
ASCII: BS
Decimal: 8
Hexadecimal: $08

Example:
```
"L",8
"=",13,10
```

Explanation: This command prints data which is located in the print buffer. The printhead moves one character to the left and prints a second character, which overlaps the character currently on the page. The BS command is ignored if the printhead is in the left margin, the previous character is a HT character or a command is entered for an absolute or relative point position. The command is also ignored if another alignment, such as left justified, is chosen (as in the block set). The printhead returns to its original position if graphics were printed.

CR — Standard, IBM mode

Function: Carriage return.

Format:
ASCII: CR
Decimal: 13
Hexadecimal: $0D

Example:
```
"Printed",13
"over one another",13,10
```

Explanation: The characters in the print buffer are printed and the printhead returns to the left margin.

CAN — Standard, IBM mode

Function: Deletes a line.

Format:

ASCII:	CAN
Decimal:	24
Hexadecimal:	$18

Example:
```
"This line will be erased",24
"As you can see!",13,10
```

Explanation: This command erases the last line in the print buffer if it isn't printed. The control codes remain unchanged.

DEL — Standard

Function: Deletes a character.

Format:

ASCII:	DEL
Decimal:	127
Hexadecimal:	$7F

Example:
```
"The erased X"
127
"is not printed",13,10
```

Explanation: This command deletes the last character in the print buffer if it isn't printed. The control codes remain unchanged.

FF — Standard, IBM mode

Function: Form feed.

Format:

ASCII:	FF
Decimal:	12
Hexadecimal:	$0C

Example:
```
"A page just for me",13,10
12
```

Explanation: The paper is advanced to the top of the following page.

LF — **Standard, IBM mode**

Function: Line feed.

Format:

ASCII:	LF	
Decimal:	10	
Hexadecimal:	$0A	

Example:

```
10,10,10
```

Explanation: This command prints the data in the print buffer and advances the paper to the next line (according to the given line spacing).

ESC 5 — **IBM mode**

Function: Switches the automatic line feed on or off.

Format:

ASCII:	ESC	"5"	n
Decimal:	27	53	n
Hexadecimal:	$1B	$35	n

Parameter: n=0: Turns the automatic line feed on.
n=1: Turns the automatic line feed off.

Example:

```
27,53,1
```

Explanation: This command adds a line feed after each carriage return.

ESC J — **Standard, IBM mode**

Function: Line feed to n/216 inch (9 pin) or n/180 inch (24 pin).

Format:

ASCII:	ESC	"J"	n
Decimal:	27	74	n
Hexadecimal:	$1B	$4A	n

Parameter: A value between 0 and 255 must be entered for n.

Example:

```
27,74,100
"smaller",13,10
27,74,10
"smaller",13,10
13,10
27,74,50
"larger",13,10
27,74,200
"larger",13,10
```

Explanation: The paper is advanced n/216 inch with 9 pin printers and n/180 inch with 24 pin printers.

A setting of n=36 with 9 pin printers is the standard setting for single spacing (6 lines per inch). The value of n=30 is given for 24 pin printers.

ESC 0 (NUL) **Standard, IBM mode**

Function: Line spacing of 1/8 inch.

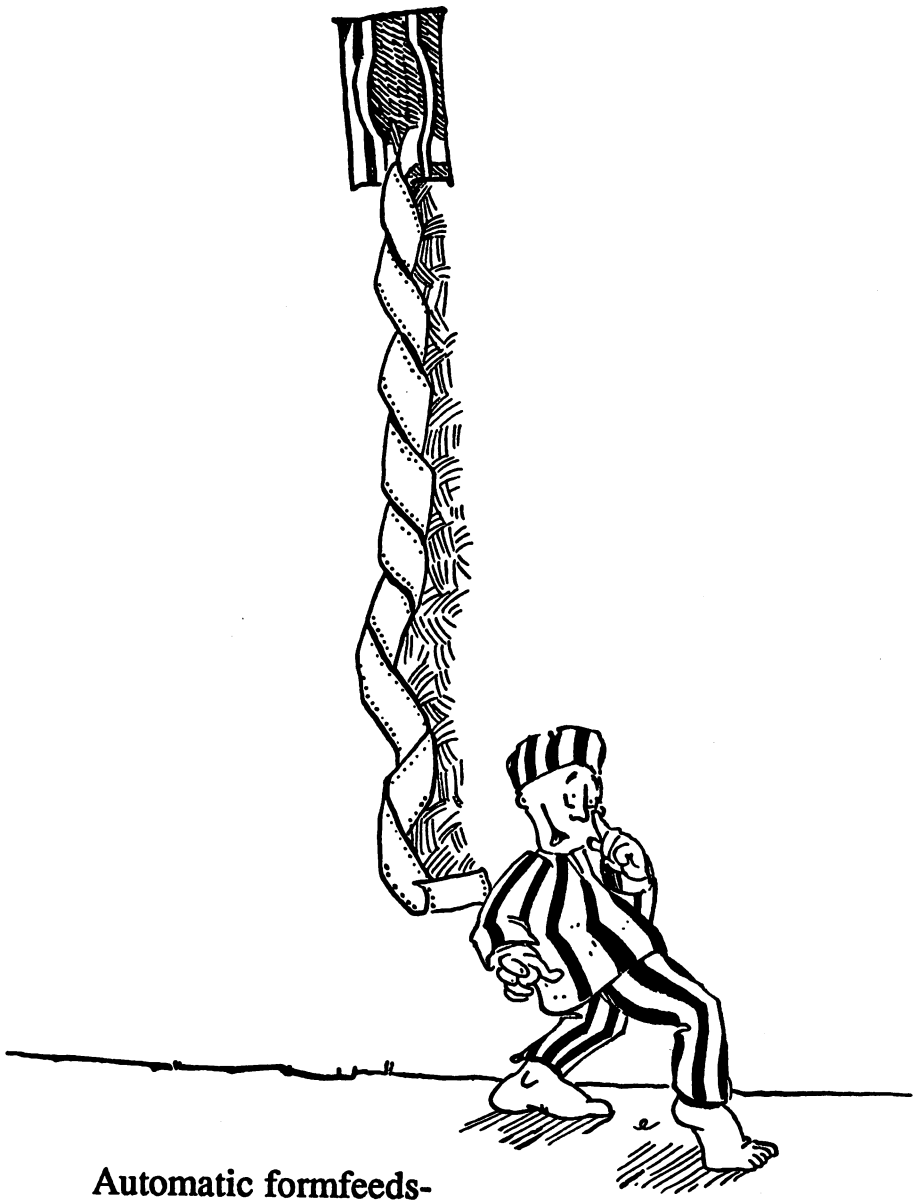
Format:

ASCII:	ESC	"0"
Decimal:	27	48
Hexadecimal:	$1B	$30

Example:

```
27,48
"hello",13,10
```

Explanation: This command sets the line spacing to 1/8 inch. Therefore you can have 96 lines on continuous feed paper or 94 lines on a single sheet (8.5 x 11 inch size). With NUL, it is handled as the ASCII character 0 instead of as the value "0".



Automatic formfeeds-
they work for me!

ESC 1 — Standard, IBM mode

Function: Line spacing 7/72 inch.

Format:

ASCII:	ESC	"1"
Decimal:	27	49
Hexadecimal:	$1B	$31

Example:

```
27,49
"goodbye",13,10
```

Explanation: This command is valid only for 9 pin printers. The line spacing is set at 7/72 inch for the following line feed commands. It is handled as the ASCII character 1, not as the value 1.

ESC 2 — Standard, IBM mode

Function: Line spacing of 1/6 inch (standard setting).

Format:

ASCII:	ESC	"2"
Decimal:	27	50
Hexadecimal:	$1B	$32

Example:

```
27,50
"hello again",13,10
```

Explanation: Epson: The line spacing is set to 1/6 inch for the following line feed commands. It is handled as the ASCII character 2, not the ASCII code 2. This is the given value when the printer is switched on.

IBM: Uses the line spacing saved with `ESC A`. If an `ESC A` command was not sent, `ESC 2` sets the line spacing at 1/6 inch. The 2 is handled as the numeral 2, not the ASCII code 2.

ESC 3 — Standard, IBM mode

Function: Line spacing of n/216 inch (9 pin) and n/180 inch (24 pin).

Format:

ASCII:	ESC	"3"	n
Decimal:	27	51	n
Hexadecimal:	$1B	$33	n

Parameter: n is a value ranging from 0 to 255.

Example:

```
27,51,100
"smaller",13,10
"smaller",13,10
10
27,51,200
"larger",13,10
"larger",13,10
```

Explanation: The line spacing is set to n/smallest feed for all additional line feed commands. This is n/216 inch for 9 pin printers and n/180 inch for 24 pin printers. The larger the value for n, the larger the line spacing.

ESC A — Standard, IBM mode

Function: Line spacing of n/72 inch (9 pin) and n/60 inch (24 pin).

Format:

ASCII:	ESC	"A"	n
Decimal:	27	65	n
Hexadecimal:	$1B	$41	n

Parameter: n is a value ranging from 0 to 85.

Example:

```
27,65,40
"smaller",13,10
"smaller",13,10
10
27,65,80
"larger",13,10
"larger",13,10
```

Explanation: Epson: The line spacing is set to n/middle feed for all of the line feed commands. This is n/72 inch for 9 pin and n/60 inch for 24 pin printers.

IBM: Sets the line spacing to n/72. This value stays in memory until the printer receives an ESC 2 command. A value between 0 and 85 must be given for n.

ESC + — Expanded ESC/P Command set

Function: Line spacing of n/360 inch.

Format:

ASCII:	ESC	"+"	n
Decimal:	27	43	n
Hexadecimal:	$1B	$2B	n

Parameter: n is a value ranging from 0 to 255.

Example:
```
27,43,100
"smaller",13,10
"smaller",13,10
10
27,43,200
"larger",13,10
"larger",13,10
```

Explanation: The line spacing is set to n/360 for all of the subsequent line feed commands. The larger the value of n, the larger the line feed.

Text Formatting

NOTE: These commands correspond to the most recent ESC/P command set available. Your printer may not respond to some of these commands. Check the command type and consult your printer manual for more information.

ESC N — Standard, IBM mode

Function: Sets bottom margin.

Format:

ASCII:	ESC	"N"	n
Decimal:	27	78	n
Hexadecimal:	$1B	$4E	n

Parameter: n is a value ranging from 0 to 127.

Example:
```
27,78,32
```

Explanation: This command establishes the bottom margin. The range is a value between 0 and 127. The proper bottom margin setting is important because the page length depends on it. The bottom margin is automatically placed at 1 if the "skip perforation" DIP is ON. If the page length is changed with the ESC C or ESC C NUL command, the ESC N command is cancelled.

ESC O — Standard, IBM mode

Function: Deletes the bottom margin.

Format:

ASCII:	ESC	"O"
Decimal:	27	79
Hexadecimal:	$1B	$4F

Example: `27,79`

Explanation: The bottom margin, which is set with the `ESC N` command is deleted with the `ESC O` command. This means that the print output will be continued endlessly unless the software takes control of the page format. The bottom margin is erased with this command if the skip perforation DIP switch is ON.

VT — Standard, IBM mode

Function: Vertical tabs.

Format:

ASCII:	VT
Decimal:	11
Hexadecimal:	$0B

Example: See `ESC B`.

Explanation: This command prints the data in the buffer and then advances the paper to the next set tab, which is chosen with `ESC /`. If you haven't selected a channel, 0 will be used. The paper is advanced a line further if no vertical tabulators are set.

ESC B — Standard, IBM mode

Function: Set vertical tabs.

Format:

ASCII:	ESC	"B"	n1	n2	...	"NUL"
Decimal:	27	66	n1	n2	...	0
Hexadecimal:	$1B	$42	n1	n2	...	$00

Parameter: The tab values are entered as n1, n2, n3 and so on. n must be between 1 and 255 and must be entered in ascending order.

Example:

```
27,66,15,30,45,60,0
"TAB1",11
"TAB2",11
"TAB3",11
"TAB4",11
```

Explanation: You can use different line spacings in a page by setting vertical tabs instead of changing the setting of the line spacing. The character NUL (dec 0) marks the end of the command. All tab settings can be cleared with the `ESC B` command followed by NUL. Changing the line spacing after this command has no influence on the absolute position of the tabs.

ESC b — Standard

Function: Sets the vertical tab channel.

Format:

ASCII:	ESC	"b"	c	n1	n2	...	"NUL"
Decimal:	27	98	c	n1	n2	...	0
Hexadecimal:	$1B	$62	c	n1	n2	...	$00

Parameters: The channel number is given with c. This variable contains the channel numbers 0 through 7. n1 and n2, the tab positions, are entered as values between 1 and 255 (ascending order).

Example: See `ESC /`

Explanation: This command enables you to set a maximum of 16 vertical tabs in one of 8 tab channels. Other tabs can be set in each of these eight channels. With the `ESC /` command you can choose the channels from which the tabs are used. The end of the command is marked with the character NUL. The tabs can be cleared by executing the `ESC B` and `NUL` commands. The absolute position of the tab is unchanged if the line spacing is changed with this command.

ESC / — Standard

Function: Selects the vertical tab channel.

Format:

ASCII:	ESC	"/"	c
Decimal:	27	47	c
Hexadecimal:	$1B	$2F	c

Parameter: A value between 0 and 7 must be chosen for the variable c.

Example:

```
27,47,1
27,98,1,15,30,45,60,0
27,47,1
"TAB1",11
"TAB2",11
"TAB3",11
"TAB4",11
```

Explanation: All additional `VT` commands use the tab setting from tab channel c.

ESC l — Standard

Function: Sets the left margin.

Format:

ASCII:	ESC	"l"	n
Decimal:	27	108	n
Hexadecimal:	$1B	$6C	n

Parameters: The left margin is set with n columns in the respective character width. n must be a value ranging from 0 to 160.

Example:

```
27,108,10
"Print up to the 11th column",13,10
```

Explanation: This command sets the left margin. The value will be ignored if it's larger than 8 inches. The margin position is reached according to the size of the characters. The right margin is set to the character size 10 pitch with proportional text. The command must be at the beginning of the line. All of the data in the same line in the print buffer disappears. The character used here is a 1 (left) and may not be swapped with the numeral 1.

ESC Q — Standard

Function: Sets the right margin.

Format:

ASCII:	ESC	"Q"	n
Decimal:	27	81	n
Hexadecimal:	$1B	$51	n

Parameter: n is a value ranging from 1 to 255.

Example:

```
27,81,70
"The last character is in the 70th column"
"The text continues in the next line",13,10
```

Explanation: This command must be given at the beginning of a line. The absolute position of the margin depends on the respective text size (compressed text, expanded text, normal text). The right margin corresponds to the setting of pica text with proportional text. All of the data in the same line in the print buffer is erased. A carriage return and a line feed command are sent when the right margin is reached.

ESC X — IBM mode

Function: Sets the left and right margins.

Format:

ASCII:	ESC	"X"	n1	n2
Decimal:	27	88	n1	n2
Hexadecimal:	$1B	$58	n1	n2

Parameter: The left margin is set to n1 in the respective character width and the right margin is set to n2. The values for n1 and n2 must be between 0 and 255.

Example:

```
27,88,10,70
"The first character is in the 11th column"
"and the last character is in the 70th column",13,10
```

Explanation: The absolute position of the margin setting depends on the text size chosen. The smallest width setting of the print area is .5 inches. This command must be at the beginning of the line since all of the data in the same line in the print buffer is erased.

HT — Standard, IBM mode

Function: Tabulates horizontally.

Format:

ASCII:	HT
Decimal:	9
Hexadecimal:	$09

Example:

```
27,68,15,30,45,60,0
"TAB1",09
"TAB2",09
"TAB3",09
"TAB4",13,10
27,82
"TAB1",09
"TAB2",09
"TAB3",09
"TAB4",13,10
```

Explanation: Epson: The next horizontal tab is controlled with this command. If this value isn't changed with the ESC D command, the standard width is set at a distance of 8 characters. Since it's handled as the absolute position in a print line, the character width is not changed any further. The command is ignored if another text supply is chosen as left justified with the ESC a command.

IBM: Tabs are set at character positions in this mode, so that the absolute position on the line is changed when the character size changes. The tab can then be set to a character position according to the actual character size.

Various software programs and some operating systems do not send HT characters to the printer. Instead, they set them to null characters so that the output is controlled from the printer and the tabs of the printer cannot be used.

ESC D **Standard, IBM mode**

Function: Sets the horizontal tabs.

Format:

ASCII:	ESC	"D"	n1	n2	...	"NUL"
Decimal:	27	68	n1	n2	...	0
Hexadecimal:	$1B	$44	n1	n2	...	$00

Parameter: Up to 32 horizontal tabulators can be set as n1, n2, n3, n4 (values between 1 and 255).

Example:

```
27,68,15,30,45,60,0
"TAB1",09
"TAB2",09
"TAB3",09
"TAB4",09,13,10
27,68,0
```

Explanation: This command enables you to set 32 horizontal tabs. They must be entered in ascending order with the values for n1, n2, n3, and so on. The character NUL ends the command. The tabs are set in pica distance with proportional print. To clear the tabs, use the command `ESC D NUL`.

ESC R **IBM mode**

Function: Restores the default tabs.

Format:

ASCII:	ESC	"R"
Decimal:	27	82
Hexadecimal:	$1B	$52

Example:

```
27,68,15,30,45,60,0
"TAB1",09
"TAB2",09
"TAB3",09
"TAB4",13,10
27,82
"TAB1",09
"TAB2",09
"TAB3",09
"TAB4",13,10
```

Explanation: This command clears all of the vertical and horizontal tabs.

ESC $ — Standard

Function: Sets the absolute horizontal printhead position.

Format:

ASCII:	ESC	"$"	n1	n2
Decimal:	27	36	n1	n2
Hexadecimal:	$1B	$24	n1	n2

Parameter: The printhead is placed in an absolute position independent of the character size. n1 must have a value between 0 and 255 and n2 must have a value between 0 and 3.

Example:

```
27,36,100,2
```

Explanation: The point position is performed according to the formula (n1 + n2 x 256). Each point corresponds to 1/60 inch. The maximum point position can be given with 816. However, the command doesn't know if the given position exceeds the right margin.

ESC \ — Standard

Function: Sets relative point position.

Format:

ASCII:	ESC	"\"	n1	n2
Decimal:	27	92	n1	n2
Hexadecimal:	$1B	$5C	n1	n2

Parameter: The printhead moves to a point position relative to its current position. The values for n1 and n2 must be between 0 and 255.

Example:

```
27,92,100,2
```

Explanation: The printhead can be moved to any point on the page in order to start the printing. The movement is done according to the formula (n1 + 256 x n2). One point corresponds to 1/120 inch. The movement must be

calculated from n1 and n2 in points. If the data is put on the left side, the value of 65.536 is used. The command will be ignored if the printhead is moved outside the margins. The number of points can be calculated as follows:

```
n1=n x MOD 256
n2=INT(n/256)
```

ESC SP **Standard**

Function: Defines the intermediate space between the characters.

Format:

ASCII:	ESC	SP	n
Decimal:	27	32	n
Hexadecimal:	$1B	$20	n

Parameter: The size of the space is given in n point positions (a value between 0 and 127).

Example:

```
"ABC",13,10
27,32,60
"ABC",13,10
```

Explanation: This command determines how much space appears to the right of each character before another character starts.

ESC a **Standard**

Function: Chooses the text alignment.

Format:

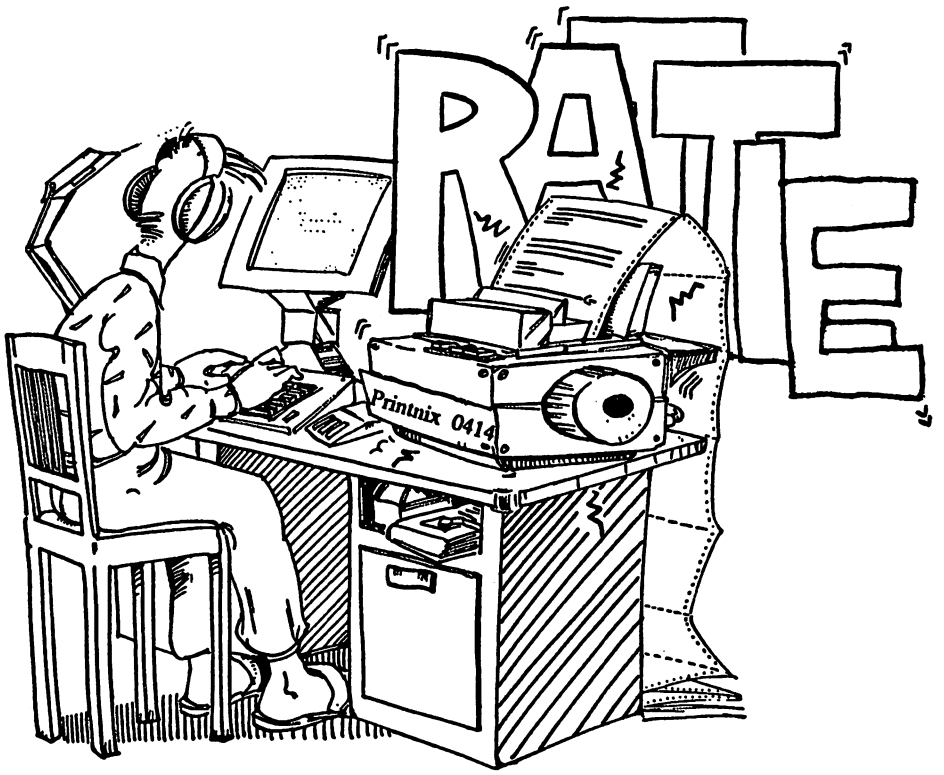
ASCII:	ESC	"a"	n
Decimal:	27	97	n
Hexadecimal:	$1B	$61	n

Parameter:
0=left justified
1=centered
2=right justified
3=fully justified

Example:

```
27,97,2
"This is a test of the ESC a command to see",13,10
"if it actually right justifies text",13,10
"This concludes this test",13,10
```

Explanation: While using word processors, you frequently need to center or justify your text. This command should be given at the beginning of the line. Any previous text in the same line will not be affected. If n=3 is chosen, no text line adjustments can be made while entering text.


RATE
Printnix 0414

Text Types

NOTE: These commands correspond to the most recent ESC/P command set available. Your printer may not respond to some of these commands. Check the command type and consult your printer manual for more information.

ESC x **Standard**

Function: Selects the print mode.

Format:

ASCII:	ESC	"x"	n
Decimal:	27	120	n
Hexadecimal:	$1B	$78	n

Parameter:
n=0: normal text
n=1: high quality text

Example:
```
27,120,1
"Nice acrobaaaaat",13,10
```

Explanation: The draft mode is used with n=0 and the LQ/NLQ mode is used with n=1.

ESC k **Standard**

Function: Selects LQ/NLQ text.

Format:

ASCII:	ESC	"k"	n
Decimal:	27	107	n
Hexadecimal:	$1B	$6B	n

Parameter: n=LQ/NLQ text type, according to the printer used.

Explanation: A text type is chosen with this command. Changes after the selection of the LQ/NLQ mode go into effect as long as the printer is in the draft mode while you are entering the command.

ESC I — IBM mode

Function: Chooses the text type.

Format:

ASCII:	ESC	"I"	n
Decimal:	27	73	n
Hexadecimal:	$1B	$49	n

Parameter:

0 draft mode, standard
2 NLQ mode
4 user defined characters in the draft mode
6 user defined characters in the NLQ mode

Explanation: One of the described text types is chosen according to the value of n. The draft mode is equivalent to the fast text and is advised only for pictures. The letters are printed near letter quality in the NLQ mode.

Any new characters must be defined beforehand with the ESC = command for n=4 and n=6.

ESC ! — Standard

Function: Combines print modes.

Format:

ASCII:	ESC	"!"	n
Decimal:	27	33	n
Hexadecimal:	$1B	$21	n

Parameter: This command allows you to combine the control of the text size, the text variants and other print settings.

Explanation: With this command you can select the acceptable combinations of the following modes: 10 pitch (Pica), 12 pitch (Elite), proportional text, small or bold text, double strike, italics and underlined. If the mode is active, a 1 is set and if the mode is inactive, a 0 is set. The bit position of the mode should be described in your manual. The result comes from multiplying the number (0 or 1) of the position by 2 and adding these values.

Text Size

NOTE: These commands correspond to the most recent ESC/P command set available. Your printer may not respond to some of these commands. Check the command type and consult your printer manual for more information.

ESC P — **Standard**

Function: Selects 10 cpi (Pica).

Format:

ASCII:	ESC	"P"
Decimal:	27	80
Hexadecimal:	$1B	$50

Example:

```
27,80
"The character width pica",13,10
```

Explanation: The text type Pica (10 characters per inch) is selected with this command.

ESC M — **Standard**

Function: Selects 12 cpi (Elite).

Format:

ASCII:	ESC	"M"
Decimal:	27	77
Hexadecimal:	$1B	$4D

Example:

```
PRINTER 27,"M"
PRINTER "Text width Elite",13,10
```

Explanation: The text type Elite (12 characters per inch) is entered with this command and deactivates the standard type Pica (10 characters per inch).

ESC : — **IBM mode**

Function: Selects 12 cpi (Elite).

Format:

ASCII:	ESC	":"
Decimal:	27	58
Hexadecimal:	$1B	$3A

Example:

```
27,58
"The character width Elite",13,10
```

Example:
```
27,58
"The character width Elite",13,10
```

Explanation: 12 characters per inch are printed with the Elite text type.

ESC g — Expanded ESC/P Command set

Function: Selects micro print (15 cpi).

Format:

ASCII:	ESC	"g"
Decimal:	27	103
Hexadecimal:	$1B	$67

Example:
```
RESET
"Pica (10 characters per inch)",13,10
27,103
"Micro print (15 characters per inch)",13,10
27,80
```

Explanation: This command allows a printing of 15 characters per inch. The print is smaller both vertically and horizontally. Pica and Elite are switched off with this command. You can deactivate the micro print by activating a text type that was previously active. A combination with small print is not possible.

ESC p — Standard

Function: Switches proportional print on/off.

Format:

ASCII:	ESC	"p"	n
Decimal:	27	112	n
Hexadecimal:	$1B	$70	n

Parameter:
n=1: mode activated
n=0: mode deactivated

Example:
```
27,112,1
"Proportional",13,10
27,112,0
"Monospace",13,10
```

Explanation: The width of a character in proportional text varies according to the character used (for example, o needs more space than i). If this text is selected, the respective character spacing is deactivated. Combining proportional text with block set is possible only with a word processor that can process proportional text.

ESC P — **IBM mode**

Function: Switches proportional print on/off.

Format:

ASCII:	ESC	"P"	n
Decimal:	27	80	n
Hexadecimal:	$1B	$50	n

Parameter: n=1: mode activated
n=0: mode deactivated

Example:

```
27,80,1
"Proportional",13,10
27,80,0
"Monospace",13,10
```

Explanation: The command selects the proportional text which is activated with n=1 and deactivated with n=0.

SI — **Standard, IBM mode**

Function: Activates condensed print for one line.

Format:

ASCII:	SI
Decimal:	15
Hexadecimal:	$0F

Example: See DC2.

Explanation: Epson: With this command, text characters are printed at 60% of their normal width. This command does not work in the letter quality mode of the 9 pin printer.

IBM: Condensed print cannot be combined with Pica, Elite or proportional.

ESC SI — **Standard, IBM mode**

Function: Activates condensed print.

Format:

ASCII:	ESC	SI
Decimal:	27	15
Hexadecimal:	$1B	$OF

Example: See DC2.

Explanation: This command is the same as the `SI` command.

DC2 — Standard, IBM mode

Function: Deactivates condensed, Elite and proportional prints (IBM mode).

Format:

ASCII:	DC2
Decimal:	18
Hexadecimal:	$12

Example:

```
27,15
"Small",13,10
18
```

Explanation: Epson: The condensed print that was activated with the SI and ESC SI commands is cancelled.

IBM: Deactivates condensed print, Elite and proportional texts, and activates the Pica text size.

ESC SO — Standard, IBM mode

Function: Selects expanded print for one line.

Format:

ASCII:	ESC	SO
Decimal:	27	14
Hexadecimal:	$1B	$0E

Example: See DC4.

Explanation: The characters of the following text are increased to double their width with this command. ESC SO is cancelled with the DC4 command or a carriage return.

DC4 — Standard, IBM mode

Function: Cancels expanded print.

Format:

ASCII:	DC4
Decimal:	20
Hexadecimal:	$14

Example:

```
27,14,"Wide",13,10
20,"Normal width",13,10
```

Explanation: Any expanded text activated with the SO or ESC SO commands will be cancelled with this command. However, this command has no effect if the expanded text was activated with ESC W.

ESC W — **Standard, IBM mode**

Function: Activates/deactivates expanded print.

Format:

ASCII:	ESC	"W"	n
Decimal:	27	87	n
Hexadecimal:	$1B	$57	n

Parameter: n=1: activated mode
n=0: deactivates mode

Example:

```
27,87,1
"Wide",13,10
27,87,0
"Normal text",13,10
```

Explanation: All of the characters following this command are displayed in expanded text if n=1. This command is cancelled if n=0. The number of characters per line is cut in half with expanded print.

ESC w — **Expanded ESP/C Command set**

Function: Deactivates/activates doubled character height.

Format:

ASCII:	ESC	"w"	n
Decimal:	27	119	n
Hexadecimal:	$1B	$77	n

Parameter: The characters are doubled in height if n=1. If n=0, the double height characters are cancelled.

Example:

```
27,119,1
"doubled height",13,10
27,119,0
"normal height",13,10
```

Explanation: All of the characters after this command are printed in double height as long as n=1. This command cannot be used in conjunction with the small print. If the proportions should be set, the line spacing must be changed with the height of the characters so that you get the correct number of lines per page.

ESC [@ IBM mode

Function: Selects the character height mode.

Format:

ASCII:	ESC	"["	"@"	n1	n2	m1	m2	m3	m4
Decimal:	27	91	64	n1	n2	m1	m2	m3	m4
Hexadecimal:	$1B	$5B	$40	n1	n2	m1	m2	m3	m4

Parameter: This command sets the character height and the line spacing.

Example:

```
27,91,64,4,0,0,0,32,2
```

Explanation: n1, n2, m1 and m2 are determined as follows:

n1=4
n2=0
m1=0
m2=0

The value for m3 sets the line spacing and the character height. m4 sets the character width.

m3	line spacing and character height
0	unchanged
1	unchanged line spacing, normal height
2	normal line spacing, doubled height
16	normal line spacing, unchanged height
17	normal line spacing, normal height
18	normal line spacing, doubled height
32	doubled line spacing, unchanged height
33	doubled line spacing, normal height
34	doubled line spacing, doubled height

m3 values, line spacing and character height

m4	character width
0	unchanged
1	standard width
2	doubled width

m4 values, character width

Special Effects

NOTE: These commands correspond to the most recent ESC/P command set available. Your printer may not respond to some of these commands. Check the command type and consult your printer manual for more information.

ESC E — **Standard, IBM mode**

Function: Sets bold print.

Format:

ASCII:	ESC	"E"
Decimal:	27	69
Hexadecimal:	$1B	$45

Example: See `ESC F`.

Explanation: The individual points are printed twice in bold print. Although bold print can be combined with double strike, the print speed will be slower.

ESC F — **Standard, IBM mode**

Function: Switches bold print off.

Format:

ASCII:	ESC	"F"
Decimal:	27	70
Hexadecimal:	$1B	$46

Example:

```
27,69
"Bold is nice",13,10
27,70
"Normal text",13,10
```

Explanation: The bold print that was switched on with `ESC E` is cancelled.

ESC G — **Standard, IBM mode**

Function: Activates double strike.

Format:

ASCII:	ESC	"G"
Decimal:	27	71
Hexadecimal:	$1B	$47

Example: See ESC H.

Explanation: This command double strikes the text so each line is printed twice. Although double strike can be combined with bold print, the print speed will be slower.

ESC H — Standard, IBM mode

Function: Deactivates double strike.

Format:

ASCII:	ESC	"H"	
Decimal:	27	72	
Hexadecimal:	$1B	$48	

Example:

```
27,72
"Double strike",13,10
27,73
"Normal text",13,10
```

Explanation: Cancels the double strike command activated by ESC G.

ESC S — Standard, IBM mode

Function: Activates superscript/subscript.

Format:

ASCII:	ESC	"S"	n
Decimal:	27	83	n
Hexadecimal:	$1B	$53	n

Parameter: n=0: activates superscript
n=1: activates subscript

Example:

```
72
27,83,0
"superscript",13,10
RESET
84
27,83,1
"subscript",13,10
```

Explanation: The characters will appear 1/3 smaller vertically and horizontally in the printout. Any underlining will appear normally.

Another cup of tea?

ESC T — Standard, IBM mode

Function: Deactivates superscript/subscript.

Format:

ASCII:	ESC	"T"	
Decimal:	27	84	
Hexadecimal:	$1B	$54	

Example:

```
27,83,1
"subscript",13,10
27,84
"normal text",13,10
```

Explanation: This command cancels the settings in `ESC S`.

ESC - — Standard, IBM mode

Function: Switches underline on/off.

Format:

ASCII:	ESC	"-"	n
Decimal:	27	45	n
Hexadecimal:	$1B	$2D	n

Parameter:
n=1: activates the mode
n=0: deactivates the mode

Example:

```
27,45,1
"underline",13,10
27,45,0
"normal text",13,10
```

Explanation: All of the characters and spaces are underlined. Be sure that the final row of points are underlined when defining certain characters.

ESC — IBM mode

Function: Activates/deactivates the over line.

Format:

ASCII:	ESC	"_"	n
Decimal:	27	95	n
Hexadecimal:	$1B	$5F	n

Parameter:
n=1: activates the mode
n=0: deactivates the mode

Example:

```
27,95,1
"over line",13,10
27,95,0
"normal text",13,10
```

Explanation: This command makes an over line possible. With n=1 this command is activated and with n=0 this command is deactivated.

ESC (- Expanded ESC/P Command set

Function: Selects line marking.

Format:

ASCII:	ESC	"(-"		n1	n2	m	d1	d2
Decimal:	27	40	45	n1	n2	m	d1	d2
Hexadecimal:	$1B	28	2D	n1	n2	m	d1	d2

Parameter: The first three values are assigned as follows:

n1=3,n2=0,m=1

The value for d1 sets the position of the marker:

d1	marker
1	underline
2	hyphen
3	over line

d1 values, set position of marker

The value d2 defines the type of marker: if the line should be single, doubled, broken or hyphenated:

d2	line type
0	erase the mode that was defined with d1
1	single hyphenated line
2	doubled hyphenated line
5	single broken line
6	doubled broken line

d2 values, type of marker

Example:

```
27,40,45,3,0,1,2,6
"You can mark invalid text",13,10
27,40,45,3,0,1,1,2
"and leave important text alone",13,10
27,40,45,3,0,1,1,0
```

Explanation: You can set different types of line markers with this command. Double and single lines are not possible in the same print position.

ESC q — **Expanded ESC/P Command set**

Function: Selects the character representation.

Format:

ASCII:	ESC	"q"	n
Decimal:	27	113	n
Hexadecimal:	$1B	71	n

Parameter:

n	character representation
0	standard (erases all previous settings)
1	outline
2	shadow
3	outline shadow combined

Character representation

Example:

```
27,120,1,27,113,1
"Outlining can be used in LQ mode",13,10
27,119,1,27,87,1,27,113,3
"TITLE",13,10
27,120,0,27,113,0
27,119,0,27,87,0
```

Explanation: Special print effects can be chosen with this command. An example of this is the use of outline and shadow to enhance titles.

Character Sets

NOTE: These commands correspond to the most recent ESC/P command set available. Your printer may not respond to some of these commands. Check the command type and consult your printer manual for more information.

ESC t — **Standard**

Function: Selects character sets.

Format:

ASCII:	ESC	"t"	n
Decimal:	27	116	n
Hexadecimal:	$1B	$74	n

Parameter: n=0: selects italic character set
n=1: selects graphic character set

Example:

```
27,116,0
193,13,10
27,116,1
193,13,10
```

Explanation: The graphic character set is selected with n=1. Graphic characters can be converted into control codes with the ESC 7 command. The italic character set is selected with n=0. This is chosen from the upper half of the table, which also contains the control codes. These can be made into printable codes with ESC 6.

The ESC 7 command can be cancelled with the ESC 6 command. The character tables can accept which characters can be inserted in the individual modes.

ESC 4 — Standard

Function: Selects italic print.

Format:

ASCII:	ESC	"4"
Decimal:	27	52
Hexadecimal:	$1B	$34

Example: See ESC 5.

Explanation: The command prints the characters, in italics, that follow it. Italic characters are also printed if codes with an eight bit set are sent to the printer.

ESC 5 — Standard

Function: Deactivates italic print.

Format:

ASCII:	ESC	"5"
Decimal:	27	53
Hexadecimal:	$1B	$35

Example:

```
27,52
"italics",13,10
27,53
"normal text",13,10
```

Explanation: The italic print activated with the ESC 4 command is erased. The italic print is used again if a code over 128 is received.

ESC 6 — Standard, IBM mode

Function: Expands the printable codes.

Format:

ASCII:	ESC	"6"
Decimal:	27	54
Hexadecimal:	$1B	$36

Example: See ESC 7.

Explanation: Epson: After sending this command, the higher control codes (ASCII 128-159) can be printed as characters and symbols instead of repeating the functions of the ASCII codes 0-31.

IBM: Selects the international character set (IBM character set 2). In addition, the ASCII codes 3-6 are printed as graphic symbols.

ESC 7 — Standard, IBM mode

Function: Cancels ESC 6.

Format:

ASCII:	ESC	"7"
Decimal:	27	55
Hexadecimal:	$1B	$37

Example:

```
27,26
135,13,10
27,27
135,13,10
```

Explanation: Epson: The ASCII codes 128-159 are allocated with control codes with this command. If the ESC 7 command is sent, the codes 128-159 become control codes that correspond to the codes 0-31 in the bottom half of the character set.

IBM: Chooses the IBM character set (IBM character set 1) if the international character was activated (IBM character set 2).

ESC I — Standard

Function: Expands the printable codes.

Format:

ASCII:	ESC	"I"	n
Decimal:	27	73	n
Hexadecimal:	$1B	$49	n

Parameter: n=1: printable ASCII codes
n=0: non-printable ASCII codes

Example:
```
27,73,1
7,135,13,10
27,73,0
7,135,13,10
```

Explanation: If you enter n=1, the ASCII codes 0-31 and 128-159 can now be printed. These codes cannot be printed in the usual way. Instead, the user defined characters are used. The ASCII codes 0-31 and 128-159 cannot be printed again if you enter n=0.

ESC R **Standard**

Function: Activates the international character set.

Format:

ASCII:	ESC	"R"	n
Decimal:	27	82	n
Hexadecimal:	$1B	$52	n

Parameter:

n	country
0	USA
1	France
2	Germany
3	Great Britain
4	Denmark 1
5	Sweden
6	Italy
7	Spain
8	Japan
9	Norway
10	Denmark 2
11	Spain 2
12	Latin America

International character set

Example:
```
27,82,2
123,124,125,126,13,10
27,82,0
123,124,125,126,13,10
```

Explanation: Certain character codes can be used to enter foreign characters. The differences in each of the languages can be taken from different character sets.

ESC & Standard

Function: Sets user-defined characters.

Format:

ASCII:	ESC	"&"	NUL	n	m	data...
Decimal:	27	38	0	n	m	data...
Hexadecimal:	$1b	$26	$00	n	m	data...

Parameter: Characters are defined with this command:

n ASCII code of the character defined first
m ASCII code of the character defined last

Example: See "Creating User-Defined Characters" in Chapter 6.

Explanation: This command makes it possible to create some characters (see Chapter 6). If only one character is defined then n=m. You must define the characters in the mode in which they are to be printed later. The data contains a row for each of the characters to be defined. The exact number of data depends on the character type to be defined.

ESC : Standard

Function: Copies ROM into RAM.

Format:

ASCII:	ESC	":"	NUL	NUL	NUL
Decimal:	27	58	0	0	0
Hexadecimal:	$1b	$3A	$00	$00	$00

Example: See Chapter 6.

Explanation: Copies characters from ROM into RAM. This ensures that certain characters can be redefined without changing every character.

ESC % Standard

Function: Activates/deactivates user-defined character set.

Format:

ASCII:	ESC	"%"	n
Decimal:	27	37	n
Hexadecimal:	$1B	$25	n

Parameter: n=1: activates the user-defined character set
n=0: deactivates the user-defined character set

Example: See Chapter 6.

ESC = **IBM mode**

Function: User-defined characters.

Format:

ASCII:	ESC	"="	n1	n2	...	nk
Decimal:	27	61	n1	n2	...	nk
Hexadecimal:	$1B	$3D	n1	n2	...	nk

Parameter: If c = the entire number of characters to be defined, then:

b	(c x 13) + 2
n1	b MOD 256
n2	INT (b/256)
n3	20 in all cases
n4	the code of the character defined first
n5	0 if the 8 pins above are used
n5	128 if the bottom pins are used
n6	0 in all cases
n7	up to nk contain the data that defines the characters; 11 data numbers are given for each character

Example: See Chapter 6.

Explanation: The data numbers for the individual characters come from the raster for the Epson mode in Chapter 7. If a user defined character should be printed, the `ESC I` command must be given.

ESC ** **IBM mode

Function: Prints a character from the symbol character set.

Format:

ASCII:	ESC	"\"	n1	n2	data
Decimal:	27	92	n1	n2	data
Hexadecimal:	$1B	$5C	n1	n2	data

Parameter: See explanation.

Example:

```
27,92,3,0,4,5,6,13,10
```

Explanation: This command prints a number of characters from the IBM symbol character set. The number of characters = n1 + (n2 x 256). Symbol character sets and the respective data codes are found in Appendix A.

ESC ^ IBM mode

Function: Prints a character from the symbol character set.

Format:

ASCII:	ESC	"^"	c
Decimal:	27	94	c
Hexadecimal:	$1B	$5E	c

Parameter: The variable c stands for a character.

Example:

```
27,94,3,13,10
```

Explanation: A character = c is printed from the symbol character set. The symbol character set and the codes used for c are in Appendix A.

Graphics

NOTE: These commands correspond to the most recent ESC/P command set available. Your printer may not respond to some of these commands. Check the command type and consult your printer manual for more information.

ESC * Standard

Function: Selects graphics mode.

Format:

ASCII:	ESC	"*"	m	n1	n2	data...
Decimal:	27	42	m	n1	n2	data...
Hexadecimal:	$1B	$2A	m	n1	n2	data...

Parameter: The values n1 and n2 designate the number of the data column. The number is produced as follows: n1 + (n2 x 256).

Mode	pixel width	pixels/inch	adjoining pixels	pins
0	single density	60	possible	8
1	double density	120	possible	8
2	high speed/thickness	120	not possible	8
3	quadruple density	240	not possible	8
4	screen graphics	80	possible	8
5	plotter (1:1)	72	possible	8
6	screen graphics	90	possible	8
7	double density,plotter	144	possible	8
32	single density	60	possible	24
33	double density	120	possible	24
38	screen graphics III	90	possible	24
39	triple density	180	possible	24
40	sextuple density	360	not possible	24

Data column

Example: See "Printing Graphics" in Chapter 6.

Explanation: m selects the corresponding graphics mode. By varying the point density you can change the horizontal dimension of the newly defined graphic. A graphic with a resolution of 120 dpi is only half as wide as the same graphic with 60 dpi. The clarity and sharpness of the printout changes with the height of the resolution.

ESC K — **Standard, IBM mode**

Function: Activates the 8 point graphic print with single density.

Format:

ASCII:	ESC	"K"	n1	n2	data...
Decimal:	27	75	n1	n2	data...
Hexadecimal:	$1B	$4A	n1	n2	data...

Parameter: See explanation.

Example: See Chapter 6.

Explanation: The graphics mode with single density is chosen with this command. This function can also be entered with the `ESC *` command and m=0 (standard). The entire number of columns is calculated with n1 + (n2 * 256).

ESC L — **Standard, IBM mode**

Function: Activates the 8 point graphic print with double density.

Format:

ASCII:	ESC	"L"	n1	n2	data...
Decimal:	27	76	n1	n2	data...
Hexadecimal:	$1B	$4C	n1	n2	data...

Parameter: See explanation.

Example: See Chapter 6.

Explanation: The graphic print with double density is activated with this command. The same effect can be achieved with the `ESC *` command and m. `ESC L` can be redefined by `ESC ?` and another mode chosen. The number of columns is calculated with n1 + (n2 * 256).

ESC Y — **Standard, IBM mode**

Function: Activates the graphic print with double density and high speed.

Format:

ASCII:	ESC	"Y"	n1	n2	data...
Decimal:	27	89	n1	n2	data...
Hexadecimal:	$1B	$59	n1	n2	data...

Parameters: See explanation.

Example: See Chapter 6.

Explanation: The graphics mode is selected with double density and higher speed. The effect is the same as with the ESC * command and m=2. In addition, ESC Y can be redefined with ESC ? and another mode selected (standard).

The number of columns is calculated with n1 + (n2 * 256).

ESC Z — Standard, IBM mode

Function: Activates the 8 point graphic print with quadruple density.

Format:

ASCII:	ESC	"Z"	n1	n2	data...
Decimal:	27	90	n1	n2	data...
Hexadecimal:	$1B	$5A	n1	n2	data...

Parameters: See explanation.

Example: See Chapter 6.

Explanation: Activates the graphic print with quadruple density. The same effect can be achieved with the ESC * command and m=3. ESC Z can be redefined with ESC ? and another mode selected (standard). The number of columns is calculated with n1 + (n2 * 256).

ESC ? — Standard, IBM mode

Function: Reassigns graphic commands.

Format:

ASCII:	ESC	"?"	n	m
Decimal:	27	63	n	m
Hexadecimal:	$1B	$3F	n	m

Parameters: The value m is handled as the mode m in the ESC * command. The variable n is handled as the ASCII characters K, L, Y or Z to be changed from the command sequence.

Example: See Chapter 6.

Explanation: One of the graphics modes executed under ESC * can be reassigned to one of the ESC K, ESC L, ESC Y or ESC Z commands.

ESC ^ **Standard**

Function: Activates the 9 pin graphic print.

Format:

ASCII:	ESC	"^"	m	n1	n2
Decimal:	27	94	m	n1	n2
Hexadecimal:	$1B	$5E	m	n1	n2

Parameters: The variable m sets the print density.
If m=0, the single thickness is used.
If m=1, the double thickness is used.

Explanation: The 9 point graphics mode is selected with this command. If d is the same as the number of necessary columns, then:

```
n1=d MOD 256
n2=INT(d/256)
```

Chapter 5
Software Customization

A positive trend in the computer industry recently is that software and hardware have been consistently becoming more user-friendly. Certain features such as WYSIWYG (What You See Is What You Get) word processing can save you time and money.

But even though the software may be user-friendly and versatile, you must still have the correct printer data in the software and the correct character set in the printer to obtain a printout that looks like the image on the screen.

Printer Drivers

As it stands, the trend toward user-friendliness in printer drivers is not taken very seriously. This is indicated by the number of printer drivers offered in software packages today. Usually the number of drivers are fewer than the number of printers now on the market. This is understandable, since it's impossible to keep up with the market. However, there should be ways for the user to modify a driver for his/her own printer.

Some application software manuals suggest that only well-trained programmers should try writing printer drivers. The user often has a single option: Select a similar printer driver from those offered by the application, and forget about making use of those little printer extras that cannot be accessed from the similar driver.

The efficiency of the printer driver plays a major role in the final output of the file. Therefore, programs which allow typesetting in proportional script must include a complete range of control codes to offer values for every symbol in calculating its position. All these control codes and calculations should be made more understandable.

Therefore, it's impossible to be more specific on how printer drivers are created. For some general information, though, let's look at two of Abacus products for Amiga, and how you can adapt them to support different printers.

TextPro and BeckerText printer drivers

BeckerText and TextPro enable you to modify existing printer drivers to create a custom printer driver. These drivers are located in the PRT drawers of the TextPro and BeckerText diskettes. Let's look at the standard printer driver.

BeckerText standard printer driver:

```
\0      27,'@',27,'0',27,'R',0,18   * Epson printer list
\1+     27,'E'                      * bold on
\1-     27,'F'                      * bold off
\2+     27,'4'                      * italic on
\2-     27,'5'                      * italic off
\3+     27,'-',1                    * underline on
\3-     27.'-',0                    * underline off
\4+     27,'G'                      * double strike on
\4-     27,'H'                      * double strike off
\5+     27,'S',0                    * superscript on
\5-     27,'T'                      * superscript off
\6+     27,'S',1                    * subscript on
\6-     27,'T'                      * subscript off
\A      18,27,'P'                   * elite
\B      18,27,'M'                   * pica
\C      15                          * condensed
\E      14                          * enlarged
\a      10                          * 10 cpi
\b      12                          * 12 cpi
\c      17                          * 17 cpi
\e      5                           * 5 cpi
\Z      27,'A'                      * line spacing in 72s "
\G0     27,'*',4                    *  80 cpi for 8-pixel-font
\G1     27,'*',1                    * 120 cpi for 12-pixel-font
\g0     8                           * 8 pins
\g1     8                           * 8 pins
\V      27,'L'                      * graphic sequence for vertical
\v      8                           * 8 pins for vertical
\P      960                         * points per line
\Q+     27,'x',1                    * NLQ on
\Q-     27,'x',0                    * NLQ off
\n      13,10                       * new line (CR/LF)
ä       27,'R',2,'{',27,'R',0
ö       27,'R',2,'|',27,'R',0
ü       27,'R',2,'}',27,'R',0
```

```
ß     27,'R',2,'~',27,'R',0
§     27,'R',2,'@',27,'R',0
Ä     27,'R',2,'[',27,'R',0
Ö     27,'R',2,'\',27,'R',0
Ü     27,'R',2,']',27,'R',0
æ     27,'R',4,'{',27,'R',0
Ç     27,'R',1,'\',27,'R',0
£     27,'R',3,'#',27,'R',0
Φ     27,'R',4,'|',27,'R',0
å     27,'R',5,'}',27,'R',0
°     27,'R',1,'[',27,'R',0
Æ     27,'R',4,'[',27,'R',0
Ç     27,'R',1,'\',27,'R',0
¿     27,'R',7,']',27,'R',0
Ø     27,'R',4,'\',27,'R',0
Å     27,'R',4,']',27,'R',0
ì     27,'R',7,'[',27,'R',0
Ñ     27,'R',7,'\',27,'R',0
à     27,'R',1,'@',27,'R',0
è     27,'R',1,'}',27,'R',0
é     27,'R',1,'{',27,'R',0
è     27,'R',6,'}',27,'R',0
ñ     27,'R',7,'|',27,'R',0
ò     27,'R',6,'|',27,'R',0
ù     27,'R',1,'|',27,'R',0
```

The above printer driver uses some of the control codes which you read about in the preceding chapter. The numbers following the control characters are the ASCII symbols that comprise the control characters. The printer executes the command specified by the control characters. For example, the line "\1+ 27,'E'" instructs the printer to print the text following the control codes in bold type. The "27,'E'" code is the ASCII representation of ESC E.

Here's a complete listing of the control codes used in BeckerText and TextPro printer drivers:

Function	Control symbol
printer installation	\0
bold	\1
italics	\2
underline	\3
double strike	\4
superscript	\5
subscript	\6
pica	\A
elite	\B
condensed script	\C
wide script	\E
line feed	\n
10 cpi	\a
12 cpi	\b
17 cpi	\c
5 cpi	\d
line spacing	\Z
activate line spacing	\z
8*8 font	\G0
12*12 font	\G1
print pin type (8 or 9 pins)	\g0
print pin type (24 pins)	\g1
vertical graphic print	\V
number of pins for vertical graphic print	\v
number of dots per line	\P
NLQ mode	\Q
printwheel change	\T
printer font 0	\F0
printer font 1	\F1
printer font 2	\F2
printer font 3	\F3
printer font 4	\F4
printer font 5	\F5
printer font 6	\F6
printer font 7	\F7
printer font 8	\F8
printer font 9	\F9

As the table shows, some control characters have changed, and some new ones have been added. All changed and new characters are explained as follows:

Printer initialization \0

The printer command following this control code is sent to the printer at the beginning of printer operation.

Double strike \4
The printer command following this control code controls double strike. Syntax:

```
\4+ double strike on
\4- double strike off
```

Line feed \n The printer command following this control code sends a line feed.

10 CPI \a The value following this control code sets the pitch to pica type (10 characters per inch).

12 CPI \b The value following this control code sets the pitch to elite type (12 characters per inch).

17 CPI \c The value following this control code sets the pitch to condensed type (17 characters per inch).

5 CPI \d The value following this control code sets the pitch to expanded type (5 characters per inch).

Line spacing \Z
The printer command following this control code sets the line spacing in 1/72 inch increments.

Activate line spacing \z
If the printer needs additional printer commands to set the line spacing, they need to follow this control code.

8*8 font \G0 The printer command following this control code activates graphic mode.

12*12 font \G1 The printer command following this control code activates double density, high speed graphic printing.

Printer pin type (8 or 9 pins) \g0
The printer command following this control code specifies the available pins. Enter 8 if you're using an 8 or 9 pin printer. Enter 24 if you're using a 24 pin printer.

Printer pin type (24 pins) \g1
If you're using a 24 pin printer enter 24 after the control code. Enter 8 if you're not using a 24 pin printer.

Vertical graphic print \V
The printer command following this control code sets the printer to vertical graphic printing (effective on Epson and Epson compatible printers only).

Number of pins for vertical graphic printing \v
The value following this control code must be the same value placed in \g0.

Number of dots per line \P
The value following this control code specifies the number of dots per line in vertical printing, based on the following equation:

```
dots_per_inch*printable_width
```

NLQ mode \Q The printer command following this control code controls NLQ mode. Syntax:

```
\Q+ NLQ on
\Q- NLQ off
```

Printwheel change \T
This control code allows the printwheel to be changed in a daisy wheel printer. For example, the following line allows the printwheel change when bold text is encountered:

```
\T   1
```

Printer font 1-9 \F0-\F9
If the printer has several fonts at its disposal, then the fonts can be accessed through these control codes. The following line structure may be set:

```
<control code>              <printer command>
```

Example:

```
\G0                            27,'*',4
<control code>              <printer command>
```

The first value of the control code is given as a decimal value. The values that follow are either entered as decimal values or ASCII values.

NOTE: Each value is separated from the next by a comma. If an ASCII value is entered it has to be placed within apostrophes.

If you're not sure which printer command is used, refer to your printer manual. It is beyond the scope of this book to list all commands for every printer on the market.

You may not need to create your own printer driver. Printer drivers are necessary in two cases:

a) The printer has special features which cannot be used with compatible printer drivers.

b) No printer driver exists for the printer.

Let's look at the symbols and codes following the regular printer control codes:

Example:

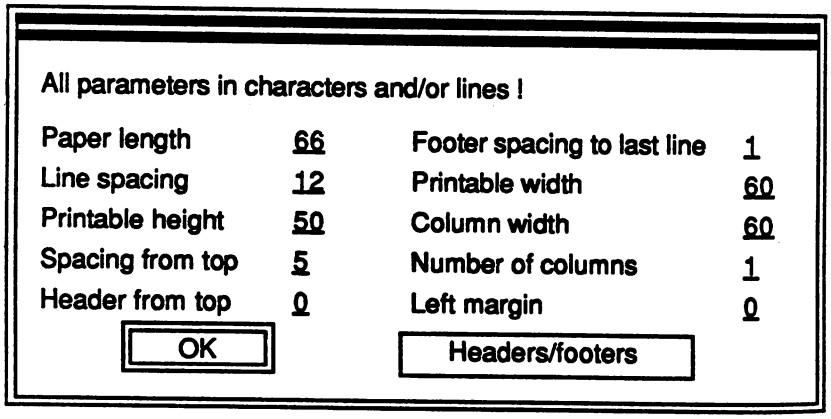
```
ä    27,'R',2,'{',27,'R',0
ö    27,'R',2,'|',27,'R',0
ü    27,'R',2,'}',27,'R',0
ß    27,'R',2,'~',27,'R',0
§    27,'R',2,'@',27,'R',0
Ä    27,'R',2,'[',27,'R',0
Ö    27,'R',2,'\',27,'R',0
Ü    27,'R',2,']',27,'R',0
æ    27,'R',4,'{',27,'R',0
```

These lines assign the corresponding foreign character to a key combination. Here's how the lines are structured:

```
    ä        27,'R',2      '{'                 27,'R',0
{special}   {German}    {char. on}          {enable Amer.}
{char.  }   {char. }    {Amer. keyboard}    {char. set    }
```

Formatting in BeckerText and TextPro

This chapter deals with formatting in BeckerText and TextPro, since mistakes can be made using these programs. The Formats menu of BeckerText/TextPro allows you to set the appearance of the printed text. After selecting the Formatting menu and the Formats command, the following page setup requester appears:



Page setup requester

To change an existing value, click on the value with the mouse pointer and change it using the keyboard. Click on the OK gadget or press the <Return> key when done with changes.

The page setup requester contains the following parameters:

Paper length This value specifies the length of the paper to be used. The paper length is given in number of lines. The maximum value is 199 lines. The default value of 66 lines is the normal size of commercially used continuous feed printer paper. If single sheet paper is used, then the standard value has to be decreased by 7. This has to be done, because the programs execute an advance of 6 lines at the end of the page. The paper length should always be set according to single line spacing, even when printing is done in a larger line spacing.

Line spacing This value specifies the distance between two printed lines in typographical points. A typographical point equals 1/72 of an inch. Your printer's manual should list line spacings for single spaced text. Once you enter the line spacing in this requester, the spacing can be changed to single spaced text, 1-1/2 spaced text or double spaced text using the Line Spacing item from the Style menu.

This is the formula for calculating the spacing:

```
Line_spacing =(pitch [inches])/(lines_per_inch)
```

Printable height

This value specifies the height of the actual printed page, rather than the height of the paper. The maximum height can be 199 lines.

Spacing from top
This value specifies the number of lines from the top of the page to the top of the first line of printed text.

Header from top This value specifies the number of lines from the top of the page to the first line of the header. This value must be set to a minimum of 1, even if you aren't including a header.

Footer spacing to last line
This value specifies the number of lines between the last line of printed text and the footer. This value must be set to a minimum of 1, even if you aren't including a header.

Printable width This value specifies the width of the printed text in characters. Change this value only if you want to print in multiple columns. The formula for printable width in multiple columns is as follows:

```
print_width = ((col_width[char])*(num_col))+(num_col - 1)
```

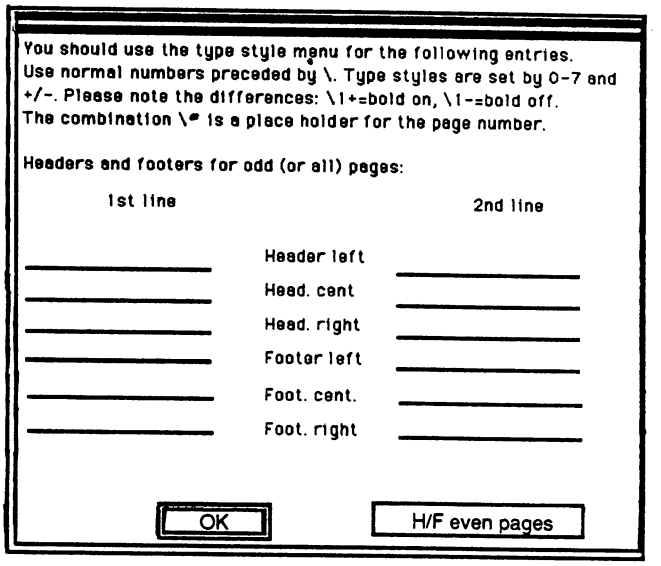
Column width This value specifies the width of a column, if several columns are printed. The minimum column width is 10 characters. The maximum is 89 characters.

Number of columns
This value specifies the number of printed columns, up to a maximum of five parallel columns.

Left margin This value specifies the number of characters between the left edge of the page and the leftmost character in the printed text.

Clicking on the OK gadget saves any changes. Clicking on the Headers/footers gadget lets you define header and footer texts.

After activating the Headers/footers gadget a requester appears. In this requester you can define the header and footer lines for odd pages. If there are to be no special header or footer line definitions for even pages then click on the OK gadget. This automatically assigns the odd header and footer definitions to the even headers and footers as well. To edit any numbers in the requester just place the mouse pointer on the respective line and click the left mouse button. A cursor appears, which may be moved from one line to the next with the cursor keys. You can edit a line using the <Del> and <Backspace> keys.



Headers/footers requester

Here are the control codes supported by headers and footers:

Style	Control code
normal	\0
bold	\1
italics	\2
underline	\3
red	\4
super	\5
sub	\6
pica	\A
elite	\B
condensed	\C
wide	\E
page number	\#
date	\D
time	\T
suppress of header	\n
suppress footer	\m

The plus and minus signs enable or disable the styles. The header/footer control codes and styles are as follows:

Normal\0 Prints text as normal (\0+ normal on, \0- normal off).

Bold\1 Prints text as bold text (\1+ bold on, \1- bold off).

Italics\2 Prints text as italic (\2+ italics on, \2- italics off).

Underline\3 Prints text as underlined (\3+ underline on, \3- underline off).

Red\4 Prints text as red (color printers) or NLQ text (\4+ red on, \4- red off).

Super\5 Prints text as superscript (\5+ super on, \5- super off).

Sub\6 Prints text as subscript (\6+ sub on, \6- sub off).

Pica\A Prints text as pica (10 CPI) (\A+ pica on, \A- pica off).

Elite\B Prints text as elite (12 CPI) (\B+ elite on, \B- elite off).

Condensed\C Prints text as condensed (\C+ condensed on, \C- condensed off).

Wide\E Prints text as wide (expanded) (\E+ wide on, \E- wide off).

Page number\# Prints the current page number (\# print page number).

Date\D Prints the current date (\D print date).

Time\T Prints the current time (\T print time).

Suppress header\n
Omits header from the first page of the printed document.

Suppress footer\m
Omits footer from the first page of the printed document.

The text for the header or footer lines are entered in the header or footer lines, the same as you would type them anywhere else. To exit the first or second header/footer requester, click on the OK gadget.The header or footer lines will be saved during the storage of the text. With the Default gadget the format may be saved during the storage.

Editing Workbench printer drivers

Existing Workbench Printer drivers may be changed to the specification of the user by using the public domain program PrtDrvGen. This is only of interest if you own a printer for which a printer driver does not currently exist. The program is started from the Shell by entering the command line "PrtDrvGen". After the program is booted, a copyright note and the window for your first entries appears.

In the first line enter the name of the printer driver to be edited. The default setting for this line is "Sample".

NOTE: To edit another printer driver, that printer driver must be in the same directory as the PrtDrvGen program.

To edit the existing name move the mouse pointer to that name and click the left mouse button. A cursor will appear. Use the <Backspace> and <Delete> key to edit the name. Press the <Return> key once the new name is entered. Your screen will look similar to the following figure.

```
PrtDrvGen 2.2

Driver name:  Sample

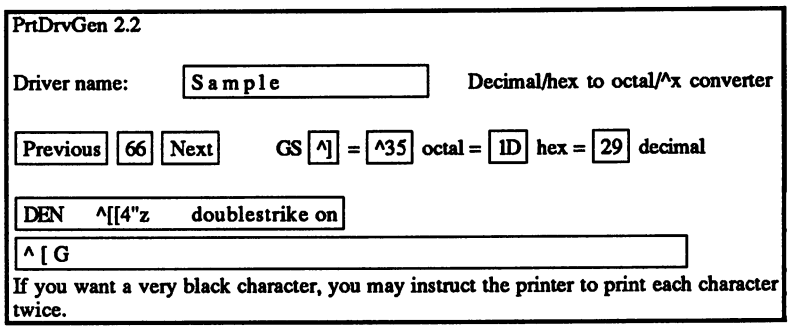
[A] Use ASCII text file as input
    The file <driver name> .dat in the current directory will be
    used as input for this program. After it has been read, you
    may change the <driver name>. When exiting the program the
    changed parameters will be stored in the file <driver name>
    .dat and the previous <driver name> .dat will be renamed to
    <driver name> .bak. Never embed SPACEs in the driver name.
    E.g. <driver name> = EPSON, file names: EPSON.dat,
    EPSON.bak.

[B] Decode existing driver
    The current directory is searched for a file <driver name>.
    If not found the file DEVS:printers/<driver name> will be
    decoded and many of the parameters for this program will be
    found. You must add the remaining, especially those for the
    graphics. The parameters will be stored in the <driver name>
    .dat file. For subsequent runs of this program this option
    will be faster than option A above.
```

The first PrtDrvGen Screen

Clicking on the A gadget uses an ASCII text file for the printer driver file. This text file will only be produced if you select the Save parameters only item from PrtDrvGen's Help etc. menu. By clicking on the B gadget the program uses a printer driver as the basic file.

When you use the PrtDrvGen program for the first time, click on the B gadget, as there will be no ASCII text file available yet. A new window appears. The name of the printer driver also appears in this window. Notice the Next and Previous gadgets. Clicking these gadgets moves you to the next and previous printer driver entries, respectively. Your screen will look similar to the following figure.

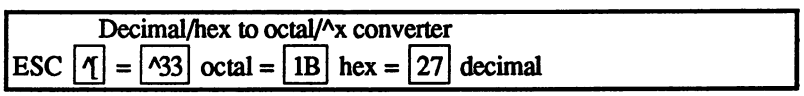


Editing a Printer Driver

The current screen number appears in a text gadget between the Next and Previous gadgets. You may enter another number to move to another screen quickly by clicking on this gadget and editing the number using the <Backspace> and <Delete> keys. This is much faster than using the Next and Previous gadgets to move from the beginning of the driver to the end.

For example, perhaps you want to edit screen number 20, then screen number 102. After editing number 20, instead of clicking on the Next gadget eighty-two times, click on the entry number, delete it and enter the number 102. Press the <Return> key after entering the number. Now the contents of entry number 102 will appear.

To the right of the Next gadget is the Decimal/hex to octal/^x converter. With this, values may be converted into octal, hexadecimal and decimal notation. The value may be entered as a decimal or hexadecimal number. This is then converted into the other number formats and also into ASCII control characters.



Decimal/Hex to Octal/^x Converter

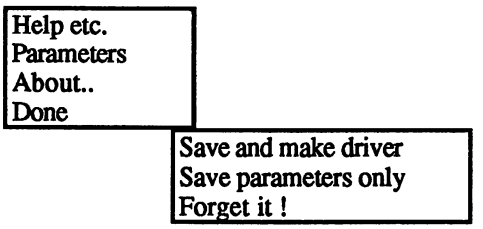
The contents of the selected entry appear in the longer text gadgets. The first text gadget provides the name of the entry. The second line contains the actual fields used to do the conversions. The entries are changed easily by moving the mouse pointer to the entry and clicking the left mouse button. A cursor appears and the entry may be edited as usual. You may also delete the selected entry by pressing <right Amiga><x>, or restore the deleted entry by pressing <right Amiga><q>.

The Help etc. menu displays the following items:

- Parameters
- About...
- Done

The Parameters item lists program parameters, while the About... item supplies basic information about PrtDrvGen.

The Done item is the most important item on the menu. Selecting the Save and make driver submenu item generates a working Workbench printer driver and creates a parameters file with a .dat extension. This .dat file contains all parameters in ASCII format. Selecting the Save parameters only submenu item creates a .dat parameter file. Selecting the Forget it ! submenu item exits the PrtDrvGen program without creating a file.



Done Menu Item

Let's take a close look at part of a typical .dat file:

```
9 Pica size (SHORPO, 0.01 Chars Per Inch) w:1000
10 Elite size (SHORP2, 0.01 Chars Per Inch) w:1200
11 Fine size (SHORP4, 0.01 Chars Per Inch) w:1500
12 US Letter, Width (0.01 inch) w:800
13 US Letter, Length  (0.01 inch) w:1100
14 US Letter, Lines to skip at perforation at 6 LPI w:6
```

Entries 9-14 all contain numeric values specifying page sizes and text sizes. For example, entry 14 contains the number of lines which are to be skipped after the perforation.

```
45 IND     ^[D      line feed s:^12
46 NEL     ^[E      return line feed s:^15^12
47 RI      ^[M      reverse line feed s:^[&a-120V
```

Entries 45-47 contain different control codes. For example, entry 45 contains the octal value of the line feed control code (octal 12, decimal 10). The "^" character preceding the octal number indicates that an ESC character must be sent before sending the control code itself.

Chapter 6
Graphic and Character Definition

Now that you have some understanding of how your own characters and dot graphics are created, we'll show you in detail how the dot matrix printhead operates.

Although there are many different models and styles of dot matrix printers, they all operate in the same way. So in terms of operation, it doesn't matter whether you're using an 8 pin, 9 pin, 18 pin or 24 pin printer. The individual pins, which are fired by an electrical impulse, strike the ribbon and then the ink is displayed on the paper.

There are generally only two different categories of dot matrix printers. These are the printers with 8 or 9 pins in a row or printers with 18 or 24 pins in two rows. The 9 pin and 24 pin printers are the two most commonly used.

The number of pins, their measurements and the distance the printhead's motor is advanced determine the quality and speed of the printout.

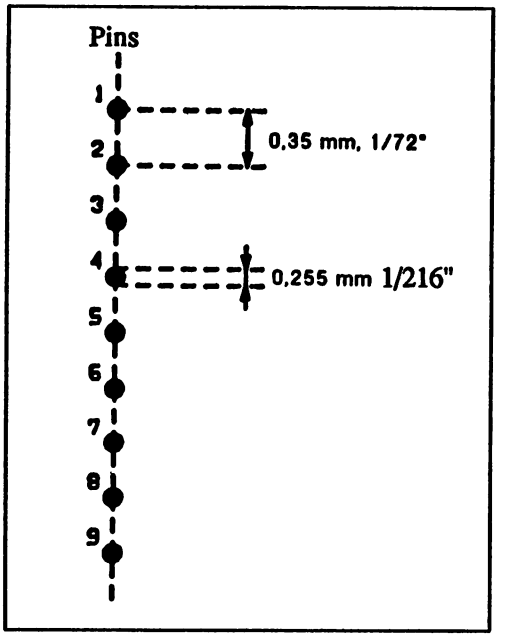
9 Pin Printers

The printhead of a 9 pin printer consists of 9 vertical pins and 6 horizontal pins (see the following figure). The individual pins are .255 mm thick and 1/72 inches away from each other. The horizontal resolution of the printer is determined by the smallest horizontal distance from the motor. With most 9 pin printers this is 1/240 inch.

Most characters that are printed with 9 pin printers are designed to be less than five dots wide. Since five dots aren't sufficient for high quality printouts, the printer actually prints some dots half way between the main columns in the matrix. The sixth row remains blank to allow space between letters.

This actually produces a column width of 11 dots instead of 6 dots. The dots in these intermediate columns overlap with the dots in the main column. Therefore, it isn't possible to have dots printed consecutively in an outer column and an inside column in the same row.

This happens because the printhead, which moves at a speed of approximately 1/100th of a second, requires time to return to the starting position before firing again.



Pin arrangement (9-pin printer)

You can get a printout two, three or four times thicker by positioning the printhead in two, three or four step increments.

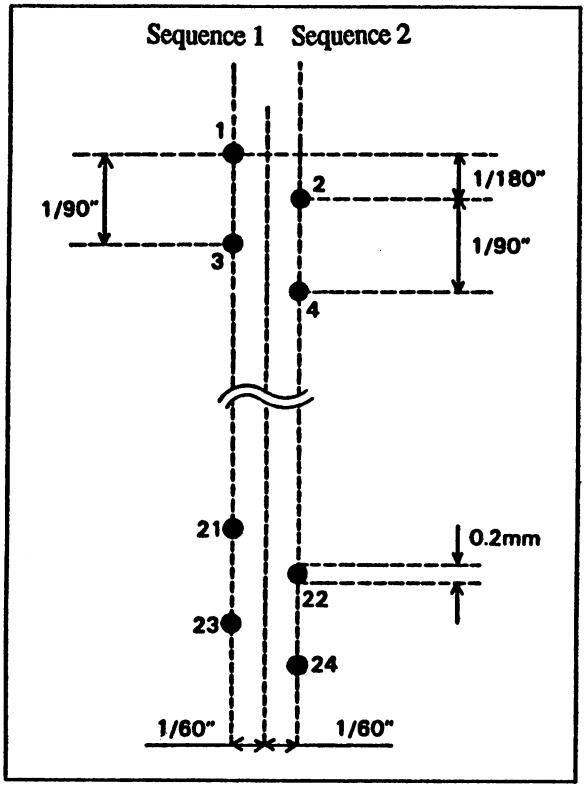
The maximum vertical resolution isn't determined by the movement of the motor in the highest resolution. In the highest resolution, this is 1/216 of an inch. The maximum vertical resolution is only 144 dots per inch. You must decide the best resolution since each line must be run through three times with a vertical pin spacing of 1/72 inch in order to get the full resolution (3 * 1/216 = 1/72 inch).

You can't use a spacing of 1/240, for example, if you're using the NLQ mode. In this mode, the printhead goes over the line that will be printed twice. The second time the dots are moved over 1/144 of an inch, which places them in the middle of the first dots. A symmetrical image is produced on the second pass. The resolution with which the individual characters are printed is 120 * 144 dots per inch.

The highest possible resolution per square inch comes from the maximum horizontal and vertical resolution per inch. This is 240 * 144, with four print executions and can be increased to 240 * 216 in six print executions. You must decide how many print executions to use.

24 Pin Printer Dot matrix printers containing 24 pin printheads have their printheads arranged in two rows of twelve pins.

Because of the number and arrangement of its pins, the 24 pin printer needs two print executions for its maximum resolution of 360 * 180 dots per square inch.



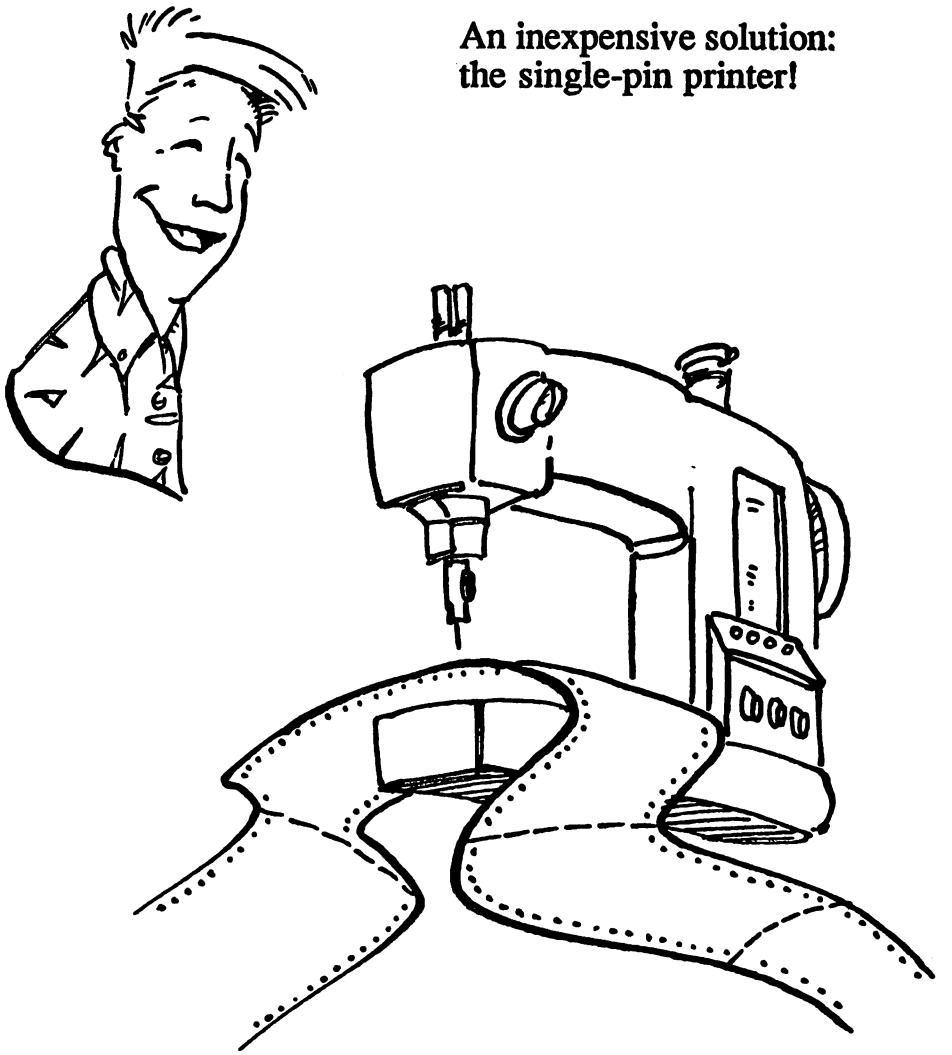
Pin arrangement (24-pin printer)

The individual pins measure .2 mm (about .008") and are 1/90 inch away from each other in the row. The second row is offset 1/180 inch vertically and is 1/30 inch apart horizontally. When printing, one of the two rows (depending on the direction the printhead is moving) fires 1/30 inch later than the other.

Like the 9 pin printer, the horizontal resolution of a 24 pin printer is determined by the smallest horizontal distance from the motor, which is 1/360 inch. Also, the fired pins need a short time before they can be reactivated. To get the full resolution of 360 dots per inch the printhead must overprint a line a second time.

The maximum vertical resolution is reached on one pass. A resolution of 180 dots per inch can be achieved with the pins in the second row.

NOTE: Although most 24 pin printers support 9 pin printer graphic commands, the printed result in the vertical direction is distorted by the different line feeds (1/180 inch with 24 pin printers; 1/216 inch for 9 pin printers). Also, the picture will be lighter because of the smaller pins.



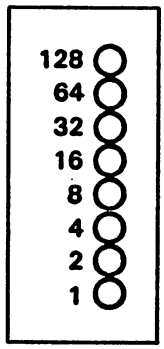
Printing Graphics

A dot matrix printout is similar to a newspaper photograph. If you look closely at a photo in a newspaper, you'll see that it is made up of individual points or dots.

Pin Control

Information transferred by computers is defined in *bytes*. For printers this term represents a group of 8 pins. This is why one pin (usually the bottom) of 9 pin printers is not used and 24 pin printers divide columns into three sections of 8 pins.

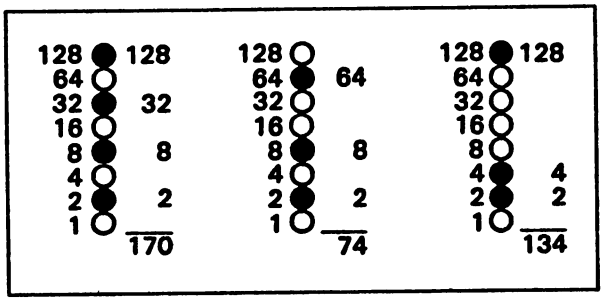
There are 256 possible combinations for these 8 pins. A combination of pins represents each of these 256 numbers. Each pin is assigned a number as follows:



Number assignment for each pin

Along with the *graphic command*, you must also send the printer the corresponding number of the pin(s) you want fired. For example, you must use the number 64 in order to control the second pin from the top. If you want to address multiple pins simultaneously, the individual number values must be totaled. The sum of these is the value that must be sent to the printer. The following figure shows three examples for controlling multiple pins in one row.

To activate the first, third, fifth and seventh pins, the pin numbers must be added. Any combination of eight pins using this system results in a number between 0 and 255. This number becomes the graphic command and informs the printer which pins it should control.



Multiple pin control

9 Pin/24 Pin: A Small Difference

We said earlier in this chapter that a 24 pin printer consists of three columns of eight pins. The printer command must be divided among these three columns. To control a 24 pin column you need three bytes of information. Depending on the graphic mode you select, it can be a tremendous amount of work to create your own graphics.

For example, to create a company logo that has a line one inch long in the high resolution mode of 360 dots per inch, you would need a command consisting of 1080 numbers.

In the following sections we'll show you how to define simple graphics.

The Graphic Commands

The 9 pin and 24 pin printers accept the following command for defining user-defined graphics:

```
ESC * m n1 n2 data
```

The sequence `ESC *` represents the actual command for choosing the graphic setting. You specify the desired graphic resolution with the parameter m (see the following table). Only the first six graphic modes can be chosen for 9 pin printers while 24 pin printers can use all eleven graphic modes.

Option	Pins	m	Horizontal density (dpi)
Single density	8	0	60
Double density	8	1	120
High speed, double density	8	2	120
Quadruple density	8	3	240
Screen graphics CRT I	8	4	80
Screen graphics CRT II	8	6	90
Single density	24	32	60
Double density	24	33	120
Screen graphics CRT II	24	38	90
Triple density	24	39	180
Sextuple density	24	40	360

Graphics mode for 9 and 24-pin printers

NOTE: Some columns may not always print in this mode.

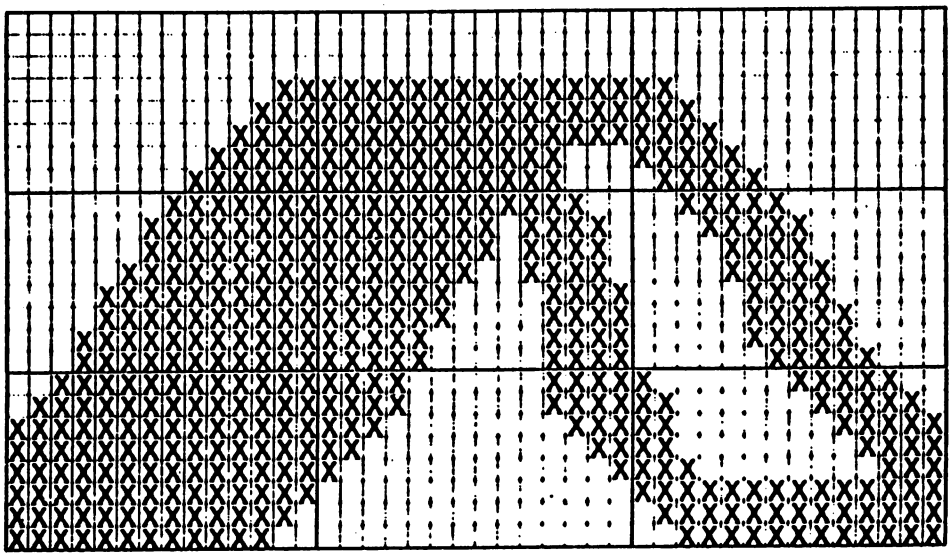
Parameters n1 and n2 tell the printer the column number of the graphic character. In this case two numbers (bytes) are needed because one byte can only represent a number between 0 and 255 however a high resolution graphic line contains up to 2880 columns.

Do the following to find the values for n1 and n2: Divide the number of columns by 256. Enter the whole number value as the parameter n2, and the remainder as n1. For example, if you want 1632 columns of graphic data to be sent, the whole number value for n2 is the result of dividing 256 into 1632 (or, 1632/256 = 6, with a remainder of 96). Enter 6 as the value for n2, and enter 96 as the value for n1.

Because the command syntax expects two numbers for the column number, two values are required even if you only use one. If fewer than 256 columns are needed, the column number is entered for n1 and the number 0 is entered for n2.

NOTE: The printer interprets the number given by n1 and n2 as graphic data. Make sure you send the correct amount of data, or the printer will stop. If you send more data than required, the extra numbers are interpreted as text or control commands.

The First Step To create a *graphic character*, sketch the character on graph paper first (according to the size of the graphic). In our example the graphic character is 42 columns wide and 24 dots high (see the following figure).



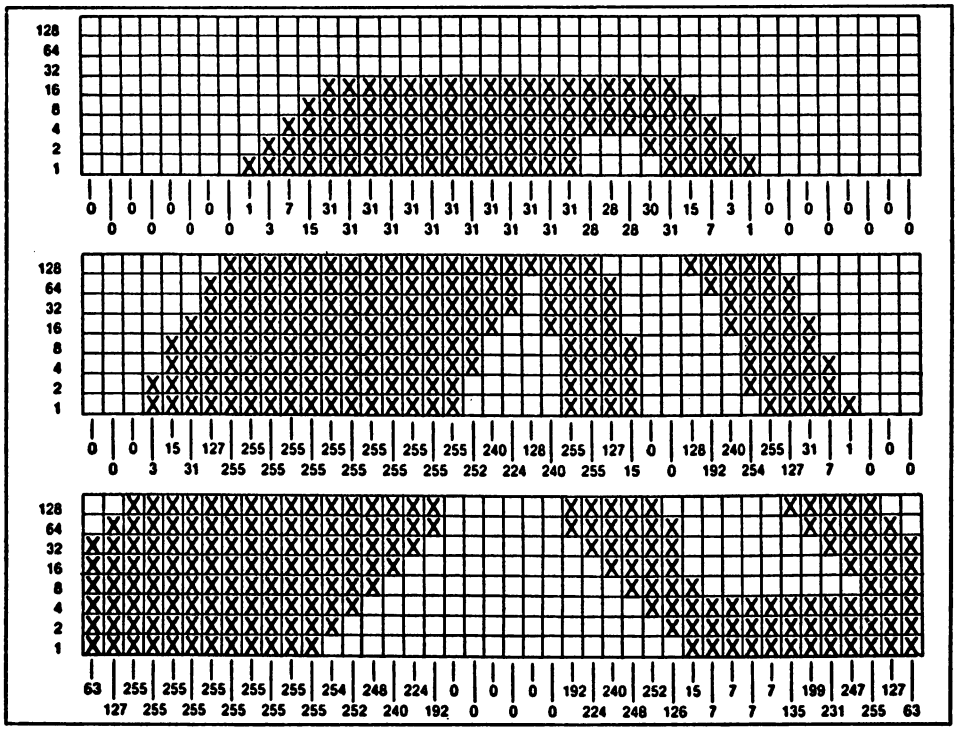
Sample of a graphic character

Now you need to calculate the number value for the dot matrix. Then print the graphic character, first as an 8 pin graphic and then as a 24 pin graphic. In both cases, the graphic must be divided into three rows that are each eight dots high.

It would be easier to obtain the sum for each column by totaling the individual dot rows with the respective number value (1, 2, 4, 8, 16, 32, 64 and 128) and then writing the result under the respective *print column.*

NOTE: A print column consists of three bytes (numbers) for a 24 pin printhead. The first three numbers of the first column must be sent to the printer followed by the three bytes of the second column and so on.

These 24 dot high graphics must be printed in three lines of eight dots high on 24 pin printers. The graphic is divided into three sections.



Computing the character matrix

The data is sent to the printer line by line and the graphics mode is reselected for each new line. The line feed must be reduced to 8/72" so that no spaces appear between the individual graphic lines. Use the graphic command `ESC *` for each graphic line. For example, choose the resolution 1, enter the column number, n1: 42, n2: 0 and then enter the values for each column one after another: 0,0,0,0,1,7 and so on.

---

8 Pin Graphics

The PrinterTool program listed in the back of the book and included on the companion diskette accompanying this book will help you define graphic characters.

Run the PrinterTool program and enter the following:

```
27,65,8
```

Since our graphic consists of three lines, the line feed should be reduced to 8/72 inch. This will eliminate empty space between the individual graphic lines. Enter:

```
27,42,0,42,0
```

This command enables graphics mode (27,42), selects a resolution of 60 dpi (,0) and specifies a column number of 42 (,42,). The 42 numeric values for the first graphic line follow. Enter:

```
0,0,0,0,0,0,0
0,1,3,7,15,31,31
31,31,31,31,31,31,31
31,31,31,31,28,28,28
30,31,15,7,3,1,0
0,0,0,0,0,0,0
```

Now send a line feed to print the first line.

```
13,10
```

The following is a command for graphic print and 42 data bytes followed by a line feed:

```
27,42,0,42,0
0,0,0,3,15,31,127
255,255,255,255,255,255,255
255,255,255,255,255,252,240
224,128,240,255,255,127,15
0,0,128,192,240,254,255
127,31,7,1,0,0,0
13,10
```

The graphics mode is activated again.

```
27,42,0,42,0
```

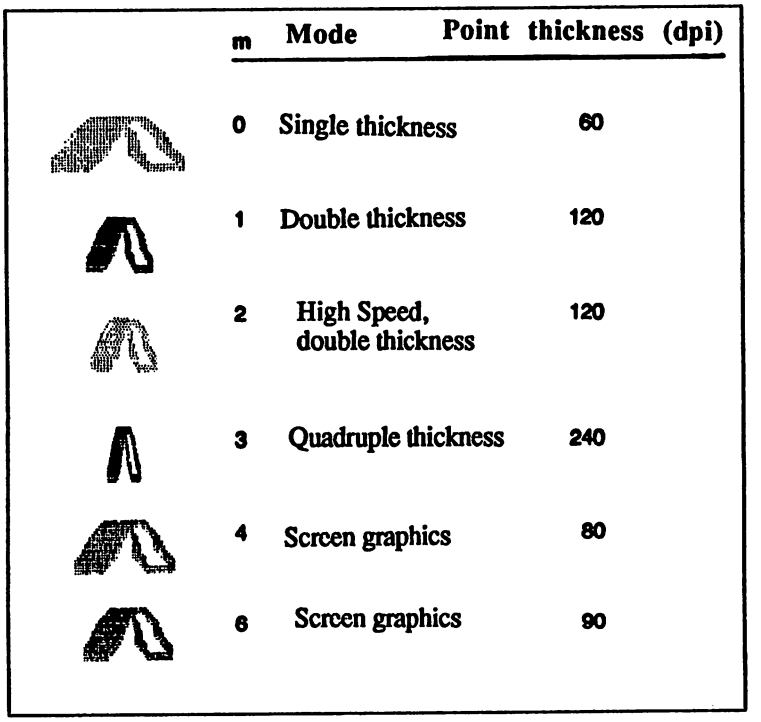
Then 42 bytes for the third graphic line are sent.

```
63,127,255,255,255,255,255
255,255,255,255,255,254,252
248,240,224,192,0,0,0
0,0,0,192,224,240,248
252,126,15,7,7,7,7
135,199,231,247,255,127,63
10
```

To complete the commands, set the line feed to 12/72 inch again.

```
27,65,12
```

There are five other graphic modes you can choose besides the resolution of 60 dpi, which was used in this example. As you can see, using different modes distorts the graphic (see the following table).



m	Mode	Point thickness (dpi)
0	Single thickness	60
1	Double thickness	120
2	High Speed, double thickness	120
3	Quadruple thickness	240
4	Screen graphics	80
6	Screen graphics	90

Graphic modes for 9-pin printers

Alternative Graphic Commands/Adjacent Points

NOTE: IBM and compatible printers do not accept the `ESC *` command. These printers use `ESC K, L, Y or Z` to activate the individual resolutions.

With all of the graphic modes it is not possible to set dots adjacent to each other.

	Mode	Code	Dots per inch	Bordering dots
0	Single density	ESC K	60	yes
1	Double density	ESC L	120	yes
2	High speed double density	ESC Y	120	no
3	Quadruple density	ESC Z	240	no
4	Screen graphics	none	80	yes
5	Plotter (1:1)	none	72	yes
6	Screen graphics II	none	90	yes
7	Double density plotter	none	144	yes

Other graphic commands/bordering points

Reassigning Graphic Commands

To be able to use programs that use the alternative graphic commands (i.e. `ESC Y`) and the new resolutions on the current model printers, you can assign the commands to a new mode with this command:

```
ESC ? s m
```

The variable s is the command for the resolution (K, L, Y or Z) and the variable m is the number of the newly assigned graphic mode.

To set the `ESC K` command to the screen graphic mode CRT I, the command is:

```
27,63,75,4
```

A logical application would assign another resolution to the graphic command used for the output of bar charts. This would be able to compress the printout horizontally.

---

24 Pin Graphics

In this section we'll show how to print graphic characters, which were defined in the 8 pin mode, with 24 pins. In this case only one print line is printed so that the 24 pin printer is able to print the 24 dot high characters.

We need to change the horizontal resolution so that the characters are not distorted (because they were smaller in the 8 pin mode).This is done by selecting a resolution one third the height of the 8 pin mode so that the characters take up only a third of the width.

The PrinterTool program listed in the back of the book and included on the companion diskette accompanying this book will help you define graphic characters.

Run the PrinterTool program and enter the following:

```
27,42,39,42,0
```

Is that lifelike, or what?

(27,42) enables the graphic command. Select a resolution of 180 dpi (,39) and set a column number of 32 (,42,0), followed by the print column values. Three consecutive numbers comprise a print column:

```
0,0,63,0,0,127,0
0,255,0,3,255,0,15
255,0,31,255,0,127,255
0,255,255,1,255,255,3
255,255,7,255,255,15,255
255,31,255,254,31,255,252
31,255,248,31,255,240,31
255,224,31,255,192,31,255
0,31,252,0,31,240,0
31,224,0,31,128,0,31
240,0,31,255,192,28,255
224,28,127,240,28,15,248
30,0,252,31,0,126,15
128,15,7,192,7,3,240
7,1,254,7,0,255,7
0,127,135,0,31,199,0
7,231,0,1,247,0,0
255,0,0,127,0,0,63
```

Conclude the definition with a carriage return (CR).

```
13
```

There are four additional 24 pin resolutions to choose from besides the graphic mode chosen here with 180 dpi. 9 pin printers using different modes distort the graphic.

	Mode	Thickness	(dpi)
	32	Single thickness	60
	33	Double thickness	120
	38	CRT3 screen graphics	90
	39	Triple thickness	180
	40	Sextuple thickness	360

Graphic modes for 24-pin printers

Creating User-Defined Characters

The printer contains different commands that can be used to define special characters. These commands are also used to switch between different character sets. This is similar to creating graphics because the individual pins must be controlled directly.

Use the same steps as with the graphic programming (see "Printing Graphics" earlier in this chapter) to create your own characters.

Fundamentals The character sets located in the printer obviously can be accessed by the printer but cannot be changed or overwritten. However, the characters that you design are placed in the printer ROM (read only memory) and can be changed, erased or overwritten. The data or characters that were in the printer ROM are lost when the printer is switched off.

NOTE: When there is a hardware reset (switching the computer on/off or through the INIT connection of the printer cable), the entire contents of the RAM memory are lost. If you initialize the printer with the software command `ESC @`, the contents of the memory remain the same. You must switch to the RAM character set again. We'll discuss this in more detail later.

Unlike graphic programming, you must execute two or more commands to print a user-defined character. You also shouldn't be surprised if the defined character does not appear on the printout.

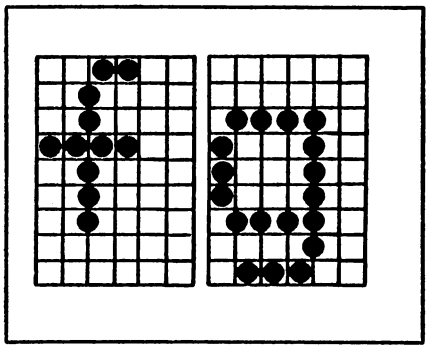
NOTE: Except in the graphic mode, 8 pin characters cannot be printed by a 24 pin printer. The commands for creating and activating the defined characters are identical, but, because of the numerous variations, there are additional considerations with the 24 pin printer.

9 Pin Printers

Preparation Each of your defined characters must be assigned a number so that the printer will be able to print these characters exactly as they should appear.

With a sheet of graph paper, sketch the dot pattern that represents the character you're defining. Remember that with 9 pin printers there is an 11 column wide and 9 row high matrix available for each character.

The sketches for the characters f and g look like the following (see the following figure):

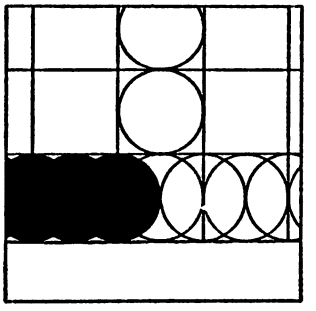


Sketching characters

The FOCOS program on the companion diskette will help simplify the sketching and calculating. More details on how this works can be found at the end of this section. Now we will show you the individual commands and limitations.

Please remember that there are four limitations in user-defined characters. Only the top or bottom eight pins of the printhead should be used in defining a character. The bottom two rows are used for the descenders of letters such as j and g, and for underlining.

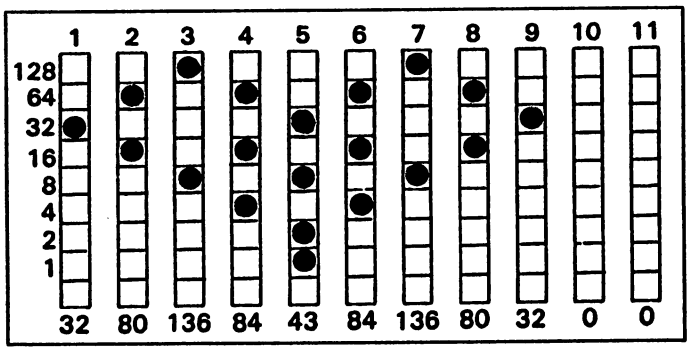
The last two columns have to remain empty to provide space between the characters. Also, the dots shouldn't overlap horizontally. Therefore, only every second horizontal dot may be controlled.



Double strike for overlapping (9-pin printer)

The row of numbers representing the printed character are derived from calculating the value for each print column (see the following figure).

Most 9 pin printers only allow user-defined characters in draft mode.



Computing the matrix

9 Pin Printer/Commands for User-Defined Characters

Follow these steps when using user-defined characters (one or more character codes in a row):

1. Sketch the character and convert it into numbers.

2. Set the printer in the draft mode.

3. Send the command ESC & (27,38) to the printer along with the data that defines the character.

4. Send the ASCII code for the first and last character of the character group (the same code if it is only one character).

5. The number that is sent as the attribute byte should be used if the top or bottom 8 pins are used. The attribute byte is sent so that the width of the character is specified in proportional print. Later we will explain how this number can be transmitted.

   The value 139 is sufficient for all characters using the top 8 pins, beginning in the first column, and ending in column nine. The value 11 should be used if characters should be printed with the same column number in the bottom 8 pins.

6. Set the dot pattern for the respective columns of the characters and enter this data. There must be eleven data fields for each character, even if some columns remain empty. One character can occupy up to eleven columns.

NOTE: The command syntax for IBM and IBM compatible printers is different. These differences will be explained at the end of this section.

ESC &	Command

Format:

ASCII:	ESC	&	NUL	n1	n2	a1	d1	..d11
Decimal:	27	38	0	n1	n2	a1	d1	..d11
Hexadecimal:	1B	26	00	n1	n2	a1	d1	..d11

Parameters:

n1: ASCII code for the first character to be defined
n2: ASCII code for the last character; n1=n2 if only one character should be defined
a1: attribute byte
d1-11: data for each character to be defined

Explanation: Each definition consists of ESC and & as well as the previously described variables.

The Attribute Byte

The attribute byte determines if the bottom or top 8 pins should be used and if proportional mode should be used.

To calculate the exact values, the attribute byte must start from 0, when using the bottom 8 pins (this must be the value when using proportional mode) and from 128, when using the top 8 pins. Also, if you're using proportional mode, be sure that additional values are added according to which column the printing will begin and end.

In proportional spacing, empty columns must contain values because the placement of one character depends on a previous character. The necessary value can be calculated with the following list. Only one of the first seven columns can be used as the first columns and all of the characters must be at least five columns wide.

Calculating the Attribute "a"

The attribute controls the bottom or top 8 pins of the 9 pin printhead. The definition area of the character is determined with the proportional data (start and end position).

0 = control bottom 8 pins
128 = control top 8 pins

Starting position	Addition value	End position	Addition value
1	0	4	5
2	16	5	5
3	32	6	6
4	48	7	7
5	64	8	8
6	80	9	9
7	96	10	10
8	112	11	11

The following example controls the 8 top pins of the printhead. The starting dot is column 1 and the ending dot is column 11 (including the two columns for the space to the next character). The attribute in this example is:

```
"a" :(10001011)2=(8B)H)(139)D
```

Explanation:

Top 8 pins	128
start position = col 1	0
end position = col 11	11
	139

NOTE: The maximum definition area for a character is 11 columns with the 12th column set to 0. The minimum definition area is 5 columns.

A character must always be defined with 11 data bytes (including proportional characters). Any empty columns must contain values of 0 either before or after the character.

The column number printed can be varied with proportional characters by setting the start and end position of the attribute byte. The proportional mode is activated with `27,112,1`.

Printing User-Defined Characters

After a character is defined, a software command must be used to switch to the user-defined character set. Another command is used to switch between different character sets:

ESC % **Command**

Format:

ASCII:	ESC	%	n
Decimal:	27	37	n
Hexadecimal:	1B	25	n

Parameter: If n=0, the default character set is used; if n=1 the user-defined character set is used.

Explanation: The ESC % command enables you to switch between the normal ROM character set and a user-defined character set. This command is ignored if no characters are present in the user-defined character set. When user-defined characters are saved, the character set can be activated. Otherwise, the ROM character set remains active.

Remember that even though ASCII codes range from 0 to 255, the ASCII codes 0-31 cannot be used because they are not character codes. If you want to print a newly defined character, you must send the definition data to the printer first (27,38,0,data). For example, the character "@" (ASCII code 64) is defined as a mask.

If the command ESC % is sent to the printer to switch to the user-defined character set, the mask is printed instead of "@". If you return to the standard character set with the ESC % 0, the "@" will be printed normally.

The following is a listing for the operation of this command. Insert your companion diskette, run the PrinterTool program and enter the following lines:

```
RESET
27,118,0
27,38,0,64,64,139,32,80,136,84,43,84,136,80,32,0,0
27,37,1
"ABCDE",13,10
64,32,64,32,64,13,10
"FGHIJ",13,10
27,37,0
"ABCDE",13,10
64,32,64,32,64,13,10
"FGHIJ",13,10
```

After activating the user-defined character set (line 4), the printer will know only one character. This happens because this is the only character defined in the RAM character set.

Changing ROM Characters

The entire character set doesn't always need to be changed. It's also possible to modify a single character if you want to define one of the ASCII codes as another printable character. The standard characters can be copied into the RAM area where they can be redefined until the ESC : command is entered.

ESC : Command

Format:

ASCII:	ESC	:	NUL	NUL	NUL
Decimal:	27	58	0	0	0
Hexadecimal:	1B	3A	00	00	00

Explanation:

This character succession is entered as the second step for loading user-defined characters. If this command is entered before a special character is defined, the user-defined character set can be used as the normal character set. This eliminates switching between the RAM and ROM character sets.

To use all of the characters that belong to a character set and also the newly defined character sets, insert your companion diskette, run the PrinterTool program and enter the following lines:

```
RESET
27,118,0
27,58,0,0,0
27,38,0,64,64,139,32,80,136,84,43,84,136,80,32,0,0
27,37,1
```

The following determines whether the command to be copied in the RAM character set is present:

```
RESET
27,"x",0
27,58,0,0,0
27,38,0,64,64,139,32,80,136,84,43,84,136,80,32,0,0
27,37,1
"ABCDE",13,10
64,32,64,32,64,13,10
"FGHIJ",13,10
27,37,0
"ABCDE",13,10
64,32,64,32,64,13,10
"FGHIJ",13,10
```

All of the standard characters can be used in the ROM as well as the RAM character set.

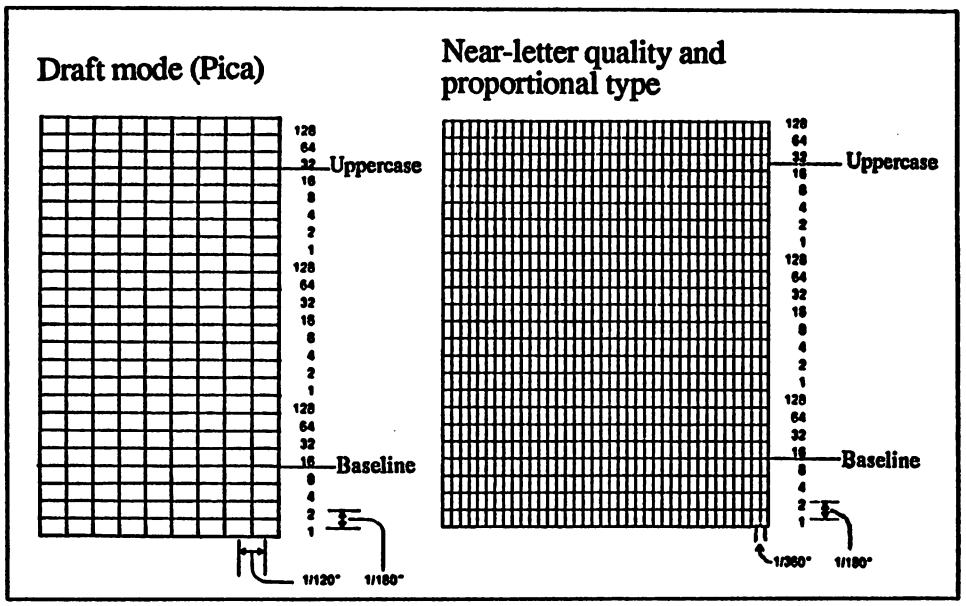
24 Pin Printers

Designing Characters

In order to define your own characters you need a matrix with 24 dots in the vertical direction, which means a point for each pin of the printhead. The number of horizontal points (i.e., the width of the matrix) varies with the character set being used.

Only 37 points are needed for proportional characters, 29 points for letter quality characters and 9 points for draft characters. When printing characters in letter quality or proportional mode, the distance between the individual points must be reduced.

You can see both matrices in the following figure. The lines labeled with the capital letters provide the top limit of a standard capital letter and the bottom line marks the bottom portion of all letters except those with descenders (e.g., p and g). The bottom line is usually reserved for underlining.



Draft and letter quality matrices

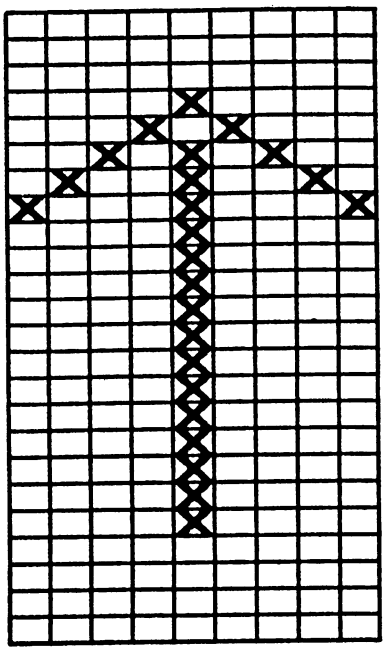
Letter quality text doesn't need all of the columns in a matrix. For any character type (draft, letter quality and proportional text) you must remember that dots in the same row of two consecutive characters must

not touch. Each character must include a column of free points to its left or right.

Defining Your Own Characters

Start with a sheet of graph paper. Mark each box which you want filled in by a pixel with an X (see the following figure for an illustration of an arrow drawn in this fashion).

You must transfer the point pattern to a numeric format in order to send it to the printer. Each point is assigned a value and each point column (with a maximum of 24 points) should be divided into three sections of 8 points. One byte always represents eight points. Each byte consists of 8 bits so there is one point per bit.

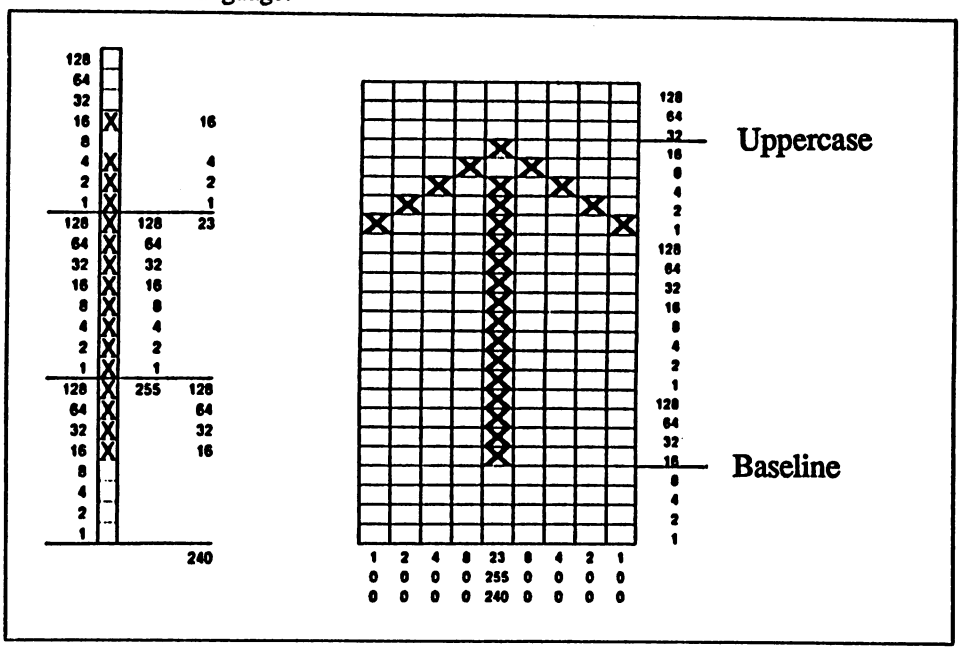


User-defined character (draft mode)

Calculating Column Values

The bits are represented by the values 1, 2, 4, 8, 16, 32, 64 and 128 inside of a byte. The highest bit (128) is the top point and the lowest bit (1) is the bottom point in a vertical point column. We will now explain how a character can be calculated by using this method. The left drawing in the following figure shows the calculation of the data for the middle column of a character.

Once you add the individual values of the row in which points should appear, you have calculated the value of each individual byte. The right drawing shows us the same characters with the three values for each point column. Decimal numbers are used because most example programs are written in BASIC, and most users are familiar with decimal numbers. Information about the printer can also be transferred in binary or hexadecimal form, depending on the programming language.



Computing the matrix

As soon as you have drawn your user-defined character on graph paper and have transferred the necessary points into decimal numbers, you can send the information to the printer.

Sending Character Information to the Printer

The user-defined characters are loaded from the printer in the current text type (proportional, letter quality or draft) and attribute (superscript, subscript or italic). If you want to print a character in italics, the italic mode must already be active when you define the character.

The command for defining specific characters reads:

```
ESC & 0 n1 n2 d0 d1 d2 data
```

0 (or ASCII code NUL) marks the start of a command sequence.

One command enables you to define multiple characters that use the values n1 and n2 as ASCII codes for the first and last characters to be defined. n1=n2 for the definition of only one character. Any other code between decimal 32 and 127 can be used for n1 and n2 in other cases. Since it handles the number 32 as an empty step code, this number should be reduced. Letters can also be entered for n1 and n2.

If all of the 128 download characters are simultaneously needed as the standard characters of the ROM, the top half of the ASCII character set from 128 to 255 (80 to FF hex) can be used with italics and graphic characters as download characters. To do this use the command `ESC t2`. For example, the character defined as ASCII 65 can easily be printed by adding 128 to this code and then printing ASCII 193.

The following example explains the difference between n1 and n2. If you want to define the characters A - Z, n1=A (or ASCII code 65) and n2 is the same as the letter Z (or ASCII code 90). To replace the entire alphabet of capital letters, the command `ESC & 0 AZ` would be given to the printer followed by the corresponding data.

Mode	d1(max)	d0 + d1 + d2 (max.)
Draft mode	9	12
Near letter quality (10 cpi)	29	36
Near letter quality (12 cpi)	23	30
Proportional text	37	42

Maximum character widths (user-defined characters)

The three data bytes (d0-d2) define the character width and the number of free columns on the right and left. d0 is the left and d2 the right distance (in point columns). d1 defines the number of point columns that are produced from the defined characters.

The last section of the character definition contains the data that defines the dot pattern for each column of a character. Since 3 bytes must be entered for each point in a vertical character column, the LQ needs d1 x 3 bytes for d2.

The following example should be useful for programming user-defined characters. Insert your companion diskette, run the PrinterTool program and enter the following lines:

```
RESET
27,120,0
27,36,0,64,64,0,9,2
0,1,0,0,2,0,0,4,0,0,8,0,0,25
255,240,8,0,0,4,0,0,2,0,0,1,0,0
"@@@",13,10
27,37,1
"@@@",13,10
27,37,0
"@@@",13,10
```

ESC x (27,120,0, line 2) selects draft mode. The actual character definition begins in the third line. The number 64 stands for n1 and n2 and labels the first and last characters to be defined (only 1 here). The three following characters contain the values for the variables d0, d1 and d2. The information for the formation of a character in sent to our printer in the fourth line.

Printing User-Defined Characters

An arrow character is defined by entering the command lines above. This is loaded instead of ASCII code 64 in the RAM memory (lines 1-4). Lines 5-9 print normal characters, while the arrow prints from line 7.

You can see that the normal characters saved in ROM are available as well as the user-defined characters. Switching between the two character sets is possible with the following command:

```
ESC % n (decimal: 27,37,n)
```

If n=0 the normal character set is activated (ROM characters). If n=1 the user-defined character set is activated. If n=1 is entered but no user-defined character set is present in RAM, the ESC % n command is ignored and the normal characters are printed.

Copying ROM into the RAM

If the user-defined character set is activated and we try to print other characters, only the arrow is printed because it is the only character in RAM. All of the codes for the undefined characters, including spaces, are ignored.

Usually you change only some, not all, of the characters of the alphabet. It is possible to switch between the standard and the user-defined character sets, but it is easier to copy all of the standard characters from the ROM into the RAM area. The command reads:

```
ESC : 0 0 0 (decimal: 27,58,0,0,0)
```

Since this command erases all of the valid user-defined characters, you should always activate it before programming your own characters. If you enter this command at the beginning of a program and then define a special character, the user-defined character will be activated and used as the standard character. This would require switching between the individual character sets.

Letter Quality Characters

You can choose the letter quality mode with the `ESC x 1` command and develop user-defined characters in a 29 column matrix as letter quality or proportional print characters. The points in such a matrix horizontally lie next to each other as in a matrix in draft mode (1/360 inch instead of 1/120 inch).

Proportional Characters

The user-defined characters have a very high resolution when they are selected in proportional mode because all 37 columns of the character matrix are needed to create the character.

Remember that the columns can be printed next to each other in proportional characters and letter quality characters as well as in draft mode. A point position must be left on both sides of each printed point.

Superscript/Subscript

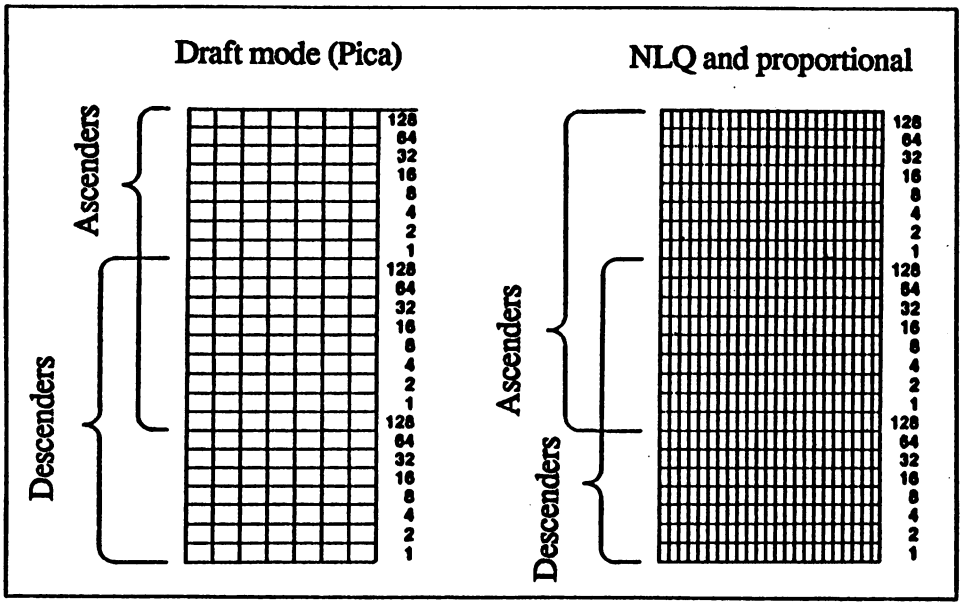
Even creating superscript and subscript user-defined characters is possible. Since you selected the letter quality mode before creating characters in letter quality text, all you have to do is activate the superscript/subscript mode.

These characters are smaller than normal characters. However, they are not different in the way they are created but in the way they are placed by the printer. Their width in point columns can differ by a maximum of 16 points vertically.

Mode	d1(max)	d0 + d1 + d2 (max.)
Draft mode	7	12
Near letter quality (12 cpi)	23	36
Proportional text	23	42

Maximum character widths (subscript/superscript)

Since these characters are smaller, they require less information to be defined. There are only two data bytes for each vertical point column. The matrix for the development of such a character is displayed in the following figure.



Superscript/subscript matrices (draft)

Combining Print Modes

Since the three different types of user-defined characters can be combined with most of the print functions, this makes them very versatile (i.e., expanded print). However, they cannot be combined with each other.

If you have defined characters in one mode and characters in another mode, the characters entered in the first mode will be lost. You can always save only one kind of user-defined characters in RAM.

If you switch into another mode and activate the user-defined mode after finishing defining your own characters, this command is ignored. Although the printer doesn't print anything in this case, the user-defined characters remain.

Once you activate the mode in which these characters were created, they are printed on the printer. All of the user-defined characters are saved in RAM. As soon as the printer is switched off or initialized with an INIT signal, the characters are lost. Some systems even erase the user-defined characters as soon as BASIC is loaded.

Chapter 7
Other Print Technologies

Like other computer peripherals such as disk drives or hard drives, printers come in many shapes and sizes. Dot matrix printers are widespread but they have a lot of competition. These printers are suitable for everyday use but not for certain applications. Even though dot matrix printers are louder, they're capable of printing graphics that a letter quality printer cannot. If you want to avoid the noise but retain the capbility of printing graphics, you must use either the ink jet or the thermal printer.

In the following pages we'll discuss the advantages and disadvantages of these printers. We'll also explain how these printers operate.

Daisy Wheel Printers

Even though still in use, primarily because of their versatility, many computer users consider the daisy wheel printers as the dinosaur of the printer industry.

How They Work

Daisy wheel printers, sometimes also called *typewriter printers*, are very similar to typewriters. The mechanical parts are the same but the letters are sent along a cable connected to a computer. This connection is made through a serial or parallel interface. The transferred data is processed like a dot matrix printer but pins aren't fired. Instead, an impulse rotates a wheel of characters called a daisy wheel. Its name derives from the wheel resembling a daisy. The impulse moves the desired letter under the hammer. The hammer presses the character against an inked ribbon, which then impacts against the paper.

Daisy wheel printing is slower than with dot matrix printers because it takes longer for the correct letter to be moved into position. Daisy wheel printers have a print quality matched only by laser printers.

You can print graphics on a daisy wheel printer by using a special *graphic wheel*. The different graphic patterns appear on this wheel to create the graphic symbols. The disadvantage of using this printer for graphics is that the resolution is not very good and the print speed is extremely slow.

A daisy wheel printer is limited to the characters included on the daisy wheel. When using special print effects, the printing time doubles. Bold type can be obtained when the hammer strikes the proper letter a little off center. To underline, a line is printed before the letter is printed. In order to use italics, special characters or other text types, the type wheel must be exchanged with the proper wheel.

Operating a Daisy Wheel Printer

What the daisy wheel printer lacks in speed and graphic/text capabilities, it makes up for in additional equipment such as a semi-automatic or fully automatic single sheet feeder.

Operating a daisy wheel printer isn't much different than operating a dot matrix printer. There is a TOF (Top Of Form) key on single sheet feeders which pulls the sheet to the top. The more expensive daisy wheel printers have a copy mode, which allows the document to be saved by pressing a key and printed as often as desired.

The Typewriter as Printer

Many typewriters can be connected to a computer by using an interface and used as printers. However, we don't recommend using a typewriter as a printer.

One disadvantage is that a typewriter and correct interface cost almost as much as a good dot matrix printer. Also, using a typewriter reduces the life of the typewriter because the computer operates it at a higher than normal speed.

Another disadvantage is that typewriters usually print in just one direction. Since this *unidirectional* print increases the printing time, using a typewriter is slower than using a daisy wheel printer.

Daisy Wheel Printer Drivers

Daisy wheel printers contain *text processors*. These processors can control the printer and transfer commands for adding text only when the correct driver is loaded. But daisy wheel printers speak their own language.

The command set for daisy wheels deviates from the ESC/P or IBM character set. With an Epson or IBM printer driver, the printout may not function properly.

If there isn't a special driver for your daisy wheel printer included with your word processing application, try one of the following drivers. Each program has a driver for at least one of these printers:

- Diablo, Diablo 630 or similar daisy wheel printer
- HR 5, HR 10, HR 15, HR 20 or HR 40 (Brother)
- Gabi 9009 (Triumph Adler typewriter)

However, even if the correct driver is used often the printer doesn't produce the expected result. We'll look at the following areas:

- Identifying incorrect printer drivers and printer interruptions.
- Deviations between drivers.
- How to make a printer driver work.

Incorrect Printer Drivers

When your printer produces strange-looking characters on the paper, this is a sign that the installed printer driver is for a dot matrix printer. Daisy wheel printers accept only a fraction of the commands accepted by a dot matrix printer. Try another printer driver.

Deviations Between Drivers

Since the daisy wheel printer isn't as popular as the dot matrix printer, the number of drivers for this printer is relatively small. Often, you must use another printer driver, or, if the driver for your own printer is used, you may not get the desired result. This is because the adjustments for daisy wheel printers have a lower priority, and many times the driver can only be created with the help of the printer manual.

A frequent error associated with daisy wheel printers is incorrect line spacing. Your word processor may allow you to finely adjust line spacing to compensate.

Creating Your Own Drivers

Most applications have fairly friendly printer drivers. Many applications will include printer drivers that will either be near compatible or completely compatible with your daisy wheel printer.

Daisy Wheel Printer Commands

This section contains an overview of the most frequently used commands, as well as their syntax for dot matrix printers according to the ESC/P command set. You will also find the necessary commands for creating a new driver, and if you want to modify an already existing dot matrix printer driver, you can read the corresponding command for the typewriter printer.

Configuration

Function	ESC/P	Daisy wheel	Comments
initialize printer	ESC @	ESC CR P	
unidirectional	ESC U	ESC \	prints in one direction
print direction	n/a	ESC 5/ESC 6	left to right or vice versa
page length	ESC C NUL	ESC FF	
set start of page	ESC 4	ESC T	
set page end	n/a	ESC L	
automatic CR	n/a	ESC ",#	activate/ deactivate

Mechanical Printer Control

Function	ESC/P	Daisy wheel	Comments
back step 1/120"	n/a	ESC BS	
paper feed	n/a(FF)	ESC EM R	feeds one sheet
line feed	n/a	ESC U/ESC D	1/2 line forward/ back
line back	n/a	ESC LF	back a line
line spacing	n/a	ESC RS	1/48" division
line spacing	ESC 3	n/a	1/216 or 1/180" division
determine color	n/a	ESC A, B	red or black

Text Formatting

Function	ESC/P	Daisy wheel	Comments
set left margin	ESC 9	ESC I	in the current position
set right margin	ESC 0	ESC Q	same
set top margin	n/a	ESC T	same
set bottom margin	ESC N	ESC L	same
erase top/bottom margin	ESC O	ESC C	
tabulate vertically	VT	ESC VT	absolute
set VT stop	ESC B	ESC -	in the current position
tabulate horizontally	HT	ESC HT	absolute
set HT stop	ESC D	ESC 1	in the current position
erase HT stop	n/a	ESC 8	same
erase all VT and HT stops	ESC D NUL	ESC 2	
block set	ESC a	ESC M	
centers text	ESC a	ESC =	

Text Size

Function	ESC/P	Daisy wheel	Comments
text division	ESC SP	ESC US/ESC S	1/120"division
proportional text	ESC p	ESC P/ESC Q	

Print Effects

Function	ESC/P	Daisy wheel	Comments
bold on	ESC E	ESC W	label: shadow print
bold off	ESC F	ESC &	deactivates double strike
double strike on	ESC G	ESC F	
double strike off	ESC H	ESC O	
underline on/off	ESC -	ESC E/ESC R	two commands
hyphens on/off	n/a	ESC H/ESC I	
global deactivation of print effects	n/a	ESC X	

Graphics

Function	ESC/P	Daisy wheel	Comments
Graphic mode ON	ESC * etc.	ESC 3	
Graphic mode OFF	n/a	ESC 4	

Character Sets

Function	ESC/P	Daisy wheel	Comments
print special characters	ESC \	ESC Y	

Ink Jet Printers

A print technology that is based on the principal of the dot matrix printer is the ink jet printer. For a long time this printer received little attention, partially because of the expense of the delicate ink jets.

Ink jet printers belong to the *non-impact* category of printers. These printers are called non-impact because nothing except the ink touches the paper. An advantage of this is that these printers are quieter. However, there are other advantages for using the ink jet printer.

Since it uses the same command set as its counterpart, the dot matrix printer, controlling the ink jet printer doesn't present any problems.

Ink jet/dot matrix compatibility applies to the graphic mode as well as the text mode. Another advantage of the ink jet is its printing speed, which is much faster than the speed of a dot matrix printer

However, even though this printer has advantages, it is impossible to avoid some problems. For example, the ink jet printer isn't suitable for printing with multiple sheets, such as invoices. If you attempt to print

multiple sheets using an ink jet printer, it may leave blots on the first sheet. This printer is unsuitable for multiple sheet printing.

The ink jet printer also requires special paper. The surface structure of this paper must be a non-absorbent paper, otherwise the ink will run, which produces an unclear printout.

For the best results, a non wood pulp paper, or the corresponding quality in a continuous form, should be used. A paper with a talcum surface is recommended for printing graphics. Heavily filled areas and delicate point rasters are printed with greater contrast on the surfaces of these papers.

To show you how an ink jet printer creates its output, we'll present the working principles of this device.

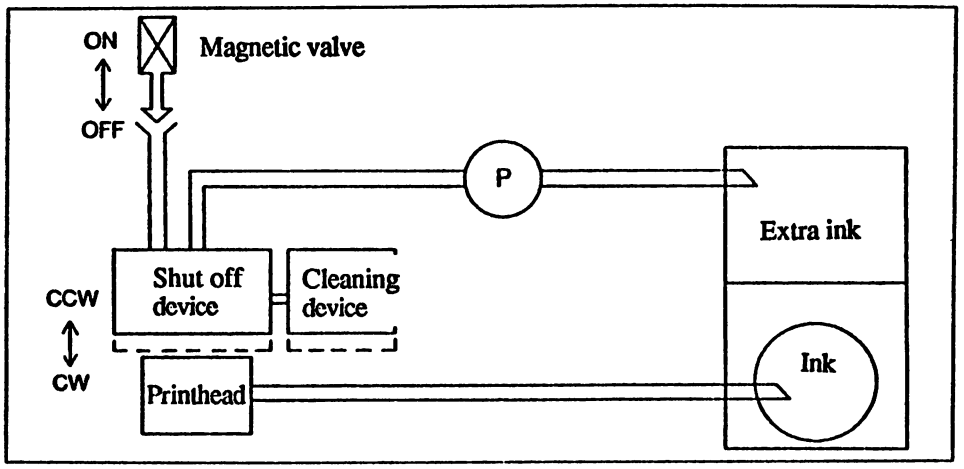
Those of you who are technically inclined will get an idea of what an ink jet printer does when its printhead stands at the left margin of the paper.

How They Work

There are two main principles for the ink jet printers. One method is the *bubble jet* method. The ink is warmed by small heating elements and small drops are pushed out by gas blasts. The gas condenses again and then this process is repeated.

The other method, called *drop on demand*, is more common. We'll show you this method and how the printer works.

The ink jet printer has an expensive print unit as well as an extremely delicate mechanism. The following figure shows a diagram of the individual parts of an ink jet printer.

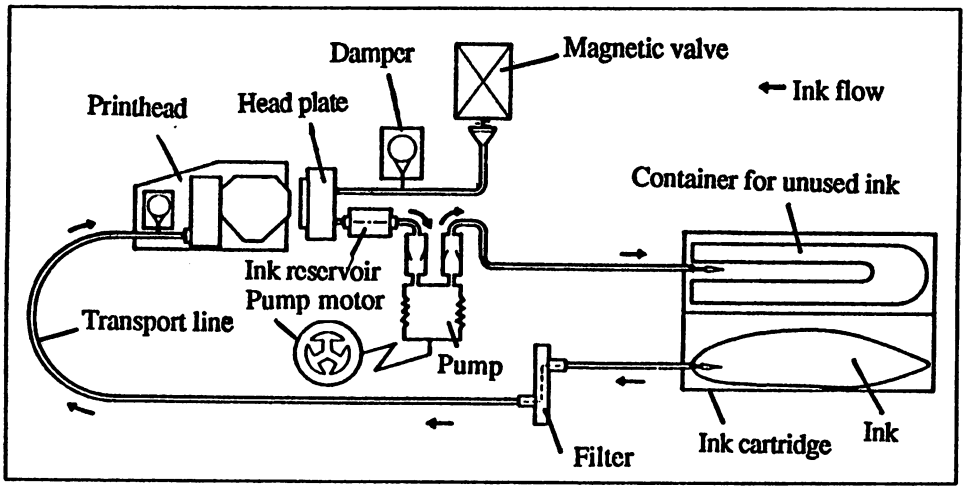


Basic operation-ink jet printer

One block of the work circuit is the ink reservoir. A color cassette is installed on one side of this device. The color dispenser fills the printhead. When first switched on, the printhead goes to the left margin of the print area, where the closing device and the cleaning device are located.

First the printhead positions itself on the closing device. Then the ink from the color holder is placed in the printhead and the old ink is pushed from the printhead. The magnetic valve opens and the excess ink is pumped into a holder. Then new ink goes into the printhead and fills the jets.

Next the printhead moves to the cleaning device. Small cleaning brushes remove the dust and dirt particles from the printhead. This startup operation, which lasts a few seconds, ensures that the jets keep working for a long time.

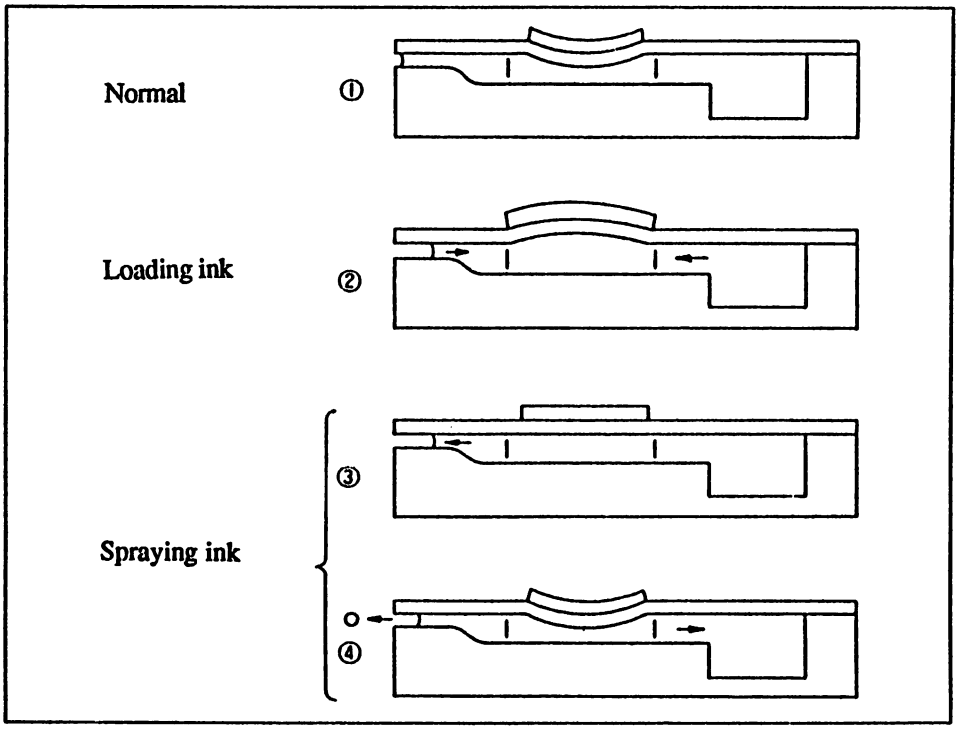


Ink jet printer mechanism

The above figure shows the individual components of the complete printing circuit. The ink moves through a filter to the printhead. The closing device ensures that the color in the leftover color holder is pumped before the cleaning operation. The magnetic valve starts this operation and the pump motor and the pump deliver the old color to the holder.

The printhead consists of many small parts. Drop on demand means that the ink is shot with an electrical impulse. Some small crystals may form on the surface because of the electricity.

The following figure shows the individual phases from the normal condition to the removal of the ink.

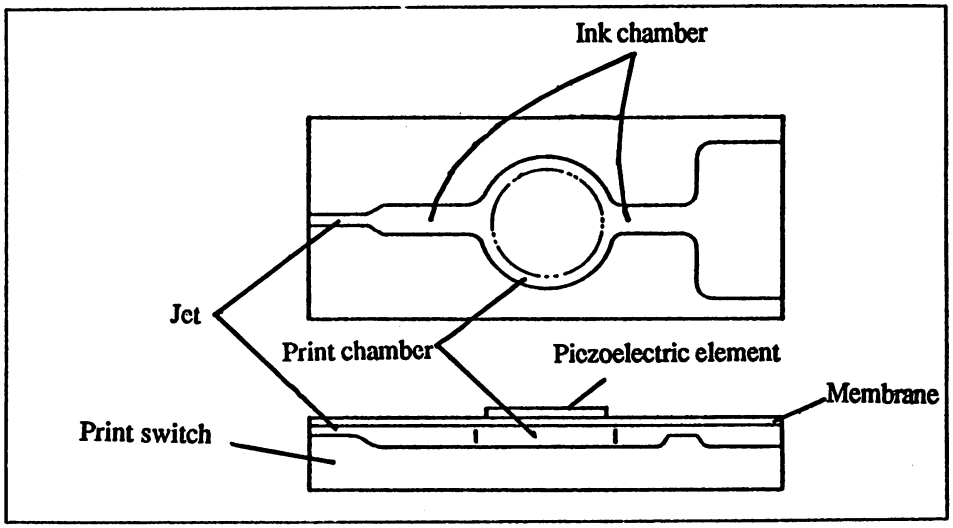


Ink jet-operating phases

The first illustration shows the normal condition of the piezo element (electrical element) when it is switched on. The element is permanently loaded in this shape.

Illustration 2 shows how the ink is loaded. Notice the change to the piezo element, which is switched off.

Illustrations 3 and 4 show the ink spray process. When voltage goes through the piezo element, it returns to its normal shape.



Ink jet components

Because of the mechanisms used in ink jet printers, they are very easy to use. But they should be kept free of dust and dirt. As you notice dirt and dust accumulate, use a cotton swab to clean the dirt from the paper.

As we mentioned earlier, the kind of paper used is more important with these printers than with dot matrix printers. The paper should be free of wood pulp but most importantly, it shouldn't be too fibrous. It's also important that the paper surface be clean so that the color does not run and spread or bleed.

Finally, there is one last point to remember when using ink jet printers. After printing you should remember that the ink may not be completely dry. Therefore, depending on the type of paper used, it's possible to smudge the text.

If you're using good paper, the ink will dry two lines after it is printed. But if the paper is full of wood pulp, the ink can take considerably longer to dry.

Thermal Printers

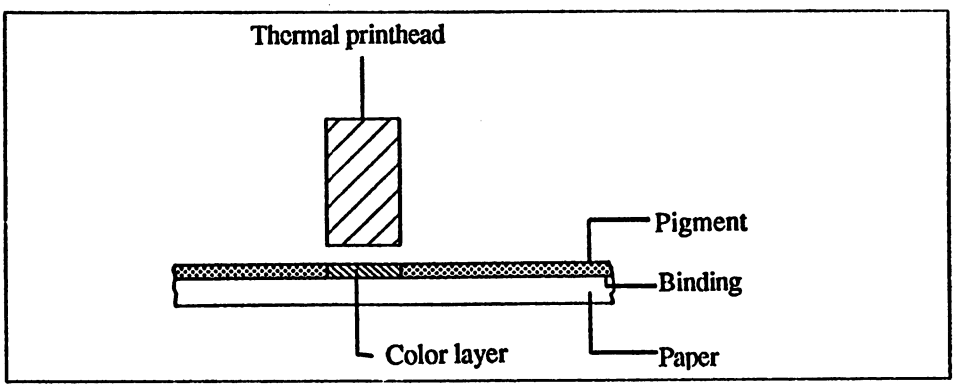
Not many people realize that the thermal printer was specifically designed for some applications. There are about seven different kinds of thermal printers. The thermal reactions and thermal transfer methods used with these printers are important in the printer market.

Thermal Reaction Print

Printers that work according to the *thermal reaction method* are incorrectly labeled as thermal printers. This is the generic name used for all printers that work according to the thermal principle. A thermal reaction printer is one that prints, with its printhead, on special paper.

This is used mostly as a portable printer or a mini printer used with a pocket computer. The print operation of a thermal reaction printer is done without a ribbon. The ribbon material is found in the paper. The printhead consists of multiple heating elements, which form the dots that make up the printed image.

By applying voltage, these heating elements reach a temperature of over 300 degrees. The color is created by a chemical reaction, which is caused by heating the paper surface.



Thermal printer elements

The above figure demonstrates how the paper is darkened with thermal reaction print. The printhead travels a short distance over the special paper, which consists of two layers: the face of the paper and the ink substance (lactone and florane). These two layers are merged through a cement.

A chemical process occurs in the ink substance through the high temperature of the heating elements of the printhead. This results in the darkening of the active location and the printed image is created. Unfortunately, the print created is light.

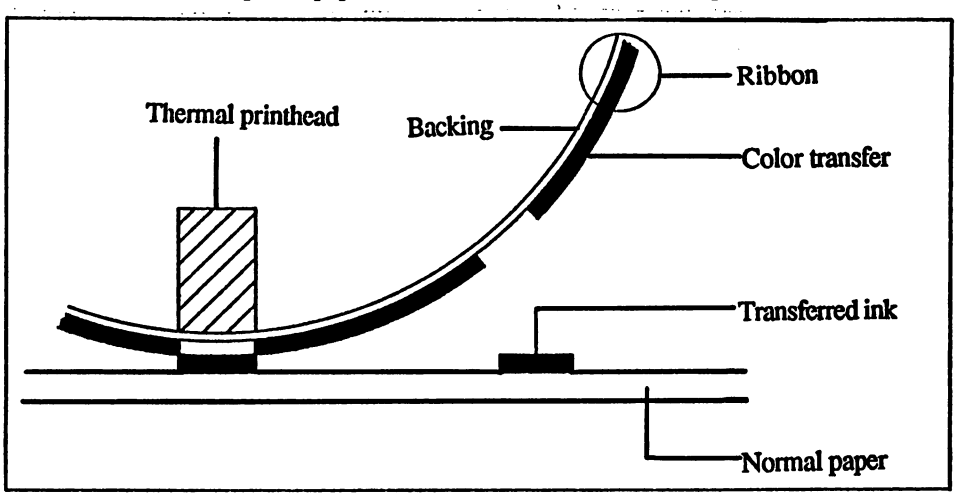
There are some advantages and disadvantages to this unusual method of printing. The simple construction of the printhead and the lack of a ribbon are definitely advantages. This method is recommended for small printers (i.e., mini printers for pocket computers) or for a portable system. The printed image that a thermal reaction printer creates is full of contrast and is very sharp.

Another advantage is that the only noise created is limited to the print mechanics used to move the printhead. Don't be fooled by the low cost of a thermal reaction printer. The inferior paper quality and high operating costs are disadvantages. Since the cost of the special paper adds up quickly, this device is not suitable for printing large quantities of data.

Thermal Transfer Print

The thermal transfer method of printing is similar to that of thermal reaction printing. The differences are that thermal transfer printers use a ribbon and print on normal paper.

Since thermal transfer printers work with a printhead as with the thermal reaction printer's, it is possible to use it without a ribbon but with special paper, almost like a thermal reaction printer.



Thermal printing process

The printhead of this printer consists of multiple heater elements just like the thermal reaction printhead. Each individual segment adds a point to the printed image. By adding a voltage, the heating elements can reach a temperature of over 300 degrees Celsius. The printhead presses the ribbon against the paper during the print operation.

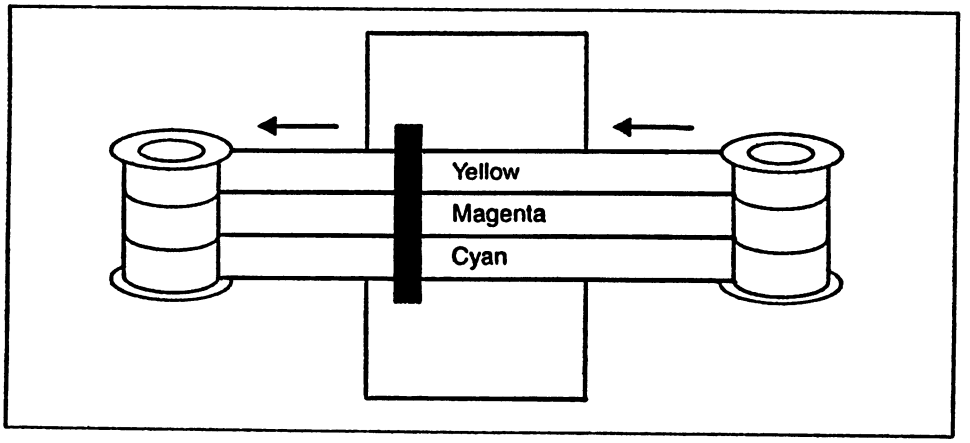
The ribbon consists of a base foil and a wax color. The color from the base foil is melted when the heating elements become hot and the color is transferred to the paper. Then the ribbon is taken away from the paper again and there is a blank spot on the ribbon. However, the ribbon can only be run through once. If you are at the end of a ribbon, a new ribbon must be used, which can become expensive.

A disadvantage of using this printer is the high operating cost. Also, thermal transfer printers are not very fast. Do matrix and ink jet printers can reach a faster data printing speed. However, the thermal transfer printer is very quiet, compact and easy to maintain. The printout is very high quality and isn't faded like that of the thermal reaction printer.

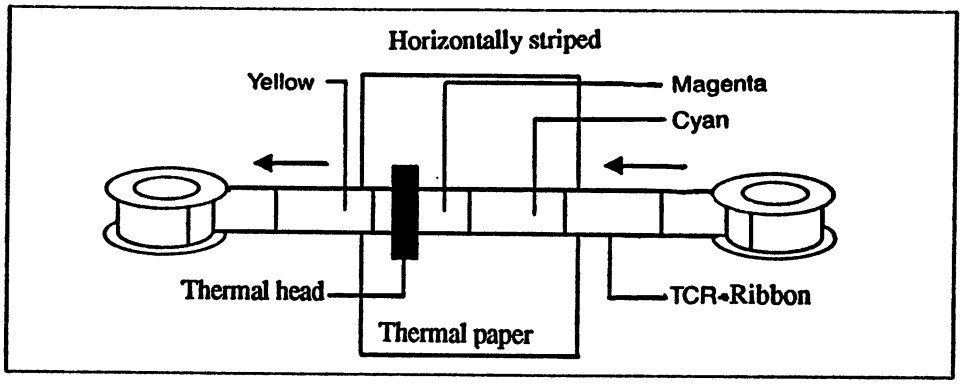
Color Thermal Transfer Printers

Color print is rarely associated with thermal transfer printers. But the printouts produced with color thermal transfer printers are very good quality and very symmetrical. The print method is identical to the method used for one color thermal transfer.

Instead of the color ribbon containing only one color on the base foil, it contains three or four colors. The colors are either placed on top of each other, as in the following figure or divided into small strips next to each other, as in the figure following the next.



Three color printer ribbon (parallel colors)



Three color printer ribbon (consecutive colors)

The three color ribbons contain the three basic colors of *subtractive color mixing*: yellow, magenta and cyan. To use black, these three colors must be mixed together. This operation takes a lot of time because the line must be run through for each color. Also, many ribbons are required. However, this mixing isn't needed for all color ribbons. Multi-colored ribbons contain a band or field of black in addition to the three basic colors.

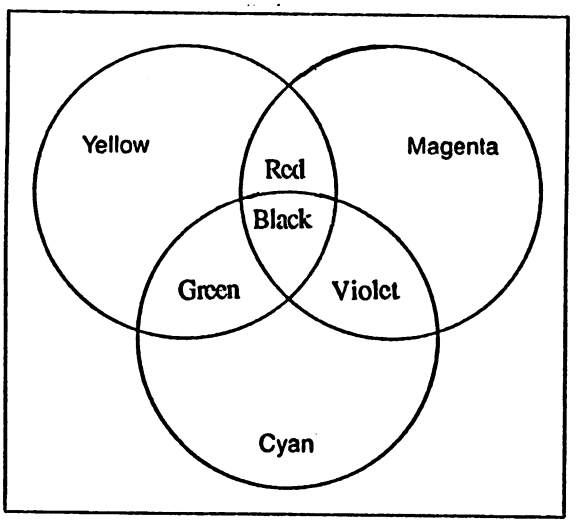
Mixing subtractive colors are the same as mixing individual colors. Each color that enters our eyes has a certain wavelength. For example, red has a large wavelength and blue has a short wavelength. If the eye receives these two colors at once, it mixes them to make brown. White contains all of the wavelengths of the color spectrum. This is called subtractive color mixing because the respective colors can be perceived by absorbing certain wavelengths.

If the color pigment of cyan is placed on white paper, this point appears as cyan because not all of the wavelengths of the white light are returned. Only the wavelengths of the middle and short areas are reflected.

You can obtain seven different colors by mixing (printing over each other) the three basic colors. Mixing the colors yellow and cyan results in green, magenta and cyan produce violet, yellow and magenta become red, and mixing all of the colors results in black. The colors are mixed by printing over the basic colors.

The printhead must travel over a line more than once to complete the printout, which takes up a long time. So that you are not limited to only seven colors, *autotypical color mixing* can be used in addition to subtractive color mixing. Instead of the colors being printed on top of each other, they are printed next to each other.

This method is only used with printheads that have a very high resolution so that the effect of the color mixing can be clearly seen.



Color mixing

Even though this printer has a high operating cost and the ribbons have a short life span, there is no alternative for high quality color printouts.

Dot matrix printer commands can generally be used (ESC/P or IBM) with these printers. The more expensive printers include laser printer emulations and PostScript® boards. You can either use inexpensive continuous feed paper or expensive individual sheets. We recommend a paper with a delicate surface for high quality printouts because they provide the best results.

Chapter 8
Printer Problem Solving

So far you have learned about various printers and how they operate. Often it is difficult to apply what you learn about your printer or to use all of the capabilities of your printer.

Helpful Hints

We've collected some information in this chapter that will help you in your every day work. Also, you can discover ways to use your printer without using several different types of software.

Since some of the tips require the PrinterTool program from the companion diskette, you should now load and run this program.

NOTE: All of the following examples use the ESC/P command set. Check to see if the commands used are supported by your printer and then enter the correct sequence for your own printer.

Hint 1: Printer Control Simplified

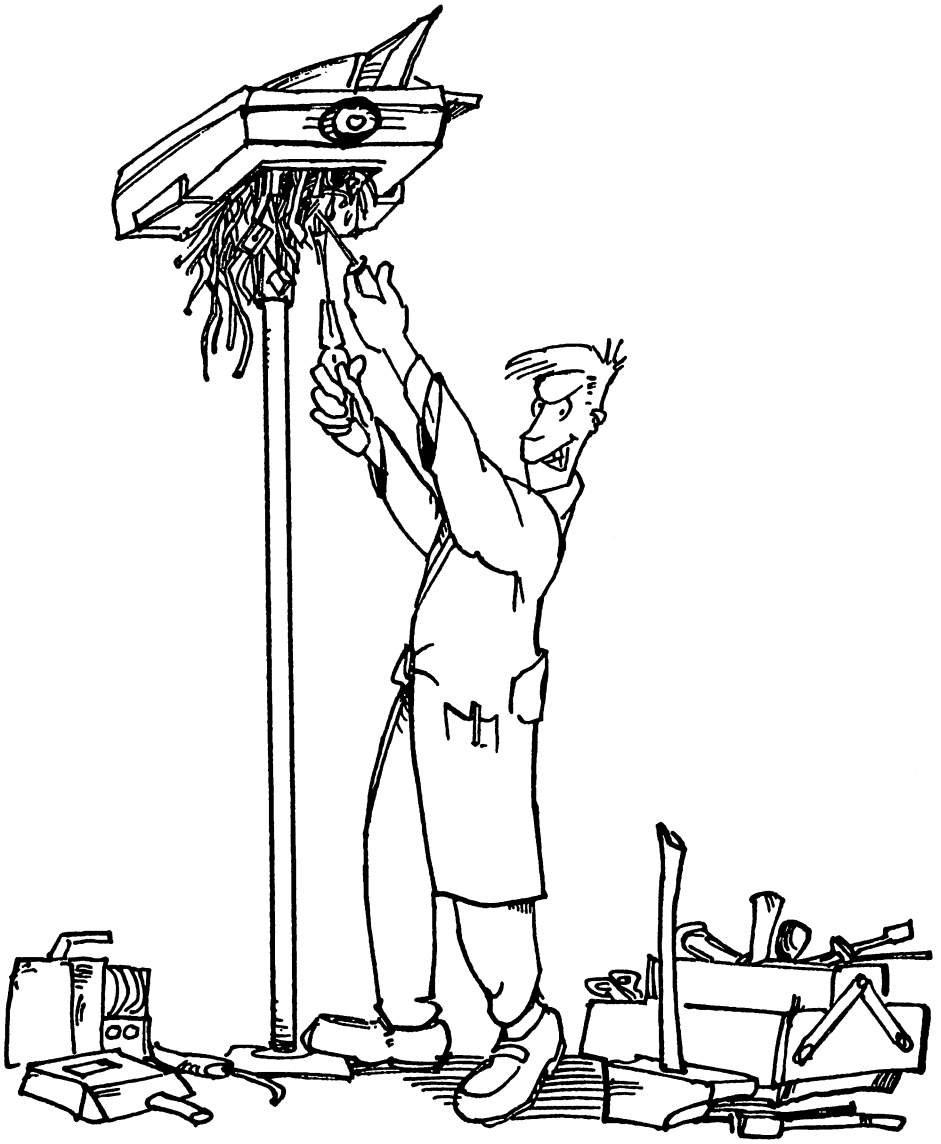
The easiest way to call printer functions is to use the PrinterTool program included on the accompanying companion diskette and listed at the end of this book. It allows you to enter printer control in English, decimal and hexadecimal format.

The following commands all enable bold text using the PrinterTool program:

```
BOLDON
27,69
$1B,$45
```

Hint 2: Using the Correct Emulation

Be sure that your printer either runs in the ESC/P mode or understands its commands, which means that the printer must operate in an Epson emulation mode. Other printers, like the IBM printers, have a different command set so they interpret the commands differently.



I want it to do 250 CPS!

Hint 3: Text Input and Output for One Line

A simple method for displaying up to 118 characters of unformatted text is to use the ECHO command from the Shell. The following command sends the words "The walrus and the carpenter" to the printer:

```
ECHO > prt: "The walrus and the carpenter"
```

Hint 4: Printing in the Background

You can place a printing task in the background. This is particularly useful if you want to edit a file while another file is printing. Enter the following from the Shell:

```
RUN COPY TextFile TO PRT:
ENDSHELL
```

Entering these two commands copies TextFile to the printer and exits the Shell to the Workbench.

NOTE: You cannot access the printer while the file is printing from the RUN COPY command.

Hint 5: Printer Control under AmigaDOS

By using a small trick, it is possible to control the printer directly from AmigaDOS. To do this, you must set the printer to the italic character set (usually called the standard character set) with the DIP switches.

Since the *printer control characters* (form feed, carriage return, escape, etc.) are specified starting at ASCII code 128 decimal, you can use them for printer control.

Enter the ECHO >PAR: command as you normally would to send text to the parallel interface. After you enter the space following PAR:, press and release the <Esc> key. This displays an inverse video left bracket ([) on the screen: That's your ESC command. Immediately following this inverse video left bracket, enter your printer command. For example, the following will enable bold print:

```
ECHO >PAR: [E
```

An alternate method uses the combination "*e" instead of pressing the <Esc> key. The following prints one line of text in bold italic form, and one line in normal form:

```
ECHO >PAR: "*eE*e4 Bold and italic text"
ECHO >PAR: "*eF*e5 Plain text"
```

If you omit the text, only the control command is sent to the printer.

Hint 6: Justified and Formatted Text Output Without a Word Processor

Suppose that you have completed an ASCII text, such as a letter, without using a word processor (e.g., you wrote it using ED or a similar application). You want the text configured to a 10 character left margin, 60 characters per line of text and a 10 character right margin. The next few lines will allow you to print this data without using a word processor.

Run the PrinterTool program. Enter the following to set the right margin to 70 characters (this may only work in one particular print mode—consult your printer manual):

```
27,81,70
```

Enter the following command to set the left margin to 10 characters:

```
27,108,10
```

Enter the following command to enable justification (your printer may only use justified mode when in NLQ or LQ modes—consult your printer's manual):

```
27,97,3
```

Enter the following to start file mode in the PrinterTool program:

```
file
```

When PrinterTool prompts you, enter the filename and press <Return>. The text prints on the page according to your specifications.

All this can be entered in one command sequence:

```
27,108,10,27,81,70,27,97,3
```

Hint 7: Perforation Skip

If you frequently use continuous feed paper, you probably know that sometimes listings or text displayed with `TYPE` (see Hint 6) continue past the end of the page or is printed over the perforation.

Most printers have a DIP switch which activates the perforation skip. This leaves the top and bottom 1/2" of a page blank when active. The perforation skip is ignored when the DIP switch is inactive.

For example, on a photocopier, the text which is printed over the perforation may be unreadable, and the text at the bottom won't copy, since the copier cannot "see" the last 1/2" at the bottom of the page.

NOTE: When using software that performs text formatting (e.g. a word processor), remember to disable the perforation skip, since the software may have its own page settings.

Hint 8: Label Printing

A printer capability that frequently causes problems is label printing. Wide carriage printers produce the most problems when printing narrow single or continuous feed labels. The printer informs you that it can't find any paper.

The cause of the error is the location of the paper out sensor (usually a small optical or mechanical sensor that is located left of center and under the platen). Since the labels are so narrow, the sensor may not detect the labels.

There are three ways to avoid this problem.

1. Disable the paper out sensor by turning the proper DIP switch off or on (consult your printer manual).

2. Disable the paper out sensor through software (consult your printer manual).

3. Tape down the paper out sensor. You should use this method only when there is no DIP switch to disable the paper out sensor or if the sensor cannot be disabled through software. This may happen accidentally if a label gets clogged in the mechanism.

Although all three methods are practical, they remove control of the paper out sensor. Since the sensor can no longer check whether there is paper under the printhead, the printer can continue printing to the platen after the paper runs out, thus causing wear on the printhead and platen.

Troubleshooting

When a user is new to a printer, it's difficult to remember all of the details required for an error-free printout. It's annoying when it takes ten or more tries to print a single letter.

In this section, we'll present the most frequently encountered errors and how these errors happen. We'll also discuss how these errors can be detected and eliminated. The errors, their origins and their removal are the same, regardless of the type of printer you own.

Problem 1: Printer not Responding (Parallel Interface)

If your printer doesn't print when you send a command, check the following:

- Make sure the printer has paper, that the cable to the computer is firmly attached at both ends and that the printer is in the ON-LINE mode after being switched on.
- Switch the printer on and switch the computer off. When the computer is switched on again, the printer will perform its initialization (positioning the printhead in the left margin) after a short time.

If these don't apply, there are three other possibilities:

- The computer's interface is defective.
- The printer is defective.
- The interface cable isn't connected properly.

The last point is the cause of the error 95% of the time. If you have purchased the printer cable, exchange it or examine it at the dealership. If you have put the cable together yourself, you should compare the connections with those listed in the Appendices.

Problem 2: Printer not Responding (Serial Interface)

When printing with a serial interface remember that the computer must be instructed to send printer output through the serial interface instead of the parallel interface. Make sure the Serial gadget is clicked in Preferences (See Chapter 2), and see Chapter 3 for information on redirecting output to the serial interface SER:. A popular setting for the serial port when printing through that interface is:

```
Baud Rate   = 9600
Parity      = None
Bits / Char = 8
Stop Bits   = 1
```

The printer must be assigned the same serial parameters as the computer. This is done by setting the corresponding DIP switches (see Chapter 2). If the printer is still not responding, check the cable.

NOTE: Use a null modem cable or printer cable specifically designed for Amiga/serial printer connection. A standard serial cable is normally used for modem connection and shouldn't be used to connect a serial printer to the Amiga.

A cable arrangement that works with 90% of all computers and printers on the market can be found in Chapter 1.

Problem 3: Device Prints Strange Characters (Serial Interface)

If your printer displays strange characters instead of normal text, this is usually caused by different parity settings in the computer and printer.

Write down your current DIP switch settings for later reference. Set the appropriate DIP switches in the printer, and make sure that the serial parameters in Preferences match the DIP settings in your printer.

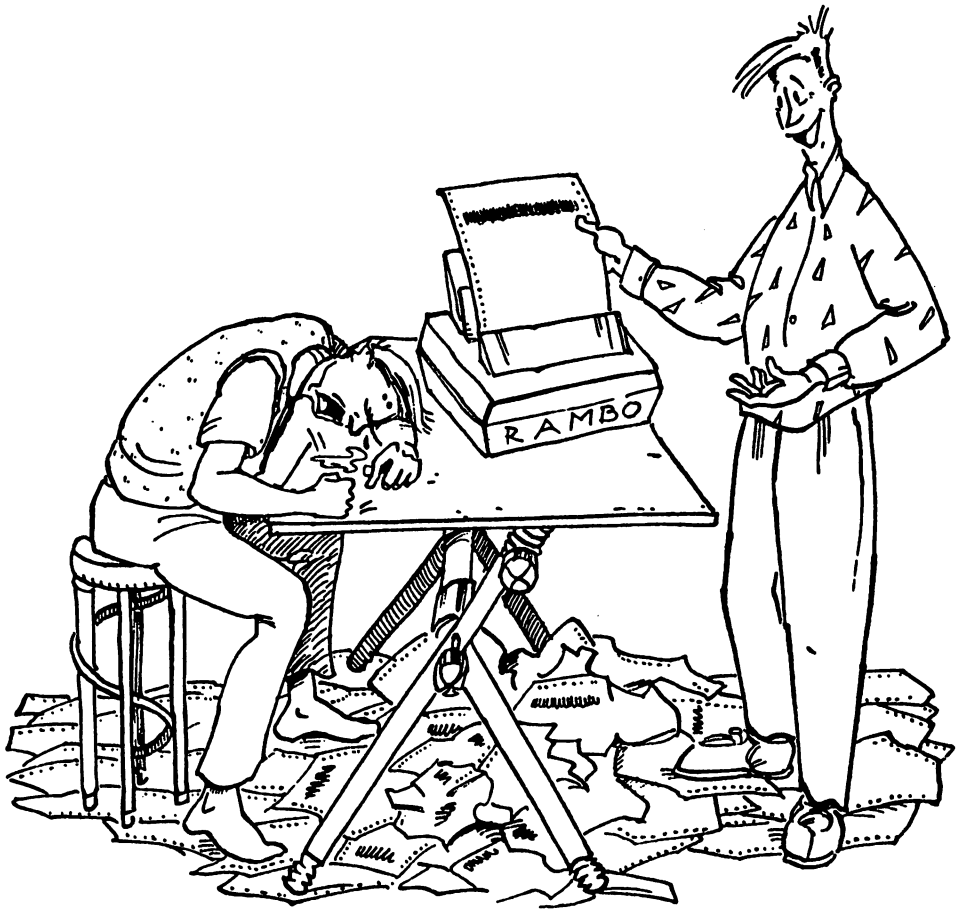
Another reason for this problem may be a baud rate that is too high. Since each manufacturer has its own settings for the signal and pin arrangements, there can be timing problems with high transfer speeds.

If you encounter this error, set your printer and Amiga to a slower transfer rate.

Problem 4: Printer Prints a few Characters and Stops

This almost always occurs in data exchange between printer and computer while using a serial interface.

The printer uses the DTR signal or the XON/XOFF protocol (over the TD line) to signal the computer whether or not it is ready to receive data. The error is usually caused by an incorrect cable connection. Make sure pin 20 (DTR) of the printer is connected to pin 6 (DSR) of the Amiga.



Don't be upset. Think of it as data compression!

Problem 5: One Line is Printed Over Another

This happens when the computer or the printer doesn't send a line feed signal. This problem can be solved by setting the DIP switch 2-4 to UP (ON) (see Chapter 2).

Problem 6: Blank Lines Appear in the Printout

The printer needs a carriage return character (CR—OD hex or 13 decimal) at the end of each text line in order to set the printhead to the left margin again.

A line feed character (LF—0A hex or 10 decimal) must follow so that the paper is moved further. Different computers and programs send this character themselves while others only send a carriage return and expect the printer to execute the line feed.

If both systems send a line feed, the paper is moved down two lines at the end of each line.

This problem can be solved when the line feed DIP switch is switched off (see Chapter 2). Be sure to write down your current DIP switch settings before changing any DIP switches.

Some software applications allow you to select a double line feed. In this case you must be sure that this DIP switch is deactivated.

Problem 7: Start of Page not Printed

This problem frequently occurs if you want to print multiple pages in sequence. The printout begins a few lines earlier on each page until it finally begins at the end of the last page.

The DIP switch for the page length is set incorrectly. With certain programs, mostly word processors, you must remember that the form length is set at 66 lines.

Some software applications insert their own form feeds. Because of this, you must provide the application with the exact paper length.

Problem 8: Incorrect Start of Page

You may wonder why the printer never starts printing at the beginning of the page. Since the starts of pages aren't added to each other, an incorrect page beginning may occur after re-formatting a page.

You must find out how the printer determines the start of the page. This setting is selected the moment the printer is switched on.

If the printer is switched on when it is in the middle of a page, a form feed will always return the printer to that position on the next page.

You can set the correct position with a software command or by switching form justification.

The same result can be achieved if the paper is moved by hand while the printer is on. However, since using this method isn't good for the step motor, this cannot be set by the printer. This results in the printer staying in the old position and executing an incorrect form feed.

Problem 9: Printer Beeps When Turned On

The tone made by the printer when it is switched on may indicate that the printer is not connected. Check the connections.

Problem 10: Printer does not Switch to the Desired Mode

Certain combinations of text types and attributes aren't possible on a 9 pin printer. Because of this, one of the two commands is ignored. Refer to your printer manual for the possible combinations.

Problem 11: Printer Executes Command Incorrectly or Not at All

Many printers have two different modes: ESC/P mode and IBM mode. Some IBM mode commands coincide with ESC/P commands, others don't.

A typical symptom of this problem is when the printer doesn't execute the command for italic text. Set your printer to the ESC/P whenever possible (often called the standard mode by the manufacturers) or, if possible, use the IBM printer driver included with the software application being used.

Problem 12: Smudged or Dark Print

Make sure that the ribbon is inserted correctly, and that the correct side is facing the paper. If the ribbon has not been changed for a while, it may need changing.

Problem 13: Uneven or Broken Up Print

The ribbon must be at the correct height, otherwise the top or bottom pins may not impact against the ribbon.

Check to see if the ribbon container/cassette is set firmly in place. Also, if the printer is used frequently and for long periods of time, the printhead will wear out. Some signs of this are:

- A white space in each printed line (missing pin).
- Lowercase letters like g, p and y are printed without their descenders (missing bottom pin).
- Nothing appears on the printout (all pins missing).

- Some points are darker than others (one or more pins are not reset quickly enough after hitting).

Replace the printhead or have your dealer replace it.

Problem 14: Print Type Changes during Print Operation

You can specify control characters that change print mode. The ASCII character ESC, value 27 (1B hex) is interpreted by the printer so that the following character is used as a printer command.

With certain character sets (such as the italic character set), the value 155 (9B hex) is also handled as an ESC character. If one of these characters (27 or 155) is sent in a print document, an unwanted effect may occur.

Problem 15: Paper is Pulled Forward

This happens frequently during the output of graphical data. The error can occur if an automatic single sheet feeder is replaced with a tractor unit, without changing the corresponding DIP switch.

When using a tractor unit the DIP switch for the single sheet feeder must be set to OFF.

Problem 16: Shaky Graphic Characters

Since the IBM graphic characters cannot work in either the LQ/NLQ or the draft mode (graphic characters are taller than one line), it's impossible to get quality print when using bidirectional print mode. The characters often appear in lighter ink in the bottom third of the printout.

To correct this error, switch the printer to unidirectional mode. This mode is switched on with the following command, called from the PrinterTool program on the companion diskette accompanying this book:

```
27,85,1
```

The printhead only prints when moving from left to right. Therefore, the print speed is cut in half but the exact position of the individual pins is guaranteed.

NOTE: Don't forget to switch the printer back to bidirectional mode using the command:

```
27,85,0
```

This command returns you to normal text. This will also increase the print speed.


Printer tuning

Problem 17: Paper Out Message While Printing Labels

An application that can cause many problems is printing labels. Most of the problems occur with the wide carriage printers while printing small individual or continuous labels.

A warning beep sounds and a light blinks when the printer runs out of available paper. This is caused by the small optical or mechanical sensor that is usually located left of center and behind the wheel. There are two ways to solve this problem:

1. Switch the paper end sensor off with the DIP switch. (This is not possible with all printers.)

2. Cover the sensor with a piece of tape or a label. This method should only be used when there is no DIP switch for the paper end sensor.

Both methods are practical but completely lock the paper out sensor into one position. Since the sensor no longer checks to see if paper is present, the printer continues printing past the end of the last page.

Problem 18: Page Not Completely Printed (Continuous Feed Paper)

A text printed with the TYPE command or with a word processor doesn't fill the entire page despite the corresponding settings. Often, it leaves about 1/2" blank at the top and bottom of the page.

A perforation skip can be set on almost every printer by using a DIP switch. If the perforation skip is set, the printer automatically leaves one inch blank at the division between the two pages. Disabling this switch provides more space at the bottom of the page.

Problem 19: Incorrect Page Setup (Continuous Feed Paper)

The form feed executes too soon, despite correctly set paper formats in the word processor (66 lines). A few lines are printed at the top of the next page and then some blank lines are set.

A perforation skip can be set on almost every printer by using a DIP switch. If the perforation skip is set, the printer automatically leaves one inch blank at the division between the two pages. Disabling this switch provides more page space.

To add more lines, change the setting for the page length in the program being used or disable the perforation skip.

Problem 20: Incorrect Page Setup (Page Too Short)

You have loaded a foreign text and the form feed executes too soon despite the correct settings for the paper format in the word processor (66 lines or 72 lines). A few lines are printed at the beginning of the next page and then a few blank lines are printed in the middle of the sheet.

The text you loaded has a format that is justified for another page format.

Save the text again as unformatted and reload it.

Problem 21: Incorrect Page Setup (Spaces in the Text)

You have loaded a foreign text and the form feed executes too soon despite the correct settings for the paper format in the word processor (72 lines or 66 lines). After 2/3 of the page has been printed, a few blank lines are inserted and then the printout continues.

The text you loaded has a format that is justified for another page format.

Save the text again unformatted and load it again.

Problem 22: Line Feed Too Large or Too Small

Text printed with a word processor displays a line feed that is too small or too large. This disturbs the page format, leaving holes in the text.

You have chosen a 24 pin printer even though you have a 9 pin printer. Since 9 pin printers have a line feed of n/216 inch and 24 pin printers have a line feed of n/180 inch, a 24 pin printer executes a larger line feed than a 9 pin printer for the same value of n.

Chapter 9
Accessories

Besides the printer itself, there are also many other accessories available. The printer manufacturers offer only a few of these devices. We'll discuss the most interesting accessories so that you can get an idea of what's available and how you can use them.

Just remember that these devices are accessories. This means that you may have no need for any of these devices but someone else may find one or two of them indispensable. Let your judgement and your wallet be your guides.

Accessories from the Manufacturer

Certain accessories found on a printer may only be available from the manufacturer of that particular printer.

Sheet Feeder

Many printers already have semi-automatic single sheet feeders as standard equipment. Each sheet must be manually fed into the printer before pressing a key for printing.

See Chapter 2 of this book for an illustration of a single sheet feeder.

An improved version of this is the cut sheet feeder, available for a few printers. This removes a single sheet from a paper tray, partially inserts the sheet in the printer and signals the printer to finish loading the sheet and start printing.

There is a significant difference in price between these accessories. The price for a single sheet feeder can range from $100 to $500. Some of these simply work mechanically and others are equipped electronically and require an additional cable.

Besides the capabilities, of the cut sheet feeder, there are also other considerations that should be viewed when planning to buy one.

The maximum capacity of a sheet feeder determines its effectiveness. Asheet feeder with a capacity of only 20 sheets limits its usefulness but a capacity of 50 sheets would be a practical addition to a business.

The number of output chutes is also an important consideration. This accessory is capable of sending the paper down two or more chutes, depending on the application.

To avoid spending a lot of money on an accessory that doesn't fit your needs, you should ask for a demonstration prior to purchase. There are usually several different types to choose from at a computer store.

Font Module

Most printers have only one or two fonts. This may be inconvenient for some users, especially those who may use their printers for publishing.

The *font modules* are a useful accessory provided by the manufacturers. Each module contains a complete character set (e.g. Times Roman), which can be used instead of the internal font supplied with the printer.

Unfortunately, few older printers provide connections to this type of accessory without major hardware modifications. If it comes down to this, the less expensive course is to buy a newer printer that accepts font cartridges.

The sizes and capabilities of the modules vary from manufacturer to manufacturer. But usually these differences are only cosmetic. The ability to produce a printout that matches certain requirements makes this accessory very valuable.

Pull Tractor

Most printers include a tractor mechanism which pulls the paper through as standard equipment. A few friction feed printers may only offer this as an option, which costs the user extra money.

One disadvantage of using the pull tractor mechanism is that the tractor needs part of the first page of the continuous feed paper to take hold of the paper. However, the pull tractor allows easy label printing and striking a single line multiple times (e.g. for high-resolution graphics and user defined fonts).

Push Tractor

Some printer models offer a *push tractor*. This tractor minimizes paper waste, since the tractor mechanism holds the page near the bottom and pushes the paper through to the printhead.

Unfortunately, multiple label printing is risky with the push tractor. Labels may move off of their perforated paper backing and get stuck in the printer mechanism.

If you want the paper to move both forward and backward, you must use a bidirectional pull tractor. With this type of pull tractor, the paper reaches the tractor feed pins before it reaches the wheel. The

bidirectional pull tractor can move the paper up or down within the printer, allowing more versatility in multiple strike printing.

Although this tractor provides more flexibility, it usually is more expensive than the other tractor mechanisms.

Interface Hardware

There may be times when you want to connect your printer up to a computer that doesn't have standard parallel or serial connections (e.g. some models of home computer).

A few manufacturers sell special *interface hardware* to allow connections between your printer and another computer. These other models contain interfaces that are incompatible with standard parallel and serial peripheral devices.

Third Party Accessories

Various firms, other than the printer manufacturer, offer accessories that are designed for all printers. There are many useful accessories that can substantially lighten your work load.

Printer Switch It is possible to give several computers access to a printer at the same time by using the *printer switch.*

There are various types of switches that, for example, connect two or more computers to one printer and adapters with integrated memory. It's also possible to connect multiple computers together, which are then connected to one printer.

The printer switch automatically manages the printing by holding the text in memory so the computer is again ready to work.

The prices vary according to the number of printers and computers connected and the available functions.

Damping Mat Dot matrix and daisy wheel printers are very noisy. A sound absorbing mat under the printer can decrease the amount of noise.

Printer Stands There are basically two types of *printer stands.* One that is adequate for most applications will simply hold the printer above the sheets of blank paper.

Other printer stands not only have space under the printer for extra paper, but also provide a tray for catching the printed pages.

Scanner

You can add a *scanner* to your printer. This allows you to scan graphics and pictures. A small photoelectric cell is attached to the printhead, usually replacing the ribbon cartridge. A cable then connects this to the computer.

A software program controls the printhead and reads the data from the photoelectric cell. The scan operation is slow with generally a medium resolution quality (120 dpi).

NOTE:

Since the printheads of the individual printers move with different speeds, scanners are usually geared just for one specific model. Before you buy one make sure that the scan operation has sufficient resolution for your printer, and that the holding bracket for the photoelectric cell fits on the printhead of your printer.

A second type of scanner is about the size of a mouse and hand-held. This scanner connects to the computer through an expansion card. The user moves the scanner over the image he/she wants scanned, and the scanner captures that image. The speed of this scanner is much faster than the printhead type, and usually creates a higher resolution image (200-300 dpi).

Sound Enclosure Hood

If you use a printer in an office or a business environment you can suppress the noise of your printer with a *sound enclosure hood*. The hood will completely encase the printer and allow it to print without disturbing you.

Data Ruler

For those of you who write frequently, such as journalists, a *data ruler* is helpful for creating formats. The data ruler contains different scales that make it possible to measure in different units. The best data rulers have point, inch and centimeter divisions.

Multiple scales with different characters or lines per inch make it possible to determine exactly how many lines or characters fit in a certain area. You can also use the data ruler to count lines or characters that are already written.

Graph Paper

An effective aid in creating formulas for graphics is *graph paper*. With large and small scale graph paper you can sketch your formula and quickly read the positions of the individual text locations.

Graph paper can also assist you in determining window size or the positions for the tractor feeds. It can also help you create form letters by aligning forms and testing output.

Paper Sorter You may want to use a *paper sorter* if you work with various continuous feed formulas. This device makes it possible to print different color paper or labels and sort them into any order. Instead of laying them all out on the table you can choose the desired formula and put it on the printer. The paper that isn't used can be stored in the holder until the next time the printer is used.

Tearing Device Another useful option is a *tearing device* for the tractor feeds. If you work with continuous feed paper, this device can help you neatly tear the paper at the perforations. Up to 25 sheets can be inserted and torn from the tractor feeds.

External Printer Buffer

At first glance, an *external print buffer* may seem large and unnecessary. Equipped with 512K of RAM and several inputs, the buffer can receive data from as many computers as it has inputs. The wait time for a printout decreases because the printer buffer stores data, which allows the computer users to continue using their computers. In instances in which it may not be practical or economical to use more than one printer, the external printer buffer allows multiple computers to share one printer.

A good buffer can also add flexibility to your printouts. For example, with a *bypass function* you can interrupt long printouts in order to print another job. This is best accomplished between printed pages.

The *copy function* allows data sent to the buffer to be printed more than once. This function is especially important for form letters because the printer can work by itself.

A *pause function* is used to halt the print operation to change paper or make other adjustments. You should determine your needs on these, and possible other, additional features before you purchase a buffer.

Copy Holder Instead of making the output easier or faster, a *copy holder* makes data input easier. This accessory holds a written page (for example, a customer order form) so that the computer user has both hands free to enter the data into the computer. A ruler, which highlights the line to be read, is attached to the copy holder and makes it easier to find certain text passages. How the copy holder is adjusted depends on the application. It can be attached to the monitor, table or desk.

Data Binder Use a *data binder* to organize your printouts in a certain order, Several pages of continuous feed paper can be stored without removing it from the tractor feed mechanism. Also, you can easily insert or remove the paper. A data binder can be placed in a hanging file or stored in a three ring binder.

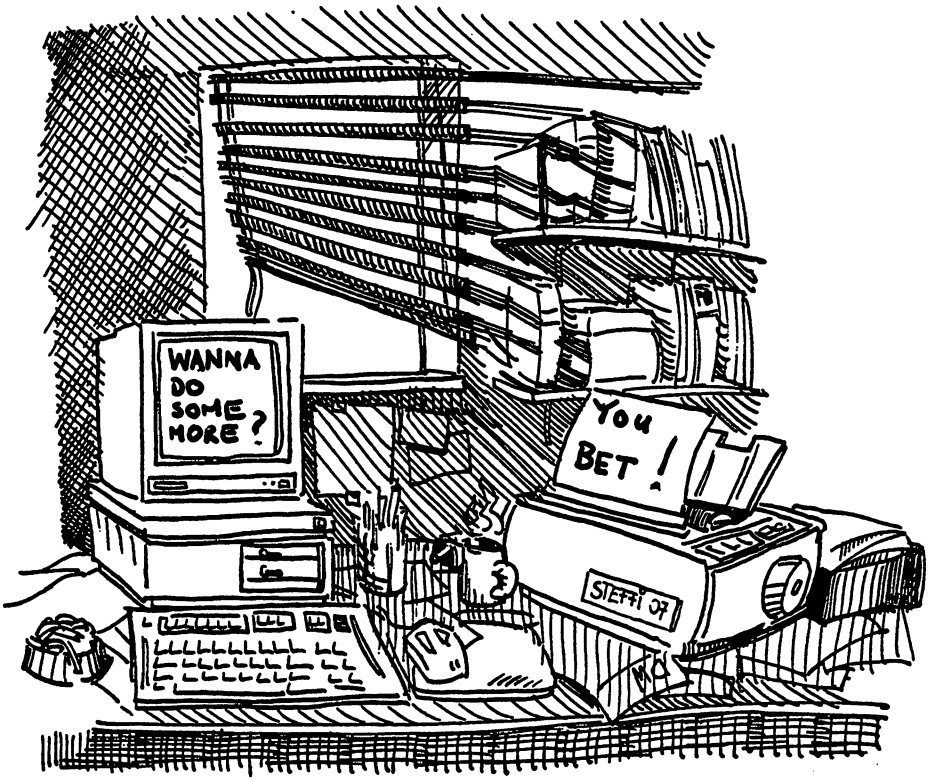
Data Switch Box

Frequently you may need to control two or more printers from one computer. For example, you may need the speed of a dot matrix printer for printing mailing labels but may also need the professional appearance of a laser printer or daisywheel printer for important correspondence.

By using a *data switch*, you won't have to change printer cables. This switch allows the computer to be connected to both printers simultaneously. The desired printer can be chosen through a toggle switch.

Printer Buffer with Remote Control

If you have a printer that is located in a central position in your office and you must control large amounts of data, the *printer buffer with remote control* can make your work easier. The functions of the printer can be controlled with the remote control, but only within a certain radius of the printer.


WANNA
DO
SOME
MORE?
YOU
BET!
STEFFI 97

Chapter 10
Tool Box

You'll find the following files in Appendix B and in the AmigaPrinters drawer of the companion diskette accompanying this book:

Overview

PrinterTool.BAS	Printer control program in AmigaBASIC
PrinterTool.RUN	Runtime version of PrinterTool.BAS (compiled using HiSoft's AC-BASIC compiler)
ScriptFile	Script file to add printer commands to your startup sequence
PrintCode.BAS	Simple AmigaBASIC program demonstrating printer code entry

Making a Backup Copy

Make a backup copy of the companion diskette and put the original companion diskette away so that it won't accidentally be damaged or destroyed. Use this backup copy for your experimentation.

NOTE: You must have AmigaBASIC to run PrinterTool.BAS. The compiled version of this program, PrinterTool.RUN, runs without AmigaBASIC.

Descriptions

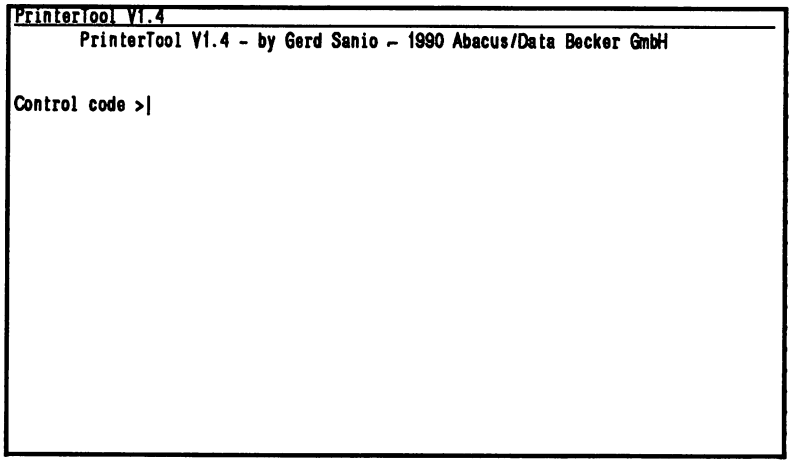
The functions and uses of the programs found on the companion diskette will be explained in the following sections.

PrinterTool

Description This utility directly transfers commands to a dot matrix printer. PrinterTool.BAS requires AmigaBASIC to run, while PrinterTool.RUN is a runtime version of the same program, compiled using HiSoft's AC-BASIC Compiler.

Starting

Insert the backup you made of the companion diskette (if you're running the BASIC version, make sure you've copied AmigaBASIC to this diskette as well). Run the program by double-clicking the PrinterTool icon. A window appears:



The parameters entered in a PrinterTool command can be separated by commas or periods. Possible parameters are descriptive text, decimal or hexadecimal values, or text in quotation marks.

Parameters

The operating status of the printer can be set or reset by entering one of the following command words:

```
BOLDON, BOLD ON, BOLDOFF, BOLD OFF
DOUBLEON, DOUBLE ON, DOUBLEOFF, DOUBLE OFF
UNDERLINEON, UNDERLINE ON, UNDERLINEOFF, UNDERLINE OFF
ITALICON, ITALIC ON, ITALICOFF, ITALIC OFF
CONDENSEDON, CONDENSED ON, CONDENSEDOFF, CONDENSED OFF
EXPANDEDON, EXPANDED ON, EXPANDEDOFF, EXPANDED OFF
ELITE
PICA
FORMFEED, FORM FEED, FF
LINEFEED, LINE FEED, LF
RESET
```

Switching to italics does not work when the printer is in the IBM mode.

Example

The following turns on underlined printing:

```
UNDERLINEON<Return>
```

This command places the printer in the underline mode and ensures that all of the following text will be underlined. The following command switches off the underline mode:

```
UNDERLINEOFF<Return>
```

The character thickness Pica (10 cpi) is set with:

```
PICA<Return>
```

Elite (12 cpi) is set with:

```
ELITE<Return>
```

Entering one of the following moves the paper one line up:

```
LF<Return>
LINEFEED<Return>
LINE FEED<Return>
```

Entering one of the following moves the paper to the next page:

```
FF<Return>
FORMFEED<Return>
FORM FEED<Return>
```

Entering the following initializes the printer:

```
RESET<Return>
```

The buffer contents are not deleted. The printer must be set in the Epson standard ESC/P mode because all of the commands transferred are in this mode.

Entering the following in the PrinterTool program displays a help screen:

```
HELP<Return>
```

```
PrinterTool Help
Usual syntax: Escape,code,"Text to print",CRcode,LFcode
Codes can be entered in decimal or hex.
EXAMPLES: 27,69,"This is BOLD",13,10
          $1b,$46,"This disables BOLD",$0C,$0A

Control code words can also be entered for printer control.
EXAMPLE: Underline On >or< UnderlineOn both enable underlining mode.
         Enter the control code word at the prompt and press <RETURN>,
         then enter the text and the CR,LF codes.

Typewriter Mode:

  F1-Load text    F2-Save text    F3-Change tabs
  F4-Clear memory F5-Exit typewriter  F6-Print text

Most typewriter mode control codes consist of a code letter
and E (enable) or D (disable). Codes are enclosed in periods.
.BE. (Bold enable) .BD. (Bold disable) .FF. (Form feed) etc.

Please press <RETURN>
```

ASCII Characters

There are three different formats for transferring commands and ASCII characters: decimal, hexadecimal and alphanumeric. The decimal and hexadecimal forms are used for transferring commands to the printer.

The alphanumeric form is used to output text directly, but control code words can also be used.

Let's look at three different examples that produce the same result each time. The printer is switched to bold print.

First, decimal values, which we've used throughout this book with the PrinterTool program:

```
27,69<Return>
```

A $ character should precede hexadecimal values:

```
$1B,$45<Return>
```

Control code words should be entered separately from other commands:

```
BOLDON<Return>
BOLD ON<Return>
```

ESC and FS (ASCII 27 and 28) used in transmitting printer commands must always be sent as decimal or hexadecimal values.

If you want to print text, you must add a carriage return and a line feed to the end of the line of text. To do this just add the numbers ,13,10 to the end of the text. Dot matrix printers print the text received when a

line is filled or a CR is sent. If your printer automatically executes a line feed after it receives a CR command, you'll get an extra blank line by entering the ,10. You may need to experiment with your DIP switches if an additional line feed is being inserted—consult your printer's manual.

File Mode

The PrinterTool program also has a file mode, which allows you to print text files without exiting PrinterTool and invoking the Shell. The following command invokes file mode:

```
FILE<Return>
```

PrinterTool displays the following prompt, into which you must enter the name of the file you want printed:

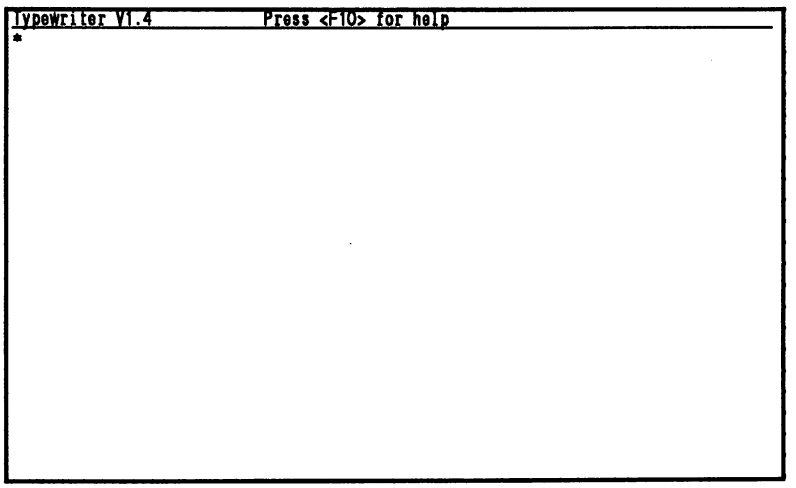
```
Filename>
```

Typewriter Mode

The PrinterTool program includes a typewriter mode which can be accessed by entering the following:

```
TYPEWRITER<Return>
```

When you enter this, the following window appears:



Typewriter mode provides you with a simple text editor. You can save, load and print text, set default tab stops, clear the text currently in memory and return to the main PrinterTool program.

The following commands are available:

<F1> Load existing text.

<F2> Save text currently in memory.

<F3> Set default tabs. Values for default tab lengths can range from 1 to 20.

<F4> Clear memory of any text.

<F5> Quits typewriter mode and returns you to the main PrinterTool screen.

<F6> Prints text currently in memory.

<F10> Displays the following help screen:

```
Help
Load text - F1  Save text      - F2
Set tabs  - F3  Clear memory   - F4
Quit      - F5  Print text     - F6
Press <RETURN> to exit
```

Typewriter Mode Printer Codes

Typewriter mode allows simple text formatting using its own printer codes. Most typewriter mode printer codes begin with a period, followed by the first letter of the style you want, followed by E (for Enable) or D (for Disable), and end with a period. Typewriter mode supports the following formats:

Code	Function
.BE.	Bold enabled
.BD.	Bold disabled
.DE.	Doubled strike enabled
.DD.	Doubled strike disabled
.UE.	Underline enabled
.UD.	Underline disabled
.IE.	Italic enabled
.ID.	Italic disabled
.CE.	Condensed enabled
.CD.	Condensed disabled
.EE.	Expanded enabled
.ED.	Expanded disabled
.LE	Elite enabled
.PE.	Pica enabled
.FF.	Form feed
.LF.	Line feed
.RE.	Printer reset

Ending the Session

Entering the following command ends PrinterTool.BAS and returns you to AmigaBASIC:

```
END<Return>
```

Selecting the Quit item from the Project menu ends PrinterTool.RUN and returns you to the Workbench.

ScriptFile

This script file adds a set of printer commands to your AmigaDOS configuration. It can be executed either from the Shell or double-clicked from the Workbench (provided the C directory on your Workbench diskette includes IconX).

Starting from the Shell

Boot your system. Insert the backup you made of the companion diskette in a disk drive. Invoke the Shell and change to the drive containing the companion diskette using the CD command. Enter the following to execute ScriptFile:

```
EXECUTE SCRIPTFILE<Return>
```

Starting from the Workbench

Boot your system. Insert the backup you made of the companion diskette in a disk drive. Open the drawer marked "AmigaPrinters" and double-click the ScriptFile icon.

ScriptFile adds the following commands to the Shell using the `ALIAS` command:

`PDir`	Similar to `DIR` command—sends directory to printer.
`PList`	Similar to `LIST` command—sends data to printer.
`BoldOn`	Enables bold printing.
`BoldOff`	Disables bold printing.
`DoubleOn`	Enables double strike printing.
`DoubleOff`	Disables double strike printing.

If you prefer, you can insert these commands in the Shell-Startup file, contained in the S directory of your Workbench diskette. The commands listed in Shell-Startup automatically load into AmigaDOS.

```
alias PDir dir >prt:
alias PList list >prt:
alias BoldOn echo >par: "*eE"
alias BoldOff echo >par: "*eF"
alias DoubleOn echo >par: "*eG"
alias DoubleOff echo >par: "*eH"
```

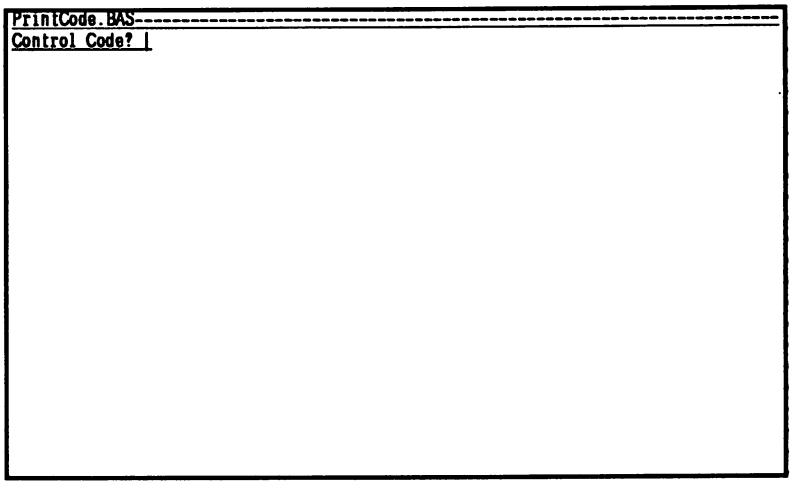
PrintCode.BAS

This AmigaBASIC program is a simple demonstration of printer code entry.

Start

Boot your system. Insert the backup copy you made of the companion diskette for this book (including AmigaBASIC) and double-click the PrintCode.BAS icon.

The following screen appears:



Enter the number of the control code you want sent to the printer (e.g., 4 for Italics on, etc.). Enter the code and press <Return>. The program then prompts you for the text you want sent to the printer. Enter this text and press <Return>. The program sends the code to the printer and asks if you want to send any more codes. Pressing <y><Return> displays the `Control code?` prompt again, while entering <n><Return> ends the program.

```
Loop: CLS
INPUT "Control Code";s$
INPUT "Text";Tx$
seq$=CHR$(27)+s$
OPEN "PAR:" FOR OUTPUT AS #2
PRINT#2,seq$;
PRINT#2,Tx$
CLOSE 2
INPUT "Do you want to enter another control code (y/n)";again$
IF again$ <>"y" THEN END ELSE Loop
```

Appendix A: Tables and Glossary

Character Sets

The following tables contain important information about working with character sets. The ASCII Table gives the meaning of non-printable ASCII codes, the ASCII Overview provides the decimal, hexadecimal and binary values of a character and the IBM Special Character Table informs you of the control codes (0-31) of the IBM characters.

ASCII Table

The first two columns contain the decimal and hexadecimal values of a character. The standard italic character set is in the third column. The fourth column explains the meaning of the character and the fifth column contains the IBM character set.

Dec. value	Hex value	ASCII char.	Meaning	IBM char.
0	00	NUL	Fill character	
1	01	SOH		
2	02	STX		
3	03	ETX		♥
4	04	EOT		♦
5	05	ENQ		♣
6	06	ACK		♠
7	07	BEL	Bell	
8	08	BS	Backspace	
9	09	HT	Horizontal tab	
10	0A	LF	Line feed	
11	0B	VT	Vertical tab	
12	0C	FF	Form feed	

Dec. value	Hex value	ASCII char.	Meaning	IBM char.
13	0D	CR	Carriage return	
14	0E	SO	Bold On	
15	0F	SI	Condensed On	
16	10	DLE	Data Link Escape	
17	11	DC1	On Line	
18	12	DC2	Condensed Off	
19	13	DC3	Off Line	
20	14	DC4	Bold Off	
21	15	NAK	Negative AcKnowedge	
22	16	SYN	Synchronization	
23	17	ETB	End of Text Block	
24	18	CAN	Cancel	
25	19	EM	End of Medium	
26	1A	SUB	Substitute	
27	1B	ESC	Escape	
28	1C	FS	File Separator	
29	1D	GS	Group Separator	
30	1E	RS	Record Separator	
31	1F	US	Unit Separator	
32	20	SP	Space	
33	21	!		!
34	22	"		"
35	23	#		#
36	24	$		$
37	25	%		%
38	26	&		&
39	27	'		'
40	28	(		(
41	29	)		)
42	2A	*		*
43	2B	+		+
44	2C	,		,
45	2D	-		-
46	2E	.		.
47	2F	/		/
48	30	0		0
49	31	1		1
50	32	2		2

Dec. value	Hex value	ASCII char.	Meaning	IBM char.
51	33	3		3
52	34	4		4
53	35	5		5
54	36	6		6
55	37	7		7
56	38	8		8
57	39	9		9
58	3A	:		:
59	3B	;		;
60	3C	<		<
61	3D	=		=
62	3E	>		>
63	3F	?		?
64	40	@		@
65	41	A		A
66	42	B		B
67	43	C		C
68	44	D		D
69	45	E		E
70	46	F		F
71	47	G		G
72	48	H		H
73	49	I		I
74	4A	J		J
75	4B	K		K
76	4C	L		L
77	4D	M		M
78	4E	N		N
79	4F	O		O
80	50	P		P
81	51	Q		Q
82	52	R		R
83	53	S		S
84	54	T		T
85	55	U		U
86	56	V		V
87	57	W		W
88	58	X		X

Dec. value	Hex value	ASCII char.	Meaning	IBM char.
89	59	Y		Y
90	5A	Z		Z
91	5B	[		[
92	5C	\		\
93	5D	]		]
94	5E	^		^
95	5F			
96	60	`		`
97	61	a		a
98	62	b		b
99	63	c		c
100	64	d		d
101	65	e		e
102	66	f		f
103	67	g		g
104	68	h		h
105	69	i		i
106	6A	j		j
107	6B	k		k
108	6C	l		l
109	6D	m		m
110	6E	n		n
111	6F	o		o
112	70	p		p
113	71	q		q
114	72	r		r
115	73	s		s
116	74	t		t
117	75	u		u
118	76	v		v
119	77	w		w
120	78	x		x
121	79	y		y
122	7A	z		z
123	7B	{		{
124	7C	|		|
125	7D	}		}
126	7E	~		~

Dec. value	Hex value	ASCII char.	Meaning	IBM char.
127	7F			
128	80	NUL		Ç
129	81	SOH		ü
130	82	STX		é
131	83	ETX		â
132	84	EOT		ä
133	85	ENQ		à
134	86	ACK		å
135	87	BEL	Bell	ç
136	88	BS	Backspace	ê
137	89	HT	Horizontal tab	ë
138	8A	LF	Line feed	è
139	8B	VT	Vertical tab	ï
140	8C	FF	Form feed	î
141	8D	CR	Carriage return	ì
142	8E	SO	Bold On	Ä
143	8F	SI	Condensed On	Å
144	90	DLE	Data Link Escape	É
145	91	DC1	On Line	æ
146	92	DC2	Condensed Off	Æ
147	93	DC3	Off Line	ô
148	94	DC4	Bold Off	ö
149	95	NAK	Negative AcKnowedge	ò
150	96	SYN	Synchronization	û
151	97	ETB	End of Text Block	ù
152	98	CAN	Cancel	ÿ
153	99	EM	End of Medium	Ö
154	9A	SUB	Substitute	Ü
155	9B	ESC	Escape	¢
156	9C	FS	File Separator	£
157	9D	GS	Group Separator	¥
158	9E	RS	Record Separator	P
159	9F	US	Unit Separator	ƒ
160	A0	SP	Space	á
161	A1	!		í
162	A2	"		ó
163	A3	#		ú
164	A4	$		ñ

Dec. value	Hex value	ASCII char.	Meaning	IBM char.
165	A5	%		Ñ
166	A6	&		ª
167	A7	'		º
168	A8	(		¿
169	A9	)		⌐
170	AA	*		¬
171	AB	+		½
172	AC	,		¼
173	AD	-		¡
174	AE	.		«
175	AF	/		»
176	B0	0		▒
177	B1	1		▒
178	B2	2		▒
179	B3	3		▒
180	B4	4		▒
181	B5	5		▒
182	B6	6		▒
183	B7	7		▒
184	B8	8		▒
185	B9	9		▒
186	BA	:		▒
187	BB	;		▒
188	BC	<		▒
189	BD	=		▒
190	BE	>		▒
191	BF	?		▒
192	C0	@		▒
193	C1	A		▒
194	C2	B		▒
195	C3	C		▒
196	C4	D		▒
197	C5	E		▒
198	C6	F		▒
199	C7	G		▒
200	C8	H		▒
201	C9	I		▒
202	CA	J		▒

Dec. value	Hex value	ASCII char.	Meaning	IBM char.
203	CB	K		╦
204	CC	L		╠
205	CD	M		═
206	CE	N		╬
207	CF	O		╧
208	D0	P		╨
209	D1	Q		╤
210	D2	R		╥
211	D3	S		╙
212	D4	T		╘
213	D5	U		╒
214	D6	V		╓
215	D7	W		╫
216	D8	X		╪
217	D9	Y		┘
218	DA	Z		┌
219	DB	[		■
220	DC	\		▄
221	DD	]		▌
222	DE	^		▐
223	DF			▀
224	E0	`		α
225	E1	a		ß
226	E2	b		Γ
227	E3	c		π
228	E4	d		Σ
229	E5	e		σ
230	E6	f		µ
231	E7	g		τ
232	E8	h		Φ
233	E9	i		Θ
234	EA	j		Ω
235	EB	k		δ
236	EC	l		∞
237	ED	m		φ
238	EE	n		ε
239	EF	o		∩
240	F0	p		≡

Dec. value	Hex value	ASCII char.	Meaning	IBM char.
241	F1	q		±
242	F2	r		≥
243	F3	s		≤
244	F4	t		⌠
245	F5	u		⌡
246	F6	v		÷
247	F7	w		≈
248	F8	x		°
249	F9	y		∙
250	FA	z		·
251	FB	{		√
252	FC	|		^{n}
253	FD	}		^{2}
254	FE	~		■
255	FF			

ASCII Overview (Italic character set)

	Hex.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Hex.	Bin	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	0	16	32	0 48	@ 64	P 80	` 96	p 112	128	144	160	0 176	@ 192	P 208	` 224	p 240
1	0001	1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
2	0010	2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
3	0011	3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115	131	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
4	0100	4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	$ 164	4 180	D 196	T 212	d 228	t 244
5	0101	5	21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	% 165	5 181	E 197	U 213	e 229	u 245
6	0110	6	22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	& 166	6 182	F 198	V 214	f 230	v 246
7	0111	BEL 7	23	' 39	7 55	G 71	W 87	g 103	w 119	BEL 135	151	' 167	7 183	G 199	W 215	g 231	w 247
8	1000	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
9	1001	HT 9	EM 25	) 41	9 57	I 73	Y 89	i 105	y 121	HT 137	EM 153	) 169	9 185	I 201	Y 217	i 233	y 249
A	1010	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	LF 138	154	* 170	: 186	J 202	Z 218	j 234	z 250
B	1011	VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	VT 139	ESC 155	+ 171	; 187	K 203	[219	k 235	{ 251
C	1100	FF 12	28	, 44	< 60	L 76	\ 92	l 108	¦ 124	FF 140	156	, 172	< 188	L 204	\ 220	l 236	¦ 252
D	1101	CR 13	29	- 45	= 61	M 77	] 93	m 109	} 125	CR 141	157	- 173	= 189	M 205	] 221	m 237	} 253
E	1110	SO 14	30	. 46	> 62	N 78	^ 94	n 110	~ 126	SO 142	158	. 174	> 190	N 206	^ 222	n 238	~ 254
F	1111	SI 15	31	/ 47	? 63	O 79	_ 95	o 111	DEL 127	SI 143	159	/ 175	? 191	O 207	_ 223	o 239	DEL 255

ASCII Overview (IBM character set)

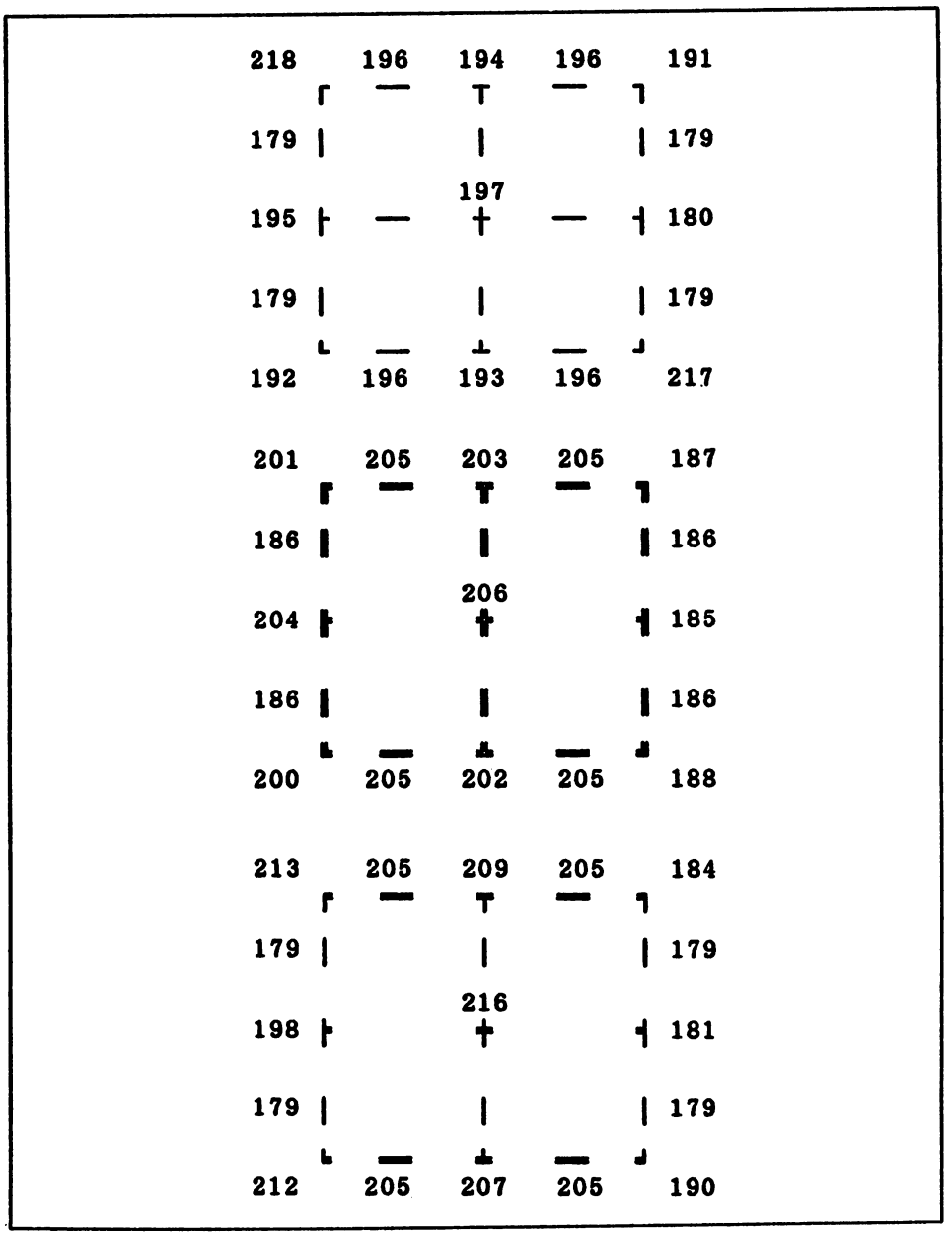
Hex.		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Hex.	Bin	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	0	1	2	♥ 3	♦ 4	♣ 5	♠ 6	BEL 7	BS 8	HT 9	LF 10	VT 11	FF 12	CR 13	SO 14	SI 15
1	0001	16	DC1 17	DC2 18	DC3 19	DC4 20	§ 21	22	23	CAN 24	EM 25	26	ESC 27	FS 28	29	30	31
2	0010	32	! 33	" 34	# 35	$ 36	% 37	& 38	' 39	(40	) 41	* 42	+ 43	, 44	- 45	. 46	/ 47
3	0011	0 48	1 49	2 50	3 51	4 52	5 53	6 54	7 55	8 56	9 57	: 58	; 59	< 60	= 61	> 62	? 63
4	0100	@ 64	A 65	B 66	C 67	D 68	E 69	F 70	G 71	H 72	I 73	J 74	K 75	L 76	M 77	N 78	O 79
5	0101	P 80	Q 81	R 82	S 83	T 84	U 85	V 86	W 87	X 88	Y 89	Z 90	[91	\ 92	] 93	^ 94	_ 95
6	0110	` 96	a 97	b 98	c 99	d 100	e 101	f 102	g 103	h 104	i 105	j 106	k 107	l 108	m 109	n 110	o 111
7	0111	p 112	q 113	r 114	s 115	t 116	u 117	v 118	w 119	x 120	y 121	z 122	{ 123	¦ 124	} 125	~ 126	DEL 127
8	1000	Ç 128	ü 129	é 130	â 131	ä 132	à 133	å 134	ç 135	ê 136	ë 137	è 138	ï 139	î 140	ì 141	Ä 142	Å 143
9	1001	É 144	æ 145	Æ 146	ô 147	ö 148	ò 149	û 150	ù 151	ÿ 152	Ö 153	Ü 154	¢ 155	£ 156	¥ 157	₧ 158	ƒ 159
A	1010	á 160	í 161	ó 162	ú 163	ñ 164	Ñ 165	ª 166	º 167	¿ 168	⌐ 169	¬ 170	½ 171	¼ 172	¡ 173	« 174	» 175
B	1011	░ 176	▒ 177	▓ 178	│ 179	┤ 180	╡ 181	╢ 182	╖ 183	╕ 184	╣ 185	║ 186	╗ 187	╝ 188	╜ 189	╛ 190	┐ 191
C	1100	└ 192	┴ 193	┬ 194	├ 195	─ 196	┼ 197	╞ 198	╟ 199	╚ 200	╔ 201	╩ 202	╦ 203	╠ 204	═ 205	╬ 206	╧ 207
D	1101	╨ 208	╤ 209	╥ 210	╙ 211	╘ 212	╒ 213	╓ 214	╫ 215	╪ 216	┘ 217	┌ 218	█ 219	▄ 220	▌ 221	▐ 222	▀ 223
E	1110	α 224	ß 225	Γ 226	π 227	Σ 228	σ 229	µ 230	τ 231	Φ 232	Θ 233	Ω 234	δ 235	∞ 236	φ 237	ε 238	∩ 239
F	1111	≡ 240	± 241	≥ 242	≤ 243	⌠ 244	⌡ 245	÷ 246	≈ 247	° 248	∙ 249	· 250	√ 251	ⁿ 252	² 253	■ 254	255

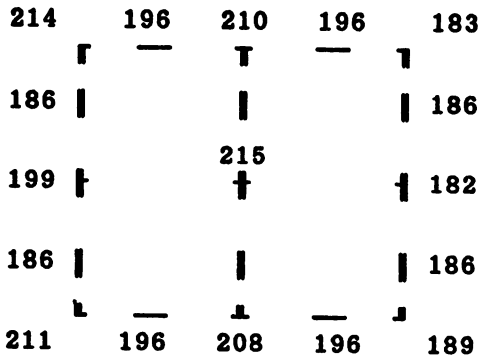
IBM Symbol and International Character Set

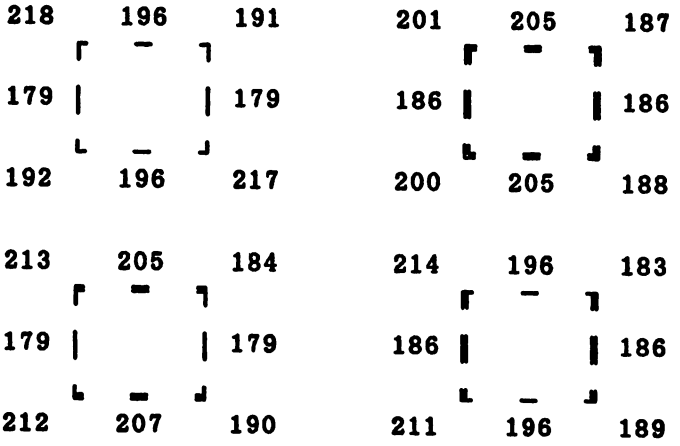
	Hex.	0	1
Hex.	Bin	0000	0001
0	0000	0	16
1	0001	1	17
2	0010	2	18
3	0011	3	19
4	0100	4	20
5	0101	5	21
6	0110	6	22
7	0111	7	23
8	1000	8	24
9	1001	9	25
A	1010	10	26
B	1011	11	27
C	1100	12	28
D	1101	13	29
E	1110	14	30
F	1111	15	31

Country		Decimal	35	36	64	91	92	93	94	96	123	124	125	126
		Hex	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	USA		#	$	@	[	\	]	^	`	{	¦	}	~
1	France		#	$	à	°	ç	§	^	`	é	ù	è	¨
2	Germany		#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
3	Great Britain		£	$	@	[	\	]	^	`	{	¦	}	~
4	Denmark I		#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
5	Sweden		#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
6	Italy		#	$	@	°	\	é	^	ù	à	ò	è	ì
7	Spain I		₧	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
8	Japan		#	$	@	[	¥	]	^	`	{	¦	}	~
9	Norway		₣	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
10	Denmark II		#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
11	Spain II		#	$	á	¡	Ñ	¿	é	`	í	ñ	ó	ú
12	Latin America		#	$	á	¡	Ñ	¿	é	ü	í	ñ	ó	ú

IBM Linedraw Characters (Graphic character set)





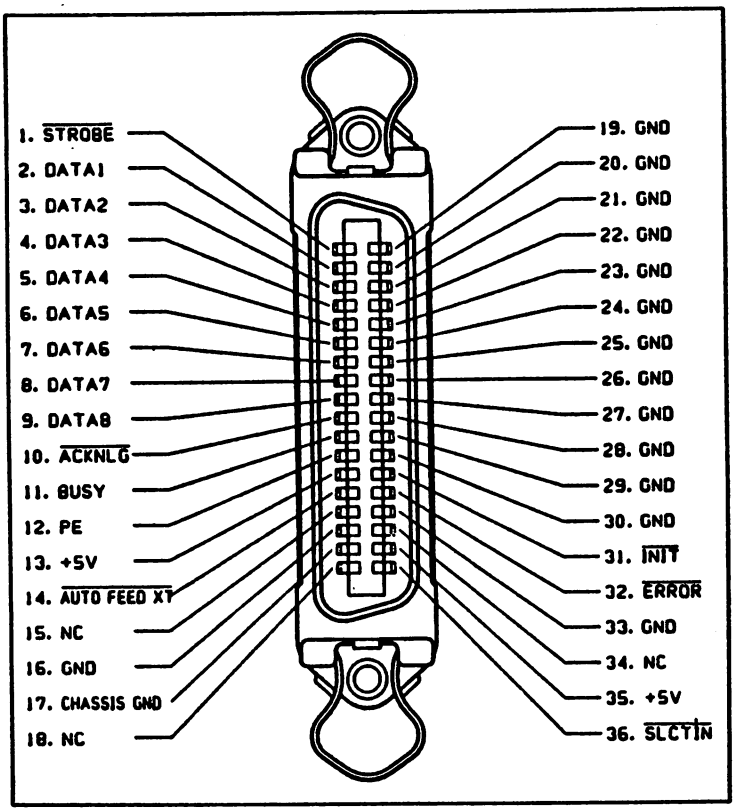


132 = ä
148 = ö
129 = ü
142 = Ä
153 = Ö
154 = Ü
225 = ß

64 = @
91 = [
92 = \
93 =]
123 = {
124 = ¦
125 = }

Parallel Interface

Amphenol Connector

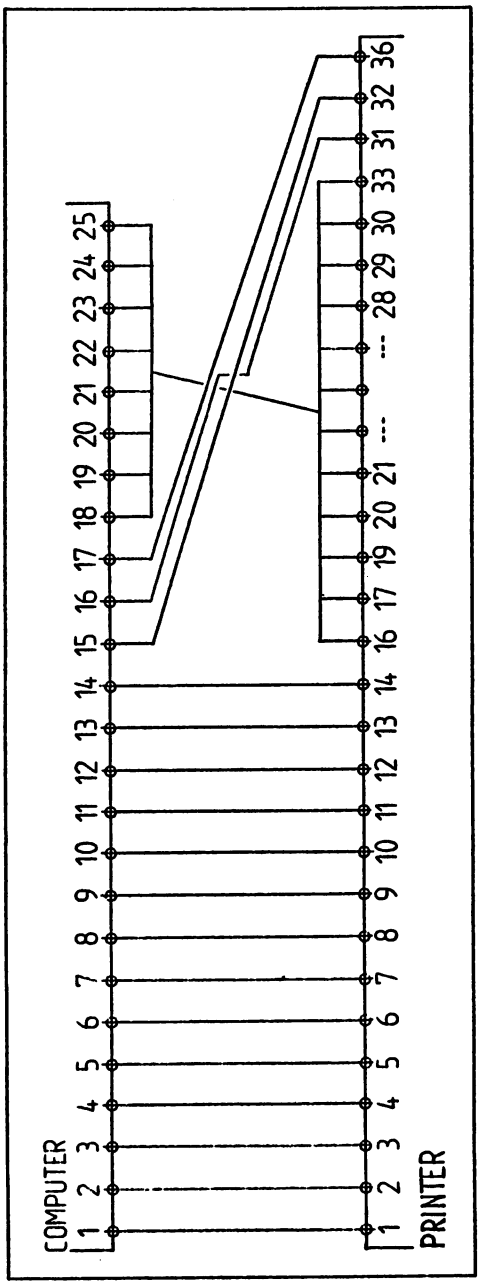


Pin Arrangement and Signals

Pin #	Signal Label	Direction*	Description
1	$\overline{\text{STROBE}}$	C > P	Strobe impulse sends data (usually H signal). Data is read using the L signal.
2	DATA 1	C > P	Signals for parallel data bits 1 through 8. H = HIGH = logical 1 L = LOW = logical 0
3	DATA 2	C > P	
4	DATA 3	C > P	
5	DATA 3	C > P	
6	DATA 5	C > P	
7	DATA 6	C > P	
8	DATA 7	C > P	
9	DATA 8	C > P	
10	$\overline{\text{ACKNLG}}$	P > C	5μ wide impulse which occurs after data is received. The next data reception can occur when this signal ends.
11	BUSY	P > C	Indicates printer operating status. If this signal is L, the printer is ready to receive more data.
12	$\overline{\text{PAPER EMPTY}}$	P > C	Indicates no paper in the printer (usually L signal). If DIP switch 1-5 is OFF, this signal is L.
13	SELECTED	P > C	H signal indicates ON-LINE.
14	$\overline{\text{AUTOFEED XT}}$	C > P	L signal automatically adds a LF to each CR.
15	(NC)		Not used.
16	SIGNAL GND		Signal ground.
17	CHASSIS GND		Chassis ground.
18	+5 V DC	P >	External +5 volts.
19-30	GND		Ground connection.
31	$\overline{\text{RESET}}$	C > P	L signal resets printer.
32	$\overline{\text{ERROR}}$	C > P	L signal if the printer detects an error.
33	EXT GND		External ground.
34-35	(NC)		Not used.
36	$\overline{\text{SELECT IN}}$	C > P	L signal suppresses DC1/DC3.

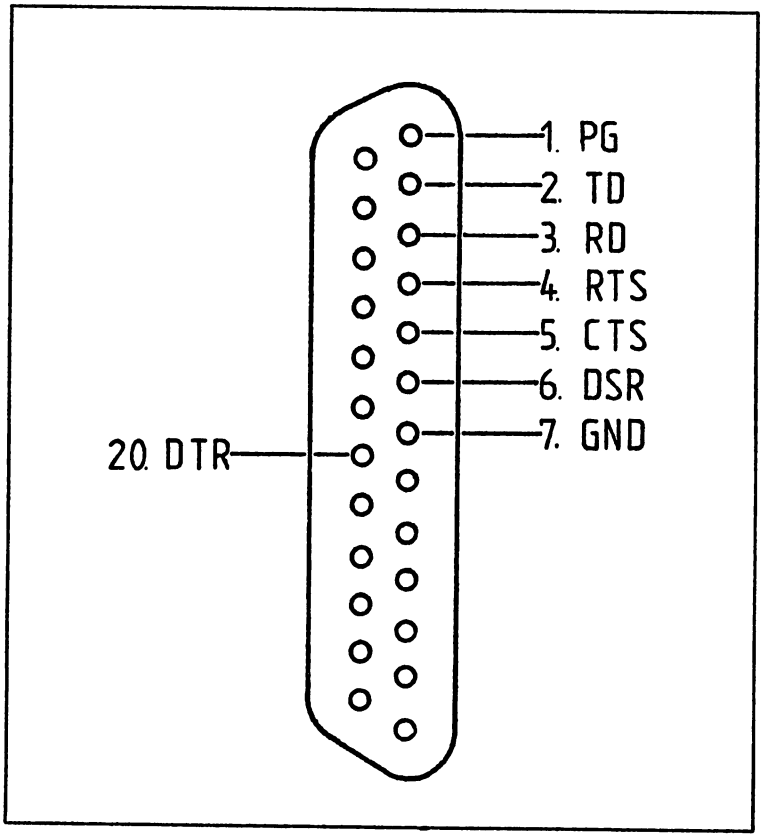
*C = computer, P = printer

Parallel Printer Cable



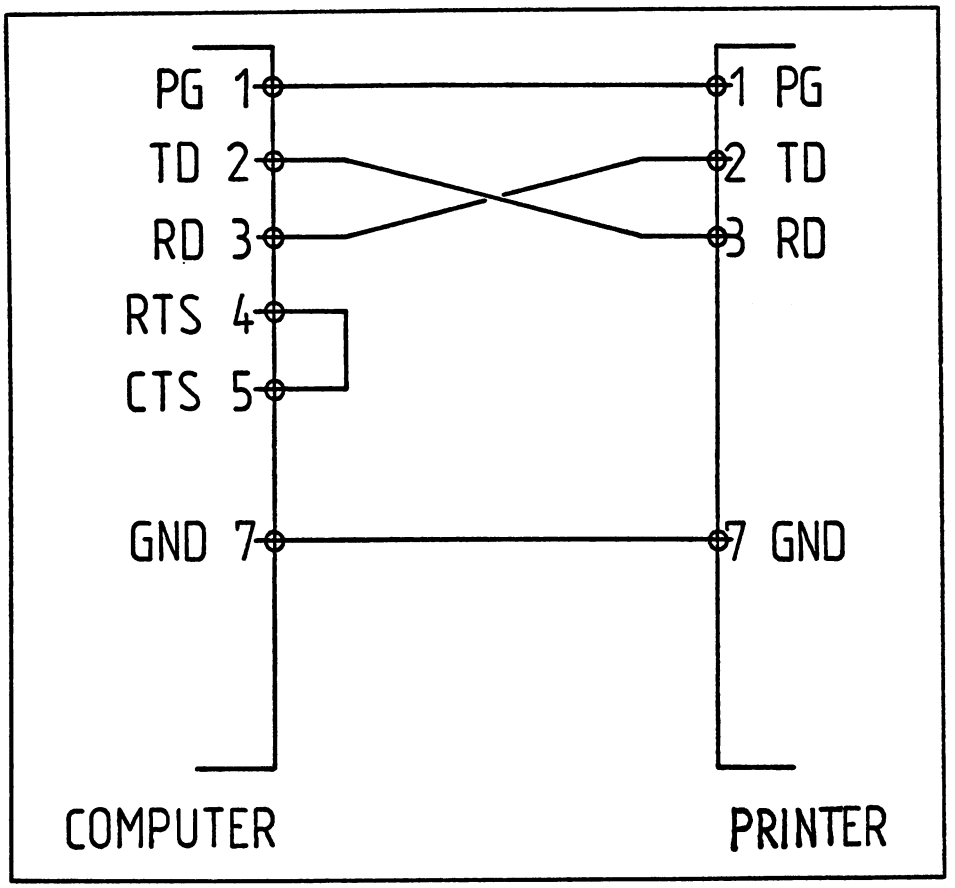
Serial Interface

25 pin SUB D Connector

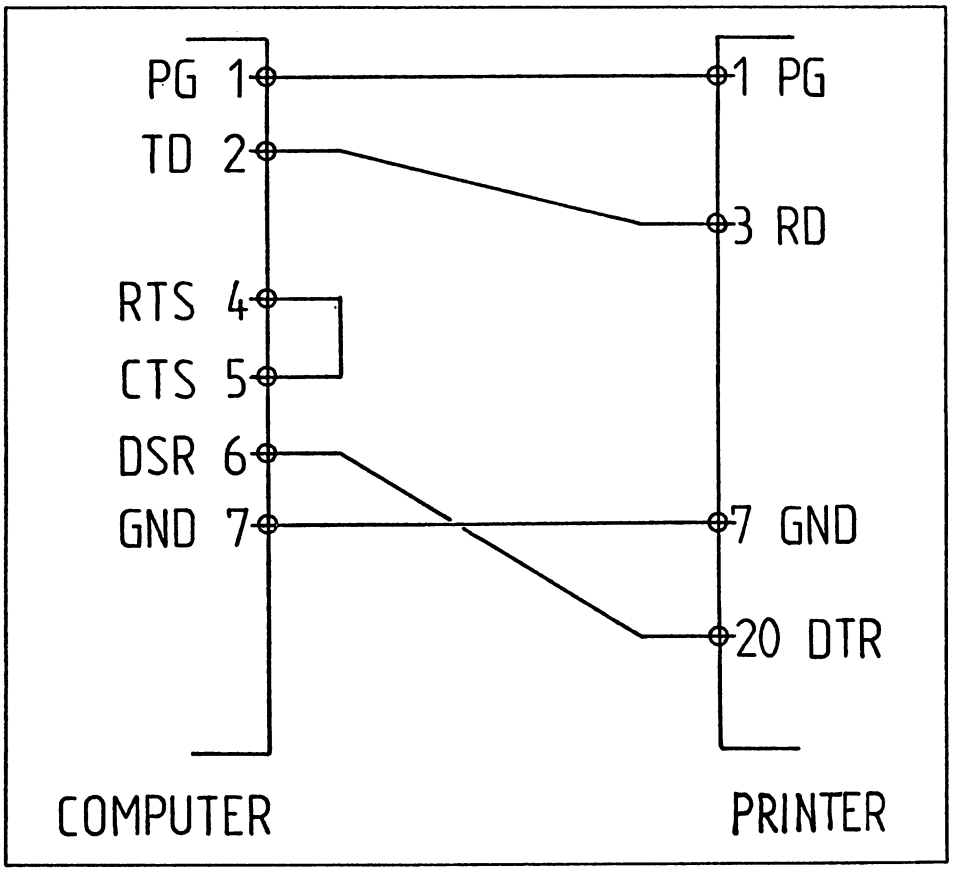


#	Signal Label	Direction*	Description
1	PG	C < P	Protective ground.
2	TD	C > P	Transmit data.
3	RD	C < P	Receive data.
5	RTS	C < P	Request to send data.
7	GND		Signal ground.
20	DTR	C < P	Data terminal ready.

Serial Printer Cable (Hardware handshake)



Serial Printer Cable (Software handshake)



Command Overview

ASCII	DEC	HEX	Description	Mode	Page
BEL	7	07	bell (signal tone)	standard/IBM	56
BS	8	08	backspace	standard/IBM	56
HT	9	09	horizontal tab	standard/IBM	68
LF	10	0A	line feed	standard/IBM	58
VT	11	0B	vertical tab	standard/IBM	64
FF	12	0C	form feed	standard/IBM	57
CR	13	0D	carriage return	standard/IBM	56
SO	14	0E	expanded print (single line)	standard/IBM	78
SI	15	0F	condensed print (single line)	standard/IBM	77
DC1	17	11	printer ON-LINE	standard/IBM	49
DC2	18	12	disable condensed print	standard	78
DC2	18	12	disable condensed/Elite/ proportional print	IBM	78
DC3	19	13	printer OFF-LINE	standard	49
DC4	20	14	disable expanded print	standard/IBM	79
CAN	24	18	delete line	standard/IBM	57
DEL	127	7F	delete line	standard	57
ESC SO	14	0E	wide print (single line)	standard/IBM	78
ESC SI	15	0F	condensed print	standard/IBM	77
ESC EM	25	19	enable/disable automatic single sheet feed	expanded ESC/P	54
ESC SP	32	20	set character spacing	standard	70
ESC !	33	21	combine print modes	standard	74
ESC #	35	23	clear MSB defaults	standard	53
ESC $	36	24	determines absolute point position	standard	69
ESC %	37	25	enable user-defined character set	standard	92
ESC &	38	26	determine user-defined character set	standard	91
ESC (-	40	28	select line marking	expanded ESC/P	86
ESC *	42	2A	select graphic mode	standard	95
ESC +	43	2B	line spacing n/360 inch	expanded ESC/P	63
ESC -	45	2D	underlining ON/OFF	standard/IBM	85
ESC /	47	2F	select vertical tab channel	standard	66
ESC 0	48	30	1/8 inch line spacing	standard/IBM	59
ESC 1	49	31	7/72 inch line spacing	standard/IBM	61
ESC 2	50	32	1/6 inch line	standard/IBM	61
ESC 3	51	33	n/216 (n/180) in. line spacing	standard/IBM	61
ESC 4	52	34	enable italic print	standard	88
ESC 4	52	34	set start of page	IBM	55
ESC 5	53	35	disable italic print	standard	89
ESC 5	53	35	enable/disable auto line feed	IBM	58
ESC 6	54	36	expand printable codes	standard/IBM	89
ESC 7	55	37	cancels ESC 6	standard/IBM	89

ASCII	DEC	HEX	Description	Mode	Page
ESC 8	56	38	disable paper out sensor	standard/IBM	55
ESC 9	57	39	enable paper out sensor	standard/IBM	55
ESC :	58	3A	Elite (12 cpi)	IBM	75
ESC :	58	3A	copy ROM into RAM	standard	92
ESC <	60	3C	enable unidirectional print (single line)	standard	51
ESC =	61	3D	set MSB to 0	standard	53
ESC =	61	3D	enable user-defined characters	IBM	92
ESC >	62	3E	set MSB to 1	standard	53
ESC ?	63	3F	enable graphic mode	standard/IBM	97
ESC @	64	40	initialize printer	standard	49
ESC A	65	41	n/72 inch line spacing	standard/IBM	62
ESC B	66	42	set vertical tabs	standard/IBM	65
ESC C	67	43	set page length in lines	standard/IBM	53
ESC CNUL	67	43	set page length in inches	standard/IBM	54
ESC D	68	44	set horizontal tabs	standard/IBM	68
ESC E	69	45	enable bold print	standard/IBM	82
ESC F	70	46	disable bold print	standard/IBM	82
ESC G	71	47	enable double strike	standard/IBM	82
ESC H	72	48	disable double strike	standard/IBM	83
ESC I	73	49	expand printable codes	standard	90
ESC I	73	49	select font	IBM	73
ESC J	74	4A	n/216 (n/180) in. line feed	standard/IBM	58
ESC K	75	4B	enable 8 point single density graphics	standard/IBM	95
ESC L	76	4C	enable 8 point double density graphics	standard/IBM	96
ESC M	77	4D	Elite (12 cpi)	standard	75
ESC N	78	4E	set bottom margin	standard/IBM	64
ESC O	79	4F	clear bottom margin	standard/IBM	64
ESC P	80	50	Pica (10 cpi)	standard	75
ESC P	80	50	proportional print ON/OFF	IBM	77
ESC Q	81	51	set right margin	standard	67
ESC R	82	52	enable international character set	standard	90
ESC R	82	52	default tab values	IBM	69
ESC S	83	53	enable superscript/subscript	standard/IBM	83
ESC T	84	54	disable superscript/subscript	standard/IBM	85
ESC U	85	55	enable unidirectional print	standard/IBM	51
ESC W	87	57	expanded print	standard/IBM	79
ESC X	88	58	set left/right margins	IBM	67
ESC Y	89	59	enable double density, high speed graphics	standard/IBM	96
ESC Z	90	5A	enable 8 point, quadruple density graphics	standard/IBM	97
ESC [@	91	5B	set character height mode	IBM	80
ESC \	92	5C	set relative point position	standard	70
ESC \	92	5C	print character from symbol character set	IBM	93
ESC ^	94	5E	enable 9 pin graphics	standard	98

ASCII	DEC	HEX	Description	Mode	Page
ESC ^	94	5E	print character from symbol character set	IBM	93
ESC _	95	5F	enable/disable overstrike	IBM	85
ESC a	97	61	set alignment	standard	71
ESC b	98	62	set vertical tabs in channels	standard	65
ESC g	103	67	chooses micro print	expanded ESC/P	76
ESC i	105	69	enable/disable typewriter mode	standard/IBM	50
ESC k	107	6B	enable LQ/NLQ mode	standard	73
ESC l	108	6C	sets left margin	standard	66
ESC p	112	70	proportional print ON/OFF	standard	76
ESC q	113	71	select character mode	expanded ESC/P	87
ESC s	155	73	enable/disable half speed	standard	50
ESC t	116	74	select character set	standard	88
ESC w	119	77	double character height ON/OFF	expanded ESC/P	80
ESC x	120	78	select print mode	standard	73

Command Overview by Function Group

Printer Driver/Data Transfer Control

ASCII	DEC	HEX	Description	Mode	Page
ESC @	64	40	initialize printer	standard	49
DC1	17	11	printer ON-LINE	standard/IBM	49
DC3	19	13	printer OFF-LINE	standard	49
DEL	127	7F	erases line	standard	57
ESC s	115	73	enable/disable half speed	standard	50
ESC <	60	3C	select unidirectional print (single line)	standard	51
ESC U	85	55	select unidirectional print	standard/IBM	51
ESC i	105	69	enable/disable typewriter mode	standard/IBM	50
ESC EM	25	19	enable/disable automatic sheet feed	expanded ESC/P	54
ESC =	61	3D	set MSB to 0	standard	53
ESC >	62	3E	set MSB to 1	standard	53
ESC #	35	23	clear MSB default	standard	53
BEL	7	07	bell	standard/IBM	56
CR	13	0D	carriage return	standard/IBM	56
CAN	24	18	delete line	standard/IBM	57
ESC 9	57	39	enable paper out sensor	standard/IBM	55
ESC 8	56	38	disable paper out sensor	standard/IBM	55

Vertical/Horizontal Print Control

ASCII	DEC	HEX	Description	Mode	Page
FF	12	0C	form feed	standard/IBM	57
ESC C	67	43	set page length in lines	standard/IBM	53
ESC C NUL	67	43	set page length in inches	standard/IBM	54
ESC N	78	4E	set bottom margin	standard/IBM	64
ESC O	79	4F	clear bottom margin	standard/IBM	64
LF	10	0A	line feed	standard/IBM	58
ESC +	43	2B	n/360 inch line spacing	expanded ESC/P	63
ESC 0	48	30	1/8 inch line spacing	standard/IBM	59
ESC 1	49	31	7/72 inch line spacing	standard/IBM	61
ESC 2	50	32	1/6 inch line spacing	standard/IBM	61
ESC 3	51	33	n/216 (n/180) in. line spacing	standard/IBM	61
ESC 4	52	34	set start of page	IBM	55
ESC 5	53	35	enable/disable auto line feed	IBM	58
ESC A	65	41	n/72 inch line spacing	standard/IBM	62
ESC J	74	4A	n/216 (n/180) in. line feed	standard/IBM	58
VT	11	0B	vertical tabs	standard/IBM	64
ESC B	66	42	set vertical tabs	standard/IBM	65
ESC b	98	62	set vertical tabs in channels	standard	65
ESC /	47	2F	select vertical tab channel	standard	66
ESC l	108	6C	set left margin	standard	66
ESC Q	81	51	set right margin	standard	67
ESC X	88	58	set left/right margins	IBM	67
BS	8	08	backspace	standard/IBM	56
ESC $	36	24	set absolute point position	standard	69
ESC \	92	5C	set relative point position	standard	70
HT	9	09	horizontal tabs	standard/IBM	68
ESC D	68	44	set horizontal tabs	standard/IBM	68
ESC R	82	52	set tab default values	IBM	69

Print Mode/Text Size and Character Width

ASCII	DEC	HEX	Description	Mode	Page
ESC x	120	78	set print mode	standard	73
ESC I	73	49	select font	IBM	73
ESC k	107	6B	select LQ/NLQ mode	standard	73
ESC !	33	21	combine print modes	standard	74
ESC P	80	50	Pica (10 cpi)	standard	75
ESC M	77	4D	Elite (12 cpi)	standard	75
ESC :	58	3A	Elite (12 cpi)	IBM	75
ESC g	103	67	micro (15 cpi)	expanded ESC/P	76
ESC p	112	70	proportional print ON/OFF	standard	76
ESC P	80	50	proportional print ON/OFF	IBM	77
ESC SI	15	0F	condensed mode (single line)	standard/IBM	77
ESC SI	15	0F	enable condensed mode	standard/IBM	77
ESC SO	14	0E	expanded mode (single line)	standard/IBM	78
DC2	18	12	disable condensed mode	standard/IBM	78
SO	14	0E	expanded mode (single line)	standard/IBM	78
ESC w	119	77	double height ON/OFF	expanded ESC/P	80
ESC [@	91	5B	select character height	IBM	80
DC4	20	14	disable expanded mode	standard/IBM	79
ESC W	87	57	enable/disable expanded mode	standard/IBM	79

Print Effects/Text Processing

ASCII	DEC	HEX	Description	Mode	Page
ESC E	69	45	enable bold print	standard/IBM	82
ESC F	70	46	disable bold print	standard/IBM	82
ESC G	71	47	enable double strike	standard/IBM	82
ESC H	72	48	disable double strike	standard/IBM	83
ESC S	83	53	enable superscript/subscript	standard/IBM	83
ESC T	84	54	disable superscript/subscript	standard/IBM	85
ESC -	45	2D	underlining ON/OFF	standard/IBM	85
ESC _	95	5F	overlining ON/OFF	IBM	85
ESC (-	40	28	select line marking	expanded ESC/P	86
ESC q	113	71	select character mode	expanded ESC/P	87
ESC a	97	61	select alignment	standard	71
ESC SP	32	20	set character spacing	standard	70

Character Tables

ASCII	DEC	HEX	Description	Mode	Page
ESC t	116	74	select font	standard	88
ESC 4	52	34	enable italic print	standard	88
ESC 5	53	35	disable italic print	standard	89
ESC R	82	52	enable international character set	standard	90
ESC ^	94	5E	print one symbol char.	IBM	93
ESC \	92	5C	print multiple symbol chars.	IBM	93

User-Defined Characters/Graphics

ASCII	DEC	HEX	Description	Mode	Page
ESC &	38	26	set user-defined characters	standard	91
ESC =	61	3D	set user-defined characters	IBM	92
ESC :	58	3A	copy ROM into RAM	standard	92
ESC %	37	25	enable user-defined characters	standard	92
ESC I	73	49	enable user-defined characters	IBM	73
ESC 6	54	36	expand printable codes	standard/IBM	89
ESC I	73	49	expand printable codes	standard	90
ESC 7	55	37	cancels ESC 6 expansion	standard/IBM	89
ESC K	75	4B	enable 8 point single density graphic print	standard/IBM	95
ESC L	76	4C	enable 8 point double density graphic print	standard/IBM	96
ESC Y	89	59	enable double density, high speed graphic print	standard/IBM	96
ESC Z	90	5A	enable 8 point, quadruple density graphic print	standard/IBM	97
ESC *	42	2A	select graphic mode	standard	95
ESC ?	63	3F	switch graphic mode	standard/IBM	97
ESC ^	94	5E	enable 9 pin graphic print	standard	98

Glossary

ASCII Abbreviation for American Standard Code for Information Interchange. It is the normal code used in computing for the transfer and display of letters, numbers, special characters and printer control characters. A character is assigned a number between 0 and 255. When the computer sends a value, such as 65, the printer displays an "A" because this letter is assigned to 65. Refer to the tables on ASCII characters for more information about which character or control code is assigned to which number.

Batch File A group of DOS commands that are saved as a text file. When activated, each command is processed in sequence. A batch file can also call applications. In AmigaDOS this is commonly called a script file.

Baud Unit for data transfer: 1 baud = 1 bit per second. The baud rate gives the speed with which the bits are sent from the computer to the printer through the serial interface.

Bidirectional Movement in two directions. When printing text the printhead moves from left to right in one line, and then from right to left in the next line. This increases the printing speed. A bidirectional tractor can move paper both up and down.

Binary Number system based on the number two. All numerals (0, 1) are counted as places of 2. For example, you would count:

0, 1, 10, 11, 100, 101, 110, 111, 1000,..

in binary, instead of:

0, 1, 2, 3, 4, 5, 6, 7, 8, ...

To calculate the numbers, the first number must be multiplied by 2^0 (1), the second by 2^1 (2), the third by 2^2 (4), the fourth by 2^3 (8) and so on.

Bit Binary digit. Binary values have only two conditions, 0 (off) or 1 (on). A bit is the smallest unit of information that a computer processes. The computer sends the printer 8 bits which form one byte.

Buffer Memory used for temporarily storing information. Many printers have a buffer in which text is stored while waiting to be printed.

Byte A group of 8 bits which can have 2^8=256 conditions from 0 to 255. The byte also has a larger grouping: kilobyte and megabyte. A kilobyte contains 1,024 bytes and a megabyte contains 1,048,576 bytes.

Centronics See Parallel Interface.

Continuous Feed Paper
Sheets of paper that are separated by perforations. Usually there are also perforated margins which fit into the pins of the tractor mechanism.

Control Code Combination of ASCII characters that execute or change settings in the printer.

Control Panel Section of the printer displaying keys and lights. The control panel usually includes an On-Line or SLCT key to interrupt or enable the connection with the computer. It also has one or two keys that perform line feeds or form feeds. Some models also have keys for font selection and special functions, such as paper parking. There are also lights which indicate whether the printer is On-Line or Off-Line, whether data is being transferred, which font is active and whether or not there is paper.

CPI Abbreviation for characters per inch. Unit of measurement for printed character width: the more cpi a text contains, the smaller the characters will be.

CPS Abbreviation for characters per second. Unit of measurement for the printing speed.

CR Abbreviation for carriage return. This command moves the printhead to the left margin.

Daisy Wheel Printer
Printer that has characters on a wheel. The daisy wheel printer prints by rotating this wheel to the correct letter and driving the letter through an inked ribbon to the paper.

Data Dump See Hex Dump.

Decimal Number system based on the number 10. All numbers (0 through 9) are counted as places from 10.

DIP Switches Dual Inline Package switches. These small switches on the printer control the basic printer settings (the character set used, paper length, etc.) that will be in effect once the printer is switched on.

Dot Matrix Printer
The main subject of this book. Dot matrix printers construct the letters

from pins in a matrix. Most dot matrix printers consist of either 9 pin or 24 pin printheads.

Downloaded Character Set
Also called user-defined character set. The user defines the form and appearance of the characters. The entire form is saved in RAM and is used when printing instead of the standard character set.

DPI Abbreviation for Dots Per Inch. Unit of measurement for graphic resolution of printers.

Draft Text quality used only for rough printings and listings because it is very fast but not of very high quality.

Editing Creating and changing programs, text and batch files.

Editor Program used to create text and script files. AmigaDOS includes an editor called ED. Word processors are also editors but are easier to use than ED, and offer more options than ED.

Elite Name of a character width of 12 cpi.

Emulation Imitates another device.

ESC Also called ESCAPE. Indicates to the printer that the code that follows should be interpreted as a software command instead of as a letter or number.

ESC/P Epson standard code for printers. This is the normal command set for most important printer controls. Many printer manufacturers follow this standard. Printers that use this code are called Epson compatible.

FF Abbreviation for Form Feed. This command moves the paper to the beginning of the next page.

Font Another name for a character set.

Font Cartridge ROM expansion cartridge that adds fonts (character sets) to a printer.

FS Abbreviation for Form Separator. Some printers use this symbol instead of ESC to indicate printer commands.

Handshake Control methods used for data transfer.

Hex Dump Printer mode in which data is displayed in hexadecimal values.

Hexadecimal Number system based on the number 16. All of the numbers (0 through 9 and A through F) are counted as units of 16. This makes it possible to represent all of the bytes (0 through 255) in two places. For

example, you would write $0F instead of 15. Hexadecimal numbers are preceded by a $ or a & to distinguish them from other number systems.

Inch Unit of measurement: 1 inch = 2.54 cm.

Initialization Also called reset. This sets the printer back to its power-up status. All of the settings return to the default values. The contents of the buffer remain untouched.

Ink Jet Printer Special form of dot matrix printer in which the matrix is made of jets instead of pins. These jets spray a fine stream of ink onto the paper.

Justification Paragraph alignment. Left justified text indicates a paragraph aligned to the left margin. Right justified text indicates a paragraph aligned to the right margin. Fully justified text is aligned to the right and left margins, forming a block.

Laser Printer Printer that prints an entire page at one time using a laser and toner, similar to a photocopier.

LF Abbreviation for Line Feed. This command moves the paper a set distance.

LQ Abbreviation for Letter Quality. This print quality is finer than draft quality. Letter quality text looks similar to that typed on a typewriter or a daisy wheel printer.

Microperforation
A very fine paper perforation. It enables you to use continuous feed paper for correspondence.

Mouse Input device used in some applications. The mouse controls the movement of a pointer or cursor, instead of using cursor keys.

MS-DOS Also called PC-DOS. Operating system for IBM PC and compatible computers. It controls communication between user and computer and organizes the access to peripheral devices connected to the computer.

NLQ Abbreviation for Near Letter Quality. This print quality is somewhat rougher than letter quality.

OFF-LINE Printer status indicating that the printer is not ready to accept or print data. This status can be set by deactivating the ON-LINE switch on the printer's control panel.

ON-LINE Printer status indicating that the printer is ready to accept and print data. This status can be set by activating the ON-LINE switch on the printer's control panel.

Paper Out Sensor
This sensor determines whether or not there is paper in the printer. This prevents the printer from printing on the platen.

Parallel Interface
Also called Centronics interface. The normal connection between computers and printers. It includes 8 data connections through which information is sent one byte at a time. Refer to the table on pin arrangement and signals in order to find the pin arrangement.

Parity Method for checking serial interface data transfer. A bit at the end of the data block checks for an error. Parity can be set at even, odd or no parity.

PC-DOS See MS-DOS.

Perforation Skip
Printer function that ensures that the printer doesn't print on the perforation at the end of the page during the printing of long, unformatted texts.

Peripherals Name for all devices that can be connected to a computer, such as keyboards, monitors, printers, mice, etc.

Pica Name for a character width of 10 cpi.

Platen Rubber roller on which printer paper lies in front of the printhead. The printhead's pins impact against the paper and platen, leaving characters on the printed page.

Printer Driver Section of a program (such as a word processor) that converts the document being processed so that it can be printed out on a specific printer.

Printer Switch Device that enables two computers to use one printer. The printer is either controlled electronically or with a manual switch.

Proportional Print type in which the characters take up only as much space as needed in order to form the letter. For example, an I needs less space than an O or an M.

Protocol Method used by the computer to determine whether data is sent and received properly. This is accomplished through the serial interface.

Protocol Mode Automatic redirection of output from screen to printer. Pressing <Ctrl><P> on an IBM PC keyboard sends data that would normally appear on the screen to the printer. Pressing <Ctrl><P> again disables this redirection.

Pull Tractor Part of the printer that moves continuous feed paper by pulling it behind the wheel over pins in the tractor feed holes.

Ragged Right Also called left justified text: Text aligned to the left margin leaving uneven right edges to the text.

RAM Abbreviation for Random Access Memory. Memory in the computer or printer used for storing data. When the computer is switched off, this data is lost. In the printer the RAM stores data and any downloaded (user-defined) character sets.

Reset Also called initialization. This sets the printer back to its power-up status. All of the settings return to the default values. The contents of the buffer remain untouched.

Ribbon Inked piece of plastic or fabric, which supplies the ink for printing characters. Used with dot matrix printers, daisy wheel printers and typewriters.

ROM Abbreviation for Read Only Memory. Hard memory in the computer or printer containing data that cannot be changed, such as font construction.

RS-232 See Serial interface.

ScriptFile A group of AmigaDOS commands that are saved as a text file. When activated, each command is processed in sequence. A script file can also call applications.

Self Test Holding down certain keys when turning on a printer performs a quick test of printing functions. The printer usually prints a complete set of text, and occasionally a ROM version number of the printer's operating system. A self test can be executed without turning the printer on.

Serial Interface Also called RS-232 interface. Connection between computer and printer which transfers data one byte at a time (serially). Refer to the serial printer cable diagram in this Appendix for the pin arrangement.

Sheet Feeder Single sheet feeder. Mechanical or electronic device that allows the printer to access individual pages from a stack of sheets.

Slot Also called expansion slot. A slot in the computer or printer's circuit board into which other circuits can be inserted. These circuits can include font cartridges (printer) or memory expansion (computer).

Spooler Used for buffering data. A spooler is connected between the computer and printer. It contains enough RAM to save large amounts of text so that the computer can be used for other tasks.

Thermal Printer
Special form printer in which the matrix is made up of pins that heat up, creating print on heat sensitive paper.

Tractor Feed Part of the printer that moves continuous feed paper over pins and onto the platen of the printer.

Typewriter Machine used for directly printing text through a keyboard.

Unidirectional Movement in one direction. Most printers operate bidirectionally. Unidirectional print is used only for output of special forms or graphics. Unidirectional tractors can only move the paper in one direction.

User-Defined Character Set
Also called downloaded character set. The user defines the form and appearance of the characters. The entire form is saved in RAM and is used when printing instead of the standard character set.

Utility An application that helps the user fulfill various needs. The PRINTER program included on the companion diskette for this book is a utility which allows easy transmission of printer commands.

Word Processor Application used for creating and processing text for printing. A word processor is different from using a typewriter because entering and editing the text can be divided into two separate processes.

WYSIWYG Abbreviation for What You See Is What You Get. In a program such as a word processor, the document appears on the monitor as it will appear on a printout.

Appendix B: Program Listings

The following pages contain the source listings of the program files mentioned in this program.

PrinterTool.BAS	Printer control program in AmigaBASIC.
ScriptFile	Script file to add printer commands to your startup sequence.
PrintCode.BAS	Simple AmigaBASIC program demonstrating printer code entry.

PrinterTool.BAS

```
REM
REM
REM     PrinterTool V1.4 for Amiga Printers Inside & Out
REM     THE FINAL RELEASE
REM
DIM DValue(200),HF(200),AF(200),AValue(200)
DIM c(200),D(200),Dstring$(200),Hvalue(200),a$(200),b(200)
 ON ERROR GOTO ErrorOutput

Loop:
       GOSUB openmenu
       GOSUB printmsg
       GOSUB getinput
       GOTO Loop

openmenu:

       WINDOW 1,"PrinterTool V1.4",(0,0)-(628,185),16
       RETURN
EndItAll:
       WINDOW CLOSE 1
       END

printmsg:

       CLS
       PRINT "       PrinterTool V1.4 - by Gerd Sanio
"CHR$(169)" 1990 Abacus/Data Becker GmbH"
       PRINT
       PRINT
       PRINT
```

```
        re = 0
        i1 = 0
        LINE INPUT "Control code >";Control$
        RETURN

getinput:
        tf = 0
        IF UCASE$(Control$) = "BOLD ON" THEN
Sequence$=CHR$(27)+CHR$(69):re=1:GOTO Direct
        IF UCASE$(Control$) = "BOLD OFF" THEN
Sequence$=CHR$(27)+CHR$(70):re=1:GOTO Direct
        IF UCASE$(Control$) = "DOUBLE ON" THEN
Sequence$=CHR$(27)+CHR$(71):re=1:GOTO Direct
        IF UCASE$(Control$) = "DOUBLE OFF" THEN
Sequence$=CHR$(27)+CHR$(72):re=1:GOTO Direct
        IF UCASE$(Control$) = "UNDERLINE ON" THEN
Sequence$=CHR$(27)+CHR$(45)+CHR$(49):re=1:GOTO Direct
        IF UCASE$(Control$) = "UNDERLINE OFF" THEN
Sequence$=CHR$(27)+CHR$(45)+CHR$(48):re=1:GOTO Direct
        IF UCASE$(Control$) = "ITALIC ON" THEN
Sequence$=CHR$(27)+CHR$(52):re=1:GOTO Direct
        IF UCASE$(Control$) = "ITALIC OFF" THEN
Sequence$=CHR$(27)+CHR$(53):re=1:GOTO Direct
        IF UCASE$(Control$) = "CONDENSED ON" THEN
Sequence$=CHR$(27)+CHR$(15):re=1:GOTO Direct
        IF UCASE$(Control$) = "CONDENSED OFF" THEN
Sequence$=CHR$(18):re=1:GOTO Direct
        IF UCASE$(Control$) = "EXPANDED ON" THEN
Sequence$=CHR$(27)+CHR$(87)+CHR$(49):re=1:GOTO Direct
        IF UCASE$(Control$) = "EXPANDED OFF" THEN
Sequence$=CHR$(27)+CHR$(87)+CHR$(48):re=1:GOTO Direct
        IF UCASE$(Control$) = "ELITE" THEN
Sequence$=CHR$(27)+CHR$(77):re=1:GOTO Direct
        IF UCASE$(Control$) = "PICA" THEN
Sequence$=CHR$(27)+CHR$(80):re=1:GOTO Direct
        IF UCASE$(Control$) = "FORM FEED" THEN
Sequence$=CHR$(12):re=1:GOTO Direct
        IF UCASE$(Control$) = "LINE FEED" THEN
Sequence$=CHR$(10):re=1:GOTO Direct
        IF UCASE$(Control$) = "FF" THEN
Sequence$=CHR$(12):re=1:GOTO Direct
        IF UCASE$(Control$) = "LF" THEN
Sequence$=CHR$(10):re=1:GOTO Direct
        IF UCASE$(Control$) = "RESET" THEN
Sequence$=CHR$(27)+CHR$(64):re=1:GOTO Direct
        IF UCASE$(Control$) = "BOLDON" THEN
Sequence$=CHR$(27)+CHR$(69):re=1:GOTO Direct
        IF UCASE$(Control$) = "BOLDOFF" THEN
Sequence$=CHR$(27)+CHR$(70):re=1:GOTO Direct
        IF UCASE$(Control$) = "DOUBLEON" THEN
Sequence$=CHR$(27)+CHR$(71):re=1:GOTO Direct
```

```
        IF UCASE$(Control$) = "DOUBLEOFF" THEN
Sequence$=CHR$(27)+CHR$(72):re=1:GOTO Direct
        IF UCASE$(Control$) = "UNDERLINEON" THEN
Sequence$=CHR$(27)+CHR$(45)+CHR$(49):re=1:GOTO Direct
        IF UCASE$(Control$) = "UNDERLINEOFF" THEN
Sequence$=CHR$(27)+CHR$(45)+CHR$(48):re=1:GOTO Direct
        IF UCASE$(Control$) = "ITALICON" THEN
Sequence$=CHR$(27)+CHR$(52):re=1:GOTO Direct
        IF UCASE$(Control$) = "ITALICOFF" THEN
Sequence$=CHR$(27)+CHR$(53):re=1:GOTO Direct
        IF UCASE$(Control$) = "CONDENSEDON" THEN
Sequence$=CHR$(27)+CHR$(15):re=1:GOTO Direct
        IF UCASE$(Control$) = "CONDENSEDOFF" THEN
Sequence$=CHR$(18):re=1:GOTO Direct
        IF UCASE$(Control$) = "EXPANDEDON" THEN
Sequence$=CHR$(27)+CHR$(87)+CHR$(49):re=1:GOTO Direct
        IF UCASE$(Control$) = "EXPANDEDOFF" THEN
Sequence$=CHR$(27)+CHR$(87)+CHR$(48):re=1:GOTO Direct
        IF UCASE$(Control$) = "FORMFEED" THEN
Sequence$=CHR$(12):re=1:GOTO Direct
        IF UCASE$(Control$) = "LINEFEED" THEN
Sequence$=CHR$(10):re=1:GOTO Direct
        IF UCASE$(Control$) = "RESET" THEN
Sequence$=CHR$(27)+CHR$(64):re=1:GOTO Direct
        IF UCASE$(Control$) = "END" THEN EndItAll
        IF UCASE$(Control$) = "TYPEWRITER" THEN Typewriter
        IF UCASE$(Control$) = "HELP" THEN HelpMe
        IF UCASE$(Control$) = "FILE" THEN FileInput

        Length = LEN(Control$)
        IF Length < 1 THEN PError



DecNmbr:
g = 1:n = 0:i1 = 1:i2 = 1:b = 0:i3 = 0:i4 = 0:i5 = 0
loopp:
  k = INSTR(i2,Control$,",")
  IF k = 0 THEN jumpd
  IF i2 = Length THEN jumpd
  MID$(Control$,k,1)="."
  i2 = i2 +1
  GOTO loopp

jumpd:
  i2 = 1

loopd:
  a = INSTR(i2,Control$,".")
  IF a <> 0 THEN GOSUB Found
    IF a = 0 THEN Dj1
 GOTO loopd
```

```
Dj1:
  c(i1) = Length - (i2-1)
 D(1) = 1

Copy:
  FOR i = i1 TO 1 STEP -1
  n = D(i)
  m = c(i)
  Dstring$(i) = MID$(Control$,n,m)
 NEXT i

   FOR i = i1 TO 1 STEP -1
  DValue(i) = VAL(Dstring$(i))
  x = D(i)
  IF DValue(i) = 0 AND ASC(MID$(Control$,x,1)) = 34 THEN
i3 = i3 +1:AF(i3) =i
  IF DValue(i) = 0 AND ASC(MID$(Control$,x,1)) = 36 THEN
i4 = i4 +1:HF(i4) =i
  NEXT i
  IF i3 > 0 THEN GOSUB ConvertAscii
  IF i4 > 0 THEN GOSUB ConvertHex
i = 0:j = 0:i5 = i4:l = 0:j2 = j:k= 0:p = 0
SEQ:
     i = i +1
     j = j +1
     l = l +1
    ia = AF(i3):ih = HF(i4)
    IF i = Length THEN JSeq
    IF i3 > 0 AND ia = i THEN GOSUB AJump
   IF i4 > 0 AND ih = i THEN GOSUB HJump
   IF DValue(i) <> 0 THEN Sequence$ = Sequence$ +
CHR$(DValue(i))
   IF i <> Length THEN GOTO SEQ
JSeq:
        GOTO SendSequence
HJump:
       Sequence$ = Sequence$ + CHR$(HValue(i4))
       i4 = i4 -1
       RETURN


AJump:
       Sequence$ = Sequence$ + a$(i)
       RETURN

key:
       IF INKEY$ <>" " THEN key
       GOTO Loop

Jump2:
        RETURN
```

```
Typewriter:
 li =1:ta = 3:tz = 1
     WINDOW 2,"Typewriter V1.4                Press <F10>
for help",(0,0)-(628,185),16
     CLS
     PRINT
     PRINT "*";
     IF Sequence$ <> "" THEN GOSUB OldSequencePrint
     tf = 1
tloop:
     key$ = INKEY$
       IF key$ ="" THEN tloop
       IF ASC(key$) = 129 THEN tload   ' F1
       IF ASC(key$) = 130 THEN tsave   ' F2
       IF ASC(key$) = 131 THEN ttas    ' F3
       IF ASC(key$) = 132 THEN tdel    ' F4
       IF ASC(key$) = 133 THEN tend    ' F5
       IF ASC(key$) = 134 THEN tpr     ' F6
       IF ASC(key$) = 138 THEN tphelp  ' F10
       IF ASC(key$) = 8   THEN tbsp    ' Backspace
       IF ASC(key$) = 9   THEN tta     ' Tab
       IF ASC(key$) = 13  THEN rtn     ' Line feed
       IF ASC(key$) = 32  THEN tsp     ' Space
       IF ASC(key$) = 44  THEN tcom    ' Comma
       IF ASC(key$) = 46  THEN tper    ' Period
       IF ASC(key$) <33 OR ASC(key$) >125 THEN tloop
tjumpn:
       PRINT key$;
       tz = tz +1
       Sequence$ = Sequence$ + key$
       GOTO tloop
tsp:   Sequence$ = Sequence$ + " "
       PRINT " ";
       GOTO tloop
tbsp:  Sequence$ = MID$(Sequence$,1,(LEN(Sequence$)-1))
       PRINT CHR$(8);
       tz=tz-1
       GOTO tloop
tdel:  Sequence$ = ""
       tz = 1
       CLS
       PRINT
       PRINT "*";
       GOTO tloop

tcom:  tz = tz +2
       Sequence$ = Sequence$ + ", "
       PRINT ", ";
       GOTO tloop

tper:   tz = tz +1
```

```
        Sequence$ = Sequence$ + "."
        PRINT ".";
        GOTO tloop

tend:   tf = 0
        WINDOW CLOSE 2
        GOTO Loop

ttas:   WINDOW 3,"Set tabs",(10,10)-(240,40),16
ttaj:   CLS
        PRINT
        INPUT "Tab length (1-20)> ",ta
        IF ta > 20 OR ta < 1 THEN ttaj
        WINDOW CLOSE 3
        GOTO tloop

tta:    tz1 = tz+ta
        PRINT TAB (tz1) " ";
        FOR i = tz TO tz1-1
        Sequence$ = Sequence$ + " "
        NEXT i
        tz = tz1
        GOTO tloop

tpr:    WINDOW 3,"Print text",(10,10)-(240,40),16
        PRINT
        INPUT "Print text (y/n) ",dr$
        IF dr$ <> "y" THEN drj
        Sequence2$ = "":sf2=0
        FOR i = 1 TO LEN(Sequence$)
        IF i + 3 > LEN (Sequence$) THEN PJ1
        Seqr$ = MID$(Sequence$,i,4)
        IF UCASE$(Seqr$) = ".BE." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(69):sf2=1
        IF UCASE$(Seqr$) = ".BD." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(70):sf2=1
        IF UCASE$(Seqr$) = ".DE." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(71):sf2=1
        IF UCASE$(Seqr$) = ".DD." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(72):sf2=1
        IF UCASE$(Seqr$) = ".UE." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(45)+CHR$(49):sf2=1
        IF UCASE$(Seqr$) = ".UD." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(45)+CHR$(48):sf2=1
        IF UCASE$(Seqr$) = ".IE." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(52):sf2=1
        IF UCASE$(Seqr$) = ".ID." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(53):sf2=1
        IF UCASE$(Seqr$) = ".CE." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(15):sf2=1
        IF UCASE$(Seqr$) = ".CD." THEN Sequence2$ =
Sequence2$+CHR$(18):sf2=1
```

```
       IF UCASE$(Seqr$) = ".EE." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(87)+CHR$(49):sf2=1
       IF UCASE$(Seqr$) = ".ED." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(87)+CHR$(48):sf2=1
       IF UCASE$(Seqr$) = ".LE." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(77):sf2=1
       IF UCASE$(Seqr$) = ".PE." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(80):sf2=1
       IF UCASE$(Seqr$) = ".FF." THEN Sequence2$ =
Sequence2$+CHR$(12):sf2=1
       IF UCASE$(Seqr$) = ".LF." THEN Sequence2$ =
Sequence2$+CHR$(10):sf2=1
       IF UCASE$(Seqr$) = ".RE." THEN Sequence2$ =
Sequence2$+CHR$(27)+CHR$(64):sf2=1
PJ1:   IF sf2 = 0 THEN Sequence2$ = Sequence2$ +
MID$(Sequence$,i,1)
       IF sf2 = 1 THEN sf2 = 0:i = i +3
       NEXT i
       OPEN "PAR:" FOR OUTPUT AS #2
       FOR i = 1 TO LEN(Sequence2$)
       PRINT #2,MID$(Sequence2$,i,1);
       NEXT i
       CLOSE #2

drj:   WINDOW CLOSE 3
       GOTO tloop


tphelp: WINDOW 3,"Help",(10,10)-(275,47),16
        PRINT "Load text - F1  Save text    - F2"
        PRINT "Set tabs  - F3  Clear memory - F4"
        PRINT "Quit      - F5  Print text   - F6"
        LINE INPUT "Press <RETURN> to exit";tphelpbye$
        WINDOW CLOSE 3
        GOTO tloop

tsave: WINDOW 3,"Save text",(10,10)-(240,40),16
       PRINT
       INPUT "Filename> ",DAT$
       OPEN DAT$+".TXT" FOR OUTPUT AS #2
       FOR i = 1 TO LEN(Sequence$)
       PRINT #2,MID$(Sequence$,i,1);
       NEXT i
       CLOSE #2
       WINDOW CLOSE 3
       GOTO tloop

tload: WINDOW 3,"Load file",(10,10)-(240,40),16
   PRINT
      INPUT "Filename> ",DAT$
      WINDOW CLOSE 3
      OPEN DAT$+".TXT" FOR INPUT AS #2
```

```
        WHILE NOT EOF(2)
        INPUT #2,Seqr$
        PRINT Seqr$
        tz = tz+1
        Sequence$ = Sequence$ + Seqr$
        Sequence$ = Sequence$+CHR$(13)
        Sequence$ = Sequence$+CHR$(10)
        PRINT "*";
        li = li + 1
        WEND
        CLOSE #2
        tz = 1
        GOTO tloop

OldSequencePrint:
        FOR i = 1 TO LEN (Sequence$)
        Seqr$ = MID$(Sequence$,i,1)
        IF Seqr$ = CHR$(13) THEN OSJ1
        PRINT Seqr$;

OSJ2:
        NEXT i
        RETURN

OSJ1: PRINT CHR$(13);
        PRINT "*";
        i=i+1:li=li+1
        GOTO OSJ2
rtn:
        li =li +1:tz = 1
        IF li > 16 THEN ES
        PRINT key$;:PRINT "*";
rj:     Sequence$ = Sequence$+CHR$(13)
        Sequence$ = Sequence$+CHR$(10)
        GOTO tloop

ES:     CLS:li =1:tz = 1
        PRINT "*";
        GOTO rj


ConvertHex:
        FOR j = 1 TO i4 :REM i4 = Num Strings
        x2 = HF(j):REM x2 = String number
        Part1$ = MID$(Dstring$(x2),2,1)
        Part2$ = MID$(Dstring$(x2),3,1)
        DecValue1 = ASC(Part1$)
        DecValue2 = ASC(Part2$)
    IF DecValue1 > 96 THEN DecValue1 = DecValue1-87:F1 = 1
    IF DecValue2 > 96 THEN DecValue2 = DecValue2-87:F2 = 1
    IF F1 = 1 AND F2 = 1 THEN GOTO Hj1
```

```
   IF DecValue1 > 64 AND F1 <> 1 THEN DecValue1 =
DecValue1-55:F1 = 1
   IF DecValue2 > 64 AND F2 <> 2 THEN DecValue2 =
DecValue2-55:F2 = 1
   IF F1 = 1 AND F2 = 1 THEN GOTO Hj1
   IF F1 <> 1 THEN DecValue1 = DecValue1-48
   IF F2 <> 1 THEN DecValue2 = DecValue2-48

Hj1:
     F1 = 0
      F2 = 0
      HValue(j) = DecValue1 * 16 + DecValue2
      IF Ges > 255 THEN PError
      NEXT j
      RETURN

ConvertAscii:
      FOR j = i3 TO 1 STEP -1 :REM i3 = Number of strings
      x2 = AF(j):REM x2 = String number
      f = b(j)+2
      le = LEN(Dstring$(x2))-2
       h$ = Dstring$(x2)
      a$(x2) = MID$(h$,2,le)
      NEXT j
      RETURN

Found:
      LET b(i1) = a
      LET c(i1) = (a-1)-b(i1-1)
      i1 = i1 +1
      i2 = a+1
      LET D(i1) = i2
      RETURN



FileInput:

      LINE INPUT "Filename >";FileName$
      IF FileName$="" GOTO Loop
      OPEN FileName$ FOR INPUT AS #1
      OPEN "PAR:" FOR OUTPUT AS #2
      WHILE NOT EOF(1)
      LINE INPUT #1,value$
      PRINT #2,value$
      WEND
      CLOSE #1
      CLOSE #2
      GOTO Loop

HelpMe: WINDOW 4,"PrinterTool Help",(30,11)-(606,182),16
```

```
        PRINT " Usual syntax: Escape,code,"CHR$(34)"Text
to print";CHR$(34);",CRcode,LFcode"
        PRINT " Codes can be entered in decimal or hex."
        PRINT " EXAMPLES: 27,69,"CHR$(34)"This is
BOLD"CHR$(34)",13,10"
        PRINT "           $1b,$46,"CHR$(34)"This disables
BOLD"CHR$(34)",$0C,$0A"
        PRINT
        PRINT " Control code words can also be entered
for printer control."
        PRINT " EXAMPLE: Underline On  >or<  UnderlineOn
both enable underlining mode."
        PRINT "          Enter the control code word at
the prompt and press <RETURN>,"
        PRINT "          then enter the text and the
CR,LF codes."
        PRINT "
        PRINT " Typewriter Mode:"
        PRINT:PRINT "   F1-Load text       F2-Save text
F3-Change tabs"
        PRINT "   F4-Clear memory    F5-Exit typewriter
F6-Print text "
        PRINT:PRINT " Most typewriter mode control codes
consist of a code letter"
              PRINT " and E (enable) or D (disable).
Codes are enclosed in periods."
        PRINT " .BE. (Bold enable) .BD. (Bold disable)
.FF. (Form feed) etc."
        PRINT
        LINE INPUT "Please press <RETURN>";exithelp$
        WINDOW CLOSE 4
        GOTO Loop

SendSequence:
   IF Length=1 AND Sequence$=CHR$(34) THEN
Sequence$="":GOTO Loop

Direct:

      OPEN "PAR:" FOR OUTPUT AS #2
      IF re=1 THEN re=0:PRINT #2,Sequence$;:CLOSE
#2:Sequence$="":GOTO Loop
      IF tf=1 THEN PRINT #2,Sequence$;:CLOSE
#2:Sequence$="":GOTO tloop
      PRINT #2,Sequence$+CHR$(13);
      CLOSE #2
      Sequence$="":GOTO Loop


PError:

      PRINT:PRINT "     Illegal input!!"
```

```
      PRINT"          Please press <SPACE>"
      GOTO key

ErrorOutput:

      IF ERR=53 THEN Message$="File not found"
      IF ERR=49 THEN Message$="Device or file not
available"
      IF ERR=64 THEN Message$="Illegal filename"
      IF ERR=49 THEN Message$="File not found"

      PRINT:PRINT "ERROR:  ";:PRINT Message$:PRINT
      LINE INPUT"           -- Please press <RETURN> --
",a$
      RESUME Loop
```

ScriptFile

```
alias PDir dir >prt:
alias PList list >prt:
alias BoldOn echo >par: "*eE"
alias BoldOff echo >par: "*eF"
alias DoubleOn echo >par: "*eG"
alias DoubleOff echo >par: "*eH"
```

PrintCode.BAS

```
type printcode.bas
Loop: CLS
INPUT "Control code";s$
INPUT "Text        ";Tx$
seq$=CHR$(27)+s$
OPEN "PAR:" FOR OUTPUT AS #2
PRINT#2,seq$;
PRINT#2,Tx$
CLOSE 2
INPUT "Do you want to enter another control code
(y/n)";again$
IF again$ <>"y" THEN END ELSE Loop
```

Index

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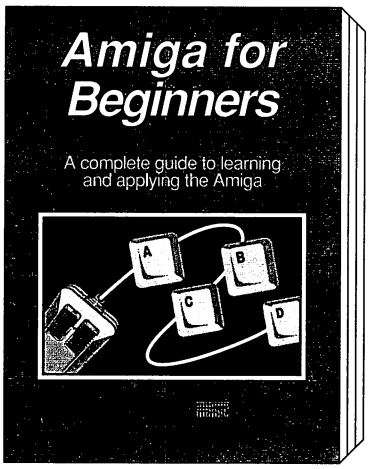

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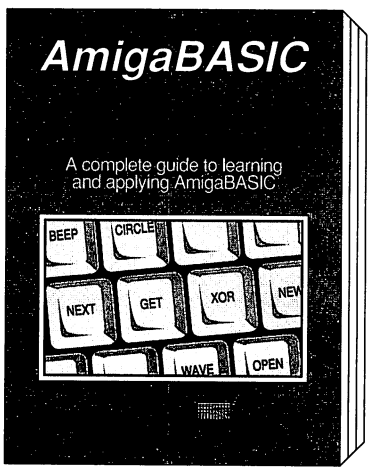

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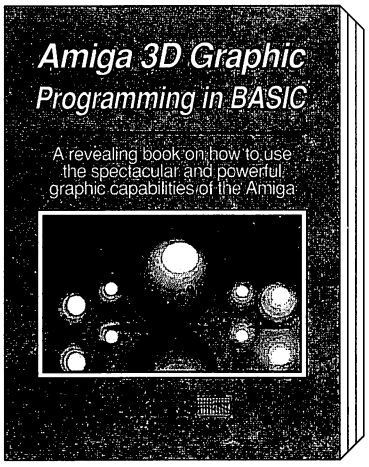

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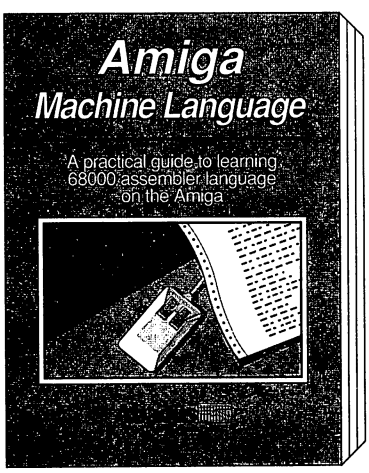

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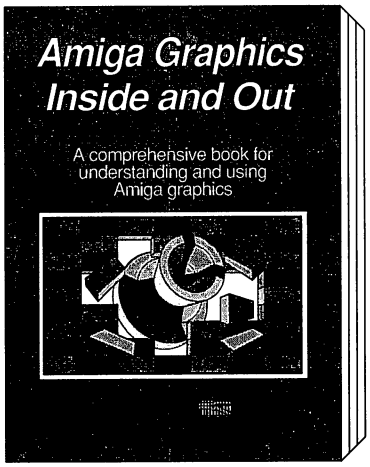

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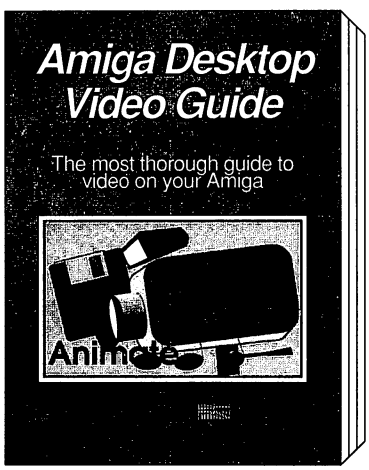

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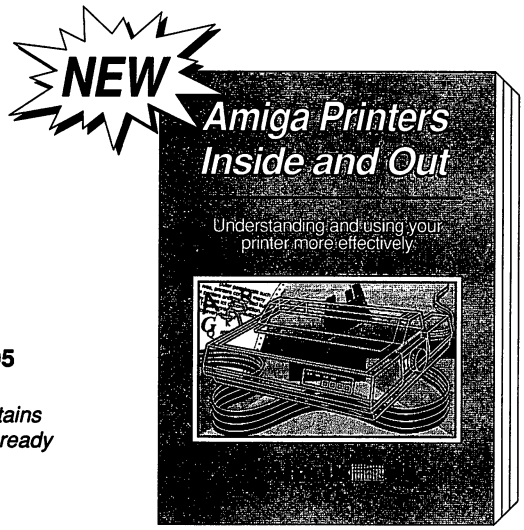

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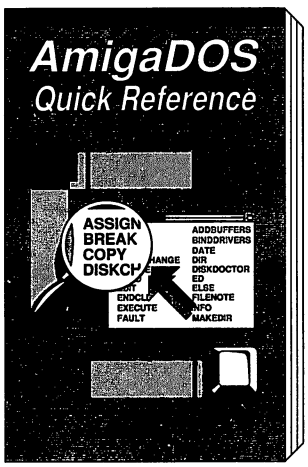

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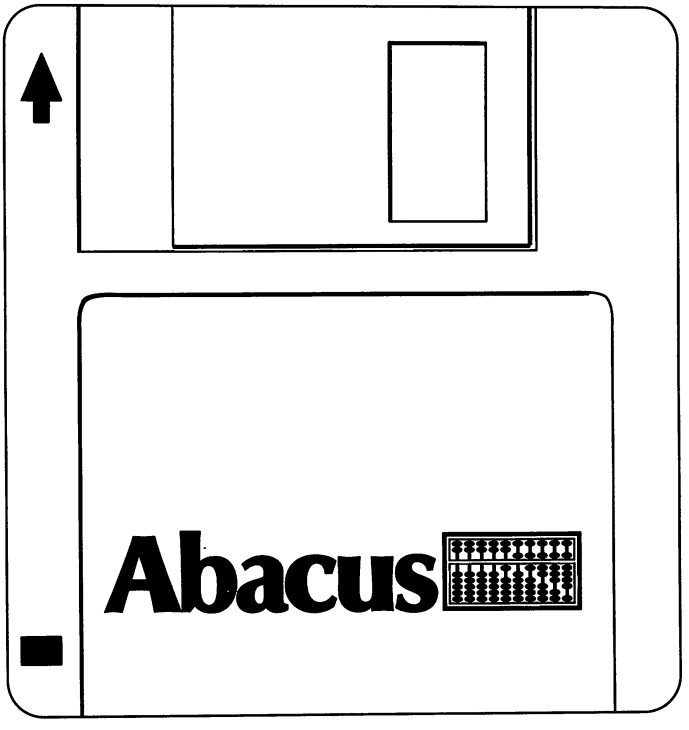
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```
AmigaPrinters Drawer
PrinterTool.BAS
ScriptFile
PrintCode.BAS
: Enter printer code <Return> and text <Return>

BeckerText-prt and TextPro-prt Drawers
          BrotherHR15.prt
          ComMPS-1000.prt
          DaisyWheel.prt
          EpsonLQ800.prt
          EpsonRX-FX.prt
          Gemini10X.prt
          HP_LaserJet.prt
          HP_PaintJet.prt
          IBM-compatible.prt
          NEC-PX.prt
          Okidata192-IBM.prt
          Okidata192-Std.prt
          Okidata192Plus-IBM.prt
          OkidataLaser6.prt
          Okimate20.prt
          Panasonic1091.prt
          SeikoshaSL80AI.prt
          SeikoshaSP1000i.prt
          standard.prt
          StarNL10.prt
          StarNX-1000.prt
          StarNX-1000MF.prt
          StarSG10-IBMmode.prt
          StarSG10-
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Includes WORKBENCH 2.0 Printer Info

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- WORKBENCH Printer drivers explained in detail
- Amiga fonts as printer fonts and much more!

This book contains a companion disk that will save you hours of typing in the programs. These programs include many printer utilities, such as PrinterTool and more.

Ralf Ockenfelds is a contributing editor to European magazines on the subject of peripherals and their uses.

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