IBM Maintenance Library

4224 Printer
Maintenance Information Manual

SC31-3541-1

Second Edition (July, 1987)

This edition obsoletes SC31-3541-0. Changes to this manual are indicated by a vertical bar in the left margin.

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About This Book

The purpose of this book is to provide you, the service representative, with information necessary to repair the IBM 4224 Printer.

You use this book after following the *IBM 4224 Printer Maintenance Analysis Procedures (MAPs).* The MAPs refer you to pages in this book as you identify the failing unit and replace it.

Section 000 introduces you to the 4224 family of printers, the various functional units, operator controls, and diagnostic procedures.

Sections 100-600 have the removal and installation procedures.

Section 700 provides reference information such as locations, and tools and test equipment.

Section 800 provides you with operator type information that will aid you in repairs.

In addition, a glossary and index help you understand and find material presented in this book.

Related Publications

- *IBM 4224 Printer Guide to Operations,* GC31-3621.
- *IBM 4224 Printer Operating Instructions for Models 1XX,* GC31-2546.
  This guide contains information specific to twinaxial-attached 4224 printers that attach to System/36 and System/38.
- *IBM 4224 Printer Operating Instructions for Models 3XX,* GC31-2545.
  This guide contains information specific to 4224 printers that attach to Series/1 and System/88 with RS422-A or RS232-C serial-attached cables.
- *IBM 4224 Printer Operating Instructions for Models 2XX,* GC31-2547.
  This guide contains information specific to 4224 printers that use a coaxial cable to connect it to a computer or controller.
- *IBM 4224 Printer Product and Programming Description Manual,* GC31-2550.
  This manual contains information specific to Model 3XX printers.
- *IBM 4224 Printer Product and Programming Description Manual,* GC31-2551.
  This manual contains information specific to Model 1XX and Model 2XX printers.
- *IBM 4224 Printer Setup Instructions,* GC31-3607.
- *IBM 4224 Printer Planning and Site Preparation Guide,* GC31-3625.
- *IBM 4224 Printer Parts Catalog,* SC31-3542.
- *IBM 4224 Maintenance Analysis Procedures,* B/M 6258859. Order by *MES* (Miscellaneous Equipment Specifications).

General Guidelines for Safety

If you are aware of the guidelines for working with electrical and mechanical equipment and practice these guidelines, you can work safely with this equipment.

You need not fear electricity, but you must respect it.

You should take every safety precaution possible and observe the following safety practices while maintaining IBM equipment:

1. You should not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if this is a potential problem.
2. Remove all power before removing or assembling major components, working in the immediate area of power supplies, performing mechanical inspection of power supplies, or installing changes in machine circuitry.
3. Power supplies, fans, motors, and other units with voltages that exceed 30 V ac or 42.4 V dc

must not be serviced with power on when the unit is removed from its normal installed position within the machine, unless maintenance documentation clearly states otherwise. (This is done to ensure that proper grounding is maintained.)

4. Unplug the power supply cord whenever possible before working on the machine. The wall box switch when turned off should be locked in the off position or tagged with a DO NOT OPERATE tag (form Z229-0237). Be aware that a non-IBM attachment to an IBM machine may be powered from another source and be controlled by a different disconnect or circuit breaker.

5. When it is absolutely necessary to work on equipment having exposed live electrical circuitry, observe the following precautions:

   a. Another person familiar with power off controls must be in the immediate vicinity. (Someone must be there to turn off power if it should become necessary.)

   b. Do not wear any jewelry, chains, metallic frame eyeglasses, or metal cuff links. (In the event of contact, there will be more current flowing because of the greater contact area afforded by the metal.)

   c. Use only insulated pliers, screwdrivers, and appropriate probe tips/extenders. (Remember, worn or cracked insulation is unsafe.)

   d. Use only one hand when working on energized equipment. Keep the other hand in your pocket or behind your back. (Remember there must be a complete circuit for electrical shock. This procedure helps eliminate a path that could complete a circuit through you!)

   e. When using test equipment, be certain that controls are set correctly and that insulated probes of proper capacity are used.

   f. Avoid contacting ground potential (metal floor strips, machine frames, and so on); use suitable rubber mats purchased locally if necessary.

6. Follow special safety instructions when working with extremely high voltages. These instructions are outlined in CE memos and the safety portion of maintenance documentation. Use extreme care when checking high voltage.

7. Avoid use of tools and test equipment that have not been approved by IBM. Electrical hand tools (wire wrap guns, drills, and so on) should be inspected periodically.

8. Replace worn or broken tools and test equipment.

9. After maintenance, restore all safety devices, such as guards, shields, signs and ground leads. Replace any safety device that is worn or defective. (These safety devices are there to protect you from a hazard. Don't defeat their purpose by not replacing them at the completion of the service call.)

10. Safety glasses must be worn when:

    a. Using a hammer to drive pins, and so on

    b. Power hand drilling

    c. Using spring hooks, attaching springs

    d. Soldering, wire cutting, removing steel bands

    e. Parts cleaning, using solvents, chemicals and cleaners

    f. Working with electrolytic capacitors that have blowout plugs

    g. All other conditions that might be hazardous to your eyes.

11. Never assume that a circuit is de-energized. Check it first.

12. Always be alert to potential hazards in your working environment (for example, damp floors, nongrounded extension cords, power surges, missing safety grounds, and so on).

13. Do not touch live electrical circuits with the surface of the plastic dental mirrors. The surface of the dental mirror is conductive and can result in machine damage and personal injury.

14. Do not use solvents, cleaners, or oils that have not been approved by IBM.

15. Lift by standing or pushing up with strong leg muscles. This takes the strain off the back muscles. Do not lift any equipment or parts which you feel uncomfortable with.

16. Service personnel are responsible to be certain that no action on their part renders the product unsafe or exposes hazards to customer personnel.

17. Place removed machine covers in a safe out-of-the-way location while servicing the machine. These covers must be placed on the machine before the machine is returned to the customer.

18. Always place your tool kit away from walk areas where no one can trip over it (for example, under a desk or table).

19. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled up above the elbow. Long hair and scarves must be secured.

20. Ties must be tucked in shirt or have a tie clasp (preferably nonconductive) approximately three inches from the end when servicing a machine.

21. Before starting equipment, make sure that fellow service personnel and customer personnel are not in a hazardous position.

22. Maintain good housekeeping in the area of the machines while performing and after completing maintenance.

23. Avoid touching moving mechanical parts when lubricating, checking for play, and so on.

Prevention Is the Key

Prevention is the key to electrical safety. You should always be conscious of electrical safety and practice *good habits* such as:

- Make certain that the customer's power receptacle meets IBM equipment requirements.
- Inspect line cords and plugs. Check for loose, damaged, or worn parts.
- Before removing a component which can retain a charge from the machine, review the procedure in the maintenance documentation. Wear safety glasses and CAREFULLY discharge the necessary components exactly as directed by the service procedure.
- Do not use a normal lamp as a trouble light.

Know the Condition of Your Machines

Never *assume* anything about a machine or circuit. No machine is completely safe *all* of the time. The exact condition of a machine may be unknown. Here are some of the reasons why:

- The power receptacle could be incorrectly wired.
- Safety devices or features could be missing or defective.
- The maintenance and/or modification history may be uncertain or unclear.
- A possible design deficiency could exist.
- The machine may have suffered transportation damage.
- The machine might have an unsafe alteration or attachment.
- An engineering change (EC) or sales change may have been improperly installed.
- The machine may have deteriorated due to age or environmental extremes.

- A component could be defective, creating a hazard.
- Some component of the machine may have been incorrectly assembled.

These are some of the ways the condition of the machine can affect your safety. *Before you begin a service call or procedure, exercise good judgment and proceed with caution.*

Electrical Accidents

Four steps that should be taken in the event of an electrical accident:

1. USE CAUTION—DON'T BE A VICTIM YOURSELF.
2. TURN POWER OFF.
3. HAVE SOMEONE ELSE GET MEDICAL HELP.
4. ADMINISTER RESCUE BREATHING IF VICTIM IS NOT BREATHING.

Administering First Aid

In implementing rescue procedures in an electrical accident, one must:

- *Use Caution.* If the victim is still in contact with the electrical current source, it may be necessary to use the room EPO (Emergency Power Off) or disconnect switch to remove the electrical current.

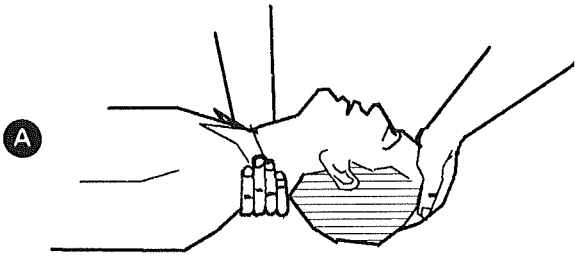
  If the EPO or disconnect switch cannot be located, use a dry stick or another nonconducting object to pull or push the victim away from contact with the electrical equipment.

- *Act Quickly.* If the victim is unconscious, he/she may need rescue breathing and possibly external cardiac compression if the heart is not beating.

- *Call Fire Rescue* (Rescue Squad, Emergency, Ambulance, Hospital, and so on). Have someone summon medical aid.

Determine if the victim needs rescue breathing.

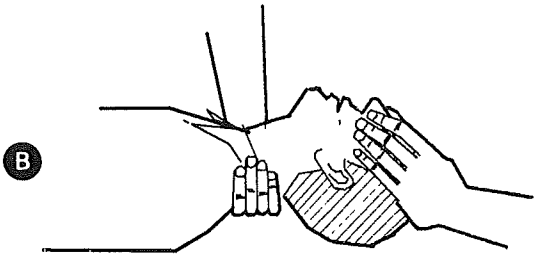
1. Make certain that the victim's airway is open and that it is not obstructed. Check the mouth for objects that may be blocking the airway such as gum, food, dentures or even the tongue. Position the victim on his back and place one hand beneath the victim's neck and the other hand on his forehead. Then lift the neck with one hand and tilt the head backward with pressure on the forehead from the other hand (A).



2. Now you must *look, listen, and feel* to determine if the victim is breathing freely. Place your cheek close to the victim's mouth and nose to listen and feel for the exhaling of air.

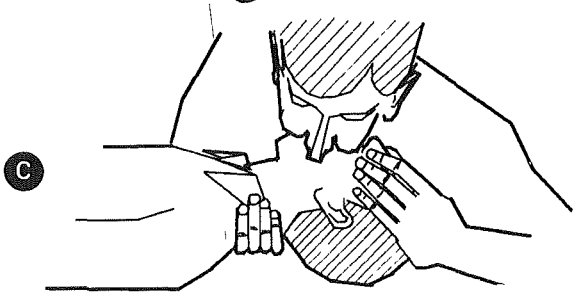
   At the same time, look at the chest and upper abdomen to see if they rise and fall. If the victim is not breathing properly, you should:

   a. With the head in a backward tilt (A), continue to exert pressure on the victim's forehead with your hand while rotating this same hand so that you can pinch the victim's nostrils together with the thumb and index finger (B).

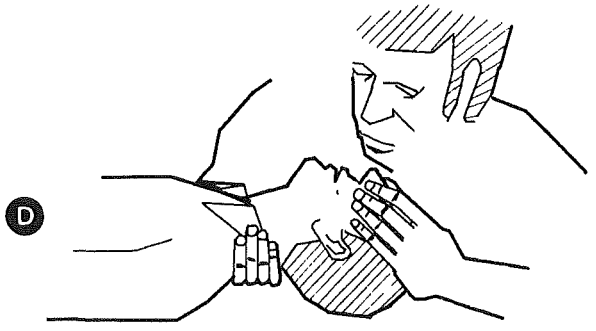


CAUTION
Use extreme care when administering rescue breathing to a victim that may have breathed in toxic fumes. DO NOT INHALE AIR EXHAUSTED BY THE VICTIM.

b. Open your mouth wide and take a deep breath. Make a tight seal with your mouth around the victim's mouth and blow into the victim's mouth C.



c. Remove your mouth from the victim and allow the victim to exhale while watching for the victim's chest to fall D.



d. Repeat this cycle once every five seconds until the victim breathes for himself or medical help arrives.

Reporting Accidents

It is a service representative's responsibility to report all electrical accidents, potential electrical hazards, and "near-miss" accidents to your *manager*. Remember, a near-miss accident might be the result of a design deficiency and prompt reporting will assure that the situation will be resolved quickly.

It is important to report even a minor shock because the conditions that caused it need only be varied slightly to cause serious injury.

Handling Parts That Are Sensitive to Electrostatic Discharge

Electrostatic discharge (ESD) can damage certain cards and logic boards when you handle them. If current from such a discharge passes through these parts, damage can range from immediate failure to degraded performance (the parts wear out prematurely). Use the following to reduce the exposure to damage from ESD:

- Field ESD kit
- Wrist bands
- Protective card caddies.

Field ESD Kit

Generally, you should consider all logic cards and boards to be ESD sensitive, and when you handle them, you must use the Field ESD Kit (part number 6428316). This kit contains the following:

Part No.	Description
6428166	ESD cord
6428274	ESD mat, safe work surface
6428275	Conductive black plastic box
6428317	Label containing instructions (inside lid of box)
6428318	Label, outside identification

Before you use the tools, read the instructions that are supplied with the kit. The instructions contain **SAFETY** practices that you **must follow** and some general practices that will help you to use the kit correctly.

Wrist Bands

In addition to the kit, you need a wrist band for personal grounding. The following two sizes are available and must be ordered separately:

Part No.	Description
6428167	Wrist band, small (beige)
6428169	Wrist band, large (blue)

The small wrist band is for a wrist circumference that is less than 165 mm (6.5 inches). The large band is for a wrist circumference that is 165 mm (6.5 inches) or more.

All other wrist bands are obsoleted by the new wrist bands. A number of the obsoleted wrist bands were shipped with some machines. These bands are no longer approved for use and you should discard them.

Card Caddies

The following two new ESD protective card caddies have been released:

Part No.	Description
6428141	Conductive, soft-sided caddy (Full size = 36 4W x 3H cards)
6317023	Conductive, soft-sided caddy (Half size = 18 4W x 3H cards)

Both caddies have a snap fastener for attaching the ESD cord (part of the ESD kit). This permits the caddy to serve as a large ESD safe work surface.

Both caddies also have a carrying strap that is long enough to permit you to carry the caddy over your shoulder.

The new soft caddies are intended for logic cards, but sometimes can include small mechanical parts if the caddy is stocked to support a particular product. Do not carry large heavy parts in the new soft caddies Use the old style caddies to carry mechanical parts and other items.

Safety Notices

There are three types of safety notices. They are printed here to show you what they look like and explain the purpose of each.

Danger Notices

DANGER
This type notice advises you of a condition that could present a potential hazard where loss of life or serious personal injury is possible unless care is used.

A Danger Notice appears in the following section:

1. 611 Power Supply.....Page 600-2

DANGER
Whenever you perform power supply MAP procedure 3600, be sure to follow each step carefully. These steps ensure that you avoid exposure to electrical hazards when operating the power supply out of the printer with the power cord connected.

Caution Notices

CAUTION
This type notice advises of a condition that could present a potential hazard where personal injury (other than life threatening) is possible unless care is used.

Warning Notices

Warning: This type notice advises of a potential condition that could cause machine or program damage unless care is used.

Safety Inspection Procedure for the 4224

The following safety inspection should be performed on any 4224 Printer that is being considered for an IBM maintenance agreement when there is any reason to question its safety. If the inspection indicates the level of safeness is unacceptable, it must be brought up to an acceptable level before IBM service can be provided.

Getting Ready:

Before doing the inspection procedures, ensure that the present conditions are safe, the printer is powered off and all electrical power is removed at the line cord.

Safety Conditions:

If present conditions are not safe, you must determine if the condition is serious.

For example, the following conditions are not safe:

- Electrical: Missing ground strap from the power supply to the frame assembly (See Section 611).
- Mechanical: Any of the three power supply mounting screws that are not installed.
- Paper guide shield not secure (See Section 119).

You must correct any problem found in these areas before you continue with this inspection.

Safety Education:

Before doing the inspection procedures, you must have completed the Electrical Safety Training Course for IBM Service Representatives.

Performing the Inspection:

IBM machines are designed and assembled with safety items installed to protect owners, operators and service personnel from injury. This inspection identifies areas of the machine that may not be safe. Use good judgment to identify other safety conditions not covered by this guide.

__ 1. With the power switch in the off position, verify that the printer does not power on.

__ 2. With the power switch in the on position, verify that the printer powers on.

__ 3. With the power switch in the on position, verify that the printer powers off when the switch is put in the off position.

__ 4. Leave the switch in the **off** position and remove the line cord before continuing with the safety inspection.

__ 5. Check the line cord for visible cracks, wear or damage.

__ 6. Ensure that the line cord has the correct power plug.

__ 7. Check for 0.1 ohm (or less) of resistance between the line cord ground and the ground pin on the power plug.

__ 8. Ensure that all the safety ground screws and wires are connected as shown in the safety ground schematic (AA017).

__ 9. Check the inside of the printer for foreign materials.

__ 10. Check all printer covers for loose or broken hinges and sharp edges.

__ 11. Ensure that the power supply rivets have not been tampered with.

__ 12. Connect the line cord and set the power switch to the **on** position and verify that the printer powers on.

__ 13. Return the printer to the customer and inform the local branch office of the inspection results.

Contents

000. General Information

000 Entry Contents

001 - Printer Theory and Overview

This section describes the IBM 4224 Printer and its functional units. It also describes controls, lights, and operator panel keys.

The IBM 4224 Printer is a serial, impact wire-matrix printer. It is a table-top printer with an integrated controller/processor. The IBM 4224 prints bidirectionally at speeds of 200 or 400 characters per second (cps), depending on the model.

The IBM 4224 is for business or general purpose printing. It has three print modes: data processing, data-processing text, and near-letter quality. The IBM 4224 Printer can print:

- OCR A
- OCR B
- Bar codes
- Oversized characters
- Graphics for business applications
- Forms
- User defined symbols
- Retained segments
- Overlays
- Color (color models only)
- Word processing applications.

The print head is a customer-replaceable unit (CRU). Service for this assembly is not covered by the IBM Maintenance Agreement.

The printer can use one of three forms-handling devices. They are:

- Continuous forms device (CFD)
- Document on demand device (DOD)
- Document insertion device (DID).

The customer can remove and replace each device. The IBM Maintenance Agreement covers all forms-handling devices as part of the base machine.

The printer electronics is packaged on four cards (attachment, controller, driver, and base card) and in the printer power supply. The attachment card is unique to the system being used.

Model Identification

The first digit of the model designation defines the system attachment:

1 = System 36/38 (Twinaxial)
2 = System/370 (Coaxial)
3 = Series/1, System/88, RS232-C, and RS422-A (Serial).

The second digit defines the memory size, the forms handling device, and color printing capability:

0 = 64K memory, CFD, DID, DOD
C = 512K memory, CFD, color printing
E = 512K memory, CFD, DID, DOD.

The third digit defines printer speed:

1 = 200 characters per second
2 = 400 characters per second.

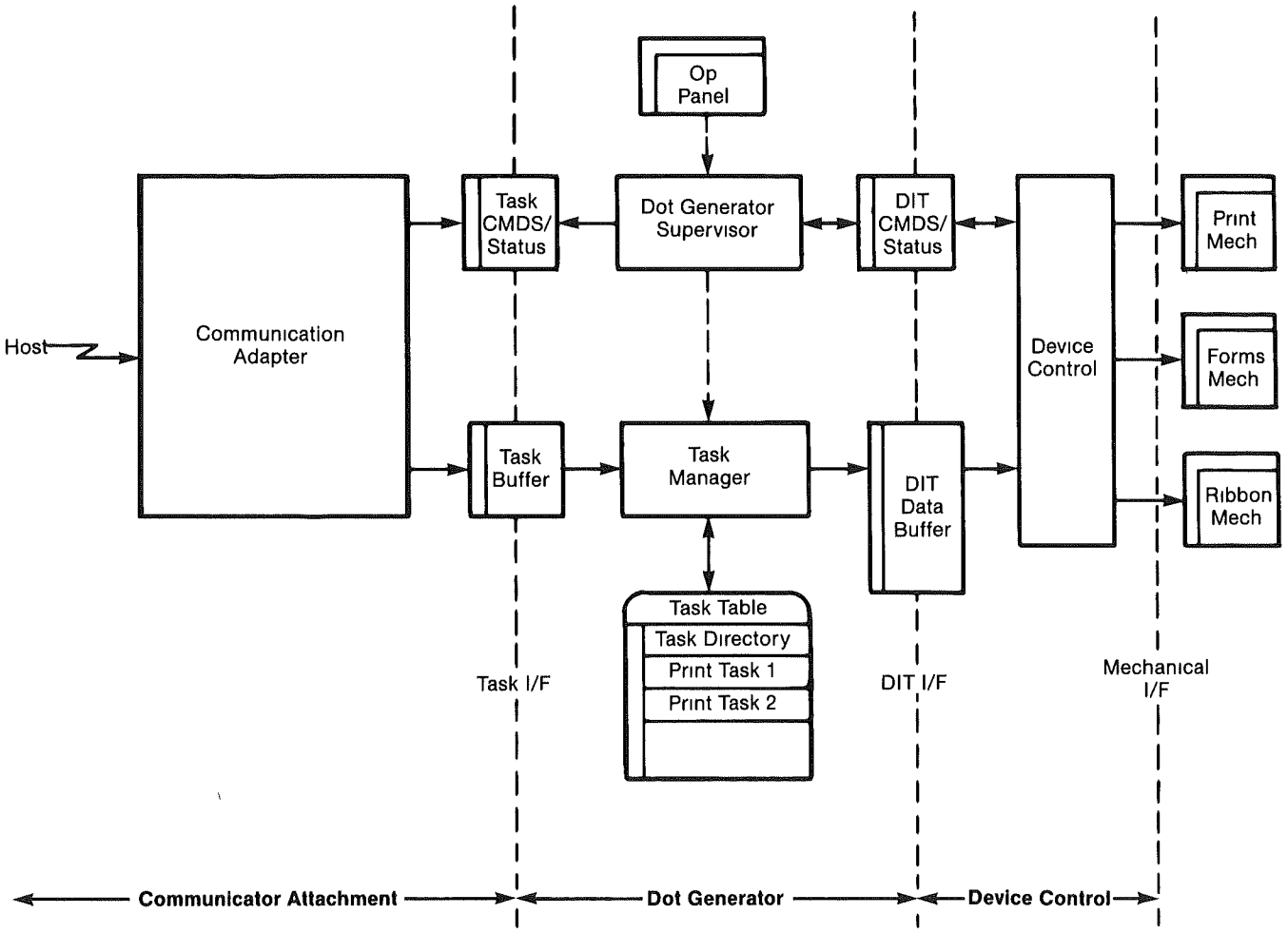
For example:

A Model 301 is serial-attached, has 64K memory, and prints at 200 characters per second.

Note: The model number on the front left side of the paper entry chute shows only the last two digits.

003 - Control and Data Flow Description

The following illustration shows the basic data flow paths for the IBM 4224 Printer.



005 - Basic Assurance Tests (BATs)

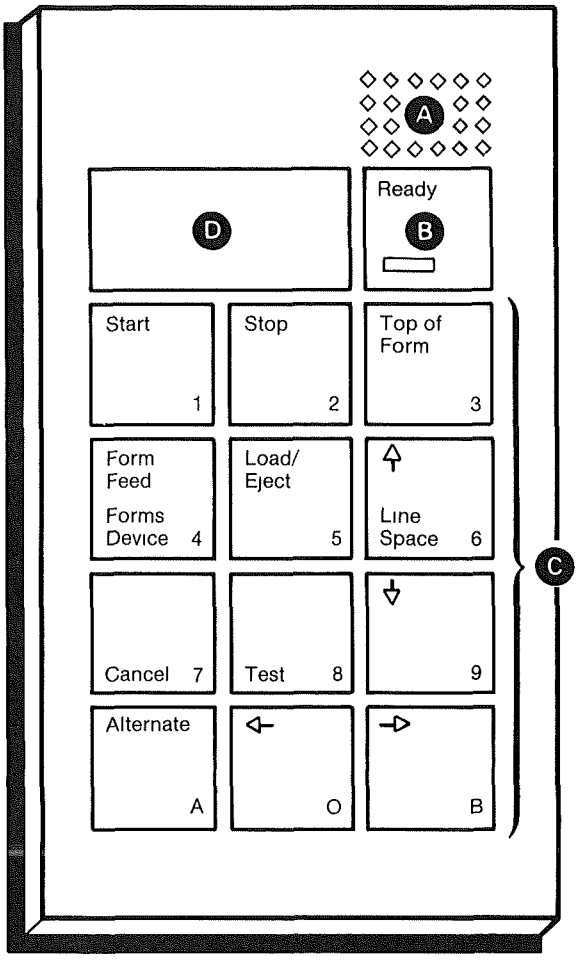
When the power is switched on, diagnostic tests, called basic assurance tests (BATs), automatically run under control of microcode in the printer. If an error occurs in any basic assurance test, an error code is shown on the operator panel display.

The mechanical basic assurance tests simulate online conditions. These tests verify the forms motor and the print head drive motor (along with the ribbon motor) for correct operation.

010 - Operator Control Panel

The operator panel consists of:

- (A) An audible alarm
- (B) A Ready light
- (C) 12 keys
- (D) A three-position LED display.



011 - LED Display and Ready Light

The Display

The three-position display (D) shows the present printer status by displaying:

- Up to three alphameric characters (status codes)
- "FFF" which displays when you switch on the printer power
- "A" in the first position followed by numeric characters in the second and third positions (program error code assignments).

The *IBM 4224 Printer Operating Instructions* lists the status codes and gives recovery procedures. AXX status codes are described in the *Product and Programming Description.*

The Ready Light

The Ready light (B) has three operating conditions:

On (Solid): The printer is ready to print, but has not received data from the computer.

Off (Solid): The printer is not ready to print and no data has been received from the computer.

Blinking: The printer has received data from the computer and is storing it, or the printer is doing one of the printer tests.

013 - The Keys

The operator panel has the following keys:

- Start
- Stop
- Top of Form
- Form Feed
- Load/Eject
- Up/down arrows
- Cancel
- Test
- Alternate
- Left/right arrows.

Start (1)

Pressing **Start**:

- Makes the printer ready and the Ready light comes on or blinks if data is ready to print
- Starts the printer printing if no error conditions appear in the display and if the computer is sending data to be printed
- Starts a test when the printer is in test mode
- Clears some status codes from the display and turns off the alarm if it is set to sound.

Stop (2)

Pressing **Stop**:

- Allows use of the other keys
- Stops printing
- Stops the printer from printing a test if the printer is in test mode
- Stops the printer alarm (if beeping)
- Clears some error conditions from the display
- Turns off the Ready light unless data is in the printer in which case the Ready light blinks
- Causes the printer to display 00 (or a test number to display if the printer is in test mode).

Top of Form (3)

Pressing **Top of Form** sets the first print line when using the continuous forms device or the first possible print line when using the document on demand device. Pressing this key establishes the first print line on the first form and maintains that same starting position for all subsequent forms. The alarm will beep to indicate that this key has been pressed.

Once the top of form has been established, adjustments can be made by using the up and down arrow keys. You should not press the key again unless you want to establish a new first print line.

Form Feed (4)

Pressing **Form Feed** advances the forms so that the next form to print is at the top-of-form position when you are using the continuous forms device or the document on demand device.

Notes:

1. The factory-set value for maximum page length is one line. To be able to advance the form to its full length, you must change the maximum page length value to the length of the form. Also, print speed may be reduced if the maximum page length setting is not greater than one line.
2. If you interrupt a print job and press **Form Feed**, and then press **Start** (when you are ready to resume the job), the printer starts printing on the next form at the place where printing was interrupted on the previous form.

Load/Eject (5)

Pressing **Load/Eject**:

- **Document on Demand Device:** Do not press **Stop** first. Pressing **Load/Eject** makes the printer *not ready* (the printer displays 03) and advances the form so that you can tear off the form at the perforation and remove it from the printer. Pressing the key a second time, moves the next form to be printed back to the first print line position and makes the printer ready.

- **Document Insertion Device:** Loads or ejects the printed form. If you have accidentally loaded the wrong form, pressing this key ejects the form.

- **Continuous Forms Device:** Ejects forms from the printer when the printer detects the end of the form.

Up/Down Arrows (6 and 9)

Pressing the **up** or **down arrow** moves the form 0.355 mm (0.014 in.) in the direction of the arrow each time you press the key. If you continue to hold the up arrow key, the forms move continuously until you release the key.

Notes:

1. For the document insertion device and the document on demand device, the printer stores movements within 1/6 inch to keep track of the top-of-forms position.

2. The down movement is limited because backing up the forms can cause them to buckle and might damage the printer.

Left/Right Arrows (0 and B)

Pressing the **left** or **right arrow** sets the position of the left margin. Position changes appear in the display in units from 00 to 20. Movement is in 0.676 mm (0.026 in.) units. The limit of maximum movement is 18.11 mm (0.713 in.) from the center of the tractor pins for continuous forms or from the left edge of a cut form. The initial factory setting for this is 10.

Note: You cannot observe the movement. The adjustment is done within the printer circuitry. The printer stores the selected position and uses it to determine the left margin for each subsequent print line.

Cancel (7)

For Model 2XX printers only, this key functions as a PA1 (program attention) key.

Pressing **Cancel** sends a message to the computer or controller (the printer displays 61) or the printer displays 09. The 61 display goes away when the controller accepts the input.

Test (8)

For Model 2XX printers only, this key functions as a PA2 (program attention) key.

Pressing **Test** sends a message to the computer or controller (the printer displays 62) or the printer displays 09. The 62 display goes away when the controller accepts the input.

Alternate (A)

The **Alternate** key is used in combination with other keys to do the following "alternate" functions:

- Cancel
- Test
- Line Space
- Forms Device Selection
- Print Alignment
- Buffer Print/Reprint (depending on model)
- Checking and changing of configuration option values.

Cancel (Models 1XX)

Pressing and holding **Alternate** and then pressing **Cancel** may cause the printer to send a message to the computer to cancel the print job and to clear data.

If the printer is in test mode, the printer exits test mode, the Ready light goes out, the printer does a power-on reset, and stops with the Ready light off.

Cancel (Models 2XX)

Pressing and holding **Alternate** and then pressing **Cancel** allows you to cancel a job before it finishes and the printer displays 59 or 09. You can use this function to clear data from the printer storage areas. Data in the printer storage areas will be indicated by a blinking Ready light.

If the printer is in test mode (*offline*), the printer exits test mode, the Ready light goes out, the printer does a power-on reset, and stops with a blank display and the Ready light on. If you use this key combination for *online* checking or changing, the printer does not do a power-on reset and stops in the *not ready* state (the printer displays 00).

Cancel (Models 3XX)

Press and holding **Alternate** and then pressing **Cancel** allows you to clear data from the printer buffer.

If the printer is in test mode, the printer exits test mode, the Ready light goes out, and the printer does a power-on reset.

Test

Pressing and holding **Alternate** and then pressing **Test** puts the printer in test mode.

Pressing and holding **Alternate** and then pressing and releasing **Test** allows you to screen through the test routine menu. The last number in the display when you release the keys is the test routine selected.

Line Space

Pressing and holding **Alternate** and then pressing **Line Space** causes the printer to advance the forms in 1/6 inch steps. (If you hold **Alternate** and **Line Space** for more than 1/2 second, the forms will move continuously.) If you use this key combination when the Ready light is blinking, the vertical print position might become misaligned.

Forms Device

Pressing and holding **Alternate** and then pressing **Forms Device** causes a device number to appear in the display.

The device number in the display should match the type of forms device installed in the printer. Each forms device has the device number printed on the upper left corner.

Continuous Forms Device (CFD) = F1

Document on Demand Device (DOD) = F2

Document Insertion Device (DID) = F3

Print Alignment

Pressing and holding **Alternate** and then pressing and holding **Start** causes "H's" to print. A line of "H's" continues to print across the page until 80 have been printed or until you release the keys.

You can use this key combination to align the horizontal and vertical position of the first print character.

Buffer Print (Models 1XX)

Pressing and holding **Alternate** and then pressing **3** puts the printer in buffer print mode and the printer displays 00.

Pressing **Start** makes the printer ready. The printer displays 27 to indicate that buffer print mode is active. If the computer system is ready to send data to the printer, the printer prints the data in a hexadecimal format.

Pressing **Stop** or switching power Off (O), takes the printer out of buffer mode.

Buffer Reprint (Models 2XX)

Pressing and holding **Alternate** and then pressing 3 causes the printer to reprint the contents of the attachment card buffer or the printer displays 09.

Buffer Print (Models 3XX)

Pressing and holding **Alternate** and then pressing **3** displays the buffer print mode value (00=off, 01=on). When buffer print is set to 01, the printer prints in a special format. Use the printout to solve program problems.

To change the setting, press and hold **Alternate** and then press and release **3** until the value you want displays. When you release both keys, the last value in the display becomes the selected value.

After you release the keys, the printer returns to the *not ready* state, and the display shows 00.

After you print all the data and press **Stop**, one line of data might be in the buffer in the special format. After resetting buffer print to 00=off, press **Start** to print this last line.

Note: Refer to the *IBM 4224 Printer Product and Programming Description* for the interpretation of the special format printout.

020 - Controls

021 - Power Switch

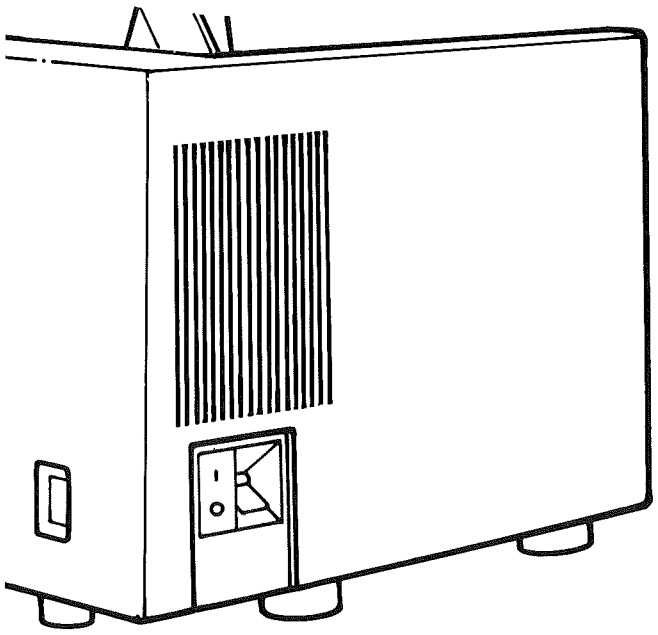
The power switch, located toward the rear on the left side of the printer, has two positions: | (On) and O (Off).

This switch should remain on during printing operations unless you are experiencing printer problems. If you do switch the power off, you must wait 10 seconds before switching the power on again.

If printing must be stopped to align or change forms, or to adjust or change the print ribbon, press the Stop key.

Important

Do not switch off the printer power or you may lose data in the printer buffer and data coming from the system to your printer.

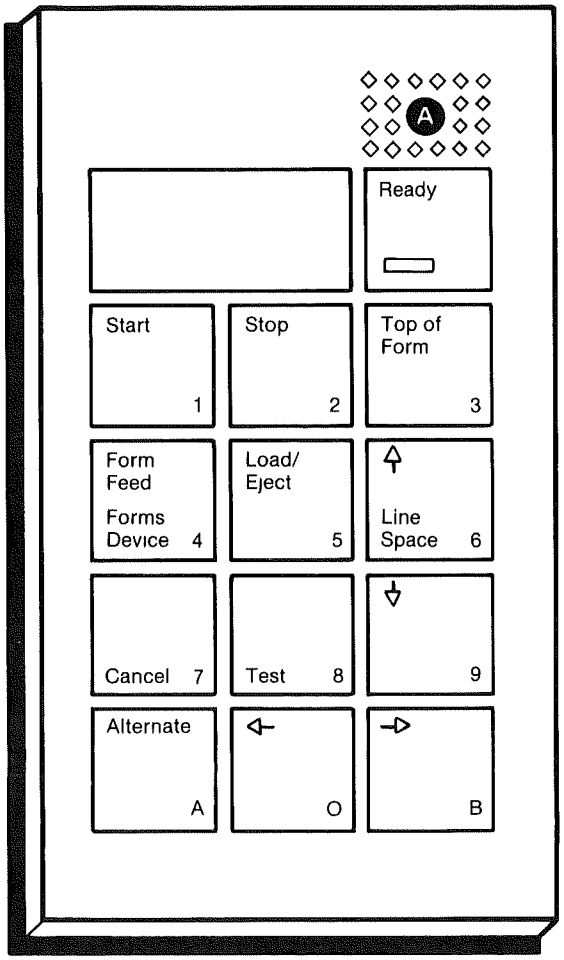


023 - Alarm

The printer alarm (A), located at the top of the operator panel, "beeps" (if enabled) to indicate a printer error or status condition. Pressing the Stop key turns the alarm off.

Use customer printer test 304 to enable or disable the alarm. The customer printer tests are explained in the *IBM 4224 Printer Operating Instructions.*

Note: To provide an indication of pressing the Top of Form key, the alarm produces a short beep (whether it is enabled or disabled).



030 - Printer Functional Units

031 - Print Mechanism

The print mechanism is the mechanical base of the printer. It consists of two sideframes, a permanently mounted platen, the print head carrier, shafts, forms motor, print head motor, drive belt, ribbon motor, sensors, and cable assemblies.

Print Head Drive

The print head motor is a dc motor with emitters attached at the end of the motor shaft. The control card tracks and controls print head movement through the driver card. The motor is attached to the print head carrier by a notched belt. Belt tension is adjusted by moving the belt idler assembly.

The control card sets emitters to zero when the print head is in the left-most (home) position. All movement is referenced from the home position. The print head automatically returns to the home position whenever the printer is inactive for more than five seconds.

Error codes are displayed for overcurrent conditions, open motor or driver card circuits, and internal driver card failures.

Print Head

The print wires are fired by +38 V dc drivers controlled by the control card logic through the driver card. There is no feedback or error detection circuitry for the print wires. A specially designed print test is used for problem isolation.

The print head is a customer purchase responsibility.

032 - Forms Drive

The forms drive is a dc stepper motor controlled by control card logic. Driver card voltages are fed to the motor and move the paper 0.35 mm (0.014 in.) for normal print spacing. On the Model X01 the paper is moved 0.18 mm (0.007 in.) between passes while printing in near-letter-quality (NLQ) mode.

Error codes are displayed for overcurrent conditions, open motor or driver card circuits, and internal driver card failures.

In addition, an error code is displayed whenever the installed forms module does not agree with the printer configuration or when an operation is requested of a module not installed.

033 - Forms Devices

Continuous Forms Device (CFD)

The continuous forms device is optional on all models. The device mounts inside the printer and vertically positions continuous forms (paper sheets separated by perforations). The device is normally used when printing large volume work, or work that requires minimal operator intervention.

Document Insertion Device (DID)

The DID is available as an option on Models X01, X02, and XE2. The device mounts inside the printer to vertically position cut forms (individual paper sheets).

Document on Demand Device (DOD)

The DOD is available as an option on Models X01, X02, and XE2. The device mounts inside the printer to vertically position continuous forms (paper sheets separated by perforations). The device is used when printing small volume work that requires the continuous forms to be separated at the perforation after each job (such as an individual invoice). A tear bar is on top of the device so the operator can easily separate forms as required.

034 - Ribbon Drive

The ribbon drive motor is a dc motor controlled by the control card through the driver card logic. There is an overcurrent detection circuit for the ribbon drive. All other failures are observed as print or ribbon failures.

Color Ribbon Shift Drive

The ribbon shift is a dc stepper motor controlled by the control card through the driver card logic. There is no feedback or motion circuitry for the motor. All failures are considered color-selection failures.

Ribbons

Warning: The IBM ribbons for the IBM 4224 Printer are specially formulated with a lubricating non-particulate ink that ensures proper print head performance. The use of ribbons that do not meet IBM specifications could result in sticking print wires or missing dots.

Each ribbon is packaged in a disposable cartridge. For non-color model printers only, there are two types of ribbons available. They are:

- Standard width - Black multipurpose
- Standard width - Extended life.

For color models, there are three types of ribbons available. They are:

- Wide - Black multipurpose
- Wide - Accent color
- Wide - Subtractive color.

035 - Cooling Fan

The cooling fan is a single-speed dc motor.

036 - Sensors

End-of-Forms

When the continuous forms device or the document on demand device is installed, the end-of-forms sensor detects the last form feeding into the printer. When the trailing edge of the form passes this sensor, a busy condition is made available to the system. Printing stops after printing the last line of the form.

When the document insertion device is installed, this sensor indicates when paper is inserted and signals the device to move the paper to the first print line.

Ribbon Type (Color Models Only)

These two switches, mounted on the ribbon crossbar, detect whether a black fabric, accent color, or subtractive color ribbon is installed.

Print Head Speed Inhibitor Switch

This switch causes the printer to print at a slower speed whenever the access cover is opened.

037 - Power Supply

The power supply provides -15 V dc, +5 V dc, +15 V dc, and +38 V dc power. The power distribution is shown in maintenance information drawing AA014.

The power supply has an LED light for checking the power supply operation. This light comes on when the power is switched on. After a few seconds it goes off to indicate that the voltage supplies are present. The LED will light continuously if there is a power supply failure.

CAUTION
Voltages can be present with the LED on if the power supply system reset line is grounded.

038 - Printed Circuit Cards

The following printed circuit cards are in the IBM 4224 Printer:

Base Card

This card is the common inter-connector for the logic cards, power supply, motors, sensors, fan, and print head.

Control Card

This card contains the logic that controls forms movement, print head movement, and basic operations as directed by the host program or the operator through the operator panel.

The microprocessor that performs the basic assurance tests is also on this card. System Reset goes inactive during the tests.

Driver Card

This card contains the driving circuits for all of the electro-mechanical functions. Error detection signals when an overcurrent condition exists. A protect line becomes active when the driver card is removed or improperly seated.

Attachment Card

The attachment card interfaces between the printer and the using system. The IBM 4224 Printer attaches to twinaxial, coaxial, and serial-cabled systems.

050 - Diagnostics

This section describes methods used to determine what is causing the printer to fail. It contains instructions for selecting repair tests and the customer tests necessary for successful diagnosis to isolate the failing unit.

Printouts are provided to help you check the output of the printer against the expected results for the tests. The printouts vary, depending on model type.

051 - Replaceable Units

The IBM 4224 Printer is designed so that service work can be done in the simplest of ways. The repair procedures make it unnecessary to find failing components down to the smallest part. Rather, the printer is divided into convenient replaceable units.

These units are:

Customer-Replaceable Unit (CRU)

These are the units that customer personnel can replace to repair a printer. They are:

- Print head
- Ribbon cartridge.

The customer can remove and replace these units with the printer cover on the printer. Internal parts are not accessible.

Field-Replaceable Unit (FRU)

These are the units that service personnel can replace to repair a printer. These repairs are done with the covers removed. Internal parts are fully accessible. A maintenance procedure for each FRU is in Sections 100 through 800.

052 - Diagnostic Testing

Two levels of built-in diagnostic tests help you and the customer identify the source of printer problems. When a test identifies a failing unit, you are referred to a procedure that tells you how to replace the failing unit.

The two levels of built-in diagnostic tests are:

Customer Tests (3XX)

The customer uses these tests to check or change configuration options such as characters-per-inch, maximum page length, lines-per-inch, and so on. CE repair (8XX) tests are not considered customer tests.

Print test 300 allows the customer to print a line of H's as a test pattern to help align forms.

Print test 301 allows the customer to print a test pattern to check the print head, print quality, color integrity (for color models), and the configuration option settings. Sections 053 and 054 describe these tests. Other customer tests are described in the *IBM 4224 Printer Operating Instructions.*

Also, the automatic power-on tests can indicate (by a status code in the display) to the customer if a problem exists. Status codes and their recovery actions are listed in the *IBM 4224 Printer Operating Instructions.*

CE/Repair Diagnostics (8XX)

These in-depth tests identify a failing field-replaceable unit. Run these tests, as well as any of the customer tests, to determine the necessary repair.

- Power-On tests (automatic)
- Repair tests (manual/sequential/selectable)

You have to put the printer in customer test mode (300 displayed) before you can run any of the repair tests. Sections 055 and 056 describe how to use the CE/Repair tests.

053 - How to Select Customer Print Tests

Only customer tests 300 and 301 are described here. A full explanation of other customer tests is found in the *IBM 4224 Printer Operating Instructions*. The other customers tests described in the *IBM 4224 Operating Instructions* are referred to as configuration options, not tests.

How to Enter and End Customer Print Tests 300 and 301

1. Press **Stop**.
2. Press and hold **Alternate** and then press and release **Test** until the printer displays **300** (or **301**). The last number to appear in the display is the test selected. Release the key. A blinking **300** (or **301**) remains in the display.
3. Press **Start** to print. The test number stops blinking and the test runs. See "Test 301 - Print Verification" on page 000-15 for an illustration of the printout for test 301.
4. To end test mode, press and hold **Alternate** and then press and release **Cancel**. A power-on reset occurs.

Note: The attachment card does not have to be installed to run any of these offline tests. If the attachment card is not installed, the display shows a code "65" at the completion of the power-on-reset tests (press the Stop key).

054 - Customer Test Descriptions

When checking print quality in the tests on the following pages, use the check list below to determine if there is a quality problem. Check for:

- Even densities
- Even character spacing
- Even line spacing
- No smudging of characters
- No missing dots
- Good line registration
- No wavy lines
- Good colors
- Correct colors.

Test 300 - Print Alignment

Test 300 allows the customer to print a line of H's as a test pattern to help align forms.

Note: There is an online print alignment function. See 000-7.

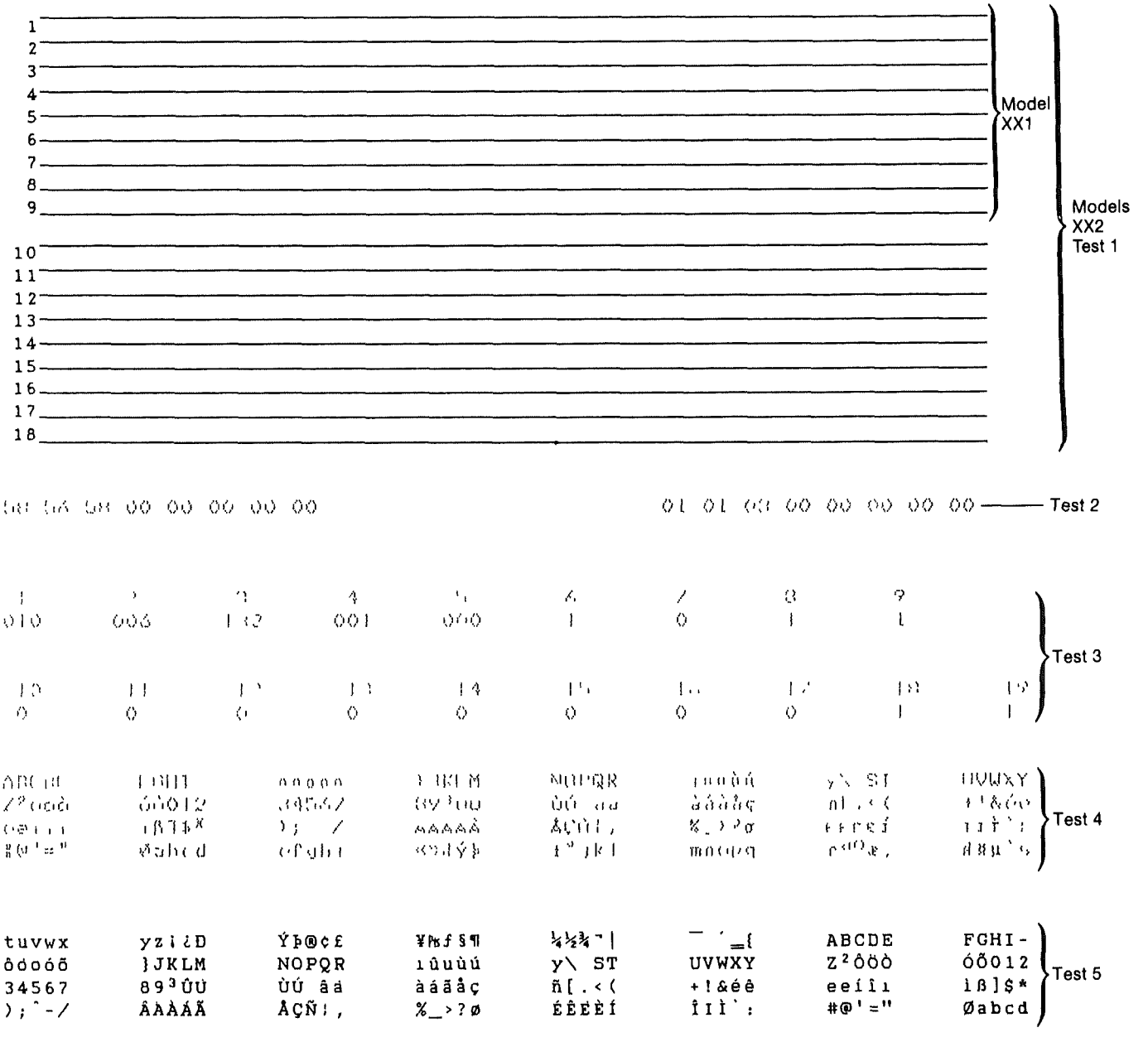
After test 300 is selected and **Start** is pressed, the printer goes from an offline, not-ready state to an offline, ready state. A line of 80 H's prints in data-processing quality at 10 characters-per-inch. This allows the customer to visually verify the location of the left-most print position as well as the base line of the printed line. After the line of H's prints, the customer can fine-adjust the print position by pressing the left or right (vernier) keys. Those two keys adjust the home position of the print head.

The test can be rerun by pressing **Start**. Because the printer does not do a line space for a rerun, the next line of H's will overprint the previous line of H's.

Test 301 - Print Verification

The following is an example of a test 301 printout. This test requires a form with a minimum dimension of 8 x 11 inches. The actual print will vary, depending on which model you are testing.

The tests are explained in more detail on the following pages. Routine 301 may be restarted at any point by pressing the **Stop** key and then the **Start** key.



Test 1 - Print Wire Test

A missing or partial line of print indicates a problem.

Test 2 - Printer Error Log

The error log records error codes and keeps a running count of the errors. The CE may ask the customer to do a test 301 printout to obtain a copy of the current error log. The CE interprets the error log. A more detailed description of the error log is on page 000-17.

Test 3 - Configuration Table

The printer configuration table shows the offline settings of the configuration options. A breakdown of the configuration table is in the *IBM 4224 Printer Operating Instructions* and is different for Models 1XX, 2XX, and 3XX.

Test 4 - Print Quality Test (DP) - Models X02, XE2, and XC2 (head rotated)

With Black Ribbon: A ripple pattern of four lines prints in data-processing quality.

With Accent Ribbon (Four Colors): The first line prints in black and the next three lines each print in a different color (bands 1, 2, and 3).

With Subtractive Ribbon (Eight Colors): A ripple pattern of eight lines prints. The first line prints in black, and the next seven lines each print in a different color.

Test 5 - Print Quality Test (NLQ) - Models X02, XE2, and XC2 (head not rotated)

With Black Ribbon: A ripple pattern of four lines prints in near-letter quality.

With Accent Ribbon (Four Colors): The first line prints in black and the next three lines each print in a different color (bands 1, 2, and 3).

With Subtractive Ribbon (Eight Colors): A ripple pattern of eight lines prints. The first line prints in black, and the next seven lines each print in a different color.

055 - How to Select CE/Repair Tests

The CE test descriptions begin on page 000-18.

How to Put the Printer into CE/Repair Mode

1. Press and hold **Alternate**. While still holding **Alternate**, press and release **Test** until the printer displays 300 (blinking). Release the key.
2. Press and hold **Alternate**. While holding **Alternate**, press the **0** and **B** keys at the same time. Release the keys. The printer displays 800 (blinking).

   Note: There is no test 800. When 800 is displayed on the operator panel, this indicates that the printer is in CE/repair diagnostic mode.

How to Select a Specific CE/Repair Test

1. Load forms (Section 800).
2. Press and hold the **Alternate** key.
3. While still holding **Alternate**, use the numbers on the keys to enter the desired test routine number.
4. Release the **Alternate** key.
5. Press the **Start** key. The display stops blinking and the selected test runs.

Many of the CE/repair tests are looping tests (except 801, 819, and 860). That means they continue to run until you press the Stop key or an error occurs.

When you press the Stop key, the test that is running stops (except for 850 - Operator panel test). The display blinks with the number of the test that was running. You can restart the test by pressing the Start key or you can select another test by using the Alternate key.

How to End the CE/Repair Mode

1. Press and hold the **Alternate** key and then press the **B** key.
2. Release both keys. A power-on reset occurs and the printer is ready for normal operation.

If an Error Occurs

1. The printer displays the error code.
2. Press **Stop** to clear the error. The printer displays the number of the test that was running when the error occurred.
3. To restart the test, press **Start**.

Error Log

Sixteen bytes in NVRAM are reserved for the printer internal error log, which consists of eight error code bytes and eight corresponding count bytes.

When an error is encountered, a check is made to determine if the code for this error is the same as the last recorded error code. If they are the same, the corresponding count byte is increased by 1. When a count byte reaches maximum (X'FF'), error recording is suspended until a different error type is encountered.

When the error code differs from the last recorded error code, the new error is placed in the left-most position and all previous errors are pushed to the right by one position.

When all available error log positions have been used, and an error occurs that results in a different error code from the last recorded error code, the oldest logged error code and the corresponding count byte are dropped from the log to allow recording of the current code.

Error Log Utilization

Use the error log to recognize any intermittent or potential future problems with the printer. The error log is retrieved by offline verification test 301.

The eight error code bytes are printed in reverse chronological order; the most current error is on the left; the oldest to the far right. The eight corresponding count bytes print separately in the same sequence to the right of the error code bytes.

Example: The first error byte matches the first count byte, reading left to right.

```
58 56 58 00 00 00 00     01 01 03 00 00 00 00
   \                        \
   Error Code Byte          Error Count
```

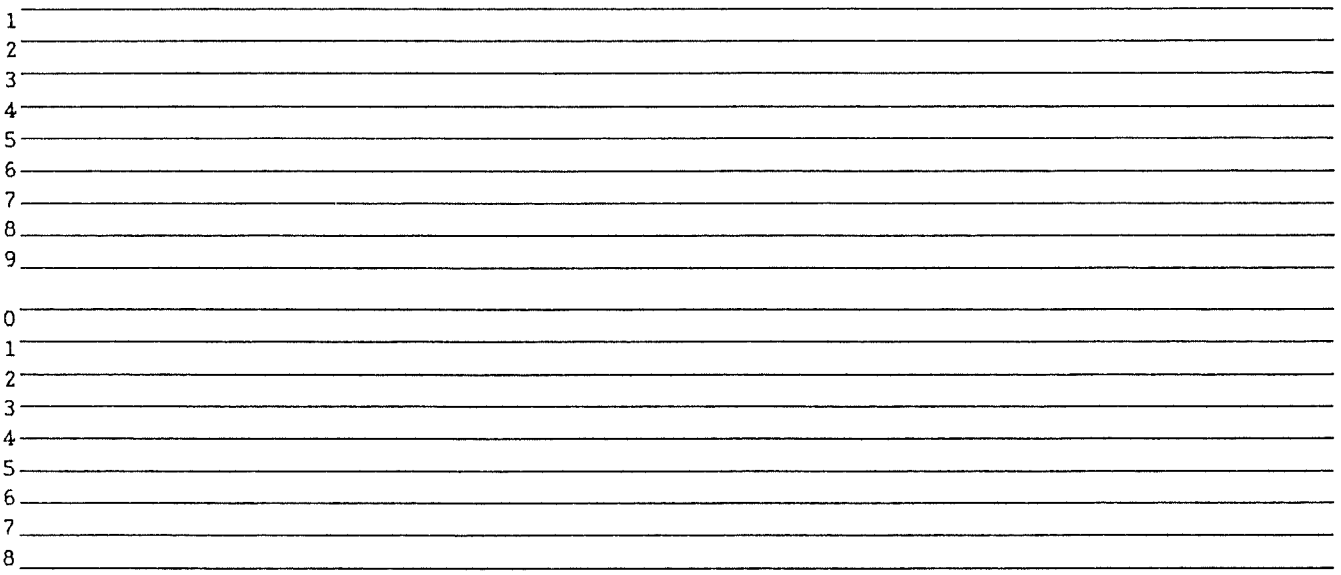
In the above example, error "58" is the most recent error, and has occurred once since the "56" error occurred. The oldest recorded error (also a "58") occurred three times before the "56"error. The maximum number of times that an error can be recorded is 255. The counter is at X'FF'.

056 - CE/Repair Test Descriptions

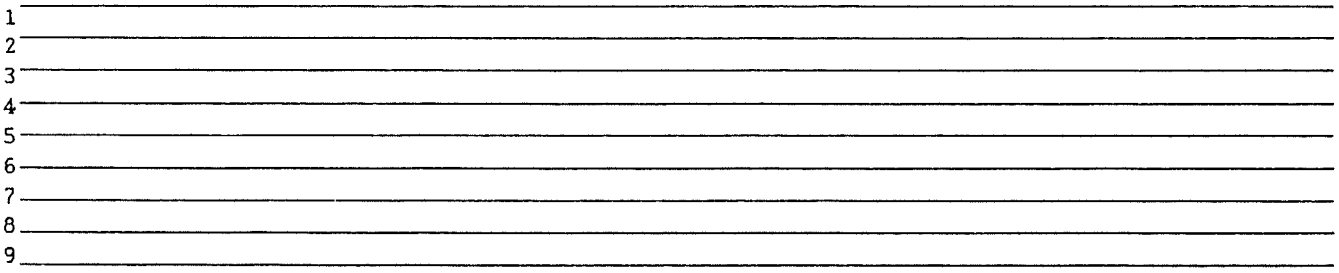
Test 801 - Print Wire Test

This test verifies that all print wires are working. Each print wire prints a number and a horizontal row of dots. This test stops at completion. The following are examples of successful 18-wire print head and 9-wire print head test printouts.

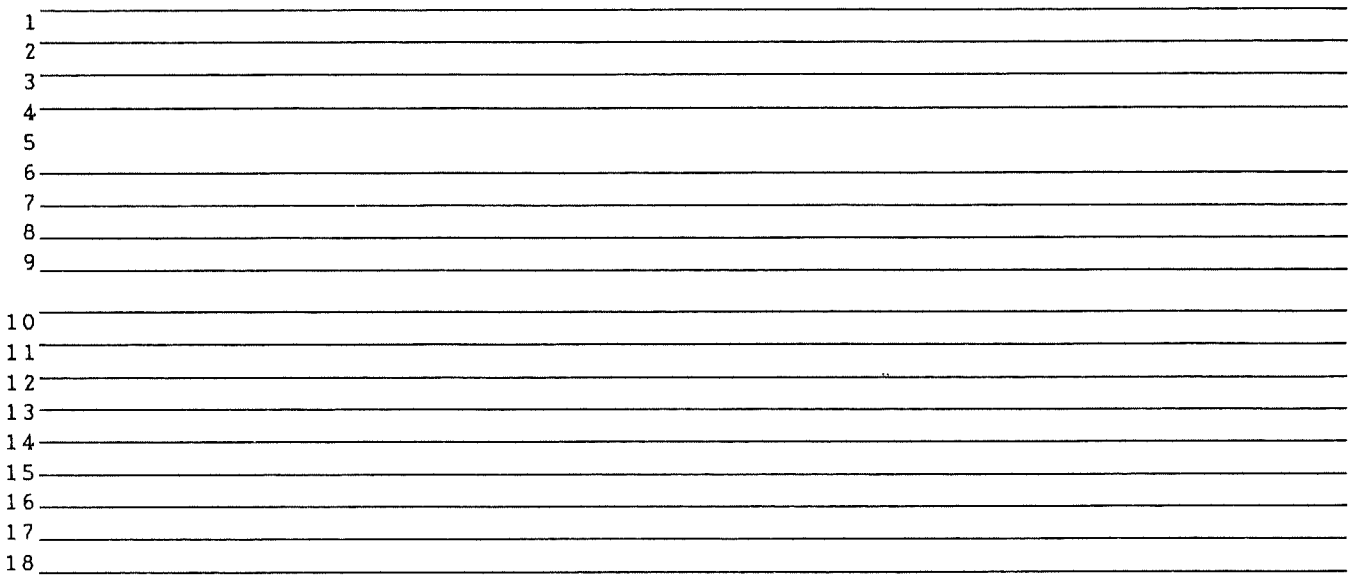
18-Wire Print Head Test (Models X02, XE2, and XC2)



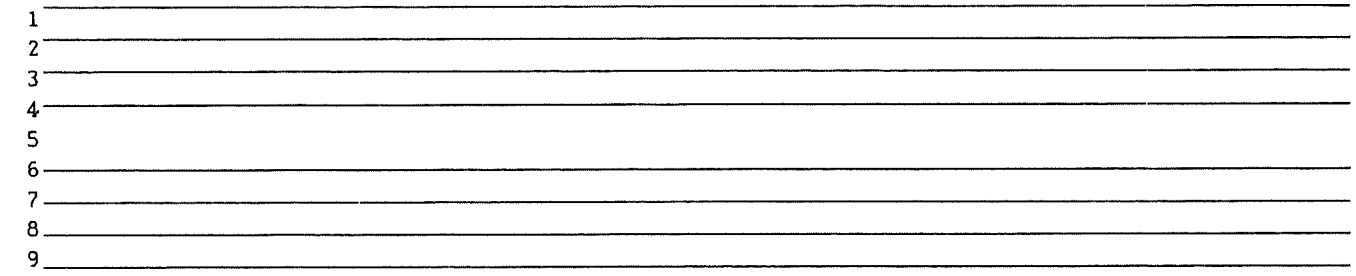
9-Wire Print Head Test (Model X01)



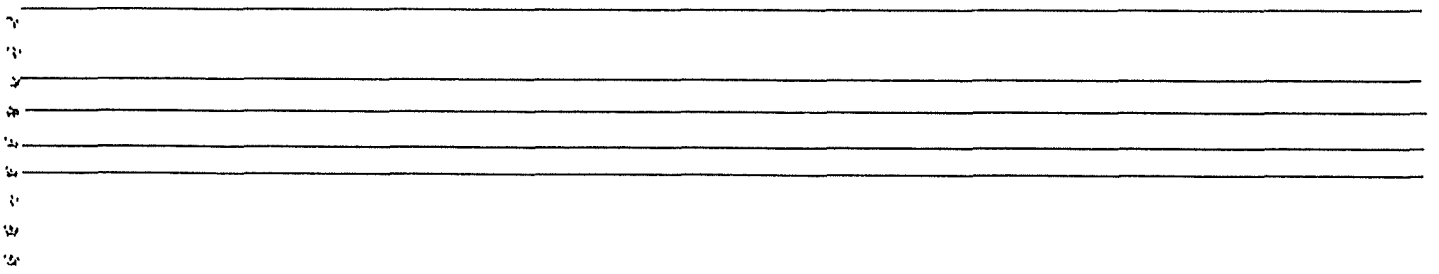
801A-Wire Number 5 Not Printing (Models X02, XE2, and XC2)



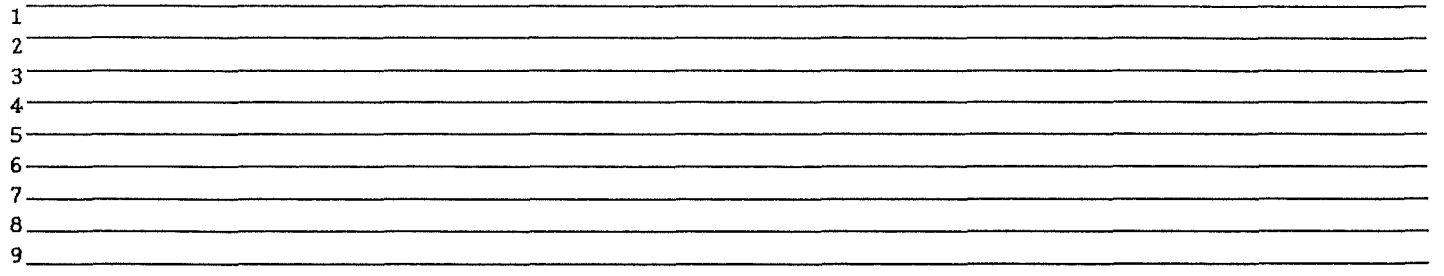
801B-Wire Number 5 Not Printing (Model X01)



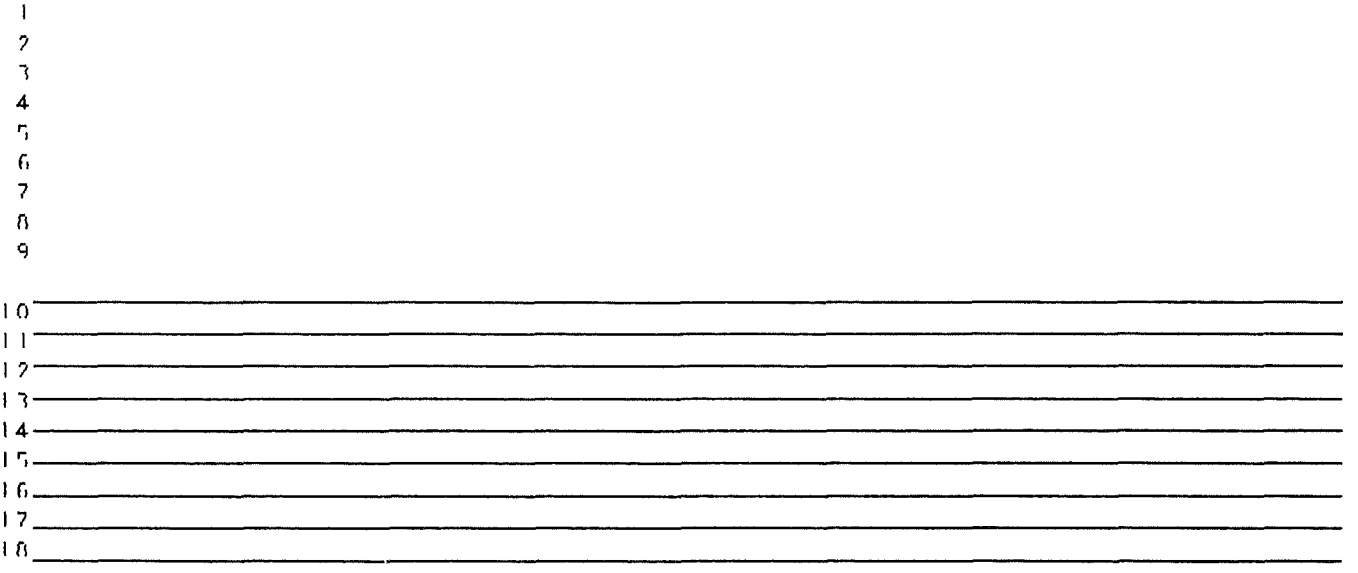
801C-Print Head Cable Connector in Test Position
(Model X01)



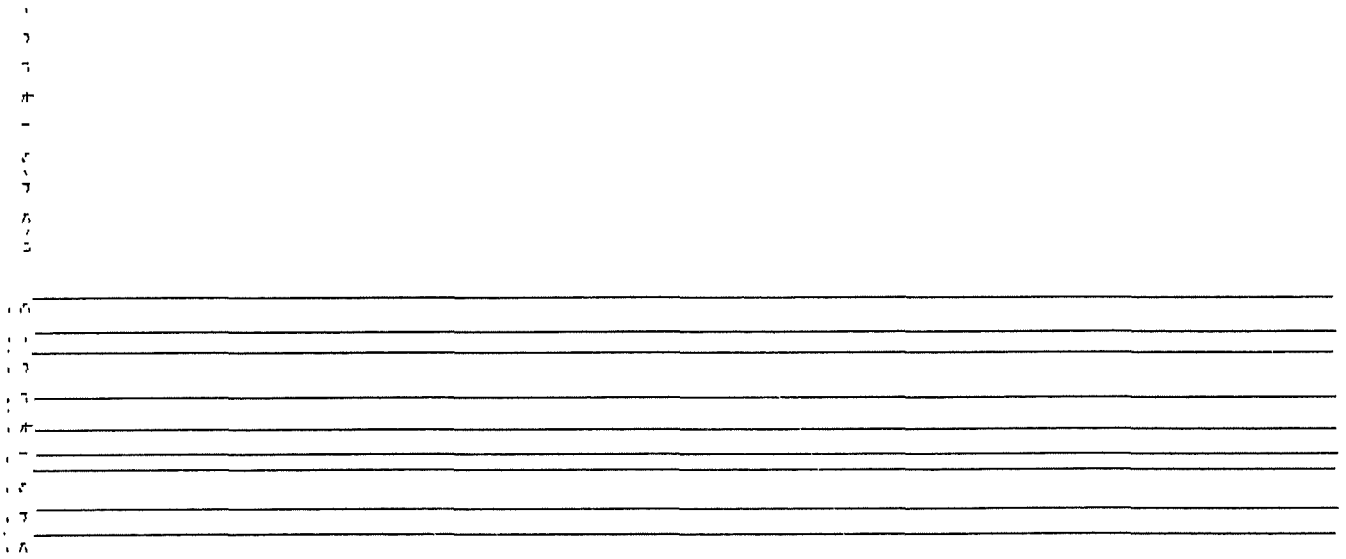
801C-Print Head Cable Connector in Run Position
(Model X01)



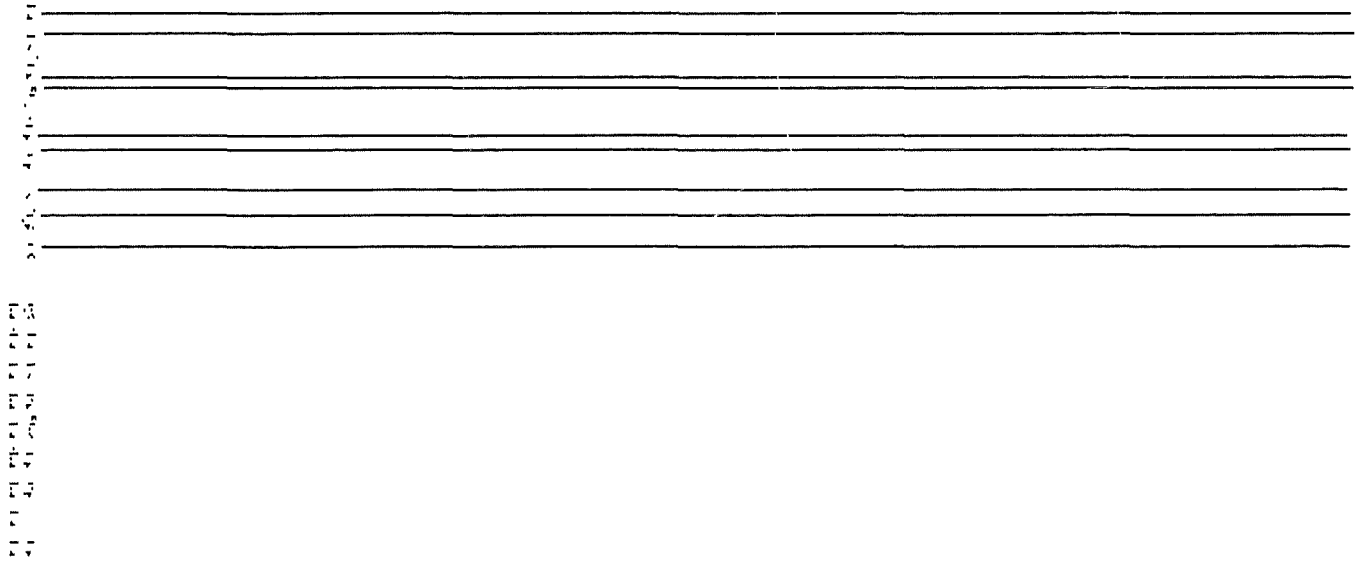
801D-Print Head Cable Connector '1'
Disconnected (Model X02)



801E-Print Head Cable Connector '2' Connected to Connector '1' (Models X02, XE2, and XC2)



801F-Print Head Cable Connector '1' Connected to Connector '2' (Model X02, XE2, and XC2)



Test 802 - Near-letter Quality (NLQ) Print Test

This print test verifies print quality in NLQ mode. The print head is not rotated for Models X02, XE2, or XC2. Model X01 requires two passes. A ripple pattern prints until the Stop key is pressed.

```
 âaaaaãåçñ[.<(+!&éêeeèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»
âaàáãåçñ[ <(+!&éêeeèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»d
aàáãåçñ[.<(+!&éêeeèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»dý
àáãåçñ[.<(+!&éêeeèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»dýþ
áãåçñ[.<(+!&éêeeèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»dýþ±
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åçñ[.<(+!&éêeèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»dýþ±°j
çñ[.<(+!&éêeèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»dýþ±°jk
ñ[.<(+!&éêèèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»dýþ±°jkl
[.<(+!&éêèèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»dýþ±°jklm
 <(+!&éêeèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»dýþ±°jklmn
<(+!&éêeèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»dýþ±°jklmno
(+!&éêeèíîıìß]$*);^-/ÂAÀÁÃÅÇÑ¦,%_>?øÉÊEÈÍÎIÌ`:#@'="Øabcdefghı«»dýþ±°jklmnop
```
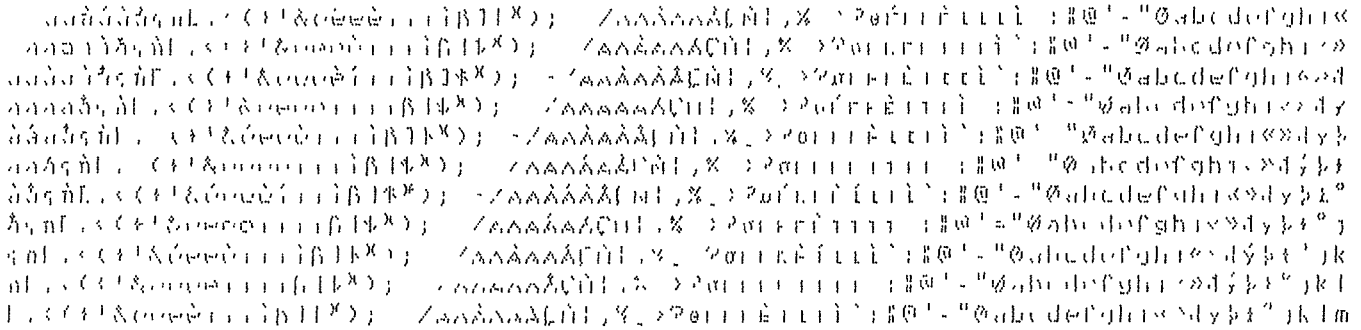
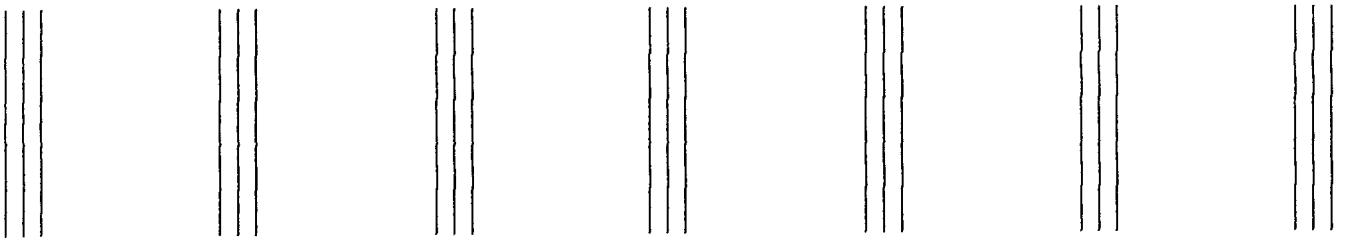

Test 803 - Data-processing (DP) Quality Print Test

This print test verifies print quality in DP mode. The print head is rotated for Models X02, XE2, and XC2. A ripple pattern prints until the Stop key is pressed.



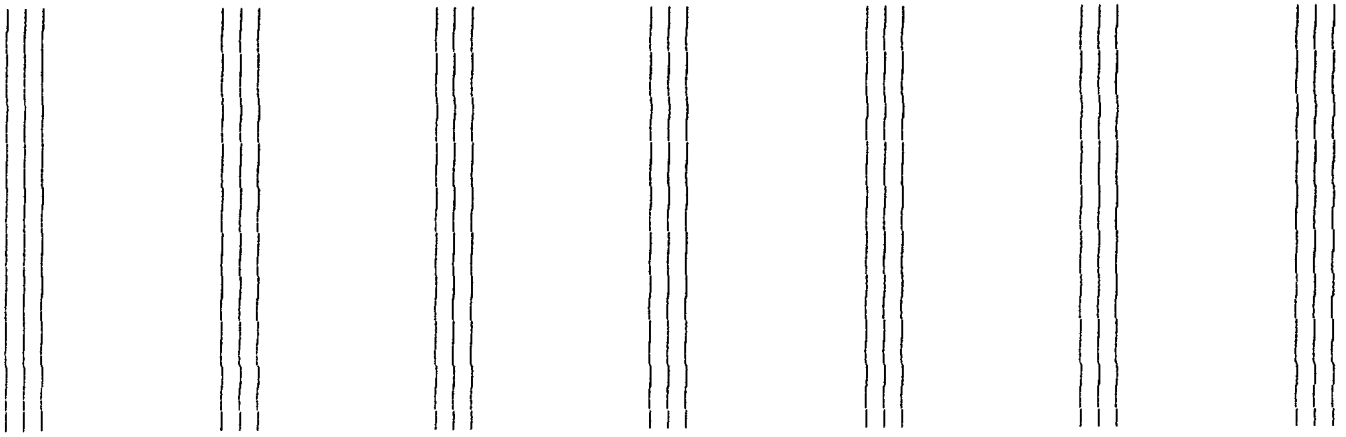
Test 804 - Line-to-Line Registration Quality Test (NLQ)

This print test verifies line-to-line registration by printing vertical bars in NLQ mode. The print head is not rotated for Models X02, XE2, and XC2. The test pattern prints until the Stop key is pressed.



Test 805 - Line-to-Line Registration Quality Test (DP)

This print test verifies line-to-line registration by printing vertical bars in DP mode. The print head is rotated for Models X02, XE2, and XC2. The test pattern prints until the Stop key is pressed.



Test 806 - Condensed Print Test

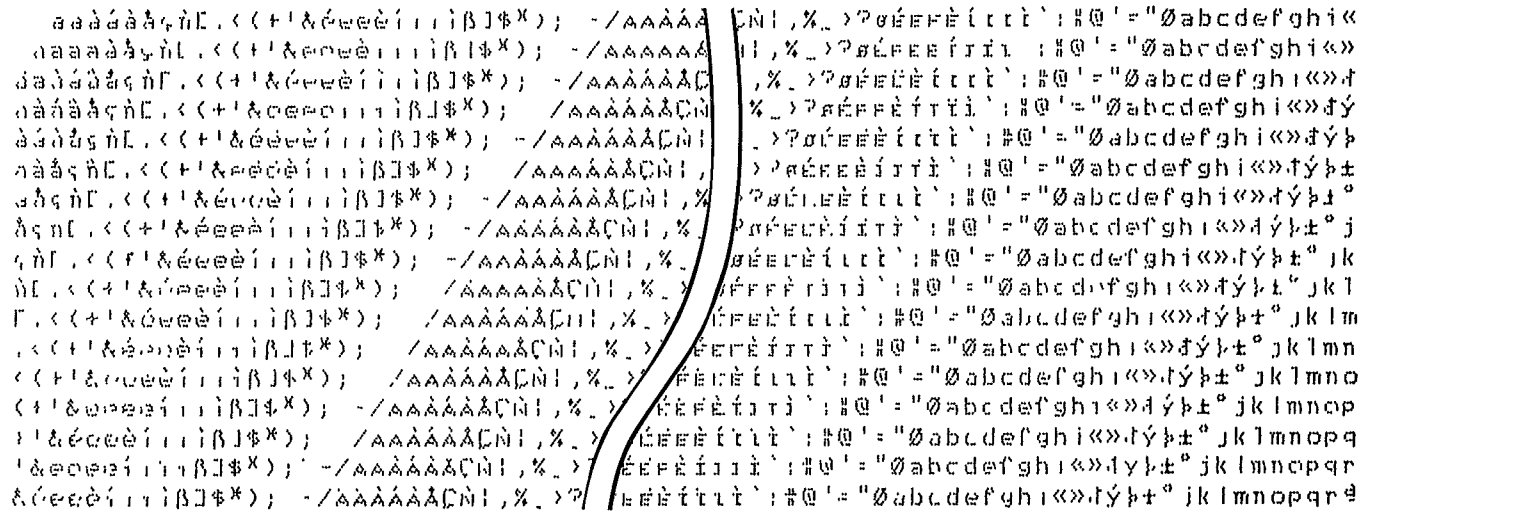
This print test verifies condensed print quality by printing a ripple pattern in 16.7 characters per inch. Condensed print at 16.7 CPI is available on printers with serial numbers XXF0001 and above. The test pattern prints until the Stop key is pressed.

Test 807 - 198 Character Platen Check

Note: You must use 14-inch wide paper to run this test.

This test verifies printing 198 characters at 15 characters per inch. This ensures that the platen is aligned the same at both ends of the print line.

Check that the print density is the same at the left edge and the right edge. The test prints until the Stop key is pressed.

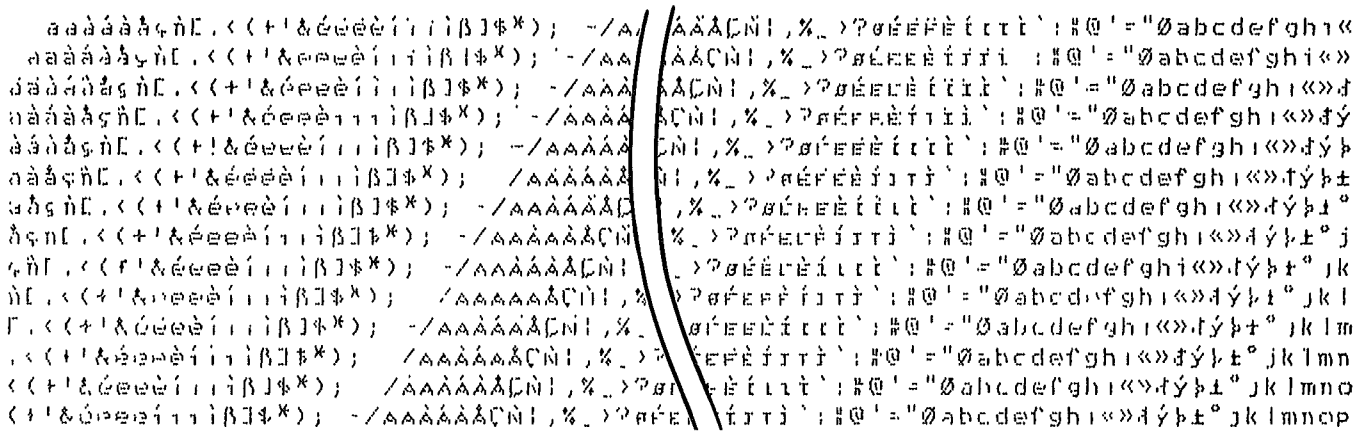


Test 808 - 132 Character Platen Check

Note: You must use 14-inch wide paper to run this test.

This test verifies printing 132 characters at 10 characters per inch. This ensures that the platen is aligned the same at both ends of the print line.

Check that the print density is the same at the left edge and the at the right edge. The test prints until the Stop key is pressed.

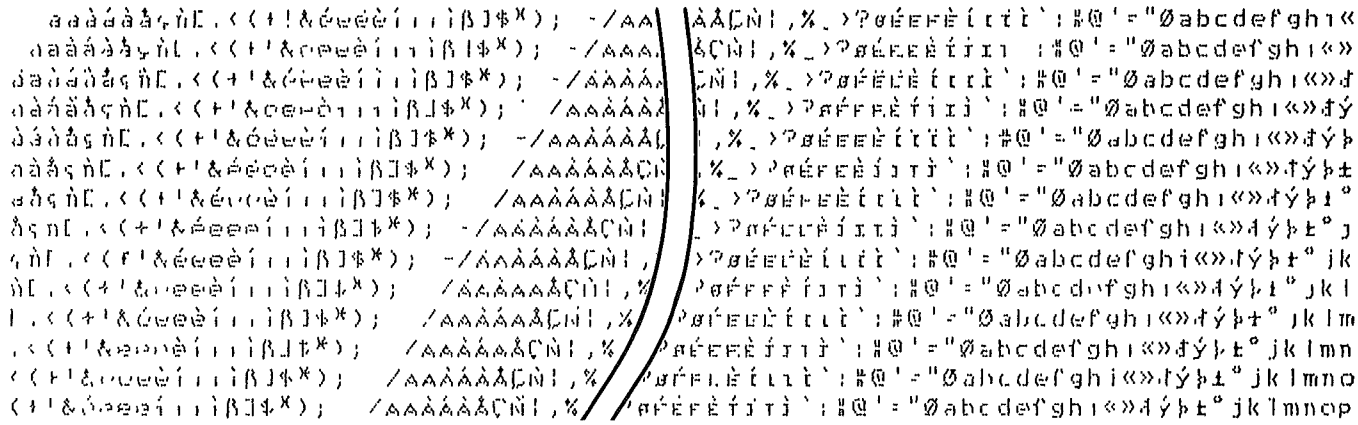


Test 809 - 158 Character Platen Check

Note: You must use 14-inch wide paper to run this test.

This test verifies printing 158 characters at 12 characters per inch. This ensures that the platen is aligned the same at both ends of the print line.

Check that the print density is the same at the left edge and the at the right edge. The test prints until the Stop key is pressed.



Test 810 - Head Speed Check, Slow

This test verifies that the print head runs correctly by printing blanks at 10 characters per inch. The test runs in NLQ mode on Models X02, XE2, and XC2. The test runs in data-processing-text mode on Model X01. This test runs with or without forms until the Stop key is pressed. All sensors are ignored during the test.

Test 811 - Head Speed Check, Medium

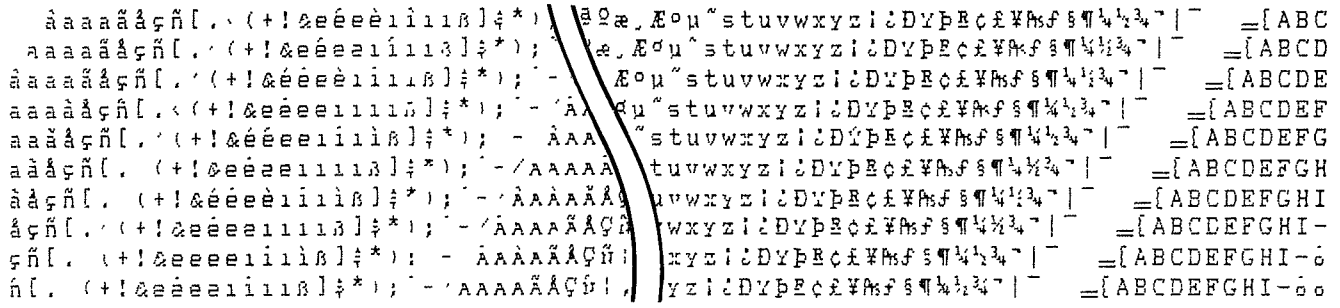
This test is the same as test 810 for Model X01. It is also the same for Models X02, XE2, and XC2 except that it runs in data-processing text mode. The test runs until the Stop key is pressed.

Test 812 - Head Speed Check, Fast

This test is the same as test 810 except that all models are run in data processing print mode. The test prints until the Stop key is pressed.

Test 813 - Data-processing (DP) Text Mode Print Quality Test

This print test verifies the print quality in DP-text mode. A ripple pattern prints until the Stop key is pressed.

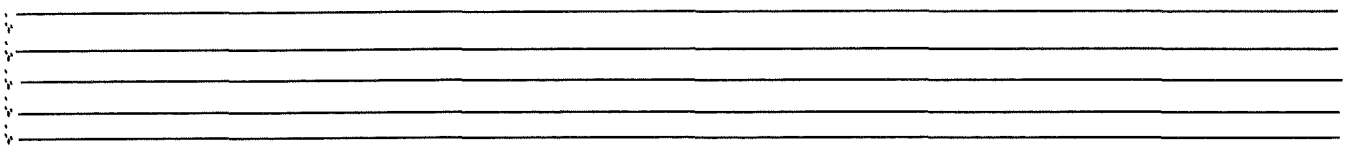


Test 814 - Unassigned.

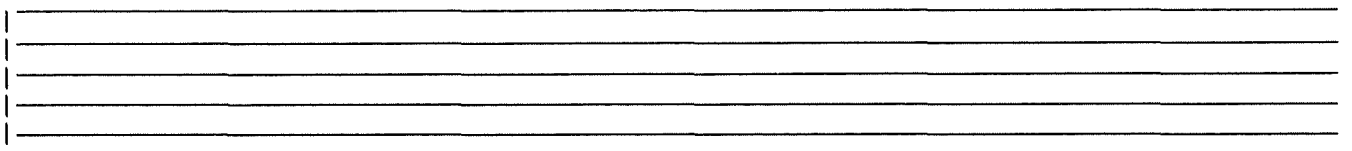
Test 815

This is the same test as customer test 306.

815-Print Head Cable Connector in Test Position (Model X01)



815-Print Head Cable Connector in Run Position (Model X01)



Tests 816 through 818 - Unassigned.

Test 819 - Buffer and Data Print

This test is a buffer and data dump that is used by plant engineering.

Test 820 - Forms Motor Verification

This test verifies that the forms motor runs correctly. The forms motor runs continuously whether any of the forms feed devices are installed or not. This test runs until the Stop key is pressed.

Tests 821 through 829 - Unassigned.

Test 830 - Ribbon Motor Verification

This test verifies that the ribbon motor runs correctly. The motor runs continuously with or without a ribbon installed. All sensors are ignored during the test. This test runs until the Stop key is pressed.

Tests 831 through 839 - Unassigned.

Test 840 - Ribbon Shift Motor Verification

This test runs on color models only.

The test verifies that the color ribbon shifts correctly. The shift motor steps through each color position after printing one character on a line with no forms movement. An example would be A in one color, B in the second color, C in the third color, and D in the fourth color. All sensors are ignored during this test. This test runs until the Stop key is pressed.

Accent Ribbon

ABCD -- Color band 1 (A) = Red
ABCD -- Color band 2 (B) = Black
ABCD -- Color band 3 (C) = Blue
ABCD -- Color band 4 (D) = Green

Subtractive Ribbon

ABCD -- Color band 1 (A) = Cyan (blue)
ABCD -- Color band 2 (B) = Black
ABCD -- Color band 3 (C) = Magenta (red)
ABCD -- Color band 4 (D) = Yellow

The following eight tests check that the correct color prints for both the accent and subtractive ribbons. A ripple pattern prints for each of the eight tests.

Test 841 - Color Print Verification (Color 1)

A ripple pattern prints in color 1. The accent and subtractive color ribbon prints in blue. This test runs until the Stop key is pressed.

Test 842 - Color Print Verification (Color 2)

A ripple pattern prints in color 2. The accent color is red; subtractive color is red. This test runs until the Stop key is pressed.

Test 843 - Color Print Verification (Color 3)

A ripple pattern prints in color 3. The accent color is black; subtractive color is magenta. This test runs until the Stop key is pressed.

Test 844 - Color Print Verification (Color 4)

A ripple pattern prints in color 4. The accent color is green; subtractive color is green. This test runs until the Stop key is pressed.

Test 845 - Color Print Verification (Color 5)

A ripple pattern prints in color 5. The accent color is black; subtractive color is cyan. This test runs until the Stop key is pressed

Test 846 - Color Print Verification (Color 6)

A ripple pattern prints in color 6. The accent color is black; subtractive color is yellow. This test runs until the Stop key is pressed.

Test 847 - Color Print Verification (Color 7)

A ripple pattern prints in color 7. The accent and subtractive color ribbons print in black. This test runs until the Stop key is pressed.

Test 848 - Color Print Verification (Color 8)

A ripple pattern prints in color 8. The accent color is black; subtractive color is brown. This test runs until the Stop key is pressed.

Test 849 - Unassigned.

Test 850 - Operator Panel Verification Test

As long as a key is held down, the number or letter of that key is displayed on the three display segments and the alarm sounds. When the key is released, the display reads "850".

To end this test:

1. Press and hold the Alternate (A) key.
2. Press the Stop key
3. A blinking "850" indicates that the test is over.

Test 851 - Machine Sensor Verification

This test verifies the form and ribbon sensors operation. When the Start key is pressed, the status of the sensors is shown in the three-position operator panel display.

Hundreds digit: This digit indicates the state of the print head speed inhibitor switch.

0 = Switch open
1 = Switch closed

Tens digit: This digit indicates the state of the ribbon module sensors on the Model XC2. This digit is always zero for Models X01, X02, and XE2.

0 = No ribbon installed
1 = Accent ribbon installed
2 = Subtractive ribbon installed
3 = Black ribbon installed

Ones digit: This digit indicates the state of the paper sensors.

0 = No paper in paper path
1 = All paper sensors detecting paper
2 = Some, but not all sensors detecting paper

Tests 852 through 859 - Unassigned.

Tests 860 and 862

These two tests are *not* really tests. They are routines that are used as aids in analyzing a printer problem. These routines are selected using the Alternate (A) key in the same way as any of the 8XX tests. These routines are described below.

Test 860 - Print Then Clear Error Log

This test prints the error, clears it, and then prints the cleared error log. Each of the left eight bytes indicates the machine-logged errors. The eight bytes in the same position on the right indicate the number of times that error occurred (in hex).

```
58 56 58 00 00 00 00     01 01 03 00 00 00 00
   \                        \
    Error Code Byte          Error Count
```

In the example above, error 56 occurred once.

Test 862 - Clear Error Log

This test clears the error log, returns the printer defaults to their factory settings and displays the size of the NVRAM installed in the printer. When you select this test and press the Start key, the size of the NVRAM is posted in the display and the Ready light is turned on.

You end this test by pressing the Stop key.

Note: Test 862 is provided for manufacturing ease of use in setting the printer Non-Volatile RAM (NVRAM) to a shippable state.

057 - Service Checks

Perform the steps called out in the MAPs.

1. Check the condition of the ribbon. The ribbon should be replaced if it is:
   - Dry (no ink)
   - Folding
   - Worn or torn
   - Colors are bleeding excessively (color ribbons only).
2. Ensure that the ribbon is installed correctly (Section 811).
3. Ensure that the forms device and the forms are installed correctly (Section 820).
4. Ensure that the forms thickness lever adjustment (Section 387) and the forms tension knob (Section 827) settings are correct.

   Note: The forms tension knob is on the continuous forms device only.
5. Remove the forms device (Section 820), and look for torn pieces of paper, foam, etc., that could be causing the jam. Clear the jam.
6. Turn the drive gear on the forms feed device and check for binds. Ensure that the tractor pins and the shafts turn as you turn the drive gear for the continuous form feed and document on demand devices. For the document on demand and document insertion devices, ensure that the feed rolls also turn properly. If problems are found, replace the device.
7. Inspect the forms feed device for broken or missing parts. If you find broken or missing parts, or if the device still does not operate properly, replace it.
8. Verify that the forms feed drive gear and the forms feed idler gear (Section 715) are not damaged and that they fit together properly with the forms feed device gear. Ensure that the gears are not packed with any foreign materials. Repair or replace parts as necessary.
9. Inspect the carrier drive belt and idler assembly for loose, defective and/or missing parts (Section 343) If problems are found, replace the failing part.
10. Manually move the print head carrier from one side frame to the other to check for binds or excessive looseness. Replace the failing FRU (field replacable unit) (Section 329).
11. Inspect the carrier upper bearing, support guide, pad, and spring (Section 333) for damaged, loose, or missing parts. Repair or replace as necessary.

12. Ensure that the print head (Section 320) and print head cables (Section 325) are installed properly.

13. On printers with 18-wire print heads (two print head cables), check the print head rotate mechanism (Section 331) for binds, damaged, or missing parts. Replace as necessary.

100. Covers, Shields, and Frame

100 Entry Contents

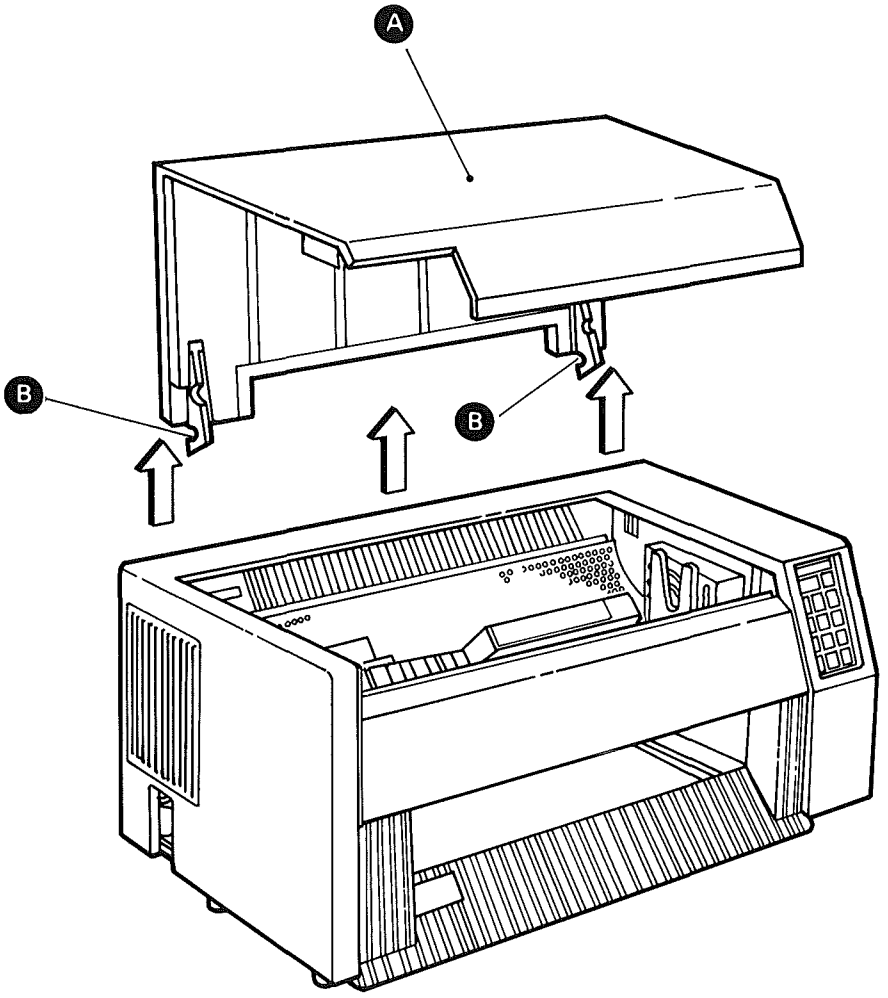
111 - Access Cover

Removal

1. Open the access cover (A) until it is straight up.
2. Lift the cover to remove it.

Installation

1. Align the access cover notches (B) with the printer cover studs, then lower the access cover in place.
2. Close the access cover (A).



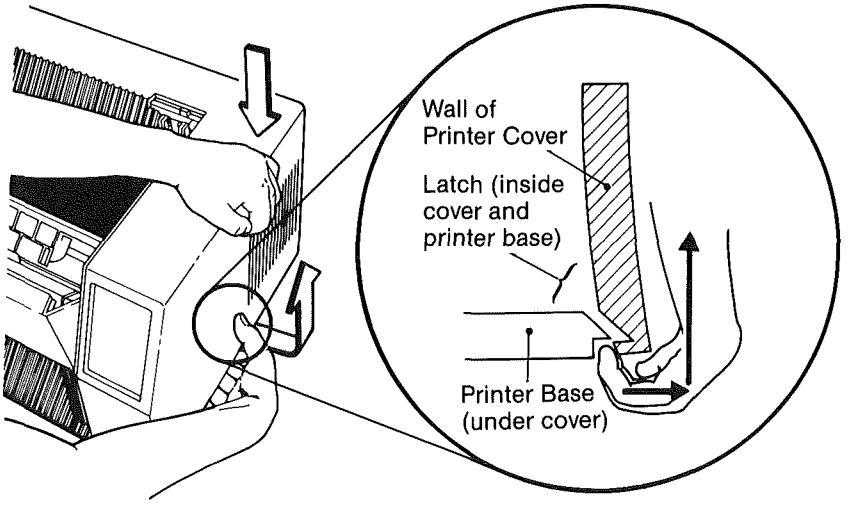
113 - Printer Cover Assembly

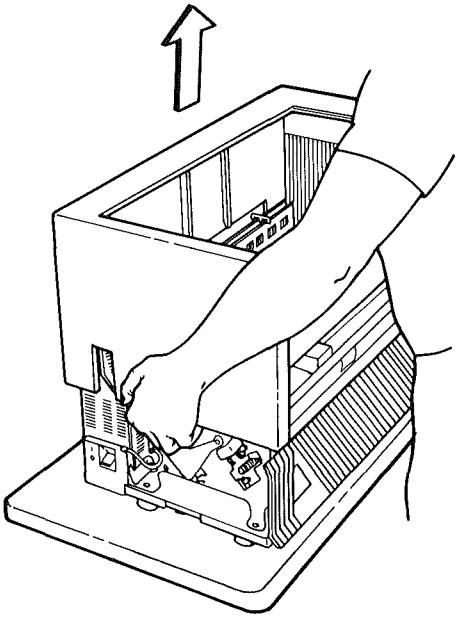
Removal

1. Remove the forms from the printer.
2. Set the power switch to O (Off).
3. Disconnect the power cord from the printer connector.
4. Remove the access cover (Section 111).
5. Move the print head to the center of the printer.
6. Push down on the top-side-edge of the printer cover, then pull the bottom of the cover outward and up until the cover clears the molded latches as shown below.
7. Repeat step 6 for the other side.
8. Lift the cover straight up to remove it, as shown below.

Installation

1. Ensure that the print head is in the center of the printer.
2. Place the cover on the printer.
3. Push the top-side-edges of the cover down until it latches.
4. Install the access cover (Section 111).
5. Connect the power cord to the printer connector.





115 - Entry Paper Chute

Removal

1. Set the power switch to O (Off).
2. Disconnect the power cord from the printer.
3. Remove the access cover (Section 111).
4. Remove the printer cover (Section 113).
5. Remove the forms device (Section 820).

   Note: If the entry paper chute (C) is being removed only to obtain access to another area, continue with steps 11 through 16 only.

6. Remove the paper guide shield (Section 119).
7. Remove the power supply ground strap from the frame.
8. Disconnect the end-of-forms sensor cable (T) from the base card connector.
9. Disconnect the print head speed inhibitor switch (R) cable from the base card connector.
10. Carefully remove the cable ties holding the sensor cables.
11. Remove the print head cable clamps from the top of the entry paper chute.
12. Remove the attachment card (Section 411).
13. Carefully place the printer on its back.
14. Using a screwdriver, push the left locking tabs (A) to the right until they can be pushed through the holes in the printer base.
15. Place the printer on its base, and lift the left side of the entry paper chute until the locator stud (B) can clear the base.
16. With the locator stud cleared from the base, slide the entry paper chute to the left and lift it from the printer.
17. Remove the print head speed inhibitor switch (Section 345) and the end of forms sensor (Section 383) from the entry paper chute.

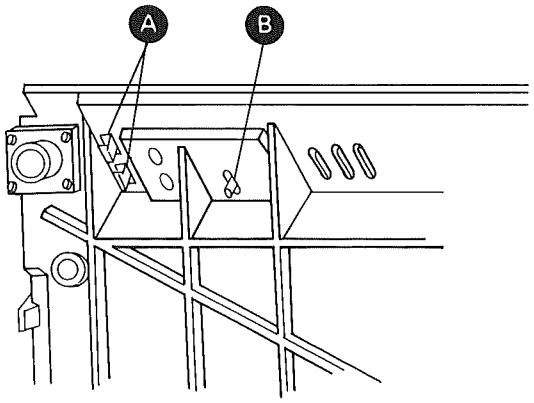
Installation

1. If removed, install the print head speed inhibitor switch (Section 345) and the end of forms sensor (Section 383) to the paper chute (C)
2. To install the paper chute, align the locating tabs (A) and the locator stud (B) with the holes in the base and press.

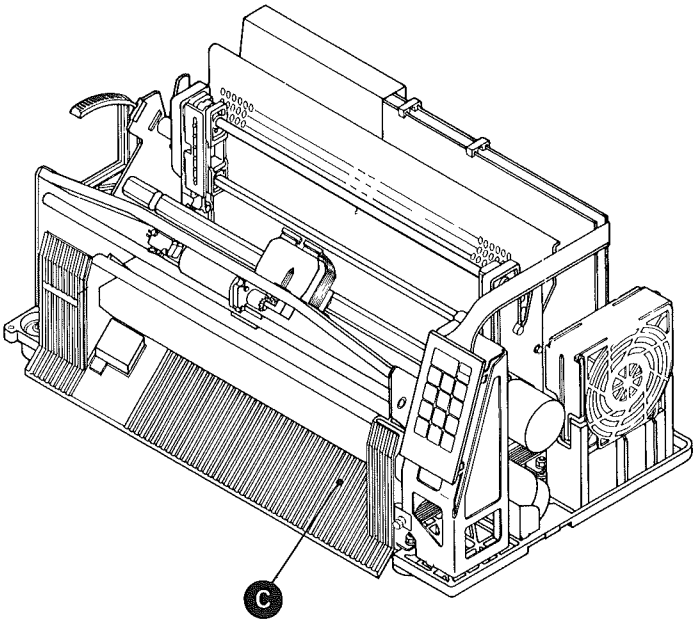
   Note: If the entry paper chute was removed only to gain access to another area, go to step 9.

3. Connect the end-of-forms sensor cable (T) to the base card connector.
4. Install the power supply ground strap to the frame.
5. Install the print head cable and clamps to the top of the paper chute.
6. Connect the print head speed inhibitor switch (R) cable to the base card connector.
7. Tie the cable in place.
8. Install the paper guide shield (Section 119).
9. Replace the attachment card (Section 411).
10. Install the forms device (Section 820).
11. Install the printer cover (Section 113).
12. Install the access cover (Section 111).
13. Connect the power cord to the printer.

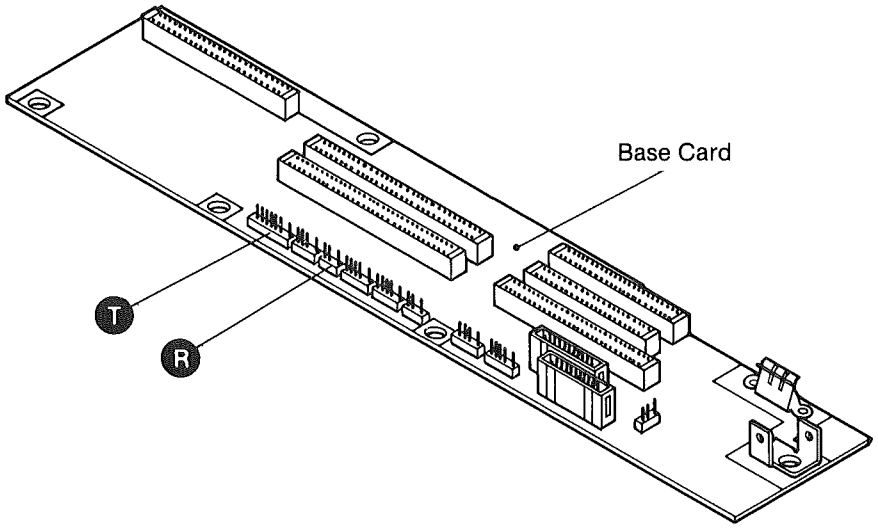
115 - Entry Paper Chute (continued)

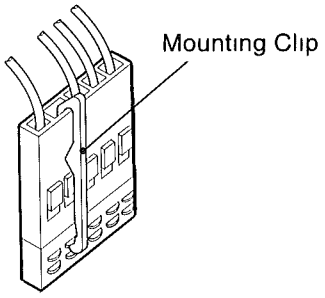


Bottom View of Left Front



Note: Connectors are held to sockets by a mounting clip. Squeeze the top of the clip to release.

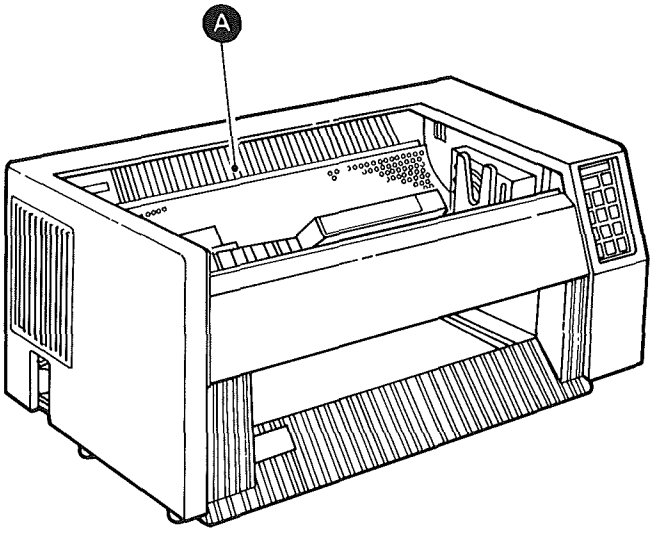




117 - Exit Paper Chute

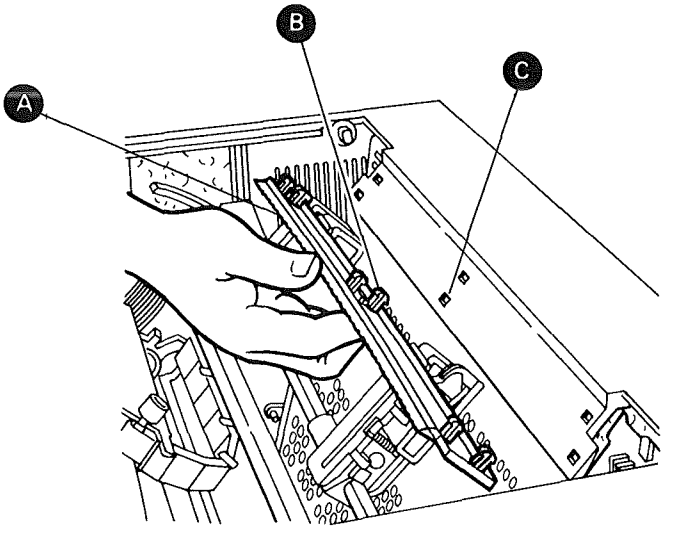
Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Insert a wide flat-blade screwdriver between the cover and the exit paper chute (A), then twist the screwdriver to separate the chute from the cover.



Installation

1. Align the mounting studs (B) with the holes (C) in the cover and press to install the paper chute.
2. Install the access cover (Section 111).



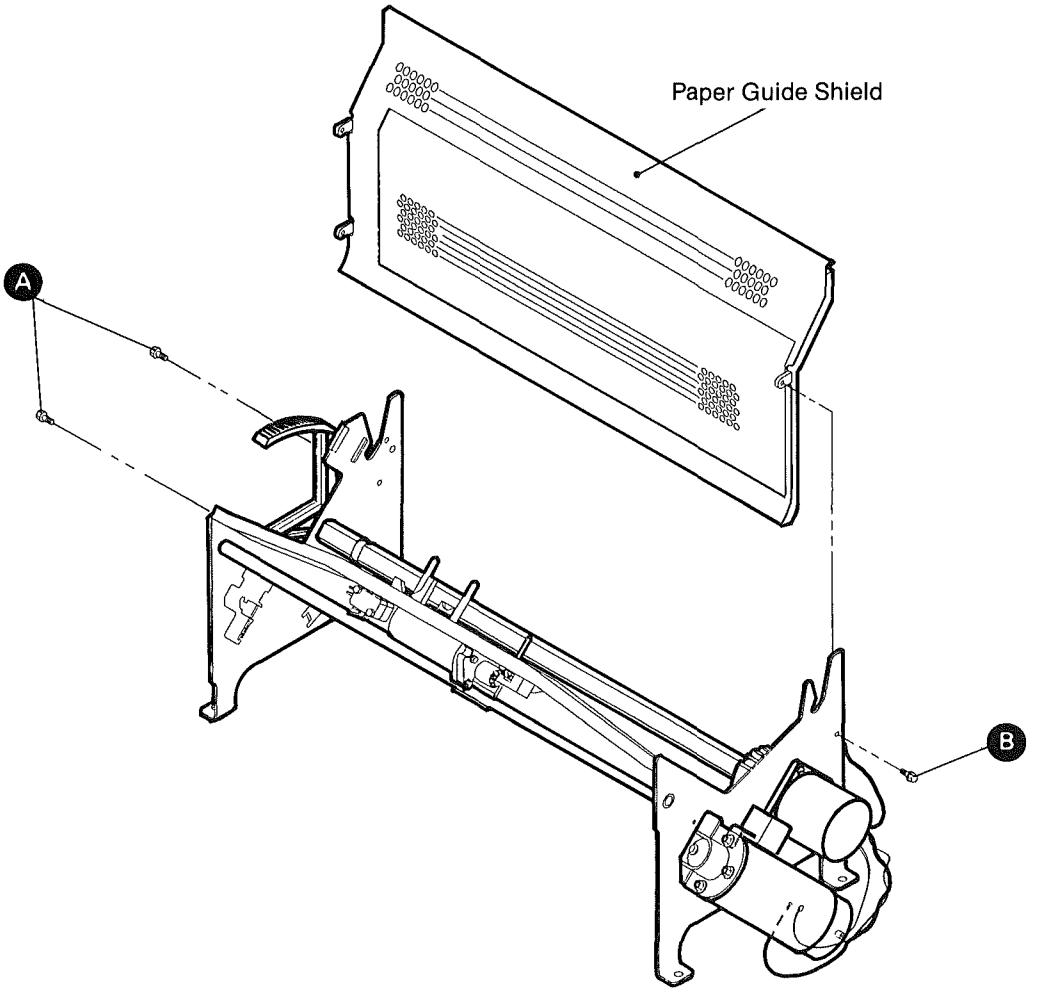
119 - Paper Guide Shield

Removal

1. Remove the access cover (Section 111).
2. Remove the printer cover (Section 113).
3. Remove the forms device (Section 820).
4. Disconnect the operator control panel cable from the control card (Section 215).
5. Remove the two paper guide shield mounting screws (A).
6. Loosen the locating screw (B) on the right side of the frame
7. Remove the paper guide shield.

Installation

1. Place the paper guide shield in the printer.
2. Install the two shield mounting screws (A). Tighten the locating screw (B) into the upper locating tab of the shield.
3. Connect the operator control panel cable to the control card (Section 215).
4. Install the forms device (Section 820).
5. Install the printer cover (Section 113).
6. Install the access cover (Section 111).



121 - Frame Assembly

Removal

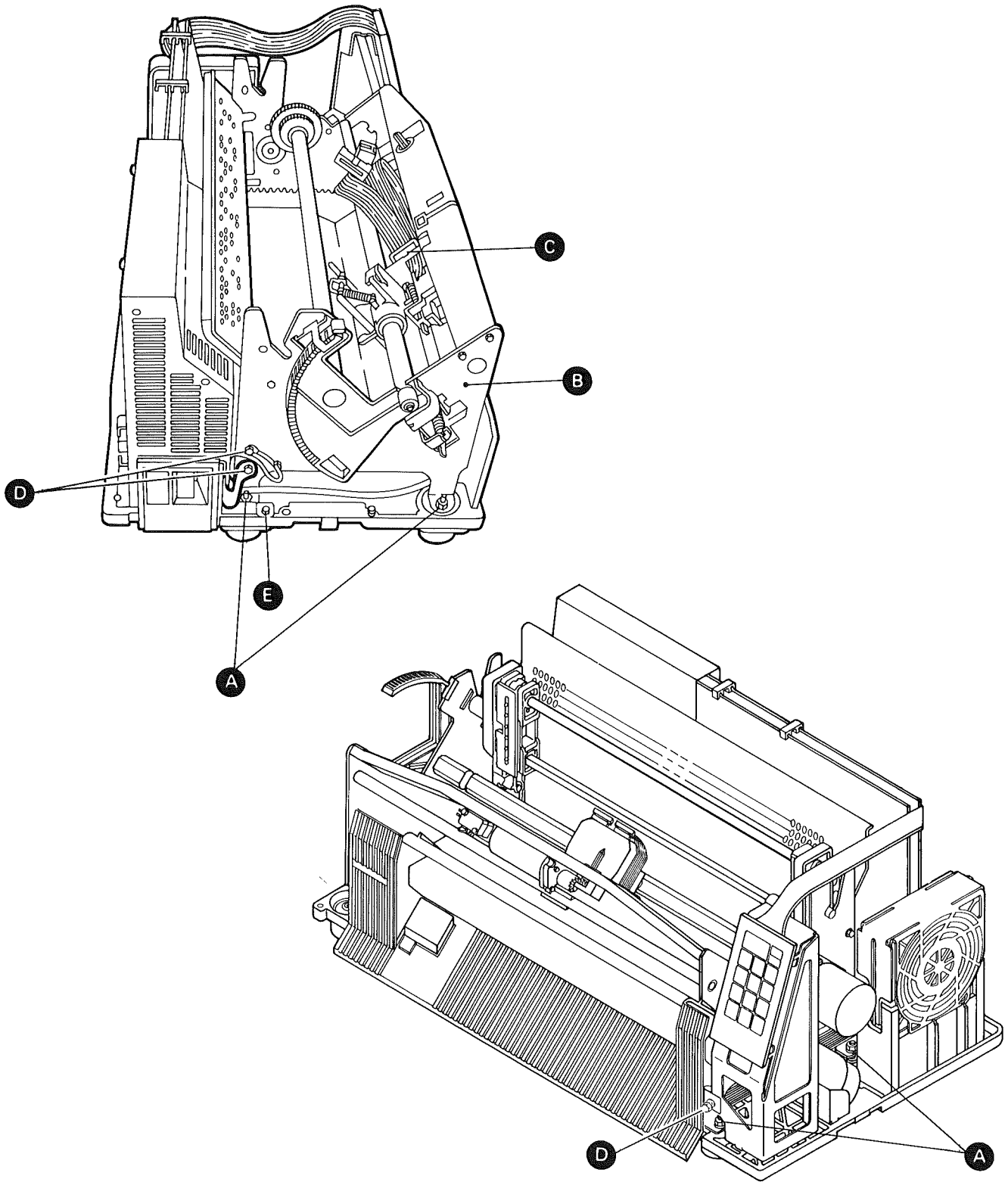
1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the forms device (Section 820).
5. Remove the ribbon cartridge (Section 812).
6. Remove the print head (Section 321).
7. Remove the print head cable clamp **C** from the carrier.
8. Remove the paper guide shield (Section 119).
9. Remove the three ground straps **D**.
10. Remove the following connectors from the base card (Section 721):
    - Forms motor cable **L**
    - Print head carrier motor cable **P**
    - Emitter cable **N**.
11. Remove the ribbon drive crossbar (Section 361).
12. Remove the operator control panel (Section 511).
13. Remove the entry chute (Section 115) from the base; **do not disconnect any cables.**
14. Remove the front-left power supply mounting screw **E**.
15. Remove the four frame assembly mounting nuts **A**.
16. Lift out the frame assembly **B**.

Installation

1. Set the frame assembly into place in the base.
2. Install the power supply mounting screw **E**.
3. Install the four frame assembly mounting nuts **A**.
4. Install the ribbon drive crossbar (Section 361).
5. Install the following connectors to the base card (Section 721):
    - Forms motor cable **L**
    - Print head carrier motor cable **P**
    - Emitter cable **N**.

    Note: Ensure that you route the cables properly and they do not interfere with other parts or functions of the printer.
6. Install the entry chute (Section 115).
7. Install the paper guide shield (Section 119).
8. Install the operator control panel (Section 511).
9. Install the print head cable clamp **C**.
10. Install the print head (Section 321).
11. Install the ribbon cartridge (Section 811).
12. Install the printer cover (Section 113).
13. Install the forms device (Section 820).
14. Install the access cover (Section 111).

121 - Frame Assembly (continued)



200. Logic Cards

200 Entry Contents

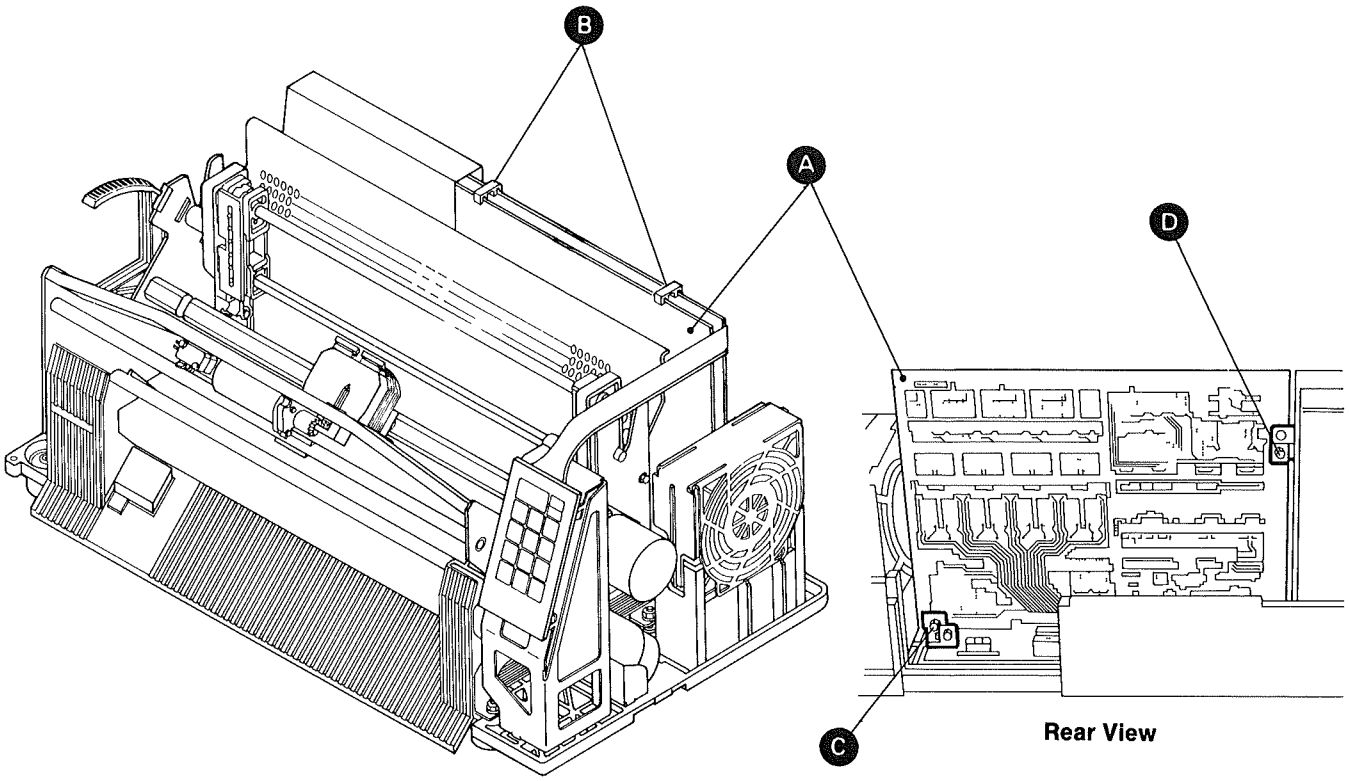
211 - Driver Card

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the two holding clips (B).
5. Remove the attachment card (Section 411).
6. Remove the control card (Section 215).
7. Loosen the driver card mounting screw (C) and remove screw (D).
8. Carefully lift the driver card (A) out of the base card connectors.

Installation

1. Carefully install the driver card (A) in the base card connectors ((E) and (F) in Section 721).
2. Install and tighten the two driver card mounting screws (C) and (D).
3. Install the control card (Section 215). Ensure that you connect the operator control cable.
4. Install the attachment card (Section 411).
5. Install the two holding clips (B).
6. Install the printer cover (Section 113).
7. Install the access cover (Section 111).

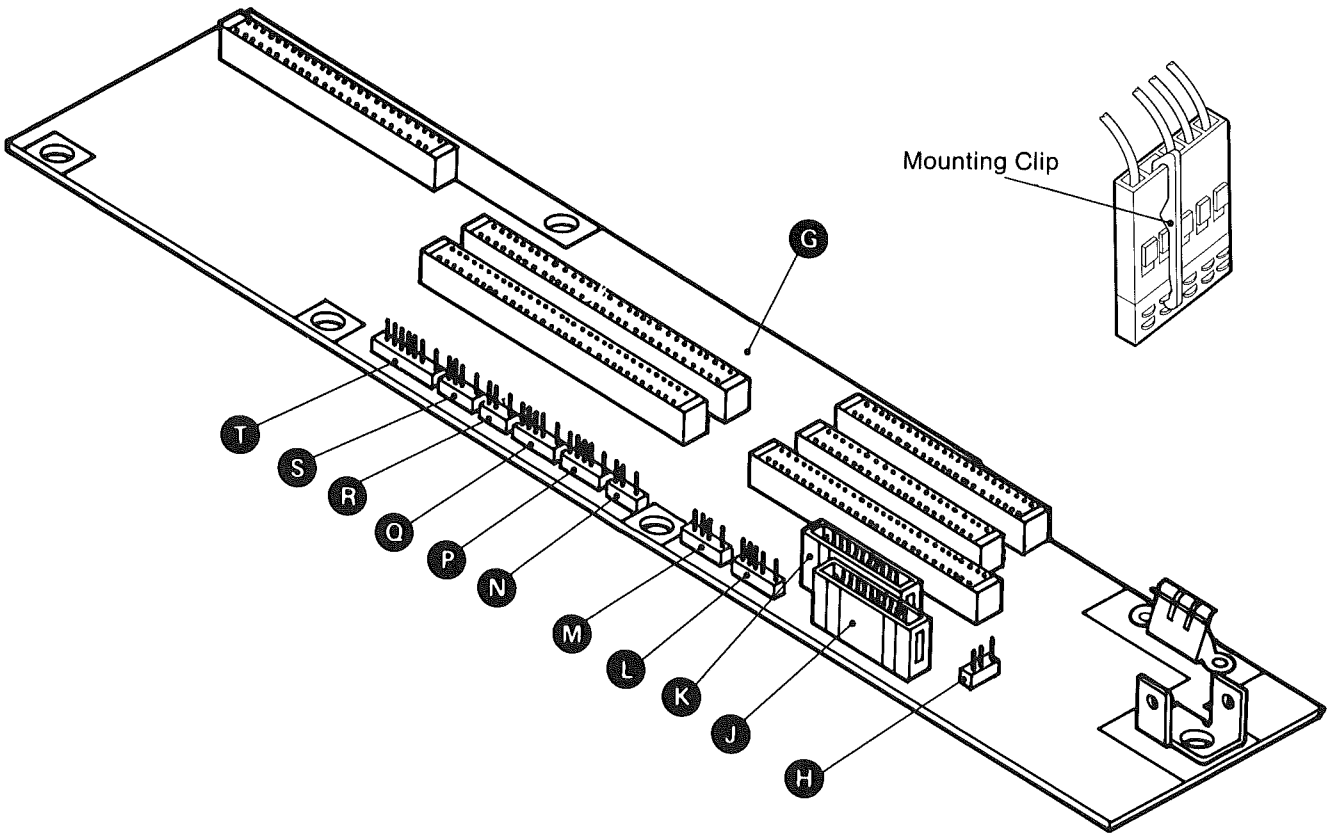


213 - Base Card

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the attachment card (Section 411).
5. Remove the control card (Section 215).
6. Remove the driver card (Section 211).
7. Remove the power supply (Section 611).
8. Disconnect the following from the base card:
   a. Fan cable (H)
   b. Print head cable (J) and also (K) on XX2 Models
   c. Forms motor cable (L)
   d. Ribbon motor cable (M)
   e. Print head carrier motor cable (N)
   f. Print head emitter cable (P)
   g. Ribbon shift cable (Q) (Model XC2)
   h. Head speed inhibitor switch cable (R)
   i. Ribbon type sensor cable (S) (Model XC2)
   j. Forms sensor cable (T).
9. Remove the six base card mounting screws.
10. Remove the base card (G).

Note: Connectors are held to sockets by a mounting clip. Squeeze the top of the clip to release.



213 - Base Card (Continued)

Installation

1. Place the base card into position G.

   Warning: To prevent stripping, **do not over-tighten.**

2. Install the six base card mounting screws.

3. Connect to the base card:

   a. Forms sensor cable T

   b. Ribbon type sensor cable S (Model XC2)

   c. Head speed inhibitor switch cable R

   d. Ribbon shift cable Q (Model XC2)

   e. Print head emitter cable P

   f. Print head carrier motor cable N

   g. Ribbon motor cable M

   h. Forms motor cable L

   i. Print head cable J and also K on XX2 Models

   j. Fan cable H.

4. Install the power supply (Section 611).

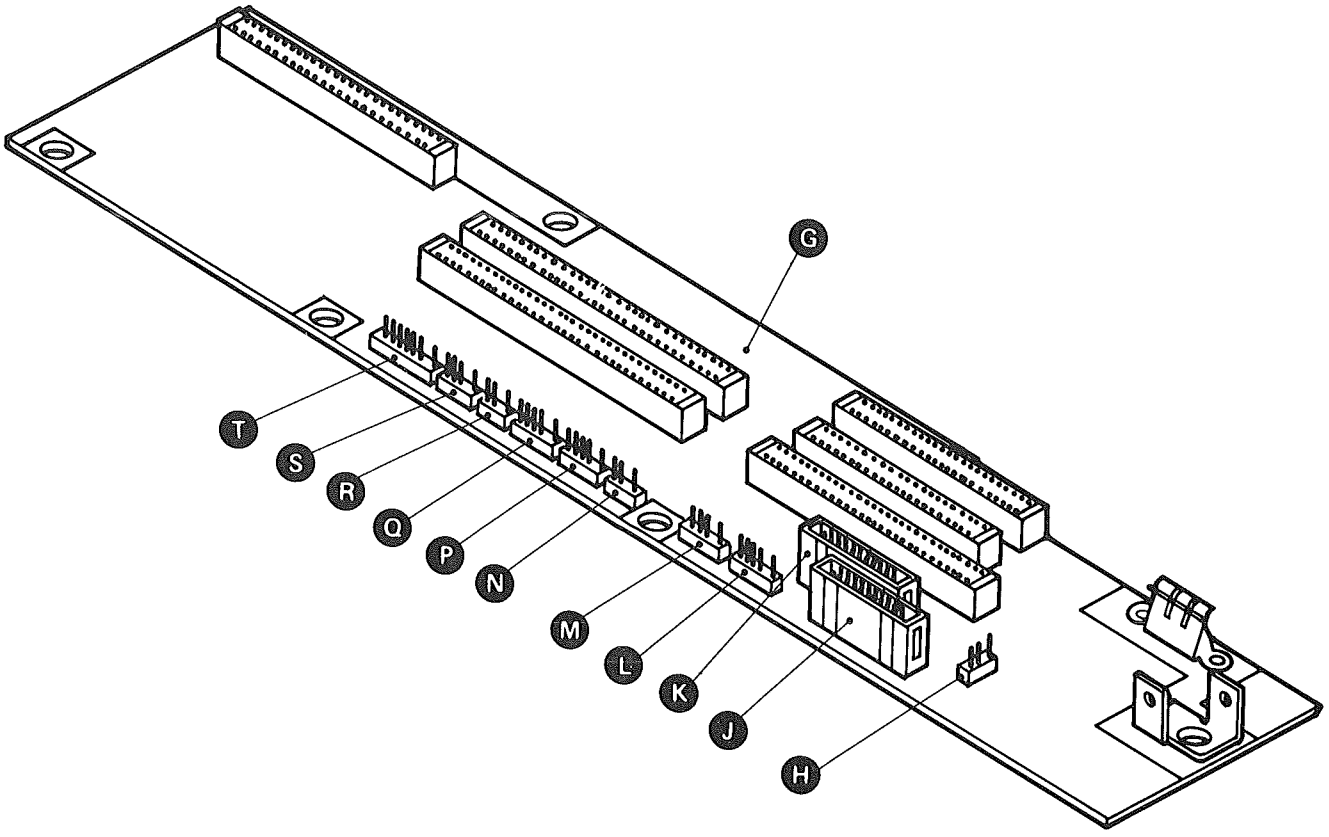
5. Install the driver card (Section 211).

6. Install the control card (Section 215).

7. Install the attachment card (Section 411).

8. Install the printer cover (Section 113).

9. Install the access cover (Section 111).



215 - Control Card

There are two control cards. One contains 64K memory and the other 512K memory. To replace the control card, order the part number stamped on the card you are replacing.

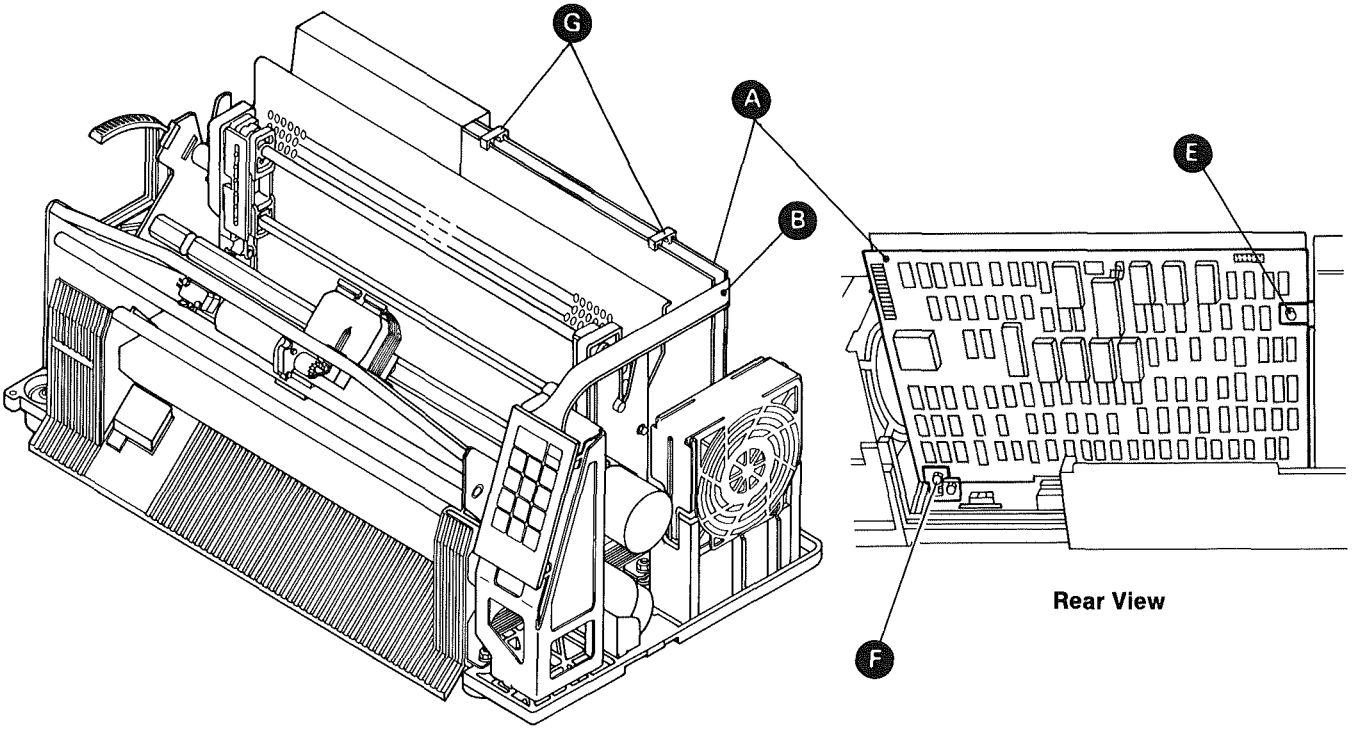
Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the two card-holding clips (G).
5. Remove the attachment card (Section 411).
6. Carefully disconnect the operator control panel cable (B) from the control card.
7. Loosen control card mounting screw (F) and remove screw (E).
8. Lift the control card (A) to remove it from the base card.

Installation

1. Install the control card (A) into the base card connectors ((C) and (D) in Section 721).
2. Install and tighten the two control card mounting screws (F) and (E).
3. Connect the operator control panel cable (B) to the control card.
4. Install the attachment card (Section 411).
5. Install the two card-holding clips (G).
6. Install the printer cover (Section 113).
7. Install the access cover (Section 111).

Note: When you install a new control card, you must set the address to the customer configuration before you attach the system signal cable to the printer.



300. Print Units

300 Entry Contents

320 - Print Head and Carrier

321 - Print Head

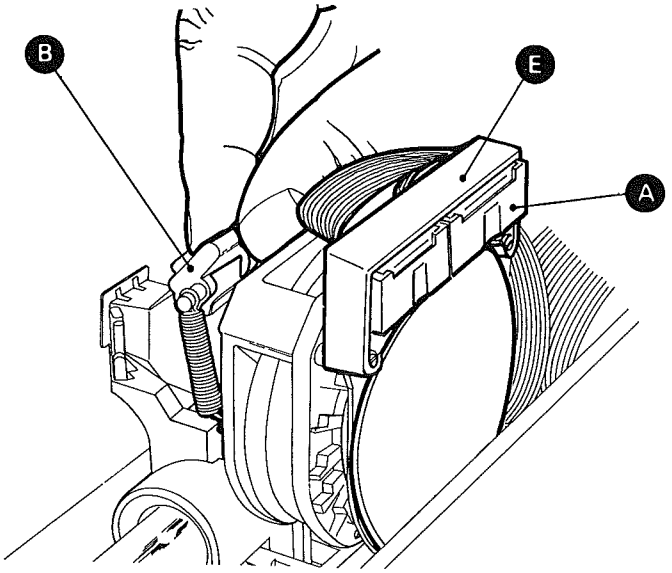
The print head is a customer-purchase responsibility.

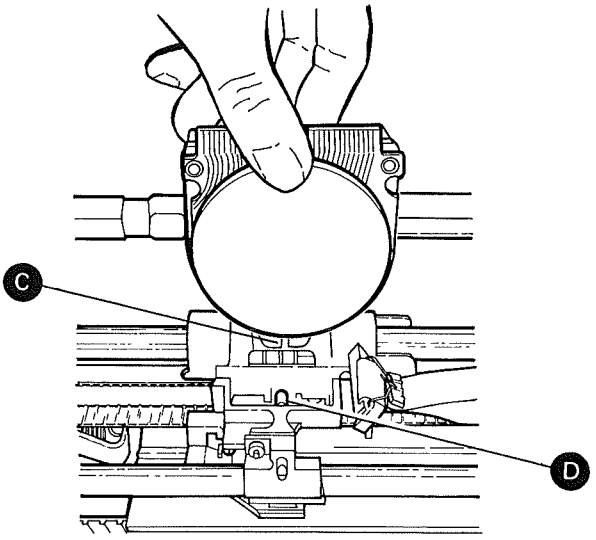
Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Move the print head to the center of the printer.
4. Remove the ribbon (Section 812).
5. Remove the print head connector clamp E (press down on top of the clamp; then pull the right leg out to remove the clamp).
6. Disconnect the print head cable A (two cables on Models X02 and XC2).
7. Rotate the print head latch B toward the front of the printer.
8. Remove the latch spring from the right side of the latch.
9. Remove the print head by lifting it out of the printer.

Installation

1. Place the print head in the carrier so that the slot C in the print head lines up with the pin D on the carrier.
2. Place the latch B in the cradle on the print head.
3. Install the latch spring on the right side of the latch.
4. Rotate the latch toward the rear of the printer until it locks into place.
5. Connect the print head cable to the print head.
6. Install the print head connector clamp.
7. Install the ribbon (Section 811).
8. Install the access cover (Section 111).





323 - Print Head Latch and Springs

Removal

1. Set the power switch to O (Off).
2. Open the access cover.
3. Move the print head to the center of the printer.
4. Remove the print head (Section 321).

   To remove the latch:

   a. Remove the left latch spring from the latch stud (A).

   b. Remove and replace the latch.

   To remove the latch springs:

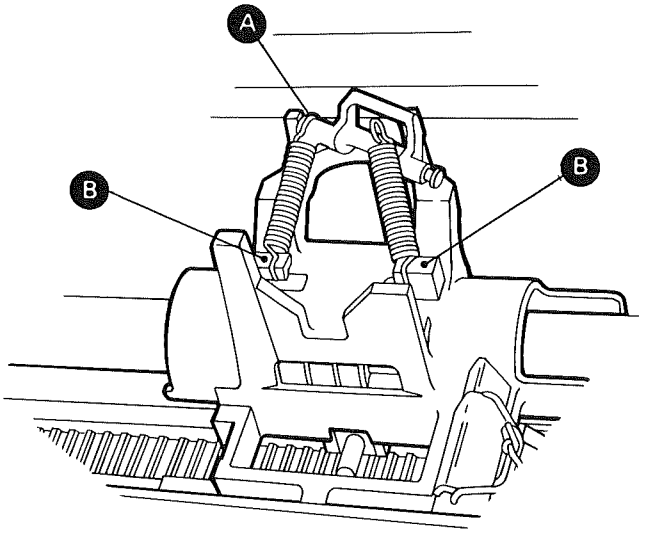
   Note: Be careful when replacing the springs to ensure that the springs do not interfere with the customer's installation of the print head.

   a. Remove the latch springs from the latch stud (A) and carrier studs (B).

   b. Remove and replace the latch springs.

Installation

1. Reverse the removal procedure.



325 - Print Head Cables

Removal

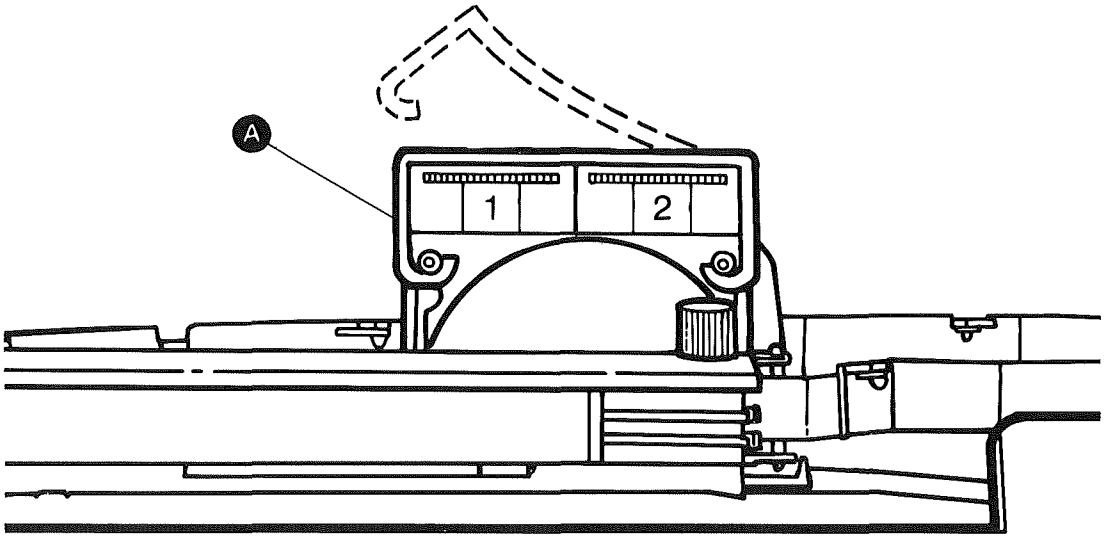
1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the ribbon cartridge (Section 812).
5. Remove the forms device (Section 820)
6. Remove the paper guide shield (Section 119).
7. Remove the entry chute (Section 115); do not disconnect the sensor cables.
8. Remove the print head connector clamp (A) (press down on top of the clamp; then pull the left leg out to remove the clamp).
9. Disconnect the cable(s) from the print head connector(s).
10. Remove the ribbon shift motor shield on Model XC2 (Section 365).
11. Disconnect the ribbon shift cable from the ribbon shift motor. See Section 365 (Z).
12. Disconnect the print head cable(s) from the base card connector(s). (See (J) in Section 721; also see (K) for Model XC2).
13. Disconnect the ribbon shift cable from the base card connector (Model XC2 only; see (Q) in Section 721).
14. Remove all cable ties and clamps.
15. Remove the print head cable.

Installation

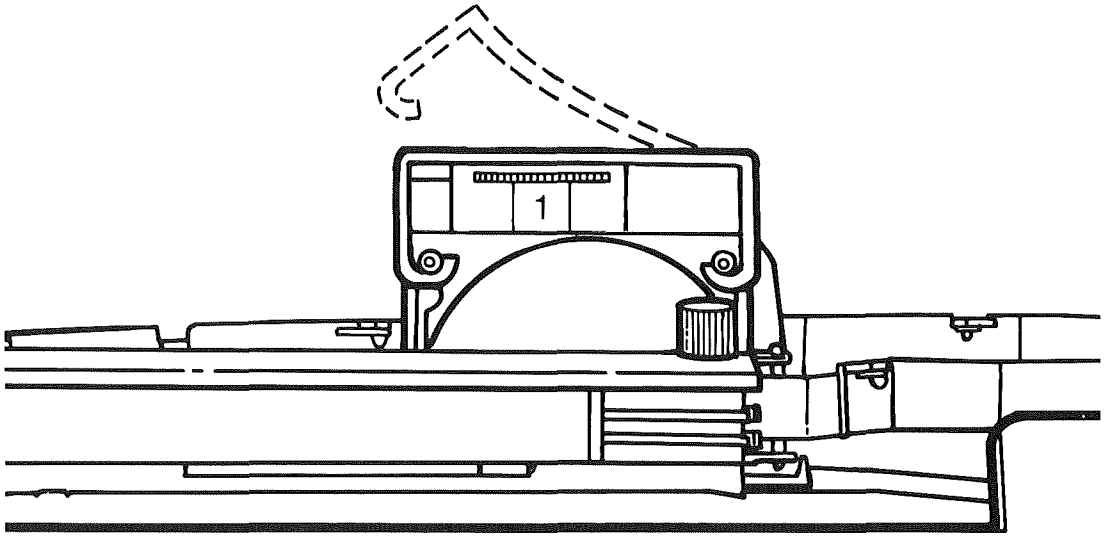
1. Connect the print head cable(s) to the base card connector(s). (See (J) in Section 721; also see (K) for Model XC2.)
2. Connect the ribbon shift cable to the base card connector (Model XC2 only; see (Q) in Section 721).
3. Starting from the base card, route the print head cable assembly along the inside of the right side frame, then up to the entry chute and to the print head.
4. Connect the ribbon shift cable to the ribbon shift motor. See Section 365 (Z).
5. Install the ribbon shift motor shield.
6. Connect the print head cable(s) to the print head connector(s).
7. Install and connect all cables ties and clamps.
8. Install the paper guide shield (Section 119).
9. Install the entry chute (Section 115).
10. Install the forms device (Section 820).
11. Install the ribbon cartridge (Section 811).
12. Install the printer cover (Section 113).
13. Install the access cover (Section 111).

325 - Print Head Cable (Continued)

Model XX2



Model XX1



329 - Print Head Carrier and Shaft

Removal

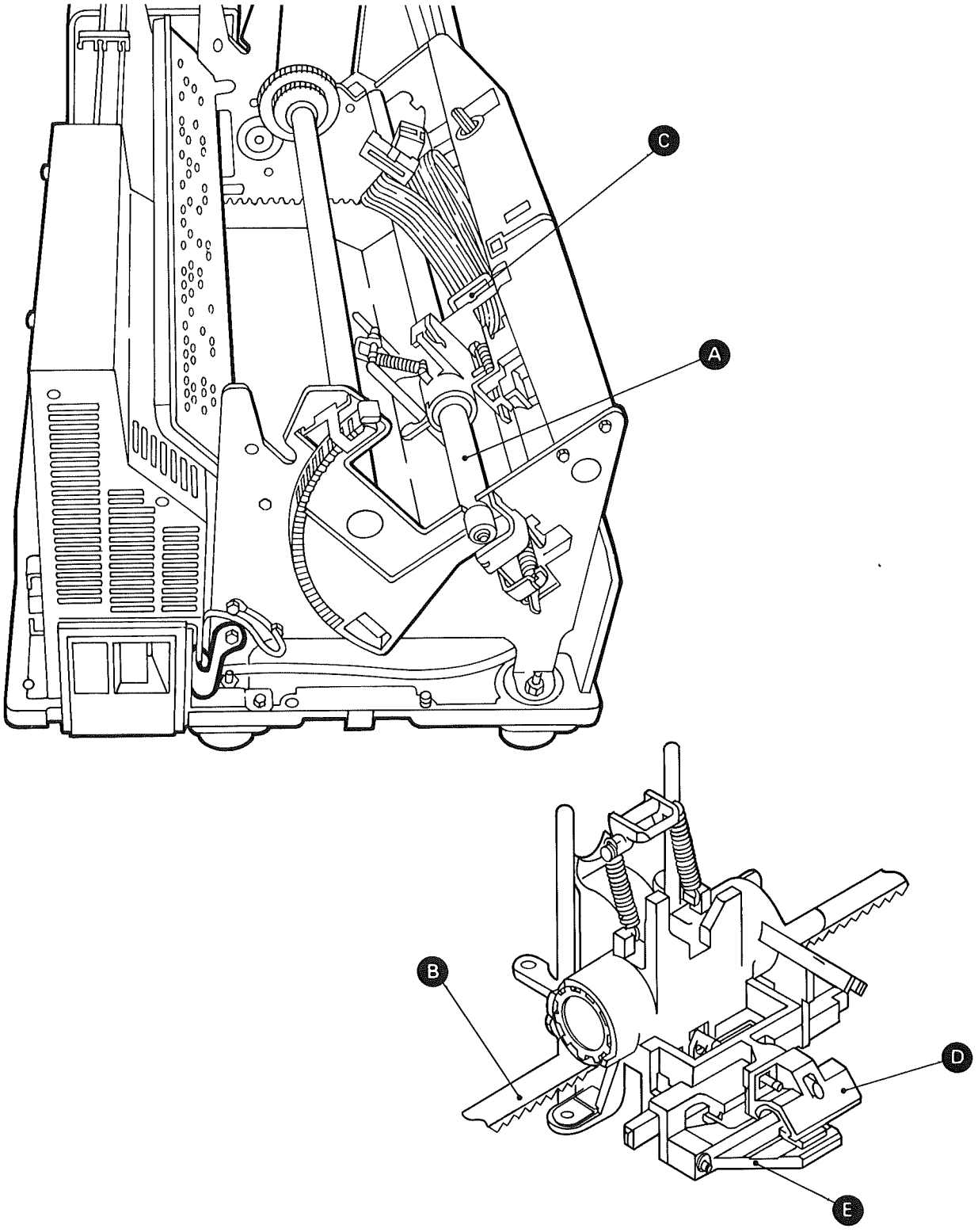
1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the ribbon cartridge (Section 812).
5. Remove the print head (Section 321).
6. Remove the forms thickness lever (Section 385).

   Note: Turn the screw clockwise to loosen.
7. Remove the carrier drive belt idler assembly (Section 343).
8. Remove the print head cable clamp (C) from the carrier.
9. Remove the operator control panel (Section 511).
10. Remove the carrier drive belt from the print head carrier motor pulley.
11. Move the carrier main shaft (A) to the right, and then lift the shaft, carrier, and drive belt out of the printer.
12. Slide the main shaft out of the carrier assembly.
13. On Model XC2, disconnect the ribbon shift cable from the ribbon shift motor.
14. On Model XC2, remove the ribbon shift motor (Section 365).
15. Remove the carrier drive belt clamp (Section 341).
16. Remove the drive belt (B).

Installation

1. Install the carrier drive belt and the print head cable and clamp on the carrier.
2. On Model XC2, install the ribbon shift motor (Section 365).
3. On Model XC2, connect the color cable to the ribbon shift motor cable connector.
4. Spread the upper bearing (D) and support guide (E) apart to install the carrier to the carrier support shaft.
5. Apply a thin film of IBM No. 23 grease to each end of the main shaft, and slide the main shaft onto the carrier assembly with the longer shouldered end to the left.
6. On Model XC2, connect the color cable to the ribbon shift motor cable connector.
7. Align both ends of the shaft with the holes in the sideframes. Then rotate and firmly push the shaft to the left until you position both ends of the shaft in the sideframe holes.
8. Place the carrier drive belt on the print head carrier drive motor pulley.
9. Install the carrier drive belt idler assembly (Section 343).
10. Install the print head (Section 321).
11. Rotate the carrier main shaft until the flat on the right end is up.
12. Install and adjust the forms thickness lever (Sections 385 and 387).
13. Install the ribbon cartridge (Section 811).
14. Install the printer cover (Section 113).
15. Install the access cover (Section 111).

329 - Print Head Carrier and Shaft (continued)



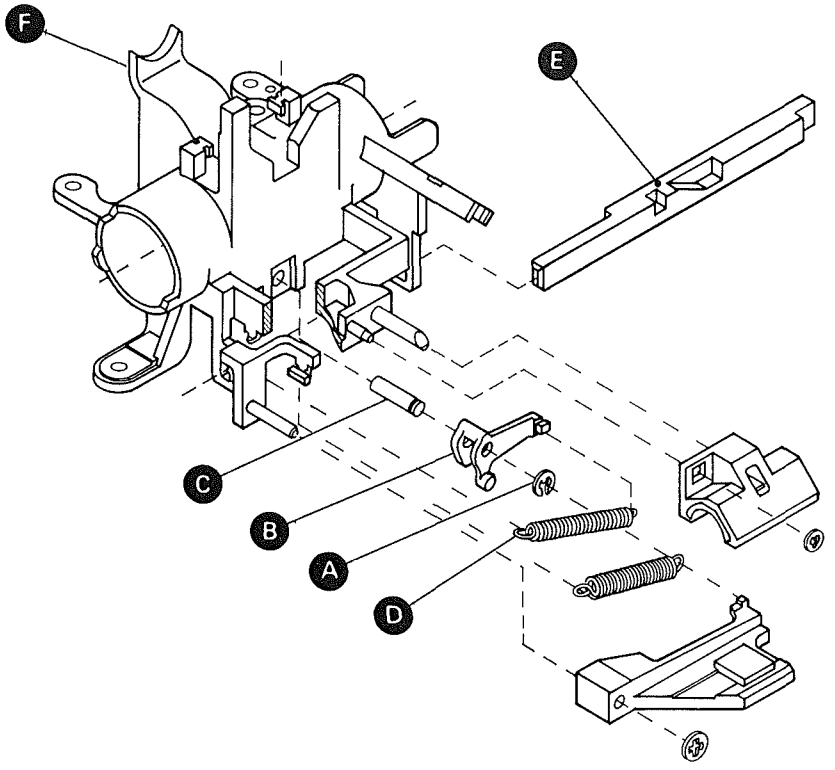
331 - Head Tilt Spring, Actuator, and Shuttle (Models X02, XE2, and XC2)

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the print head (Section 321).
4. Remove the printer cover (Section 113).
5. Remove the entry chute (Section 115).
6. Disconnect the spring (D) from the tilt actuator (B) and the carrier frame (F).
7. Remove the E-clip (A).
8. Remove the tilt actuator (B) from the tilt pin (C).
9. Remove the head tilt shuttle (E).

Installation

1. Install the head tilt shuttle (E).
2. Install the tilt actuator (B) on the tilt pin (C).
3. Install the E-clip (A).
4. Connect the spring (D) to the tilt actuator (B) and the carrier frame (F).
5. Install the print head (Section 321).
6. Install the entry chute (Section 115).
7. Install the printer cover (Section 113).
8. Install the access cover (Section 111).



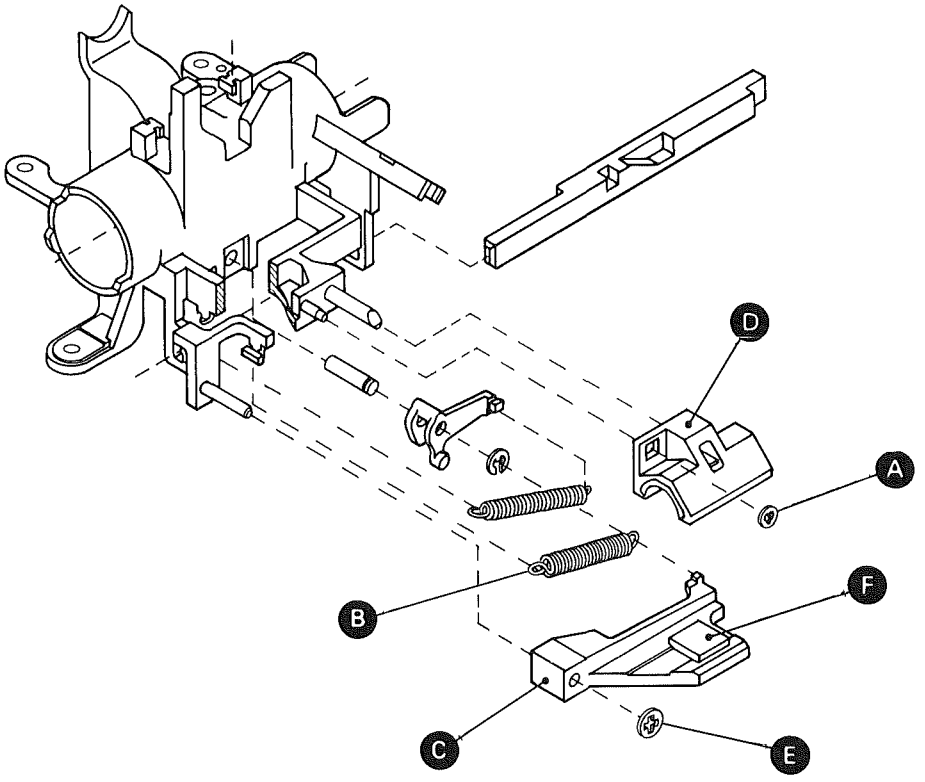
333 - Carrier Upper Bearing, Support Guide, Pad, and Spring

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the print head (Section 321).
5. Remove the carrier (Section 329).
6. Remove the retainer clip (A) and the upper bearing (D).
7. Remove the carrier support guide spring (B).
8. Remove the retainer clip (E).
9. Remove the carrier support guide (C) and pad (F).

Installation

1. Install the carrier support guide (C) and pad (F).
2. Install the retainer clip (E).
3. Install the carrier support guide spring (B).
4. Install the upper bearing (D) and the retainer clip (A).
5. Install the carrier (Section 329).
6. Install the print head (Section 321).
7. Install the printer cover (Section 113).
8. Install the access cover (Section 111).



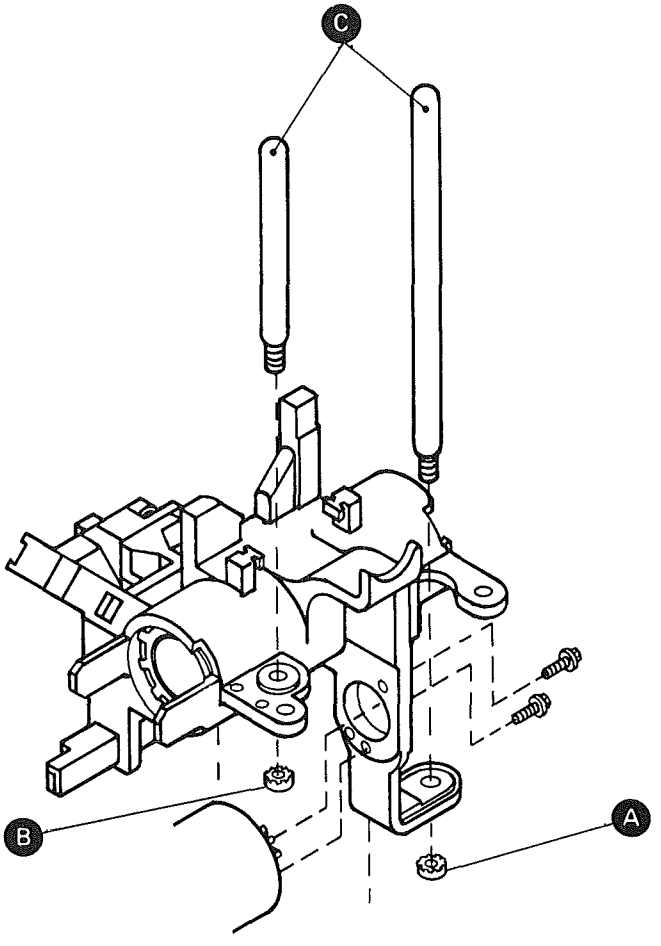
335 - Ribbon Shift Slide Pins (Model XC2)

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the ribbon cartridge (Section 812).
5. Remove the entry chute (Section 115) from the base, do not disconnect any cables.
6. Remove the long slide pin mounting nut (A).
7. Remove the short slide pin mounting nut (B).
8. Remove the slide pins (C).

Installation

1. Move the print head to the center of the printer.
2. Install the long slide pin with mounting nut (A).
3. Install the short slide pin with mounting nut (B).
4. Install the entry chute (Section 115).
5. Install the ribbon cartridge (Section 811).
6. Install the printer cover (Section 113).
7. Install the access cover (Section 111).



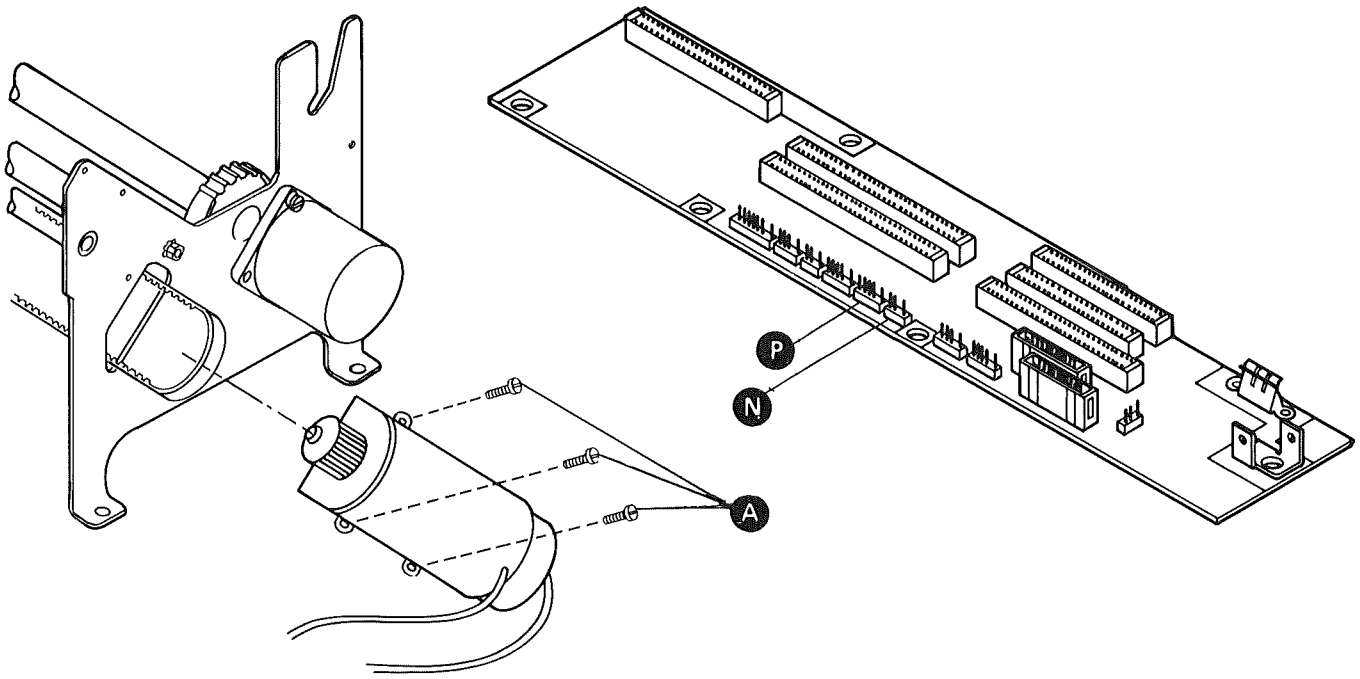
337 - Print Head Carrier Drive Motor

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the operator control panel (Section 511).
5. Remove the operator control panel bracket (Section 513).
6. Remove the forms device (Section 820).
7. Remove the paper guide shield (Section 119).
8. Squeeze the top of the mounting clip and disconnect the motor cable and emitter cable from the base card connectors (N) and (P).
9. Remove the three motor bracket mounting screws (A).
10. Slip the belt off the motor pulley and lift out the motor and bracket.

Installation

1. Place the belt on the pulley and pivot the motor and bracket into place.
2. Install the three motor bracket mounting screws (A).
3. Loosen the belt idler assembly adjusting screw (Section 343) so the idler spring can take up the slack in the belt. Tighten the adjusting screw.
4. Connect the motor cable to the base card connector (N), and the emitter cable to (P) of the base card connector.
5. Install the paper guide shield (Section 119).
6. Install the forms device (Section 820).
7. Install the operator control panel bracket (Section 513).
8. Install the operator control panel (Section 511).
9. Install the printer cover (Section 113).
10. Install the access cover (Section 111).



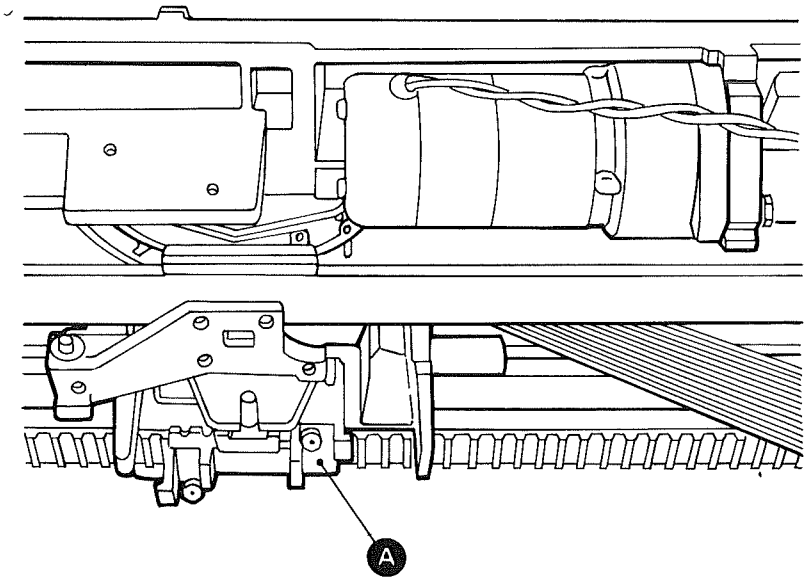
339 - Print Head Carrier Drive Belt

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the entry chute (Section 115); do not disconnect any cables from the chute.
5. Loosen the adjusting screw for the carrier drive belt idler assembly and remove the idler assembly spring (Section 343).
6. Remove the belt from the print head carrier motor pulley.
7. Pull out the idler assembly and remove the belt (the idler pulley is loose).
8. Remove the carrier drive belt clamp (A). On Model XC2, you must remove the ribbon shift cable shield (Section 365 (B)).
9. Remove the belt.

Installation

1. Install the carrier drive belt and the drive-belt carrier clamp (A) to the carrier. On Model XC2, install the ribbon shift cable shield.
2. Install the idler assembly spring (Section 343).
3. Install the entry chute (Section 115).
4. Install the printer cover (Section 113).
5. Install the access cover (Section 111).



Viewed Under the Carrier

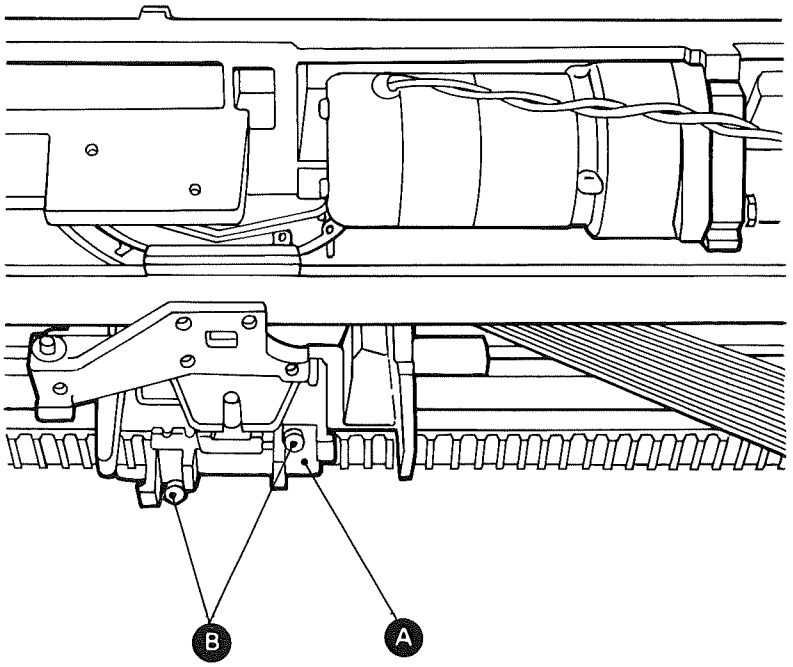
341 - Print Head Carrier Drive Belt Clamp

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the entry chute (Section 115); do not disconnect any cables from the chute.
5. Remove the carrier drive belt clamp (A) by removing the two mounting screws (B). On Model XC2, remove the ribbon shift cable shield (Section 365 (B)).

Installation

1. Install the carrier drive belt and drive belt clamp (A) onto the carrier with the two mounting screws (B). On Model XC2, install the ribbon shift cable shield.
2. Install the entry chute (Section 115).
3. Install the printer cover (Section 113).
4. Install the access cover (Section 111).

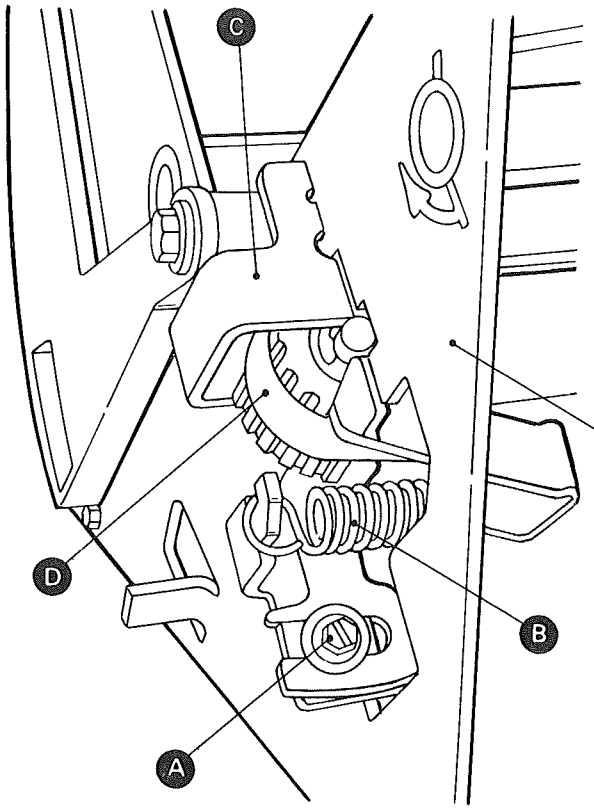


Viewed Under the Carrier

343 - Print Head Carrier Drive Belt Idler Assembly

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the entry chute (Section 115) from the base; do not disconnect any cables.
5. Loosen the idler assembly adjusting screw (A).
6. Remove the belt tension spring (B)
7. Pivot the idler assembly (C) away from the adjusting screw (A).
8. Remove the idler assembly (pulley and idler bracket).



Installation

1. Remove the operator control panel (Section 511).
2. Remove the belt from the print head carrier drive pulley (D).
3. Put the left end of the belt on the idler pulley and fit the pulley into the idler assembly bracket.
4. Place the two lugs of the bracket into the holes in the side frame and pivot the bracket just under the flat washer on the adjusting screw and snug the screw.
5. Place the belt around the print head carrier motor pulley.
6. Connect the belt tension spring (B).
7. Loosen, then tighten the idler assembly adjusting screw (A).
8. Install the operator control panel (Section 511).
9. Install the entry chute (Section 115).
10. Install the printer cover (Section 113).
11. Install the access cover (Section 111).

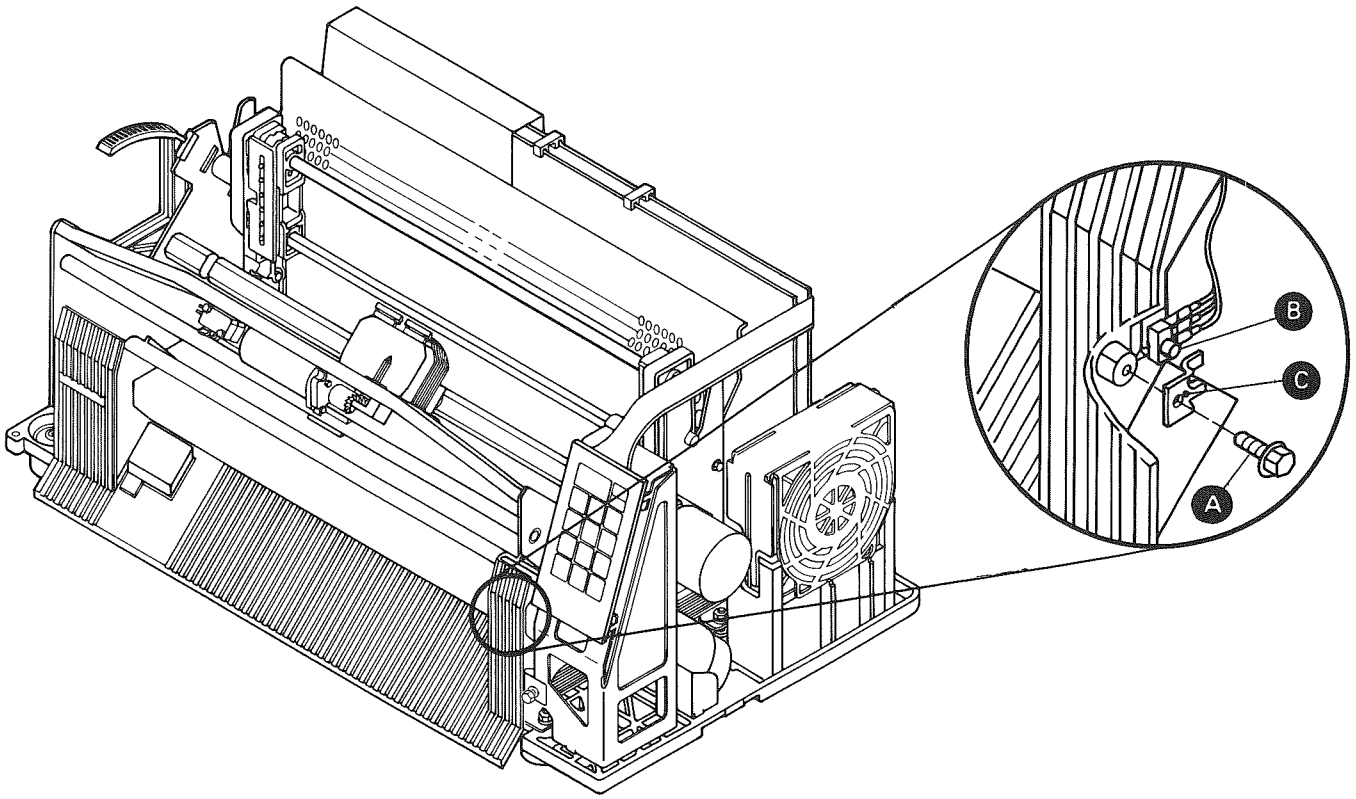
345 - Print Head Speed Inhibitor Switch

Removal

1. Remove the access cover (Section 111)
2. Remove the printer cover (Section 113).
3. Remove the forms device (Section 820)
4. Remove the paper guide shield (Section 119).
5. Disconnect the head speed-inhibitor switch cable from the base card connector (see R in Section 721).
6. Remove the entry chute (Section 115); do not disconnect the end-of-forms sensor.
7. Remove the switch mounting screw A and bracket C
8. Remove the leads from the switch
9. Remove the switch B.

Installation

1. Place the inhibitor switch into the slot on the entry chute
2. Install the bracket C and mounting screw A.
3. Route the inhibitor switch cable to the base card
4. Connect the inhibitor switch cable to the base card connector (see R in Section 721)
5. Ensure that you have installed all cable ties and clamps
6. Install the entry paper chute (Section 115).
7. Install the paper guide shield (Section 119).
8. Install the forms device (Section 820).
9. Install the printer cover (Section 113).
10. Install the access cover (Section 111)



360 - Ribbon Units

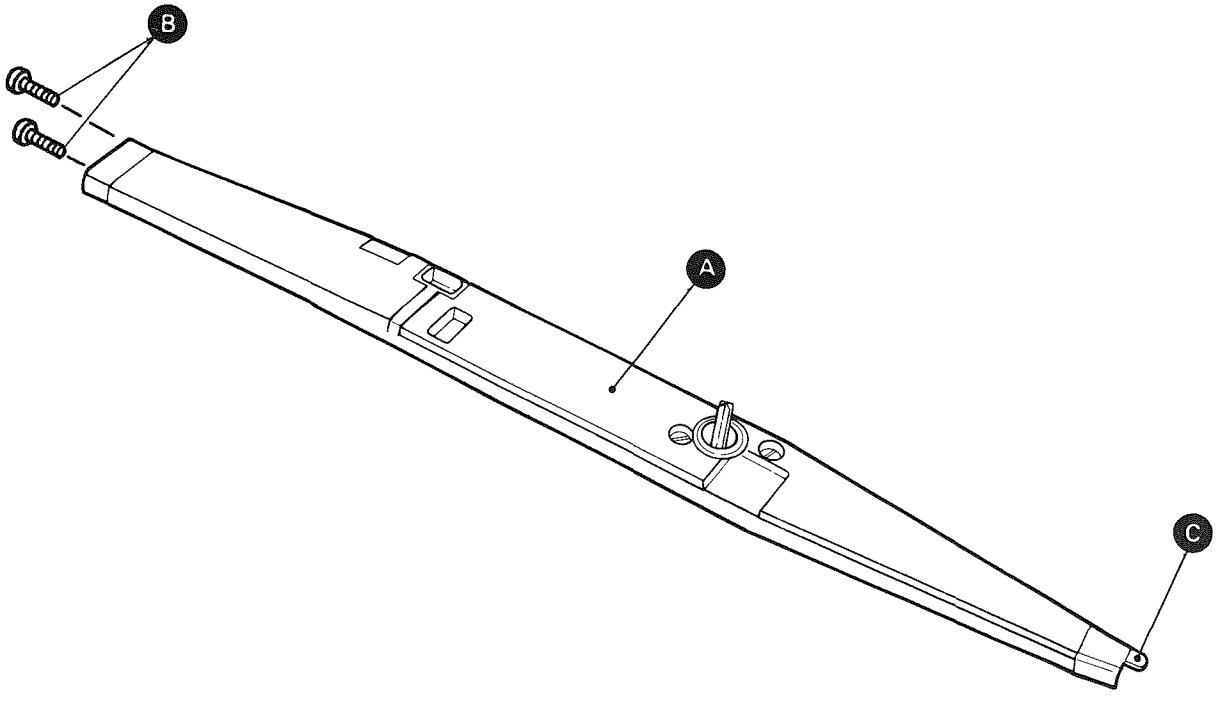
361 Ribbon Drive Crossbar

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111)
3. Remove the printer cover (Section 113).
4. Remove the ribbon cartridge (Section 812).
5. Remove the crossbar mounting screws (B) and lift the crossbar up and to the left to remove the mounting pin (C) from the left sideframe.
6. Remove the ribbon drive crossbar assembly (A)
7. Remove the ribbon drive motor assembly (Section 363).
8. On Model XC2, remove the ribbon type sensors (Section 369).

Installation

1. On Model XC2, install the ribbon type sensors (Section 369)
2. Install the ribbon drive motor assembly (Section 363)
3. Lower the crossbar assembly (A) in place, inserting the mounting pin (C) into the left sideframe, and install the crossbar mounting screws (B)
4. Install the ribbon cartridge (Section 811).
5. Install the printer cover (Section 113).
6. Install the access cover (Section 111).



363 - Ribbon Drive Motor Assembly

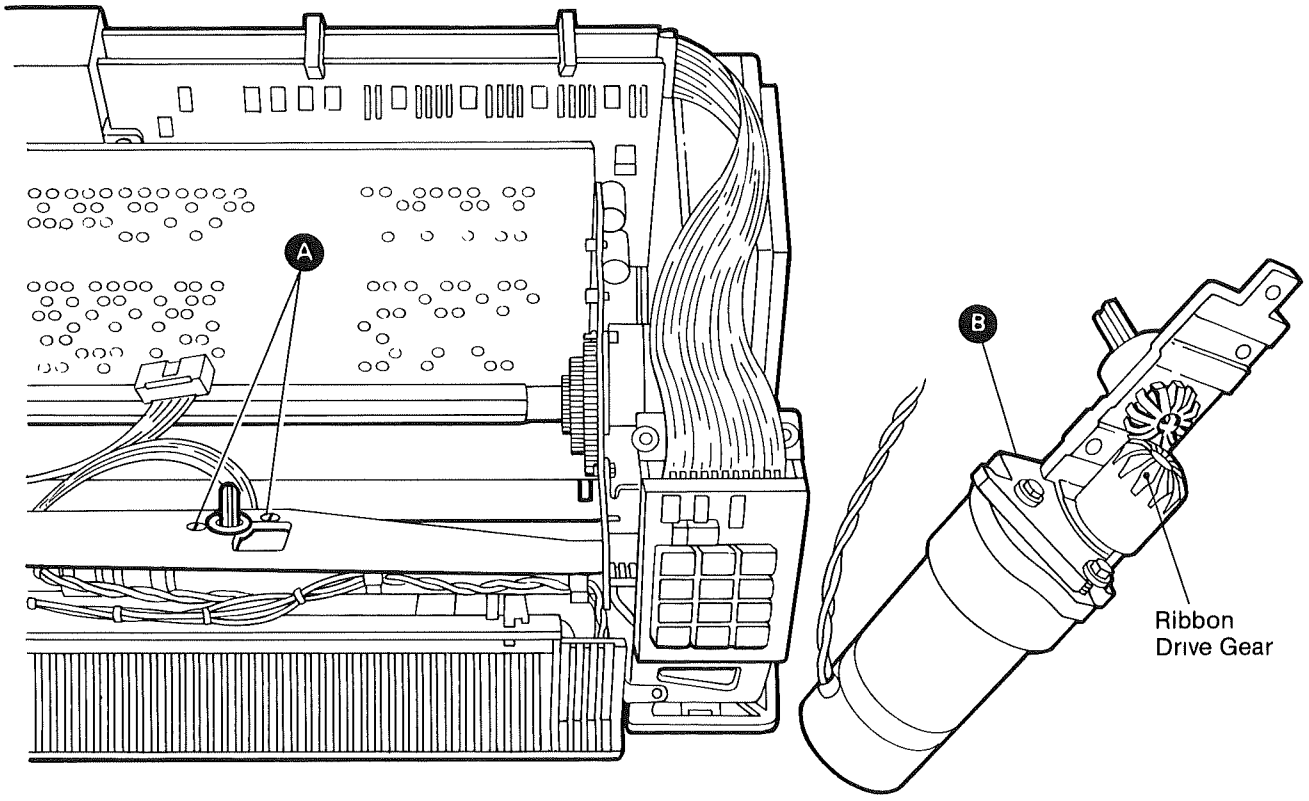
Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the ribbon cartridge (Section 812).
5. Remove the forms device (Section 820).
6. Remove the paper guide shield (Section 119).
7. Squeeze the top of the mounting clip and disconnect the motor cable from the base card connector (see M in Section 721).
8. Remove the two ribbon drive motor assembly mounting screws A.
9. Remove the ribbon motor assembly B.

Installation

1. Install the two ribbon drive motor assembly mounting screws A to the crossbar and the ribbon drive motor assembly.
2. Route the cable through the cable clamps.
3. Connect the motor cable to the base card connector (see M in Section 721).
4. Install the paper guide shield (Section 119).
5. Install the forms device (Section 820).
6. Install the ribbon cartridge (Section 811)
7. Install the printer cover (Section 113).
8. Install the access cover (Section 111).

Service check - Test 830



365 - Ribbon Shift Motor (Model XC2)

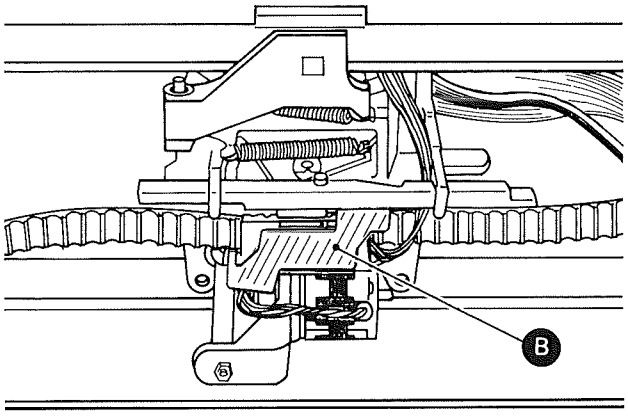
Removal

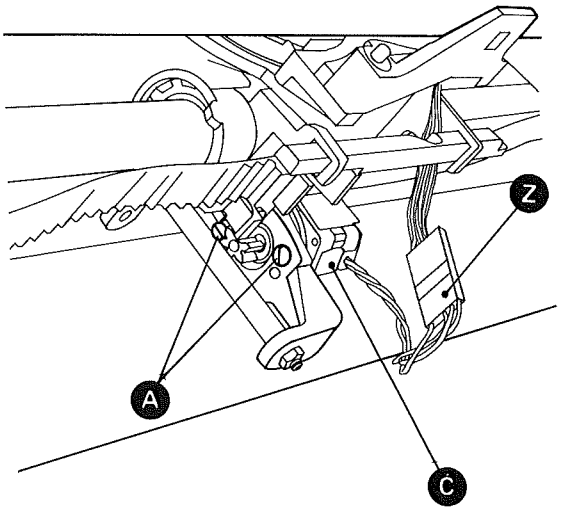
1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the ribbon cartridge (Section 812).
5. Remove the forms device (Section 820).
6. Remove the entry paper chute (Section 115), do not remove the sensor cables.
7. Remove the ribbon shift motor shield (B).
8. Disconnect the ribbon shift motor connector (Z).
9. Remove the two motor mounting screws (A).
10. Remove the ribbon shift motor (C).

Installation

1. Hold the ribbon shift motor in place with the motor gear and the ribbon shift gear meshed.
2. Install the two motor mounting screws (A).
3. Connect the ribbon shift motor connector (Z).
4. Install the ribbon shift motor shield (B).
5. Install the entry paper chute (Section 115).
6. Install the forms device (Section 820).
7. Install the ribbon cartridge (Section 811).
8. Install the printer cover (Section 113).
9. Install the access cover (Section 111).

Service check - Test 840





Viewed Under the Carrier

367 - Ribbon Shift Cable (Model XC2) - See Section 325

369 - Ribbon Type Sensors (Model XC2)

Removal

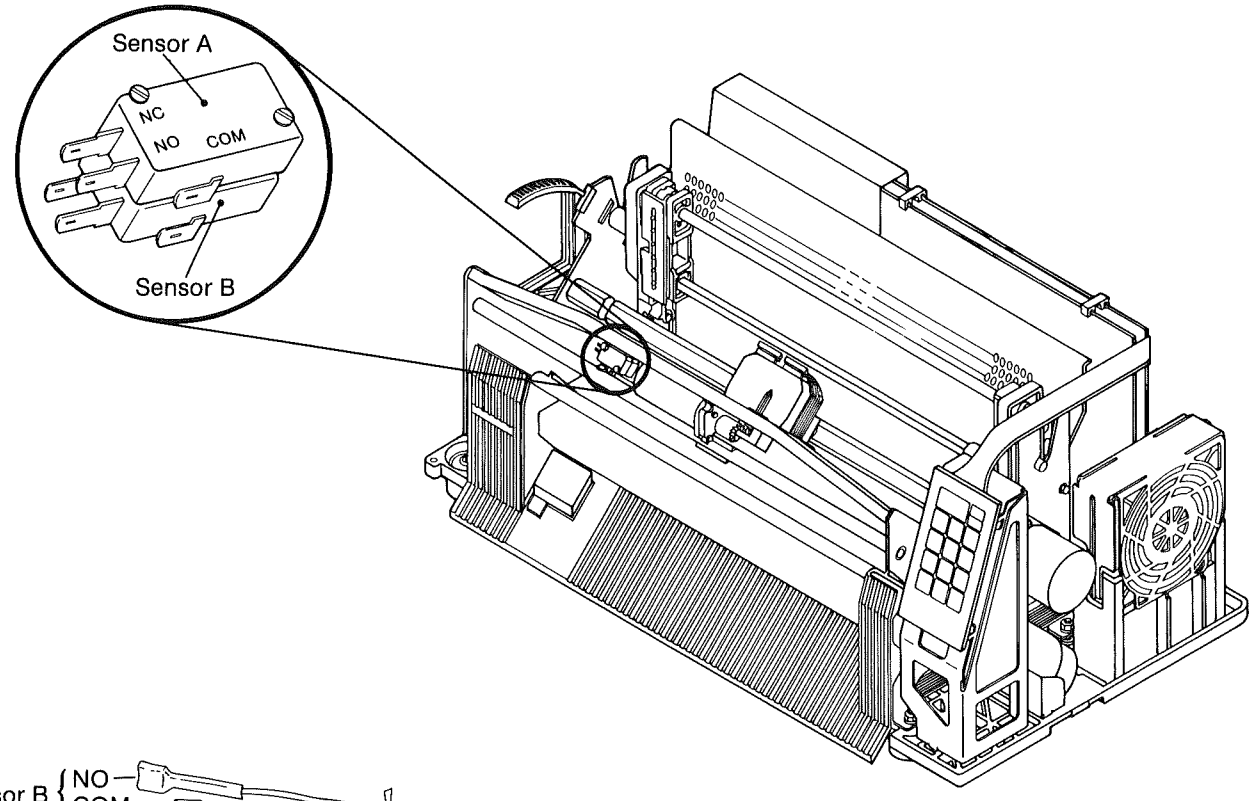
1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the ribbon cartridge (Section 812).
5. Disconnect the sensor cable from the sensor.
6. Remove the two sensor mounting screws.

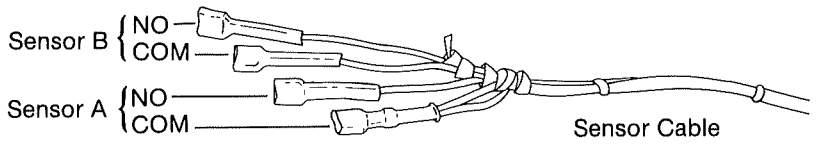
Installation

1. Install the two sensor mounting screws.
2. Connect the sensor cable to the sensors.

   Note: Sensor **A** is to the front of the printer and sensor **B** is to the rear.
3. Install the ribbon cartridge (Section 811).
4. Install the printer cover (Section 113).
5. Install the access cover (Section 111).

Service check - Tests 841-848





371 - Ribbon Sensor Cable (Model XC2)

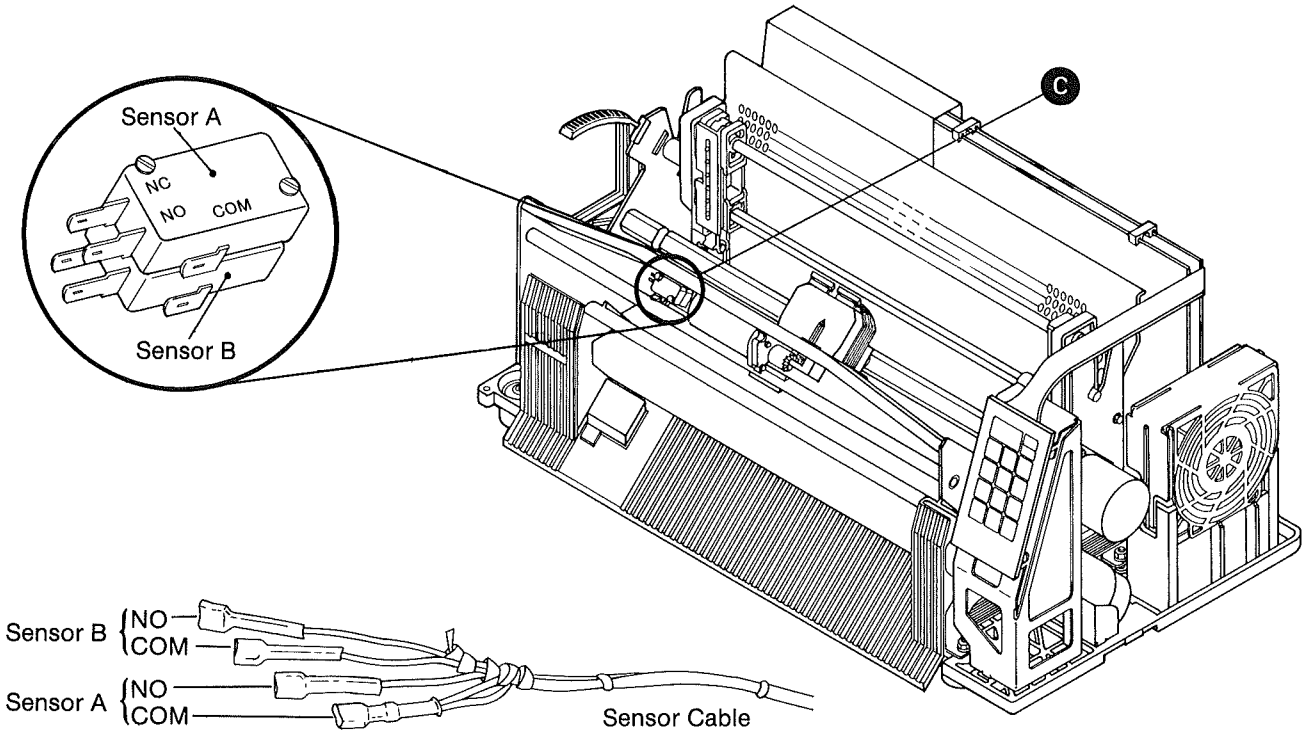
Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the forms device (Section 820).
5. Remove the paper guide shield (Section 119); do not disconnect the end of forms sensor.
6. Remove the sensor cable from the sensors (C).
7. Remove the entry chute (Section 115).
8. Disconnect the head speed-inhibitor switch cables from the switch.
9. Squeeze the top of the mounting clip and disconnect the sensor cable from the base card connectors (see (S) and (R) in Section 721).
10. Remove the cable assembly.

Installation

1. Route the cable through the same clamps as the old cable.
2. Install the head speed-inhibitor cable.
3. Install the entry chute (Section 115).
4. Connect the sensor cable to the base card connectors (see (S) and (R) in Section 721).
5. Connect the sensor cable to the sensors (C).

   Note: Sensor A is to the front of the printer and sensor B is to the rear.
6. Install the paper guide shield (Section 119).
7. Install the forms device (Section 820).
8. Install the printer cover (Section 113).
9. Install the access cover (Section 111).



380 - Forms Feed Units

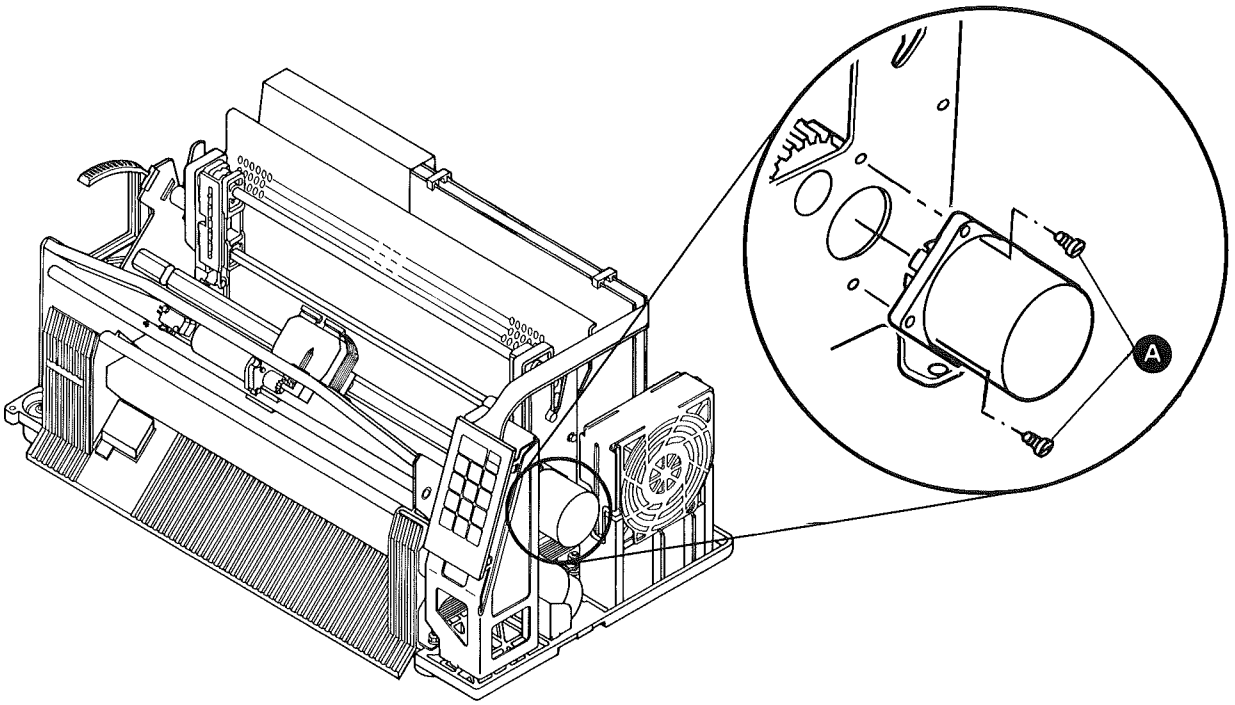
381 Forms Feed Motor

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the forms device (Section 820).
5. Remove the paper guide shield (Section 119).
6 Squeeze the top of the mounting clip and disconnect the motor cable from the base card connector (see L in Section 721).
7. Remove the two motor mounting screws A.
8. Remove the motor.

Installation

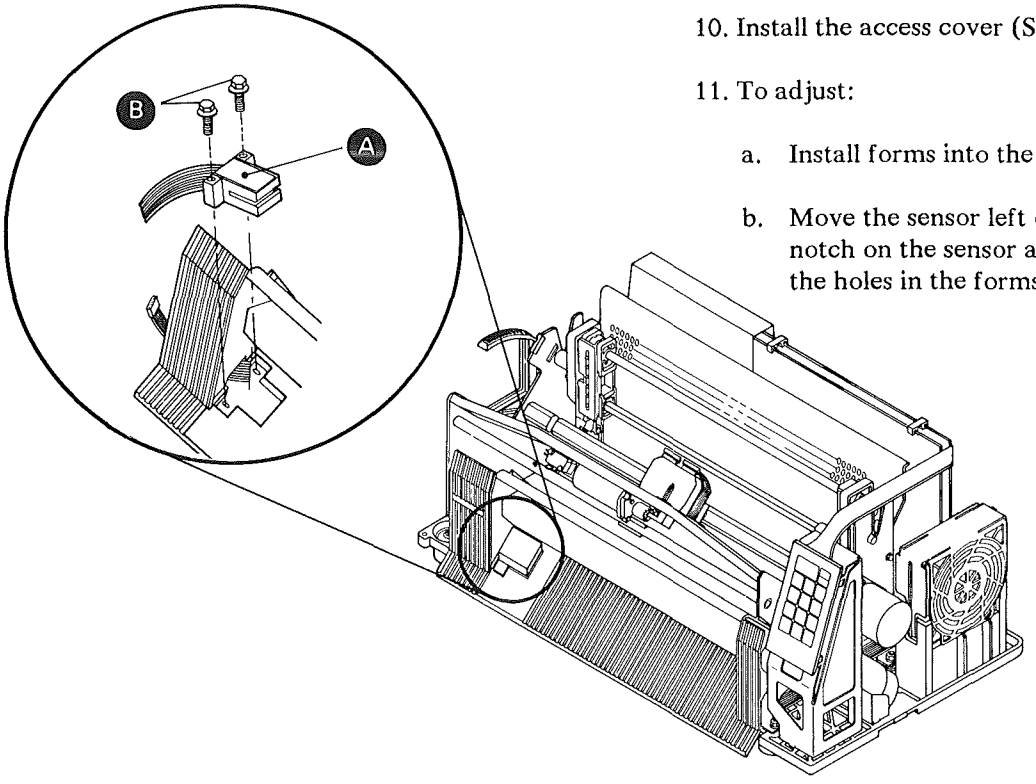
1. Put the motor into place and mesh with the idler gear.
2. Install the two motor mounting screws A.
3. Connect the motor cable to the base card connector (see L in Section 721).
4. Install the paper guide shield (Section 119).
5. Install the forms device (Section 820).
6. Install the printer cover (Section 113).
7. Install the access cover (Section 111).



383 - End-of-Forms Sensor

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the forms device (Section 820).
5. Remove the paper guide shield (Section 119).
6. Remove the power supply grounding strap from the frame.
7. Disconnect the end-of-forms sensor cable from the base card connector (see T in Section 721).
8. Remove the two sensor mounting screws B.
9. Remove the cable tie holding the sensor cable.
10. Remove the sensor assembly A.



Installation

1. Route the end-of-forms sensor cable to the base card connector (see T in Section 721). Ensure that the cable will not be pinched or damaged by the covers.
2. Connect the sensor cable to the base card.
3. Tie the cable to the base.
4. Install the sensor and mounting screws B.
5. Install the power supply grounding strap to the frame.
6. Install the paper guide shield (Section 119).
7. Install the forms device (Section 820).
8. Ensure that the end-of-forms sensor cable is not and will not be pinched.
9. Install the printer cover (Section 113).
10. Install the access cover (Section 111).
11. To adjust:
    a. Install forms into the printer.
    b. Move the sensor left or right so that the notch on the sensor aligns with the center of the holes in the forms.

385 - Forms Thickness Lever

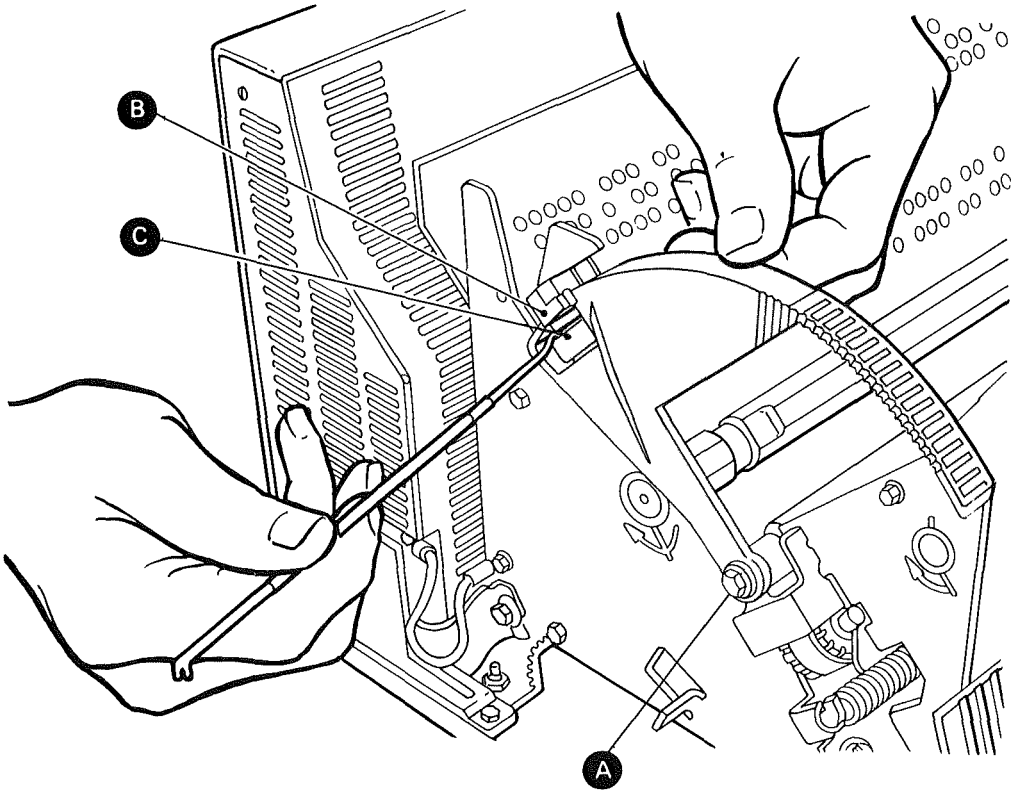
This lever changes the distance between the platen and the print head (print wires).

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Rotate the forms thickness lever toward the front of the printer and pull the latch (C) out so that it clears the forms thickness lever bracket (B).
5. Remove the forms thickness lever mounting screw (A) and starwasher. THIS IS A LEFT-HAND THREADED SCREW (turn clockwise to loosen).
6. Remove the forms thickness lever from the carrier shaft. If you are not removing the carrier shaft, you do not have to remove the flat washer.

Installation

1. Install the flat washer on the end of the carrier shaft.
2. Place the forms thickness lever on the carrier main shaft and rotate the lever toward the rear of the printer so it engages the forms thickness lever bracket.
3. Install the mounting screw (A) (counter-clockwise to tighten) and starwasher (do not tighten).
4. Perform the print head-to-platen adjustment before tightening the screw. See adjustment on the next page.
5. Install the printer cover (Section 113).
6. Install the access cover (Section 111).



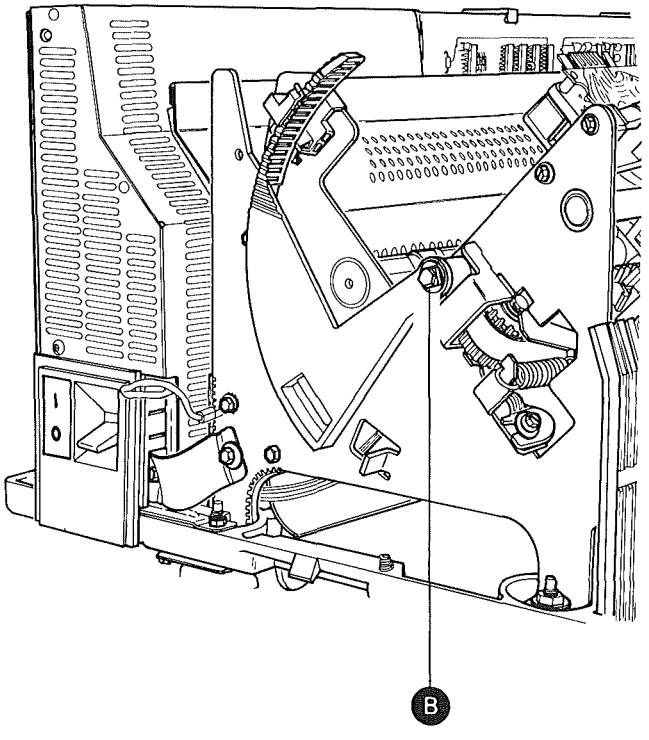
387 - Print Head-to-Platen Clearance

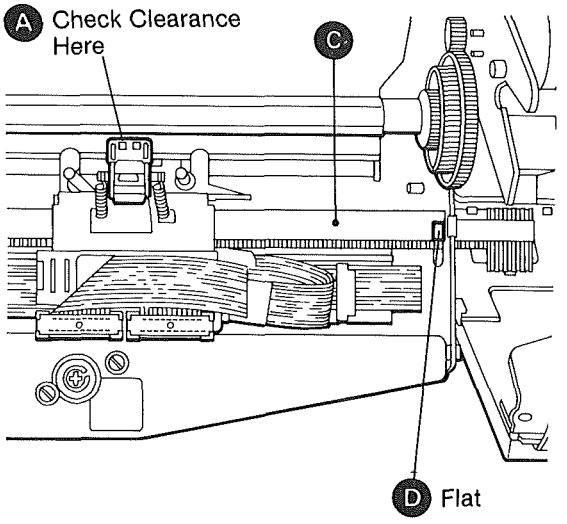
This clearance should be set to 0.15 mm (0.006 in.).

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Ensure that there are no forms in the printer.
5. Move the print head to the center of the printer.
6. Remove the ribbon cartridge (812).
7. Loosen the forms thickness lever mounting screw (B) (turn clockwise to loosen).
8. Set the forms thickness lever all the way to the rear.
9. Rotate the carrier shaft (C) so that the flat (D) on the right end is up.
10. Insert a 0.15 mm (0.006 in.) gauge between the platen and the print head.
11. Rotate the carrier shaft (C) toward the rear to get the correct clearance.
12. Tighten the forms thickness lever mounting screw
13. Check to ensure that the minimum clearance (A) across the platen is 0.15 mm (0.006 in.).

    Note: When you move the forms thickness lever away from and towards the platen, the print head should move in the same direction. If they move in opposite directions, the adjustment has been set on the wrong side of the eccentric.

    The print head should also move up and away from, or down and towards the platen. If the print head moves down and away from, or up and towards the platen, the adjustment is not set on the correct side of the shaft eccentric.





Top View

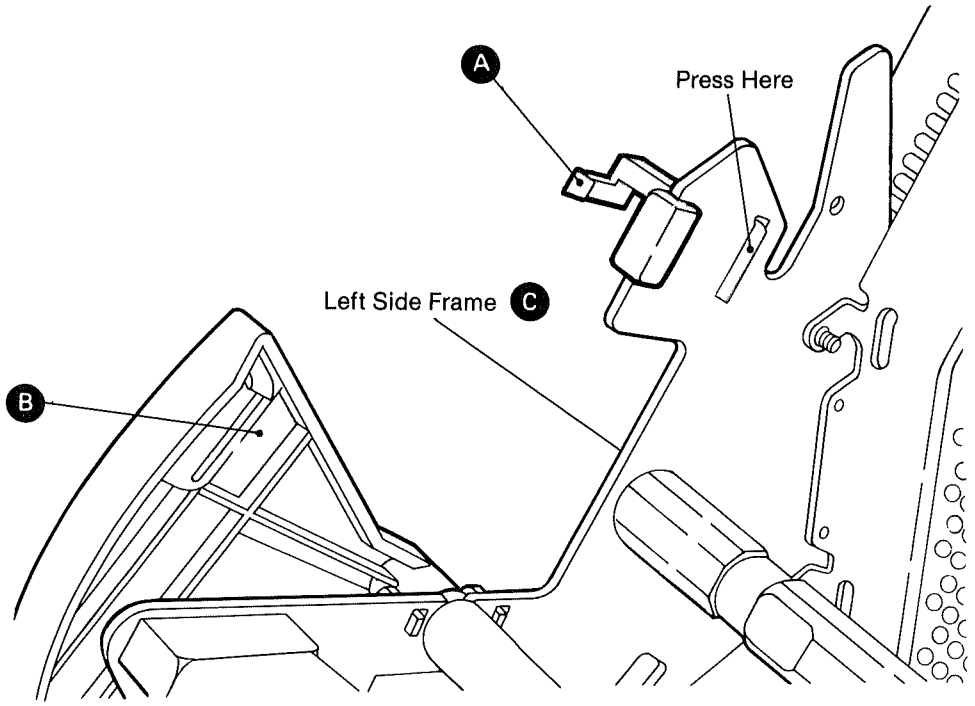
389 - Forms Thickness Lever Bracket

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Rotate the forms thickness lever toward the front of the printer and pull the latch (B) out so that it clears the forms thickness lever bracket (A).
5. Press the bottom of the bracket (A) out of the sideframe (C) and remove the bracket.

Installation

1. Press the bracket (A) into the hole in the left side frame until it snaps into place.
2. Rotate the lever toward the rear of the printer so it engages the forms thickness lever bracket.
3. Install the cover (Section 113).
4. Install the access cover (Section 111).



400. Communications

400 Entry Contents

411 - Attachment Card

Removal

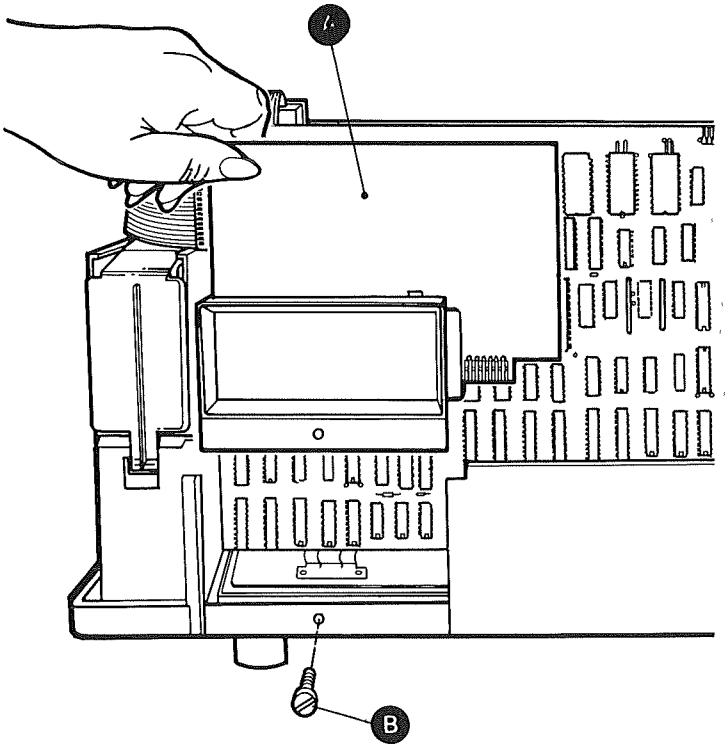
1. Set the power switch to O (Off).

   Note: On printers that are twinaxial attached, make sure you disconnect the signal cable from the attachment card and **not** the terminating "T" connector.

2. Disconnect the signal cable from the printer.
3. Remove the access cover (Section 111).
4. Remove the printer cover (Section 113).
5. Remove the two card mounting clips if necessary.
6. Remove the attachment card mounting screw (B).
7. Remove the attachment card (A) by carefully pulling the card up.

Installation

1. Install the attachment card in the base card connector (see (A) in Section 721).
2. Install the attachment card mounting screw (B).
3. Install the two card mounting clips if necessary.
4. Install the printer cover (Section 113).
5. Install the access cover (Section 111).
6. Connect the signal cable to the printer.



500. Operator Control Panel

500 Entry Contents

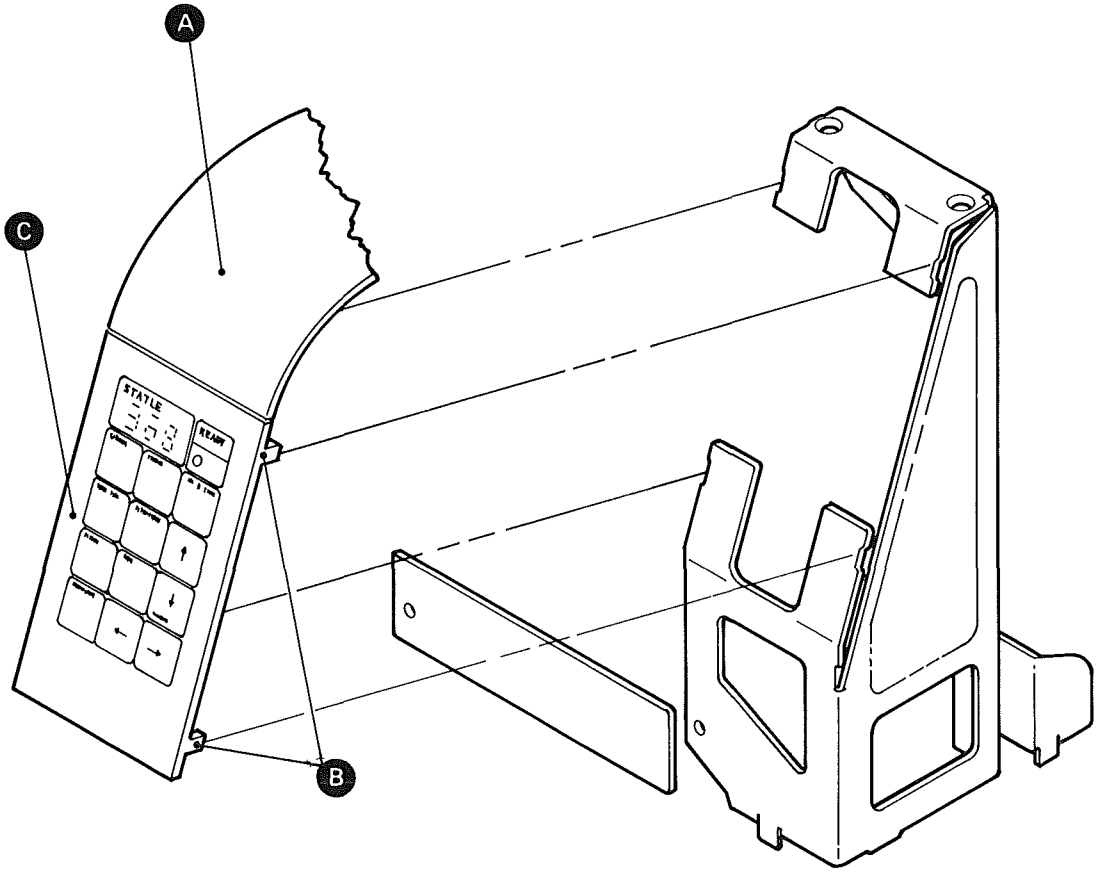
511 - Operator Control Panel

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Do not disconnect the operator control panel cable from the control card if you are removing the panel to get to another part. If you are *replacing* the operator control panel, disconnect the operator control panel cable (A) from the control card.
5. Unsnap the operator control panel mounting clips (B) and remove the operator control panel assembly (C).

Installation

1. Place the operator control panel assembly (C) in position.
2. Press the area of the four mounting clips (B) until the operator control panel snaps into place.
3. Ensure that the operator control panel cable (A) is connected to the control card.
4. Install the printer cover (Section 113).
5. Install the access cover (Section 111).



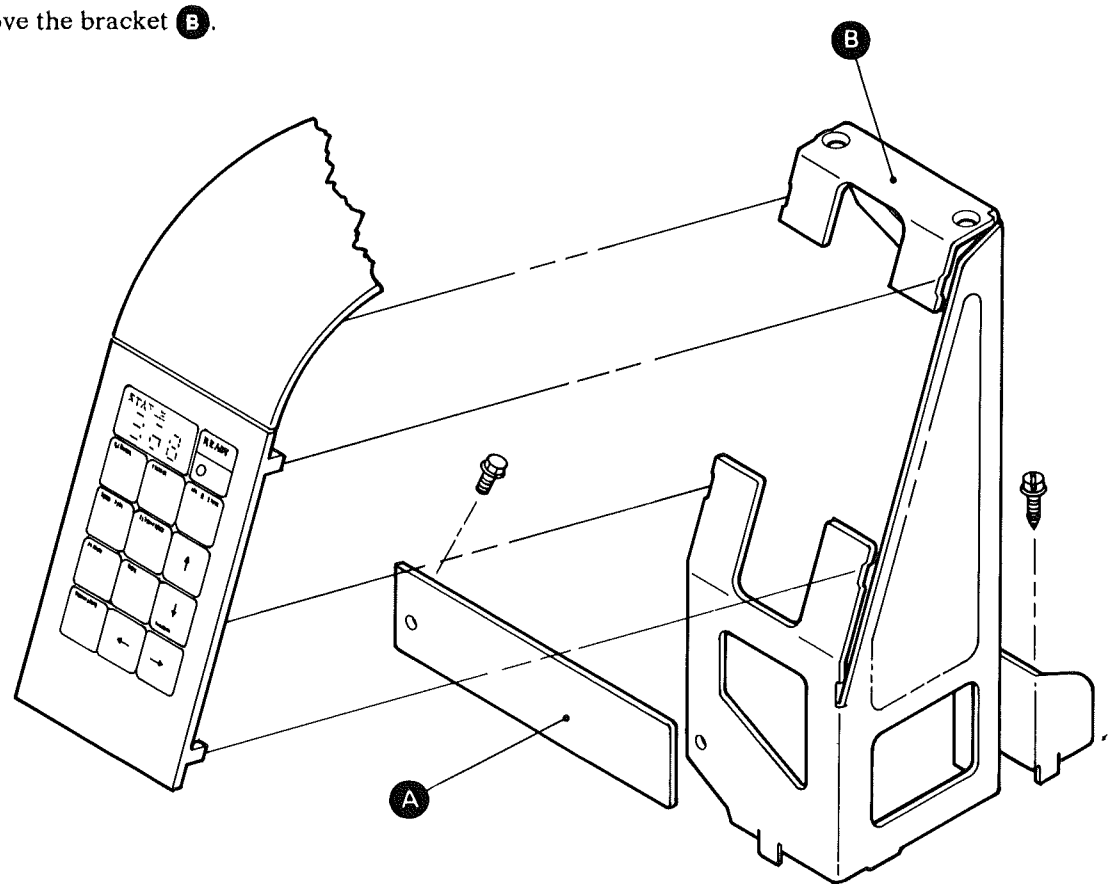
513 - Operator Control Panel Bracket

Removal

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Remove the operator control panel (Section 511).
5. Remove the ground strap (A).
6. Remove the three hex mounting screws on the operator control panel bracket.
7. Remove the bracket (B).

Installation

1. Place the operator control panel bracket (B) in position.
2. Install the hex mounting screws.
3. Install the ground strap (A).
4. Install the operator control panel (Section 511).
5. Install the printer cover (Section 113).
6. Install the access cover (Section 111).



600. Power and Fan

600 Entry Contents

611 - Power Supply

DANGER
Whenever you perform power supply MAP procedure 3600, be sure to follow each step carefully. These steps ensure that you avoid exposure to electrical hazards when operating the power supply out of the printer with the power cord connected.

Removal

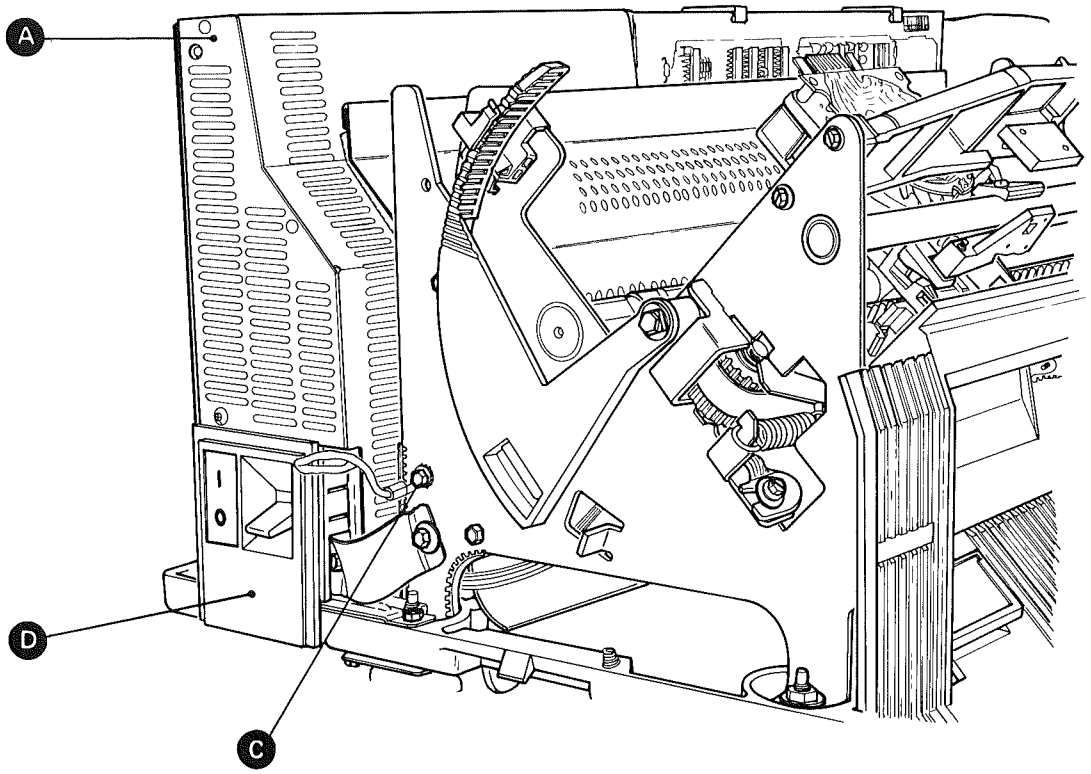
1. Remove the forms from the printer.
2. Set the power switch to O (Off).
3. Disconnect the power cord from the printer.
4. Remove the access cover (Section 111).
5. Remove the printer cover (Section 113).
6. Remove screw and star washer (C) and disconnect the ground straps from the sideframe.
7. Remove the attachment card (Section 411).
8. Remove the control card (Section 215).
9. Remove the driver card mounting screw (B).
10. Remove the three power supply mounting screws.
11. Lift the power supply (A) to remove it from the base card.

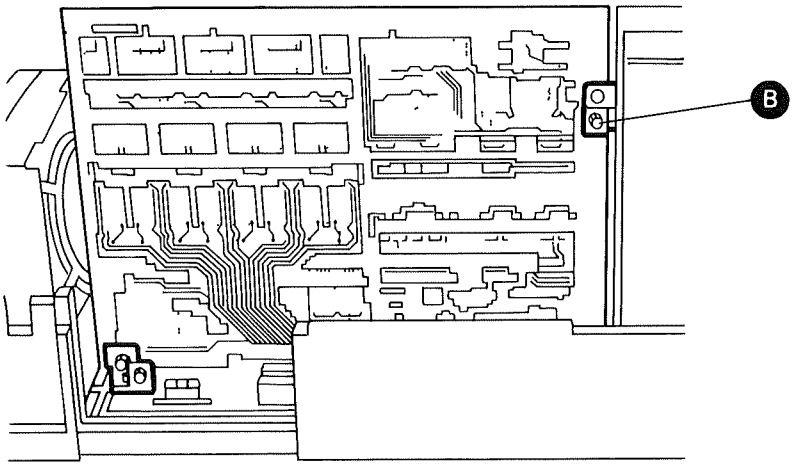
Installation

1. Ensure that the power switch is set to (O) Off and disconnect the power cord.
2. Install the power supply into the base card connector (see (B) in Section 721).

   Warning: To prevent stripping, do not over-tighten.
3. Install the three mounting screws.
4. Connect the ground straps. Be sure to install the star washer (C) between the ground wire and the sideframe.
5. Install the driver card mounting screw (B).
6. Install the control card (Section 215).
7. Install the attachment card (Section 411).
8. Install the printer cover (Section 113).
9. Install the access cover (Section 111).
10. Connect the power cord to the printer.

611 - Power Supply (Continued)





Rear View

613 - Cooling Fan and Bracket

Removal

To remove the cooling fan bracket:

1. Set the power switch to O (Off).
2. Remove the access cover (Section 111).
3. Remove the printer cover (Section 113).
4. Disconnect the operator control panel cable from the control (C) card.
5. Release the cooling fan bracket (B) by pressing the top and spreading the bottom sides apart and lifting it up.

To remove the cooling fan:

a. Ensure that the cooling fan bracket has been removed.
b. On Model XC2, remove the paper guide shield (Section 119).
c. Lift the fan assembly (A) out of the base.
d. Unplug the cooling fan cable from the base card connector (H) (Section 721).

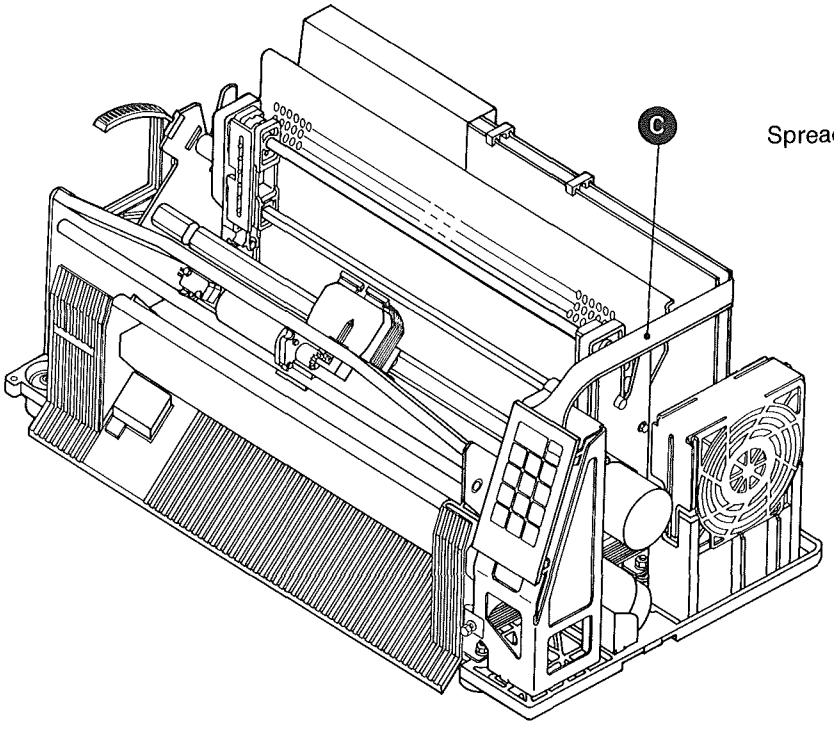
Installation

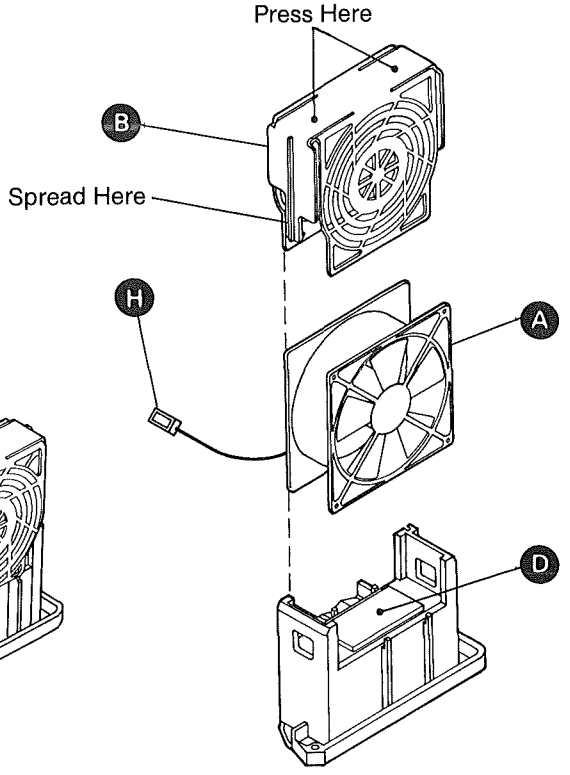
To install the cooling fan:

1. Connect the cooling fan cable to the base card connector (H) (Section 721).
2. On Model XC2, install the paper guide shield (Section 119).
3. Ensure that the fan pad (D) is in place.
4. Place the fan assembly into the base with the fan leads at the lower front corner.

To install the cooling fan bracket:

a. Place the cooling fan mounting bracket (B) over the cooling fan and press down on the top sides to lock it in place.
b. Connect the operator control panel cable to the control card.
c. Install the printer cover (Section 113).
d Install the access cover (Section 111).





700. Reference Information

700 Entry Contents

710 - Locations

711 - Locations, with Cover On (Left-Front)

1 Exit paper chute

2 Printer cover

3 Operator panel

4 Entry paper chute

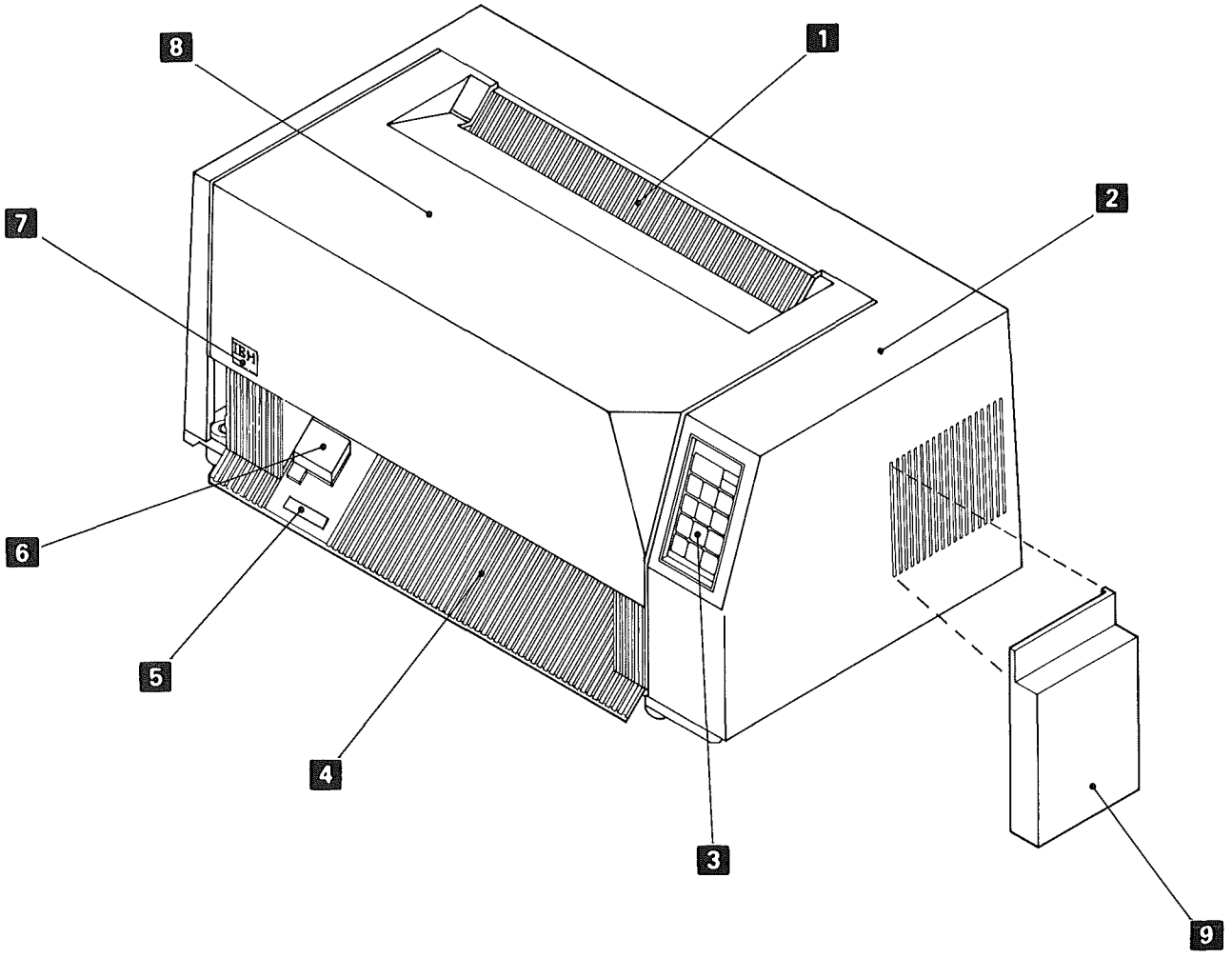
5 Serial number and model type

6 End-of-Forms sensor

7 IBM logo

8 Access cover

9 Bookholder for Operating Instructions (customer installed)

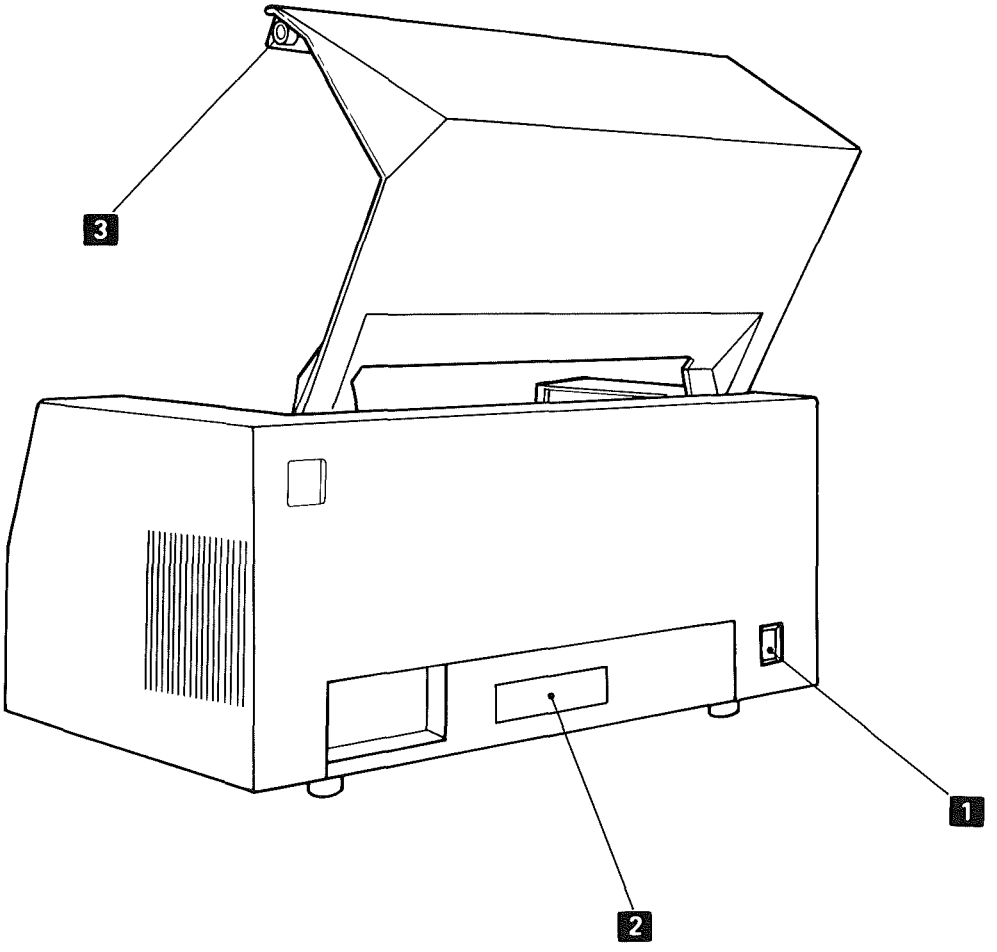


713 - Locations, with Cover On (Left-Rear)

1 Power cord connector

2 Power requirements label

3 Head speed inhibitor magnet



715 - Locations, Right Isometric

1 Power supply

2 Print head

3 Driver card

4 Control card

5 Forms motor

6 Cooling fan

7 Forms feed idler gear

8 Carrier motor

9 Forms feed drive gear

10 Operator panel bracket

11 Ribbon drive motor

12 Ribbon type sensors (Model XC2)

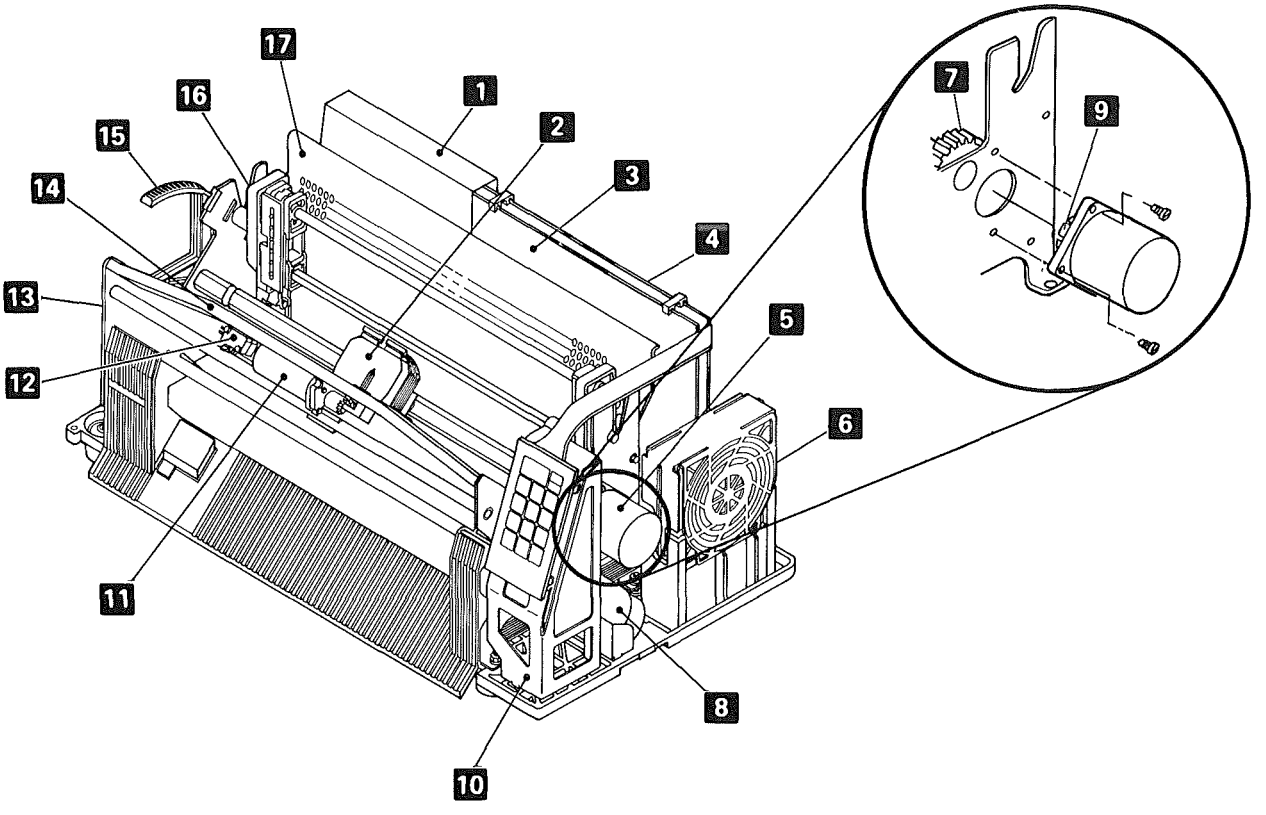
13 Frame assembly

14 Ribbon crossbar

15 Forms thickness lever

16 Forms feed device

17 Paper guide shield



717 - Locations, Rear

1 Attachment card

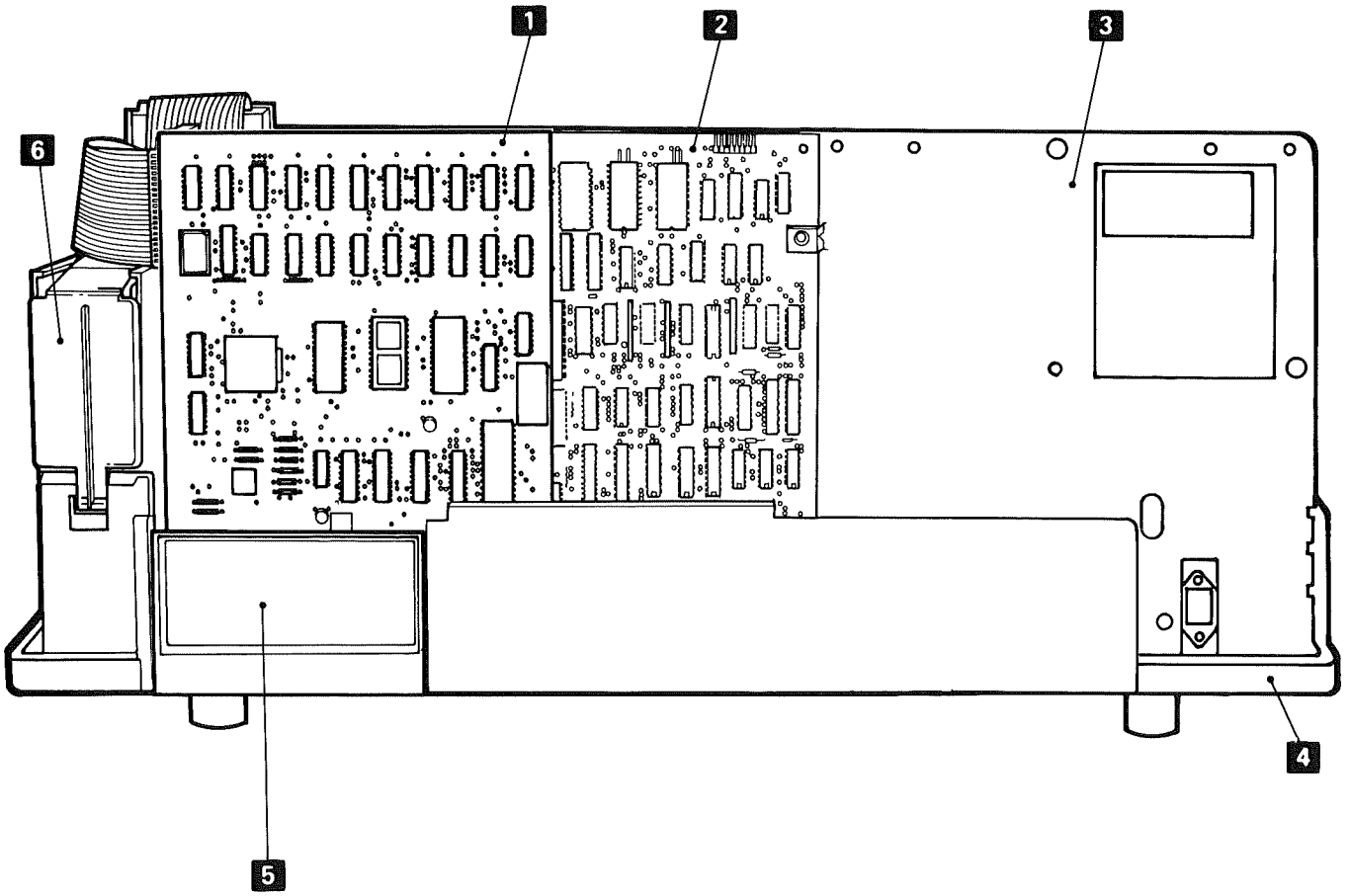
2 Control card

3 Power supply

4 Base

5 Signal cable connector

6 Fan assembly



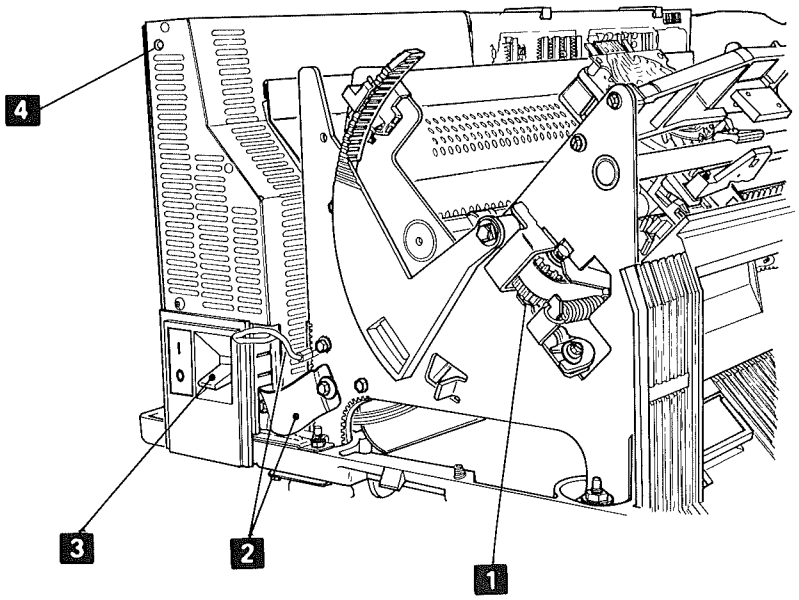
719 - Locations

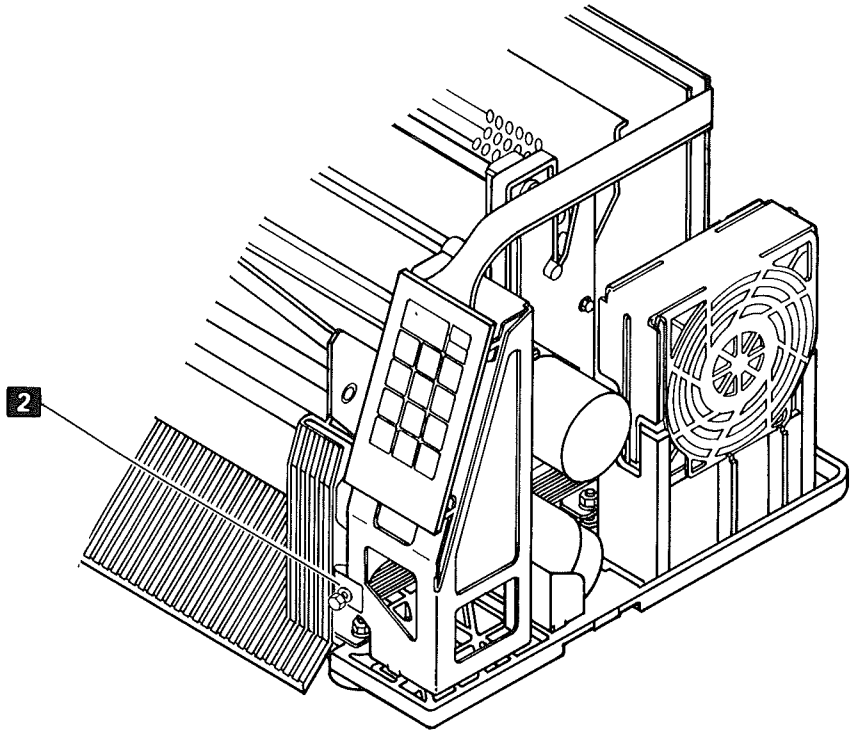
1 Carrier drive belt idler

2 Ground straps

3 Power switch

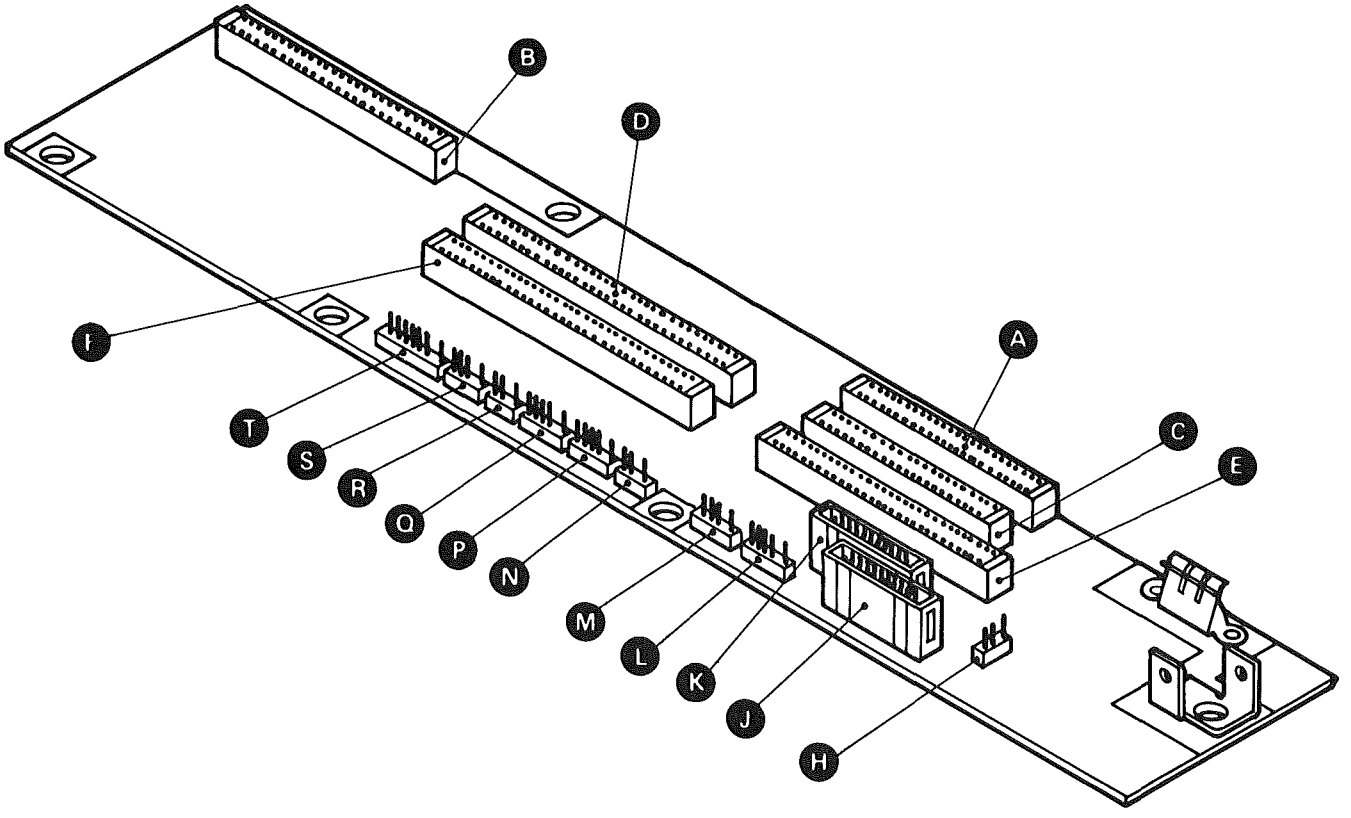
4 Power supply LED





721 - Locations, Base Card Connectors

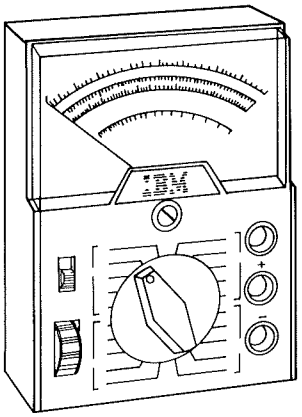
- (A) Attachment card
- (B) Power supply
- (C) (D) Control card (2)
- (E) (F) Driver card (2)
- (H) Fan cable
- (J) Print head cable (all models)
- (K) Print head cable (Models XX2)
- (L) Forms motor cable
- (M) Ribbon motor cable
- (N) Carrier motor cable
- (P) Carrier motor emitter cable
- (Q) Color cable (Model XC2)
- (R) Head speed inhibitor switch
- (S) Ribbon type sensor cable
- (T) End-of-Forms sensor cable



740 - Tools and Test Equipment

741 - Analog CE Meter (P/N 1749231)

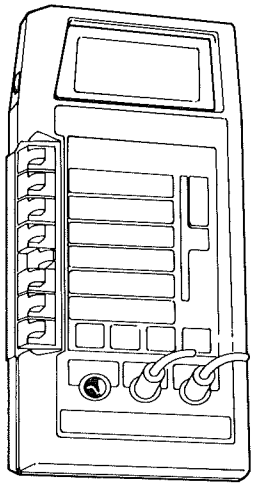
The analog CE meter is used for measuring the ac and dc voltage and for performing continuity checks.



743 - Digital CE Meter (P/N 9900628)

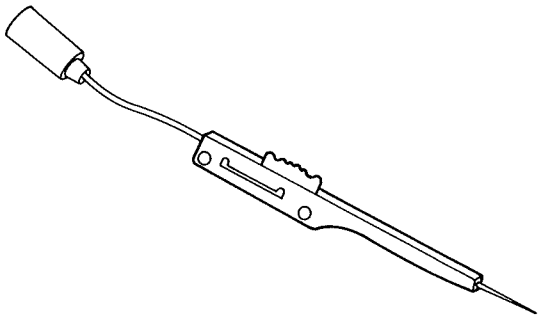
The digital CE meter is used for measuring the ac and dc voltage and for performing continuity checks.

Order meter leads (P/N 21222) for use with this meter.



745 - Miniprobe (P/N 453718)

The miniprobe attaches to the test leads of the CE meter and is used to probe connectors.



747 - Metric Tool Supplement (P/N 1749235)

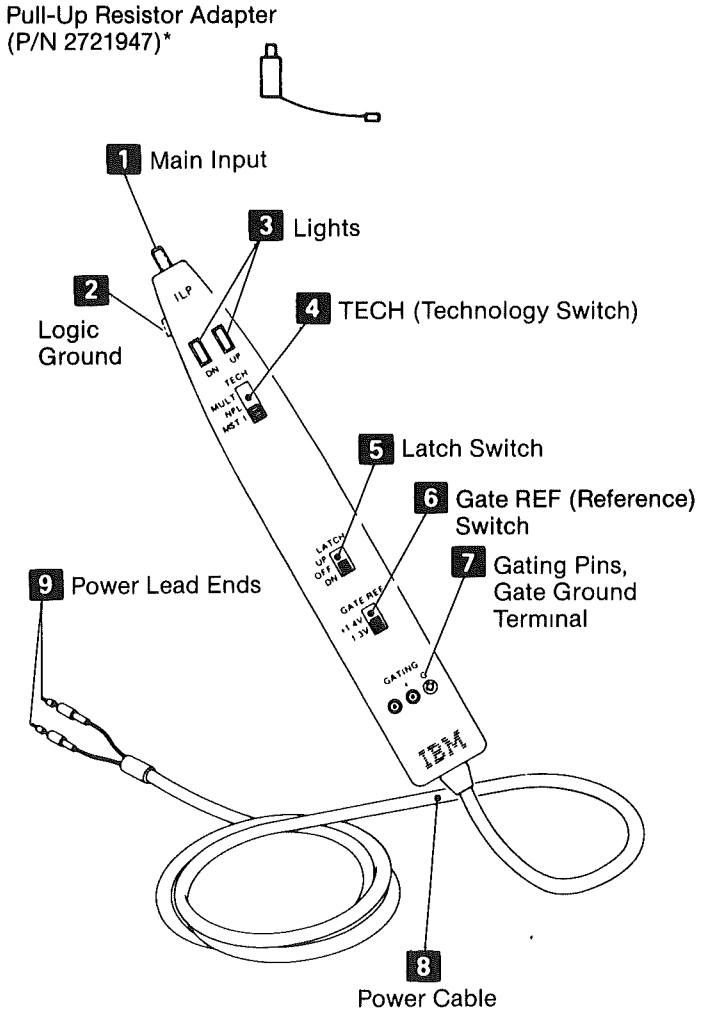
The metric tool supplement (not shown) contains the tools needed to repair metric machines.

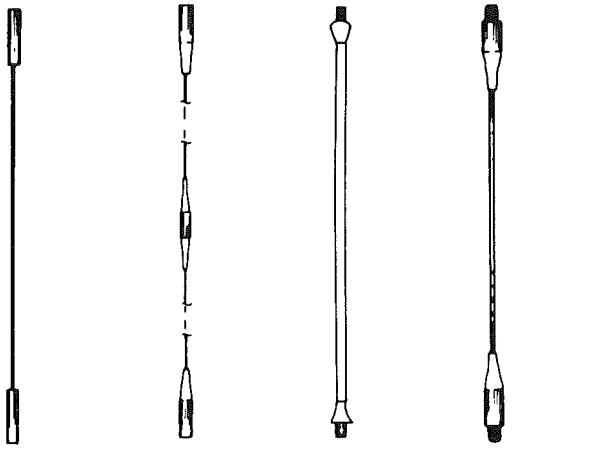
751 - Integrated Logic Probe (P/N 453222)

The IBM Integrated Logic Probe (ILP), P/N 8550201, is a small hand-held device used to observe logic signals. The ILP kit (P/N 453222) includes:

- The IBM Integrated Logic Probe Unit
- Standard accessories
- *IBM Integrated Logic Probe Operator's Guide,* S226-3951.

For Integrated Logic Probe operating instructions, refer to the *IBM Integrated Logic Probe Operator's Guide,*S226-3951.





P/N 2588263 Gate Jumper 300 mm (12-inch) (One)

P/N 8550208 Gate (10K) Resistor Jumper 300 mm (12-inch) (One)

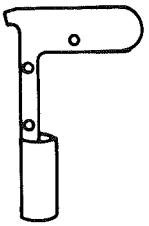
P/N 8565942 Ground Lead 300 mm (12-inch) (One)

P/N 5500900 Ground Lead 125 mm (5-inch) (One)

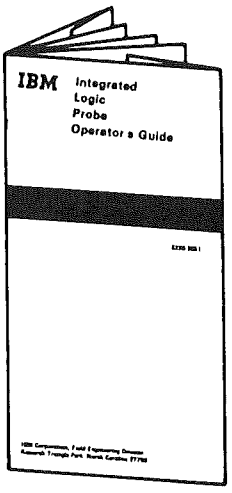
P/N 8550205 Straight Probe Tip Pin (One)

P/N 453167 SLT Probe Tip, Straight (Three)

P/N 461159 Alligator Clip (Three)



P/N 453826 SLT Probe Tip, Flag (One)



Integrated Logic Probe Operator's Guide, S226-3951 (One)

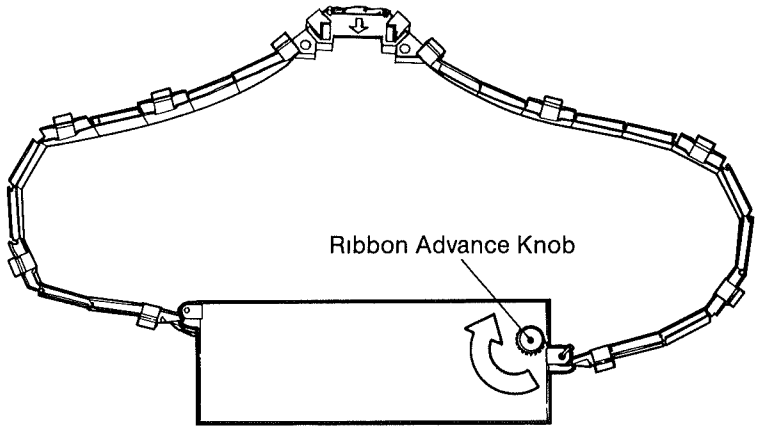
800. Changing Ribbons, Forms, and Forms Devices

800 Entry Contents

810 - Ribbon Cartridge

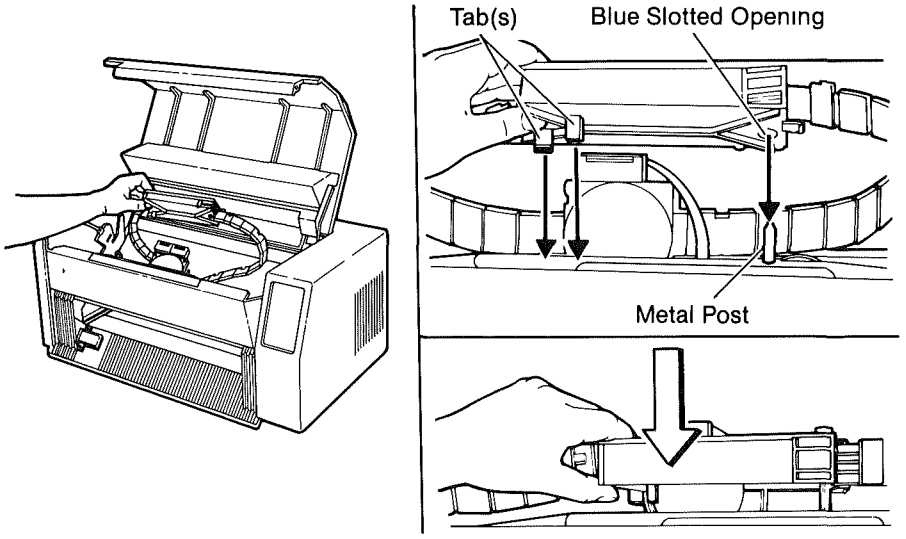
811 - Ribbon Cartridge Installation

1. Press the Stop key.
2. Open the access cover.
3. Slide the print head to the center of the printer.
4. Move the blue forms thickness lever to the "*" position.
5. Turn the ribbon advance knob in the direction of the arrow to take up slack in the ribbon.



6. Align the blue slotted opening on the bottom of the ribbon cartridge with the ribbon drive shaft. You may have to turn the ribbon advance knob to align the slots.

7. Lower the ribbon cartridge onto the ribbon drive shaft. Ensure that the plastic tab(s) on the bottom of the ribbon cartridge align with the hole(s) in the ribbon crossbar.

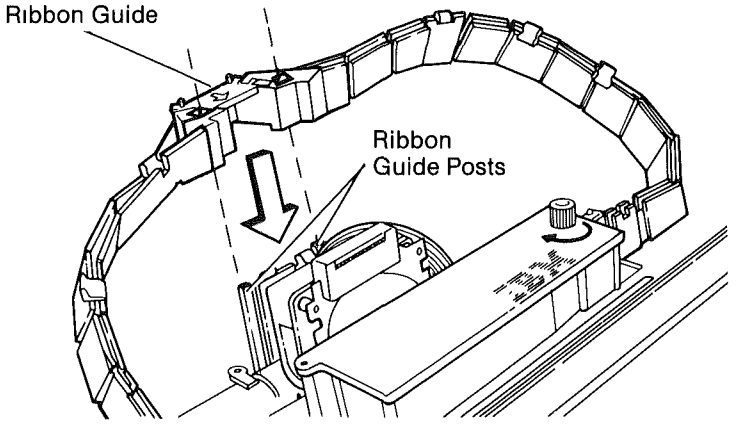


8. Press down on the ribbon cartridge to snap it into place.

Narrow Ribbon (Models X01, X02, and XE2)

a. Align the holes in the ribbon guide with the ribbon guide posts on the print head carrier. **Press the guide all the way down on the posts until the tops of the posts are flush with the top of the ribbon guide.**

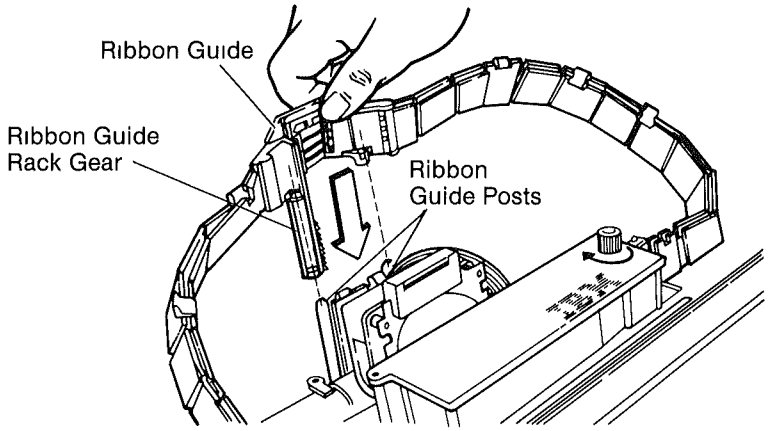
Ensure that the ribbon does not twist or fold.



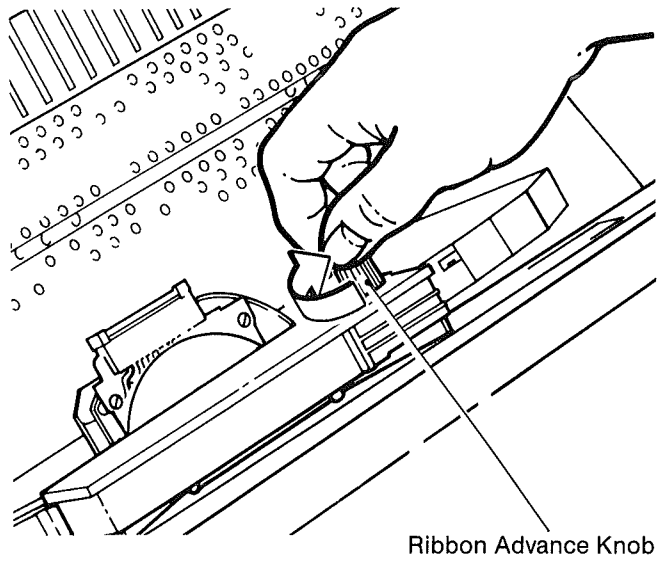
| **Wide Ribbon (Model XC2)**

1. Align the holes in the ribbon guide with the ribbon guide posts on the print head carrier and slide the ribbon guide straight down as shown.

   Ensure that the ribbon does not twist or fold.



2. Turn the ribbon advance knob in the direction of the arrow to remove any slack from the ribbon.

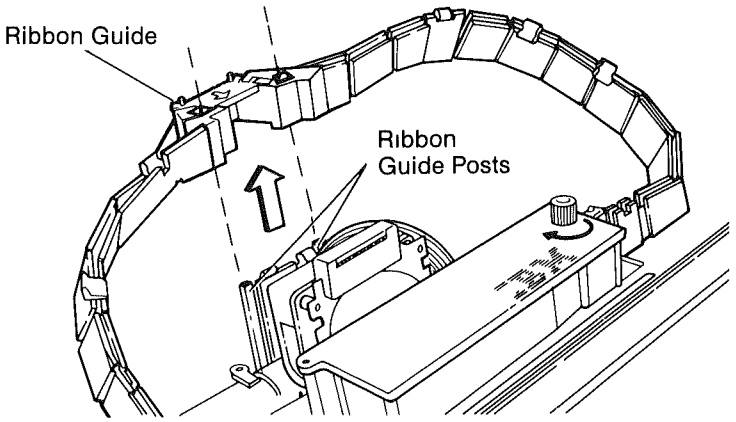


812 - Ribbon Cartridge Removal

Note: Ensure that the print head is in the center of the printer and that the forms thickness lever is at the "*" position.

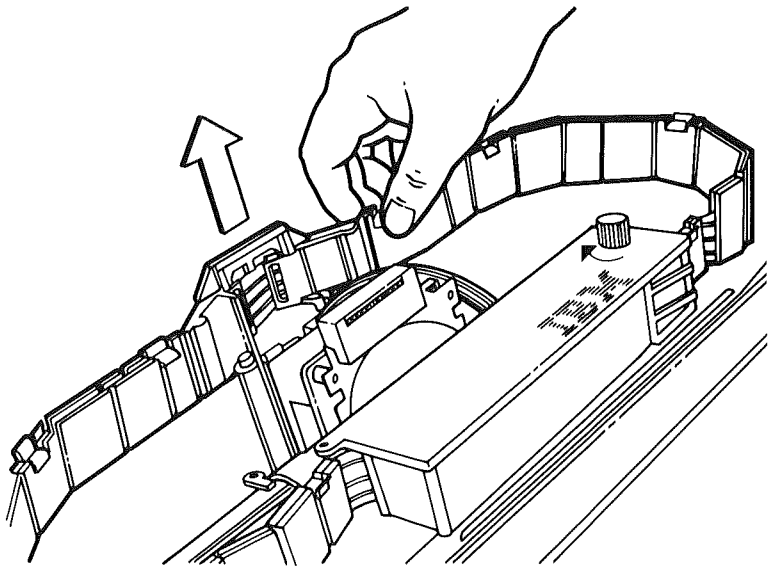
Narrow Ribbon

1. Press the Stop key.
2. Open the access cover.
3. Remove the ribbon guide from the guide post by pulling it toward the front of the printer, then up.
4. Unsnap the ribbon cartridge from the ribbon crossbar by pulling the cartridge upward.



Wide Ribbon

1. Press the Stop key.
2. Open the access cover.
3. Remove the ribbon guide by lifting the guide from the ribbon guide posts.
4. Unsnap the ribbon cartridge from the ribbon crossbar by pulling the cartridge upward.



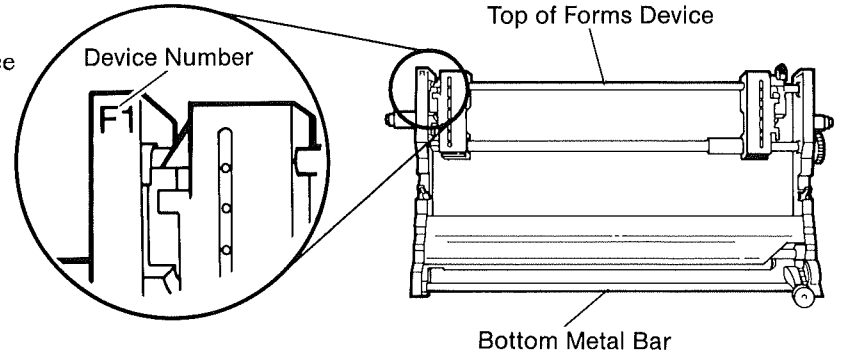
820 - Forms Devices

821 - Installation and Removal

1. Set the power switch to On.

2. To set the device code, press and hold the **Alternate** key, and then press the **Forms Device** key. While holding the **Alternate** key, press and release the **Forms Device** key until the printer display matches the code located on the upper left corner of the forms device. Release both keys.

   - F1 = Continuous forms device
   - F2 = Document on demand device
   - F3 = Document insertion device



3. **To install the forms device:**

   If you have forms device F1, go to Section 823.
   If you have forms device F2, go to Section 829.
   If you have forms device F3, go to Section 835.

   To remove the forms device:

   If you have forms device F1, go to Section 825.
   If you have forms device F2, go to Section 831.
   If you have forms device F3, go to Section 837.

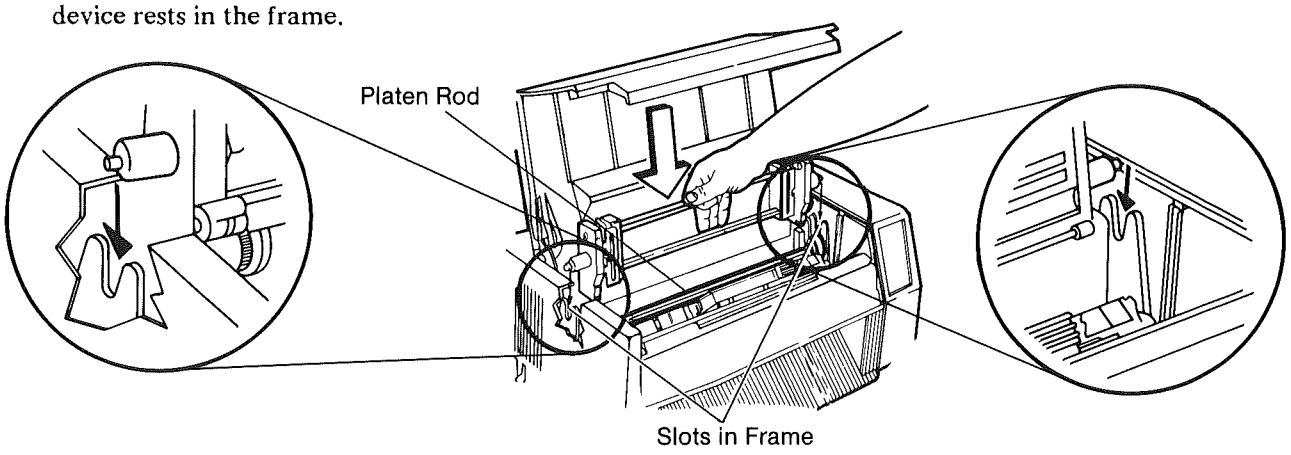
823 - Installing the F1 Forms Device

1. Press the Stop key.

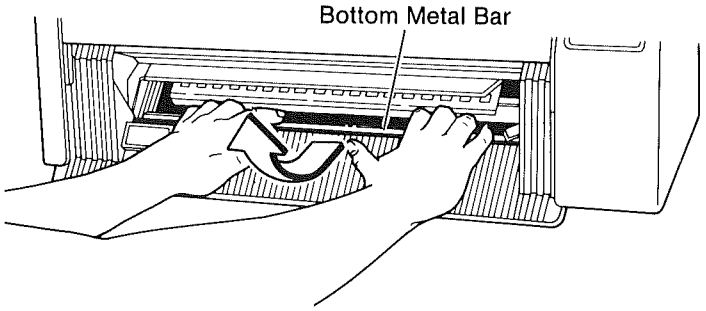
2. Open the printer access cover.

3. Hold the forms device so that the device code is in the upper left corner facing you.

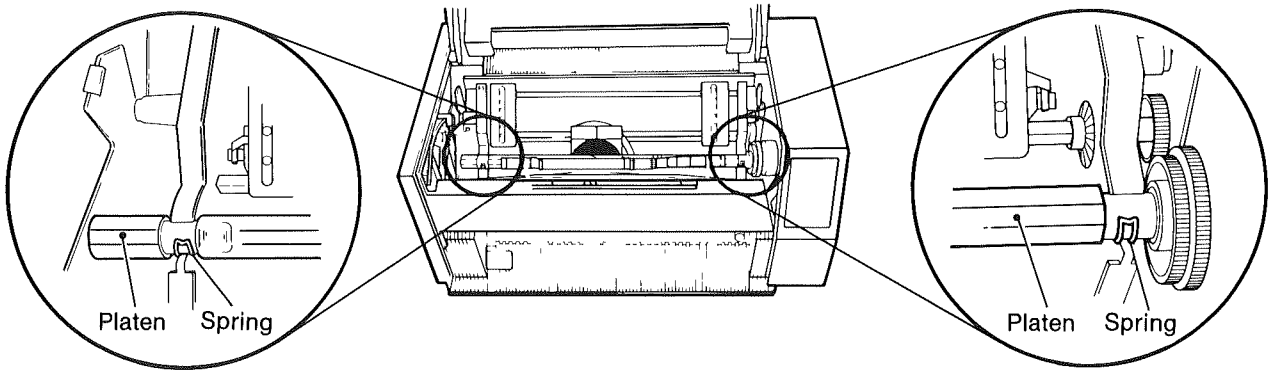
4. Lower the device into the printer behind the platen and align the ends of the device with the slots in the frame. Continue to lower the device until the device rests in the frame.



5. Grasp the metal bar at the bottom of the device with BOTH hands and pull the device toward you until both ends lock into place on the platen.



6. Check both the left and right sides to ensure that the spring is around the platen as shown below.

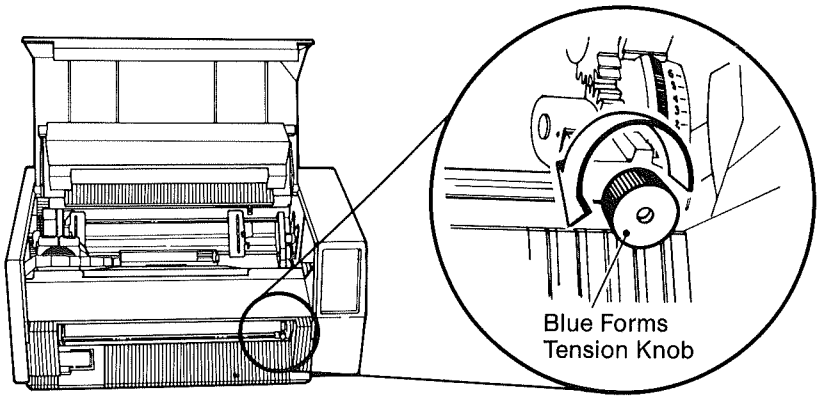


825 - Removing the F1 Forms Device

1. Press the Stop key.
2. Open the access cover.
3. Remove the forms from the printer.
4. Push the bottom of the forms device toward the rear of the printer to unlock the device from the platen.
5. Lift the forms device out of the printer.

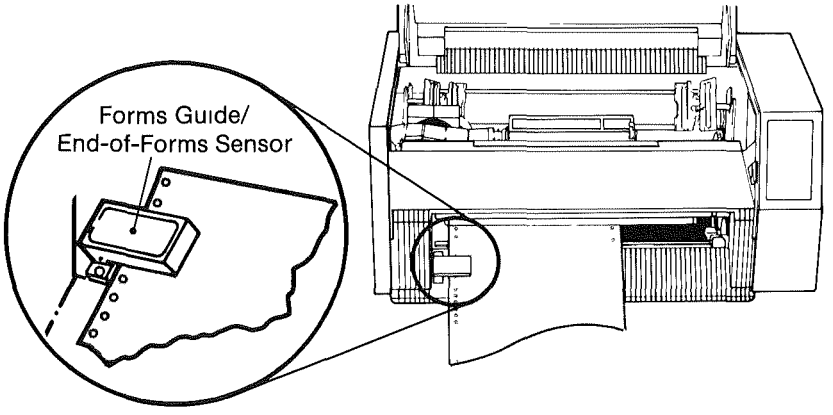
827 - Loading Forms (F1)

1. Press the Stop key.
2. Slide the print head to the far left side of the printer.
3. Loosen the forms tension knob by turning in the direction of the arrow shown below and then move the forms tension knob toward the bottom of the printer until you see the "*" position.



4. Unlock the blue locking lever on the right tractor and slide the tractor to the extreme right.
5. Open both of the blue tractor doors.

6. Feed the form onto the entry chute of the printer. Ensure that the form goes under the forms guide/end-of-forms sensor.



7. Align and put the left margin holes of the form over the left tractor pins and close the blue tractor door.

8. Move the right tractor until the right margin holes of the form fit on the right tractor pins. Ensure that the forms are level.

9. Close the right tractor door.

10. Hold the tractor in place and lock the blue locking lever.

11. Slide the print head to the center of the printer.

12. Move the forms thickness lever to 1.

13. Close the access cover.

829 - Installing the F2 Forms Device

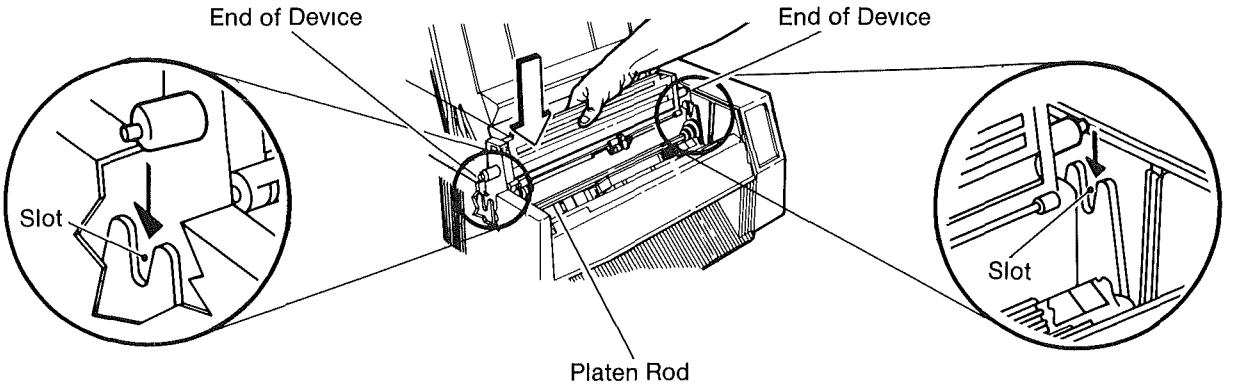
1. Press the Stop key.

2. Open the printer access cover and move the print head to the center of the printer.

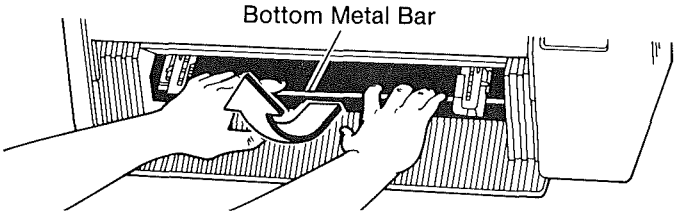
3. Hold the forms device so that the device code is in the upper left corner facing you.

4. Unlock the right tractor's locking lever and move the tractor and the blue sliding guides to the extreme right. Ensure that the tractor doors are closed.

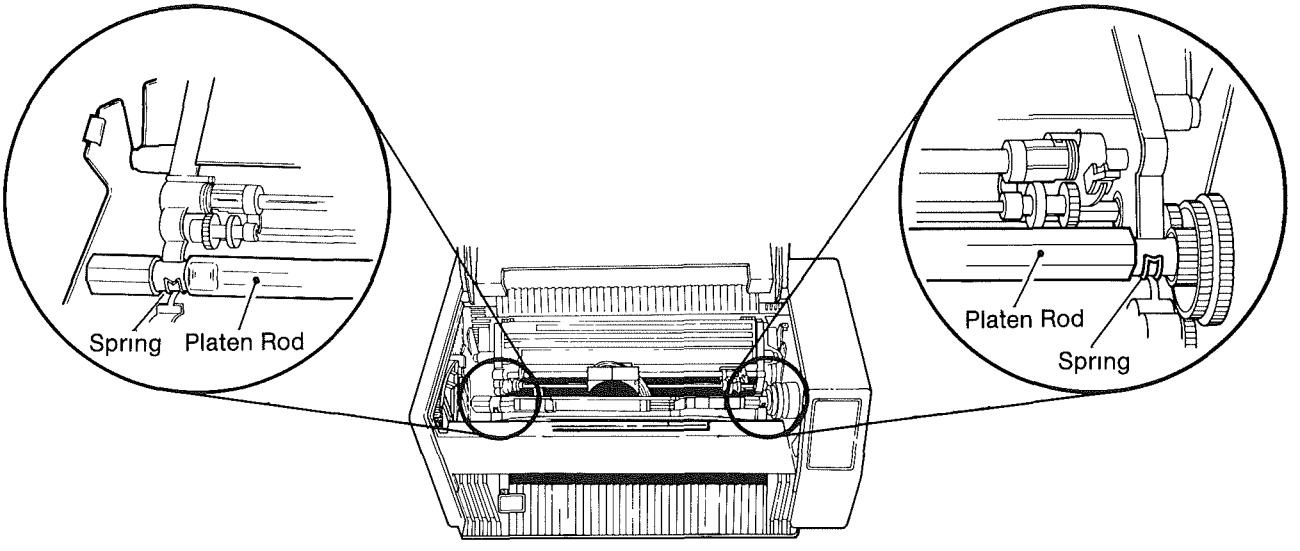
5. Lower the device into the printer behind the platen and align the ends of the device with the slots in the frame. Continue to lower the device until the device rests in the frame.



6. Grasp the metal bar at the bottom of the device with BOTH hands and pull the device toward you until both ends lock into place on the platen.



7. Check both the left and right sides to ensure that the spring is around the platen as shown below.

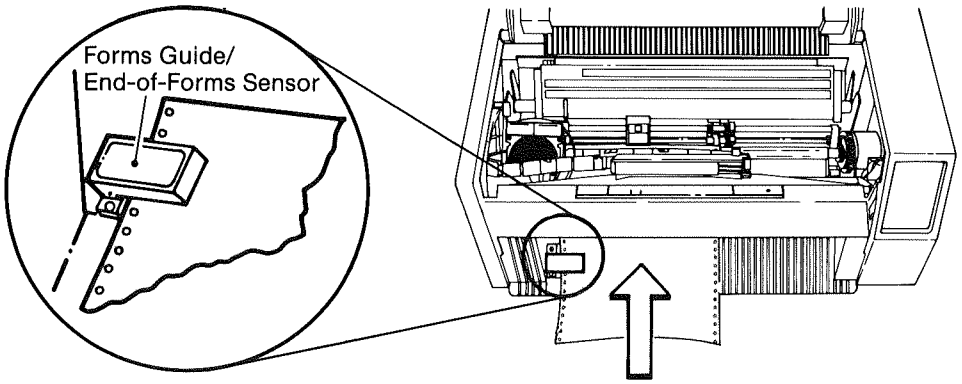


831 - Removing the F2 Forms Device

1. Press the Stop key.
2. Open the access cover.
3. Remove the forms from the printer.
4. Push the bottom of the forms device toward the rear of the printer to unlock the device from the platen.
5. Lift the forms device out of the printer.

833 - Loading Forms (F2)

1. Press the Stop key.
2. Slide the print head to the far left side of the printer.
3. Unlock the blue locking lever on the right tractor and slide the tractor to the extreme right.
4. Open both of the blue tractor doors.
5. Feed the form onto the entry chute of the printer. Ensure that the form goes under the forms guide/end-of-forms sensor.



6. Align and put the left margin holes of the form over the left tractor pins and close the blue tractor door.
7. Move the right tractor until the right margin holes of the form fit on the right tractor pins. Ensure that the forms are level.
8. Close the right tractor door.
9. Hold the tractor in place and lock the blue locking lever.
10. Space the blue sliding guides evenly between the tractors.
11. Slide the print head to the center of the printer.
12. Move the forms thickness lever to 1.
13. Close the access cover.

835 - Installing the F3 Forms Device

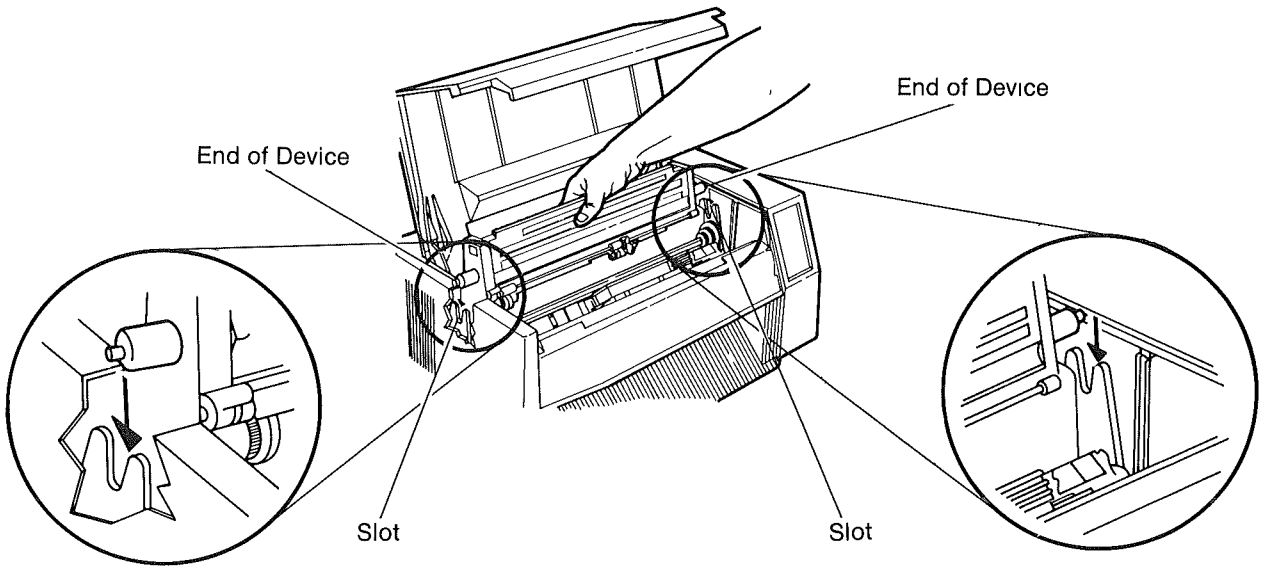
1 Press the Stop key.

2. Open the printer access cover and move the print head to the center of the printer.

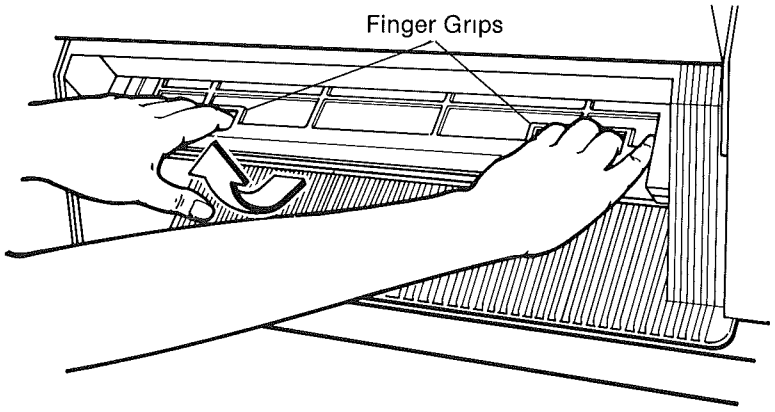
3. Hold the forms device so that the device code is in the upper left corner facing you.

4. Unlock the right roller assembly locking lever and move the assembly and the blue sliding guide to the extreme right.

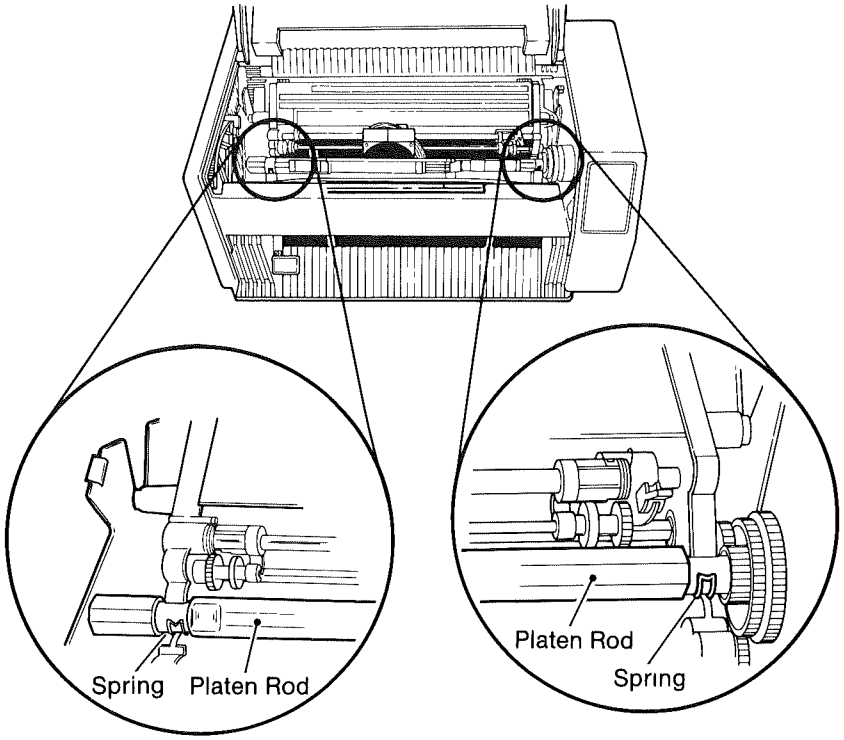
5. Lower the device into the printer behind the platen and align the ends of the device with the slots in the frame. Continue to lower the device until the device rests in the frame.



6. Grasp the bottom of the device with BOTH hands and pull the device toward you until both ends lock into place on the platen.

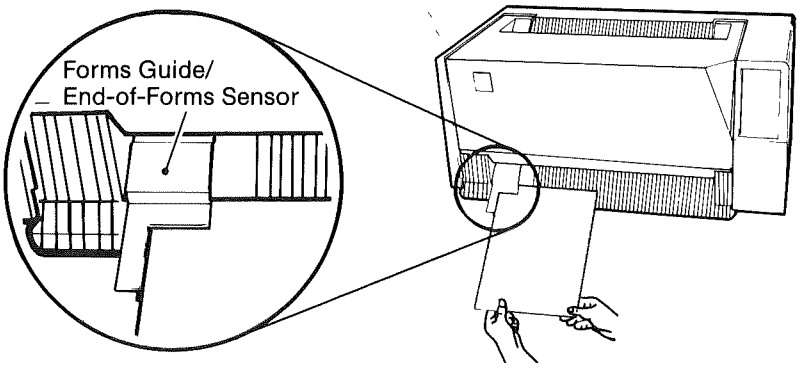


7. Check both the left and right sides to ensure that the spring is around the platen as shown below.



8. Place the lower forms guide next to the forms guide/end-of-forms sensor. Then, slide the lower forms guide to the left until it locks on.

   Note: There are two types of lower forms guides. The new-style guide is larger and is recommended for use with larger forms. Because of its extra width, the new-style guide has a tab that you need to ensure goes under the paper chute.

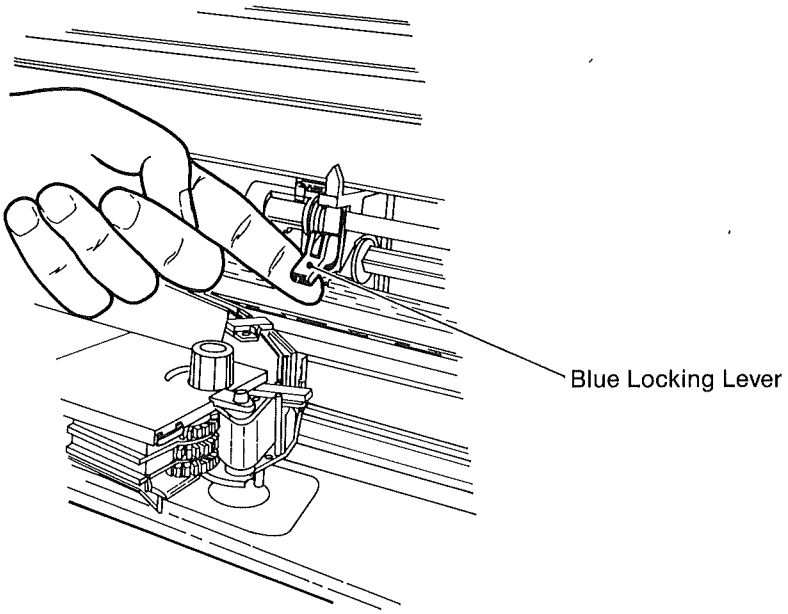


9. Slide the print head to the far left side.

10. Get 3 or 4 sheets of 8 1/2 in. x 11 in. single-part cut forms.

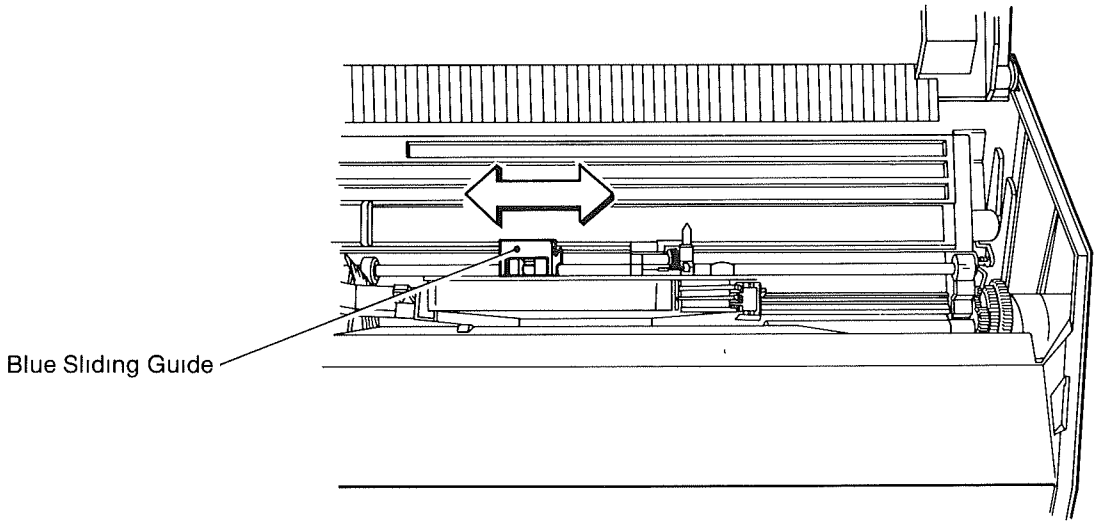
11. Hold a form in front of the forms guide and against the left stop.

12. Unlock the blue locking lever and move the right roller assembly so that the pointer lines up with the right edge of the form.



13. Lock the blue locking lever.

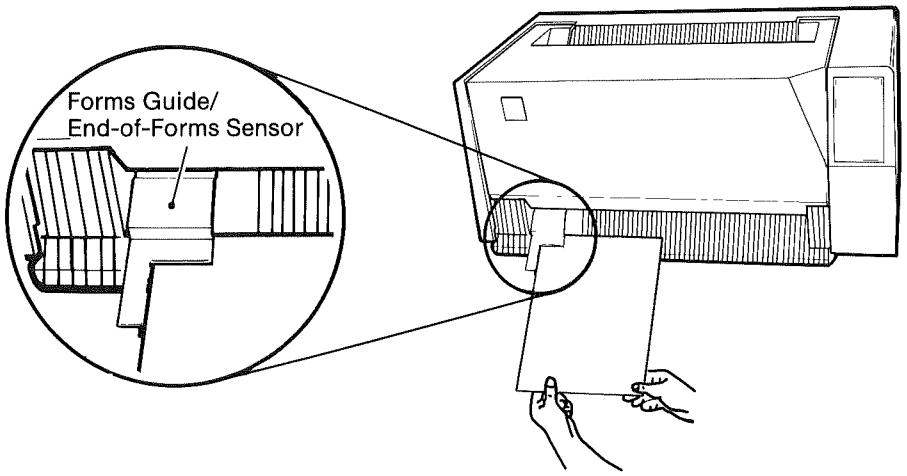
14. Center the blue sliding guide between the rollers.



15. Close the access cover.

16. Feed the form under the forms guide/end-of-forms sensor until the top edge of the form contacts both the left and right feed rollers.

17. Press the Load/Eject key. The printer automatically advances the form to the first print line.



837 - Removing the F3 Forms Device

1. Press the Stop key.
2. Open the access cover.
3. Remove the forms from the printer.
4. Push the bottom of the forms device toward the rear of the printer to unlock the device from the platen.
5. Lift the forms device out of the printer.

Glossary

This glossary helps you understand words, terms, and abbreviations used in the MAPs and maintenance manual Help is provided for both the U S and world-wide maintenance personnel

This glossary defines abbreviations, acronyms, and words that are used in this service manual and are not defined in the IBM *Limited Vocabulary*, ZC28-2510

The primary source for the definitions is the IBM *Dictionary of Computing*, GC20-1699

Abbreviations

APA. All Points Addressable

B/M Bill of Material

BCD. Binary Coded Decimal

Code 39. A Specific Bar Code Type

CPAR. Customer Problem Analysis and Resolution

CPI. Characters Per Inch

CSR Customer Service Representative

CSU. Customer Set-up

DID. Document Insertion Device

DOD Document On Demand

DP. Data Processing

EAN. A Specific Bar Code Type (European Article Number)

ED/FI. Error Detection and Fault Isolation

EMEA Europe Middle East Africa

EOF. End of Forms

ERP. Error Recovery Procedures

FBM Field Bill of Material

FPL. First Print Line

FPPL. First Possible Print Line

FRU. Field Replaceable Unit

Hz. Hertz (Cycles)

IAD. Installation Activity Document

IPS Inches Per Second

I-S Industry Standard

KVA. Kilo Volt Amps

LAC. Load Alternate Characters

LBS. Pounds

LED Light Emitting Diode

LPI Lines Per Inch

LPM. Lines Per Minute

MIM Maintenance Information Manual

MM. Metric Notation - millimeter

MPP Maximum Print Position

MVT. Manufacturing Verification Test

NLQ. Near-Letter Quality

NVRAM. Non-Volatile RAM

OCR. Optical Character Recognition

PDP. Problem Determination Procedures

POD. Power-On Diagnostics

POR. Power-On Reset

PSM. Proportionally Spaced Fonts

PSS. Programmable Symbol Set

RAM. Random Access Memory

RAS. Reliability, Availability, Serviceability

REA. Request for Engineering Action

ROS. Read Only Storage

TOF. Top Of Forms

U.K. United Kingdom

UPC. A Specific Bar Code Type (Universal Product Code)

U.S. United States

Vac. Volt Alternating Current

Vdc Volt Direct Current

WP Word Processing

Glossary

ANSI American National Standards Institute

audible alarm An alarm that is activated when predetermined events occur that require operator attention or intervention for system operation

bidirectional. Printing in either direction, right-to-left, or left-to-right

buffer storage A temporary storage in which data is held for processing

channel. A data path that connects the processing unit, storage, and input/output devices

characters-per-inch (CPI). The number of alpha/numeric characters that fit into one inch of printed text

comm (n) Abbreviation for common, as used in electric circuits

computer (n) (ISO) A data processor that can perform substantial computation, including numerous arithmetic or logic operations, without intervention by a human operator during the run

computer system. Performs user-designated data manipulation, including arithmetic and logic operations

continuous forms A series of connected paper forms that feed continuously through a printing device The connection between the forms is perforated to allow the user to tear them apart

continuous forms device. A forms feed device that allows printing of continuous forms in an unattended mode of operation

continuous forms paper. A continuous length of single-ply, fanfolded paper with both edges punched for tractor feeding and with perforation between pages

cut forms. A single form, not connected to other forms. The form may have more than one part, that is, it may have an original and one or more copies

data stream Print data and control information flowing from host system (computer) to the printer, from beginning to end without interruption.

domestic. Pertaining to machines for use in the United States and Canada

end-of-forms A signal that indicates when the printer is at the bottom of the last form to be printed before reloading paper

first possible print line (n). A horizontal print line, near the top of the paper, above which the printer will not print

form feed. Paper movement used to bring an assigned part of a form to the printing position

impact printer. A printer in which printing is the result of mechanical impacts.

line A predetermined number of characters that when grouped together form one line of print

lines-per-inch The number of lines of text or graphics that can be placed in one inch of space measured vertically

LPI. See *lines-per-inch*

monitor (v). To collect and analyze data

OCR. See *optical character recognition*

operator panel. A functional unit containing switches used to control a printer or other data processing units, or a portion of these devices that may contain indicators giving information on the functioning of the system

optical character recognition (OCR). (1)The machine identification of printed characters through use of light-sensitive devices (2)Character recognition that uses optical means to identify graphic characters

output data. Data being delivered or to be delivered from a device such as a printer or computer program.

overcurrent. A flow of electrical current that exceeds the normal rated flow for a circuit or device

platen. A backing, usually cylindrical, against which printing mechanisms strike or otherwise deposit ink to produce an image

power switch. A device that makes and breaks the contact between equipment and the main electricity supply

printer. (1)An output device that produces a durable record of data in the form of a sequence of discrete graphic characters belonging to a discrete character set (2)A device that writes output data from a system on paper or other medium

printer operating speed The rate at which print-out occurs, expressed in characters per second or in lines per minute

print head. That part of the printer that prints data and is comprised of alpha/numeric and special characters

printout The printing or typing of recorded text

print positions The maximum number of characters that can be printed on a single line

print skip. The speed at which the printer advances the paper through the carriage without printing

print speed. The number of characters printed per unit of time

processing. The performance of logical operations and calculations on data, including the temporary retention of data in processing storage while it is being operated upon

proportional spacing The function whereby characters are spaced according to their natural width

ribbon guide. A device that guides the ribbon from a full spool to an empty one

routed. The specific places a cable or wires are fastened

slot. An opening that has a length greater that the width

status indicator. An indicator that visually shows the status of one or more operations during processing

system. In data processing, a collection of men, machines, and methods organized to accomplish a set of specific functions

tear bar (n). A bar that has an edge suitable for operators to separate continuous forms after they are printed

tractor. The mechanism that controls movement of continuous forms paper via the carrier holes

underscoring. A line under an individual character or group of characters

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