OKIDATA

OKIMATE 10

Printer Manual
for Commodore® Computers
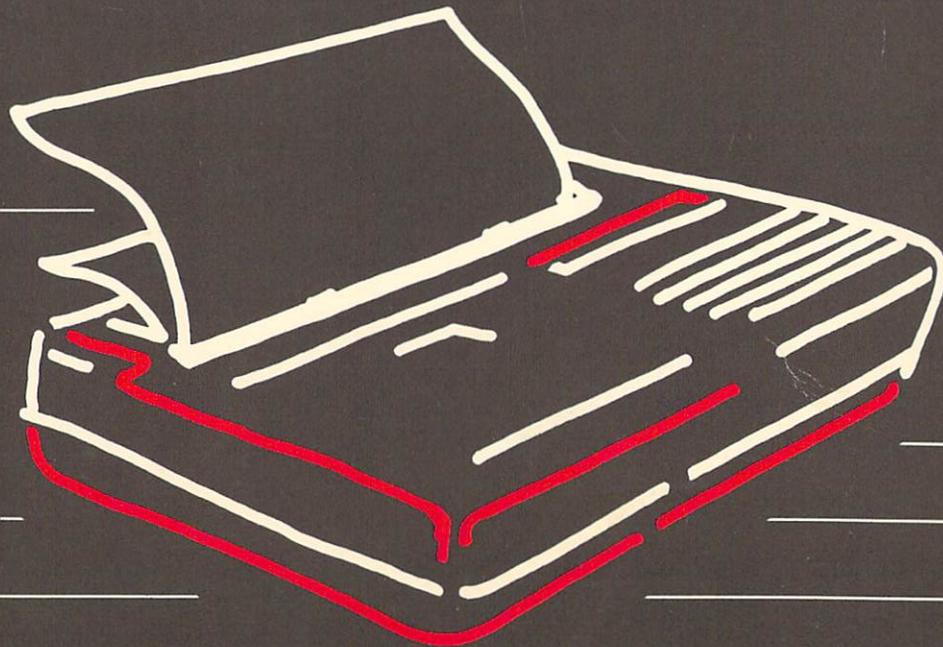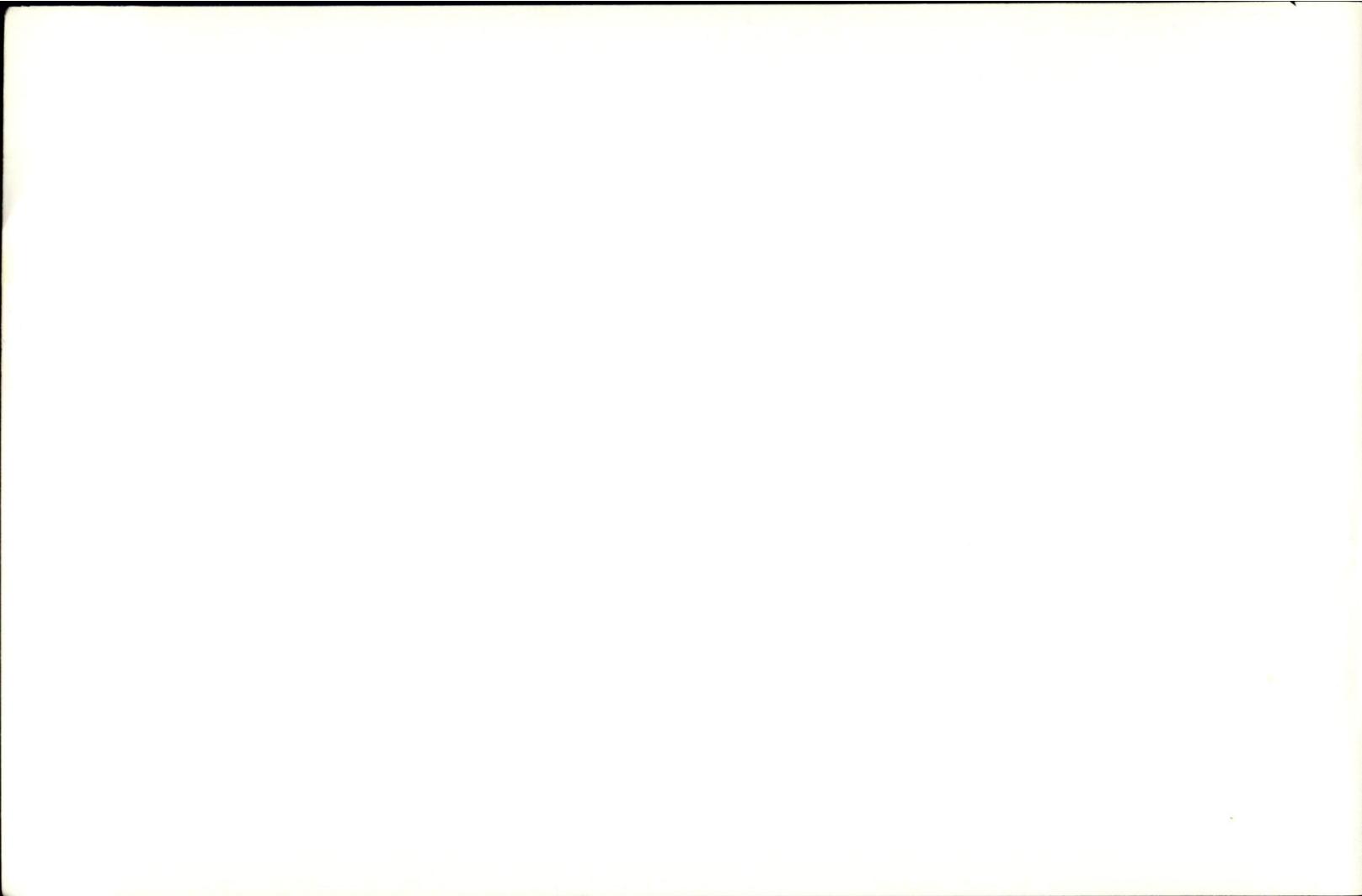
OKIMATE 10™
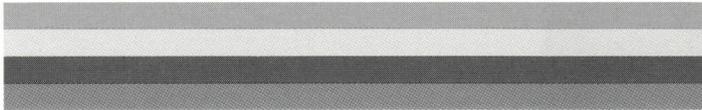
THE PERSONAL COLOR PRINTER

SPECIAL NOTE

This handbook will help you install and use your new OKIDATA printer. It contains everything you need to know to print with your OKIMATE's special features.

Every effort has been made to insure that the information in this document is complete, accurate and up-to-date. OKIDATA assumes no responsibility for the results of errors beyond its control. OKIDATA also cannot guarantee that changes in software and equipment made by other manufacturers, and referred to in this handbook, will not affect the applicability of the information in this handbook.

Revised edition July 1985.

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OKIMATE 10

Opening Moves

The rules of printing with your OKIMATE are easy, like learning the basic moves of a game. Within the next few pages, you'll be printing away.

But the OKIMATE isn't all fun and games. It gets down to some serious business. As you progress with your skills and knowledge, you'll learn the challenge of advanced strategy from special printing effects to color graphics. Follow this handbook to set up your pieces and to learn the basic rules.

From then on, it's your move!
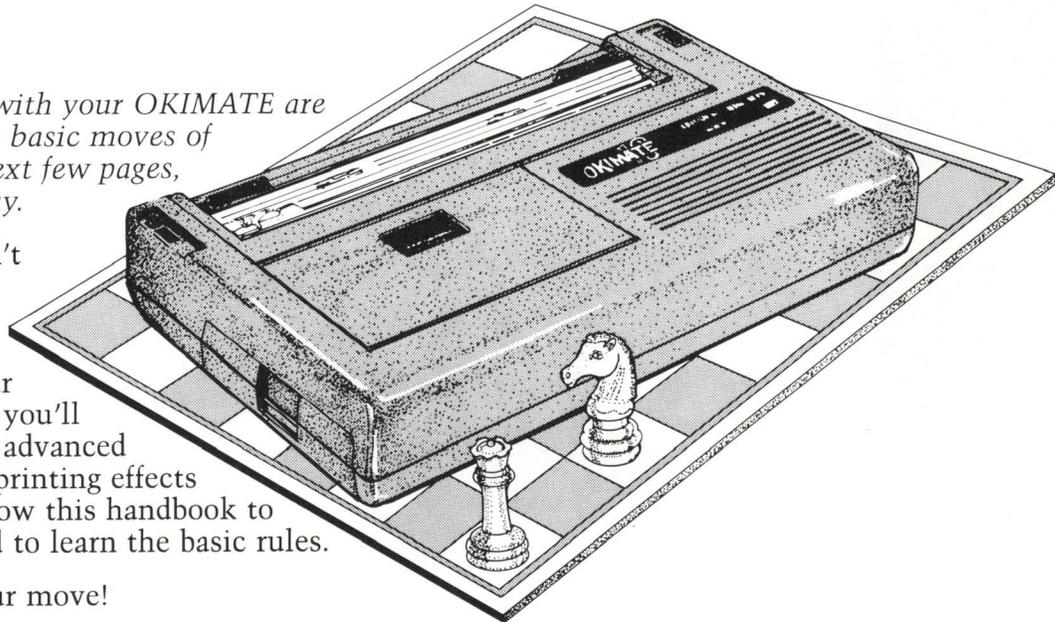
The Playing Pieces

Before you begin, make sure you have the following:

In the printer box...
    The OKIMATE 10 printer, of course

In the Plug 'N Print Kit...
    The Printer Handbook
    Black ribbon (in the clear bag)
    Color ribbon (in the color bag)
    Computer paper
    Commodore data cable
    "Learn to Print" demonstration and "Color
        Print" on disk
    Plug 'N Print Control Module for
        Commodore
    Commodore Control Module locking cover

If any of these items is missing or damaged, return the complete package, along with your sales receipt, to the place of purchase.

Don't plug your printer in just yet—we'll tell you when you can.

Inserting the Control Module

1. Slide the module into the slot until it is firmly in place.

2. Carefully push the module board with your thumb until you feel it's secure.

3. Insert the module locking cover as shown.

Follow the directions on the next few pages to setup and run the "Learn to Print" demonstration program. In about 15 minutes you can be printing in black or in color. At this point you only need the paper and the equipment supplied with your Commodore Plug 'N Print kit. (More detailed information on operating your OKIMATE is provided in Chapter 2, "A Player's Guide" which begins on page 15.)

Control Module

Module Locking Cover
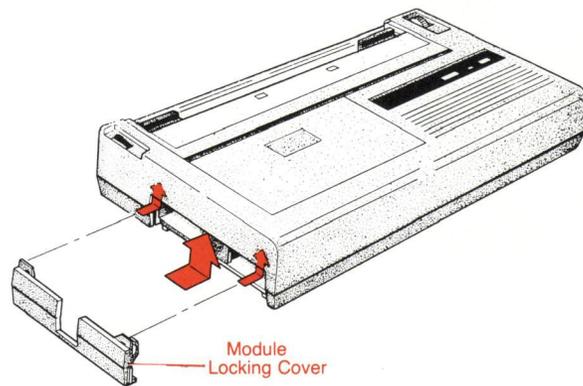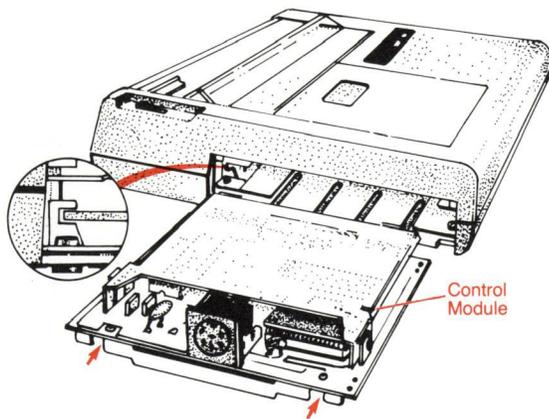
IMPORTANT: Always turn OKIMATE off before inserting or removing the control module. Directions for removing the control module are found on page 44.

Connecting the Commodore

Connect your OKIMATE to your Commodore:

Make sure both the OKIMATE and the Commodore are OFF.

Plug one end of the data cable supplied in your Plug 'N Print kit into the Commodore computer or the Commodore disk drive.

Connect the other end of the cable into the port on OKIMATE's control module.
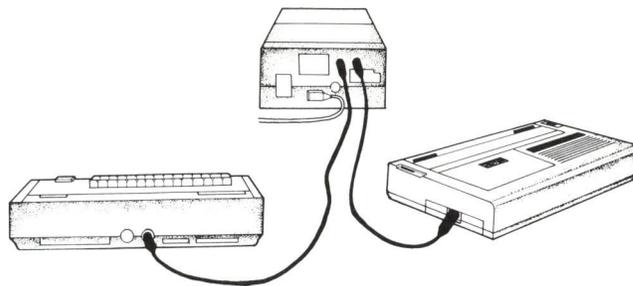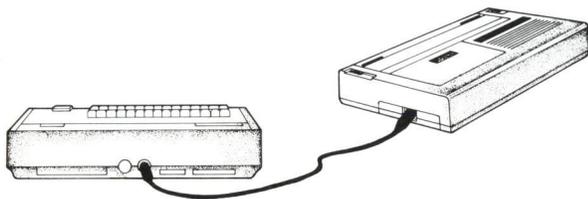
For a sample printout and an on-screen tutorial, run the program on your "Learn to Print" disk. Directions for using the demonstration disk follow.

NOTE TO VIC 20 OWNERS: When you're ready to run the Learn to Print program unplug any expansion memory connected to your computer.

Overview of the OKIMATE 10

Here are the locations of the buttons and levers you'll be using to load paper and ribbon into your printer:

Paper Guides

Paper Window

Paper Door

Paper Release Lever

Paper Advance Knob

OKIMATE 10   Dark ▶   Ready   Select

Control Panel

ON/OFF Power Switch

Ribbon Door
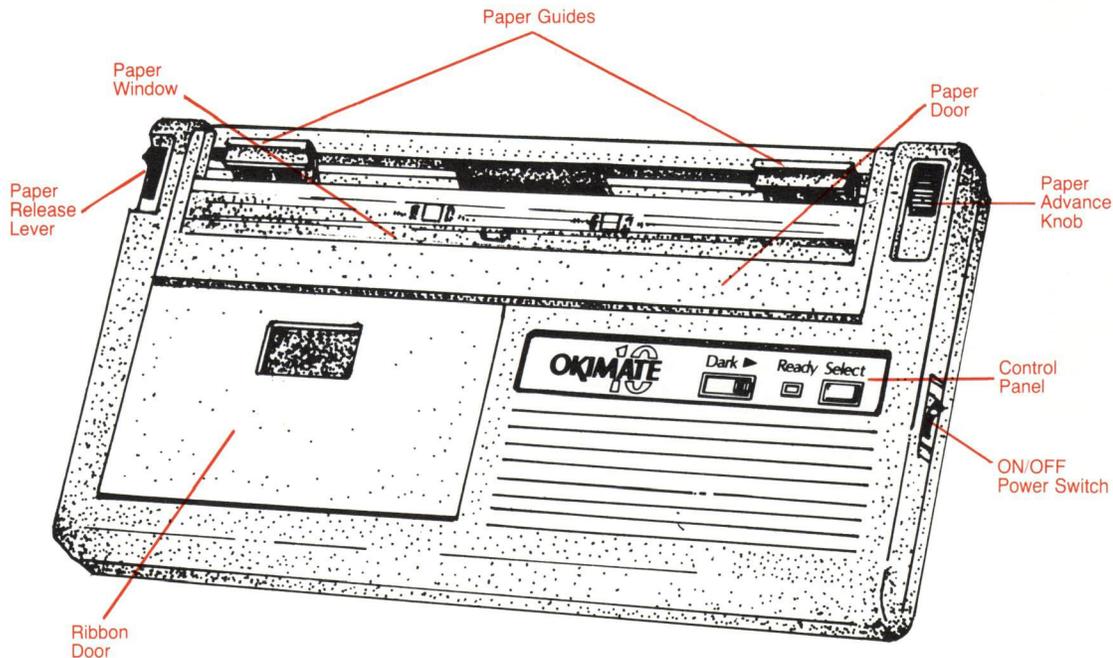
To get the best printing from your OKI-MATE, use smooth paper, like the computer paper that came with your Plug 'N Print kit. Smooth paper made especially for ribbon-transfer printers is available at most mass retail chain stores, office supply stores and computer stores. Look for these brands:

- Plain Paper for Thermal Transfer Printers from Hammermill Paper Company
- Compucolor Ribbon Transfer Paper from Schoeller Paper Company
- Rediform Paper Company boxes marked "Recommended for Thermal Transfer Printers"
- Acetate sheets up to .005 inch thick for transparencies.

Paper is also available from OKIDATA Supplies. See page 47 for our toll-free number.

Inserting Computer Paper

1. Set a small stack of computer paper on the table behind the OKIMATE.

2. Open the paper window.

3. Open the paper release for sprocket paper.
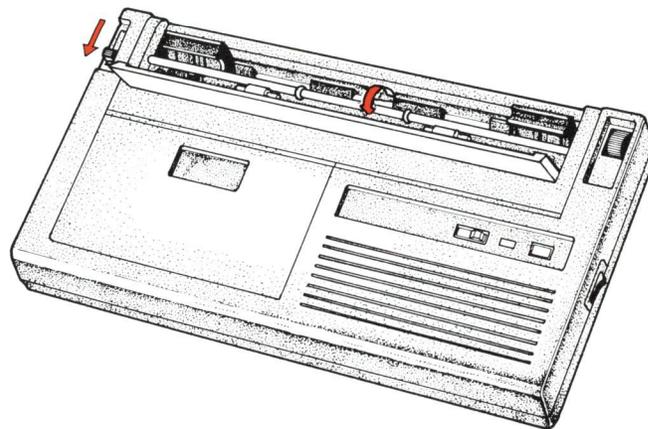
NOTE: Refer to page 9 for the correct position of the paper rollers.

4. Notice the markings behind each of the paper guides. If you are using the sprocket paper supplied with your Plug 'n Print kit adjust the paper guide so that the ◯▯ symbol lines up with the same symbol marked "9.5" on the printer.
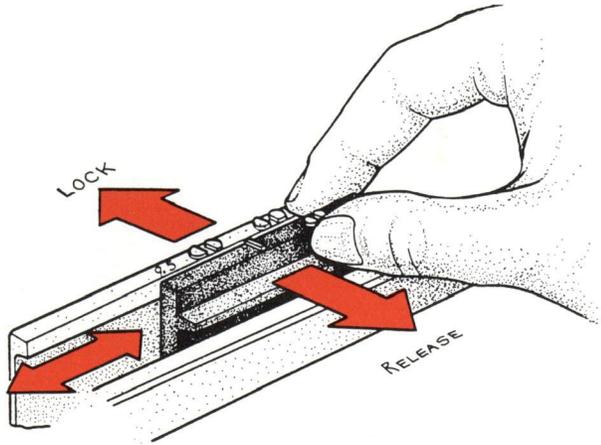
Pull the paper guide toward you to release and slide to the right or left to adjust to the correct paper width. When set, push the paper guide back to lock into place.

5. Insert the paper behind the paper guides.
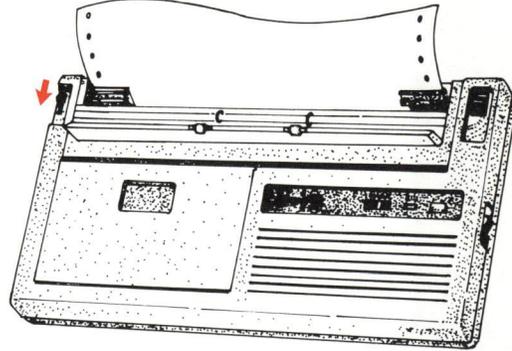
6. Advance the paper with the paper advance knob.
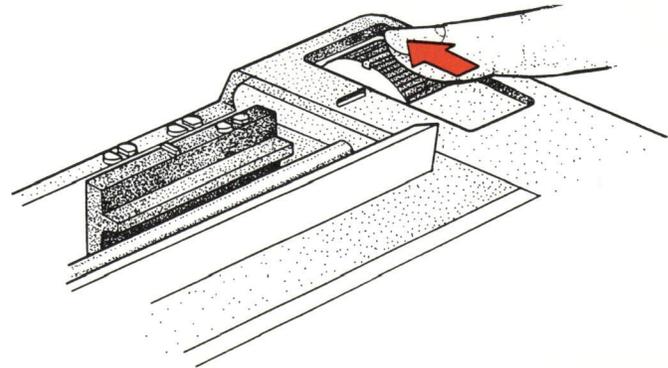
7. Close the paper window.
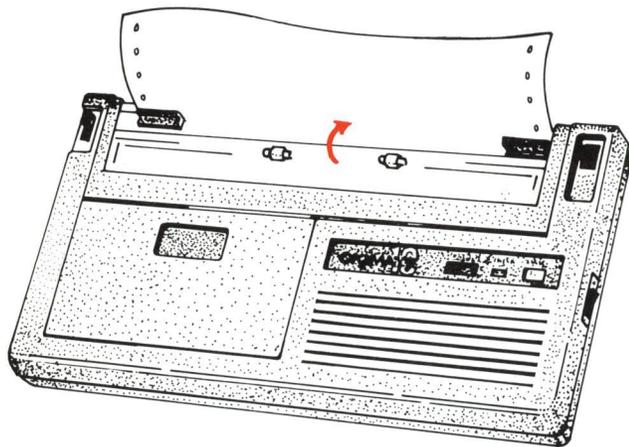
8. Use the paper advance knob to advance the paper to where you would like printing to start. If you advance the paper so that it is even with the paper window, print will begin 1/2 inch below the top of the page. Then when you turn OKIMATE on, the first printing line is recorded into memory and OKIMATE will automatically leave a 1/2 inch bottom and top margin on succeeding pages.

Inserting Single Sheets

1. Open the paper door.

2. If a ribbon is in the printer, pull back the printhead to provide clearance between the paper and exposed ribbon.

3. Adjust the paper guides so that the ⫾ marks are just outside the width of the paper—see illustration. To adjust the paper guides, pull the guide towards you to unlock and slide to the right or left then push back the paper guides to lock their position.

4. Insert the paper *behind the paper guides,* holding the paper upright and guiding it into the printer.

5. Advance the paper with the paper advance knob.
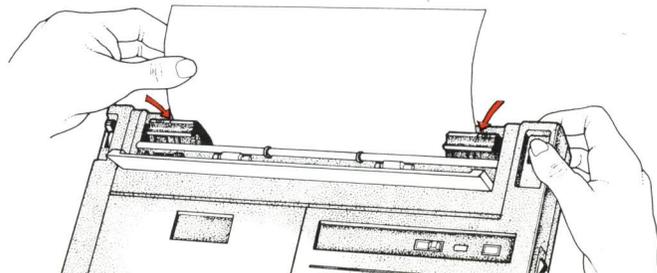
6. Push the printhead back to its upright position.

7. Close the paper release and the paper door.

8. Use the paper advance knob to advance the paper to where you would like printing to begin.

9. Continue to advance the paper so that it is even with the paper window. This will allow printing to begin 1/2 inch below the top of the page—the distance between the top edge and the first printed line on a page.

10. Check the position of the paper rollers, making sure they are evenly spaced between the right and left paper guides. If both rollers are to the left or all the way to the right, you may have difficulty inserting paper.

Correct Position of Rollers

RIGHT

WRONG
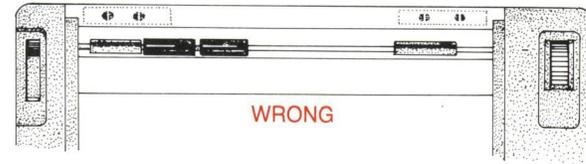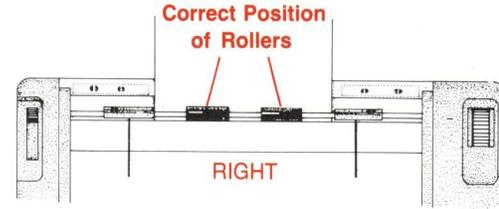
Loading the Ribbon

1. Remove the black ribbon from the clear bag.

2. Open the paper and ribbon doors.

Paper Door

Ribbon Door
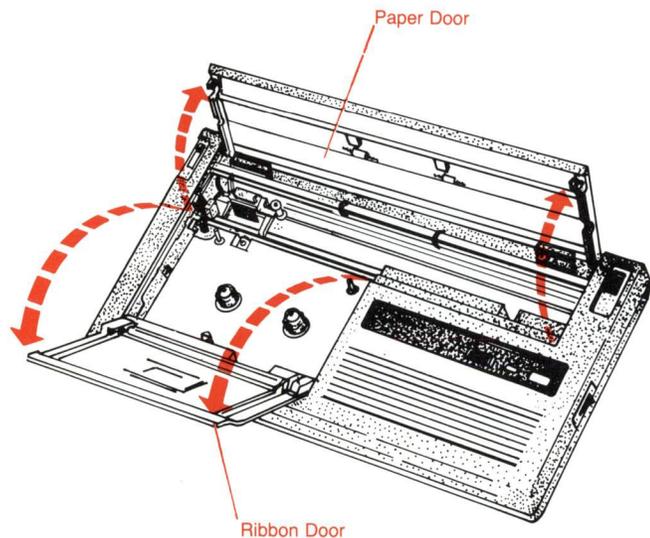
IMPORTANT: If the ribbon is loose, use the blue thumbdial to take up the slack before inserting the cartridge onto the plate.

Printhead

Printhead
Carriage
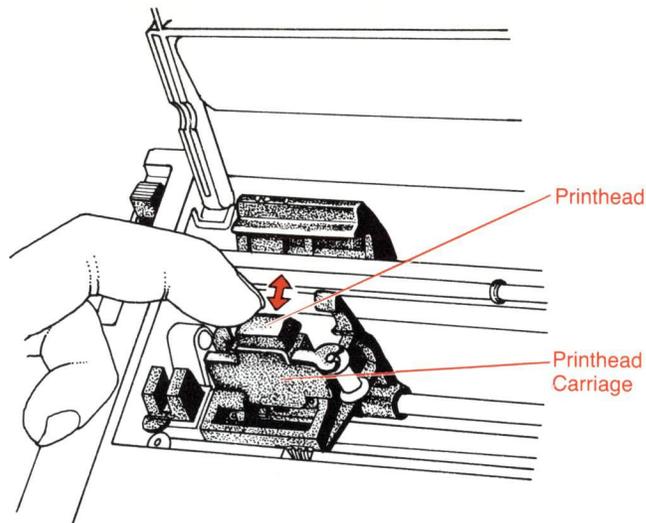
3. Remove the clip from the underside of the ribbon cartridge.

4. Slide the printhead carriage to the left side of the printer.

5. Grasp the printhead with your thumb and index finger then pull it towards you.

6. Lower the ribbon cartridge onto the plate, slipping the exposed ribbon in front of the printhead as shown below.
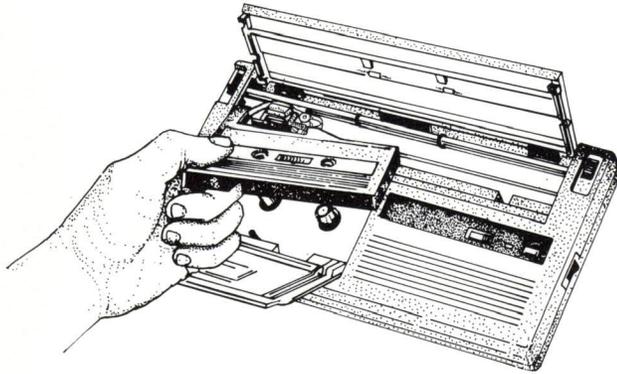
7. Close the ribbon door and then the paper door.
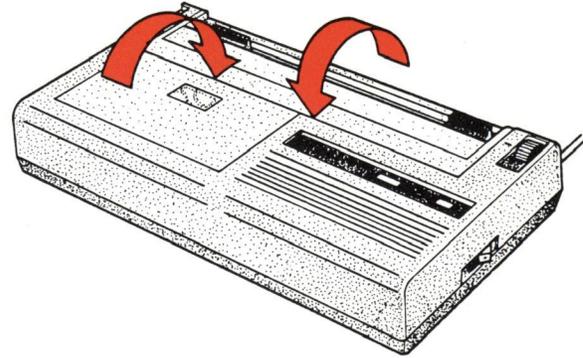
IMPORTANT

Insert the ribbon between the posts and printhead exactly as shown. Gently push the printhead carriage back to its upright position. The ribbon **must** *be clamped between the left post and the printhead as shown.*
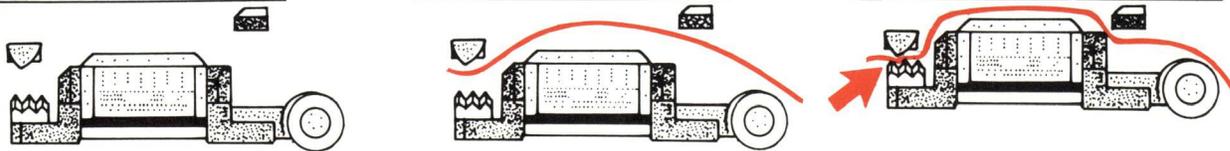
Printing A Test Pattern

Make sure your OKIMATE on/off switch is
still OFF (plugging the printer in with it
turned on can cause damage). *Insert the plug
into a grounded electrical outlet. DO NOT
use a conversion cord, like an extension cord,
which ignores the ground—OKIMATE must
always be grounded.*
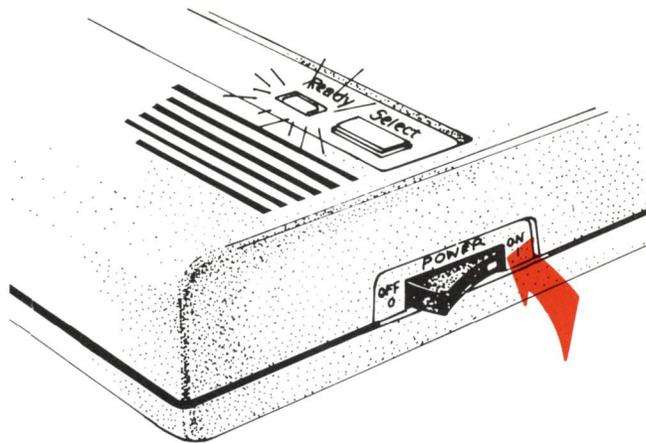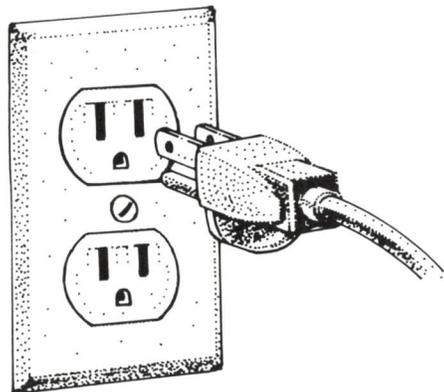
*To begin the self test, hold the select button
down and turn OKIMATE on at the same
time. Count to 2 before releasing the select
button and OKIMATE will print a test pat-
tern.*

IJKLMNOPQRSTUVWXYZ[£]↑←─●│──┐ ┡ ⌐↳╘⌐
JKLMNOPQRSTUVWXYZ[£]↑←─●│──┐ ┡ ⌐↳╘⌐

To stop the test, turn off your OKIMATE.

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Beginning the Match

Let's take a closer look at the control center of your OKIMATE. The picture below reveals the locations of the levers, lights and buttons you'll be introduced to in this chapter.
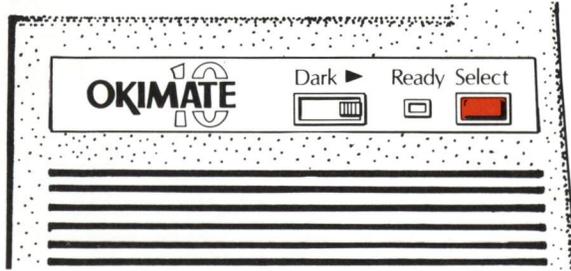
DARK: Controls darkness of print. Normally set this switch in the center.

SELECT: This is the PAUSE/RESTART button. To stop the printer while it is printing, press this button and continue to hold it down until the printhead reaches the end of a line. Once the printhead is at the end of a line, release the SELECT button and the printer will stop printing. At that time, the READY light will blink slowly indicating that printing has been stopped.

The SELECT button has three other functions:

1. Press to restart the printer after stopping it.
2. Press to restart the printer after changing paper or ribbon.
3. Press along with the ON button to begin a self test.

READY LIGHT: A steady light means the printer is ON and ready to receive data.

A slow blink means you've either pressed the SELECT button to stop OKIMATE from printing or it's time to replace paper or ribbon.

A rapid blink means OKIMATE has slowed down printing to cool. The printer will automatically resume full speed when the printhead temperature is lowered. This should happen infrequently, if at all, when OKIMATE has been continuously printing.

NOTE: If you use the SELECT button to stop printing color graphics, the OKIMATE will first print all the colors selected for a line before stopping—blue is the last color to print.

Running the Disk Demonstration

There are two programs on your demonstration disk—one is a combination demonstration of OKIMATE's capabilities and a tutorial; the other one is a color print program that allows you to print a picture from a previously created file. Both programs give you a chance to see what OKIMATE can do right away. The Learn to Print program is compatible with the Commodore 64, VIC 20, SX-64, Plus/4, VIC 16 and the Commodore 128*. Here's how you use them:

1. Insert the Learn to Print disk into your disk drive.
2. Type: `LOAD "LEARN",8`
3. Press the `RETURN` key.
4. When you see the READY prompt, type: `RUN`
5. Press the `RETURN` key.

After a minute or so to load, the program will begin. First you'll have the opportunity to see black and white and color demonstrations—the disk will tell you when to put the color ribbon in. You'll get a hard-copy sample of everything you can do with your OKIMATE.

The Rules of the Game

Chances are that you want to use your OKIMATE to print information from a software package, whether it's a record of your budget from a financial program or a letter to Aunt Mary on your word processor. It's easy to do because these packages almost always have a feature that controls printing, so that all you have to do is follow the instructions provided with your software. Keep in mind that from the computer's point of view, OKIMATE works the same way as the Commodore 1525 printer does, so if OKIMATE 10 isn't listed, follow any instructions given in your software manual for the 1525 printer.

* must be in 64 emulation mode.

Using a Software Package

There are so many software packages available for Commodore computers that we simply can't provide you with specific details on how each one works with OKIMATE.

However, we have included setup procedures for three popular word processing packages—Easy Script, Paper Clip and Word Pro 3—that may prove valuable to you.

A Player's Guide

Puzzled about your next move?

This section will give you time to understand much more about the printer, helping you to piece everything together.

OKIMATE works with nearly all word processing packages and over a dozen graphics packages. Here we'll show how three popular software packages work with your printer. There's also a reference chart on page 36 to use as a guide.
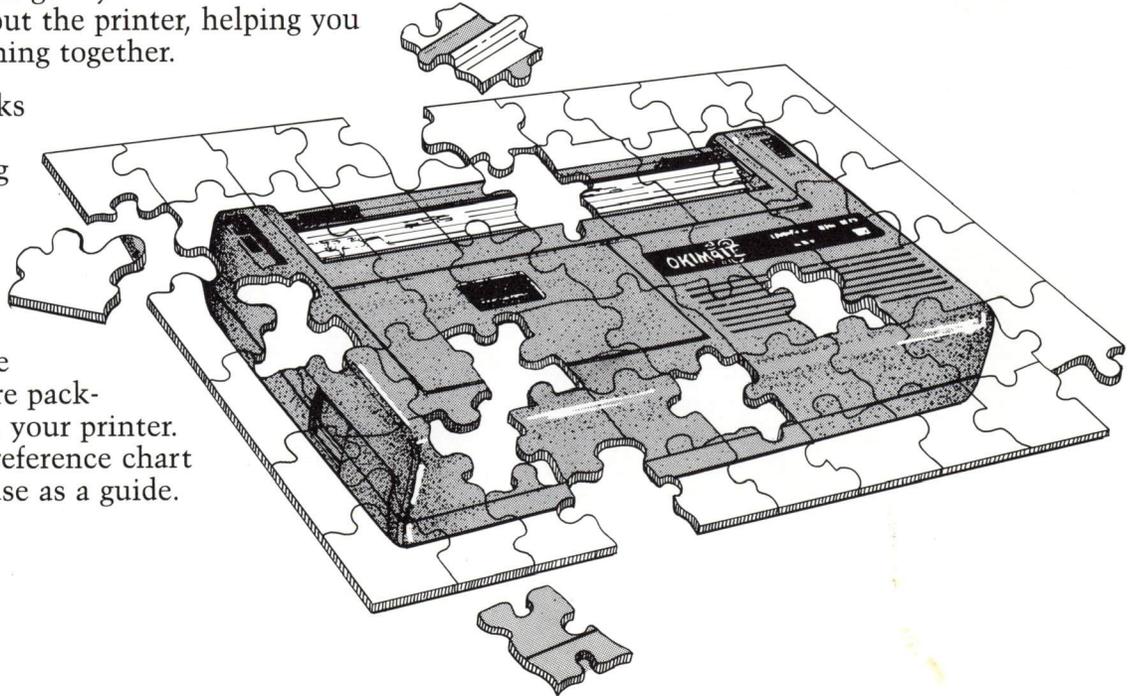
Most computers and printers use a standard numerical coding system called ASCII. Commodore products, however, operate with a different code, usually referred to as Commodore ASCII, and this is the same code that your OKIMATE with the Commodore Plug 'N Print module uses. So be sure to follow printing procedures for Commodore ASCII if your software packages use different procedures for each coding system.

Some programs ask you to select which printer you have from a list called a "menu." If the menu doesn't include OKIMATE 10, use Commodore 1525.

Your software may give provisions for using OKIMATE's special features, like different sizes and styles of type, although the flexibility of these packages often varies. You'll need to know the special codes that control the features you want—check the handy reference chart on page 36—and how your software handles those codes—check your software instructions.

The way printer control codes are handled differs from package to package. Some have special codes that go before OKIMATE's codes. Others have ways you can assign OKIMATE's codes to characters you're not likely to use, such as the @ symbol, so that you can change printing styles with a single keystroke. The instructions which came with your software packages should explain how it deals with printers.

Remember that your software package may not let OKIMATE do all the things it's capable of—an accounting package, for example, will probably let you pick a style of type for the entire document but will not allow you to change features within the document.

USING PAPER CLIP

The Setup

1. Insert the Paper Clip battery pack into the Commodore joystick port 1.

2. Turn on your computer. When READY appears, type: RUN <CR>

3. Slide the Paper Clip disk into drive A.

4. When READY appears, type: LOAD "PRINTER SETUP-D",8 <CR>

    NOTE: First time installation only.

5. When LOAD CHARACTER SET appears, type: Y <CR>

6. When FILENAME appears, type: standard CBM <CR>

    NOTE: The screen will fill with random characters and will gradually clear.

7. When LOAD PREVIOUS FILE appears, type: Y <CR>

8. When FILENAME appears, type: 1525-p-alf <CR>

9. When '@'?64 appears, hold down the CONTROL key and type 0.

    NOTE: <CR> means press the RETURN key.

10. Use the CRSR DOWN key to skip to PRINTER INITIALIZE CHARACTERS and enter the following command to turn off the OKIMATE 10 automatic skip over perforation:

    Press the DEL key to erase the current entry.

    Type: 27 <CR>

    Press the DEL key to erase the next entry.

    Type: 66 <CR>

    Press <CR> three times.

    When SECONDARY ADDRESS appears, press <CR> once.

11. Use the CRSR DOWN key to skip to PITCH = 12 CHARACTERS PER INCH and enter the following command to print bold:

    Press the DEL key twice to erase 15.

    Type: 29 <CR>

    Press the DEL key to erase 0.

    Type: 14 <CR>

Press <CR> three times.

When SECONDARY ADDRESS appears press <CR> once.

When the PITCH = 15 CHARACTERS PER INCH appears, press the DEL key twice to erase 15.

Type: 29 <CR>

Press <CR> four times.

When SECONDARY ADDRESS appears press <CR> once.

NOTE: The remainder of the commands are identical to the Commodore printer and do not need to be changed.

12. Use the CRSR DOWN key to advance to SECONDARY ADDRESS FOR TEXT and press the <CR> once.

13. Remove the Paper Clip disk and insert a formatted data disk.

14. Hold down the CONTROL key and the SHIFT key and press 9.

15. When FILENAME appears, type: OKI-MATE 10 <CR>

16. When DRIVE # appears, type: 0

Creating a Document

NOTE: Make sure the data disk is still in the disk drive.

1. Load "P*", 8 <CR>

2. Press CONTROL then L.

3. When FILENAME appears, type: OKI-MATE 10 <CR>

4. Press CONTROL then L.

   NOTE: If creating a new file skip to step 6.

5. When FILENAME appears, type the name of the document you want to edit.

6. When you are preparing your document and wish to change printing styles, press the British pound sign key and enter the change code. For example, if you wanted to change the left margin to 15, you would press the British pound sign key then type: lm15

   Likewise, if you wanted to print in bold, you would press the British pound sign key and then type: pt12

Printing a Document

1. Press CONTROL then O.

2. When CONTINUOUS OUTPUT appears, type: N <CR>

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3. When FILL VARIABLE BLOCKS appears, type: N <CR>

4. When NUMBER OF COPIES appears, type: 1 <CR>

5. When STARTING PAGE appears, type: 1 <CR>

6. When GLOBAL appears, type: N <CR>

Exiting Paper Clip

Press CONTROL then X.

USING WORD PRO 3

NOTE: <CR> means press the RETURN key.

1. Turn on your computer and insert the Word Pro disk.

2. When READY appears, type: LOAD "*",8 <CR>

3. When READY appears again, type: RUN<CR>

4. Select 8027 from the menu by typing: 8

5. When # of LINES appears, type: 329 <CR>

6. When PRINTER DEVICE appears, type: 4

7. When PRINTER appears, select ASCII so type: A

8. When DISK DRIVE appears, type: 08

9. When the status line appears, press and release the CONTROL KEY then type:/

IMPORTANT: Cursor Down and Skip Over Perforation "off" commands must be given at the beginning of each document.

10. When the checkmark symbol appears, we're going to assign printer codes to locations 0 through 9.

$0 = 29{:}1 = 15{:}2 = 145{:}3 = 17{:}4 = 14{:}5 = 146{:}6 = 18{:}7 = 27{:}8 = 66$

This is what you just entered:

0 = condensed print
1 = normal print
2 = cursor up mode
3 = cursor down mode
4 = wide print
5 = print black on white
6 = print white on black (reverse)
7 and 8 = stop automatic skip over perforation

Entering Print Features in a Document

Anytime you want to use any of the above codes in a document, call up the feature like so:

> Press and release the CONTROL KEY then type: ;

> Enter the code number for the feature you want to perform.

> For example, if you wanted to print a title in wide print, you would now type: 4 <CR>

> When you wanted to return to normal print, you would again press and release the CONTROL KEY, type: ; and then type: 1 <CR>

You can also change margin settings by following the checkmark character with the command lm for left margin and rm for right margin and ju for justifying the text. Therefore, if you wanted your right margin to be 70, your left margin to be 12, and the text to be justified, your command line would look like this:

> lm12:rm70:ju1 <CR>

Keep in mind, you will probably want to change margin settings whenever you change character pitch. Also, since the OKIMATE 10 is set up to perform an automatic skip over perforation at the bottom of the page and so is WORD PRO, you may want to enter the 7 and 8 commands to turn off the OKIMATE 10 skip over perforation feature at the beginning of your documents.

Printing a Document

After you've created a document, simply press and release the CONTROL key then type: O followed by C <CR> and OKIMATE should begin printing.

USING EASY SCRIPT

1. Put your Easy Script disk in drive A.
2. Type: LOAD "0:*",8,1 <CR>
3. When Easy Script is loaded, the following questions will appear:

   Text Width?   40-240 cols.

   Disk or Tape?

   Printer Type?   0-4

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4. The OKIMATE 10 has 80 columns, so type: 80 <CR>

5. If you're using a disk drive, type: D <CR>

6. The OKIMATE 10 emulates the Commodore printer, so type: 0

7. When the edit mode screen is displayed, enter these commands:

   Press F3 key then type: 0 = 27

   Press F3 key then type: 1 = 66

   Press F3 key then type: 2 = 14

   Press F3 key then type: 3 = 15

   Press F3 key then type: 4 = 29

   Press F3 key then type: 5 = 18

   Press F3 key then type: 6 = 146

   NOTE: You can assign up to 10 values.

8. This is what you have entered:

   0 and 1 = turns off OKIMATE 10 skip over perforation
   2 = double width printing
   3 = normal 10 cpi printing

   4 = fine print 17 cpi
   5 = reverse printing
   6 = normal black on white printing

Creating a Document

1. Whenever you want to change printer features in a document, press the F1 key and the number you assigned to the feature you want. For example, if you want to print double width, you would press F1 and type: 2

   To return to normal print, you would press F1 then type: 3

2. To stop the OKIMATE 10 from performing a skip over perforation, you would press F1 then type: 0 and F1 then type: 1

Printing a Document

To print a document, follow these four steps:

1. Press the F1 key.

2. Type: O

3. Type: C

4. Type: P

Using Color Graphics

The Color Print program available with your OKIMATE works only with the Commodore 64, 128* and SX64 model computers and a compatible graphics software program, like Doodle, Edumate Light Pen, Koala Pad Super Sketch, Flexidraw, Paint Magic, Chalkboard and Sorcerer's Apprentice.

OKIMATE does a fine job reproducing over two dozen colors for graphs, bar charts and pie charts. Since it is very difficult to program your own color pictures dot by dot, OKIMATE is designed to work with many of the paint, draw and sketch packages available in most retail stores. Use them to create a picture on your screen and then use OKIMATE's Color Print program to print the picture.

Once you have the right equipment (if you don't yet, try some color samples on the OKIMATE 10 disk), here's how you run OKIMATE's Color Print program:

* Commodore 128 must be in 64 emulation mode.

1. Insert the Learn to Print disk in the disk drive.
2. Type: `LOAD "COLOR",8`
3. Press the `RETURN` key.
4. When the READY prompt appears, type: `RUN`
5. Press the `RETURN` key.

After about a minute, you'll see the main title frame. The program will then ask you if you want instructions. Answer "Y" for "yes" the first time around. You'll be asked to prepare the OKIMATE with paper and a black ribbon. The program will then print an instruction sheet explaining how to print a picture.

The Color Print program is completely self-documenting, so all you have to do is follow the directions on the screen at each step to choose the format you're using and the picture you want to print. The program will even

tell you if OKIMATE isn't ready to print and will give you a list of things to check. If you want to conserve your color ribbon, select just one example from the color program to see how OKIMATE prints colors.

Once you've made your selections and the printer is ready—don't forget to insert the color ribbon—just press the RETURN key and watch OKIMATE print your picture in full color. It will take a while because each line must print three times, but the results should be worth the wait.

BASIC PRINTING IN A NUTSHELL

To print a program you need these statements:

10   **OPEN**   **3**,   **4**,   **0**

Line number

Open channel to printer

Logical file number—identifies the channel—can be any number from 0 to 255

Secondary address—determines the character set:
- 0 (optional) = upper case/graphics (cursor up)
- 7 = upper case/lower case (cursor down) characters

Device number—the printer is 4—if you have 2 printers, one will be 5. See page 45 if you want OKIMATE to be device number 5.

20   **PRINT#3**, **"TEXT TO BE PRINTED"**

Print to printer—do not use "?" to abbreviate

Must be the same as logical file number in OPEN statement

30   **CLOSE 3**

Closes channel to printer after you've finished printing

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Printing Listings

Use these commands in the immediate mode (no line number):

OPEN   **3,**   **4,**   **0**

Logical file number (0-255)   Device number—printer is usually 4   Secondary address—
0 (default) = cursor up
7 = cursor down

CMD 3

Sends output to printer instead of display screen—READY prompt appears on printer not screen

LIST

Program listing is printed—you can also use standard PRINT statements to control the printer after CMD

PRINT#3:CLOSE 3

Both are needed to close a channel after CMD—READY prompt returns to screen

If this doesn't work, press the RUN/STOP and RESTORE keys at the same time

Creating Special Effects

When you turn on OKIMATE, it will print 10 characters per inch and 6 lines per inch like a standard PICA typewriter. But OKIMATE features a variety of printing styles you can use to put extra flair into your printouts. All you have to do is insert simple codes into your PRINT# statement using the CHR$ function, like this:

```
20 PRINT#3,"NORMAL";CHR$(14);
   "WIDE";CHR$(15);"NORMAL AGAIN"
```

The sample program which follows will show you how this works using a combination of OKIMATE's features.

```
5 REM***OKIMATE 10 SAMPLE PROGRAM***
10 OPEN 2,4
20 PRINT#2,"NORMAL WIDTH, 10 CPI"
30 PRINT#2,CHR$(29);"FINE PRINT, 17 CPI"
40 PRINT#2,CHR$(15);"BACK TO NORMAL"
50 PRINT#2,CHR$(14);"WIDE, 5 CPI";CHR$(15);" BACK TO NORMAL"
60 PRINT#2,CHR$(29);CHR$(14);"BOLD, 8.5 CPI ";CHR$(29);"BACK TO FINE PRINT"
70 PRINT#2,CHR$(15);"CURSOR UP FOR CAPITALS & GRAPHICS: ● O ↑ ♥ ⌒"
80 PRINT#2,CHR$(17);"CURSOR DOWN FOR LOWERCASE ";CHR$(145);"BACK TO CURSOR UP"
90 PRINT#2,CHR$(18);"REVERSE FIELD";CHR$(146);" NORMAL";
100 PRINT#2,CHR$(18);CHR$(14);" MIX ";CHR$(17);"& MATCH ";CHR$(145);CHR$(15);
110 PRINT#2,"x ┴ ●"
120 PRINT#2,"REVERSE FIELD CANCELS AT LINE END"
130 PRINT#2,CHR$(16);"05INDENT FIVE SPACES"
135 PRINT#2,"BACK TO NORMAL"
140 CLOSE 2
```

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```
NORMAL WIDTH, 10 CPI
FINE PRINT, 17 CPI
BACK TO NORMAL
WIDE,  5  CPI BACK TO NORMAL
BOLD, 8.5 CPI BACK TO FINE PRINT
CURSOR UP FOR CAPITALS & GRAPHICS: ● O ♠ ♣ ⌒
cursor down for lowercase BACK TO CURSOR UP
REVERSE FIELD NORMAL ▆▐▌◆X◆█ & match X▄▌0
REVERSE FIELD CANCELS AT LINE END
      INDENT FIVE SPACES
BACK TO NORMAL
```

<div style="display:flex">

<div>

Character Size

CHR$(15)   Normal - 10 cpi (Characters Per Inch)
This is the default setting—what you get
automatically when you turn on the
printer.

CHR$(29)   Fine - 17 cpi

CHR$(14)   Double width - doubles the width of either
normal or fine print. Combine codes like
this:
CHR$(15);CHR$(14) - Wide print: 5 cpi
CHR$(29);CHR$(14) - Bold print: 8.5 cpi
To cancel double width, use either one of
these-
CHR$(15) to return to normal print
                    or
CHR$(29) to return to fine print

</div>

<div>

Character Set

CHR$(145)   Cursor Up characters - upper case charac-
ters, numerals, punctuation and graphics
characters

CHR$(17)   Cursor Down characters - upper and lower
case characters, numerals and punctuation

NOTES: The secondary address in your OPEN statement deter-
mines which character set the printer will use.

To print Cursor Up: OPEN 3,4,0 or OPEN 3,4

To print Cursor Down: OPEN 3,4,7

Keep in mind that these codes are controlled on the screen
independently of the printer. (On the screen you switch from
Cursor Up to Cursor Down mode by pressing the Commodore
and Shift keys at the same time.) This can be a little confus-
ing—what you see on the screen is not necessarily what you'll

</div>

</div>

get from the printer. If you're programming for a Cursor Down printout, we recommend that you set the screen to reflect the Cursor Down display.

Reverse Field

CHR$(18)   Reverse field - prints white characters against a black background

CHR$(146)   Reverse field off - returns to standard black-on-white printing

NOTE:
This feature is automatically cancelled at the end of the line. Put CHR$(18) at the beginning of each line you want to print in reverse field.

Indenting/Tabs

CHR$(16);"nn"   Indent - starts printing at column number "nn"

NOTES:
1. This command can be used at the beginning of a line to indent or in the middle of a line to tab.
2. The columns are as wide as a character—1/10 inch in normal print, 1/17 inch in fine print.

Page Formatting

CHR$(13)   Line Feed - advances the page by one line

CHR$(27);
CHR$(10);   Fine Line Feed - advances page by n/144 inch
CHR$(n);

NOTES:
1. n can be any number between 0 and 255. When n is 0, the line feed is 256/144 inch.
2. This code should go at the end of a line and a semicolon must always follow it.

CHR$(12)   Form Feed (New Page) - advances the paper to the first printing line of the next page

Continuous Printing

CHR$(27);"A"   Automatic Skip ON - when the printer comes to within 1/2 inch of the bottom of an 11 inch page, it automatically skips to the first print line of the next page

CHR$(27);"B"   Automatic Skip OFF - the printer prints continuously without skipping

NOTES: The printer will perform an automatic skip unless you add the automatic skip off command to your program. This feature may interfere with some word processing packages that perform their own page formatting. For more information on how to turn off automatic skip when you're using a word processor, see page 43.

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Fine Positioning

This feature lets you start printing at a specific distance from the left margin. This distance is measured in dot columns, which is 1/60" wide for normal print. (There are 480 dot columns on a line.)

NOTE: If you're using fine print or bold print, the distance from the left margin will be measured in columns that are 1/103" wide. The procedure is the same, but keep in mind that there are 824 dot columns on a line of fine print.

Suppose you wanted to start printing at the 180th column, which would be three inches from the margin. Add this command:

```
PRINT#3,CHR$(27);CHR$(16);
```

Follow the command with two codes which represent the number of dot columns. Take the number of dot columns (180 in our example) and divide it by 256. The quotient is the first code; the remainder is the second. First divide 180 by 256, like this:

$$
\begin{array}{r}
0 \text{ quotient} \\
256\overline{)180} \\
-\ 0 \text{ subtract} \\
\hline
180 \text{ remainder}
\end{array}
$$

Now, take the quotient and the remainder and add them to your print statement, followed by your text:

```
PRINT#3,CHR$(27);CHR$(16);
CHR$(0);CHR$(180);"TEXT..."
```

Black and White Graphics

You can use OKIMATE with any graphics program that can produce a printout—just by following the directions for the Commodore 1525 in your software manual. You can also program graphics directly, but it takes a little bit of paperwork.

The first step is to map out your image on a piece of graph paper. OKIMATE prints graphics in columns of seven dots, so divide your picture, like ours', into seven-row strips.

The numbers on the left show the value of each dot position in a column. Starting at the left column add the values for each position that contains a dot. Then add the next column to the right and so on until you have a total value for each of the seven columns.

```
10 OPEN 3,4
20 PRINT#3,CHR$(8);CHR$(255);CHR$(194);CHR$(196);
   CHR$(200);CHR$(208);CHR$(224);
30 PRINT#3,CHR$(192);CHR$(15)
```

Will give you this:

Now take each column and add 128 to the totals. Then you're ready to put everything together in a print statement.

First comes CHR$(8), which tells OKIMATE to print graphics; follow this with the data we calculated above. If you want to combine graphics with text, enter CHR$(15) to return to normal text printing.

Be sure to add CHR$(15) when you're finished printing graphics—otherwise OKIMATE will stay in graphics mode until you turn it off. You'll end up with static if you try to print text.

Value	Rows 1	2	3	4	5	6	7
1	○						
2	○	○					
4	○		○				
8	○			○			
16	○				○		
32	○					○	
64	○	○	○	○	○	○	○

Column total	127	66	68	72	80	96	64
Plus 128							
Total	255	194	196	200	208	224	192

```
10 DATA 255,194,196,200,208,224,192
20 FOR I=1 TO 7
30 READ G
40 G$=G$ + CHR$(G)
50 NEXT I
60 OPEN 3,4
70 PRINT#3,CHR$(8);G$;CHR$(15)
80 CLOSE 3
```

Will give you this:

◣

Data Statements

Writing graphic data the way we just did can be a little tedious. You can make things a lot easier for yourself by reading the information from a data statement. Keep in mind that the OKIMATE can print a maximum of 480 graphic columns in one line. If you send more than that, printing will continue at the left margin of the next line.

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```
10 OPEN 3,4
20 L$=CHR$(8)+CHR$(26)+CHR$(30)+CHR$(221)+CHR$(15)
30 PRINT#3,L$;"GRAPHICS";L$
40 CLOSE 3
```

Will give you this:

▬▬▬▬▬GRAPHICS▬▬▬▬▬

Repeating Graphics

If you're creating a decorative border, bar chart or similar graphics, you'll find the repeat graphics command, CHR$(8);CHR$(26), very useful. The repeat command repeats one column of dots up to 255 times.

Just follow the CHR$(8);CHR$(26) command with the number of repetitions in CHR$ form, then the graphic information. Putting CHR$(0) after the repeat command will create 256 repetitions.

Color Printing

The easiest way to get a color printout with your OKIMATE is to use the Color Print program on your disk. First you create your illustration with your graphics package and then you save it on a separate disk. Next you load the OKIMATE Color Print program and request to print your own creation from the menu. Be sure to have your color ribbon in then insert the disk where your picture is saved. OKIMATE will print your picture in vivid colors.

You can also write your own programs to print characters or graphics in color, but it's a

```
10 EM$=CHR$(27):EM$=EM$+CHR$(25):REM ALIGN COLOR RIBBON
20 OPEN 3,4
30 PRINT#3,EM$;"    4   TEXT COLORS:   5   ORANGE YELLOW GREEN   8   BLACK"
40 PRINT#3,"    4   TEXT COLORS: RED ORANGE        14          PURPLE BLACK"
50 PRINT#3,"    4   TEXT COLORS:        19          GREEN PURPLE BLACK BLUE"
60 CLOSE 3
```

rather complicated process. Here we'll explain how the color printing system works and how to use it in BASIC programs.

The color ribbon consists of three color strips—yellow, magenta, and cyan—plus a black and clear marker strip. OKIMATE uses the non-printing marker strip to align the ribbon. The color strips are for printing.

The printhead passes over each line three times, once for each color strip. After the third pass, OKIMATE looks for the alignment command to reset the ribbon to the first

NOTE: In the color program above the blue numbers indicate the number of spaces to insert. For example, line 50 uses 4 spaces followed by text then 19 spaces.

color. *Like an artist mixing colors on a palette, OKIMATE can print in a variety of colors just by mixing the three primary colors on the paper.*

Every color printing program must include these codes at the beginning of the first print statement:

$$CHR\$(27);CHR\$(25)$$

This tells OKIMATE to look for the alignment marker and to set the ribbon at the beginning of the first color, yellow. Therefore, anything printed in the next print statement appears in yellow. The following print state-

ment data appears in magenta and the third appears in cyan.

At the end of the third print statement, add CHR$(13) to return the printhead to the left and to advance the paper one line. The next print statement must again begin with the alignment command, CHR$(27);CHR$(25).

Don't forget to insert the color ribbon before trying this print sample!

Color Shading (For Experts Only)

The program you just did printed seven colors, but OKIMATE isn't limited to that. By combining dot graphics and color printing, you can create a variety of resolutions and hues. The secret to reproducing the colors in our program on page 35 is a checkered graphic pattern that combines color dots with white spaces.

When you print this pattern in color, you get a light shade of that particular color, since the color you choose is mixed with white. For example, a checkered red gives you a pink shade. By combining light colors with other light colors, you can create dozens of colors.

The program we've provided will give you a printout of 26 colors. It uses three subroutines to create solid blocks of color, checkered patterns and white spaces. The data statements in lines 4000, 4010 and 4020 list the possible combinations of yellow, magenta and cyan using these subroutines:

```
5     REM COMMODORE COLOR DEMO
10    OPEN 3,4
20    READ Y,M,C
30    PRINT#3,CHR$(27);CHR$(25);
35    PRINT#3,CHR$(8);
40    ON Y GOSUB 1000,2000,3000
50    ON M GOSUB 1000,2000,3000
60    ON C GOSUB 1000,2000,3000
70    PRINT#3,CHR$(27);CHR$(10);CHR$(14);
80    IF Y=0 THEN PRINT#3,CHR$(15):CLOSE 3:END
90    GOTO 20
1000  PRINT#3,CHR$(26);CHR$(250);CHR$(255);
1005  PRINT#3,CHR$(13);
1010  RETURN
2000  FOR X=1 TO 125
2010  PRINT#3,CHR$(213);CHR$(170);
2020  NEXT X
2025  PRINT#3,CHR$(13);
2030  RETURN
3000  PRINT#3,CHR$(13);
3010  RETURN
4000  DATA 1,1,1,2,1,1,3,1,1,2,2,1,3,1,2,2,3,1,3,2,1,3,3,1,3,2,2,3,3,2,1,2,1
4010  DATA 2,1,2,2,2,2,1,1,3,2,1,3,3,1,3,2,3,2,2,2,3,3,2,3,1,2,2,1,2,3,1,3,3
4020  DATA 2,3,3,1,1,2,1,3,1,1,3,2,0,0,0
4030  REM:1=SOLID COLOR
4040  REM:2=HALF-TONE
4050  REM:3=WHITE (SKIP COLOR)
```

OKIMATE 10 COMMODORE
COMMAND REFERENCE CHART

Function	Decimal	Hexadecimal
Character sizes:		
Normal	15	0F
Wide	15 14	0F 0E
Fine	29	1D
Bold	29 14	1D 0E
Color printing:		
Align ribbon	27 25	1B 19
End of line	13	0D
Cursor mode:		
Cursor up	145	91
Cursor down	17	11
Fine line spacing	27 10 n	1B 0A n
Formatting:		
Advance to new page	12	0C
Carriage return	13	0D

Function	Decimal	Hexadecimal
Formatting (cont.)		
CR and one line feed	10	0A
Perforation skip on	27 65	1B 41
Perforation skip off	27 66	1B 42
Tabbing	16 n	10 n
Graphics:		
Start	8	08
Stop	15	0F
Repeat	26 n	1A n
Reverse field:		
Reverse image	18	12
Return to normal	146	92
Starting position:		
Dot column	27 16 n1 n2	1B 10 n1 n2
Character column	16 n1 n2	10 n1 n2

NOTE: The lower case "n" given with some of the commands represents a variable number.

Dealing with Trouble
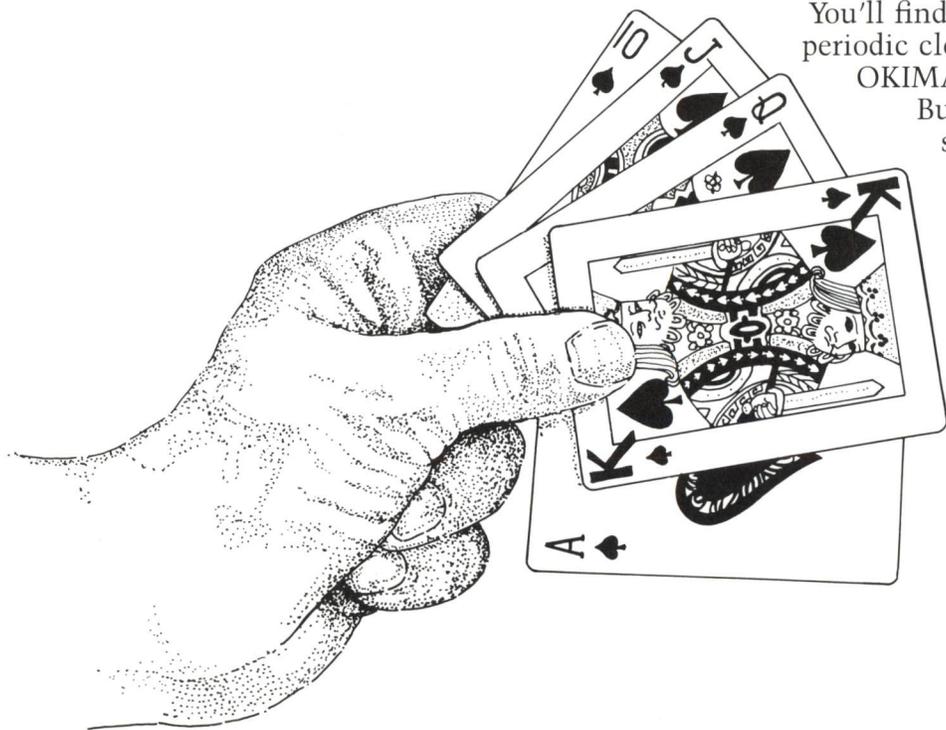
You'll find that with the recommended periodic cleaning of the printhead, your OKIMATE is the best deal in town. But if it's in the cards that you someday have problems with your printer, this section is designed to give you a hand.

You don't have to be a computer ace to handle the minor problems listed here. However for problems you can't deal with, don't gamble on fixing them yourself, use the repair and warranty information on page 50.

Cleaning Up

Wipe the OKIMATE paper window with a clean, damp, lint-free cloth whenever ribbon ink or dust begins to accumulate.

Clean your OKIMATE printhead after every ribbon change or whenever you notice the print fading or missing dots.

1. Turn off your OKIMATE.
2. Unplug your OKIMATE.
3. Open both the paper and ribbon doors.
4. Remove the ribbon cartridge, returning the printhead to its upright position.
5. Unsnap the printhead lock lever, leaving the printhead in its upright position.
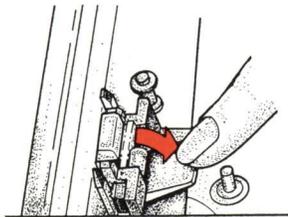
6. Grasp the tab attached to the printhead and lift the printhead out of the assembly.
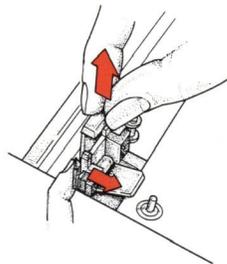
7. Wipe the dark surface of the printhead with a clean, lint-free cloth that has been dipped in alcohol or an alcohol-based typewriter cleaning solution.
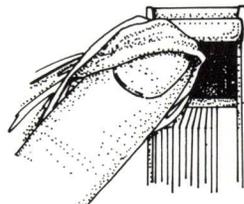
8. Wipe off all ink and paper lint.

9. Replace the printhead—make absolutely certain that the black thermal surface faces towards the paper.
10. Close the printhead lock lever.
11. Replace the ribbon cartridge.
12. Close the paper and ribbon doors.

Replacing the Printhead

If you notice the characters or graphics printed by your OKIMATE are not fully formed, with one or more dots consistently missing, your printhead may need replacing. Clean the printhead first, according to the directions on page 38 and then if the problem still persists, replace the printhead. (Ordering information is on page 47.)

To replace the printhead, remove it following the steps described in "Cleaning Up" on page 38. Insert a new printhead in its place—making absolutely certain that the dark thermal side of the printhead faces the paper and the printhead carriage is in its upright position.

Check'Mate

Use this handy troubleshooting guide if you have any problems with your printer:

What happens if. . .
. . . the printer doesn't work and the READY light is not on?

Check the data cable and the Plug 'N Print control module connections. Make sure both your printer and computer are switched on.

. . . the READY light blinks slowly?

Your printer is out of paper or ribbon. Replenish the supply and press the SELECT switch when ready to continue.

. . . the READY light blinks rapidly and the printer slows down?

The printhead has overheated. Do not shut off power—the printer will automatically resume full speed when it cools.

. . . printing becomes faded or blurred?

The printhead needs cleaning. Follow the steps in "Cleaning Up" on page 38.

Improper ribbon feeding causes the OKIMATE to print on used ribbon. Make sure that the ribbon is inserted as shown on page 11. The ribbon must pass between the left post and the ribbon grip pad.
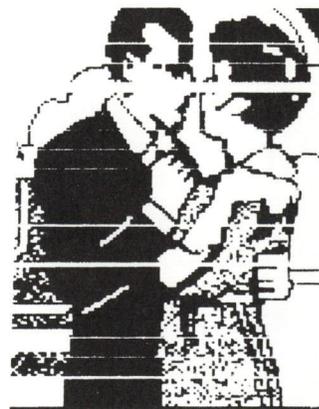
Make sure the paper release lever is in the open position for computer paper. This will reduce the number and the thickness of the white lines in graphics but, keep in mind, some thin white lines are normal.

```
      Better than
       OKIMATE
       the OKIMATE
     be made on the
  BOLD PRINT.
```

Your paper isn't feeding properly—check the paper path to make sure nothing is preventing the paper from advancing freely into the printer. If something is laying on the paper or if the paper gets caught, a full line feed may not occur.

Your paper is too rough-textured for the OKIMATE. The example shown was produced using 25% cotton bond paper. See page 6 for our recommendations for paper available in 15,000 office supply and stationery stores or order direct by phone using our toll-free number.

```
OKIMATE 10
SECOND LINE
THIRD LINE
FOURTH LINE
```

```
TK! MNOPQRSTUVWX
K! MNOPQRSTUVWXY
! MNOPQRSTUVWXYZ
MNOPQRSTUVWXYZ [
NOPQRSTUVWXYZ [£
OPQRSTUVWXYZ [£]
PQRSTUVWXYZ [£] ↑
```

Improper line feeding between the first and second lines usually occurs when you finish loading paper, advance it too far then use the paper advance knob to back up the paper. The resulting slack may cause the incomplete line feed after the first line is printed. To prevent this, always finish paper loading with a forward movement of the paper advance knob.

If one dot consistently doesn't print, try cleaning the printhead (directions are on page 38). If that doesn't solve the problem, then the printhead needs to be replaced. Call the toll-free number on page 47 to order, then follow the directions for printhead replacement on page 39.

The perforation skip feature, explained on page 28, may interfere with your picture if printing doesn't start at the top of the page. Before printing a picture, turn your OKIMATE off, adjust your paper, then turn your OKI-MATE back on.

...I'm using a word processing package and my OKIMATE performs unnecessary line or page skips!

When your OKIMATE gets to within 1/2" of the bottom of an 11" page, it automatically skips to the next page so that it won't print over perforations on computer paper. However, since some word processing packages allow for this, it can interfere with the page formatting features, throwing off the page arrangement.

There are two ways to correct this problem:

1. Set the page length of your document to be no more than 60 lines. Be sure to take into account any top or bottom margins your word processor adds.

2. Use this short BASIC program to turn off OKIMATE's automatic skip feature. Before loading your word processing package, enter the following:

    ```
    OPEN3,4:PRINT#3,CHR$(27);"B":
    CLOSE3 [ENTER]
    ```

3. Add the control codes to the beginning of your documents for turning off automatic skip. Instructions for doing this with three popular word processing packages begin on page 17. Use these examples as a guide for the package you're using.

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Then load your word processing package.

...my color prints are mostly yellow and red?

You have the color ribbon installed wrong. Make sure the ribbon passes between the left post and the ribbon grip pad. See page 11 for instructions.

...the color ribbon "slips" at the end of each line, printing the wrong color on the right edge of the image?

The gripper, located to the left of the print-head, has accumulated ink. Clean it according to the directions for printhead care on page 38.

...dull patches appear in black printing or brown patches appear in color printing?

You have the DARK control set too high and the ink is not transferring properly. Just lower the setting and your printouts should be fine.

...the colors on my printout don't match the screen?

OKIMATE'S colors are not exactly the same as the Commodore's screen colors, although we've matched them as closely as possible. Two of the Commodore gray shades, gray 1 and gray 2, do have a slight blue tint on the OKIMATE.

. . . paper loading is difficult?

Make sure the paper guides are properly set for the width of the paper you've inserted. Align the sprocket holes with the round markers on the paper guides. Then check the paper rollers. They should be evenly spaced between the left and right paper guides.

. . . I want to remove the control module from the printer?

Turn both the OKIMATE and the COMMO-DORE off. Disconnect the power cord and the data cable. Remove the locking cover and insert the tabs in the cover into the slots on the module. Holding on to the cover, gently slide the module out of the printer. Don't use the ports to pull the module out, they may snap off.

. . . I have more than one printer!

You can make your OKIMATE device 5 by changing jumper plug SP1 on your Plug 'N Print control module. Here's how:

1. Turn off your OKIMATE and your COMMODORE.

2. Disconnect the data cable.

3. Remove the module locking cover.
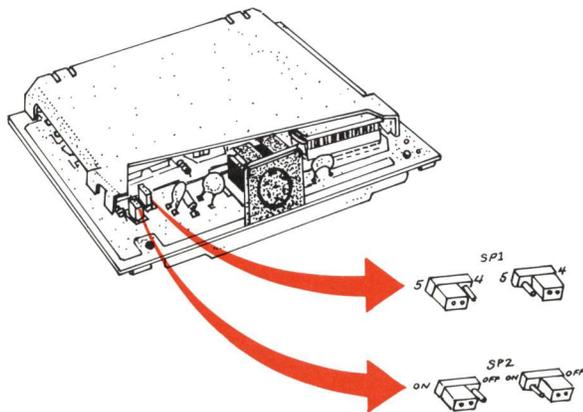
4. Insert the tabs in the locking cover into the slots in the module and gently slide the module out.

5. Unsnap the plastic cover on the control module and find the jumper plug labeled SP1.

6. Grasp the white plug and pull it up.

7. Insert the white plug on the side labeled "5."

8. Snap the plastic cover back into place.

9. Slide the control module back into OKIMATE.

10. Reconnect the data cable.

11. Make sure you address OKIMATE as device 5 in your programs.

. . . my documents are doubled spaced and I want single spacing!

Some software packages add their own line-feeds at the end of a line. Follow the directions above to change jumper plug SP2 to off—which stops OKIMATE from performing a linefeed—eliminating step 11.

. . . I have questions or problems not answered here?

Whom you call depends on the nature of your problem. If you are missing an item in your Plug 'N Print Kit, take the entire kit back to the place of purchase.

If you require service on your OKIMATE10 printer, call 1-800-OKIDATA (in New Jersey, call 609-235-2600) and, if necessary, we'll refer you to send the printer to one of our three service centers. If you are instructed to ship your printer, here's what you'll need to do:

How to Pack	Use the original carton and styrofoam if possible. Otherwise pack your printer in a strong, corrugated cardboard box and surround it with at least three inches of crumpled newspaper.
What to Ship	Send the printer, the operating module (plugged into the side of the printer), and a print sample identifying your problem—if possible. Please include a written description of your problem, what software you're using and your phone number. DO NOT SEND YOUR RIBBON CARTRIDGE, DATA CABLE, DISKS OR TAPES. A DATED SALES RECEIPT MUST BE INCLUDED FOR WARRANTY REPAIRS.
How to Ship	Prepaid
Where to Ship	Send to the OKIDATA Service Center recommended by our Customer Service Representative. There's a listing on page 50.
Service Centers	All warranty repair service must be performed by an Authorized OKIDATA Service Center. (Read the Limited Warranty information on page 50 for additional information.)
Repair Warranty	All repairs performed by an OKIDATA Service Center are warranted for 30 days.

If you have questions concerning operating the OKIMATE that are not addressed in this handbook, call 1-800-OKIDATA between 8 a.m and 7 p.m EST and a Customer Service Representative will be happy to assist you.

Ordering Parts and Supplies

Now you can order OKIMATE 10 supplies and spare parts by phone and charge them to your VISA or MasterCard. The following items are available:
- PAPER
- RIBBONS
- REPLACEMENT PRINTHEADS
- "LEARN TO PRINT" DEMONSTRA-TION ON CASSETTE TAPE FOR COMMODORE VIC 20 AND 64 ONLY.

To order, call toll-free 1-800-524-0338 or if calling from New Jersey dial 1-800-624-1076.

Operators are on duty Monday through Friday from 8:30 a.m. until 9:00 p.m. EST.

Specifications—OKIMATE 10

Print Method

Method:	Thermal Transfer Dot Matrix
Format:	Unidirectional printing

Characters

Character size:	9H × 9V dots
Lower case:	True, below-the-line descenders
Character pitches: (CPI = characters per inch; CPL = characters per line)	Wide print: 5 CPI/40 CPL Bold print: 8 CPI/66 CPL Text print: 10 CPI/80 CPL Fine print: 17 CPI/136 CPL
Line spacing:	6 or 8 Lines per inch
Reverse printing:	Yes
Special characters:	Graphic characters

Graphics

Density:	60H × 72V dots per inch
Printline:	480H × 7V dots
Line spacing:	14/144" or variable n/144"

Speed

Text:	Speed—60 characters per second Throughput—240 words per minute
Graphics:	Speed—18 characters per second

Paper

Type:	Thermal or smooth paper recommended on page 6.
Paper feed:	Pin feed for computer paper and friction feed for single sheets or roll paper
Width:	5" to 10"
Special features:	Paper out detector Top of page setting (skip over perforation) with automatic top and bottom margins on computer paper

Printhead

Print elements:	9
Dot type:	Square dots for full coverage
Replacement:	Snap in—No tools required.

Warranty and Repair Information

LIMITED WARRANTY

Okidata, Division of OKI AMERICA, Inc. ("Okidata") warrants this OKIMATE Printer to be free from defect in material and workmanship and will remedy any such defect according to the terms of the Limited Warranty. This limited warranty does not extend to printer ribbon, a consumable item.

Okidata will repair (or at its option, replace) at no charge any defective component(s) of the OKIMATE Printer for ninety (90) days from the date of purchase. This Limited Warranty extends to the original purchaser only.

To make request or claim for service under this Limited Warranty, the original purchaser must return the Okidata product, shipping prepaid, in the original shipping container or equivalent, to Okidata or an Okidata authorized service or repair center and assume the risk of loss or damage in transit to Okidata. Proof of purchase for the product showing the date of purchase, dealer's name, (serial number) and item purchased must accompany any request for work to be performed under this Limited Warranty.

This Limited Warranty shall not apply if the product has been damaged due to abuse, misuse, misapplication, accident, or as a result of service or modification by any other than an authorized Okidata repair center.

THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE ON THE FACE HEREOF AND DESCRIBED ABOVE. NO WARRANTIES WHETHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL EXTEND BEYOND THE WARRANTY PERIOD DESCRIBED ABOVE OF NINETY DAYS. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

OKIDATA SHALL NOT BE RESPONSIBLE OR LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OR LOSS ARISING FROM THE USE OF THIS PRODUCT. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.

This Limited Warranty applies to this product when sold in the continental United States. Additional information on obtaining service under this Limited Warranty is available by contacting Okidata at any of the repair centers listed below.

OKIDATA SERVICE CENTERS

WEST	MIDWEST	EAST
834 Auburn Court	1155A W. Dundee Road	111 Gaither Drive
Fremont, CA	Arlington Heights, IL	Mt. Laurel, NJ
94536	60004	08054
(415) 657-0600	(312) 253-8055	(609) 235-2600

This warranty for this product when purchased outside of the continental United States may vary. Contact your Okidata Dealer for warranty service information.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Ribbon

Type: Black or color
Single-strike

Ribbon: Easy load, "clean hands"
cartridge

Ribbon life: 120K characters in black.
About 35K characters or 10
screen prints in color.

Special features: Ribbon near-end detector
Ribbon-saving (ribbon does not
advance when multiple
spaces are printed).

Controls

Power: ON/OFF switch

Select: PAUSE/RESTART push button

Ready lamp: Indicates READY/NOT
READY to print

Print darkness: Slide switch

Paper handling: Typewriter-like paper release
lever and paper advance
knob

Color

Ribbon: 3 colors

Text: 7 colors

Screen print: 16 screen colors

Color graphics: 40-50 or more

Physical

Size: 13"L × 7.5"W × 2.25"H

Weight: 7 lbs.

Power: 115 volts AC, 40 watts

Features

Includes everything you   Commodore control module
need to print.   Data cable
Black ribbon
Color ribbon
Learn-to-Print software
package on disk
Color Print software package
on disk
Printer Handbook
Thermal transfer paper

Federal Communications Commission
Radio Frequency Interference Statement