IBM

Series/1

GA34-0039-3

File No. S1-01

IBM Series/1
Operator's Guide

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Federal Communications Commission (FCC) Notice

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Fourth Edition (August 1981)

This is a major revision of, and obsoletes, GA34-0039-2 and Technical Newsletters GN34-0622 and GN34-0671. This revision includes information on 4952 Processor, 4955 Processor, 4965 Diskette Drive and I/O Expansion Unit, and the 4975 Printer.

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Preface

This publication contains helpful information for those who operate the IBM Series/1. It introduces the reader to the system units, describes the associated operator controls, and tells how to operate the units with those controls. It does not describe how to use the programming support for the IBM Series/1. The programming support depends on your particular applications and company procedures.

The reader should have a basic knowledge and understanding of displays, keyboards, printers, input/output units, and their relationship to a processor.

This publication contains five chapters and two appendixes:

- "Chapter 1. Introduction" on page 1-1. briefly describes the various IBM Series/1 units.
- "Chapter 2. Turning On and Off System Power" on page 2-1. explains how to turn on and off Series/1 system power. A simple recovery procedure is included for restoring power after a power failure or an emergency power-off situation.
- "Chapter 3. Processor Consoles and Operating Procedures" on page 3-1. explains the function of the processor keys, indicators, and switches. Included are operator-initiated procedures, such as initial program load (IPL), that can be performed at the console.
- "Chapter 4. Series/1 Units and Operating Procedures" on page 4-1. explains the functions of the operator controls (such as keys and switches) as they apply to each of the Series/1 units. It also describes the operator-initiated procedures associated with each Series/1 unit.
- "Chapter 5. Operator Aids" on page 5-1. provides additional procedures to help the operator restore correct system operation following a power failure. Aids for determining the cause of problems are included as well as some suggested solutions.
- "Appendix A. Code Conversion" contains a chart for converting graphic symbols into hexadecimal and binary codes.
- "Appendix B. Applying Reflective Strips to Magnetic Tape" explains the purpose of the reflective strips and how to apply them to the tape.

Related Publications

The *IBM Series/1 Graphic Bibliography*, GA34-0055, describes the technical publications on Series/1 machines and programs that are needed by those who plan for, install, program, operate, and maintain the IBM Series/1. For a given Series/1 publication, the bibliography provides a quick reference to the title, order number, intended audience, content, and relationship to other publications in the library. To obtain copies of these publications, contact your IBM representative.

Contents

Chapter 1. Introduction

This chapter provides an overview of the various IBM Series/1 machine types. Each machine type introduced in this chapter is described in more detail in subsequent chapters.

Detailed information beyond the scope of this manual can be found in the description manuals written for each machine type. See the preface of this manual for details about related publications.

System Design Overview

The IBM Series/1 is a compact, general-purpose computing system that can be assembled in various configurations, depending on its application. Because of this flexibility, each Series/1 configuration is unique. One such configuration is shown in Figure 1 on page 1-2.

Because you, the Series/1 operator, must make your Series/1 perform the work required by your particular application, it is essential that you familiarize yourself with:

- The machine types described in this chapter
- The configuration of your Series/1
- Your company's operating procedures

The *IBM Series/1 System Summary*, GA34-0035, contains additional Series/1 information that can help you understand the system and the operations you are performing.

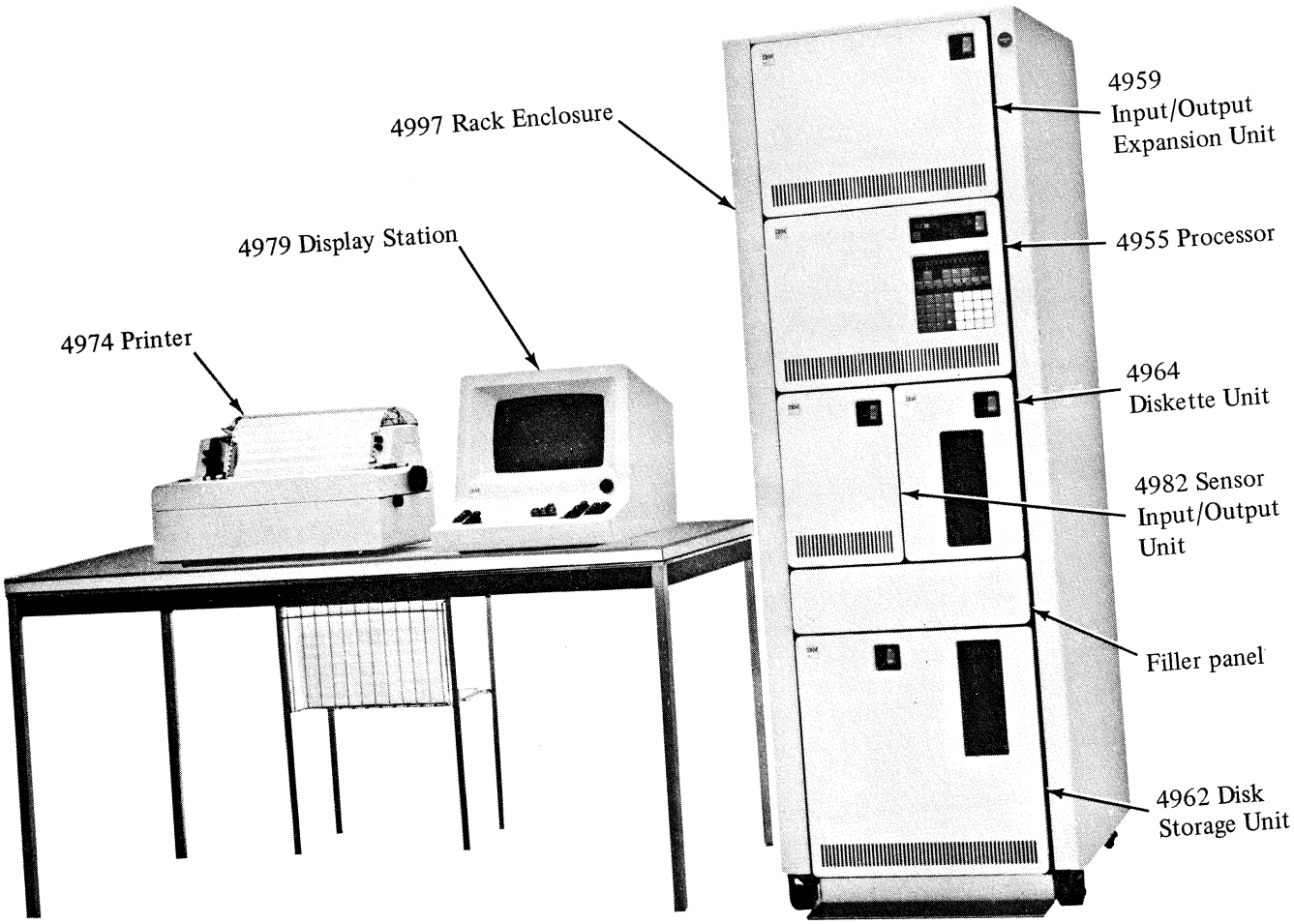


Figure 1. **Series/1 with modular units mounted in an IBM 4997 Rack Enclosure Unit.**

Machine Types and Features

This manual describes the following machine types and features:

- IBM Processor Basic Console
- IBM Processor Programmer Console
- IBM 4959 Input/Output Expansion Unit
- IBM 4959 Input/Output Expansion Unit with Two Channel Switch
- IBM 4962 Disk Storage Unit
- IBM 4963 Disk Subsystem
- IBM 4964 Diskette Unit
- IBM 4965 Diskette Drive and I/O Expansion Unit
- IBM 4966 Diskette Magazine Unit
- IBM 4969 Magnetic Tape Subsystem
- IBM 4973 Line Printer
- IBM 4974 Printer
- IBM 4975 Printer (see note)
- IBM 4979 Display Station
- IBM 4982 Sensor Input/Output Unit
- IBM 4987 Programmable Communications Subsystem
- IBM 4990 Communications Console for the 4987
- IBM 4993-1 Series/1—System/370 Termination Enclosure
- IBM 4997 Rack Enclosure
- IBM 4999 Battery Backup Unit
- IBM Communications Indicator Panel

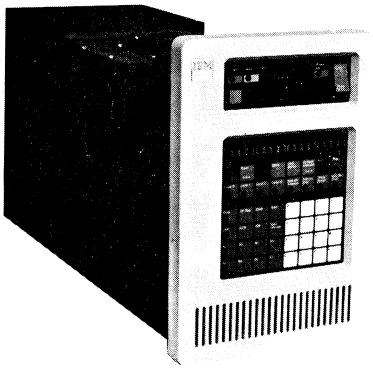
Note: The IBM Series/1 4975 Operator's Guide (GA34-0149) provides instructions on how to operate the 4975 Printer.

IBM 4952 Processor

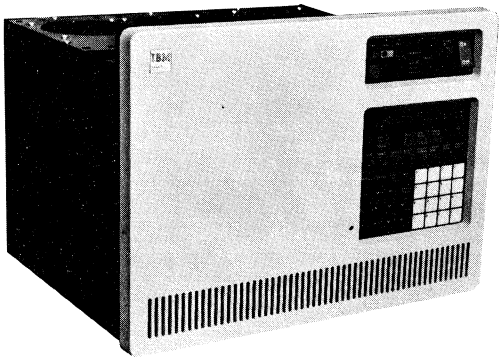
The 4952 is available in three models, as shown in Figure 2. Each model is a modular unit designed to fit into an IBM 4997 Rack Enclosure. The 4952 Model C is also available in a stand-alone enclosure (shown below). Each unit includes a circuit card that:

- Contains the processor logic, relocation translator, storage, and clock/comparator.
- Controls the interpretation and execution of instructions.
- Provides the I/O channel link to the various attachments.

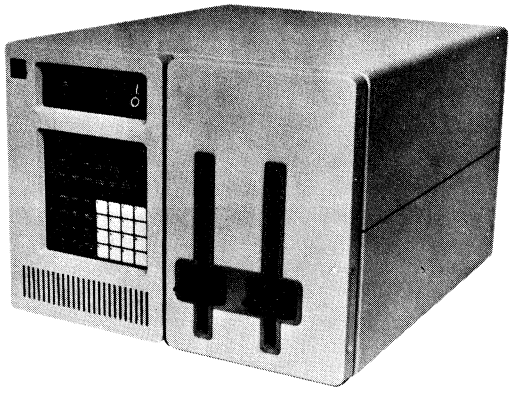
A basic console is standard on all processor units. A programmer console with special functions is available as an optional feature.



4952 Model A



4952 Model B



4952 Model C

Figure 2. **IBM 4952 Processor Models A, B, and C shown with optional programmer console installed. Model C is shown with optional stand-alone enclosure.**

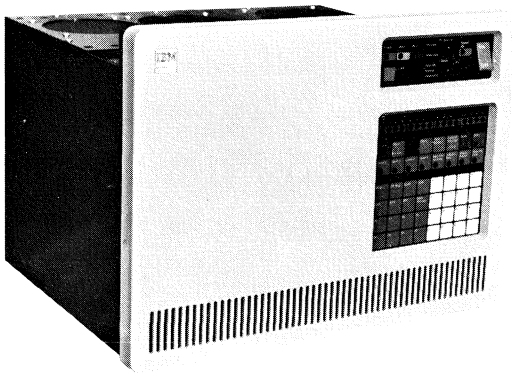
IBM 4953 and 4955 Processors

The 4953 and 4955, as shown in Figure 3, are modular units designed to fit into an IBM 4997 Rack Enclosure. Each processor unit includes the circuit cards that:

- Control the interpretation and execution of instructions
- Provide the I/O channel link to the various attachments

A basic console is standard on all processor units. A programmer console with special functions is available as an optional feature.

4953 Models A and C



4953 Models B and D and
4955 Models A, B, C, D, E, and F

Figure 3. **IBM 4953 and 4955 Processors shown with optional programmer console installed.**

IBM 4959 Input/Output Expansion Unit

The 4959, as shown in Figure 4, is a modular unit designed to fit into an IBM 4997 Rack Enclosure.

The 4959 provides card slots that allow additional I/O attachment features to be connected to the processor channel. This unit is essentially an extension of the processor channel.

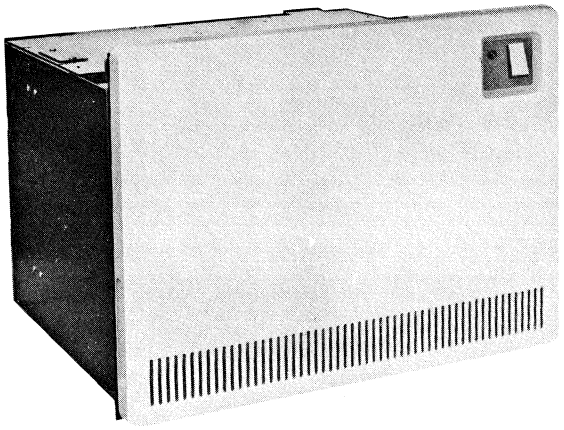


Figure 4. IBM 4959 Input/Output Expansion Unit

IBM 4959 Input/Output Expansion Unit with Two Channel Switch

The Series/1 Two Channel Switch (TCS) is a feature of the 4959 I/O Expansion Unit and is designed to switch common I/O devices between two Series/1 processors.

The 4959 with TCS installed has a console control panel as shown in Figure 5.

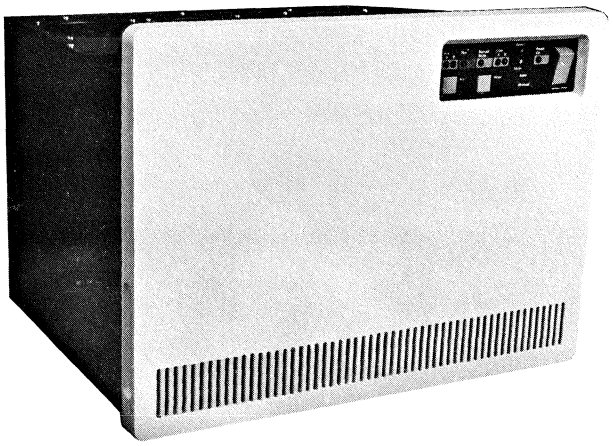


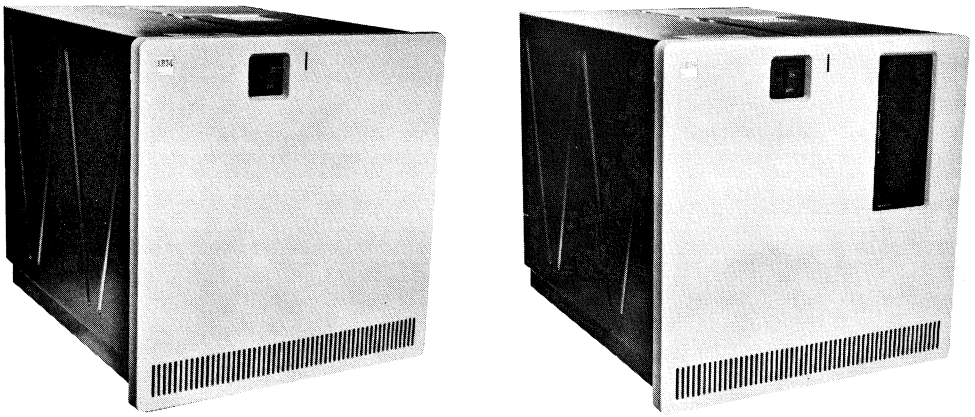
Figure 5. 4959 I/O Expansion Unit with TCS Console

IBM 4962 Disk Storage Unit

The 4962, as shown in Figure 6, is a modular unit designed to fit into an IBM 4997 Rack Enclosure.

The 4962 provides direct access storage for both data records and programs. Data is stored on a nonremovable magnetic disk.

Some models of the 4962 offer a combination of the disk unit and the diskette unit to provide additional storage capacity.



Models 1, 1F, and 3 Models 2, 2F, and 4

Figure 6. IBM 4962 Disk Storage Units

IBM 4963 Disk Subsystem

The 4963 Disk Subsystem consists of one primary unit and a maximum of three expansion units. Each unit, as shown in Figure 7, is designed to fit into an IBM 4997 Rack Enclosure.

The 4963 provides direct access storage for both data records and programs. Data is stored on nonremovable magnetic disks.

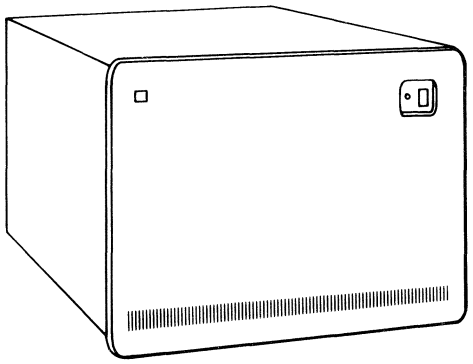


Figure 7. IBM 4963 Disk Storage Unit

IBM 4964 Diskette Unit

The 4964, as shown in Figure 8, is a modular unit designed to fit into an IBM 4997 Rack Enclosure.

The 4964 records data on removable diskettes, which allows you to load new programs or transfer data between systems.

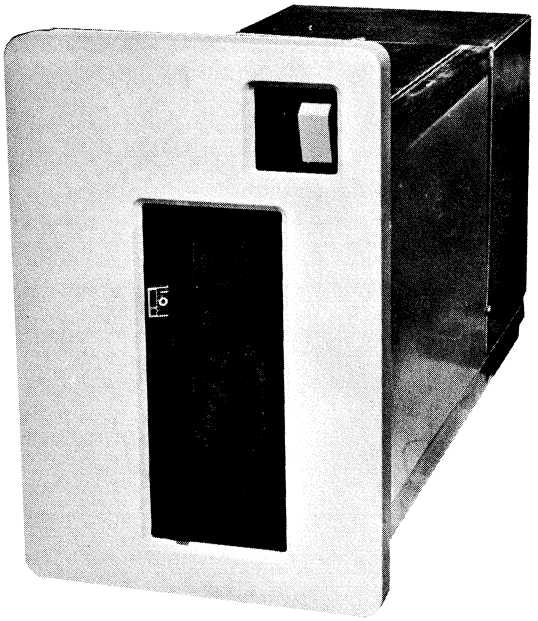


Figure 8. **IBM 4964 Diskette Unit**

IBM 4965 Diskette Drive and I/O Expansion Unit

The 4965, as shown in Figure 9, is a modular unit designed to fit into an IBM 4997 Rack Enclosure. The 4965 unit is a direct access data exchange storage device with one 1.2 megabytes diskette drive, and four card sockets for I/O features. The second diskette drive is an optional feature.

The 4965 records data on removable diskettes, which allows you to load new programs or transfer data between systems.

The 4965 connects to either a processor or an I/O expansion unit.

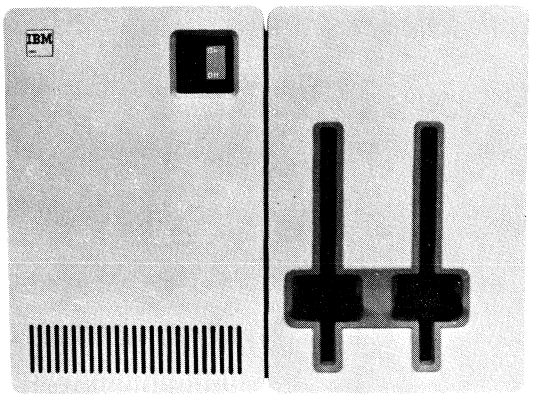


Figure 9. IBM 4965 Diskette Drive and I/O Expansion Unit

IBM 4966 Diskette Magazine Unit

The 4966, as shown in Figure 10, is a modular unit designed to fit into an IBM 4997 Rack Enclosure.

The 4966 provides direct access storage for both data records and programs.

The 4966 records data on removable diskettes, which allows you to load new programs or transfer data between systems.

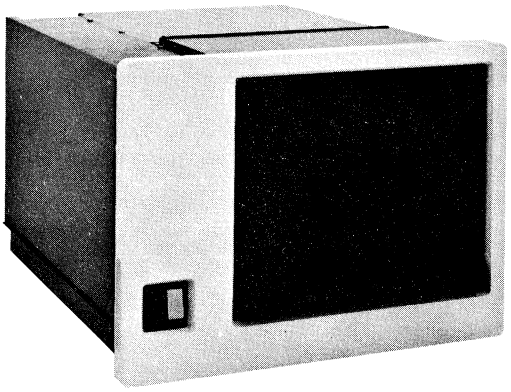


Figure 10. IBM 4966 Diskette Magazine Unit

IBM 4969 Magnetic Tape Subsystem

The IBM 4969 Magnetic Tape Subsystem provides sequential access storage for data records and programs. The tape units record data on 13-millimeter (0.5-inch) wide tape that is contained on a removable reel. This portability allows you to move the recorded data to and from other tape units and systems. It consists of one primary unit and a maximum of three expansion units.

The 4969 is available in two basic models:

- Model 4 reads and writes tape at 1.1 meters per second (45 inches per second).
- Model 7 reads and writes tape at 1.9 meters per second (75 inches per second).

In each subsystem, all units must be the same model. Each unit, as shown in Figure 11, is a modular unit designed to fit into an IBM 4997 Rack Enclosure Model 2.

Model 4 Model 7

Figure 11. IBM 4969 Magnetic Tape Units

IBM 4973 Line Printer

The 4973, as shown in Figure 12, is a free-standing, impact-type printer that provides medium to high-speed hard-copy output on continuous forms paper.

Print speed depends on the printer model:

- Model 1—80 to 155 lines per minute
- Model 2—235 to 414 lines per minute

A forms stand is an optional feature for the Model 1; the Model 2 has a forms enclosure built-in.

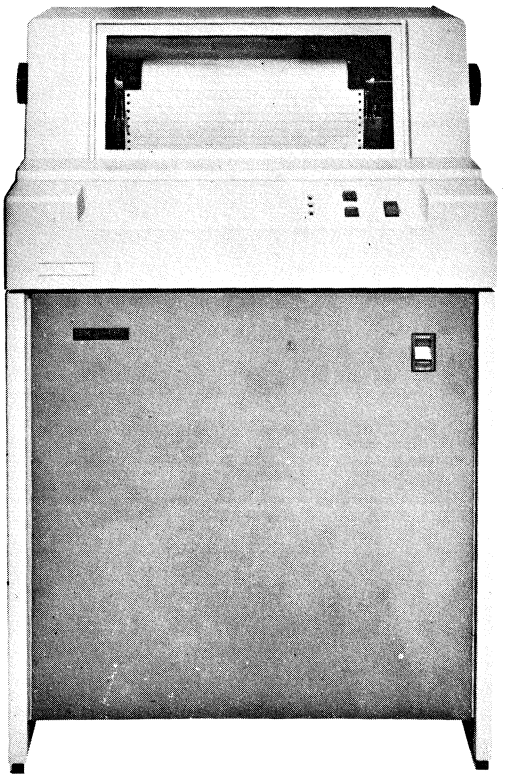


Figure 12. IBM 4973 Line Printer

IBM 4974 Printer

The 4974, as shown in Figure 13, is a tabletop printer that produces characters by printing a pattern of dots. It provides medium-speed output.

The 4974 accepts up to six-part cut or continuous forms. However, five and six-part forms should be tried for satisfactory feeding registration and print quality.

A forms tractor with a chain-drive paper feed is provided for printing on margin-punched multipart continuous forms or preprinted continuous forms.

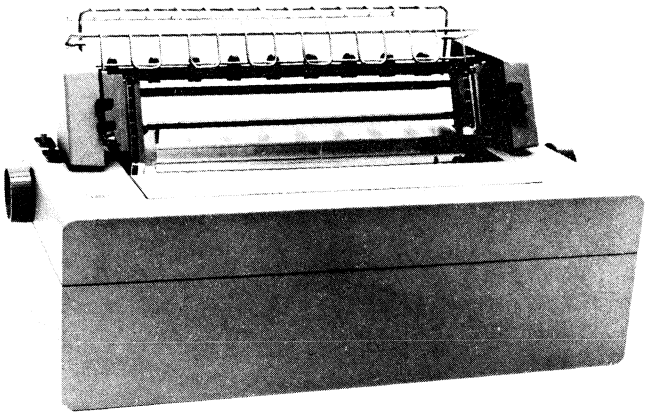


Figure 13. IBM 4974 Printer

IBM 4975 Printer

The 4975, as shown in Figure Figure 14, is a tabletop serial printer with a wire matrix head that produces characters by printing a pattern of dots. Some models of the 4975 can be operated locally, or remote from the Series/1 system.

The *IBM Series/1 4975 Operator's Guide* (GA34-0149) provides instructions on how to operate this printer.

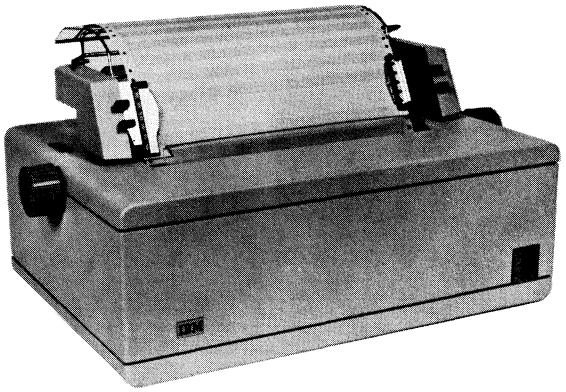


Figure 14. IBM 4975 Printer

IBM 4979 Display Station

The 4979, as shown in Figure 15, is a tabletop unit that serves as a communication link between the user and the system.

The display station displays data transmitted to or from the processor. ,

The display station enables the user to:

- Retrieve data from the processor
- Enter, modify, or delete data on the display
- Send the new or revised data to the processor

Figure 15. **IBM 4979 Display Station**

IBM 4982 Sensor Input/Output Unit

The 4982, as shown in Figure 16, is a modular unit designed to fit into an IBM 4997 Rack Enclosure.

The 4982 allows digital and analog I/O features to be attached to ,the processor channel.

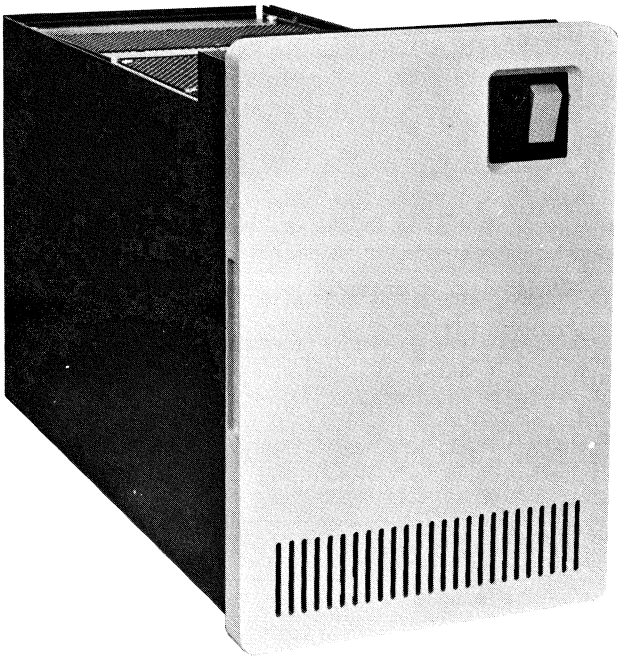


Figure 16. **IBM 4982 Sensor Input/Output Unit**

IBM 4987 Programmable Communications Subsystem

The 4987, as shown in Figure 17, is a modular unit designed to fit into an IBM 4997 Rack Enclosure.

The 4987 provides a combination of features that allow expanded communications versatility in the IBM Series/1.

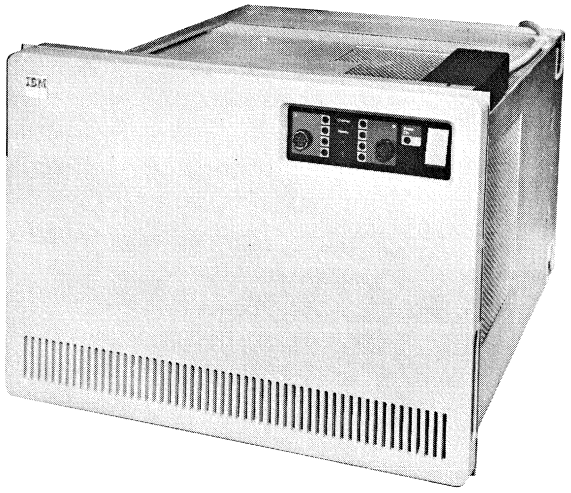


Figure 17. IBM 4987 Programmable Communications Subsystem

IBM 4990 Communications Console for the 4987

The 4990, as shown in Figure 18, is an optional hand-held console for altering and debugging programs, and for defining problems.

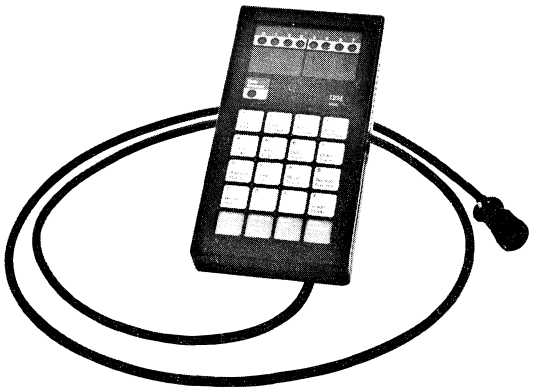


Figure 18. IBM 4990 Communications Console for the 4987

IBM 4993-1 Series/1—System/370 Termination Enclosure

Attaching a System/370, 303X, or 43XX processor to a Series/1 requires a Series/1—System/370 attachment that consists of:

- An IBM 4993-1 Series/1—System/370 Termination Enclosure, and
- An IBM Series/1—System/370 Channel Attachment Feature

The 4993-1, as shown in Figure 19, is a modular unit designed to fit into an IBM 4997 Rack Enclosure. The 4993-1 provides physical support, mechanical connection, and electrical termination for the System/370 channel interface cables.

The channel attachment feature provides storage-to-storage communications between a Series/1 and either:

- A System/370 (Models 135-168)
- A 3031, 3032, or 3033 Processor, or
- A 4331 or 4341 Processor

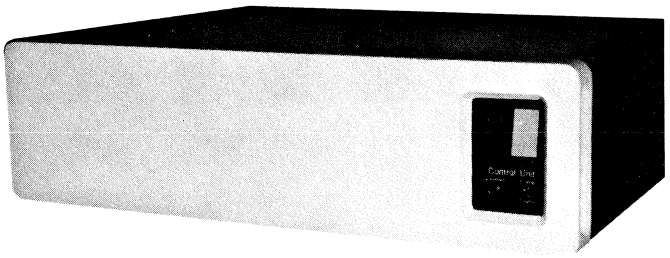


Figure 19. **IBM 4993-1 Series/1—System/370 Termination Enclosure**

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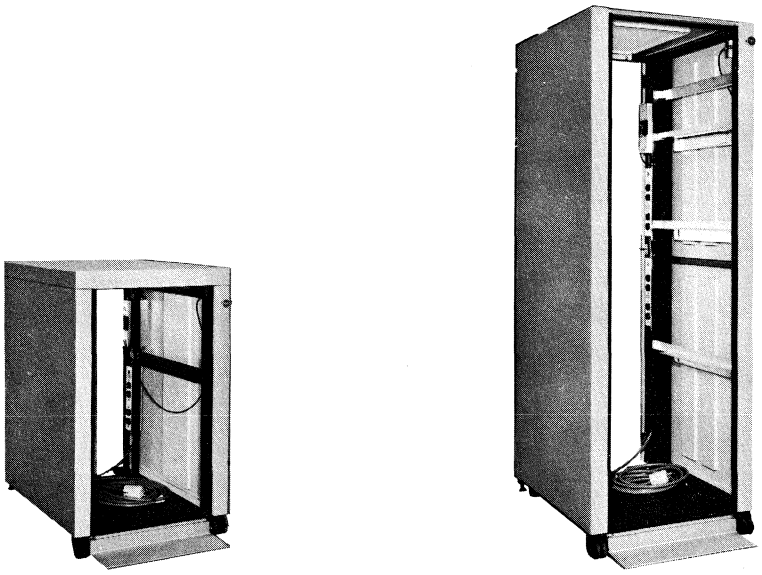
IBM 4997 Rack Enclosure

The 4997, as shown in Figure 20, is a modular unit designed to provide mounting space for the IBM Series/1 modular units.

A primary power distribution system, including an emergency power-off switch, supplies power to all units in the enclosure. Four models provide two sizes and a choice of plain or decorative filler panels.



Models 1A and 1B

Models 2A and 2B

Figure 20. IBM 4997 Rack Enclosures

IBM 4999 Battery Backup Unit

The 4999, as shown in Figure 21, is a modular unit designed to fit into an IBM 4997 Rack Enclosure.

The 4999 supplies and monitors processor ac utility power. If for some reason the utility power becomes inadequate or is temporarily lost, the battery backup unit substitutes dc-to-ac inverted power from a user-supplied battery. This backup power prevents losing main storage data during a utility power failure.

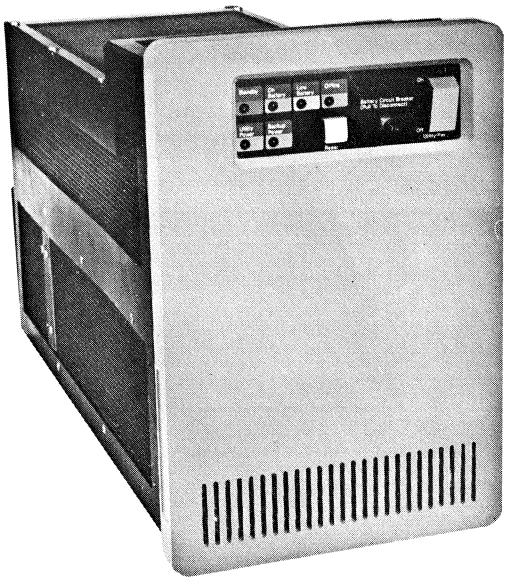


Figure 21. IBM 4999 Battery Backup Unit

IBM Communications Indicator Panel

The IBM Communications Indicator Panel, as shown in Figure 22, is an optional feature and is physically located behind the front cover of the processor or I/O expansion unit in which the panel is installed.

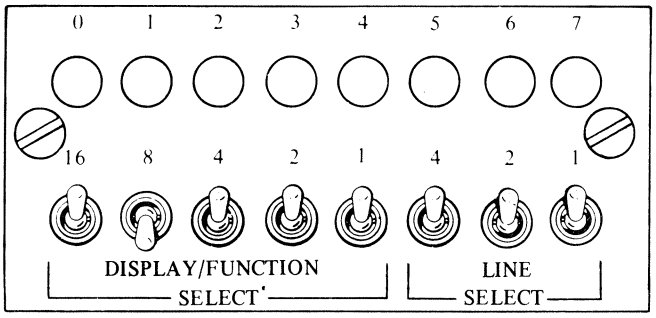


Figure 22. **IBM Communications Indicator Panel**

Chapter 2. Turning On and Off System Power

This chapter explains how to turn on and off Series/1 system power. A simple recovery procedure is included for restoring power after a power failure or an emergency power-off situation (Emergency Pull switch was pulled).

As mentioned in "Chapter 1. Introduction" on page 1-1, not all Series/1 systems are alike. Therefore, the procedures in this chapter are for a typical system configuration.

Turning On System Power

Prerequisites

Before attempting to apply power to the Series/1, refer to Figures 1 and 2 and make sure that:

- The power cords 6 are plugged in for all:
  - — rack enclosures
  - — table top units
  - — free standing units
- If a battery backup unit is included in the system, make sure that:
  - — The processor power cord is plugged into the battery backup unit outlet receptacle 9 (three-prong plug at the rear of the battery backup unit).
  - — The battery backup unit power cord is plugged into the rack enclosure power distribution panel 8.
  - — The battery is connected.
- All power cords from the rack-mounted units are plugged into the rack enclosure power distribution panel 8.
- The rack enclosure circuit breaker 7 is in the On position.
- All covers for all units are closed.

Applying Power

Follow these procedures in the correct order, to apply power to the Series/1. If the indicated machine type does not apply, then proceed to the next step.

1. Verify that the Emergency Pull switch 4 is pushed in.
2. Set the Enable/Disable switch 5 on the 4993-1 to the Disable position.
3. Place the On/Off switch for the Series/1 units in the On position, in the following order.

   1st
   - 4973 line printer
   - 4974 printer
   - 4975 printer
   - 4978 display station
   - 4979 display station

   2nd
   - 4962 disk storage unit
   - 4964 diskette unit
   - 4965 diskette drive and I/O expansion unit
   - 4966 diskette magazine unit
   - 4969 magnetic tape subsystem
   - 4982 sensor I/O unit
   - 4987 programmable communications subsystem
   - 4999 battery backup unit

3rd
4959 I/O expansion unit with TCS
4959 I/O expansion unit(s)

4th 4952, 4953 or 4955 processor units

5th 4963 disk subsystem

6th 4993-1 Series/1-System/370 termination enclosure

Always power on the 4993-1 last. If your system does not include a 4993-1, always power on the 4963 last.

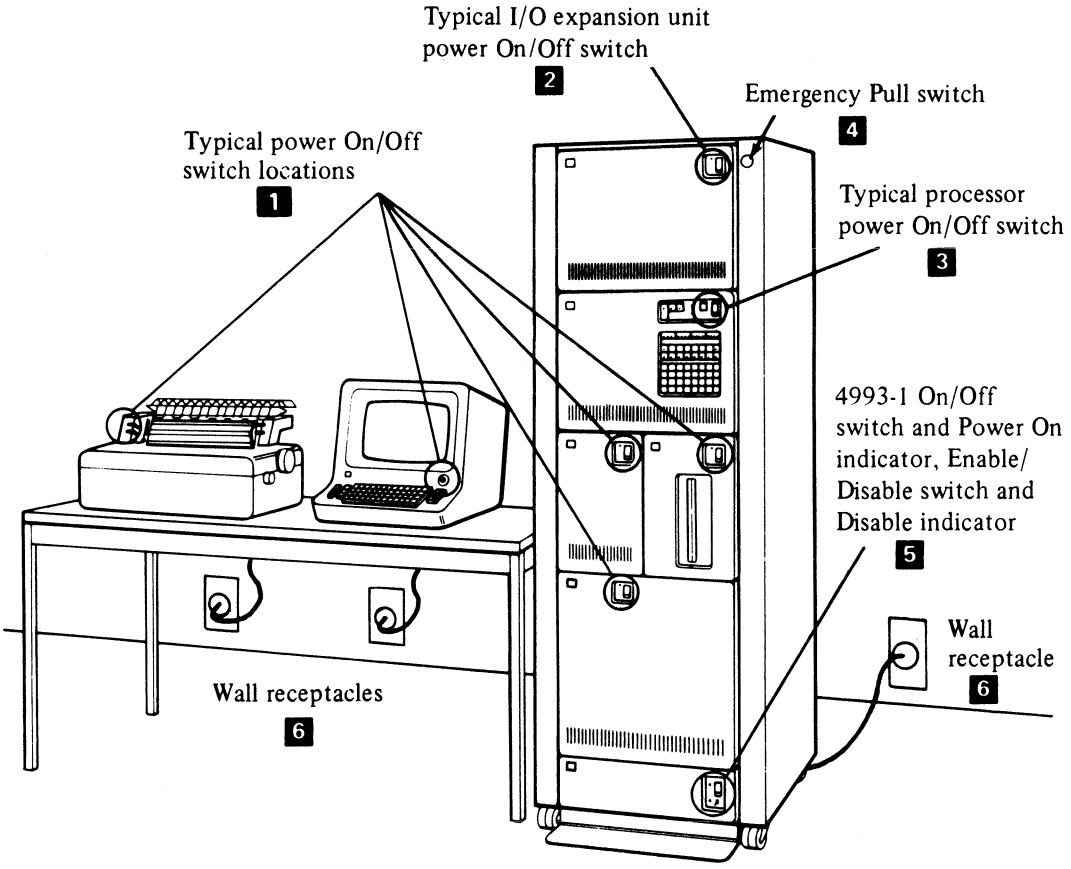


Figure 23. Series/1 power locations

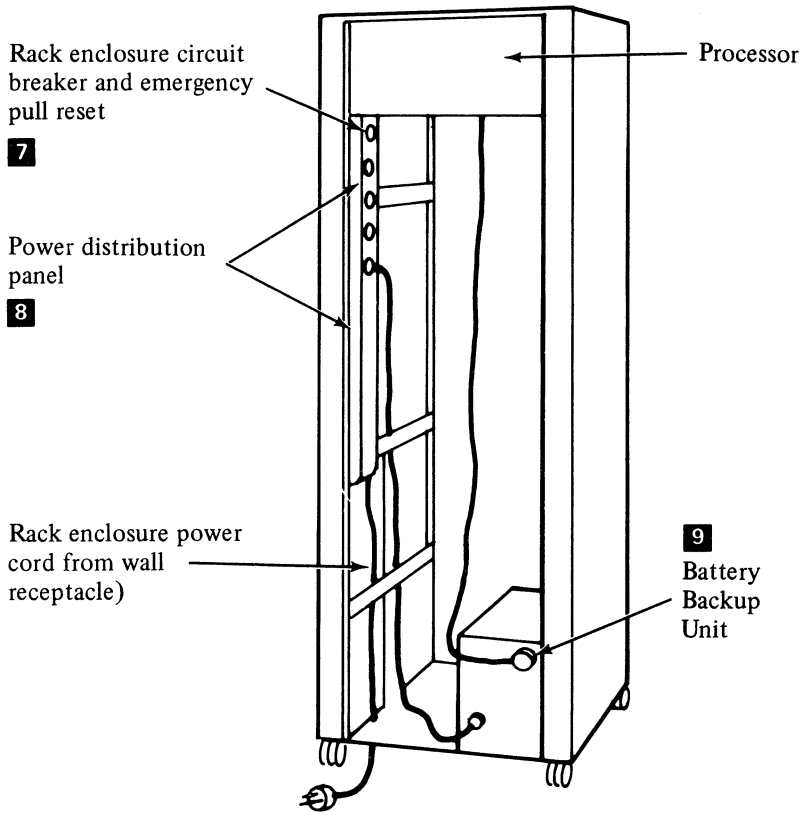


Figure 24. **Rack enclosure power locations (rear view)**

Turning Off System Power

Normal Operation

If you have the 4993-1 Series/1—System/370 Termination Enclosure, refer to Figure 23 on page 2-3 and take the 4993-1 offline first by performing these steps:

1. Notify the System/370 operator that the unit is being taken offline.
2. Set the Enable/Disable switch 5 to the Disable position and verify that the Disable indicator is on (indicating that the unit is offline).

   Note: If the Disable indicator does not turn on, *do not proceed* call your customer engineer.

3. Place the On/Off switch 5 on the 4993-1 in the Off position.

To turn off system power on the Series/1, place the On/Off switch 1 for each unit in the Off position (Figure 23 on page 2-3).

Note: Do not use the Emergency Pull switch for a normal power-off sequence. This switch is connected to an internal circuit breaker that must be manually reset from the back of the rack enclosure.

Emergency

You can remove power from all of the units mounted *within* a rack enclosure by pulling the Emergency Pull switch 4 (Figure 23 on page 2-3).

Note: If this is a multiple-rack system, each rack's Emergency Pull switch must be pulled.

To restore power after an emergency power-off:

- Place all power On/Off switches to the Off position.
- Correct the problem that caused the emergency removal of power.
- Restore power by following the procedure as described under "Turning On System Power."

Chapter 3. Processor Consoles and Operating Procedures

This chapter explains the function of each switch, indicator, and key on the Series/1 processor consoles. It also describes the operator-initiated procedures, such as initial program load (IPL), that can be performed at the consoles. Each processor comes equipped with a basic console. They can, however, come equipped with a basic console and an optional programmer console as shown in Figure 25.

The 4952 Model C processor is equipped with one or two diskette slots. Refer to Chapter 4, "IBM 4965 Diskette Drive and I/O Expansion Unit" for instructions on using the diskette drive.

The basic console is primarily intended for systems that are totally dedicated to a particular application where operator intervention is not needed to execute jobs.

The basic console with the optional programmer console is used in operator-oriented systems where a variety of programs are entered and executed during the day. This more versatile console arrangement helps you diagnose program and machine problems. It allows you to display and alter data and programs that are in storage.

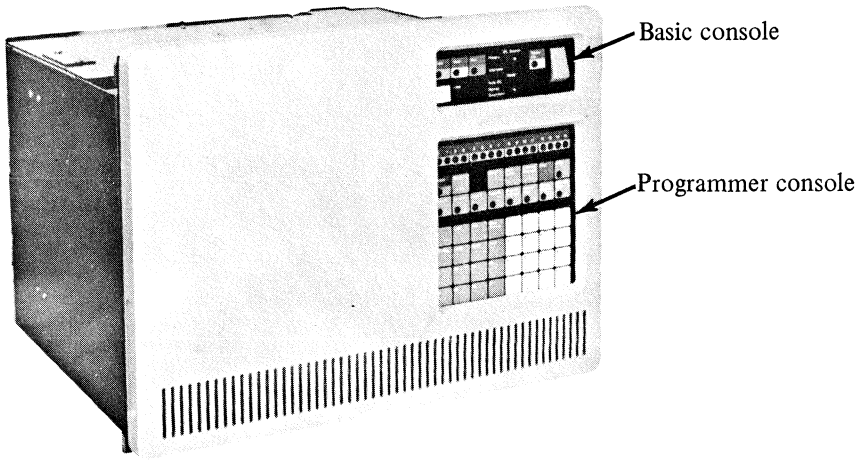


Figure 25. Series/1 processor consoles

Basic Console

The basic console has the following switches and indicators as shown in Figures 26 through Figure 30 on page 3-8.

- Switches
  - — On/Off
  - — IPL Source
  - — Mode
  - — Load
- Indicators
  - — Power On
  - — Run
  - — Wait
  - — Load

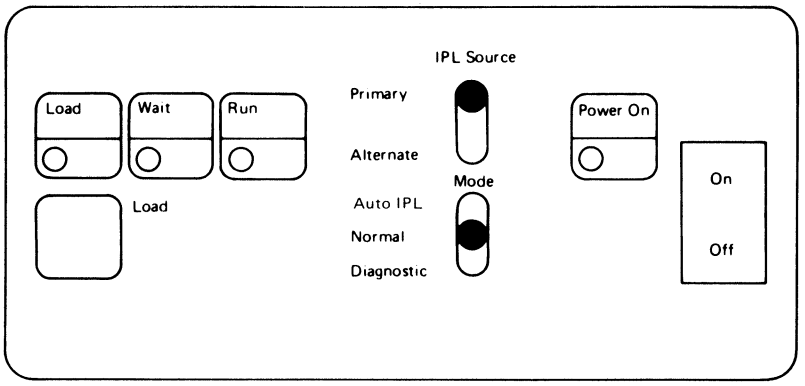


Figure 26. Basic console

Switches

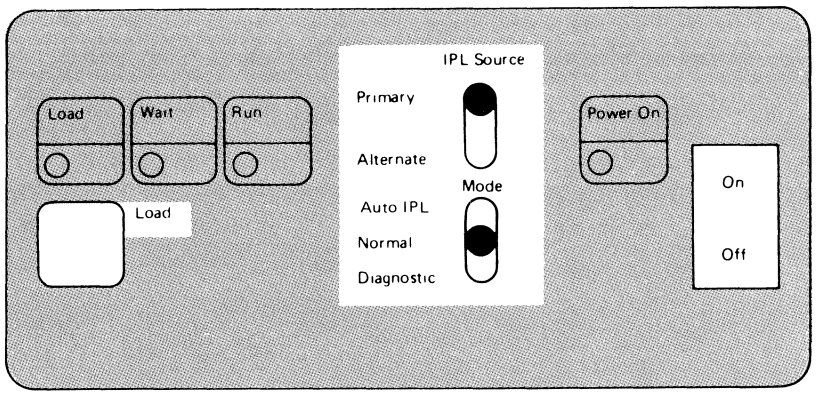
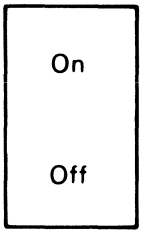


Figure 27. Basic console switches

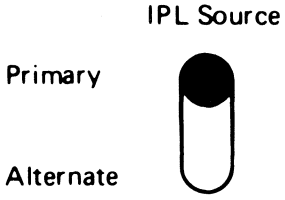
On/Off Switch



Pressing the top of the On/Off switch applies power to the processor card file and turns on the Power On indicator.

Pressing the bottom of the On/Off switch removes power from the processor card file and turns off the Power On indicator.

IPL Source Switch

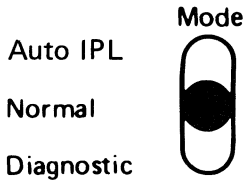


The IPL Source switch selects the Input/Output (I/O) device to be used for initial program loading.

There are two positions on the IPL Source switch:

- The primary position selects the primary IPL device for your system
- The alternate position selects the alternate IPL device for your system

Mode Switch



The Mode switch has three positions that allow you to select the mode you will operate in:

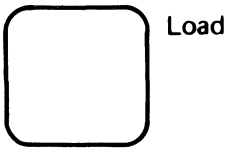
- Auto IPL
- Normal
- Diagnostic

Auto IPL—The IPL is automatically initiated after a successful power-on sequence. Bit 13 of the processor status word (PSW) is set to indicate to the software that an automatic IPL was performed. In this mode, Stop instructions are treated as no-ops (no-operation).

Normal—This position is for attended operations. In this mode, Stop instructions are treated as no-ops (no-operation).

Diagnostic—This position is used only with the programmer console. It places the processor in diagnostic mode. When the processor is in diagnostic mode, Stop instructions cause the processor to enter the stop state.

Load Switch



Pressing the Load switch causes:

- A system reset
- An initial program load (IPL)

When the IPL functions are in process, the Load indicator is on. It remains on until the IPL is completed.

Indicators

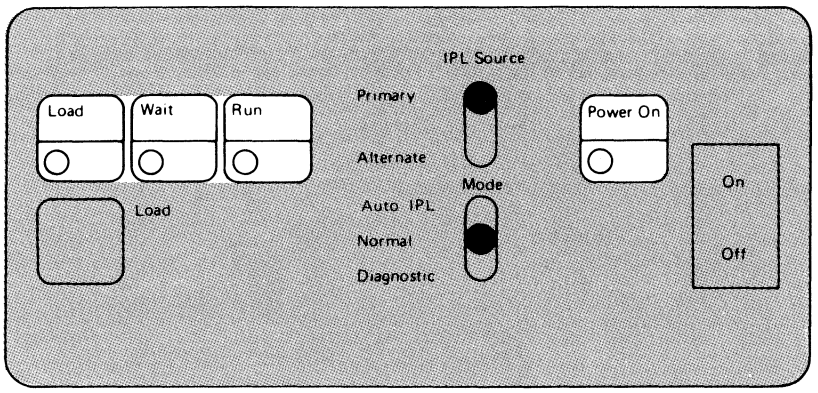
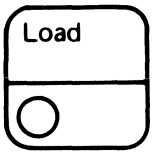


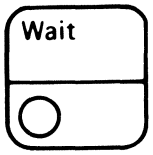
Figure 28. Basic console indicators

Load Indicator



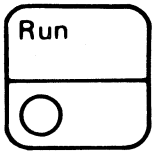
The Load indicator is on when the machine is performing an initial program load (IPL).

Wait Indicator



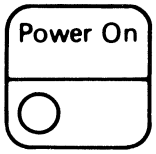
The Wait indicator is turned on when a program instruction exits the active level and no interrupts are pending.

Run Indicator



The Run indicator is on when the program is executing instructions.

Power On Indicator

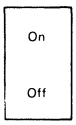


The Power On indicator is on when the correct power levels are available to the processor card file.

Initial Program Load (IPL) Procedures

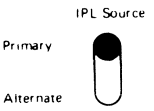
Normal/Diagnostic IPL Procedure

IPL the system as follows:

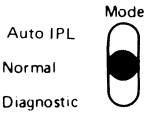


Set the On/Off switch to the On position.

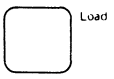
Prepare the IPL unit. A Series/1 can be IPLed by one of several units. If a diskette is to be used, load it as described under "IBM 4964 Diskette Unit," "IBM 4965 Diskette Drive and I/O Expansion Unit," or "IBM 4966 Diskette Magazine Unit" in "Chapter 4. Series/1 Units and Operating Procedures."



Select the IPL source. The source could vary from system to system. If in doubt, ask your system programmer.



Select the IPL mode (Normal or Diagnostic).



Press the Load switch. The load indicator will remain on until IPL is complete. The system is now ready to run your program.

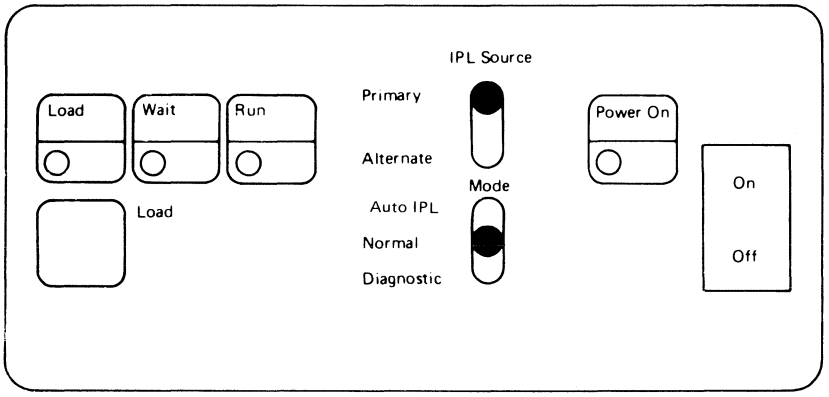
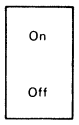


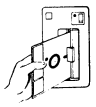
Figure 29. **Basic console**

Auto IPL Procedure

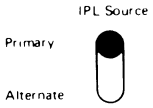
Load the system as follows:



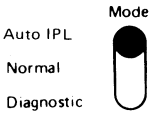
Set the On/Off switch to the Off position.



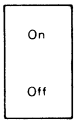
Prepare the IPL unit. A Series/1 can be loaded by one of several units. If a diskette is to be used, load it as described under "IBM 4964 Diskette Unit," "IBM 4965 Diskette Drive and I/O Expansion Unit," or "IBM 4966 Diskette Magazine Unit" in "Chapter 4. Series/1 Units and Operating Procedures"



Select the IPL source. The source could vary from system to system. If in doubt, ask your system programmer.



Set the Mode switch to Auto IPL.



Set the On/Off switch to the On position.

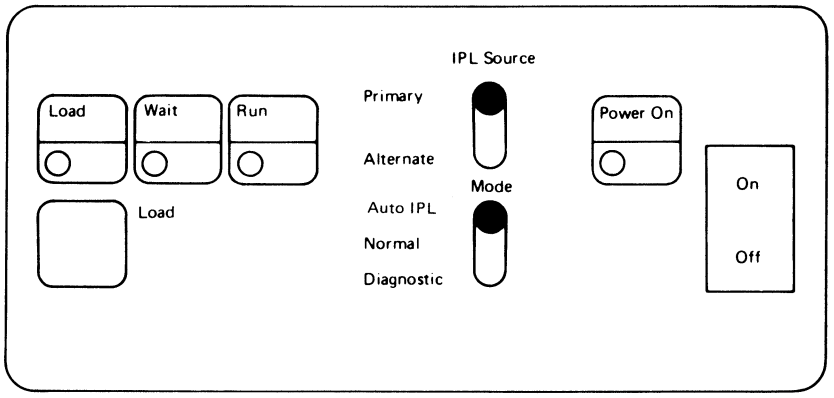


Figure 30. Basic console

Programmer Console

The programmer console has the following indicators and keys as shown in Figure 31 on page 3-10.

- Indicators
  - — Check
  - — Data Display
- Key/Indicators
  - — Stop
  - — Stop On Error
  - — Check Restart
  - — Instruct Step (single instruction step)
  - — Stop On Address
  - — Level 0—Level 3
- Keys
  - — Reset
  - — Store
  - — Data Buffer
  - — Console Interrupt
  - — Start
  - — PSW (processor status word)
  - — Op Reg (operation register)
  - — CIAR (current instruction address register)
  - — SAR (storage address register)
  - — Main Storage
- Level-Dependent Keys
  - — LSR (level status register)
  - — AKR (address key register)
  - — IAR (instruction address register)
  - — R0–R7 (general purpose registers 0–7)
- Data Entry Keys 0–9 and A–F

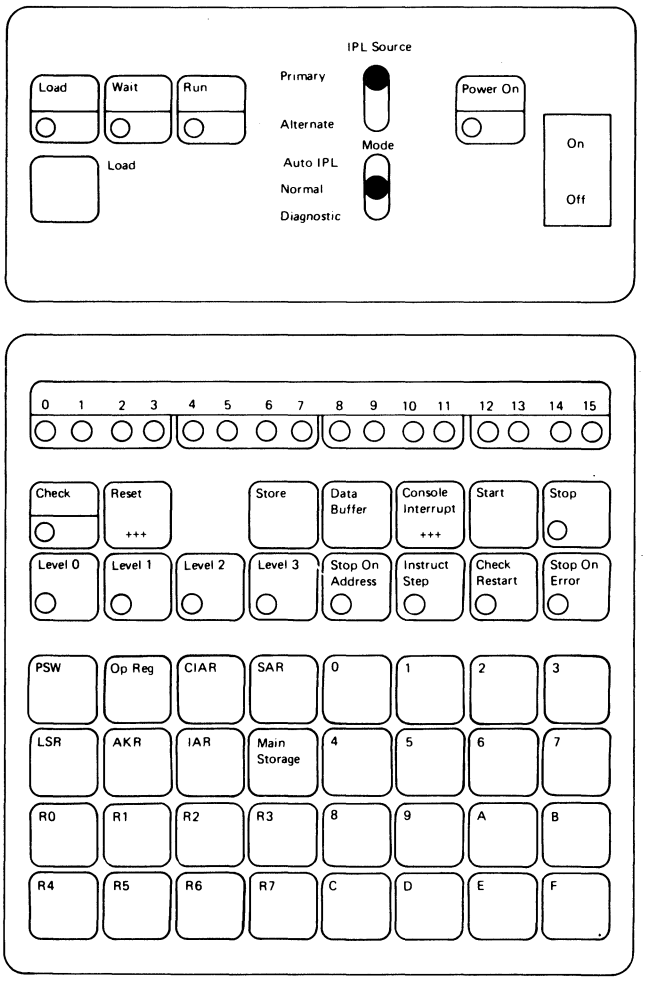


Figure 31. Basic console and programmer console

Notes:

1. The programmer console keys are touch sensitive; they produce a tone when you press them if that command is executed by the processor.
2. The Reset and Console Interrupt keys have a +++ on the face of the keys, which means additional pressure must be used to activate these keys. This minimizes the possibility of the operator accidently activating these functions.

Indicators

The programmer console has the following indicators:

- Check
- Data Display

The location of these indicators is shown in Figure 32.

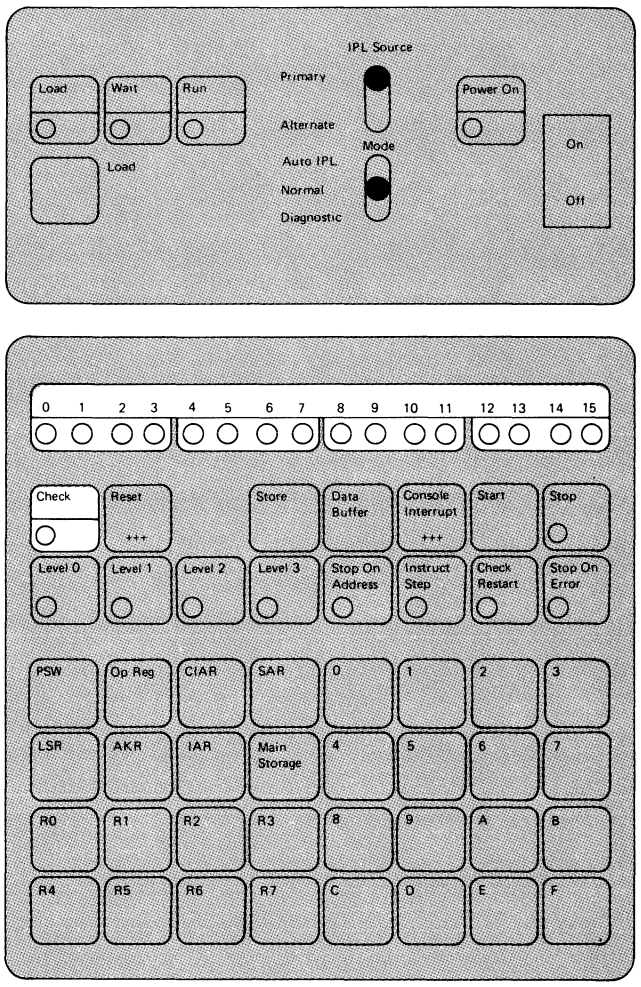
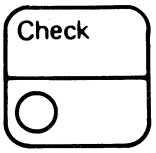


Figure 32. Programmer console indicators

Check Indicator

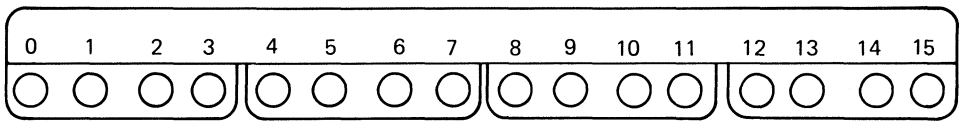


The Check indicator is on when a machine-check or program-check class interrupt has occurred. You can turn off the Check indicator by:

- Clearing the check condition by doing any one of the following:
  - — Press the Reset key
  - — Press the Load key
  - — Execute a Copy Processor Status and Reset (CPPSR) instruction. If the processor is in the supervisor state, this instruction resets bits 0–12 of the PSW.
- Pressing any console key while the processor is in the stop state. Note that the check condition is also cleared by pressing the Reset key or the Load key.

While the processor is in the stop state, the Check indicator indicates main storage parity errors or invalid storage addresses during display operations.

Data Display Indicators



The Data Display indicators represent the 16 bits of a register or storage word.

When the processor is in the run state (run indicator is on), the console data buffer is displayed in the Data Display indicators. When the processor enters the stop state, the instruction address register (IAR) is displayed until another system resource is selected. Other system resources that could be displayed while in the stop state are:

- Processor status word (PSW)
- Operator register (Op Reg)
- Current instruction address register (CIAR)
- Storage address register (SAR)
- Level status registers (LSR) 0–3
- Address key register (AKR) (4952 and 4955 processors only)
- Main storage (data word)
- General purpose registers (R0–R7)
- Data buffer
- Data being keyed into the data buffer register by the operator (see Figure 33).

Example of entering data (F3A8) to be stored, entry shifts from right to left.

Action	Data display indicators
Press Data Entry key F	(F)
Press Data Entry key 3	(F) (3)
Press Data Entry key A	(F) (3) (A)
Press Data Entry key 8	(F) (3) (A) (8)

Legend:

● Indicator on
○ Indicator off

Figure 33. Data display indicator example

Combination Key/Indicators

The programmer console has nine combination key/indicators:

- Stop
- Level 0 through Level 3
- Stop On Address
- Instruct Step
- Check Restart
- Stop On Error

The combination key/indicators are shown in Figure 34.

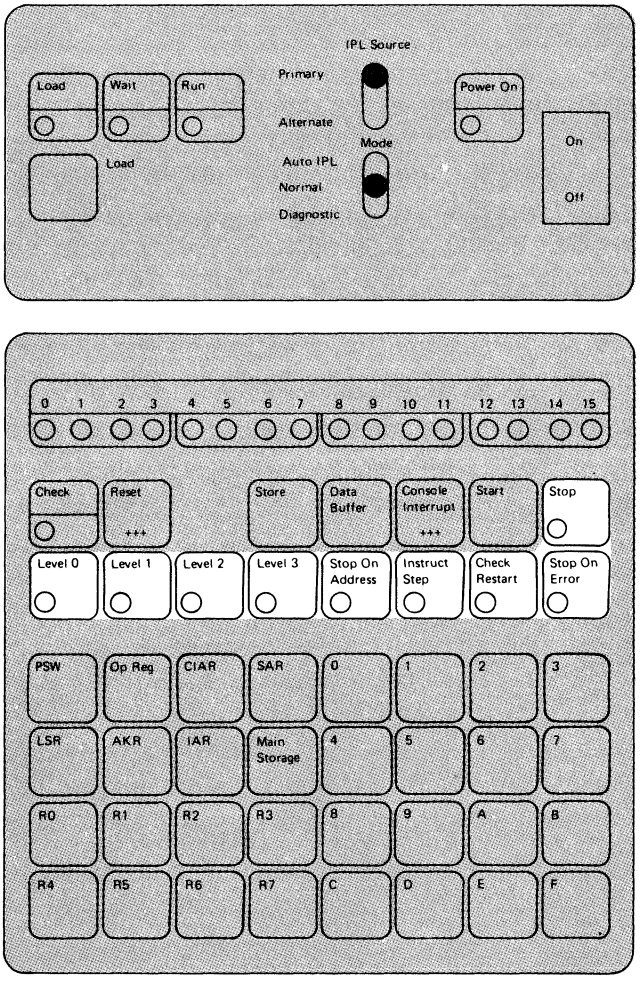
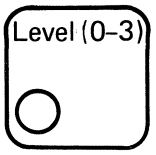


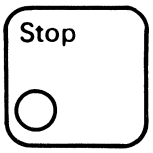
Figure 34. Programmer console combination key/indicators

Level Keys/Indicators



The current active level (0–3) is always displayed by one of these level indicators. When the processor is in the stop state, you can press any of the level keys and cause that level to be selected and the associated indicator to be turned on.

Stop Key/Indicator



The Stop indicator is on when the processor is in the stop state.

- When the Stop key is pressed, one of the following occurs:
  - — In run state, the current instruction is completed.
  - — In wait state, stop state is entered directly.
  - — In stop state, the information that was in the IAR when the processor entered the stop state is displayed in the Data Display indicators.

When the processor is in the stop state, it means that:

- The processor executed a Stop instruction (diagnostic mode only).
- An address compare occurred in stop-on-address mode.
- An error occurred in stop-on-error mode.
- The Reset key was pressed.
- A power-on reset occurred.
- Instruction-step mode was selected while in run state.

Stop On Address Key/Indicator

Pressing the Stop On Address key:

- Places the processor in stop-on-address mode
- Displays the contents of the stop-on-address buffer
- Turns on the Stop On Address indicator
- Turns off the Instruct Step indicator (if it was on)

Pressing the Stop On Address key a second time:

- Resets stop-on-address mode
- Turns off the Stop On Address indicator

Instruct Step Key/Indicator

Pressing the Instruct Step key:

- Places the processor in instruction-step mode
- Turns on the Instruct Step indicator
- Turns off the Stop On Address indicator (if it was on)

Pressing the Instruct Step key a second time:

- Resets instruction-step mode and holds the processor in stop state.
- Turns off the Instruct Step indicator

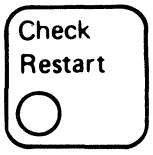
To operate the processor in instruction-step mode:

1. Key in the desired starting address.
2. Store the address in the IAR.
3. Press the Instruct Step key, then press the Start key.

The instruction located at the starting address is executed and the processor returns to the stop state. The IAR is updated to the next instruction address. This address is displayed in the Data Display indicators.

Each time you press the Start key, one instruction is executed and the IAR is updated to the next instruction address.

Check Restart Key/Indicator



Note: The Check Restart key and Stop On Error key work in toggle fashion. When one is pressed, the other is reset if it is on.

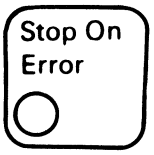
Pressing the Check Restart key causes:

- The processor to reset and the Check Restart indicator to turn on
- Program execution to automatically resume at address 0000 on level 0 following a power/thermal warning class interrupt, a program check, or a machine-check error

Pressing this key a second time resets the check-restart mode.

Note: A power/thermal warning class interrupt does not occur if the summary mask is disabled (LSR bit 11 equals 0).

Stop On Error Key/Indicator



Note: The Check Restart key and Stop On Error key work in toggle fashion. When one is pressed, the other is reset if it is on.

Pressing the Stop On Error key places the processor in stop-on-error mode.

The processor will then enter the stop state because of a:

- Program check or a machine check
- Power/thermal warning class interrupt

To determine the cause of the error, display the PSW. To restart the processor, press the Reset key and then the Start key.

Notes:

1. Pressing only the Start key allows the processor to proceed with the class interrupt as if stop mode had not occurred.
2. Due to manual intervention, the Check indicator might have been turned off while the processor was in the stop state. After the class-interrupt routine is completed, control might be returned to the instruction that caused the error and the processor might attempt to reexecute the instruction.
3. Some instructions are not reexecutable because the initial error altered the operand registers or storage locations before the instruction was terminated. In this case, you must be familiar with the program because manual restoration of affected locations must be made before restarting the program.
4. A power/thermal-warning class interrupt does not occur if the summary mask is disabled (LSR bit 11 set to 0).

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Keys

The programmer console has 10 keys:

- Reset
- Store
- Data Buffer
- Console Interrupt
- Start
- PSW (processor status word)
- Op Reg (operation register)
- CIAR (current instruction address register)
- SAR (storage address register)
- Main Storage

The keys are shown in Figure 35.

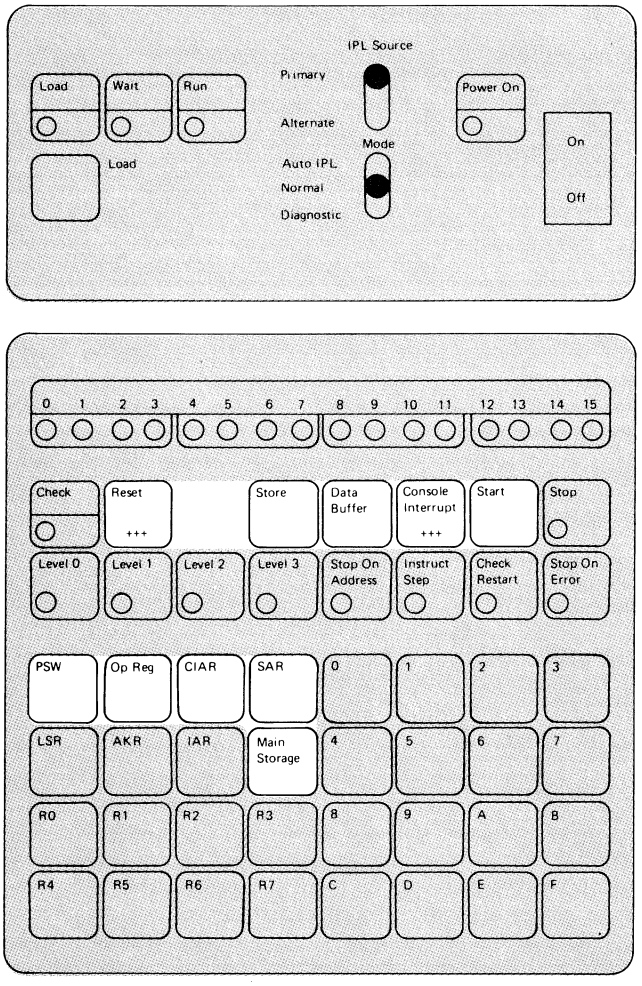
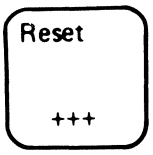


Figure 35. Programmer console keys

Reset Key



When you press this key (see Note 2), a system reset is initiated that performs the following functions:

- IAR on level 0 is set to zeros
- AKR on level 0 is set to zeros[2]
- Console AKR is set to zeros[2]
- Interrupt mask set to all levels enabled
- LSR on level 0
  - — Indicators set to zeros
  - — Summary mask enabled
  - — Supervisor state and in-process flag turned on
  - — Trace disabled
- LSR for levels 1–3 set to zeros
- PSW set to zeros (except bits 13 and 15)
- SAR set to zeros
- CIAR set to zeros
- Sets display register to zeros (Display Indicators display zeros)

Upon completion of a system reset, the processor is placed in the stop state with the Stop indicator on.

System reset does not affect:

- General purpose registers (all levels)
- IAR (levels 1–3)
- AKR (levels 1–3)[2]
- Storage key stack[1]
- Main storage
- Console data buffer
- Segmentation registers (relocation translator function)[2] (See Note 1)
- Floating-point registers (floating-point feature)[1]
- Stop-on-address buffer
- Clock/comparator[3]

---

1 Applies to the 4955 processor only.
2 Applies to the 4952 and 4955 processors only.
3 Applies to the 4952 processor only

Notes:

1. On the 4955 Models B and D, the relocation translator function is a feature. The relocation translator function is standard on the 4952 and 4955 Models E and F. If you are not sure if your processor has the relocation translator function feature, contact your programmer.
2. The +++ on the key means additional pressure must be used to activate this key. This helps you avoid accidently activating it.

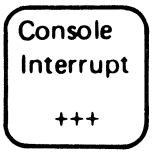
Store Key

The Store key is effective only when the processor is in the stop state. Pressing this key causes the last data entry to be stored in the last selected resource.

Data Buffer Key

Pressing the Data Buffer key causes the console data buffer to be selected. The contents of the console data buffer are displayed in the Data Display indicators.

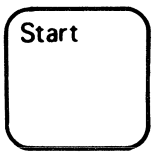
Console Interrupt Key



The Console Interrupt key is effective only if the processor is in the run or wait state and the summary mask is enabled. A console class interrupt occurs.

> **Note:** The +++ means additional pressure must be used to activate this key. This helps you avoid accidently activating it.

Start Key



The Start key is effective only when the processor is in the stop state. When this key is pressed, the processor exits from the stop state and resumes execution at the address in the IAR on the current level (the level that was active when the stop state was entered). If the stop state was entered from a system reset, execution begins at address 0000, level 0. If the stop state was entered from the wait state, the processor returns to the wait state.

PSW Key

Pressing the PSW key selects the processor status word. The contents of the PSW are displayed in the Data Display indicators. Data cannot be stored into the PSW from the console. See the following table for bit meanings.

Processor Status Word (PSW) Table

Bit	*Meaning*	*Category*
0	Specification check	Program check
1	Invalid storage address	Program check
2	Privilege violate	Program check
3	Protect check[5]	Program check
4	Invalid function (may be program check)	Soft exception
5	Floating-point exception[4]	Soft exception
6	Stack exception	Soft exception
7	Not used	
8	Storage parity check	Machine check
9	Not used	
10	CPU control check	Machine check
11	I/O check	Machine check
12	Sequence indicator	Status flag
13	Auto-IPL	Status flag
14	Translator enabled[5]	Status flag
15	Power/thermal warning	Power/Thermal

[4] Applies to the 4955 processor only.

[5] Applies to 4952 and 4955 processors only.

Op Reg Key

Pressing the Op Reg key selects the operation register and displays bits 0–15 in the Data Display indicators. Data cannot be stored into the Op Reg from the console.

CIAR Key

Pressing the CIAR key, after the processor enters the stop state, selects the current instruction address register and causes the address of the instruction just executed to be displayed. You cannot store data into the CIAR from the console.

SAR Key

Pressing the SAR key while the processor is in the stop state displays the contents of the storage address register. An address can be stored into the SAR to address main storage for display or store operations. Bit 15 of the SAR cannot be set from the console.

Main Storage Key

Pressing the Main Storage key selects main storage as the facility to be accessed by the console. When this key is pressed, the contents of the main storage location addressed by the storage address register (SAR) are displayed in the Data Display indicators. Procedures for displaying and storing main storage appear later in this chapter.

Level-Dependent Keys

The programmer console has 11 level-dependent keys:

- LSR (level status register)
- AKR (address key register) (4952 and 4955 processors only)
- IAR (instruction address register)
- R0–R7 (general purpose registers)

The level-dependent keys select registers that are duplicated in hardware for each of the four interrupt levels.

Pressing these keys (except AKR), after a level has been selected, causes the contents of that register to be displayed in the Data Display indicators.

The level-dependent keys are shown in Figure 36.

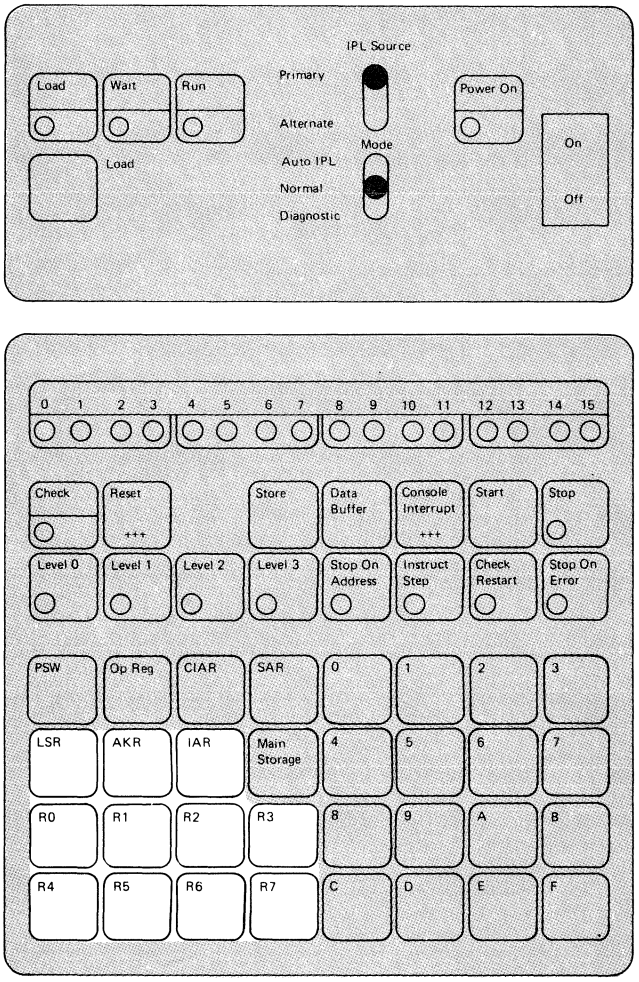
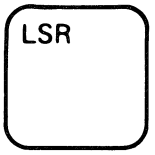


Figure 36. Programmer console level-dependent keys

LSR Key



Pressing the LSR key displays the contents of the level status register in the Data Display indicators.

Data cannot be stored into this register from the console.

AKR Key

This key applies to the 4952 and 4955 only. To display the address key register for a given level:

1. Press the AKR key.
   a. The *console* AKR is displayed in the Data Display indicators; ignore it, and proceed to next step.
2. Press the desired Level key.

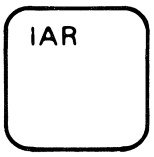
The *level* AKR for the desired level is now displayed in the Data Display indicators.

The *level* AKR for a given level is for display only, data cannot be stored in this register.

The console AKR is used for console operations only and data can be stored into or displayed from this register.

> **Note:** Pressing the Store key after selecting an AKR for a given level causes no action and no audio tone response.

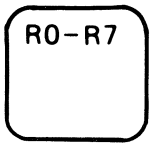
IAR Key



The Instruction Address Register (IAR) contains the main storage address of the next instruction to be executed on the selected level.

Pressing the IAR key displays the IAR contents. The contents of these registers, except for bit 15, can be modified from the console. (See "Storing Into Level-Dependent Registers," later in this chapter.)

R0–R7 Keys



The eight keys labeled R0–R7 represent the eight general purpose registers. These registers can be displayed by pressing a Level key (0–3) and then the desired register key (R0–R7). The contents of any general purpose register can be modified from the console. (See "Storing Into Level-Dependent Registers," later in this chapter.)

Data Entry Keys

There are sixteen Data Entry keys (0–F), which you can use to:

- Enter addresses
- Enter data into a selected register or storage location

The Data Entry keys are shown in Figure 37.

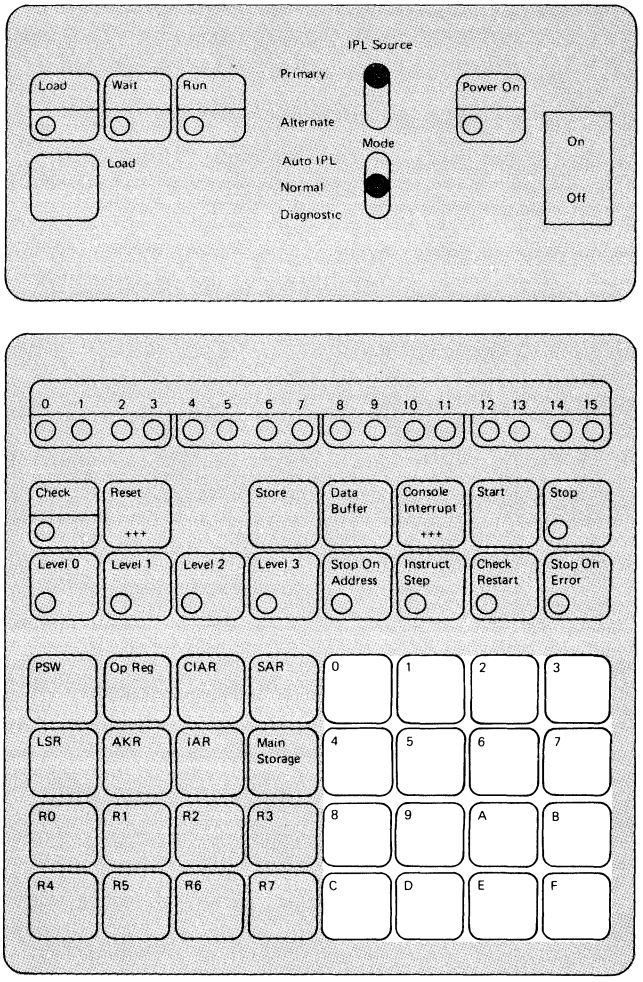
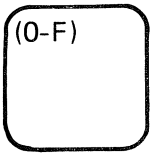


Figure 37. **Programmer console data entry keys**

Data Entry Keys



Wait and Run State. When the processor is in the wait or run state, pressing a Data Entry key:

- Enters the associated character in the console data buffer
- Displays the binary equivalent of the entered character in the Data Display indicators

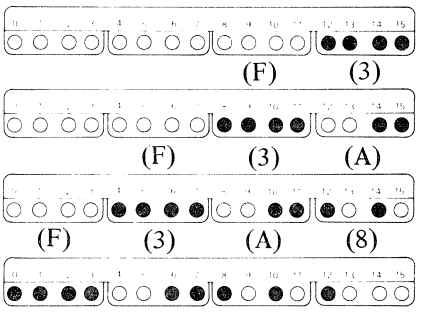
Each successive key entry causes the previous information to shift left four positions in the Data Display indicators (one hexadecimal character position) until four entries have been made. See Figure 33 on page 3-13 for a key entry example.

Stop State. When the processor is in the stop state, entries can be made into the console data buffer by:

- Pressing the Data Buffer key
- Entering the data; data entries are displayed in the Data Display indicators
- Pressing the Store key

Example of entering data (F3A8) to be stored, entry shifts from right to left.

Action	Data display indicators
Press Data Entry key F	(F)
Press Data Entry key 3	(F) (3)
Press Data Entry key A	(F) (3) (A)
Press Data Entry key 8	(F) (3) (A) (8)



Legend:

● Indicator on
○ Indicator off

Displaying Main Storage

The following keys are used to display main storage locations:

- AKR (4952 and 4955 only)
- 0–F (Data Entry keys)
- Store
- SAR
- Main Storage

These keys are shown in Figure 38.

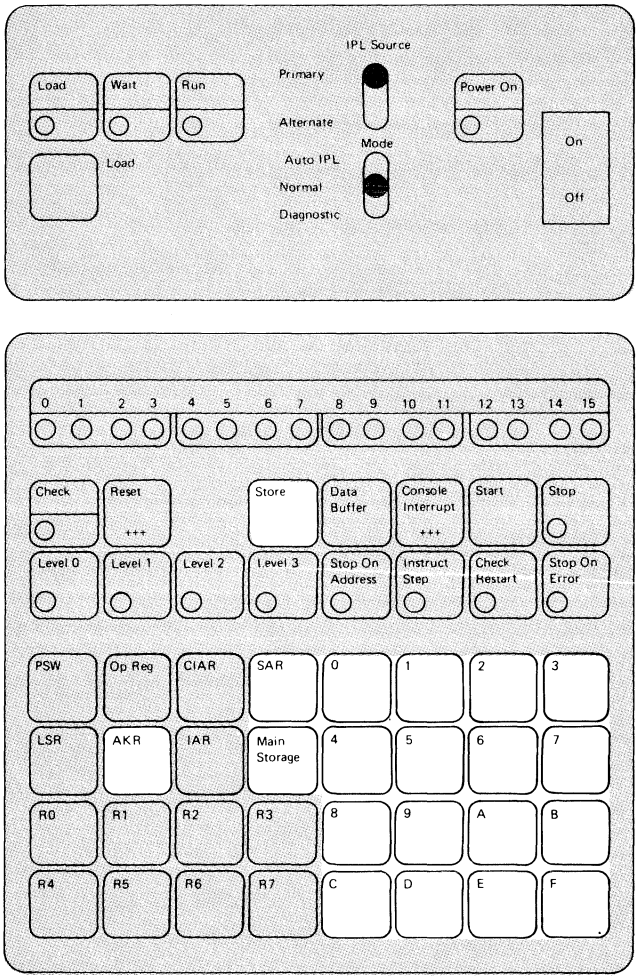


Figure 38. Basic console and programmer console

Introduction

There are two procedures for displaying main storage locations:

- Procedure 1—Processors without Relocation Translator installed or installed and *not* enabled.
- Procedure 2—Processors with Relocation Translator installed and enabled. This procedure assumes that you have a thorough knowledge of the Relocation Translator and the storage mapping assigned by the program.

If you are not sure if your processor has the Relocation Translator, contact your programmer.

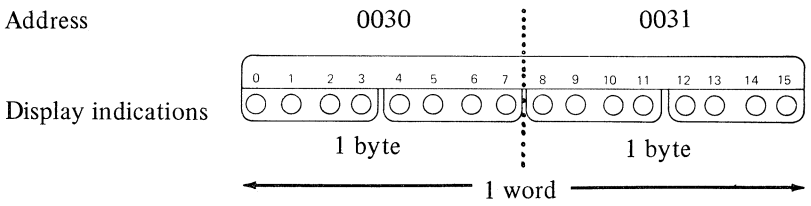
If an invalid storage address or a protect-check condition occurs:

- The program check is suppressed.
- PSW bit 1 is turned on. (The PSW bit will not cause a class interrupt to occur when the processor enters the run state. The bit is only an indication to you of an error while displaying main storage.)
- The Check indicator is not turned on.
- The storage access is suppressed.
- The Data Display indicators are set to a value of 0003 with no other usual indication of the error.[6]
- The Data Display indicators are set to a value of 0025.[7]

Main storage data is always displayed as a word (two bytes). Since SAR bit 15 cannot be set to 1 from the console, the address for either byte would result in the same "word" address in SAR.

For example, entering byte address 0030 or 0031 would cause the same word to be displayed.

- Indicators 0–7 display the byte with the even address.
- Indicators 8–15 display the byte with the odd address.



The contents of the addressed storage location are displayed in the Data Display indicators. To display sequential main storage locations, continue pressing the Main Storage key. Each time you press the Main Storage key, the storage address is increased by 2 and the data at those locations is displayed in the Data Display indicators.

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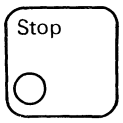
6 Applies to the 4953 and 4955 only.
7 Applies to the 4952 only.

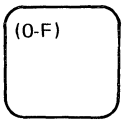
Procedure 1—Processors without Relocation Translator Function

To display main storage locations, for processors without Relocation Translator installed or installed and *not* enabled, use the following keys in the sequence shown.



Press the Stop key. The processor must be in the stop state.

Press the SAR key. The contents of SAR will be displayed in the Data Display indicators.



Key in *four* hex characters (selected address) in the Data Entry keys. This address is displayed as entered in the Data Display indicators.

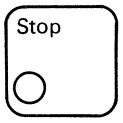
Press the Store key. The address that is displayed in the Data Display indicators is stored into the SAR.

Press the Main Storage key. The contents of the main storage location addressed by the SAR are displayed in the Data Display indicators.

End of Procedure

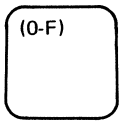
Procedure 2—Processors with Relocation Translator Function

To display main storage locations, for processors with Relocation Translator enabled, use the following keys in the sequence shown.



Press the Stop key. The processor must be in the stop state.

Press the AKR key. The contents of the console AKR are displayed in the Data Display indicators.

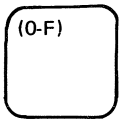


On the 4952 processor, key in *one* hex character, 0 or 1 (new address key). This character is displayed in bits 12–15 of the Data Display indicators. The key is stored in bit 15. Bits 0–14 are irrelevant.

On the 4955 processor, key in *one* hex character, 0–7 (new address key). This character is displayed in bits 12–15 of the Data Display indicators. The key is stored in bits 13–15. Bits 0–12 are irrelevant.

Press the Store key. The new address key is now stored into the console AKR.

Press the SAR key. The contents of the SAR will be displayed in the Data Display indicators.



Key in *four* hex characters (selected address). This address is displayed in the Data Display indicators.

Press the Store key. The address that is displayed in the Data Display indicators is now stored into the SAR.

Press the Main Storage key. The contents of the main storage location addressed by the SAR are displayed in the Data Display indicators.

End of Procedure.

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Storing into Main Storage

The following keys are used to store data into main storage:

- AKR (4952 and 4955 only)
- Store
- SAR
- Main Storage
- 0–F (Data Entry keys)

These keys are shown in Figure 39.

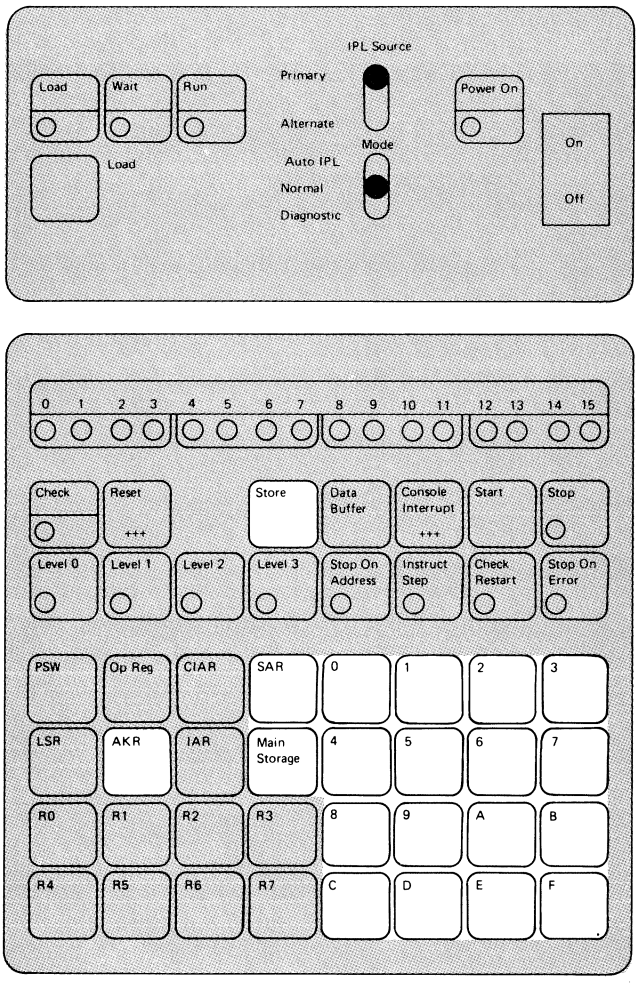


Figure 39. Basic console and programmer consoie

Introduction

There are two procedures for storing data into main storage:

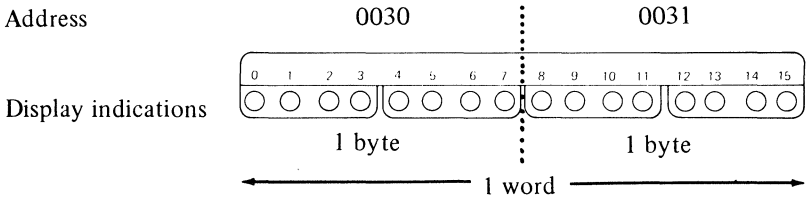
- Procedure 1—Processors without Relocation Translator installed or installed and *not* enabled.
- Procedure 2—Processors with Relocation Translator installed and enabled. This procedure assumes that you have a thorough knowledge of the Relocation Translator and the storage mapping assigned by the program.

If you are not sure if your processor has the Relocation Translator, contact your programmer.

Main storage data is always displayed as a word (two bytes). Since SAR bit 15 cannot be set to 1 from the console, the address for either byte would result in the same "word" address in SAR.

For example, entering byte address 0030 or 0031 would cause the same word to be displayed.

- Indicators 0–7 display the byte with the even address.
- Indicators 8–15 display the byte with the odd address.

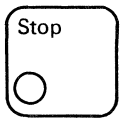


To display sequential main storage locations, continue pressing the Main Storage key. Each time you press the Main Storage key, the storage address is increased by 2 and the data at those locations is displayed in the Data Display indicators.

Bit 15 of the Data Display indicators cannot be turned on from the console.

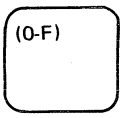
Procedure 1—Processors without Relocation Translator Function

To store data into main storage, for processors without Relocation Translator installed or installed and *not* enabled, use the following keys in the sequence shown.



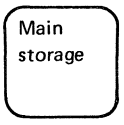
Press the Stop key. The processor must be in the stop state.

Press the SAR key. The current contents of the SAR are displayed in the Data Display indicators.

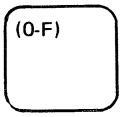


Key in *four* hex characters (selected address). The address is displayed in the Data Display indicators.

Press the Store key. The address displayed in the Data Display indicators is stored in the SAR.



Press the Main Storage key. The contents of the addressed storage location are displayed in the Data Display indicators.



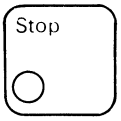
Key in *four* hex characters (the data that is to be stored into main storage). This data is displayed in the Data Display indicators.

Press the Store key. The data that is displayed in the Data Display indicators is stored at the selected storage location.

End of Procedure.

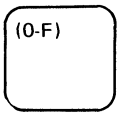
Procedure 2—Processors with Relocation Translator Function

To store data into main storage, for processors with Relocation Translator enabled, use the following keys in the sequence shown.



Press the Stop key. The processor must be in the stop state.

Press the AKR key. The contents of the console AKR are displayed in the Data Display indicators.

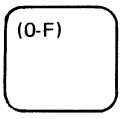


On the 4952 processor, key in *one* hex character, 0 or 1 (new address key). This character is displayed in bits 12–15 of the Data Display indicators. The key is stored in bit 15. Bits 0–14 are irrelevant.

On the 4955 processor, key in *one* hex character, 0–7 (new address key). This character is displayed in bits 12–15 of the Data Display indicators. The key is stored in bits 13–15. Bits 0–12 are irrelevant.

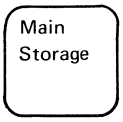
Press the Store key. This will store the new address key into the AKR.

Press the SAR key. The current contents of the SAR are displayed in the Data Display indicators.

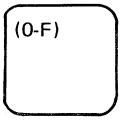


Key in *four* hex characters (selected address). The address is displayed in the Data Display indicators.

Press the Store key. The address displayed in the Data Display indicators is stored into the SAR.



Press the Main Storage key. The contents of the addressed storage location are displayed in the Data Display indicators.



Key in *four* hex characters (the data that is to be stored into main storage). This data is displayed in the Data Display indicators.

Press the Store key. The data that is displayed in the Data Display indicators is stored at the selected storage location. Each subsequent pressing of the Store key causes the SAR to be increased by 2, and the data stored at that location to be displayed in the Data Display indicators.

End of Procedure.

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Displaying Level-Dependent Registers

The following keys are used to display level-dependent registers:

- Level 0 through Level 3
- LSR
- AKR (4952 and 4955 only)
- IAR
- R0–R7 (general purpose registers)

These keys are shown in Figure 40.

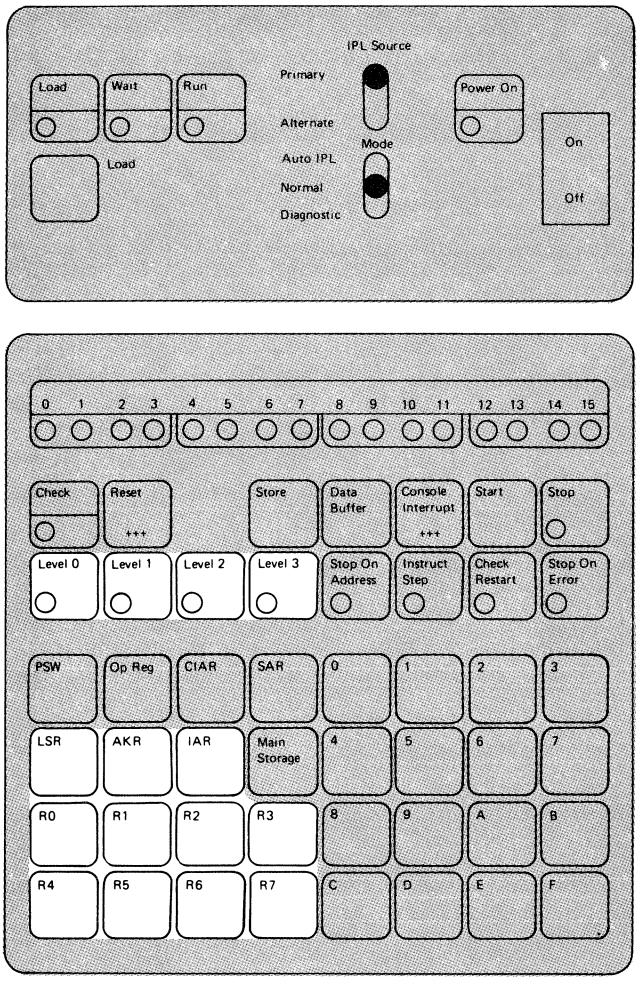


Figure 40. Basic console and programmer console

Introduction

You can display, in the Data Display indicators, the contents of the following level-dependent registers:

- LSR
- AKR (4952 and 4955 only)
- IAR
- R0–R7 (general purpose registers)

> **Note:** To display the AKR register, refer to the procedure given under "AKR Key" in this chapter.

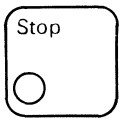
On the 4952 and 4953, to display the same register on a different level, you must reselect the register each time you change levels.

On the 4955, to display the same register on each level, select the register and then press each Level key.

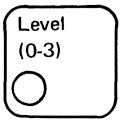
Procedure

To display level-dependent registers (except AKR), use the following keys in the sequence shown. (To display the AKR register, refer to the procedure given under "AKR Key" in this chapter.)

Press the Stop key. The processor must be in the stop state.



Press the desired level key (Level 0–Level 3).



Press the desired register key (LSR, IAR, or R0–R7). The contents of that register are displayed in the Data Display indicators.

End of Procedure.

Storing into Level-Dependent Registers

The following keys are used to store data into level-dependent registers:

- Level 0 through Level 3
- IAR
- R0–R7 (general purpose registers)
- 0–F (Data Entry keys)
- Store

These keys are shown in Figure 41.

Note: Data cannot be stored into the LSR or AKR registers from the console.

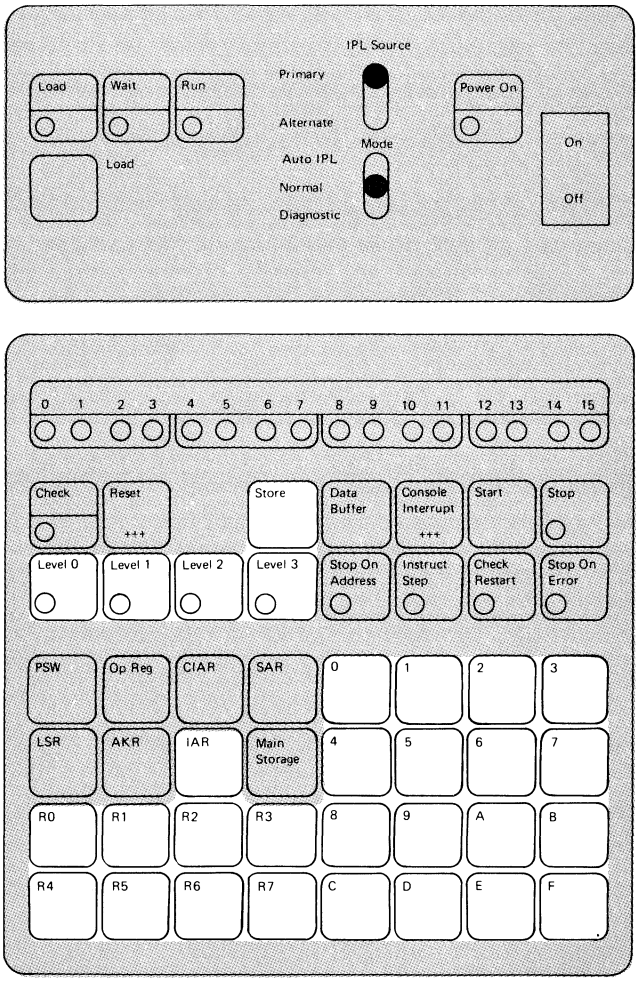


Figure 41. **Basic console and programmer console**

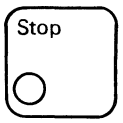
Introduction

On the 4952 and 4953, to store data into the same register on a different level, you must reselect the register each time you change levels.

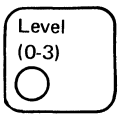
On the 4955, to store data into the same register on a different level, you must select the level, then key in the data that is to be stored. If the same data is to be stored, select the level and press the Store key.

Procedure

To store data into level-dependent registers (except LSR and AKR), use the following keys in the sequence shown.

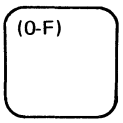


Press the Stop key. The processor must be in the stop state.



Press the desired level key (Level 0–Level 3).

Press the desired register key (IAR or R0–R7) for the register where the data is to be stored. The contents of that register are displayed in the Data Display indicators.



Key in *four* hex characters (the data that is to be stored). This data is displayed in the Data Display indicators.

Press the Store key. The data that is displayed is stored into the selected register.

End of Procedure.

Establishing Stop-on-Address Mode

The following keys are used to establish stop-on-address mode:

- AKR (4952 and 4955 only)
- 0–F (Data Entry keys)
- Store
- Stop On Address
- Start

These keys are shown in Figure 42.

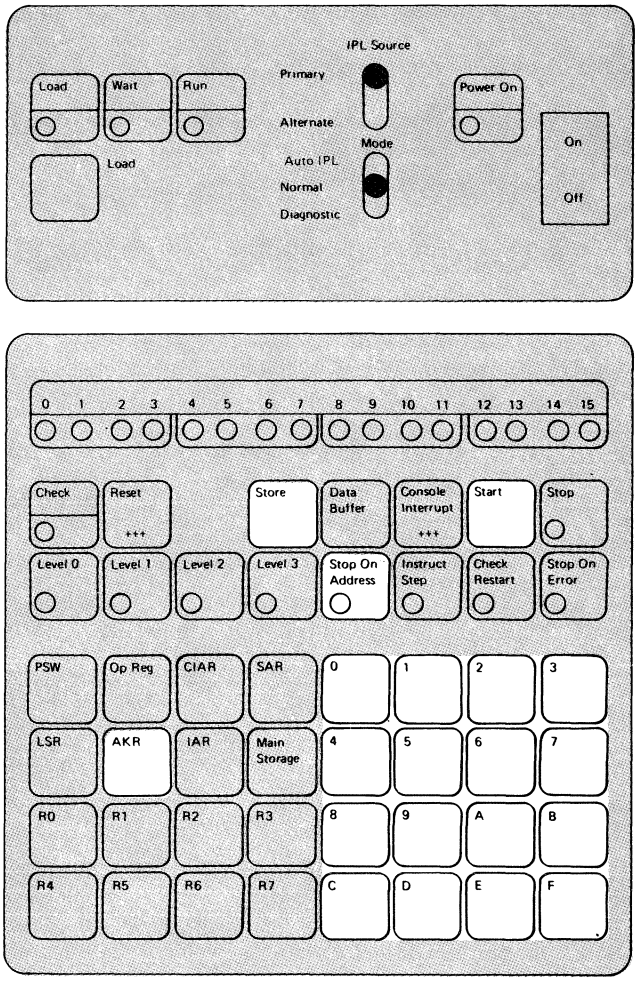


Figure 42. Basic console and programmer console

Introduction

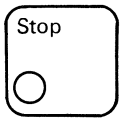
There are two procedures for establishing stop-on-address mode:

- Procedure 1—Processors without Relocation Translator installed or installed and *not* enabled.
- Procedure 2—Processors with Relocation Translator installed *and* enabled. This procedure assumes you have a thorough knowledge of the Relocation Translator and the storage mapping assigned by the program.

If you are not sure if your processor has the Relocation Translator, contact your programmer or his equivalent.

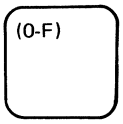
Procedure 1—Processors without Relocation Translator Function

To establish stop-on-address mode, for processors without Relocation Translator installed or installed and *not* enabled, use the following keys in the sequence shown.



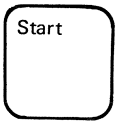
Press the Stop key. The processor must be in the stop state.

Press the Stop On Address key.



Key in *four* hex characters (selected address—the address you want).

Press the Store key. The selected address is placed in the stop-on-address buffer.



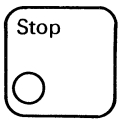
Press the Start key. Execution begins at the current IAR address on the current level. When the selected address and the address in the IAR match, the processor stops.

To restart the processor, press the Start key.

End of Procedure.

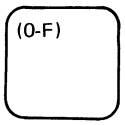
Procedure 2—Processors with Relocation Translator Function

To establish stop-on-address mode, for processors with Relocation Translator enabled, use the following keys in the sequence shown.



Press the Stop key. The processor must be in the stop state.

Press the AKR key. The contents of the console AKR are displayed in the Data Display indicators.

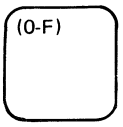


On the 4952 processor, key in *one* hex character, 0 or 1 (new address key). This character is displayed in bits 12–15 of the Data Display indicators. The key is stored in bit 15. Bits 0–14 are irrelevant.

On the 4955 processor, key in *one* hex character, 0–7 (new address key). This character is displayed in bits 12–15 of the Data Display indicators. The key is stored in bits 13–15. Bits 0–12 are irrelevant.

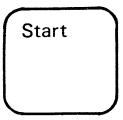
Press the Store key. This will store the new address key into the AKR.

Press the Stop on Address key.



Key in *four* hex characters (selected address—the address you want to stop on).

Press the Store key. The selected address and address key are placed in the stop-on-address buffer.



Press the Start key. Execution begins at the current IAR address on the current level. When the selected address and the address in the IAR match, the processor stops.

To restart the processor, press the Start key.

End of Procedure.

Chapter 4. Series/1 Units and Operating Procedures

This chapter explains the function of the operator controls (such as keys and switches) as they apply to each of the Series/1 units.

It also describes the operator-initiated procedures associated with each Series/1 unit. For operator procedures to insert diskettes in the 4952 Model C Processor, refer to the 4965 Diskette Drive and I/O Expansion Unit procedures in this chapter.

IBM 4959 Input/Output Expansion Unit

The 4959 I/O Expansion Unit has an On/Off switch and a Power On indicator as shown in Figure 43.

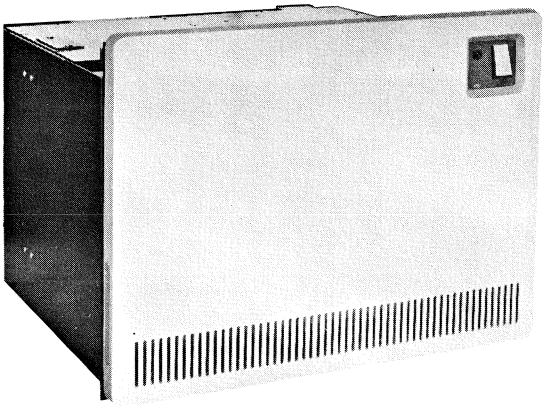
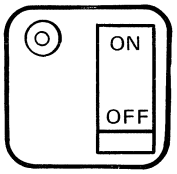


Figure 43. 4959 I/O Expansion Unit

On/Off Switch and Power On Indicator



Pressing the top of the On/Off switch applies power to the I/O expansion card file and turns on the Power On indicator.

Pressing the bottom of the On/Off switch removes power from the I/O expansion card file and turns off the Power On indicator.

IBM 4959 Input/Output Expansion Unit with Two Channel Switch (TCS)

The 4959 I/O Expansion Unit with TCS has the following operator controls as shown in Figure 44.

- Switches
  - — On/Off
  - — Select
  - — Mode
- Keys
  - — Attn
  - — Reset
- Indicators
  - — Ack A/B
  - — Run
  - — Manual Mode
  - — Conn A/B
  - — Power On

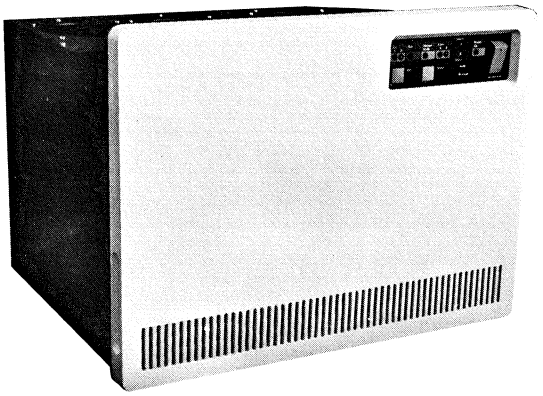


Figure 44. 4959 I/O Expansion Unit with TCS Console

TCS—Console Switches

The TCS console has the following switches:

- On/Off
- Select
- Mode

These switches are shown in Figure 45.

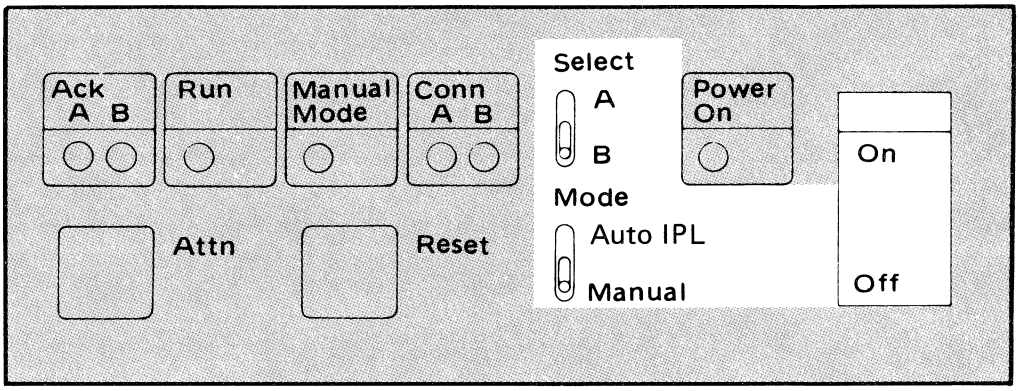
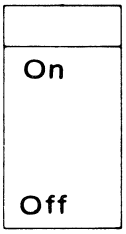


Figure 45. TCS Console Switches

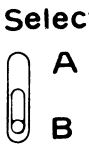
On/Off Switch



Pressing the top of the On/Off switch applies power to the TCS I/O expansion card file and turns on the Power On indicator.

Pressing the bottom of the On/Off switch removes power from the TCS I/O expansion card file and turns off the Power On indicator.

Select Switch

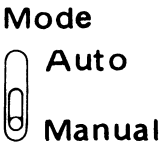


When the Select switch is in the A position, the "A" processor has been selected for connection through the "A" side of the TCS to the common I/O in the TCS I/O expansion card file.

When the Select switch is in the B position, the "B" processor has been selected for connection through the "B" side of the TCS to the common I/O in the TCS I/O expansion card file.

Note: The Select switch is used with the Reset key. (See Reset key.)

Mode Switch



Placing the Mode switch in the Auto position selects automatic mode. (Auto mode means that the TCS switches to the back-up processor if the processor in use fails.)

Placing the Mode switch in the Manual position selects manual mode. (Manual mode means that the TCS can be switched manually.)

Note: The mode switch is used with the Reset key. (See Reset key.)

TCS—Console Keys

The TCS Console has the following keys:

- Attn
- Reset

These keys are shown in Figure 46.

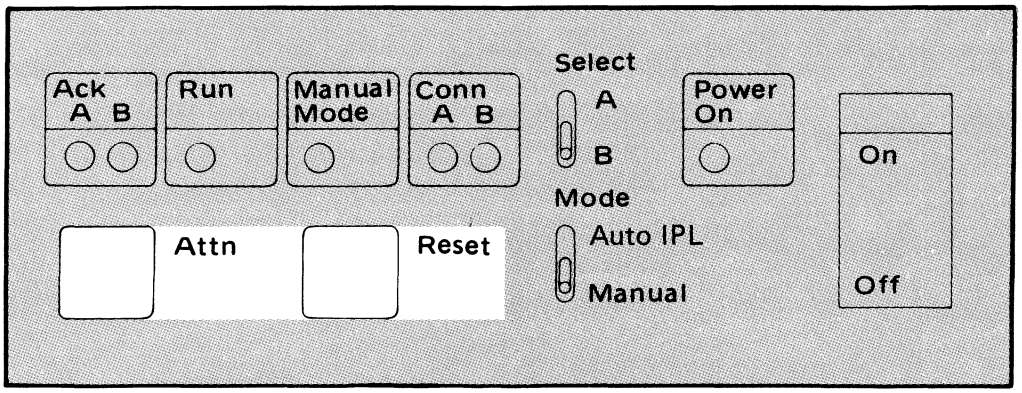
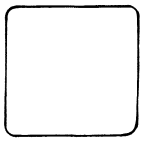


Figure 46. TCS Console Keys

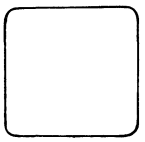
Attn Key



Pressing the Attn key turns the Ack A/B indicators off and when released, posts a console attention interrupt to both processors. (Status word bits 8 and 9 are posted, if required.)

The Attn key is used with the Select and Mode switches to notify the program of impending operator action in manual mode or to request processor action/responses in automatic mode.

Reset Key



Pressing the Reset key:

- Turns the Ack A/B indicators off
- Resets and stops the operations monitor
- Sets status bits 2 and 5 to 0
- Places the TCS in operator-intervention mode
- Enables the functions selected by the Select and Mode switches

While the Reset key is held down, the entire TCS is in an interrupt-pending condition.

Releasing the Reset key posts a console attention interrupt to both processors.

> **Note:** Pressing the Reset key while the common I/O is operational may cause I/O checks; therefore, the Attn key should be used to alert the programs of impending operator intervention prior to pressing the Reset key.

TCS—Console Indicators

The TCS Console has the following indicators:

- Ack A/B
- Run
- Manual Mode
- Conn A/B
- Power On

These indicators are shown in Figure 47.

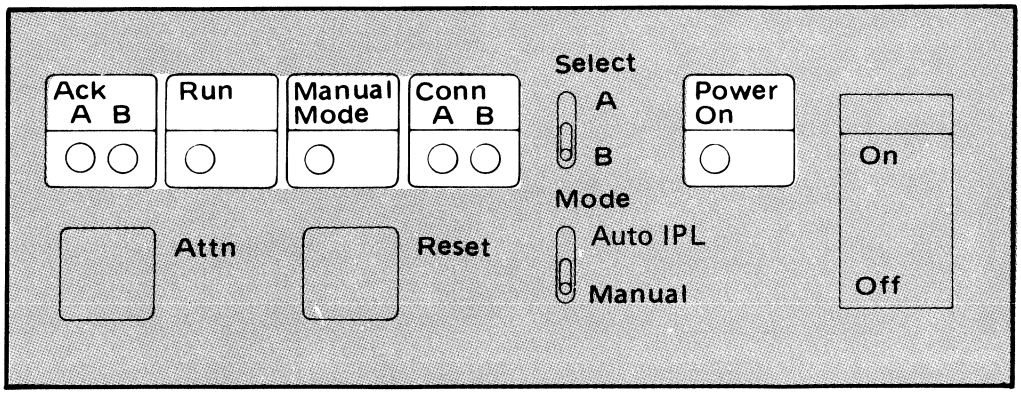
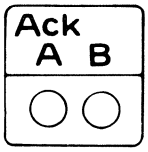


Figure 47. TCS Console Indicators

Ack A/B Indicators



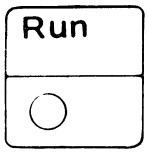
The Ack A or B indicator is turned on when the processor on the "A" or "B" side of the TCS executes a Console Acknowledge command.

The corresponding Ack A or B indicator is turned off by:

- A device reset,
- A system reset, or
- A Halt I/O issued by the processor on the corresponding "A" or "B" side of the TCS.

Both indicators are turned off when the Attn or Reset key is pressed.

Run Indicator

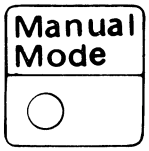


The Run indicator is turned on when the operations monitor is running.

The Run indicator is turned off by:

- Stopping the operations monitor in test mode,
- Resetting the operations monitor,
- Incurring a time-out in the operations monitor, or
- System reset or IPL on the connected processor.

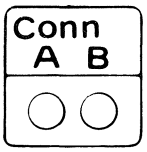
Manual Mode Indicator



The Manual Mode indicator is turned on when manual mode is in effect (the Mode switch is in the Manual position and the reset key is pressed and released).

The Manual Mode indicator is turned off when automatic mode is in effect (the Mode switch is in the Auto position and the reset key is pressed and released).

Conn A/B Indicators



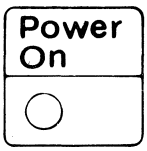
The appropriate Conn A or B indicator is on when the corresponding processor on the "A" or "B" side of the TCS is connected to the common I/O devices and the operations monitor.

When one of these indicators is blinking, an operations monitor time-out has occurred on the corresponding processor.

In automatic mode, pressing the Reset key will not turn off an indicator that is on, but will turn off an indicator that is blinking.

In the manual mode, the Select switch determines which indicator is turned on when the Reset key is pressed.

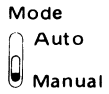
Power On Indicator



The Power On indicator is on when the correct power levels are available to the TCS I/O expansion card file.

TCS—Manual Switch-Over Procedure

To switch common I/O devices from one processor to the other, use the following suggested[8] procedure.



Step 1. Place the Mode switch in the Manual position.

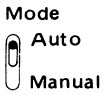
Step 2. Place the Select switch in the desired position, A or B. See Notes 1 and 2 before proceeding to Step 3.

Step 3. Press the Reset key. (Pressing this key with I/O operations in process could cause I/O errors.)

At this time:

The Manual Mode indicator will be on.

The corresponding Conn A or B indicator will be on (depends upon the Select switch setting). See Note 3 before proceeding to Step 4.



Step 4. Place the Mode switch in the Auto position. See Notes 1 and 2 before proceeding to Step 5.

[8] Your actual procedure is determined by the application software. See your programmer (or his equivalent) for your specific procedure.

Step 5. Press the Reset key. (Pressing this key with I/O operations in process could cause I/O errors.)

At this time:

The Manual Mode indicator will be off.

The Ack A or B indicator might come on to acknowledge the change in processors (software dependent).

End of procedure.

Notes:

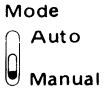
1. Your procedure might require you to press the Attn key before pressing the Reset key.
2. The Reset and Attn keys are not interlocked; therefore be sure to press only one key at a time. If these keys are pressed simultaneously, unpredicatable results can occur.
3. Steps 4 and 5 are required only if you desire to place the TCS in automatic mode.

TCS—Manual IPL Procedure

To IPL the Series/1 system from a common I/O device, use the following suggested[8] procedure.

Note: This procedure assumes IPL of processor A first and processor B second (both in manual mode of operation).

Step 1. Place the Select switch in position A.



Step 2. Place the Mode switch in the Manual position. See Notes 1 and 2 before proceeding to Step 3.

Step 3. Press the Reset key. (Pressing this key with I/O operations in process could cause I/O errors.)

At this time:

The Conn A indicator will be on.

The Manual Mode indicator will be on.

Note: The first processor (A) is now connected to the common I/O devices.

Step 4. Perform an IPL for processor A. Refer to "Initial Program Load (IPL) Procedures" in "Chapter 3. Processor Consoles and Operating Procedures"Proceed to Step 5 when the IPL is complete.

Step 5. Place the Select switch in position B. See Notes 1 and 2 before proceeding to Step 6.

Step 6. Press the Reset key. (Pressing this key with I/O operations in process could cause I/O errors.)

At this time:

The Conn B indicator will be on.

Note: The second processor (B) is now connected to the common I/O devices.

Step 7. Perform an IPL for processor B. Refer to "Initial Program Load (IPL) Procedures" in "Chapter 3. Processor Consoles and Operating Procedures"

End of procedure.

Notes:

1. Your procedure might require you to press the Attn key before pressing the Reset key.
2. The Reset and Attn keys are not interlocked; therefore, be sure to press only one key at a time. If these keys are pressed simultaneously, unpredicatable results can occur.

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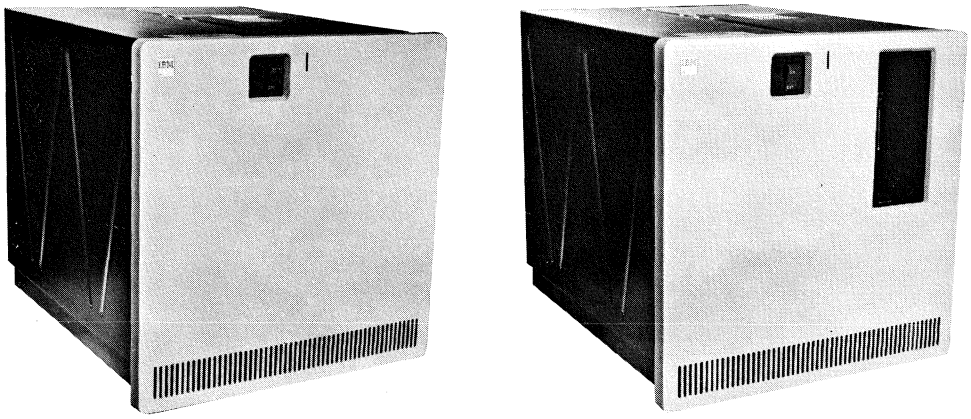
IBM 4962 Disk Storage Unit

The 4962 Disk Storage Unit has an On/Off switch, a Power On indicator, and a sliding door (on some models) as shown in Figure 48.

- On/Off switch and Power On indicator—all models
- Sliding Door—Models 2, 2F, and 4 only

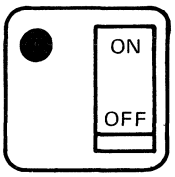
Diskette operation for the 4962 Models 2, 2F, and 4 is identical to the diskette operations for the 4964 Diskette Unit. Therefore, refer to "IBM 4964 Diskette Unit" in this chapter for all diskette operations using 4962 Models 2, 2F, and 4.



Models 1, 1F, and 3 Models 2, 2F, and 4

Figure 48. 4962 Disk Storage Units

On/Off Switch and Power On Indicator



Pressing the top of the On/Off switch applies power to the Disk Storage Unit and turns on the Power On indicator.

Pressing the bottom of the On/Off switch removes power from the Disk Storage Unit and turns off the Power On indicator.

> **Note:** The Disk Storage Unit is ready for operation approximately 16 seconds after the Power On indicator turns on.

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IBM 4963 Disk Subsystem

The 4963 Disk Subsystem, which consists of one primary unit and a maximum of three expansion units, has a Power indicator and an On/Off switch on each unit as shown in Figure 49.

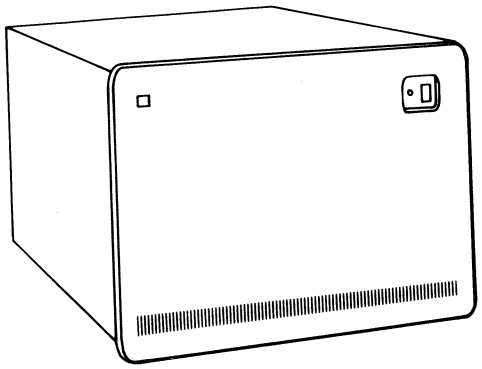
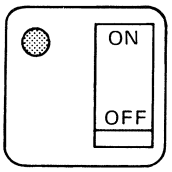


Figure 49. 4963 Disk Storage Unit

On/Off Switch and Power Indicator



Pressing the top of the On/Off switch applies power to the disk storage unit and turns on the Power indicator.

Pressing the bottom of the On/Off switch removes power from the disk storage unit and turns off the Power indicator.

Notes:

1. The disk storage unit is ready for operation approximately 16 seconds after the unit is powered on.
2. If the Power indicator flashes at a constant rate after power is applied, the unit should be powered off and a customer engineer should be called.

IBM 4964 Diskette Unit

The 4964 Diskette Unit has an On/Off switch, a Power On indicator, and a sliding door as shown in Figure 50.

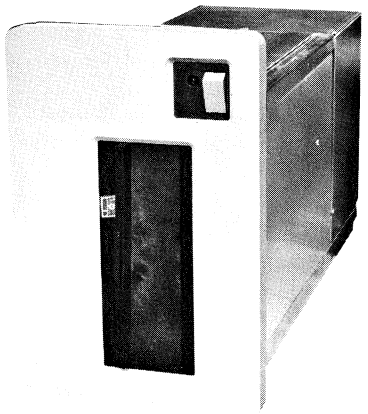
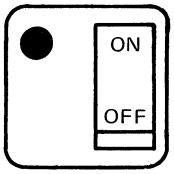


Figure 50. 4964 Diskette Unit

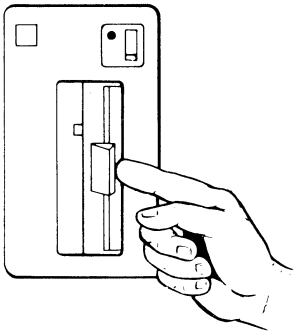
On/Off Switch and Power On Indicator



Pressing the top of the On/Off switch applies power to the Diskette Unit and turns on the Power On indicator.

Pressing the bottom of the On/Off switch removes power from the Diskette Unit and turns off the Power On indicator.

Diskette Door

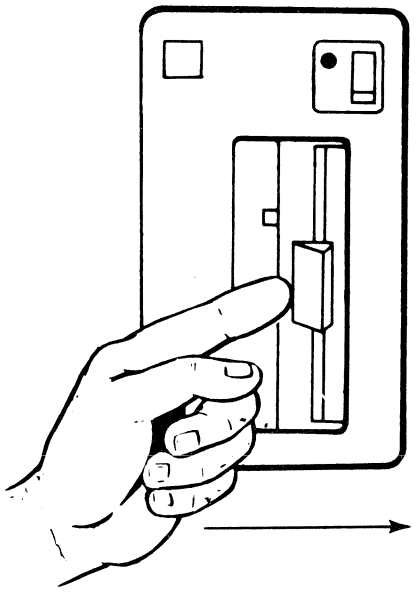


The diskette door must be closed and latched after inserting or removing a diskette.

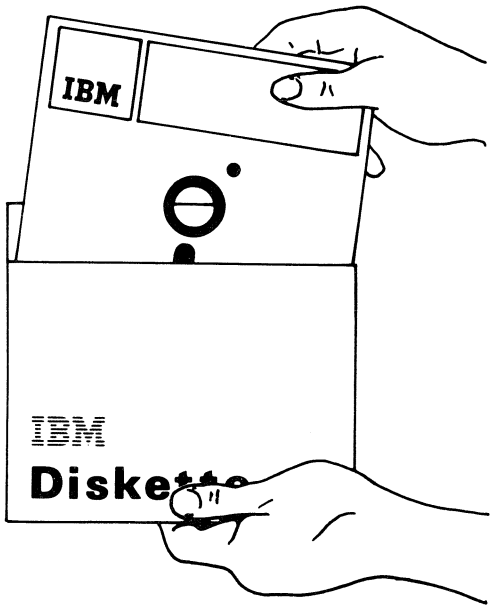
4964—Inserting Diskettes

To insert a diskette into the Diskette Unit, use the following procedure.

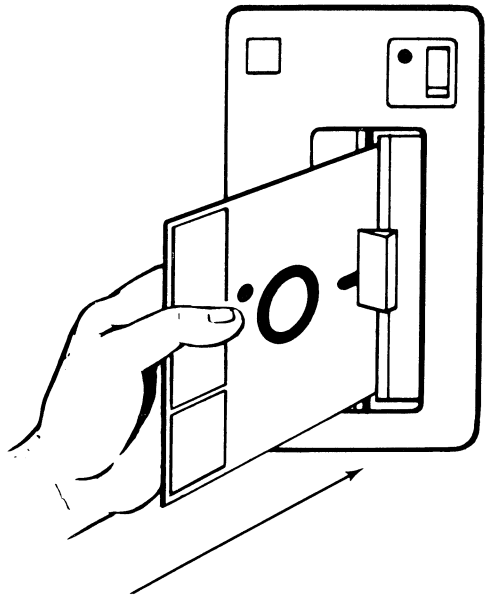
1. Press as shown and slide the diskette door to the right. Check to be sure the slot is empty.



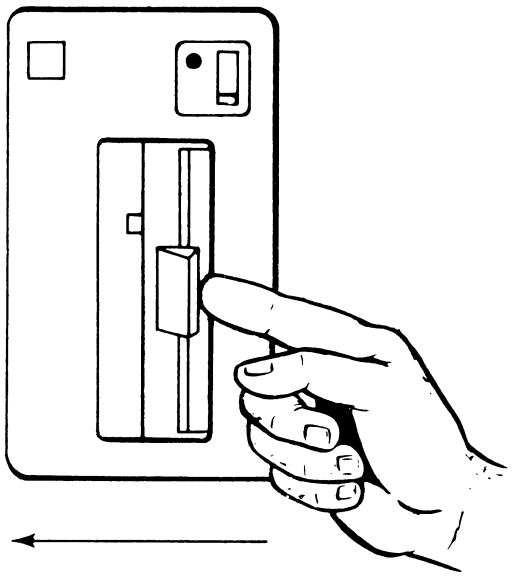
2. Grasp the diskette by the label (upper edge) and remove it from its envelope.



3. Insert the diskette squarely into the Diskette Unit opening, with the label facing towards the right, until it is stopped by the locating surfaces. (Do not force or bend the diskette.)



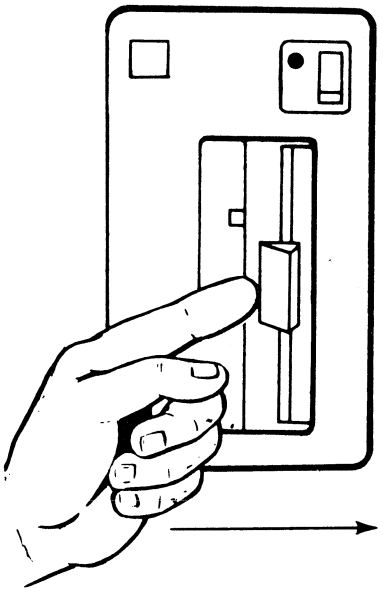
4. Press as shown and slide the diskette door to the left until it latches.



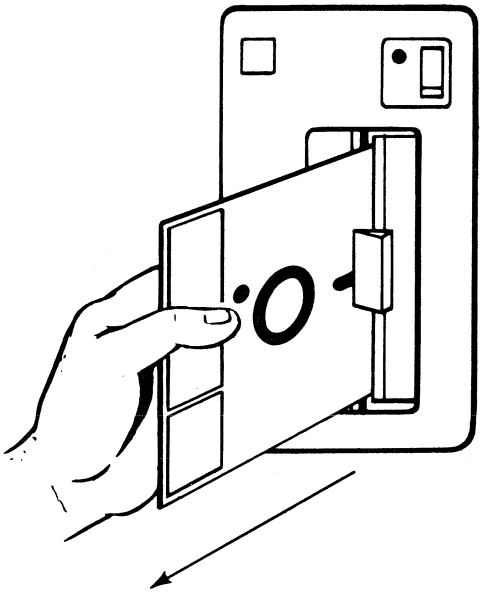
4964—Removing Diskettes

To remove a diskette from the Diskette Unit, use the following procedure.

1. Press as shown and slide diskette door to the right.



2. Grasp the diskette by the label and pull the diskette straight out.



3. Slide the diskette into its envelope and return it to a clean diskette storage area.

4964—Handling and Storing Diskettes

Handling

Proper handling and storage of your diskettes is important. To prevent damaging your diskettes and destroying the data stored on them, follow these suggestions:

- Do not use damaged (torn, folded, creased) diskettes; they might cause errors.
- Do not use a diskette if its surface becomes contaminated with fluids (soft drinks, coffee) or abrasive substances (metal filings).
- To remove a diskette from its envelope, hold the diskette by its upper edge and pull.
- Put the diskette in its envelope when you are not using it or when you are writing on its label.
- Always handle the diskette by its label area to avoid touching the recording surface.
- Never write on a diskette with a pencil; use fiber-tip or ball-point pens for labeling diskettes.
- Do not attach paper clips to diskettes.
- Do not touch or clean the recording surface.
- Keep the diskette away from magnets; any diskette exposed to a magnetic field will lose information.
- Do not expose the diskette to excessive heat or sunlight.
- Do not place heavy objects on the diskette.
- If you mail diskettes, place them in a box or a heavy cardboard mailer.

Short-Term Storage

Store often-used diskettes in their envelopes. If you lay them flat, put no more than ten in one stack; if you stand them on edge, support the diskettes so they do not lean or sag.

Long-Term Storage

Store seldom-used diskettes in their original shipping cartons, with each diskette in its protective envelope. Shipping cartons may be stored either vertically or horizontally.

CAUTION
Do not apply pressure to diskette envelopes or cartons because pressure can warp the diskettes.

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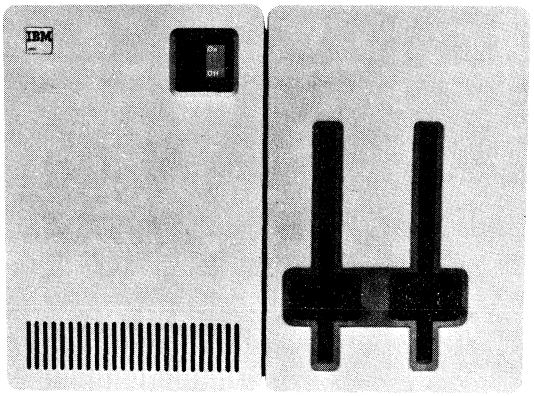
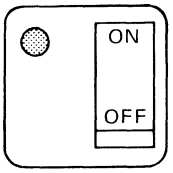
IBM 4965 Diskette Drive and I/O Expansion Unit

The 4965 Diskette Drive and I/O Expansion Unit (without Two Channel Switch) has an On/Off switch, a Power On indicator and one or two slots for inserting diskettes, as shown below.



On/Off Switch and Power On Indicator

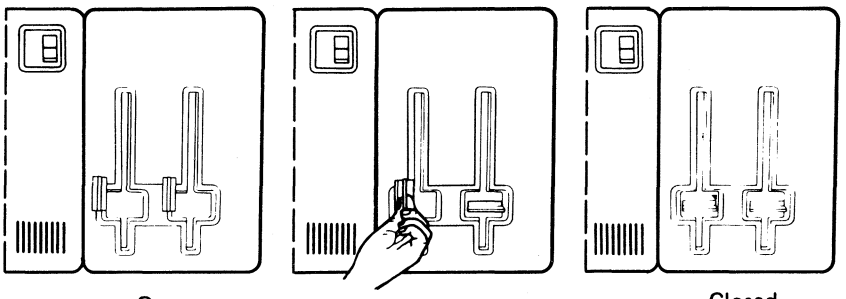


Pressing the top of the On/Off switch applies power to the Diskette Unit and turns on the Power On indicator.

Pressing the bottom of the On/Off switch removes power from the Diskette Unit and turns off the Power On indicator.

> **Note:** The 4965 is shown without the Two Channel Switch feature. Refer to the 4959 I/O Expansion Unit with Two Channel Switch for operator controls.

Diskette Door

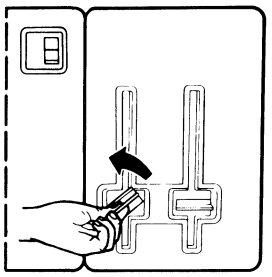


Turn the lever 90° clockwise to the horizontal position to lock the diskette in place. Reverse the lever from horizontal to vertical position to release the diskette. The locking lever must be closed after inserting a diskette.

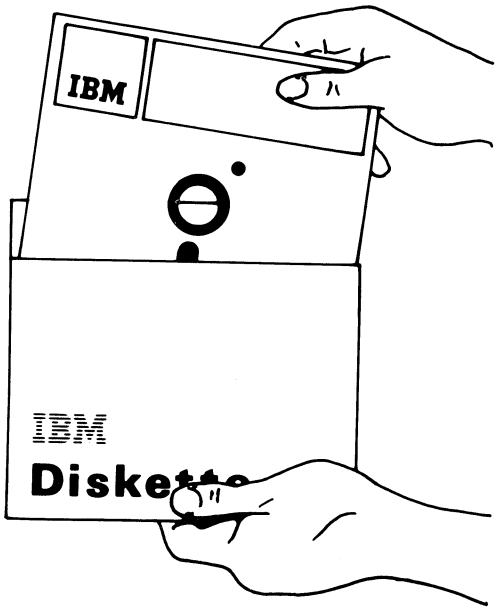
4965—Inserting Diskettes

Use the following procedure to insert a diskette into the Diskette Drive.

1. Turn lever to vertical (open) position, check to ensure the slot is empty.

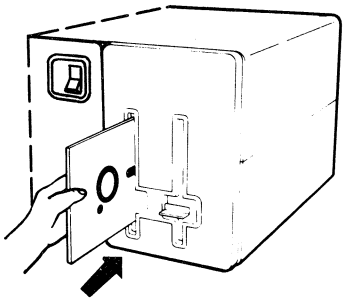


2. Grasp the diskette by the label (upper edge) and remove it from its envelope.

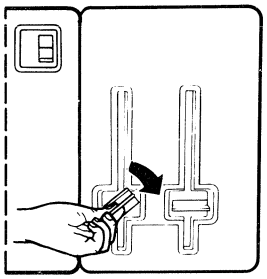


3. Insert the diskette squarely into the Diskette Drive opening, with the label facing towards the left, until it is stopped by the locating surfaces.

   Do not force or bend the diskette.



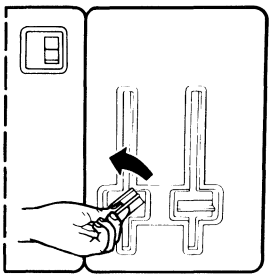
4. Turn the lever to the horizontal position to lock the diskette door.



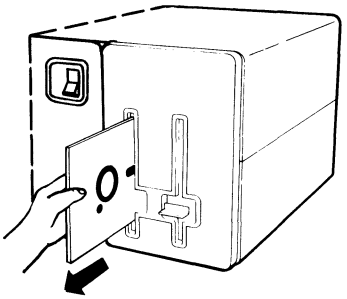
4965—Removing Diskettes

Use the following procedure to remove a diskette from the Diskette Drive.

1. Turn lever counterclockwise 90° from the horizontal to the vertical position to release the diskette.



2. Grasp the diskette by the label and pull it straight out.



3. Slide the diskette into its storage envelope and return it to a clean diskette storage area.

4965—Handling and Storing Diskettes

Handling

Proper handling and storage of your diskettes is important. To prevent damaging your diskettes and destroying the data stored on them, follow these suggestions:

- Do not use damaged (torn, folded, creased) diskettes; they might cause errors.
- Do not use a diskette if its surface becomes contaminated with fluids (soft drinks, coffee) or abrasive substances (metal filings).
- To remove a diskette from its envelope, hold the diskette by its upper edge and pull.
- Put the diskette in its envelope when you are not using it or when you are writing on its label.
- Always handle the diskette by its label area to avoid touching the recording surface.
- Never write on a diskette with a pencil; use fiber-tip or ball-point pens for labeling diskettes.
- Do not attach paper clips to diskettes.
- Do not touch or clean the recording surface.
- Keep the diskette away from magnets; any diskette exposed to a magnetic field will lose information.
- Do not expose the diskette to excessive heat or sunlight.
- Do not place heavy objects on the diskette.
- If you mail diskettes, place them in a box or a heavy cardboard mailer.

Short-Term Storage

Store often-used diskettes in their envelopes. If you lay them flat, put no more than ten in one stack; if you stand them on edge, support the diskettes so they do not lean or sag.

Long-Term Storage

Store seldom-used diskettes in their original shipping cartons, with each diskette in its protective envelope. Shipping cartons may be stored either vertically or horizontally.

CAUTION
Do not apply pressure to diskette envelopes or cartons because pressure can warp the diskettes.

IBM 4966 Diskette Magazine Unit

The 4966 Diskette Magazine Unit has an On/Off switch, a Power On indicator, and a door for inserting diskettes and magazines as shown in Figure 51.

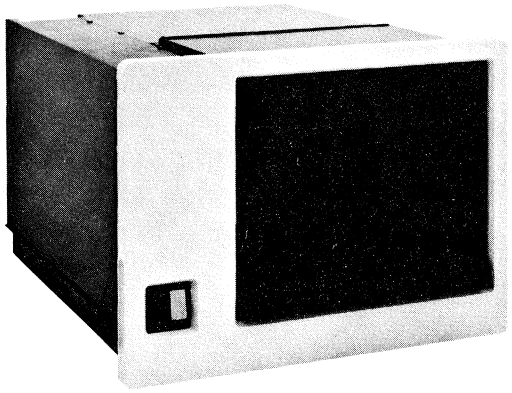
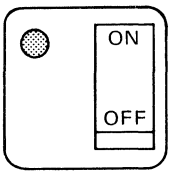


Figure 51. 4966 Diskette Magazine Unit

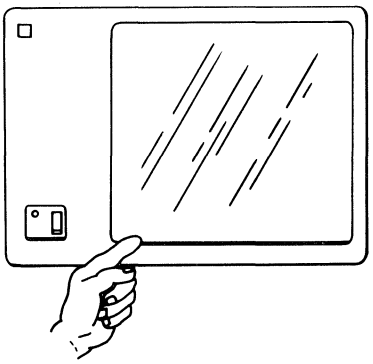
On/Off Switch and Power On Indicator



Pressing the top of the On/Off switch applies power to the Diskette Magazine Unit and turns on the Power On indicator.

Pressing the bottom of the On/Off switch removes power from the Diskette Magazine Unit and turns off the Power On indicator.

Diskette/Magazine Door

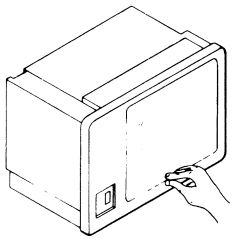


The diskette/magazine door must be closed after inserting or removing diskettes or magazines.

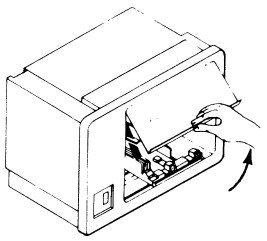
4966—Inserting Diskettes

To insert a diskette into the Diskette Magazine Unit, use the following procedure:

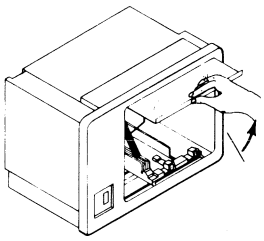
1. Lift the bottom of the diskette/magazine door outward and up, and slide the door back into the unit as shown.



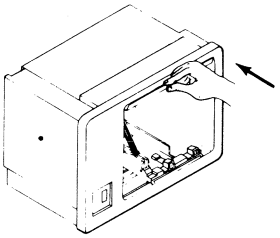
Step A



Step B

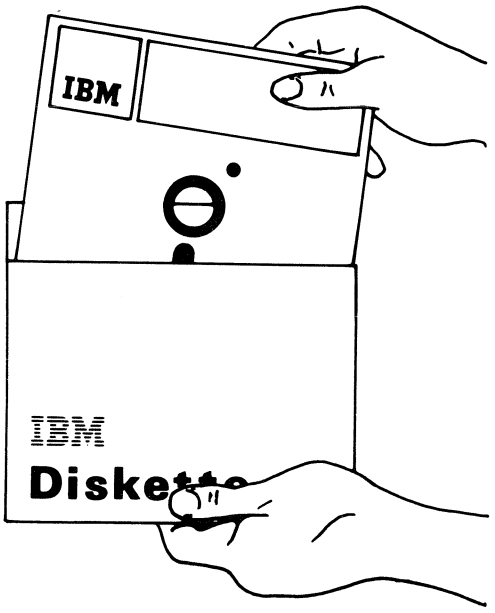


Step C

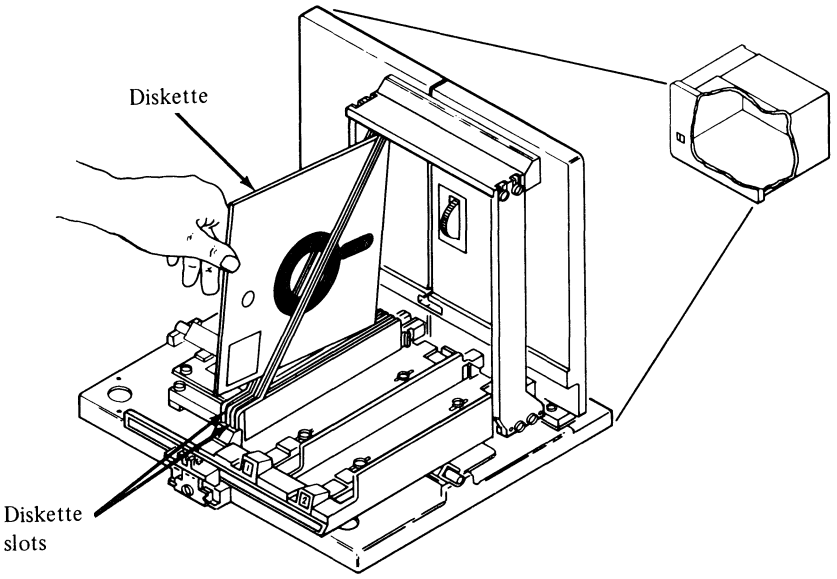


Step D

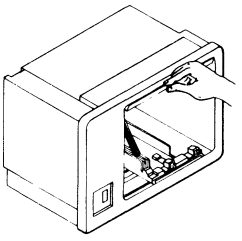
2. Grasp the diskette by the label (upper edge) and remove it from its envelope.

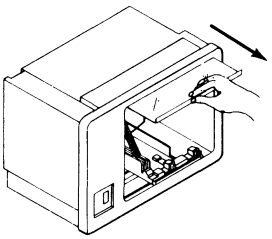


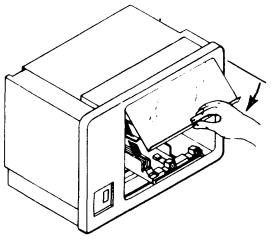
3. Insert the diskette into the diskette slot (three slots are available), with the label facing toward the right. (Do not force or bend the diskette.)

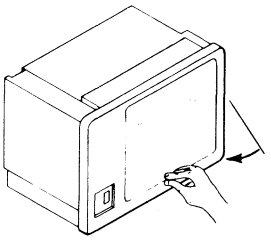


4. Slide the door forward out of the Diskette Magazine Unit, and lower as shown.


Step A


Step B

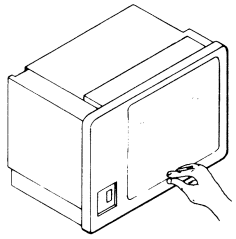

Step C


Step D

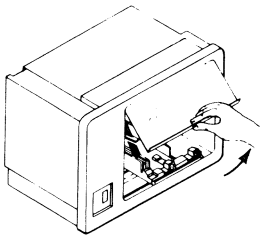
4966—Removing Diskettes

To remove a diskette from the Diskette Magazine Unit, use the following procedure:

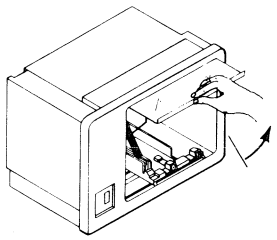
1. Lift the bottom of the diskette/magazine door outward and up, and slide the door back into the unit as shown.



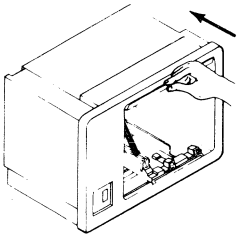
Step A



Step B

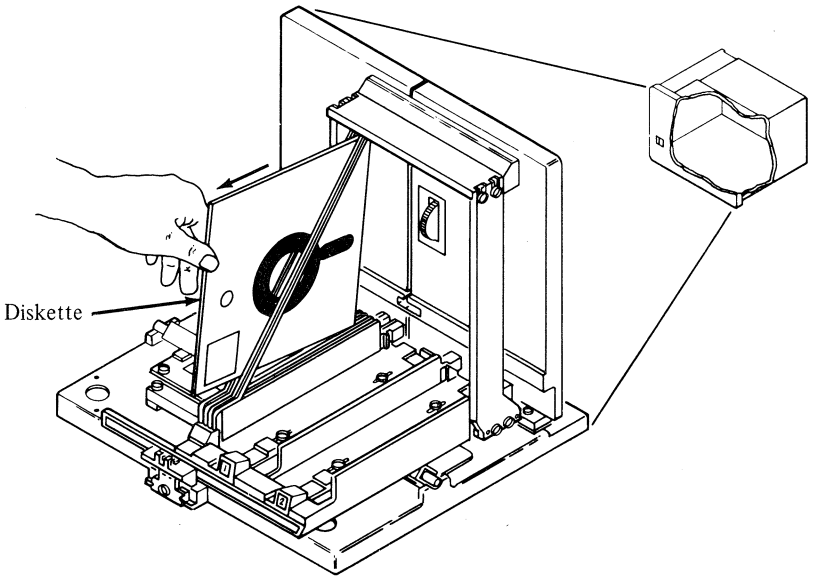


Step C



Step D

2. Grasp the diskette by the label, lift the diskette just enough to clear the stop, and pull the diskette straight out.

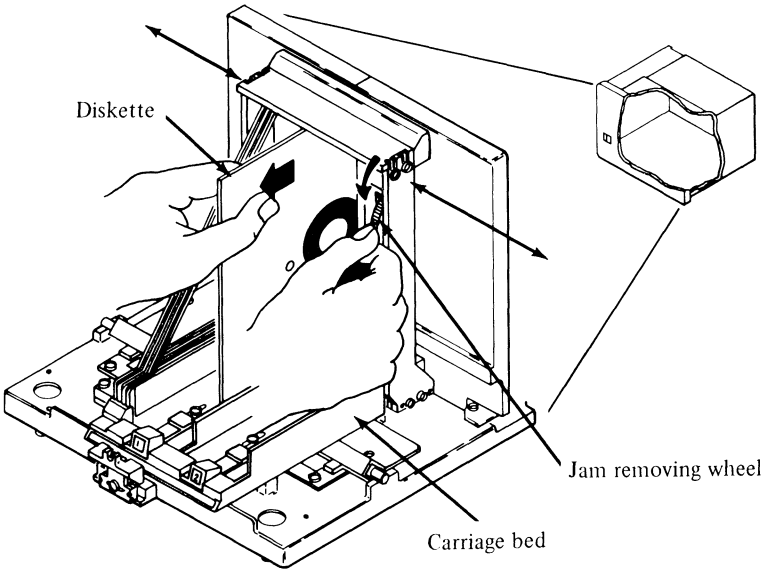


4966—Removing Jammed Diskettes

To remove a jammed diskette from the Diskette Magazine Unit, use the following procedure:

1. Turn off power to the Diskette Magazine Unit.

   Note: If a magazine is in the unit, remove it to gain access to the diskette and jam-removing wheel. For magazine removal information, see "4966—Removing Magazines" later in this chapter.



2. Grasp the diskette by the label. Press in the jam-removing wheel while rotating the wheel in the direction indicated in the illustration until the diskette is free.

4966—Handling and Storing Diskettes

Handling

Proper handling and storage of your diskettes is important. To prevent damaging your diskettes and destroying the data stored on them, follow these suggestions:

- Do not use damaged (torn, folded, creased) diskettes; they might cause errors.
- Do not use a diskette if its surface becomes contaminated with fluids (soft drinks, coffee) or abrasive substances (metal filings).
- To remove a diskette from its envelope, hold the diskette by its upper edge and pull.
- Put the diskette in its envelope when you are not using it or when you are writing on its label.
- Always handle the diskette by its label area to avoid touching the recording surface.
- Never write on a diskette with a pencil; use fiber-tip or ball-point pens for labeling diskettes.
- Do not attach paper clips to diskettes.
- Do not touch or clean the recording surface.
- Keep the diskette away from magnets; any diskette exposed to a magnetic field will lose information.
- Do not expose the diskette to excessive heat or sunlight.
- Do not place heavy objects on the diskette.
- If you mail diskettes, place them in a box or a heavy cardboard mailer.

Short-Term Storage

Store often-used diskettes in their envelopes. If you lay them flat, put no more than ten in one stack; if you stand them on edge, support the diskettes so they do not lean or sag. Diskettes may also be stored in magazines. But, make sure that the magazine cover is installed properly.

Long-Term Storage

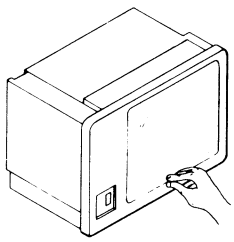
Store seldom-used diskettes in their original shipping cartons, with each diskette in its protective envelope. Shipping cartons may be stored either vertically or horizontally.

CAUTION
Do not apply pressure to diskette envelopes or cartons because pressure can warp the diskettes.

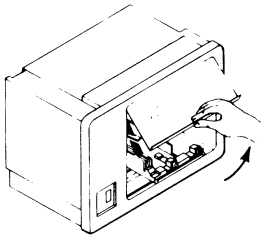
4966—Inserting Magazines

To insert a magazine into the Diskette Magazine Unit, use the following procedure:

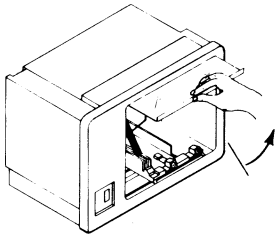
1. Lift the bottom of the diskette/magazine door outward and up, and slide the door back into the unit as shown.



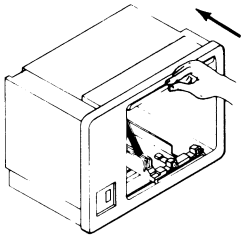
Step A



Step B

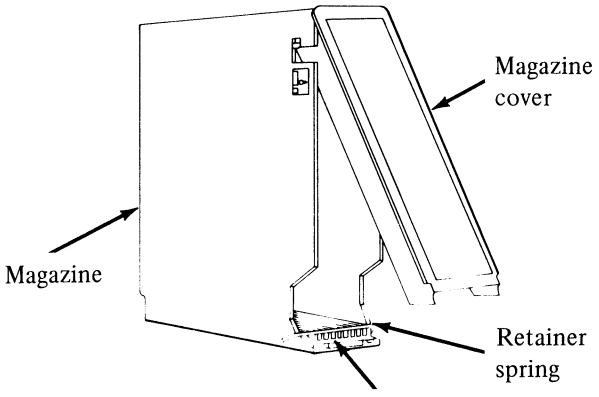


Step C



Step D

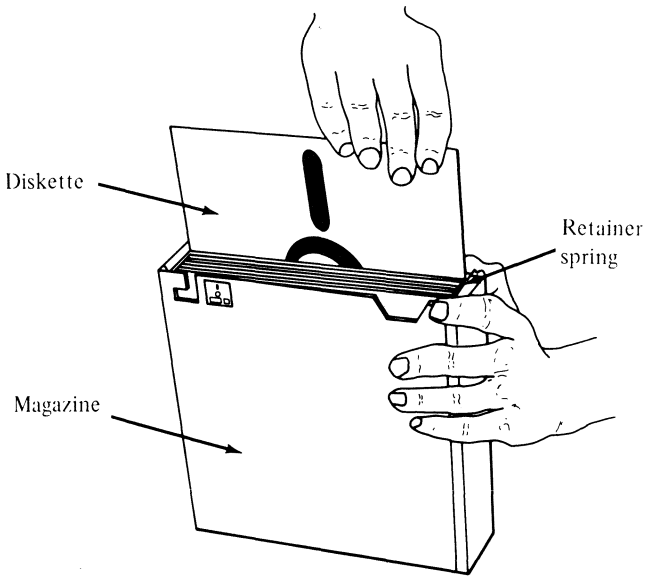
2. Remove the magazine cover (retainer spring must be held back).



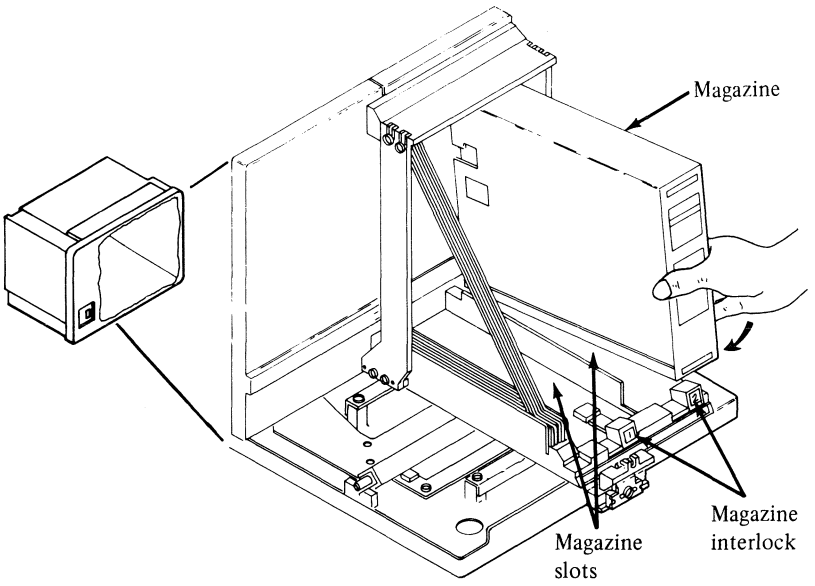
Note: If the magazine is not already loaded with the desired diskettes, proceed with step 3; if the magazine is loaded with the desired diskettes, skip to step 5.

3. Obtain the desired diskettes and remove them from their envelopes. (To remove a diskette from its envelope, see step 2 of "4966—Inserting Diskettes" earlier in this chapter.)

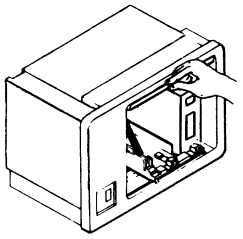
4. Grasp the magazine in one hand. Using your thumb and forefinger, hold the retainer spring back while you place the diskettes into the available slots in the magazine with your free hand. The diskette labels should face to the right when the magazine is placed in the unit.



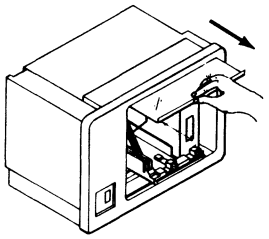
5. Place the magazine into one of the two magazine slots. Be sure the magazine is locked in place by checking the magazine interlock/indicator.



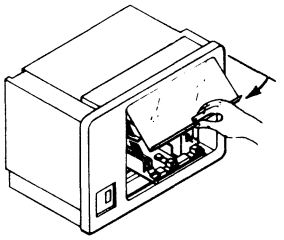
6. **Slide the door forward from Diskette Magazine Unit and lower it as shown.**



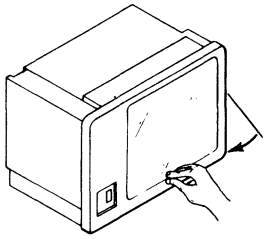
Step A



Step B



Step C

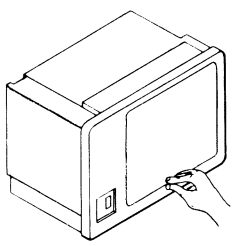


Step D

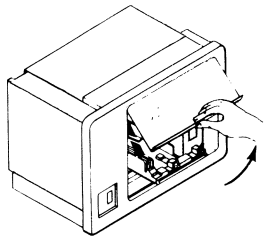
4966—Removing Magazines

To remove a magazine from the Diskette Magazine Unit, use the following procedure:

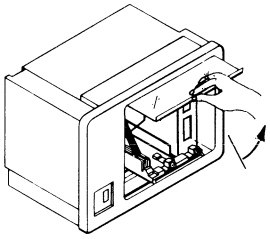
1. Lift the bottom of the diskette/magazine door outward and up, and slide it back into the unit as shown.



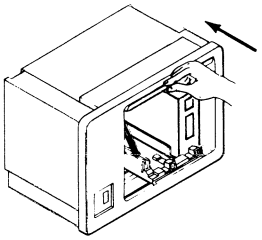
Step A



Step B

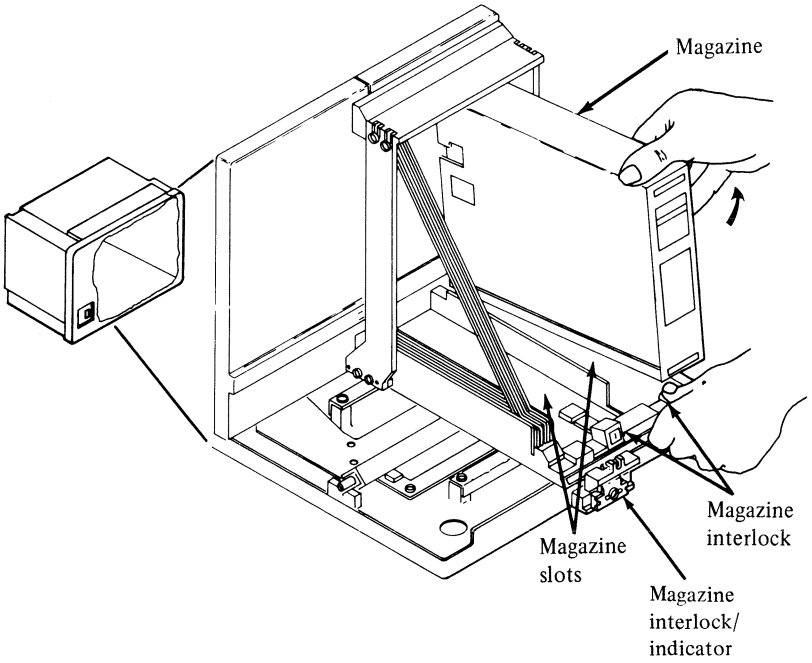


Step C



Step D

2. Grasp the magazine with one hand. Use your other hand to press the magazine interlock and unlock the magazine. (If the magazine you want to remove is positioned above the magazine interlock/indicator, you must push the magazine interlock/indicator down before you can unlock the magazine.) Lift the magazine and remove it from the unit.



3. If the magazine is not to be used for diskette storage, remove the diskettes from the magazine, slide them into their envelopes, and return them to a clean storage area.
4. Put the magazine cover on and return the magazine to its storage area.

Note: For jammed diskette removal information, see "4966—Removing Jammed Diskettes" earlier in this chapter.

4966—Handling Magazines

Proper magazine handling is important, especially if the magazine is to be used for diskette storage. To prevent damaging the magazine and diskettes, follow these suggestions:

- Do not use damaged (cracked, broken, creased) magazines.
- Never write on a magazine with a pencil. Use fiber-tip or ball-point pens for labeling magazines.
- Keep the loaded magazines away from magnets; any diskette exposed to a magnetic field will lose information.
- Do not expose a diskette loaded magazine to excessive heat or sunlight.
- Do not place heavy objects on the magazine.

IBM 4969 Magnetic Tape Subsystem

The 4969 Magnetic Tape Subsystem has the following switches and indicators as shown in Figures 4-10 and 4-11. Some are combination switches and indicators; the others perform only one of the two functions.

- Power switch/indicator
- Reverse switch/indicator
- File Protect indicator
- Load switch/indicator
- Forward switch/indicator
- On Line switch/indicator
- Rewind switch
- Reset switch
- Emergency Push switch (Model 7 only)

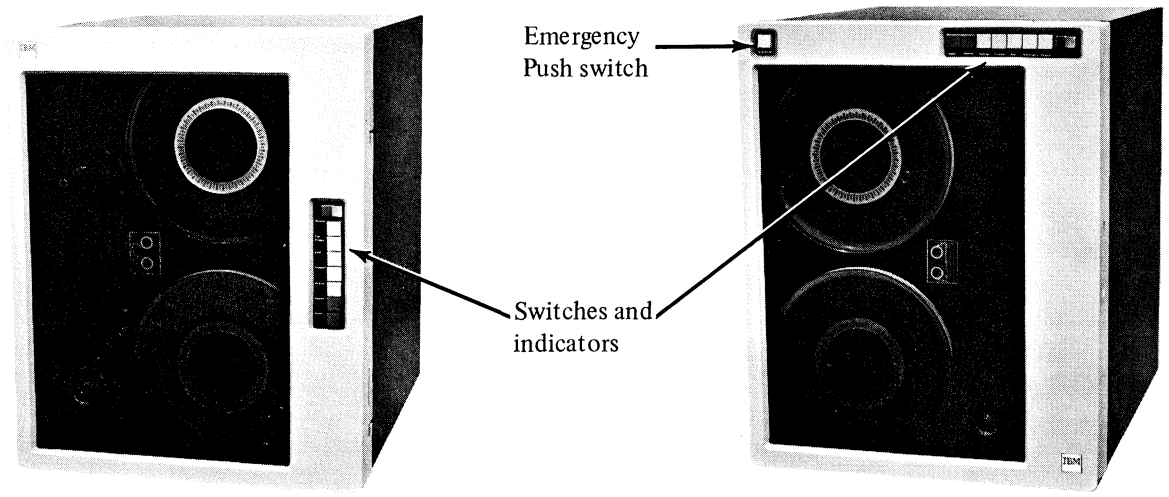
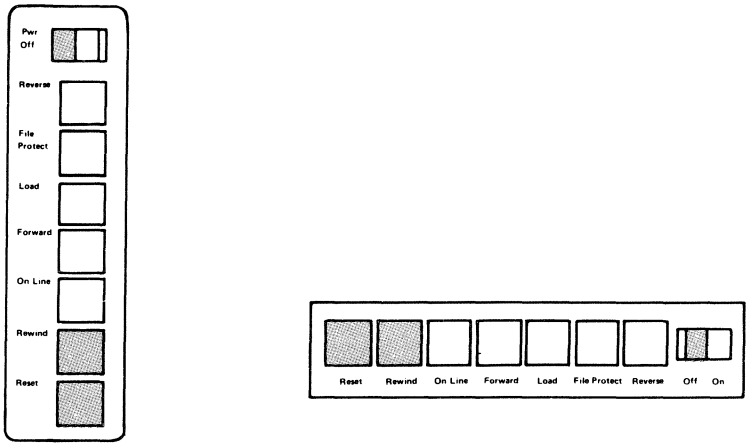


Figure 52. IBM Magnetic Tape Unit Switches and Indicators

4969—Switches and Indicators



Model 4 Model 7

Figure 53. IBM 4969 Switches and Indicators

Power Switch/Indicator

Model 4 Model 7

Pressing the right side (white portion) of the Power switch/indicator applies power to the 4969 and turns on the indicator (white portion).

Pressing the left side (red portion) of the Power switch/indicator removes power from the 4969 and turns off the indicator (white portion).

Note: On multi-unit tape systems:

- The primary unit must be turned on for any tape unit in that system to operate. If you are not sure which is the primary unit, contact your programmer.
- Never apply or remove tape-unit power when the On Line indicator of any unit in that system is on. All units to be used should be turned on at the same time.

Reverse Switch/Indicator

Model 4 Model 7

Pressing the Reverse switch/indicator (disabled when the 4969 is online) turns on the indicator and moves the tape in reverse at read/write speed until the tape reaches load point. (Tape motion can be stopped by pressing the Reset switch.)

File Protect Indicator

Model 4 Model 7

The File Protect indicator is on when a write-enable ring is not installed on the file reel. Without a ring installed, no information can be written or erased on the tape.

Load Switch/Indicator

Model 4 Model 7

Pressing the Load switch/indicator (after the tape is threaded) moves the tape to the load point, turns on the Load indicator when the tape reaches load point, and puts the tape unit online. After the 4969 is online, the Load switch is functionally disabled. The Load switch is enabled again if tape tension is lost (Model 4) or if vacuum in the vacuum chamber is lost (Model 7).

The Load indicator is on whenever the tape is at load point.

Forward Switch/Indicator

Model 4 Model 7

Pressing the Forward switch/indicator (disabled when the 4969 is online) turns on the indicator and moves the tape forward at read/write speed until the tape reaches the end-of-tape marker. (Tape motion can be stopped by pressing the Reset switch.)

On Line Switch/Indicator

Model 4 Model 7

Pressing the On Line switch/indicator turns on the indicator and puts the 4969 online. (The unit automatically goes online when initially loaded.)

Note: The On Line switch/indicator controls the state of the 4969 as online or offline.

- When Online:
  - — The 4969 accepts system commands only and disables all operator controls except Reset.
  - — The 4969 can be taken offline by a system command, by breaking an interlock, or by pressing Reset.
- When Offline:
  - — The 4969 is controlled manually from the operator control panel.
  - — The 4969 can be put back online (if tape tension is present and interlocks are closed) by pressing On Line.

Rewind Switch

Model 4 Model 7

Pressing the Rewind switch causes the tape to rewind at high speed. (Rewinding can be halted by pressing the Reset switch.)

Pressing the rewind switch when the tape is at the load point initiates an unload operation (the tape is drawn from the tape path).

Notes:

1. The Rewind switch is disabled when the unit is online.
2. On a Model 7, the tape can be moved from the take-up reel (machine reel) to the file reel with the front cover open by pressing and holding the Rewind switch.

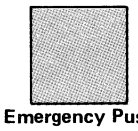
Reset Switch

Model 4 Model 7

Pressing the Reset switch:

- Places the 4969 offline.
- Stops all tape motion unless an unload operation is already in progress (Model 4 only).
- Stops all tape motion (Model 7 only).
- Clears all read, write, and control functions previously initiated.

Emergency Push Switch (Model 7 only)



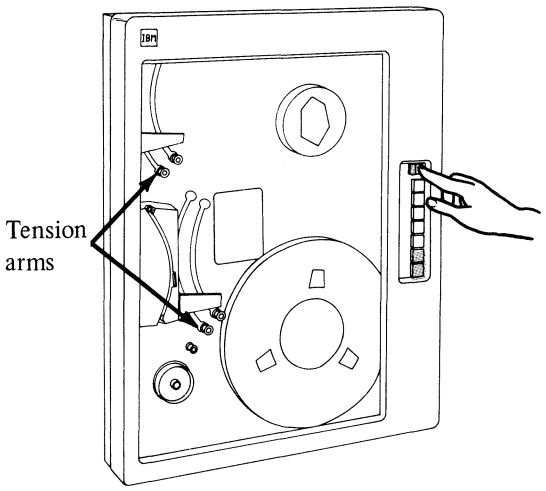
Pressing the Emergency Push switch turns off all power to the unit. The Emergency Push switch should only be used for emergencies such as presence of smoke or fire in the unit or when the Power switch does not work. To reset the Emergency Push switch, open the front cover and pull the switch back out.

4969 Model 4—Loading Tape

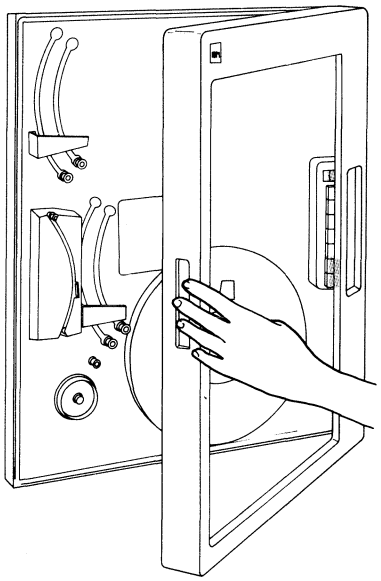
To load a reel of tape on the 4969 Model 4, use the following procedure.

Note: On a multi-unit system, do not turn power on or off when the On Line indicator of another unit in the system is on.

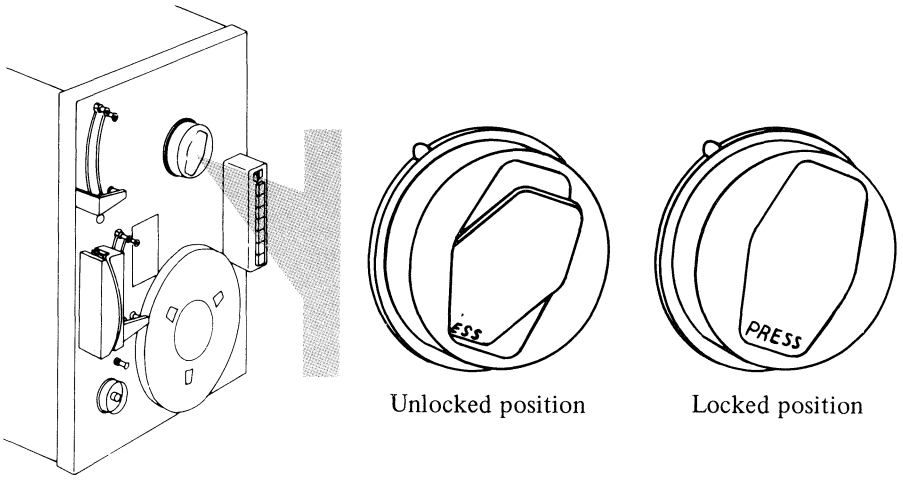
1. If the power is off, press the right side (white portion) of the Power switch/indicator to apply power to the unit.



2. If the tension arms are not in the down position, press Load.
3. Open the front cover.
   - Place your fingers in the grove on the left side of the front cover and swing the cover completely open.

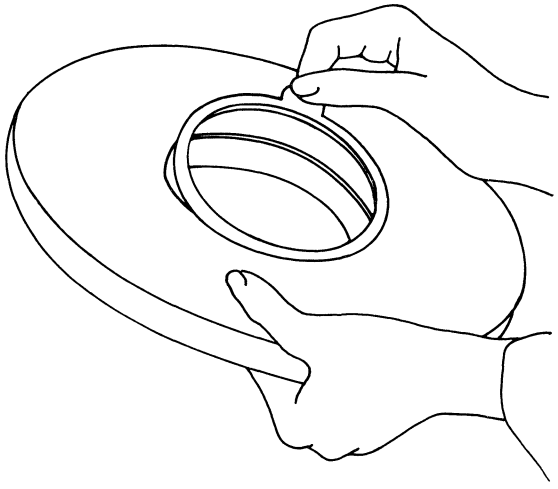


4. Unlock the file-reel hold-down knob.
   - Press the toggle of the hold-down knob.

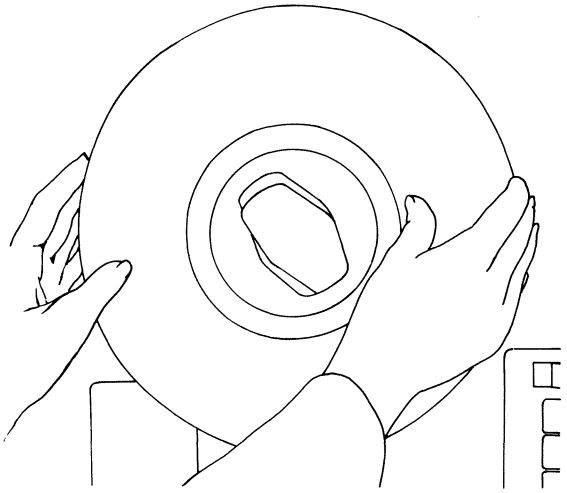


Unlocked position Locked position

5. If you intend to write data on the tape, place a write-enable ring in the slot on the back of the file reel.

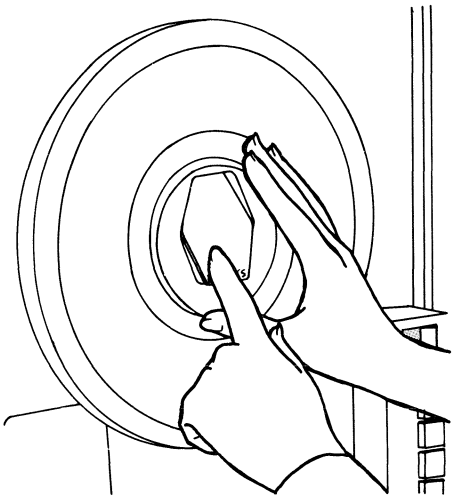


6. Place the file reel on the hold-down knob with the write-enable ring (or the slot provided for the ring) toward the tape unit.

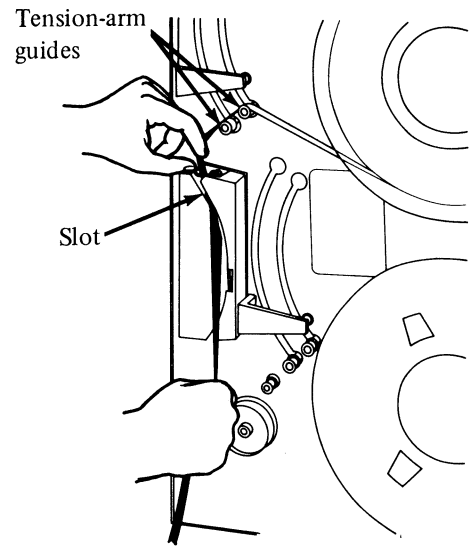


CAUTION
To prevent tape damage, follow the tape-handling precautions described under "4969—Tape Handling and Storage" later in this chapter.

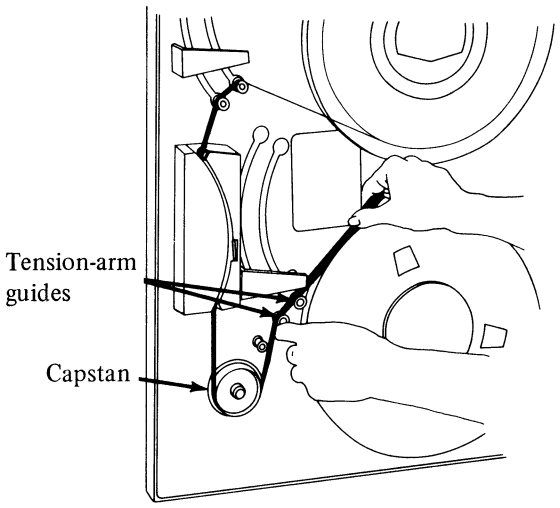
7. Press the reel firmly against the hold-down knob by using your fingertips placed against the reel's hub. Then, press the extended end of the toggle until it is flush with the face of the hold-down knob.



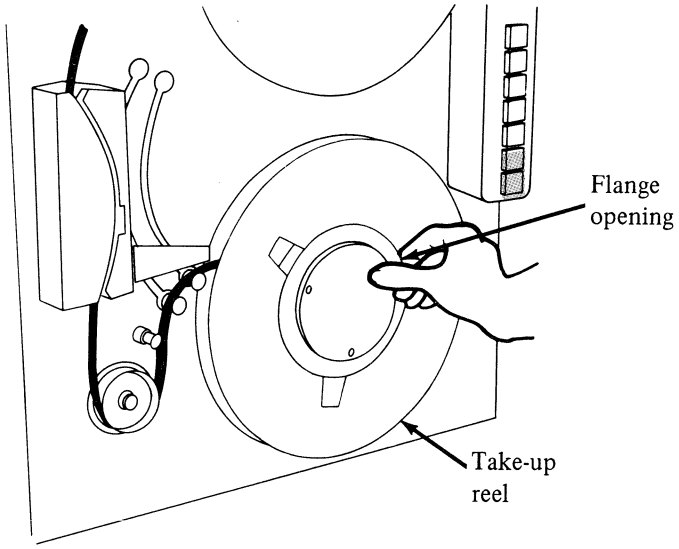
8. Thread the tape over the tension-arm guides and down through the slot in the read/write head-assembly cover.



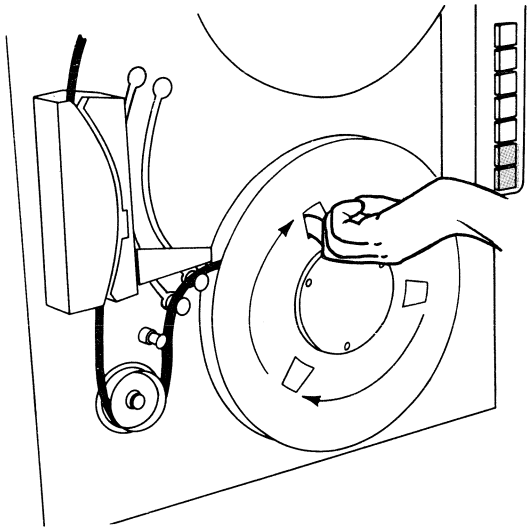
9. Thread the tape around the capstan and over the lower two tension-arm guides.



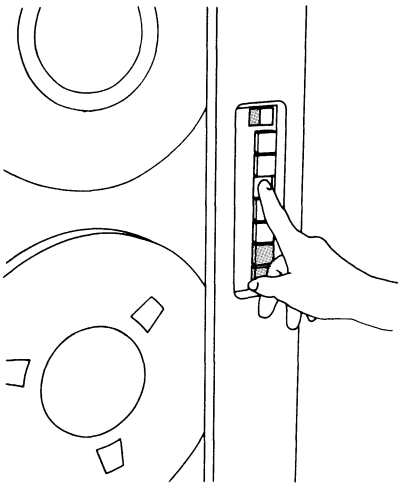
10. Thread the tape over the top of the take-up (machine) reel, then press the end of the tape against the reel's hub by placing your finger through one of the flange openings.



11. While holding the tape against the hub, turn the reel clockwise until the end of the tape is overlapped and secured by the next tape layer; then, by hand, wind the take-up (machine) reel three full turns, clockwise.



12. Close the front cover and press the Load switch. (To halt loading before it's complete, press Reset.)



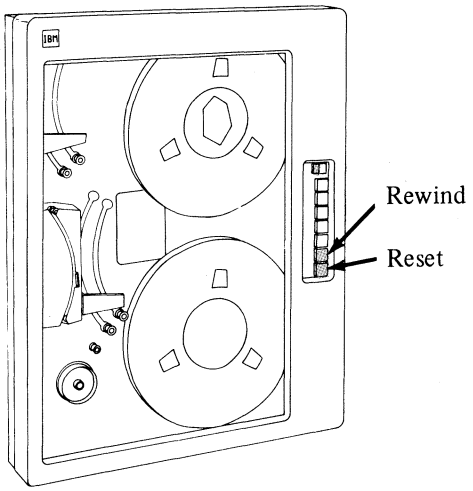
Notes:

1. All tension arms will move to their normal operating positions, and the capstan will pull the tape forward to the load point. Control of the tape unit will then be turned over to the system, and the On Line and Load indicators will turn on.
2. If there is no write-enable ring in the tape reel, the File Protect indicator should turn on. If the indicator fails to turn on, contact your service representative.
3. If the tape does not stop at the load point, check leader length and proper placement of the load-point (reflective strip) marker. The marker should be 3 to 4.5 meters (10 to 15 feet) from the leading end of the tape. See "Appendix B, Applying Reflective Strips to Magnetic Tape" for instruction on how to apply the marker.
4. To obtain manual control of the tape unit, press the Reset switch.

End of procedure

4969 Model 4—Rewinding Tape

To rewind the tape when it is not at the load point press Reset; then press Rewind. (To halt rewinding before it's complete, press Reset again.)



When you press Rewind:

Notes:

1. The tape rewinds at high speed past the load point.
2. After passing the load point, the tape stops.
3. The tape then moves forward at read/write speed until the load point is reached again.
4. The tape stops at the load point and the Load indicator turns on.

End of procedure

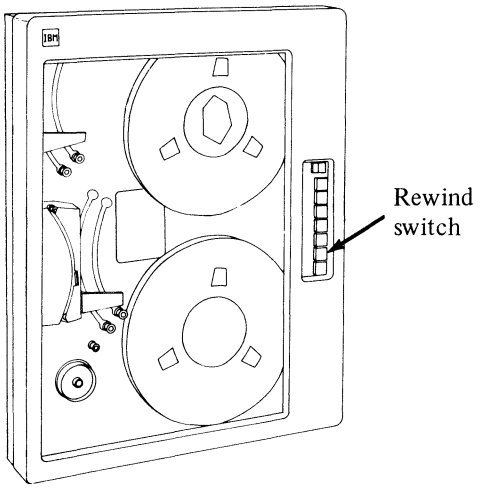
4969 Model 4—Unloading Tape

To unload the tape, do the following:

1. If the tape is not positioned at load point, perform the tape rewinding procedure described earlier.
2. Press Reset; then press Rewind.

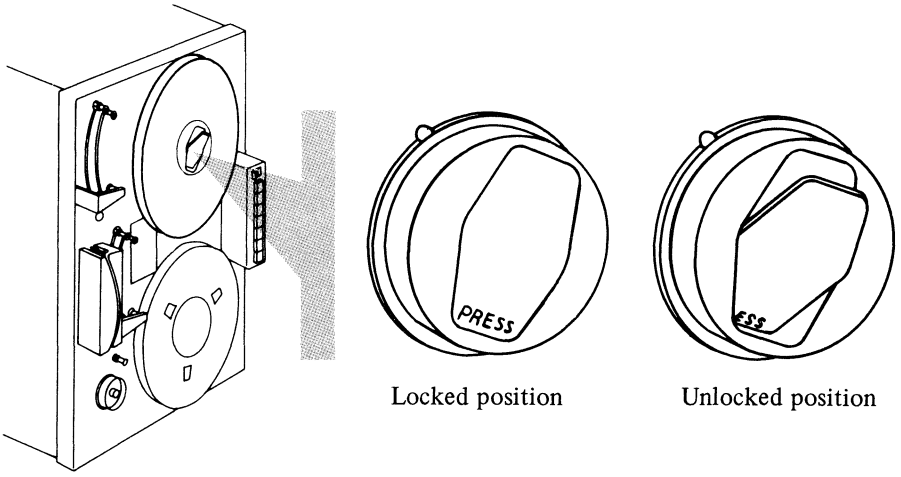
CAUTION

Do not open the front cover while tape is rewinding. The tension arms may stop in the up position. If the front cover is opened, close the cover then press Load.



Note: The tape will be pulled through the tape path and returned to the file reel.

3. Open the front cover.
4. Press the toggle of the hold-down knob to unlock the file reel.



Locked position Unlocked position

5. Remove the tape reel from the hold-down knob and close the front cover.

End of procedure

4969 Model 4—Recovering from a Power Failure

If there is a power failure while the unit is in operation, the tension arms extend and tension on the tape is relaxed to prevent tape damage.

To recover from such a power failure, do the following after power is restored to the unit. ("Chapter 5. Operator Aids," lists things to check if you have trouble restoring power.)

1. Open the front cover.
2. Rotate the file reel by hand to take up any tape slack.
3. Close the front cover.
4. Press the Load switch.
5. When the tension arms return to their operating position, press the Reset switch (to stop tape motion).
6. Press the Rewind switch to position the tape at load point.

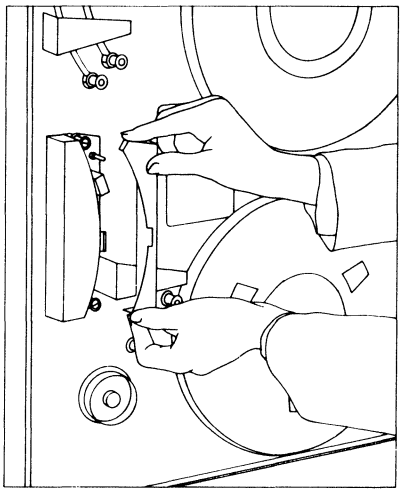
End of procedure

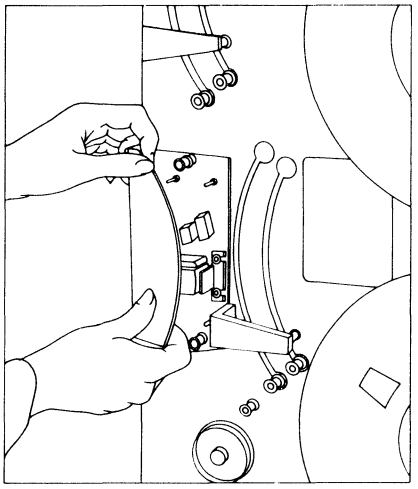
4969 Model 4—Cleaning

Proper and regular cleaning is important to ensure the reliability of the tape unit.

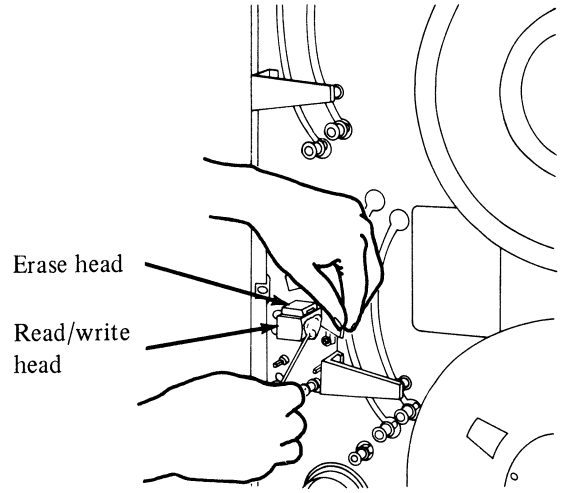
The tape transport, heads, and capstan should be cleaned after every eight hours of use.

1. Remove the file reel. (See "4969 Model 4—Unloading Tape" described earlier in this chapter.)
2. Turn off the power to the unit.
3. Remove both head covers (one at a time) by using both hands to gently pull them directly away from the unit.

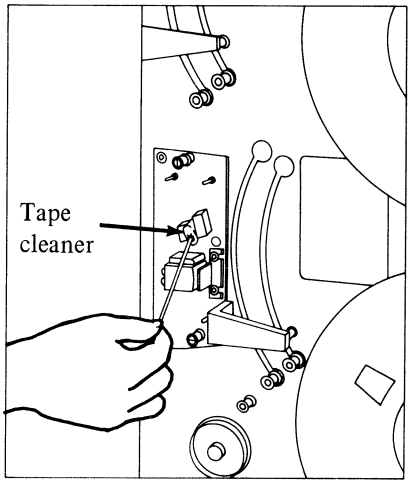




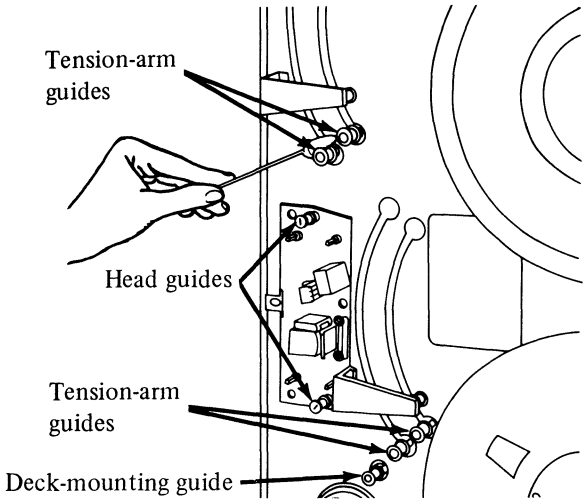
4. Moisten a lint-free swab with IBM cleaner, part 453511, and carefully swab both the read/write and erase head surfaces.



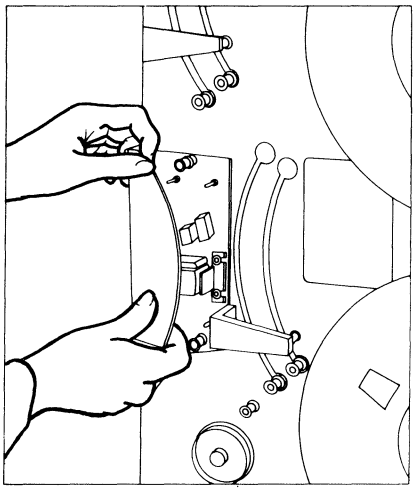
5. Dry the swabbed surfaces with a clean, lint-free cloth.
6. Clean the face of the tape cleaner, using the same procedure described in step 4.

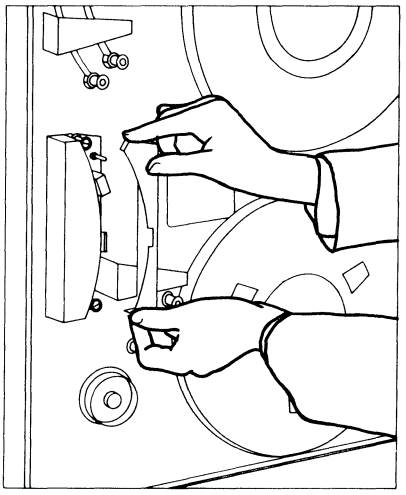


7. Clean the head guides, tension-arm guides, and deck-mounting guide, using the same procedure described in step 4.



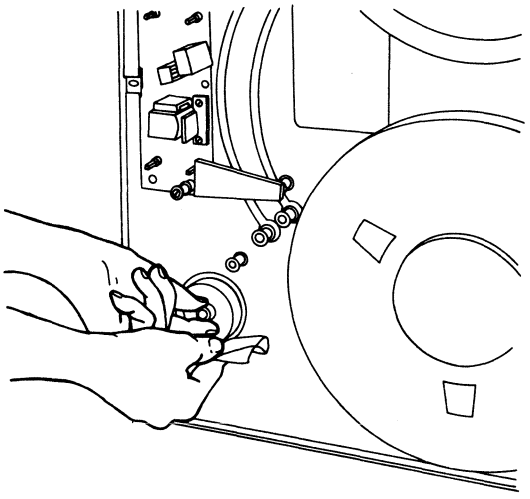
8. Replace both head covers. (Align the holes in the covers with the mounting pins on the unit.)





CAUTION
Use only water to clean the capstan; other solvents can damage the capstan surface.

9. Moisten a clean, lint-free cloth with water.
10. Rotate the capstan slowly with one hand and clean the rubber surface of the capstan with the moistened cloth with the other hand.



11. Dry the capstan with a clean, lint-free cloth.
12. Inspect the capstan's rubber surface for rough or polished spots. If either is observed, contact your service representative.

End of procedure

General Cleaning

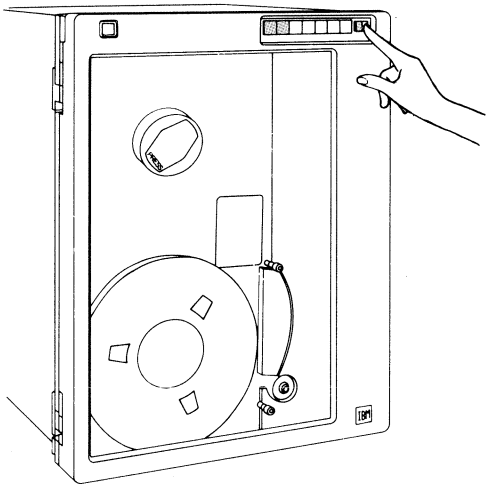
For every four months of one-shift operation, the entire front surface of the unit should be cleaned to remove accumulations of dust around the hold-down knob and the head area. The head covers should be removed and cleaned on the inside and outside to remove dust and other possible tape contaminants.

4969 Model 7—Loading Tape

To load a reel of tape on the 4969 Model 7, use the following procedure.

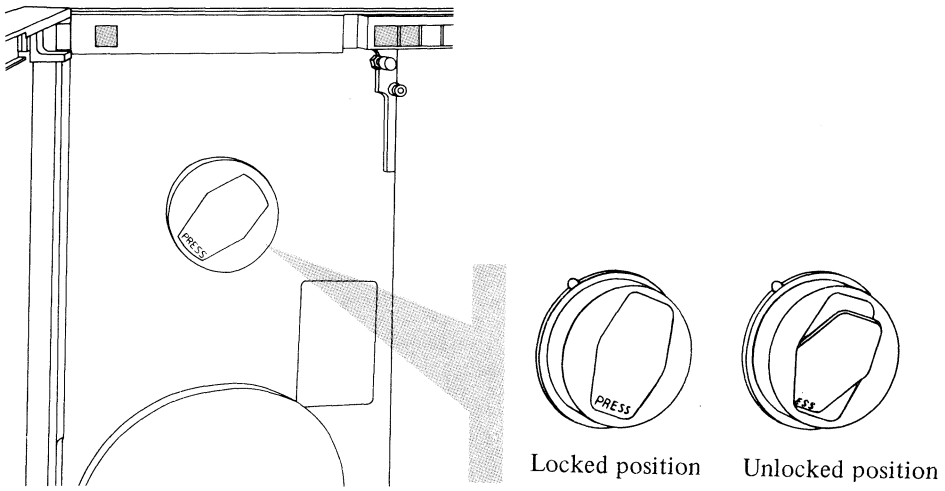
Note: On a multi-unit system, do not turn power on or off when the On Line indicator of another unit in the system is on.

1. If the power is off, press the right side (white portion) of the Power switch/indicator to apply power to the unit.

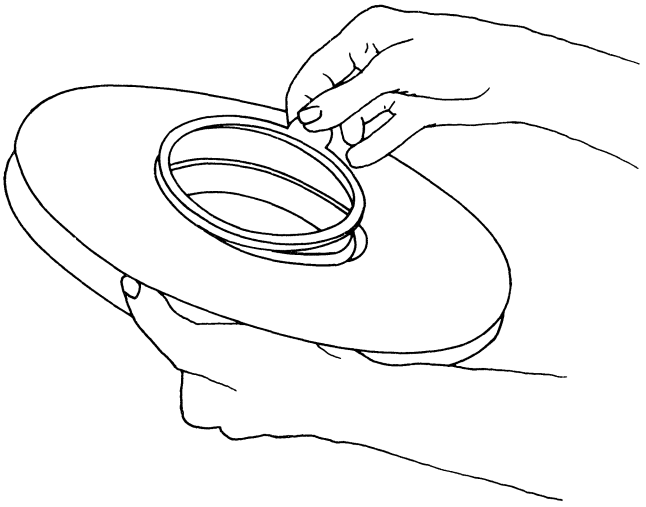


2. Open the front cover.
   - Place your fingers in the grove on the right side of the front cover and swing the cover completely open.

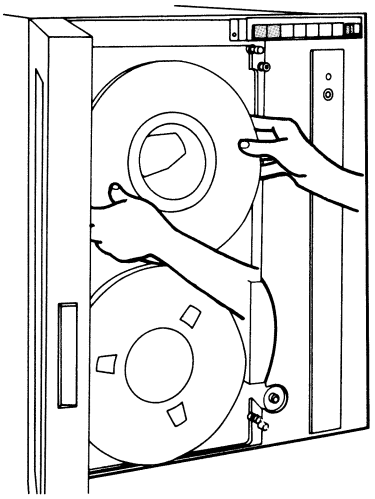
3. Unlock the file-reel hold-down knob.
   - Press the toggle of the hold-down knob.



4. If you intend to write data on the tape, place a write-enable ring in the slot on the back of the file reel.

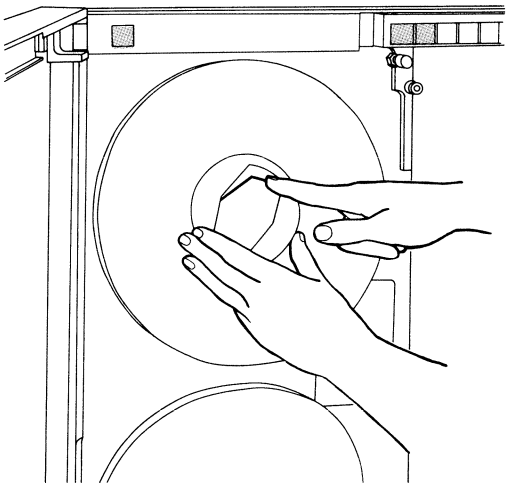


5. Place the file reel on the hold-down knob with the write-enable ring (or the slot provided for the ring) toward the tape unit.

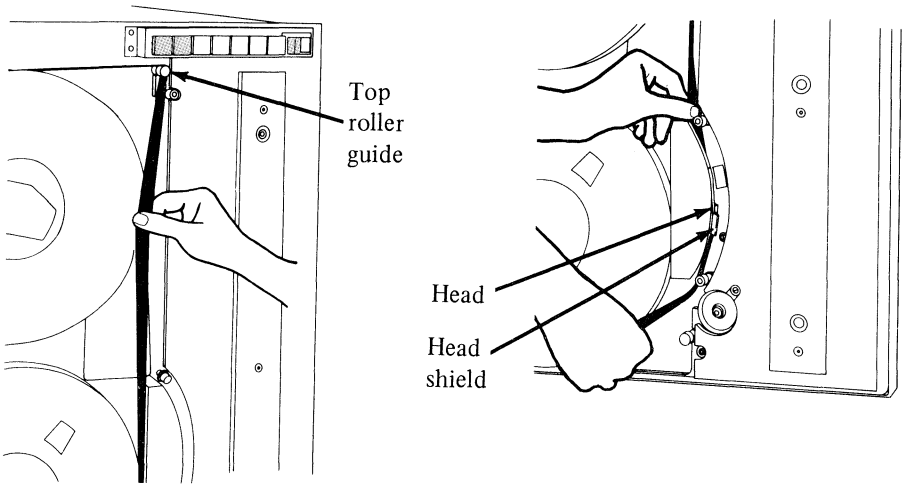


CAUTION
To prevent tape damage, follow the tape-handling precautions described under "4969—Tape Handling and Storage" later in this chapter.

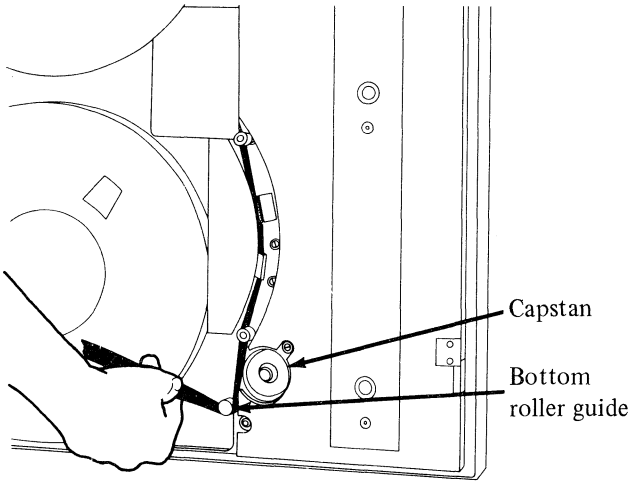
6. Press the reel firmly against the hold-down knob by using your fingertips placed against the reel's hub. Then, press the extended end of the toggle until it is flush with the face of the hold-down knob.



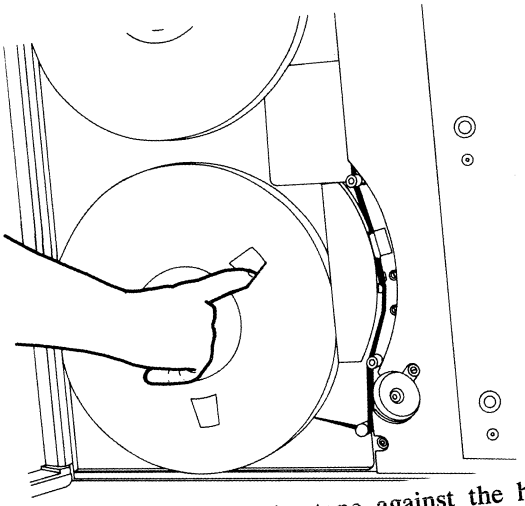
7. Thread the tape over the top roller guide and down through the slot between the head and head shield.



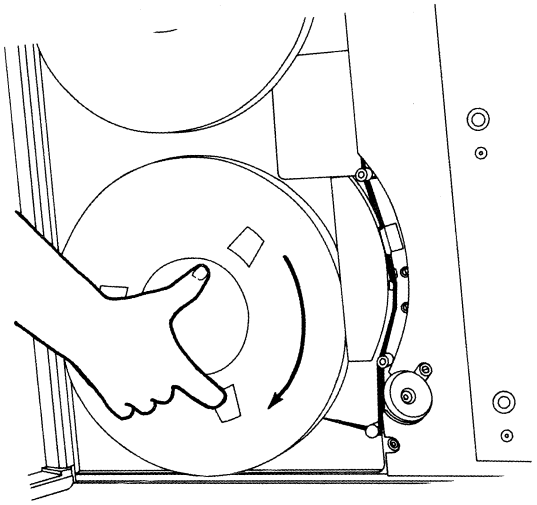
8. Thread the tape down between the capstan and the bottom roller guide.



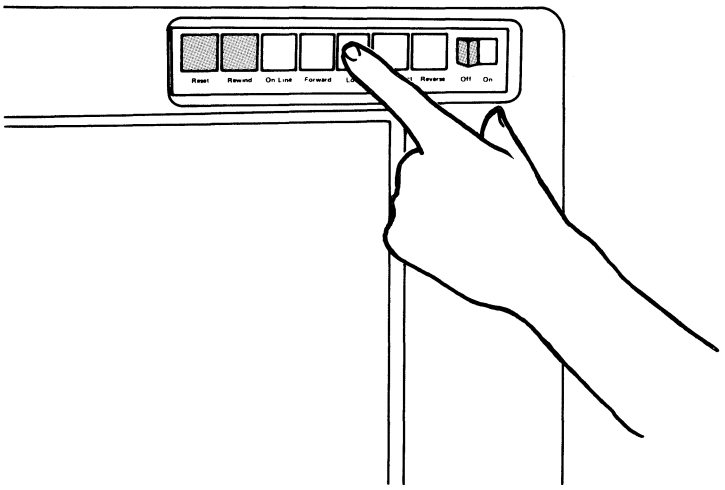
9. Thread the tape under the take-up reel, then press the end of the tape against the reel's hub by placing your finger through one of the flange openings.



10. While holding the tape against the hub, turn the reel clockwise until the end of the tape is overlapped and secured by the next tape layer; then, by hand, wind the take-up (machine) reel three full turns, clockwise.



11. Close the front cover and press the Load switch. (To halt loading before it's complete, press Reset.)

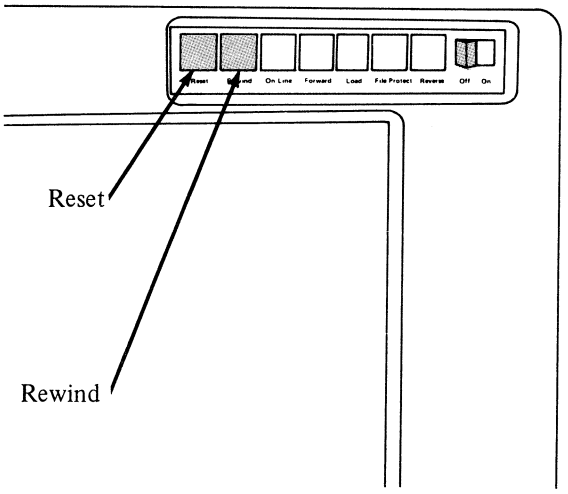


1. The tape will enter the vacuum chambers and the capstan will pull the tape forward to the load point. Control of the tape unit will then be turned over to the system, and the On Line and Load indicators will turn on.
2. If there is no write-enable ring in the tape reel, the File Protect indicator should turn on. If the indicator fails to turn on, contact your service representative.
3. If the tape does not stop at the load point, check leader length and proper placement of the load-point (reflective strip) marker. The marker should be 3 to 4.5 meters (10 to 15 feet) from the leading end of the tape. If the marker is missing or not properly placed, see "Appendix B, Applying Reflective Strips to Magnetic Tape" for instructions on how to apply the marker.
4. To obtain manual control of the tape unit, press the Reset switch.

End of procedure

4969 Model 7—Rewinding Tape

To rewind the tape when it is not at the load point press Reset; then press Rewind. (To halt rewinding before it's complete, press Reset again.)



When you press Rewind:

Notes:

1. The tape rewinds at high speed past the load point.
2. After passing the load point, the tape stops.
3. The tape then moves forward at read/write speed until the load point is reached again.
4. The tape stops at the load point and the Load indicator turns on.

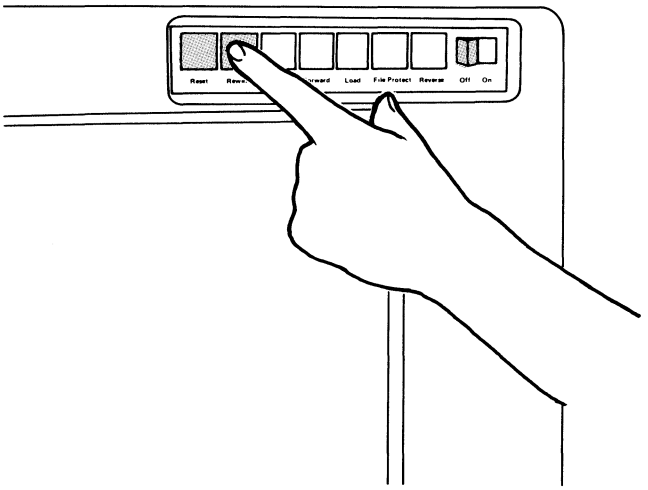
End of procedure

4969 Model 7—Unloading Tape

Tape unloading can be accomplished when the Load indicator is on (indicating that the tape is at load point).

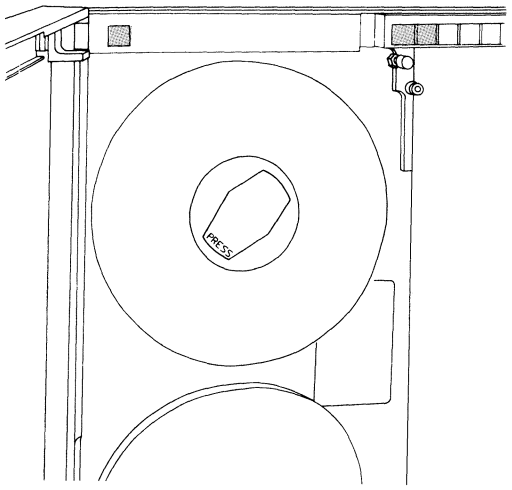
To unload the tape, do the following:

1. If the tape is not positioned at load point, perform the tape rewinding procedure described earlier.
2. Press Reset; then press Rewind.



Note: If any tape remains in the tape path after performing step 2, press and hold Rewind until the tape is completely rewound onto the file reel.

3. Open the front cover.
4. Press the toggle of the hold-down knob to unlock the file reel.

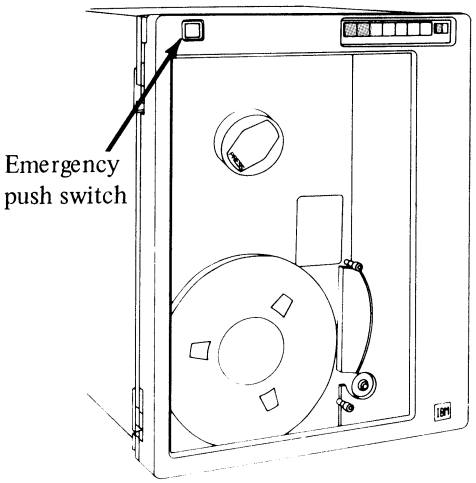


5. Remove the tape reel from the hold-down knob and close the front cover.

End of procedure

4969 Model 7—Emergency Power Off

1. Press the Emergency Push switch.



2. Contact your service representative.

   Note: The Emergency Push switch should only be used for emergencies such as presence of smoke or fire in the unit or when the Power switch does not work.

If the switch is pushed in by accident, reset it by opening the front cover and pulling the switch back out to its reset position.

End of procedure

4969 Model 7—Recovering from a Power Failure

If there is a power failure while the unit is in operation, tension on the tape is relaxed to prevent tape damage.

To recover from such a power failure, do the following after power is restored to the unit. ("Chapter 5. Operator Aids" on page 5-1 "Operator Aids," lists things to check if you have trouble restoring power.)

CAUTION
Do not attempt a load operation while tape is in the vacuum chambers.

1. To remove the tape from the vacuum chambers, press and hold the Rewind switch until the tape is removed from the chambers.
2. Open the front cover and rotate the file reel by hand to take up any tape slack.
3. Close the front cover and press the Load switch.

   Note: The tape will enter the vacuum chambers and the capstan will pull the tape forward.
4. Press the Reset switch (to stop tape motion).
5. To establish offline (manual) control, press the Rewind switch; to establish online (system) control, press the On Line switch.

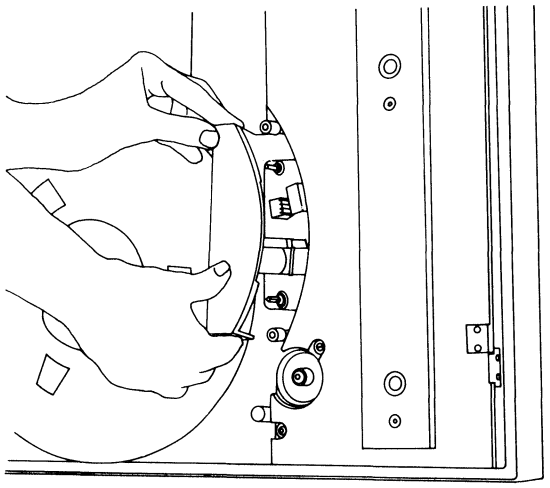
End of procedure

4969 Model 7—Cleaning

Proper and regular cleaning is important to ensure the reliability of the tape unit.

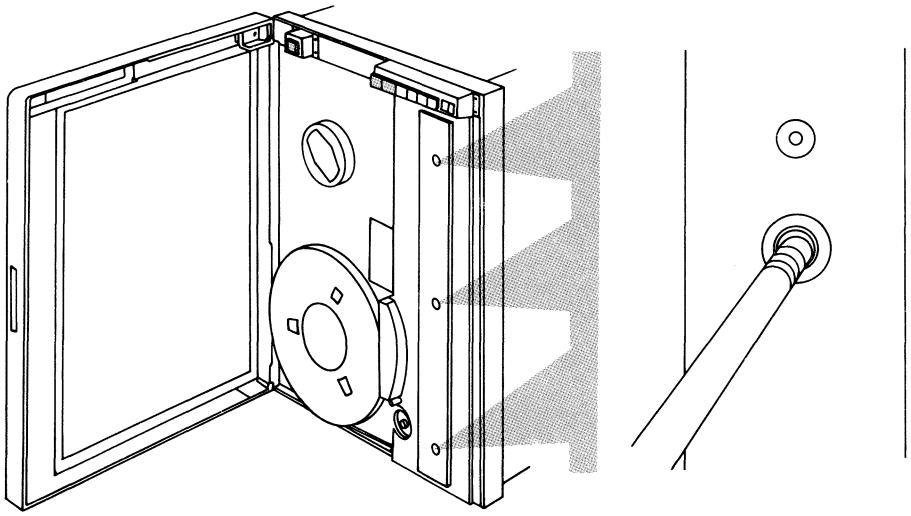
The tape transport, heads, and capstan should be cleaned after every eight hours of use, unless otherwise specified.

1. Remove the file reel. (See "4969 Model 7—Unloading Tape" described earlier in this chapter.)
2. Turn off the power to the unit.
3. Remove the head cover by using both hands to gently pull it directly away from the front of the unit.

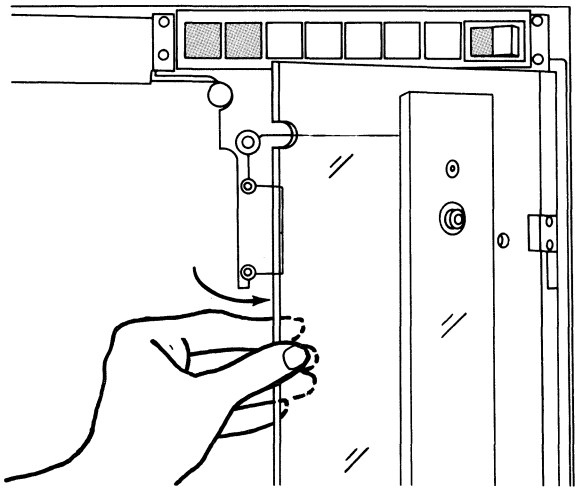


4. Open the vacuum-chamber door.

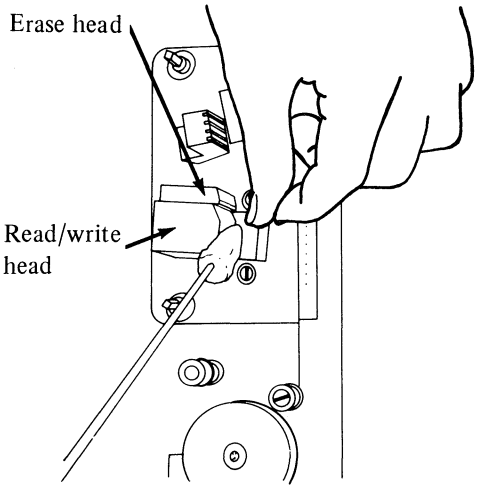
   a. Press and release the three spring-actuated latches with a nonabrasive, slender object, such as the eraser end of a pencil.



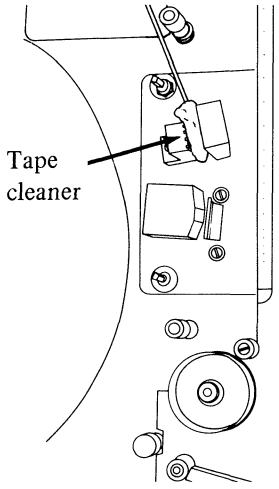
   b. Swing the door open to the right.

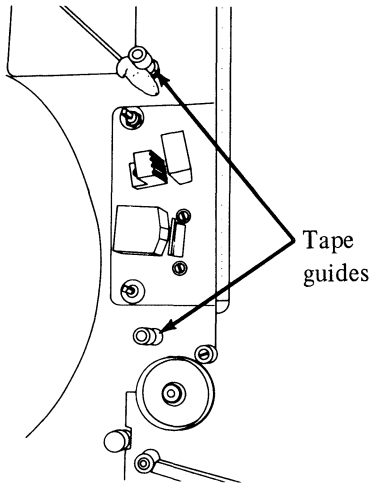


5. Moisten a lint-free swab applicator with IBM cleaner, part 453511, and carefully swab the read/write and erase head surfaces.

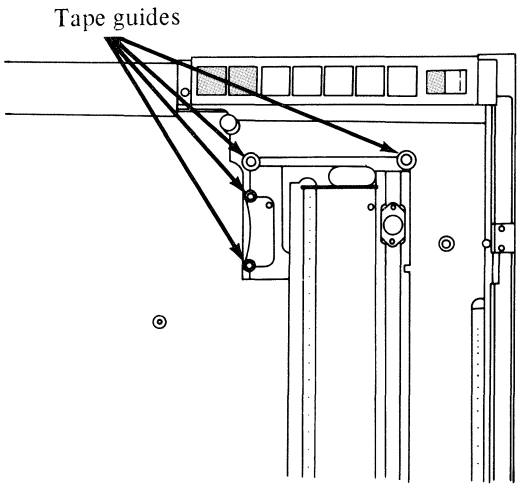


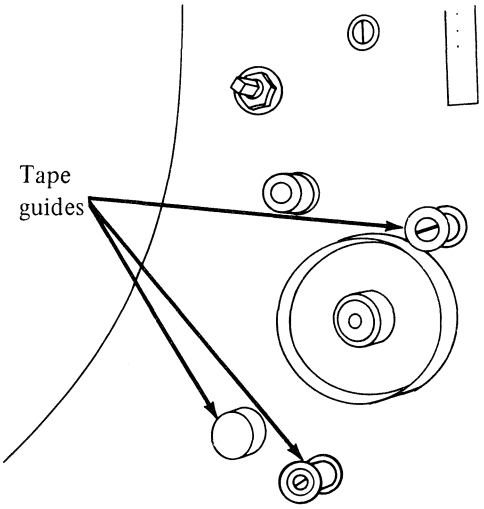
6. Dry the swabbed surfaces with a clean lint-free cloth.
7. Clean the face of the tape cleaner and the two tape guides, using the same procedure described in step 5.





8. Moisten a lint-free swab applicator in IBM cleaner, part 453511, and carefully swab all seven remaining tape guides.

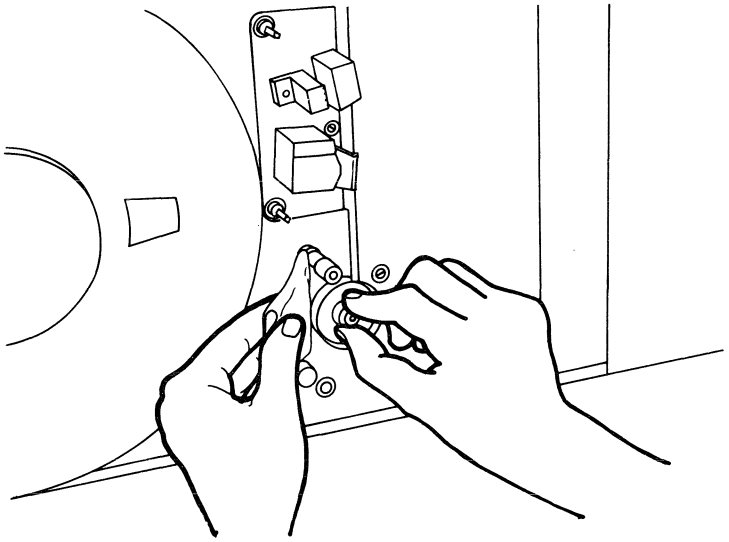




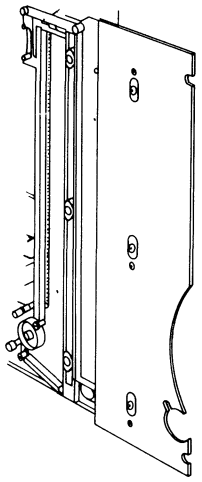
9. Dry the surfaces with a clean, lint-free cloth.

CAUTION
Use only water to clean the capstan; other solvents can damage the capstan surface.

10. Moisten a clean lint-free cloth with water.
11. Rotate the capstan slowly with one hand and clean the rubber surface of the capstan with the moistened cloth with the other hand.



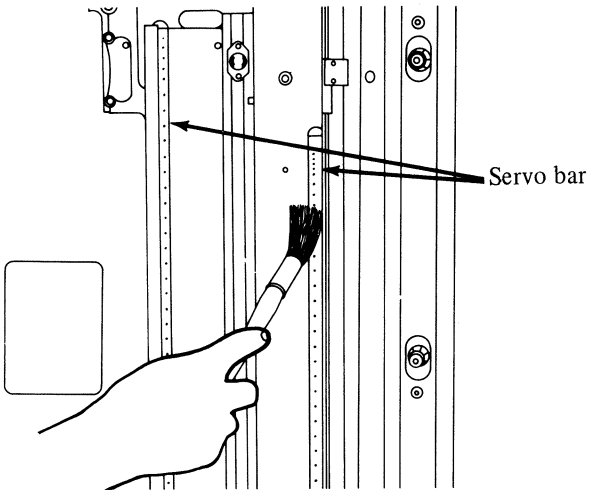
12. Dry the capstan with a clean, lint-free cloth.
13. Inspect the capstan's rubber surface for rough or polished spots. If either is observed, contact your service representative.
14. Moisten a lint-free cloth with water and clean the entire vacuum chamber area.



15. Dry the vacuum chamber with a clean, lint-free cloth.

Note: The servo bars should be cleaned after every 40 hours of operation.

16. Dip an IBM cleaning brush, part 6837357, in IBM cleaner, part 453511.
17. Position the brush at a 45-degree angle to the servo bar so that all bristle tips are against the servo bar.



18. Using light pressure, brush back-and-forth over the line of holes, working your way up from the bottom.

    Note: Proper cleaning action is obtained only if you can feel the brush bristles snag on the holes (indicating penetration).

19. Repeat the brushing action from top to bottom.

Reassembly

At the conclusion of the cleaning operation:

1. Replace the head cover by aligning the holes in the cover with the pins on the unit and pressing the cover firmly into place.
2. Close the vacuum-chamber door and lock it into place by pressing and releasing the three spring-actuated latches with a nonabrasive, slender object, such as the eraser end of a pencil.

End of procedure

General Cleaning

For every four months of one-shift operation, the entire front surface of the unit should be cleaned to remove accumulations of dust around the hold-down knob and the head area. The head cover should be removed and cleaned on the inside and outside to remove dust and other possible tape contaminants.

4969—Tape Handling and Storage

Proper handling and storage of your magnetic tapes are important. To prevent damaging your tapes and destroying the data recorded on them, heed these suggestions:

Handling

- Never leave tape reels or containers exposed. Tape may be damaged, or dust accumulating on the tape or in the container can contaminate the tape.
- Erasing information on a tape-reel identification label is a cause of contamination. Use new labels when changing reel identification. Select a label with an adhesive backing that does not leave a residue and that can be applied and removed easily.
- Never allow a loose end of a tape to touch the floor; dirt picked up in this manner can reach the tape transport and be passed on to other sections of the tape.
- Do not allow smoking in areas where tape is in use. Ashes contaminate tape. Hot ashes can permanently damage the surface.
- Do not touch the tape edges through the reel openings or press on the reel flanges. Such pressure will compress the tape and damage its edges.
- Be very careful when removing the write-enable ring. Always unload tape before removing the write-enable ring; never remove the ring while tape is threaded in the tape unit.

Storage

- Before storing a tape, secure the loose end of the tape with a tape-end retainer to prevent the tape from unwinding in the container.
- Always store tape in an upright position. Never store tapes flat or in stacks; accidental damage or reel warpage might result.
- Store tapes in a cabinet or shelf that is elevated from the floor and is away from sources of dust. Dust can be transferred from the outside of the container to the reel during load and unload operations.

IBM 4973 Line Printer

The 4973 Line Printer, as shown in Figure 54, has the following switches, indicators, and controls:

- Console Switches
  - — Enable/Disable
  - — Space
  - — Restore
  - — Power On/Power Off (located below the console on the front panel)
- Console Indicators
  - — Ready
  - — Printer Check
  - — Forms Check
- Controls
  - — Forms-advance and vernier knob
  - — Front forms-alignment scale
  - — Rear forms-alignment scale
  - — Print-position scale
  - — Print-line indicator
  - — Forms-thickness lever
  - — Forms tractors
  - — Upper paper clamp (model 1 only)
  - — Print-belt release lever
  - — Print-unit release lever
  - — Ribbon guides
  - — Ribbon-drive release lever
  - — Ribbon-cassette release button

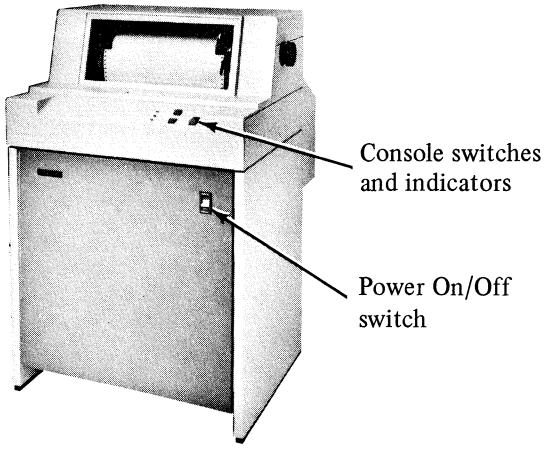


Figure 54. 4973 Line Printer Operator Controls

4973—Console Switches

The 4973 has the following console switches:

- Enable/Disable
- Space
- Restore
- Power On/Power Off (located below the console on the front panel)

These switches are shown in Figure 55.

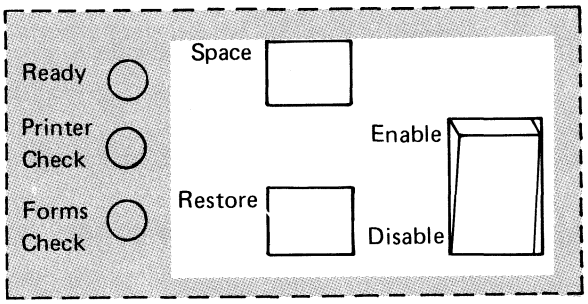
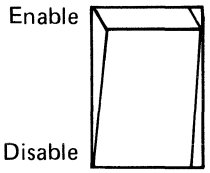


Figure 55. 4973 Console Switches

Enable/Disable Switch



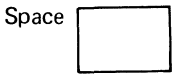
The Enable/Disable switch must be in the Enable position to allow the system to control the printer.

If the Enable/Disable switch is moved to the Disable position during a print operation, the printer finishes printing the current line and then stops.

If the Enable/Disable switch is moved to the Disable position while the carriage is moving the forms, the carriage finishes the operation in progress and then stops.

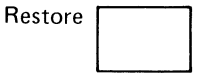
The Enable/Disable switch is also used to reset the Print Check indicator after all machine-check conditions have been reset.

Space Switch



Pressing the Space switch advances the forms one print line and also causes the print ribbon and the print belt to move.

Restore Switch

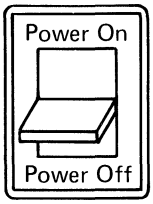


Pressing the Restore switch advances the forms to the first print line and also causes the print ribbon and the print belt to move.

> **Note:** The space and restore operations require that the top cover is closed and the Enable/Disable switch is in the Disable position.

If the top cover is open, space and restore operations only advance the electronic counter. Physically moving the forms must be done manually with the forms-advance knob.

Power On/Power Off Switch



Placing the Power On/Power Off switch in the Power On position applies power to the printer.

> **Note:** The card file containing the 4973 attachment feature must be powered on after the printer and before the processor. If the attachment resides within the processor module, power on the processor module after the 4973 printer.

Placing the Power On/Power Off switch in the Power Off position removes power from the printer.

4973—Console Indicators

The 4973 has the following console indicators:

- Ready
- Printer Check
- Forms Check

These indicators are shown in Figure 56.

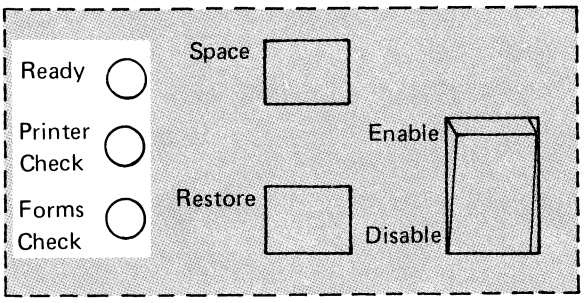
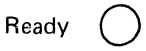


Figure 56. 4973 Console Indicators

Ready Indicator

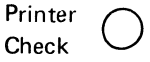


When the Ready indicator is on, the printer is ready to accept commands from the system.

The Ready indicator turns off if:

- There is a power failure or the Power On/Power Off switch is placed in the off position
- The Enable/Disable switch is placed in the Disable position
- The printer cover is opened
- The print unit is opened
- An over-temperature condition occurs

Printer Check Indicator

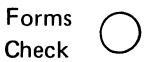


The Printer Check indicator is turned on when a machine-oriented check occurs.

Look for any obvious reason for the check condition (such as the cover or print unit open), correct the situation, and then reset the Printer Check indicator as follows:

- Move the Enable/Disable switch to the Disable position and then back to the Enable position.
- If the Printer Check indicator remains on, a check condition still exists. Investigate the situation further and repeat the above step.

Forms Check Indicator



The Forms Check indicator is turned on when a forms-oriented error occurs.

Look for the reason for the error, such as a forms jam or the machine is at end-of-forms. When the condition is corrected, the Forms Check indicator will turn off.

Indicator Test

You can test all of the indicators as follows:

1. Place the Enable/Disable switch in the Enable position.
2. Press both the Space and Restore switches simultaneously.
3. All indicators should turn on.

4973—Controls

Forms-Advance and Vernier Knob

The forms-advance and vernier knob positions the forms vertically. If you use this control to change the position of the forms in the printer, the change is not recorded by the system (see Figure 57).

Therefore, if you advance the forms from line 4 to line 8, when printing resumes, the system continues as though you had not changed lines.

The vernier is engaged by pushing the forms-advance knob in.

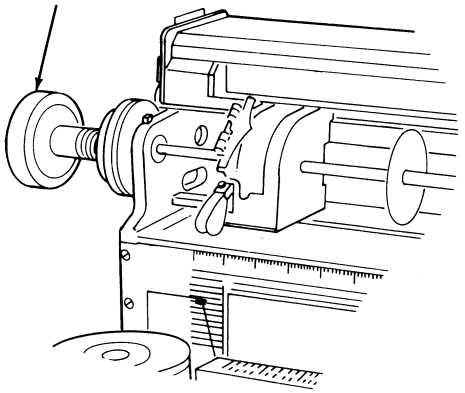


Figure 57. Forms-Advance and Vernier Knob

Front Forms-Alignment Scale

The front forms-alignment scale, located directly below the forms tractor, is used in conjunction with the rear forms-alignment scale to ensure proper forms alignment (see Figure 58).

This is done by aligning the edge of the forms to the same position on the two scales.

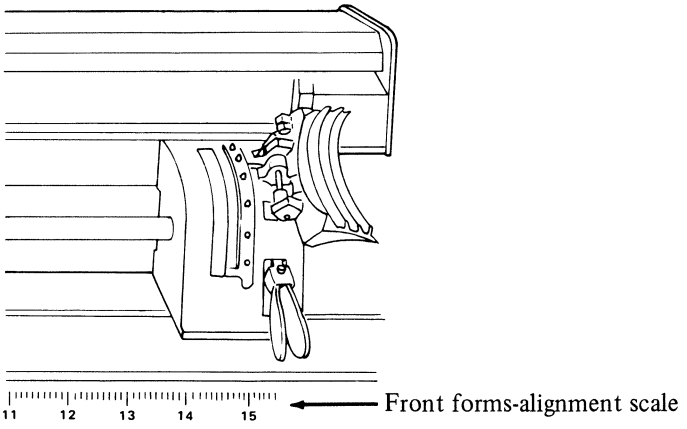


Figure 58. Front Forms-Alignment Scale

Rear Forms-Alignment Scale

The rear forms-alignment scale, located at the rear of the machine in the forms chute, is used in conjunction with the front forms-alignment scale to ensure proper forms alignment (see Figure 59).

This is done by aligning the edge of the forms to the same position on the two scales.

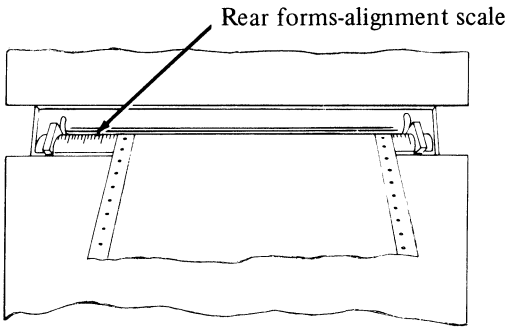


Figure 59. Rear Forms-Alignment Scale

Print-Position Scale

The print-position scale, located on the platen, shows the location of the print positions, and is used to horizontally align the forms for proper printing (see Figure 60).

On the Model 2 only, this scale pivots upward for access to the ribbon.

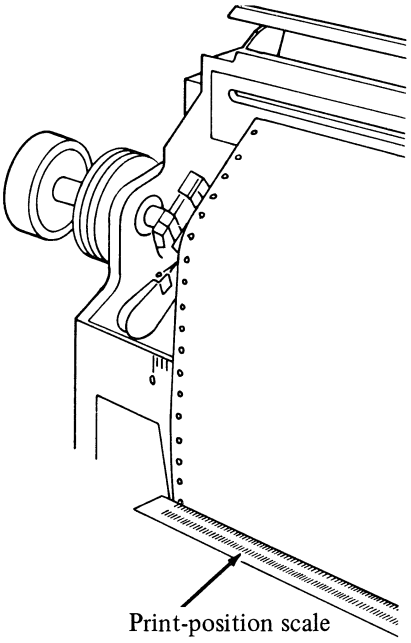


Figure 60. Print-Position Scale

Print-Line Indicator

The print-line indicator, located at the front of the machine directly below the forms-alignment scale and the forms tractors, is used to vertically align the forms to any print line desired (see Figure 61).

Note: The print-line indicator is graduated for printing at six lines per inch.

Example

If you intend to have the printer start printing at the fourth line below the horizontal perforation, move the forms so the perforation is aligned to 4 on the print-line indicator.

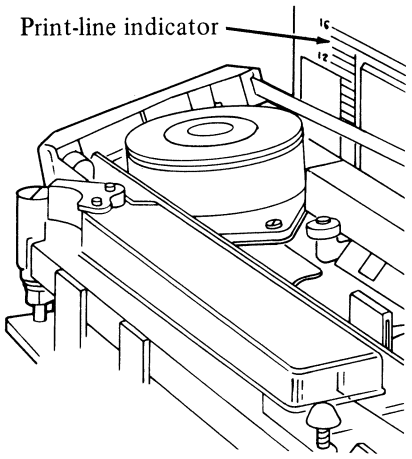


Figure 61. Print-Line Indicator

Forms-Thickness Lever

The forms-thickness lever controls the print impression to accommodate various forms thickness or multiple copies of forms. The printer will accommodate one- to six-part forms. It is recommended that card stock not be used in the printer (see Figure 62).

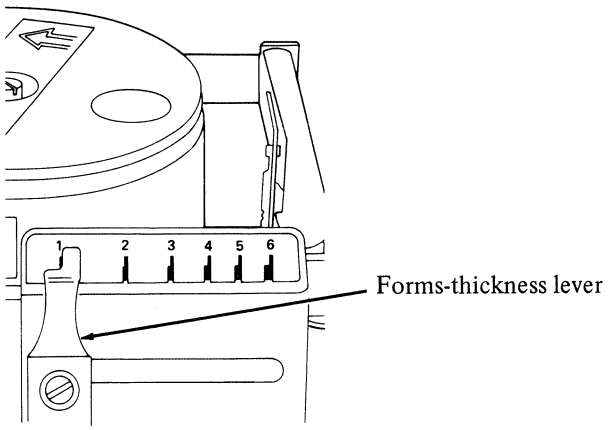


Figure 62. Forms-Thickness Lever

Forms Tractors

There are two pin-feed forms tractors on this printer. They can be positioned right or left to accommodate different forms widths.

To move the forms tractors, pinch the tractor release levers together and shift the tractors horizontally to the desired position.

Releasing these levers locks the forms tractors in the selected position. The forms tractor covers hold the forms-feed holes onto the tractor pins. These covers open for loading the forms as shown in Figure 63.

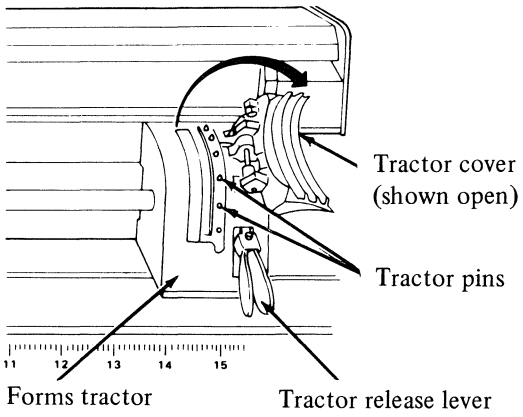


Figure 63. Forms Tractor

Upper Paper Clamp (Model 1 only)

The upper paper clamp opens automatically when the upper paper-clamp latch, located on the top of the printer, is pushed inward (see Figure 64).

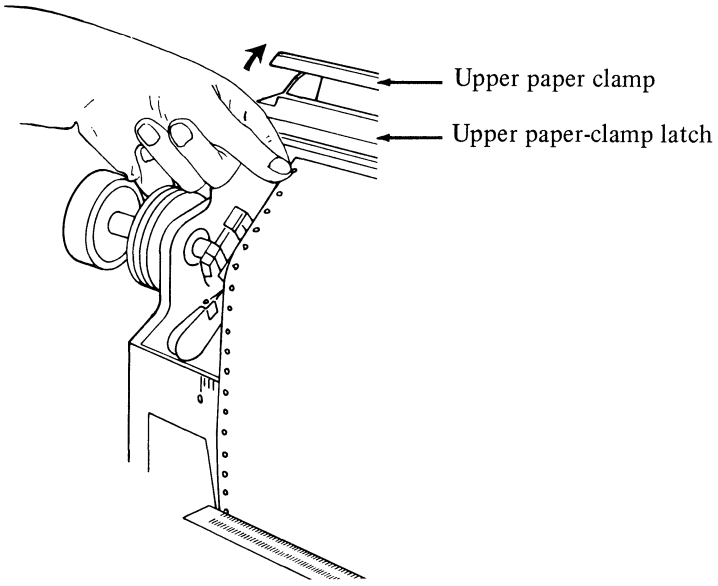


Figure 64. Upper Paper Clamp

Print-Belt Release Lever

The print-belt release lever is a two-position lever that releases tension on the print belt.

Pulling the print-belt release lever towards the front of the machine, as shown in Figure 65, releases the belt tension.

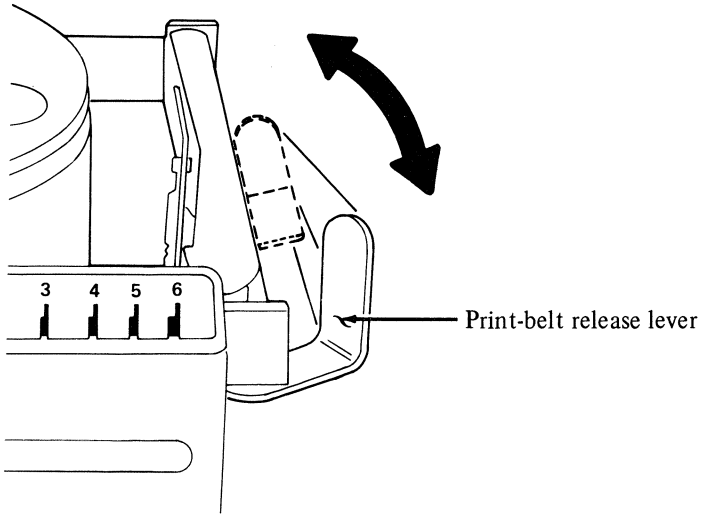


Figure 65. Print-Belt Release Lever

Print-Unit Release Lever

The print-unit release lever, when pulled forward as shown in Figure 66, opens the print unit. Pushing this lever towards the rear of the machine closes the print unit.

> **Note:** With the print unit open, the printer will not operate, the Printer Check indicator will come on, and the Ready indicator will not come on.

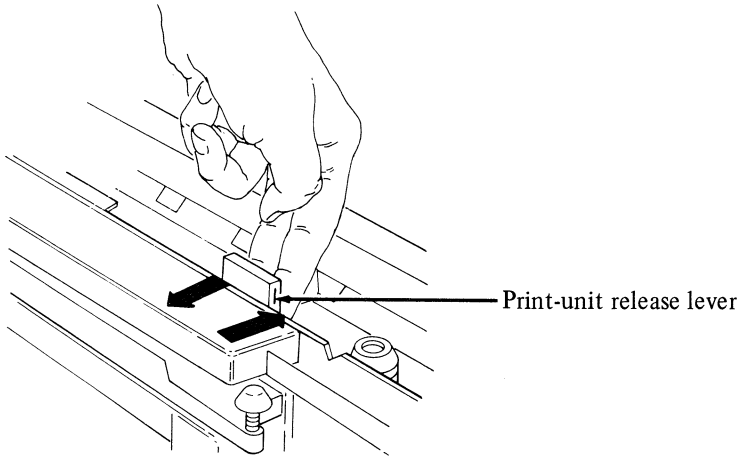


Figure 66. Print-Unit Release Lever

Ribbon Guides

The ribbon guides align the ribbon to the print belt. To lift the ribbon up and away from the print line, raise the ribbon guides as shown in Figure 67.

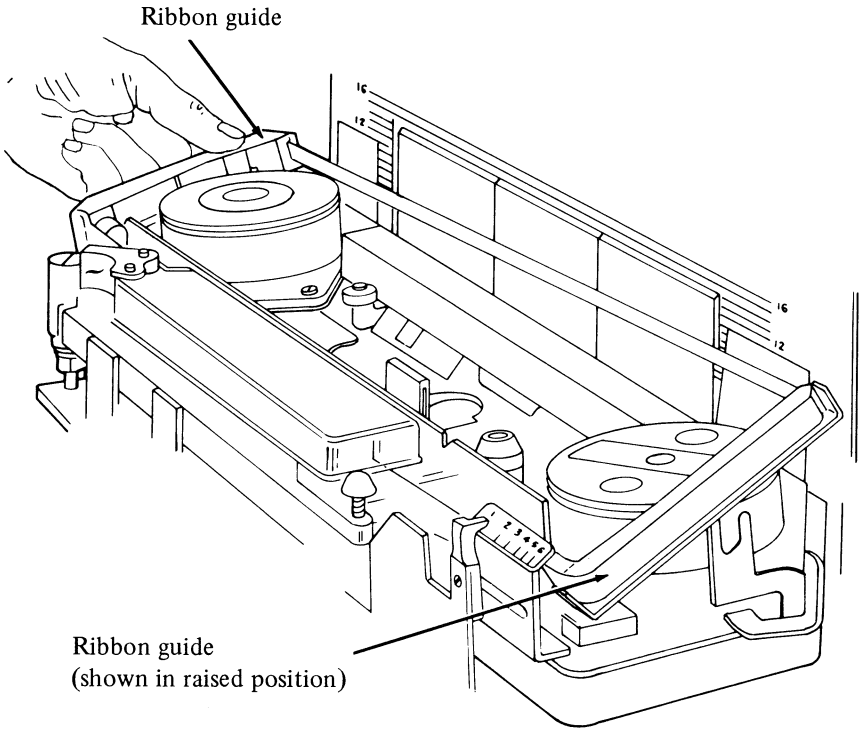


Figure 67. Ribbon Guides

Ribbon-Drive Release Lever

Pushing the ribbon-drive release lever towards the rear of the machine opens the feed rolls and releases the ribbon drive (see Figure 68).

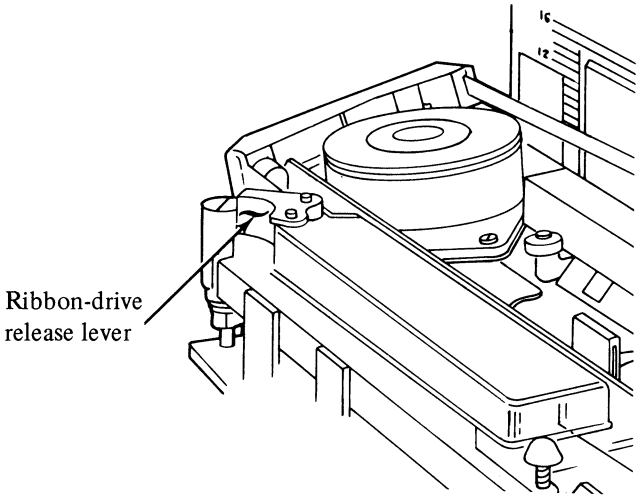


Figure 68. Ribbon-drive release lever

Ribbon-Cassette Release Button

Pressing downward on the ribbon-cassette release button as shown in Figure 69, releases the ribbon cassette so that the cassette can slide to the right and be removed. The ribbon is supplied in the cassette.

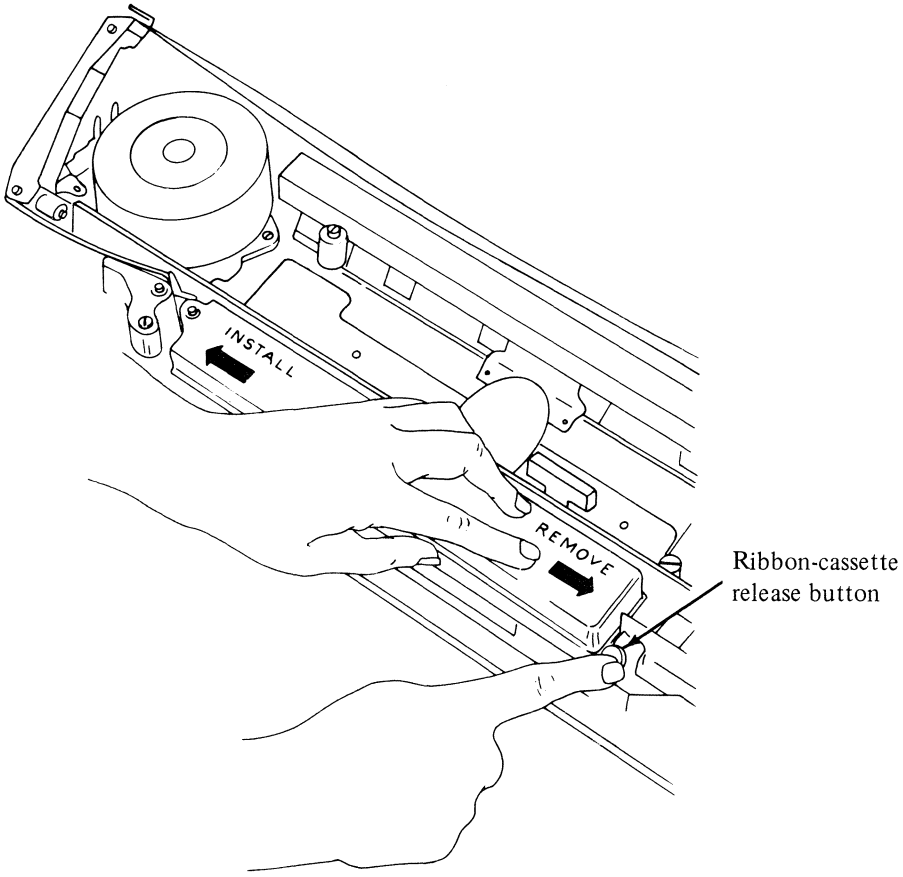
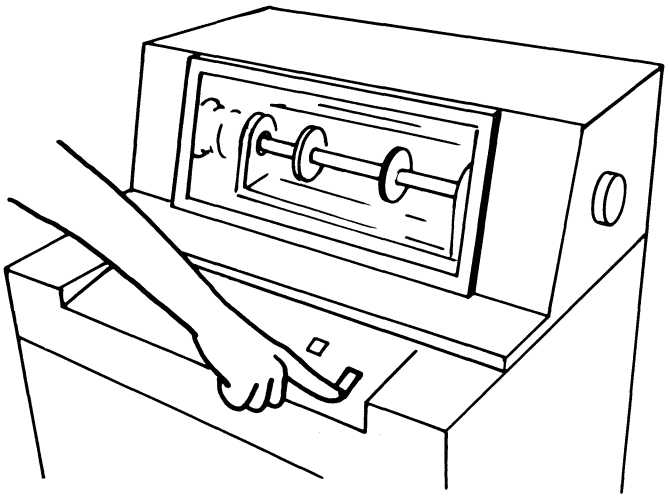


Figure 69. Ribbon-Cassette Release Button

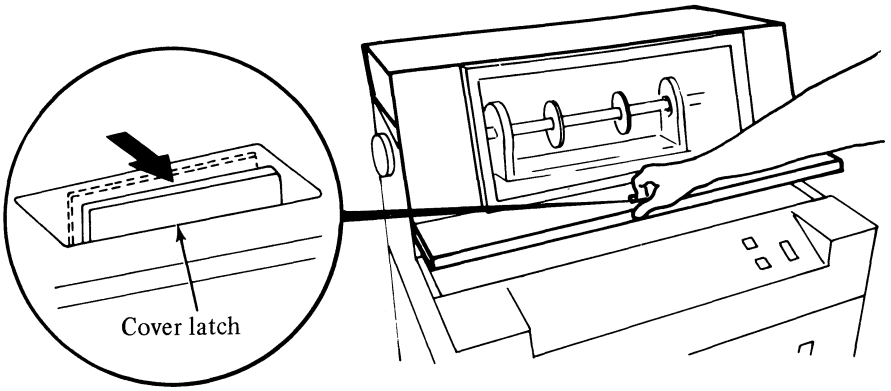
4973 Model 1—Loading Paper

To load paper (margin-punched forms) into the 4973 Model 1 Line Printer, use the following procedure.

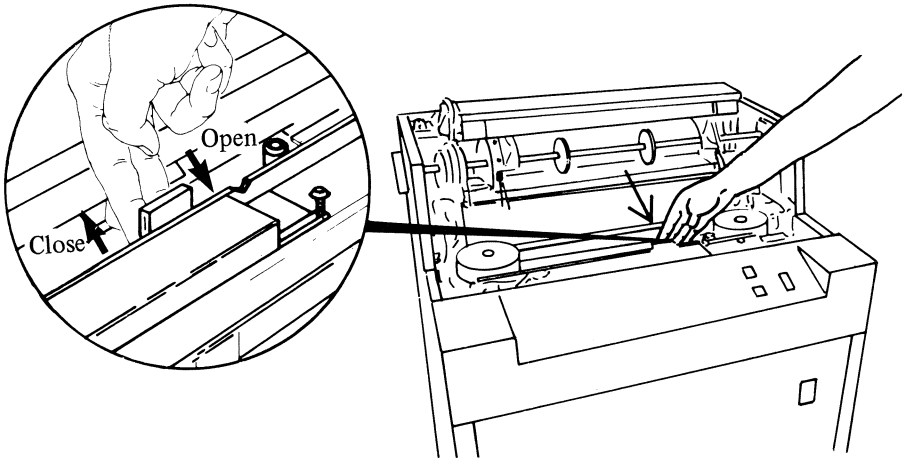
1. Place the Enable/Disable switch in the Disable position.



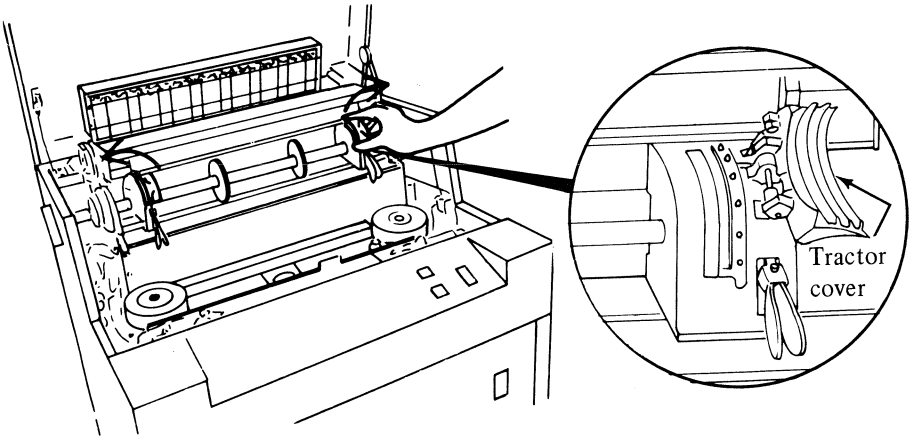
2. Open the printer cover.
   - Place your fingers behind the latch and move the latch towards the front of the printer. Then lift the cover.



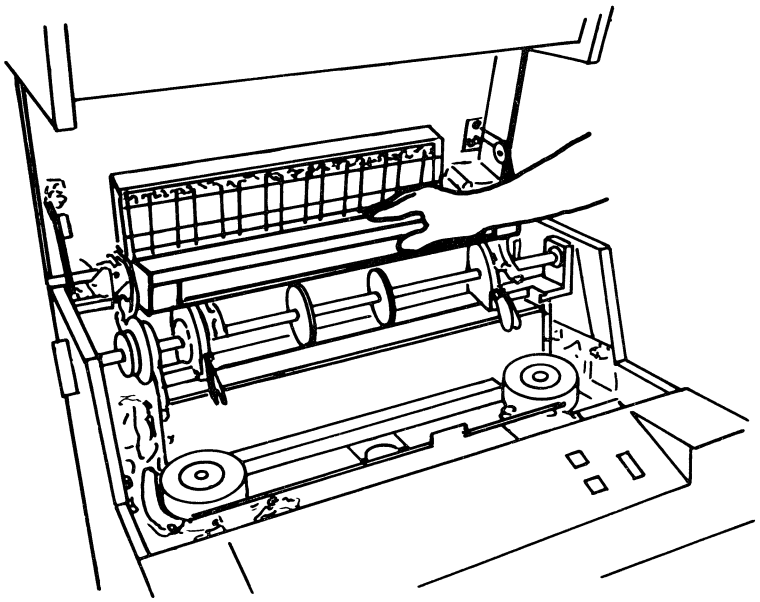
3. Open the print unit.
   - Pull the print-unit release lever towards the front of the printer.



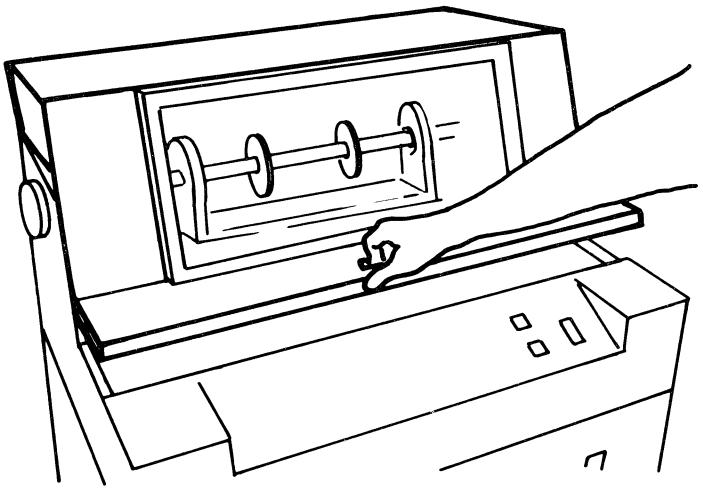
4. Open the tractor covers.
   - Pivot them outward.



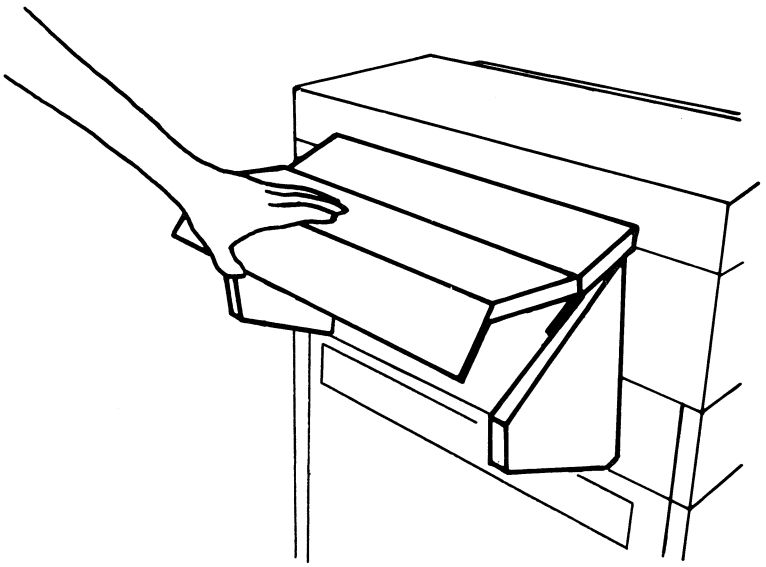
5. Open the upper paper clamp.
   - Press the front surface of the clamp and lift it up.



6. Close the printer cover.

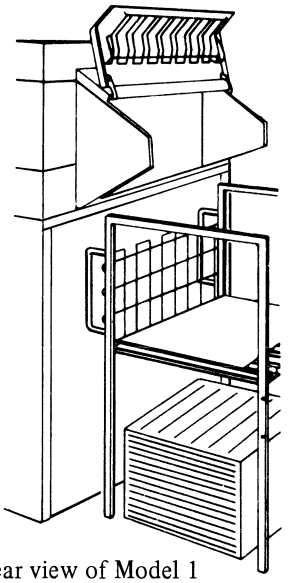


7. Lift the rear top cover.



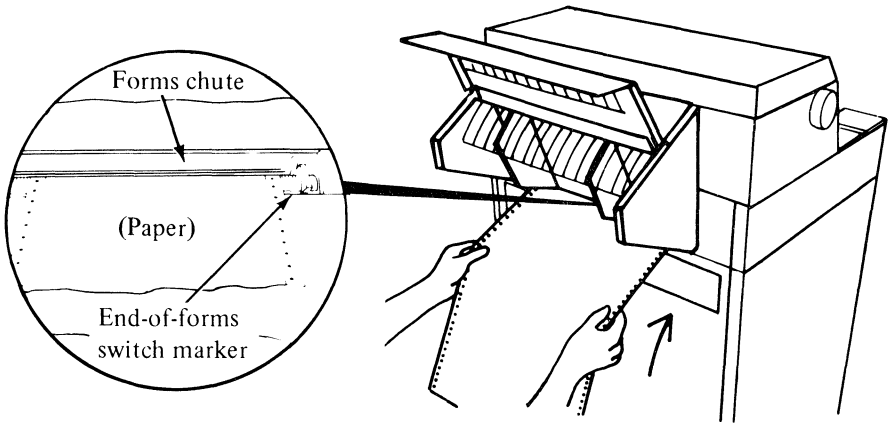
8. Place the forms under the forms stand.

   Note: To ensure proper paper feeding, the forms should always be removed from the box.

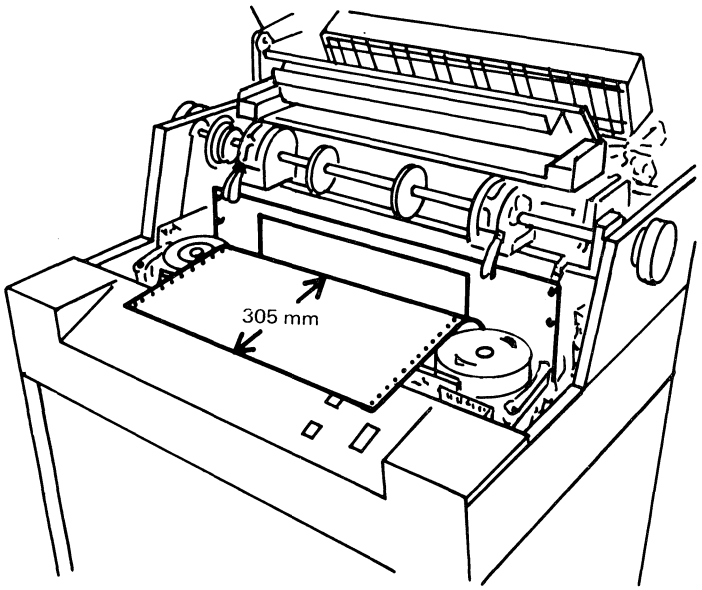


Rear view of Model 1

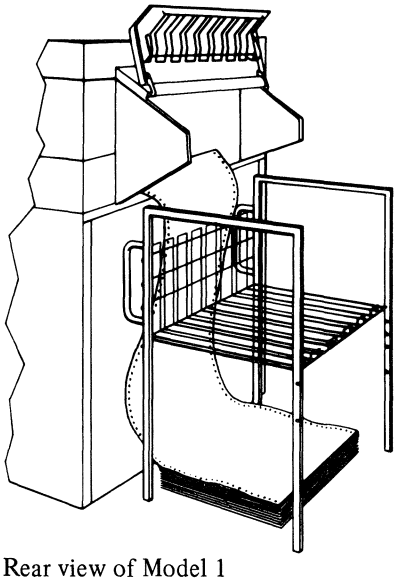
9. Feed the paper squarely into the forms chute.
   - Position the forms to pass over the end-of-forms (EOF) switch marker.
   - Hint: Fold the paper back at the second perforation, then feed it into the forms chute.



10. Feed the paper into the forms chute until about 305 mm (12 in.) of paper appears at the front of the printer.

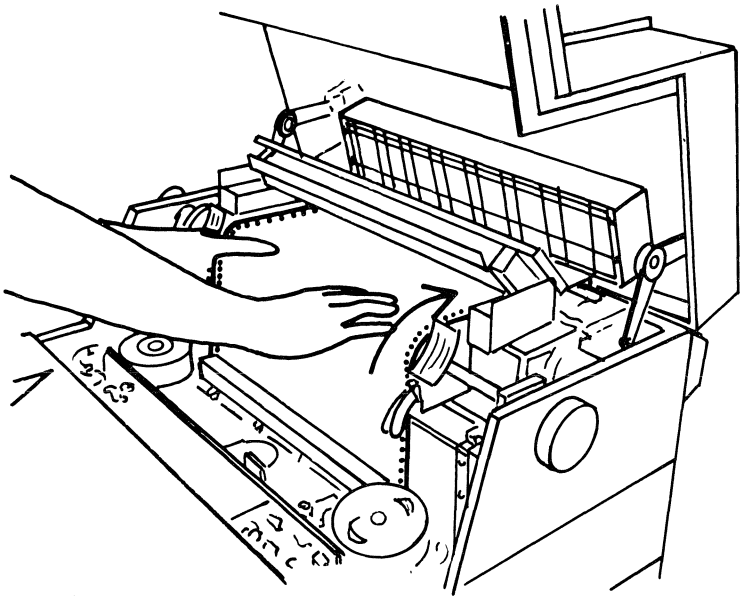


11. Allow space between the forms stand and the rear of the printer so that there is no interference to paper movement.

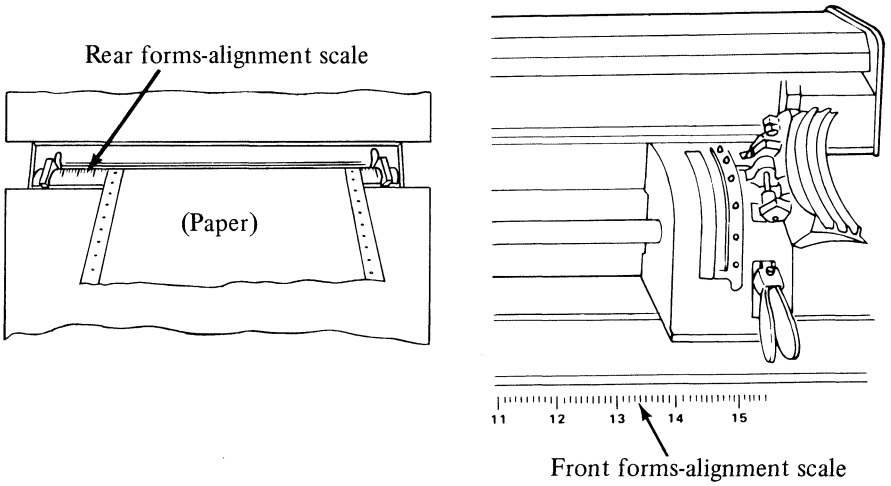


Rear view of Model 1

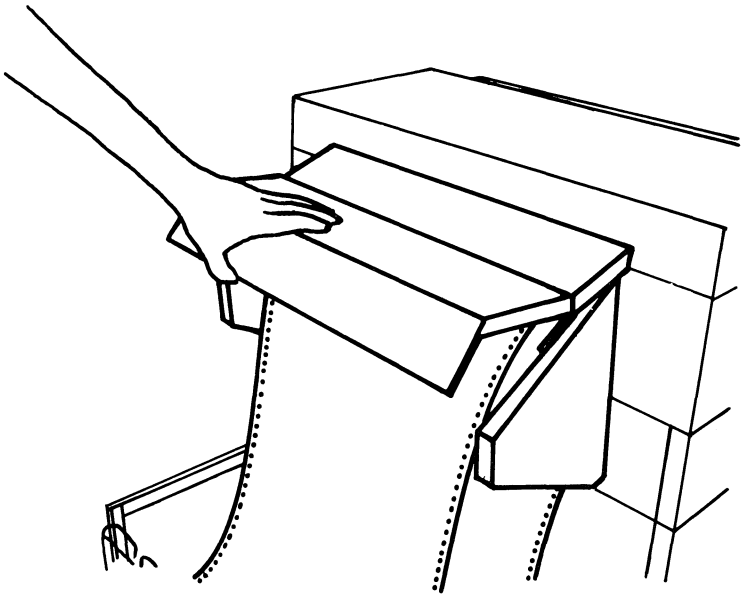
12. Open the printer cover.
    - Place the paper over the tractor pins.
    - Feed the paper through the exit chute.



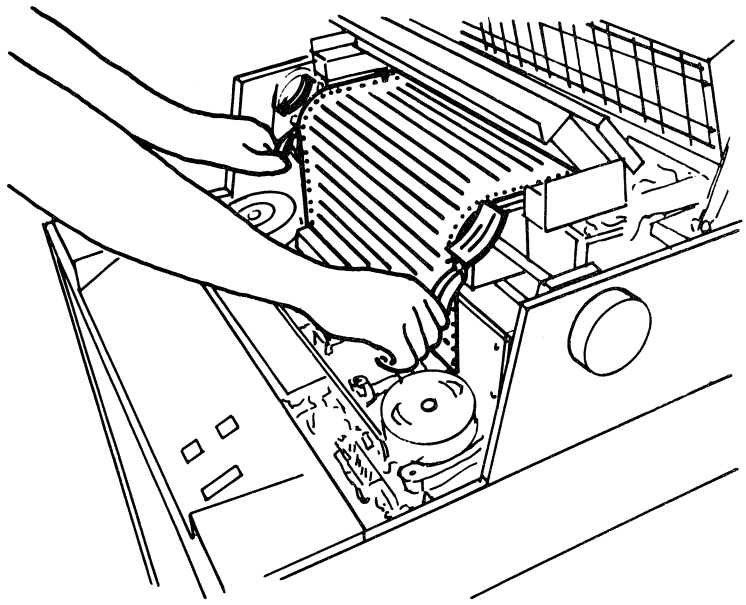
13. Check the lateral adjustment of the paper with the front and rear forms-alignment scales.
    - The distance between the rear forms guides should be set slightly greater than the width of the paper.



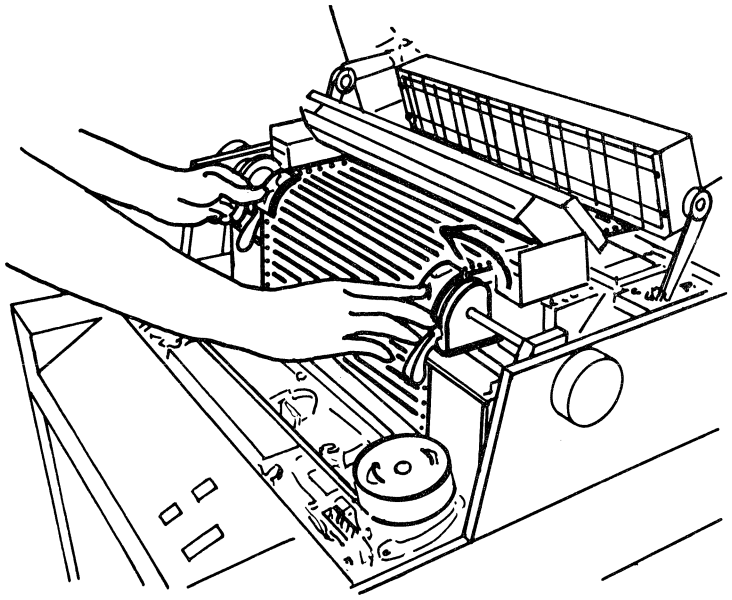
14. Close the rear top cover.



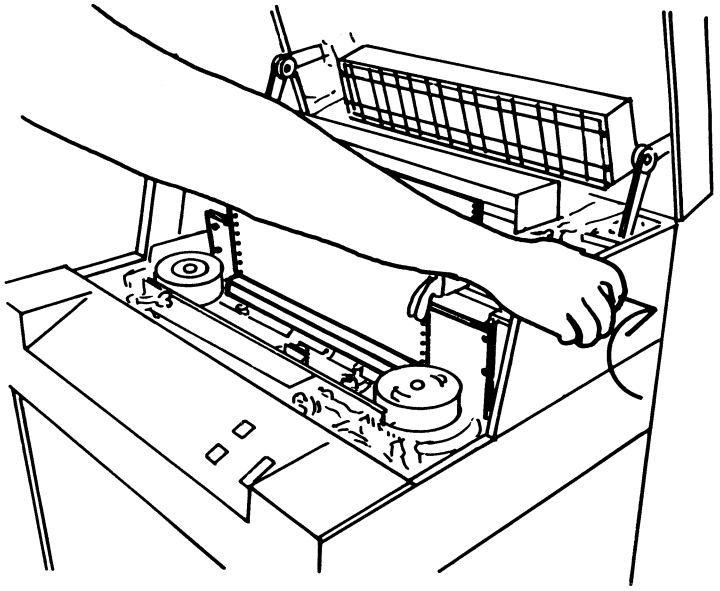
15. Adjust the paper for correct paper tension.
    - Squeeze the tractor-release levers and slide them horizontally to adjust the paper for straightness and smoothness.



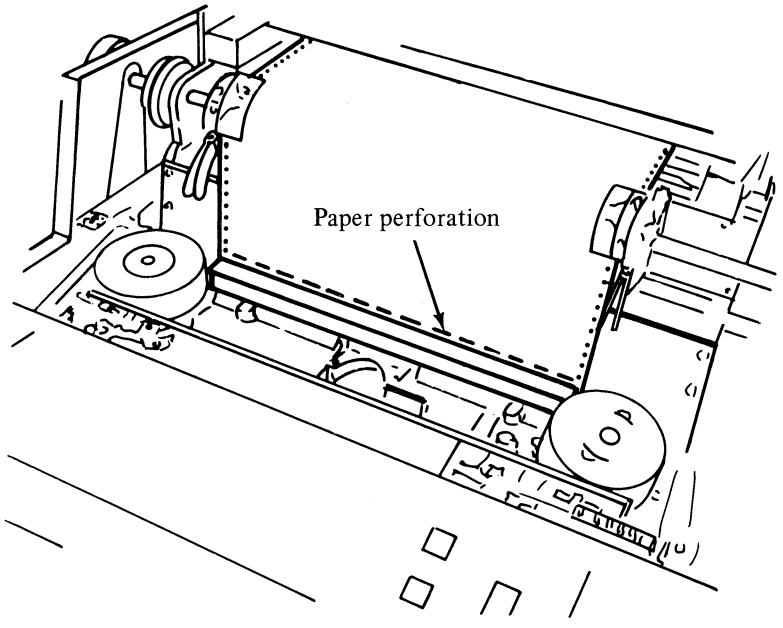
16. Close the tractor covers over the paper.



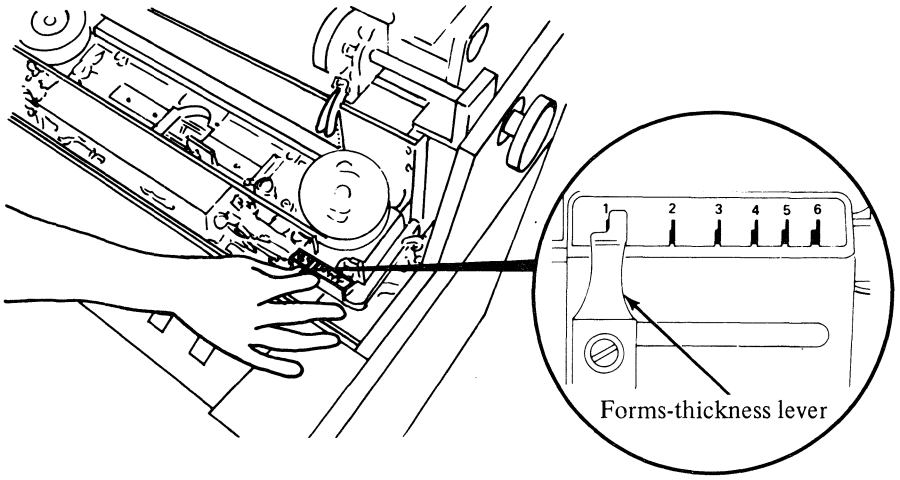
17. Turn the forms advance knob to verify that the paper is advancing correctly.



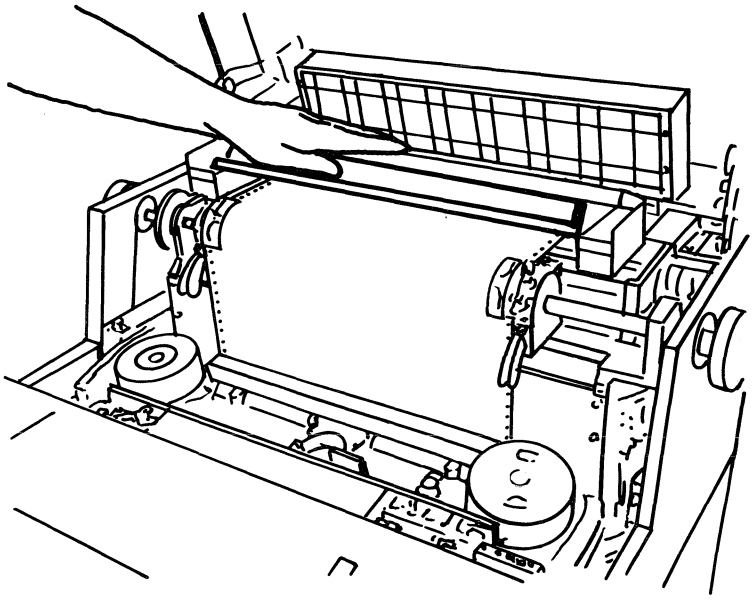
18. Check for correct horizontal paper alignment.
    - The perforated edge of the paper should be parallel to the edge of the print-position scale.



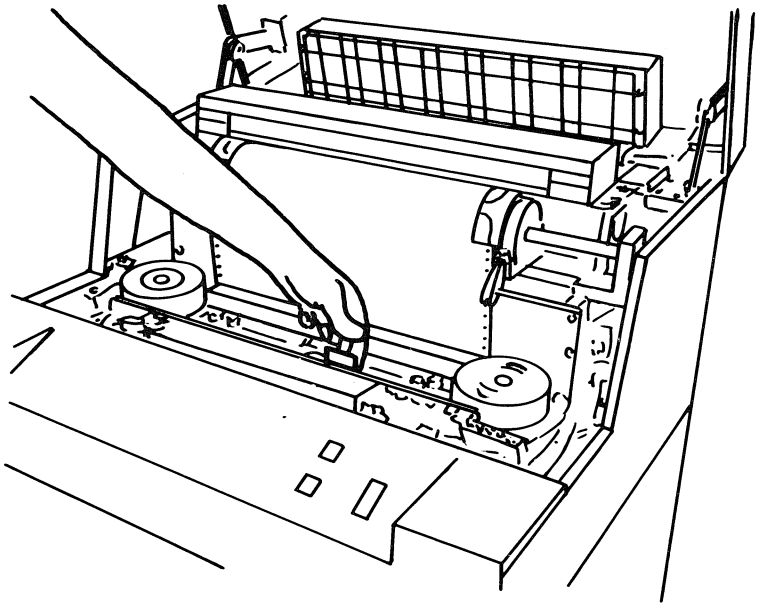
19. Set the forms-thickness lever.
    - Move the lever to the number that matches the forms thickness of the paper you are loading.



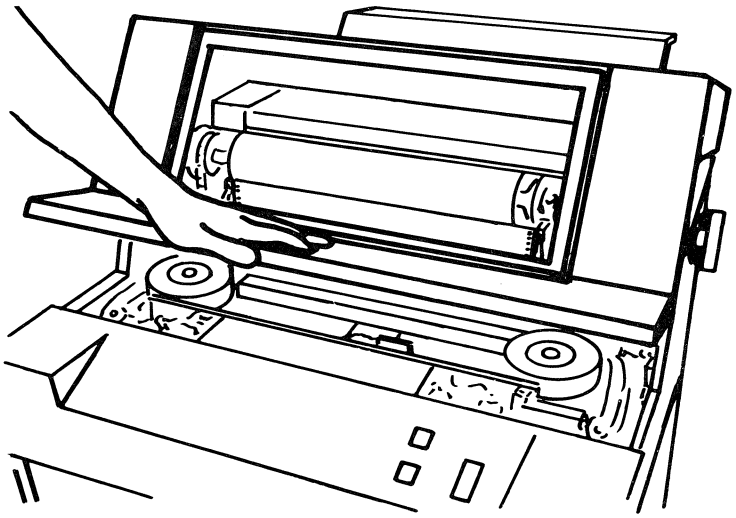
20. Close the upper paper clamp.
    - Press downward on the clamp until it clicks.



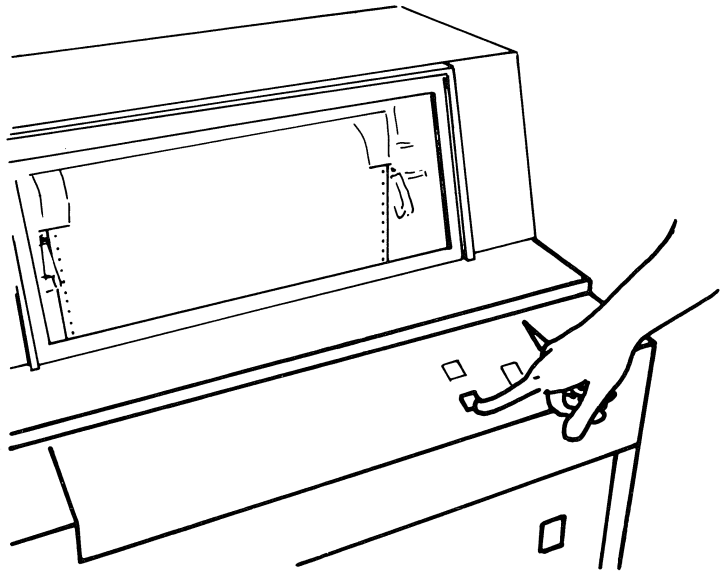
21. Close the print unit.
    - Lift the print-unit release lever until the print unit locks in place.



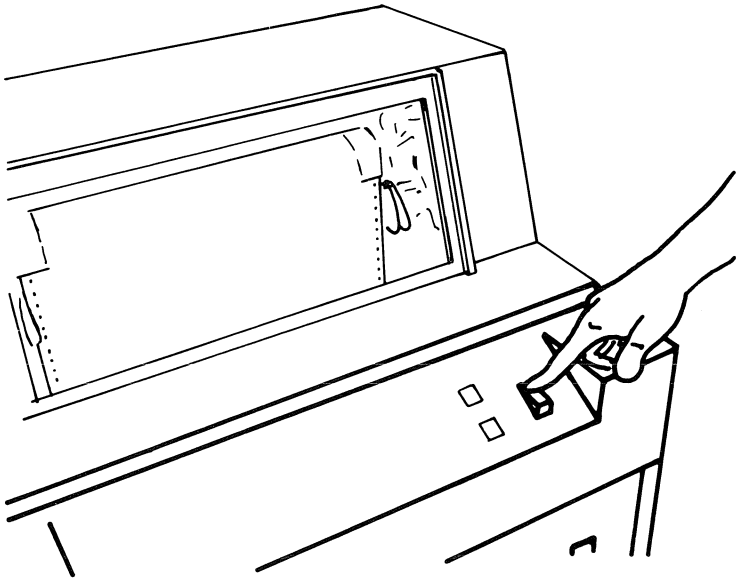
22. Close the printer cover.



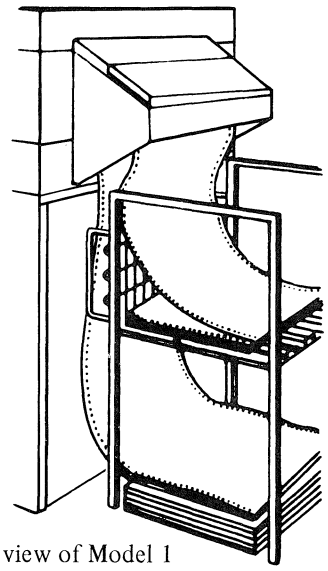
23. Turn on the printer power and press the Restore switch to advance the paper.



24. Place the Enable/Disable switch in the Enable position.
    - The Ready indicator comes on.



25. Adjust the forms and the forms stand, if necessary, so that the paper feeds vertically and without interference.
    - Be sure the paper leaving the printer is stacking neatly.



Rear view of Model 1

26. Refer to "4973 Models 1 and 2—Aligning Forms to First Print Line" at the end of this chapter to establish the desired first print line.

    End of procedure.

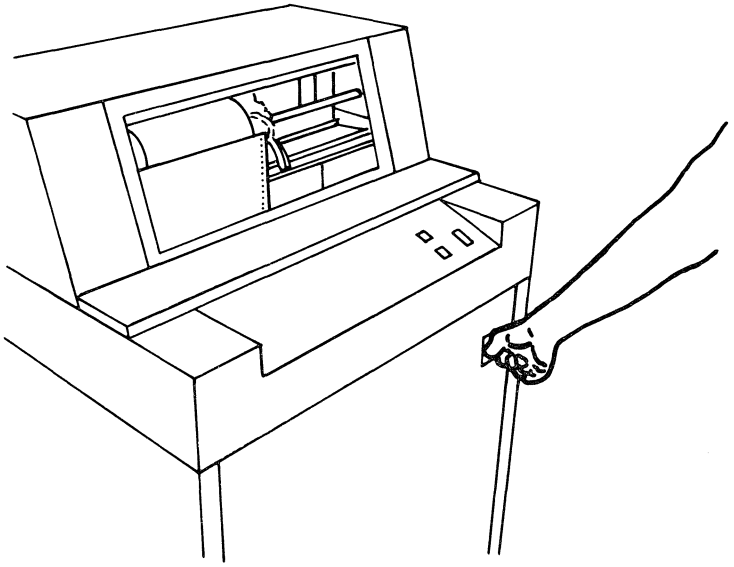
4973 Model 1—Replacing Ribbon

To replace the ribbon in the 4973 Model 1 Line Printer, use the following procedure.

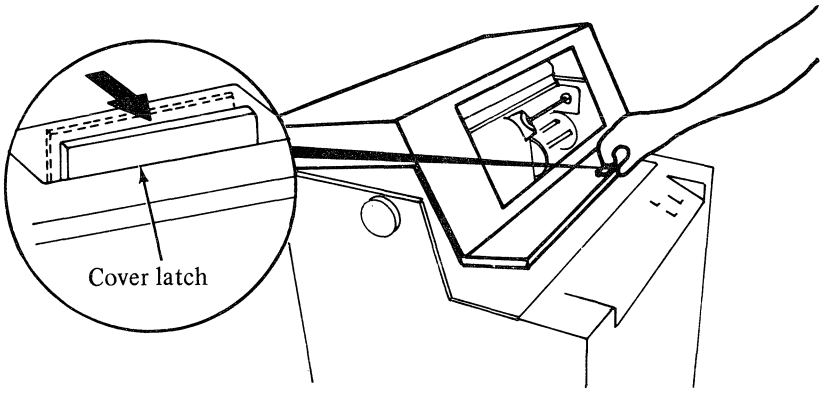
Notes:

1. Using plastic gloves is recommended for handling the ribbon.
2. Use IBM ribbon part number 1136634 or its equivalent.

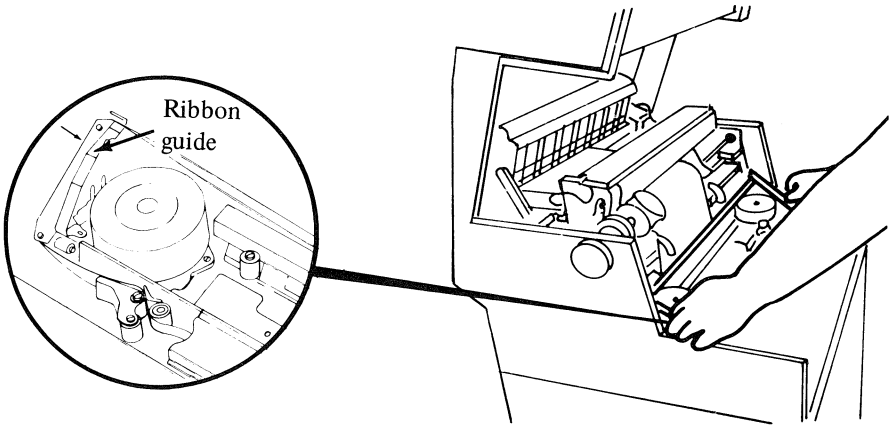
1. Turn off the printer power.



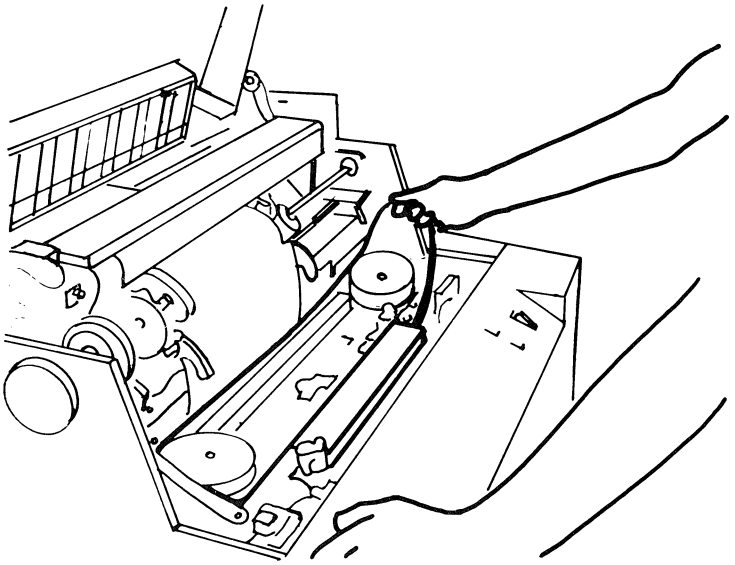
2. Open the printer cover.
   - Place your fingers behind the latch and move the latch towards the front of the printer. Then lift the cover.



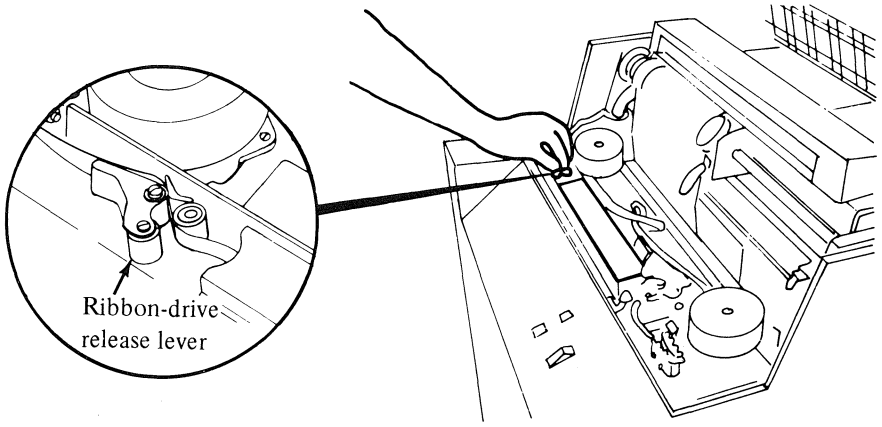
3. Lift the ribbon guides.



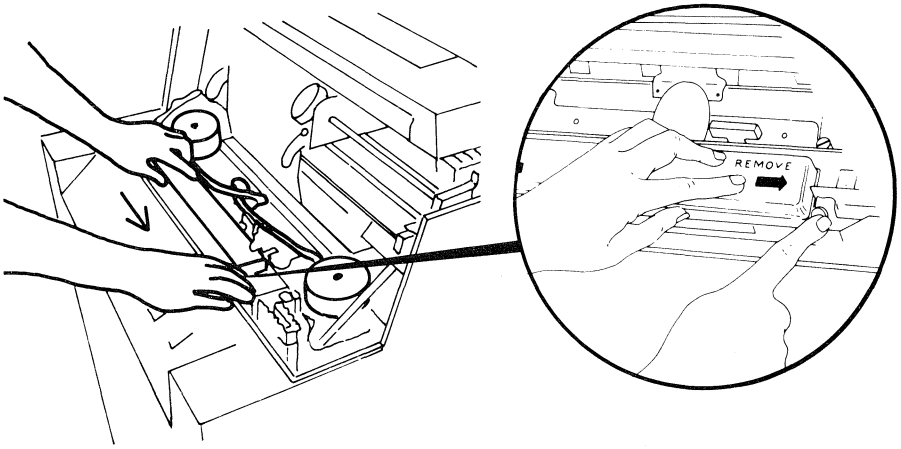
4. Remove the ribbon from the ribbon guides.



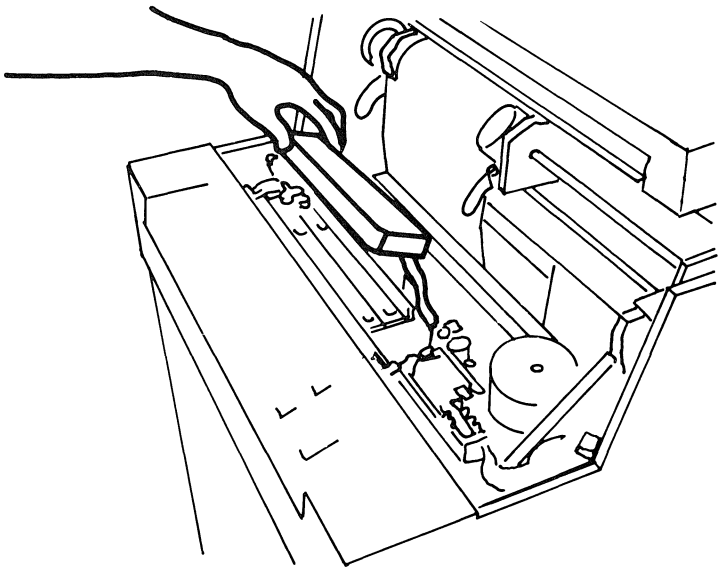
5. Open the ribbon-drive release lever.
   - Push the lever towards the rear of the printer.



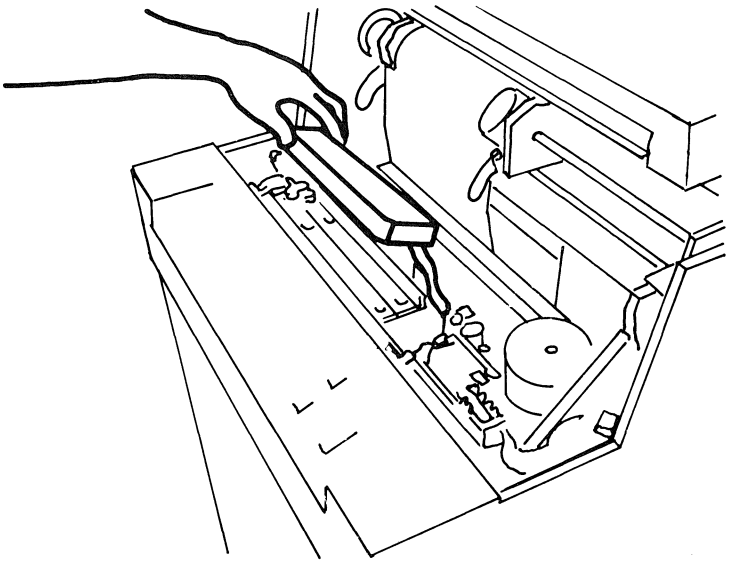
6. Release the ribbon cassette.
   - Press the ribbon-cassette release button and slide the cassette to the right, over the button.



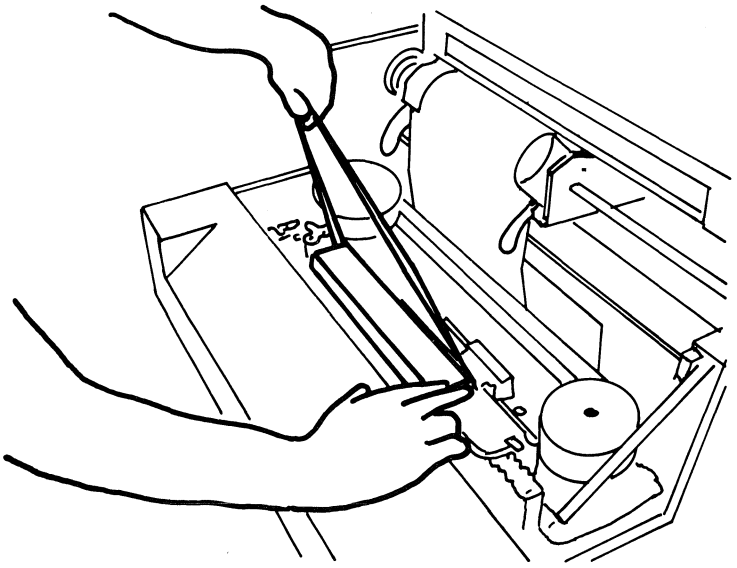
7. Remove the ribbon cassette and discard it.



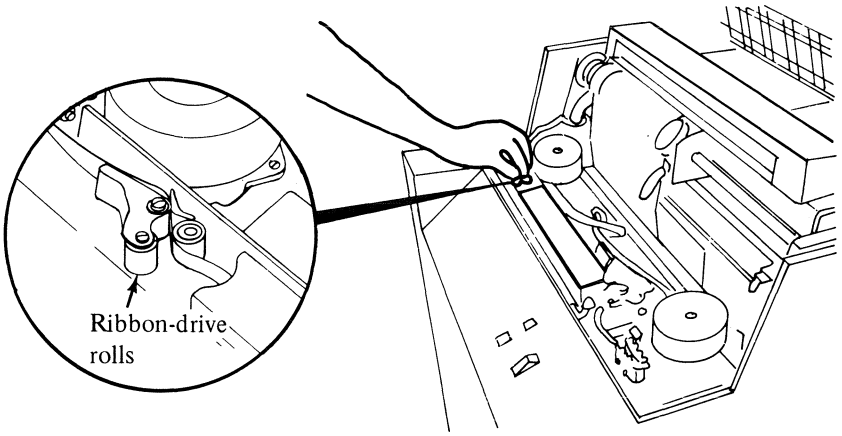
8. Obtain a new ribbon cassette and place it in the printer.



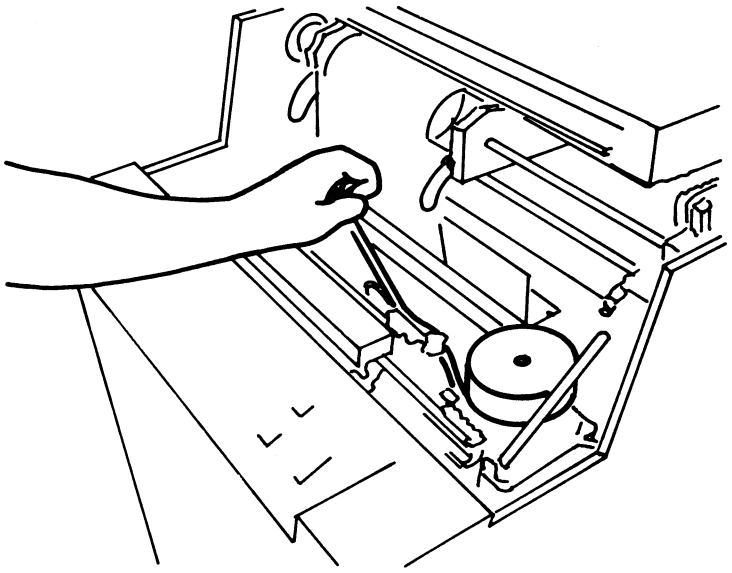
9. Pull about 150 mm (6 in.) of ribbon from the left end of the ribbon cassette.



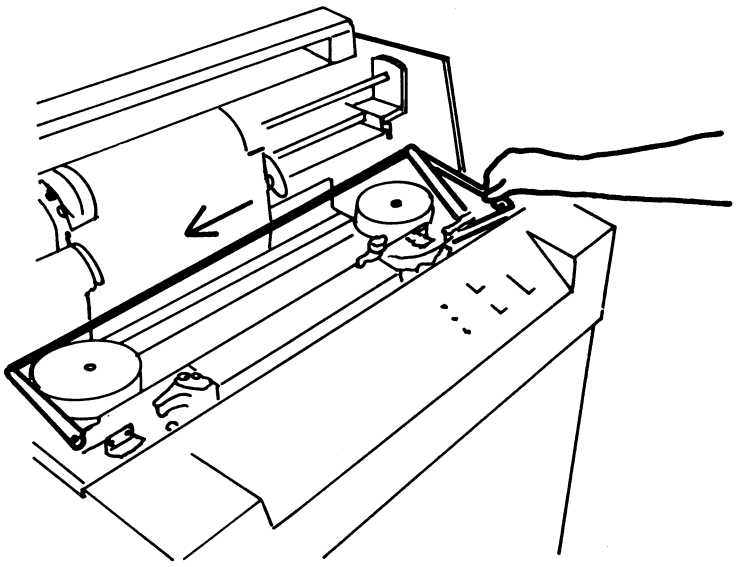
10. Thread the ribbon through the ribbon-drive rolls.



11. Make sure that there is some slack in the ribbon.

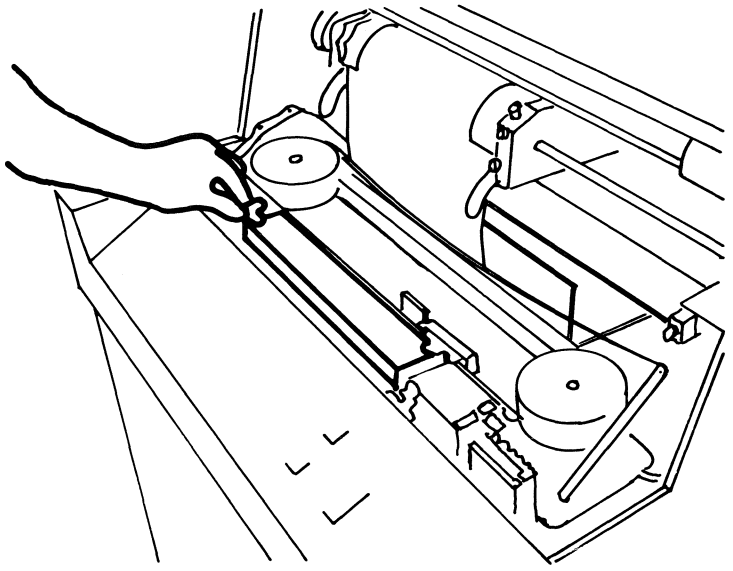


12. Place the ribbon in the right ribbon guide, then thread it to the left ribbon guide.

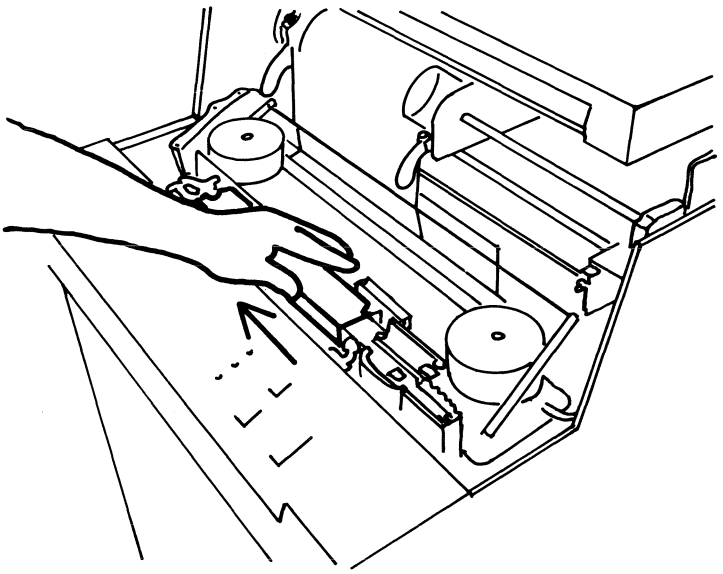


13. Close the ribbon-drive release lever.

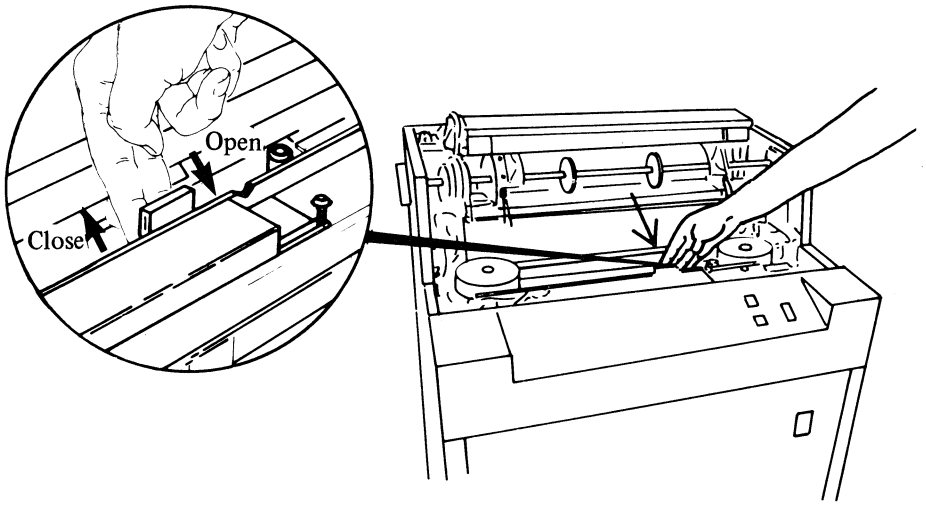
    Note: When the ribbon is taut, there should be a half twist in the ribbon. The twist should be between the cassette and the right ribbon guide.



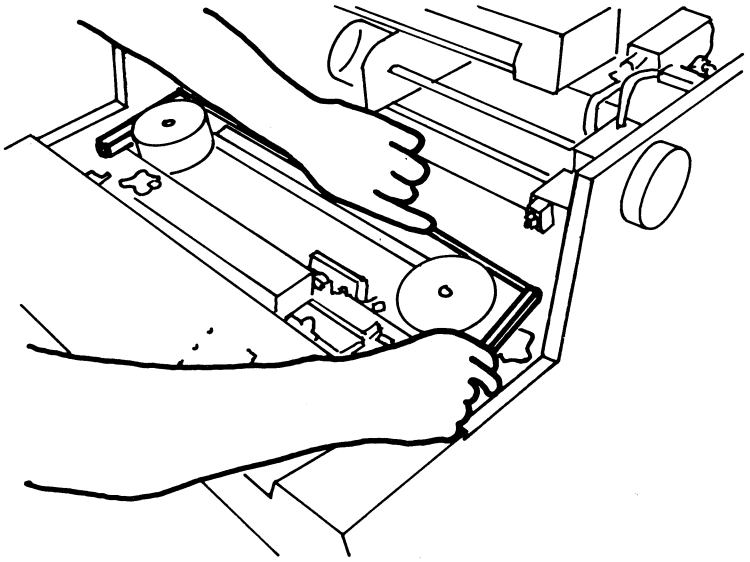
14. Lock the cassette in place.
    - Push the cassette downward and slide it to the left.
    - The blue ribbon-cassette release button is now visible.



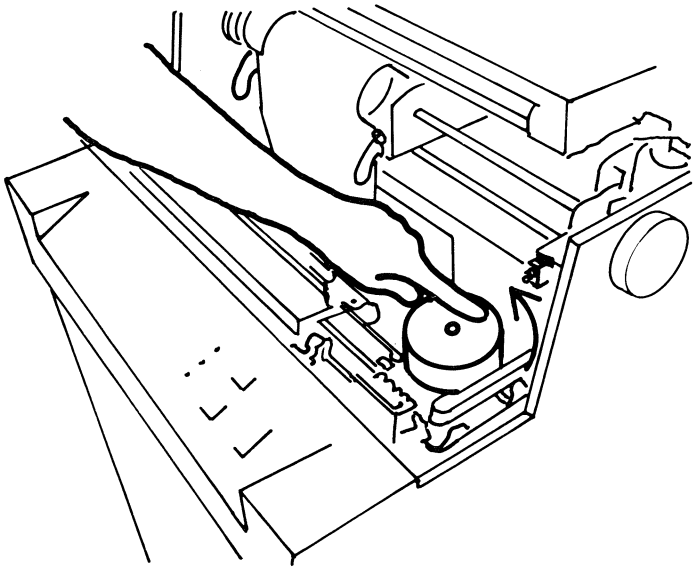
15. Open the print unit.
    - Pull the print-unit release lever towards the front of the printer.



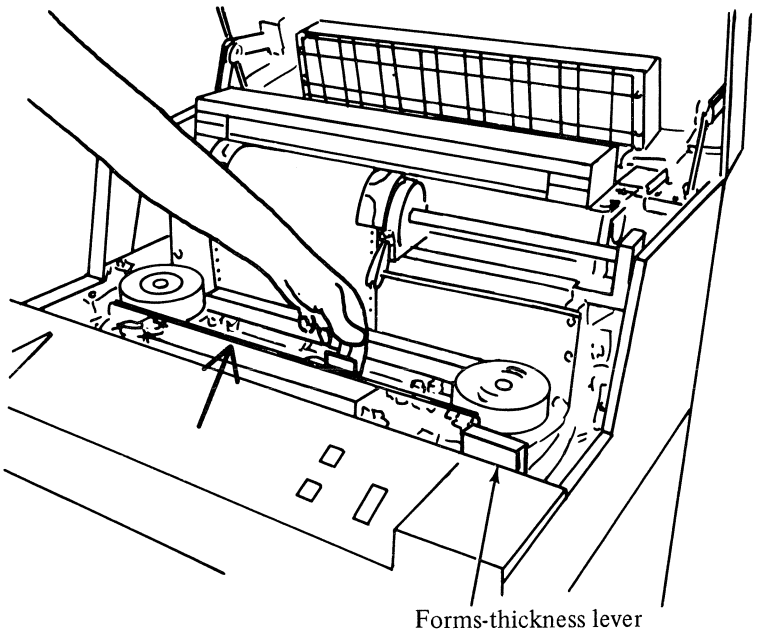
16. Lower the ribbon guide.
    - Be sure the ribbon drops in front of the plastic shield.



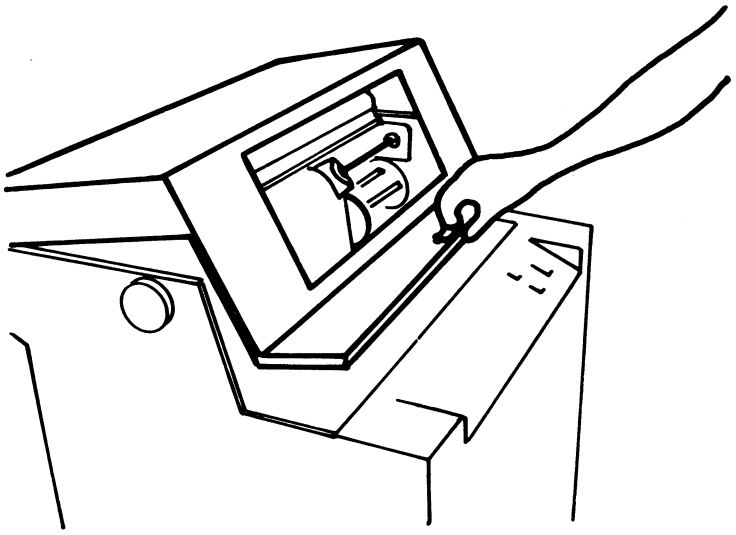
17. Turn the pulley counterclockwise to take up any ribbon slack and to verify that the ribbon is feeding correctly.



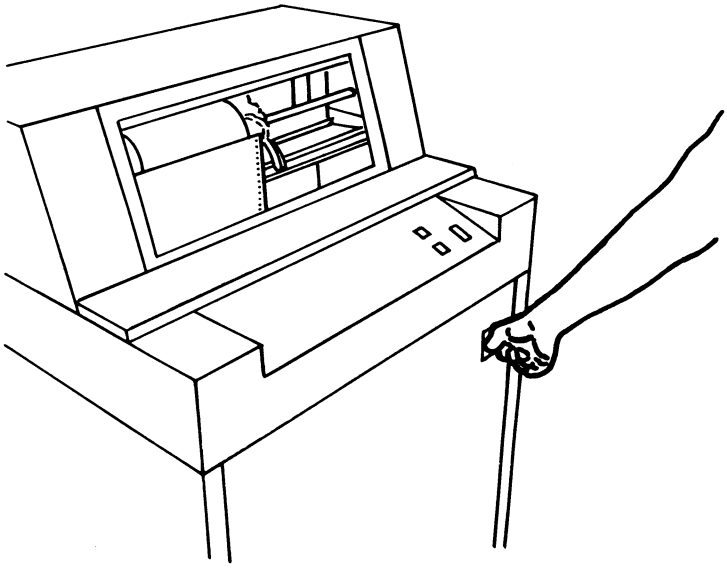
18. Close the print unit.
    - Lift the print-unit release lever until the print unit locks in place.



19. Close the printer cover.



20. Turn on the printer power.

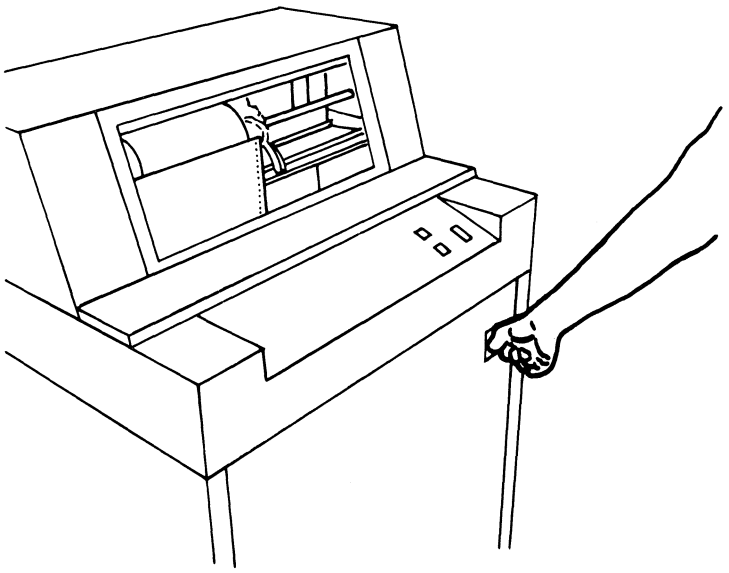


End of procedure.

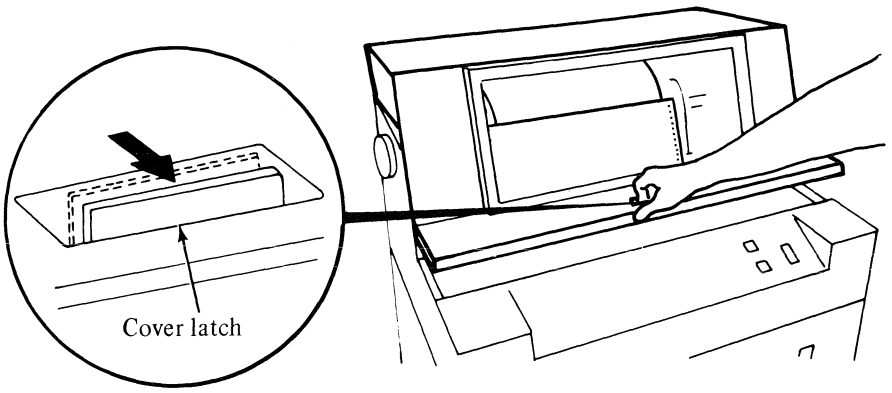
4973 Model 1—Replacing Print Belt

To replace the print belt on the 4973 Model 1 Line Printer, use the following procedure.

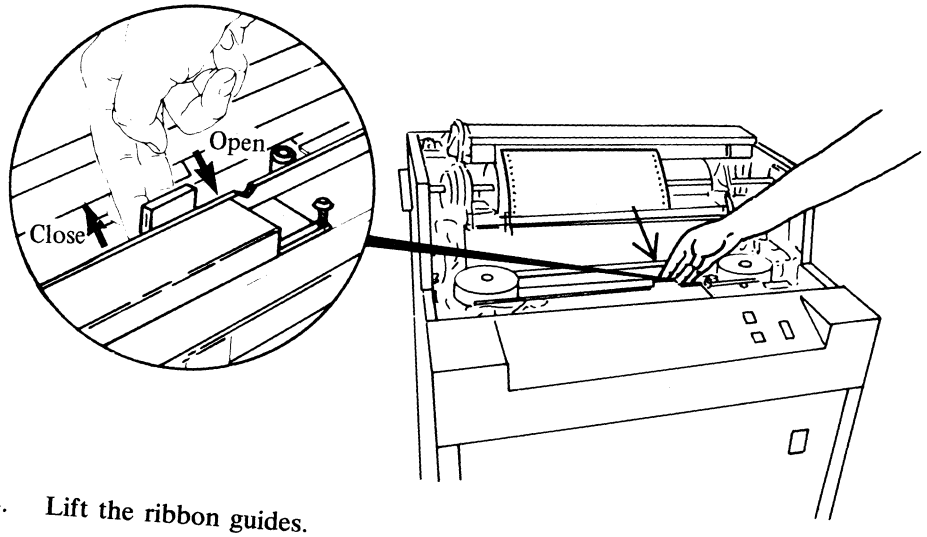
1. Turn off the printer power.



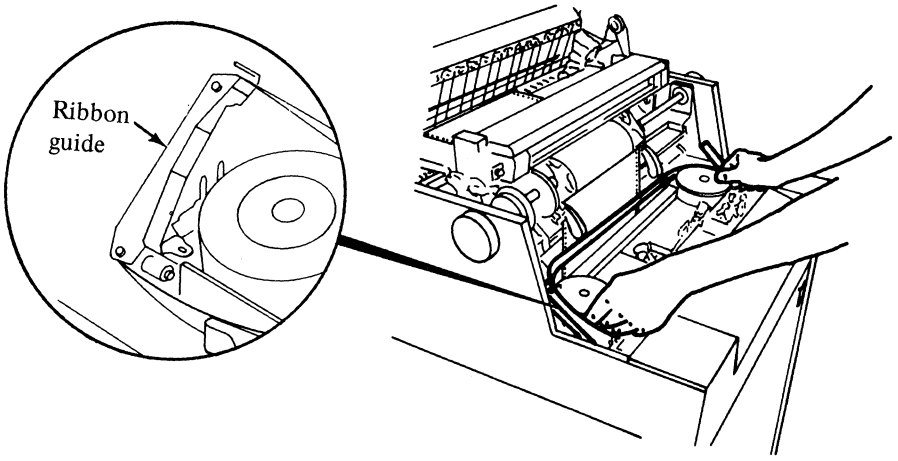
2. Open the printer cover.
   - Place your fingers behind the latch and move the latch towards the front of the printer. Then lift the cover.



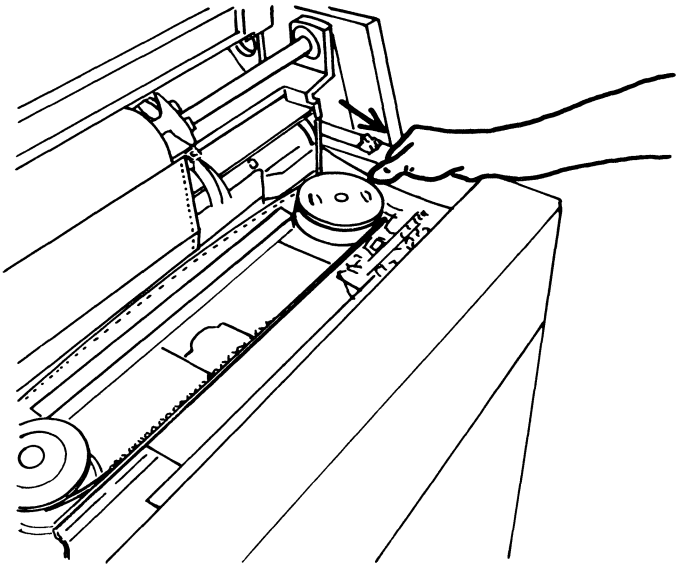
3. Open the print unit.
   - Pull the print-unit release lever towards the front of the printer.



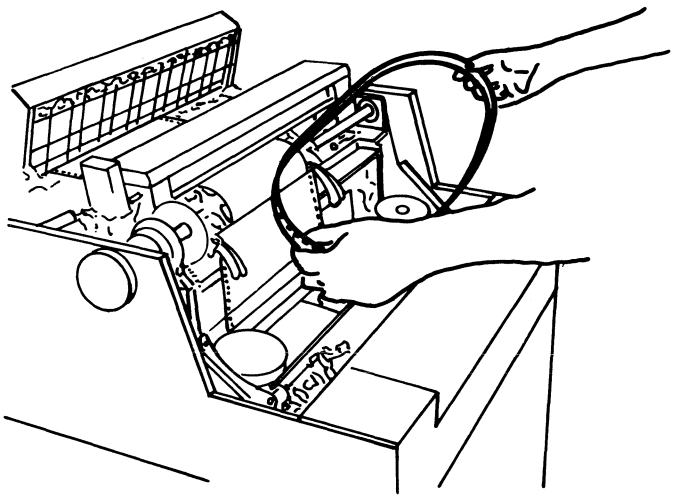
4. Lift the ribbon guides.



5. Pull the print-belt release lever towards the front of the machine.

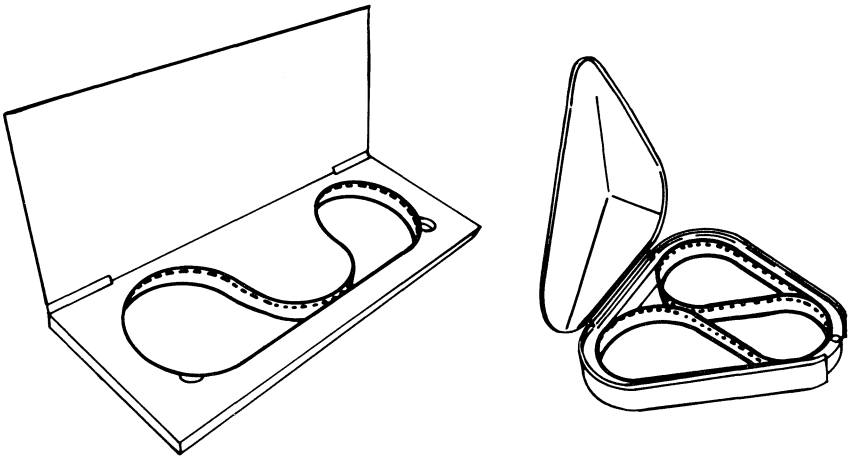


6. Remove the print belt.
   - Lift both sides of the belt at the same time.
   - Place the belt in its container.



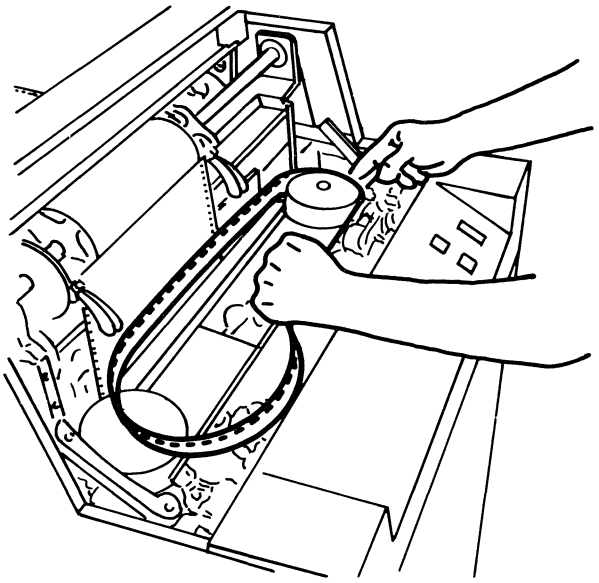
7. Obtain a new print belt.

   Note: The new print belt could be packaged in either of the ways shown.

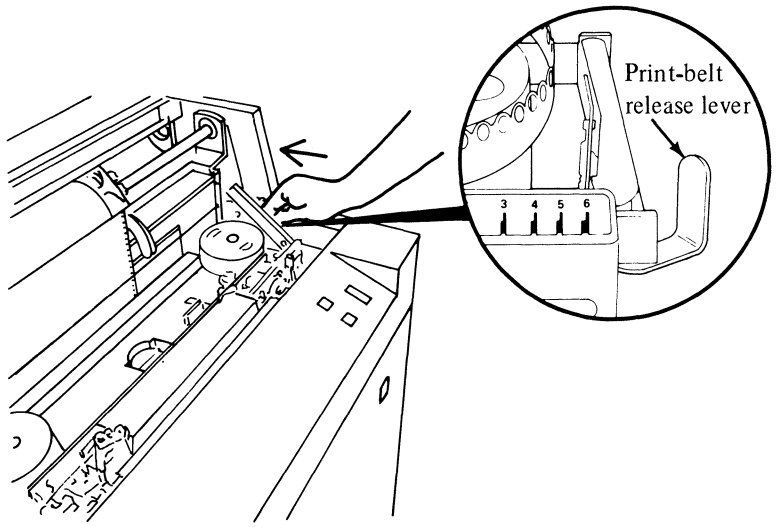


8. Install the new print belt.

   - Hold the print belt with the print type up and place the belt around the pulleys and behind the belt guard.

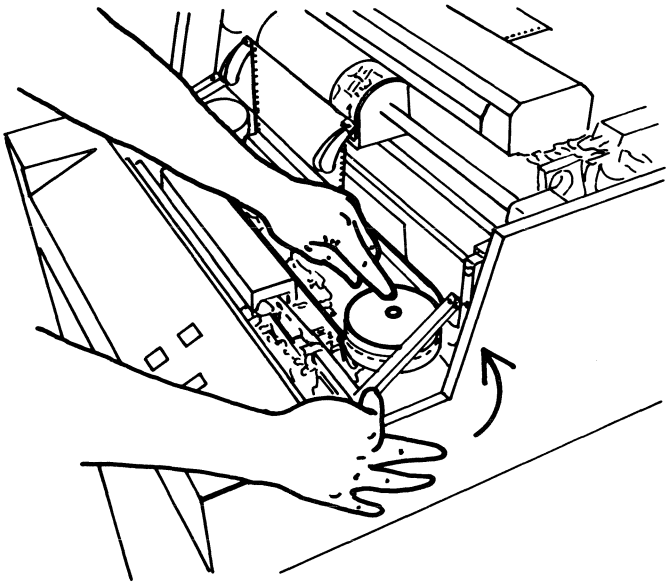


9. Push the print-belt release lever towards the rear of the machine.

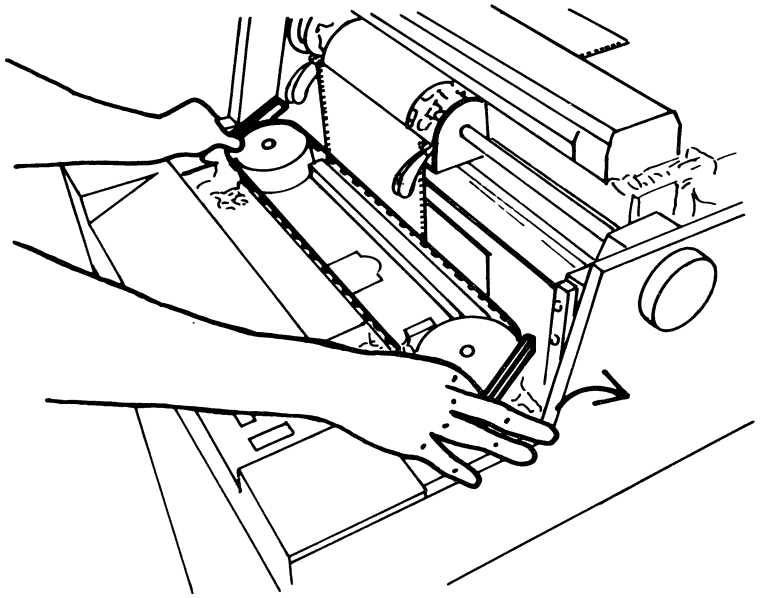


10. Turn the print-belt pulley counterclockwise.
    - The belt should move downward on the pulley.

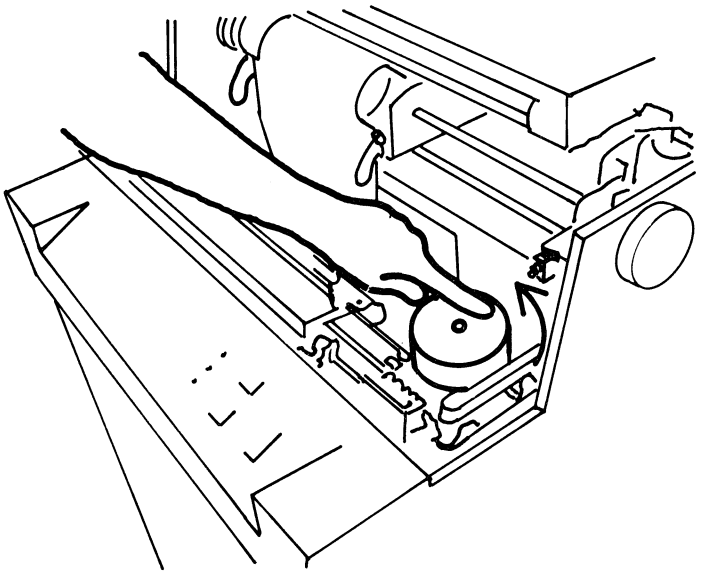
    If the belt does not move downward, do the following:
    - Remove the belt.
    - Check the belt path for interference.
    - Correct the problem.
    - Reinstall the belt (repeat steps 8 through 10).



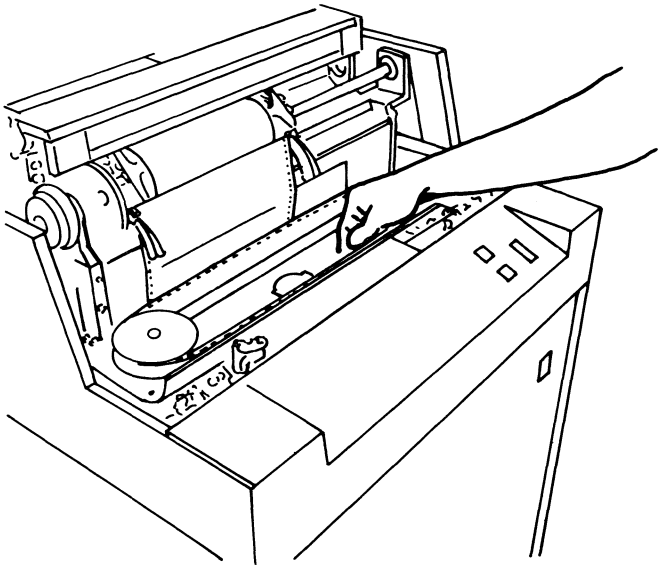
11. Lower the ribbon guides.



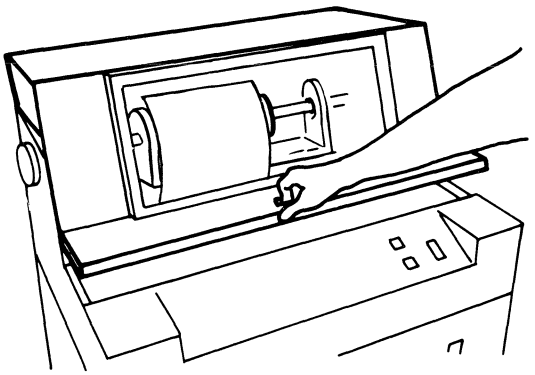
12. Turn the pulley to make sure that the print ribbon and print belt are moving smoothly.



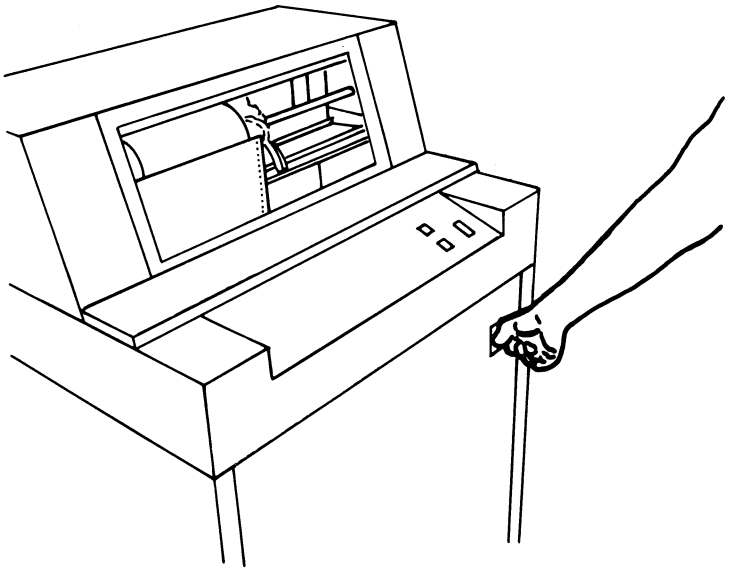
13. Close the print unit.
    - Lift the print-unit release lever until the print unit locks in place.



14. Close the printer cover.



15. Turn on the printer power.

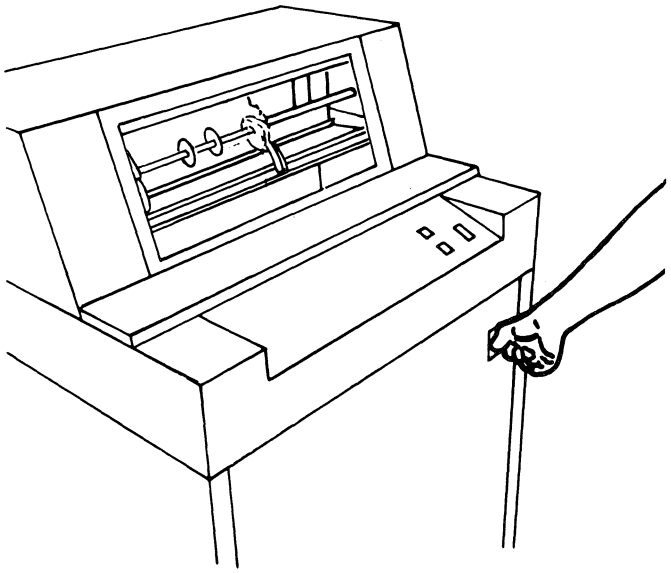


End of procedure.

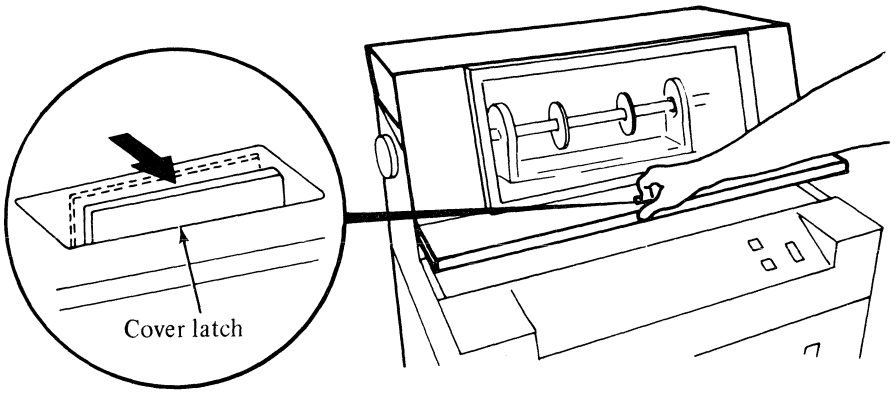
4973 Model 2— Loading Paper

To load paper (margin-punched forms) into the 4973 Model 2 Line Printer, use the following procedure.

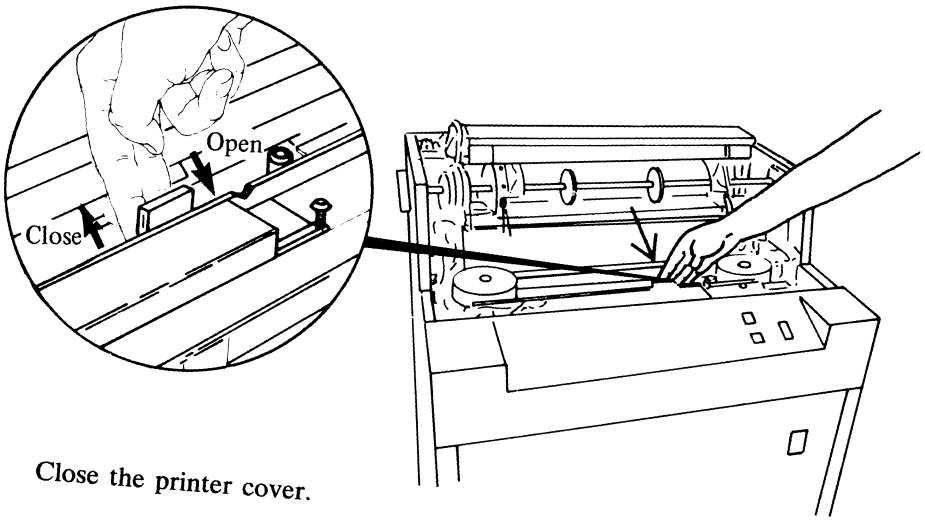
1. Turn off the printer power.



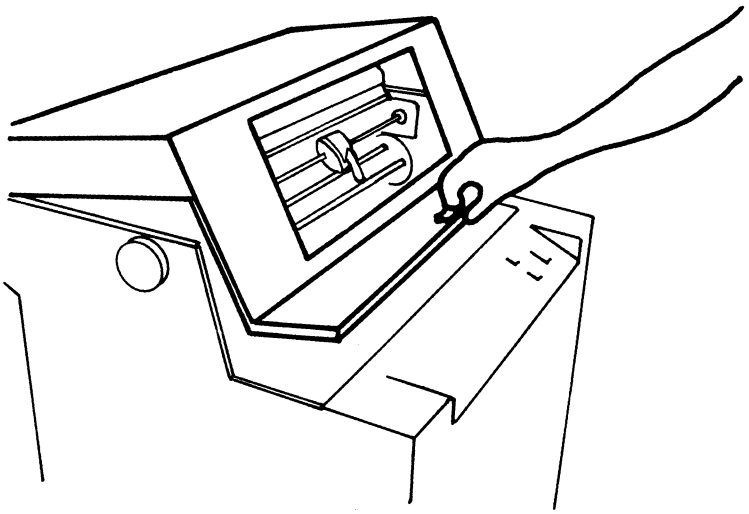
2. Open the printer cover.
   - Place your fingers behind the latch and move the latch towards the front of the printer. Then lift the cover.



3. Open the print unit.
   - Pull the print-unit release lever towards the front of the printer.

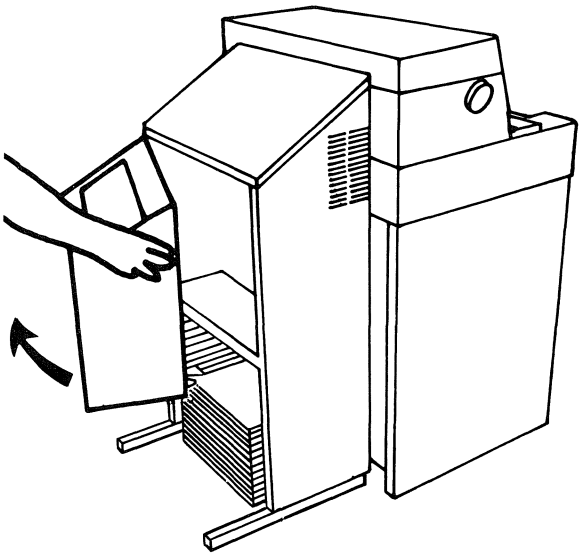


4. Close the printer cover.

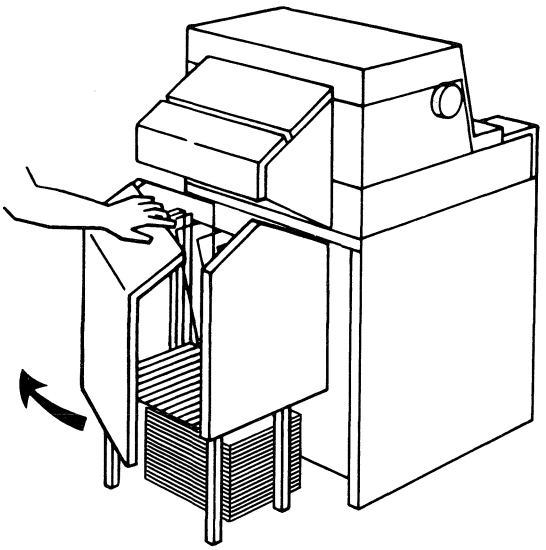


5. Open the rear forms-enclosure door and place the forms on the floor, inside the enclosure.

   Note: There are two styles of forms enclosures as shown in the following illustration. To ensure proper paper feeding in either style, the forms should be removed from the box.

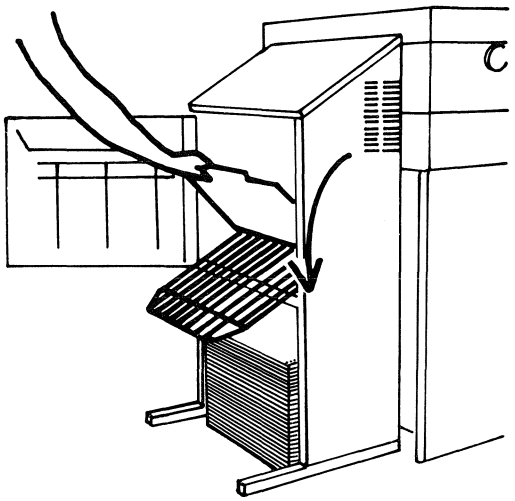


4973 with style A forms enclosure

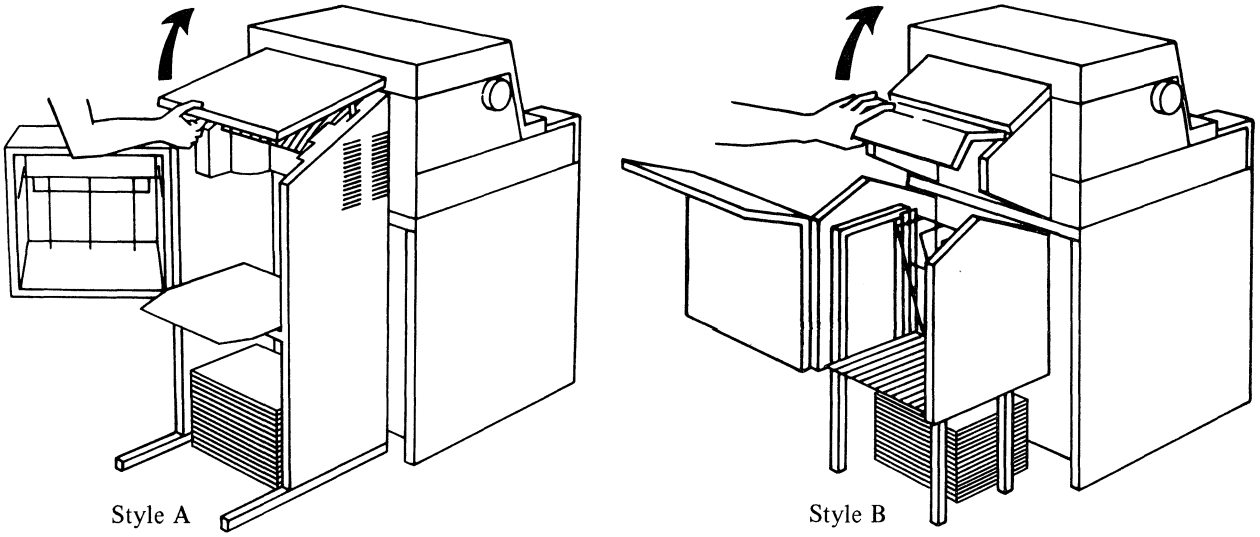


4973 with style B forms enclosure

6. Open the forms shelf (style A only).
   - Pivot the forms shelf towards you.



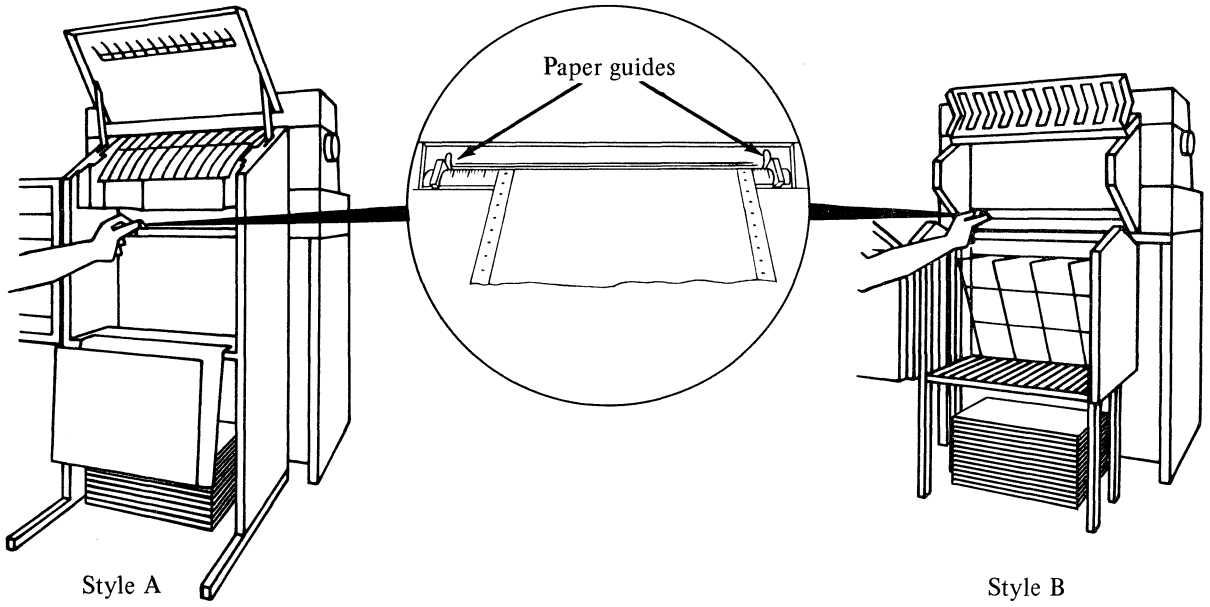
7. Lift the forms-enclosure top cover.



Style A

Style B

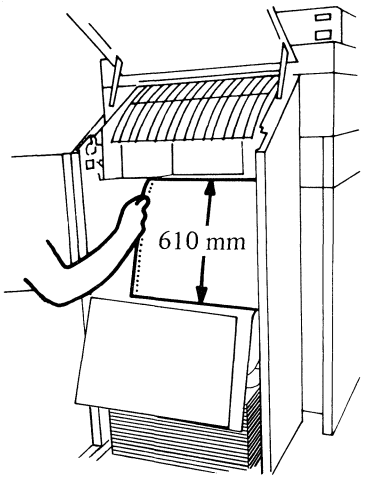
8. Slide the adjustable paper guides to the extreme outward position.



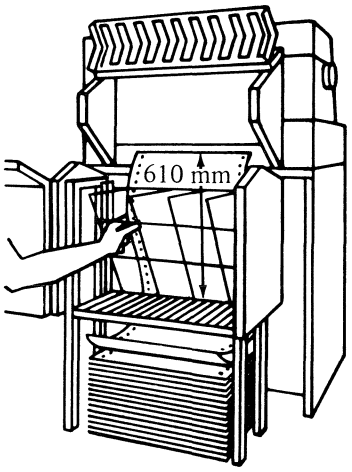
Style A

Style B

9. Feed about 610 mm (2 ft) of paper into the paper slot.
   - Hint: Fold single-part paper back at the second perforation to make a double thickness, then feed it squarely into the forms chute (the slot above the rear forms-alignment scale).
   - The paper will feed through the print unit and come out on the front side of the printer.
   - Check that enough paper to grasp has come through to the front of the printer.

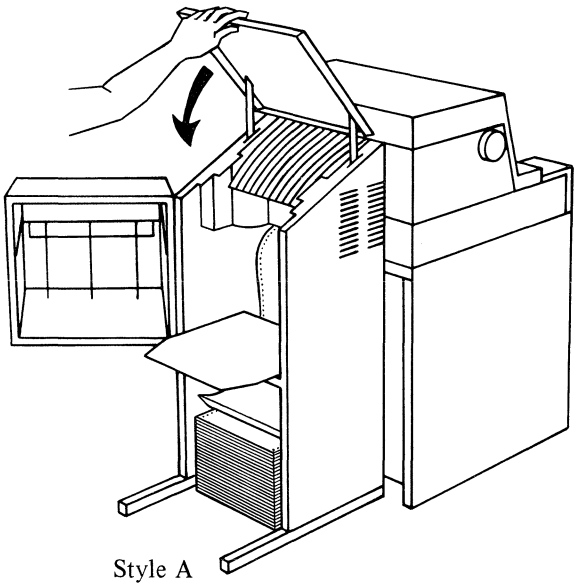


Style A

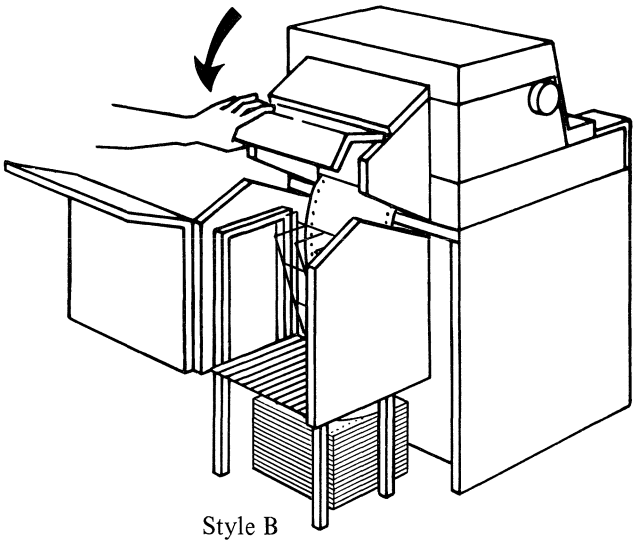


Style B

10. Close the rear forms-enclosure top cover.

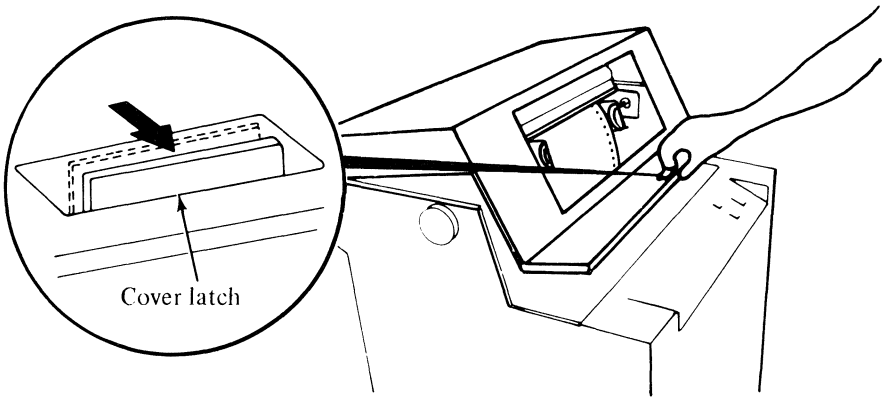


Style A

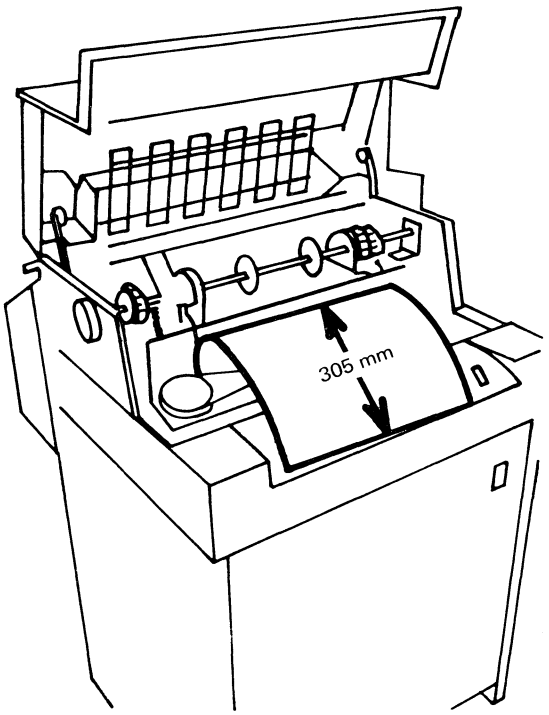


Style B

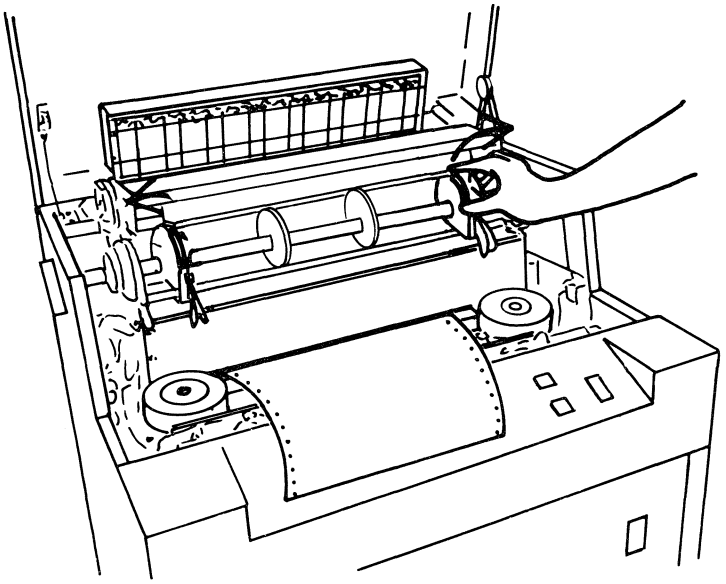
11. Open the printer cover.
    - Place your fingers behind the latch and move the latch towards the front of the printer. Then lift the cover.



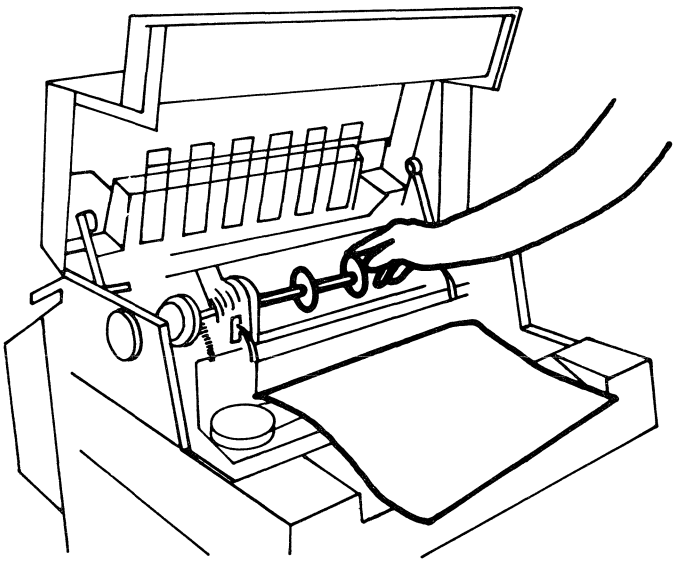
12. Pull about 305 mm (1 ft) of paper through to the front of the machine.
    - Unfold the paper if necessary.



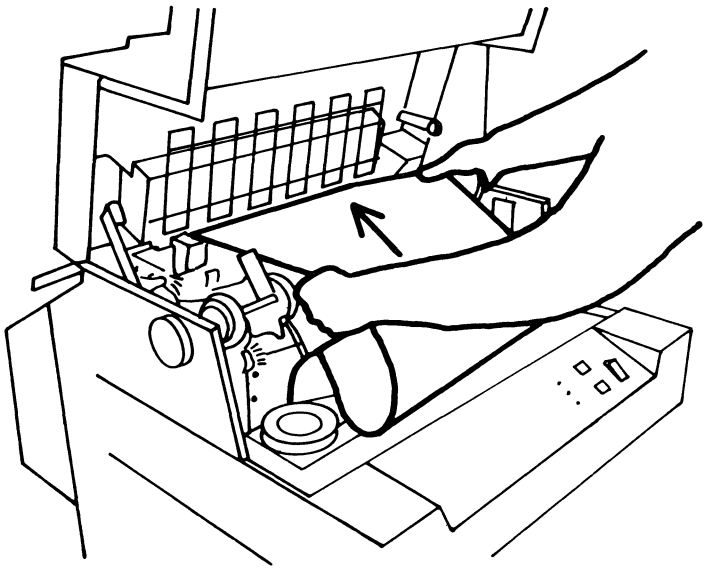
13. Adjust the forms tractors as follows:
    - Squeeze the tractor-release levers and slide the right tractor to the extreme right and the left tractor to the extreme left.
    - Open the forms-tractor covers by pivoting them outward.



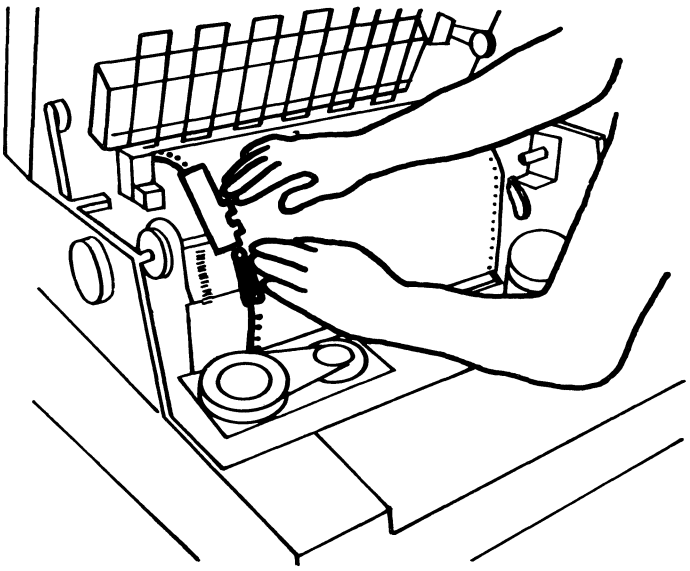
14. Space the center-forms guides evenly under the paper.



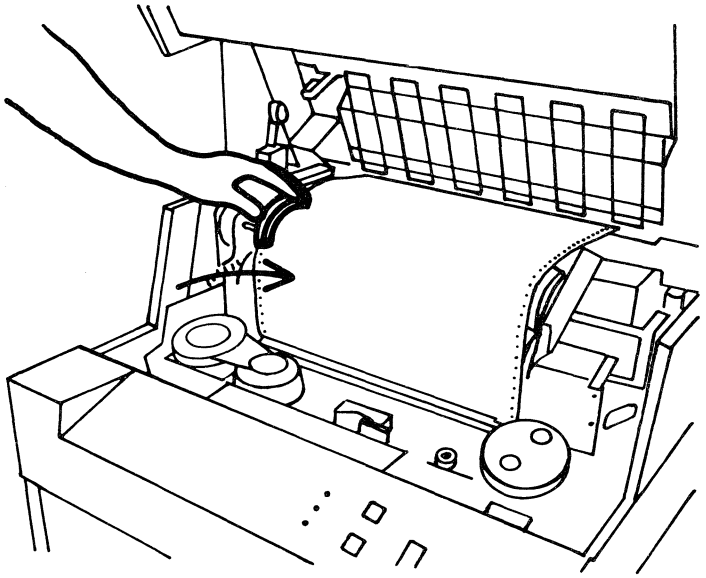
15. Feed the paper through the exit guides.



16. Adjust the left forms tractor.
    - Place the paper over the tractor pins.



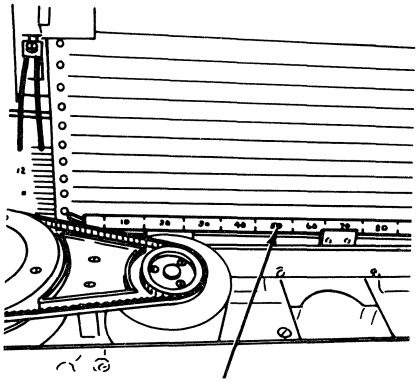
17. Close the left forms-tractor cover.



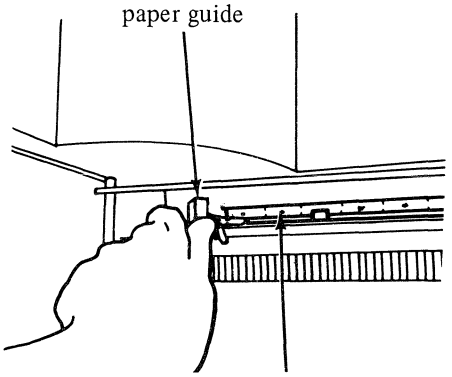
18. Check the lateral adjustment of the paper with the front and rear forms-alignment scales.

    Note: Observe the value of the left front forms-alignment scale, and using this value:

    - Position the paper to the same value on the rear forms-alignment scale.
    - Slide the rear adjustable-paper guides to be slightly greater than the width of the paper.
    - Position the forms so that the paper feeds straight.

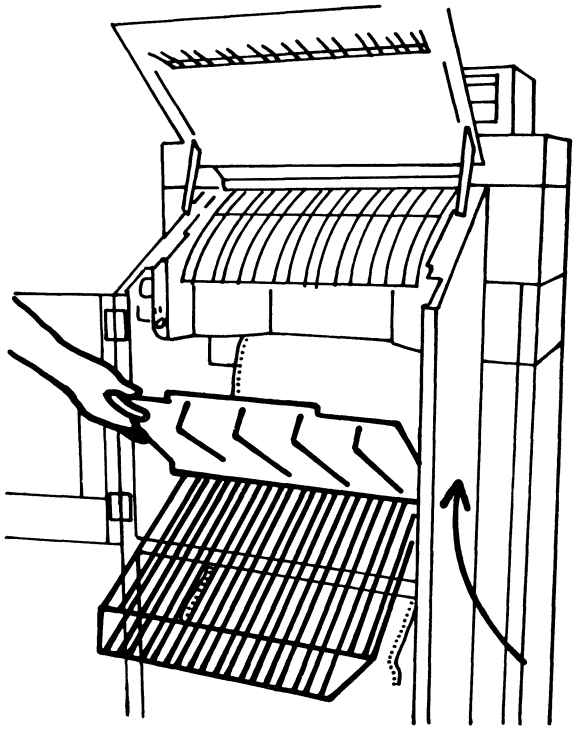


Front forms-alignment scale
(front of printer)



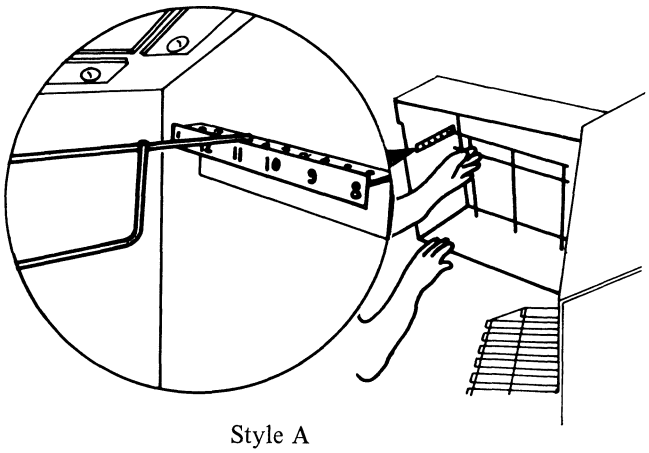
Rear forms-alignment scale
(at rear of printer, inside)

19. Close the forms shelf (style A only).

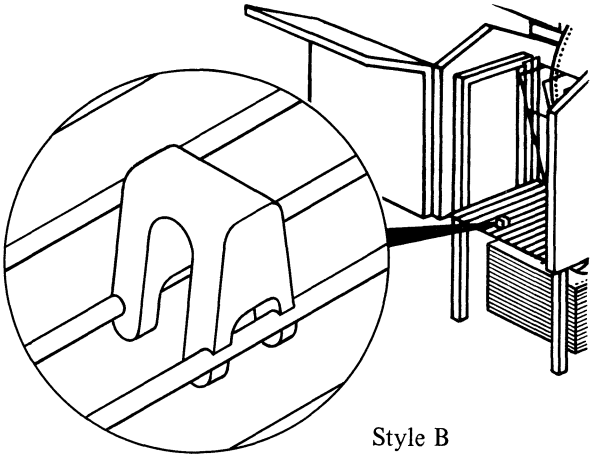


20. Adjust the forms-height rack to the forms height (the distance between folds) (style A only).

    Adjust the forms stop to the forms height (the distance between folds) (style B only).

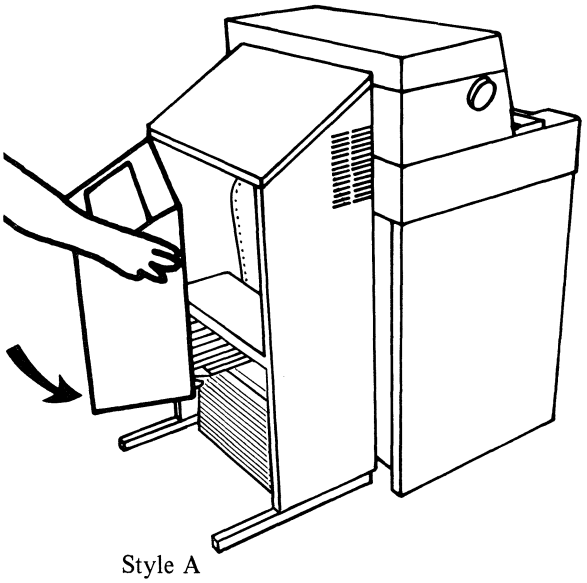


Style A

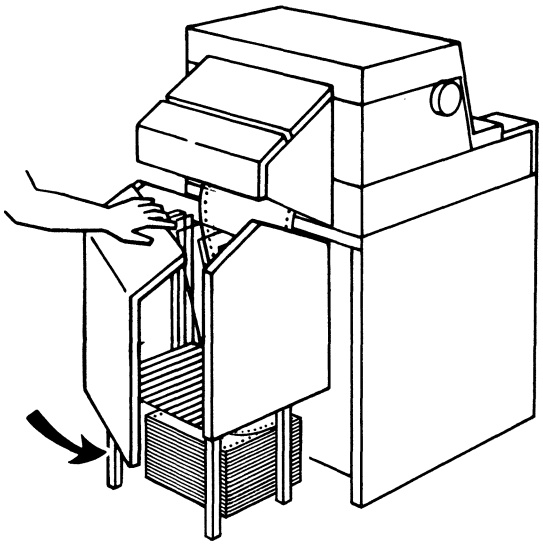


Style B

21. Close the rear forms-enclosure door.

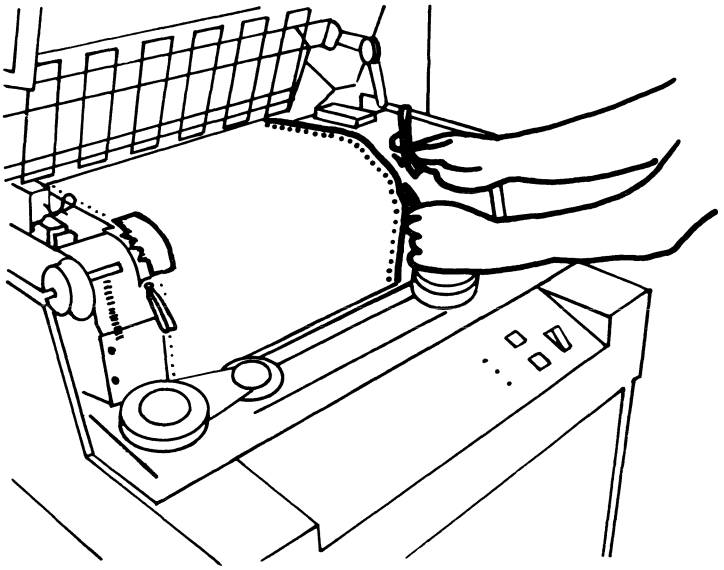


Style A



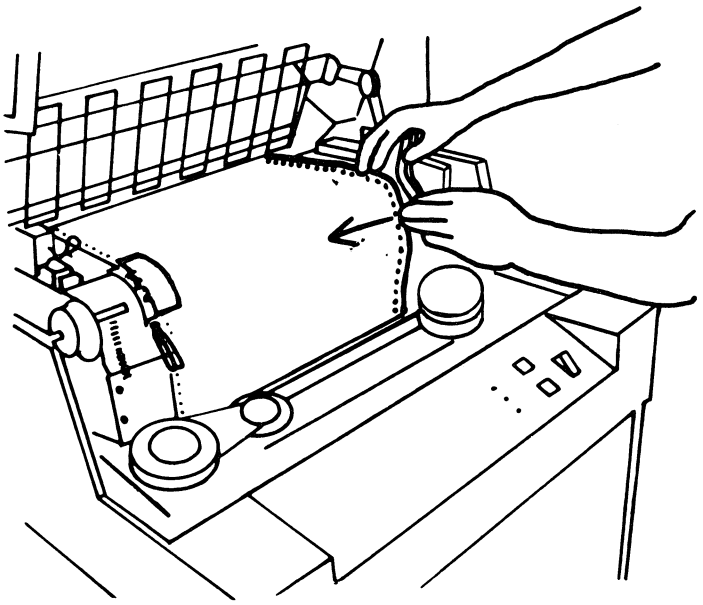
Style B

22. Adjust the right forms tractor as follows:
    - Squeeze the tractor-release lever and slide the tractor towards the right edge of the paper.
    - Place the paper over the tractor pins.
    - Adjust the paper for straightness and smoothness.

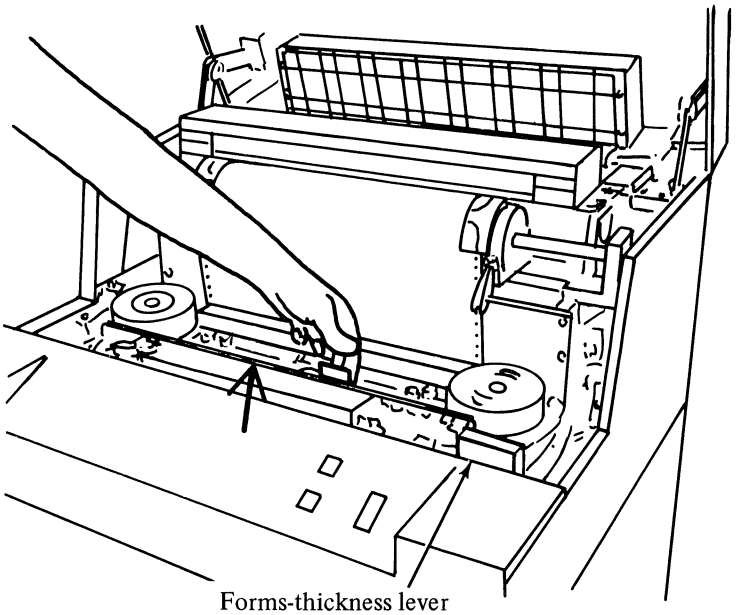


23. Close the right forms-tractor cover.

    Note: The paper must be secure on the tractor pins.

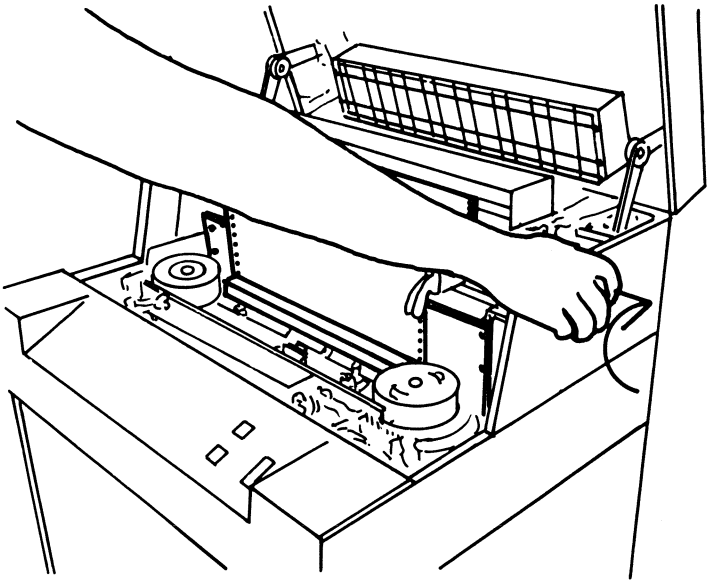


24. Close the print unit and adjust the forms-thickness lever.
    - Lift the print-unit release lever until the print unit locks in place.
    - Slide the forms-thickness lever to match the thickness of the forms used.

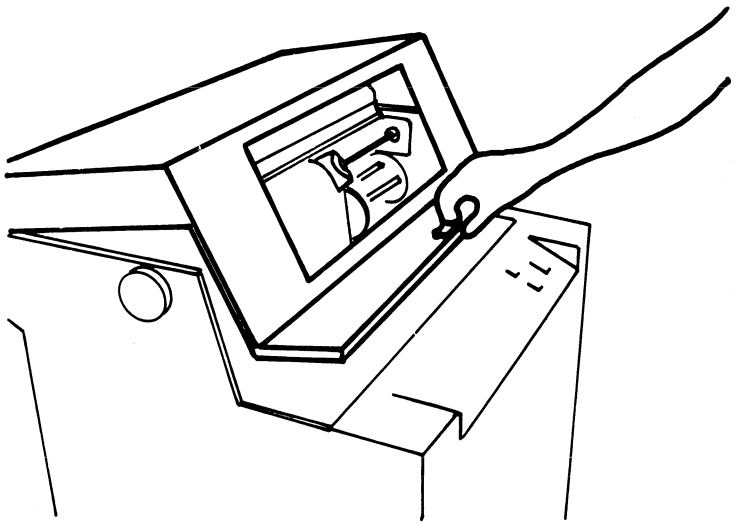


Forms-thickness lever

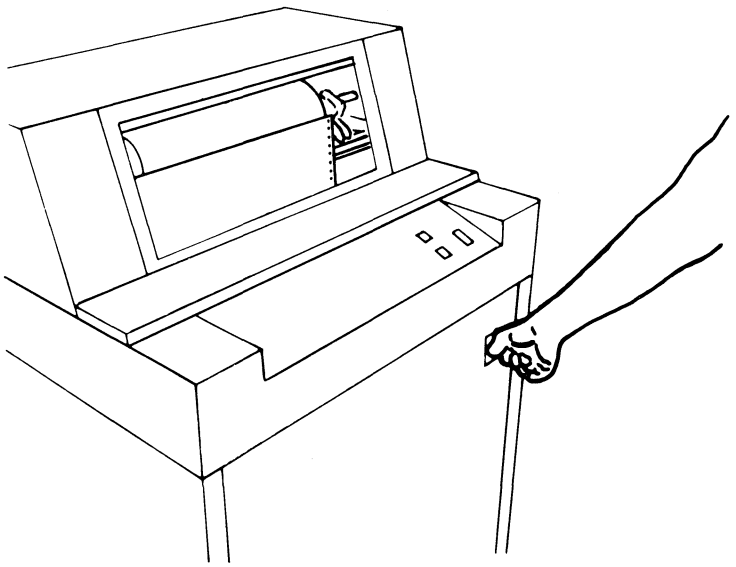
25. Turn the forms-advance knob to ensure that the paper is advancing and stacking correctly.



26. Close the printer cover.



27. Turn on the printer power.



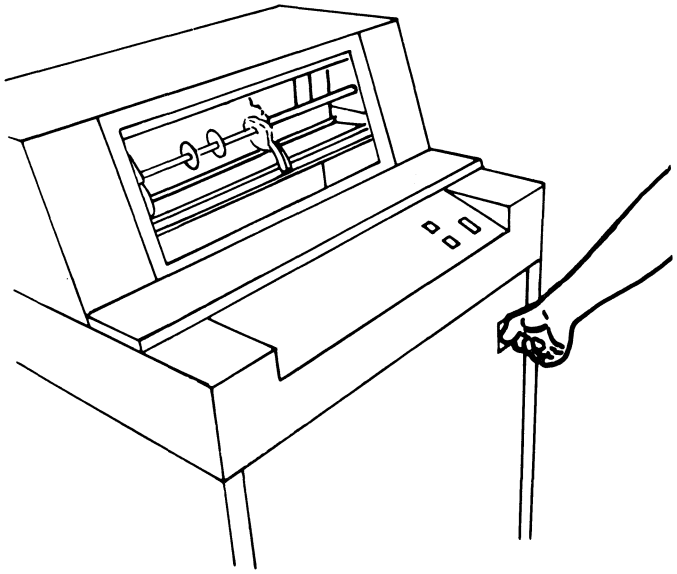
28. Refer to "4973 Models 1 and 2—Aligning Forms to First Line" to establish the desired first print line.

End of procedure.

4973 Model 2—Replacing Ribbon

To replace the ribbon in the 4973 Model 2 Line Printer, use the following procedure.

1. Turn off the printer power.

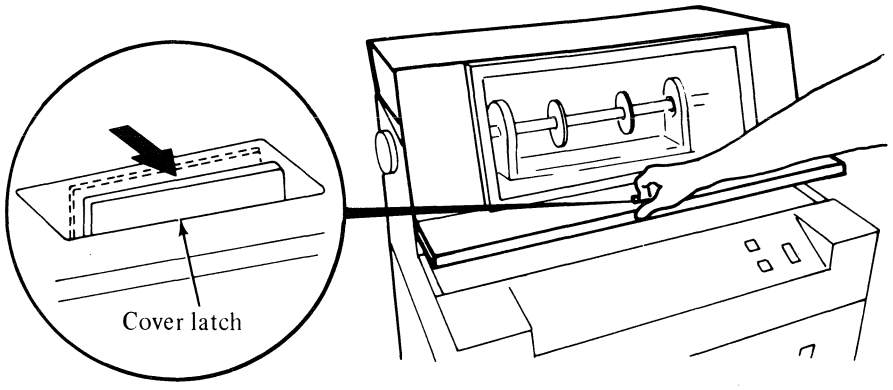


Notes:

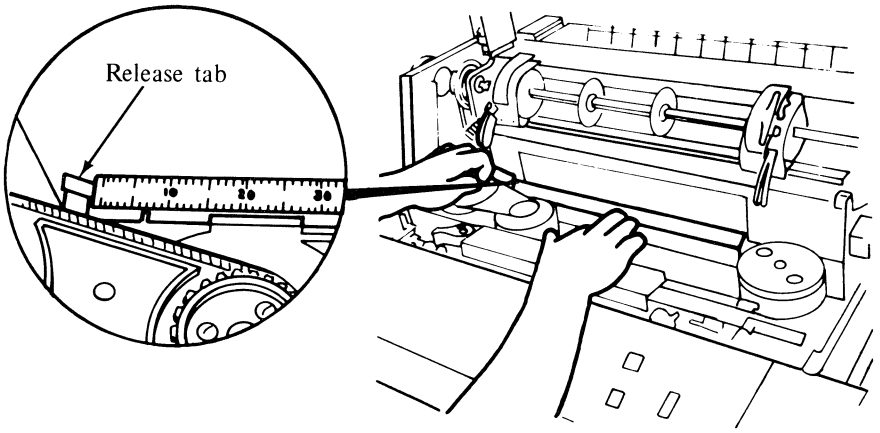
a. Using plastic gloves is recommended for handling the ribbon.

b. Use IBM ribbon, part 1136670, or its equivalent.

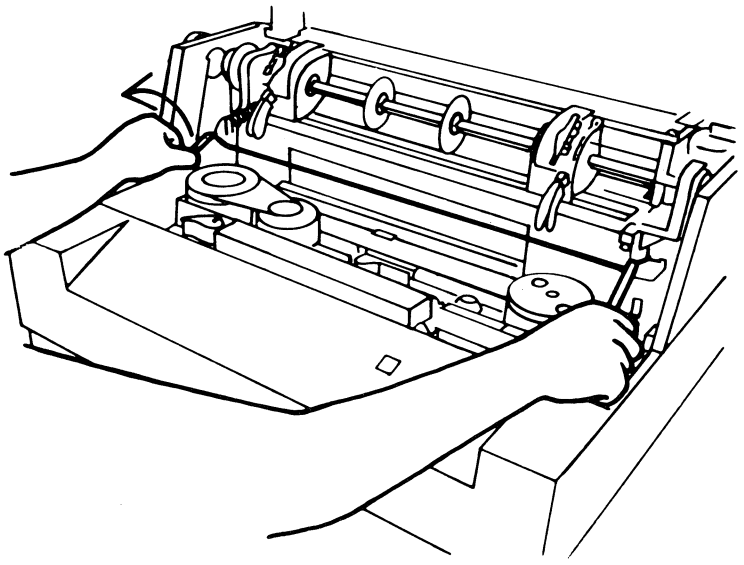
2. Open the printer cover.
   - Place your fingers behind the latch and move the latch towards the front of the printer. Then lift the cover.



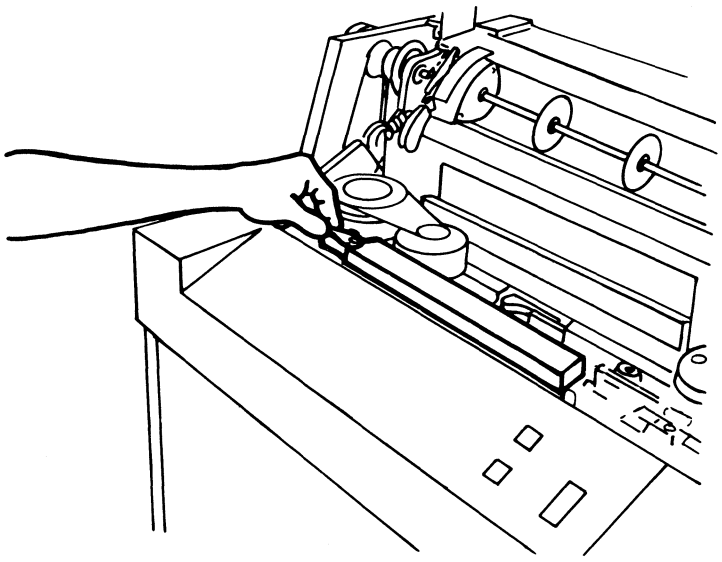
3. Open the top ribbon guide.
   - Press the release tab (located on the left side of the guide) and open the guide towards the front of the printer.



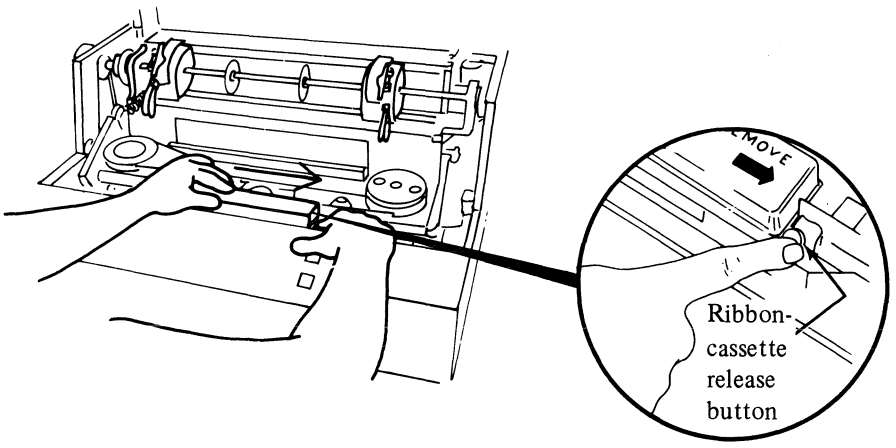
4. Lift the side ribbon guides.



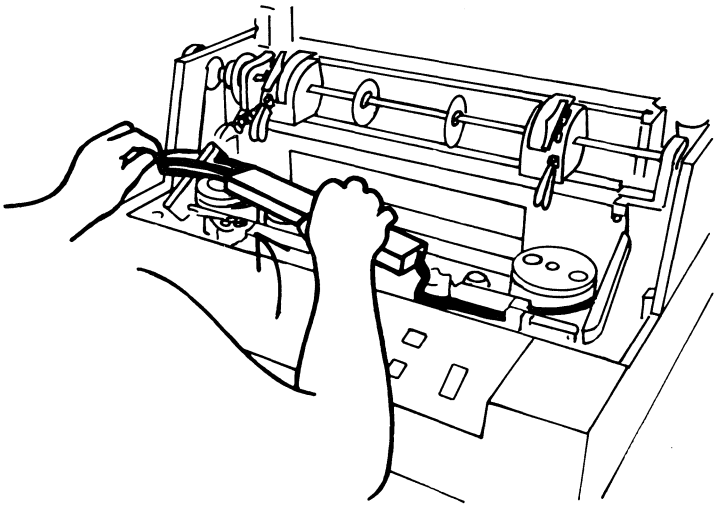
5. Open the ribbon-drive release lever.
   - Push the lever towards the rear of the printer.



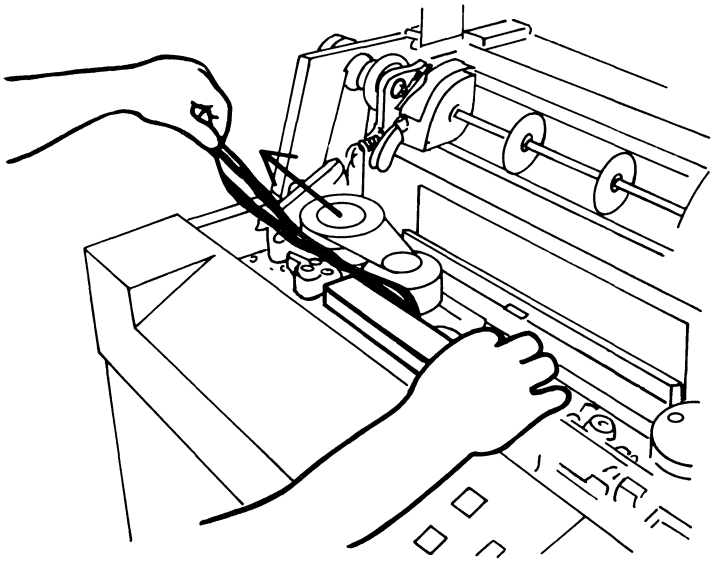
6. Release the ribbon cassette.
   - Press the ribbon-release button and slide the cassette to the right, over the button.



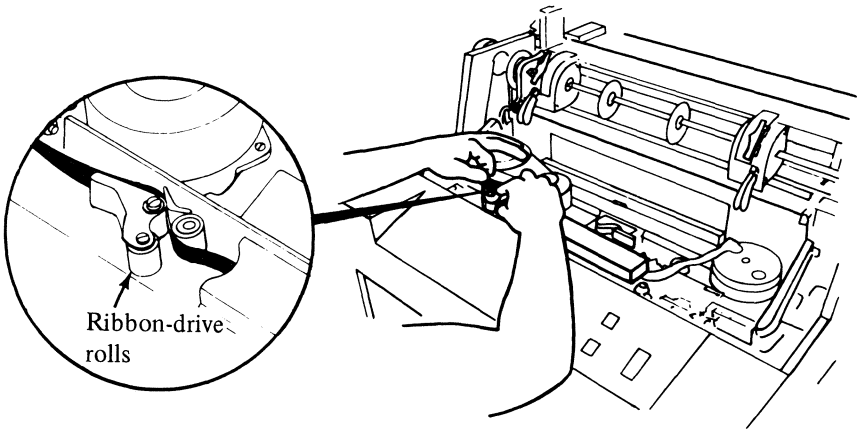
7. Remove the cassette and ribbon, and discard them.



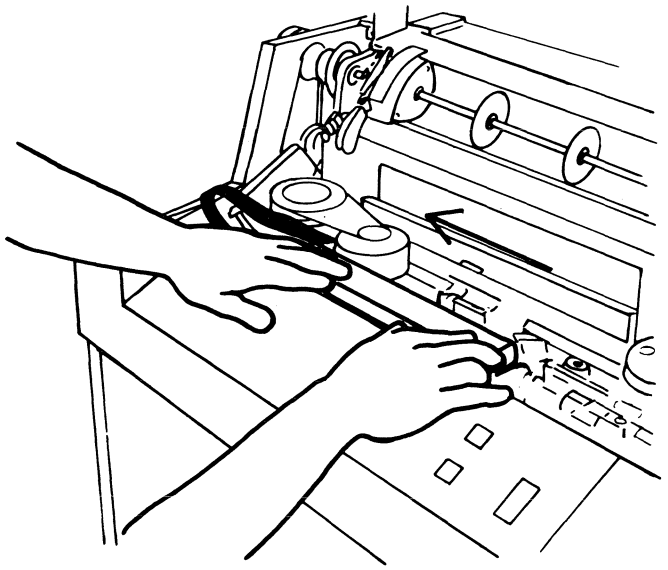
8. Obtain a new ribbon cassette and pull about 150 mm (6 in.) of ribbon from the left end of it.



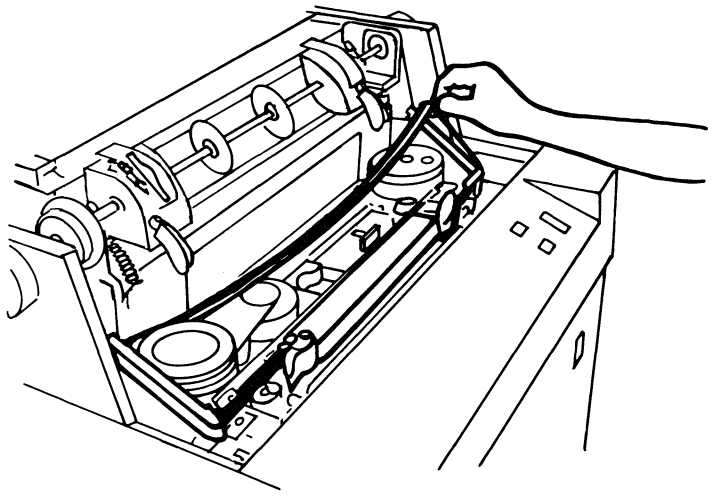
9. Place the ribbon cassette in the printer and thread the ribbon through the ribbon-drive rolls.



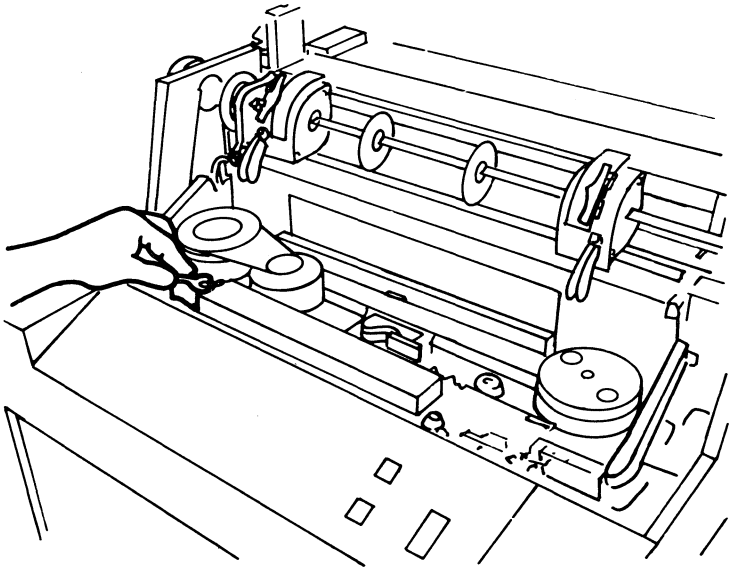
10. Lock the ribbon cassette in place.
    - Push the cassette downward and slide it to the left.
    - The blue ribbon-cassette release button is now visible.



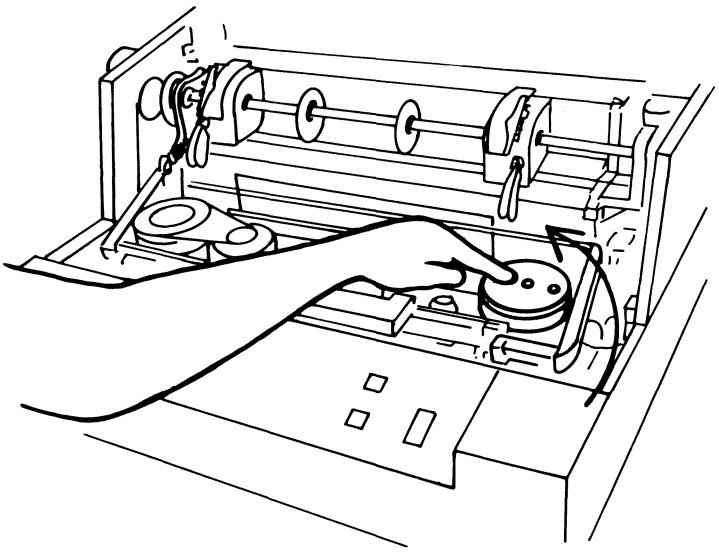
11. Thread the ribbon through the side ribbon guides.



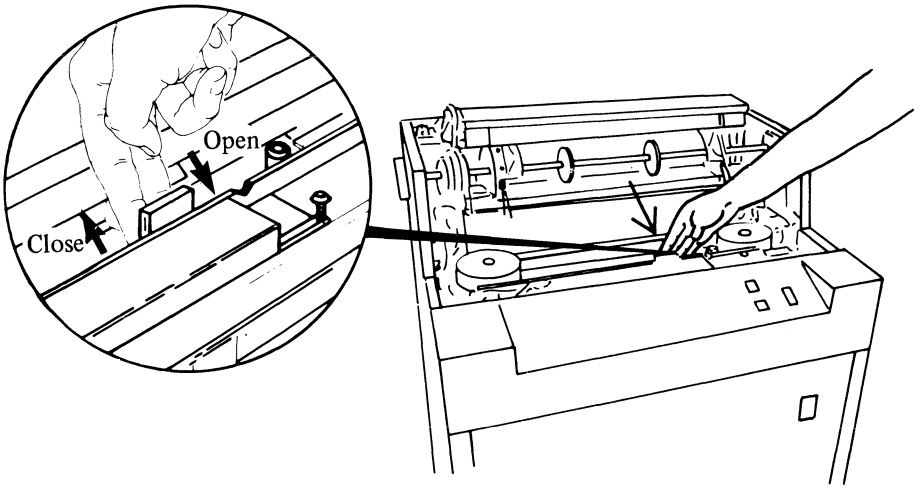
12. Close the ribbon-drive release lever.



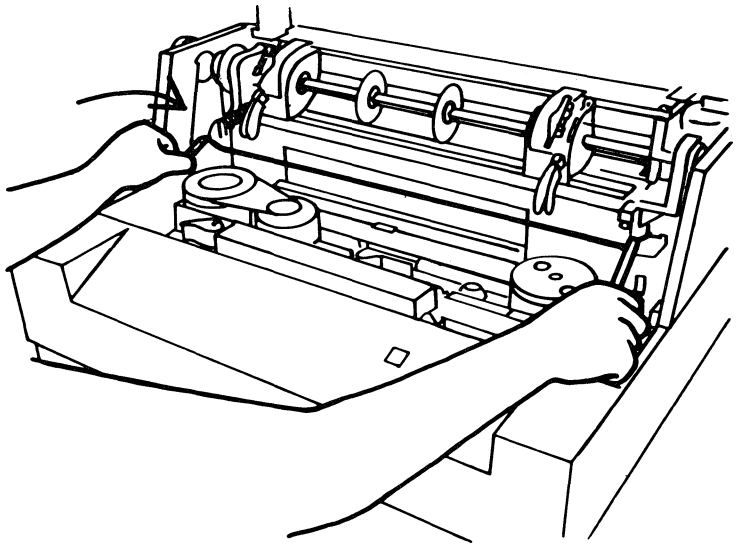
13. Turn the pulley counterclockwise to take up any ribbon slack and to verify that the ribbon is feeding correctly.



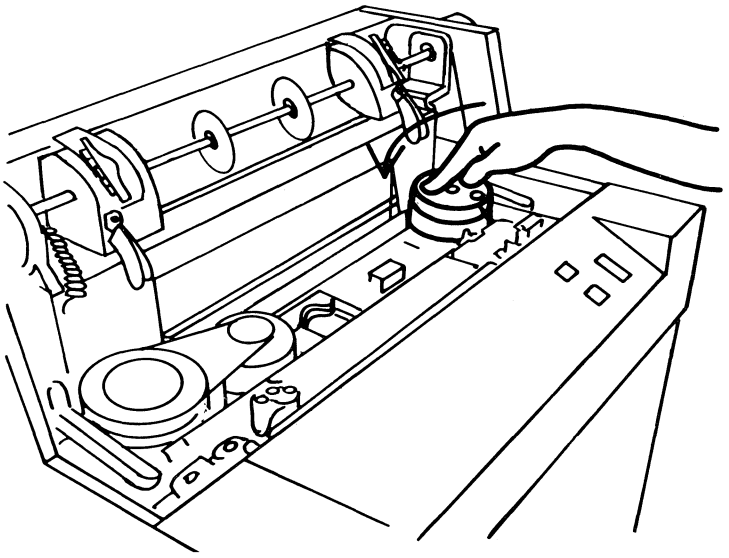
14. Open the print unit.
    - Pull the print-unit release lever towards the front of the cover.



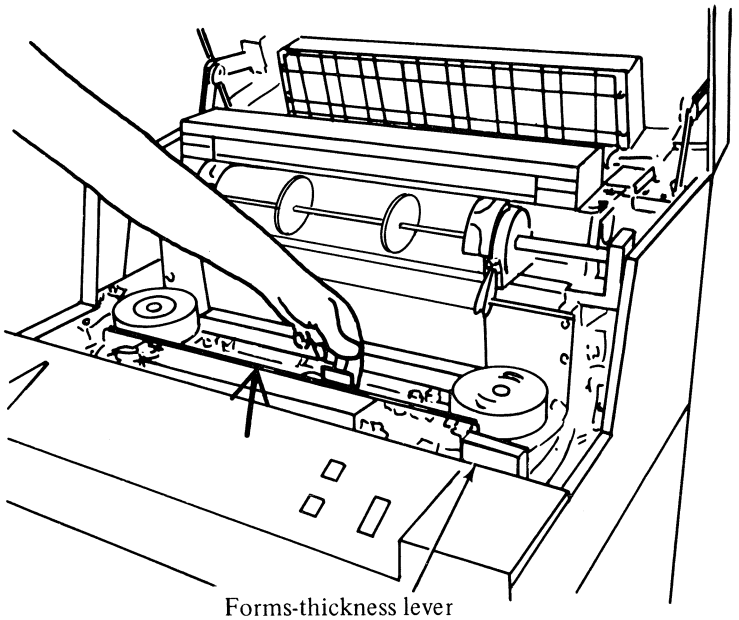
15. Lower the side ribbon guides.
    - Be sure the ribbon drops in front of the plastic ribbon shields.



16. Turn the pulley to verify smooth ribbon movement.

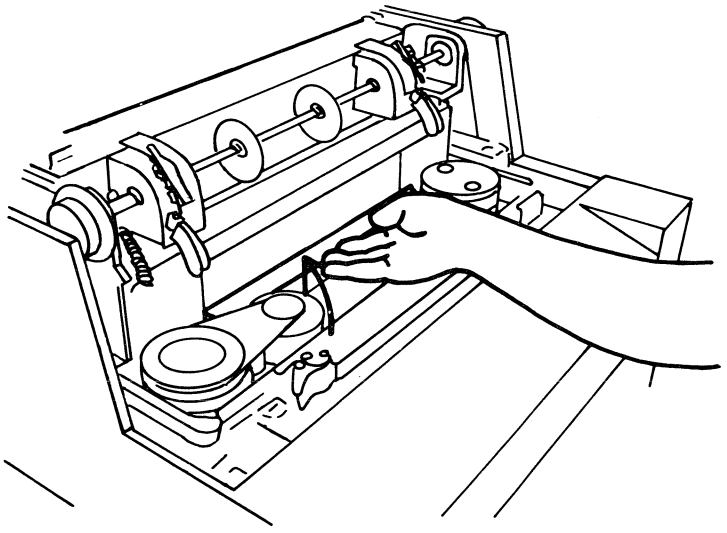


17. Close the print unit.
    - Lift the print-unit release lever until the print unit locks in place.

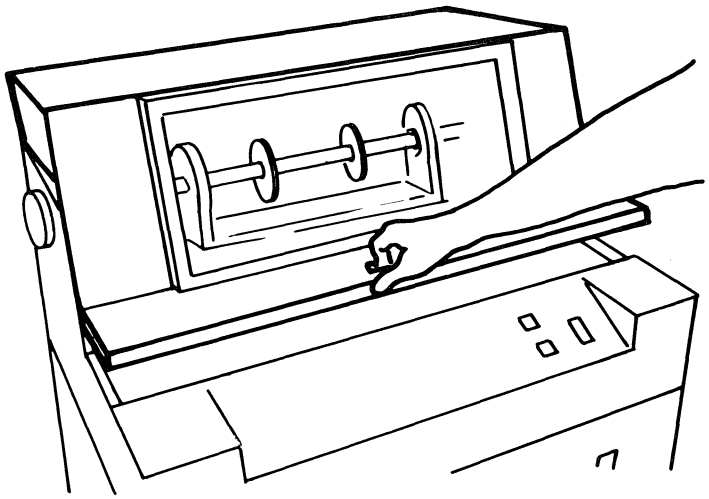


Forms-thickness lever

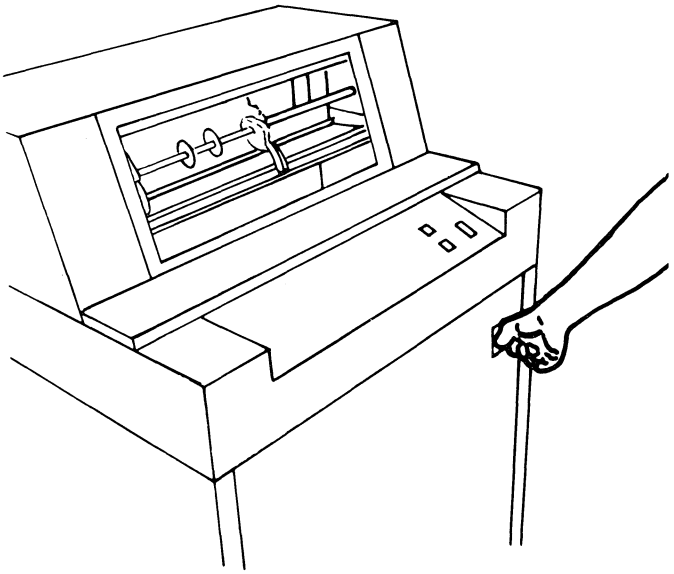
18. Close the top ribbon guide.



19. Close the printer cover.



20. Turn on the printer power.

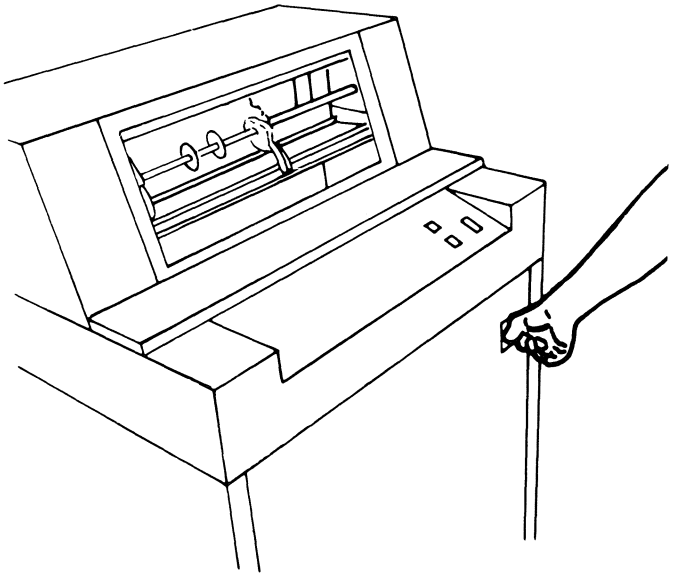


End of procedure.

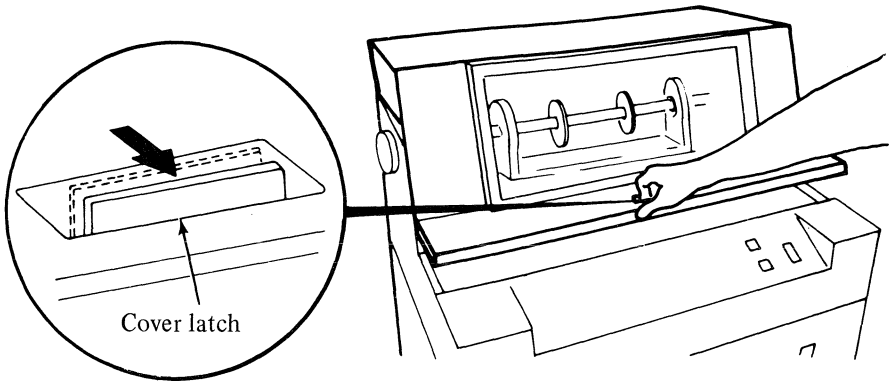
4973 Model 2—Replacing Print Belt

To replace the print belt on the 4973 Model 2 Line Printer, use the following procedure.

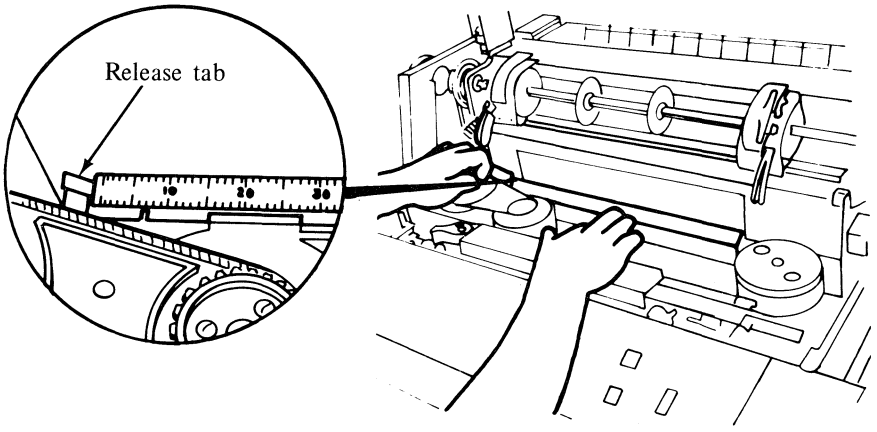
1. Turn off the printer power.



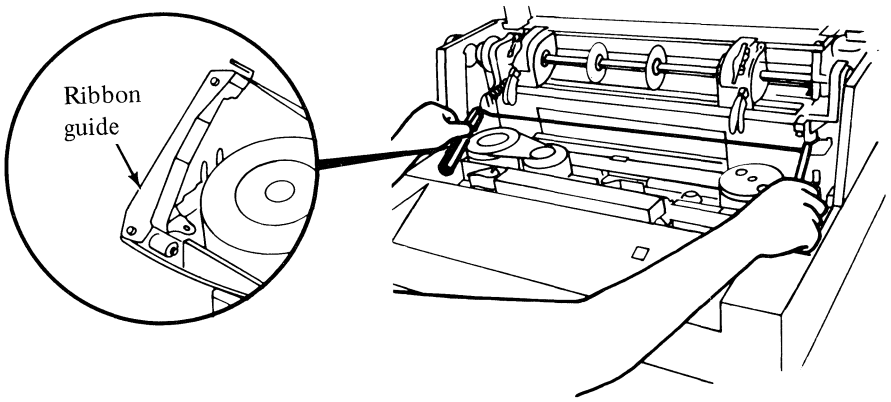
2. Open the printer cover.
   - Place your fingers behind the latch and move the latch towards the front of the printer. Then lift the cover.



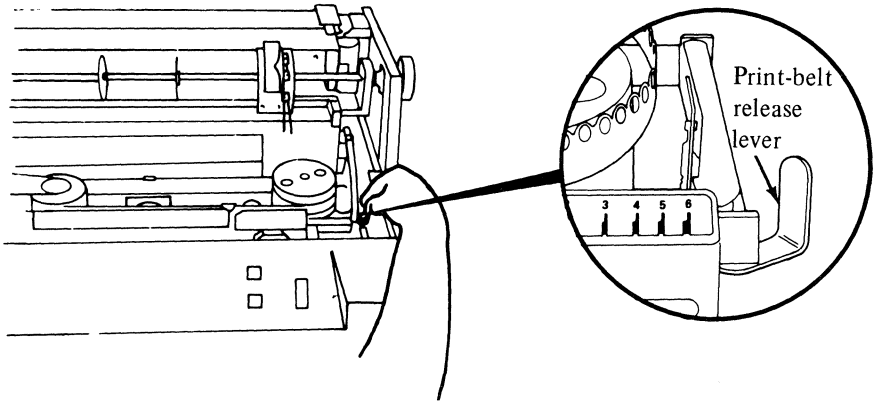
3. Open the top ribbon guide.
   - Press the release tab (located on the left side of the guide) and open the guide towards the front of the printer.



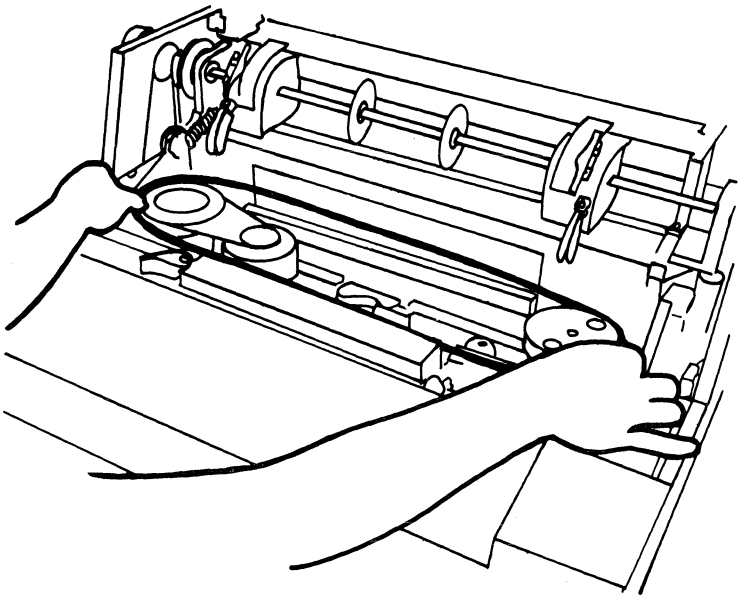
4. Lift the side ribbon guides.



5. Pull the print-belt release lever towards the front of the printer.

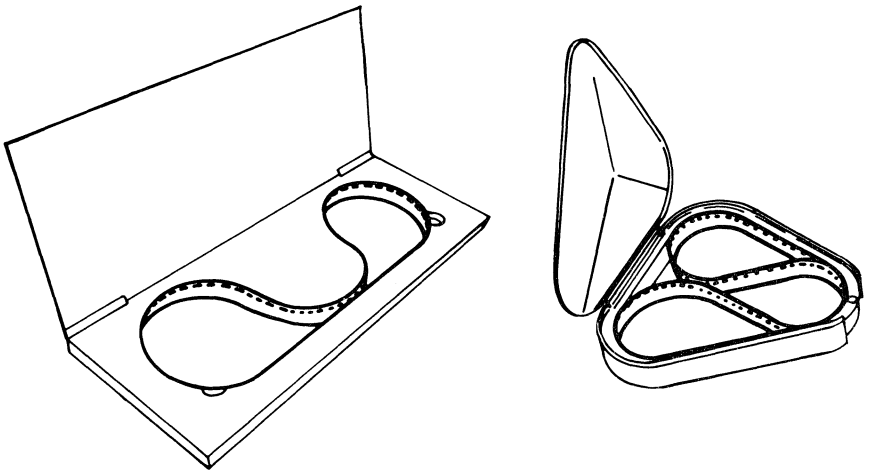


6. Remove the print belt.
   - Lift both sides of the belt at the same time.
   - Place belt in its container.

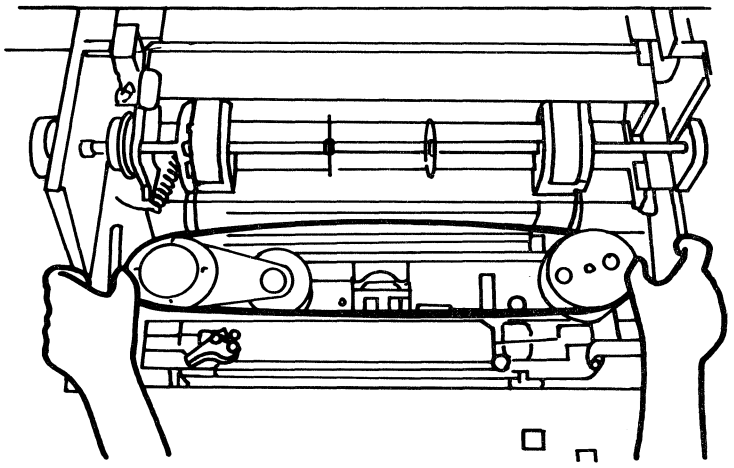


7. Obtain a new print belt.

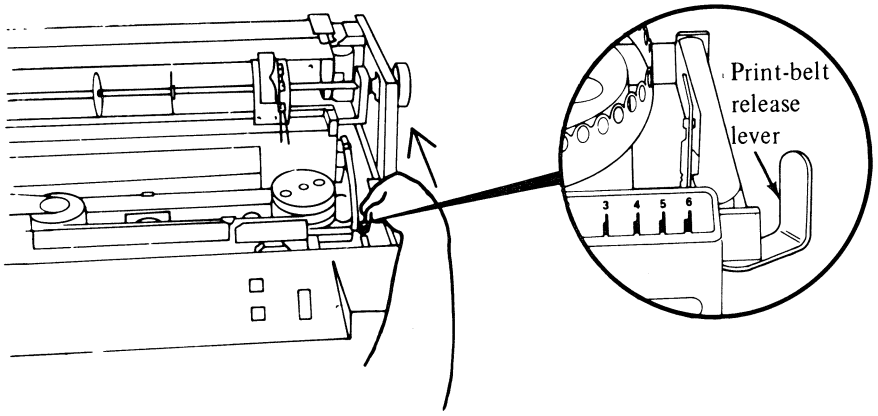
   Note: The new print belt could be packaged in either of the ways shown.



8. Install the new print belt.
   - Hold the print belt with the print type up and place the belt around the pulleys.
   - Position the belt about halfway down the pulleys.

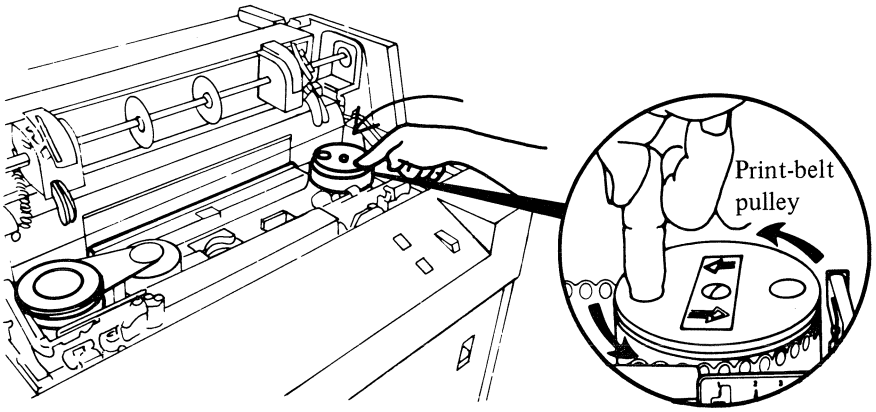


9. Push the print-belt release lever towards the rear of the machine.

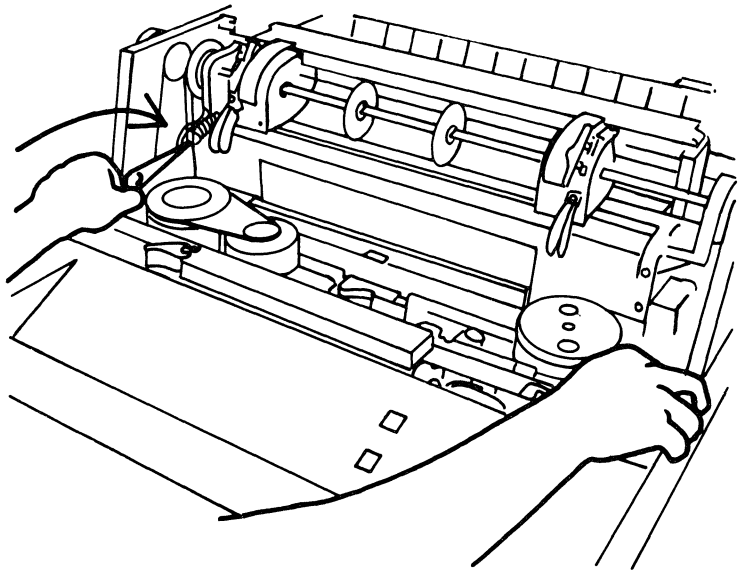


10. Turn the print-belt pulley counterclockwise.
    - The belt should move downward on the pulley.

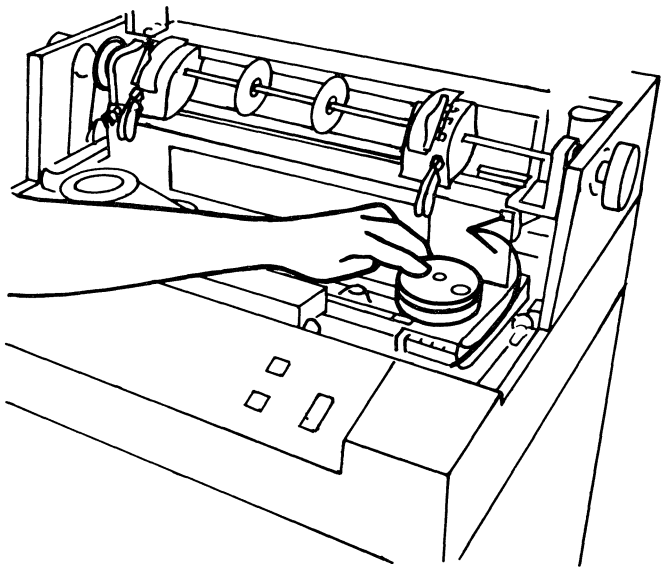
      Note: If the belt does not move down on the pulley, there is interference below the belt or the belt is positioned incorrectly. Therefore, do the following:
    - Remove the belt.
    - Check the belt path for interference.
    - Correct the problem.
    - Reinstall the belt (repeat steps 8 through 10).



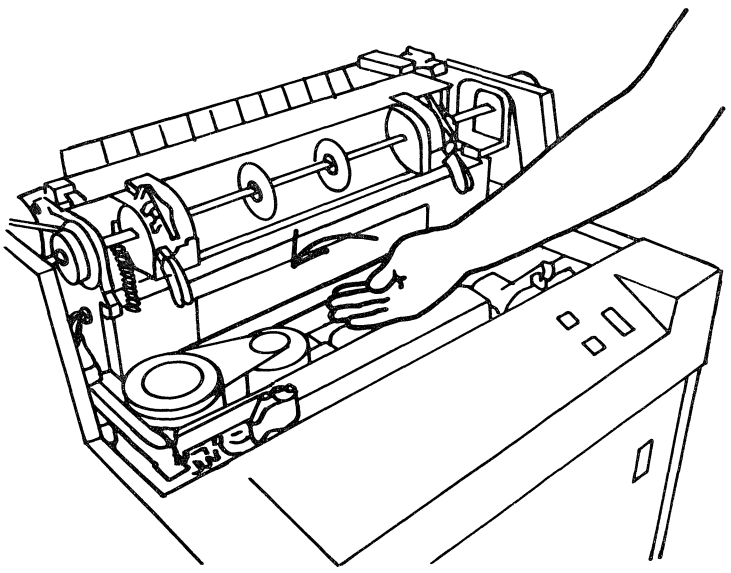
11. Lower the ribbon guides.



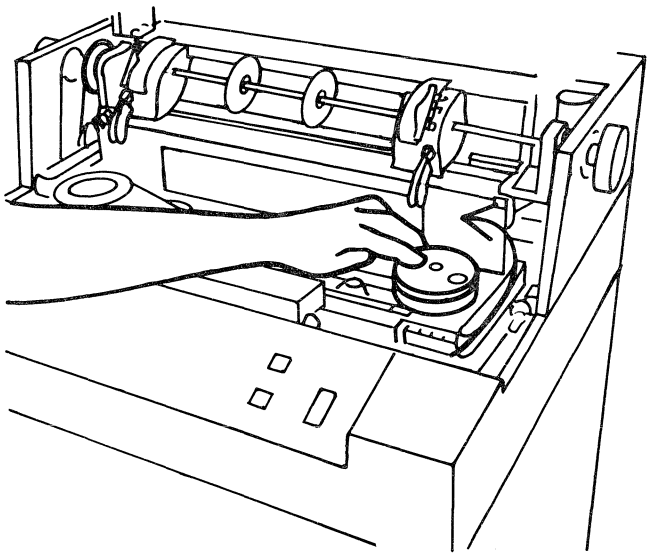
12. Turn the pulley counterclockwise to properly place the ribbon.



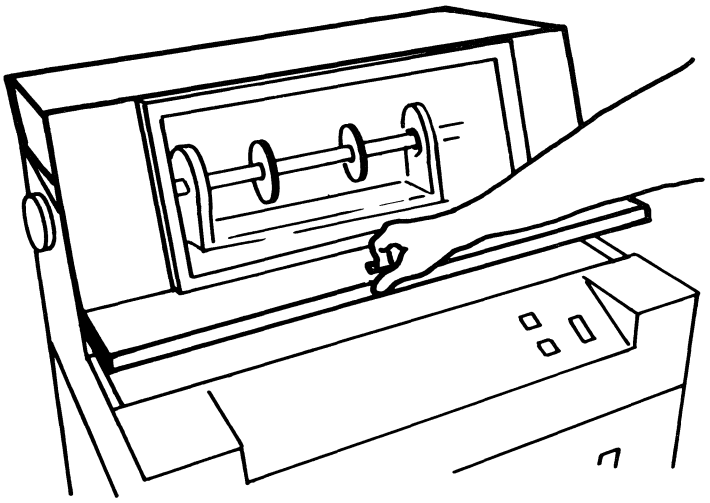
13. Close the top ribbon guide.



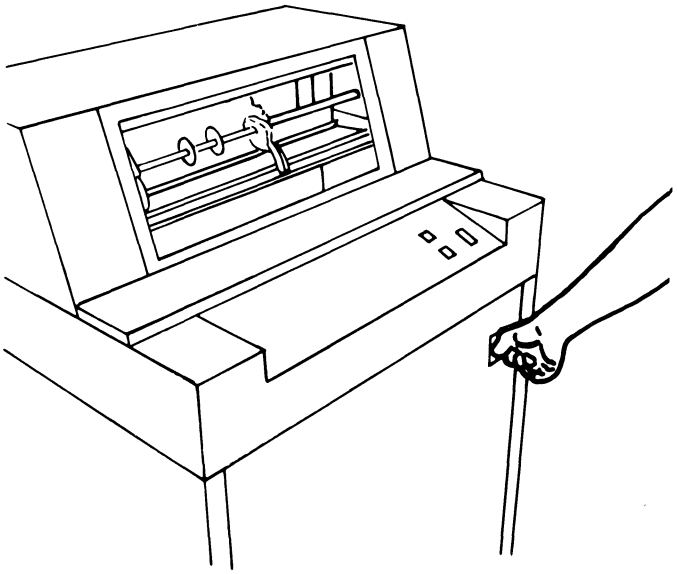
14. Turn the pulley to make sure that the print ribbon and print belt are moving smoothly.



15. Close the printer cover.



16. Turn on the printer power.



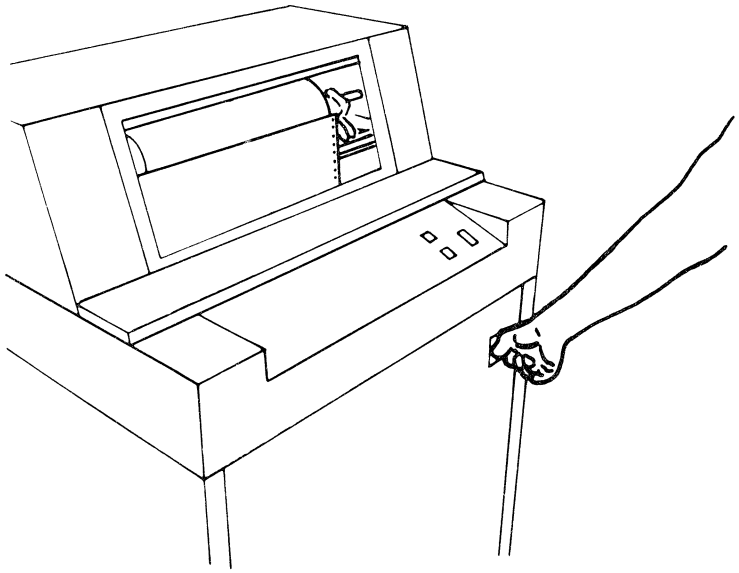
End of procedure.

4973 Models 1 and 2—Aligning Forms to First Print Line

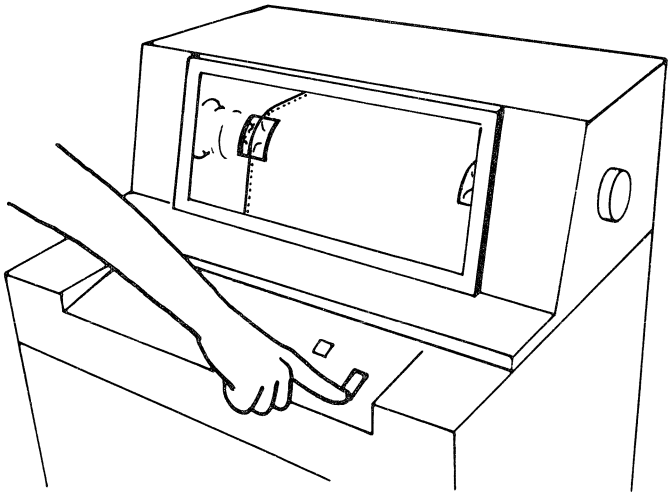
To align forms to the first print line, use the following procedure.

Note: Processor power must be on.

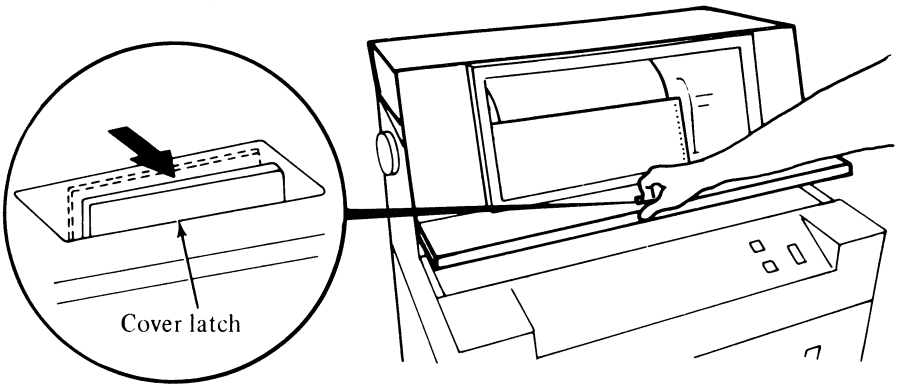
1. Turn on the printer power.



2. Place the Enable/Disable switch in the Disable position.



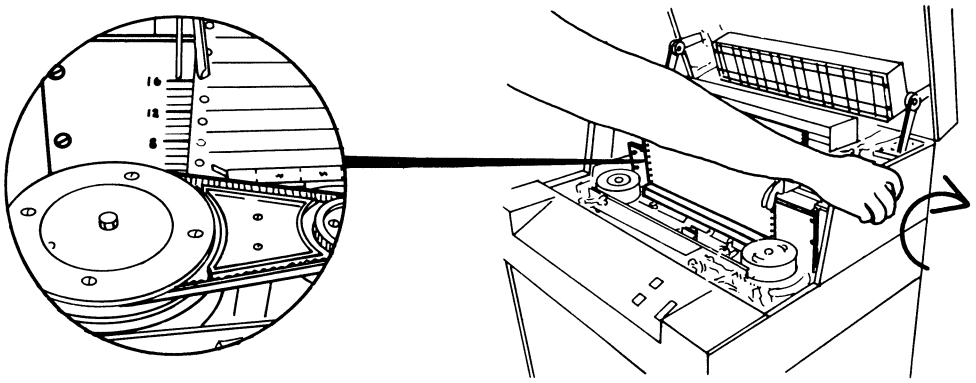
3. Open the printer cover.
   - Place your fingers behind the latch and move the latch towards the front of the printer. Then lift the cover.



4. Turn the forms-advance knob to align the perforation with the desired number on the print-line indicator.

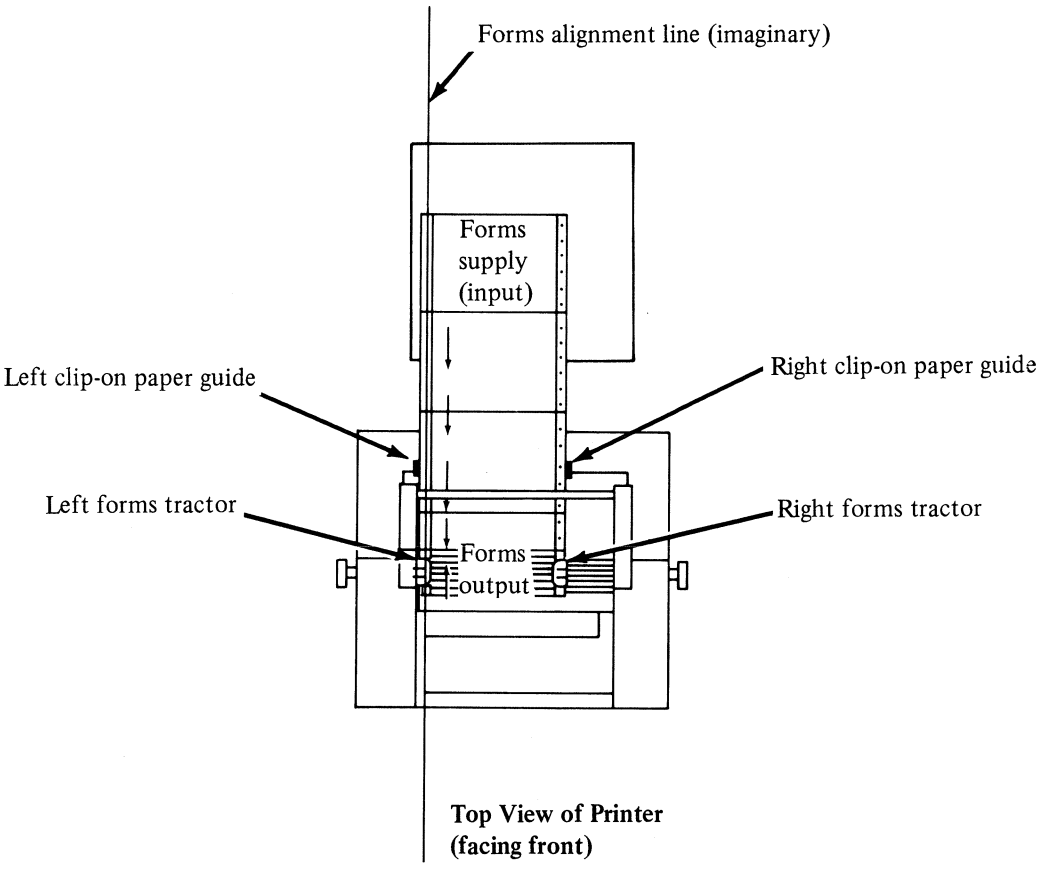
   Example

   If the fourth line below the perforation is the desired first print line, align the perforation to 4 on the print-line indicator.

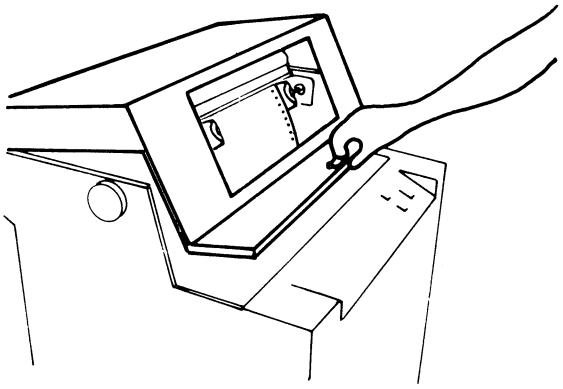


5. When forms are loaded and aligned for the first print position, align the forms feeding into the printer with the forms feeding from the printer by positioning the left and right clip-on paper guides located on the forms guide rack rod as shown.

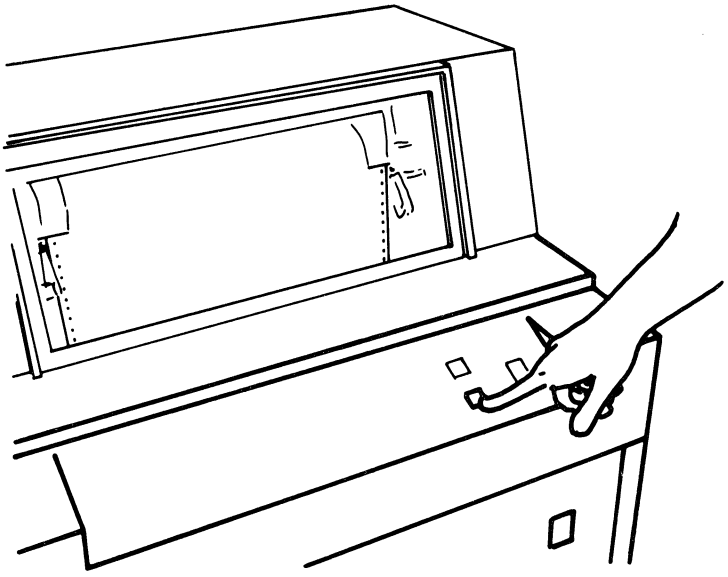
   To prevent uphill, downhill, or wavy printing, and to ensure proper forms feeding, position the forms supply (stack or box) so that forms feeding into the printer will follow the (imaginary) forms alignment line shown.



6. Close the Printer cover.

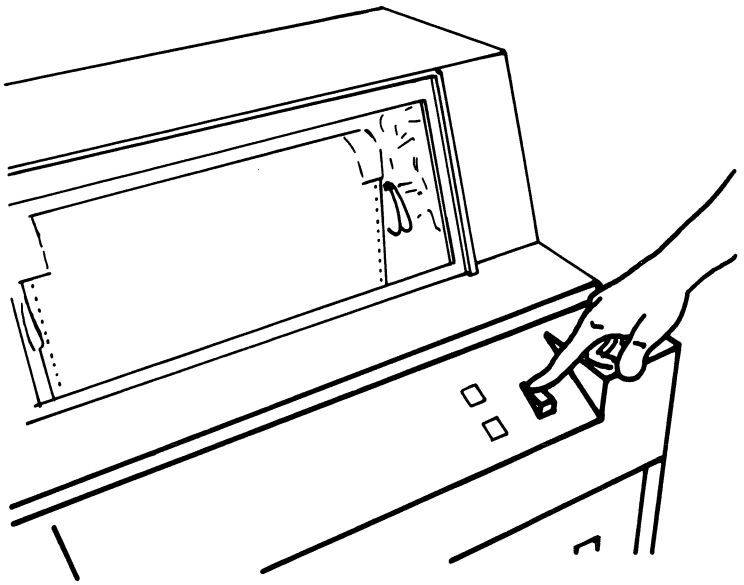


7. Press the Restore switch.



8. Place the Enable/Disable switch in the Enable position.

   Note: Forms parameters could be software dependent. If you experience difficulty in aligning the forms to the first print line, check with your system programmer.



End of procedure.

IBM 4974 Printer

The 4974 Printer has the following switches and controls.

- Switches
  - — Power On/Off
  - — Mode
- Controls
  - — Paper-release lever
  - — Paper-advance knob
  - — Horizontal fine-adjustment knob
  - — Copy-control dial
  - — Ribbon feed-roll release knob
  - — Ribbon-advance knob
  - — End of Forms

These switches and controls are shown in Figure 70.

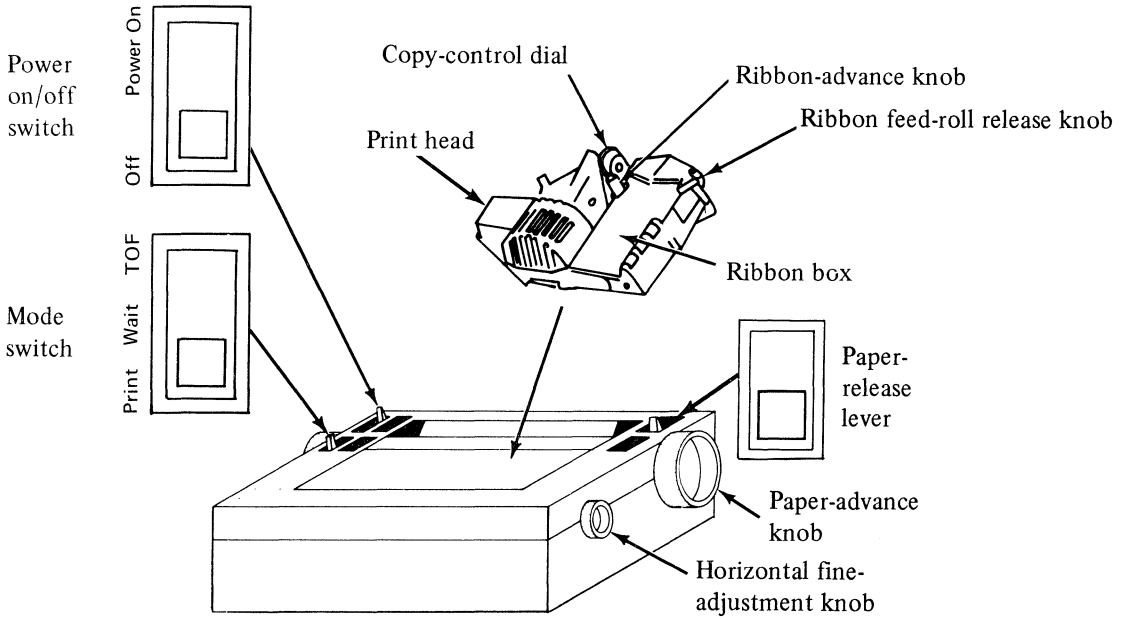
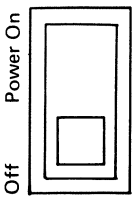


Figure 70. 4974 Printer (Shown With Forms Tractor Removed)

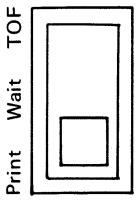
4974—Switches

Power On/Off Switch



Moving the Power On/Off switch to the Power On position applies power to the printer.

Mode Switch



The Mode switch controls the operating mode of the printer. The Mode switch has three positions:

- Print
- Wait
- TOF (top of forms)

Print—Placing the Mode switch in the Print position allows the printer to perform the commands sent from the processor. The Print position is used for normal operation.

Wait—Placing the Mode switch in the Wait position:

- Prevents the printer from accepting processor commands
- Allows the operator to manually align the forms

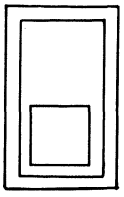
If a command is being executed when the Mode switch is moved to the Wait position, the printer will finish executing that command.

TOF—Placing the Mode switch in the TOF position:

- Prevents the printer from accepting processor commands
- Causes the printer to logically position the forms to line one, regardless of manual forms movement. This allows the operator to manually align the forms to the top-of-forms position.

4974—Controls

Paper-Release Lever



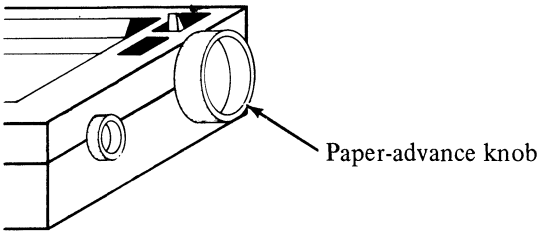
Moving the paper-release lever to the LOAD position releases the pressure rolls from the platen to aid in:

- Forms insertion
- Forms removal

Moving the paper-release lever to the PRINT position permits:

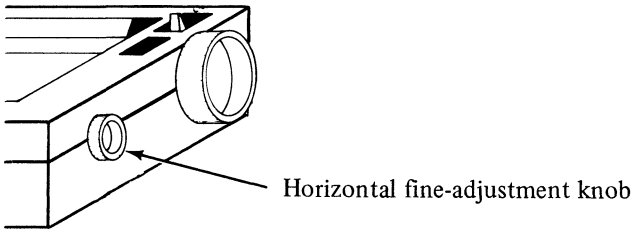
- Forms tractor unit installation
- End-of-forms switch operation

Paper-Advance Knob



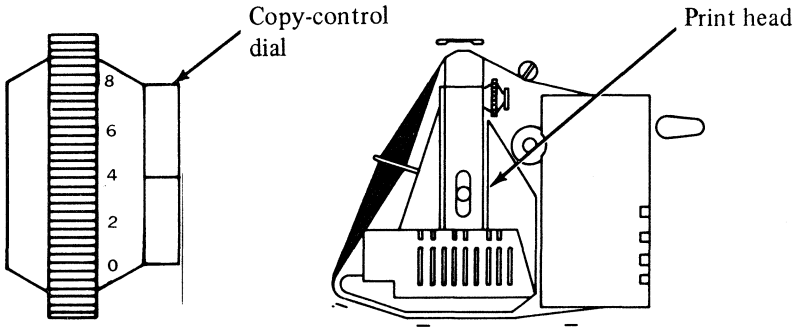
Turning the paper-advance knob moves the forms vertically.

Horizontal Fine-Adjustment Knob



Turning the horizontal fine-adjustment knob moves the print head horizontally for alignment to the forms.

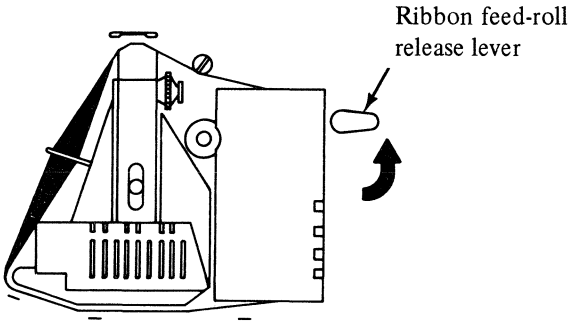
Copy-Control Dial



Turning the copy-control dial adjusts the distance between the print head and the platen.

- For one-part forms, set the dial to zero.
- For multipart forms, move the dial towards 8 until:
  - — The printing on the last part is legible, and
  - — The printing on the first part is free of ribbon smudging.

Ribbon Feed-Roll Release Knob



Turning the ribbon feed-roll release knob to the right provides clearance between the feed roll and ribbon for installing or removing the ribbon.

End-of-Forms Switch

The end-of-forms switch is effective when the paper-release lever is in the PRINT position.

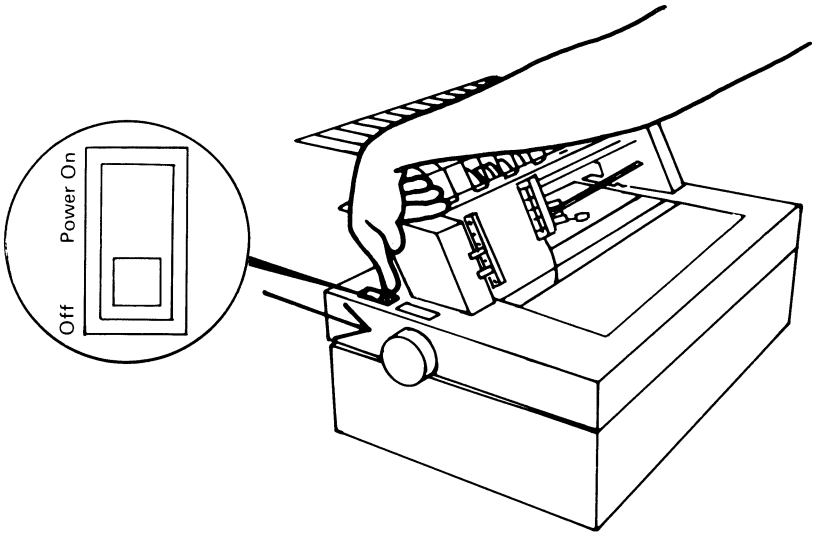
The end-of-forms switch (not shown) signals the processor that the end of the forms is from 25.4 to 76.2 mm (1 to 3 in.) from the line being printed.

4974—Replacing Ribbon

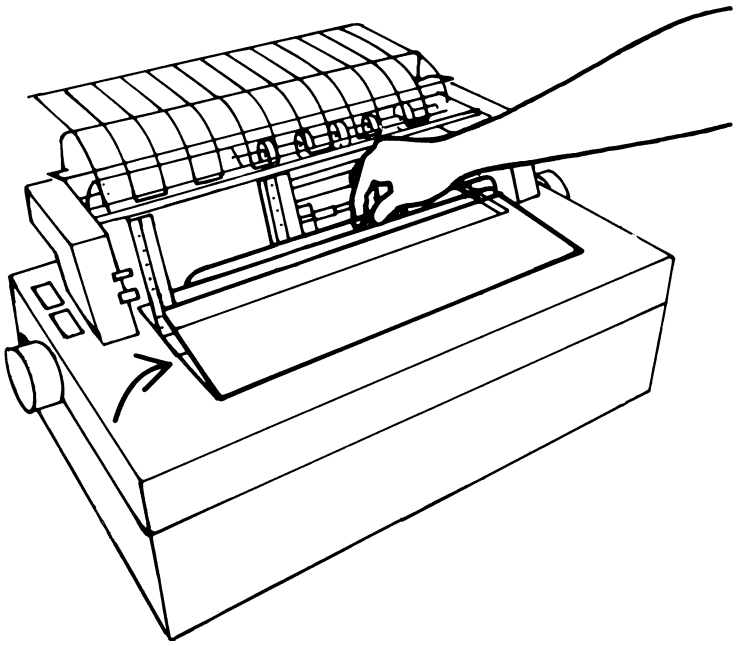
To replace the ribbon in the 4974 Printer, use the following procedure.

Note: Using the plastic gloves provided with the ribbon is recommended when handling the ribbon.

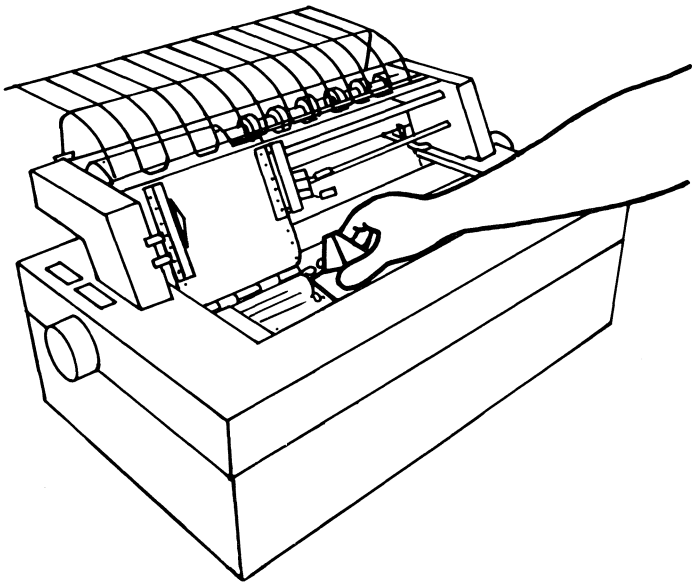
1. Turn off the printer power.



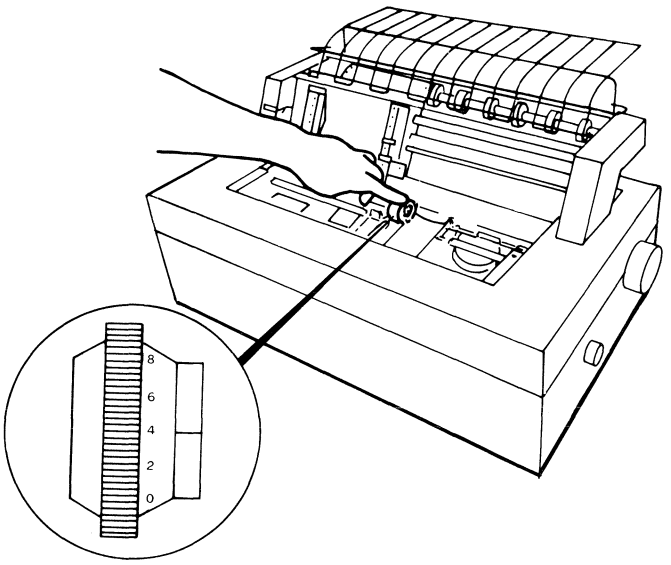
2. Remove the small access cover.
   - Lift the clear plastic edge nearest the paper.
   - Set the cover in a safe place.



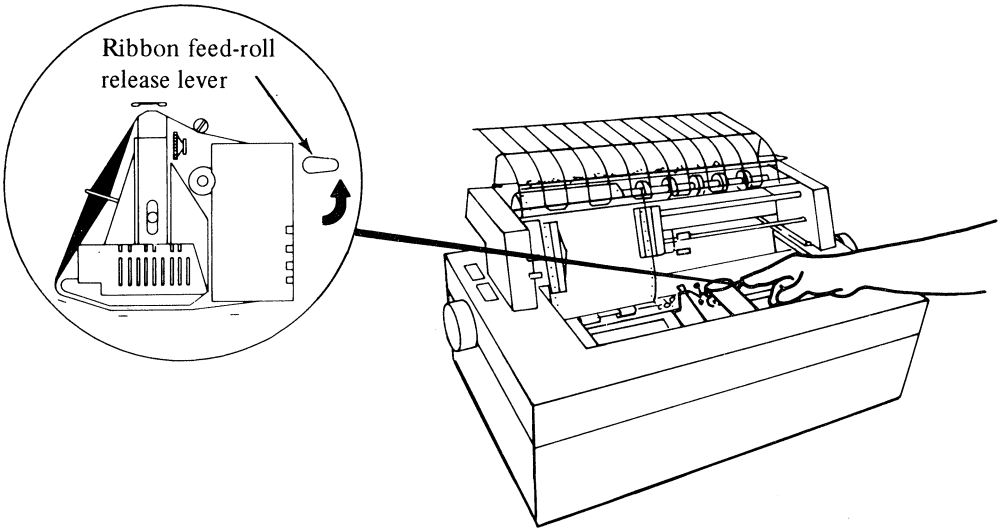
3. Move the Print head to the center of the printer.



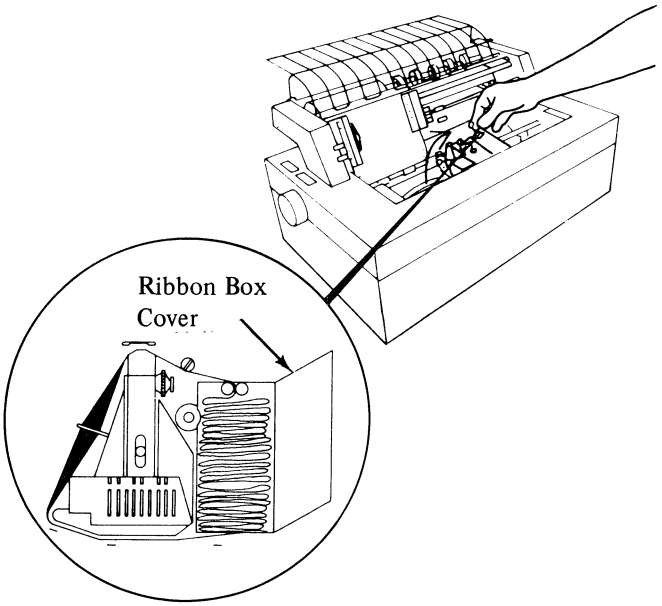
4. Turn the copy-control dial to position 9.
   - Position 9 (positions 1, 3, 5, 7, and 9 are not shown) is the last position when turning the dial towards the front of the printer.



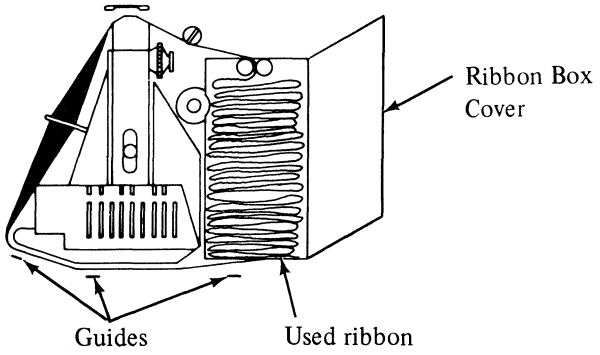
5. Open the ribbon feed rolls.
   - Turn the ribbon feed-roll release knob so it points to the right.



6. Open the ribbon box.
   - Lift the lid.

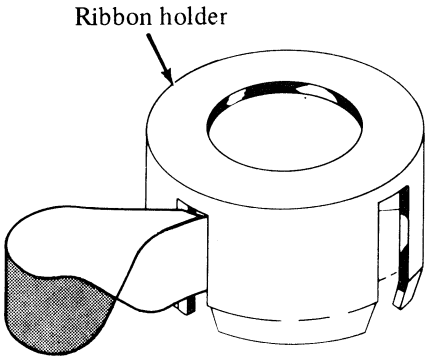


7. Observe how the existing ribbon is installed.
   - Note the threading.

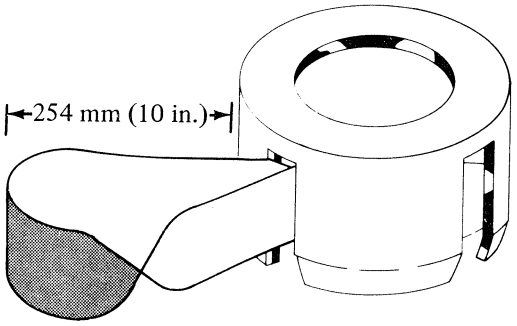


8. Remove the existing ribbon from the ribbon guides and ribbon box.
   - Discard the ribbon.

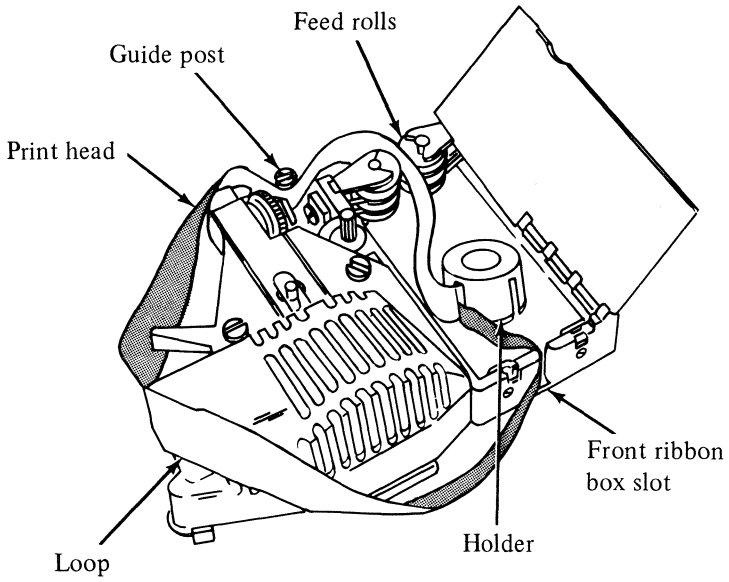
9. Obtain a new ribbon.



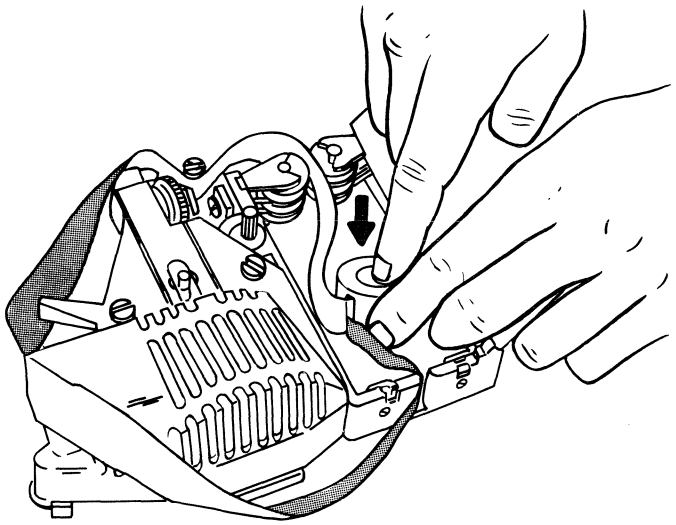
10. Grasp the black plastic ribbon holder and the ribbon firmly with the right hand and squeeze just enough to keep the ribbon from falling out.
    - Gently pull out about 254 mm (10 in.) of ribbon with the left hand.
    - Do *not* attempt to remove the twist in the ribbon.



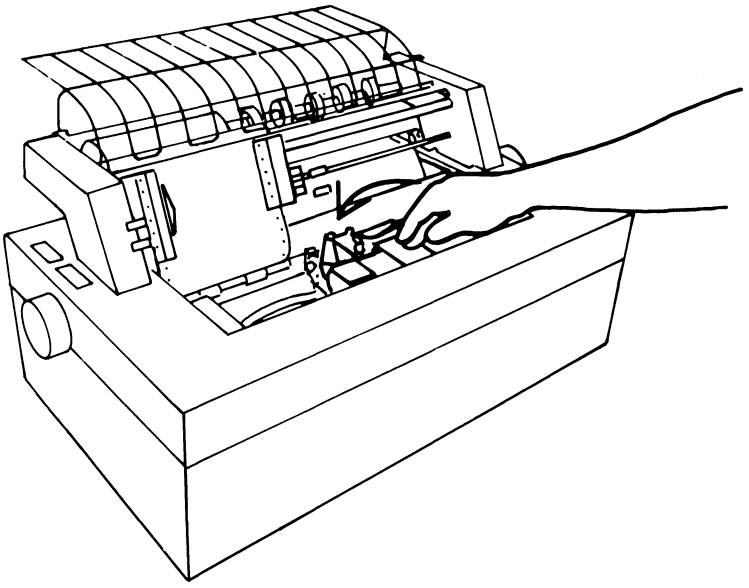
11. Form a loop in the ribbon and lay it across the print head.
    - Place the ribbon in the ribbon box.
    - Thread one end of the ribbon through the feed rolls and on the inside of the guide post.
    - Thread the other end of the ribbon through the front slot in the ribbon box.



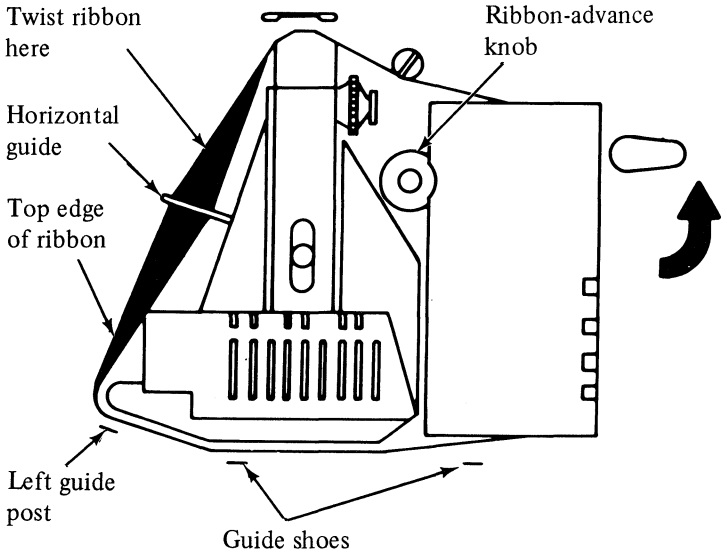
12. Hold the center of the ribbon in place and remove holder by lifting up.



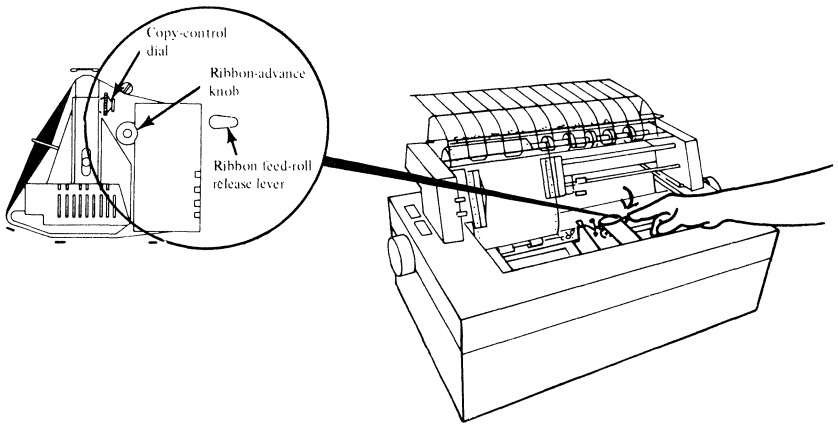
13. Close the ribbon box.



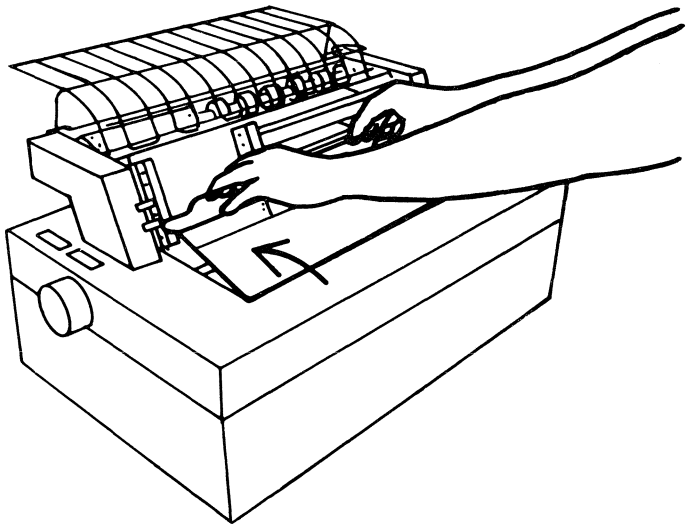
14. Thread the rest of the ribbon loop through the horizontal guide, left guide post, and guide shoes as shown below.
    - Make sure the twist in the ribbon feeds through the horizontal guide as shown.



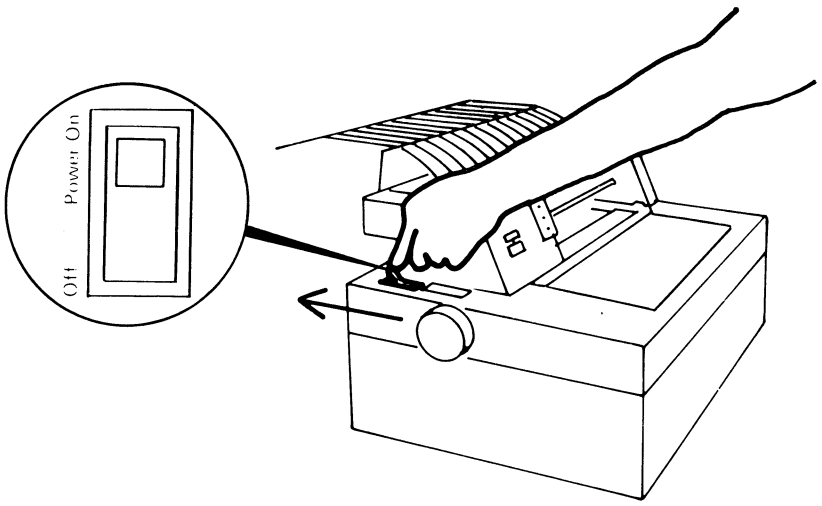
15. Turn the ribbon feed-roll release knob clockwise to close the ribbon feed rolls.
    - Turn the ribbon-advance knob clockwise to remove the slack from the ribbon.
    - Check for proper ribbon feeding by moving the print head back and forth. The ribbon should continuously move clockwise when the print head is moving.
    - Set the copy-control dial to the appropriate number for the best print quality.



16. Replace the small access cover.



17. Turn on the printer power.



End of procedure.

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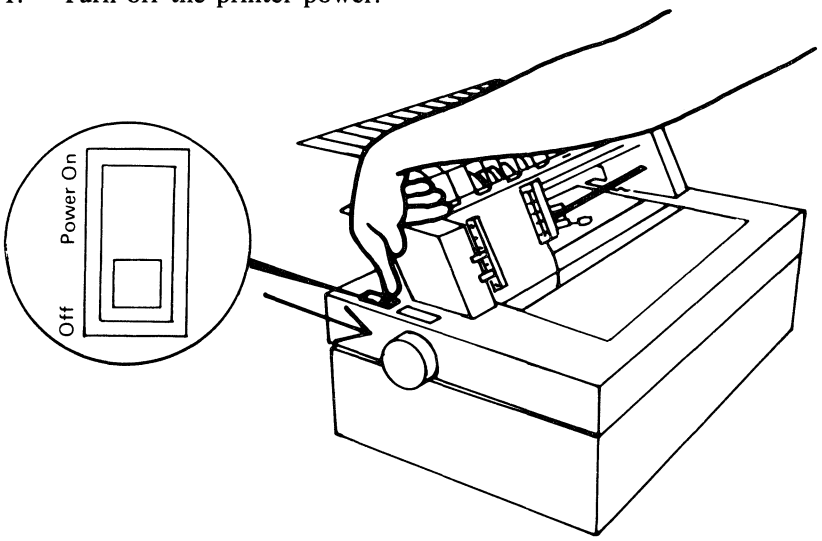
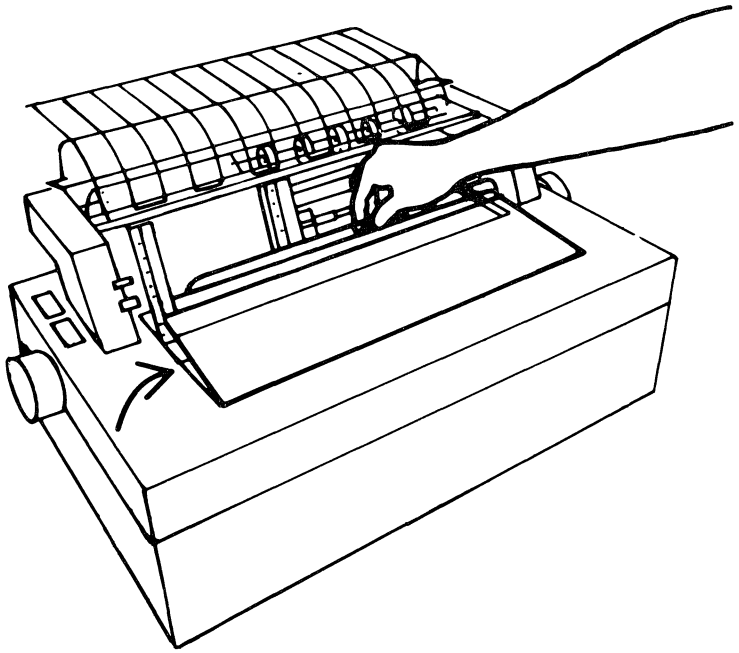
4974—Replacing Ribbon Cartridge

Use the following procedure to remove the ribbon cartridge from the 4974 printer.

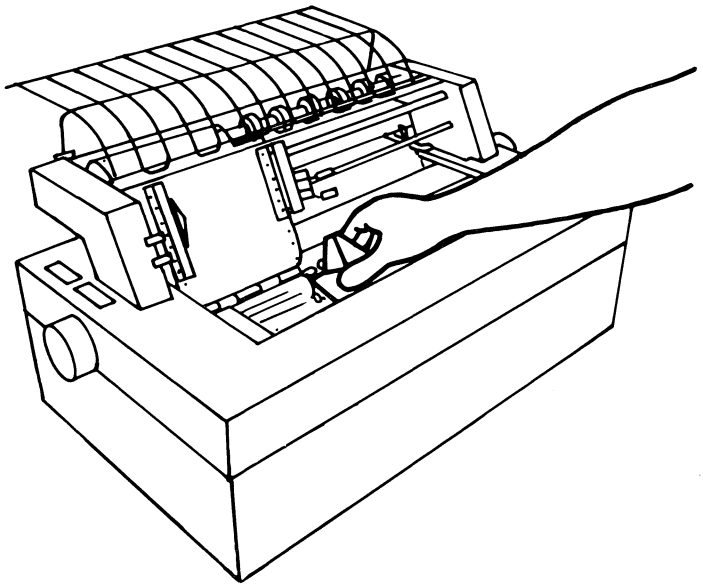
1. Turn off the printer power.



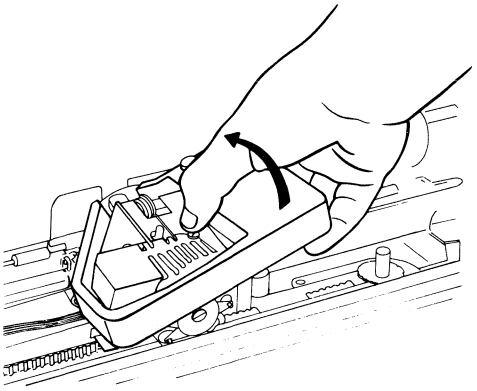
2. Remove the small access cover.
   - Lift the clear plastic edge nearest the paper.
   - Set the cover in a safe place.



3. Move the print head to the center of the printer.



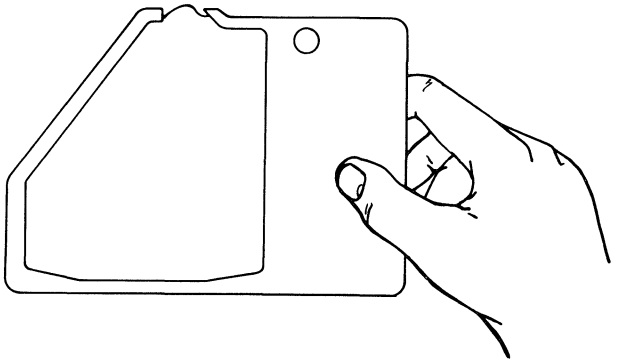
4. Grasp the cartridge as shown, and press your right thumb down on the cover mounting screw while lifting the wide part of the cartridge, until the cartridge releases upward.



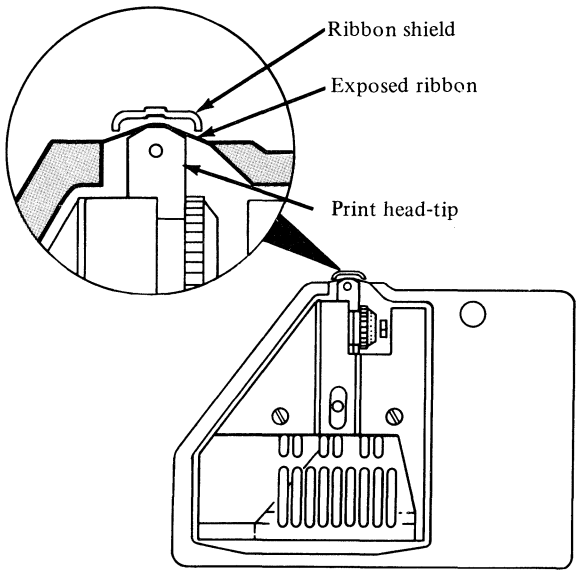
5. Lift the cartridge free of the print head and dispose of the cartridge.

Use the following procedure to install the ribbon cartridge in the 4974 printer.

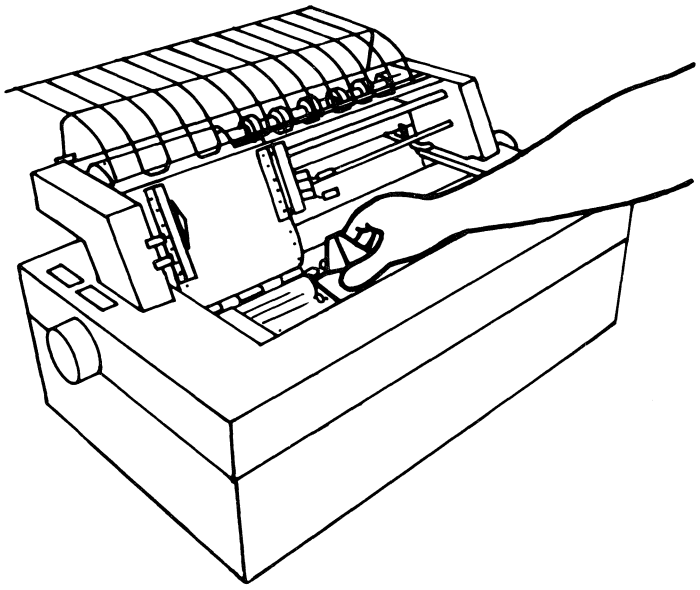
1. Hold the cartridge so that the wide part is to the right, and the (blue) ribbon advance knob is up.



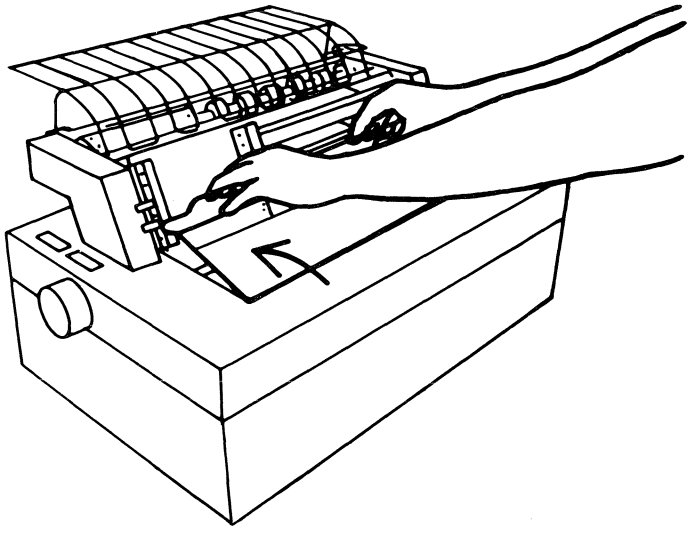
2. Keeping the wide part of the cartridge to the right, guide the exposed ribbon between the print head tip and the ribbon shield; then, lower the cartridge into place around the print head and press down on the cartridge until it firmly seats.



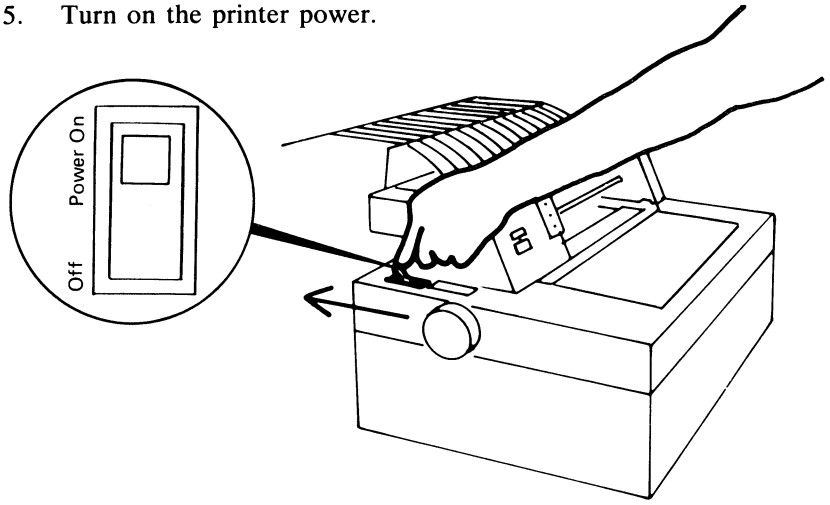
3. Move the print head left and right to ensure proper seating of the cartridge and proper feeding of the ribbon.



4. Replace the small access cover.



5. Turn on the printer power.

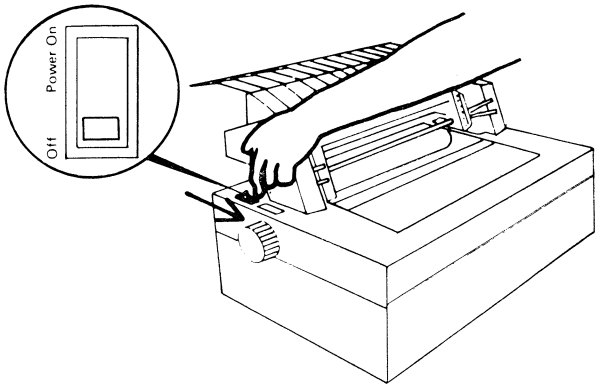


End of procedure.

4974—Using Cut Forms

To load cut forms into the 4974 Printer, use the following procedure.

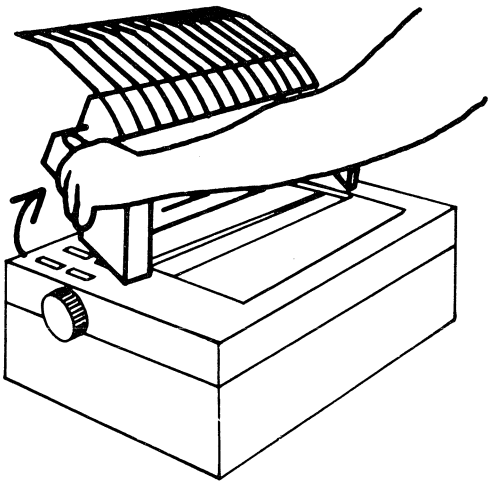
1. Turn off the printer power.



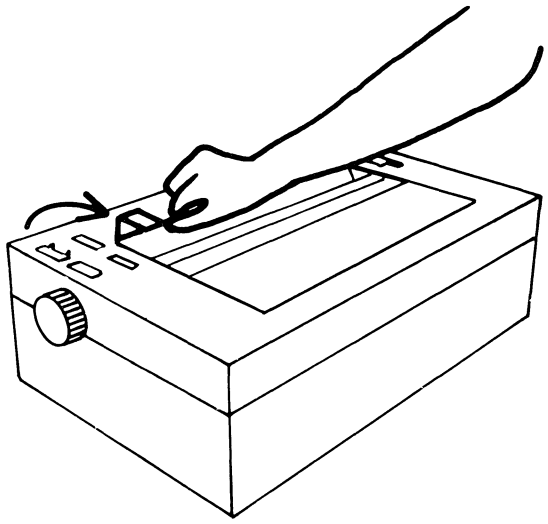
2. Remove the forms-tractor unit.

   Note: Read entire procedure before starting.

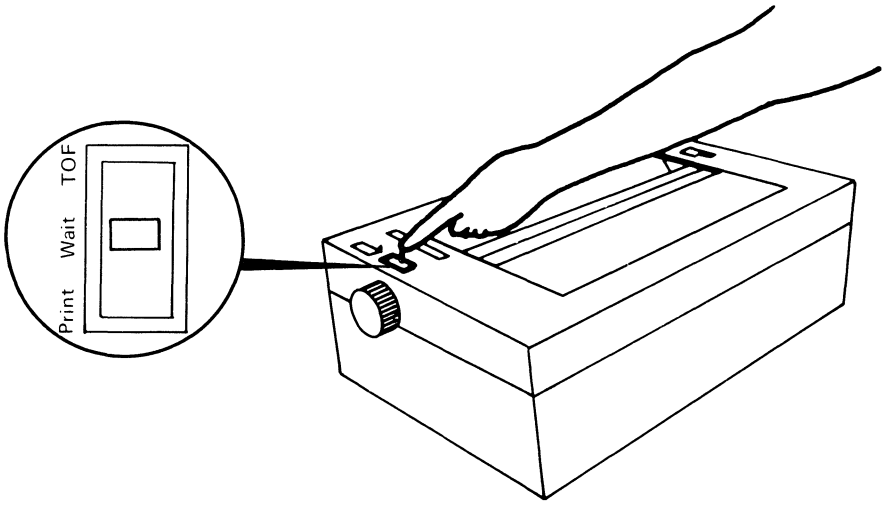
   - Grasp both sides of the forms-tractor unit.
   - Pivot the forms-tractor unit towards the front of the printer until the rear legs release from the retaining pins.
   - Lift the forms-tractor unit off the printer.
   - Set the forms-tractor unit aside in a safe place.



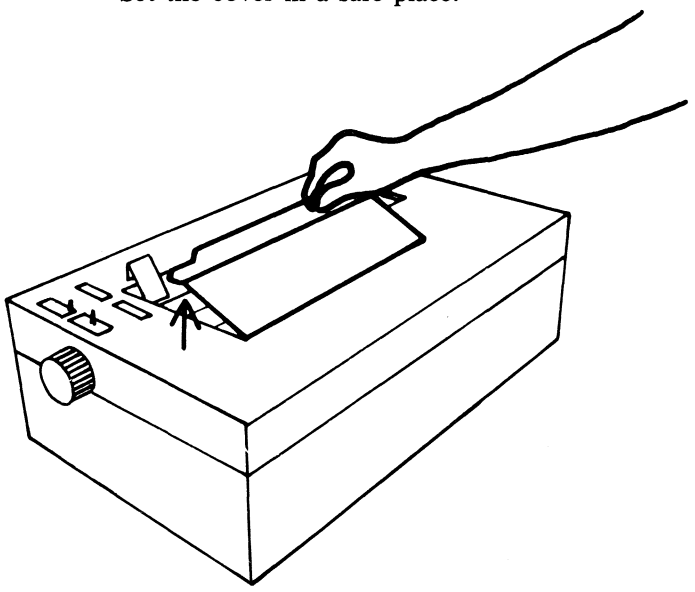
3. Flip the forms guide towards the front of the printer.



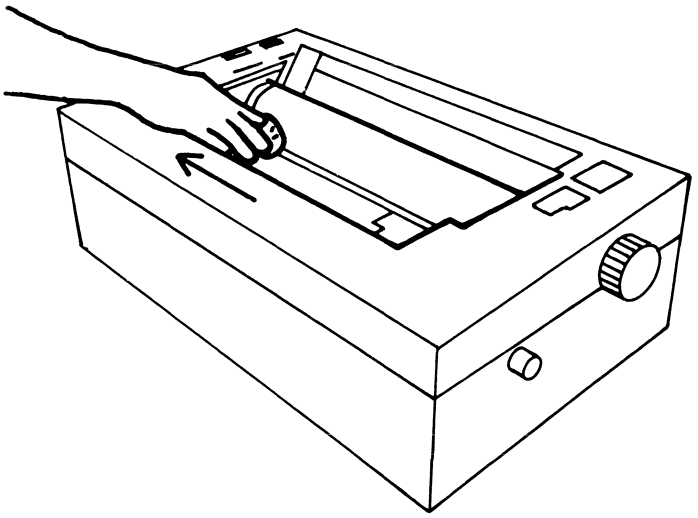
4. Move the Mode switch to the Wait position.



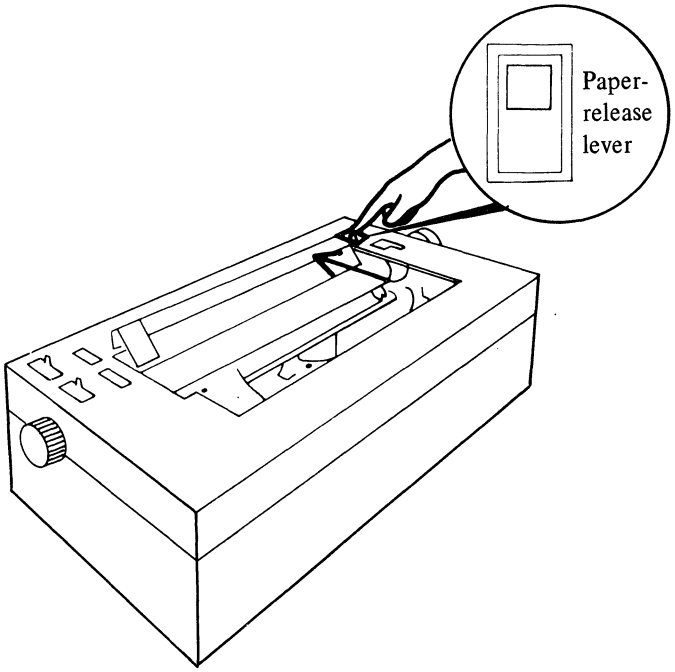
5. Remove the small access cover.
   - Lift the clear plastic edge nearest the paper.
   - Set the cover in a safe place.



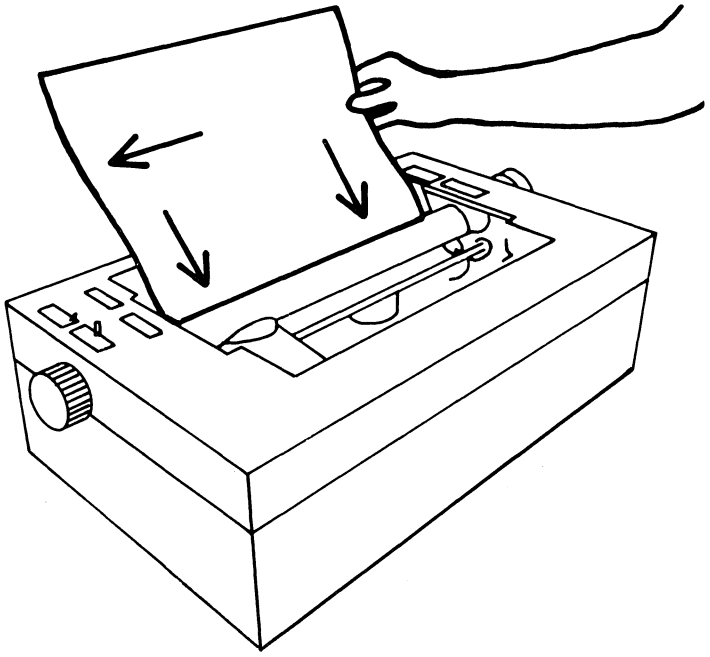
6. Move the print head to the extreme left position.



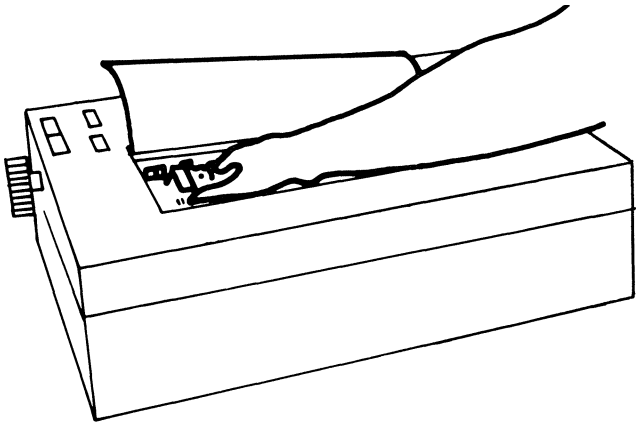
7. Move the paper-release lever to the LOAD position (towards the rear of the printer).



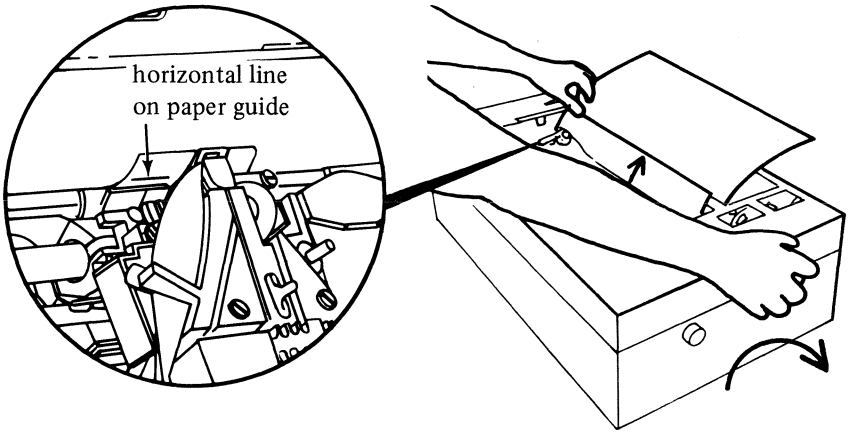
8. Insert cut forms into the printer as follows:
   - Place the cut form against the left cut-forms guide.
   - Push the paper behind the platen until the paper stops.
   - Rotate the paper-advance knob with one hand while maintaining pressure on the cut form with the other hand.



9. Be sure the print head is positioned to the right.

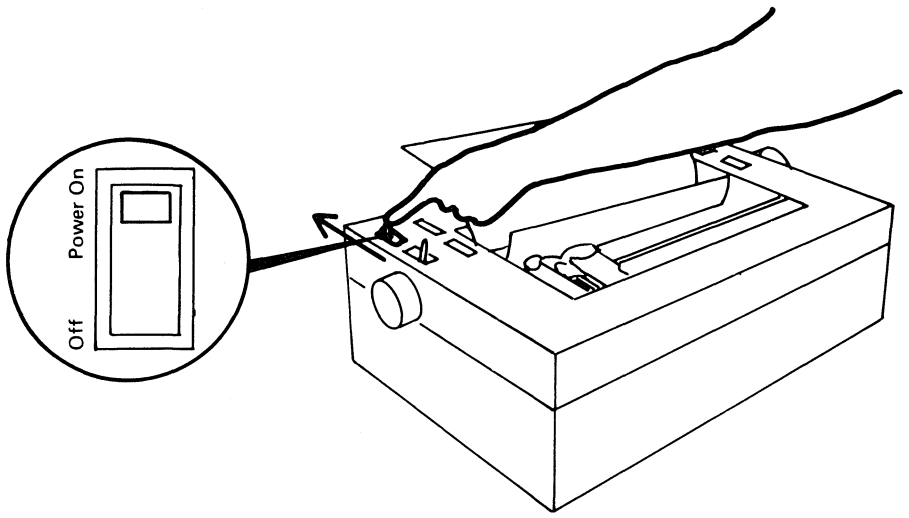


10. Align the first line of print as follows (to be used when lined paper is used):
    - Align the horizontal line on the paper with the horizontal line on the print-head paper guide.

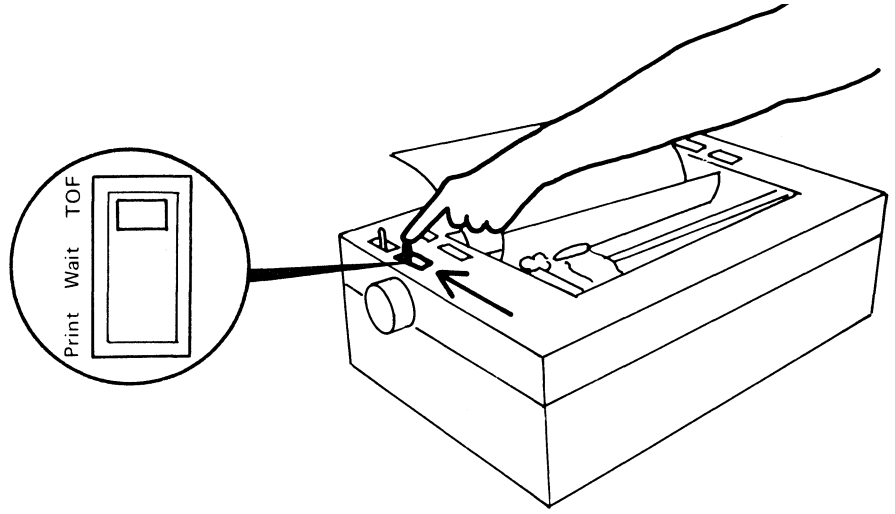


11. Turn on the printer power.

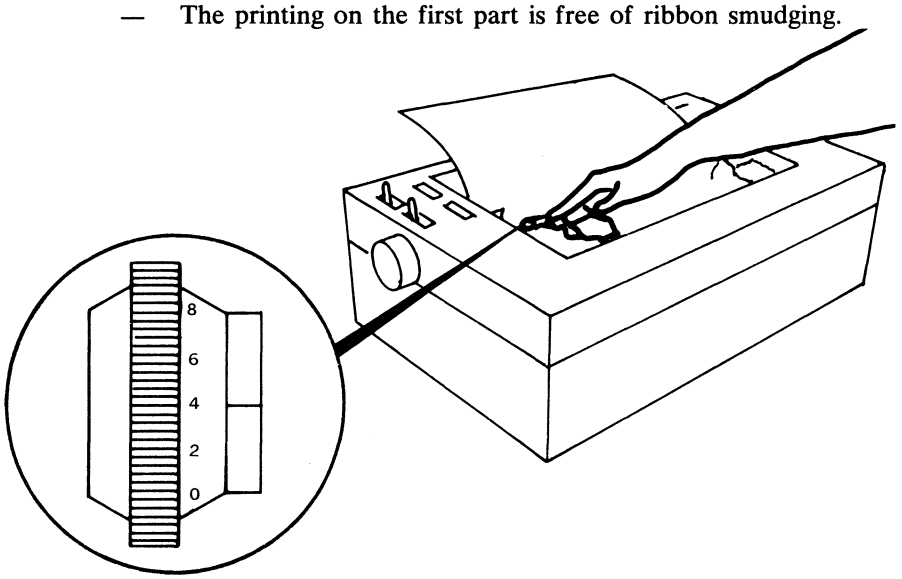
    Note: Be sure the processor power is turned on.



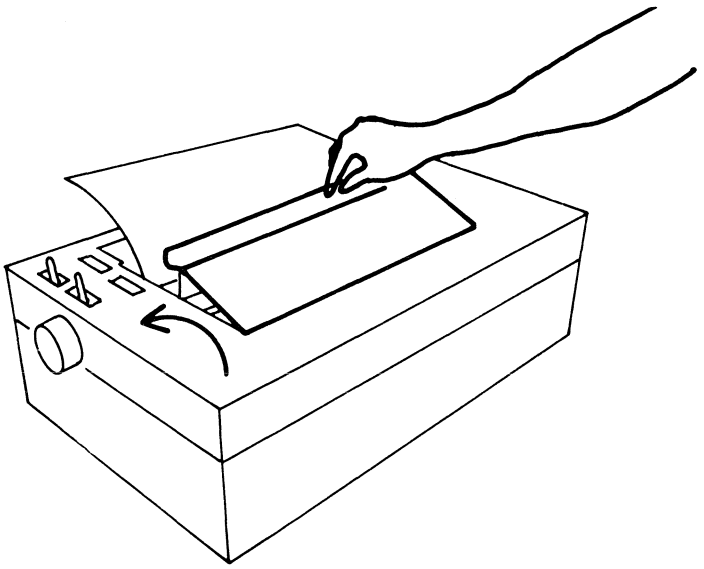
12. Move the Mode switch to the TOF (top of forms) position.



13. Adjust the copy-control dial to accommodate the thickness of the forms you are loading (this dial is located on the print-head assembly).
    - For one-part forms, set the dial to zero.
    - For multi-part forms, move the dial towards 8 until:
        — The printing on the last part is legible, and
        — The printing on the first part is free of ribbon smudging.

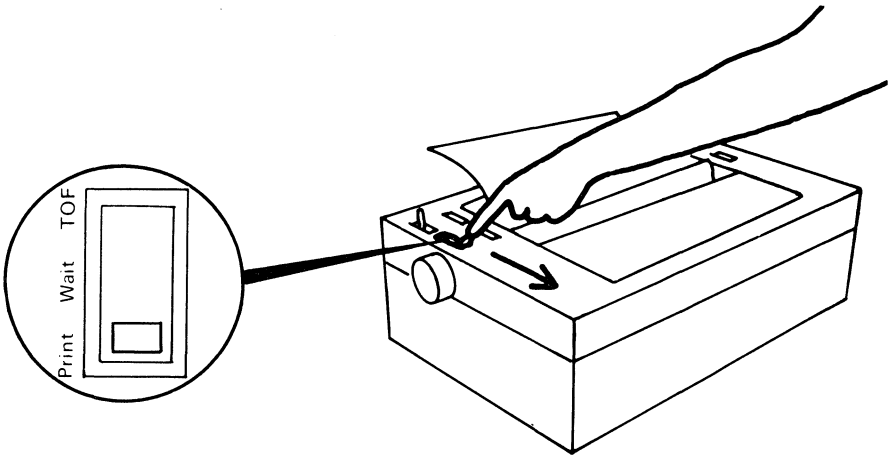


14. Replace the small access cover.



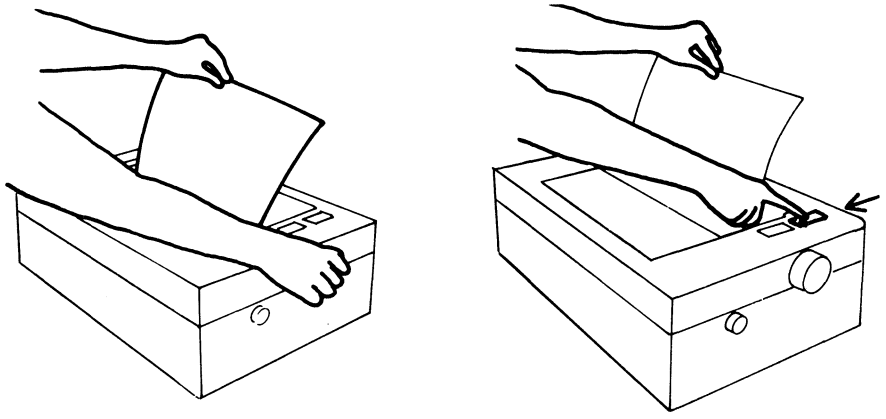
15. Move the Mode switch to the PRINT position.
    - The print head will automatically move to the left position and then begin printing.

      Note: When printing is completed, turn off the printer power.

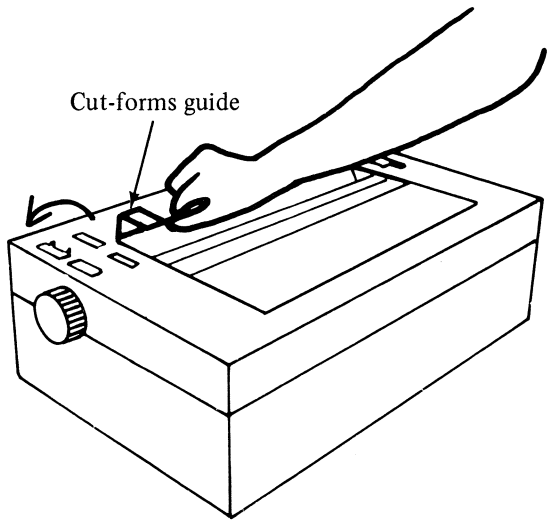


16. To remove the cut forms:
    - Turn the platen and roll the paper out, or
    - Place the paper-release lever in the PRINT position and pull the paper out.

      Note: If additional cut forms are to be used, repeat steps 4–16.

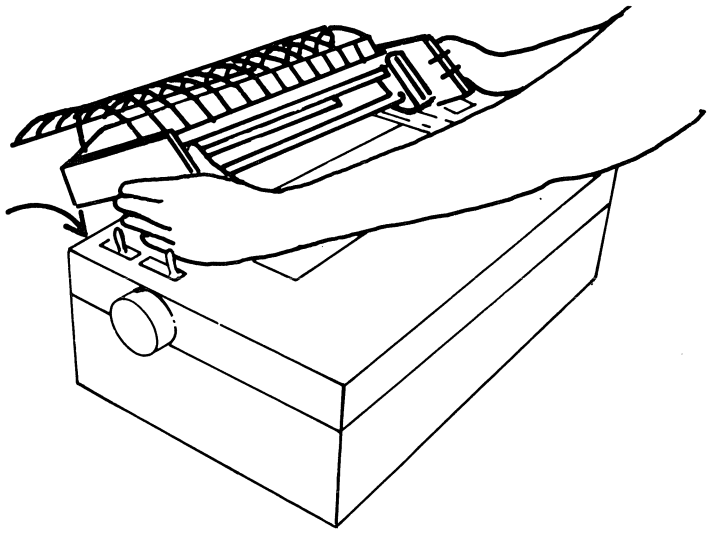


17. Flip the cut-forms guide towards the rear of the printer.



18. Replace the forms-tractor unit on the printer as follows:
    - Position the back legs of the tractor into the back cover slots.
    - Push downward on the back legs until they click into place.
    - Lower the front of the unit into place.

    Note: Check the final placement by verifying that:
    - The paper-advance knobs turn freely, and
    - The tractor pins move.



End of procedure.

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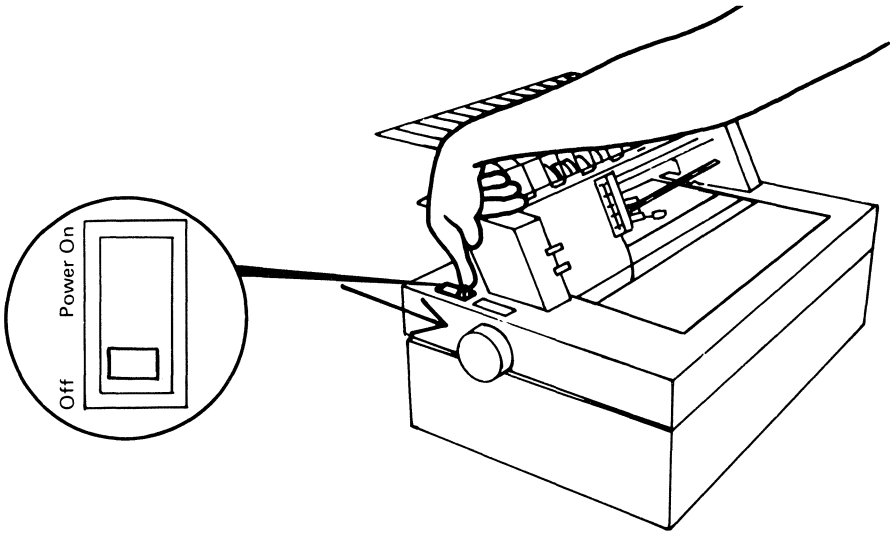
4974—Loading Margin-Punched Forms

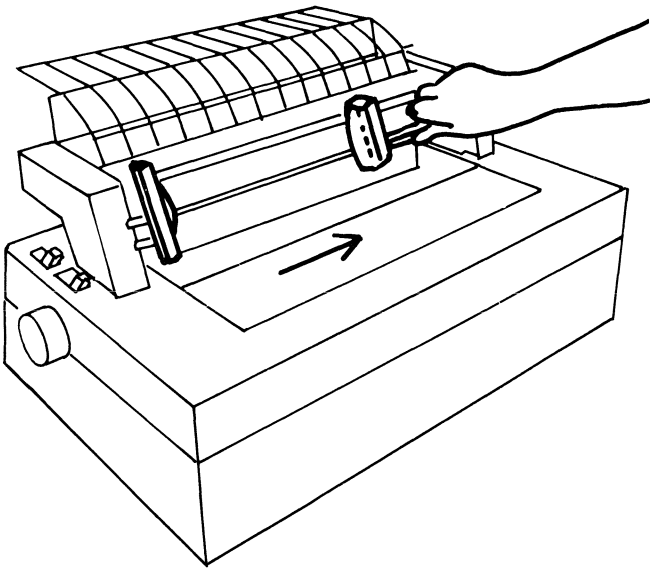
To load margin-punched forms into the 4974 Printer, use the following procedure.

1. Turn off the printer power.

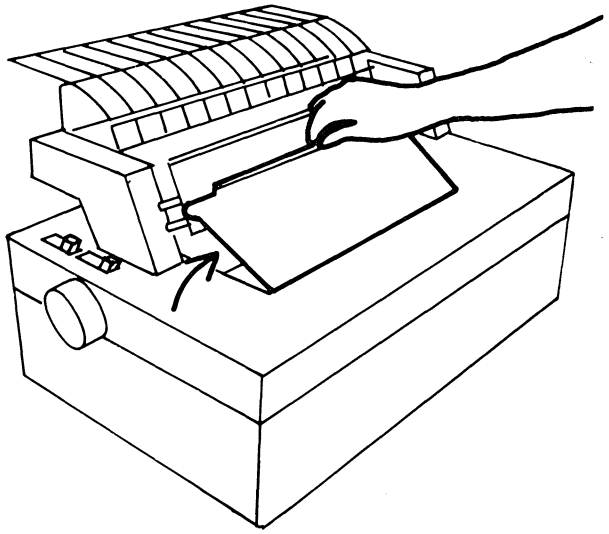
   Note: If forms tractor is not installed, refer to Installing Forms Tractor.



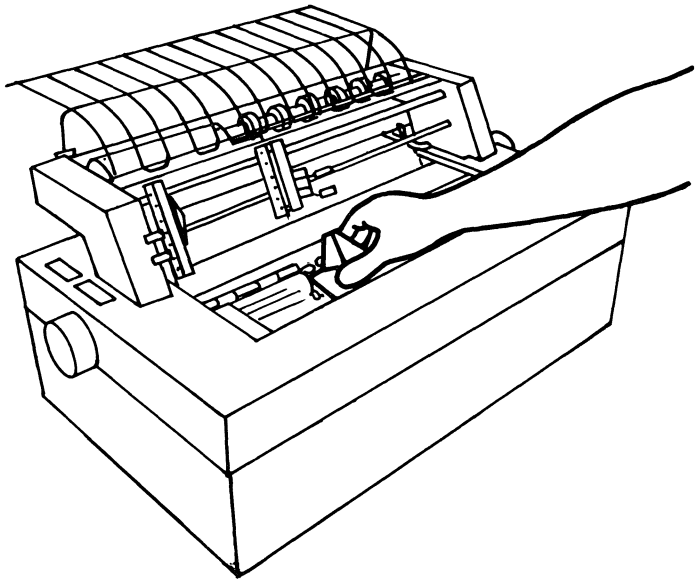
2. Squeeze the right forms-tractor adjusting levers and slide the tractor to the right side.



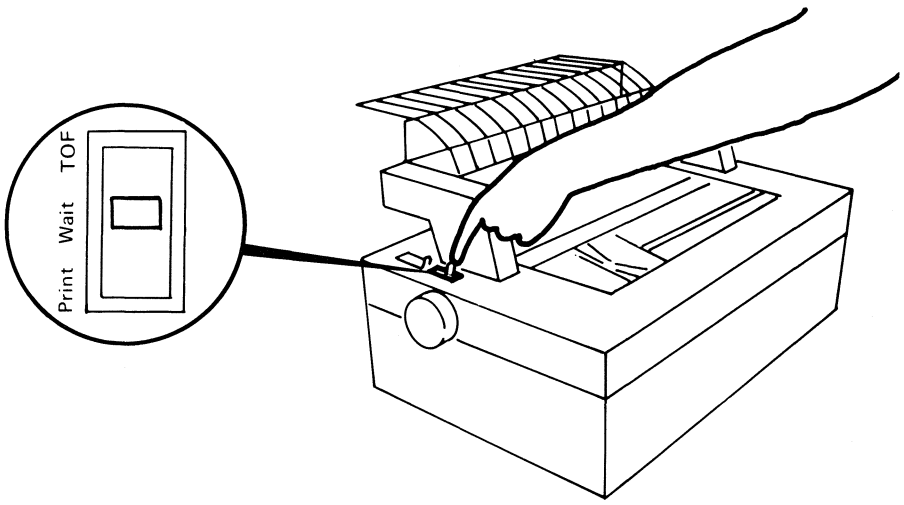
3. Remove the small access cover.
   - Lift the clear plastic edge nearest the paper.
   - Set the cover in a safe place.



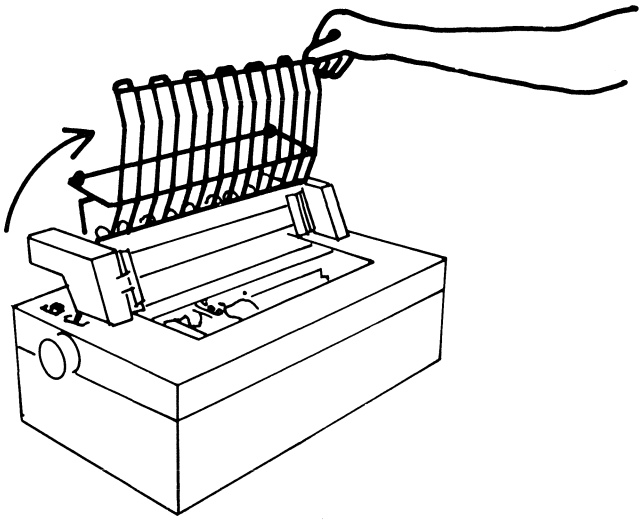
4. Move the Print head to the left side.



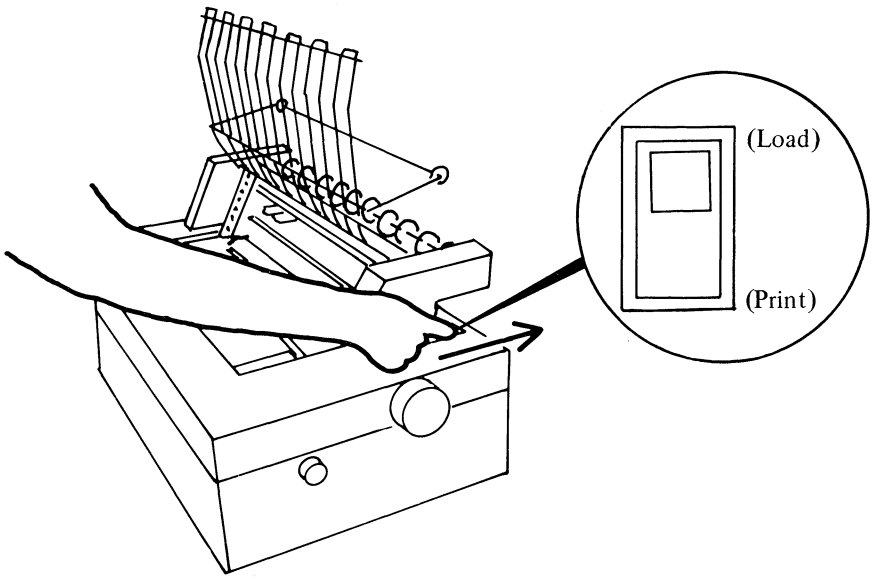
5. Move the Mode switch to the Wait position.



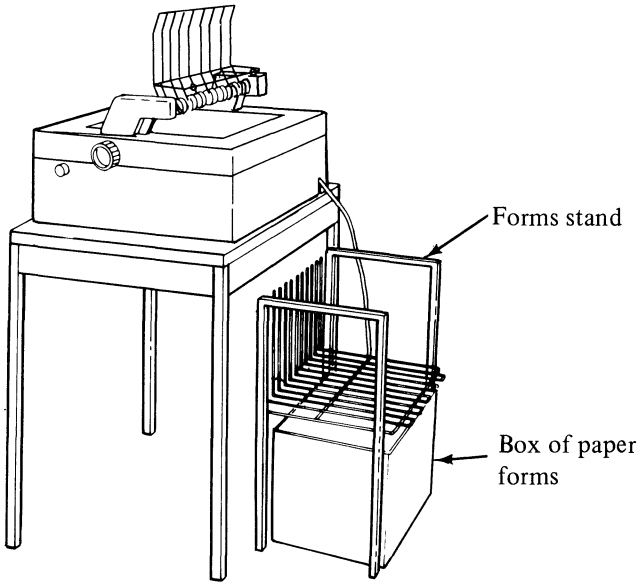
6. Pivot the forms-guide rack up and towards the front of the printer to a vertical position.



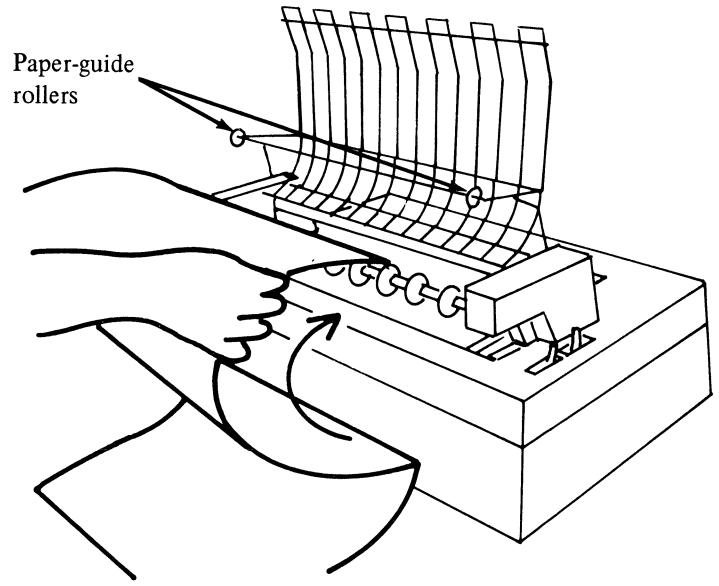
7. Move the paper-release lever to the LOAD position (towards the back of the printer).



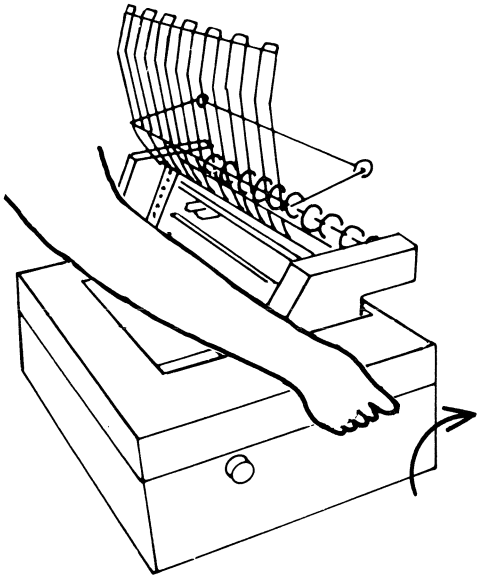
8. Place the forms supply under the forms stand.
   - Hint: Cutting the flaps off the box helps avoid unnecessary drag on the paper.



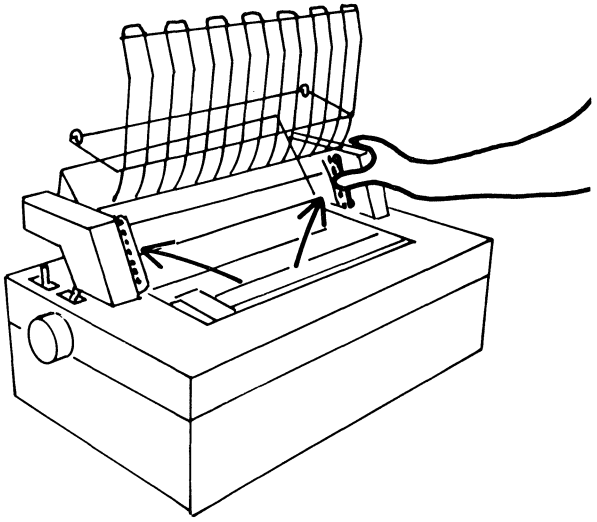
9. Feed the leading edge of the paper over the rollers, then downward, behind the platen. Adjust the paper-guide rollers to the width of the paper.
   - Rollers should be placed at the outside edge of the paper.



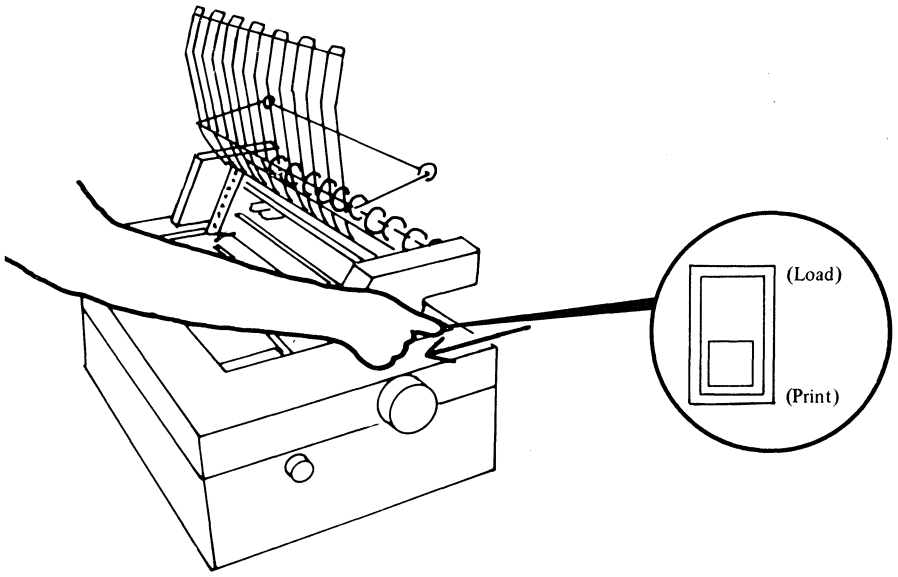
10. Turn the paper-advance knob to move the paper around the platen, so the paper can be grasped at the front of the printer.



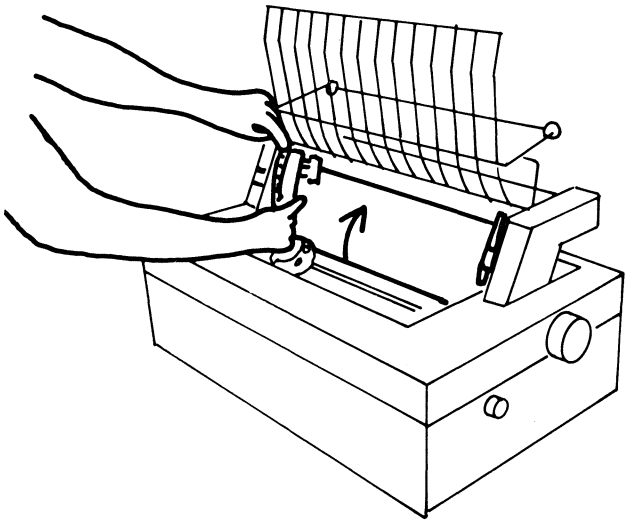
11. Open both tractor covers.



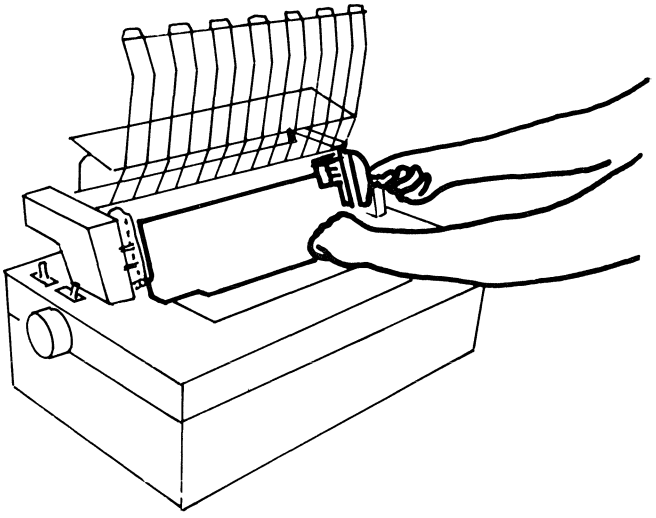
12. Move the paper-release lever to the PRINT position (towards the front of the printer).



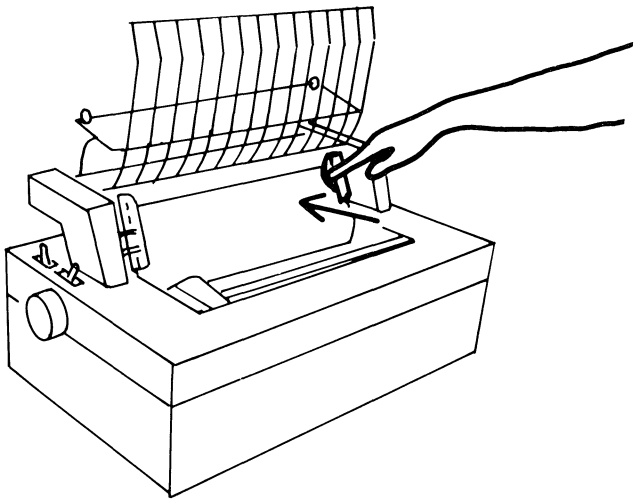
13. Pull the paper up at the front of the platen.
    - Place the left margin holes of the paper over the left tractor pins.
    - Close the left tractor cover.



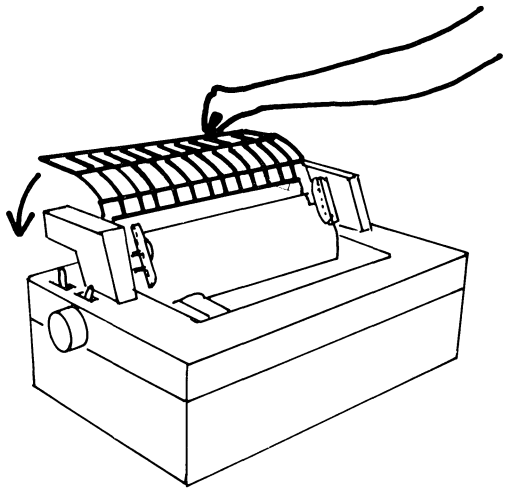
14. Squeeze the right forms-tractor adjusting lever and slide the tractor pins under the right side of the paper and adjust the tension of the paper.



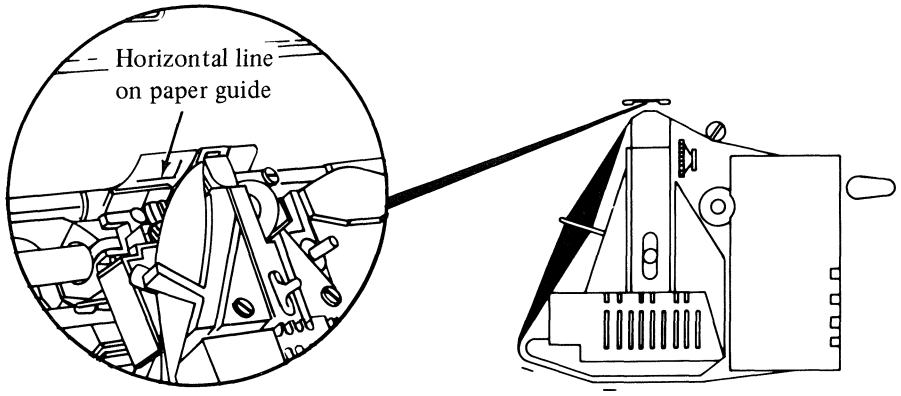
15. Place the right margin holes of the paper over the right tractor pins.
    - Check that the corresponding right and left margin holes are aligned horizontally.
    - Close the right tractor cover.



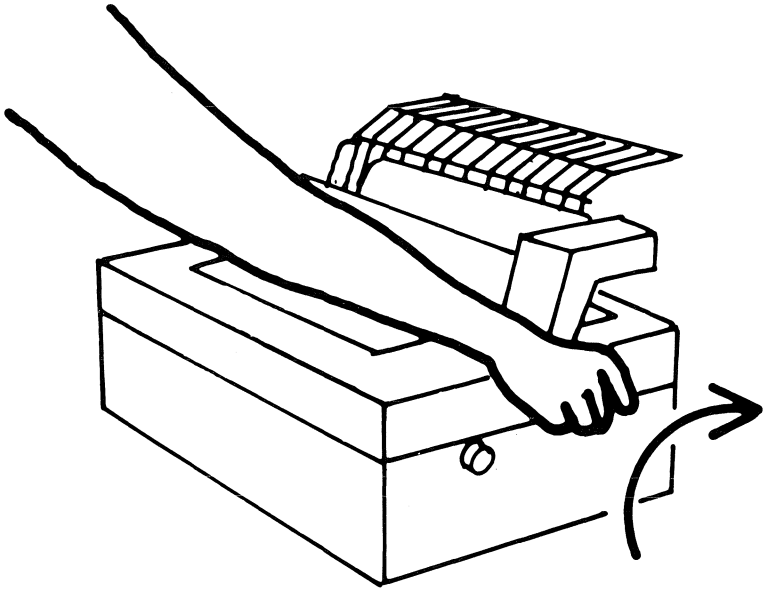
16. Pivot the forms-guide rack to a horizontal position.



17. Move the print head to the right until the print-head paper guide marks are visable. Align the horizontal guide marks with the horizontal line on the paper.

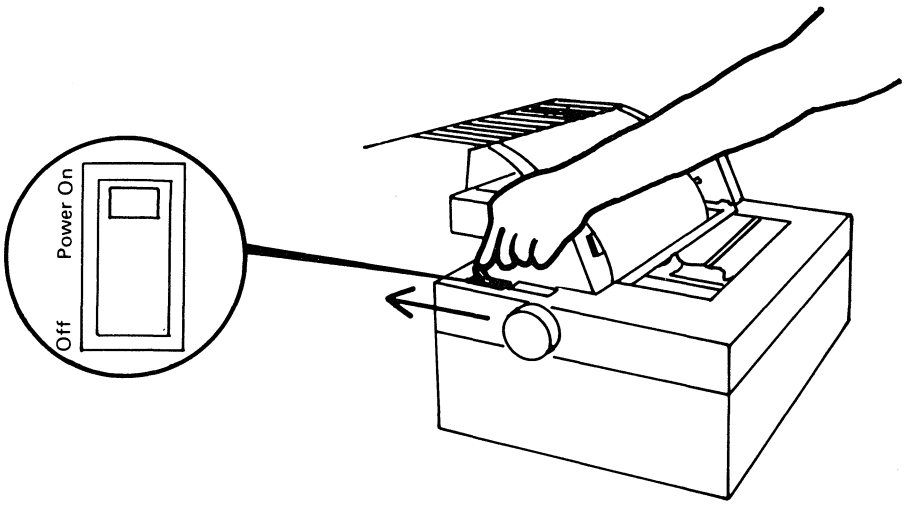


18. Turn the paper-advance knob until the horizontal line on the paper aligns with the horizontal line on the print-head paper guide.

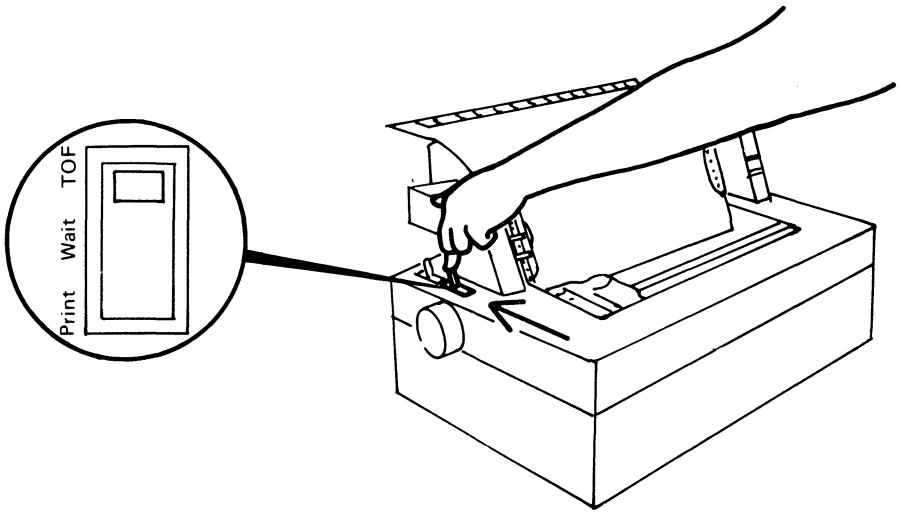


19. Turn on the printer power.

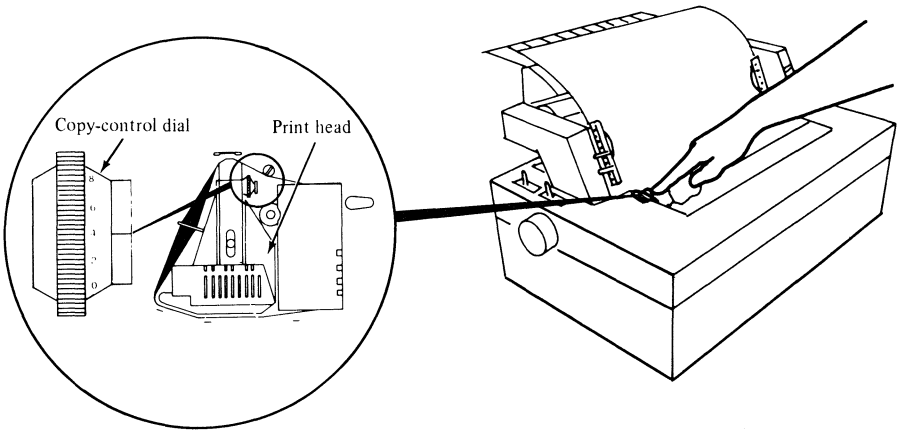
Note: Processor power should be turned on.



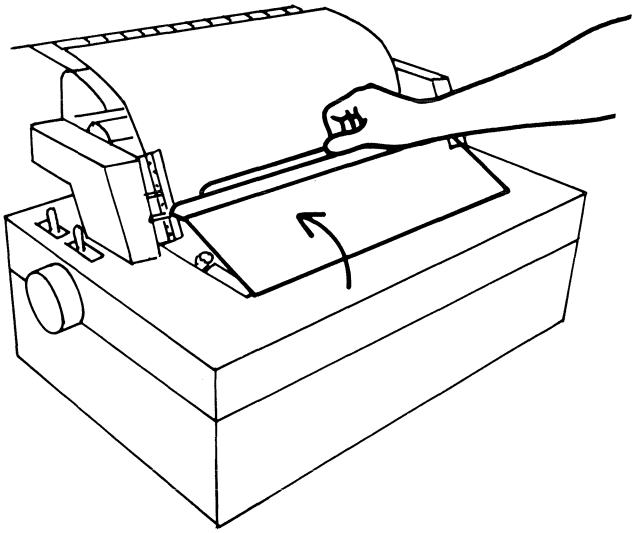
20. Move the Mode switch to the TOF (Top of Forms) position.



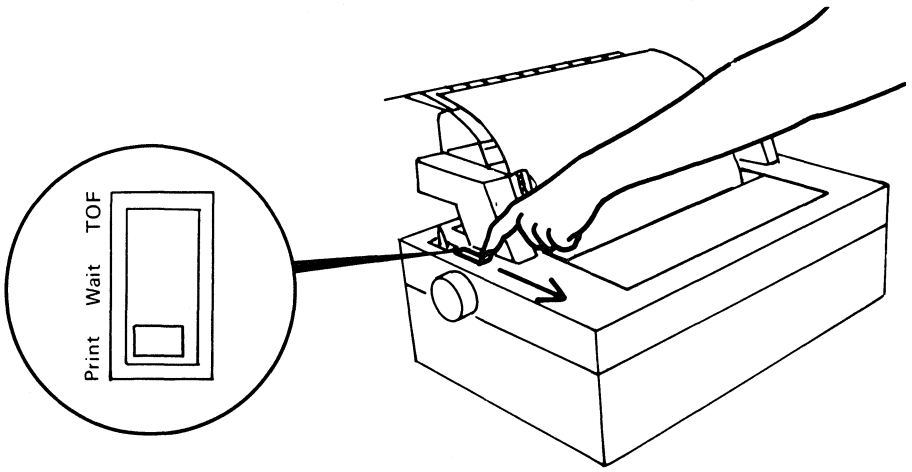
21. Adjust the copy-control dial for good print quality and to accommodate the thickness of the forms you are loading.
    - For one-part forms, set the dial to zero.
    - For multi-part forms, move the dial towards 8 until:
        — The printing on the last part is legible, and
        — The printing on the first part is free of ribbon smudging.



22. Replace the small access cover.



23. Move the Mode switch to the PRINT position.
    - Check printing alignment when printing begins. If adjustment is necessary, refer to "Aligning Preprinted Forms."
    - Check the stacking of the forms on the forms stand. For efficient stacking, the fold should be in the same direction as the original fold.
    - To avoid stacking problems, limit stack height to 355 mm (14 in.).

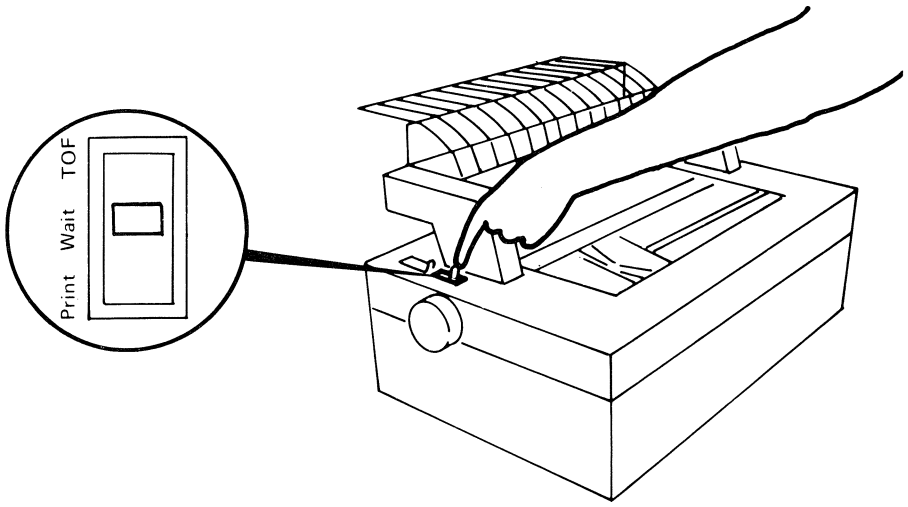


End of procedure.

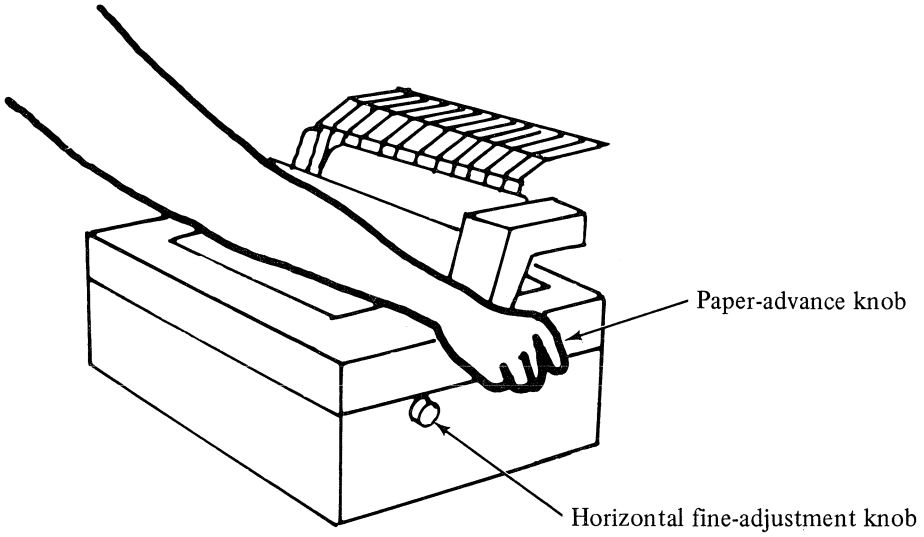
4974—Aligning Preprinted Forms

To align preprinted forms, use the following procedure.

1. Print one line.
2. Move the Mode switch to the Wait position.

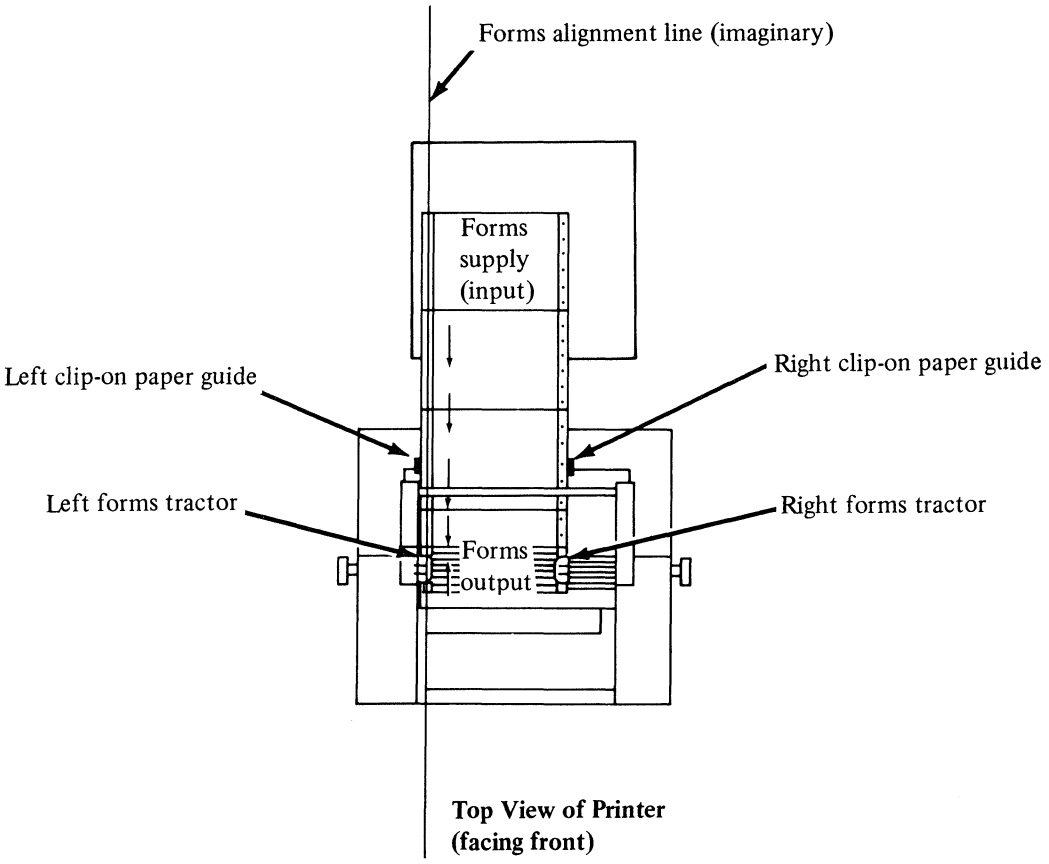


3. Adjust the paper-advance and horizontal fine-adjustment knobs to align the print with the preprinted lines of the form.



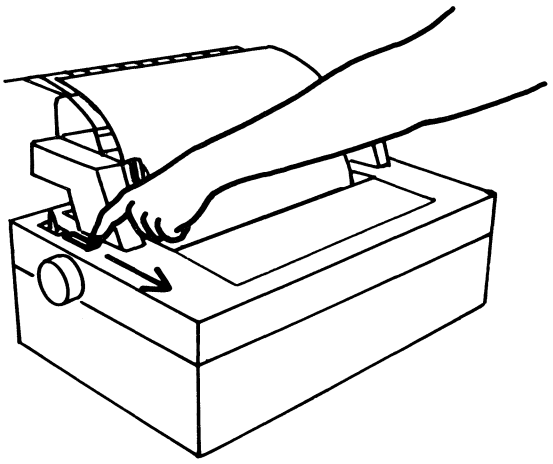
4. When forms are loaded and aligned for the first print position, align the forms feeding into the printer with the forms feeding from the printer by positioning the left and right clip-on paper guides located on the forms guide rack rod as shown.

   To prevent uphill, downhill, or wavy printing, and to ensure proper forms feeding, position the forms supply (stack or box) so that forms feeding into the printer will follow the (imaginery) forms alignment line shown.



Top View of Printer (facing front)

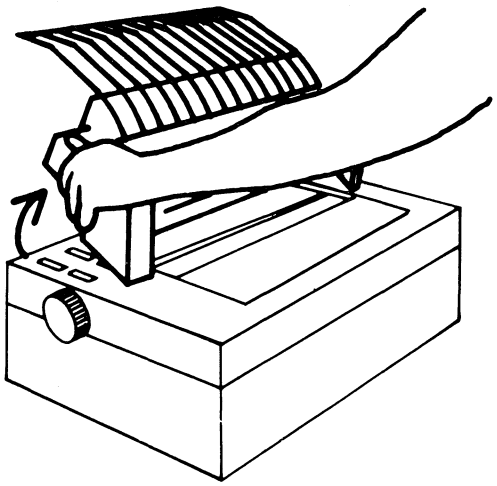
5. Move the Mode switch to the PRINT position.



End of procedure.

4974—Removing Forms Tractor

1. To remove the forms tractor, grasp both sides as shown.
   - Before lifting, pivot the unit towards the front of the printer until the rear legs snap free; then lift straight up.



   - Set the forms tractor in a safe place.

End of procedure.

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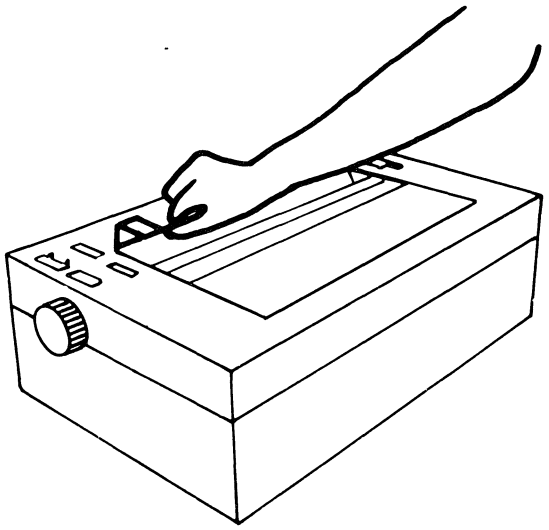
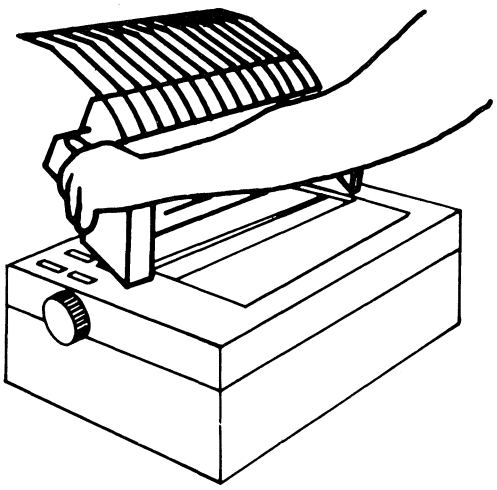
4974—Installing Forms Tractor

To place the forms tractor in position on the top of the printer, use the following procedure.

Note: Be sure the cut-forms guide is flat against the printer before beginning.

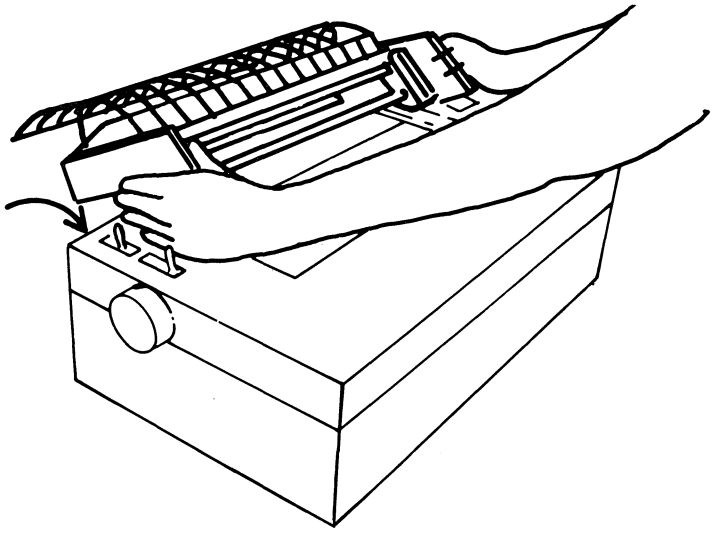


1. Position the back legs of the forms tractor in the back cover slots.



2. Press downward until the back legs snap into place.
   - Pivot the forms tractor towards the front of the printer until the front legs lock into position.

     Note: Check the final placement by verifying that:
   - The paper-advance knobs turn freely, and
   - The tractor pins move.



End of procedure.

IBM 4979 Display Station

The 4979 Display Station has the following components as shown in Figure 71.

- Display Screen
- Power and Display Screen Controls
  - — On/Off
  - — Contrast
  - — Brightness
- Keyboard

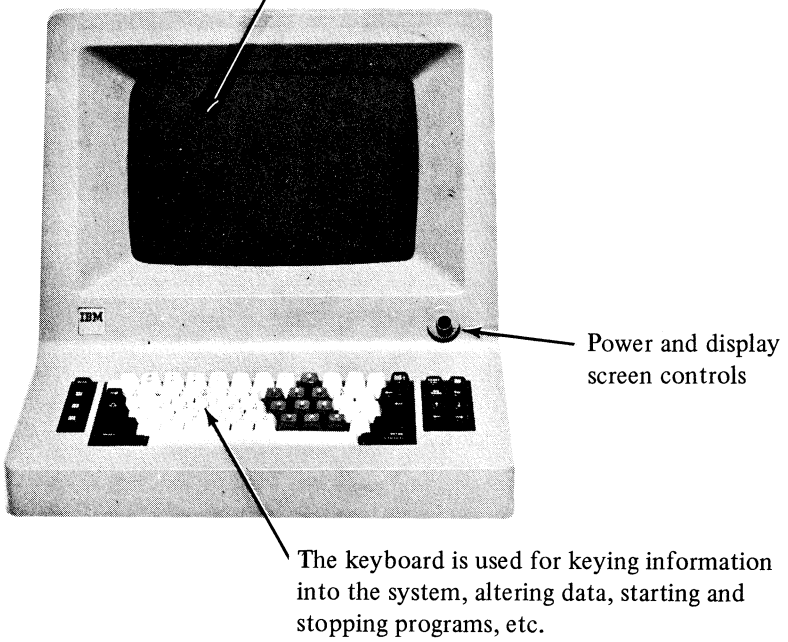


Figure 71. 4979 Display Station

4979—Display Screen

The display screen is similar to that of a television receiver. It provides an image display of data that is:

- Transmitted to the processor (your keyboard input)
- Transmitted to the display screen by the processor

Therefore, the display station enables you to enter, modify, or delete data on the screen, and to cause (by pressing an Interrupt Request key, such as ENTER) the *revised* display to be returned to the processor for storage or additional processing.

The application program displays images on the screen in one of two modes:

- Unformatted mode
- Formatted mode

4979—Screen Format

Unformatted Mode

In unformatted mode, as shown in Figure 72, the screen is left unformatted and you can use the screen in a free-form manner.

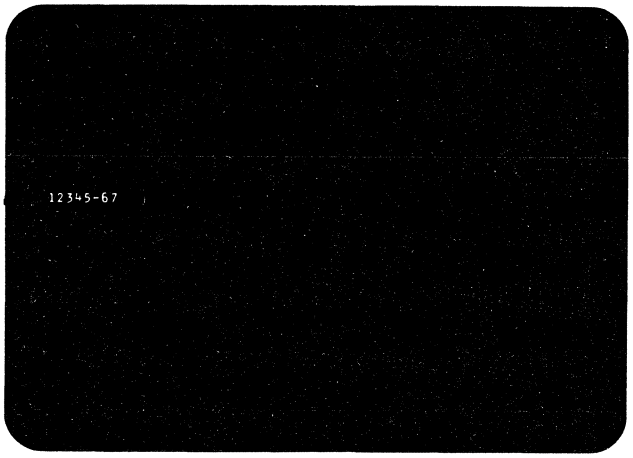


Figure 72. Unformatted Screen Example

Formatted Mode

In formatted mode, as shown in Figure 73, the screen is completely or partially formatted by the application program.

Areas on the screen that always contain the same type of information (data) are called fields. There are two types of data fields on a formatted screen:

- Unprotected data field
- Protected data field

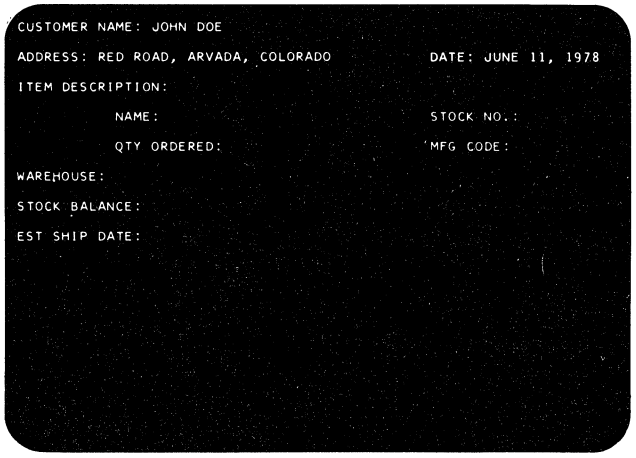


Figure 73. Formatted Screen Example

Unprotected Data Field All of your *entries* will go into unprotected fields known as input fields. The actual customer name, address, and date in Figure 73 are examples of input fields.*:* These fields are highlighted on the screen by brighter characters. You can enter, modify, or delete (by keyboard action) data in any unprotected input field.

Protected Data Field You cannot enter data (by keyboard action) into protected data fields. The words CUSTOMER NAME:, ADDRESS:, and DATE: in Figure 73 are examples of protected data fields.*:* These fields are not displayed as brightly as the unprotected fields.

4979—Cursor

The cursor, as shown in Figure 74, is a special symbol that resembles an underscore. It is displayed beneath a character or character position on the screen to indicate where the next character entered from the keyboard will be displayed.

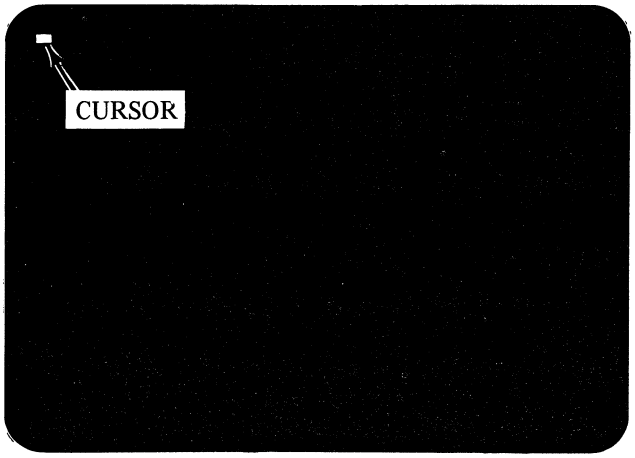


Figure 74. Cursor

Only one cursor can be displayed on the screen.

- Turning on the display station causes the cursor to be displayed in the first location on the screen (Figure 74)., following a command from the application program to unlock the keybaord.
- Repositioning the cursor can be done by keyboard action and by the program.
- Pressing any interrupt request key, such as ENTER, deletes the cursor from the screen to indicate that the keyboard is locked.
- A command from the application program is required to unlock the keyboard and cause the cursor to reappear.
- The cursor flashes (blinks) during insert-mode operations.

When the cursor, as shown in Figure 75, is displayed under a character, that character can be changed or deleted by keyboard action unless it is a protected character.

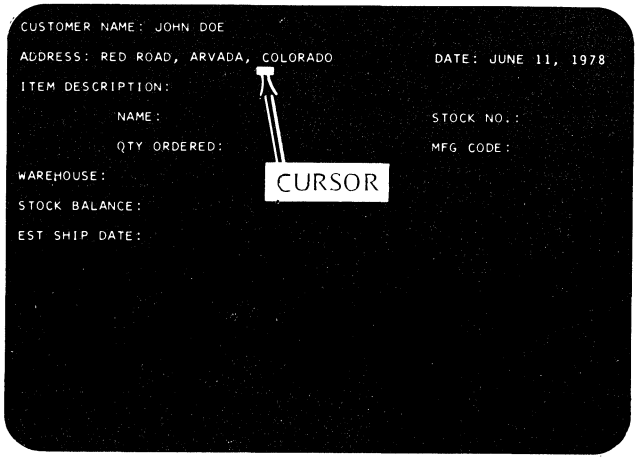


Figure 75. **Cursor Under *Unprotected* Display Character**

When the cursor, as shown in Figure 76, is displayed under a blank position, a character can be inserted in that position by keyboard action unless that position is a protected space character.

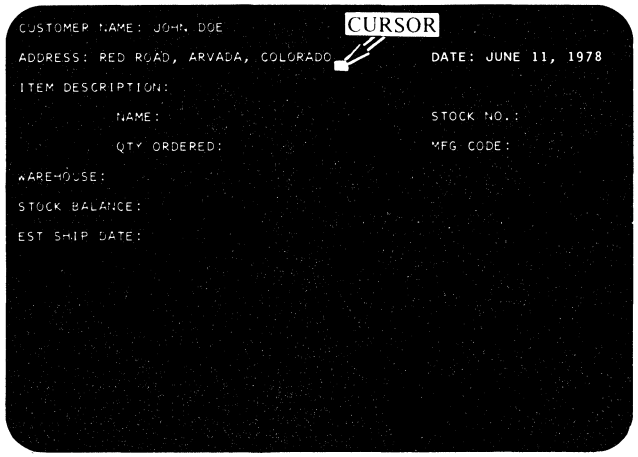


Figure 76. **Cursor Under *Unprotected* Space Character**

When the cursor, as shown in Figure 77, is displayed under a position that contains a protected character (or protected space character), that position cannot be modified by keyboard action.

Attempting to modify (by keyboard action) a protected character or a protected space character causes the cursor to be moved one position to the right.

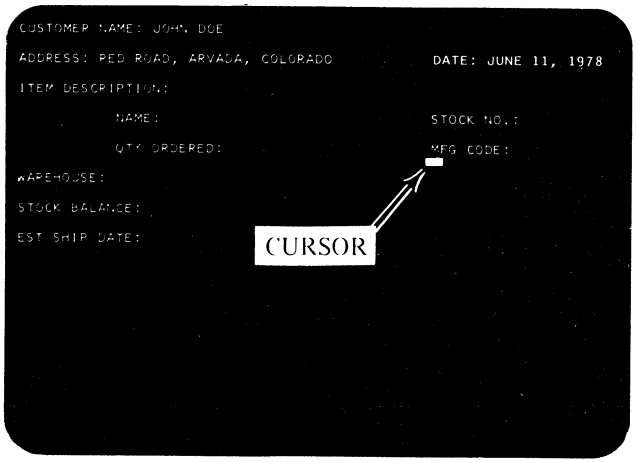


Figure 77. **Cursor Under *Protected* Character**

4979—Power and Display Screen Controls

The display station has three controls (located on a common stem) that are separate from the keyboard:

- On/Off
- Brightness
- Contrast

These controls are shown in Figure 78.

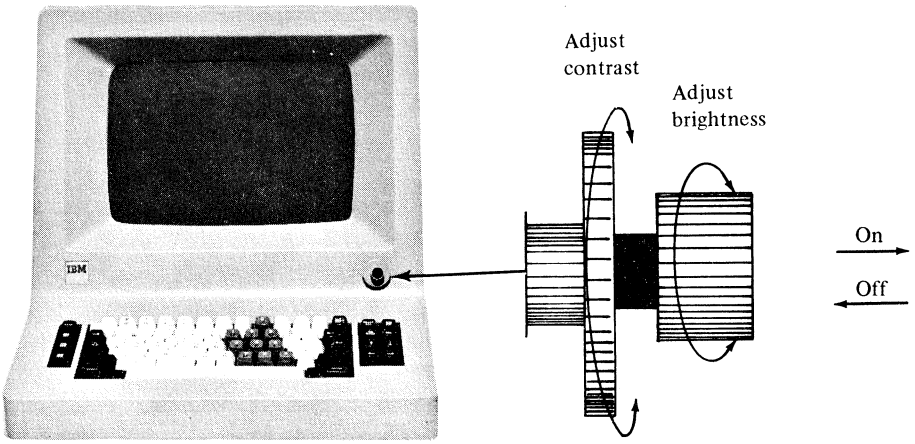


Figure 78. Power and Display Screen Controls

On/Off Control

Pulling the brightness control towards you applies power to the display station.

Pushing the brightness control away from you removes power from the display station.

Brightness Control

Rotating the brightness control adjusts the brightness of the displayed characters.

Contrast Control

Rotating the contrast control adjusts the contrast between the highlighted and nonhighlighted characters.

4979—Keyboard

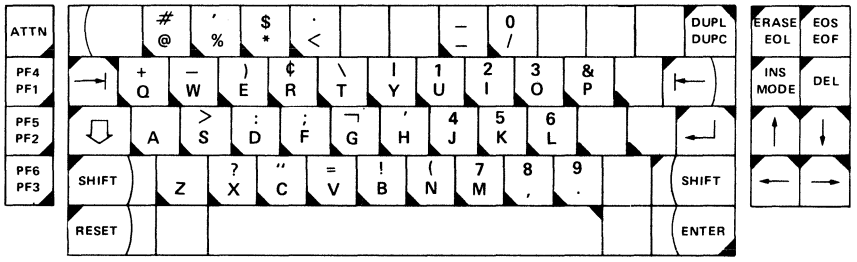
The display station keyboard is shown in Figure 79. The alphanumeric, punctuation, and special-character keys form the main body of the keyboard with special control keys on each side.

The keys are arranged in four groups:

- SHIFT/LOCK
- Graphic alphanumeric
- Local function
- Interrupt request

All keys are color coded for easy identification:

- Alphabetic and graphic keys are white keys with black letters.
- Numeric keys are light gray keys with uppershift numbers in white and lowershift characters in black.
- Local function and interrupt keys are charcoal-gray keys with white letters or symbols.



Legend

(Typamatic action)
Local function & Shift Lock
Graphic alphanumeric
Interrupt request
Mechanically Locked

Figure 79. Display Station Keyboard

Note: Certain keys within the graphic-alphanumeric and local-function groups have *typamatic* action.

This means that they have the ability to repeat their character or operation automatically if held down. The typamatic keys increase operating speed.

After an initial pause after the first key entry, the typamatic keys operate at approximately 10 key entries per second.

4979—SHIFT/LOCK Keys

The SHIFT/LOCK keys, as shown in Figure 80, operate similar to a standard typewriter keyboard.

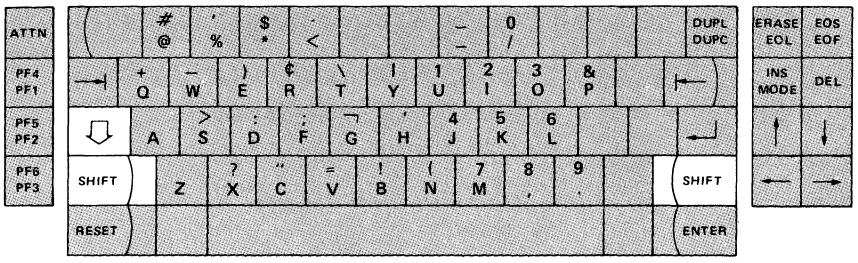
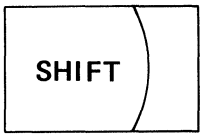


Figure 80. SHIFT/LOCK Keys

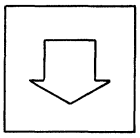
SHIFT Key



Pressing either the left or right SHIFT key, while pressing a dual-character key, displays the upper symbol of that key.

If the character key has no upper symbol, such as the "A" key, the SHIFT key has no effect on the character displayed.

LOCK Key



Pressing the LOCK key (wide arrow) *electronically* locks the keyboard in upshift mode. The keyboard will remain in upshift mode until you release it by pressing either SHIFT key.

4979—Graphic-Alphanumeric Keys

The graphic-alphanumeric keys, as shown in -- Figure id 'f4' unknown --, represent the 64 alphabetic, numeric, space, and graphic symbols displayable on the screen.

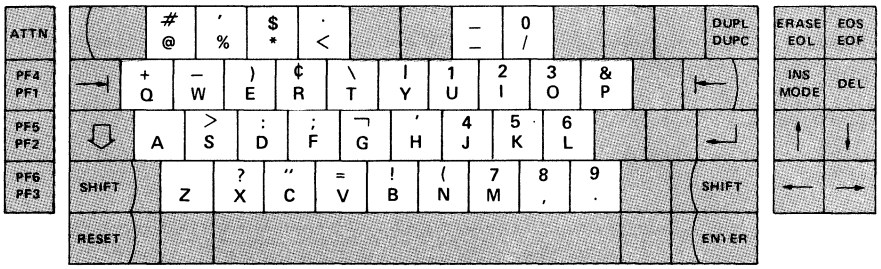


Figure 81. Graphic-Alphanumeric Keys

Pressing a graphic-alphanumeric key:

- Displays the appropriate symbol on the screen in the position marked by the cursor
- Moves the cursor one position to the right after the entered character is displayed

Dual-character keys can display either character depending on the position of the SHIFT and LOCK keys. Dual-character keys have two symbols or characters inscribed on the face of the key.

- Pressing the key in downshift mode (SHIFT key not depressed or LOCK key disabled) causes the lower symbols to be displayed.
- Pressing the key in upshift mode (SHIFT key depressed while pressing the character key or LOCK key enabled) causes the upper symbols to be displayed.

  Note: None of the graphic-alphanumeric keys send an interrupt to the program.

Alphabetic Characters

All but two (A and Z) of the alphabetic keys are dual-character keys as shown in Figure 82.

- The alphabetic characters on the faces of these keys are always displayed in uppercase.
- In upshifted mode, the symbols on the upper half of the key face are displayed.

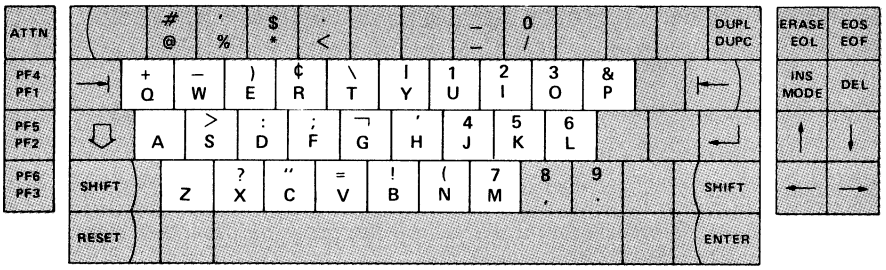


Figure 82. Alphabetic Character Keys

Numeric Characters

With the keyboard in upshifted mode, the appropriate graphic-alphanumeric keys display the numeric symbols on the upper half of their key faces as shown in Figure 83.

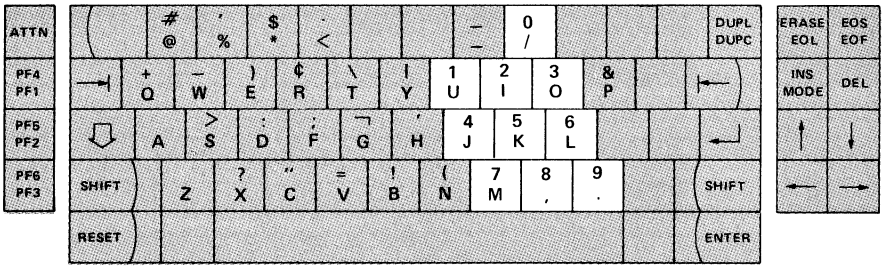


Figure 83. Numeric Character Keys

Graphic Characters

Graphic characters (such as +, ?, and $) are located on the upper half of most of the alphabetic keys, and on the lower half of two of the numeric keys (the 8 and 9).

Space Bar

A space is considered an actual character that occupies a position or location on the face of the screen.

- When the space bar, as shown in Figure 84, is pressed in upshifted mode, a space code or blank is entered on the screen and replaces whatever character was in that position.

  Note: A space can never be inserted in place of a protected character when the keyboard is in the upshifted mode.

- When the space bar is pressed in downshifted mode, the cursor will advance to the right, through unprotected positions without altering data.
- The space bar has *typamatic* action.

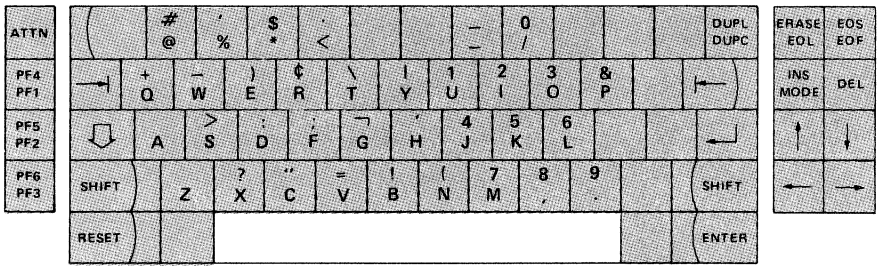


Figure 84. Space Bar

4979—Local-Function Keys

The Local-function keys, as shown in -- Figure id 'f4' unknown --, cause movement of data characters or the cursor *within* the display station but they do not cause an interrupt request. The keys in this group are:

- Tab Forward*
- Tab Backward
- New Line*
- Up Cursor*
- Down Cursor*
- Left Cursor*
- Right Cursor*
- DUPL/DUPC*
- ERASE EOL
- EOS/EOF
- DEL
- INS MODE
- RESET

Note: The keys indicated with an asterisk are *typamatic* keys.

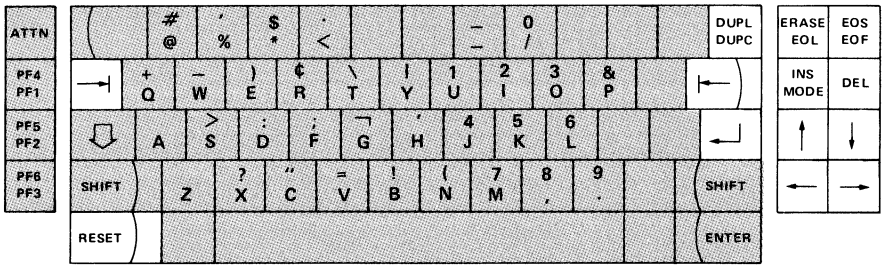


Figure 85. Local-Function Keys

Cursor-Positioning Keys

Because the position of the cursor determines where the next character will be entered, it is important to know how to move the cursor to any location on the screen.

The cursor-positioning keys, as shown in -- Figure id 'f4' unknown --, are part of the local-function keys. They rapidly position the cursor to any character position without affecting any of the information already on the screen.

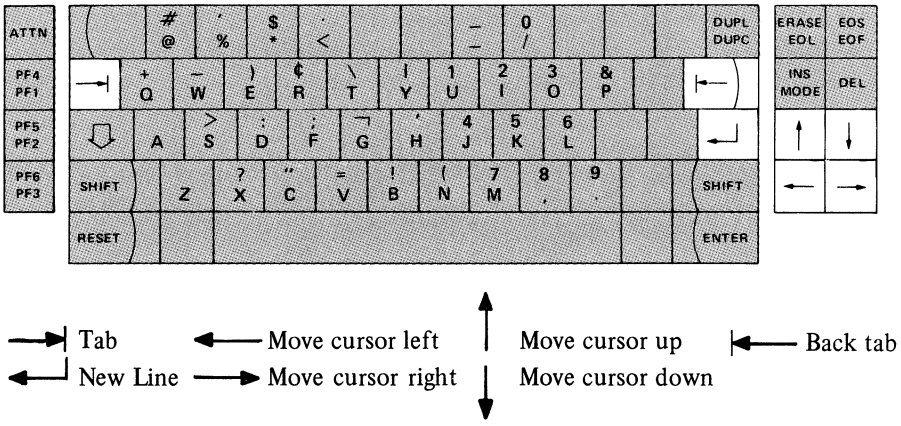
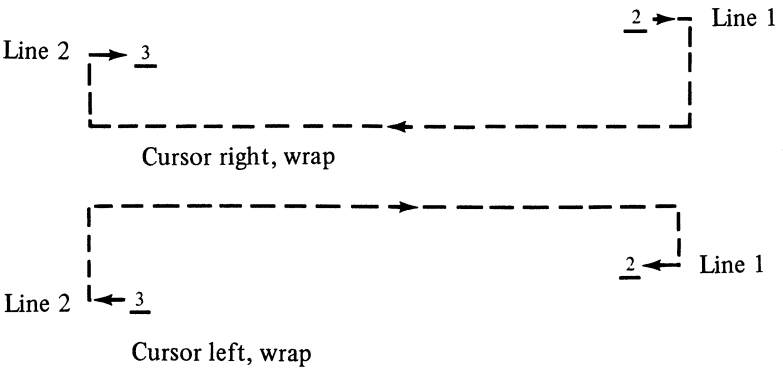


Figure 86. Cursor-Positioning Keys

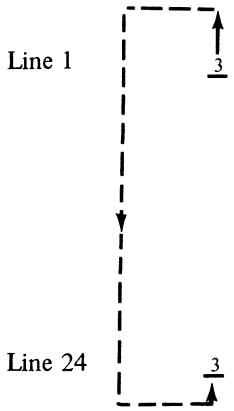
Cursor Wrap

The cursor-positioning keys move the cursor in a horizontal (left or right) or vertical (up or down) direction.

If you hold down the Right Cursor key, the cursor will move off the right side of the screen and will reappear one line *lower* and on the *left* side. If you hold down the Left Cursor key, the cursor will move off the left side of the screen and will reappear one line *higher* and on the *right* side of the screen. These operations are called cursor wrap.

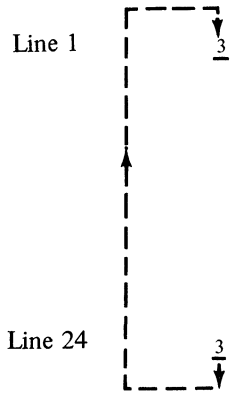


Cursor wrap will also occur when the cursor is moved off the top or bottom of the screen. The Up Cursor key will move the cursor off the top line and the cursor will reappear in the same character position on the *bottom* line (no horizontal movement occurs).



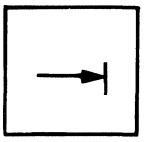
Up cursor, wrap

The Down Cursor key will move the cursor off the bottom of the screen and the cursor will reappear at the *top* line (no horizontal movement occurs).



Down cursor, wrap

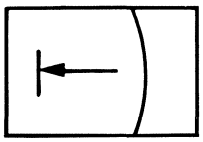
Tab Forward Key



Pressing the Tab Forward key causes the cursor to skip in typamatic mode, from field to field.

- The cursor seeks the first character of the first unprotected field, (searching from left-to-right and top line to bottom line, from one unprotected field to another), until reaching the last position of the bottom line. The cursor will then wrap to the first position of line 1.
- On a display with no unprotected fields, the cursor is repositioned to the upper left corner of the screen.

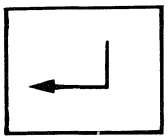
Tab Backward Key



Pressing the Tab Backward key causes the cursor to skip to the leftmost unprotected field, then scan all leftmost character positions of unprotected fields, line by line, in a right-to-left and bottom-to-top sequence.

- If no unprotected fields are encountered, the cursor stops at the first character position on line 1.

New Line Key



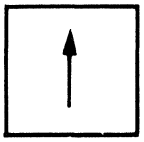
Pressing the New Line key moves the cursor to the first unprotected character position of the new lower line. Two possible conditions exist:

- On an unformatted screen, the cursor moves to the first character position of next lower line.
- On a formatted screen, the cursor moves to the first unprotected character position of the next lower line containing unprotected character positions.

This is a typamatic key. When it is held down, the cursor continues seeking new lower lines.

- If all character positions are protected or the bottom line is exceeded, the cursor will wrap to the first character position of line 1.

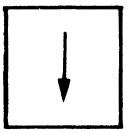
Up Cursor Key



Pressing the Up Cursor key moves the cursor up.

- The cursor moves up one line per each stroke of the key or continues upward if this typamatic key is held down.
- If the top line is exceeded, the cursor will wrap to the bottom line, but will remain in the same character column.

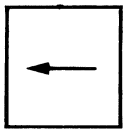
Down Cursor Key



Pressing the Down Cursor key moves the cursor down.

- The cursor moves down one line per key stroke, or continues downward if this typamatic key is held down.
- When the bottom line is exceeded, the cursor wraps to the first line, but does not change character columns.

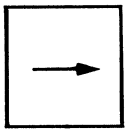
Left Cursor Key



Pressing the Left Cursor key moves the cursor from right to left, one character position at a time.

- When the left side of the screen is exceeded, the cursor wraps to the rightmost character position of the next upper line.
- When the first position of line 1 is exceeded, the cursor wraps to the rightmost character position of the bottom line and continues as long as this typamatic key is held down.

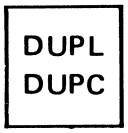
Right Cursor Key



Pressing the Right Cursor key moves the cursor from left to right, one character per key stroke.

- If the right side of the screen is exceeded, the cursor wraps to the leftmost character position of the next lower line.
- When the last position of the last line is exceeded, the cursor wraps to the leftmost character position of the top line and continues as long as this typamatic key is held down.

DUPL/DUPC Key



Pressing the DUPL/DUPC key, when in upshift mode, performs a duplicate-line operation.

- The same character is entered into the current cursor position as the character located in the line directly above the cursor.
- All protected characters are duplicated as unprotected characters in the new line.
- Encountering a protected position in the new line or releasing this typamatic key stops the duplicate-line operation.

Pressing the DUPL/DUPC key, when in downshift mode, performs a duplicate-character operation.

- The same character is entered into the current cursor position as the character located directly to the left of the cursor.
- Encountering a protected position or releasing this typamatic key stops the duplicate-character operation.

EOL Key

Pressing the EOL key performs an erase-to-end-of-line operation.

- All characters from the current cursor position to the end of the current line are replaced with blanks.
- Protected characters are not affected.
- The cursor wraps to the next lower line, but no furhter action occurs until the ERASE EOL key is pressed again.

EOS/EOF Key

Pressing the EOS/EOF key, when in upshift mode, performs an erase-to-end-of-screen operation.

- All unprotected characters from the current cursor position to the end of the screen are replaced with blanks.
- Protected characters are not affected.
- The cursor wraps to the first position of the top line, but no further action occurs until the key is pressed again.

Pressing the EOS/EOF key, when in downshift mode, performs an erase-to-end-of-field operation.

- All unprotected characters from the current cursor location to the EOF (end of field) or until EOS (end of screen) is detected are replaced with blanks.
- If detecting end-of-field stops the operation, the cursor comes to rest under the first protected character of the next field.
- If detecting end-of-screen stops the operation, the cursor wraps to the first position of the top line.

DEL Key

Pressing the DEL key, when the cursor is located in an unprotected field, performs a delete operation.

- The character occupying the position underlined by the cursor is deleted.
- All characters to the right of the cursor in that field or line are shifted one position to the left.
- Characters cannot shift into a protected location.

If the delete operation is attempted in a protected field, the operation is not executed and the cursor is not moved. The DEL key resets insert mode, if it is active.

INS MODE Key

Pressing the INS (insert) MODE key puts the keyboard in insert mode. (Refer to Figure 87 on page 4-230.)

- The INS MODE key allows you to enter characters in the middle of a field without destroying information already displayed there.
- All keys perform normally while in this mode.
- All entries are inserted before the character above the *current* cursor position.
- Insert mode is indicated by the cursor flashing off and on.

All characters already displayed on this line, to the right of the cursor, will be automatically shifted right one character position for each new character that is inserted.

- The number of characters that can be inserted is limited to one character less than the number of blanks remaining in the field.

Inserting characters is not performed when:

- An attempt is made to insert a character into a protected location.
- Inserting a character would cause a character to shift out at the end of a line or into a protected location.

The insert mode is reset by any of the following:

- Pressing the RESET key
- Pressing the DEL (delete) key

RESET Key

Pressing the RESET key resets insert mode.

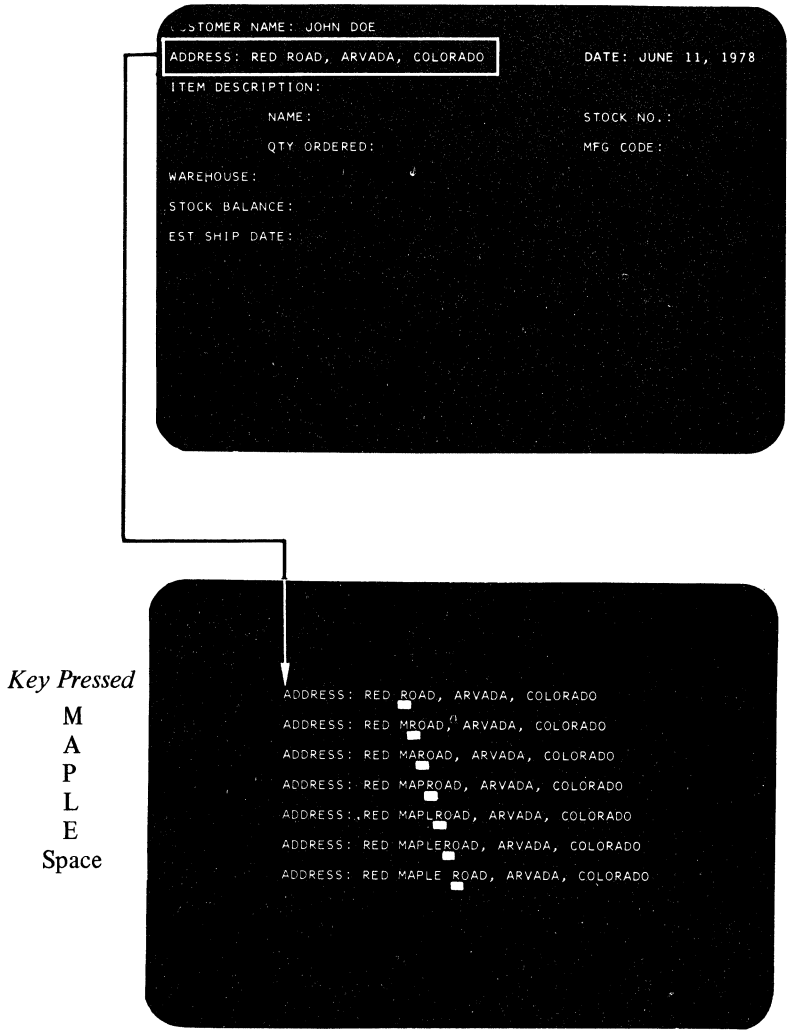


Figure 87. Insert-Mode Operation

4979—Interrupt-Request Keys

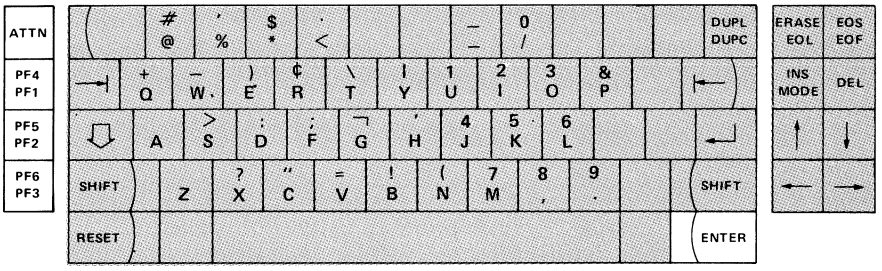
The interrupt#request keys, as shown in -- Figure id 'f4' unknown --, send an attention interrupt-request to the processor. This locks the keyboard and prevents you from making any additional key entries, until the system has responded to the interrupt.

While the keyboard is locked, the cursor is blanked out (turned off) to indicate that the keyboard is locked.

Note: None of the interrupt-request keys have typamatic action.

The keys in this group are:

- ATTN
- PF4/PF1
- PF5/PF2
- PF6/PF3
- ENTER



ATTN Key

Pressing the ATTN (attention) key causes an interrupt, which the program usually uses to ready the keyboard and display.

- The function of this key may, however, be defined by the program.

PF Keys

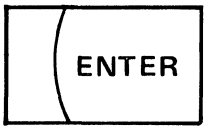
Pressing a PF (program function) key causes an interrupt and a code that identifies which program key was pressed. The PF4, PF5, and PF6 keys are active in upshift mode.

- These keys permit rapid issuing or entry of predetermined operator information.
- Each program can tailor the function of these keys to fit its specific needs.
- As their name implies, their purposes are determined by the particular program they are assigned to.

ENTER Key

Pressing the ENTER key causes an interrupt, which the program usually uses to cause data on the display screen to be transferred to the processor. This data then becomes available to the executing program.

- The function of this key may, however, be defined by the program.



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IBM 4982 Sensor Input/Output Unit

The 4982 Sensor Input/Output Unit has an On/Off switch and a Power On indicator as shown in Figure 89.

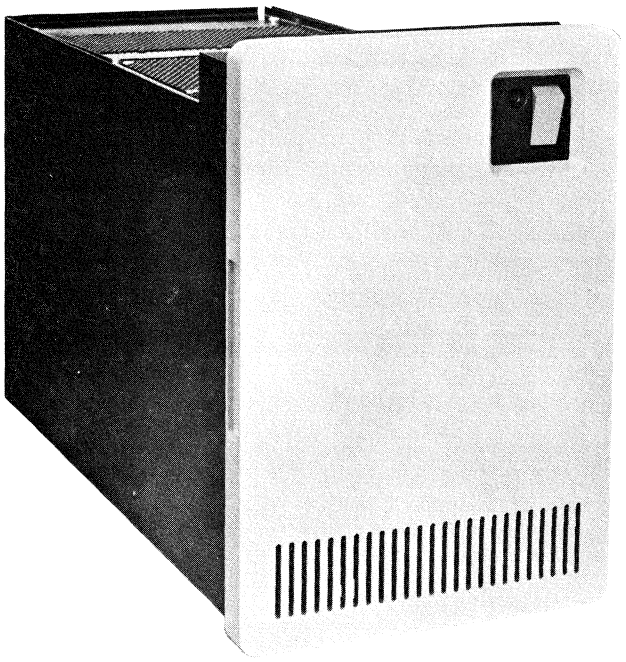
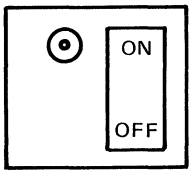


Figure 89. **4982 Sensor Input/Output Unit**

On/Off Switch and Power On Indicator



Pressing the top of the On/Off switch applies power to the sensor I/O unit and turns on the Power On indicator.

Pressing the bottom of the On/Off switch removes power from the sensor I/O unit and turns off the Power On indicator.

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IBM 4987 Programmable Communications Subsystem

The 4987 Programmable Communiations Subsystem has the following operator controls as shown in Figure 90.

- 4987 indicator panel
- IBM 4990 Model 1 Communications Console for the 4987. (This hand-held console attaches to the 4987 indicator panel by a cable.)

  Note: Refer to *IBM Series/1 4987 Programmable Communications Subsystem and 4990 Model 1 Communications Console for the 4987 Description*, GA34-0049 for a detailed description of the 4990 console and its user-initiated procedures.

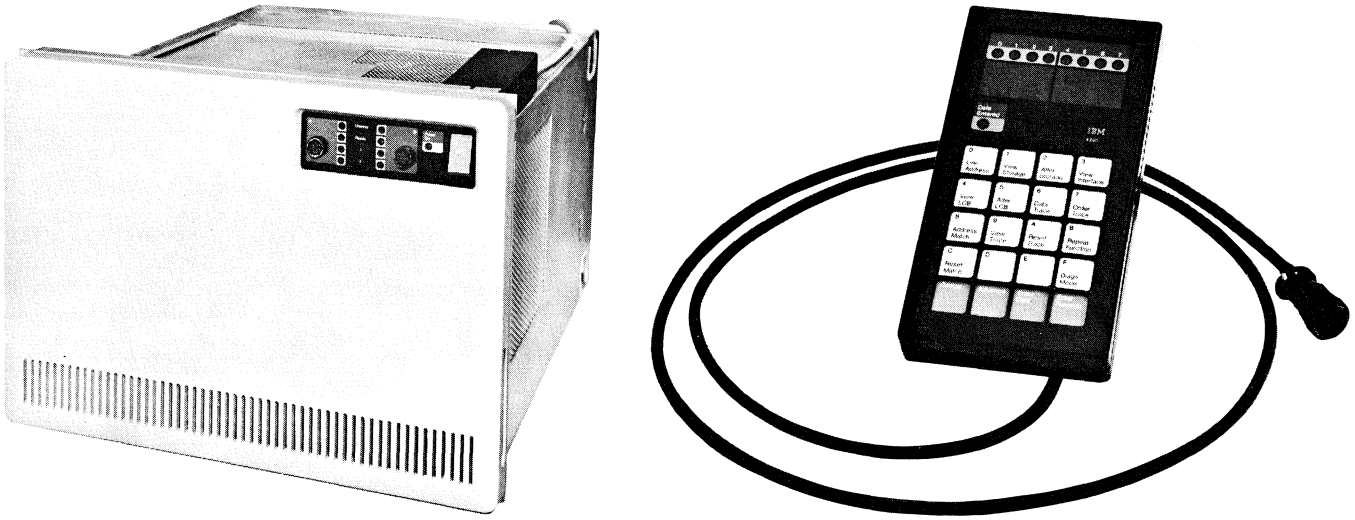


Figure 90. **4987 Programmable Communication Subsystem and the 4990 Communications Console for the 4987**

4987—Indicator Panel

The 4987 indicator panel has the following switches, indicators, and connectors, as shown in Figure 91.

- On/Off switch and Power On indicator
- Lights 1 and 2
- Ready lights
- Channel lights
- 4990 Model 1 console connectors

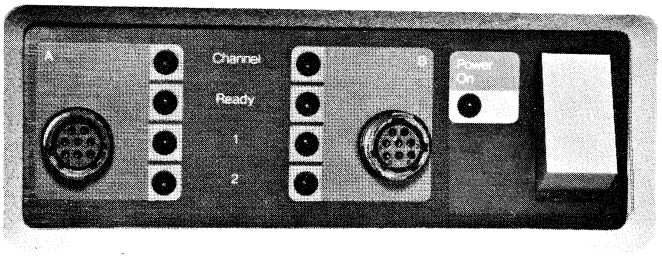
Figure 91. 4987 Indicator Panel

The indicator lights and 4990 console connectors are divided in two groups labeled A and B.

- Group A is used only when the expansion scanner (optional feature) is installed in the 4987.
- Group A operates identically to group B.

The four indicator lights in each group indicate the progress of the 4987 in preparing to communicate with external devices and also indicates when communication is in progress.

On/Off Switch and Power On Indicator

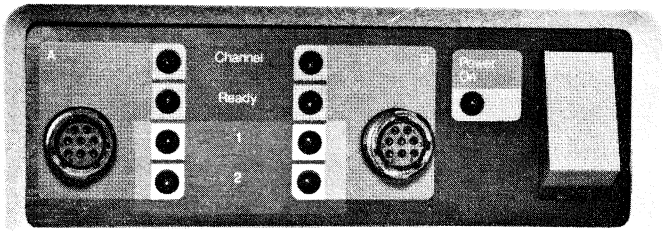


Pressing the top of the On/Off switch applies power to the subsystem and turns on the Power On indicator.

Pressing the bottom of the On/Off switch removes power from the subsystem and turns off the Power On indicator.

- When power is applied to the 4987 and to the processor or I/O expansion unit housing the controller, the first thing that occurs is execution of power-on diagnostic programs controlled by the microprocessor in the controller.

Lights 1 and 2



As the power-on diagnostic programs are executed, Lights 1 and 2 turn on and off in the following order:

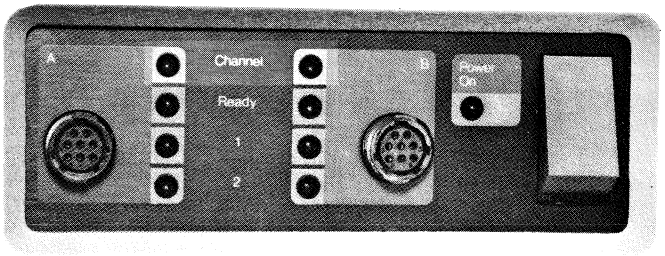
Light 1	Light 2
Off	Off
On	Off
Off	On
On	On

If the sequence described above does not end with Light 1, Light 2, and the Ready light on, a failure has been detected by the microdiagnostic program.

Ready Light

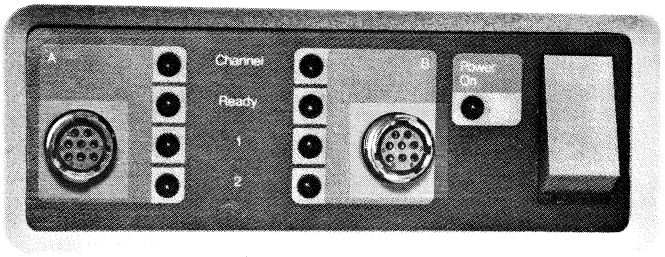
The Ready light turns on at the end of the microdiagnostic program to indicate that the 4987 is ready to communicate with the processor. If the Ready light is not on, the subsystem is not usable for communication.

Channel Light



The Channel light turns on any time there is activity on the channel between the processor and the 4987.

Console Connectors



The console connectors are used to attach the 4987 (by a cable) to the IBM 4990 Model 1 Communications Console for the 4987.

IBM 4993-1 Series/1—System/370 Termination Enclosure

The 4993-1 Series/1—System/370 Termination Enclosure, as shown in Figure 92, has an:

- On/Off switch and Power On indicator
- Enable/Disable switch and Disable indicator

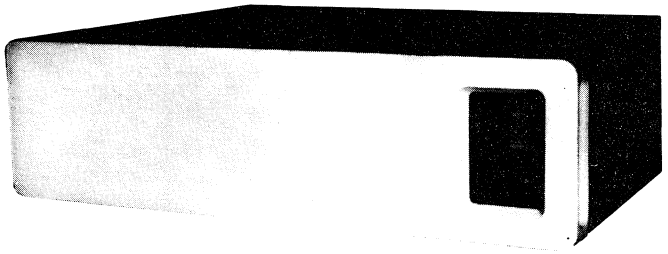
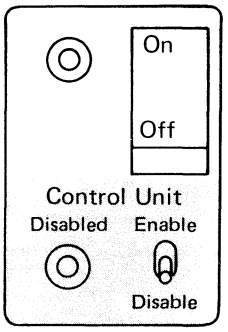


Figure 92. 4993-1 Series/1—System/370 Termination Enclosure

4993-1—Switches and Indicators

On/Off Switch and Power On Indicator



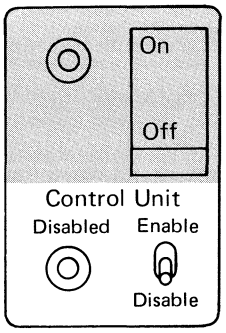
Pressing the top of the On/Off switch applies power to the unit (not the attachment feature card) and turns on the Power On indicator.

Pressing the bottom of the On/Off switch removes power from the unit and turns off the Power On indicator.

CAUTION

To prevent adversely affecting the System/370 operation, follow the power on/off procedures described under "Turning On System Power" and "Turning Off System Power" in "Chapter 2. Turning On and Off System Power" on page 2-1.

Enable/Disable Switch and Disable Indicator



When the Enable/Disable switch is in the Enable position and the On/Off switch is in the On position, the unit is enabled (switched online).

When the Enable/Disable switch is in the Disable position, the Disable indicator is turned on and the unit is disabled (switched offline).

CAUTION

To prevent adversely affecting the System/370 operation, follow the enable/disable procedures described under "Turning On System Power" and "Turning Off System Power" in "Chapter 2. Turning On and Off System Power" on page 2-1.

IBM 4997 Rack Enclosure

The 4997 Rack enclosure has one operator control, an Emergency Pull switch as shown in Figure 93.

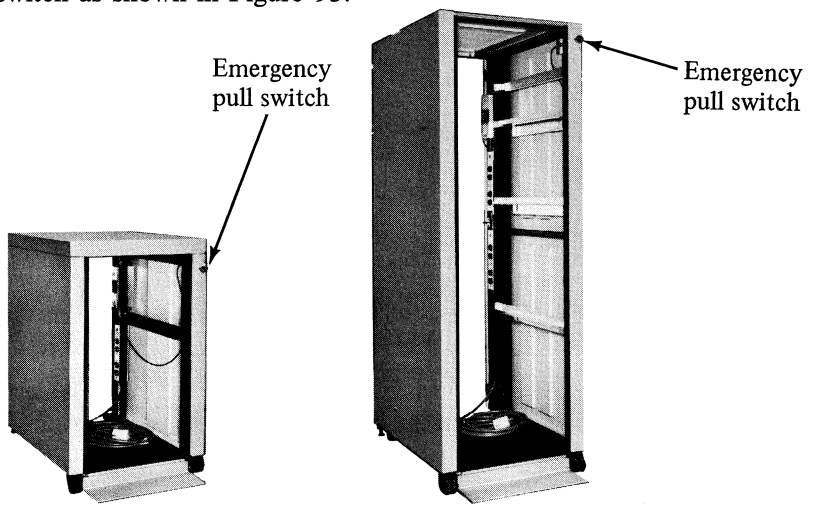


Figure 93. 4997 Rack Enclosures

Emergency Pull Switch

Note: *The Emergency Pull switch should only be used in an emergency.*

Pulling the Emergency Pull switch:

- Removes power from all the units mounted *within* a rack enclosure

  Note: If this is a multiple-rack system, each racks Emergency Pull switch must be pulled.

To restore power:

- Place all 4997 rack-mounted unit power switches to off.
- Correct the condition that caused the emergency.
- Open the 4997 Rack Enclosure rear cover.
- Locate the circuit breaker in the upper left corner of the rack enclosure.
- Push the circuit breaker to the on position—this will reposition the Emergency Pull switch.
- Close the 4997 Rack Enclosure rear cover.
- See "Applying Power" under "Turning On System Power" in "Chapter 2. Turning On and Off System Power" on page 2-1 for powering-on instructions.
- Place the processor power switch to on.

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IBM 4999 Battery Backup Unit

The 4999 Battery Backup Unit has the following switches and indicators as shown in Figure 94.

- Switches
  - — Utility Power On/Off
  - — Battery Circuit Breaker
  - — Reset
- Indicators
  - — Standby
  - — On Battery
  - — Low Battery
  - — Offline
  - — Utility Power
  - — Backup Power

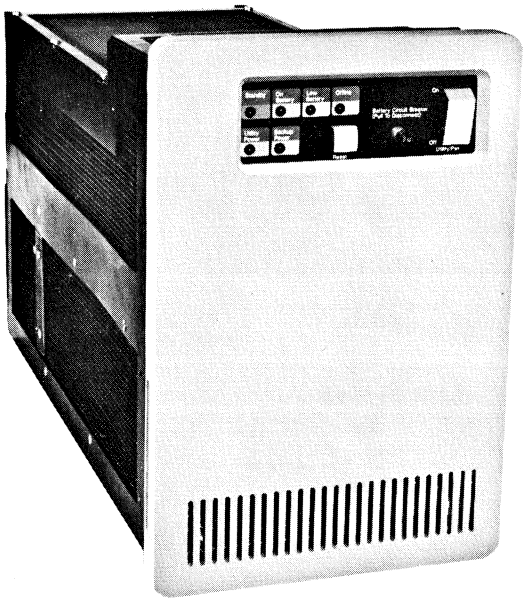


Figure 94. 4999 Battery Backup Unit

4999—Console Switches

The 4999 console has the following switches:

- Utility Power On/Off
- Battery Circuit Breaker
- Reset

These switches are shown in Figure 95.

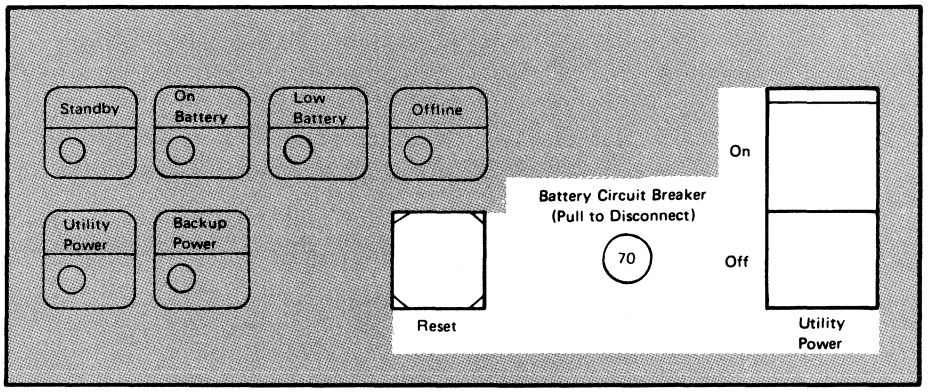
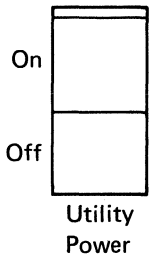


Figure 95. 4999 Console Switches

Utility Power On/Off



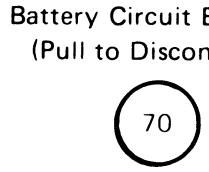
Pressing the On position applies ac power to the:

- Processor receptacle
- Utility Power indicator

Pressing the Off position removes all ac power from the:

- Processor receptacle
- Utility Power indicator

Battery Circuit Breaker



The 70-ampere Battery Circuit Breaker protects the processor by automatically removing the battery power if excessive current is drawn.

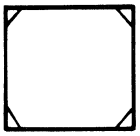
Pushing the Battery Circuit Breaker in:

- Applies battery power to the inverter, detection, and control circuitry
- Turns on the Backup Power indicator

Pulling the Battery Circuit Breaker out:

- Removes all battery power
- Turns off the Backup Power indicator

Reset Switch



Pushing the Reset switch, a momentary pushbutton:

- Resets the 4999 to standby mode
  - — After ac power is turned on during initial startings or
  - — After the battery has recovered from an offline condition (see "Offline Indicator" in this section)

4999—Console Indicators

The 4999 console has the following indicators:

- Standby
- On Battery
- Low Battery
- Offline
- Utility Power
- Backup Power

These indicators are shown in Figure 96.

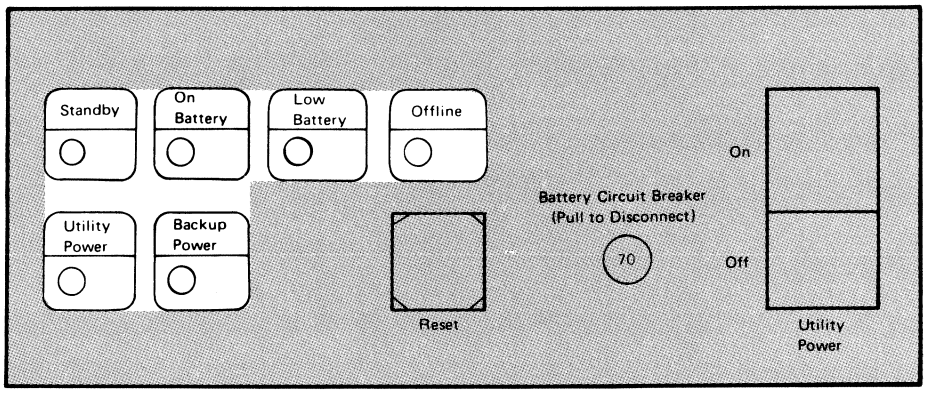
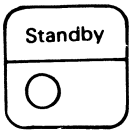


Figure 96. 4999 Console Indicators

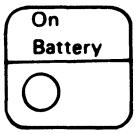
Standby Indicator



The Standby indicator is turned on when the following conditions are satisfied:

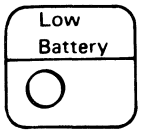
- The Utility Power switch is on and the Reset switch was pressed when the line voltage was at least 87 volts (175 volts for the 4999 Model 2).
- The processor power supply is on.
- The ac line voltage is at least 80 volts (160 volts for the 4999 Model 2).
- The battery voltage has not dropped below 10 volts causing an offline condition (see "Offline Indicator" in this section).

On Battery Indicator



The On Battery indicator is turned on when battery power is being supplied to the processor via the dc-to-ac inverter.

Low Battery Indicator



The Low Battery indicator is turned on when:

- The battery voltage drops below 11 volts.

The Low Battery indicator remains on until the battery has recovered to 12 volts.

The 4999 automatically enters an offline mode when:

- The battery voltage drops below 10 volts and adequate ac voltage is not available.

Offline Indicator

The Offline indicator is turned on when:

- Battery voltage drops below 10 volts.

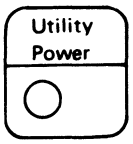
If the battery voltage drop occurs while the 4999 is in the on-battery mode, the processor is switched to ac line power. If adequate ac power is not available, the processor automatically powers-off.

If the battery voltage drop occurs while the 4999 is in the standby mode, the processor remains on ac power. If this ac power is lost, the processor powers-off.

The Offline indicator remains on until:

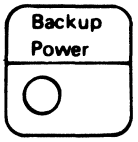
- The battery voltage recovers to 12 volts and
- The reset switch is pressed.

Utility Power Indicator



The Utility Power indicator is turned on when the Utility Power switch is placed in the on position and ac line voltage is available to the 4999.

Backup Power Indicator



The Backup Power indicator is turned on when the Battery Circuit Breaker is pushed in and battery power is available.

IBM Series/1 Communications Indicator Panel

The communications indicator panel has the following switches and indicators, as shown in Figure 97.

Note: The communications indicator panel (an optional feature) is physically located *behind* the front cover of the processor or I/O expansion unit in which the panel is installed.

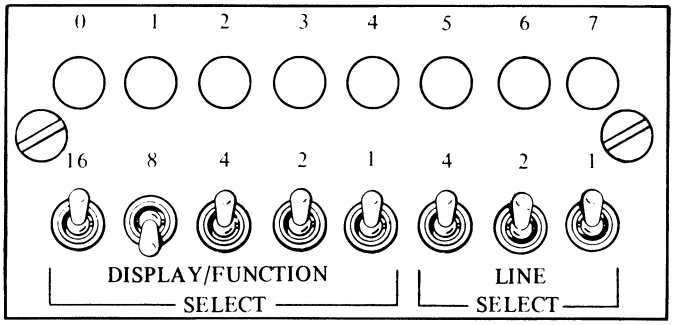


Figure 97. Communications Indicator Panel

LINE SELECT Switches

The three LINE SELECT switches are used only with multiple line attachments. A line is selected by setting the last three bits of its device address, in binary form, into the LINE SELECT switches.

DISPLAY/FUNCTION SELECT Switches

These switches determine what information is displayed in the indicator lamps.

Indicators

The indicators have different meaning for different attachments. For attachment types, switch settings, and their associated indicator meanings, refer to *Series/1 Communications Feature Description*, GA34-0028.

Chapter 5. Operator Aids

The purpose of this chapter is to help you restore correct system operation in case of failure. It contains information that might help you determine the cause of the problem and what to do to correct it. There is a section included for diagnosing 4973 Line Printer problems.

Operator Check List

In case of failure on this unit...	*Check these items...*
All rack-mounted units	Make sure that: • The Emergency Pull switch is in the normal position. • The rack-enclosure circuit breaker is on. • The main power cord is plugged in. • The main power circuit breaker is on.
Single units	Make sure that: • The power cord is plugged in. • The On/Off switch is on. • Power is available at the power source receptacle. • The unit covers are closed.

In case of failure on this unit...	*Check these items...*
Processor unit	Make sure that: • The power cord is plugged in. • The On/Off switch is on. If you have the 4993-1 Series/1—System/370 Termination Enclosure, don't change the On/Off switch setting without following the power on/off procedures described under "Turning On System Power" and "Turning Off System Power" in "Chapter 2. Turning On and Off System Power" on page 2-1. • The Power On indicator is on. • The IPL Source switch is in the correct position. • The Mode switch is in the correct position. If the programmer console is installed, check for the correct settings of the: • Stop on Address key/indicator • Instruct Step key/indicator • Check Restart key/indicator • Stop on Error key/indicator With the Mode switch in the Normal or Diagnostic position, power-on should turn on the following indicators: • Power On • All Data Display positions • Stop • Level 0 (4952 and 4953) Pressing Reset should turn off Data Display indicators.

In case of failure on this unit...	*Check these items...*
Diskette Unit or Diskette Magazine Unit	Make sure that: • The power cord is plugged in. • The On/Off switch is on. • The correct diskette is loaded. • The diskette is correctly inserted. • On the Diskette Unit, the diskette door is latched. • On the Diskette Magazine Unit, the diskette/magazine door is closed. If the problem still exists after doing the above, try another diskette.
Display Station	Make sure that: • The power cord is plugged in. • The On/Off (Brightness control) is pulled to the outer position. • The cursor is illuminated. • The brightness control is turned clockwise. • The contrast control is turned clockwise. Printers
Printers	Make sure that: • The power cord is plugged in. • The Power On/Power Off switch is on. • The Enable/Disable switch is in the Enable position (4973 only). • The Mode switch is in the PRINT position (4974 only). • The correct forms are loaded. • The forms adjustment is set correctly. • The ribbon is installed correctly. • The print belt is installed correctly (4973 only). If a forms tractor is used: • Are the forms loaded properly. • Is the paper-release lever in the forward position (4974 only). Refer to "4973 Line Printer—Printing Problems" in this chapter for additional information on 4973 printing problems.

In case of failure on this unit...	*Check these items...*
Communications Indicator Panel	Make sure that: • The modems are powered-on and ready. • The DISPLAY/FUNCTION SELECT switches are off, or set according to local operating procedures.
Sensor Input/Output Unit	Make sure that: • The power cord is plugged in. • The On/Off switch is on. • The Power On indicator is on.
Programmable Communications Subsystem	Make sure that: • The power cord is plugged in. • The On/Off switch is on. • The Power On indicator is on. • The modems are powered-on and ready.
Battery Backup Unit	Make sure that: • The power cord is plugged in. • The Utility Power switch is on. • The Battery Circuit Breaker is in the correct position.
Disk Subsystem or Disk Storage Unit	Make sure that: • The power cord is plugged in. • The On/Off switch is on. • The Power On indicator is on.
Input/Output Expansion Unit	Make sure that: • The power cord is plugged in. • The On/Off switch is on. If you have the 4993-1 Series/1—System/370 Termination Enclosure, don't change the On/Off switch setting without following the power on/off procedures described under "Turning On System Power" and "Turning Off System Power" in "Chapter 2. Turning On and Off System Power" on page 2-1. • The Power On indicator is on. If Two Channel Switch is installed, • The Mode switch is in the correct position. • The Select switch is in the correct position.

In case of failure on this unit...	*Check these items...*
Series/1—System/370 Channel Attachment	Make sure that: • The power cord is plugged in. • The On/Off switch is on. • The Power On indicator is on. • The Enable/Disable switch is in the Enable position. • The Disable indicator is off. **Note:** Don't change either of the above switch settings without following the procedures described under "Turning On System Power" and "Turning Off System System Power" in "Chapter 2. Turning On and Off System Power" on page 2-1.
Magnetic Tape Unit	Make sure that: • The power cord is plugged in. • The Power switch/indicator is on. • All interlocks are closed (front cover closed). • The tape is loaded correctly (with ring inserted into the tape reel when recording). • For online operation, the On Line indicator is on. • For multi-unit systems, the primary unit is turned on. • The Emergency Push switch is pulled out to the reset position (model 7 only).

IPL Problem Isolation Flowchart

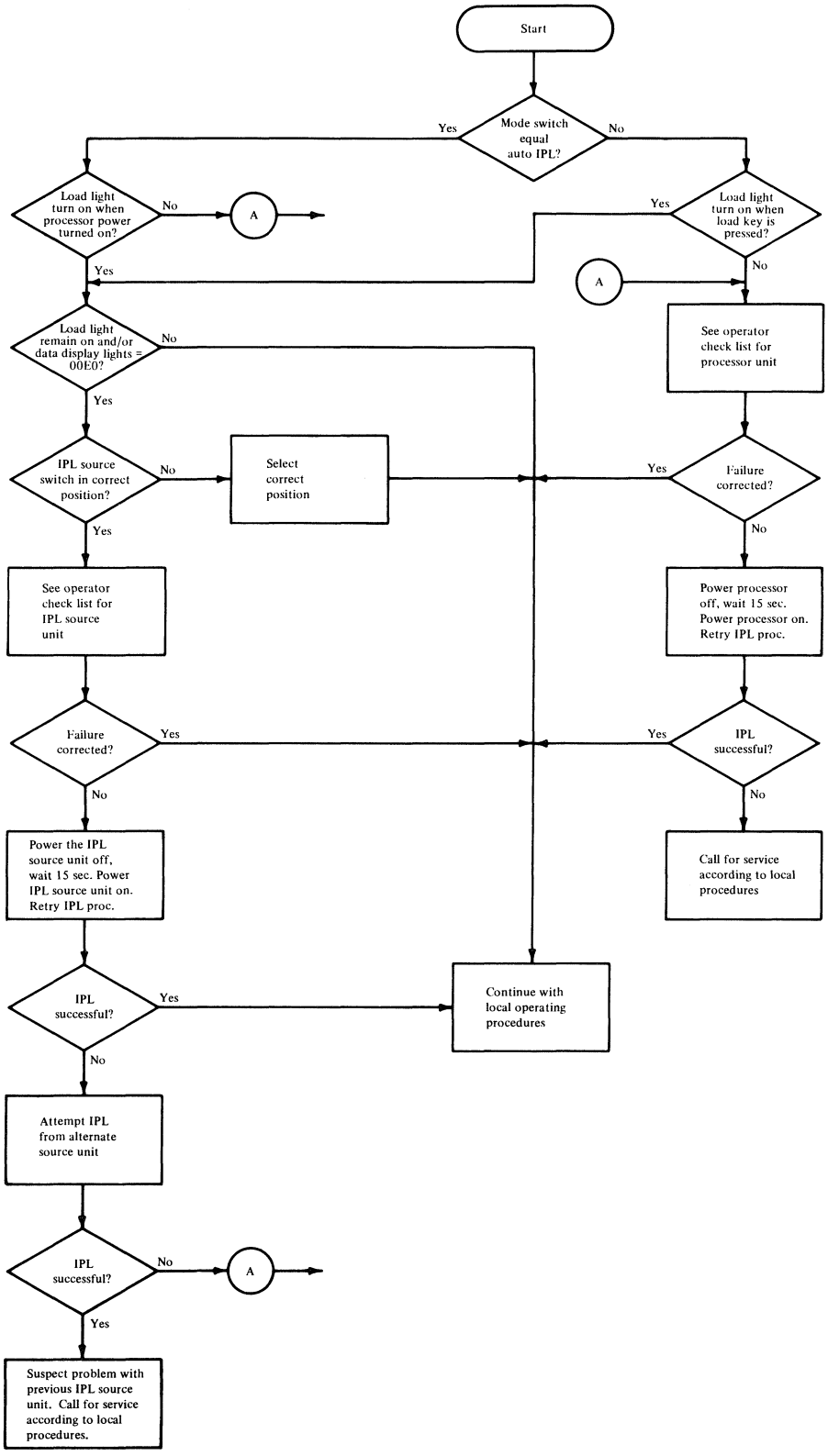


Figure 98. IPL problem isolation flowchart

4973 Line Printer—Printing Problems

Symptom	*Possible cause*
First and second print lines are too close together on the first form.	Improper forms alignment to the first print line. Follow the correct alignment procedure. The forms were moved while the printer power was off or following a Printer Check (hammer or thermal). Power-on the machine and follow the forms alignment procedure.
The print line is not level across the width of the form.	The edge of the forms is not aligned to the same positions on the front and rear forms-alignment scales. Realign the forms, set the forms-chute guides, and adjust the forms input stack. The forms-chute guides are not set properly. Set the guides to the edges of the forms. The forms input stack is not aligned with the printer. Shift the stack so that forms feed easily and squarely into the forms chute. Readjust the forms-chute guides.
False form-jam detection.	Dirt or paper dust is covering the sensing area, under the left tractor cover, or the upper paper clamp. Clean with a soft cloth or tissue. The forms feed holes are not clear of chads, crimps, or other debris. Clear out the loose paper and restart.
The ribbon raises when manually feeding multipart forms.	The forms-thickness lever is set incorrectly. Set the lever to the number of parts in the forms being used. Stiff folds at the form perforation are lifting the ribbon. Open the print unit when manually feeding these forms. Rotate the print-belt pulley to feed the ribbon back on its path. Close the print unit and realign the forms.

Symptom	*Possible cause*
The printing is not clear.	The forms-thickness lever is set incorrectly. Set the lever to the number of parts in the form being used. The ribbon is curled over and is smudging the print. Replace the ribbon.
The printing is light.	The ribbon is worn. Replace the ribbon. Incorrect thickness setting. Set the forms-thickness lever.

Appendix A. Code Conversion

Graphic symbol (EBCDIC)	*Hexa-decimal code*	*Binary code*
A	C1	1100 0001
B	C2	1100 0010
C	C3	1100 0011
D	C4	1100 0100
E	C5	1100 0101
F	C6	1100 0110
G	C7	1100 0111
H	C8	1100 1000
I	C9	1100 1001
J	D1	1101 0001
K	D2	1101 0010
L	D3	1101 0011
M	D4	1101 0100
N	D5	1101 0101
O	D6	1101 0110
P	D7	1101 0111
Q	D8	1101 1000
R	D9	1101 1001
S	E2	1110 0010
T	E3	1110 0011
U	E4	1110 0100
V	E5	1110 0101
W	E6	1110 0110
X	E7	1110 0111
Y	E8	1110 1000
Z	E9	1110 1001
0	F0	1111 0000
1	F1	1111 0001
2	F2	1111 0010
3	F3	1111 0011
4	F4	1111 0100
5	F5	1111 0101

Graphic symbol (EBCDIC)	*Hexa-decimal code*	*Binary code*
6	F6	1111 0110
7	F7	1111 0111
8	F8	1111 1000
9	F9	1111 1001
Space	40	0100 0000
¢	4A	0100 1010
	4B	0100 1011
<	4C	0100 1100
(	4D	0100 1101
+	4E	0100 1110
|	4F	0100 1111
&	50	0101 0000
!	5A	0101 1010
$	5B	0101 1011
*	5C	0101 1100
)	5D	0101 1101
;	5E	0101 1110
¬	5F	0101 1111
-	60	0110 0000
/	61	0110 0001
	E0	1110 0000
,	6B	0110 1011
%	6C	0110 1100
_	6D	0110 1101
>	6F	0110 1110
?	6F	0110 1111
:	7A	0111 1010
#	7B	0111 1011
@	7C	0111 1100
	7D	0111 1101
=	7E	0111 1110
	7F	0111 1111

Appendix B. Applying Reflective Strips to Magnetic Tape

Magnetic tape must have some blank reel space at the beginning and end of the reel to allow correct threading through the tape transport. Markers called reflective strips are placed on the tape by the operator to enable the tape unit to sense the beginning and the end of the usable portion of tape. The markers are manually fastened to the back (uncoated) side of the tape. The tape unit senses the markers as either the load-point marker, where reading or writing is to begin, or as the end-of-tape marker, approximately where writing is to stop.

Load-Point Marker

Allow at least 3.0 to 4.5 meters (10 to 15 feet) of tape between the leading end of the tape and the load-point marker (reflective strip). See Figure 99. Place the reflective strip on the back side of the tape parallel to, and not more than 0.8 millimeter (1/32 inch) from, the edge of the tape nearest you when the reel is mounted on the tape unit.

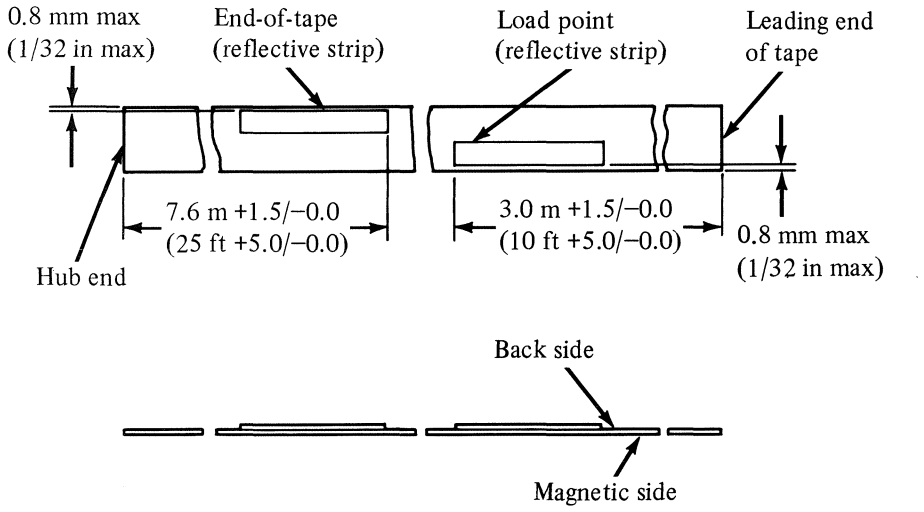


Figure 99. Placement of reflective strips

End-of-Tape Marker

Allow 7.6 to 9.1 meters (25 to 30 feet) marker (reflective strip) of tape between the end-of-tape and the physical end of the tape (see Figure 99 on page B-1). Place the reflective strip on the back side of the tape parallel to, but not more than 0.8 millimeter (1/32 inch) from, the edge of the tape nearest the tape unit when the reel is mounted.

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