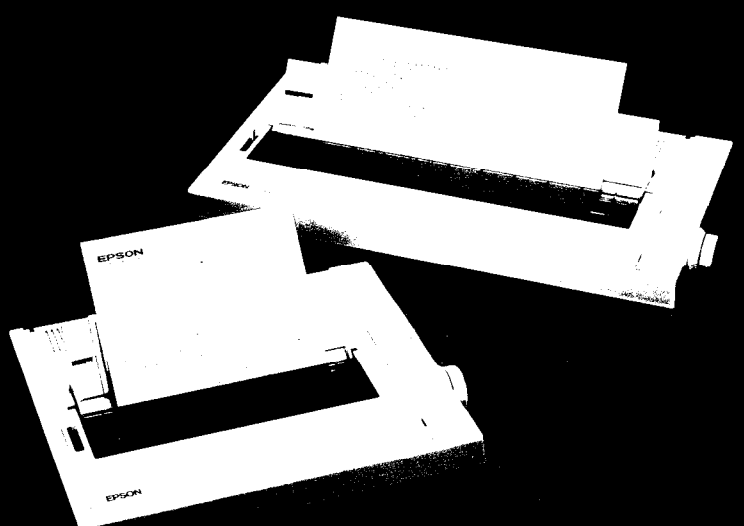
EPSON®

User's Manual



LQ-800/1000 Printers

Y4519510300A

EPSON®

LQ-800 and LQ-1000 Printers

User's Manual

FCC COMPLIANCE STATEMENT FOR AMERICAN USERS

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Plug the computer into a different outlet so that the computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems."

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

WARNING

The connection of a non-shielded printer interface cable to this printer will invalidate the FCC Certification of this device and may cause interference levels which exceed the limits established by the FCC for this equipment. If this equipment has more than one interface connector, do not leave cables connected to unused interfaces.

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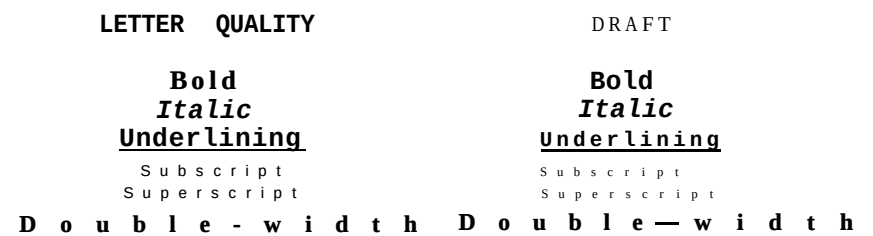
Introduction

The Epson LQ-800 and LQ-1000 are state-of-the-art, X-pin dot-matrix printers that deliver exceptional speed and sharpness in either Letter Quality or draft style.

The LQ-800 and LQ-1000 are also capable of a wide variety of print enhancements, including:



The LQ-800 and LQ-1000 combine the versatility and reliability of Epson products, with a wide range of exciting new features.

- You can select either the Letter Quality or draft typestyle with a touch of a front panel button-there are no codes to learn.
- The 24-pin print head produces sharp, crisp draft characters, and Letter Quality characters that look like they came from a typewriter.
- The LQ has built-in connectors for both parallel and serial interface cables, so there's no need for extra options or modifications.
- Option cartridges are available to further extend the capabilities of the LQ-800 and LQ-1000. These cartridges provide additional type fonts, and will also allow you to use programs designed for other popular printers.

- The compact design and light weight of the LQ make it ideal for home and business applications.
- A 7K buffer frees your computer so you can work on one document while printing another.

Using this manual

To make it easier to set up your new LQ-800 or LQ-1000, this manual includes a 10-step guide to setting up your printer. These steps take you from unpacking, through ribbon and paper loading, to printing your first document.

Easy-to-read tabs make it simple for beginners or experienced users to find information. Additional sections describe how to use your new printer with word processors, create graphics, define your own characters, and more.

If you are familiar with earlier Epson manuals, you'll find two terms changed to make them more descriptive. In this manual, *double-width* is used instead of expanded, and condensed is used in place of ***compressed.***

Chapter 1
Setting Up Your LQ Printer

Setting up your new LQ is easy. Simply follow the steps in this chapter.

Note

The LQ-800 and LQ-1000 are essentially the same printer except that the LQ-1000 can accept wider paper. Therefore, most of the illustrations in this manual show only the LQ-800. If there is a difference that you need to know about, a separate illustration shows the LQ-1000.

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1 Unpacking Your Printer

First, remove the printer from the box and take off all outside plastic covering and foam supports. See that you have received all the parts shown in the illustrations on the next page. (You'll find the paper feed knob inserted in the foam packing material.)

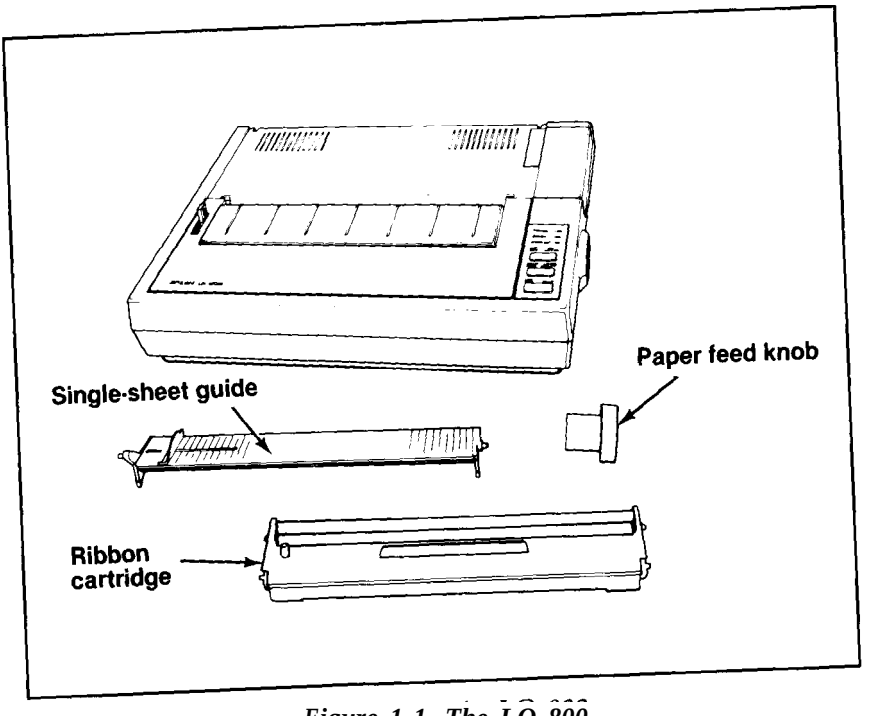

Figure 1-1. The LQ-800

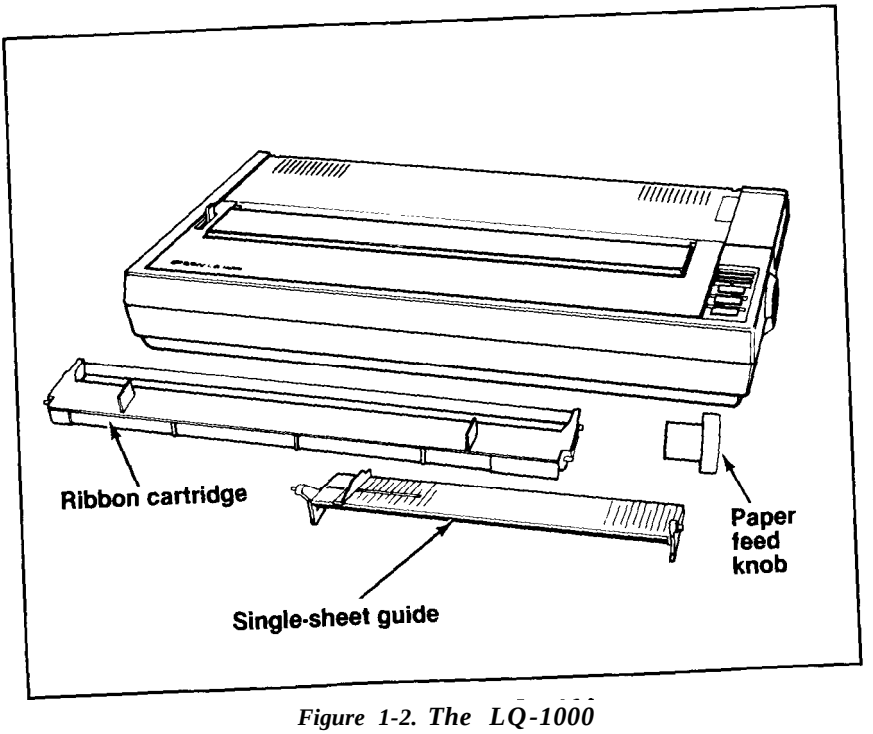

Figure 1-2. The LQ-1000

Remove the tape that holds the dust cover in place during shipping and take the cover off the printer. Simply tilt the dust cover up and lift it off the printer.

WARNING

The print head is protected by two plastic bumpers during shipping. Both of these bumpers *must* be removed before turning on the printer. Remove the long bumper to the right of the print head first, then move the print head to the center of the LQ and remove the small bumper on the left side of the print head.

There is a clear plastic overlay on the control panel to protect it from scratching and discoloration. It's up to you whether you remove the overlay or leave it on.

Installing the paper feed knob

Next install the paper feed knob. To install the knob, simply push it onto the shaft on the right side of the printer, as shown in Figure 1-3. The shaft has one flat side that must be matched with the flat side of the hole in the knob.

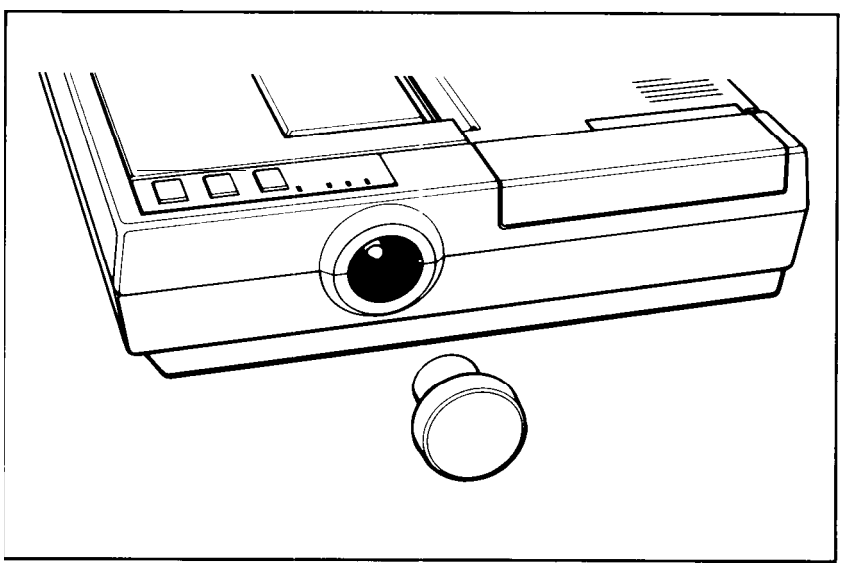

Figure 1-3. Installing the paper feed knob

Now that you've installed the paper feed knob, use it to remove the sheet of paper wrapped around the printer's platen (the black roller).

2 Selecting the Right Location

The most important consideration in choosing a location for your printer is that it be close enough to connect a cable to your computer. But also keep the following tips in mind:

- Place the printer or printer stand on a solid and level foundation. Avoid setting it on carpet, chairs, or unstable surfaces.
- Use a grounded outlet-one that has three holes to match the power plug on the printer. Don't use an adapter plug.
- Avoid using electrical outlets that are controlled by wall switches-if you accidentally turn off a switch, you could wipe out valuable information and stop your printing.
- Keep your printer and computer away from base units for cordless telephones.
- Avoid using an outlet on the same circuit breaker with large electrical machines or appliances that might disrupt the flow of power to your printer.
- Protect your printer from direct sunlight, and keep it away from excessive heat, moisture, and dust. Make sure it's not too close to a heater or any other heat source.

3 Installing the Ribbon

With the dust cover removed, you have easy access to the printer for ribbon installation and paper loading. The next time you install a ribbon or load paper, you can leave the cover on.

Now you're ready to install the ribbon.

1. Manually move the print head to the middle of the platen.

WARNING

The power must be OFF when moving the print head. Moving the print head when the power is ON may damage your printer. If you've been using your printer just before changing the ribbon cartridge, be careful not to touch the print head because it becomes hot during use.

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2. Before loading the cartridge into the printer, turn the small knob on top in the direction of the arrow to tighten the ribbon as shown in Figure 1-4.

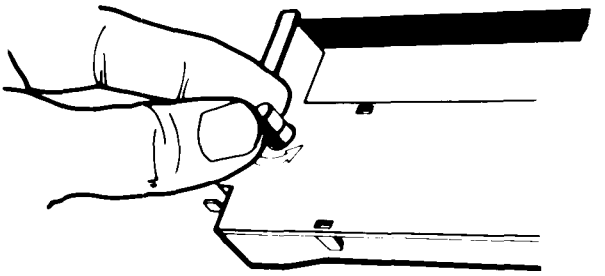


Figure 1-4. Tightening the ribbon

3. For the LQ-800, hold the ribbon cartridge by the raised plastic fin on top of the cartridge; for the LQ-1000 hold the cartridge by the two plastic tabs. Lower the cartridge into the printer, guiding the two square pins on each. end of the cartridge into the slots in the printer frame, as shown in Figures 1-5 and 1-6. Press firmly on each end of the cartridge to make sure the pins are firmly seated in the slots.

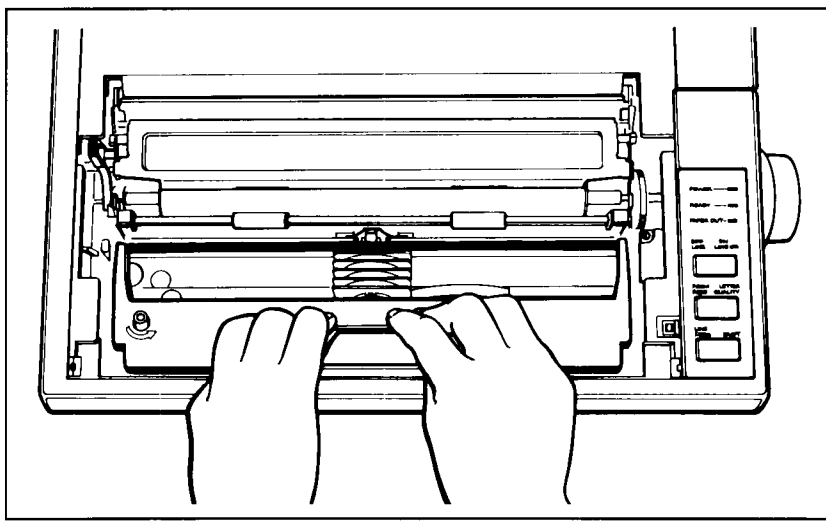


Figure 1-5. Loading the LQ-800 ribbon cartridge

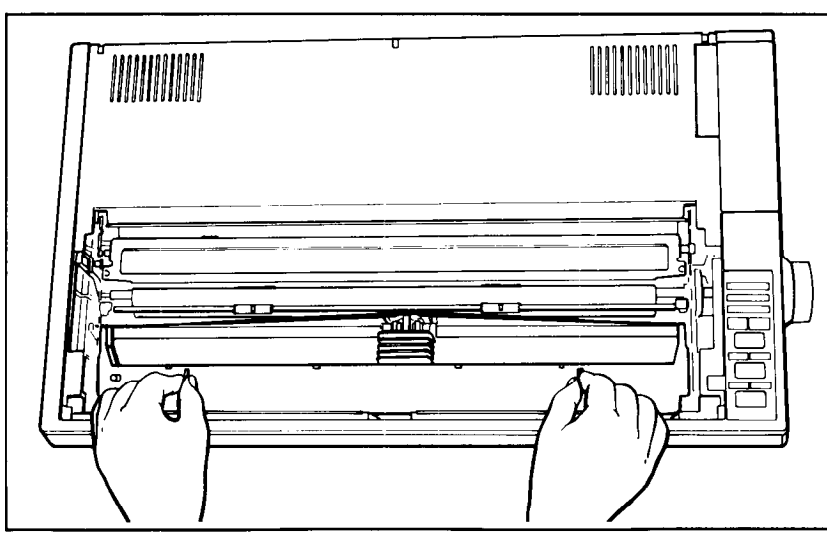


Figure 1-6. Loading the LQ-1000 ribbon cartridge

4. Now use the point of a pencil to guide the ribbon into place between the ribbon guide and the print head as shown in Figure 1-7. (There is also a diagram on the top of the ribbon cartridge itself.)

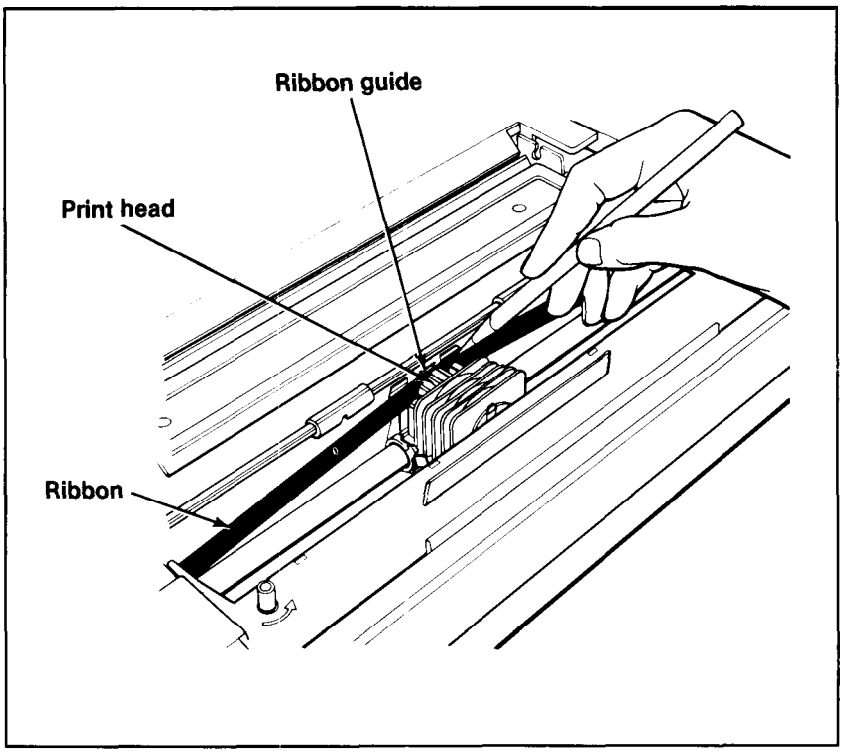


Figure 1-7. Positioning the ribbon

5. With the cartridge in place, again turn the ribbon knob in the direction of the arrow to tighten the ribbon.

And that's it-the ribbon is now installed.

Replacing the ribbon. . .

When buying new ribbon cartridges for the LQ-800 or 1000, be sure you get a ribbon ***specifically*** for the LQ-800 or 1000. Ribbon cartridges for other Epson printers, such as the FX series, may closely resemble an LQ ribbon, but their use can damage the LQ print head. Also, ribbon cartridges for the LQ-1500 will not fit the LQ-800 or 1000, and the Epson ribbon replacement pack #8758 should not be used as a replacement ribbon.

The LQ uses a continuous-loop, inked fabric ribbon. When your printing becomes too light, replace the ribbon with a fresh cartridge. To replace the ribbon, just pull up on the raised fin on top of the LQ-800 cartridge, or the two plastic tabs on the LQ-1000 and lift the cartridge out of the printer. To install a new ribbon, follow the preceding steps.

4 Loading Single-Sheet Paper

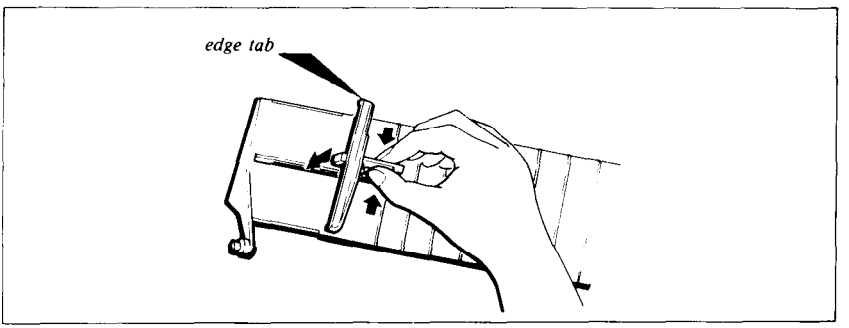
When you receive your LQ, it is set up to print on single sheets of paper. Even if you have purchased one of the optional paper feeding systems (the cut sheet feeder or the tractor unit), you should ***first*** complete the remaining setup steps before installing either of the optional systems.

It is much easier to run the self test (Step 8) and to connect the LQ to your computer (Step 9) before you install an optional system. After completing the setup steps, see Chapter 2 for installing the cut sheet feeder, or Chapter 3 for installing the tractor unit.

Installing the single-sheet guide

Now install the single-sheet guide. It helps you feed individual sheets of paper into the LQ.

First, put the edge tab into the guide frame. Holding the plastic spring, insert it into the groove as shown below.



Assembling the single-sheet guide

The guide has rounded pins on each end. These pins fit into notches on each end of the paper slot.

Slide one of the guide's pins into one notch. Then, with gentle pressure, snap the other pin into the other notch as shown in Figure 1-8.

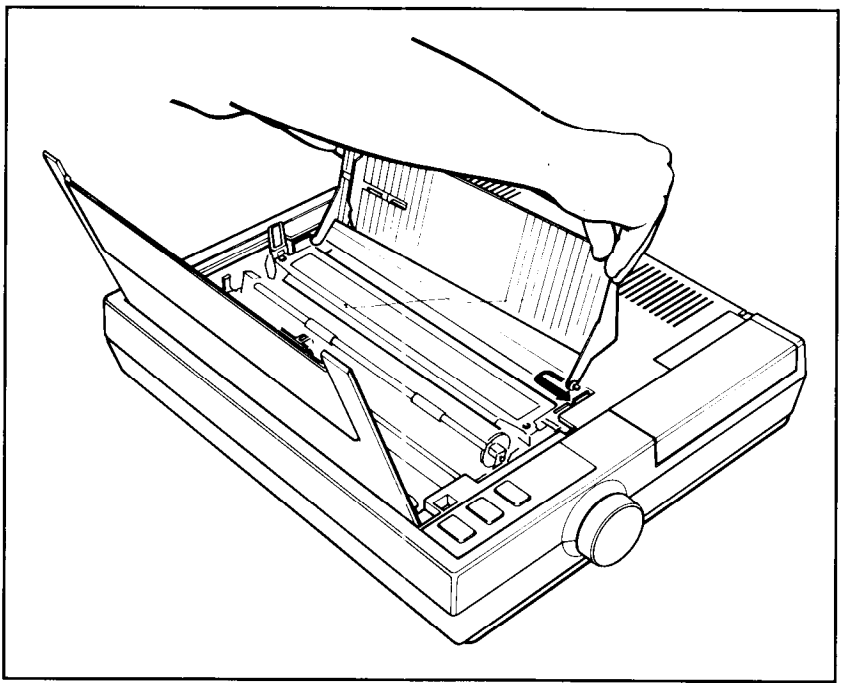


Figure 1-8. Installing the single-sheet guide

The edge tab on the left side of the guide is movable, with a click stop for its middle position. For standard-sized (8½-inch wide) paper, see that the tab is in the click-stop position.

Loading the paper

Loading single-sheet paper in the LQ is simple-it's just like loading paper in a typewriter.

1. Check that the dust cover is tilted up to make it easier to see inside the printer, as shown in Figure 1-9.

2. Make sure the paper release lever is pushed back in the direction of the arrow in the figure, and that the paper bail is pulled away from the platen.

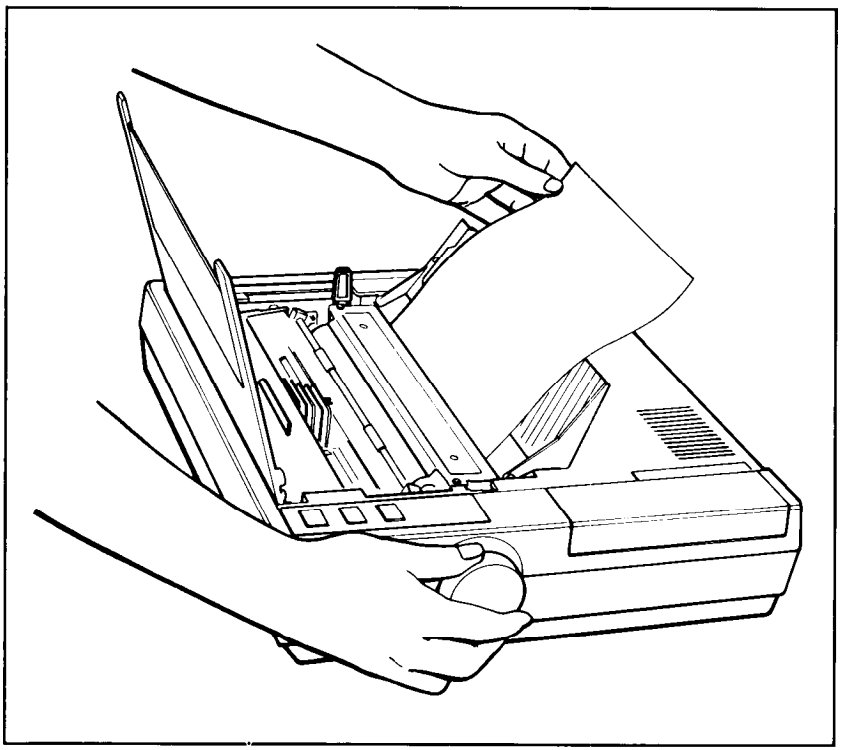


Figure 1-9. Loading single-sheet paper

3. Insert a single sheet of paper behind the platen as shown in Figure 1-9. Put the left edge of the paper against the edge tab on the single sheet guide.

4. With the power OFF use the paper feed knob to roll the paper into the printer far enough to be held by the paper bail. (If the power is ON, use the LINE FEED button as described in Step 6.)

5. Push the paper bail back against the paper, and the paper is ready.

Caution

Never use the manual paper feed knob while the power is ON because you can damage the paper feed motor. Always use the **LINE FEED** or **FORM FEED** button. You will also find that the paper feed knob turns easily when the power is **OFF,** but is difficult to turn while the power is **ON.**

When loading single-sheet paper, you may find that the LQ finishes pages at different places than your word processor or applications program does.

To ensure that your word processor and the LQ finish pages at the same point:

1. Print out a page on the LQ. Check that the LQ and your word processor have the same page length. If they differ, note how many lines they differ by. For example, if your word processor is set up to print 55 lines, but the LQ only prints 53 lines before ejecting the page, there is a difference of two lines.

2. You now have three choices:

   a) Compensate for the two-line difference when rolling the paper into the printer.

   b) Use the installation procedure on your word processor to change the default page length.

   c) Use commands in your word processing program to alter the page or margin lengths in each file to accommodate the LQ's page length.

3. Once you've established the best settings, always load the paper so that your printer starts at the same place on each page. For example, you may find that when you roll the paper one inch above the print head, the page finishes where you want it to-then each time you load paper, load it the same way.

With single-sheet paper, the key to consistent page formatting is to establish the settings that work best for you, then position the paper in the same place every time.

Adjusting the paper thickness lever

The LQ is equipped with a paper thickness lever that can be adjusted to accommodate varying thicknesses of paper.

The lever is located in front of the paper release lever on the left side of the printer as shown in Figure 1-10.

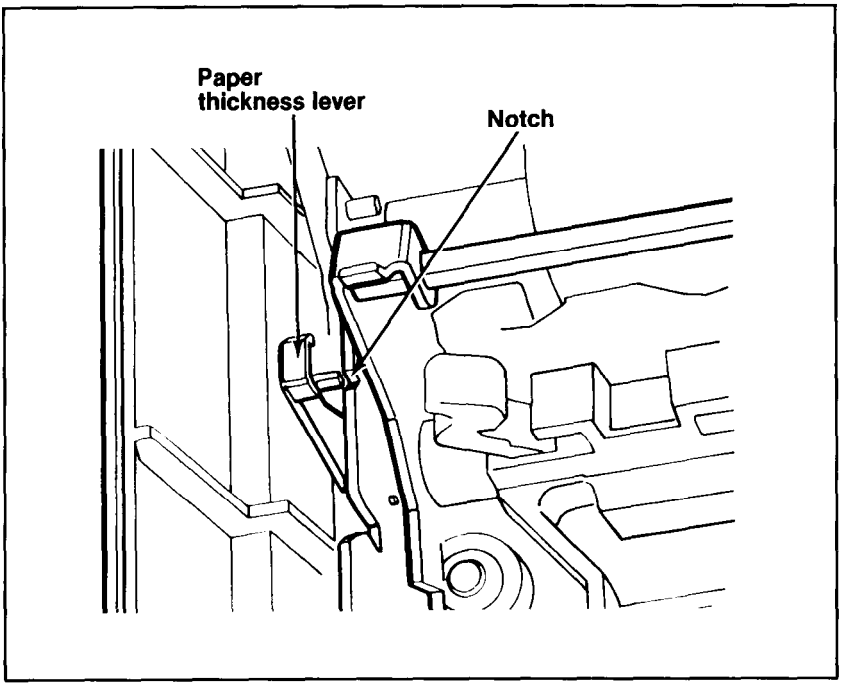


Figure 1-10. Paper thickness lever

When you receive your LQ, the lever is set for standard paper thickness (about 1/500th of an inch), with the small arm on the paper thickness lever set in the notch shown in Figure 1-10.

For thicker paper or multiple copies, pull the lever toward the front of the printer. To return the lever to the standard position, push it back until it clicks into the standard setting.

5 Turning On the Power

With the ribbon and paper installed in the LQ, it's time to turn the printer on and become acquainted with the power-up sequence.

Plug in the printer's power cord, making sure the outlet is properly grounded. Turn the power ON with the switch on the left side of the printer (see Figure 1-11).

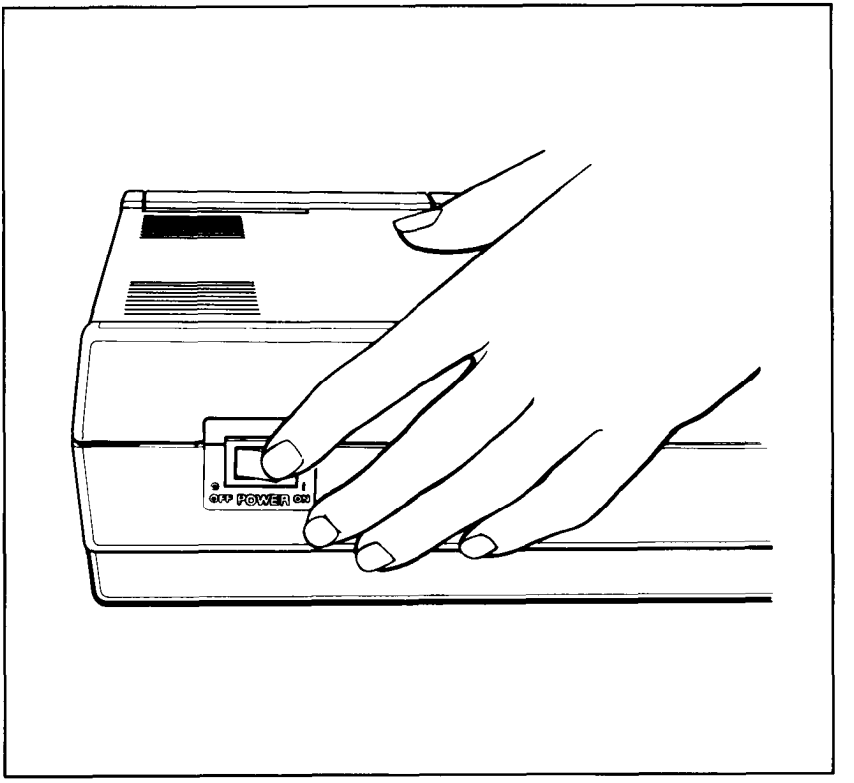


Figure 1-11. Turning on the power switch

When the power is turned ON:

- The print head moves back and forth and stops at the left side of the printer.
- The printer ***is initialized-any*** previous settings are erased, and the printer is reset to its ***default*** (or preset) values. See Appendix I for a list of default values.
- The three green lights on the control panel--POWER, READY, and ON LINE-go on. (The red PAPER OUT light does not go on unless the printer is out of paper.)

6 Operating the Control Panel

Each of the three buttons on the LQ control panel (see Figure 1-12) has two functions-the functions marked in blue (ON LINE, LETTER QUALITY, and DRAFT) are active when the printer is on ***line;*** the functions marked in black (OFF LINE, FORM FEED, and LINE FEED) are active when the printer is ***off line.*** The printer is on line when the ON LINE light is on; it is off line when the ON LINE light is off.

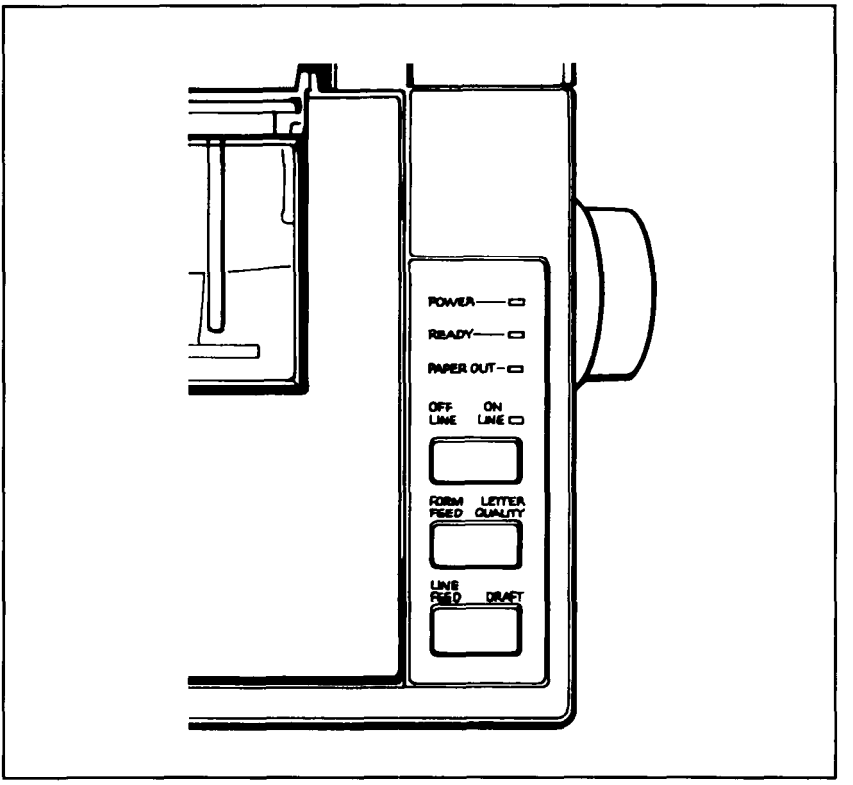


Figure 1-12. The LQ control panel

OFF LINE/ON LINE

OFF LINE--If you press this button when the green light beside it is on, the ON LINE and READY lights go off, the print head moves to the center of the platen, and the printer is set *off line-the* power is still on but the LQ won't print. This enables the form feed and line feed functions to work.

ON LINE-The green ON LINE light indicates that the printer is on ***line*** and ready to receive data. When the LQ is on line, you can select either the Letter Quality or draft mode.

FORM FEED/LETTER QUALITY

FORM FEED-Pressing this button advances the paper to the top of the next page if you're using continuous-feed paper (see Chapter 3, "Installing the Tractor Unit"). If you're using single-sheet paper, it fully ejects one sheet. The form feed function works only when the printer is off line.

LETTER QUALITY-Pressing this button selects the Letter Quality typestyle (for more information on Letter Quality, see Step 7). The printer beeps twice to acknowledge the Letter Quality selection. You can select the Letter Quality typestyle with this button only when the printer is on line.

LINE FEED/DRAFT

LINE FEED-Pressing this button advances the paper one line at a time, either while you're loading paper, or when you're adjusting where you want printing to begin. If you hold this button down, the paper advances continuously. The line feed function works only when the printer is off line.

DRAFT-Pressing this button selects the draft typestyle. The printer beeps once to acknowledge the draft selection. The draft function works only when the printer is on line.

Note

Use the LETTER QUALITY or DRAFT buttons before you tell the computer to print. Do not use them while the LQ is printing.

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7 Selecting the Letter Quality or Draft Mode

When you receive your LQ, it is preset to print in the Letter Quality mode. As shown in the sample below, the Letter Quality characters are fully formed and are ideal for formal correspondence or other presentation-quality work.

For those times when you need only a rough draft, the LQ also has a draft mode, also shown below. In draft mode, the LQ prints more quickly, because fewer dots are used to form each letter.

```
This is the Letter Quality style
This is the draft Style
```

The LQ gives you three ways to select either the Letter Quality or draft mode.

- Control panel-You can choose between the Letter Quality and draft modes with the appropriate button on the control panel.
- DIP switch-A switch on the back of the printer selects either Letter Quality or draft as the ***default*** typestyle (the style in effect when you turn the power on). See Appendix A for details.
- Software command-You can also switch between the Letter Quality and draft modes by sending a command to the printer as explained in Chapter 5.

These three choices allow you to tailor the LQ to ***your*** printing needs. If you find you use the Letter Quality mode most of the time, you can leave the settings just as they are. If you print in draft mode more than Letter Quality, just reset the DIP switch as outlined in Appendix A. But no matter what you choose, you can always use the buttons on the control panel to switch between the two styles.

8 Running the Self Test

The LQ has a built-in self test function that automatically prints out all of the characters in the selected character set-either Letter Quality or draft.

Before running the self test, make sure that paper is loaded in the printer and that the power is turned OFF. If you have an LQ-1000, be sure to use 14-inch-wide paper to avoid printing on the platen.

To run the self test in the Letter Quality mode, hold down the LETTER QUALITY button while you turn the power switch ON. To run the test in the draft mode, hold down the DRAFT button while turning the power ON. The self test then takes over.

The self test prints a version identification number, the name of the installed typeface family, then (as you can see in Figure 1-13) all of the characters in the selected character set.

The self test continues until you turn the printer off or until it runs out of paper.

Figure 1-13. LQ self test in draft and Letter Quality modes

9 Connecting Your Printer to Your Computer

Your LQ printer comes equipped with separate connections for **both** serial and parallel interfaces, so be sure to use the type your computer requires. Check your computer's documentation if you're unsure which interface you have. (If your computer requires a different type of interface, see your Epson dealer.)

The parallel interface

The connector on a parallel interface cable, as shown in Figure 1-14, is secured to both the LQ and your computer by two clips. After plugging the cable into the LQ and your computer, be sure to snap the clips in place, and connect the ground strap if the cable is equipped with one.

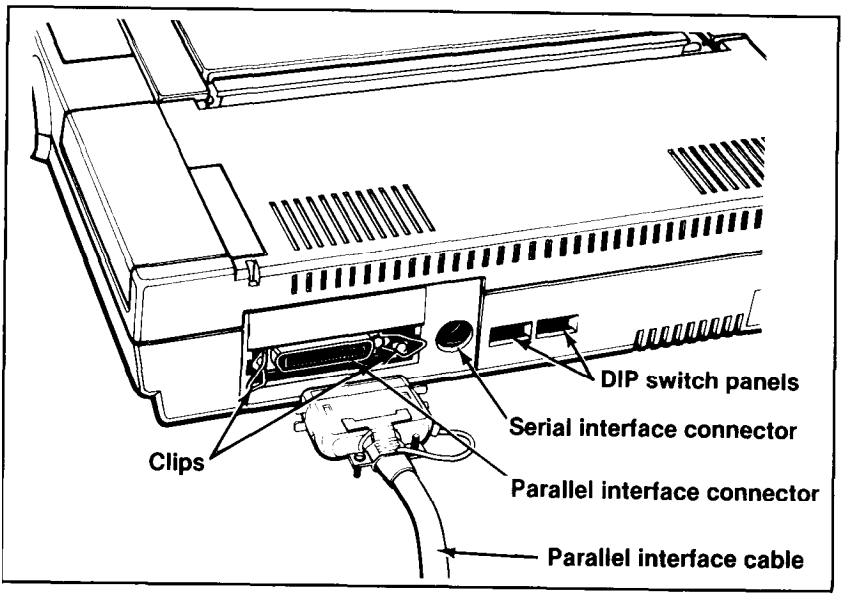

Figure 1-14. Connecting a parallel interface cable

Once you've connected a parallel cable, you're ready to print. The parallel interface does not require any additional settings.

The serial interface

If your computer is equipped with a serial interface, you should use an Epson serial interface cable-#8239 for the Apple® IIc, #8293 for the Apple IIe ***or*** Epson QX™-16, and #8294 for the IBM® PC. Plug the cable into the connector to the right of the parallel connector.

When using the serial interface, you need to reset four DIP switches so that your computer and printer will communicate properly. See Appendix A for a complete explanation of the DIP switches and how to set them for your serial interface.

10 Printing Your First Document

Now that you've completed the basic setup and operating steps, your LQ is ready to print. The following chapter explains how to set up your word processor to work with the LQ.

Additional chapters and appendixes cover programming, control codes and ESCape sequences, technical specifications and maintenance .

If you have any difficulty printing your first document, check the following list to make sure you've completed all the setup steps.

- ❑ Did you remove the plastic tab that holds the print head in place?
- ❑ Is the power source (power strip, etc.) turned ON?
- ❑ Is the ribbon properly installed? Make sure the ribbon is in front of the print head, not riding above it.
- ❑ Have you loaded the paper correctly? (Read Chapter 2 or 3 if you are using the optional cut sheet feeder or tractor unit.)
- ❑ Are the green POWER, ON LINE, and READY lights on the control panel ON? If not, press the ON LINE button to place the LQ on line. If the red PAPER OUT light is ON, check that you've loaded the paper correctly.
- ❑ Were you able to successfully run the self test in Step 8? If not, check the DIP switch settings and try again.
- ❑ Is your printer properly connected to your computer? Are you using the correct interface (serial or parallel)? If you're using a serial interface, have you set the DIP switches accordingly?

If you're still having trouble printing, read the troubleshooting section in Appendix D.

Chapter 2
The Cut Sheet Feeder

The cut sheet feeder automatically loads single sheets of paper into the LQ, allowing you to print on letterhead, bond, or individual forms.

Installing the Cut Sheet Feeder

1. Make sure the power is OFF.

2. Set DIP switch 1-8 on the back of the printer to the ON position and DIP switch **1-7** to the OFF position to select the cut sheet feeder. See Appendix A for information on resetting the DIP switches.

3. Remove the front cover that came installed on your LQ by tilting it up and lifting it off the printer. Replace it with the new cover included with the cut sheet feeder, as shown in Figure **2-1.** Leave the new cover in an upright position so you can see inside the printer. Also remove the single-sheet guide.

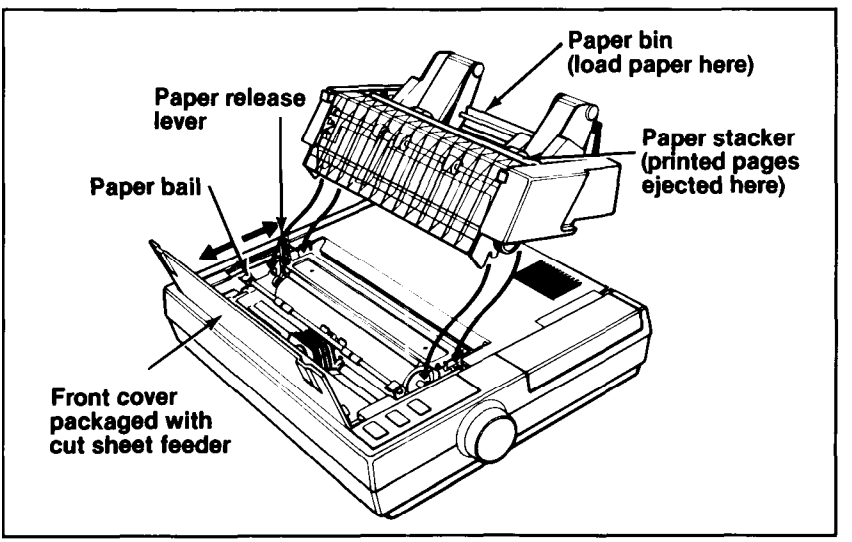

Figure 2-1. Preparing the printer for installation

4. Make sure the paper release lever is pushed back as shown in Figure **2-1.** If this lever is not pushed back, the cut sheet feeder will not fit or operate properly.

5. Pull the paper bail away from the platen (the black roller) as shown in Figure 2-1. The paper bail should remain in this position whenever the cut sheet feeder is installed.

6. Now locate the rear mounting pins on the LQ as shown in Figure **2-2.** The rear notches on the cut sheet feeder unit rest on these mounting pins.

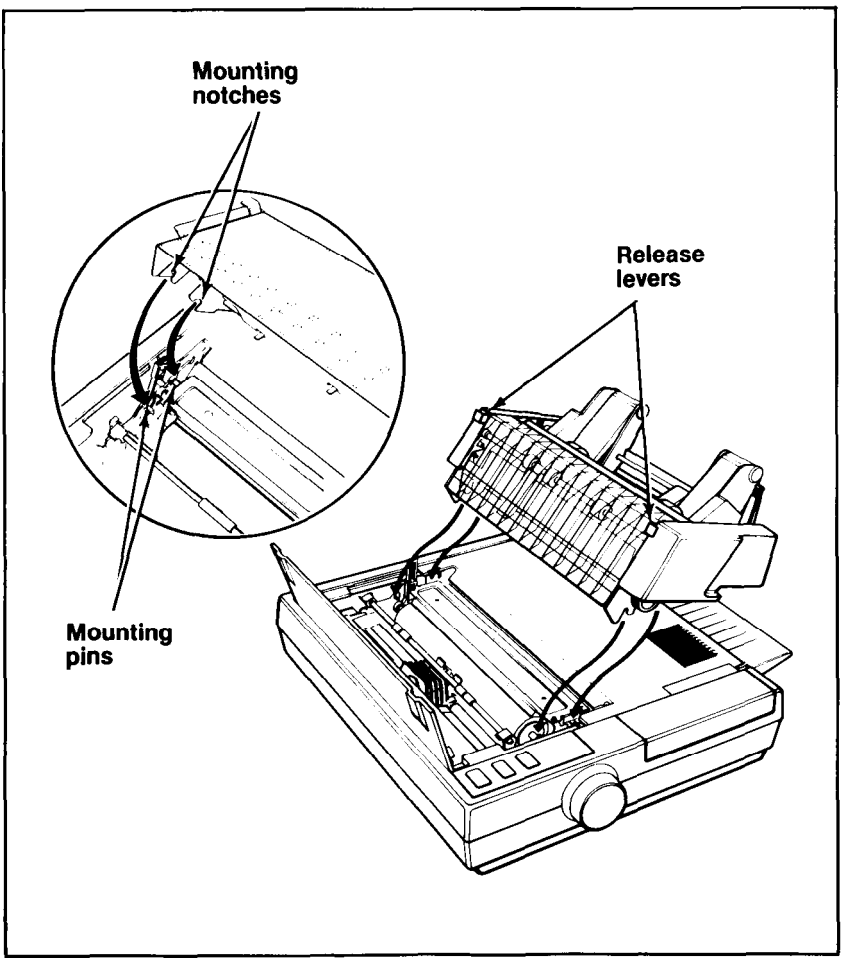

Figure 2-2. Installing the cut sheet feeder

7. Hold the cut sheet feeder assembly in two hands, and press the two cut sheet feeder release levers shown in Figure 2-1.

8. Now stand directly over the printer, look ***through*** the top of the cut sheet feeder, and guide the rear notches on the cut sheet feeder onto the rear mounting pins on the printer.

9. Tilt the cut sheet feeder forward until the front latches of the cut sheet feeder engage the front mounting pins on the printer. Release the levers and the cut sheet feeder locks in place.

Note

When the cut sheet feeder is properly installed, it ***is*** possible to tilt it forward slightly, but you cannot remove it from the printer without pressing the release levers. If you can remove the cut sheet feeder by simply lifting it off the LQ, reread the installation instructions, paying special attention to setting the rear notches of the feeder on the rear mounting pins of the printer.

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10. With the cut sheet feeder in place, you can now install the three brackets supplied with the unit. To install the two small brackets, squeeze them together and insert them into the holes on top of the paper supports, as shown in Figure 2-3.

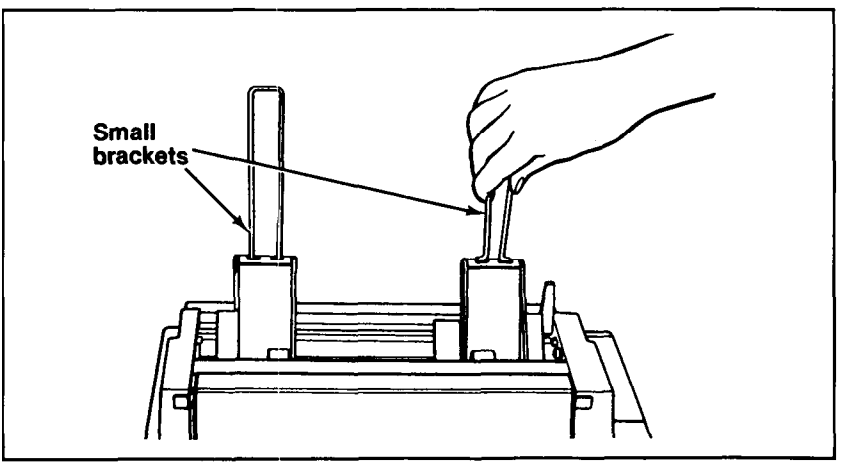


Figure 2-3. Installing the small brackets

11. For the LQ-800 model, install the large bracket in the stacker as shown in Figure 2-4. Slip the legs of the bracket into the metal slots on the bottom of the cut sheet feeder and make sure the bracket fits into the retaining clips on the upper part of the **stacker.**

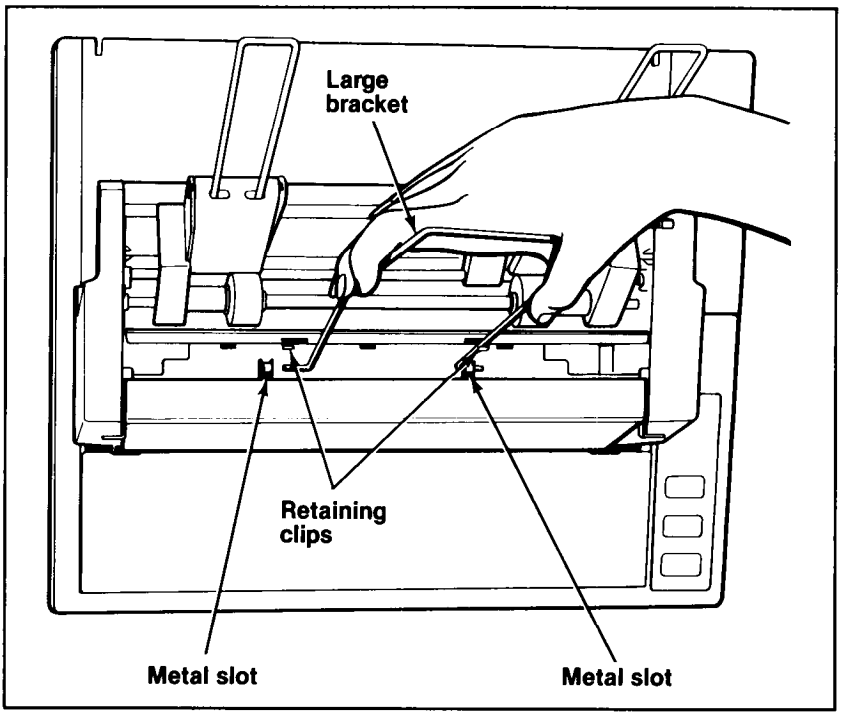


Figure 2-4. Installing the large bracket

For the LQ-1000 model, there are two large brackets. Install them both as described above and also install the paper stand shown in **Figure** 2-5.

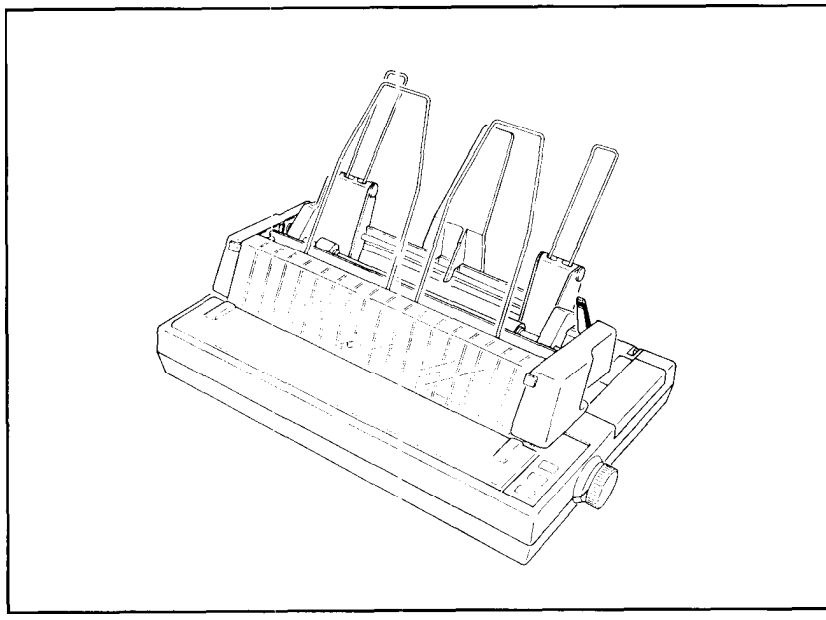


Figure **2-5.** *The LQ-1000 model*

Preparing the Paper for Loading

1. The paper ***must*** be straight and clean. If the paper is slightly bent, curled or uneven, it will not feed correctly.

2. The cut sheet feeder holds a maximum of **60** sheets of standard weight **(20** lb.) paper. If you use a lighter or heavier weight of paper, compensate accordingly. (If more than one sheet of paper is being loaded at a time, remove some of the paper from the paper bin.)

3. Loosen the paper stack by rifling through it a couple of times, then tap it on a flat surface to make it even.

Loading Paper

1. Align the arrow on the left paper guide with the arrow stamped into the metal lip of the stacker, as shown in Figure *2-6.*

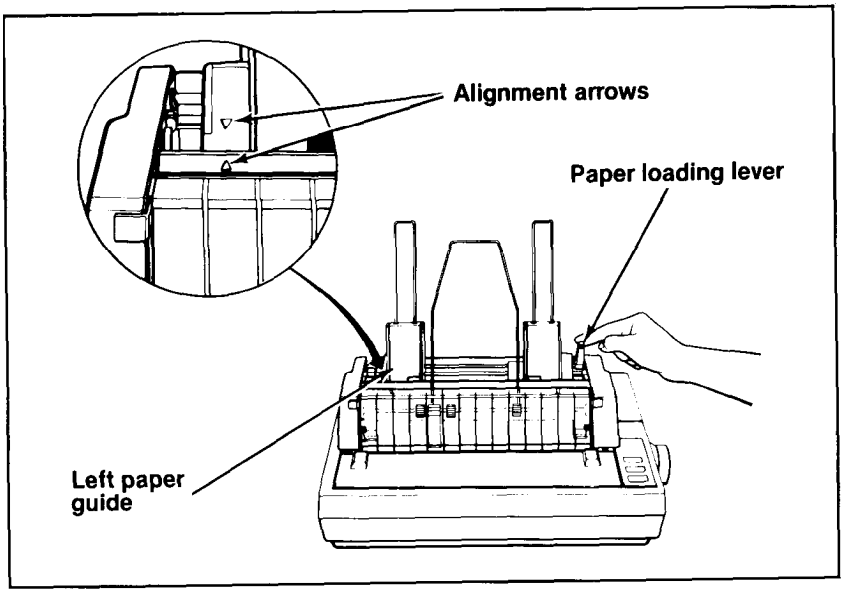


Figure 2-6. Paper support and paper loading lever

2. Pull the paper loading lever forward until it locks in the open position, as shown in Figure *2-6.*

3. Set the stack of paper in the paper bin, aligning it against the left paper guide as shown in Figure ***2-7.*** Move the right paper guide over to the edge of the stack of paper, but leave a little room so the paper doesn't bind. Make sure the paper is ***behind*** the angled metal tabs at the bottom of the left and right paper guides.

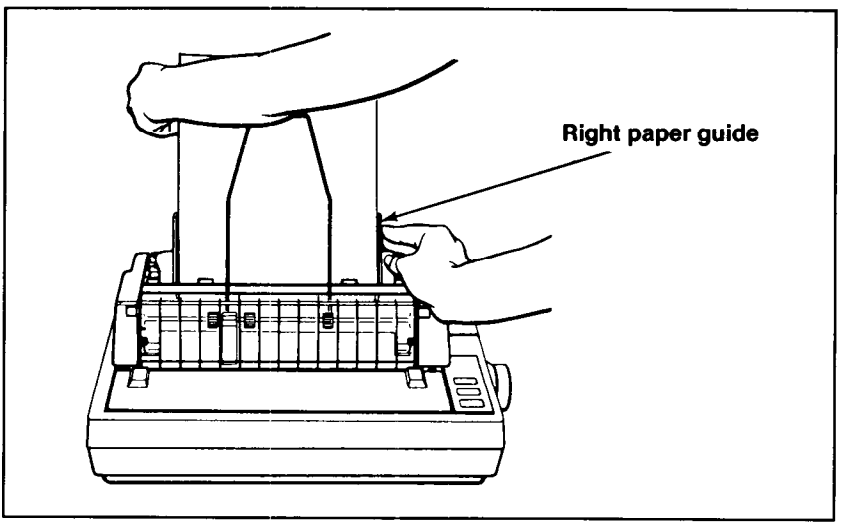


Figure 2-7. Loading paper; adjusting the right paper guide

4. Push the paper loading lever back, and the stack of paper is pushed forward against the two feeder rollers.

setting up your word processor for a cut sheet feeder. . .

If you've never used a cut sheet feeder before, you may have to set up your word processor accordingly.

When the cut sheet feeder positions the paper for printing, it automatically leaves a one-inch margin at the top of a page. If you've been printing with continuous-feed paper, you11 need to adjust the settings on your word processor so that the pages print the same with the cut sheet feeder.

There are three settings you'll probably need to change: Page Length, Top Margin, and bottom Margin. Most word processors have preset (or default) settings that are in effect each time you use the program. Check the program's documentation to find these settings, and how to change them.

The following is an example of a typical conversion.

To maintain 55 printed lines per page:

	Continuous-feed settings			Cut sheet feeder settings
Change Page Length *from*	66		*to*	6 1
Change Top Margin *from*	3	(default)	*to*	0
Change Bottom Margin *from*	8	(default)	*to*	6

Many word processors give you two choices in changing these settings: 1) You can change the settings in each individual file you print, or; 2) You can change the program's default settings so that every time you use the program, these new settings are in effect.

If your program has additional features, such as headers and footnotes, you will have to compensate accordingly. (For example, many programs include the header as part of the top margin. If you set the top margin to 0, you11 lose the header.)

With a little bit of experimenting, you'll find the best equivalent settings to use.

Printing with the Cut Sheet Feeder

1. Turn the power ON with the switch on the left side of the printer, as shown in Figure ***2-8.***

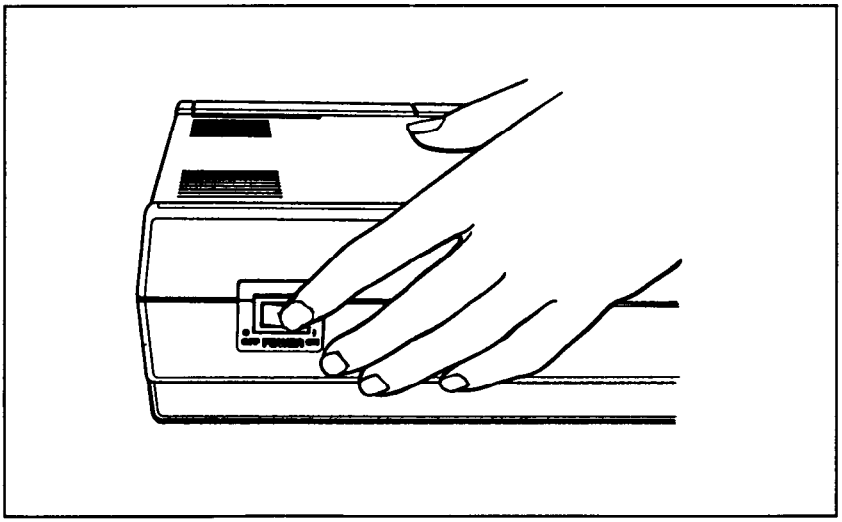


Figure 2-8. Turning the power on

2. When you turn the power ON:

- The print head moves to the left side.
- The POWER, READY, and ON LINE lights glow green.
- The red PAPER OUT light goes on. (The PAPER OUT light remains on until paper is fed into the printer.)

3. Now print a document with your word processor as you normally would. When you print a document:

- The print head moves to the center of the platen to facilitate paper loading.
- The feeder rollers feed one sheet of paper into the printer, and position the page with a one-inch margin at the top. (See the previous note “Setting up your word processor for a cut sheet feeder. . ." for information on adjusting margin and page length settings.)

- The red PAPER OUT light goes out while there's paper in the printer.
- Printing begins.

When the LQ finishes printing a document, you have three options.

If you wish ***to*** continue printing-You can print another document as you normally would; the cut sheet feeder ejects the last page from the previous job, then loads and prints the new document.

If you want to fully eject the last page of a document-First take the LQ off line by pressing the ON LINE button (the green ON LINE light goes out). Press the FORM FEED button to eject the last page into the paper stacker, and a new sheet is automatically loaded.

If you're finished printing-Remove the unused paper from the bin, take the printer off line, then use the FORM FEED button to eject the last sheet of paper. (If you press FORM FEED without removing the remaining paper from the bin, another sheet is loaded.) You can also shut the power OFF, then use the manual paper feed knob to roll the remaining sheet out of the printer.

Caution

When the power is ON, you should use only the FORM FEED or LINE FEED button to eject paper from the cut sheet feeder. If you use the manual paper feed knob, the power should always be OFF to prevent damage to the paper feed motor.

Removing the Cut Sheet Feeder

To remove the cut sheet feeder:

1. Turn the power for the printer OFF.
2. Remove all the unused paper from the bin, and any printed sheets from the stacker.
3. If a sheet of paper is still loaded in the printer, use the manual paper feed knob to remove it.

4. Hold the cut sheet feeder on each side, press the release levers as shown in Figure 2-9, and lift the unit off the printer.

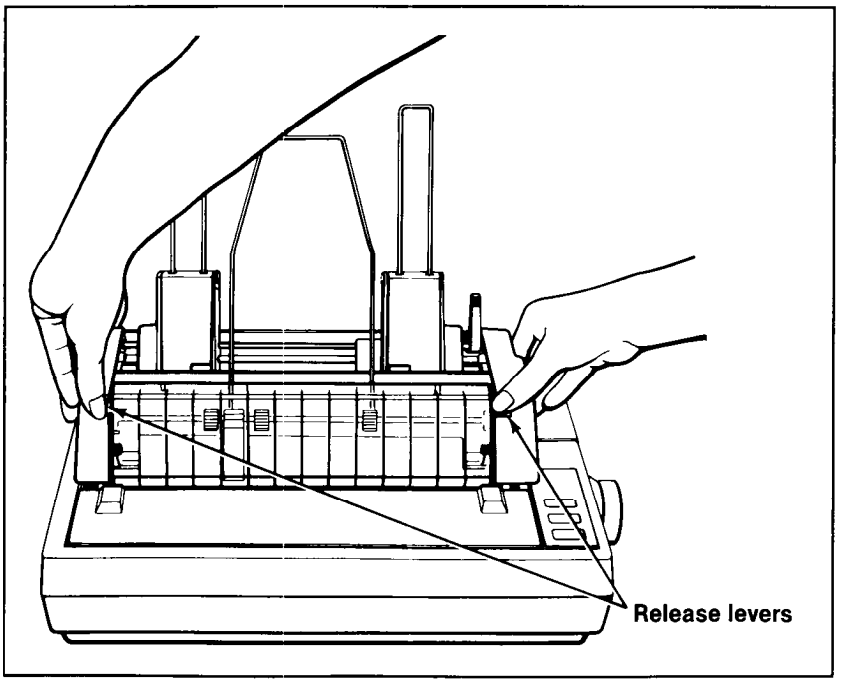


Figure 2-9. Removing the cut sheet feeder

Remember, if you decide to print with another type of paper feed system, such as the optional tractor feed, you'll **have to:**

- Reset DIP switch 1-8 from ON back to OFF. (Don't forget to turn the power OFF then ON again so the printer will record the new setting.) Reset DIP switch 1-7 (skip-over perforation) if you're using continuous-feed paper.
- Check any settings you might have changed in your word processor to compensate for the cut sheet feeder.
- Replace the original front cover if you're loading individual sheets of paper (you can leave the narrow front cover on if you're using the optional tractor feed unit).

Troubleshooting

If you have any difficulties operating the cut sheet feeder, check the troubleshooting list shown below. If you continue to have difficulty, consult your authorized Epson dealer.

Problem	Recommendation
Cut sheet feeder does not fit flush on the printer.	Check that the paper release lever on the left side of the printer is pushed back, and that the paper bail is pulled away from the platen. Review the installation instructions.
Printer doesn't print; cut sheet feeder doesn't operate.	Make sure the cable is properly connected to the printer and computer.
Cut sheet feeder operates but doesn't load paper.	Check that DIP switch 1-8 is ON and 1-7 is OFF, and that the printer has been switched OFF, then ON again to recognize the settings.
Paper loads unevenly from the paper bin.	Review the paper loading instructions-you must open the paper loading lever *first,* then set the paper on the paper shelf. If you set the paper on the gray rollers then open the paper loading lever, the paper drops down too far, becomes uneven, and does not load properly. If too much paper is loaded, it spills off the paper shelf.
Paper jams when it feeds through the cut sheet feeder.	Check to see that the paper is stacked evenly Check to see if there is too much space between the paper stack and the right paper guide, causing paper movement and unevenness.

Problem	Recommendation
Two or more sheets of paper are loaded instead of one.	Remove paper and fan it. Paper was not sufficiently loosened before being loaded into the paper bin.
	Make sure paper is loaded behind the metal tabs on the bottom of the left and right paper guides,
	Too much paper was loaded into the paper bin-remove some of the unused sheets.
	The weight of the paper is too light. Add paper.
Printing starts too low on the page.	Your word processor may not be set up properly. Review “Setting up your word processor for a cut sheet feeder . . .”
Printing is too close or too far from the left side of the paper.	Make sure the arrow on the left paper guide is aligned with the arrow stamped on the lip of the stacker.
Paper doesn’t eject evenly.	Check that there’s enough room in the stacker. If not, remove some of the printed sheets.
	More than one sheet of paper may have been loaded, which causes the paper to eject unevenly Make sure that paper was separated and loaded properly

Maintenance

To keep your cut sheet feeder working smoothly, keep it away from dust, grease, and any heat sources. A safe temperature range is 41° to 95°F.

Use a soft, clean cloth dampened with water to clean the outside of the cut sheet feeder case. Stubborn stains can be removed with non-abrasive household cleaners.

Periodically, the inside of the cut sheet feeder should be cleaned to get rid of dust and paper lint. First, turn the power OFF and remove the cut sheet feeder from the printer. Then use a soft brush to clean the inside areas. Make sure the gray rollers are kept free of dust so that the paper feeds evenly.

If you have any problems, contact your authorized Epson dealer.

Chapter 3
The Tractor Unit

The tractor unit for the LQ is easy to install and use. Before you begin the installation, make sure you have received the following:

- The tractor unit
- The smoke-colored tractor cover
- The narrow front lid
- The paper separator
- The paper shelf

Setting Up the LQ for Continuous-feed Paper

Before installing the tractor unit, you should set up your LQ so that continuous-feed paper can flow freely in and out of the printer.

Use any arrangement that allows you to put the paper underneath or behind the printer. There are many types of printer stands you can use; one example is shown in Figure 3-1. If you prefer, you can stack the paper behind the printer as shown in Figure 3-2.

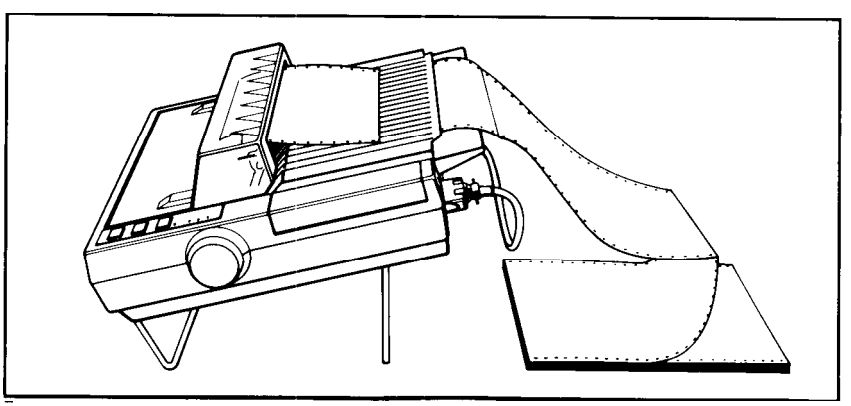


Figure 3-1. Continuous-feed paper with printer stand

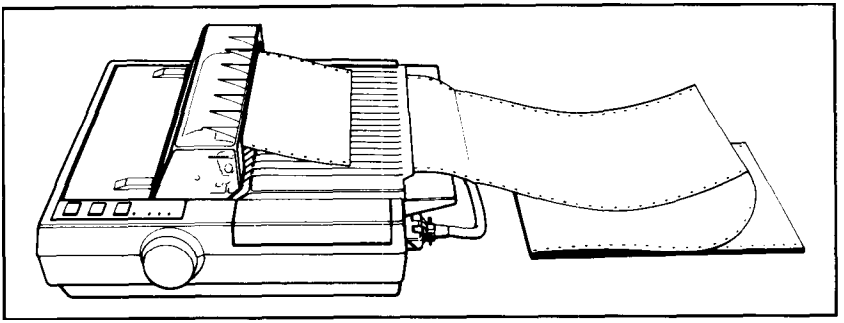


Figure 3-2. Continuous-feed paper without stand

Installing the Tractor Unit

1. Remove the original dust cover that was included with your LQ. Replace it with the front lid packaged with the tractor unit, and leave it tilted up, as shown in Figure **3-3.**

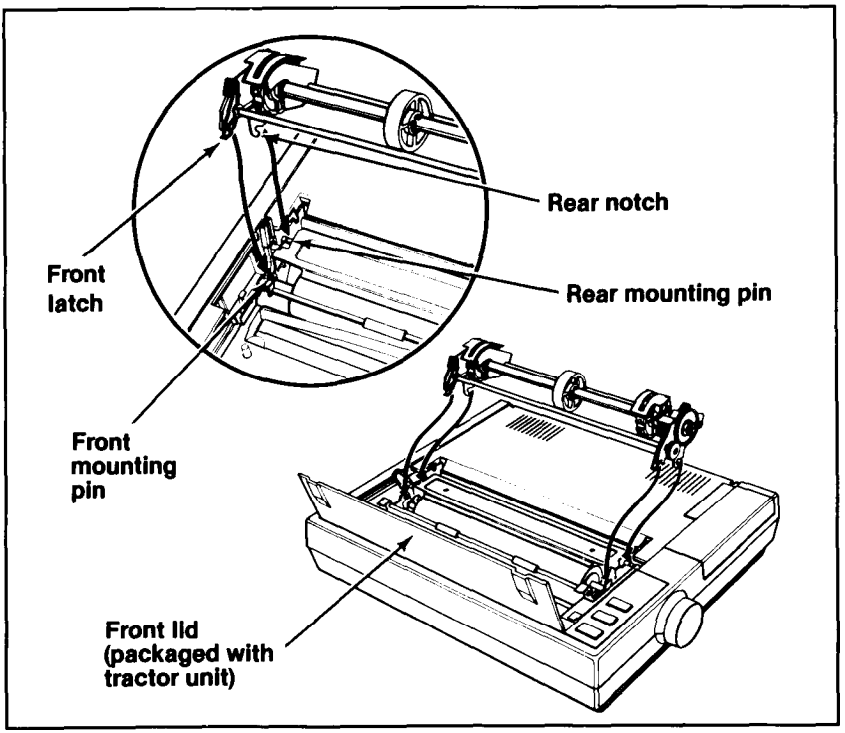


Figure 3-3. Installing the tractor unit

2. Hold the tractor with the gears to the right, and fit the rear notches on the tractor unit over the rear mounting pins on the printer, as shown in Figure **3-3.**

3. Tilt the tractor unit toward you until the front latches click in place over the front mounting pins on the printer.

Loading Paper

To load continuous-feed paper, follow these instructions:

1. Make sure that the printer is turned OFF.

2. Move the print head to the center of the printer, pull the paper bail away from the platen, and pull the paper release lever forward, as shown in Figure 3-4.

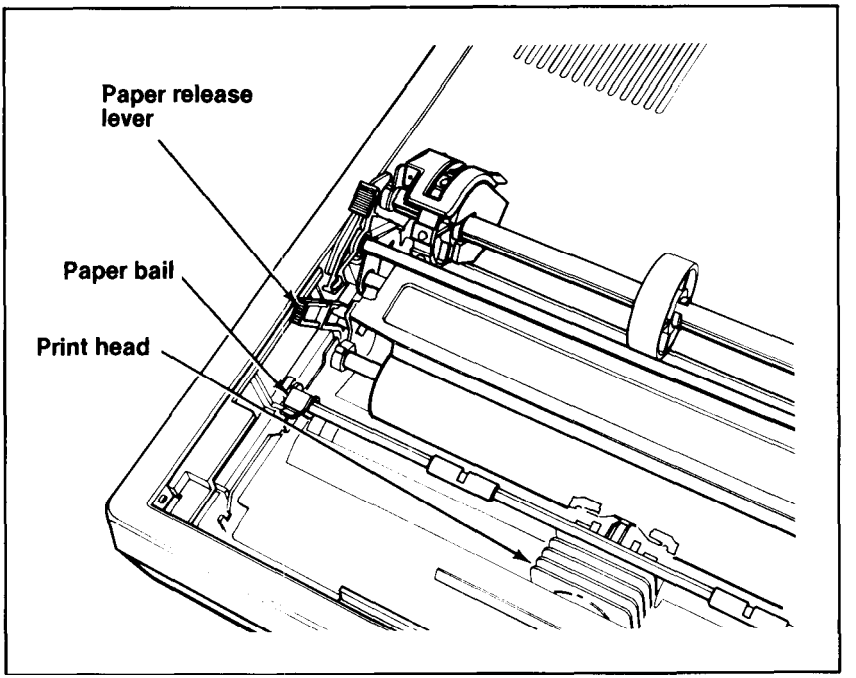


Figure 3-4. Preparing for paper loading

3. Using Figure 3-5 as a guide, pull the locking levers on the pin-feed holders forward so that you can move the holders to the left and right.

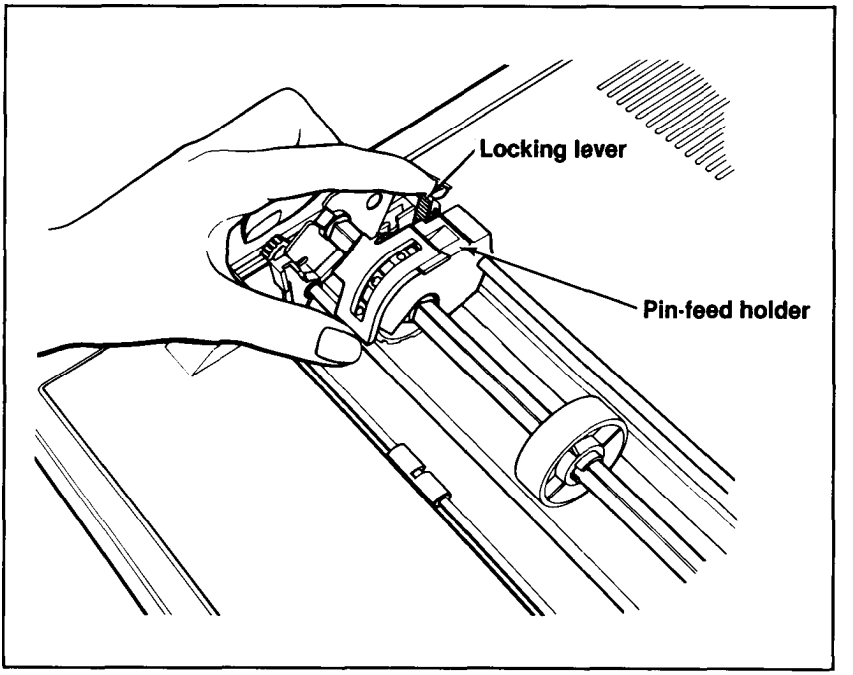


Figure 3-5. Moving the pin-feed holders

4. Position the left holder all the way to the left and push the locking lever back to lock that holder in place. Leave the right holder unlocked.

5. Open the pin-feed covers as shown in Figure ***3-6.***

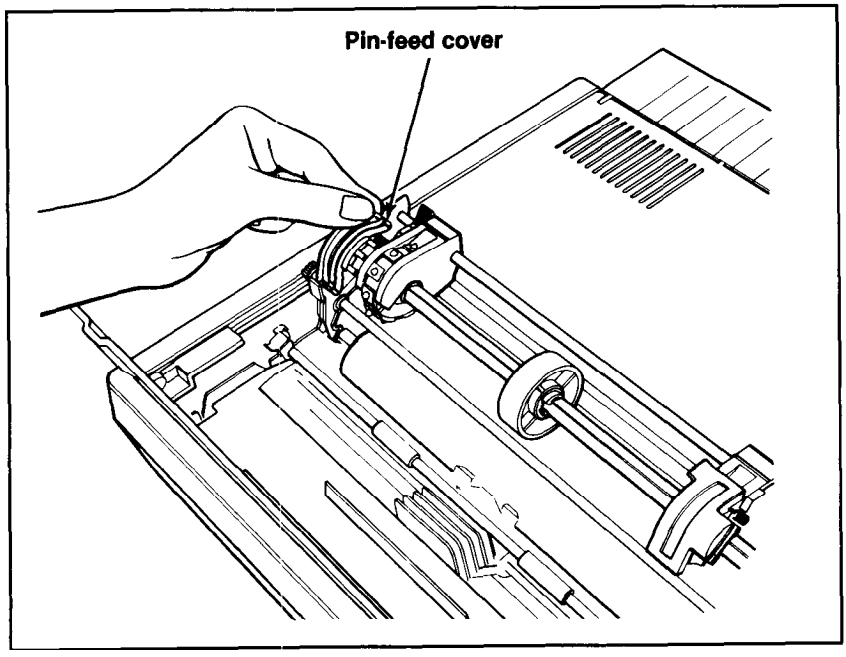


Figure 3-6. Opening the pin-feed covers

6. Now install the paper shelf by fitting it into the two notches on the back of the printer, as shown in Figure 3-7. The paper shelf keeps the paper from getting caught on the interface cable.

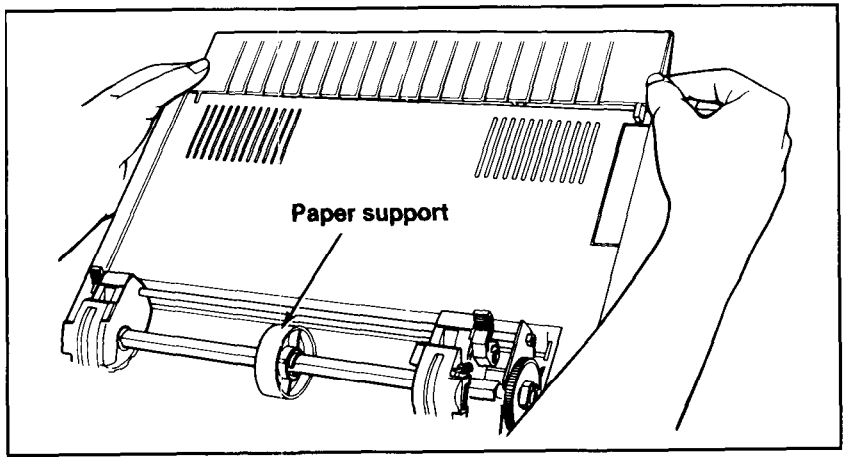


Figure 3-7. Installing the paper shelf

7. If you have an LQ-800, center the one support in the middle of the tractor as shown in Figure **3-7.** If you have an LQ-1000, space the two paper supports evenly along the width of the paper.

8. Now guide the paper behind the platen, and push it through until it comes up between the ribbon guide and the platen as shown in Figure 3-8. (Moving the paper with a side-to-side motion makes it easier to push the paper through.)

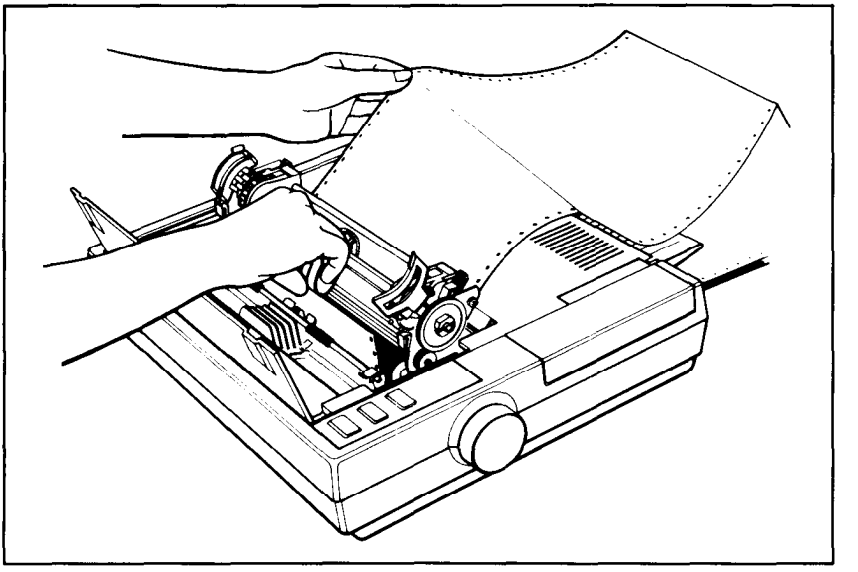


Figure 3-8. Loading paper

9. Pull the paper up until the top is above the pin-feed holders. Fit the holes on the left side of the paper over the pins in the left holder (as shown in Figure 3-9) and close the cover.

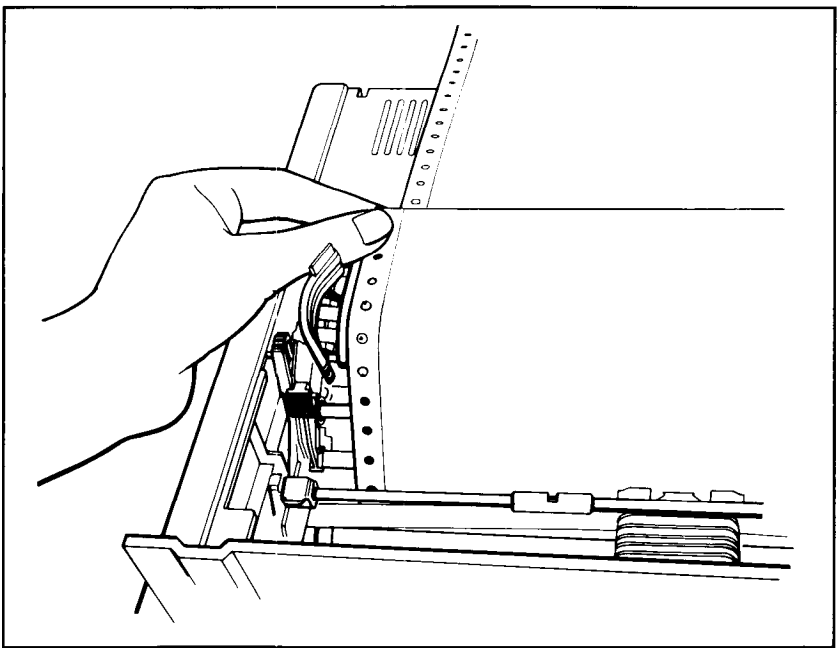


Figure 3-9. Fitting the paper over the pin feeds

10. Fit the right side of the paper into the right holder, moving the holder as needed to match the width of the paper.

11. Close the right cover, making sure the paper has no dips or wrinkles and lock the right holder in place.

12. Push the paper bail against the paper and that's it . . . the paper is ready.

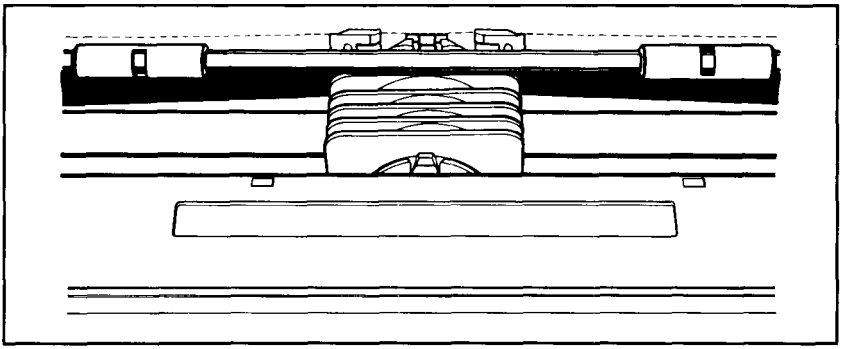


Figure 3-10. Top-of-page position

Setting the top-of-page position . . .

Once you've loaded continuous-feed paper into your LQ, you need to establish a top-of-page position so that the printed pages end where you want them to and do not cross over a perforation between pages.

To set the top-of-page position, make sure the power is OFF and use the paper feed knob to advance the paper until a perforation between sheets lines up evenly with the top of the ribbon guide, as shown in Figure 3-10.

Now turn the printer ON. This records the top-of-page setting. The printer remembers this setting and uses it when any program tells it to move to the top of the next page, or when you use the FORM FEED button to advance the paper.

If you are using a word processor or other applications program and the printing is too high or too low on the page, adjust your top-of-page setting accordingly,

Installing the paper separator and tractor cover

Once you've loaded paper into the LQ and are familiar with the steps, you can attach the paper separator that comes packaged in the cardboard enclosure. The separator ensures that the paper coming out of the printer is not pulled back in.

The separator has rounded pins on each end that fit into notches located just behind the tractor unit. Slide one of the separator's pins into one notch, then with a gentle pressure, snap the other pin into the other notch as shown in Figure 3-11.

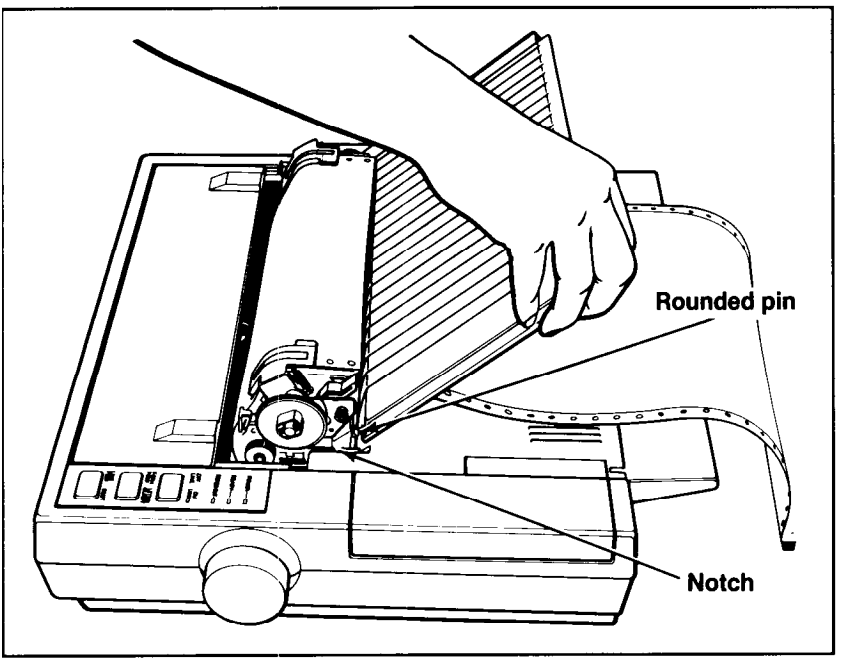


Figure 3-11. Installing the paper separator

The smoked plastic tractor cover is the finishing touch. Simply place it over the tractor unit, making sure the notches on the side of the cover fit into the slots on the printer, as shown in Figure ***3-12.***

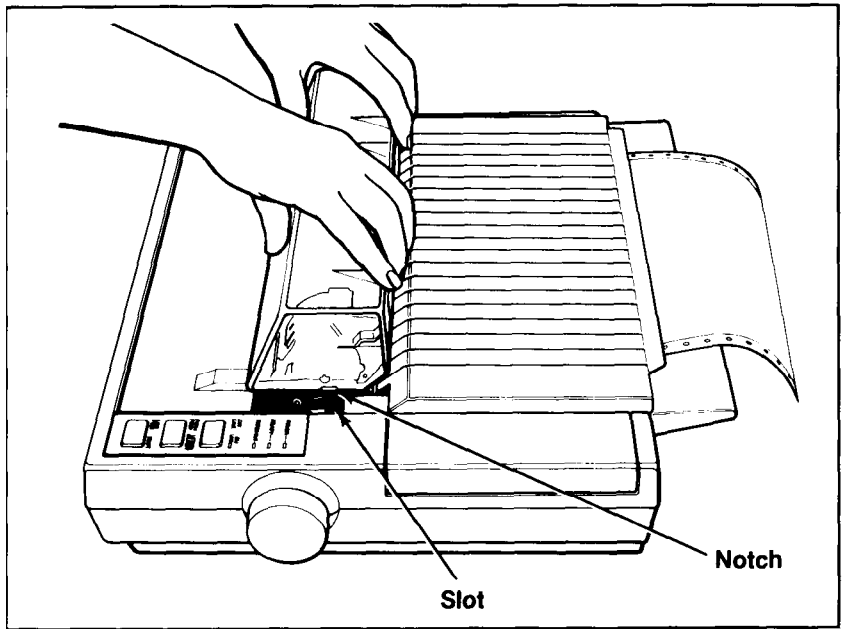


Figure 3-12. Installing the tractor cover

Removing the Optional Tractor Unit

When you want to remove the optional tractor unit from the LQ simply push back on the tractor release levers as shown in Figure 3-13, tilt the unit back, and lift it off the printer.

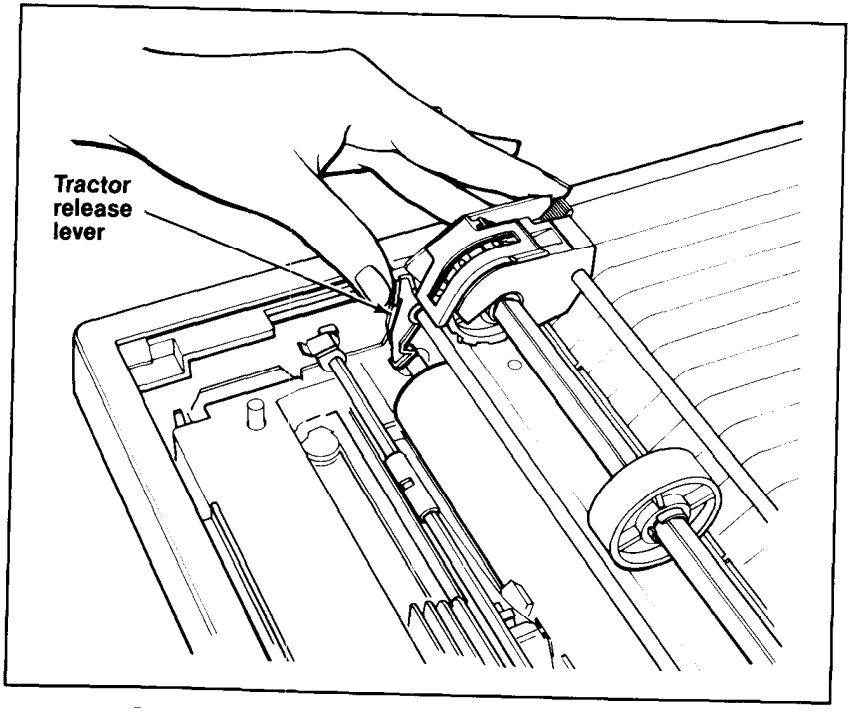


Figure 3-13. Removing the optional tractor unit

Chapter 4
Using the LQ with Commercial Software

Now that you have set up and tested your printer, you can do any of these things:

- Use the printer with commercial software (such as a word processor, spreadsheet, or database).
- Learn about the features of the printer.
- Write programs to use the features of the printer.

Most of you probably want to begin using your LQ with commercial software to print such items as documents, reports, letters, spreadsheets, and graphics. This chapter tells you what you need to know.

If you want to learn more about the features of the LQ, also read Chapters 5 and 6. For programmers the important parts of the manual are the command summary and the other appendixes.

Using Commercial Software

Commercial software programs usually need to know what type of printer you are using. You normally supply this information as part of a setup or installation process. Either the manual for your program or an on-screen menu should explain this process for you.

The program may list a number of printers from which you can choose. Pick LQ-800 or LQ-1000, depending on which printer you have.

If neither one of these printers is listed, choose **LQ-1500** because that printer recognizes virtually the same codes that the LQ-800 and LQ-1000 use. (If you have a program that does not list the LQ-1500 as an option, you may be able to obtain an update from the manufacturer. Contact your software dealer or the manufacturer to see if an update that includes the LQ-1500, LQ-1000, or LQ-800 is available.)

If your program does not list any LQ printers, choose a printer from the list below. They are listed in order of preference.

FX
LX
Rx
MX
Epson printer
Draft printer

Once you have set up or installed your commercial software program for your printer, simply follow the program's printing instructions. If you have any trouble when you print, turn to the first section in Appendix D for help.

Chapter 5
LQ Features

This chapter describes many of the printing features of the LQ. You can read this chapter if you wish, but you may not need to. Whether or not you use the rest of this manual depends upon your expertise, your interest, and the software you use.

The demonstration programs in this chapter enable you to see LQ features and print styles in action. Below are a few of the many features covered:

Letter Quality
High Speed Draft
Emphasized
Double-strike
Italics
Elite
Fifteen Characters Per Inch
Underlined
D o u b l e - w i d t h
Condensed
Superscript Subscript
Proportional

ESCape and ASCII

The details of printer-computer communication are complex, but for most purposes all you need to know is that the computer sends a series of codes (each consisting of one or more numbers) to the printer, and the printer interprets them.

Some codes tell the printer to print a character, and other codes tell it to turn on or off certain printer functions, such as emphasized or Letter Quality. Because the codes between 0 and 127 are basically standardized by the American Standard Code for Information Interchange (ASCII), they are referred to as ASCII numbers in this manual.

Nearly all of the codes for printer functions require more than one number and begin with a special code, called the escape ***code.*** This code signals that the next number is a code for a printer function and its name is usually printed with the first three letters capitalized (Escape) or it is abbreviated ESC or (ESC) .

In the demonstration programs in this manual, you'll see how ASCII and ESCape codes are used in the BASIC programming language.

- LPRINT signals that information is to be sent to the printer.
- The CHR$ (character string) function is used for numerical codes.
- CHR$(27) is the ESCape code.
- Quotation marks are used for printable characters, such as letters of the alphabet.

Your word processing or business program may use other methods to send those codes, such as pressing the **ESC** key for the ESCape code. See your software manual for further information and use Appendix B of this manual to find the proper codes. Appendix D also has some suggestions on using LQ features with applications software.

Demonstration Programs

To enable you to see the LQ features in action, this manual includes demonstrations in the BASIC programming language. Although you will probably not do much of your printing using BASIC, the demonstrations are in BASIC because nearly all personal computer systems include some version of this language. Therefore, almost everyone can try the examples.

As you run the programs (or even as you read the explanations and look at the printed examples), you learn how the LQ responds to the messages your computer sends it by printing letters, numbers, symbols, and graphics in various print modes.

Even if you never use BASIC again, you will know the capabilities of your printer, capabilities that can often solve your printing problems. For example, if you need a special symbol, such as a Greek letter, you will know that you can turn to the chapter on user-defined characters and create such a character.

If you don't want to do the exercises in BASIC, you don't have to. In most cases the software that you use for word processing, business, or graphics does the calculating and communicating with the printer for you. All you need to do is install your software as explained in Chapter 4.

Running BASIC programs. . .

This section describes how to run the BASIC demonstration programs in this manual; it is not a tutorial in BASIC programming.

Although there are many versions of BASIC, the programs in this manual are designed to work with the two most popular ones: Microsoft™ BASIC and IBM PC BASIC. If you have another version, you can run these demonstration programs by making a few changes. Appendix D has instructions for using Applesoft™ BASIC; for other versions of BASIC, consult the appropriate manual.

When you type these programs, be sure to include all spaces and punctuation marks, especially semicolons. Press RETURN at the end of each line. (On your computer the RETURN key may be marked ← or ENTER.) Computers that use a 40-column display may break some lines into two parts on the screen, but that does not affect the operation of the program. If you make a typing mistake, retype the whole line, including the line number; the new line will replace the old one.

When you have typed all the lines, type RUN and press RETURN to run the program.

If you have made changes to a program and want to see all of it on the screen, type LIST and then press RETURN to see the program on your screen. When you are completely through with one program and want to start another, type NEW and press RETURN.

Sending Control Codes to the Printer

The short program that follows illustrates the concepts of control codes and ESCape sequences. This exercise may help you make better use of this chapter and the next. Type and run the program. It should produce the printout you see below it. After the printout you'll find a detailed description of the operation of the program.

```
10 LPRINT "BASIC programs for the"
20  LPRINT  CHR$(76)CHR$(81)CHR$(45);
25  LPRINT  CHR$(56)CHR$(48)CHR$(48);
30 LPRINT  " and LQ-1000"
40 LPRINT  "W1 "CHR$(87)CHR$(49)
50  LPRINT  CHR$(27)"W1";"Double-width  print"
60  LPRINT "Still double-width"
```

```
Basic  programs  for  the
LQ-800  and  LQ-1000
W1  W1
D o u b l e - w i d t h   p r i n t
S t i l l   d o u b l e - w i d t h
```

In each line LPRINT signals that the rest of the information on the line is to be sent to the printer. In lines 10 and 30 the letters inside the quotation marks are printed just as they appear in the program.

Lines 20-25 show an alternate way of printing characters. They use the CHR$ (character string) function with the decimal code for each letter to print "LQ-800."

Line 40 prints the characters W1 using the two different methods (quotation marks and the character string function). Line 50 shows that if the ESCape code, which is CHR$(27) in BASIC, comes before the characters W1, those characters are not printed. Instead, they become part of the ESCape sequence that turns on double-width printing, which is demonstrated with the letters in quotation marks after the ESCape sequence. Line 60 shows that the double-width mode stays on for more than one line.

This program is only an introduction. The demonstration programs that follow allow you to see many more of the features of your LQ in action.

Basic Widths

The first programs print characters in the LQ's three basic widths. Further programs show you how to produce other character widths by condensing and widening the basic ones.

Pica printing

The first program prints a sample line of characters in pica. This is the *default* width on the LQ, which means it is used unless the printer receives a command to use one of the other two basic widths.

```
40 FOR X=65 TO 105
50 LPRINT CHR$(X);
60 NEXT X: LPRINT: LPRINT
```

Now run the program to print the results you see below-10 characters per inch:

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghi
```

Elite printing

To print the same line of characters in elite (which is 12 characters per inch) add the following line to your program. (Just type the new line; you don't have to retype the other lines.)

```
20 LPRINT CHR$(27)"M";
```

Now run the program to produce a sample of elite printing.

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ [\]^_'abcdefghi
```

Fifteen mode printing

To print the same characters in the fifteen mode (which is 15 characters per inch) enter this new line 20.

```
20 LPRINT CHR$(27)"g";
```

Now run the program to produce a sample of printing in the fifteen mode.

ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghi

Letter Quality and Draft

Your LQ is set at the factory to print in the Letter Quality mode unless you turn on the draft mode with the DRAFT button on the control panel or with a DIP switch (described in Appendix A). Therefore, the printouts in this manual are shown in Letter Quality. If you want to see how a feature looks in the draft mode, press the DRAFT button before you run the program. Here's a comparison of Letter Quality and Draft modes in pica width.

ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^'abcdefghi
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^'abcdefghi

Cancelling Modes

With only a few exceptions, the LQ printing modes stay on until they are turned off. In fact, the modes can stay on even if you change from one type of software to another. For example, if you run a BASIC program that turns on elite and then use a word processing program to print a document, the LQ prints that document in the elite mode.

There are two methods to turn off a printing mode when you no longer need it.

- With a specific cancelling code. Each mode has a cancelling code, which you can find in the discussion of the mode and also in Appendix I.
- By resetting the printer, a method explained in the next section.

Resetting the Printer

Resetting your LQ cancels all modes that are turned on. You can reset the printer with one of two methods:

- Sending the reset code (Escape "@")
- Turning the printer off and then on.

Either one of these methods returns the printer to what are called its defaults, which are the standard settings in effect every time you turn the printer on. Resetting the printer has two main effects. It returns the printing to single-strike pica, thus cancelling any other pitches or enhancements you may have turned on, and the current position of the print head becomes the top-of-page setting. The reset code does not cancel the draft mode if it has been selected with the panel button, but turning off the printer does cancel the draft setting.

Some of the demonstration programs end with a reset code (Escape "@") so that the commands from one program will not interfere with the commands in the next one. After you run a program with a reset code in it, remember to change the top-of-page setting before you begin printing full pages.

Disabling a program's reset code

Some word processors and other applications programs send a reset code or initialization signal to the printer before sending data to be printed. Basically, the purpose of this code or signal is to cancel any settings that might interfere with the program's print control options.

In most instances, this is fine. However, if you decide you want to set up the LQ to do something your applications program won't do, you have to make sure a reset code doesn't wipe out your new settings.

Some initialization codes can be removed by using the setup or installation procedures that are part of many applications programs. Once you're into the setup procedure, find the section that deals with initialization, and see if the program has a list of codes it sends to the printer. If it does, the setup procedure usually allows you to cancel or remove the initialization settings.

If the initialization code cannot be disabled or removed from your applications program,. you can usually use the program's print options function to control formatting and typestyles. Look in the manual for the program to find out how to select print options.

Print Quality Command

Although you can turn on the draft mode with one of the panel buttons, you can also use a software command to switch between draft and Letter Quality.

Enter and run the following program to see how Letter Quality and draft are turned on and off by an ESCape sequence (note that you use a lowercase x, not a capital X, in line 10).

```
NEW
10 LPRINT CHR$(27)"x0";
20 LPRINT "This is draft."
30 LPRINT  CHR$(27)"x1";
40 LPRINT "This is Letter Quality."
```

```
This is draft.
This is Letter Quality.
```

As you can see in this program, Letter Quality is one of the Epson modes with an ESCape code that uses a letter with the numeral one to turn on the mode and a letter with the numeral zero to turn it off. For these modes, the one or zero can be inside the quotation marks, as shown above, or as a separate character string value, as shown below:

```
10 LPRINT CHR$(27)"x"CHR$(0);
```

Other Widths

The three **basic** widths (pica, elite, and fifteen) cannot be combined with each other. If one is on, the other two are off. There are, however, two width modes that can be combined with the basic modes and with each other. These two are double-width and condensed. All characters printed by the LQ are widened by double-width and narrowed by condensed.

Double-width printing

The double-width mode doubles the width of each character. To see double-width pica printing, which is the widest typestyle available on the LQ, enter and run the program below.

As you can see in this program, double-width is another of the modes with an ESCape code that uses a letter with the numeral one to turn on the mode and a letter with the numeral zero to turn it off. Therefore, the command to turn on double-width is ESCape "W1" and the command to turn it off is ESCape "**W0**".

```
10 LPRINT "This is standard pica."
20 LPRINT CHR$(27)"W1";"Double-width pica"
30 LPRINT "Still double-width"
40 LPRINT CHR$(27)"W0";
50 LPRINT "This is standard pica again."
```

```
This is standard pica.
D o u b l e - w i d t h  p i c a
S t i l l  d o u b l e - w i d t h
This is standard pica again.
```

Double-width can also be combined with any of the three basic widths as you can see in the program below.

```
20 LPRINT CHR$(27)"W1";"Double-width pica"
30 LPRINT CHR$(27)"M";"Double-width elite"
40 LPRINT CHR$(27)"g";"Double-width fifteen"
```

```
D o u b l e - w i d t h  p i c a
D o u b l e - w i d t h  e l i t e
Double-width fifteen
```

A later section in the chapter explains a special ESCape code, Master Select, which allows you to control nine modes with only one ESCape sequence.

Condensed printing

Condensed is a mode that narrows pica or elite characters; the fifteen mode cannot be condensed. Condensed is turned on by ASCII 15, as you can see in the following program. It is turned off by ASCII 18.

```
10 LPRINT "This is standard pica."
20 LPRINT CHR$(15)"This is condensed pica."
30 LPRINT CHR$(27)"M";"This is condensed elite."
40 LPRINT CHR$( 27) "@"
```

This is standard pica.
This is condensed pica,
This is condensed elite,

By using combinations of the various width modes, the LQ can print nine widths, which range from 5 to 20 characters per inch (cpi) as shown in the table below:

Table 5-1. LQ character widths

CPI	Typestyle	Print sample
5	Double-width pica	**A B C D e f g h**
6	Double-width elite	**A B C D e f g h**
7.5	Double-width fifteen	**A B C D e f g h**
8.5	Double-width condensed pica	**ABCDefgh**
10	Pica	**ABCDefgh**
10	Double-width condensed elite	**ABCDefgh**
12	Elite	**ABCDefgh**
15	Fifteen	ABCDefgh
17.1	Condensed pica	ABCDefgh
20	Condensed elite	ABCDefgh

Print Enhancements

In addition to the widths covered, the LQ offers many print enhancements.

Emphasized mode

In the emphasized mode the LQ prints each dot twice, with the second dot slightly to the right of the first. In order to do this, the print head must slow down so that it has time to fire, retract, and fire the pins quickly enough to produce the overlapping dots. This method produces characters that are darker than single-strike characters.

To see an example of emphasized, type and run the following program.

```
NEW
10 LPRINT "This is standard printing."
20 LPRINT CHR$(27)"E";
30 LPRINT "This is emphasized printing."
100 LPRINT CHR$(27)"@"
```

This is standard printing.
This is emphasized printing.

Emphasized is an especially good method for emphasizing a word or phrase in the draft mode as shown in the printout below. The code to turn off emphasized is ESCape "F".

In the draft mode **emphasized** makes a word stand out.

Double-strike

The other bold mode is double-strike. For this mode the LQ prints each line, then moves the paper up slightly and prints the line again.

Each dot is printed twice, with the second one slightly below the first as you can see if you run this program, which uses ESCape "G" to turn on double-strike.

```
10 LPRINT "This is standard printing."
20 LPRINT CHR$(27)"G";
30 LPRINT "This is double-strike printing."
100 LPRINT CHR$(27)"@"
```

This is standard printing.
This is double-strike printing.

Since each line in this mode is printed twice, the speed of your printing is slowed. The code to turn off double-strike is ESCape "H".

Some users prefer the effect of emphasized, and others prefer double-strike. You can look at the printout below and decide for yourself.

This is standard printing,
and this is emphasized printing,
and this is double-strike printing.

Underline mode

The LQ also has a mode that underlines characters and spaces. You turn it on with ESCape "-1" and off with ESCape "-0". Note that the underline code is like the double-width code in that it uses a character, in this case the hyphen or minus sign, combined with numeral one to turn it on and a character combined with the numeral zero to turn it off. You can see it in action with the following program:

```
NEW
10 LPRINT "This is not underlined."
20 LPRINT CHR$(27)"-1";
30 LPRINT "This text is underlined."
```

This is not underlined.
This text is underlined.

Proportional mode

In the standard draft and Letter Quality modes on the LQ, each character is given the same amount of space, whether it is a narrow letter like **i** or a wide letter like a capital **W.** In the proportional mode, however, the space allowed for each letter is proportional to its size.

The proportional mode is always Letter Quality. You can see the difference between standard and proportional modes if you enter and run the following program:

```
10 LPRINT CHR$(27)"p1"
20 LPRINT "Proportional mode is on."
30 LPRINT CHR$(27)"p0";
40 LPRINT "Proportional mode is off."
```

Proportional mode is on.
Proportional mode is off.

Notice that you must use a lowercase p, not a capital P, for this mode. The next section describes Master Select, which includes another method for turning proportional on and off.

Master Select

The LQ has a special: ESCape code called Master Select that allows you to choose many possible combinations of nine different modes: pica, elite, proportional, condensed, emphasized, double-strike, double-width, italic, and underline. The format of the Master Select code is ESCape '!" followed by a number that is calculated by adding together the values of the modes listed below:

underline	**128**
italic	**64**
double-width	**32**
double-strike	**16**
emphasized	8
condensed	4
proportional	2
elite	1
pica	0

For many combinations, just add up the values of each of the modes you want and use the total as the number after ESCape "!". For example, to calculate the code for expanded underlined pica, add the following numbers together:

underline	**128**
double-width	32
pica	0
	160

To print this combination, therefore, you use ESCape "!" followed by the number **160.** In the BASIC programming language the command is **CHR$(27)"!"CHR$(l60).**

To try this number or any other, enter and run this short program, which will ask you for a Master Select number and then give you a sample of printing using that code.

```
10 INPUT "Master Select number";M
20 LPRINT CHR$(27)"!"CHR$(M)
30 LPRINT "This sample uses"
40 LPRINT "Master Select number";M
50 LPRINT CHR$(27)"@"
```

In this program, you can use any number you calculate by using the formula above, but remember that proportional can't be combined with elite. If you try to combine proportional with elite, you won't harm your printer; proportional will simply override elite.

In the printout below you can see the result of using the number 96 with this program:

This Sample uses
Master Select number 96

Master Select is a powerful code that gives you an easy way to produce multiple combinations with a single command. To produce double-strike emphasized underlined printing, for example, you need only one ESCape code instead of three.

Indeed, Master Select is such a powerful feature that it may occasionally be more powerful than you want it to be. Because it controls nine different modes, a Master Select code will cancel any of those nine that are not selected. For example, suppose that you have a page in elite and want part of it underlined. If you use ESCape "!" 128 to turn on underlining, your LQ will begin printing in underlined pica instead of underlined elite because the 128 code does not include elite. Use 129 for underlined elite or use ESCape "-1" to turn on underlining.

If you want to use Master Select with the fifteen mode, you must send the Master Select code before you send the command for fifteen mode (Escape "g"). If the fifteen mode command is sent first, Master Select will override it.

Superscript and subscript

Your LQ can also print superscripts and subscripts, which you can use for mathematical formulas, footnotes, and other items that require numbers or letters above or below the usual print line. ESCape "S0" turns on superscript and ESCape "S1" turns on subscript. ESCape "T" turns off either one. You can see them in action with the program below :

```
10 LPRINT "The formula for water is H";
20  LPRINT  CHR$(27)"S1";"2"CHR$(27)"T";
30 LPRINT  "0."
40 LPRINT  CHR$(27)"@"
```

The formula for water is H_2O .

Now that you see how to use the ESCape sequences for superscript and subscript, you can devise your own examples.

International characters

As you know, languages other than English require a few extra characters. The LQ has provided for printing in many languages by having 13 sets of international characters in its ROM (Read Only Memory).

In order to print any of these characters, you first select one of the following character sets and then use the individual characters within that set.

0	USA	7	Spain
1	France	8	Japan
2	Germany	9	Norway
3	United Kingdom	10	Denmark II
4	Denmark I	11	Spain II
5	Sweden	12	Latin America
6	Italy		

You can select any character set with an ESCape code. In BASIC it has the following format:

```
LPRINT  CHR$(27)"R"CHR$(n)
```

In this format n is the appropriate number from the list of international character sets. In other words, the BASIC command to select the French character set is:

```
LPRINT  CHR$(27)"R"CHR$(1)
```

Another method of selecting most of the international character sets is to reset a DIP switch. If you plan to use one of the first eight international sets quite a bit, see Appendix A for instructions on using the DIP switches.

Once you have selected a character set, whether you do it with the ESCape code or the DIP switches, you will be able to print several new characters. The character sets are shown in Tables 5-2, 5-3, and 5-4.

The number at the top of each column in the tables is the ASCII code that prints the characters in that column.

Table 5-2. ***International characters in*** draft ***mode***

	35	36	64	91	92	93	94	96	123	124	125	126
USA	#	$	@	[	\	]	^	`	{	¦	}	~
FRANCE	#	$	à	°	ç	§	^	`	é	ù	è	¨
GERMANY	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
UK	£	$	@	[	\	]	^	`	{	¦	}	~
DENMARK I	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	#	$	@	°	\	é	^	ù	à	ò	è	ì
SPAIN	₧	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
JAPAN	#	$	@	[	¥	]	^	`	{	¦	}	~
NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
DENMARK II	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
SPAIN II	#	$	á	¡	Ñ	¿	é	`	í	ñ	ó	ú
LATIN AMERICA	#	$	á	¡	Ñ	¿	é	ü	í	ñ	ó	ú

Table 5-3. International characters in Letter Quality mode

	35	36	64	91	92	93	94	96	123	124	125	126
USA	#	$	@	[	\	]	^	`	{	¦	}	~
FRANCE	#	$	à	°	ç	§	^	`	é	ù	è	¨
GERMANY	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
UK	£	$	@	[	\	]	^	`	{	¦	}	~
DENMARK I	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	#	$	@	°	\	é	^	ù	à	ò	è	ì
SPAIN	₧	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
JAPAN	#	$	@	[	¥	]	^	`	{	¦	}	~
NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
DENMARK II	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
SPAIN II	#	$	á	¡	Ñ	¿	é	`	í	ñ	ó	ú
LATIN AMERICA	#	$	á	¡	Ñ	¿	é	ü	í	ñ	ó	ú

Table 5-4. International characters in proportional mode

	35	36	64	91	92	93	94	96	123	124	125	126
USA	#	$	@	[	\	]	^	`	{	¦	}	~
FRANCE	#	$	à	°	ç	§	^	`	é	ù	è	¨
GERMANY	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
UK	£	$	@	[	\	]	^	`	{	¦	}	~
DENMARK I	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	#	$	@	°	\	é	^	ù	à	ò	è	ì
SPAIN	₧	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
JAPAN	#	$	@	[	¥	]	^	`	{	¦	}	~
NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
DENMARK II	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
SPAIN II	#	$	á	¡	Ñ	¿	é	`	í	ñ	ó	ú
LATIN AMERICA	#	$	á	¡	Ñ	¿	é	ü	í	ñ	ó	ú

Once you have selected an international character set with the DIP switches or the ESCape "R" code, you can use the tables to see which keys on your standard keyboard can produce the international characters you want. Simply type the character from the top row of one of the figures in order to print the corresponding character in the row of the set you have chosen.

For example, if you have reset the DIP switches for the UK character set and you press the # key, the £ symbol will be generated. Even though you will see the # symbol on the screen, the £ symbol will be printed on the paper. For another example, if you have selected the Swedish character set and you press the @ key, the É symbol will be generated.

If your keyboard does not have one of the keys that you need, you will have to send the proper ASCII number to the printer in another way, such as a programming language like BASIC.

Page Formatting

Although the LQ printer has many sophisticated commands to set margins, line spacing, horizontal and vertical tabs and character spacing, this section won't take up your time with extensive discussions of these because most are taken care of by applications programs. Instead, this section describes a few commands that the average user might need. For more information, see Appendix I, where all the commands are listed and described.

Margins

The LQ allows you to set the left and right margins with simple ESCape sequences. The left margin command is ESCape "1" followed by the number of the column you choose for the left margin. The right margin command is ESCape "Q" followed by the column number of the right margin you want. (For the left margin command, be sure to use a lowercase letter 1, not the numeral one.)

If your word processing program does not allow you to change the margins, you can send margin commands to your LQ with BASIC or another programming language before you print your documents. For example, if you prefer wider margins than your word processing program gives you, run the following BASIC program before printing. This program gives you a left margin of 10 and a right margin of 70, but you can use any numbers you prefer for the margin commands.

```
NEW
10 LPRINT CHR$(27)"1"CHR$(l0);
20 LPRINT CHR$(27)"Q"CHR$(70);
```

A program like this also allows you to choose the margins you prefer for program listings. Just remember that once you run a program that sets margins, those margins are in effect until you change them with new margin commands or turn off or reset the printer.

The maximum right margins are shown in Table 5-5.

Table 5-5. Maximum right margin settings

	LQ-800	LQ-1000
Pica	80	136
Elite	96	163
Fifteen	120	204
Condensed Elite	160	272

Skip-over-perforation

If you are using continuous-feed paper for printing program listings or other material not controlled by an applications program, you may find that the LQ prints right over the perforations between pages. The LQ has an ESCape code to prevent this: the ESCape "N" command. You send ESCape "N" followed by the number of lines you want the LQ to skip at the bottom of a page. For example, in BASIC the following line will make the LQ skip six lines after each 60 lines if your printer is set for 11-inch paper:

```
10 LPRINT CHR$(27)"N"CHR$(6);
```

Since an 11-inch page is 66 lines, this will give you one inch of blank space at the bottom of each page. If you prefer to have half of the blank space at the top of the page and half at the bottom, simply set the top-of-page approximately three lines (½ of an inch) below the perforation. (See Chapter 3 if you need to refresh your memory on setting the top-of-page.)

Line spacing

Ordinarily you don't have to worry about how the printer moves the paper so that it doesn't print lines of text on top of each other; the LQ takes care of this without any special instructions. The line spacing on the LQ, however, can be changed with an ESCape code.

The movement of the paper between lines is called a ***fine feed*** and the distance the paper moves is called a ***line space.*** In ordinary printing the line spacing is 1/6 of an inch, which produces six lines of print per inch.

The standard line spacing is the only one you need for almost all printing of text, but in some cases you may want to increase or decrease the space between lines. The LQ has several commands to do this, one of which specifies the line spacing in 180ths of an inch. If you need to make such fine adjustments in the line spacing, see Appendix I for the proper commands. In Chapter 6 you'll see how useful changes in line spacing can be for dot graphics.

Half-speed Mode

When quiet is more important than speed, you can use ESCape "s" to cut the printing speed in half. ESCape "s1" turns the half-speed mode on, and ESCape "s0" turns it off. Note that you use a lowercase s, not a capital S for this code.

Printing to the End of the Page

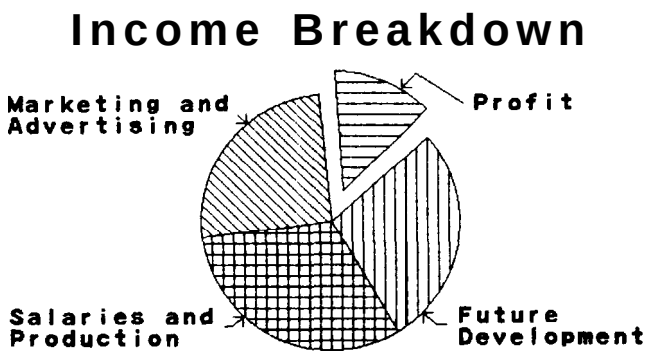
In order to protect the print head and platen, the LQ stops printing three lines from the end of the paper. This means that when you are printing on single sheets, you cannot use the last three lines of the page, but that is usually reserved for the bottom margin anyway.

Chapter 6
Graphics and User-Defined Characters

The dot graphics mode allows your LQ to produce pictures, graphs, charts, or almost any other pictorial material you can devise, and the user-defined character feature allows you or a commercial software program to put special characters in the LQ's memory so that they can be printed just as if they were ordinary letters.

Graphics

Because **many** commercial software programs use graphics, you may be able to print pictures and graphs like the ones on this page and the next by simply giving your software a few instructions.



The quickest and easiest way to print graphics on your LQ is to use a commercial graphics program. With such programs you usually create an image on your monitor and then give a command to send the image to the printer.

If you use commercial software that produces graphics, all you need to know about dot graphics is how to use the software. If, on the other hand, you wish to do your own programming or merely wish to understand how the LQ prints graphics, read on.

The print head

To understand dot graphics you need to know a little about how the LQ's print head works.

The LQ's print head has 24 pins. As it moves across the page, electrical impulses cause the pins to fire. Each time a pin fires, it strikes the inked ribbon and presses it against the paper to produce a small dot. As the head moves across the paper in draft or Letter Quality mode, the pins fire time after time in different patterns to produce letters, numbers, or symbols.

Because the dots overlap each other both horizontally and vertically in the Letter Quality mode, it is difficult to see individual dots. Instead, the letters and symbols seem to be made of unbroken lines.

In order for the dots to overlap vertically, the pins in the print head are in more than one column, but the intelligence of the printer handles the timing of pin firings so that the effect is that of 24 pins arranged in a single vertical column.

Dot patterns

The LQ's print head is able to print graphics as well as text because graphic images are formed on the LQ about the same way that pictures in newspapers and magazines are printed. If you look closely at a newspaper photograph, you can see that it is made up of many small dots. The LQ also forms its images with patterns of dots, as many as 360 dot positions per inch horizontally and 180 dots vertically. The images printed by the LQ can, therefore, be as finely detailed as the one on the first page of this chapter.

Eight-pin graphics

So that it is compatible with the many programs written for such printers such as the Epson FX and RX series, the LQ has an 8-pin graphics mode with six densities. Although this mode uses only one third of the LQ's pins, it produces good quality graphics and allows you to use the many programs written for 8-pin graphics.

Twenty-four-pin graphics

The graphics mode that takes full advantage of the LQ's print head is 24-pin graphics. It has five densities, but for simplicity this explanation will begin with only one of them, triple-density.

Triple-density prints up to 180 dots per inch horizontally. As the print head moves across the paper, every 1/180th of an inch it must receive instructions about which of its 24 pins to fire. At each position it can fire any number of pins from none to 24. This means that the printer must receive 24 bits of information for each column it prints. Since the LQ uses 8-bit bytes of information in its communication with a computer, it needs three bytes of information for each position.

Pin labels

To tell the printer which pins to fire in each column, you first divide each of the vertical columns into three sections of eight pins each and consider each section separately. Since there are 256 possible combinations of the eight pins in each section, you need a numbering system that allows you to use a single number to specify which of the 256 possible patterns you want. This numbering system is shown in Figure 6-1.

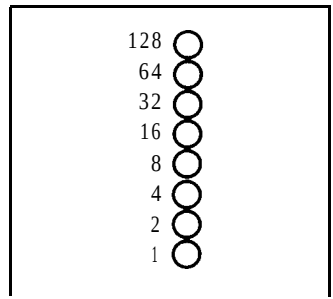


Figure 6-1. Pin numbering system

To fire any one pin, you send its number. To fire more than one pin at the same time, add up the numbers of the pins and send the sum to the printer. With these labels for the pins, you fire the top pin by sending 128. To fire the bottom pin, you send 1. If you want to fire only the top and bottom pins, you simply add 128 and 1, then send 129.

By adding the appropriate label numbers together, you can fire any combination of pins. Figure 6-2 shows three examples of how to calculate the number that will fire a particular pattern of pins.

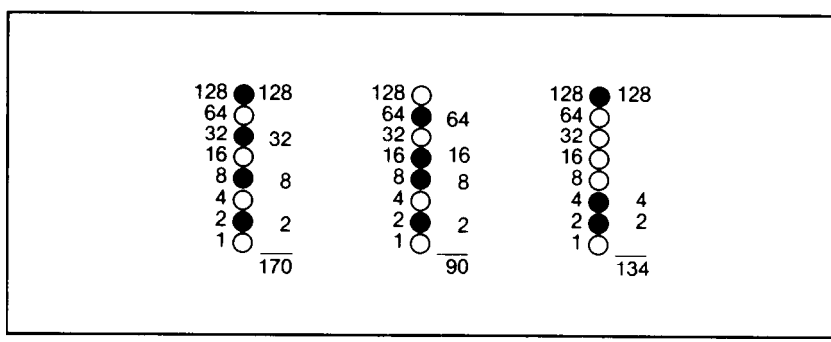


Figure 6-2. Calculations for pin patterns

With this numbering system, any combination of the eight pins adds up to a decimal number between 0 and 255, and no numbers are duplicated.

Since there are 24 pins in each column, you must make a calculation for each of the three sections in each column. As you can see, this method of planning and printing dot graphics requires considerable calculation. Because triple-density uses 180 columns per inch, printing

a single line of triple-density graphics only one inch long requires 540 numbers. Fortunately, commercial software can do the calculations for you.

Before you can put these numbers in a graphics program, however, you need to know the format of the graphics command.

Graphics Command

The graphics mode command is quite different from the other commands covered so far in this manual. For most of the other LQ modes, such as emphasized and double-width, one ESCape code turns the mode on and another turns it off. For graphics, the command is more complicated because the code **that** turns on a graphics mode also specifies how many columns it will use. After the LQ receives this code, it interprets the next numbers as pin patterns and prints them on the paper.

The LQ has one command that allows you to use any of the 11 graphics options. The format of the command is:

ESCape "*" ***m n1 n2*** data

In this command, m selects the graphics option and n1 and n2 specify the number of columns to reserve for graphics. The available graphics options are listed in Table 6-1.

Table 6-1. Graphics Options

Option	Pins	m	Horiz. density (dots/in.)
Single-density	8	0	60
Double-density	8	1	120
High-speed double-density*	8	2	120
Quadruple-density*	8	3	240
CRT I	8	4	80
CRT II	8	6	90
Single-density	24	32	60
Double-density	24	33	120
CRT III	24	38	90
Triple-density	24	39	180
Hex-density*	24	40	360

*Adjacent dots cannot be printed in this mode

Column reservation numbers

The graphics command requires more than one number to specify how many columns to reserve because one line can use thousands of columns, but the LQ does not use numbers larger than 255 (decimal). Therefore, the graphics mode command uses two numbers for reserving columns.

To figure the number of columns reserved, multiply the second number by 256 and add it to the first number. Since the command is set up for two numbers, you must supply two even if you need only one. When you need fewer than 256 columns, just make ***n1*** the number of columns you are reserving and make ***n2*** a zero.

For example, if you wish to send 1632 columns of graphics data, n1 should be 96 and *n2* should be 6 because 1632 = 96 + (6 x 256).

The LQ will interpret the number of bytes determined by *n1* and *n2* as graphics data, no matter what codes they are. This means that you must be sure to supply enough bytes of graphics data or the LQ will stop and wait for more data and will seem to be locked. If, on the other hand, you supply too much graphics data, the excess will be interpreted and printed as regular text.

First graphics program

This first program is just a simple example to show you how the graphics command, column reservation numbers, and data can be used in a BASIC program. Type in and run the following program; be especially careful to include both semicolons. The program produces the printout you see below it.

```
20  LPRINT  CHR$(27)"*"CHR$(32)CHR$(40)CHR$(0);
30 FOR X=1 TO 120
40 LPRINT CHR$(170);
50 NEXT X
```

Line 20 selects single-density 24-pin graphics (mode 32 from Table 6-1) and also reserves 40 columns for graphics. Since 24-pin graphics requires three bytes of data for each column, line 30 begins a loop to supply 120 bytes of data. Line 40 contains the number 170 that produces the first pin pattern shown in Figure 6-2, and line 50 finishes the loop.

Using hand-calculated data to print graphics

With what you know now, you can use the simplest application of graphics-using hand-calculated data to print graphic images. While this method is the most tedious, it helps you understand dot graphics. Also, it is useful for small graphic elements that are used many times.

Figure 6-3 shows how you can use a grid to plan where you want dots to be printed. This grid is for a single line of graphics 42 columns long. Since each line of 24-pin graphics is approximately 1/8th of an inch high and since triple-density graphics prints 180 dots per inch horizontally, a design planned on this figure will be about 1/8th of an inch high and less than 1/4th of an inch wide.

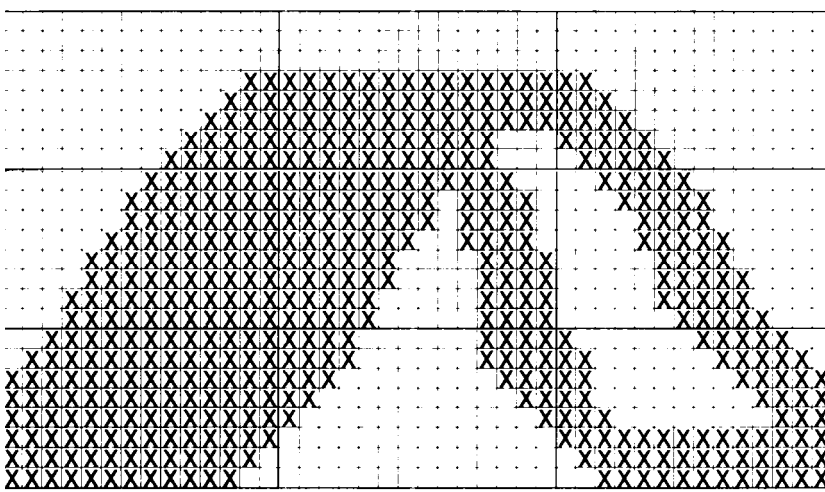


Figure 6-3. Pattern on grid

The actual pattern that the LQ prints on the paper is, of course, made up of dots that overlap each other both vertically and horizontally. The reason the planning grid uses an X for each dot is that using an accurate representation of the dots makes calculating the data numbers difficult because they cover up each other. Therefore, remember that each X represents the center of a dot, and the dots actually overlap each other.

Write the assigned values of the pins next to your design and then total the values for each column of dots. These totals are the values that will be sent to the printer as graphics data to print the design.

Figure **6-4** shows the same grid divided into three sections to make the data calculation easier. At the the bottom of each section of each column is the total of the pin numbers for that section. This gives you a total of 126 data numbers necessary to print this small figure.

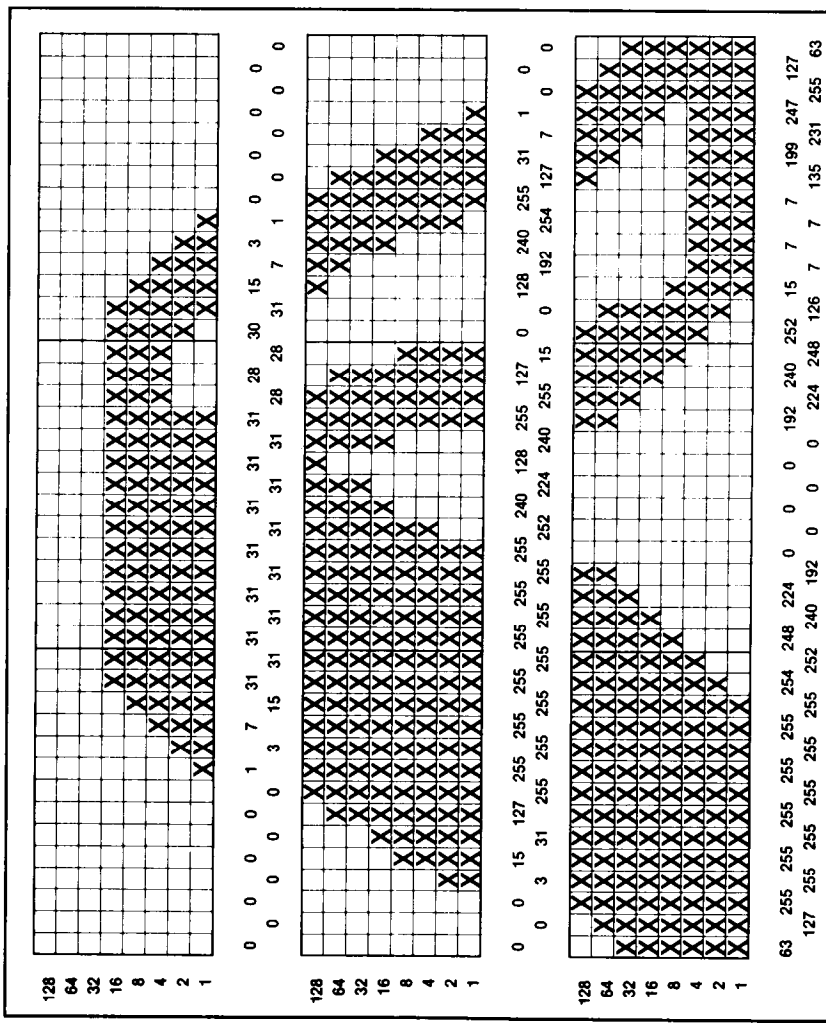


Figure 6-4. Data layout for 24-pin graphics

Here is the BASIC program that prints the design shown in Figures 6-3 and 6-4. Notice that the data numbers in lines 80-140 are the same numbers that you see in Figure 6-4. Also note that the WIDTH statement in line 10 is for IBM PC BASIC; the format may be different for your system.

```
10 WIDTH "LPT1:",255
20 LPRINT CHR$(27)"*"CHR$(39)CHR$(42)CHR$(0);
30 FOR X=1 TO 126
40 READ N
50 LPRINT CHR$(N);
60 NEXT X
70 LPRINT
80 DATA 0,0,63,0,0,127,0,0,255,0,3,255,0,15,255,0,31,255
90 DATA 0,127,255,0,255,255,1,255,255,3,255,7,255,
   255,15,255,255
100 DATA 31,255,254,31,255,252,31,255,248,31,255,240,31,
   255,224,31,255,192
110 DATA 31,255,0,31,252,0,31,240,0,31,224,0,31,128,0,
   31,240,0
120 DATA 31,255,192,28,255,224,28,127,240,28,15,248,30,
   0,252,31,0,126
130 DATA 15,128,15,7,192,7,3,240,7,1,254,7,0,255,7,0,
   127,135
140 DATA 0,31,199,0,7,231,0,1,247,0,0,255,0,0,127,0,0,63
```

In this program, line 20 assigns the graphics option (24-pin triple-density) with code 39. Code 42 sets the number of pin columns at 42. Lines 80-140 contain 126 bytes of data (42 pin columns x 3 bytes for each pin column). Lines 30-60 print the design that you see below.

Notice that the dots overlap quite a bit. This design was printed using the triple-density 24-pin graphics option because the density is the same (180 dots to the inch) in both directions.

Adding the following lines to the program above will cause the pattern to print 10 times in a row as shown below.

```
15 FOR C=l TO 10: RESTORE
65 NEXT C
```

Individual graphics options commands

As previously mentioned, the LQ responds to commands that are used by Epson FX and RX series printers. There are four individual graphics options commands that are very much the same as the ESCape "*" command, but each one works for only one graphics option. All these commands are 8-pin graphics options. Note that these commands contain one less variable than the ESCape "*" command because they don't need to select a graphics option. They are shown in Table ***6-2.***

Table 6-2. Individual graphics options commands

Command	Function	ESCape "*" Format
ESCape "K"	Single-density	ESCape "*" 0
ESCape "L"	Double-density	ESCape "*" 1
ESCape "Y"	Double-density, high-speed	ESCape "*" 2
ESCape "Z"	Quadruple-density	ESCape "*" 3

Reassigning command

The LQ has a command that allows you to change the graphics option assigned to any of the four individual graphics options commands. The command looks like this:

ESCape "?" *s m*

The letter s represents the command that you wish to change the assignment for (K, L, Y, or Z) and ***m*** is the number of the graphics option (from Table 6-1) that you want to assign to it. For example, to change the ESCape "K" command to use the CRT I screen graphics option, the command in BASIC is:

```
LPRINT  CHR$(27)"?";"K"CHR$(4)
```

This is a quick way to change the aspect ratio of the design that you are printing. Changing the graphics option will change the width without changing the height. You should, however, make this change with caution.

If you change one of the 8-pin graphics options to a 24-pin graphics option without changing the program that supplies the graphics data, you will print garbage (if the program prints at all). Remember, the 24-pin graphics options require three times as much graphics data as the 8-pin graphics options.

User-Defined Characters

With the LQ, it is possible to define and print characters of your own design. You can design an entirely new alphabet or typeface, create characters for special applications such as mathematical or scientific symbols, or create graphic patterns with user-defined characters to serve as building blocks for larger designs.

Below you can see samples of typefaces created with the user-defined character function.

You can make the task of defining characters easier by using a commercial software program that assists you in creating characters or simply supplies you with sets of characters already created. Also, some popular commercial software programs take advantage of the LQ's user-defined character function to enhance printouts. (These characters are called download characters in some programs.)

The standard characters are stored in the LQ's Read Only Memory (ROM), and the user-defined characters are stored in the LQ's Random Access Memory (RAM). In order to free the LQ's RAM for use in storing user-defined characters be sure that DIP switch 1-4 is OFF. The switch is set to OFF at the factory, but if you have turned it ON to use the 7K buffer, turn it OFF before you begin this section. (See Appendix A for instructions on changing DIP switches.)

Design grids

User-defined characters are like dot graphics because you send the printer precise instructions on where you want each dot printed. In fact, planning a user-defined character is like planning a small dot graphics pattern.

To design a character you use a grid that is 24 dots high-one dot for each wire on the LQ print head. The width of the character matrix is dependent upon the character set in use. For draft characters, the grid is nine dots wide. For Letter Quality it is 29 dots wide, and for

proportional characters it is **37** dots wide, with the dots for both Letter Quality and proportional spaced more closely together than those for draft .

Figure **6-5 shows** the two design grids. The line at the side labelled cap indicates the top of a standard capital letter, and the line labelled base indicates the baseline for all letters except those with descenders (the bottom parts of such letters as j and y). The bottom row is usually left blank because it is used for underlining.

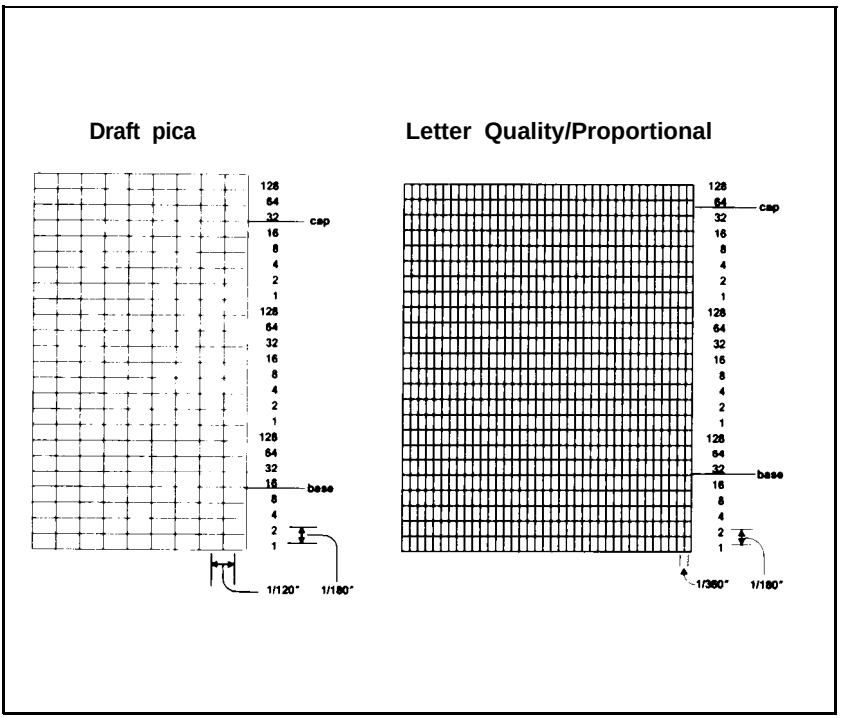


Figure 6-5. Design grids

The grid on the right side of Figure **6-5** can be used for either Letter Quality or proportional characters. For Letter Quality you do not use all the columns. See Table 6-3 for further information.

There is one restriction in designing characters. Dots in the same row may not print in adjacent columns. That is, there must be an empty dot position to the left and to the right of each dot that prints. This is true in draft, Letter Quality, and proportional.

Defining Your Own Characters

The first step in defining characters is to place the dots on a grid just as you want them to print. The examples here, like the ones in the graphics section, use an X to represent each dot. In Figure 6-6 you see a draft grid with a simple user-defined character planned on it.

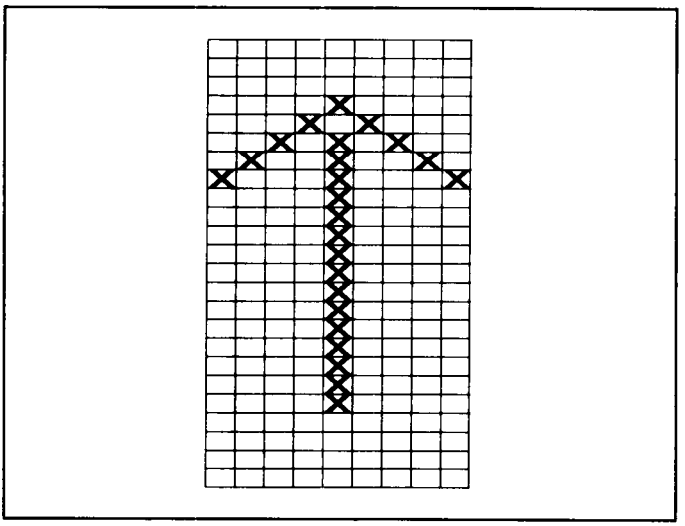


Figure 6-6. User-defined character

Now you translate the dot pattern you've created on paper to a numeric format so you can send the information to the LQ. Every dot has an assigned value. Each vertical column (which has a maximum of 24 dots) is first divided into three groups of eight dots. Each group of eight dots is represented by one byte, which consists of eight bits. Hence, one bit represents each dot.

Data numbers

The bits within each byte have values of 1, 2, 4, 8, 16, 32, 64, and 128. In the vertical column of dots, the bits are arranged so that the most significant bit (which has a value of 128) is at the top and the least significant bit (which has a value of 1) is at the bottom.

Figure 6-7 shows how to use this method to calculate the data numbers for the example character. On the left side of the figure the data numbers are calculated for the middle column. The value of each byte is calculated by adding the values of the rows where dots appear. The right side of the figure shows the whole character with the three data numbers for each column indicated at the bottom.

This manual uses decimal numbers because the example programs in this manual are written in BASIC and everyone is familiar with decimals. The data you send to the LQ, however, can be in any form (binary, decimal, hexadecimal) that you can use with your programming language.

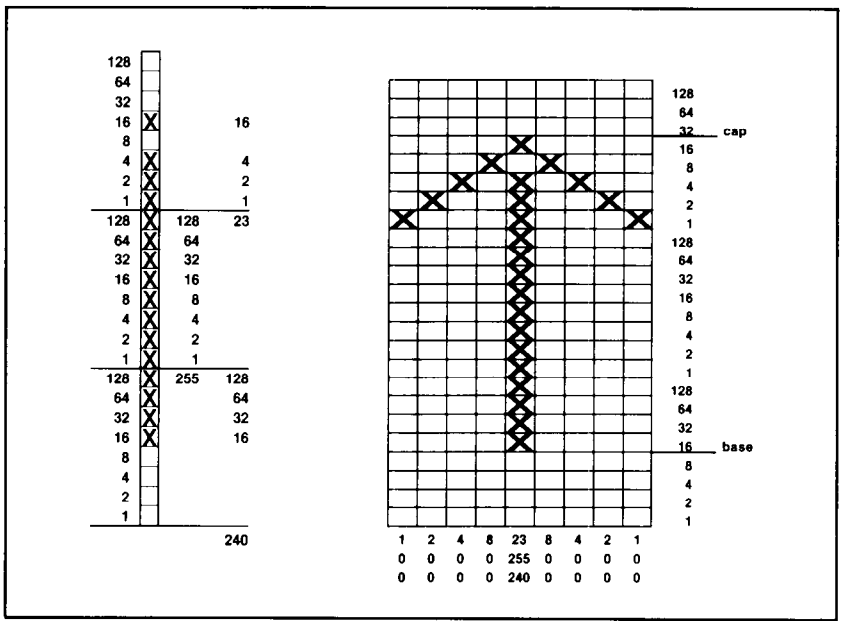


Figure 6-7. Calculating the data

You've seen how to design a character by placing dots on a grid and translated the dots to decimal equivalents. The last step in defining a character is to send this information to the printer.

Sending information to the LQ

The printer loads characters in the print style (Letter Quality, draft, or proportional) that the printer is currently using. It also records whether italic or script (either superscript or subscript) is turned on. This means that if you want to print a character in the italic mode, for example, you must have the italic mode turned on when you define the character.

The LQ command to define characters is one of the most complex in its repertoire. The format of the command is this:

ESCape "&" 0 ***nl n2 d0 dl d2*** data

The ESCape "&" is simple enough. The 0 (which is ASCII code 0, not the numeral zero in quotation marks) allows for future enhancements. At this time it is always ASCII 0.

With the LQ, you can define many characters with a single command. The values ***n1*** and ***n2*** are the ASCII codes of the first and last characters you are defining. If you are defining only one character, ***n1*** and ***n2*** are the same. You can use any codes between 32 and 127 decimal for ***nl*** and ***n2,*** but it is best not to define decimal 32, which is the code for a space. Also, you can use letters in quotation marks instead of ASCII numbers for ***n1*** and ***n2.***

An example will show how to specify ***n1*** and *n2.* If, for instance, you wanted to redefine the characters A through Z, ***n1*** would be "A" (or ASCII code 65) and ***n2*** would be "Z" (or ASCII code 90). So the command ESCape "&" 0 "AZ" (followed by the appropriate data) would replace the entire alphabet of capital letters.

Following the specification of the range of characters to be defined in this command are three data bytes ***(d0-d2)*** that specify the width of the character and the space around it. The left space (in dot columns) is specified by ***d0,*** and the right space is specified by *d2.* The second byte ***(d1)*** specifies the number of columns of dots that are printed to make up the character. By varying the width of the character itself and the spaces around it, you can create proportional-width characters that print at draft speed. Table 6-3 shows the maximum values for these bytes.

Table 6-3. Character width limits

	d1 **(maximum)**	***d0 + d1 + d2*** **(maximum)**
Draft	9	12
Letter Quality 10 cpi	29	36
Letter Quality 12 cpi	23	30
Proportional	37	42

The last part of the character definition is the actual data that defines the dot patterns for each character. Since it takes three bytes

to specify the dots in one vertical column of dots, the LQ expects ***dl*** x 3 bytes of data to follow *d2.*

An example character definition program should make this clear:

```
10 LPRINT CHR$(27)"x0"
20 LPRINT CHR$(27)"&"CHR$(0);
30 LPRINT "@@";
40 LPRINT CHR$(1)CHR$(9)CHR$(l);
50 FOR I=1 TO 27
60 READ A: LPRINT CHR$(A);
70 NEXT I
80 LPRINT "@@@@@"
90 LPRINT CHR$(27)"%"CHR$(l);
100 LPRINT "@@@@@"
110 LPRINT CHR$(27)"%"CHR$(0);
120 LPRINT "@@@@@"
130 END
140 DATA 1,0,0,2,0,0,4,0,0
150 DATA 8,0,0,23,255,240,8,0,0
160 DATA 4,0,0,2,0,0,1,0,0
```

In line 10, the ESCape "x" command selects draft style printing.

The actual character definition starts in line 20. The two at signs (@) in line 30 represent ***nl*** and *n2,* the range of characters being defined (in this case, a range of one). Line 40 contains ***d0, dl,*** and *d2.*

The information about the actual character design (which is contained in the data statements at the end of the program) is sent to the printer in the loop between lines 50 and 70.

Note

When defining Letter Quality or proportional characters, put a WIDTH statement in your program to prevent carriage return and line feed codes from interfering with your definitions .

Printing User-Defined Characters

If you entered the example program above, you defined an arrow and placed it in the RAM location for ASCII code 64 (replacing the at sign). You can now print out a three line sample of your work. The

first and third lines (printed by lines 80 and 120 of the program) print the normal at sign; the second line (line 100) prints the arrow that you defined. Run the program to see the printout below:

```
@@@@@
↑↑↑↑↑
@@@@@
```

As you can see, both sets of characters (the original ROM characters that the printer normally uses and the user-defined character set) remain in the printer available for your use. The command to switch between the two sets is used in lines 90 and 110. It is:

ESCape "%" n

If n is equal to 0, the normal ROM character set is selected (this is the default). If n is equal to 1, the user-defined character set is selected. If you select the user-defined character set before you have defined any characters, the command is ignored; the ROM characters will still be in use.

You may switch between character sets at any time-even in the middle of a line. To try it, place semicolons at the end of lines 80 and 100 in the program above.

Copying ROM to RAM

After running the program above, if you select the user-defined character set and try to print other characters, the only one that will print is the arrow. Since no other characters are in the user-defined RAM area, nothing else prints. Other characters sent to the printer don't even print as spaces; it's as if they were not sent at all.

In many cases, you will want to redefine only a few of the characters to suit your needs; the rest of the alphabet will work fine as it is. As you have seen, it is possible to switch back and forth at will between the normal character set and the user-defined character set. It is, however, rather inconvenient.

Therefore, the LQ has a command which allows you to copy all of the standard characters from ROM to the user-defined character set. The command format is:

ESCape ":" 0 0 0

Note

This command will cancel any user-defined characters you have created. You must send this command to the printer before you define characters.

If you use this command at the beginning of a program, then define your special characters and select the user-defined character set, you can print with the user-defined set as your normal character set. You'll never need to switch back and forth between sets.

Letter Quality characters

If you select Letter Quality printing with the ESCape "xl" command, you can design user-defined characters using up to 29 columns of the Letter Quality/Proportional grid. The dot columns are spaced closer together horizontally than draft style dot columns (the horizontal dot spacing is 1/360th of an inch as opposed to 1/120th of an inch for draft characters).

Proportional mode characters

Selecting the proportional character mode will yield user-defined characters of the highest resolution. Characters can be designed using all 37 columns of the Letter Quality/Proportional grid.

Remember that in Letter Quality and proportional, as in draft, you cannot place dots in adjacent columns. There must be an empty dot position to the left and right of each dot that prints.

Superscripts and subscripts

You can also create superscript and subscript user-defined characters. Just as Letter Quality characters are defined when the Letter Quality mode is selected, super/subscript characters are created when either superscript or subscript is selected.

These super/subscript characters can be used either as superscripts or as subscripts. The characters are exactly the same; it is only their placement that differs. The difference between super/subscript

characters and regular characters is that they are smaller. They are a maximum of 16 dots high and their width in dot columns is shown in Table 6-4.

Table 6-4. Super/subscript widths

	d1 (maximum)	*d0 + dl + d2* (maximum)
Draft	7	12
Letter Quality	23	36
Proportional	23	42

Since super/subscript characters are smaller, they don't require as much information when you define them. When you define super/subscript characters, you need only two bytes of data for each vertical row of dots. Design grids for these characters are shown in Figure *6-8.*

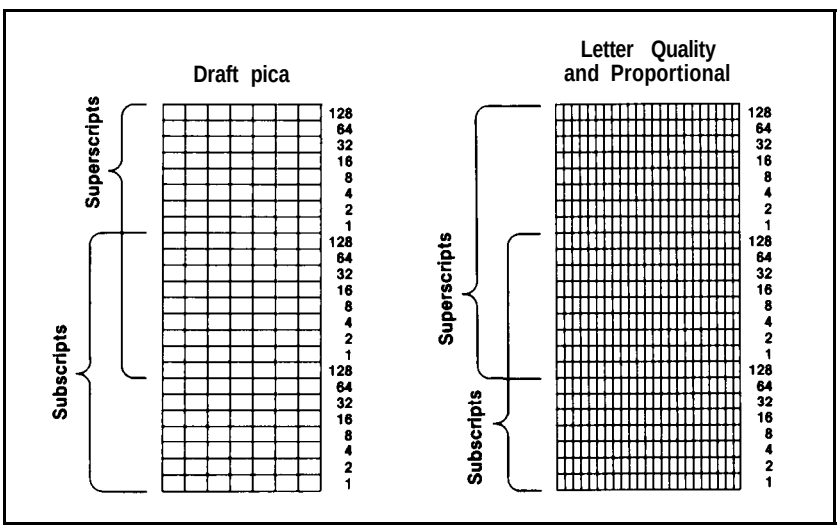


Figure 6-8. Grids for super/subscript characters

Mixing print styles

Each of the three user-defined character modes (draft, Letter Quality, and proportional) can be used in combination with most of the LQ's various print styles. For instance, emphasized works with user-defined characters. The characters you design are enhanced to give this printing effect.

Mixing the three types of user-defined characters is not permitted. If, for example, you select draft and define some characters, then select proportional and define some more, the first character definitions will be destroyed. Only one type of character definition may be stored in RAM at any time.

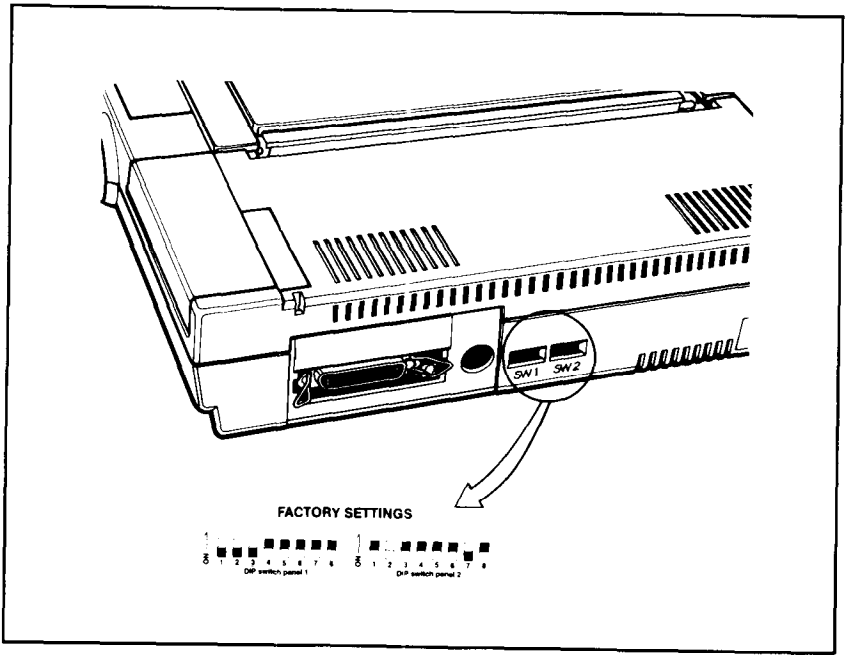
If you define characters in one mode, then switch to another mode and select the user-defined character set, the command will be ignored and nothing will print. The user-defined character definitions, however, remain unaffected. If you switch back to the mode in which they were defined, you can then select and print them.

Keep in mind that user-defined characters are stored in RAM, which is not permanent. Whenever the printer power is turned off, or the printer is initialized with the ESCape "@" command, all of the user-defined characters are lost. Also, your computer sometimes sends an initialization (INIT) signal, which wipes out all user-defined characters. (Some computers do this each time BASIC is loaded.)

Appendix A
The DIP Switches

Your LQ is equipped with sixteen DIP (Dual In-line Package) switches that allow you to change many of the printer's settings to suit your printing needs.

The DIP switches are located on two panels on the back of the printer as shown in Figure A-1, and can be easily changed with a thin, pointed object.



Figure? A-1. The DIP switch panels

If you are using the serial interface on the LQ, then you need to check switches 2-3, 2-4, 2-5, and 2-6 to make sure the settings match those on your computer.

Remember

Each time you change a DIP switch setting, you should turn the power OFF reset the switch or switches, then turn the power ON again. The LQ only recognizes a new setting at the time the power is turned ON.

The following tables describe the switches and their functions. The shaded gray boxes indicate the factory settings.

Table A-1. DIP switch panel 1

Switch No.	Function	ON	OFF	Explanation
1-1 1-2 1-3	International character set selection	See Table A-3		These three switches select the International character sets shown in Table A-3 When you receive your LQ, the switches are set for the USA character set. To see the other character sets, turn to the end of Appendix B.
1-4	select large or small buffer capacity	7K	1K	The buffer stores data from your computer. When you receive your LQ, the buffer is set for 1 kilobyte (OFF), which allows the printer to use user-deftned (downloaded) characters. If you want to free your computer while the LQ prints, change the setting to 7 kilobytes (ON).
1-5	Select Letter Quality or draft print style	draft	LQ	You can select the draft mode or the Letter Quality mode to be in effect when you turn the power on. You car still select either mode using the control panel buttons.
-6	Condensed characters	ON	OFF	Condensed characters are useful when you're printing spreadsheets and other documents where you need to print as much on a page as possible. If you set this switch to ON everything you print will be in condensed mode (unless a software command overrides it).
1-7	One-inch skip-over perforation	ON	OFF	If your commercial software does not automatically skip over the perforation between sheets of continuous-feed paper, set this switch to ON and set the top-of-page 3 lines below the perforation. The LQ then automatically leaves a top and bottom margin of ½ inch on each page, and skips over the perforations. Set this switch OFF vyhen using cut sheet feeder.
1-8	Cut sheet feeder	ON	OFF	Set this switch to ON only when using the optional cut sheet feeder.

= Factory setting When delivered

Table A-2. DIP switch panel 2

Switch No.	Function	ON	OFF	Explanation
2-1	Select 11 -inch or 12-inch paper length	12"	11"	The LQ must know the length of paper being used in order to skip perforations and establish top-of-page setting. Most continuous-feed and single-sheet paper is 11 inch.
2-2	Not used			
2-3 2-4	Select serial interface and parity setting	See Table A-4		When you receive your LQ, the DIP switches are set for a parallel interface. If your computer uses a parallel interface, you don't have to change anything. If your computer uses a serial interface, find what parity setting it requires, and set these switches according to Table A-4.
2-5 2-6	Select the baud rate if you're using a serial interface	See Table A-5		If you're using a serial interface, use these switches to set the baud rate-the rate at which the printer receives data from the computer You should check your computer manual (or commercial software program) for baud rate setting requirements, and set these switches according to Table A-5.
2-7	Printer select signal	ON	OFF	When this switch is ON, the printer cannot be deactivated by software codes. For most uses and commercial software programs, you should leave this switch ON.
2-8	Automatic line feed	ON	OFF	When this switch is ON, the LQ adds a line feed to each carriage return; when it is OFF: it does not. If your printing has an extra space between lines, turn the switch OFF. If all the lines of your printing are on top of each other, turn the switch ON.

= Factory setting when delivered

*Table A-3. International DIP switch settings**

Country	1-1	1-2	1-3
USA	ON	ON	ON
France	ON	ON	OFF
Germany	ON	OFF	ON
UK	ON	OFF	OFF
Denmark	OFF	ON	ON
Sweden	OFF	ON	OFF
Italy	OFF	OFF	ON
Spain	OFF	OFF	OFF

*There are five additional international character sets available through software commands-Japan, Norway, Denmark II, Spain II, and Latin America. See Chapter 5 for additional information.

Table A-4. Interface selection

Function	2-3	2-4
8-bit parallel interface	OFF	OFF
Serial interface, Even parity	ON	OFF
Serial interface, Odd parity	OFF	ON
Serial interface, Non parity	ON	ON

Table A-5. Baud rate selection

Baud rate	2-5	2-6
300	OFF	OFF
1200	ON	OFF
4800	OFF	ON
9600	ON	ON

= Factory setting when delivered

Appendix B
The LQ Character Set and ASCII Table

This table shows the three LQ character sets: Draft, Letter Quality, and Proportional. The table also shows the Decimal and Hexadecimal values of each character.

The codes from 0-32 and 127-160 are control codes and therefore not represented by characters. For these codes, the abbreviations of the functions are listed (i.e. BS for Backspace, LF for Line Feed, etc.). For those programs that make use of control keys, these values are also listed. Appendix I contains complete descriptions of each control code.

Dec	Hex	Abbrev	Control key
0	00	NUL	Cntl-@
1	01	SOH	Cntl-A
2	02	STX	Cntl-B
3	03	ETX	Cntl-C
4	04	EOT	Cntl-D
5	05	ENQ	Cntl-E
6	06	ACK	Cntl-F
7	07	BEL	Cntl-G
8	08	BS	Cntl-H
9	09	HT	Cntl-I
10	0A	LF	Cntl-J
11	0B	VT	Cntl-K
12	0c	FF	Cntl-L
13	0D	CR	Cntl-M
14	0E	s o	Cntl-N
15	0F	SI	Cntl-0
16	10	DLE	Cntl-P
17	11	DC1	Cntl-Q
18	12	DC2	Cntl-R
19	13	DC3	Cntl-S
20	14	DC4	Cntl-T
21	15	NAK	Cntl-U
22	16	SYN	Cntl-V
23	17	ETB	Cntl-W
24	18	CAN	Cntl-X
25	19	EM	Cntl-Y
26	1A	SUB	Cntl-Z
27	1B	ESC	Cntl-[
28	1C	FS	
29	1D	GS	
30	1E	RS	
31	1F	u s	
32	20	SP	

Dec	Hex	Draft	LQ	Prop.
32	20			
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	0
49	31	1	1	1
50	32	2	2	2
51	33	3	3	3
52	34	4	4	4
53	35	5	5	5
54	36	6	6	6
55	37	7	7	7
56	38	8	8	8
57	39	9	9	9
58	3A	:	:	:
59	3B	;	;	;
60	3C	<	<	<
61	3D	=	=	=
62	3E	>	>	>
63	3F	?	?	?
64	40	@	@	@
65	41	A	A	A
66	42	B	B	B
67	43	C	C	C
68	44	D	D	D
69	45	E	E	E
70	46	F	F	F
71	47	G	G	G
72	48	H	H	H
73	49	I	I	I
74	4A	J	J	J
75	4B	K	K	K
76	4C	L	L	L
77	4D	M	M	M
78	4E	N	N	N
79	4F	O	O	O
80	50	P	P	P
81	51	Q	Q	Q
82	52	R	R	R
83	53	S	S	S
84	54	T	T	T
85	55	U	U	U
86	56	V	V	V
87	57	W	W	W
88	58	X	X	X
89	59	Y	Y	Y
90	5A	Z	Z	Z
91	5B	[	[	[
92	5C	\	\	\
93	5D	]	]	]
94	5E	^	^	^
95	5F	_	_	_
96	60	`	`	`
97	61	a	a	a
98	62	b	b	b
99	63	c	c	c
100	64	d	d	d
101	65	e	e	e
102	66	f	f	f
103	67	g	g	g
104	68	h	h	h
105	69	i	i	i
106	6A	j	j	j
107	6B	k	k	k
108	6C	l	l	l
109	6D	m	m	m
110	6E	n	n	n
111	6F	o	o	o
112	70	p	p	p
113	71	q	q	q
114	72	r	r	r
115	73	s	s	s
116	74	t	t	t

Dec	Hex	Draft	LQ	Prop.
117	75	u	U	U
118	76	v	V	V
119	77	w	W	W
120	78	x	X	X
121	79	Y	Y	Y

Dec	Hex	Draft	LQ	Prop.
122	7A	z	z	z
123	7B	-{	{	{
124	7C	|		|
125	7D	}	}	}
126	7E	~	~	~

Dec	Hex	Abbrev.
127	7F	DEL
128	80	NUL
129	81	SOH
130	82	STX
131	83	ETX
132	84	EOT
133	85	ENQ
134	86	ACK
135	87	BEL
136	88	BS
137	89	HT
138	8A	LF
139	8B	VT
140	8C	FF
141	8D	CR
142	8E	s o
143	8F	SI

Dec	Hex	Abbrev.
144	90	DLE
145	91	DC1
146	92	DC2
147	93	DC3
148	94	DC4
149	95	NAK
150	96	SYN
151	97	ETB
152	98	CAN
153	99	EM
154	9A	SUB
155	9B	ESC
156	9C	FS
157	9D	GS
158	9E	RS
159	9F	u s
160	A0	SP

Dec	Hex	Draft	LQ	Prop.
161	Al	!	!	!
162	A2	"	"	"
163	A3	#	#	#
164	A4	$	$	$
165	A5	%	%	%
166	A6	&	&	&
167	A7	'	'	'
168	A8	(	(	(
169	A9	)	)	)
170	AA	*	*	*
171	AB	+	+	+
172	AC	,	,	,
173	AD	-	-	-
174	AE	.	.	.
175	AF	/	/	/
176	BO	0	0	0

Dec	Hex	Draft	LQ	Prop.
177	Bl	1	1	1
178	B2	2	2	2
179	B3	3	3	3
180	B4	4	4	4
181	B5	5	5	5
182	B6	6	6	6
183	B7	7	7	7
184	B8	8	8	8
185	B9	9	9	9
186	BA	:	:	:
187	BB	;	;	;
188	BC	<	<	<
189	BD	=	=	=
190	BE	>	>	>
191	BF	?	?	?
192	c o	@	@	@

Dec	Hex	Draft	LQ	Prop.
193	C1	A	*A*	*A*
194	C2	B	B	B
195	C3	C	C	C
196	C4	*D*	*D*	*D*
197	C5	*E*	*E*	*E*
198	C6	F	*F*	*F*
199	C7	G	G	G
200	C8	H	H	H
201	C9	I	I	I
202	CA	J	*J*	*J*
203	CB	K	K	K
204	*CC*	*L*	*L*	*L*
205	CD	M	M	M
206	CE	N	N	N
207	CF	O	O	O
208	D0	P	*P*	*P*
209	D1	Q	Q	Q
210	D2	R	R	*R*
211	D3	S	S	S
212	D4	T	*T*	*T*
213	D5	U	U	U
214	D6	V	V	V
215	D7	W	*W*	*W*
216	D8	X	X	X
217	D9	Y	Y	Y
218	DA	Z	*Z*	Z
219	DB	[	[	[
220	DC	\	\	\
221	DD	]	]	]
222	DE	^	^	^
223	DF	_	_	_

Dec	Hex	Draft	LQ	Prop.
224	E0	'	'	'
225	E1	a	a	*a*
226	E2	*b*	*b*	*b*
227	E3	c	c	c
228	E4	*d*	*d*	*d*
229	*E5*	*e*	*e*	e
230	E6	f	*f*	*f*
231	E7	g	g	*g*
232	E8	h	h	*h*
233	E9	i	i	*i*
234	EA	j	j	*j*
235	EB	k	k	*k*
236	EC	l	l	*1*
237	ED	*m*	*m*	*m*
238	EE	n	*n*	*n*
239	EF	o	o	*0*
240	FO	p	p	*P*
241	F1	q	q	*q*
242	F2	r	r	*r*
243	F3	s	*s*	s
244	F4	t	*t*	*t*
245	F5	u	u	u
246	F6	*v*	*v*	*v*
247	F7	w	w	*w*
248	F8	x	x	*x*
249	F9	y	Y	Y
250	FA	z	z	*z*
251	FB	{	{	{
252	FC	|	|	|
253	FD	}	}	}
254	FE	~	~	~

Appendix C
Installing the Option Cartridge

The option cartridge for the LQ lets you change typestyles, extend the capabilities the printer, or use programs designed for other popular printers. Full instructions on their use come with each module.

The cartridge is made up of two modules-the ***identity*** module and the font module. These two modules are plugged together to form an option cartridge, as shown in Figure C-1. The cartridge can then be plugged into the LQ's option cartridge compartment as shown in Figure C-2.

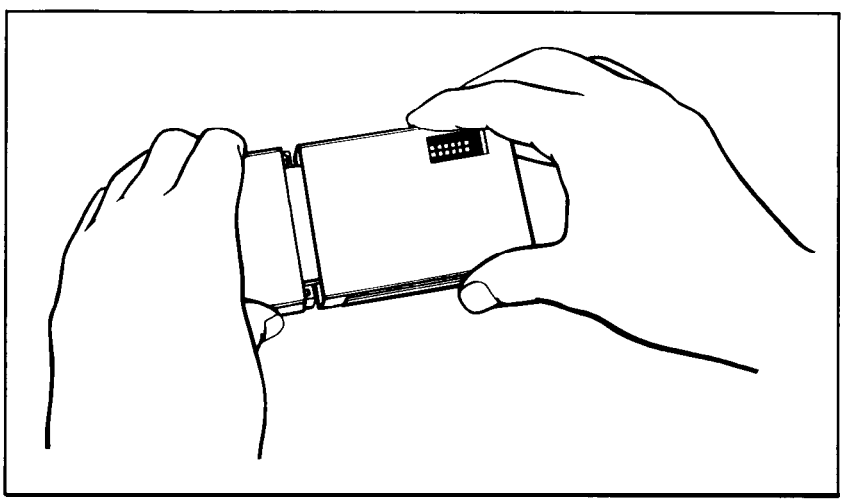


Figure C-1. Plugging the identity and font modules together

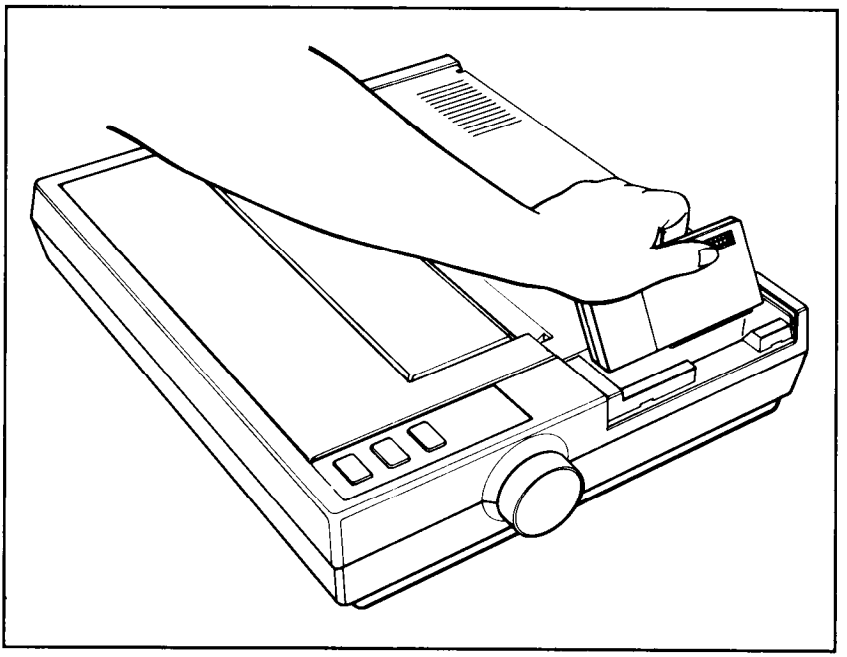


Figure C-2. Installing an option cartridge

The Identity Module

The identity modules can enhance the LQ's capabilities or give it the "personality" of another printer. Identity modules include:

- ESC/P Expansion (Epson Standard Code for Printers Expansion) #7696—This module maintains full Epson command capability, while adding the Epson Standard Graphics Set, access to additional typestyles with font modules, and greater flexibility for setting default values.
- IBM PC #7695*—This module lets you use commands and programs designed for the IBM 5152 Graphics Printer.
- Diablo 630 #7694*—This module lets you use commands and programs designed for the Diablo 630 printer.

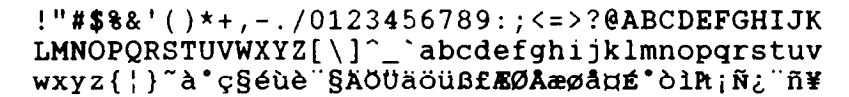
*Note: Many programs support the Epson LQ printer series. If your software programs are set up for the IBM 5152 or the Diablo 630, you may be able to reset them for the LQ, instead of purchasing a IBM or Diablo option cartridge. Refer to Chapter 4 for further setup information.

An identity module can be used with a font module or by itself. Bach identity module comes with a blank font module plugged into it. If you use an identity module by itself, leave the blank font module plugged in. If you use a font module, unplug the blank module and replace it with the font module.

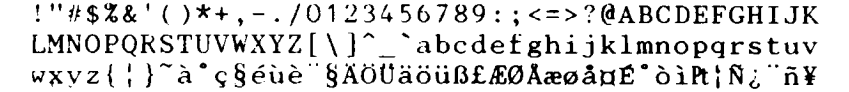
The Font Module

The font modules are available in a number of different typestyles, including:

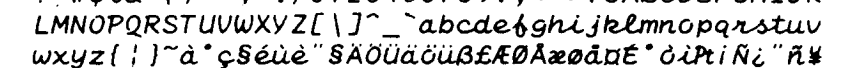
- Courier (#7400)



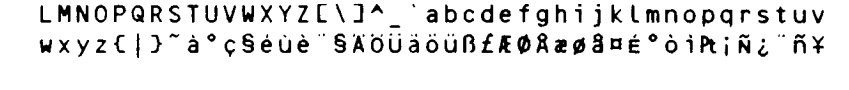
- Prestige (#7401)



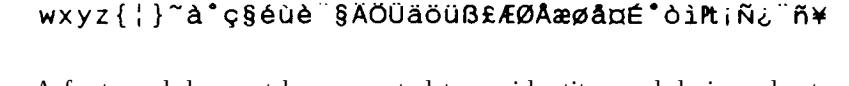
- Script (#7402)



- OCR-B (#7403)



- Sans Serif (#7404)



A font module must be connected to an identity module in order to work. The ESC/P Expansion Identity Module maintains and extends the LQ's Epson identity, and allows you to add any of the optional fonts.

Using the Option Cartridges

When installing an option cartridge, you must turn the power OFF, plug in the cartridge, then turn the power ON again so that the printer acknowledges that an option cartridge has been installed.

WARNING

Do not install or remove an option cartridge while the power is ON, because you may damage the printer. Always turn the power OFF when installing or removing an option cartridge.

With the cartridge installed, the printer reacts to the command set contained in the ***identity module.*** (For specific information on commands, see the instructions packaged with the identity module). To return to the LQ's built-in command set, turn the power OFF remove the cartridge and turn the power ON again.

For typestyle selection, the identity module may have a DIP switch that allows you to choose which typestyle will be in effect when you turn on the printer-either the LQ's built-in typestyle, or the font module typestyle.

Whichever default typestyle you select, you can still switch between the LQ's built-in typestyle and the font module typestyle by using the control panel buttons or ESCape codes. See the instructions packaged with the option cartridges for further information on the DIP switches and font selection commands.

Appendix D
Troubleshooting and Maintenance

This appendix presents solutions for possible problems, explanations of the LQ's advanced features, and maintenance tips.

Diagnosing the Problem

If the printouts from your LQ are not matching the document you've prepared on your computer, you'll need to set up a test document.

When you set up a test document on your computer, include the symbols #, [, \,], and {, because of their variation in the different character sets. Also include numbers, punctuation marks, symbols, carriage returns, and upper and lower case letters.

Now print the document. First check page B-4 to see whether the LQ is printing the correct character set. When delivered, the LQ is set to print the USA character set. If it's not printing the USA character set, determine which character set it is printing. Then consult Appendix A on DIP switches to find how to select the correct character set.

If the printout shows other problems, such as one line printing on top of another, or too much space between lines, consult the following list. The statements on the left list possible problems; the recommendations are listed on the right.

Problem	Recommendation
Nothing is printed	Make sure the printer is switched ON, and that the power source is ON. Check the connection between the printer and the computer. Be sure you are using the correct cable to connect the computer to the printer. Make sure the PAPER OUT light is OFF If it's ON, reload the paper. Check the indicator light on the printer to see if the printer is on line. Use the manual for your operating system or applications software to find out the command necessary to configure the computer. Look for a command like STAT or CONFIG- the name depends on the operating system you use.
READY light flickers when you try to print.	If you are using the parallel interface, either you have changed switch 2-7 to OFF by mistake, or you have an incorrect printer cable. If you are using the serial interface, the setting of the LQ's baud rate, parity, number of bits per character and number of stop bits may not match the computer's settings. Either change the configuration of the computer or reset the DIP switches on the LQ until the printer and computer match. Refer to your computer's manual or your dealer for details.
All the text is printed on the same line.	This happens if there is no line feed signal being sent from either the computer or the printer at the end of each line of text. To remedy the problem, change the setting of DIP switch 2-8 from OFF to ON.

Problem	Recommendation
The file is printed with an extra blank line between each line of text	This happens if there is a line feed signal being sent from both the computer and the printer at the end of each line of text. Check the setting of DIP switch 2-8. If it is set to ON, then change it to OFF If it is set to OFF already, consult your dealer regarding a printer cable designed to correct this problem.
Some of the characters printed do not match those in the file.	Check the settings of DIP switches 1-1, 1-2, and 1-3 against Table A-3 in Appendix A. Change them so that your international character set is the one printed.
The printout is garbled and does not match the file you wanted to print.	This might happen if you are using a serial interface. It probably means that the settings of the baud rate, parity, number of bits per word and number of stop bits are not the same on the computer and the printer. Change the settings of the DIP switches to match the configuration of the serial socket of the computer. See Tables A-4 and A-5 in Appendix A.
Printer suddenly stops or slows down.	This printer has a *print head protection* feature that protects the head from overheating or low power supply voltage. If the head temperature exceeds a certain value, printing is stopped until the head temperature drops to the proper range. Printing is resumed at a half print speed mode at first.
Only the printer POWER light goes on; the READY and ON LINE lights remain off.	Check to see that computer is ON. Some printer/computer connections require that you turn on the computer to operate the printer.

After you have checked the troubleshooting list, turn the printer OFF then back ON again to register any new settings of DIP switches. Then try printing your test file again. If the file still doesn't print properly, work through the problems again, changing the settings as necessary.

If a further attempt at printing your test file is unsuccessful, contact your Epson dealer.

Beeper Error Warnings

When the beeper on the LQ sounds, it usually indicates that the printer is out of paper. The beeper can also be sounded by a program that sends ASCII code 7 and by certain error conditions in the printer itself.

If the printer beeps and stops printing when it is not out of paper, turn the printer off and check to see if the paper is loaded correctly. If the paper is loaded correctly, turn the printer back on and try to print again. If the printer beeps and does not print again, take it to a qualified service person.

Hex Dump Mode

The LQ has a special feature that makes it easy for experienced printer users to find the causes of problems. The hexadecimal (hex) dump mode gives a printout of exactly what codes reach the printer.

Enter this mode by turning on the power switch on the left side of the printer while holding down the FORM FEED and LINE FEED buttons at the same time. Then, when you run a program, either an applications program or one you have written in any programming language, the LQ prints one or more lines.

Each line has two parts: the hexadecimal codes (up to 16 numbers), and the guide section (16 characters at the end of each line except the last). The hexadecimal numbers are the codes received by the printer, and the guide section helps you find a certain place in the list of codes.

Each character in the guide section corresponds to one of the codes. If the code is for a printable character, that character is printed. If the code is for a non-printable character, such as the ESCape code or the code for a line feed or carriage return, a dot is printed.

Therefore, if you run the following BASIC program while your LQ is in the hex dump mode, you get the printout below it. The printer will print all but the last line and then stop. Press the ON LINE button to print the last line.

```
l0 FOR X=70 TO 73
20 LPRINT CHR$(X): NEXT X
30 LPRINT  CHR$(27)"E"
40 LPRINT "Sample text"
50 LPRINT CHR$(27)"@"
```

```
46 0D 0A 47 0D 0A 48 0D 0A 49 0D 0A 18 45 0D 0A    F..G..H..I...E..
53 61 6D 7O 6C 65 20 74 65 78 74 0D 0A 1B 4O 0D    Sample text... @.
0A
```

You can consult Appendix B to find the meaning of the hexadecimal codes. The following explanation of the first line will put you on the right track for using the hex dump mode.

The first code in the first line is hex 46 (the same as decimal 70), which is the code for "F"; therefore "F" is printed in the first position in the guide section. Then, because there is no semicolon in line 20, BASIC sends a carriage return and a line feed, hex codes 0D and 0A. Each of these is represented by a dot in the guide section. The program then sends the hex codes 47, 48, and 49, with each followed by a carriage return and line feed.

When the program gets to line 30, it sends ESCape "E" and a carriage return and line feed. These are hex codes lB, 45, 0D, and 0A, which are represented in the guide section by a dot, an E, and two more dots. Now you can follow a hex dump printout on your own.

Some computer systems change one or more codes when sending them to the printer. The ability of the LQ to dump in hexadecimal lets you determine which codes are creating problems for your system.

A hex dump printout of a program shows you exactly what the printer is receiving, regardless of what the computer is sending. The

following test program lets you check to see what codes, if any, are problems for your software. This program is in BASIC; use an equivalent program for another programming language.

```
l0 FOR X=0 TO 255
20 LPRINT CHR$(X);
30 NEXT X
```

Put the printer in hex dump mode and then RUN the program. Remember to press the ON LINE button to make the LQ print the final line. Then compare your printout with the list of hex codes in order in Appendix B. If any are skipped or repeated, you will know that your computer system changes some codes before it sends them to the printer.

For example, in the lines below, which are the first two lines of the printout of the test program run with IBM PC BASIC release 2.0, you can see that in this case BASIC adds hex 0A, which is the code for line feed, after hex 0D, the code for a carriage return. You will also notice that the program does not send hex 1A (decimal 26). Both of these characteristics are discussed in the next section.

```
00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0A 0E  ................
0F 10 11 12 13 14 15 16 17 18 19 1B 1C 1D 1E 1F  ................
```

The hex dumping capability can help you debug a program quickly. Appendix B will help you translate the hex codes to ASCII equivalents.

IBM PC BASIC Solutions

There are three problems in using the IBM Personal Computer BASIC to drive a printer. First, the IBM PC BASIC inserts a carriage-return/line feed (CR—LF) after each 80 characters you send it. Second, it adds an LF to each CR in an LPRINT statement. Third, release 2.0 of PC BASIC will not send hex 1A (decimal 26).

Here is the way to adjust the width when it is the only problem. Tell the computer that the print line is wider than 80 characters with this WIDTH statement:

```
WIDTH "LPT1:",255
```

The 255 is a special number that prevents the computer system from inserting a CR - LF into the line. Unless, of course, there's one in your program.

The extra line feed—CHR$(10)—that accompanies each carriage return—CHR$(13)—is no problem except when you need to use CHR$(13) in a graphics program. Getting rid of the extra CHR$(10) is rather complicated. First you open the printer as a random file:

```
OPEN "LPTl:" AS #l
```

Although this allows you to send any code to the printer, you can no longer use the LPRINT command. Instead, you must use a PRINT #1 command:

```
PRINT #1, "Now I can print anything"
```

This does allow you to print anything, but it ignores any previous WIDTH statements.

If you want to print more than 80 columns per line in a graphics program, you must therefore change your opening statement to include the appropriate WIDTH statement:

```
OPEN "LPTl:" AS #l : WIDTH #l, 255
```

There is no easy solution to the problem with CHR$(26). It is best to change any instance of decimal 26 (hex 1A) in your programs to another number.

Applesoft BASIC Solutions

Applesoft BASIC does not use PRINT to send data to the screen and LPRINT to send data to the printer as Microsoft BASIC does. Therefore, you need to change the programs in this manual somewhat. In most cases all you need to do is to add two lines to each program and change all instances of LPRINT to PRINT. Add a line at the beginning of the program that states PR#l and a line at the end that states PR#0.

For the programs in this manual that contain INPUT statements, put the line that states PR#l after the INPUT statement.

QX-10® and QX-16 Solutions

The format for the WIDTH statement for the Epson QX-10 and QX-16 computers is:

```
WIDTH LPRINT 255
```

Maintenance

To keep your LQ working like new, always keep it in a safe and clean place. Keep it away from dust, grease, and any heat sources. A safe temperature range is 41°F to 95°F.

To clean the outside of the printer case, use a soft, clean cloth dampened with clear water. Stubborn stains can be removed with non-abrasive household cleaners.

The inside front portion of the printer should also be cleaned periodically to get rid of dust and paper lint. First, turn the power switch OFF and unplug the power cord from the electrical outlet. Then remove the dust cover.

Use a small vacuum cleaner and soft brush to clean inside the printer. Be careful not to bend or damage any of the parts inside the printer. With the power OFF, you can move the print head back and forth to clean under it.

Once in a great while your LQ should be lubricated by an authorized Epson dealer.

Changing the print head

The expected life of an LQ print head is about 200 million strokes. See your Epson dealer for replacements. If the print head fails suddenly or long before its estimated lifetime is over, the problem is probably in another component of the printer. Take the LQ to your dealer for service.

Removing the old print head

Be sure the power is OFF before you touch the print head. If you have been printing, wait about 15 minutes to allow the print head to cool.

Next, remove the dust cover and ribbon cartridge (see Chapter 1 for more information), and slide the print head to the middle of the printer. Unlock the print head by moving the two locking levers to the left and right, as indicated by the arrows in Figure D-1.

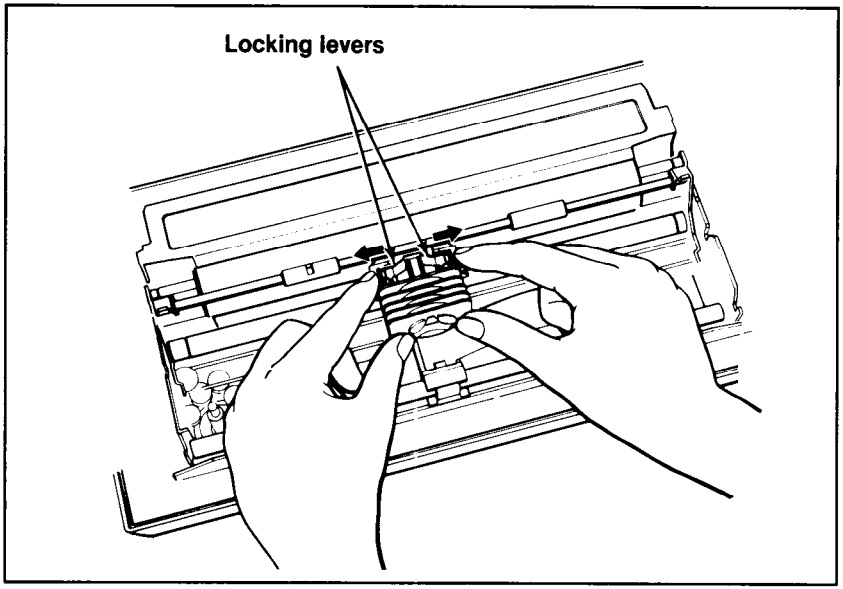


Figure D-1. Print head replacement

Slide the print head over to the left side of the printer, and lift the print head off the carriage as shown in Figure D-2. Disconnect the two copper-colored ribbon cables by gently pulling them out of the black connector blocks on the floor of the printer. Now lift the print head assembly out of the printer. (The connector blocks stay attached to the printer.)

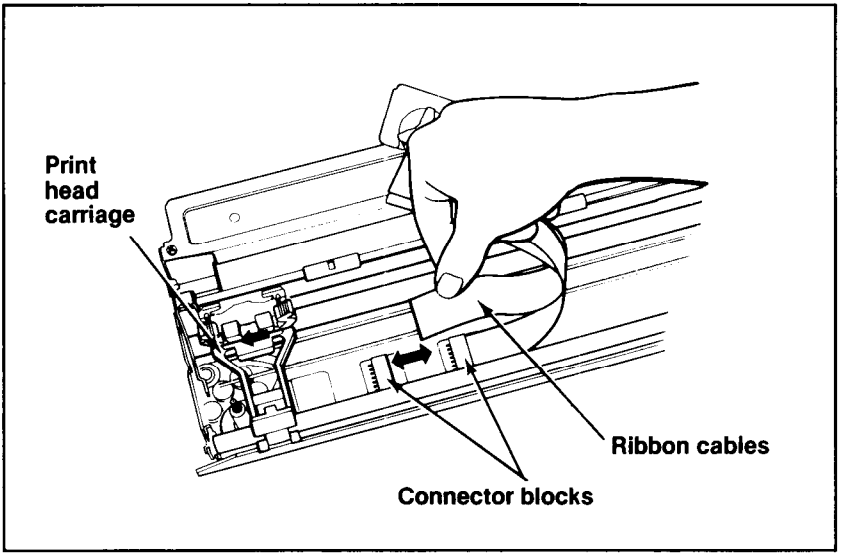


Figure D-2. Removing ***the ribbon cables***

Installing the new print head

Connect the ribbon cables to the black connector blocks by gently pushing the ends of the cables into the blocks. Place the new print head on the carriage, making sure the guide holes on the print head fit over the guide pins on the carriage.

Snap the black locking levers back in place, and that's it.

Appendix E
Widths of the Proportional Characters

This table lists the widths of the LQ's proportional characters. The values given are in 360ths of an inch (for example: a value of 36 is 36/360-inch). You may need to enter these widths into a special table for your word processing program so it can calculate the number of proportional characters that will fit on each line.

The characters with no code indicated are international characters. See Chapter 5 for information on their use. The table shows the character, its ASCII code (decimal), and its width.

Table E-1. Proportiona character widths

Character	Code	Size
	32	30
!	33	18
"	34	30
#	35	30
$	36	30
%	37	36
&	38	36
'	39	18
(	40	24
)	41	24
*	42	30
+	43	30
,	44	18
-	45	30
.	46	18
/	47	30
0	48	30
1	49	30
2	50	30
3	51	30

Character	Code	Size
4	52	30
5	53	30
6	54	30
7	55	30
8	56	30
9	57	30
:	58	18
;	59	18
<	60	30
=	61	30
>	62	30
?	63	30
@	64	36
A	65	36
B	66	36
C	67	36
D	68	36
E	69	36
F	70	36
G	71	36

Table E-1. Proportional character widths (continued)

Character	Code	Size
H	72	36
I	73	24
J	74	30
K	75	36
L	76	36
M	77	42
N	78	36
O	79	36
P	80	36
Q	81	36
R	82	36
S	83	36
T	84	36
U	85	42
V	86	36
W	87	42
X	88	36
Y	89	36
Z	90	30
[	91	24
\	92	30
]	93	24
^	94	30
_	95	30
‘	96	18
a	97	30
b	98	36
c	99	30
d	100	36
e	101	30
f	102	24
g	103	36
h	104	36
i	105	18
j	106	24
k	107	36
l	108	18
m	109	42
n	110	36
o	111	30

Character	Code	Size
p	112	36
q	113	36
r	114	30
s	115	30
t	116	24
u	117	36
v	118	36
w	119	42
x	120	30
y	121	36
z	122	30
{	123	24
¦	124	18
}	125	24
~	126	30
°		24
¤		30
ß		36
Ø		36
ø		30
¨		30
§		30
ü		36
é		30
ä		30
à		30
å		30
ç		30
è		30
ì		18
Ä		36
Å		36
É		36
æ		42
Æ		42
ö		30
ò		30
ù		36
Ö		36
Ü		42

Table E-1. Proportional character widths (continued)

Character	Code	Size
£		30
		36
Pt		42
ñ		36
Ñ		36
¿		30
¡		30

Super/subscript

	32	20
!	33	12
"	34	20
#	35	20
$	36	20
%	37	24
&	38	24
'	39	12
(	40	16
)	41	16
*	42	20
+	43	20
,	44	12
-	45	20
.	46	12
/	47	20
0	48	20
1	49	20
2	50	20
3	51	20
4	52	20
5	53	20
6	54	20
7	55	20
8	56	20
9	57	20
:	58	12
;	59	12
<	60	20
=	61	20
>	62	20
?	63	20

Character	Code	Size
@	64	24
A	65	24
B	66	24
C	67	24
D	68	24
E	69	24
F	70	24
G	71	24
H	72	24
I	73	16
J	74	20
K	75	24
L	76	24
M	77	28
N	78	24
O	79	24
P	80	24
Q	81	24
R	82	24
S	83	24
T	84	24
U	85	28
V	86	24
W	87	28
X	88	24
Y	89	24
Z	90	20
[	91	16
\	92	20
]	93	16
^	94	20
_	95	20
`	96	12
a	97	20
b	98	24
c	99	20
d	100	24
e	101	20
f	102	16
g	103	20
h	104	24

Table E-1. Proportional character widths (continued)

Character	Code	Size
i	105	12
j	106	16
k	107	24
l	108	12
m	109	28
n	110	24
o	111	20
p	112	24
q	113	24
r	114	20
s	115	20
t	116	16
u	117	24
v	118	24
w	119	28
x	120	20
y	121	24
z	122	20
{	123	16
¦	124	12
}	125	16
~	126	20
°	3	16
¤		20
Ø		24
ø		24
ø		20
¨		20
§		20
ü		24
é		20
ä		20
à		20
å		20
ç		20
è		20
ì		12
Ä		24
Å		24
É		24

Character	Code	Size
æ		28
Æ		28
ö		20
ò		20
ù		24
ð		24
ü		28
£		20
¥		24
₧		28
ñ		24
Ñ		24
¿		20
¡		12

Appendix F
The Parallel and Serial Interfaces

The LQ-800/1000 printers have both parallel and serial interfaces to communicate with the computer; this appendix describes these interfaces.

Parallel Interface

Connector pin assignments and a description of respective interface signals are shown in Table F-1.

Table F-1. Pins and signals

Signal Pin	Return Pin	Signal	Direction	Description
1	19	STROBE	IN	STROBE pulse to read data in Pulse width must be more than 0.5 microseconds at the receiving terminal.
2	20	DATA 1	IN	These signals represent information of the 1st to 8th bits of parallel data, respectively Each signal is at HIGH level when data is logical 1 and LOW when it is logical 0.
3	21	DATA 2	IN	
4	22	DATA 3		
5	23	DATA 4	IN	
6	24	DATA 5	IN	
7	25	DATA 6		
8	26	DATA 7	IN	
9	27	DATA 8	IN	
10	28	ACKNLG	OUT	Approximately 12-microsecond pulse. LOW indicates that data has been received and that the printer is ready to accept more data.
11	29	BUSY	OUT	A HIGH signal indicates that the printer cannot receive data. The signal goes HIGH in the following cases: 1) During data entry (ea.char.time) 2) During printing 3) When Off-Line 4) During printer-error state

Table F-1. Pins and signals (continued)

Signal Pin	Return Pin	Signal	Direction	Description
12	30	$\overline{PE}$	OUT	A HIGH signal indicates that the printer is out of paper.
13	—	SLCT	OUT	Pulled up to + 5 volts through 3.3k ohm resistance.
14	—	$\overline{AUTO\ FEED\ XT}$	IN	When this signal is LOW, the paper is automatically fed 1 line after printing. (The signal level can be fixed to this by setting DIP switch 2-8 to ON.)
15	—	—	—	Unused.
16	—	GND	—	Ground for twisted-pair grounding.
17	—	CHASSIS GND	—	Printer's chassis ground, which is isolated from the logic ground.
18	—	NC	—	Unused
19-30	—	GND	—	Grounds for twisted-pair grounding.
31	16	$\overline{INIT}$	IN	When this level becomes LOW, the printer controller is reset to its power-up state and the print buffer is cleared. This level is usually HIGH, its pulse width must be more than 50 microseconds at the receiving terminal.
32	—	$\overline{ERROR}$	OUT	This level becomes LOW when the printer is in: 1) Paper-end state. 2) Off-Line. 3) Error state.
33	—	GND	—	Same as for Pins 19-30.
34	—	—	—	Unused.
35	—	—	OUT	Pulled up to + 5V through 3.3k ohm resistance.
36	—	$\overline{SLCT\text{-}IN}$	IN	The DC1/DC3 code is valid only when this signal is HIGH. (Internal fixing can be carried out with DIP switch 2-7. The level of this signal is factory-set to LOW.)

Notes:

1. The column heading Direction refers to the direction of signal flow as viewed from the printer.

2. Return denotes the twisted-pair return, to be connected at signal ground level. For the interface wiring, be sure to use a twisted-pair cable for each signal and to complete the connection on the return side. To prevent noise, these cables should be shielded and connected to the chassis of the host computer or the printer but not at both ends.

3. All interface conditions are based on TTL level. Both the rise and the fall times of each signal must be less than 0.2 microseconds.

4. Data transfer must be carried out by observing the ACKNLG or BUSY signal. (Data transfer to this printer can be carried out only after receipt of the ACKNLG signal or when the level of the BUSY signal is LOW.)

Interface timing

Figure F-1 shows the timing for the parallel interface.

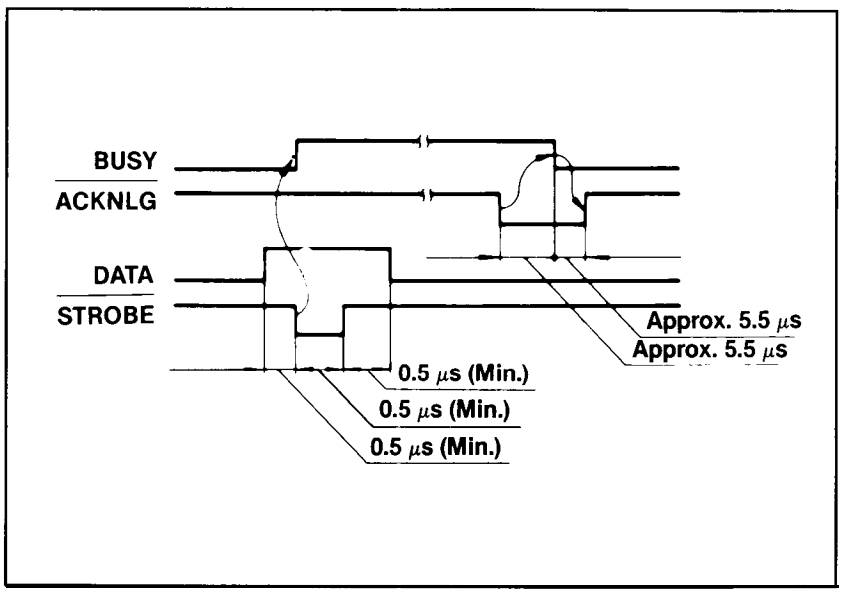


Figure F-1. Parallel interface timing

Table F-2 refers to the relations among ON-LINE, SLCT-IN **input,** DCl/DC3 and interface signals.

Table F-2. Printing enabled/disabled signals and control conditions

On-Line switch	$\overline{\text{SLCT IN}}$	DC1/DC3	$\overline{\text{ERROR}}$	BUSY	$\overline{\text{ACKNLG}}$	DATA ENTRY
OFF-LINE	HIGH/LOW	DC1/DC3	LOW	HIGH	No pulse	Disable
ON-LINE	HIGH	DC1	HIGH	LOW/HIGH (During data entry)	Pulse output after entry	Enable (Normal Process)
		DC3	HIGH	LOW/HIGH (During data entry)	Pulse output after entry	Enable (Waits DC1 see Note 2)
	LOW	DC1	HIGH	LOW/HIGH (During data entry)	Pulse output after entry	Enable (Normal Process)
		DC3	HIGH	LOW/HIGH (During data entry)	Pulse output after entry	Enable (Normal Process)

Notes:

1. In the above table, it is assumed that no ERROR status exists other than that attributable to the OFF-LINE mode.

2. Once the printer is in the deselected state by the DC3 code, the printer will not revert to the selected state unless the DC1 code is input again. In other words, in the deselected status, the input data is ignored until DC1 code is received.

3. DC1 and DC3 codes are enabled only when SW 2-7 is OFF. And SLCT-IN signal (Input Connector Pin No. 36 in case of parallel interface unit is used) is HIGH when the printer power is initialized.

4. SW 2-7 is ON or SLCT-IN is LOW when the printer is initialized, DC1/DC3 printer select/deselect control is invalidated and DC1/DC3 control code are ignored.

5. The SLCT-IN signal is HIGH and SW 2-7 is OFF when the printer is initialized, the printer will start from selected (DC1) state.

Serial Interface

Connector pin assignments and a description of respective interface signals are shown in Table F-3.

Table F-3. Pins and signals

Pin No.	Signal name	Dir	Functional Description
1	Not used	—	Reserved.
2	REV (Reverse channel)	OUT	Indicates printer is ready to receive data or not. MARK level indicates printer is not ready to receive data.
3	RXD	IN	Receives data (RS-232C level)
4	Not used	—	Reserved.
5	Signal GND	—	Signal (Logic) ground level.
6	Chassis GND	—	Printer chassis ground.

1. DIR refers to the direction of signal flow as viewed from the printer.

Word Length

Start bit: 1 bit
Data bits: 8 bits
Stop bit: **1** bit or more

Parity

Odd, Even, or Non-Parity (see Table A-4)

Appendix G
Choosing and Setting Up Optional Interfaces

This appendix summarizes the Epson interfaces compatible with the LQ-800 and LQ-1000 printers and gives instructions for installing internally mounted interface boards.

Compatible Interfaces

You can use a number of optional interfaces with the LQ-800 and LQ-1000, which supplement the built-in parallel and serial interfaces. These fall into three categories.

- Serial interfaces, which allow connection to a large range of computers without a parallel interface.
- IEEE-488 and other special interfaces, which allow connection to computers with other interface requirements (in some cases these are installed on the computer rather than the printer).
- Buffer interfaces, which provide a larger data buffer to release the computer for other tasks when printing large amounts of text.

The following Epson interfaces are compatible with the LQ-800 and LQ-1000 printers, although some of these are no longer available.

#8143	serial interface
#8148	intelligent serial interface
#8149	intelligent serial interface Type II
#8149M	intelligent serial interface Type III
#8161	IEEE-488 interface
#8165	intelligent IEEE-488 interface
#8172	32K byte buffer parallel interface
#8172M	128K byte buffer parallel interface

Internally Mounted Interface Cards

Before you can install these you need to take off the upper half of the printer case to get to the main circuit board.

WARNING

High voltages are present inside the printer when the power is switched ON. Do not remove the case and install optional interfaces unless the printer is switched OFF and the AC power cord is unplugged from its outlet. Also, beware of touching contacts on the circuit board of the printer - many of the components are sensitive to static electricity and can be destroyed by the charge that may build up on your body.

Removing and replacing the printer case

1. Turn OFF the power to both the printer and the computer, and disconnect the interface cable from the printer.

2. Remove the dust cover. Take off the paper feed knob on the right side by pulling it straight out from the printer.

3. Remove the ribbon cartridge.

4. Using a Phillips screwdriver, remove the retaining screws on the upper half of the printer case. There are two screws on the LQ-800 as shown in the diagram. On the LQ-1000, there are three screws.

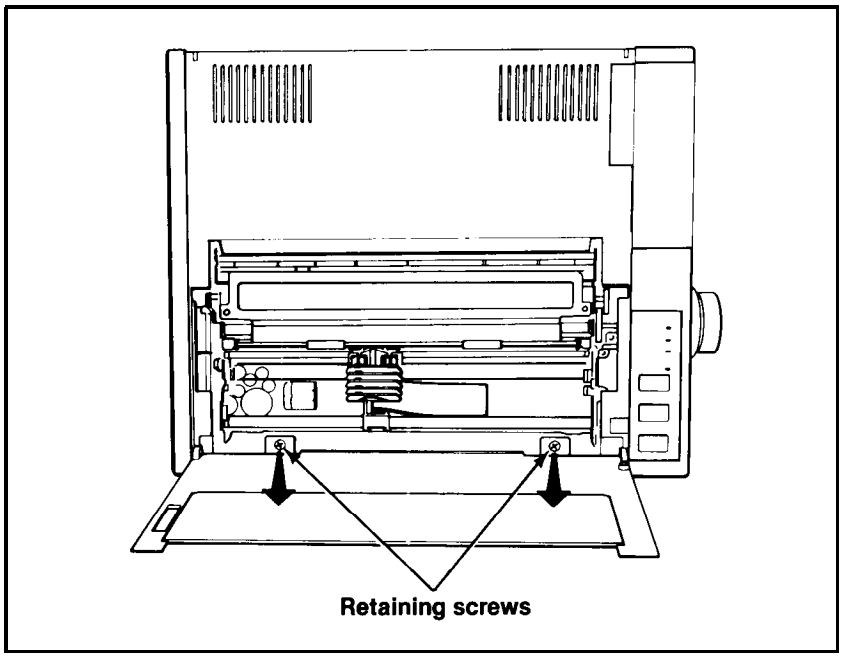


Figure G-1. Removing the upper case

5. With the printer facing you, slowly lift the upper case. Don't lift the case too high, because the control panel is still attached.

6. On the underside of the printer cover, at each end of the control panel, are two plastic retaining clips as shown in the diagram below. Reach under the control panel and squeeze these clips slightly to release the panel from the case.

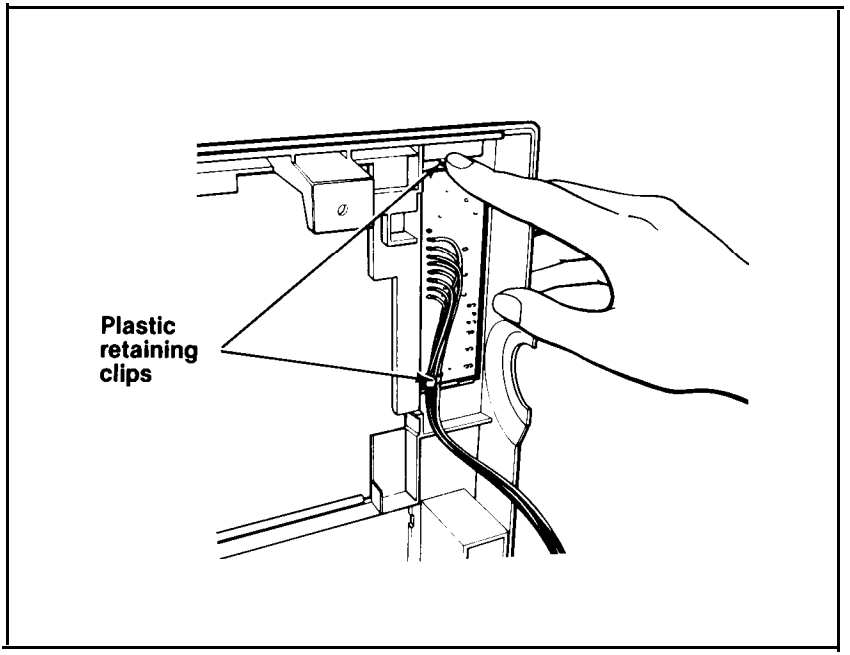


Figure G-2. Removing the control panel

7. Slip the control panel through the case and set the case to one side.

To replace the case, reverse the previous steps. Make sure that the control panel connector has not been disconnected from the main circuit board. If it needs to be reconnected, the connector can only be connected one way, so make sure that the arrangement of the holes in the connector matches the pattern of pins on the circuit board. When replacing the paper feed knob, make sure that the flat side of the shaft is matched with the hole in the paper feed knob.

Installing an Interface Board

1. Remove the upper case of the printer, following the steps described in the previous section.

2. Remove the plastic piece from the hole at the back of the upper case to allow access to the new interface connector when the case is re-assembled.

3. Locate the supports shown in Figure G-3 on which the interface board will rest, and the screw at the rear of the circuit board labelled FG. The screw marked FG is the connection for the frame ground wire. Remove the frame ground screw and the screw in the support next to the parallel connector.

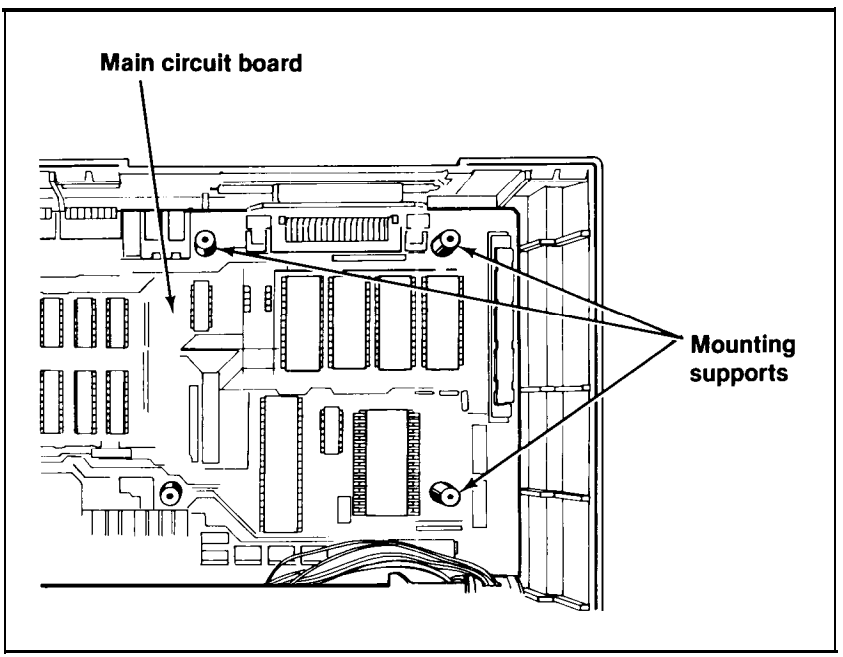


Figure G-3. Main circuit board

4. Plug the connector of the interface board into the female connector on the main circuit board of the printer. This connector is labelled CN2 on the circuit board.

5. Secure the board to the support posts using the screws provided.

6. Connect the frame ground wire to the FG terminal on the interface board, as shown in the diagram. On the LQ-1000, there are three screws.

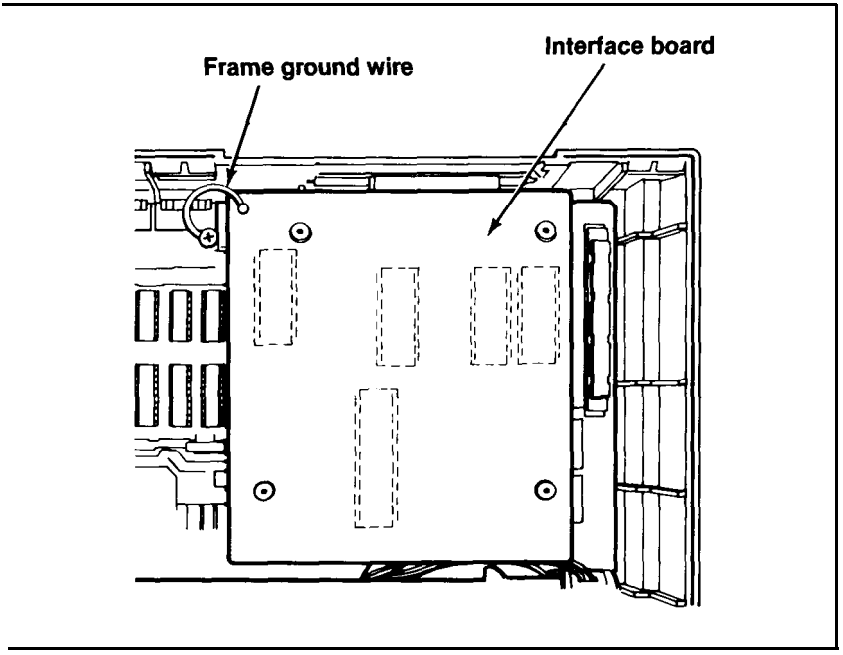


Figure G-4. Interface board mounted on main circuit board

7. Reassemble the printer, following the procedure described in the previous section.

Altering Serial Interface Settings

If you are using an optional serial interface, then you may have to alter the communications protocol of the printer or the computer in order to allow them to communicate properly. The protocol used by the printer is decided by one or two groups of DIP switches located on the serial interface board; the protocol used by the computer can probably be altered by a software command. It is essential that the printer and computer use compatible protocols.

If you can, adjust the settings on the computer rather than the interface board as the interface is set up at the factory to give optimum performance under a wide range of conditions. If your dealer has installed the interface for you, he or she should also be able to set the

computer and interface to match. If you have installed the interface yourself but are unsure of the settings, consult your dealer.

If you need to alter the settings on the interface yourself, perhaps in order to use a different computer, the following tables will help you match the computer and the interface. The settings given in the tables cover the conventions used by the computer and printer as data is transferred. If you need to adjust any of the other settings, consult the manual supplied with the interface, and if necessary your Epson dealer.

For interfaces #8143, 8148 and 8149 the baud rates are set by these switches:

Table G-1. Baud rate settings for ***8143***

baud rate	switch 1-1	switch 1-3	switch 1-4	switch 1-7
300	OFF	OFF	ON	ON
600	OFF	ON	OFF	ON
1200	OFF	OFF	OFF	ON
2400	ON	OFF	ON	OFF
4800	ON	ON	OFF	OFF
9600	ON	OFF	OFF	OFF

Table G-2. Baud rate settings *for* ***8148***

baud rate	switch 1-5	switch 1-6	switch 1-7	switch 1-8
300	ON	OFF	ON	OFF
600	ON	OFF	OFF	ON
1200	ON	OFF	OFF	OFF
2400	OFF	ON	ON	OFF
4800	OFF	ON	OFF	ON
9600	OFF	ON	OFF	OFF

Table G-3. Baud rate settings for 8149

baud rate	switch 2-5	switch 2-6	switch 2-7	switch 2-8
300	ON	OFF	ON	OFF
600	ON	OFF	OFF	ON
1200	ON	OFF	OFF	OFF
2400	OFF	ON	ON	OFF
4800	OFF	ON	OFF	ON
9600	OFF	ON	OFF	OFF

Table G-4. Parity check settings for 8143

	ON	OFF
switch 1-2	7 bits	8 bits
switch 1-6	parity enabled	parity disabled
switch 1-5	parity disabled	parity enabled

Table G-5. Parity check settings for 8148

	ON	OFF
switch 1-1	7 bits	8 bits
switch 1-2	parity enabled	parity disabled
switch 1-3	parity disabled	parity enabled

Table G-6. Parity check settings for 8149

	ON	OFF
switch 2-1	7 bits	8 bits
switch 2-2	panty enabled	parity disabled
switch 2-3	parity disabled	parity enabled

Appendix H
Technical Specifications

Printing

Printing method	Serial impact dot matrix
Pin configuration	24 wires (12 X 2 staggered, diameter 0.2mm)
Printing speed	180 characters per second per line in draft pica; 60 characters per second per line in Letter Quality pica
Paper feed speed	Approximately 100 ms/line at 1/6 inch/line and approximately 2.2 inches per second during continuous line feed
Printing direction	Bidirectional, logic seeking Unidirectional (left to right) in graphics mode
Character sets	Epson Letter Quality Roman Epson Letter Quality proportional Roman Epson Sans Serif draft
Buffer	1K or 7K bytes
Line spacing	Default is 1/6 inch. Programmable in increments of 1/180 of an inch

Characters per line:

	Maximum characters per line	
	LQ-800	LQ-1000
Pica	80	136
Pica double-width	40	68
Elite	96	163
Elite double-width	48	81
Fifteen	120	204
Condensed	137	233
Condensed elite	160	272
Condensed double-width pica	68	116

Paper

Number of copies . . . . . One original plus one copy (total thickness is .004 inches)

LQ-800

	Paper width	Paper feed
Continuous-feed paper	4" **to 10"**	Tractor feed with optional tractor unit
Cut sheet	7.2" to **10.0"**	Friction feed

LQ-1000

	Paper width	Paper feed
Continuous-feed paper	4" **to** 16"	Tractor feed with optional tractor unit
Cut sheet	7.2" to 14.3"	Friction feed

Printer

Ribbon . . . . . Cartridge ribbon, black

Ribbon life expectancy . . . . 2 million characters

MCBF . . . . . 5 million lines (excluding print head life)

Print head life . . . . . 200 million strokes

Dimensions and weight

	LQ-800	LQ-1000
Height	3.8 in.	3.8 in.
Width (with paper feed knob)	16.5 in.	23.5 in.
Depth	13.2 in.	13.2 in.
Weight	13.2 lbs.	17.6 lbs.

Power

Power . . . . . 120 VAC + 10%

Power usage . . . . . 70 volt-amperes maximum

Frequency . . . . . 49.5 to 60.5 Hz

Environment

Temperature . . . . . Operating 41°F to 95°F (5°C to 35°C)
Storage -31°F to 149°F (-35°C to 65°C)

Humidity . . . . . Operating 10% to 80% (no condensation)
Storage 5% to 85% (no condensation)

Shock . . . . . Operating 1 G (less than 1 millisecond)
Storage 2 G (less than 1 millisecond)

Vibration . . . . . Operating 0.25 G, 55Hz (maximum)
Storage 0.50 G, 55Hz (maximum)

Insulation resistance . . . . . 10 megaohms between AC power line and chassis

Dielectric strength . . . . . No trouble when 1 kilovolt (R.M.S.) 50 or 60 Hz is applied for more than 1 minute between AC power line and chassis

Parallel Interface

Interface . . . . . Centronic® compatible, g-bit parallel

Synchronization . . . . . By externally supplied STROBE pulses

Handshaking . . . . . By ACKNLG and BUSY signals

Logic level . . . . . Input data and all interface control signals are TTL levels

Serial Interface

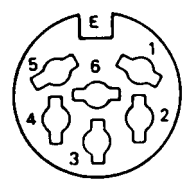
Interface . . . . . RS-232C serial

Synchronization . . . . . Asynchronous

Handshaking . . . . . By REV signal

Signal level RS-232C
MARK = "1" (-3v to -27v)
SPACE = "0" (+ 3v + 27v)

Connector . . . . . 6-pin DIN connector



Appendix I

Command Summary

This appendix lists the default settings of the LQ. It also contains all of the control codes and ESCape sequences used by the LQ. They are first listed in numerical order and then by function. Each listing in the numerical section gives the page in the function section where full information on the command is given. For many of the commands you can also consult the index to find out where they are discussed in the text.

Default Settings

When your LQ comes from the factory, it is set to the following defaults. Defaults are the settings in effect each time the printer is turned on. A dot (•) means that you can change the default for this setting by changing a DIP switch.

- Pica width

  Margins set at maximums: left margin at 0 and right margin at 80 on the LQ-800 and 136 on the LQ-1000

  l/6 of an inch line spacing

  Page length of 11 inches

  Horizontal tabs set at every eight characters

- USA character set

  Top-of-page is set at the position of the print head.

Commands in Numerical Order

The following list shows the control codes and ESCape sequences that the LQ uses along with their decimal values.

Commands by Function

This section describes all the LQ control codes. They are divided in the following way:

Print Quality	Graphics
Character Width	User-Defined Characters
Print Enhancement	MSB Control
Page Formatting	Other Codes
Word Processing	

Each command has a format section and a comment section. The format section gives the ASCII, decimal, and hexadecimal codes for the command. In some cases there is also a control key code because some commercial software programs can use a control key for a code between 0 and 27 (decimal). In this section, CTRL O for example, means hold down the control key while you press O.

Letters in parentheses, such as (n) or (d), are variables, which are explained in the comments sections.

In BASIC you can use either decimal or hexadecimal numbers, and if there is a single letter in the second ASCII code column, you can use that letter in quotation marks instead of the number below it. For example, the format section for the right margin command is as follows:

ASCII code:	**ESC**	**Q**	**(n)**
Decimal:	27	81	(n)
Hexadecimal:	**1B**	**51**	**(n)**

In BASIC you can send the command to set the right margin to 60 in three ways:

Decimal: `LPRINT CHR$(27) CHR$(81) CHR$(60)`
Hex: `LPRINT CHR$(&H1B) CHR$(&H51) CHR$(&H3C)`
Decimal with quotes: `LPRINT CHR$(27) "Q" CHR$(60)`

ESCape sequences that require a 0 or 1 with a letter, such as ESC 'Wl" to turn on double-width, can use either the ASCII code or the numeral in quotation marks for the 0 or 1. For example, in BASIC you can turn on double-width with either of the formats below:

`LPRINT CHR$(27)"Wl"` or `LPRINT CHR$(27)"W"CHR$(l)`

Print Quality

ESC x — Select Print Quality

Format:

ASCII code:	**ESC**	**x**	**(n)**
Decimal :	**27**	**120**	**(n)**
Hexadecimal:	**1B**	**78**	**(n)**

Comments:

n = `0` selects draft mode
n = `1` selects Letter Quality mode

Character Width

SI — Select Condensed Mode

Format:

ASCII code: SI
Decimal: **15**
Hexadecimal: **OF**
Control: **CTRL O**

Comments:

Condensed pica has `17.16` characters per inch.

ESC SI — Select Condensed Mode

Format:

ASCII code:	**ESC**	**SI**
Decimal:	**27**	**15**
Hexadecimal :	**1B**	**0F**

Comments:

Duplicates the SI command.

DC2 — Cancel Condensed Mode

Format:

ASCII code: DC2
Decimal: **18**
Hexadecimal: **12**
Control: **CTRL R**

Comments:

Cancels compressed printing set by SI or ESC SI.

SO — Select Double-Width Mode (one line)

Format:

ASCII code: SO
Decimal : **14**
Hexadecimal: **0E**
Control: **CTRL N**

Comments:

Doubles the width of all characters. It can be cancelled by a carriage return, DC4, ESC W or ESC !.

ESC SO — Select Double-Width Mode (one line)

Format:

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

Comments:

Duplicates the SO command.

DC4 — Cancel Double-Width Mode (one line)

Format:

ASCII code:	**DC4**
Decimal:	20
Hexadecimal :	**14**
Control:	**CTRL T**

Comments:

Cancels one-line double-width printing selected by SO or ESC SO, but not double-width printing set by ESC W or ESC !.

ESC W — Select/Cancel Double-Width Mode

Format:

ASCII code:	**ESC**	**W**	**(n)**
Decimal :	27	87	(n)
Hexadecimal:	**1B**	**57**	**(n)**

Comments:

Double-Width mode doubles the width of all characters.
n = 1 selects the mode; n = **0** cancels it

ESC M — Select Elite Width

Format:

ASCII code:	**ESC**	**M**
Decimal:	27	77
Hexadecimal:	**1B**	**4D**

Comments:

Elite width has 12 characters per inch, and cancels pica (10 cpi) or fifteen (15 cpi).

ESC P — Select Pica Width

Format:

ASCII code:	**ESC**	**P**
Decimal :	27	80
Hexadecimal :	**1B**	**50**

Comments:

Selects pica (10 characters per inch), and cancels elite (12 cpi) or fifteen (15 cpi).

ESC g — Select Fifteen Width

Format:

ASCII code:	ESC	9
Decimal:	27	103
Hexadecimal:	1B	87

Comments:

Selects **15** characters per inch, and cancels pica **(10** cpi) or elite **(12** cpi). Fifteen cannot be combined with condensed.

Print Enhancement

ESC E — Select Emphasized Mode

Format:

ASCII code:	ESC	E
Decimal:	27	69
Hexadecimal :	1B	45

Comments:

In emphasized mode, each dot is printed twice, with the second dot slightly to the right of the first. Reduces printing speed.

ESC F — Cancel Emphasized Mode

Format:

ASCII code:	ESC	F
Decimal:	27	70
Hexadecimal:	1B	46

Comments:

Turns off the mode selected by ESC E.

ESC G — Select Double-Strike Mode

Format:

ASCII code:	**ESC**	**G**
Decimal:	**27**	**71**
Hexadecimal :	**1B**	**47**

Comments:

In double-strike each line is printed twice, with the second printing slightly below the first.

ESC H — Cancel Double-Strike Mode

Format:

ASCII code:	**ESC**	**H**
Decimal:	**27**	**72**
Hexadecimal:	**1B**	**48**

Comments:

Turns off the mode selected by ESC G.

ESC S 0 — Select Superscript

Format:

ASCII code:	**ESC**	**S**	**0**
Decimal:	**27**	**83**	**0**
Hexadecimal:	**1B**	**53**	**0**

Comments:

Selects superscript mode.

ESC S 1 — Select Subscript

Format:

ASCII code:	**ESC**	**S**	**1**
Decimal:	**27**	**83**	1
Hexadecimal:	**1B**	**53**	1

Comments:

Selects subscript mode.

ESC T — Cancel Superscript/Subscript

Format:

ASCII code:	**ESC**	**T**
Decimal:	27	84
Hexadecimal:	**1B**	**54**

Comments:

Cancels either mode.

ESC - — Select/Cancel Underlining

Format:

ASCII code:	**ESC**	**-**	**(n)**
Decimal:	27	45	(n)
Hexadecimal:	**1B**	2D	**(n)**

Comments:

n = `1` selects underlining
n = `0` cancels it.

ESC ! — Master Select

Format:

ASCII code:	**ESC**	!	**(n)**
Decimal:	27	33	(n)
Hexadecimal :	**1B**	21	**(n)**

Comments:

Selects any valid combination of the following modes: pica, elite, proportional, condensed, emphasized, double-strike, double-width, italic, underline. (See Chapter 5 for more information.)

ESC 4 — Select Italic Mode

Format:

ASCII code:	**ESC**	4
Decimal :	27	52
Hexadecimal:	**1B**	34

Comments:

Causes characters to be printed in the italic character set.

ESC 5 — Cancel Italic Mode

Format:

ASCII code:	**ESC**	5
Decimal:	27	53
Hexadecimal:	**1B**	**35**

Comments:

Cancels the mode selected by ESC 4.

ESC R — Select an International Character Set

Format:

ASCII code:	**ESC**	**R**	**(n)**
Decimal :	**27**	82	**(n)**
Hexadecimal:	**1B**	**52**	**(n)**

Comments:

See Chapter 5 for details on this command.

Page Formatting

Margins

ESC Q — Set Right Margin

Format:

ASCII code:	**ESC**	**Q**	**(n)**
Decimal:	**27**	81	**(n)**
Hexadecimal:	**1B**	**51**	**(n)**

Comments:

Sets the right margin. Also cancels all text in the print buffer.
The range of n is **1** to 255.

ESC l — Set Left Margin

Format:

ASCII code:	**ESC**	l	**(n)**
Decimal:	**27**	**108**	**(n)**
Hexadecimal:	**1B**	6C	**(n)**

Comments:

Sets the left margin.
n = first printing column in the current width
The value of n is 0 to 255.
Clears previous tab settings; therefore should be set before tabs are set. Use lowercase 1, not the numeral one.

ESC N — Select Skip-Over-Perforation

Format:

ASCII code:	**ESC**	**N**	**(n)**
Decimal:	27	78	(n)
Hexadecimal:	**1B**	**4E**	**(n)**

Comments:

The variable n is the number of lines skipped between the last line printed on one page and the first line on the next page. The range of n is 0 to 127. You can select a one-inch margin as the printer default setting by moving DIP switch **1-7** to the OFF position.

ESC O — Cancel Skip-Over-Perforation

Format:

ASCII code:	**ESC**	**O**
Decimal:	27	79
Hexadecimal:	**1B**	**4F**

Comments:

Cancels the mode selected by ESC N. Use the letter "O," not the number 0.

Line spacing

LF — Line Feed

Format:

ASCII code:	**L F**
Decimal :	**10**
Hexadecimal:	**0 A**
Control:	**CTRL J**

Comments:

Advances the paper one line. The paper is advanced the default value (l/6-inch) or may be set to advance another value.

ESC 0 — Select l/&inch Line Spacing

Format:

ASCII code:	**ESC**	**0**
Decimal :	27	46
Hexadecimal:	**1B**	**30**

Comments:

Sets the line spacing to l/8 of an inch for subsequent line feed commands. The "0" is the digit zero and not ASCII code 0.

ESC 2 — Select 1/6-inch Line Spacing

Format:

ASCII code:	**ESC**	2
Decimal:	27	50
Hexadecimal:	**1B**	**32**

Comments:

Sets the line spacing to l/6 of an inch for subsequent line feed commands. The "2" is the digit two and not ASCII code 2. This is the default at power on.

ESC 3 — Select n/180-inch Line Spacing

Format:

ASCII code:	**ESC**	3	(n)
Decimal:	27	51	(n)
Hexadecimal :	**1B**	**33**	**(n)**

Comments:

Sets the line spacing to n/180 of an inch for subsequent line feed commands. The "3" is the digit three and not ASCII code 3. The value of n should be in the range 0 to 255.

ESC J — Immediate n/180-inch Line Feed

Format:

ASCII code:	**ESC**	**J**	**(n)**
Decimal :	27	74	(n)
Hexadecimal :	**1B**	**4A**	**(n)**

Comments:

Advances the paper by one line at a spacing of n/180 of an inch. The value of n should be in the range 0 to 255. This produces an immediate line feed but does not affect subsequent line spacing and does not produce a carriage return.

ESC A — Select n/60-inch Line Spacing

Format:

ASCII code:	**ESC**	**A**	**(n)**
Decimal :	**27**	65	**(n)**
Hexadecimal:	**1B**	**41**	**(n)**

Comments:

Sets the line spacing to n/60 of an inch for subsequent line feed commands. The value of n should be in the range 0 to 85.

Form feed and page length

FF — Form Feed

Format:

ASCII code: **F F**
Decimal: 12
Hexadecimal: 0C
Control: **CTRL L**

Comments:

Advances the paper to the top of the next page according to the current page length.

ESC C — Select Page Length in Lines

Format:

ASCII code:	**ESC**	**C**	**(n)**
Decimal:	27	97	(n)
Hexadecimal:	**1B**	**43**	**(n)**

Comments:

Sets the page length to n lines. The value of n is 0 to **127** lines.

ESC CO — Select Page Length in Inches

Format:

ASCII code:	**ESC**	**C**	**0**	**(n)**
Decimal:	**27**	**67**	**0**	**(n)**
Hexadecimal:	**1B**	**43**	**00**	**(n)**

Comments:

Sets the page length to n inches where n has a value of 1 to 22 inches.

Tabs

HT — Tab Horizontally

Format:

ASCII code:	**H T**
Decimal:	9
Hexadecimal:	09
Control:	**CTRL I**

Comments:

Advances the print position to the next horizontal tab setting. Default tabs are every eight spaces.

ESC D — Set Horizontal Tabs

Format:

ASCII code:	ESC	D	(n1)	(n2)	...	0
Decimal:	27	68	(n1)	(n2)	...	0
Hexadecimal:	1B	44	(n1)	(n2)	...	00

Comments:

This command allows setting of up to 32 horizontal tabs. These are entered as n1, n2, n3 etc. (in the range 1 to 255) with ASCII 0 as the terminator. The tab settings n1, n2, n3 etc. must be entered in ascending order. If nl = 0, all tabs are cleared. Tab settings are not affected by character width. With proportional printing, tab settings are based on the character width of pica print.

ESC e — Set Relative Tabs

Format:

ASCII code:	ESC	e	(n)	(m)
Decimal:	27	101	(n)	(m)
Hexadecimal:	1B	65	(n)	(m)

Comments:

The value of m is 0 to 127. If the variable n equals 0, the format is horizontal. If the variable n equals 1, the format is vertical.

VT — Tab Vertically

Format:

ASCII code: VT
Decimal : 11
Hexadecimal: 0B
Control: CTRL K

Comments:

Advances the paper to the next tab setting in the channel selected by ESC /. If no channel has been selected, channel 0 is used. If no vertical tabs have been selected, the paper advances one line.

ESC B — Set Vertical Tabs

Format:

ASCII code:	**ESC**	**B**	**(n1)**	**(n2)**	**...**	**0**
Decimal:	**27**	**66**	**(n1)**	**(n2)**	**...**	**0**
Hexadecimal:	**1B**	**42**	**(n1)**	**(n2)**	**...**	**00**

Comments:

Sets up to 16 vertical tabs in the current line spacing. The range of n is 0 to 254. the values of n must be entered in ascending order. Terminate this tab sequence with 0 or a number less than that of the last tab. Tab settings are not affected by subsequent changes in line spacing.

ESC b — Set Vertical Tabs in Channels

Format:

ASCII code:	**ESC**	**b**	**(c)**	**(n1)**	**(n2)**	**...** **0**
Decimal:	**27**	**98**	**(c)**	**(n1)**	**(n2)**	**...** **0**
Hexadecimal:	**1B**	**62**	**(c)**	**(n1)**	**(n2)**	**...** **00**

Comments:

c = 0 to 7

Sets up to 16 vertical tabs for channel c.

The tab settings can be cleared by giving a value of zero to nl. The range of n, given in lines, is 0 to 254. Tab settings are not affected by subsequent changes in line spacing.

ESC l — Select Vertical Tab Channel

Format:

ASCII code:	**ESC**	**l**	**(c)**
Decimal :	**27**	**47**	**(c)**
Hexadecimal:	**1B**	2F	**(c)**

Comments:

This command is used to select the vertical tab channel, where c has the value 0 to 7.

ESC p — Select/Cancel Proportional Mode

Format:

ASCII code:	**ESC**	p	(n)
Decimal:	**27**	**112**	**(n)**
Hexadecimal:	**1B**	**70**	**(n)**

Comments:

Selects or cancels proportional printing mode.

n = 1 selects

n = 0 cancels

See Chapter 5 for further details and Appendix E for proportional width tables. This command overrides pica (10 cpi), elite (12 cpi), and fifteen (15 cpi) commands. Turn off the proportional mode before using these commands. Proportional printing is used with ESCape "\" by most word processing programs that perform true microjustification.

ESC k — Select Family of Typestyles

Format:

ASCII code:	**ESC**	**k**	**n**
Decimal:	**27**	**107**	**n**
Hexadecimal :	**1B**	**6B**	**n**

Comments:

Selects family of typestyles. The value of n is **0** to 127. The default setting is n = 0, Roman.

ESC (space) — Select Character Space

Format:

ASCII code:	**ESC**	**(space)**	**(n)**
Decimal:	27	32	(n)
Hexadecimal:	**1B**	20	**(n)**

Comments:

Determines the amount of space added to the right of each character, specified in dots. The value of n is 0 to 127.
n = number of dots

ESC $ — Select Absolute Horizontal Tab

Format:

ASCII code:	**ESC**	**$**	**(n1)**	**(n2)**
Decimal :	**27**	**36**	**(n1)**	**(n2)**
Hexadecimal:	**1B**	**24**	**(n1)**	**(n2)**

Comments:

Moves the print head to an absolute horizontal position. The position, in inches, is determined by the formula (nl + n2 X 256)/60. If you attempt to position the print head beyond the right margin, the command is ignored.

ESC \ — Move Print Head

Format:

ASCII code:	**ESC**	****	**(n1)**	**(n2)**
Decimal:	**27**	**92**	**(n1)**	**(n2)**
Hexadecimal:	1B	**5C**	**(n1)**	**(n2)**

Comments:

Moves the print head a specified distance from the last character printed. The distance, in inches, is determined by the following formula:
Draft: (nl + (n2 X 256))/120
LQ: (nl + (n2 X 256))/180
Proportional: (n1 + (n2 X 256))/180

ESC a — Justification

Format:

ASCII code:	**ESC**	**a**	**(n)**
Decimal :	**27**	**97**	**(n)**
Hexadecimal:	**1B**	61	**(n)**

Comments:

This sequence selects justification as follows:

n = 0: Selects left justification
n = 1: Selects right justification
n = 2: Selects centering
n = 3: Selects full justification

The default setting is n = 0.

Full justification (n = 3) is performed when the buffer becomes full.

For n = 3 a WIDTH statement may be required.

For n = 3 there should be no carriage returns within a paragraph.

ESC f — Set Print Position

Format:

ASCII code:	**ESC**	**f**	**(n)**	**(m)**
Decimal:	**27**	**102**	**(n)**	**(m)**
Hexadecimal:	**1B**	**66**	**(n)**	**(m)**

Comments:

Prints spaces or line feeds without carriage returns. The value of m is 0 to 127. If the variable n equals 0, the format is horizontal. If n equals 1, the format is vertical.

Graphics

Note: See Chapter 6 for sample graphics programs.

ESC K — Select Single-Density Graphics Mode

Format:

ASCII code:	ESC	K	(n1)	(n2)
Decimal:	27	75	(n1)	(n2)
Hexadecimal:	1B	4B	(n1)	(n2)

Comments:

Turns on graphics mode with 480 possible dots per 8-inch line and 816 per 13.6-inch line. The values n1 and n2 specify the number of dot columns of graphics data to print by the formula n1 + (n2 X 256).

(8-pin graphics)

ESC L — Select Double-Density Graphics Mode

Format:

ASCII code:	ESC	L	(n1)	(n2)
Decimal:	27	76	(n1)	(n2)
Hexadecimal:	1B	4C	(n1)	(n2)

Comments:

Turns on low-speed double-density graphics mode with 960 possible dots per 8-inch line and 1632 per 13.6-inch line. The values n1 and n2 specify the number of dot columns of graphics data to print by the formula n1 + (n2 X 256).

(8-pin graphics)

ESC Y Select High-Speed Double-Density Graphics Mode

Format:

ASCII code:	**ESC**	**Y**	**(n1)**	**(n2)**
Decimal:	**27**	**89**	**(n1)**	**(n2)**
Hexadecimal:	**1B**	**59**	**(n1)**	**(n2)**

Comments:

Turns on high-speed double-density graphics mode with 960 possible dot positions per B-inch line and 1632 per 13.6-inch line. Will not print consecutive dots in a row. The values n1 and n2 specify the number of dot columns of graphics data to print by the formula n1 + (n2 X 256).

(B-pin graphics)

ESC Z Select Quadruple-Density Graphics Mode

Format:

ASCII code:	**ESC**	**Z**	**(n1)**	**(n2)**
Decimal:	**27**	**90**	**(n1)**	**(n2)**
Hexadecimal:	**1B**	**5A**	**(n1)**	**(n2)**

Comments:

Turns on quadruple-density graphics mode with 1920 possible dot positions per B-inch line and 3264 per 13.6-inch line. Will not print consecutive dots in a row. The values n1 and n2 specify the number of dot columns of graphics data to print by the formula n1 + (n2 X 256).

(B-pin graphics)

ESC * — Select Graphics Mode

Format:

ASCII code:	**ESC**	*****	**(m)**	**(n1)**	**(n2)**
Decimal:	27	42	(m)	(n1)	(n2)
Hexadecimal:	**1B**	2A	**(m)**	**(n1)**	**(n2)**

Comments:

Turns on graphics mode m. See Chapter 6 for details on the 11 modes available. The values n1 and n2 specify the number of dot columns of graphics data to print by the formula n1 + (n2 X 256).

ESC ? — Reassign Graphics Mode

Format:

ASCII code:	**ESC**	**?**	**(s)**	**(m)**
Decimal:	27	63	(s)	(m)
Hexadecimal:	**1B**	**3F**	**(s)**	**(m)**

Comments:

Changes one graphics mode to another. The variable s is a character K, L, Y or Z, which is reassigned to a new mode number m = 0-6, 32, 33, 38, 39, or 40. See Chapter 6 for details on the 11 modes available.

User-Defined Characters

Note: See Chapter 6 for sample programs and further information.

ESC & — **Define User-Defined Characters**

Format:

ASCII code:	ESC	&	NUL	(d1)	(d2)	...	(dn)
Decimal:	27	38	0	(d1)	(d2)	...	(dn)
Hexadecimal:	1B	26	00	(d1)	(d2)	...	(dn)

Comments:

This command allows characters to be re-defined in the currently selected mode. See Chapter 6 for details.

ESC : — **Copy ROM into RAM**

Format:

ASCII code:	ESC	:	0	0	0
Decimal :	27	58	0	0	0
Hexadecimal:	1B	3A	00	00	00

Comments:

This code allows the characters in the LQ ROM to be copied into RAM so that they can be used with user-defined characters.

ESC % — **Select User-Defined Set**

Format:

ASCII code:	ESC	%	(n)
Decimal :	27	37	(n)
Hexadecimal:	1B	25	(n)

Comments:

This code selects the user-defined set if n = 1 and the standard set if n = 0. ESC & is required to define the character set.

MSB Control

Note: MSB control does not work for graphics data.

ESC # — MSB Control Sequence Cancel

Format:

ASCII code:	**ESC**	#
Decimal :	27	35
Hexadecimal:	**1B**	**23**

Comments:

Cancels the MSB control set by ESC = or ESC >.

ESC = (equal) — MSB = 0 Setting

Format:

ASCII code:	**ESC**	=
Decimal :	27	61
Hexadecimal :	**1B**	**3D**

Comments:

Selects MSB as 0. When this code is input, the MSB of an B-bit data input after this code becomes 0.

ESC > — MSB = 1 Setting

Format:

ASCII code:	**ESC**	›
Decimal:	27	62
Hexadecimal:	**1B**	**3E**

Comments:

Selects MSB as 1. When this code is input, the MSB of an 8-bit data input after this code becomes 1.

Other Codes

BEL — Beeper

Format:

ASCII code: **BEL**
Decimal: 7
Hexadecimal: 07
Control: **CTRL G**

Comments:

Sounds the LQ beeper for **0.1** seconds.

BS — Backspace

Format:

ASCII code: **BS**
Decimal : 8
Hexadecimal: 08
Control: **CTRL H**

Comments:

Prints out data in the print buffer, then moves the print position one space to the left. If this code is received immediately after graphics printing, the print position of subsequent data is moved back to the point at which graphics printing started. This command should not be used in proportional mode. For accurate positioning, use the ESCape "\" command.

CR — Carriage Return

Format:

ASCII code: **CR**
Decimal: **13**
Hexadecimal: **0D**
Control: **CTRL M**

Comments:

Returns the print position to the left margin without advancing the paper. If DIP switch 2-8 is ON, the LQ will add a line feed to the carriage return.

DC1 — Select Printer

Format:

ASCII code: **DC1**
Decimal: **17**
Hexadecimal: **11**
Control: **CTRL Q**

Comments:

Returns the printer to the on-line mode if it has been switched off by the printer deselect code, DC3. It will not switch the printer on-line if it has been switched off using the ON LINE switch on the control panel.

DC3 — Deselect Printer

Format:

ASCII code: **DC3**
Decimal: **19**
Hexadecimal: **13**
Control: **CTRL S**

Comments:

Places the printer in off-line mode until the select printer code DC1 is received.

CAN — Cancel Line

Format:

ASCII code: **CAN**
Decimal: 24
Hexadecimal: **18**
Control: **CTRL X**

Comments:

Removes all text in the print buffer, but does not affect control codes.

ESC EM — Cut Sheet Feeder Control

Format:

ASCII code:	**ESC**	**EM**	**(n)**
Decimal :	27	25	**(n)**
Hexadecimal:	**1B**	**19**	**(n)**

Comments:

Used with the optional cut-sheet feeder. When n = 0 the feeder is turned off, when n = 4 it is turned on. Using DIP switch 1-8 produces the same effect.

ESC < — Select Unidirectional Mode (one line)

Format:

ASCII code:	**ESC**	<
Decimal :	27	60
Hexadecimal:	**1B**	**3C**

Comments:

Selects unidirectional printing for more accurate positioning during multiple passes of text printing. It is valid for one line only and is cancelled by a carriage return.

ESC @ — Initialize Printer

Format:

ASCII code:	**ESC**	@
Decimal :	27	64
Hexadecimal:	**1B**	**40**

Comments:

Resets the printer to the power-on state, including top of page. Clears the buffer of all data entered before the command but not after.

ESC U — Select Unidirectional Mode

Format:

ASCII code:	**ESC**	**U**	**(n)**
Decimal :	**27**	85	**(n)**
Hexadecimal:	**1B**	**55**	**(n)**

Comments:

Selects unidirectional printing for more accurate positioning during text printing.

n = 1 selects the feature

n = **0** cancels it.

(Graphics printing is always unidirectional.)

ESC s — Select Half-Speed Mode

Format:

ASCII code:	**ESC**	**s**	**(n)**
Decimal :	**27**	**115**	**(n)**
Hexadecimal:	16	**73**	**(n)**

Comments:

n = **1** selects the mode

n = **0** cancels it.

DEL — Delete Character

Format:

ASCII code:	**DEL**
Decimal:	**127**
Hexadecimal:	**7F**

Comments:

Removes the last text character in the print buffer but does not affect control codes.

INDEX

Note: See Appendix I for listings and descriptions of specific commands and ESCape sequences.

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Quick Reference

LQ-800/1000 Printers

Print Modes

Code	Dec	Hex	Function
ESC x	120	78	Select LQ or draft
SI	15	OF	Select Condensed Mode
ESC SI	15	OF	Select Condensed Mode
DC2	18	12	Cancel Condensed Mode
s o	14	0E	Select Double-Width Mode (one line)
ESC SO	14	0E	Select Double-Width Mode (one line)
DC4	20	14	Cancel Double-Width Mode (one line)
ESC W	87	57	Select/Cancel Double-Width Mode
ESC M	77	4D	Select Elite Mode
ESC P	8 0	**50**	Select Pica Mode
ESC g	103	67	Select Fifteen Mode
ESC E	**69**	45	Select Emphasized Mode
ESC F	70	46	Cancel Emphasized Mode
ESC G	71	147	Select Double-Strike Mode
ESC H	72	48	Cancel Double-Strike Mode
ESC SO	83	53	Select Superscript
ESC S1	83	53	Select Subscript
ESC T	84	54	Cancel Superscript/Subscript
ESC -	45	2D	Select/Cancel Underlining
ESC !	33	21	Master Select
ESC 4	52	34	Select Italic Mode
ESC 5	53	3 5	Cancel Italic Mode
ESC R	8 2	52	Select an International Character Set

Page Formatting

ESC Q	81	51	Set Right Margin
ESC I	108	6C	Set Left Margin
ESC N	78	4E	Select Skip-Over-Perforation
ESC O	**79**	4F	Cancel Skip-Over-Perforation
LF	10	0A	Line Feed
ESC 0	48	30	Select 1/8-inch Line Spacing
ESC 2	50	3 2	Select 1/6-inch Line Spacing
ESC 3	51	33	Select n/180-inch Line Spacing
ESC J	74	4A	Immediate n/180-inch Line Feed
ESC A	65	41	Select n/60-inch Line Spacing
FF	12	0C	Form Feed
ESC C	67	43	Select Page Length in Lines
ESC CO	67	43	Select Page Length in Inches
HT	9	09	Tab Horizontally
ESC D	68	44	Set Horizontal Tabs
ESC e	101	65	Set Relative Tabs
VT	11	06	Tab Vertically
ESC **B**	66	42	Select Vertical Tabs
ESC b	**98**	6 2	Select Vertical Tabs in Channels
ESC /	47	2F	Select Vertical Tab Channel

Control Codes by Function

The following control codes are listed briefly for quick reference, For a more detailed explanation, see Appendix I. Variables are not included in this quick reference due to their complexity. For those codes that contain variables, such as ESC "Q" (n) for setting the right margin, refer to Appendix I.

Word Processing

Code	Dec	Hex	Function
ESC p	112	70	Select/Cancel Proportional Mode
ESC k	107	6B	Select Family of Typestyles
ESC **(space)**	**32**	**20**	Select Character Space
ESC $	36	24	Select Absolute Horizontal Tab
ESC	**92**	**5C**	Move Print Head
ESC a	97	61	Justification
ESC f	102	66	Set Print Position

Graphics

ESC K	75	4B	Select Single-Density Graphics Mode
ESC L	76	4C	Select Double-Density Graphics Mode
ESC Y	89	59	Select High-Speed Double-Density Graphics Mode
ESC Z	90	5A	Select Quadruple-Density Graphics Mode
ESC .	42	2A	Select Graphics Mode
ESC ?	63	3F	Reassign Graphics Mode

User-Defined Characters

ESC &	38	26	Define User-Defined Characters
ESC :	58	3A	Copy ROM into RAM
ESC %	37	25	Select User-Defined Set

Other Codes

ESC #	35	23	MSB Control Sequence Cancel
ESC = (equal)	61	3D	MSB = 0 Setting
ESC >	62	3E	MSB = 1 Setting
BEL	**7**	07	Beeper
BS	**8**	**08**	Backspace
CR	13	0D	Carriage Return
DC1	17	11	Select Printer
DC3	19	13	Deselect Printer
CAN	24	18	Cancel Line
ESC EM	25	19	Cut Sheet Feeder Control
ESC <	60	3C	Select Unidirectional Mode (one line)
ESC @:	64	40	Initialize Printer
ESC U	85	55	Select Unidirectional Mode
ESC s	115	73	Select Half-Speed Mode
DEL	127	7F	Delete Character

Table 1. DIP switch panel 1

Switch No.	Function	ON	OFF
1-1	International character set selection	See Table 3	
1-2			
1-3			
1-4	Select input buffer capacity	7KB	1KB
1-5	Select printing style	Draft	LQ
1-6	Condensed characters	ON	OFF
1-7	1 -inch skip-over-perforation	ON	OFF
1-8	Cut sheet feeder mode	ON	OFF

Table 2. DIP switch panel 2

Switch No.	Function	ON	OFF
2-1	Select page length	12″	11″
2-2	Not used		
2-3	Interface selection	See Table 4	
2-4			
2-5	Baud rate selection	See Table 5	
2-6			
2-7	Printer select signal	ON	OFF
2-8	Automatic line feed	ON	OFF

*Table 3. International DIP switch settings**

Country	1-1	1-2	1-3
USA	ON	ON	ON
France	ON	ON	OFF
Germany	ON	OFF	ON
U.K.	ON	OFF	OFF
Denmark	OFF	ON	ON
Sweden	OFF	ON	OFF
Italy	OFF	OFF	ON
Spain	OFF	OFF	OFF

*There are five additional international character sets available through software commands-Japan, Norway Denmark II, Spain II, and Latin America. See Chapter 5 for additional information

Table 4. Interface selection

Function	2-3	2-4
8-bit parallel interface	OFF	OFF
Serial interface, Even parity	ON	OFF
Serial interface, Odd parity	OFF	ON
Serial interface, Non parity	ON	ON

= Factory setting when delivered

Table 5. Baud rate selection

Baud rate	2-5	2-6
300	OFF	OFF
1200	ON	OFF
4800	OFF	ON
9600	ON	ON

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