VT50-Series Copier
User's Manual

This manual gives operating, programming, and maintenance information on the integral electrolytic copier option offered on some of the models of the DECscope video terminal. It describes only those features which relate to the copier; the users' manual for the terminal should also be read.

INTRODUCTION

The VT50-Series Copier is a device that copies text which has appeared on the video screen of a VT50 terminal. Located within the shell of the terminal, the copier gives the VT50-Series terminals a unique ability to provide immediate hardcopy to the user, but only as needed.

The copier prints on paper not by means of ink, but by passing electric current through the paper. A humidor chamber keeps the paper moist so that the electricity can pass through the paper readily; the paper is still moist when it issues from the side of the terminal. An important part of the copying process is the printing blade. This blade is made of metal; as well as conducting electricity to the surface of the paper, the metal participates in a chemical reaction which turns the paper dark where characters are to appear. Since the blade decomposes and becomes dull, it must be changed whenever paper is changed.

The electrolytic copier is intended to provide the user with inexpensive, convenient hardcopy. It is best suited for applications in which the requirements for hardcopy will not be excessive, and where a high (typewriter-like) quality of output is not necessary.

INSTALLATION INSTRUCTIONS

Damage to the copier may occur if it is activated with the packing material still in place, or if it is used without installing the copier paper. Since the copier can be activated inadvertently in several ways (pressing the **COPY** key, experimenting with other key-sequences, or by software), the copier should be set up for use even before the terminal is plugged in and switched on.

Unpack the video terminal from the shipping carton and place it on the surface on which it is to be operated. Take hold of the copier cover at the cutting edge, which is found on the right side of the terminal (above the ON/OFF switch), and lift it upward to remove it.

It may be advisable at this point to read the body of the Copier Maintenance section of this manual to familiarize yourself with the nature of the copier, and with the terms used. Note that the printing blade is called the "anode."

You should see two strips of tape holding the blade assembly. Remove this tape. Take hold of the blade assembly by the thumbscrews and lift it up and out toward you. Remove any packing material that is between the blade assembly and the cylinder.

Remove the plastic cover to the paper chamber. The printing blade will be found within the paper chamber, in a tube or other paper container. Remove the printing blade from the paper chamber, and set it aside for the moment, but be careful where you put it, because it will be ruined if it is bent or folded. Remove the wick pad, moisten it with warm water as described in the Copier Maintenance section of this manual, and return it to the bottom of the paper chamber.

One roll of paper and one printing blade is supplied with the copier. You have already located the printing blade; the roll of paper will be found packed inside the terminal's shipping carton, at the rear of the terminal. The paper is in a plastic bag to preserve its moisture. Again referring to the directions in Copier Maintenance section of this manual for details, remove the roll of paper from the plastic bag (don't try to remove the plastic hubs which the paper is wrapped around), place the paper in the paper chamber so that the paper issues from the underside (there's a retaining bar in the paper chamber that you will have to lift up to install the paper), and replace the humidifying cover of the paper chamber. Thread the paper through the rollers which are found under the printing blade assembly.

Now loosen the three thumbscrews on the top of the blade assembly, and slide the printing blade into the slot in the blade assembly from the right. Don't use force if it doesn't go in easily, or you will bend the blade. Instead, check again to see that all the thumbscrews are loosened, and that you are feeding the blade straight into the slot.

After the blade is completely inserted into its holder, and in fact will not go any further, retighten the thumbscrews, and lower the printing blade assembly slowly onto the paper. The paper should be coming out the other side of the blade assembly, so that it passes under the printing blade on its way out of the terminal.

TESTING THE COPIER

Once these installation procedures have been performed, and once the terminal is working correctly (using acceptance test procedures which were packed with the terminal, or referring to the For Operators section of the *DECscope User's Manual*, EK-VT5X-OP), the copier can be tested by simply pressing the **COPY** key. Typing this key will designate that the entire contents of the screen should be copied by the terminal. Pressing the **COPY** key should immediately activate the motor of the copier, and the motor should run for approximately 45 seconds. At the end of this time, the copy should be available, by lifting the detent lever and pulling out a sufficient amount of paper. (You should have to pull out no more than 20 cm to see the copy.) The image on the paper should exactly match the image on the screen; any text that was on the screen will be copied on the paper.

If the screen was blank, the paper will be blank. To achieve the most complete test of the copier, text should be placed in every column of the screen before the **COPY** key is pressed, to ensure that the copier can copy at all positions on a line. It does not matter, however, whether there is text on every line of the screen, for the purposes of this test of the copier.

The **COPY** key should function at all times, regardless of the settings of any switch on the terminal, and regardless of the computer system to which the terminal is connected. If typing the **COPY** key does not activate the motor, you should check the supply of paper in the copier. The copier may have run out of paper, or the paper may no longer be moist. In either of these cases, replace the paper with a new roll as described in the *Copier User's Manual.*

OPERATING THE COPIER

When the **COPY** key is pressed, all the information currently being displayed on the screen is copied.

In addition to this screen-by-screen method of copying, a continuous-copying mode exists. Auto-Copy Mode, like Hold-Screen Mode, requires one command to enter it and another to exit it, somewhat like a light that can be switched on and off.

In Auto-Copy Mode, downward movement of the cursor causes copying to occur. When a Line Feed or Cursor Down command is performed, the line the cursor was on is copied. If a Direct Cursor Addressing command moves the cursor from line 4 to 9, then lines 4 through 8 are copied. (It is more accurate to say that such lines are not copied but "marked for copying", since the cursor can be moved down again, marking another line for copying, while previous lines are still being copied.) The copier is activated whenever one or more lines have been marked for copying. If Auto-Copy Mode is exited before all the marked lines have been copied, they will still be copied. To enter Auto-Copy Mode, the operator holds the **SHIFT** key down and presses the **COPY** key. Doing so again will cause the terminal to exit Auto-Copy Mode. Entering and exiting Auto-Copy Mode does not mark any lines for copying.

To remove output from the copier, lift the metallic lever on the side of the unit where the paper appears — the Detent Lever — and pull on the paper until all the information is visible. Lower the Detent Lever, and pull the paper up sharply so that it tears on the serrated cutting edge built into the shell of the terminal. When using the copier for the first time in several minutes, lift the Detent Lever and pull the paper out until the wet portion is reached before trying to copy anything. When the copier will not be used for an extended period of time, lift the Detent Lever to disengage the rubber rollers which feed the paper through the copier.

PROGRAMMING THE COPIER

The **COPY** key performs three functions: When unshifted, it causes the screen to be copied. When shifted, it tells the terminal to enter or exit Auto-Copy Mode. Software can perform these functions also, by transmitting Escape Sequences to the terminal. A separate Escape Sequence exists for each of the three functions.

```
┌── COPIER COMMANDS ──────────────────────────────────┐
│                                                      │
│   ESC ]                    Copy Screen               │
│                                                      │
│   ESC ^                    Enter Auto-Copy Mode       │
│                                                      │
│   ESC _                    Exit Auto-Copy Mode        │
│                                                      │
└──────────────────────────────────────────────────────┘
```

Here are two examples of software use of Auto-Copy Mode:

1. To output a file to the copier, software sends the following text and commands:

    a. **CR** and **LF**, if necessary, to ensure that the file begins on a new line.

    b. **ESC J**, if necessary, to erase extraneous data from the portion of the screen below the cursor.

    c. **ESC ^** to enter Auto-Copy Mode.

    d. The body of the file.

    e. A **LF** must be supplied if it is not the last character in the file, in order to mark the last line in the file for copying.

    f. **ESC _** to exit Auto-Copy Mode.

    The file, and only the file, will be copied.

2. To make a copy of the cursor line, the host sends the following commands: Enter Auto-Copy Mode, Line Feed, Exit Auto-Copy Mode, Cursor Up (7 characters). The cursor will be returned to its former location in the data, but if it was on the bottom line to begin with, this procedure will cause a scroll.

Although the action of the copier is not instantaneous and may lag behind data transmission, provisions exist to ensure that requested output is copied as it appeared on the screen at the time of the copying request. In three situations where information which has been requested to be copied might be destroyed or altered before it can be copied, the terminal will cease processing incoming characters:

1. In Auto-Copy Mode, when the cursor is moved up to a line that was marked for copying, but has not yet been copied, the terminal will cease processing incoming characters until the cursor line is copied.

2. In Auto-Copy Mode, if the top line was supposed to be copied but has not yet been copied, and if the cursor is on the bottom line and **LF** is received — so that a scroll would be performed and the top line would leave the screen — the terminal will not process the **LF** and subsequent characters until the top line has been copied. (This is the only situation in Auto-Copy Mode in which scrolls are prohibited. In general, the terminal does not require that data being copied be on the same line on the screen that it was when the request was made to copy it.)

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3.   The terminal will not process incoming characters after a Copy Screen command, until the entire screen has been copied.

In these situations, the terminal begins putting incoming characters in its Silo buffer, and transmits **XOFF** to the host. When the necessary copying has been finished, the terminal will begin to process the characters in the silo. When it has processed all the characters in the silo, the terminal will send **XON** to the host to indicate that it is ready for more characters.

Note that the host cannot determine if the terminal operator has pressed the **COPY** key. If there is any possibility that one of the above situations may occur, host software *must* support synchronization with **XOFF/XON** or the silo may overflow, interfering with the accuracy of the output.

In the three situations described above, characters typed by the operator are still transmitted to the host. If the terminal is switched for either Off-Line or Local Copy operation, these characters will also go into the silo. Therefore, the operator of such a terminal should refrain from typing when the copier is running, since he could cause the silo to overflow by his typing.

COPIER MAINTENANCE

There are four maintenance functions the copier user must perform: changing the paper, replacing the anode (the printing blade), moistening the wick, and cleaning the helix wires. Doing all these things at the same time saves time and maintains the highest quality of copier output.

When the blue line appears on the side of the paper, there is only 2 to 3 meters left in the roll. Since the last meter of paper will be too tightly wrinkled to copy well, remove the paper and perform the maintenance at this time.

Access to the copier compartment is gained by lifting off the cover, taking hold at the serrated edge. Lift the print head assembly up by the three thumbscrews and swing it out towards you.

The anode is a long metal strip bent lengthwise (Figure 1). It is held in place by the thumbscrews. Turn the thumbscrews counterclockwise as far as they will go, to release the anode. The anode can then be slid to the right and removed. **Do not use your fingers to remove the anode!** A worn anode often has a sharp edge where it has been rubbing against the paper. Instead, use a pencil to slide the anode out, by inserting it through one of the anode's windows.

Remove the paper cover, take out the remaining paper and the plastic hubs. Removing the paper will reveal a large cylinder with spiraled (helical) wires on its surface. This cylinder rotates when the copier is running. Salt deposits on the helix wires from the special copy paper used can cause streaks on the paper where characters are faint or do not appear at all. The helix wires can be cleaned with a damp cloth. Rotate the cylinder by hand in order to clean the entire surface. Do not try to remove the cylinder.

The wick pad and its plastic housing are in the paper chamber. Take hold of the housing by the round finger-hole and pull it out. Hold it under a faucet and run warm water over the felt, so that the wick is moistened. This helps to keep the copier paper moist throughout the life of the roll. By removing the housing to moisten the wick, the possibility of water leaking into the interior of the terminal is avoided. When the wick is moist, shake off the excess water and put the housing back in the paper chamber. Three tabs in the frame at the rear of the paper chamber will hold down the back of the wick housing. By applying pressure to the center of the housing, three tabs in the front of the paper chamber will come through rectangular holes in the wick housing, snapping the housing into place.

To install a new roll of paper, remove it from its plastic bag and unravel about 1/2 meter of paper. With one hand, lift the retaining bar which is inside the paper chamber. With the other hand, place the roll in the chamber so that the paper issues from the underside of the roll. Thread the paper through the rollers, and out the side of the terminal, and replace the paper cover.

RETAINING BAR
Holds paper in place

PAPER CHAMBER
(Humidifying cover is not
shown.) A printing blade
will be packed here.

WICK PAD
Keeps paper moist.

IN

OUT

THUMBSCREWS
Turn counterclockwise
to loosen.

HELIX WIRES
Clean lint off wires
when changing paper.

PRINTING BLADE (ANODE)
Slides in from the right.
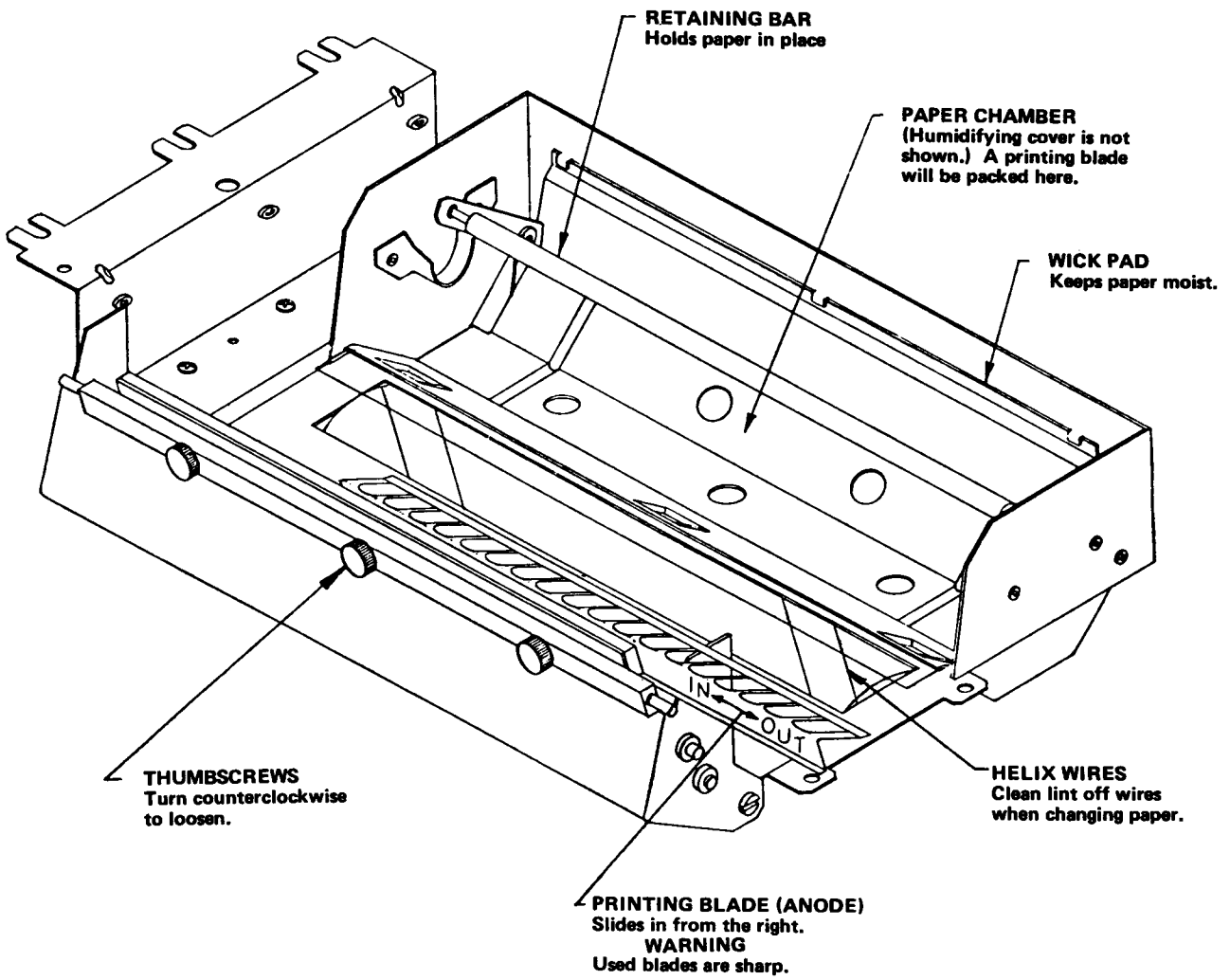**WARNING**
Used blades are sharp.

Figure 1 Copier

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A new anode can now be slid in from the right. A new anode will not be dangerously sharp. Push it to the left as far as it will go and retighten all three thumbscrews when it is in place.

To summarize the six steps in this maintenance routine:

1. Remove the anode.

2. Remove the old roll of paper.

3. Clean the helix wires.

4. Moisten the wick.

5. Install a new roll of paper.

6. Install a new anode.

If the paper is allowed to dry, it will not work in the copier. Do not leave a roll of paper in the copier for more than a month, or in its plastic bag for more than six months. To avoid unnecessary wear to the helix wires, **never** operate the copier without paper.

The Character-Width Lever is the only operator control found in the copier compartment. It is a lever located to the left of the paper chamber. This lever can be adjusted to produce characters of the desired width. Characters in the copier output which run together, or whose rightmost portions appear to be cut off, are indications that the character-width lever is set too wide.

VT50-SERIES COPIER

SUMMARY OF SPECIFICATIONS

GENERAL

Device Type: Electrolytic Copier

Principle: Facsimile Technology

PRINT CHARACTERISTICS

Character Set: Same characters as are displayable on video screen

Character Format: Same dot-matrix as video screen

Columns: 80

Lines: Variable number (continuous form)

Page Size: There is no fixed page size, since the paper is unperforated and copying can take place on a line-at-a-time basis. Pages with the same number of lines as the video screen can be copied by a single command.

OPERATION

Copy Speed: 30 lines per minute (worst case)

Modes of Operation:
1) PAGE-BY-PAGE OUTPUT
The contents of the screen are copied on command.

2) AUTO-COPY MODE
In Auto-Copy Mode, each time an **LF** (Line Feed) is received, the line the cursor was on is copied.

Control:
1) OPERATOR CONTROL
The three copier commands — Copy Screen, Enter Auto-Copy Mode, and Exit Auto-Copy Mode, can be issued from the terminal by use of the **COPY** key.

2) SOFTWARE CONTROL
The same commands can be issued from the host computer, in the form of Escape Sequences.

Synchronization: The terminal transmits **XOFF** (or DC3; octal 023) and **XON** (or DC1; octal 021) to the host to regulate the flow of data from the host to the terminal during a copying operation. The terminal will accept and display data from the host during a copying operation unless a line which has yet to be copied would be modified. The terminal features a finite buffering capacity to prevent loss of data after **XOFF** is sent.

INTERFACING

Operator Controls:

    (Physical)   Feed Lever (Paper Release)

    (Electronic)   Character-Width Lever
Keyboard Copy Commands

Interface: Internal to terminal. Terminal has EIA and current-loop connector options.

SPARE PARTS

Paper and Anode: Customer Order Numbers:

                                          VT50K-03 — 3 rolls of paper and 3 anodes

                                          VT50K-12 — 12 rolls of paper and 12 anodes

MAINTENANCE

Routine Maintenance Required: Changing paper, replacing anodes, cleaning helix, moistening wick.

ENVIRONMENTAL   DEC STD 102 — Class A environment

                                          WARNING: **Copier environment requirements are more stringent than those of the terminal.**