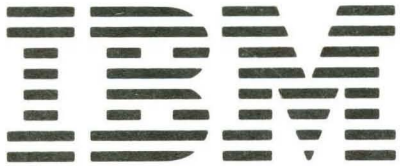

SY31-0462-0

IBM 5256 Printer
Models 1, 2, and 3
Maintenance Information Manual

MAINTENANCE INFORMATION

SY31-0462-0

IBM 5256 Printer
Models 1, 2, and 3
Maintenance Information Manual

MAINTENANCE INFORMATION

Preface

This maintenance manual is to be used for servicing the IBM 5256 Printer. Customer engineers using this manual are assumed to have completed the 5256 Printer education course.

The maintenance manual is in two major sections; maintenance and theory. Maintenance includes locations, procedures, and diagnostic aids. Theory includes data flow, functional units, and features.

Setup instructions for the 5256 Printer are in Appendix A.

Definition of terms and abbreviations that are not common but used in this manual are in the glossary and abbreviations section.

Related Publications

Related information can be found in the following manuals:

- *IBM 5250 Display Station Reference Card*, GX21-9429
- *IBM 5251 Display Station Model 11 Maintenance Analysis Procedures (MAPs)*, SY31-0571
- *IBM 5251 Display Station Model 11 Maintenance Information Manual*, SY31-0461
- *IBM 5256 Printer Maintenance Analysis Procedures (MAPs)*, SY31-0572
- *IBM 5251 Display Station Operator's Guide*, GA21-9248
- *IBM 5256 Printer Operator's Guide*, GA21-9260
- *IBM 5256 Printer Setup Procedures*, GA21-9290
- *IBM 5256 Printer IR Unit and Cause Code Guide*, ZY31-0505

Note: The following pages of the MIM have danger and caution notices. If desired, translate these notices and write your own words on the blank lines provided on these pages:

1-10	1-46
1-16	1-58
1-24	1-62
1-32	1-63
1-36	1-64
1-37	1-67
1-44	4-23

First Edition (October 1977)

The information in this manual is sometimes changed. Any changes will be given in later editions.

Requests for copies of IBM publications should be made to your IBM representative or the IBM branch office serving your locality.

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The IBM 5256 Printer has the following specific dangers:

- The print head becomes very hot during printing.

- Primary power is present at the power supply and the Power switch.

- High voltage and current are present at the ferroresonant transformer.

- Resistor 1 (in front under the safety cover) is very hot while power is on.

CE SAFETY PRACTICES

All Customer Engineers are expected to 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 you MUST work alone.
2. Remove all power, ac and dc, when removing or assembling major components, working in immediate areas of power supplies, performing mechanical inspection of power supplies, or installing changes in machine circuitry.
3. After turning off wall box power switch, lock it in the Off position or tag it with a "Do Not Operate" tag, Form 229-1266. Pull power supply cord whenever possible.
4. When it is absolutely necessary to work on equipment having exposed operating mechanical parts or exposed live electrical circuitry anywhere in the machine, observe the following precautions:
   a. Another person familiar with power off controls must be in immediate vicinity.
   b. Do not wear rings, wrist watches, chains, bracelets, or metal cuff links.
   c. Use only insulated pliers and screwdrivers.
   d. Keep one hand in pocket.
   e. When using test instruments, 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, etc.). Use suitable rubber mats, purchased locally if necessary.
5. Wear safety glasses when:
   a. Using a hammer to drive pins, riveting, staking, etc.
   b. Power or hand drilling, reaming, grinding, etc.
   c. Using spring hooks, attaching springs.
   d. Soldering, wire cutting, removing steel bands.
   e. Cleaning parts with solvents, sprays, cleaners, chemicals, etc.
   f. Performing any other work that may be hazardous to your eyes. REMEMBER – THEY ARE YOUR EYES.
6. Follow special safety instructions when performing specialized tasks, such as handling cathode ray tubes and extremely high voltages. These instructions are outlined in CEMs and the safety portion of the maintenance manuals.
7. Do not use solvents, chemicals, greases, or oils that have not been approved by IBM.
8. Avoid using tools or test equipment that have not been approved by IBM.
9. Replace worn or broken tools and test equipment.
10. Lift by standing or pushing up with stronger leg muscles – this takes strain off back muscles. Do not lift any equipment or parts weighing over 60 pounds.
11. After maintenance, restore all safety devices, such as guards, shields, signs, and grounding wires.
12. Each Customer Engineer is responsible to be certain that no action on his part renders products unsafe or exposes customer personnel to hazards.
13. Place removed machine covers in a safe out-of-the-way place where no one can trip over them.
14. Ensure that all machine covers are in place before returning machine to customer.
15. Always place CE tool kit away from walk areas where no one can trip over it; for example, under desk or table.
16. Avoid touching moving mechanical parts when lubricating, checking for play, etc.
17. When using stroboscope, do not touch ANYTHING – it may be moving.
18. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled above the elbow.
19. Ties must be tucked in shirt or have a tie clasp (preferably nonconductive) approximately 3 inches from end. Tie chains are not recommended.
20. Before starting equipment, make certain fellow CEs and customer personnel are not in a hazardous position.
21. Maintain good housekeeping in area of machine while performing and after completing maintenance.

Knowing safety rules is not enough.
An unsafe act will inevitably lead to an accident.
Use good judgment - eliminate unsafe acts.

ARTIFICIAL RESPIRATION

General Considerations

1. Start Immediately – Seconds Count
   Do not move victim unless absolutely necessary to remove from danger. Do not wait or look for help or stop to loosen clothing, warm the victim, or apply stimulants.
2. Check Mouth for Obstructions
   Remove foreign objects. Pull tongue forward.
3. Loosen Clothing – Keep Victim Warm
   Take care of these items after victim is breathing by himself or when help is available.
4. Remain in Position
   After victim revives, be ready to resume respiration if necessary.
5. Call a Doctor
   Have someone summon medical aid.
6. Don't Give Up
   Continue without interruption until victim is breathing without help or is certainly dead.

Rescue Breathing for Adults

1. Place victim on his back immediately.
2. Clear throat of water, food, or foreign matter.
3. Tilt head back to open air passage.
4. Lift jaw up to keep tongue out of air passage.
5. Pinch nostrils to prevent air leakage when you blow.
6. Blow until you see chest rise.
7. Remove your lips and allow lungs to empty.
8. Listen for snoring and gurglings – signs of throat obstruction.
9. Repeat mouth to mouth breathing 10-20 times a minute. Continue rescue breathing until victim breathes for himself.

Thumb and finger positions

Final mouth-to-mouth position

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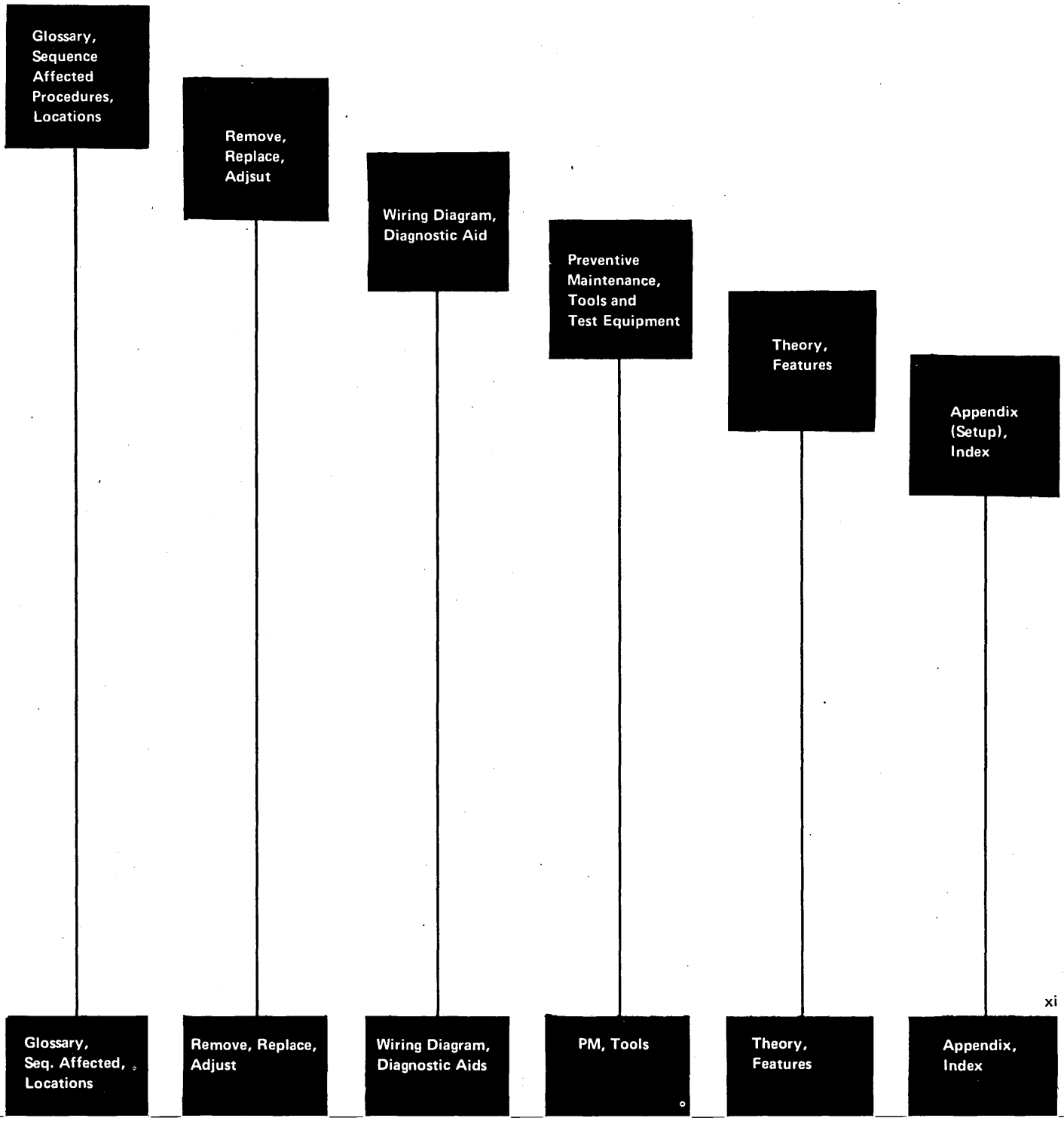
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Remove, Replace, Adjsut
Wiring Diagram, Diagnostic Aid
Preventive Maintenance, Tools and Test Equipment
Theory, Features
Appendix (Setup), Index
Glossary, Seq. Affected, Locations
Remove, Replace, Adjust
Wiring Diagram, Diagnostic Aids
PM, Tools
Theory, Features
Appendix, Index

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This list includes words and abbreviations used in the MAPs as well as those used in this manual.

A-frame: The part of the printer that supports the platen and pressure rolls.

ALU: Arithmetic and logic unit.

amp: Amplifier.

amplifier (amp and AR): A device used to increase the size of a signal.

AR: Amplifier.

AR-DF: Differential amplifier.

AR-MD: Amplifier for driving magnets.

ASCII: American National Standard Code for Information Interchange.

backlash: Gear play.

belt tensioner: The part that gives tension to the drive belt.

blows, blown (fuse): Open or opens.

buffer: A small special storage device.

C: capacitor.

carrier: The part of the printer that carries the print head and ribbon box.

CE: Customer engineer.

chk: Check.

com: The common connection on a switch.

compression spring: A spring that is pressed into a small space so that it can supply force.

CR: Diode.

crooked: Skewed; not straight; sloping.

deflector: A part that moves something away.

detenting: Locking.

dr: Drive.

EBCDIC: Extended binary coded decimal interchange code.

EC: Engineering change.

emitter: A device that generates pulses of electricity.

EOM: End of message.

EOQ: End of queue.

E1, E2, E3: Print emitter pulses.

FB (fuse): A fuse that opens the circuit with no delay.

FF: Form-feed switch.

FL: Latch (flip latch).

frame: A 16-bit group that carries information.

FRU: Field replaceable unit.

GLP: General logic probe.

gnd: Ground.

ID: Identification.

interposer: A small connector with pins on both sides (see reference 196).

IRS: Interchange record separator.

J: Jack.

LF: Line feed switch.

line turnaround: See the System Theory Maintenance Diagrams manual.

MAPs: Maintenance analysis procedures.

MHz: Megahertz.

microprocessor: Microprocessing unit.

MIM: Maintenance information manual.

mini-MAPs: MAPs 0500 through 0516.

miscellaneous MAP: A MAP that guides you in replacing parts sequentially when all other MAPs have failed to locate the problem.

MPU: Microprocessing unit.

Multi: A switch setting on the general logic probe.

N: Not (inverter).

N/C: Normally closed point of a switch.

N/O: Normally open point of a switch.

osc: Oscillator.

P: Plug

pickup: A device that senses electrical pulses.

planar: The electronic board that contains the MPU, character generator, cable adapter, control storage, control panel adapter, printer adapter, data storage, and the offline tests.

poll, polled, polling: To question a station to determine if it is ready to send or to receive data.

POR: Power on reset.

power on transition bit: A bit sent to the controller to indicate that power is on in the printer.

pressure rolls: Rubber rollers that press paper against the platen of the printer.

prt: Print.

pulsing: A distinct change between the on and off conditions of the lights on the general logic probe.

pwr: Power.

Q: A symbol for transistor.

r: Reset.

reg: Register.

reinstall: Put back the part that was removed.

remove: Take a part off the printer.

replace, replaced: Put a new part back in place of one that was removed.

retract ramp: The metal blade that moves the print head away from the platen when the carrier is moved as far as possible to the left in the printer.

ribbon drive lines: The material that is wrapped around the ribbon drive clutches to drive them when the carrier is moved.

S: Set

SB (fuse): A fuse that opens the circuit after a delay.

SCS: SNA character string.

SDLC: Synchronous data link control.

serv: Service voltage or ground.

short: Shorted or grounded circuit.

sideframe: A plate on each side of the printer mechanism.

SLT: Solid logic technology.

SNA: System network architecture.

solid: A continuous failure or indication.

SP: Stop.

ST: Start.

static eliminator: A printer part (reference 100 1) that attaches to the forms rack. The static eliminator removes electrical charges that build up when the forms move through the printer.

stepper motor: A motor that moves in regular steps.

synchronization: Two or more events occurring at the same time.

stuck: Unable to move.

TD: Time delay.

TP: Test point.

TPB: Taper pin block.

tractor chains: The parts on the tractor that protrude through the forms.

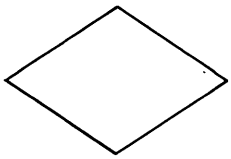
transition: Changing from active to inactive or from inactive to active.

twinaxial: A cable made of two twisted wires inside a shield.

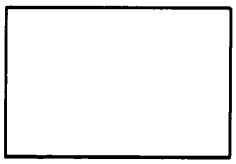
Vac: Volts alternating current.

Vdc: Volts direct current.

Legend



Decision Block



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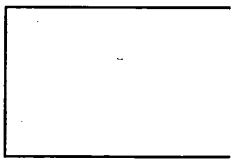

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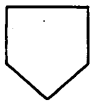
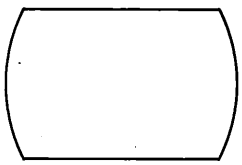
On-Page Connector



Off-Page Connector

Start or End
of Flowchart



Display Screen

Using the IBM 5256 Maintenance Information Manual

The information in this manual is to be used as reference material when diagnosing machine failures. The maintenance information manual contains maintenance procedures, diagnostic aids, theory, and high level logics. An appendix gives general information that is not directly associated with the maintenance of the 5256 Printer (information such as setup procedures). This manual is engineering change controlled and will be revised as needed to give you the latest information possible for diagnosing problems.

The format for page numbering is X-YYY.Z. X is the section number, YYY is the page number, and Z (although not normally used) is for expansion when it is not practical to give new numbers to all pages.

Reference methods used in the maintenance information manual are:

MAP 3-digit reference numbers
Page-to-page
On-page

MAP 3-digit reference numbers are assigned to location drawings and maintenance procedures to reference from the MAPs. For example, 127 indicates the forms feed emitter disk adjustment. Page-to-page references in a section are to the specific page containing the information. For example, *see page 4-15*. On-page references are: *this page*, *see below*, etc. For figures with named or numbered parts, the reference is to the specific number or name of the part.

Glossary of Terms and Abbreviations

This section contains definitions of terms and abbreviations that are not common, but are used in the MIM and MAPs.

Maintenance

This section contains location drawings and maintenance procedures for repairing or installing FRUs that the MAPs diagnosed as failing. The location drawings are of 2 types: a reference drawing showing the major functional units, and detail location drawings showing the FRUs in a functional unit. Maintenance procedures are service checks, removals, replacements, and adjustments. All procedures have 3-digit reference numbers assigned to reference from the MAPs.

Wiring Diagram

A wiring figure shows point-to-point wiring between the individual electrical FRUs in the printer.

Diagnostic Aids

This section contains diagnostic program descriptions, how to use them, and what is available when they are in control. To aid in diagnosing machine failures in greater detail, a list if error conditions is included in this section.

Preventive Maintenance

Parts needing regular service are described in this section.

Tools and Test Equipment

The tools needed to service the printer are described in this section.

Theory

The theory section contains descriptions of the functional units and features. These descriptions are preceded by a view of the system that gives you a general idea of the complete operation and where each function or feature fits in.

Features

The features section describes the operation of features for the printer.

Appendix A.

Appendix A contains the setup procedures.

Index

The index is a detailed list of all material in the maintenance information manual.

Sequence-Affected Procedures

Following is a list of sequence-affected procedures. Enter each list at any point, but perform all indicated operations from the entry point to the end of that list.

126 Forms Motor and Emitter Disassembly
125 Forms Motor Gear Backlash (Play) *plus*
127 Forms Feed Emitter Disk Adjustment
128 Forms Motor to Emitter Timing
124 Platen Gear Backlash (Play)
End

121 Platen Latches (Release Eccentrics and Springs) Adjustment *or*
129 A-Frame Alignment (see next list also)
124 Platen Gear Backlash (Play)
End

123 Platen Pressure Rolls Adjustment *or*
129 A-frame Alignment (see preceding list also)
130 End-Of-Forms Switch Adjustment
End

140 Print Emitter Board and Print Emitter Board to Pickup and Amplifier Card Removal and Replacement *or*
141 Print Emitter Board Removal and Replacement *or*
152 Carrier and Main Shaft Removal and Replacement
151 Carrier Support Shaft Removal and Replacement or
162 Print Head Cable Removal and Replacement *or*
140 Print Emitter Board and Print Emitter Board to Pickup and Amplifier Card Adjustment
143 Left Margin Adjustment
End

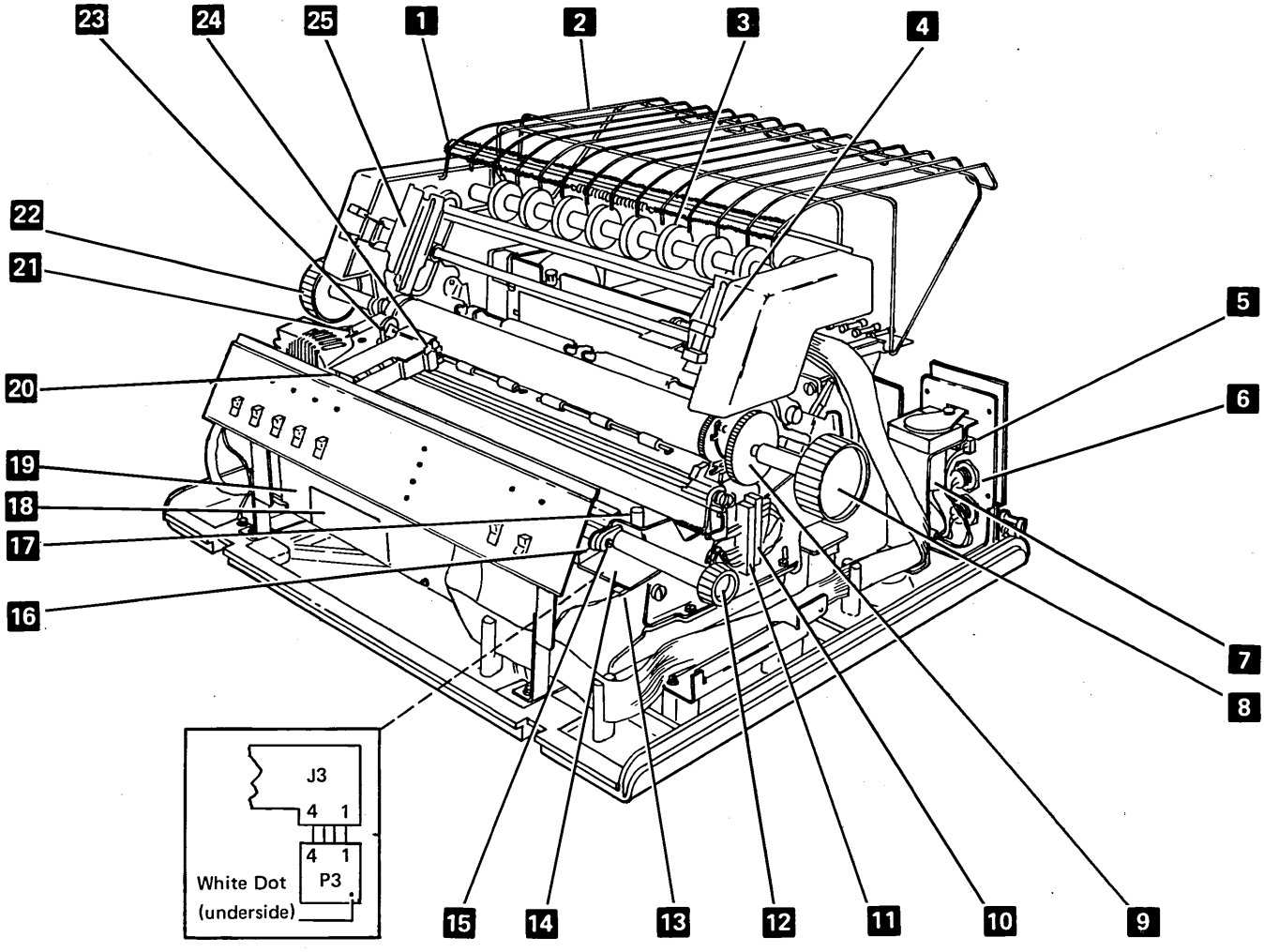
164 Print Head Ribbon Lifter Removal and Replacement *or*
166 Copy Control Dial Removal and Replacement *or*
160 Print Head Removal and Replacement
160 Print Head Adjustment
End

Glossary, Seq. Affected, Loc.

Locations

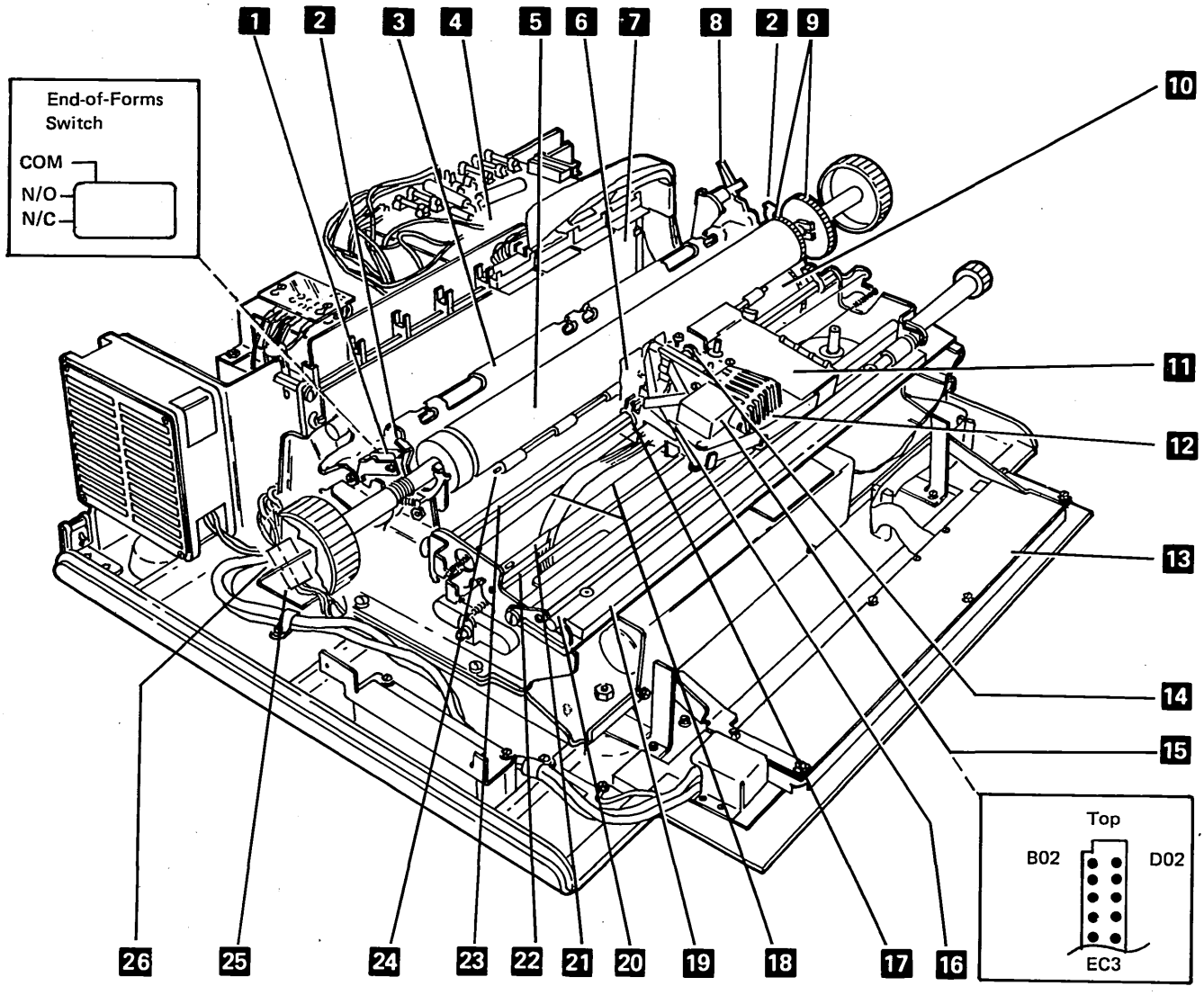
100 FRONT AND RIGHT SIDE LOCATIONS

1. Static Eliminator
2. Forms Tractor Unit Rack
3. Rollers
4. Right Tractor Release Knobs
5. Address Switches
6. Cable Connectors
7. Audible Alarm
8. Paper-Advance Knob
9. Forms Tractor Drive Gear
10. TPB2
11. TPB1
12. Horizontal Fine Adjustment Knob
13. P3
14. Oscillator, J3
15. Fine Adjustment Mounting Screw
16. Print Emitter Support
17. Carrier Motor and Pulley
18. Safety Lable
19. Safety Cover
20. Guide (ribbon box)
21. Print Head Retract Lever
22. Paper-Advance Knob
23. Ribbon-Advance Knob
24. Ribbon Release Lever (in operate position)
25. Left Tractor



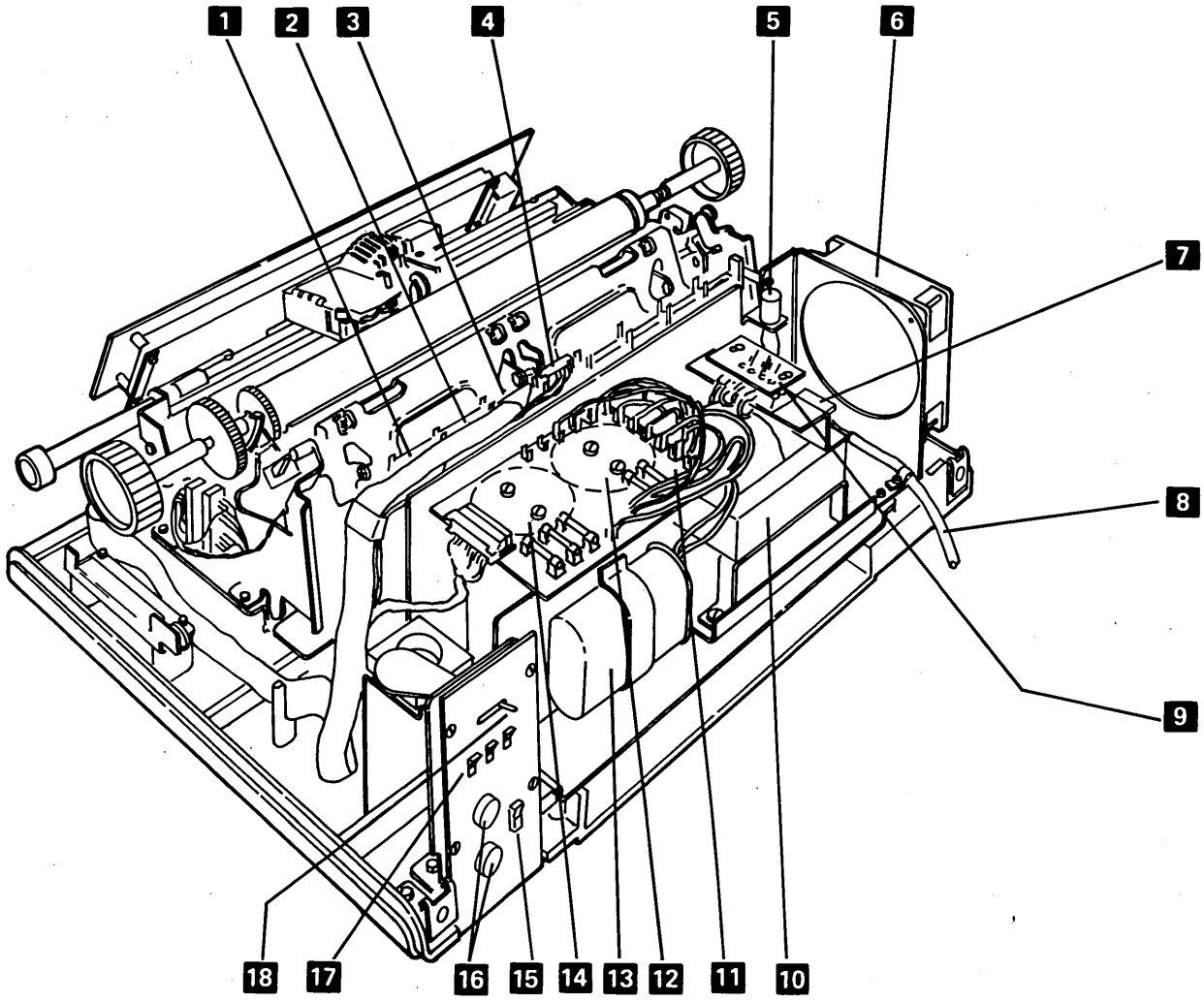
101 FRONT AND LEFT SIDE LOCATIONS

1. End-of-Forms Switch
2. Platen-Release Lever (Latch) (2)
3. A-Frame
4. Power Supply
5. Platen
6. Print Head Forms Guide
7. Planar Board
8. Paper Release Lever
9. Platen Gears
10. Idler Gear
11. Ribbon Box
12. Print Head Cover
13. Control Panel
14. Copy Control Dial
15. Connector EC3 (under the cover)
16. Oil Felt
17. Carrier
18. Ribbon Drive Lines (2)
19. Print Emitter Board Assembly
20. Hold Down Bracket
21. Retract Ramp
22. Drive Belt
23. Carrier Main Shaft
24. Platen Pressure Rolls
25. Connector J1
26. Connector P1



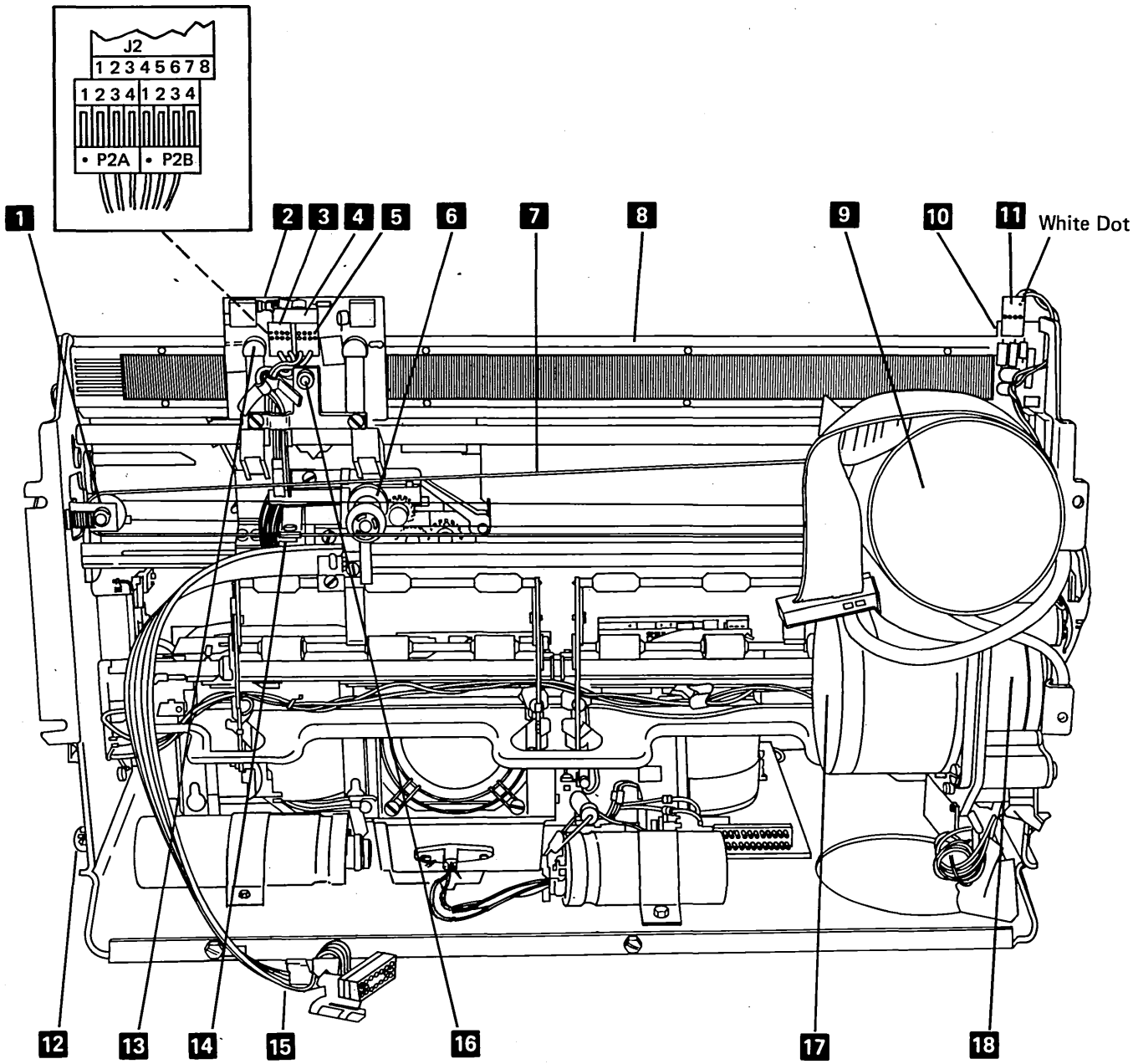
102 BACK LOCATIONS

1. B1A1
2. B1B1
3. B1C1
4. B1D1
5. Fuse F1 (3A, SB, part 2456618)
6. Fan B2
7. TB2 (line filter on some world trade machines)
8. Line Cord
9. Terminal Block TB1
10. Transformer T1
11. Power Adapter Board C1
12. Capacitor C5 (+8.5V)
13. Capacitor C12 (AC)
14. Capacitor C4 (+5V)
15. Terminator Switch
16. Cable Connectors
17. Address Switches (shown in the 0 position)
18. Audible Alarm Volume Lever



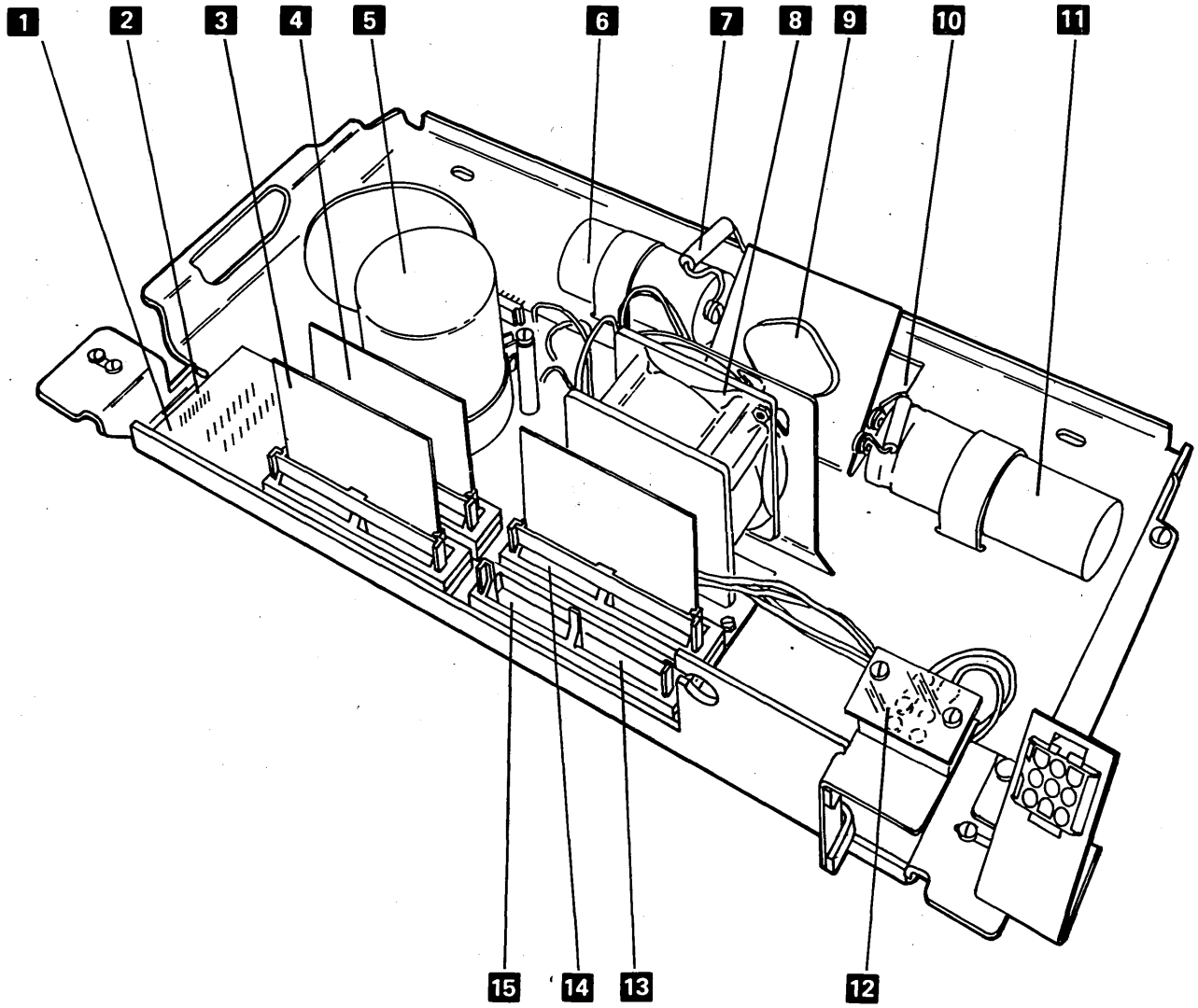
103 PRINTER MECHANISM BOTTOM LOCATIONS (PRINT MECHANISM IN SERVICE POSITION)

1. Belt Tensioner Pulley
2. Printer Emitter Pickup and Amplifier
3. P2A
4. J2
5. P2B
6. Ribbon Drive Clutches and Gears
7. Carrier Drive Belt
8. Print Emitter Board
9. Carrier Motor
10. J3 (See reference 100.)
11. P3 (See reference 100.)
12. Screw (to clamp printer in service position)
13. Print Emitter Flat Springs
14. Belt Clamp
15. Print Head Cable (EC1)
16. Compression Spring
17. Forms Feed Motor
18. Forms Feed Emitter



104 PRINTER MECHANISM BASE LOCATIONS

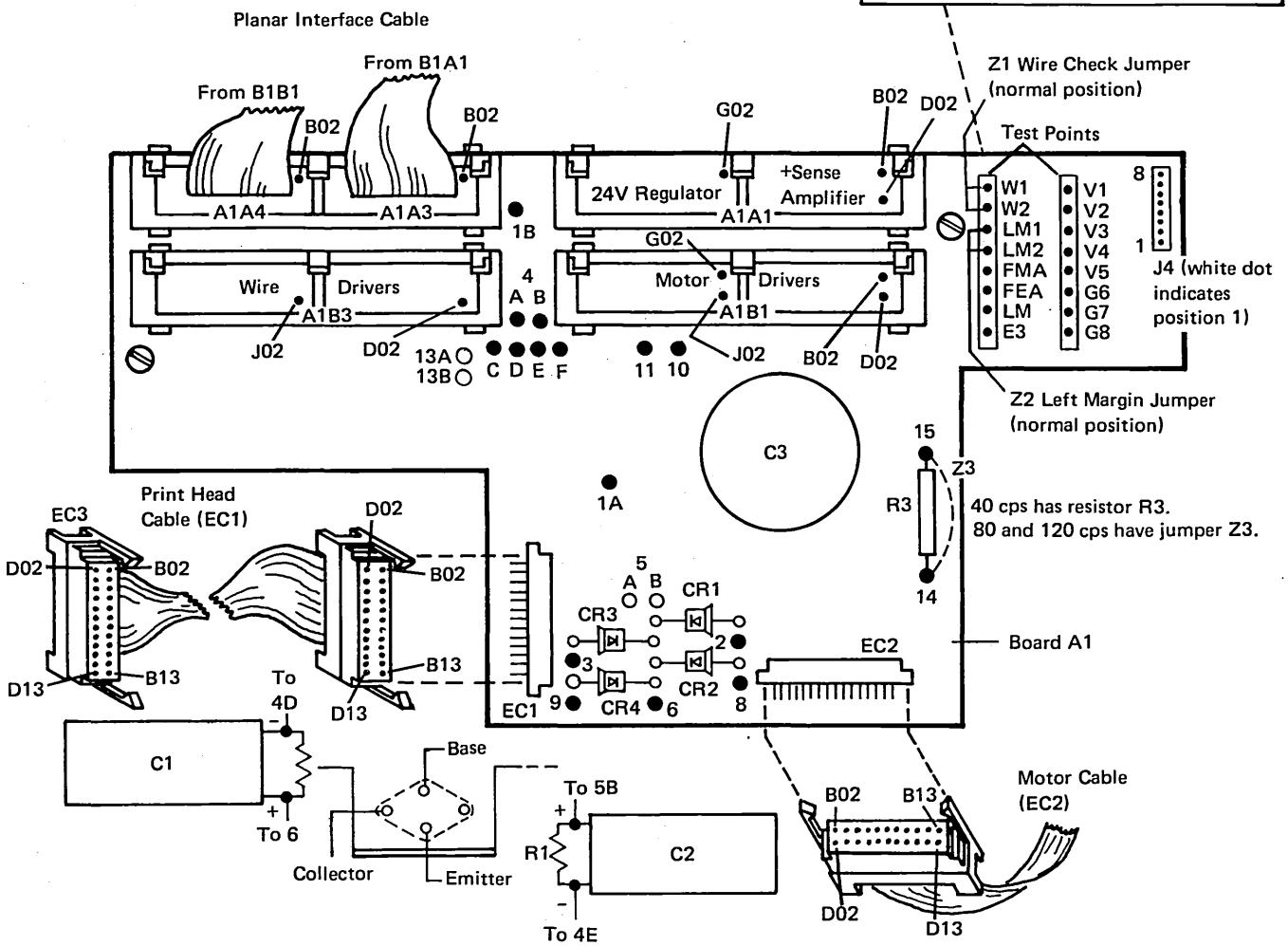
1. Power Supply Board A1 (See reference 105.)
2. J4 (See reference 105.)
3. A1A1
4. A1B1
5. Capacitor C3 (+24V)
6. Capacitor C2 (+30V)
7. Resistor R1
8. Fan B1
9. Transistor Q1
10. Resistor R2
11. Capacitor C1 (+10.8V)
12. TB3
13. A1A4
14. A1B3
15. A1A3



105 POWER SUPPLY BOARD A1 LOCATIONS AND JUMPERS

The planar board has jumpers associated with character set, speed, and cable type. (See reference 106.)

Test Points		Tolerance	
V1	+24 Vdc	24.6 Vdc	26.4 Vdc
V2	+30 Vdc	24.0 Vdc	36.0 Vdc
V3	+10.8 Vdc	8.1 Vdc	13.5 Vdc
V4	+5 Vdc	4.6 Vdc	5.5 Vdc
V5	+5 Vdc	4.6 Vdc	5.5 Vdc
W1	-Wire on		
W2	Sets wire check (to adapter)		
LM1	+Left margin		
LM2	Left margin (to adapter)		
FMA	+A forms drive		
PMA	+A carrier drive		
G6;7	Ground from A1A3 and A1A4		
G8	Ground from A1A4		



Glossary, Seq. Affected, Loc.

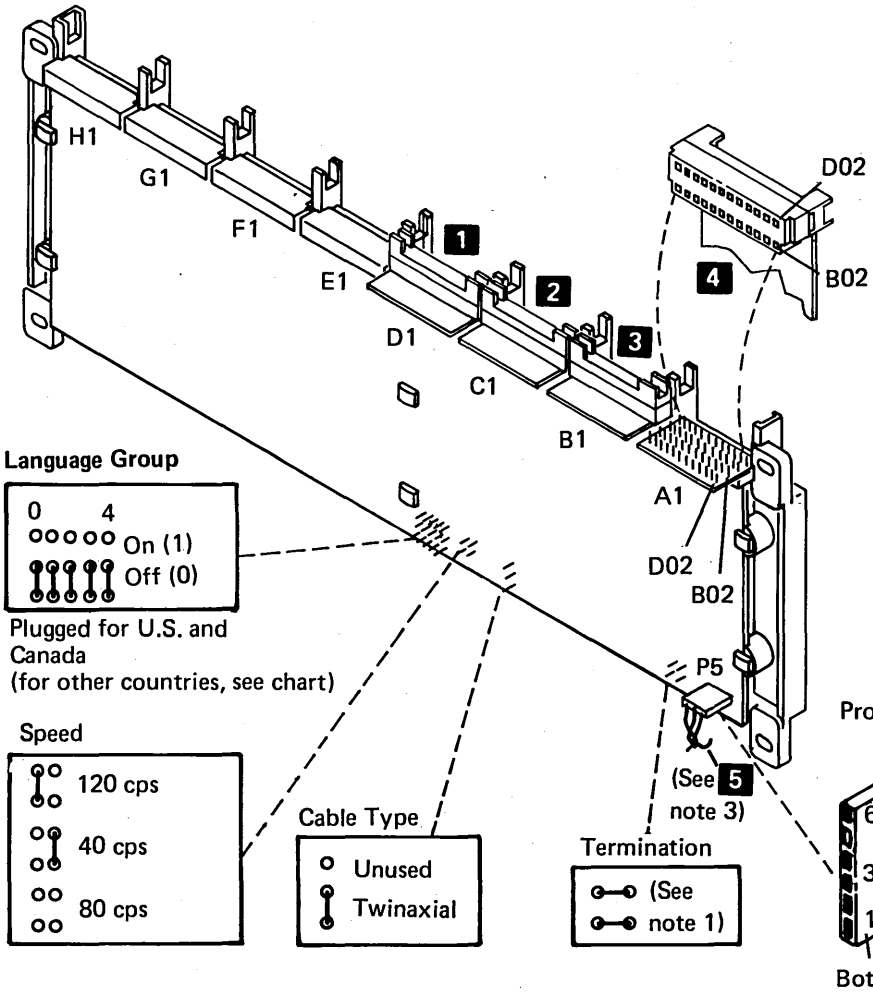
106 PLANAR BOARD B1 LOCATIONS AND JUMPERS

Power supply board A1 contains jumpers associated with speed and diagnostics. (See reference 105.)

CAUTION
When installing jumpers, they can cause a short circuit.

1. To the address switches (Cable Thru feature only).
2. To the control panel.
3. To the audible alarm, board A1A4, and board C1 (see note 2).
4. To board A1A3 and board C1 (see note 2).
5. Internal system cable.

Notes:
1. Plugged only if the Cable Thru feature *is not* installed.
2. 3 and 4 are part of the planar interface cable.
3. This cable is polarity sensitive.



Language Group

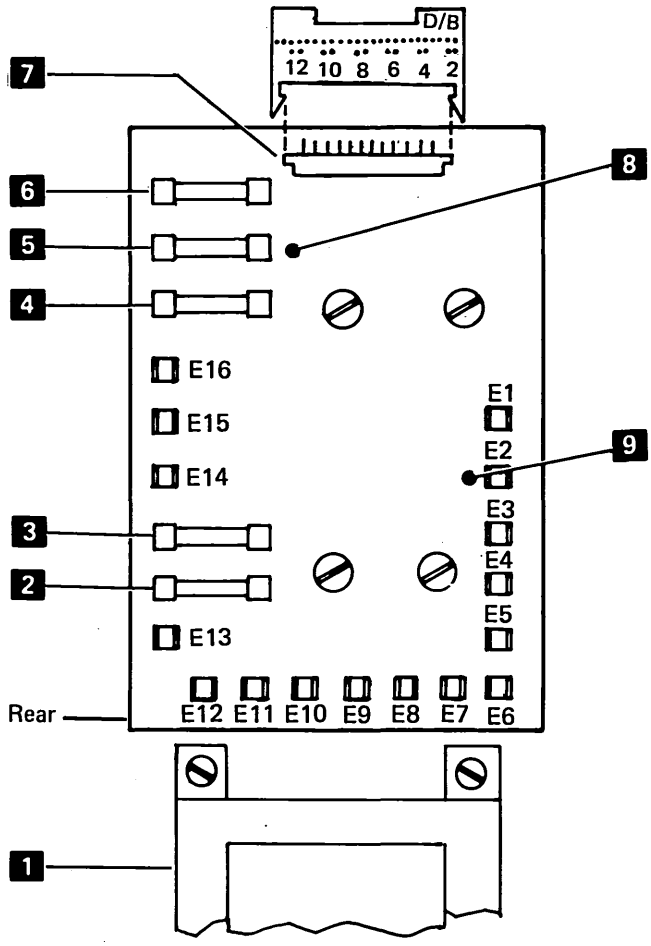
Bit 0 1 2 3 4	Country
0 0 0 0 0	U.S. and Canada
0 0 0 0 1	ASCII (international)
0 0 0 1 0	Austria and Germany
0 0 0 1 1	Belgium
0 0 1 0 0	Brazil
0 0 1 0 1	Denmark and Norway
0 0 1 1 0	Finland and Sweden
0 0 1 1 1	France
0 1 0 0 0	Italy
0 1 0 0 1	Japan
0 1 0 1 0	Portugal
0 1 0 1 1	Spain
0 1 1 0 0	Spanish Speaking
0 1 1 0 1	United Kingdom
0 1 1 1 0	Canada (French)
0 1 1 1 1	Unused
1 0 0 0 0	Katakana
1 0 0 0 1 ⋮ 1 1 1 1 0	Reserved
1 1 1 1 1	Defaults to U.S. and Canada

All jumpers must be plugged.

107 POWER ADAPTER BOARD C1 LOCATIONS

1. Transformer T1
2. Fuse 2, 4A (SB–part 1143492) +30V (+24.0V to +36.0V)*
3. Fuse 3, 8A (SB–part 1146953) +10.8V (+8.1V to +13.5V)*
4. Fuse 4, 6A (FB–part 303679) +5V (+4.6V to +5.5V)
5. Fuse 5, 3A (FB–part 855252) +8.5V (+7.82V to +9.35V)
6. Fuse 6, 1A (FB–part 855253) -5V (-4.6V to -5.5V)
7. Voltage and signal connector C1A1
8. Probe power E18 (+)
9. Probe power E17 (-)

* Fuses 2 and 3 are in the return lines.



Connector C1A1

Pin	Line	Pin	Line
B02	Unused	D02	-Power good
B03	Power on reset	D03	+5V
B04	Ground	D04	+5V
B05	Ground	D05	+5V
B06	Ground	D06	+5V
B07	Ground	D07	+5V
B08	Ground	D08	+5V
B09	Ground	D09	+5V
B10	Ground	D10	+5V
B11	Ground	D11	+8.5V
B12	Unused	D12	+8.5V
B13	-5V	D13	Unused

Board C1 Connections

C1	Transformer T1 Wires			J1	Other
	60 Hz (U.S.)	60 Hz (WT)	50 Hz (WT)		
E1	–	–	–		+5V output
E2	–	–	–		Ground
E3	–	–	–	1	
E4	10	14	16		
E5	11	15	17		
E6	9	13	15		
E7	19	23	25		
E8	20	24	26		
E9	18	22	24		
E10	16	20	22		
E11	17	21	23		
E12	15	19	21		
E13	7	11	13		
E14	13	17	19		
E15				5	Chassis Ground
E16				6	

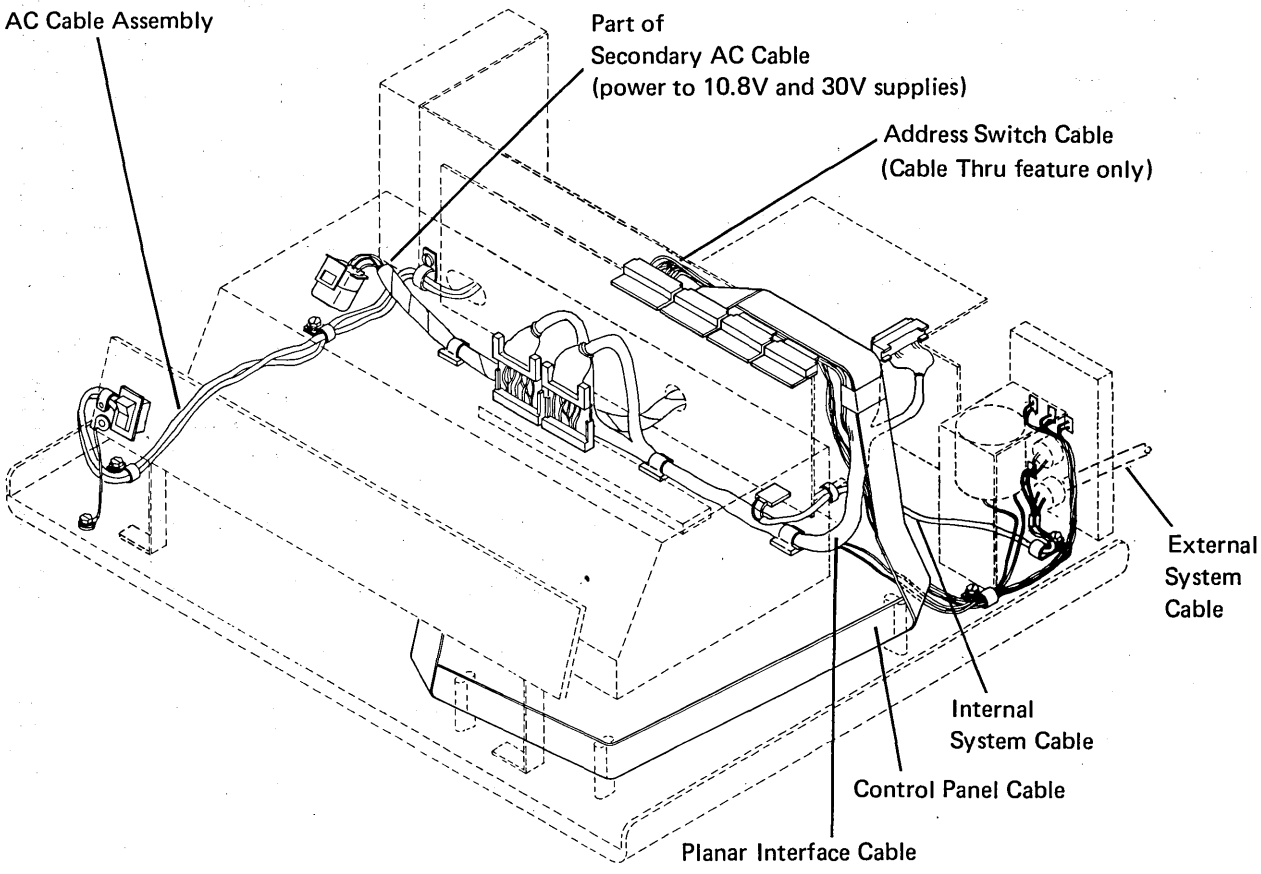
108 CABLING LOCATIONS AND STATION PROTECTOR

Motor Cables (EC2 to TPB1 and TPB2)

When installing this cable, always install the wires from the new cable one at a time as you remove the corresponding wire from the old cable.

CAUTION
Phasing is *very* important for the internal system cable and the Cable Thru feature wiring. Always connect the black-striped wire to the socket terminal beside the black dot, to the right-hand side of the Terminator switch, and to position 6 of the connector that attaches to the planar.

Note: For cable quality checks, refer to the controller documentation.



108 CABLING LOCATIONS AND STATION PROTECTOR (CONTINUED)

See IBM 5250 Information Display System Installation Manual—Physical Planning, GA21-9277 for detailed information.

The station protector is owned and maintained by the customer. The following procedure can be used to check an IBM supplied station protector.

The cables to the station protector must be disconnected before the checks can be made. This will disconnect the work stations from the system.

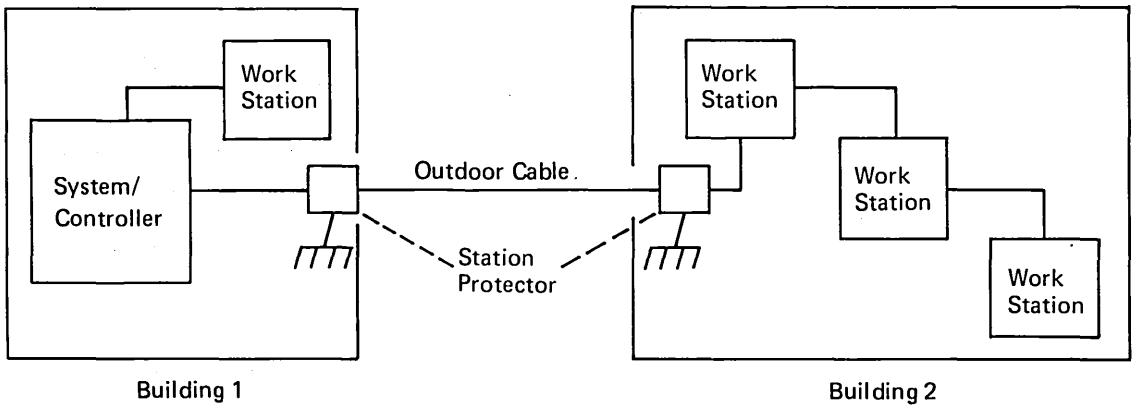
DANGER
Never handle cables or connectors during an electrical storm.

Only use CE meter part 1749231. Use the R x 100 scale.

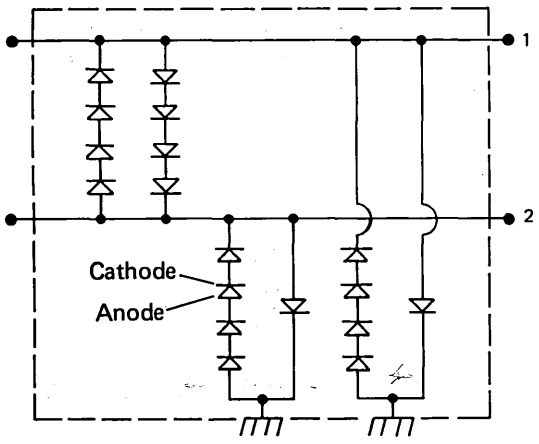
1. Check each diode with the black lead connected to the anode and the red lead connected to the cathode. The resistance should be less than 2,000 ohms.

2. Check each diode with the black lead connected to the cathode and the red lead connected to the anode. The resistance should exceed 10,000 ohms.

Typical Installation



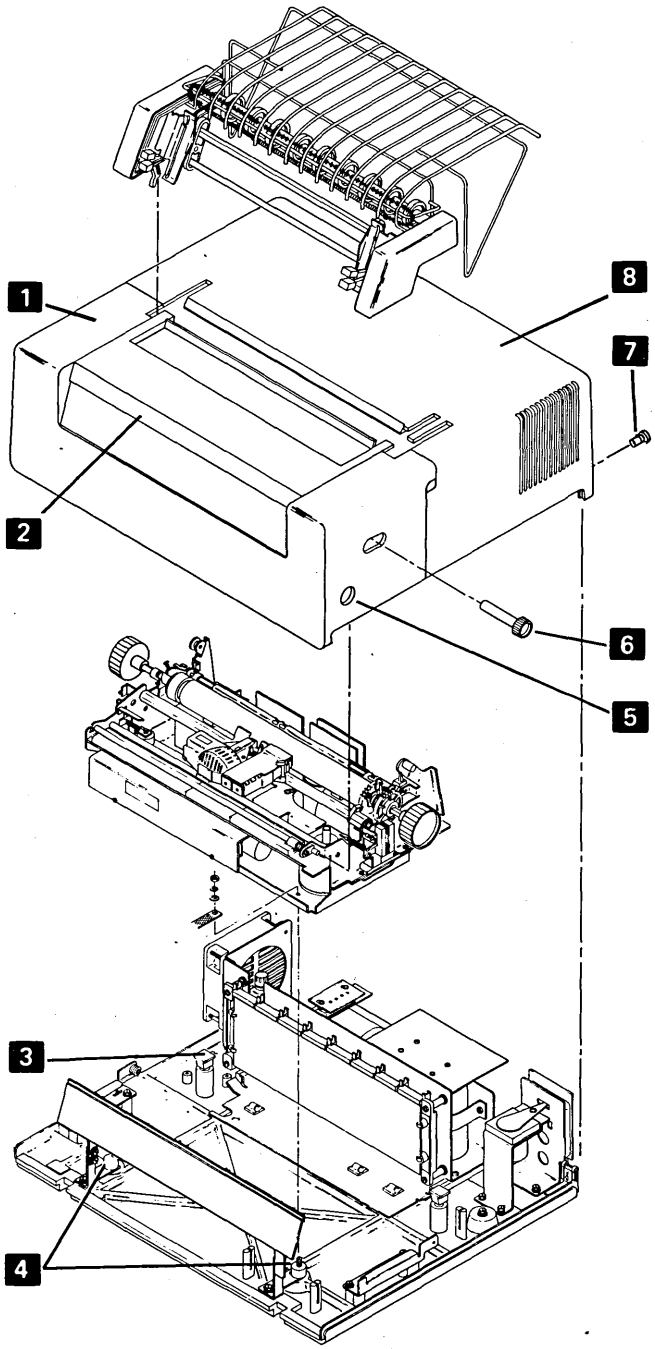
Station Protector Board



Covers

110 PRINTER COVERS

The covers are designed to let you remove the top, front, or back cover individually. Paper can remain in the machine while removing covers.



Adjustment

1. Center the platen knobs vertically and maintain a gap of 3.18 mm to 3.96 mm (1/8 inch to 5/32 inch) between the top cover and the forms tractor by adjusting the pads in back 3 and the double nuts in front 4.

2. Position the printer horizontally on the double nut pins 4 to center the Paper-Release lever in the slot.

3. Adjust the front cover by moving the bracket on each side of the machine base.

Top Cover Removal and Replacement

1. For ribbon changing and observation, slide the top cover 2 forward.

2. To remove the top cover 2, slide it forward, lift it up, and remove it to the front.

Back Cover Removal and Replacement

1. Loosen the fasteners 7 and pull the back cover 8 back to free the front cover 1.

2. Lift the cover up and remove it to the rear.

Front Cover Removal and Replacement

You can pull the front cover forward enough to let you remove the platen without removing the back cover.

1. Move the back cover 7 back. (See above.)

2. Pull off the Horizontal Fine Adjustment knob 6.

3. Press the release pushbuttons 5 on the sides of the front cover and slide the cover forward and off.[1]

---

[1]The release pushbuttons are not on all printers.

111 CONTROL PANEL AND AC CABLE ASSEMBLY

Control Panel Removal and Replacement

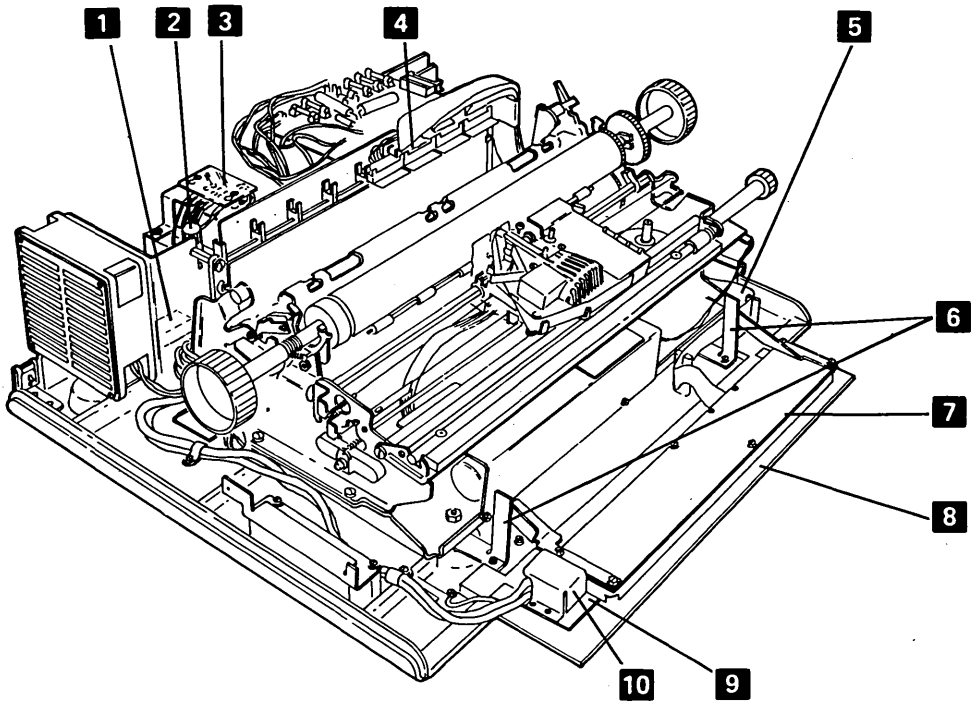
1. Power off.
2. Disconnect the line cord from the wall outlet.
3. Remove the printer covers (110).
4. Disconnect the control panel cable at the planar board socket B1C1 4.
5. Note the cable path and remove the cable to the control panel 5.
6. Loosen the 2 lower screws and remove the upper screw at each end of the panel support brackets 6.
7. Remove the back panel 7 from the front panel (6 screws) 8.
8. Remove the Power switch bracket 9 from the control panel (2 screws).
9. Reinstall the control panel by reversing the procedure.

AC Cable Assembly Removal and Replacement

The AC cable assembly includes the Power switch and the fuse.

1. Power off.
2. Disconnect the line cord from the wall outlet.
3. Remove the printer covers (110).
4. At the control panel, loosen the lower screw and remove the upper screw at each end of the panel support brackets 6.
5. Remove the Power switch shield 10.
6. Remove the Power switch.
7. Remove the fuse case 2.
8. Note the position of and remove the leads from TB2 (or the line filter) 1 and TB1 3.
9. Reinstall the cable by reversing this procedure.

Note: Some world trade machines have a line filter in place of the terminal block.

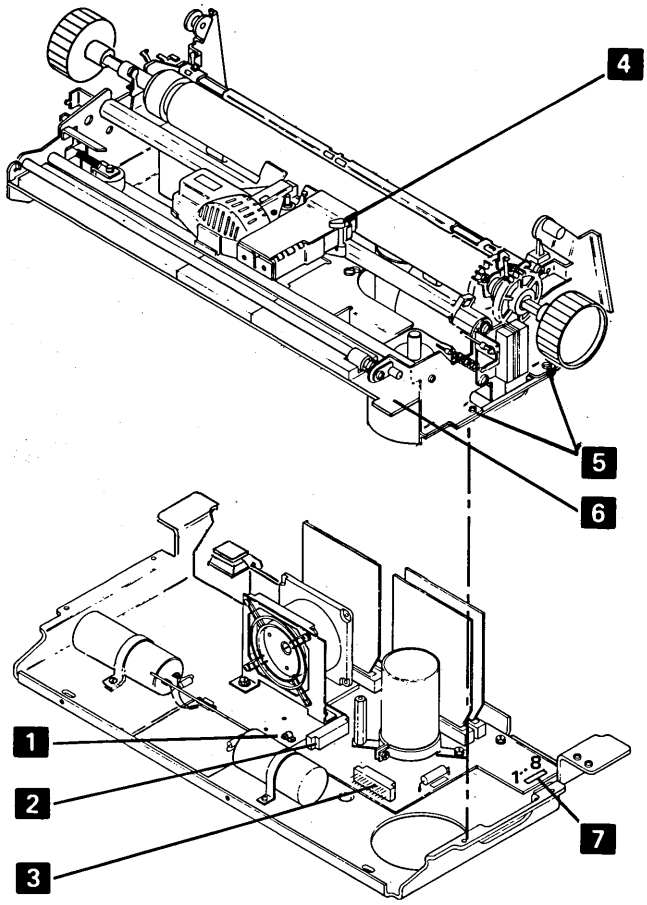


Service Positions

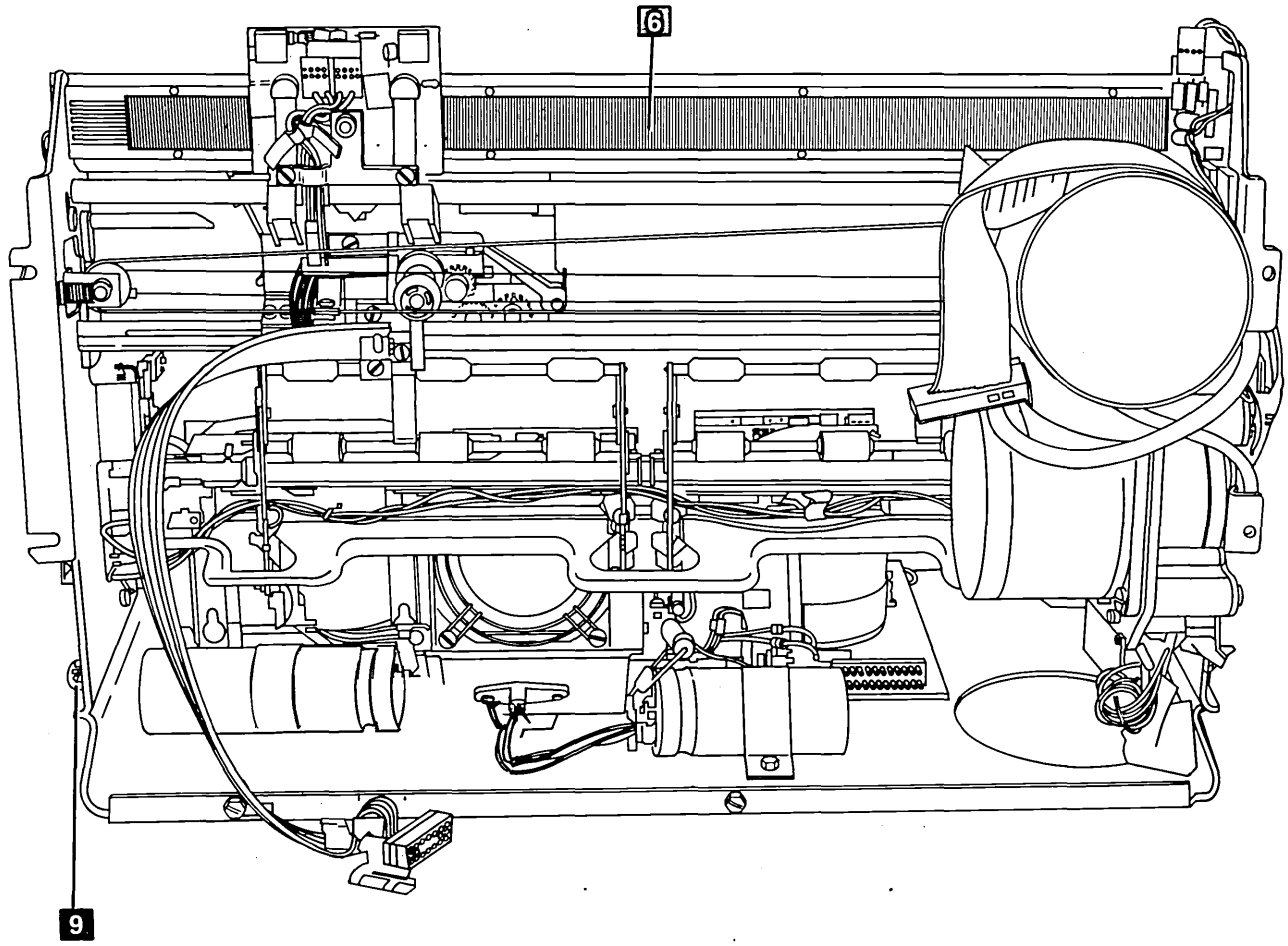
115 SEPARATING THE PRINTER FROM THE POWER SUPPLY BOARD A1 FOR SERVICE POSITIONS

1. Power off.
2. Remove the printer covers (110).
3. Remove the 2 screws and the cable clamp 1 near EC1 2.
4. Disconnect the cables at EC1 2 and EC2 3. For installation, ensure the print head cable is against the flat spring.
5. Disconnect J4 7 (white dot indicates position 1).
6. Remove the 2 screws 5 on the right end of the printer.
7. Loosen the 2 screws 9 on the left end of the printer.
8. Lift the right end of the printer slightly and slide the printer to the right to clear the screws 9.
9. Lift the printer from the power supply. If the bottom of the printer is to be serviced, remove the paper deflector and set the printer into the service position 8 on the base (so that the print emitter 6 points upward). Hold the printer in this position with a base screw 9 on the left side and a base screw 5 on the right side.

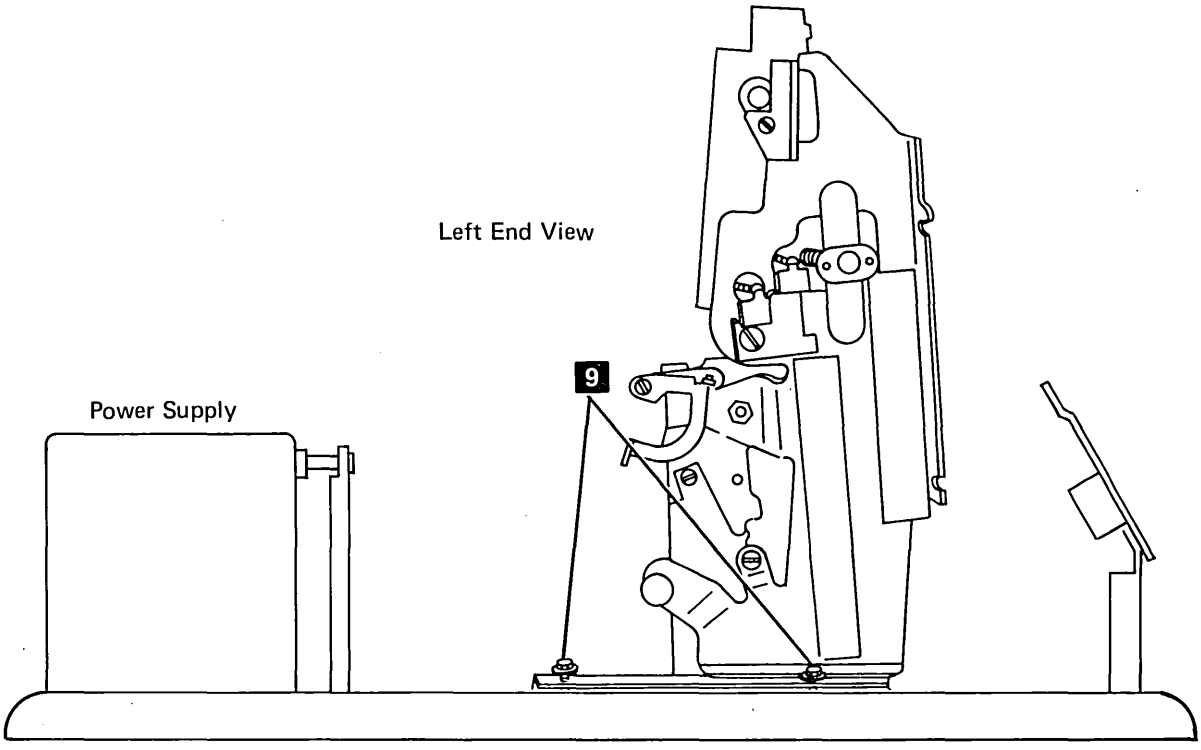
   Note: Operate the Ribbon-Release lever 4 to open the ribbon feed rolls; ensure that the ribbon box cover remains closed.
10. To install the printer on the power supply, reverse this procedure.



8 Service Position

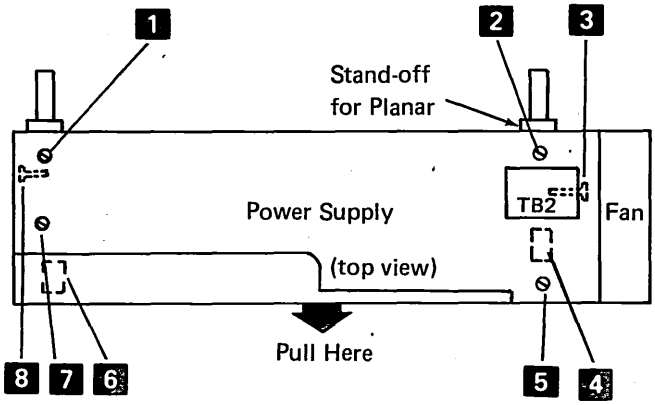


Left End View



116 MOVING THE POWER SUPPLY FOR PRINTER SERVICING

1. Power off.
2. Loosen the shipping screws 8 and 3 seven turns. You may leave them loose except for shipping.
3. Loosen the clamping screws 1, 2, 5, and 7 one-half turn.
4. Pull the power supply back, at the place shown, until screws 1 and 2 strike the stops 4 and 6.
5. To place the power supply in normal operating position, reverse this procedure.



Part Numbers

117 BOARDS, CARDS, INTERPOSERS, AND JUMPERS

Boards	Part
Planar Board B1 (See the caution.)	2767799
Power Adapter Board C1	4176517
Power Supply Board A1	1638818
Print Emitter	1638711
Cards	
A1A1	5863340
A1B1	5863342
A1B3	5863341
Print Emitter (pickup)	843202
Interposer	2731011
Jumper	1794401

CAUTION

The logic on planar board B1 can be damaged by electrostatic discharge. Do not touch any conducting (metal) parts. Hold the planar by the plastic frame when moving it.

Before you take the planar from the bag, hold the bag and touch the machine frame with your hand. This removes any static from you and the planar.

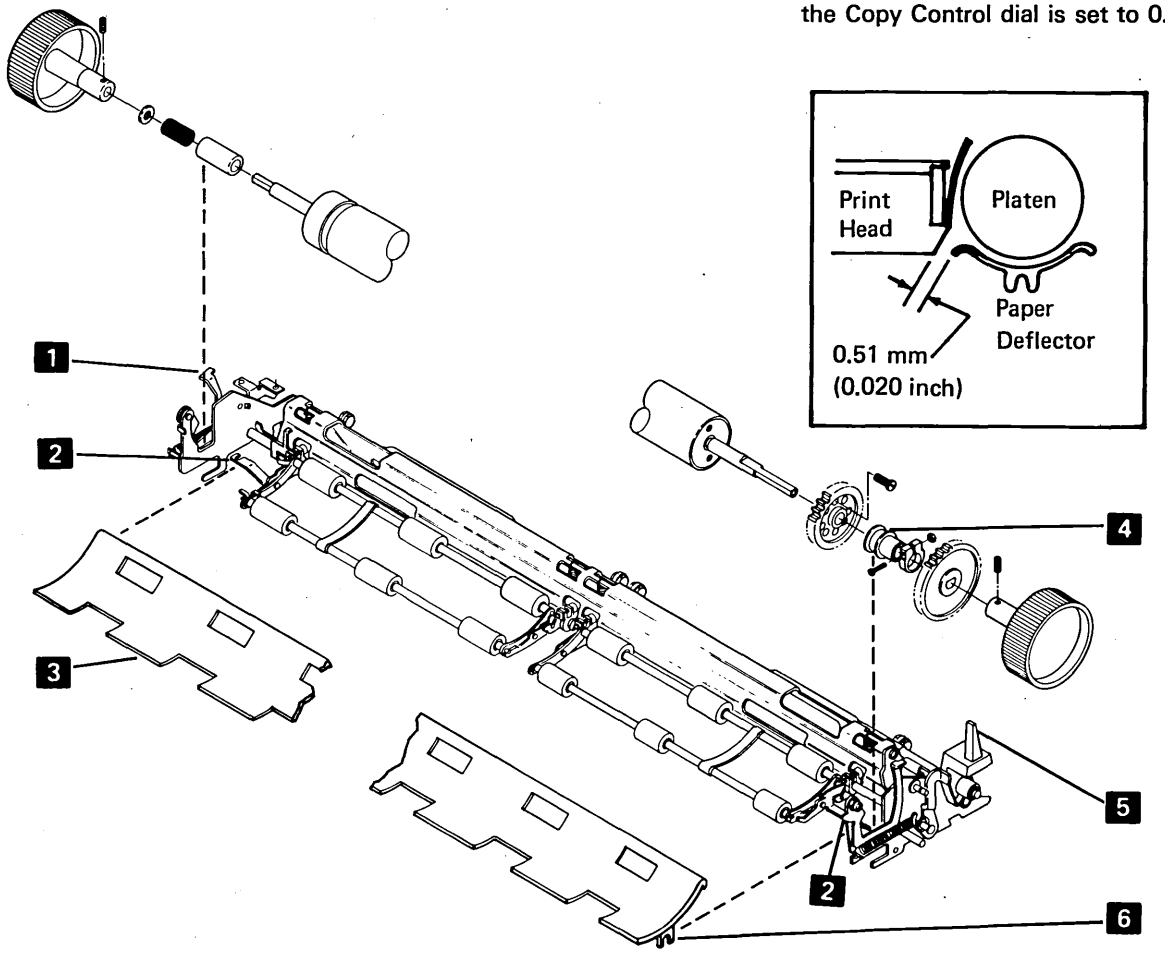
Ensure that the component side of the planar is up when you put the planar on any surface.

120 PLATEN AND PAPER DEFLECTOR

Removal and Replacement

1. Power off.
2. Center the print head on the platen.
3. Tilt the forms tractor back.
4. Pull the front cover forward to the stop (110).
5. To remove the platen, lift up on the Platen knobs while pressing down on the Platen-Release levers 1.
6. Lift out the paper deflector 3.
7. To install the platen:
   a. If the Paper-Release lever 5 is back, pull it forward.
   b. Ensure that the paper deflector 3 is seated correctly with tabs 6 engaging the locating arms 2 (both ends). Bend the tabs 6 to engage the locating arms 2 if needed.
   c. Center the print head on the platen.
   d. Align the groove 4 in the gear end of the platen shaft with the side plate. Then, press down on both ends of the platen. Ensure that the gears engage correctly.
   e. Ensure that the Platen-Release levers are completely seated.
   f. Turn the platen to check for binds.
8. Close the front cover and tilt the forms tractor forward until the arms engage the platen shaft.

Note: The locating arms 2 may need bending to ensure 0.51 mm (0.020 inch) between the paper deflector 3 and the tip of the print head when the Copy Control dial is set to 0.



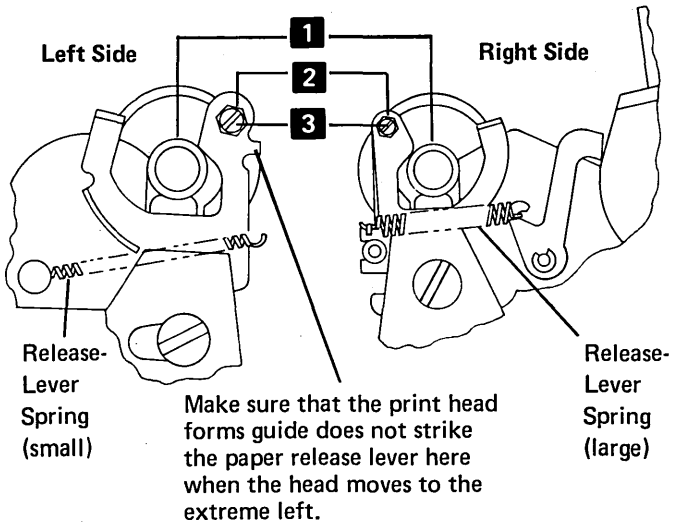
121 PLATEN LATCHES (RELEASE ECCENTRICS AND SPRINGS)

Adjustment

This procedure adjusts both the left and right eccentrics. However, when adjusting the left eccentric, ensure that the Platen Release lever does not touch the print head forms guide (101) when the carrier moves to the far left.

1. Power off.
2. Remove the forms tractor (131).
3. Remove the printer covers (110).
4. Loosen, until it is finger tight, the screw 3 that locks the eccentric nut 2.

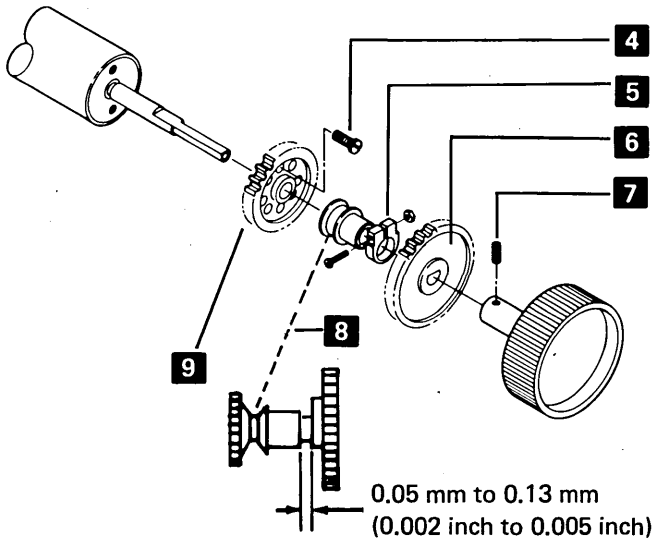
   Note: When adjusting the right side, remove the Platen knob and forms tractor drive gear. When installing, adjust gap to bushing 8.
5. Press the platen bushing 1 down and turn the eccentric nut so that when released, the lever holds the bushing tightly against the frame.
6. Hold the eccentric nut in this position and tighten the locking screw.
7. Check the platen gear backlash (play) adjustment (124).
8. Reinstall the printer cover (110).
9. Reinstall the forms tractor (131).



122 PLATEN GEARS AND BUSHING

Removal, Replacement, and Adjustment

1. Power off.
2. Tilt the forms tractor back.
3. Pull the front cover forward to the stop and remove the platen (120).
4. Remove the knob from the gear end of the platen (2 setscrews 7).
5. Loosen the clamp collar 5 on the forms tractor drive gear.
6. For installation, the bushing 8 must turn freely with 0.05 mm to 0.13 mm (0.002 inch to 0.005 inch) gap to the gear collar.
7. Remove the gear 6 and bushing 8.
8. Remove the 2 screws 4 that hold the platen gear.
9. Remove the gear 9.
10. To reinstall the gears, reverse this procedure.



123 PLATEN PRESSURE ROLLS

Adjustment

Adjust the paper-release shaft 6 so that the Paper-Release lever 2 gives a maximum pressure roll opening when the lever is forward. If the gap between the cam follower 8 and the cam 5 is 0.05 mm to 0.51 mm (0.002 inch to 0.020 inch) when the lever is back, the adjustment is correct.

Adjust the pressure roll arms 1, for a strong hold and no gap between the pressure rolls 3 and the platen, when the Paper-Release lever is back.

1. Power off.

2. Remove the printer covers (110), platen (120), tractor assembly (131), and the paper deflector.

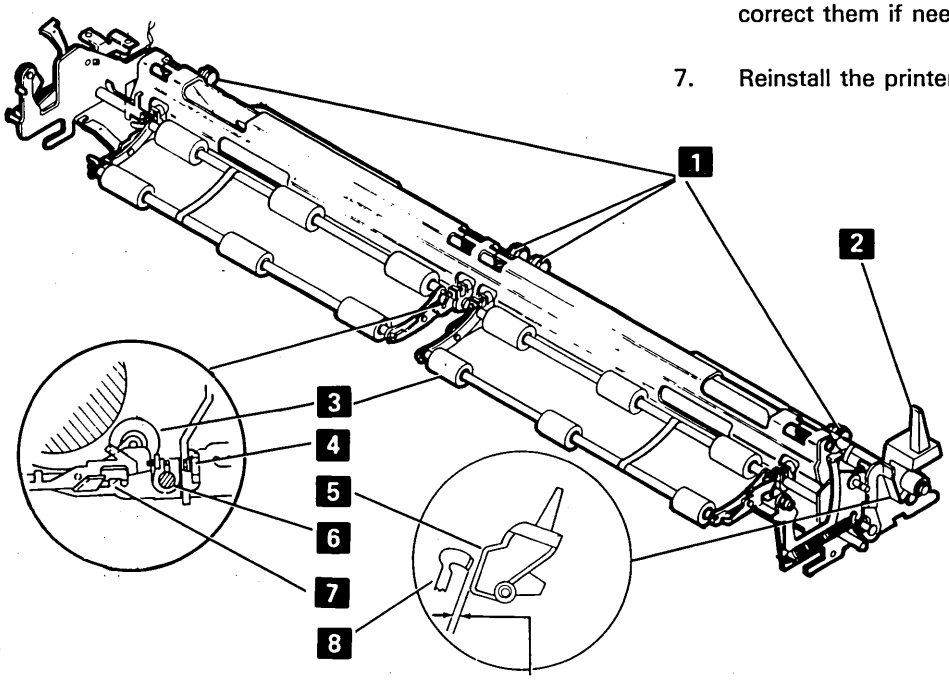
3. Adjust the paper release shaft 6:
   a. Push the Paper-Release lever 2 back.
   b. Loosen the 4 clamp collars 4 along the paper release shaft.
   c. Place a 0.38 mm (0.015 inch) gauge on the cam 5 and hold it there by pressing the cam follower 8 on the gauge.
   d. Pivot the clamp collars so that the bell cranks 7 seat on the bottom of the 4 openings; then tighten the 4 clamp collars 4.
   e. Remove the gauge, check the adjustment, and adjust again if needed.

4. Install the platen and paper deflector (print head centered on the platen).

5. Adjust the pressure roll arms:
   a. Loosen the 2 nuts 1 that hold 1 set of pressure roll arms.
   b. Move the arms as needed to remove gap between any of the pressure rolls and the platen.
   c. Check the adjustment, adjust again if needed.
   d. Check the adjustment of pressure rolls for the other half of the platen; adjust if needed, using the preceding steps.

6. Check the adjustments for platen gear backlash (play) (124) and the End-of-Forms switch (130); correct them if needed.

7. Reinstall the printer covers (110).



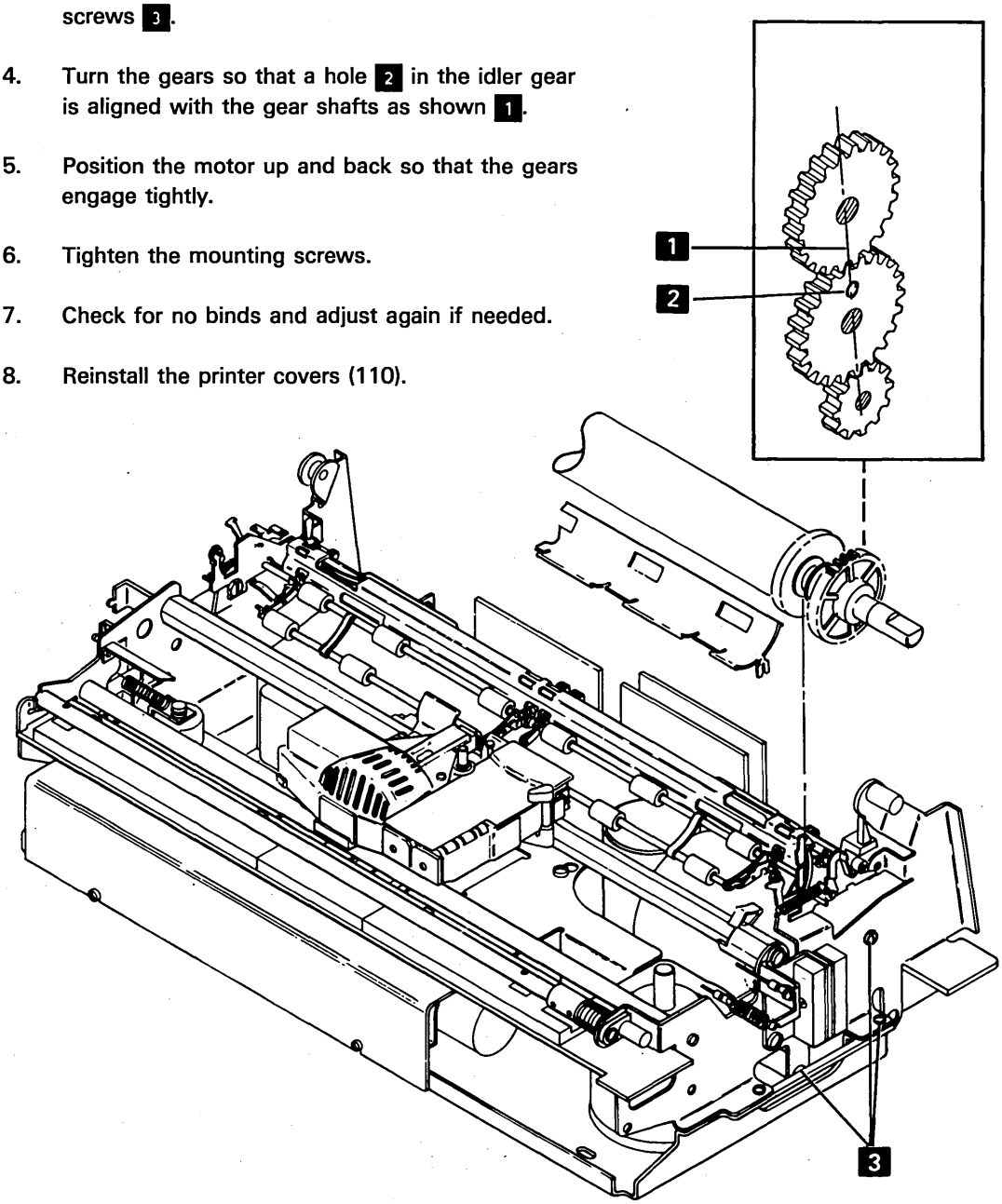
0.05 mm to 0.51 mm
(0.002 inch to 0.020 inch)

124 PLATEN GEAR BACKLASH (PLAY)

Adjustment

The idler and platen gears should have slight backlash (play) throughout their rotation. Engaging the gears at a high point, such as that which occurs in line with a hole 2 , results in correct backlash (play) at other locations.

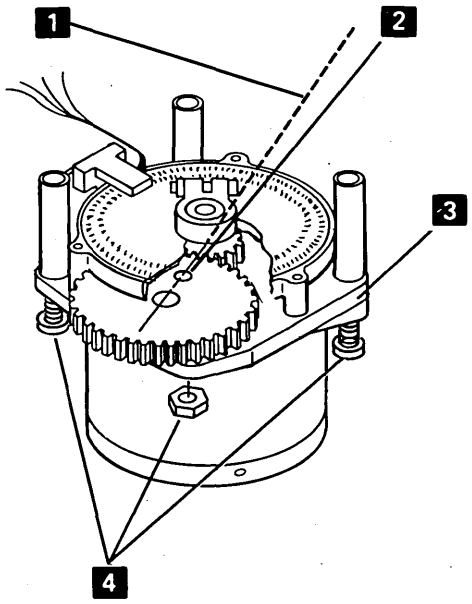
1. Power off.
2. Remove the printer covers (110).
3. Loosen the 3 forms motor and emitter mounting screws 3.
4. Turn the gears so that a hole 2 in the idler gear is aligned with the gear shafts as shown 1.
5. Position the motor up and back so that the gears engage tightly.
6. Tighten the mounting screws.
7. Check for no binds and adjust again if needed.
8. Reinstall the printer covers (110).



125 FORMS MOTOR GEAR BACKLASH (PLAY)

Adjustment

1. Power off.
2. Separate the printer from the power supply and place the printer in the service position (115).
3. Remove the forms motor and emitter assembly (126).
4. Loosen the 2 screws and the nut 4 (bolt head access through hole in the idler gear) that holds the emitter base 3 on the motor.
5. Turn the gears as needed so that a hole 2 in the idler gear is aligned with the gear shafts as shown 1.
6. Turn the emitter base 3 on the motor so that the gears engage tightly.
7. Tighten the 2 screws and the nut 4.
8. Check for binds and adjust again if needed.
9. Reinstall the forms motor and emitter assembly.
10. Adjust the platen gear backlash (play) (124).
11. Assemble the printer and power supply (115).



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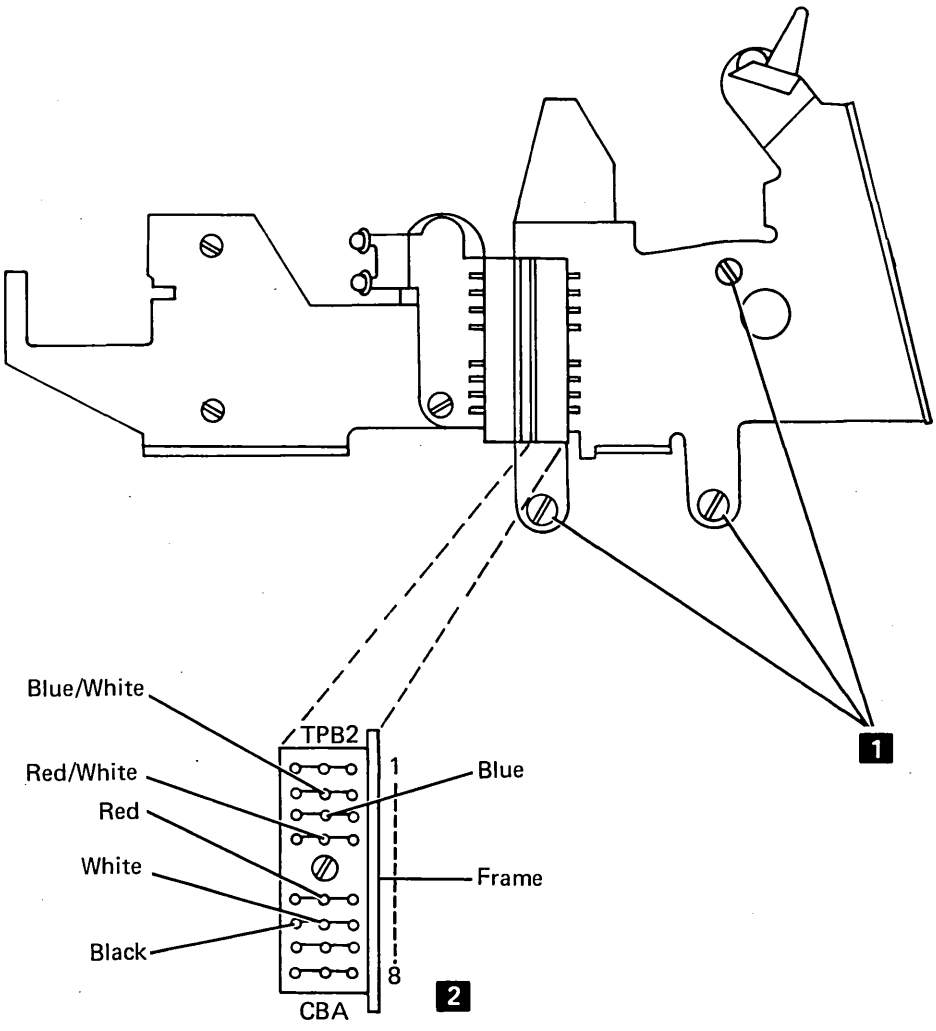
126 FORMS MOTOR AND EMITTER

Removal and Replacement

1. Power off.
2. For installation, if the motor and emitter assembly was disassembled, perform the forms motor to emitter timing (128).
3. Disconnect J4 on the power supply board A1 (105).
4. Disconnect the motor leads from TPB2 **2**.
5. Separate the printer from power supply board A1 and place the printer in the service position (115).
6. For installation only, adjust the platen gear backlash (play) (124) and return here.
7. While holding the forms motor and emitter assembly, remove the 3 mounting screws from the right side frame **1**.
8. Remove the motor and emitter assembly. To remove any parts from the motor and emitter assembly, disassemble it as needed (126).
9. To reinstall the motor and emitter assembly, reverse this procedure.

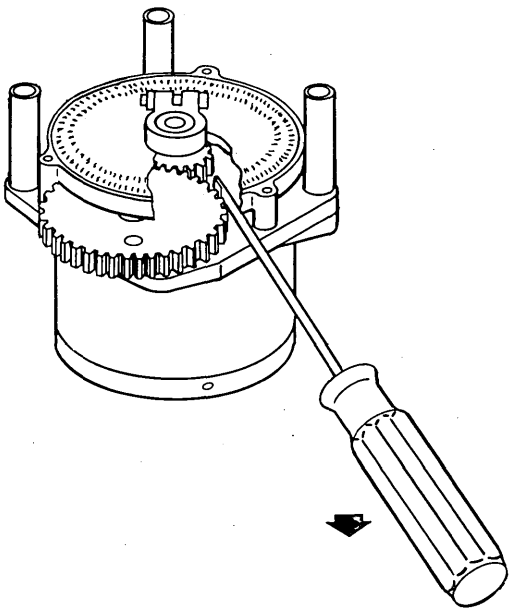


126 FORMS MOTOR AND EMITTER (CONTINUED)

Disassembly

1. Power off.
2. Remove the forms motor and emitter from the side frame (126).
3. Remove the emitter outer cover 13.
4. Loosen the clamp collar 12.
5. Remove the 2 adjusting screws 1 from the back of the base.
6. Remove the screw that holds the photocell assembly 11 and remove the photocell assembly.
7. **CAUTION**
   Do not use force on the disk; doing so will bend or scratch it.

   Remove the inner cover 8 and the disk and gear assembly from the motor shaft by using force on the motor gear as shown.



8. Remove the clip 7 that holds the idler gear 6 and lift off the gear.
9. Remove the 3 screws 2 plus the bolt and nut 3 that fasten the base 5 to the motor 4.
10. To put the motor and emitter together, use the assembly procedure.

Assembly

1. Install the 3 screws 2 plus the bolt and nut 3 that fasten the base 5 to the motor 4. Do not tighten the screws and bolt now.
2. Install the idler gear 6 with the longest hub toward the motor and install the clip.
3. Install the inner cover 8 with the 2 adjusting screws 1 finger tight.
4. Place the photocell assembly 11 on the disk and gear assembly 9 and slide them on the motor shaft.
5. Fasten the photocell assembly with its mounting screw.
6. Center the forms emitter disk in the opening. Do not scratch black paint from around the disk holes. A 0.76 mm (0.030 inch) thickness gauge should slide freely on the upper side of the disk. Check the gap at several points on the disk.
7. Tighten the clamp collar 12 and check the gap.
8. Turn the gears so that a hole in the idler gear aligns with the gear shafts. Then turn the emitter base 5 on the motor so that the gears engage tightly.
9. Tighten the screws and nut, and check play in several positions of the idler gear. Adjust again if needed.
10. Install the outer cover 13.
11. Install the motor and emitter assembly in the printer (126).

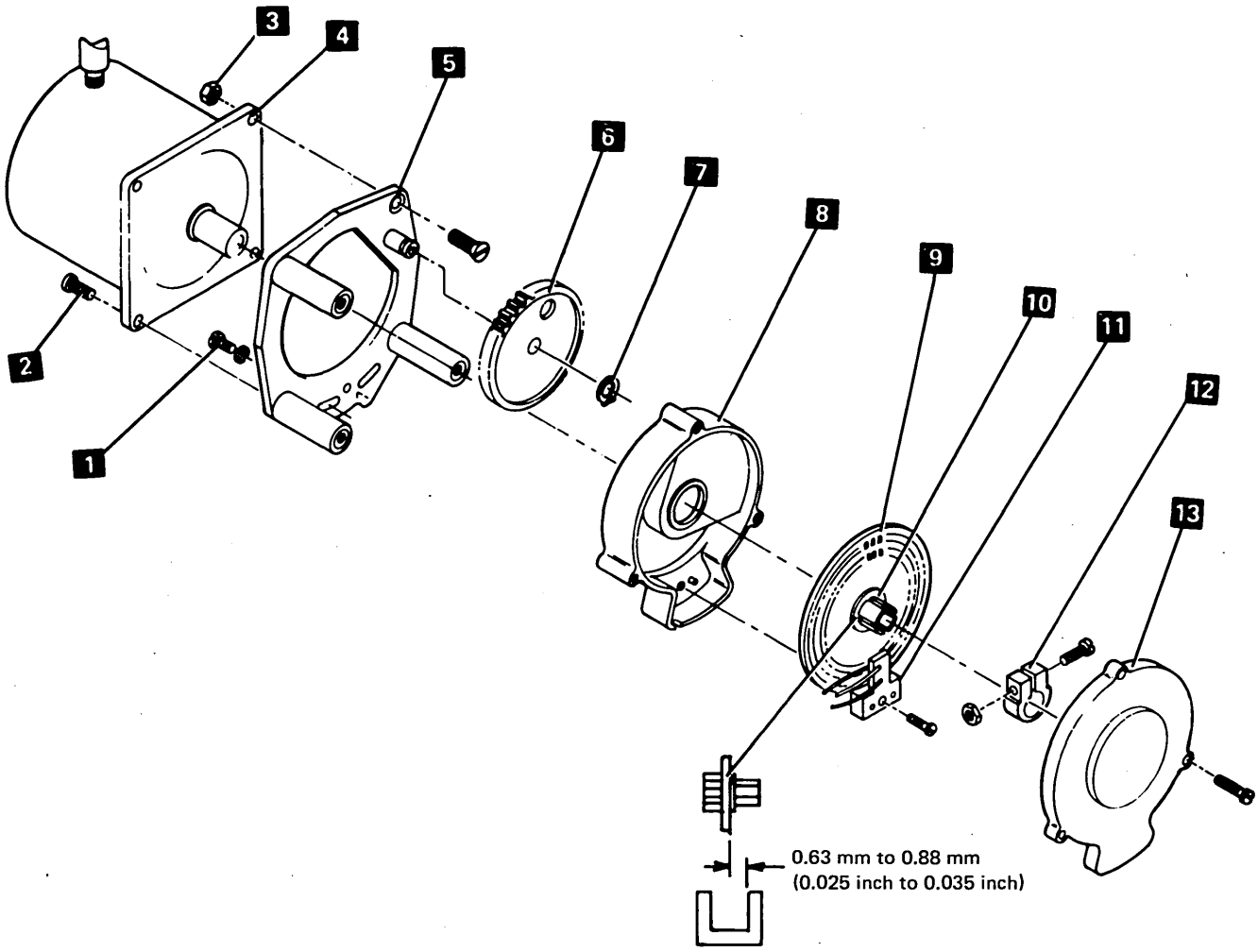
127 FORMS FEED EMITTER DISK

Adjustment

The disk should be centered in the photocell assembly opening for all positions of the disk.

1. Remove the forms motor and emitter assembly (126).
2. Remove the outer cover 13.
3. Loosen the clamp collar 12 and center the disk in the opening. Do not scratch the black paint from around the disk holes. A 0.76 mm (0.030 inch) thickness gauge should slide freely on the upper side of the disk. Check the gap at several points on the disk.
4. Tighten the clamp collar and check the gap.
5. Reinstall the outer cover.
6. Reinstall the motor and emitter assembly (126).

Forms Feed Motor
(rotated 90° clockwise)



128 FORMS MOTOR TO EMITTER TIMING

Service Check

1. Power off.

2. Remove the printer cover (110).

3. Lock the motor by connecting a jumper wire between test points FMA and G7 **2** ('forms motor drive A' to 'ground').
   a. Move the black wire from TPB2-6C to TPB2-3C **3**.
   b. Move the red wire from TPB2-5B to TPB2-6C **3**.

4. Connect the probe power wire (red) to test point C1E18 and the black wire to C1E17 (196).

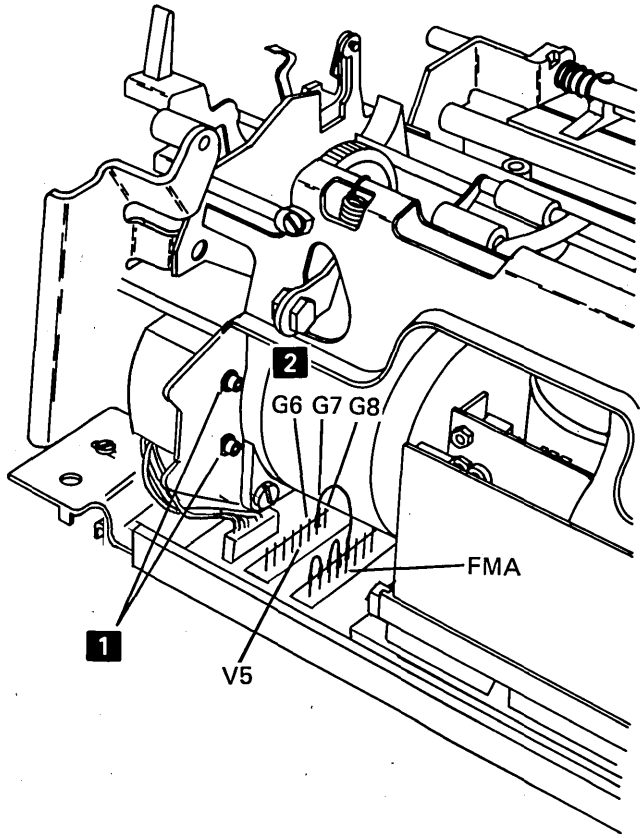
5. Probe B1B1D07 with the probe ground wire on test point G8 **2**.

6. Power on.

7. Verify the adjustment as follows:
   a. At a Platen knob, use a small amount of force in the direction to move the forms up. The probe should remain at the up level when you remove your hand from the Platen knob.
   b. At a Platen knob, use a small amount of force in the direction to move the forms down. The probe should remain at a down level when you remove your hand from the Platen knob.

8. If the timing is not correct, go to the adjustment procedure. Otherwise continue as follows:
   a. Power off.
   b. Move the red wire from TPB2-6C back to TPB2-5B **3**.
   c. Move the black wire from TPB2-3C back to TPB2-6C **3**.

9. Remove the probe and the jumper wire.



Adjustment

1. Do steps 1, 2, and 3 of the service check and return to step 2 in this procedure.

2. Loosen the photocell assembly (2 screws **1** behind the motor) so that the assembly will slide but not move by itself.

3. Connect the probe power wire (red) to test point C1E18 and the black wire to C1E17 (196).

4. Probe B1B1D07 with the probe ground wire on test point G8 **2**.

5. Power on.

6. Slide the photocell down as far as possible.

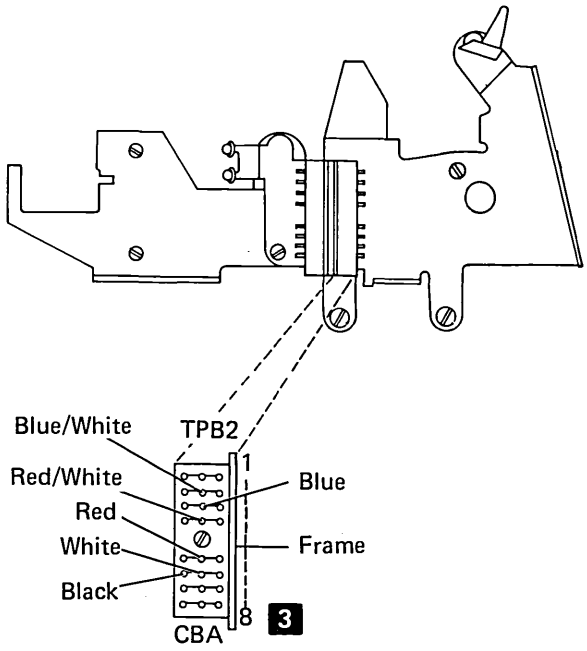
7. Slowly slide the assembly up until the probe up light comes on.

   Note: If the up light is on with the photocell down as far as possible, slide the assembly up until the up light goes off and then comes back on.

   a. Hold the photocell assembly tightly in place and tighten the 2 screws **1**.
   b. Verify the adjustment as follows:
      - At a Platen knob, use a small amount of force in the direction to move the forms up. The probe should remain at the up level when you remove your hand from the Platen knob.
      - At a Platen knob, use a small amount of force in the direction to move the forms down. The probe should remain at a down level when you remove your hand from the Platen knob.
   c. Adjust again if needed.
   d. Power off.
   e. Move the red wire from TPB2-6C back to TPB2-5B **3**.
   f. Move the black wire from TPB2-3C back to TPB2-6C **3**.

8. Remove the probe and the jumper wire.

9. Reinstall the printer covers and forms tractor unit.



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129 A-FRAME

A-frame alignment to the platen is set at the factory and mounting screws are sealed with Loctite[1].

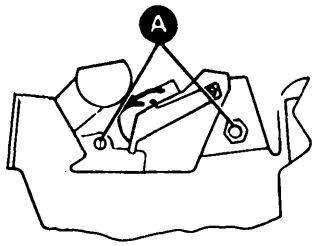
Alignment should not be needed in normal printer use. However, if alignment is needed, use the following procedure:

Service Check

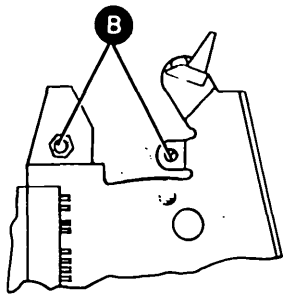
1. Set the Copy Control dial to 0.
2. Run PRT04 (191) and check for uniform printing and density at both ends of the line.
3. Adjust if needed.

Alignment

1. Power off.
2. Remove the printer cover (110).
3. Set the Copy Control dial to 0.
4. Measure the gap between the platen and the print head at both ends of the platen. Gap should be 0.30 mm to 0.36 mm (0.012 inch to 0.014 inch). If the left end dimension is not correct, go to the next step; if the right end dimension is not correct, go to step 9.
5. If the left end dimension is not correct, slightly loosen the 2 A-frame mounting screws in the left side frame (A).



6. With a brass punch and a hammer, tap on the A-frame left side plate to obtain the specified gap.
7. Tightly fasten the A-frame mounting screws (Loctite is not needed), check the gap, and adjust again if needed.
8. Check the gap at the right end of the platen. If the gap is not correct, continue on to the next step. If the gap is correct, install the printer cover (110), power on, and set the Copy Control dial for correct printing.
9. If the right end dimension is not correct, slightly loosen the 2 A-frame mounting screws in the right side frame (B).



10. With a brass punch and a hammer, tap on the A-frame right side plate to obtain the specified gap.
11. Tightly fasten the A-frame mounting screws (Loctite is not needed), check the gap, and adjust again if needed.
12. Check the gap at the left end of the platen. If the gap is not correct, return to step 5. If the gap is correct, install the printer cover (110), power on, and set the Copy Control dial for correct printing.
13. Check platen gear backlash (play) (124) and adjust, if needed.
14. Check the End-of-Forms switch adjustment and correct it if needed.

[1]Trademark of the Loctite Corp.

130 END-OF-FORMS SWITCH

Service Check

1. Set your CE meter to the R x 1 scale.
2. Connect the meter wires to the normally open (N/O) and the common (C) terminals of the switch 1.
3. Insert a 0.076 mm (0.030 inch) thickness gauge between the top of the actuator lever and the bottom of the platen groove. The meter should show that the switch has operated.

   Note: The gauge must be held horizontal and not inserted too far or the indication will not be correct.
4. Check (by operating the Paper-Release lever several times) that the override arm operates the End-of-Forms switch.
5. Adjust if needed.

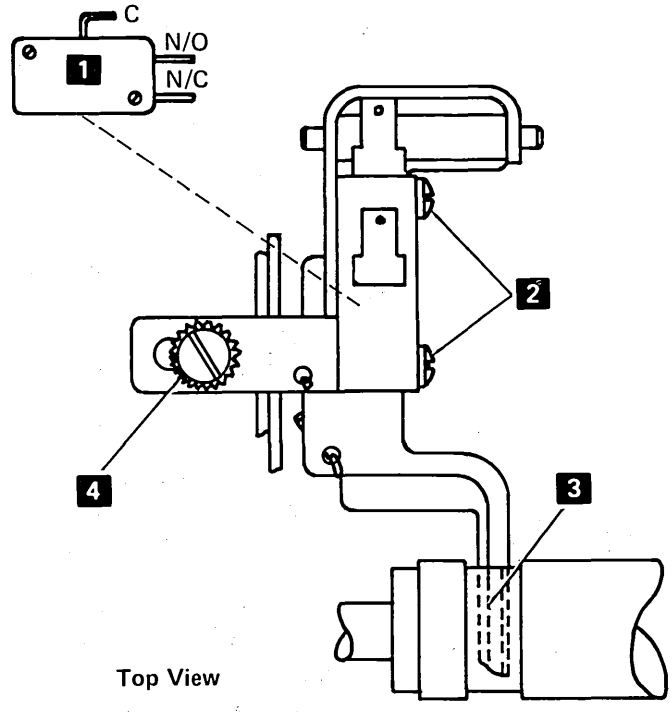
Adjustment

1. Power off.
2. Remove the printer covers (110).
3. Remove the forms tractor unit.
4. Remove the paper deflector and install the platen.
5. Pull the Paper-Release lever toward the platen and leave it there.
6. Check that the switch actuator lever is centered in the platen groove 3. If it is not centered, loosen the switch assembly mounting screw 4 and place the switch assembly in position again. Fasten the screw *tightly*.
7. Set your CE meter to the R x 1 scale.
8. Connect the CE meter leads to the normally open (N/O) and the common (C) terminals of the switch 1.
9. Loosen the 2 switch mount holding screws 8, and move the switch mount 9 toward the front of the printer.
10. Insert a 0.076 mm (0.030 inch) thickness gauge between the top of the actuator lever and the bottom of the platen groove. Slowly push the switch mount toward the rear until the meter indicates that the switch has operated.

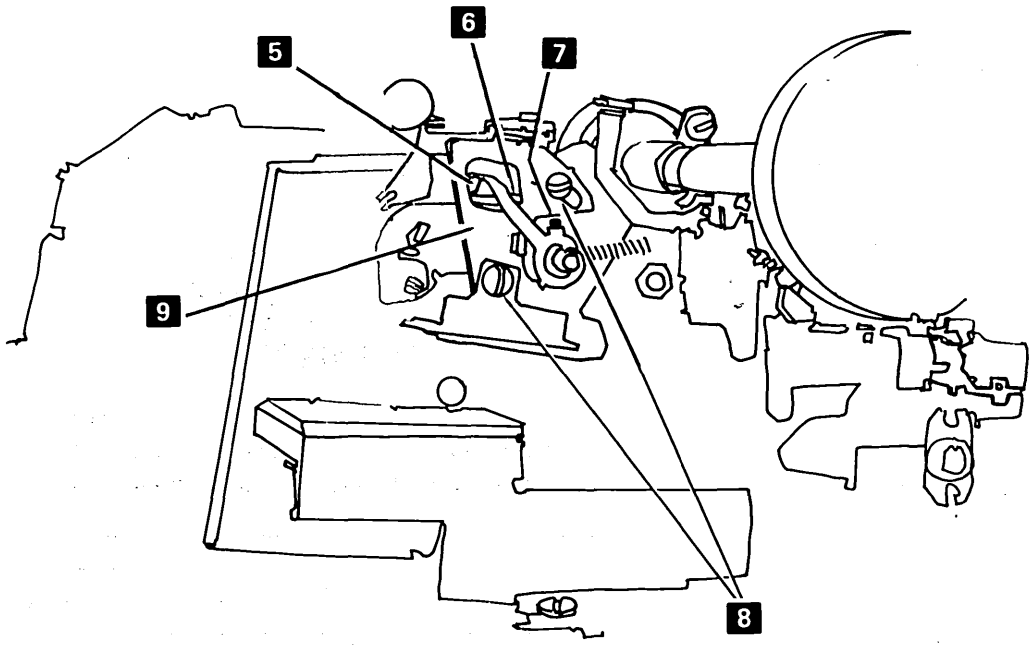
    Note: The gauge must be held horizontal and not inserted too far or the adjustment will not be correct.
11. Tighten the screws 8 and check the adjustment.
12. Remove the platen.
13. Reinstall the paper deflector and the platen.
14. Operate the Paper-Release lever several times to check that the override arm operates the End-of-Forms switch. If the switch operates, skip steps a through e. If the switch does not operate:
    a. Move the Paper-Release lever backward.
    b. Place 0.30 mm to 0.50 mm (0.012 inch to 0.020 inch) of paper between the platen and actuator lever 6.
    c. Loosen the setscrew 7 and move the override arm 5 so that the end of the arm touches, but does not move, the End-of-Forms switch actuator lever 6.
    d. Tighten the setscrew.
    e. Check the adjustment.
15. Reinstall the printer covers (110).

Removal and Replacement

1. Power off.
2. Remove the printer covers (110).
3. Remove the End-of-Forms switch assembly by removing the screw and the lockwasher 4.
4. Remove the switch from the assembly by removing the 2 screws 2.
5. Move the switch leads from the old switch to the new switch (N/C and C) 1.
6. Install the new switch on the assembly and install the assembly on the printer.
7. Adjust the switch.



Top View

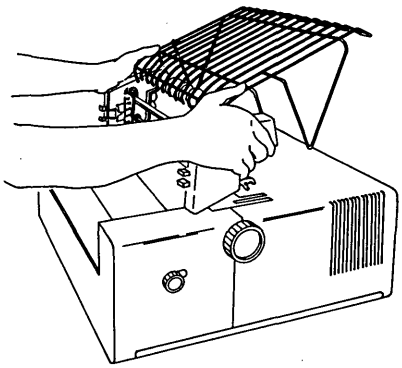


131 FORMS TRACTOR UNIT

Removal and Replacement

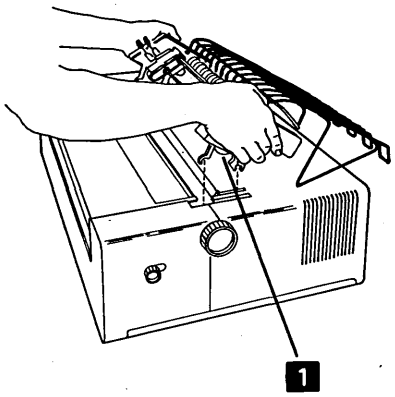
CAUTION
To prevent damage to the rear of the forms tractor unit, *do not remove the tractor unit by lifting the front first.*

1. Remove the unit by pulling up on the rear extensions and letting the unit pivot on the platen shaft.



2. Install the unit by setting it on top of the printer and pressing on the rear extensions to seat the rear legs on the pins. Then, seat the front legs over the platen shaft.

   Note: When reinstalling, ensure that the gears **1** engage correctly and that the platen and the forms tractors turn.

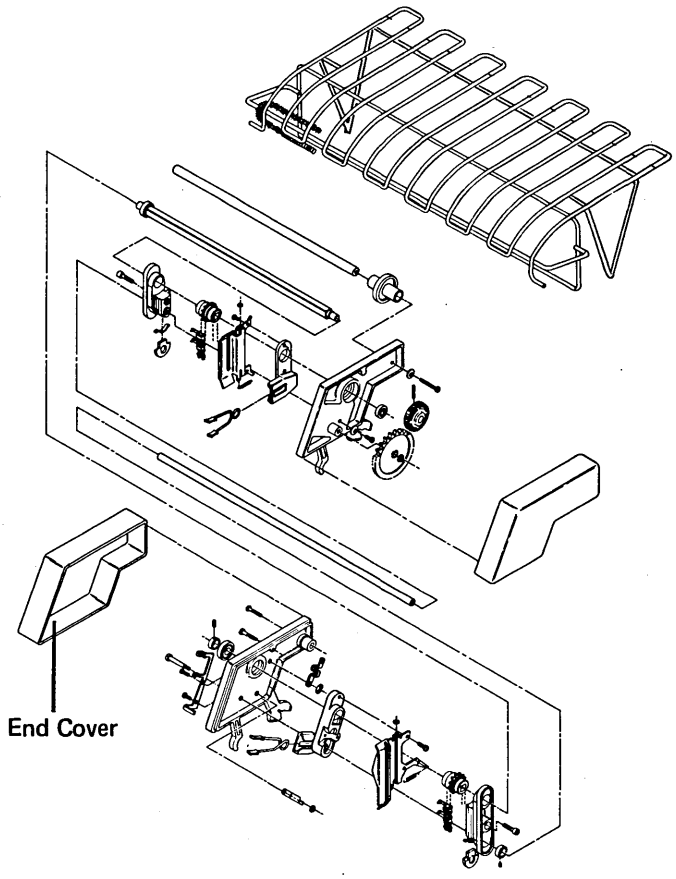


Disassembly and Assembly

1. Disassemble, as needed, as shown in the figure. The end covers are removed by just pulling them off.

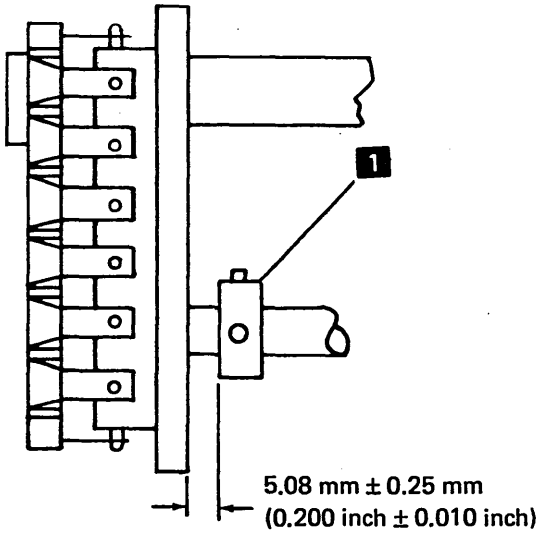
2. When the chain gears are installed, slide the gears together and ensure that the teeth on the gears line up with each other.

3. After assembling the forms tractor unit, check with a CE meter for 0 ohms between the rack and the printer base.



Left Tractor Adjustment

With the left tractor in the leftmost position, adjust the collar 1 so the tractor can move 5.08 mm ± 0.25 mm (0.200 inch ± 0.010 inch).



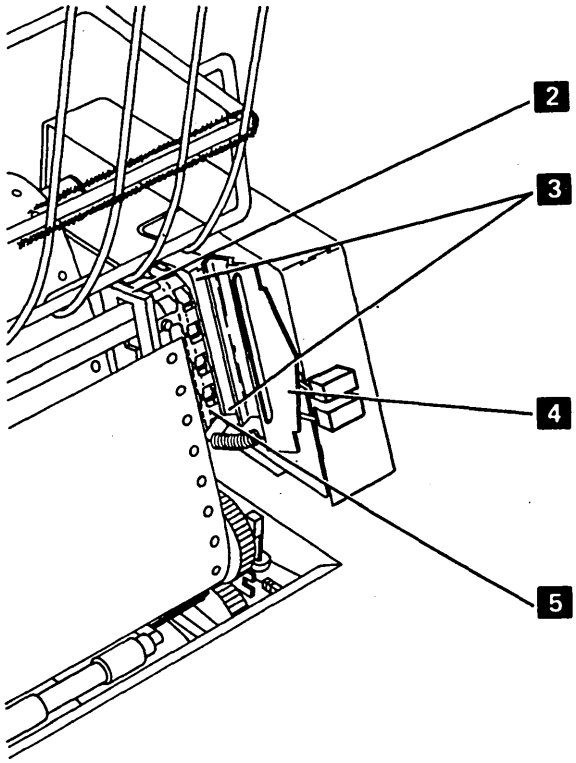
132 FORMS TRACTOR UNIT CHAIN COVER

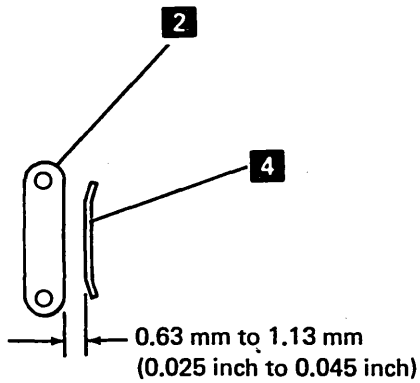
Service Check

Check for 0.63 mm to 1.13 mm (0.025 inch to 0.045 inch) between the chain guide 2 and the cover 4. Adjust if needed.

Adjustment

Bend the cover stops 3 so that the gap between the chain guide 2 and cover 4 is 0.63 mm to 1.13 mm (0.025 inch to 0.045 inch). It might be necessary to put the hinge brackets 5 in another position to obtain this gap.





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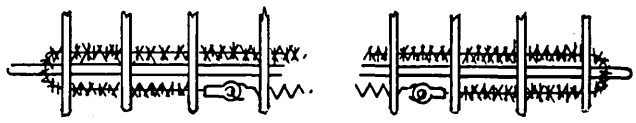
133 FORMS TRACTOR UNIT CHAIN

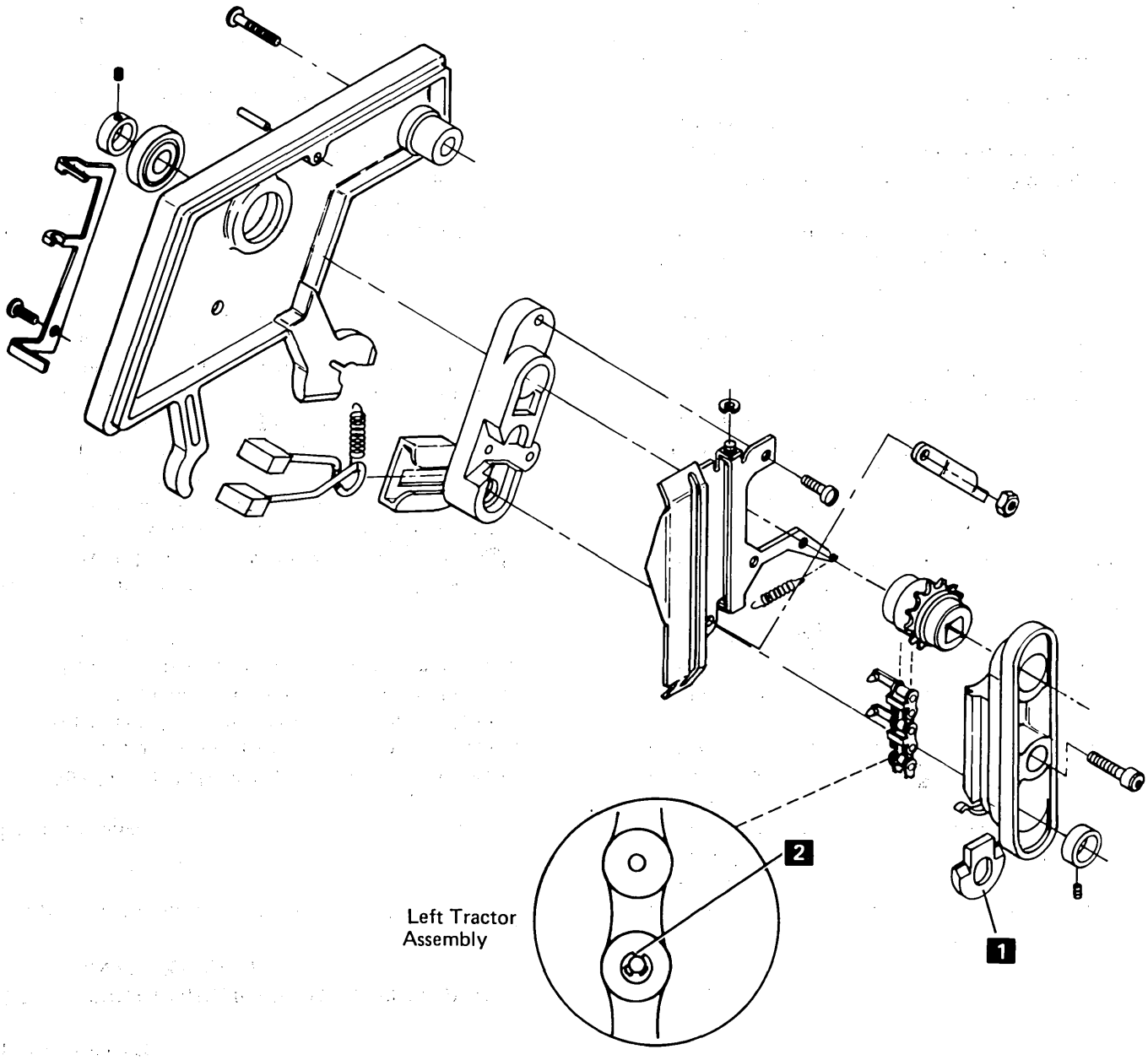
Removal and Replacement

1. Remove the forms tractor unit (131).
2. Locate the pin 2 that holds the chain together. Move the pin to the back side and remove the clip.
3. Slide the removable pin from the chain. The chain tensioner 1 and spring might fall out.
4. To reinstall a chain, reverse the procedure.

134 FORMS GUIDE RACK STATIC ELIMINATOR REPLACEMENT

Install the static eliminator as shown in the front view below.





Print Emitter

140 PRINT EMITTER BOARD TO PICKUP AND AMPLIFIER CARD

The print emitter pickup contains an amplifier.

Service Check

1. Run PRT10 (191). If the test runs OK (with all 2's, or 2's with sometimes a 1 or a 3), no adjustment is needed. If the test fails (prints mostly 1's or 3's or the left margin is not even), continue the service check to determine what part of the emitter is not adjusted correctly.

2. Check the emitter board adjustment as follows:
   a. Turn the Horizontal Fine Adjustment knob 10 counterclockwise as far as it will go (emitter board in the leftmost position).
   b. Move the carrier to the right.
   c. Insert a code plate aligning tool (part 460028) into the left hole 6 in the emitter board.
   d. Check for a gap of 2.46 mm ± 0.13 mm (0.097 inch ± 0.005 inch) between the left side frame and the aligning tool 7.
   e. Perform the adjustment if the gap is not correct.

3. Check the emitter pickup adjustment as follows:
   a. Use the Horizontal Fine Adjustment knob to set a gap of 3.25 mm ± 0.13 mm (0.128 inch ± 0.005 inch) between the aligning tool and the left side frame 9.
   b. Remove the aligning tool from the left hole in the emitter board.
   c. Move the carrier to the left against the side frame.
   d. Try to insert the 2 aligning tools through the emitter pickup and board 4.
   e. Perform the adjustment if the 2 aligning tools cannot be inserted.

Adjustment

1. Adjust the print emitter board as follows:
   a. Separate the printer from power supply board A1 (115).
   b. Turn the Horizontal Fine Adjustment knob 10 fully counterclockwise (emitter in the leftmost position).
   c. Loosen the 2 setscrews 8.
   d. Slide the emitter board as far to the right as possible.
   e. Move the carrier to the right.
   f. Insert code plate aligning tool, part 460028, into the left hole 6 in the emitter.
   g. Slide the emitter board to the left until the gap between the left side frame and the aligning tool is 2.46 mm ± 0.13 mm (0.097 inch ± 0.005 inch) 7.
   h. Tighten the 2 setscrews 8.

2. Adjust the print emitter pickup to print emitter board as follows:
   a. Use the Horizontal Fine Adjustment knob to set a gap of 3.25 mm ± 0.13 mm (0.128 inch ± 0.005 inch) between the aligning tool and the left side frame 9.
   b. Remove the aligning tool.
   c. Loosen the pickup mounting screws 5.
   d. Move the carrier to the left against the side frame.
   e. Insert the code plate aligning tools 4. Do not touch the Horizontal Fine Adjustment knob.
   f. **CAUTION**
      Do not pinch the wires to the emitter pickup.

      With the carrier against the left side frame, tighten the 2 pickup mounting screws.
   g. Remove the aligning tools.
   h. Reinstall the printer on power supply board A1 (115).
   i. Perform the left margin adjustment (143).

Printer Emitter Pickup and Amplifier Removal and Replacement

1. Separate the printer from power supply board A1 (115) and place the printer in the service position.

2. For installation, adjust the left margin (143).

3. Verify that P2A 2 and P2B 1 are connected as shown on the safety cover label; if they are not, record the way they are connected.

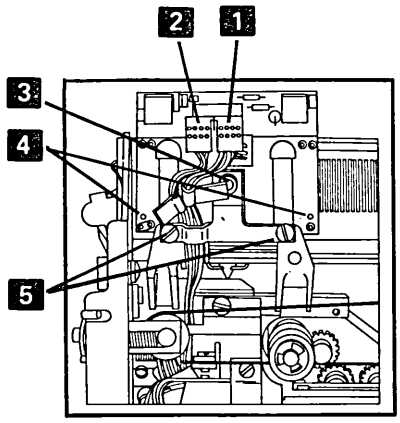
4. Disconnect P2A and P2B.

5. For installation, adjust the print emitter pickup and amplifier card (140).

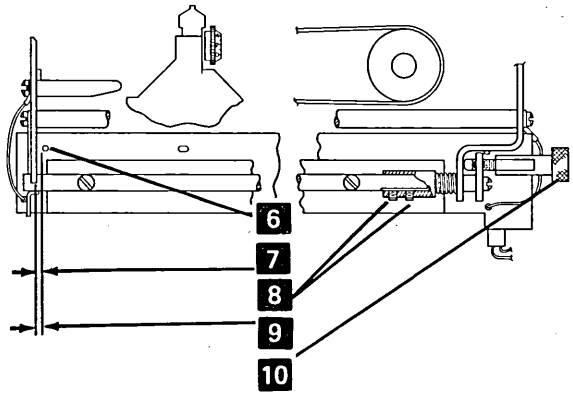
6. **CAUTION**
   The coil spring 3 is released when the pickup mounting screws are removed.

   Remove 2 screws 5 that hold the pickup to the carrier.

7. Reinstall the pickup by reversing this procedure.



Underside View with Printer in Service Position



141 PRINT EMITTER BOARD

Removal and Replacement

1. Power off.
2. Remove the printer covers (110).
3. Disconnect the connector 6 from the circuit card.
4. Remove the hold down bracket 10 from the left side frame.
5. Remove, from the right end of the shaft, the screw 5 that holds the print emitter support shaft. (The Horizontal Fine Adjustment shaft 4 will come off also.)
6. Remove the emitter 7 by pulling the left end out.
7. Reinstall the emitter by reversing this procedure.
8. Lubricate the emitter as shown in the section titled *Preventive Maintenance.*
9. Adjust the print emitter pickup (140), left margin (143), and the print emitter hold down bracket (142).

142 PRINT EMITTER HOLD DOWN BRACKET

Adjustment

Check the hold-down bracket 10 for 2 conditions:

1. There must be no vertical movement of the print emitter board 7.
2. The board must slide freely when the Horizontal Fine Adjustment knob 4 is turned in both directions.
3. Adjust if needed.

143 LEFT MARGIN

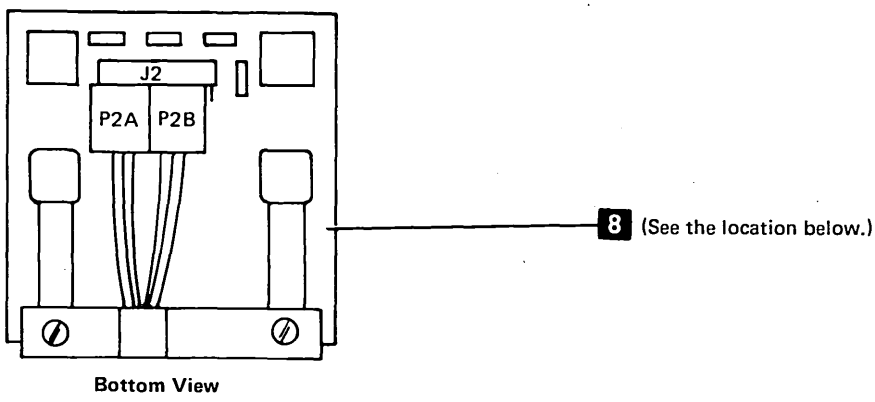
Service Check

1. Run PRT10 (191).
2. Perform the adjustment if numbers other than 2, or a 2 with sometimes a 1 or a 3, appear on the left side of the form.

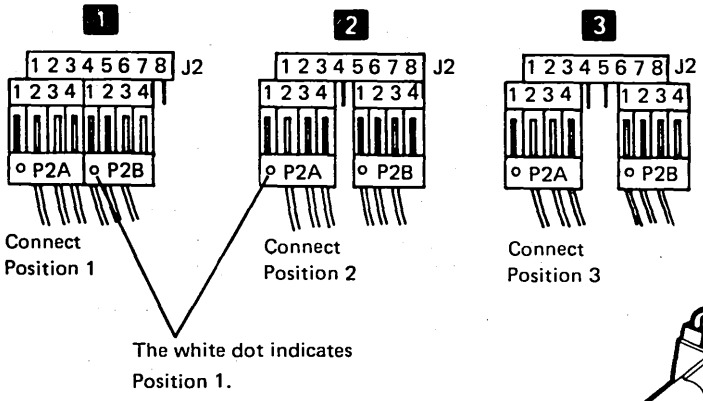
Adjustment

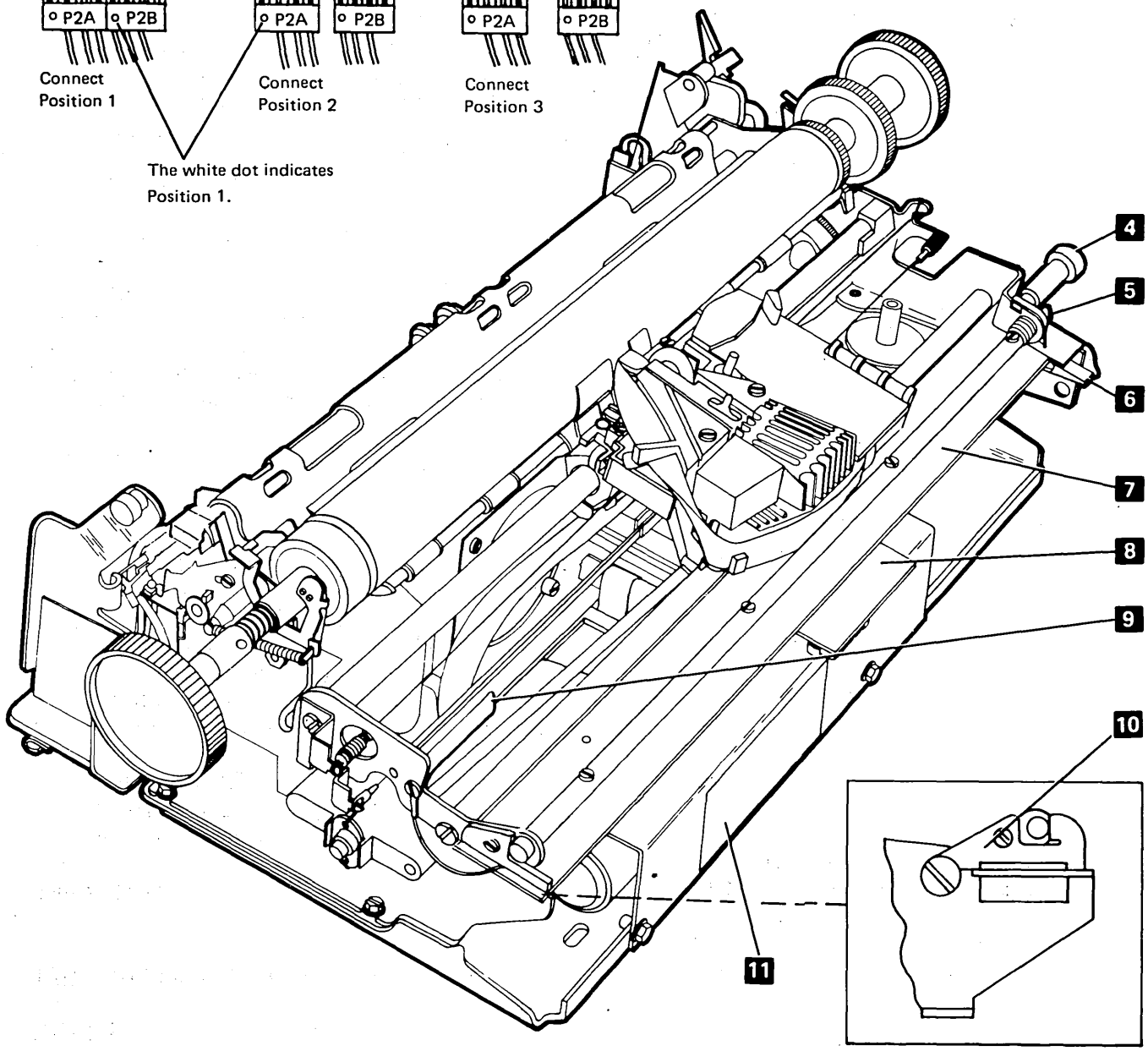
This adjustment is to ensure that the fall of the 'left margin' signal is centered between 2 'print emitter 3' signals.

1. Power off.
2. Remove the printer covers (110).
3. Turn the Horizontal Fine Adjustment knob 4 to the center of its movement.
4. Push the carrier against the left side frame.
5. Using the CE probe, observe the '-left margin' signal by connecting the probe to B1B1B10.
6. Power on.
7. Slowly move the carrier to the right (by turning the motor pulley) until the up light turns on. (Use the Horizontal Fine Adjustment knob to get as near to the shift point as possible.)
8. Mark a point on the knob 4.
9. Observe the '-print emitter 3' signal by connecting the probe to B1A1B08.
10. Check that the down light is not on at first but turns on when the Horizontal Fine Adjustment knob is turned 1/4 turn or more in each direction from the mark.
11. If the down light does turn on, go to the next step. If the down light is on at first, or does not shift as indicated, move plug P2B 8 to another position 1, 2, or 3 (see the label on the safety cover) and return to step 3.
12. Mark the last position of P2B on the label 11.
13. An operating check of the left margin timing can be made by running PRT10 (191).


J2
P2A
P2B
8 (See the location below.)

Bottom View


1
1 2 3 4 5 6 7 8 J2
1 2 3 4 1 2 3 4
P2A
P2B
Connect Position 1
2
1 2 3 4 5 6 7 8 J2
1 2 3 4 1 2 3 4
P2A
P2B
Connect Position 2
3
1 2 3 4 5 6 7 8 J2
1 2 3 4 1 2 3 4
P2A
P2B
Connect Position 3
The white dot indicates Position 1.


4
5
6
7
8
9
10
11

Carrier

150 CARRIER MAIN AND SUPPORT SHAFTS

Service Check

1. The carrier support bearing should be o.025 mm to 0.076 mm (0.001 inch to 0.003 inch) from the support shaft 1.

2. Check the main shaft adjustment as follows:
   a. Insert a strip of carbon paper about 4.7 mm (3/16 inch) wide and 127.0 mm (5 inches) long between the bearing and shaft 5.
   b. Push the carrier so the bearing rolls over the carbon paper.
   c. Check for a smooth, even mark; adjust if needed.

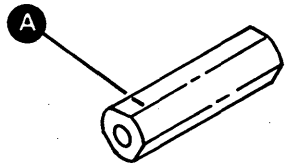
Adjustment

Two adjustments are needed for the carrier. The main shaft is adjusted for full contact of the carrier bearing on the shaft. The carrier bracket support bearing is adjusted for 0.025 mm to 0.076 mm (0.001 inch to 0.003 inch) gap to the support shaft.

1. Remove the printer covers (110).

2. Adjust the carrier support shaft bearing as follows:
   a. Separate the printer from power supply board A1 (115).
   b. Slightly loosen the socket head screw 3 at the end of the bearing eccentric 2. Remove the ribbon drive clutches for access (171).
   c. Turn the eccentric to obtain 0.025 mm to 0.076 mm (0.001 inch to 0.003 inch) gap between the bearing and shaft 1 while pushing on the bottom of the carrier as shown in the figure.
   d. Tighten the socket screw 3 on the end of the bearing eccentric.
   e. Check the gap again and adjust if needed.
   f. Assemble the printer and power supply.

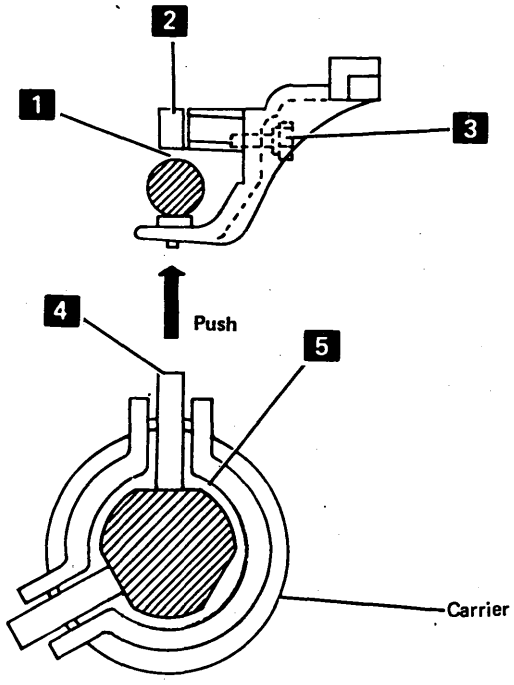
3. Adjust the carrier main shaft as follows:
   a. Loosen the screws at the shaft ends.
   b. Turn the shaft until the full width of the bearing 4 rolls on the flat part of the shaft 5. The mark A on the left end of the main shaft must be up.



   c. Hold the shaft in this position with an adjustable wrench (be careful not to damage the flat part of the shaft) and tighten the screws in the shaft ends.

4. Check the adjustment as follows:
   a. Insert a strip of carbon paper about 4.7 mm (3/16 inch) wide and 127.0 mm (5 inches) long between the bearing and shaft 5.
   b. Push the carrier so the bearing rolls over the carbon paper.
   c. Check for a smooth, even mark; adjust again if needed.

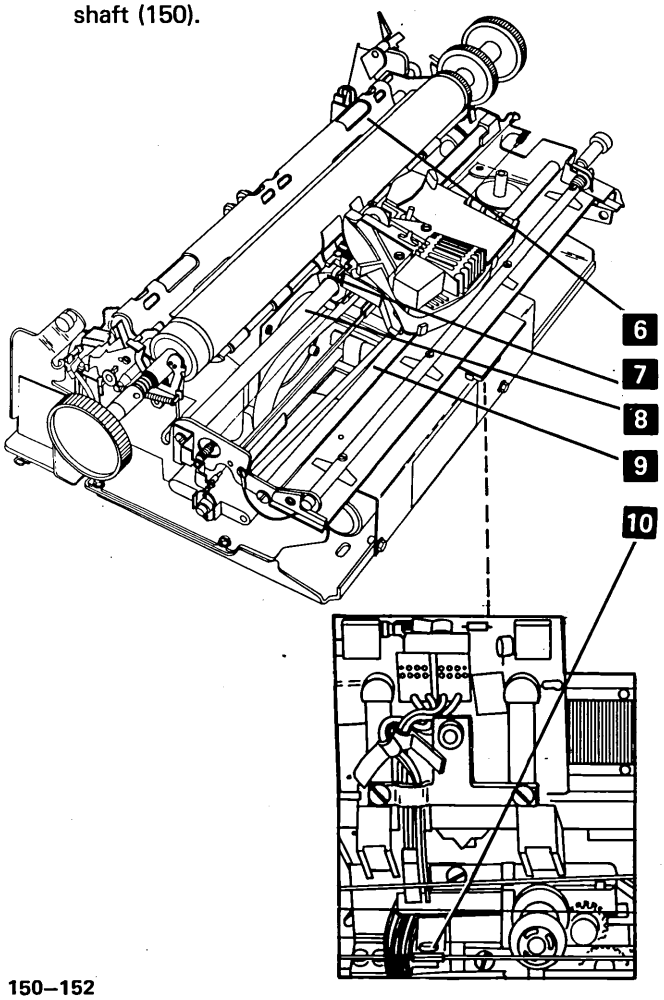
5. Reinstall the printer covers (110).



151 CARRIER SUPPORT SHAFT

Removal and Replacement

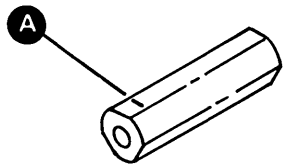
1. Power off.
2. Separate the printer from the power supply (115).
3. Remove the print emitter (141).
4. Remove the carrier drive belt from the motor.
5. Loosen the screws on the end of the carrier hexagonal (main) shaft 8.
6. Remove the screw on each end of the carrier support shaft 9.
7. Separate the side frames enough to free the support shaft.
8. To reinstall the shaft, reverse this procedure.
9. Perform adjustments for the print emitter pickup (140), the left margin (143), and the carrier main shaft (150).



152 CARRIER AND MAIN SHAFT

Removal and Replacement

1. Power off.
2. Remove the covers (110).
3. Remove the print emitter (141).
4. Remove the print head (160).
5. Separate the printer from power supply board A1 (115).
6. Loosen the belt clamp 10 and remove the belt from the motor. For installation, ensure the belt alignment is correct (153).
7. Remove the print emitter pickup (140).
8. Remove the ribbon drive lines (173).
9. Remove the screw from each end of the carrier main shaft 8.
10. Pivot the carrier and main shaft around the carrier support shaft 9 to clear the A-frame 6.
11. Lift the carrier out 7. For installation, ensure the mark A on the left end of the main shaft is up.

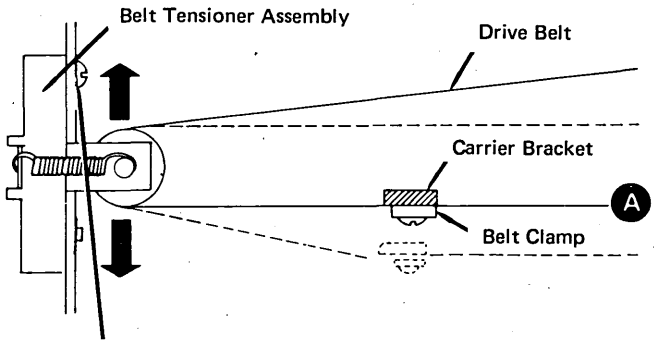


12. Remove the ribbon drive assembly (170).
13. To reinstall the carrier, reverse this procedure. Always check the following items and adjust them if needed:
    a. Carrier main shaft and carrier support shaft (150)
    b. Print head (160)
    c. Print emitter pickup (140)
    d. Left margin (143)

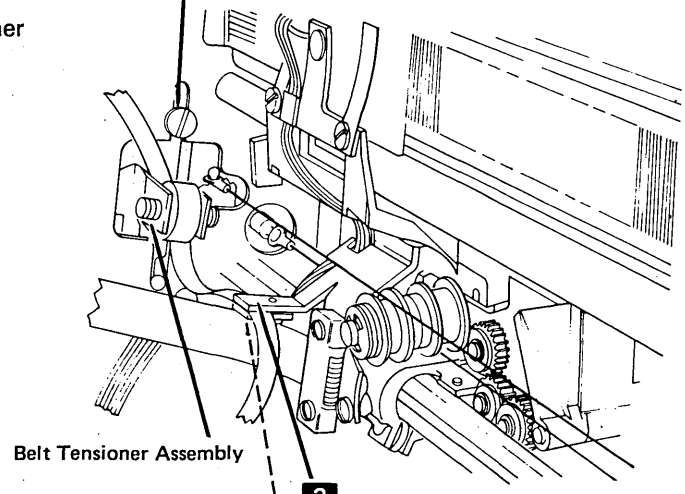
153 BELT TENSIONER ASSEMBLY

Removal and Replacement

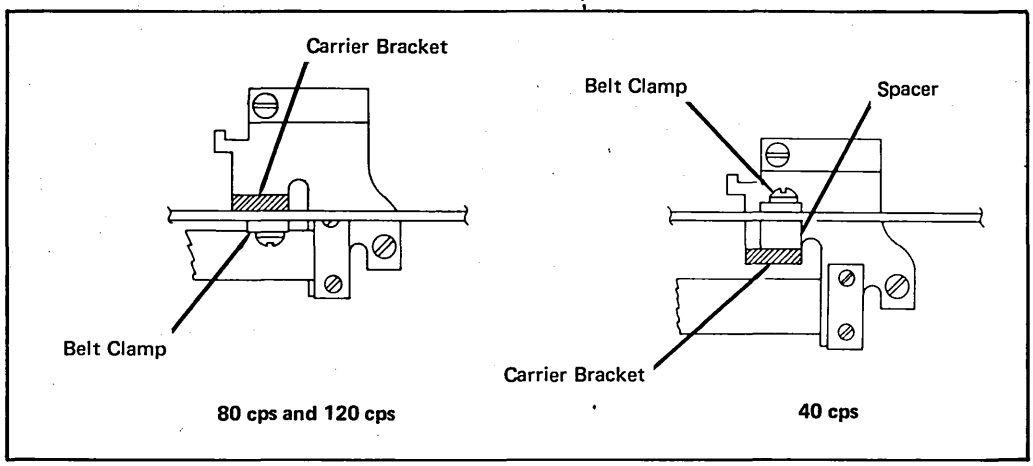
1. Power off.
2. Remove the printer covers (110).
3. Loosen the carrier to belt clamp 2 and slip the belt out of the clamp. For installation, ensure belt alignment A is correct before tightening the clamp 2 and the screw 1.
4. Remove the belt from the motor pulley.
5. Remove the screw 1. Then, remove the tensioner assembly. When reinstalling, do not tighten the screw until alignment is completed.
6. To reinstall, reverse this procedure.



1 Move the belt tensioner assembly to get proper belt alignment as shown at A.



Underside View of Printer in Service Position



154 CARRIER MOTOR AND PULLEY

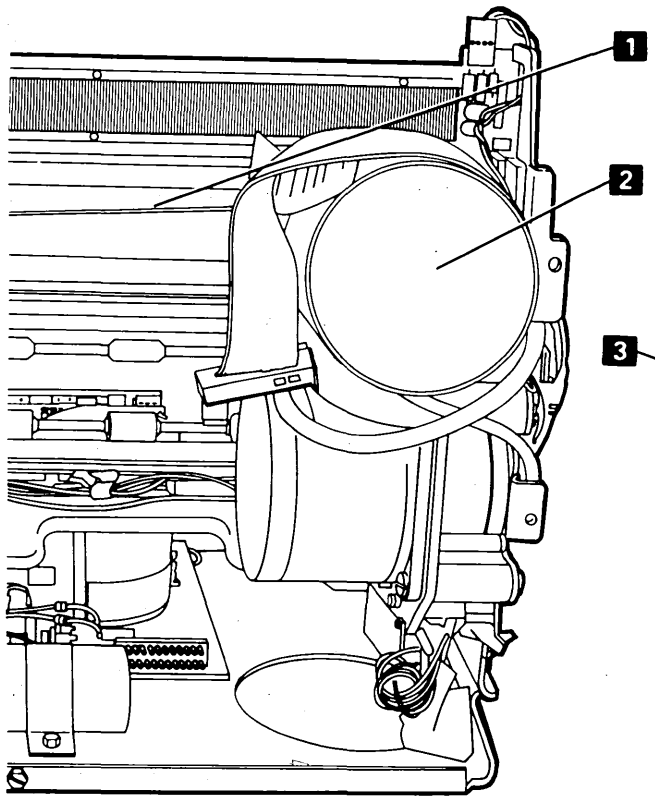
Removal and Replacement

1. Power off.
2. Separate the printer from power supply board A1 (115) and place the printer in the service position.
3. Disconnect the motor leads from TPB1 **3**.
4. Take the belt off the motor pulley **1**.
5. Remove the 2 screws holding the motor **2** to the motor mount.
6. To reinstall the motor, reverse this procedure.

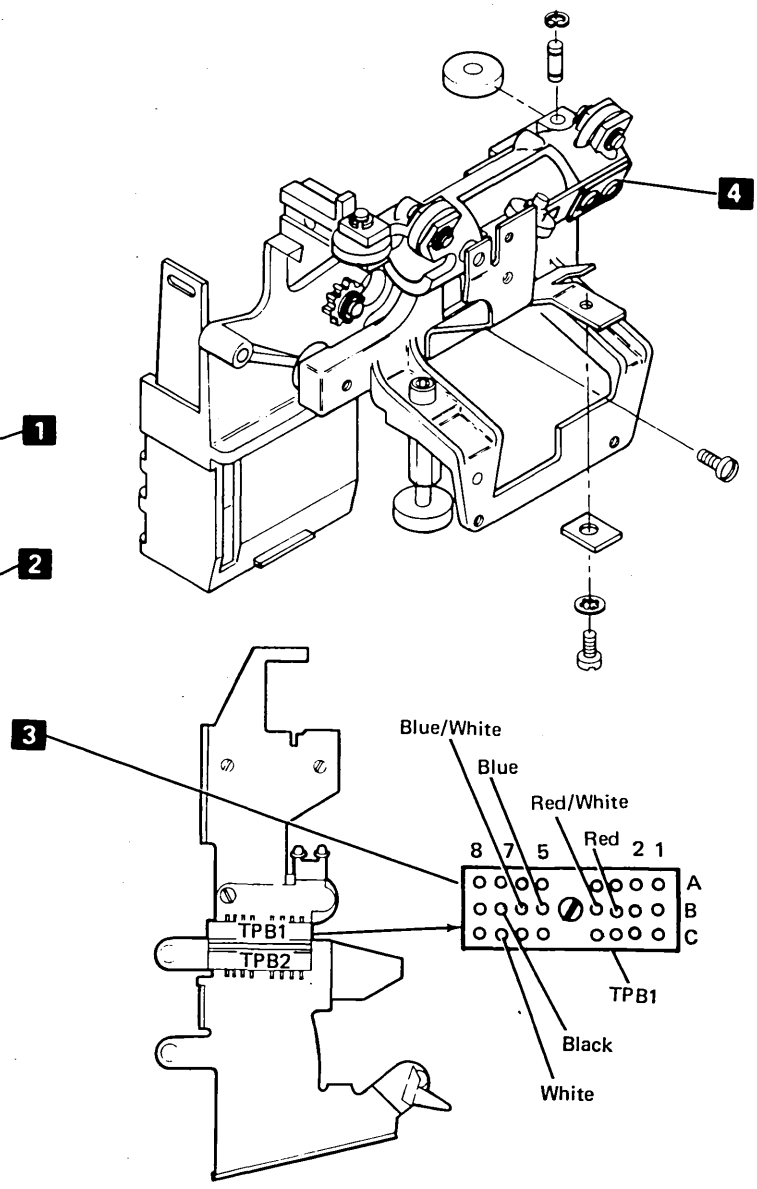
155 CARRIER LEAF SPRING AND BEARING

Removal and Replacement

1. Power off.
2. Separate the printer from power supply board A1 and place the printer in the service position (115).
3. Remove the 2 screws from the leaf spring and bearing **4**. Then, remove the assembly.
4. Reinstall the assembly by reversing this procedure. Ensure the bearing sides are parallel to the flat part of the shaft. (Look through the holes in the left side frame to verify that the parts are parallel.)



Underside View of Printer in Service Position



Service Position (right end view)

Print Head

160 PRINT HEAD

Service Check

1. Remove the printer covers (110).
2. Center the print head on the platen.
3. Remove the print head cover (2 screws) and place the cover and ribbon to the right.
4. Turn the platen so that the center point between the 2 setscrews that hold the right-hand Platen knob points straight up.
5. Set the Copy Control dial 8 to 0.
6. Check that the ends of the print wires are 0.30 mm to 0.35 mm (0.012 inch to 0.014 inch) 6 from the platen; adjust if needed.

Adjustment

1. Perform steps 1, 2, 3, and 4 of the service check; then return to step 2 of this procedure.
2. Position the print head so that the ends of the wires are 0.30 mm to 0.35 mm (0.012 inch to 0.014 inch) from the platen as follows:
   a. Loosen the hold-down 10 and screw 7 on the right of the print head.
   b. Set the Copy Control dial 8 to 0.
   c. Place a 0.35 mm (0.014 inch) thickness gauge between the platen and print head wires
   d. Position the print head in the center of the platen and push the head lightly toward the platen.
   e. Tighten the hold-down 10 and screw 7.
3. Check the adjustment and adjust again if needed.
4. Reinstall the print head cover and tighten the ribbon.
5. Install the printer covers (110).

Removal and Replacement

DANGER
The print head may be very hot after continued use. Always let the head cool before removing it.

1. Power off.
2. Remove the printer cover (110).
3. For new print head installation, put IBM No. 6 oil on the 2 felt washers on the right bar, the bronze block, and rear slide points on the left bar.
4. Push the print head to the ramp position (far left). For installation, push the print head in and out of the ramp position to ensure that the head moves back correctly.
5. Remove the ribbon from the print head and its covers, and place the ribbon to the right.
6. Open the ribbon feed rolls 4 and remove the print head cover (2 screws).
7. For installation, adjust the print head.
8. Disconnect the print head cable from EC3 5.
9. To the right of the print head, remove the screw 7 and hold-down 10 that hold the bronze tabs.
10. To the left of the print head, remove the screw 3 that holds the bronze block.
11. Remove the cover from the oil felt and pull the oil wick from the felt 9. For installation, if there is no oil in the felt, add IBM No. 6 oil and check that the wick touches all 8 print wires 11 or 12.
12. For new print head installation, install the old wick in the new print head 11 or 12.
13. Lift off the print head.
14. For installation, tilt the tip of the head down so that it will slide under the print head forms guide.
15. To reinstall the print head, reverse this procedure.

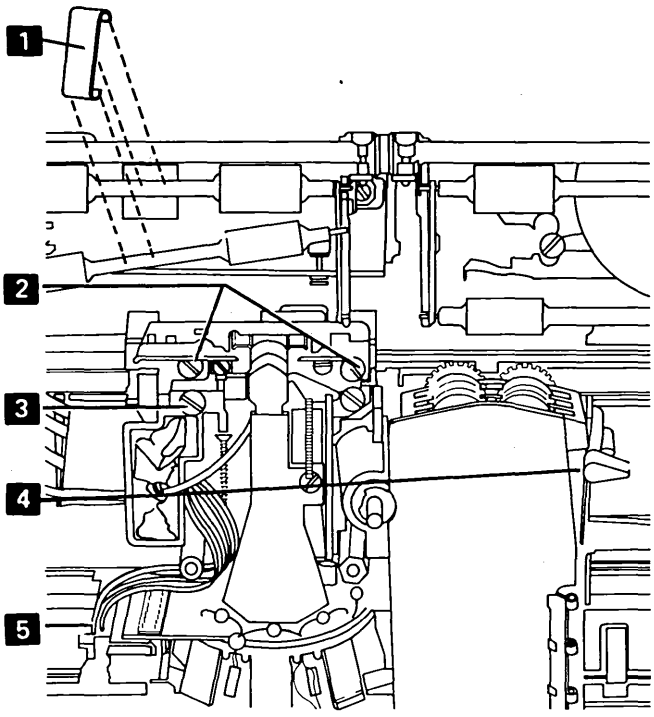
161 PRINT HEAD FORMS GUIDE

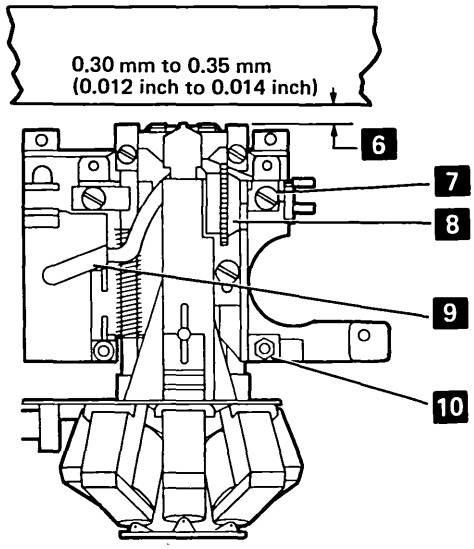
Adjustment

The print head forms guide should be as far as possible from the platen and centered inside the limits of the mounting holes.

Removal and Replacement

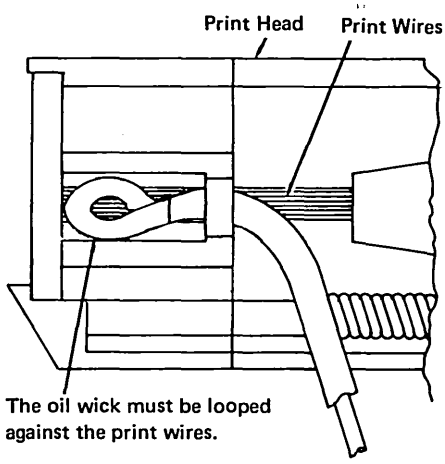
1. Power off.
2. Remove the platen and paper deflector (120).
3. Separate the pressure roll arms and move the end of the left roll shaft 1 away from the platen area.
4. Remove the 2 guide mounting screws 2 and remove the guide.
5. Install the new guide with the screws loose.
6. Center the guide in the mounting holes, press it toward the print head, and tighten the screws.
7. Complete the operation by reversing the first 4 steps.





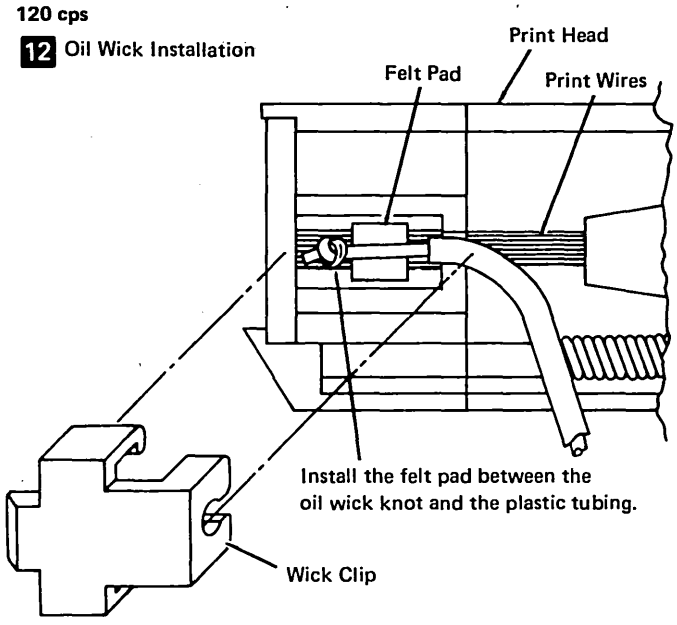
40 cps and 80 cps

11 Oil Wick Installation



120 cps

12 Oil Wick Installation



162 PRINT HEAD CABLE (EC1)

Removal

1. Power off.
2. Remove the printer covers (110).
3. Remove the print head (160). Adjust the print head on installation.
4. Separate the printer from power supply board A1 (115). Observe the cable path to aid in installing the cable.
5. Note how P2B is connected and remove P2A and P2B 1.
6. **CAUTION**
   When loosening the mounting screws for the print emitter pickup, the coil spring 2 is released.

_____

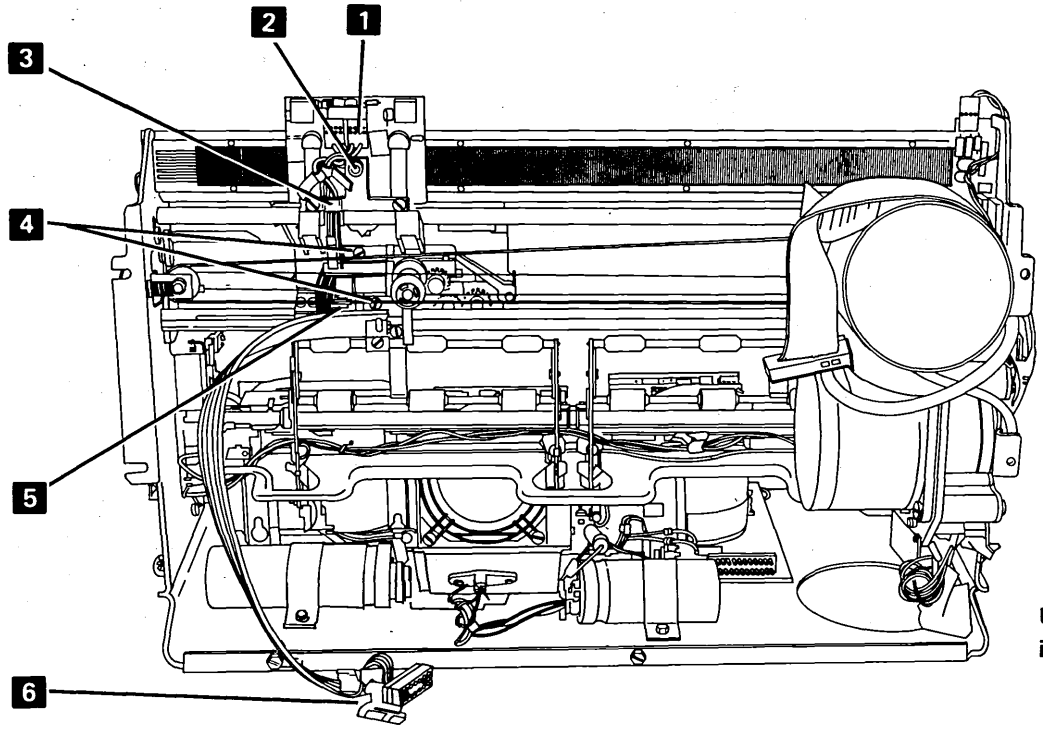
_____

_____

_____

   Loosen the print emitter pickup cable clamp 3. Remove the clamp screw on the left side and remove the wires from under the clamp.

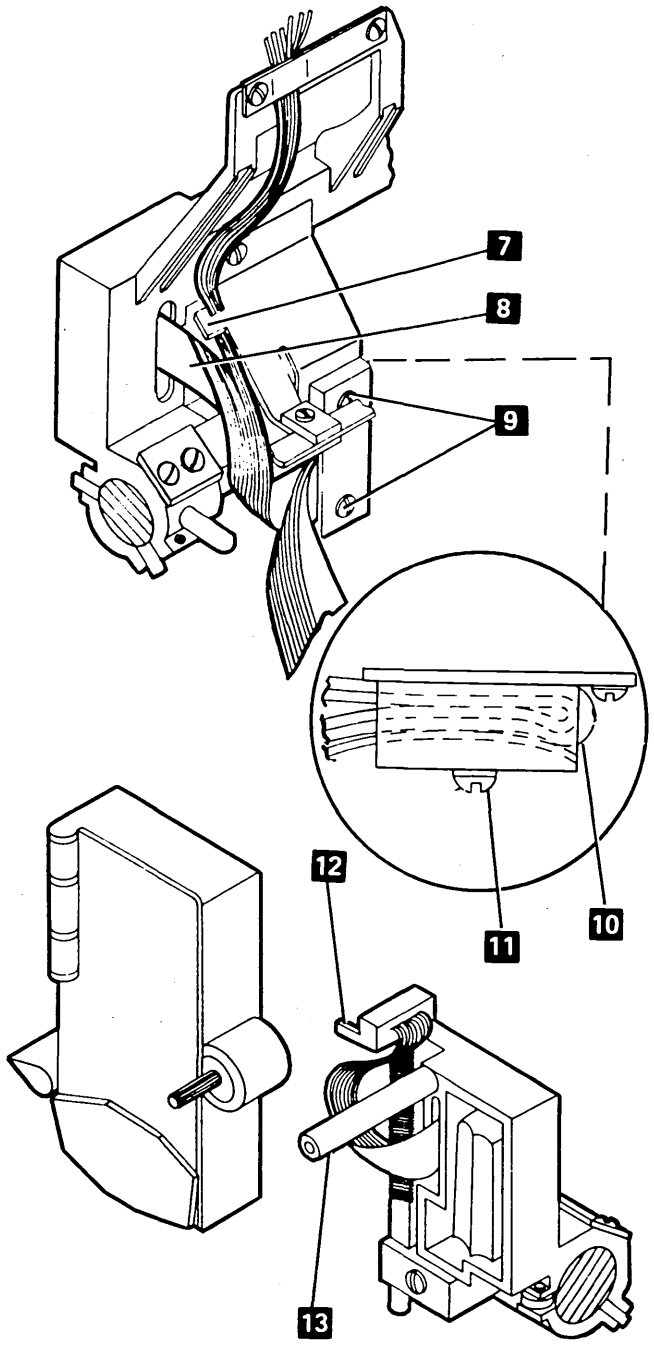
7. Loosen the belt clamp 5. Remove the cable clamp bracket 4 (2 screws).
8. Work the cable out of the holes in the casting 8 and push the connector through the hole.
9. Remove the 2 screws from the cable clamp assembly 9 (the long flat spring with plastic on the ends).
10. Remove the old cable.

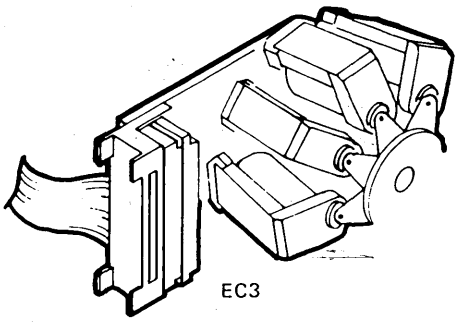


Underside View of Printer in Service Position

Replacement

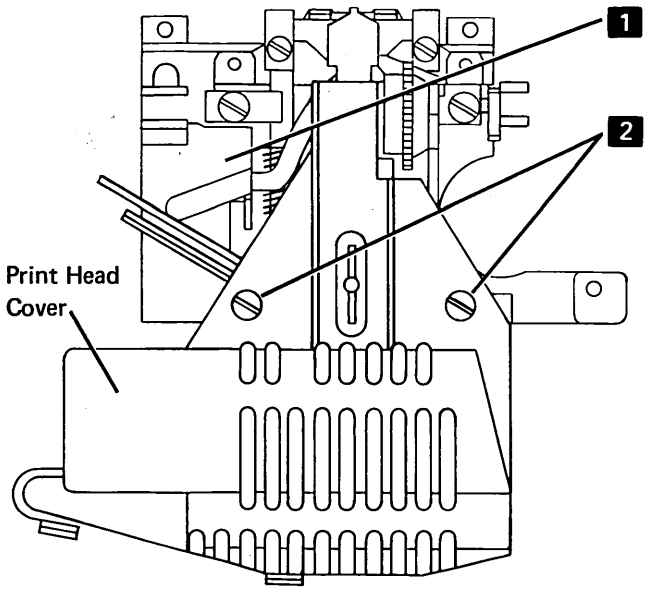
1. Fold the new cable on the mark 10.
2. Attach the cable clamp assembly and cable to the bracket 11.
3. Make a 90° counterclockwise twist in the cable and fold the cable at right angles to the long part of the cable.
4. Place the 2 small parts of the cable in the bracket notch 7 and fold them back.
5. Push the large connector through the hole in the casting and fasten the cable clamp bracket in place (2 screws) 4.
6. Work the cable into the holes so that the locking arms 12 are at the left.
7. Place the 2 small cables under the clamp for the print emitter pickup and install the screws loosely.
8. Form the cable to the flat spring.
9. Form a loop in the cable 6 at the end of the flat spring.
10. Form the print head cable around the head mounting pin 13 before connecting the cable to EC3. The loop must be large enough here so the cable causes no interference with print head movement.
11. Install the print head (160).
12. Install the printer on the power supply (115).
13. Connect P2A and P2B 1.
14. Adjust the print emitter to the pickup (140).
15. Adjust the left margin (143).




EC3

163 OIL FELT SERVICE

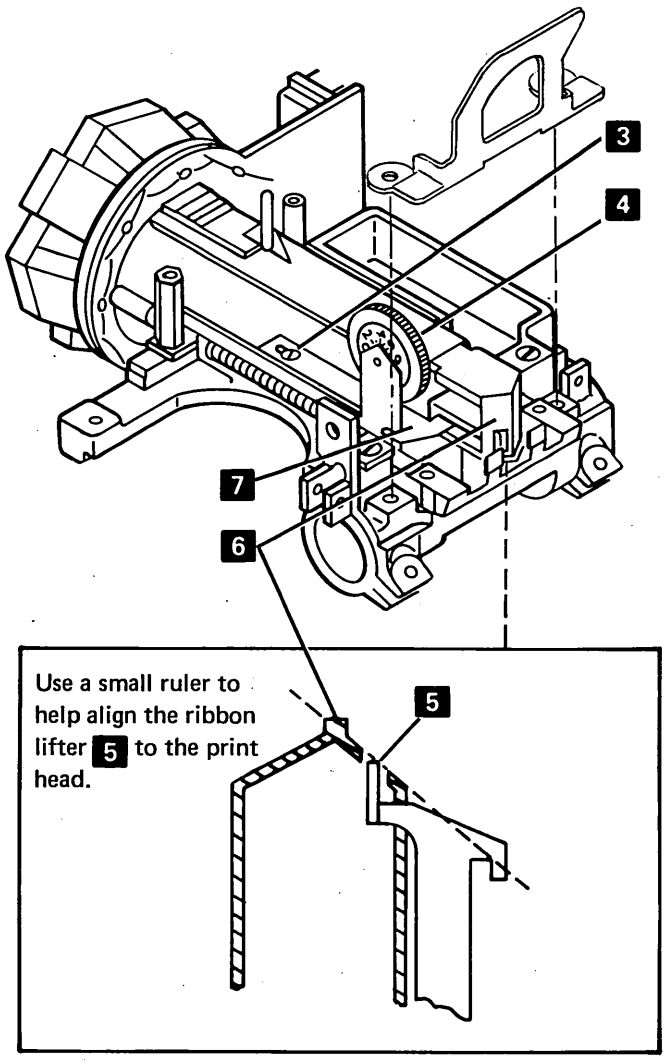
1. Power off.
2. Remove the top cover.
3. Remove the ribbon from its guides and place it on top of the ribbon in the ribbon box. (If the ribbon is worn badly, replace it.)
4. Remove the print head cover (2 screws) 2.
5. Remove the plastic cover from the oil felt 1.
6. Soak the felt with IBM No. 6 oil.
7. Complete the procedure by reversing the first 5 steps.



164 PRINT HEAD RIBBON LIFTER

Removal and Replacement

1. Power off and remove the top cover (110).
2. Remove the print head (160). Adjust the print head during installation.
3. Remove the screw 3 and the ribbon lifter 7.
4. When installing, adjust the tip of the lifter 0.00 mm to 0.05 mm (0.000 inch to 0.002 inch) 5 behind the tip of the print head 6 when the Copy Control dial 4 is set to 8.
5. Complete the procedure by reversing the first four steps.



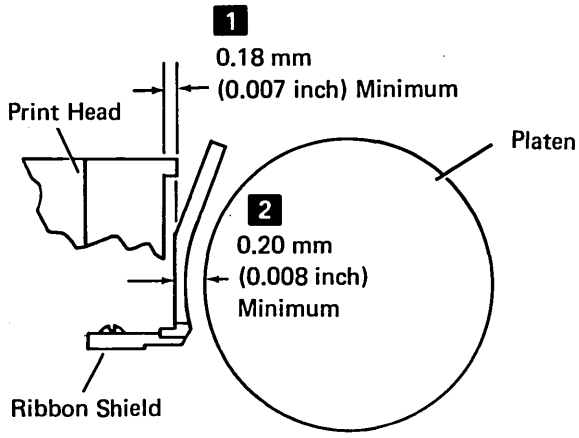
165 PRINT HEAD RIBBON SHIELD

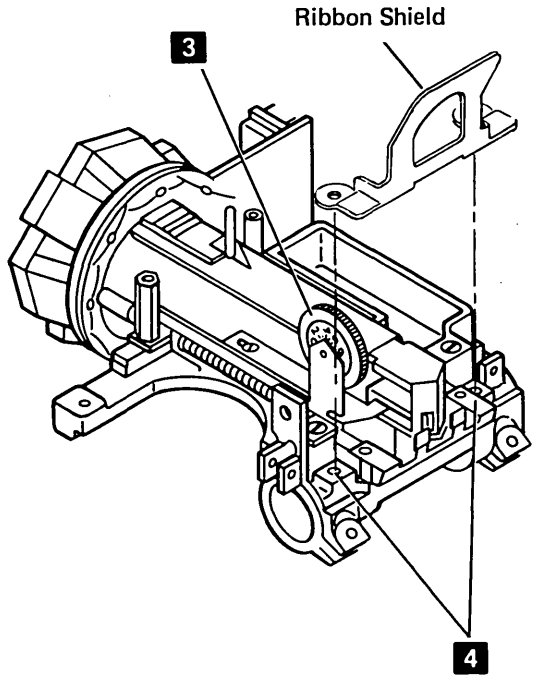
Service Check

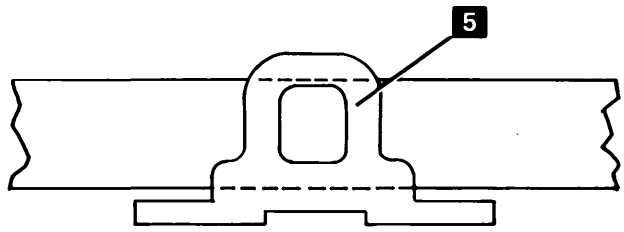
1. Power off.
2. Open the top cover.
3. Remove the paper deflector (120).
4. Remove the print head forms guide (161).
5. Open the ribbon feed rolls.
6. Check that the ribbon tracks below the bottom of the opening in the ribbon shield 5; remove the ribbon from in front of the print head.
7. Check for a 0.18 mm (0.007 inch) minimum clearance 1 between the ribbon shield and the print head so the ribbon can be installed.
8. Install the platen without the paper deflector.
9. Check for a 0.20 mm (0.008 inch) clearance between the ribbon shield and the platen 2; adjust if needed.

Removal, Replacement, and Adjustment

1. For removal, perform steps 1 through 6 of the service check; then, return to step 2 of this procedure.
2. Remove the 2 screws 4 and replace the ribbon shield. For adjustment only, loosen but do not remove the screws.
3. Install the platen without the paper deflector.
4. Set the Copy Control dial 3 to 0.
5. Place 0.30 mm to 0.50 mm (0.012 inch to 0.020 inch) of paper or cards (2 or 3 cards) between the ribbon shield and the platen.
6. Push the print head tightly against the paper or cards and tighten the 2 screws 4. This is to ensure correct parallel alignment between the ribbon shield and the platen.
7. Remove the paper or cards. The result should be a minimum of a 0.20 mm (0.008 inch) gap between the ribbon shield and the platen 2.
8. Remove the platen.
9. Assemble the machine by reversing the first 7 steps of the service check.







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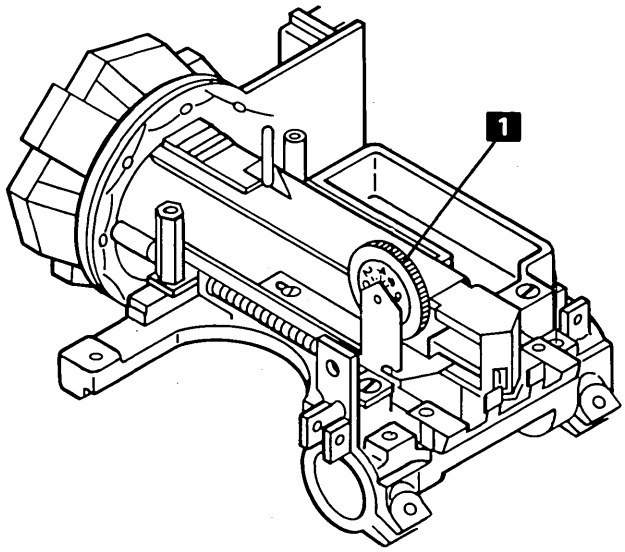
166 COPY CONTROL DIAL

Removal and Replacement

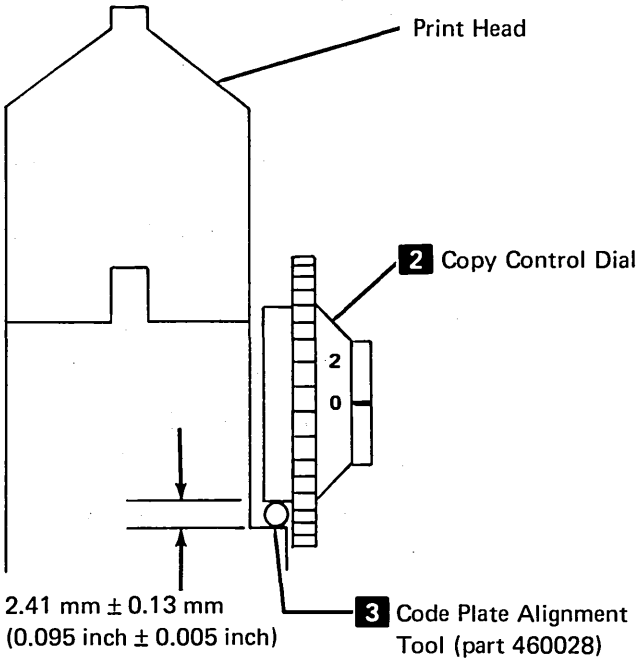
1. Remove the print head ribbon lifter (164).
2. Tilt the assembly away from the print head and remove the screw 1 that holds the dial.
3. Complete the operation by reversing the preceding steps.

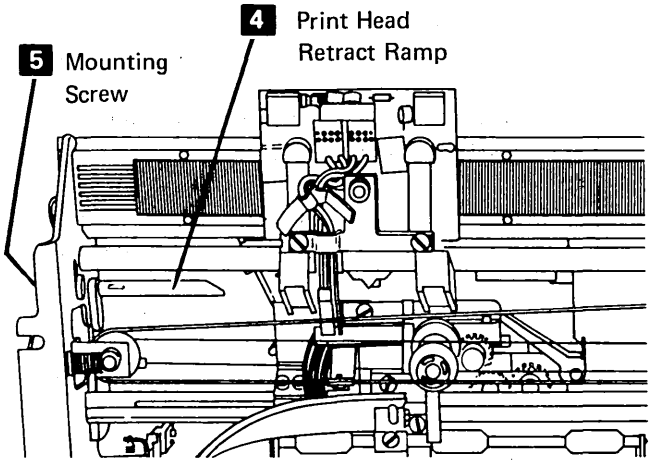


167 PRINT HEAD RETRACT RAMP

Adjustment

1. Power off.
2. Remove the printer front cover (110).
3. Loosen the 2 retract ramp mounting screws 5 slightly.
4. Move the carrier against the left side frame.
5. Set the Copy Control dial 2 to 0.
6. Position the retract ramp 4 so that the Copy Control dial is 2.41 mm ± 0.13 mm (0.095 inch ± 0.005 inch) from the print head housing. Use a code plate alignment tool (part 460028) as shown 3 to measure this setting. Tighten the 2 screws.
7. Complete the procedure by reversing steps 1 and 2.





Underside View of Printer in Service Position

Ribbon Drive

170 RIBBON DRIVE

Removal and Replacement

1. Power off and remove the printer covers (110).
2. Remove the print head (160). Adjust the print head during installation.
3. Separate the printer from power supply board A1 and place the printer in the service position (115).
4. Remove the ribbon drive lines 7 (173).
5. Remove the screw from the inside of the ribbon box 4.
6. Remove the screw from the left side of the ribbon box beside the feed rolls 1.
7. Lift out the ribbon drive.
8. To reinstall the assembly, reverse this procedure.

171 RIBBON DRIVE CLUTCHES

Removal and Replacement

1. Separate the printer from power supply board A1 and place the printer in the service position (115).
2. Remove the ribbon drive lines 7 (173).
3. Remove the clip from the bottom of the ribbon clutch shaft 6.
4. For installation, when the shaft is held, both clutches should turn clockwise (when seen from the clutch end of the shaft) 8 if you turn them.
5. Remove the clutches and washers 5.
6. To reinstall the clutches, reverse this procedure. Put a little IBM No. 23 grease on the clutch end of the shaft before installing the clutches.

172 RIBBON DRIVE SHAFT

Removal and Replacement

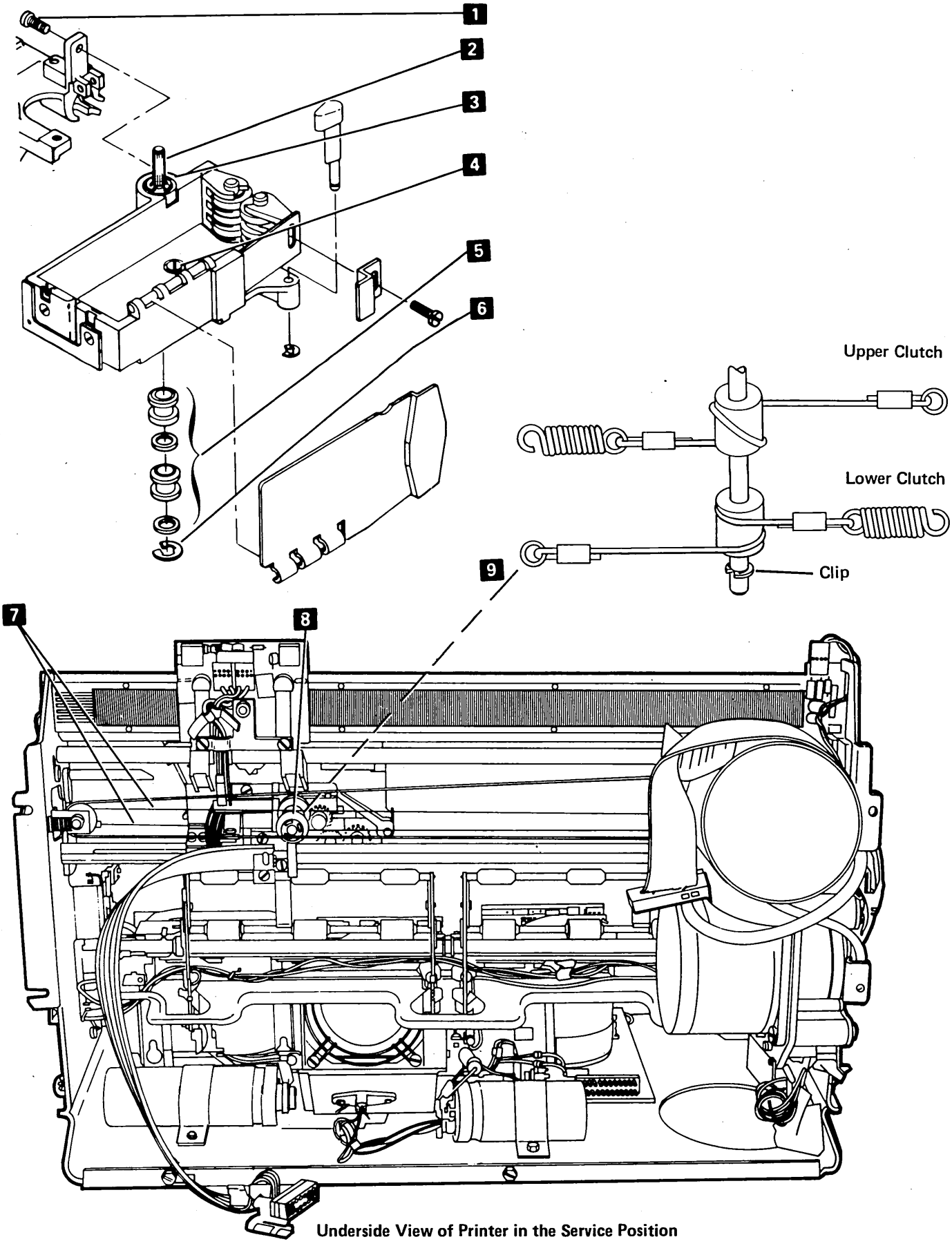
1. Power off and remove the printer covers (110).
2. Remove the ribbon (177).
3. Remove the clip at the Ribbon Advance knob 3.
4. Separate the printer from power supply board A1 and place the printer in the service position (115).
5. Remove the ribbon drive lines (173) and take the drive belt off the motor pulley.
6. Remove the shaft 2 with the clutches 5.
7. Remove the remaining clip 6 and slide the clutches 5 off the shaft.
8. For installation, when the shaft is held, both clutches should turn clockwise (when seen from the clutch end of the shaft) if you turn them.
9. To reinstall the shaft, reverse this procedure.

173 RIBBON DRIVE LINES

Removal and Replacement

1. Separate the printer from power supply board A1 and place the printer in the service position (115).
2. Remove the lines 7 from the clutches 9, but leave the springs attached to the tabs on the right and left brackets.
3. To reinstall, thread the lines so they are parallel to each other and to the carrier main shaft. The line crossovers must be as shown 9.
4. Assemble power supply board A1 to the printer (115).

Note: An aid, when installing the upper line is to use a small amount of adhesive tape to hold the loop around the clutch while attaching the ends to the side frame.



Underside View of Printer in the Service Position

Remove, Replace, Adjust

174 RIBBON FEED ROLLS

Service Check

The right and left feed rolls should be aligned with each other within 0.254 mm (0.010 inch) 1.

Adjustment

1. Power off.
2. Open the top cover.
3. Adjust the feed rolls as follows:
   a. Loosen the screw 3 that holds the right feed rolls.
   b. Open the feed rolls by pushing the flat spring to the right 6.
   c. Position the right feed rolls so that they align with the left rolls 1.
   d. Tighten the screw.

Removal and Replacement

1. Power off and remove the ribbon (177).
2. Remove the right feed rolls as follows:
   a. Remove the screw 3.
   b. Hold the flat spring 6 to the right and turn the feed rolls 5 toward the platen area to free them from the spring.
3. Remove the left feed rolls as follows:
   a. For installation, install the platen and adjust the print head.
   b. Remove the print head (160).
   c. Remove the screw 2 from the left side of the ribbon box.
   d. If the right feed rolls are in place, hold the flat spring 6 to the right and turn the left feed rolls toward the platen.
4. To reinstall the feed rolls, reverse this procedure. Align the right feed rolls vertically to the left rolls 1.

175 RIBBON DRIVE GEARS

Removal and Replacement

1. Power off.
2. Separate the printer from power supply board A1 (115).
3. Remove the clips 11 and remove the gears from the feed roll shafts.
4. Remove the drive shaft 9 (172).
5. Remove the clip 10 and remove the idler gear.
6. Reinstall the gears by reversing this procedure. Put a little IBM No. 23 grease on the gear shafts and on the gear teeth.

176 RIBBON BOX AND COVER

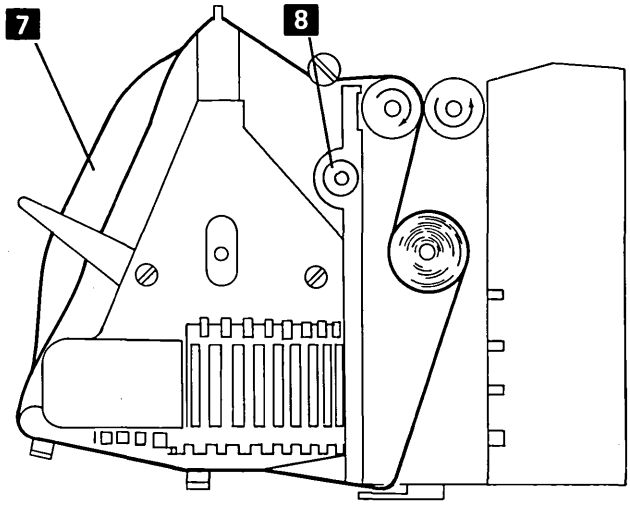
Removal and Replacement

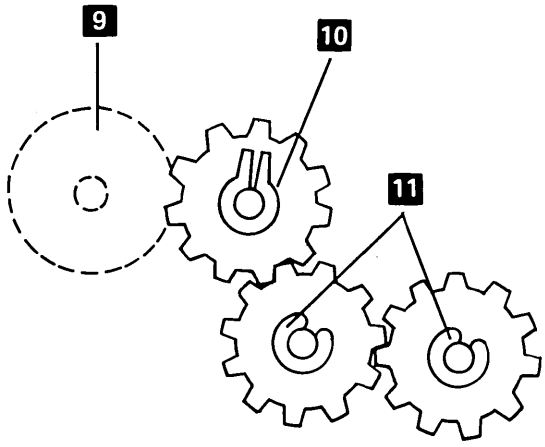
The ribbon box cover can be separated from the box at the hinge.

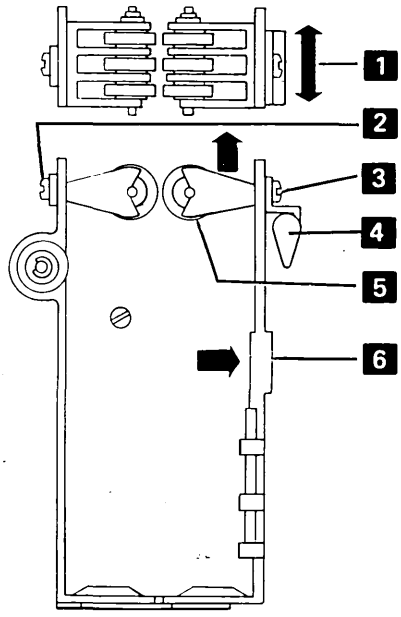
1. Power off.
2. Separate the printer from power supply board A1 and place the printer in the service position (115).
3. Remove the ribbon drive assembly (170).
4. Remove the following parts:
   a. Ribbon feed rolls (174)
   b. Ribbon drive shaft (172)
   c. Ribbon Feed Roll Release knob 4 (it has a clip on the bottom)
4. Assemble the ribbon box and cover by reversing this procedure.

177 RIBBON CHANGING

1. Power off.
2. Open the top cover.
3. Open the ribbon feed rolls 5.
4. Remove and do not save the old ribbon (see the label on the ribbon box cover).
5. Eject a new ribbon into the box by pressing on the disk in the case. Do not save the case and the disk.
6. Pull approximately 254 mm (10 inches) of ribbon from the coil and form a loop.
7. Thread the side of the loop nearest the platen as shown on the ribbon box label. Thread this end just past the print head. Close the feed rolls.
8. Thread the other end of the ribbon as shown. The half twist should now be beside the horizontal guides.
9. Tighten the ribbon by turning the knob 8. Guide the ribbon between the horizontal guides so that 1/4 turn counterclockwise is on each side of the guide.
10. Close the cover and power on.







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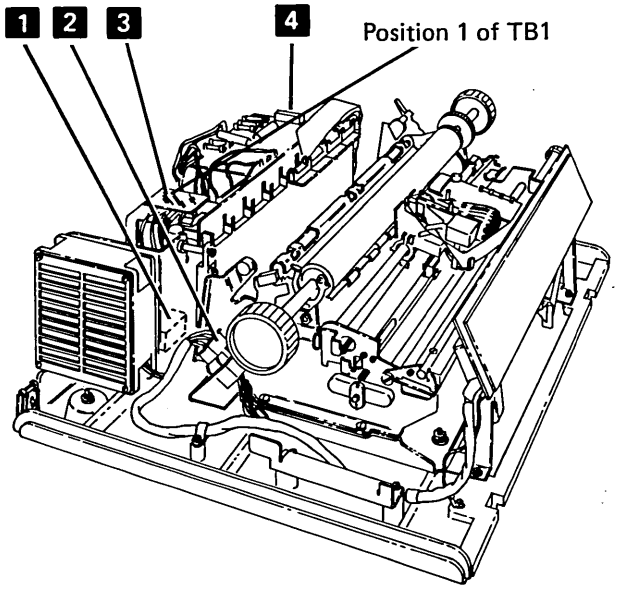
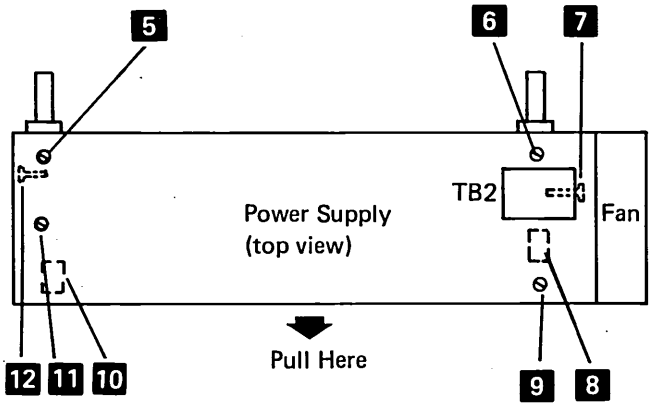
Power and Electronics

180 POWER SUPPLY



Removal and Replacement

1. Power off.
2. Disconnect the line cord.
3. Remove the printer back cover (110).
4. Loosen the shipping screws 7 and 12 seven turns. You may leave them loose except for shipping.
5. Loosen the front clamping screws 9 and 11 one-half turn.
6. Loosen the rear clamping screws 5 and 6 enough to clear the stops 8 and 10.
7. Disconnect J1 2.
8. Remove the TB1 wires 3.
9. Disconnect C1A1 4.
10. Remove the line cord from the terminal block 1. (if a line filter is present, remove phase A from A, neutral from B (189).
11. Support the power supply and remove it from the printer by pulling as shown in the drawing.
12. Reinstall the power supply by reversing this procedure.



Ripple Level Check

The peak-to-peak output ripple level should be less than 3% of the respective DC voltage when measured with an oscilloscope.

181 POWER TRANSFORMER

Removal and Replacement

1. Power off.
2. Disconnect the line cord at the wall outlet.
3. Remove the printer back cover (110).
4. Remove the wires from TB1 [3].
5. **DANGER**
   This AC capacitor might contain enough power to cause a lethal shock or a severe burn. Always discharge the capacitor by placing a screwdriver from each terminal to the case.

   Remove the transformer wires from C12 [4].
6. Remove the transformer wires from terminals E4 through E14 of board C1 [1], [2].
7. Disconnect J1 on the right side of the printer [6].
8. Remove the transformer grounding lead if one is present. Do not remove the wire from E15 on board C1 to the power supply base.
9. Remove the 4 transformer mounting screws. A grounding washer is under the left rear leg [5].
10. Lift the transformer from the power supply.
11. Reinstall the transformer by reversing this procedure.

[1]

Transformer Wires to Board C1A1 (189)

C1	Transformer T1 Wires		
	60 Hz (U.S.)	60 Hz (WT)	50 Hz (WT)
E4	10	14	16
E5	11	15	17
E6	9	13	15
E7	19	23	25
E8	20	24	26
E9	18	22	24
E10	16	20	22
E11	17	21	23
E12	15	19	21
E13	7	11	13
E14	13	17	19

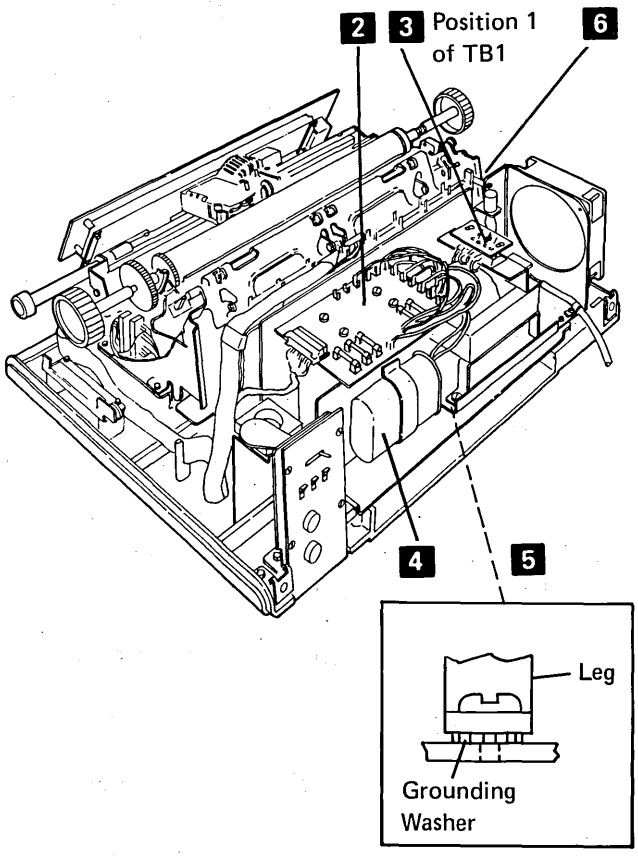
TB1 Connections

60 Hertz (189)

Input Vac	Phase A (From F1)	Neutral	Fans
100	6	7	5 and 8
115	1	4	2 and 3
200	4	7	5 and 8
208	3	7	5 and 8
220	2	7	5 and 8
230	1	7	5 and 8

50 Hertz (189)

Input Vac	Phase A (From F1)	Neutral	Fans
100	7	9	5 and 8
110	6	9	5 and 8
123.5	4	9	5 and 8
200	3	9	5 and 8
220	2	9	5 and 8
235	1	9	5 and 8



182 FANS

Fan B1 Removal and Replacement

1. Power off.
2. Remove the printer covers (110).
3. Remove the platen and paper deflector (120).
4. Disconnect the cables from A1A3 and A1A4 3.
5. Remove card A1B3 2.
6. Remove the fan wires from TB3 1.
7. Remove the 2 screws 4.
8. Slide the fan toward the front of the printer, tilt the fan backward, and remove the fan through the back of the printer.
9. Remove the fan from the bracket. When reinstalling the fan, ensure the air flow direction mark on the fan points *toward* the bracket.
10. Reinstall the fan by reversing this procedure.

Fan B2 Removal and Replacement

1. Power off.
2. Remove the printer back cover (2 screws).
3. Remove the fan wires from TB1 on the transformer 5.
4. Remove the fan 7. When reinstalling the fan, ensure that the air flow direction mark points *away from* the bracket.
5. Reinstall the fan by reversing this procedure.

183 TB2 AND LINE FILTER

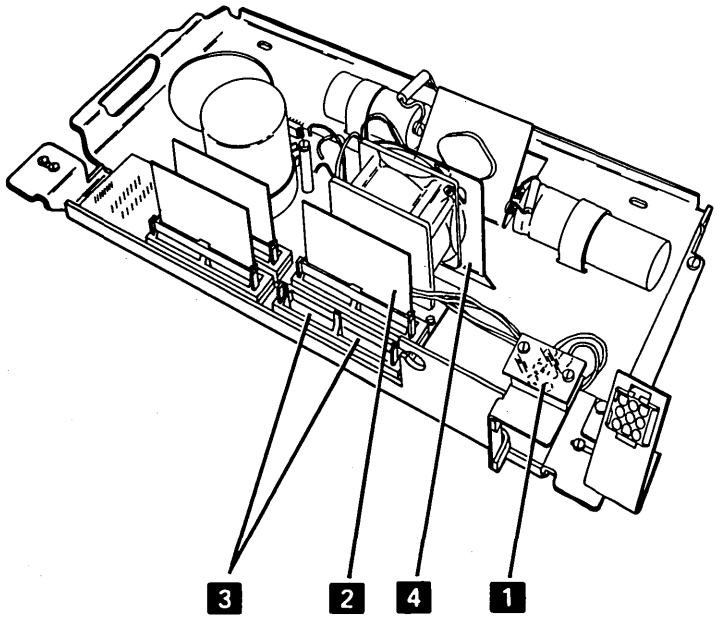
The line filter is not used on all machines.

TB2 Removal and Replacement

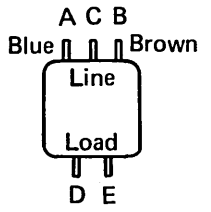
1. Power off.
2. Remove the printer back cover (110).
3. Remove the shield from TB2 6.
4. Remove the line cord wires from TB2 (phase A from 2, and neutral from 1 6) (189).
5. Remove the 2 mounting screws and lift out TB2.
6. Move the remaining leads to the new terminal block.
7. Complete the operation by reversing this procedure.

Line Filter Removal and Replacement

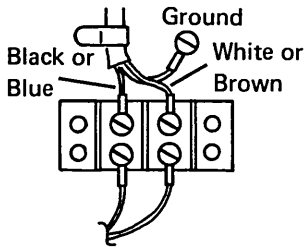
1. Power off.
2. Remove the printer back cover (110).
3. Remove the shield from the line filter 6.
4. Remove the line cord wires from the line filter (phase A from A, neutral from B 6) (189).
5. Remove the 2 mounting screws and lift out the filter.
6. Move the remaining leads to the new filter.
7. Complete the operation by reversing this procedure.



Line Filter (used on some World Trade machines)



TB2

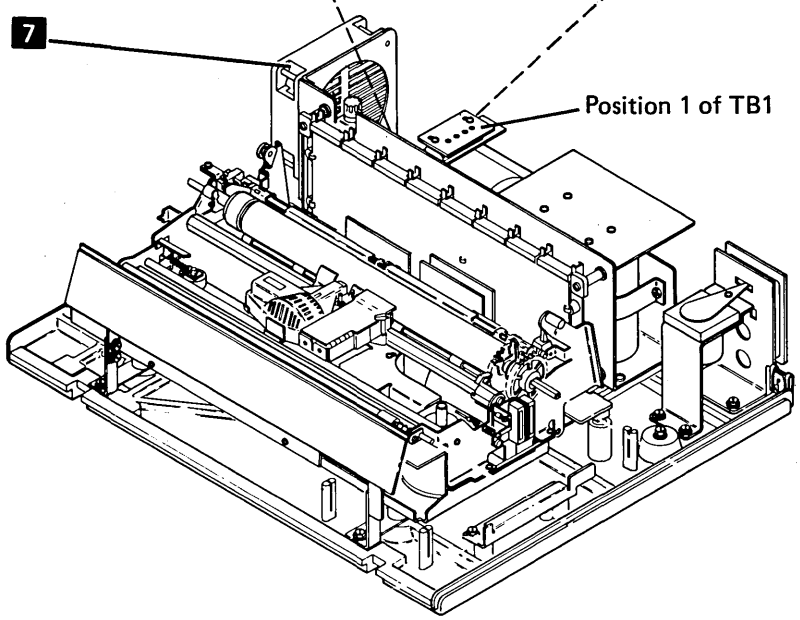


6

Power	Fan B2
60 Hertz, U.S. and Canada	2 and 3
All other countries	5 and 8

5

7



184 POWER ADAPTER BOARD C1 AND CAPACITOR ASSEMBLY

Capacitor Service Check

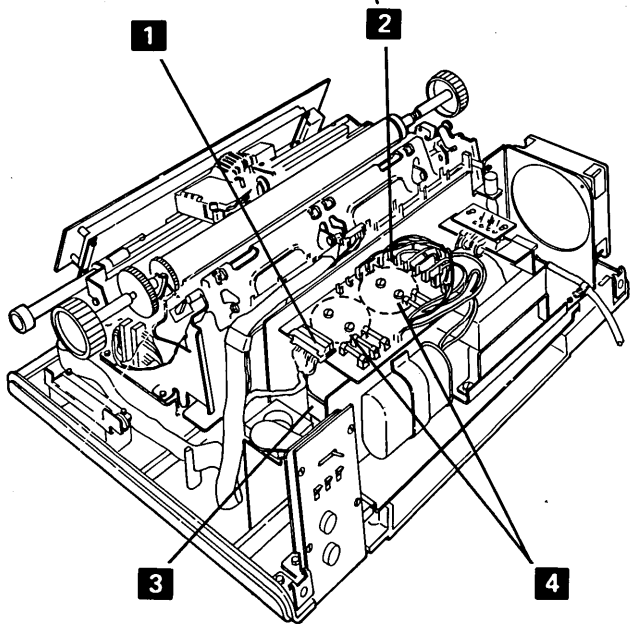
CAUTION
To avoid damage to the CE meter, always discharge the capacitor before connecting the meter wires.

1. Power off.
2. Remove the capacitor from the circuit.
3. Set a CE meter to the R x 100 scale.
4. Place a screwdriver across the capacitor terminals.
5. Connect the meter wires to the capacitor and watch the meter.
6. Reverse the meter wires at the capacitor terminals and watch the meter.
7. If the meter needle moves quickly toward 0 ohms and then slowly toward infinity (∞) each time the meter is connected, or the wires are reversed, the capacitor is OK. If not, the capacitor should be replaced.

Removal and Replacement

1. Power off.
2. Remove the printer back cover (110).
3. Disconnect C1A1 1.
4. Disconnect the wires from E3 through E16 2.
5. Loosen the clamp 3 that holds capacitors C4 and C5 4.
6. Lift the board and capacitors out of the power supply.
7. Reinstall the assembly by reversing this procedure.

C1 Pin	Tranformer T1 Wires			J1
	60 Hz U.S.	60 Hz WT	50 Hz WT	
E3				1
E4	10	14	16	
E5	11	15	17	
E6	9	13	15	
E7	19	23	25	
E8	20	24	26	
E9	18	22	24	
E10	16	20	22	
E11	17	21	23	
E12	15	19	21	
E13	7	11	13	
E14	13	17	19	
E15				5
E16				6



185 AC CAPACITOR (C12) AND CAPACITOR C3

See 184 for a capacitor check.

C12 Removal and Replacement

1. Power off.
2. Disconnect the line cord from the wall outlet.
3. Remove the back cover (110).

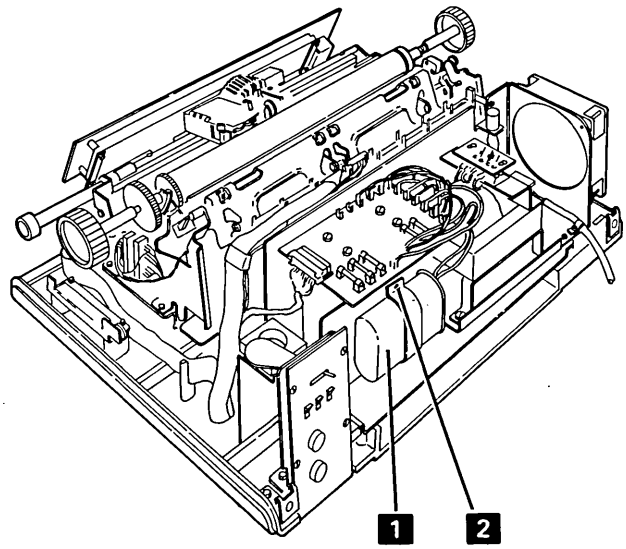
> **DANGER**
> This AC capacitor might contain enough power to cause a lethal shock or a severe burn. Always discharge the capacitor by placing a screwdriver from each terminal to the case 1.

4. After discharging the capacitor, remove the leads.
5. Loosen the capacitor clamp 2 and remove the capacitor.
6. Reinstall the capacitor by reversing this procedure.

C3 Removal and Replacement

See 184 for a capacitor check.

1. Remove the power supply board A1 (186).
2. Note the polarity connections. Then, remove the 2 capacitor connecting screws 4 on the bottom of power supply board A1.
3. To replace the capacitor, reverse this procedure. Position the capacitor as far to the rear as possible.



186 POWER SUPPLY BOARD A1 AND CABLE

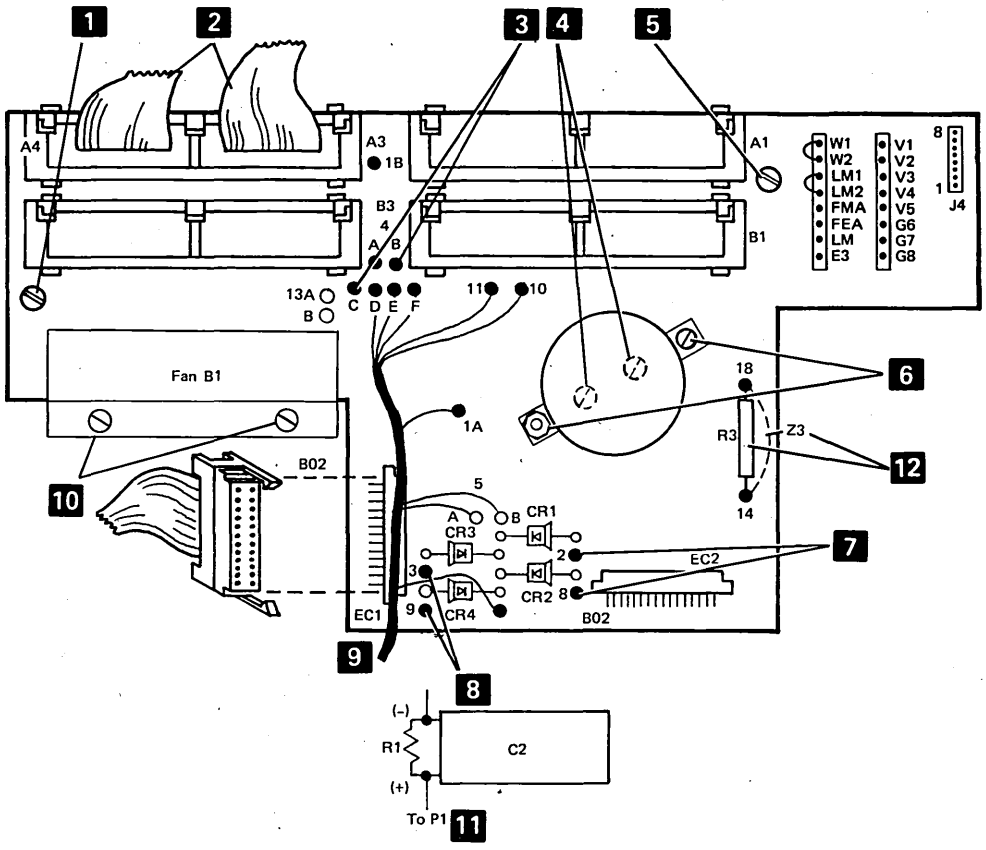
Removal and Replacement

1. Power off.
2. Separate the printer from power supply board A1 (115).
3. If the cable is not being installed with the board, disconnect the transformer wires from the board:
   a. Black from points 4B, and 4C 3.
   b. Blue from points 3 and 9 8.
   c. Red from points 2 and 8 7.
4. If the cable is being installed with the board:
   a. Disconnect P1 at the right end of the printer (seen from the rear).
   b. Disconnect the positive lead from capacitor C2 11.
5. Disconnect and label the capacitor cable leads 9 as shown.
6. Disconnect the cables from A1A3 and A1A4 2.
7. Remove the screw and stud from capacitor C3 6.
8. Remove the 2 screws 10 and move the fan to the side.
9. Remove the 2 screws 1 and 5 and lift the board out.
10. For installation, locate C3 as far to the rear of the board as possible and locate the board as far to the rear of the printer as possible.
11. To reinstall the board, reverse this procedure. Ensure that R3 or Z3 is installed 12.

CAUTION

When installing leads from the capacitors 9, polarity must be correct.

Power Supply Board A1



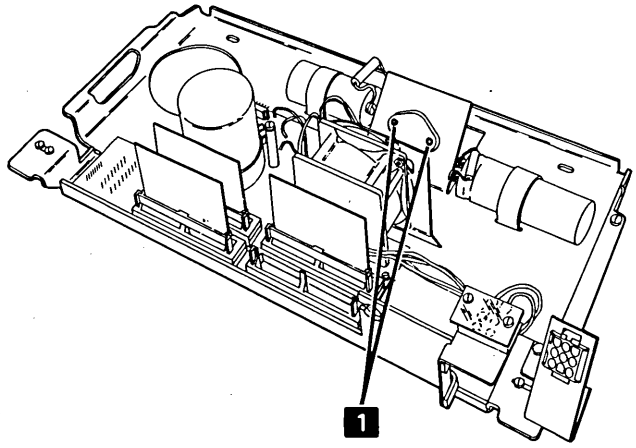
187 TRANSISTOR (Q1)

Service Check

1. Power off.
2. Separate the printer from power supply board A1 (115).
3. Remove the gray safety cover.
4. Disconnect the 3 transistor leads from the pins on board A1 (189).
5. Set up a CE meter to the R x 1000 scale.
6. Measure the resistance in both directions on each pair of leads (collector and base, collector and emitter, and emitter and base).
7. A good transistor has at least 10 times the resistance in one direction as in the other direction for all 3 pairs of leads. (Change the resistance scale if needed to verify the readings.)
8. Reconnect the transistor leads to the pins on board A1 (189).
9. Complete the procedure by replacing the transistor (see below) or by reversing this procedure.

Removal and Replacement

1. Separate the printer from power supply board A1 (115).
2. Remove the gray safety cover.
3. Remove the 2 screws **1** from the transistor.
4. Pull the transistor from the socket. An insulating washer will fall out also.
5. Replace the transistor by reversing this procedure. Always install a new insulating washer with the new transistor.



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188 PLANAR BOARD B1

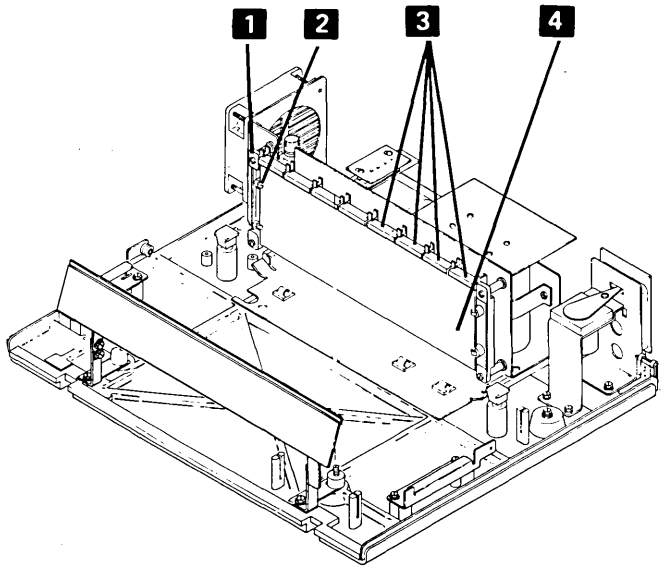
Removal and Replacement

CAUTION
The logic on planar board B1 can be damaged by electrostatic discharge. Do not touch any conducting (metal) parts. Hold the planar by the plastic frame when moving it.

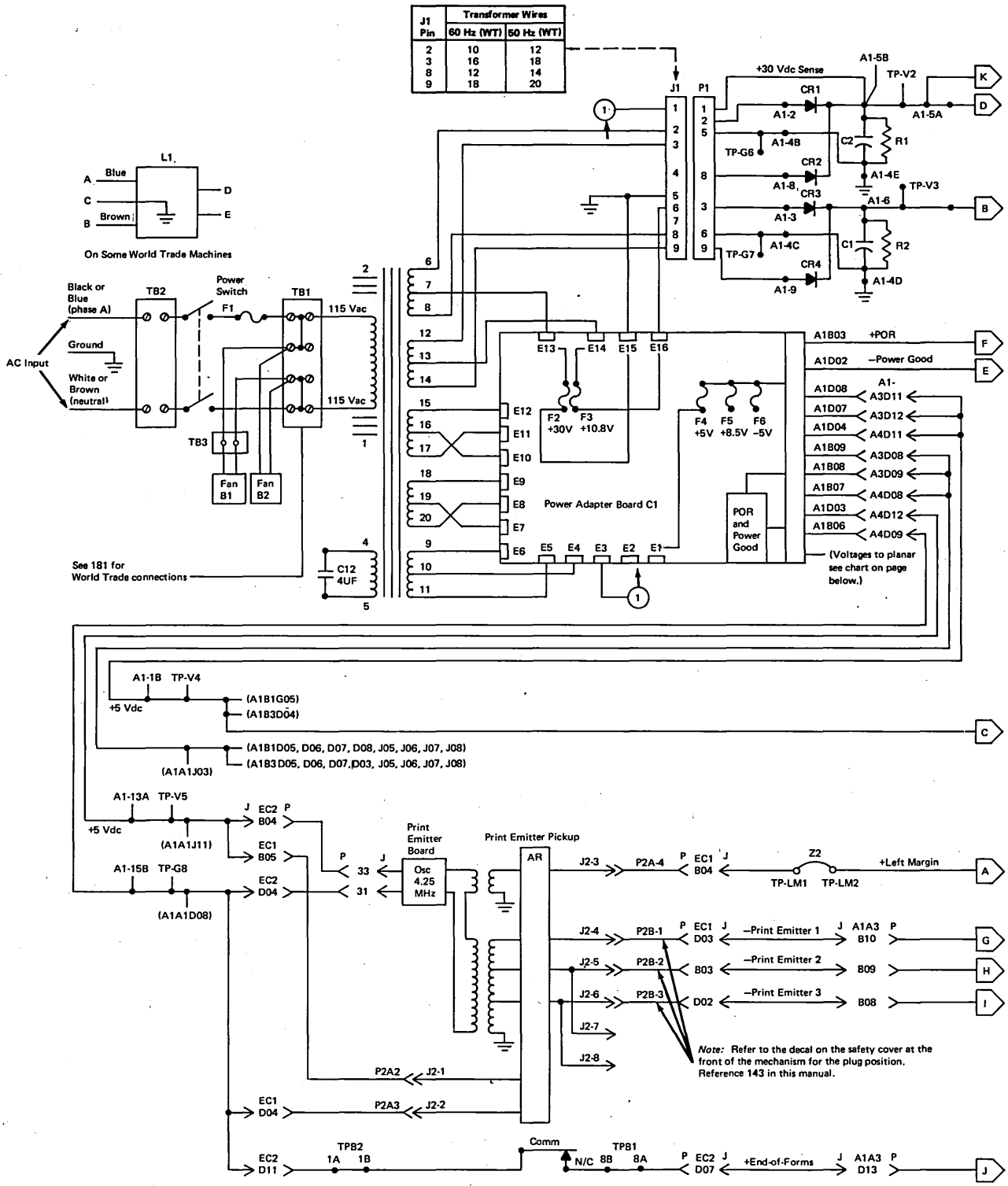
Before you take the new planar from the bag, hold the bag and touch the machine frame with your hand. This removes any static from you and the planar.

Ensure that the component side of the planar is up when you put the planar on any surface.

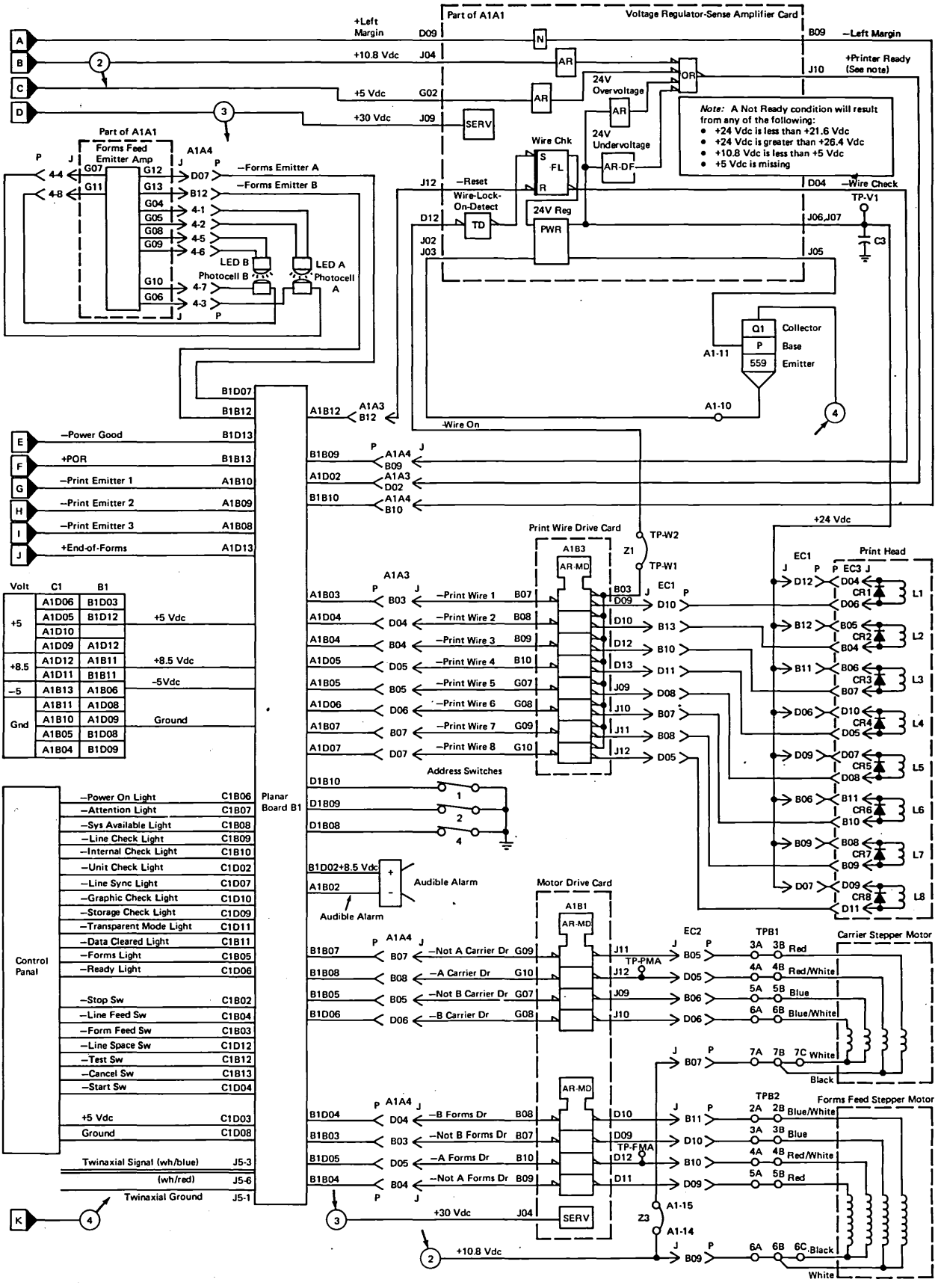
1. Power off.
2. Remove the rear cover (110).
3. Disconnect the cables **3**.
4. Remove the interposers.
5. Slide the power supply to the service position (116).
6. Remove the planar and its frame **1** from the power supply.
7. Remove the plastic pins **2** that hold the planar board to its frame.
8. Remove the planar board **4**.
9. Ensure that jumpers for language group, cable type, speed, and cable termination on the new planar are the same as those on the old planar. (Jumpers are shown on 106.)
10. Reverse steps 1 through 8 to reinstall planar board B1.



189 PRINTER WIRING DIAGRAM



189 PRINTER WIRING DIAGRAM (CONTINUED)



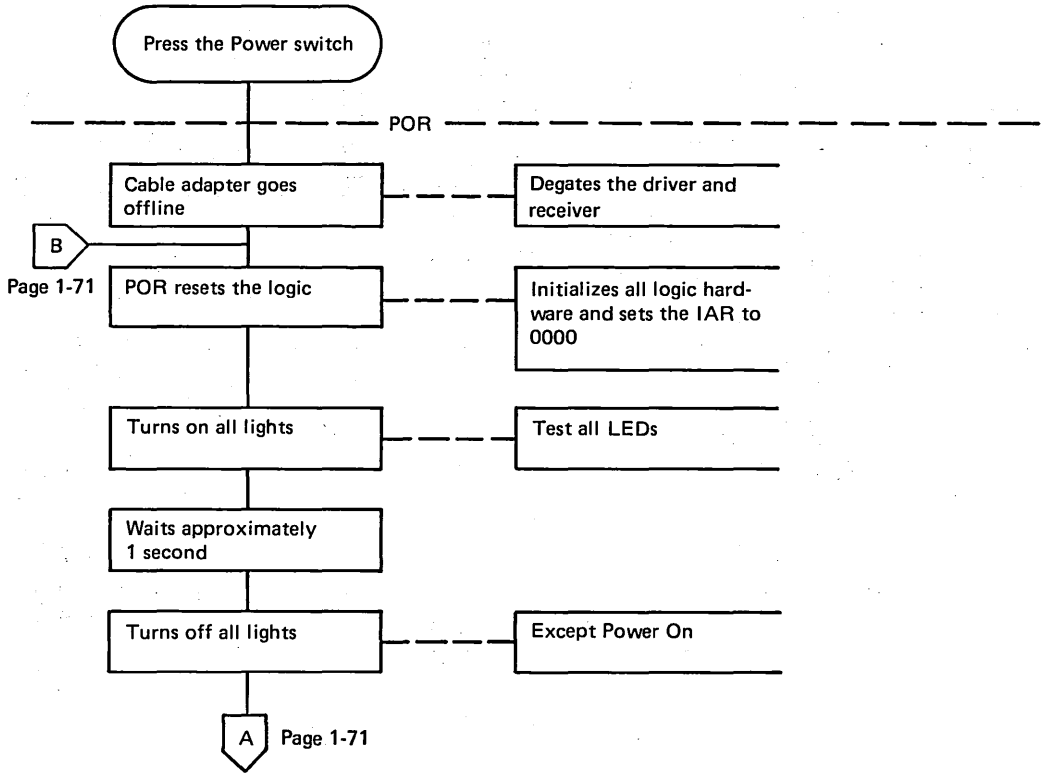
Wiring Diagram, Diagnostic Aids

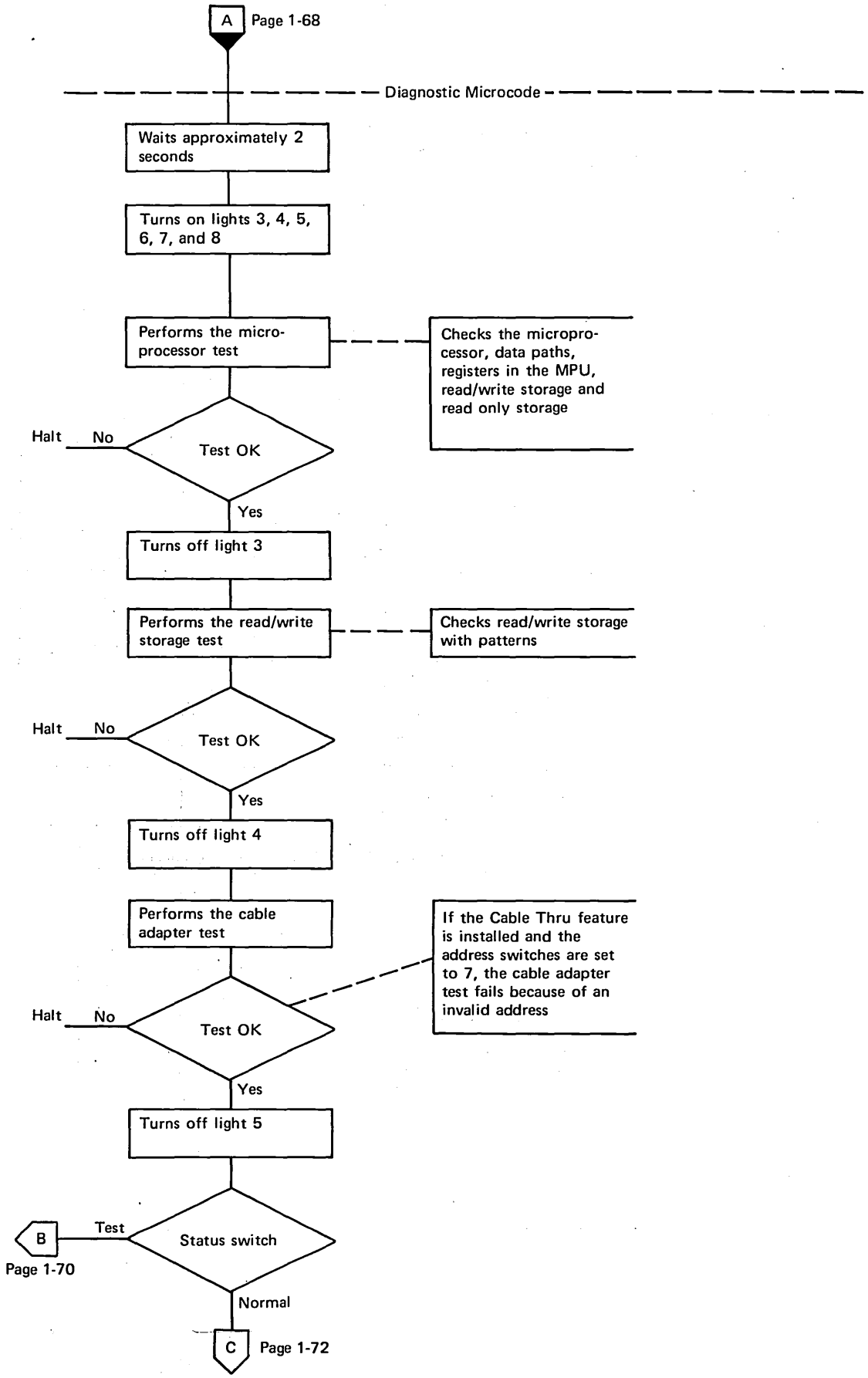
Diagnostic Aids

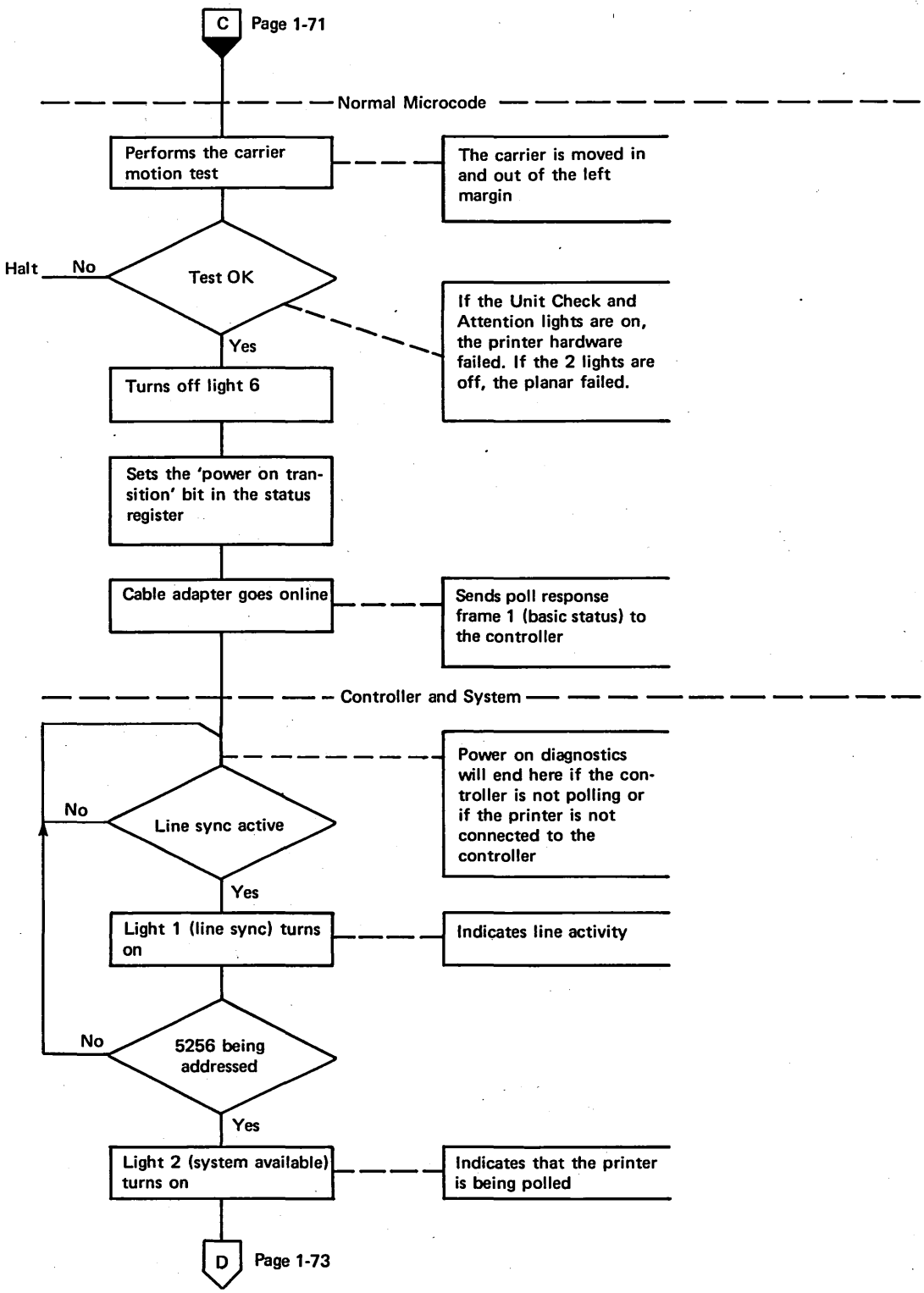
190 POWER ON DIAGNOSTIC

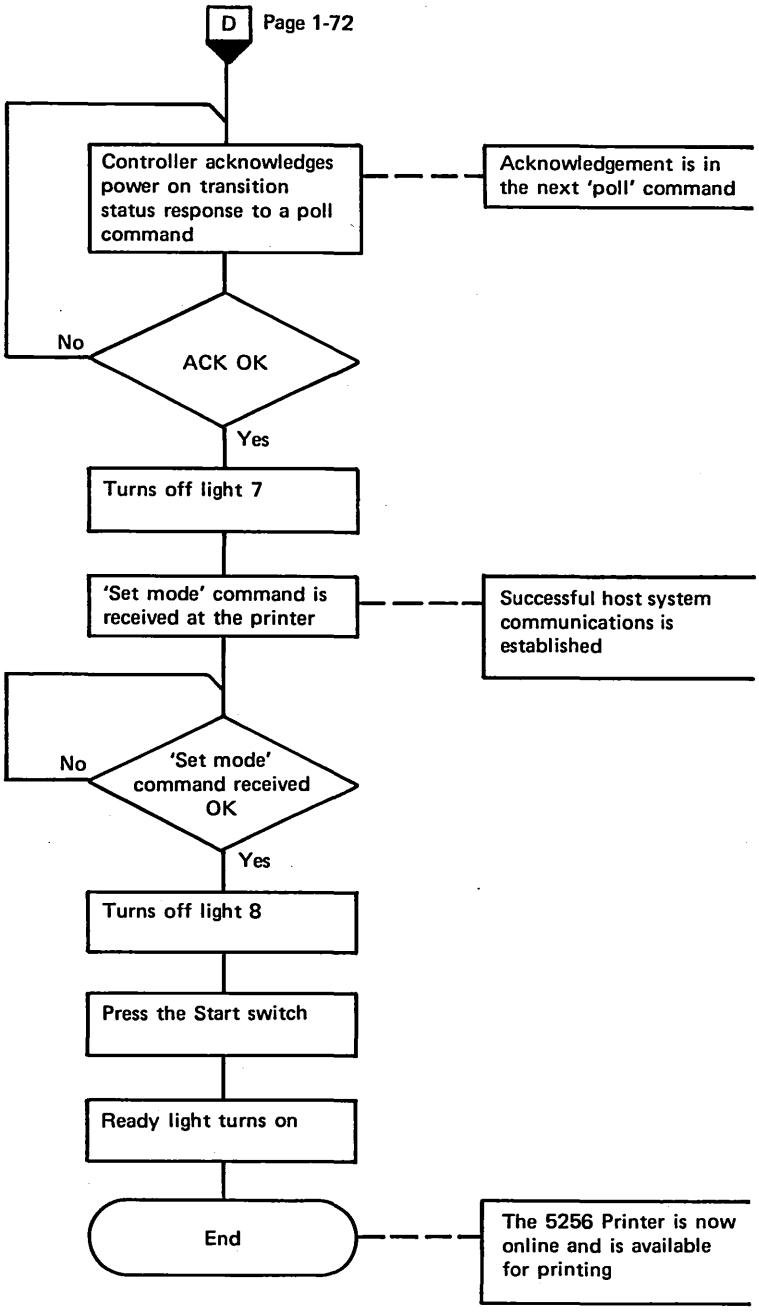
The power on diagnostic checks the basic internal functions of the printer. The following flowchart shows the sequence of events that occur when the Power switch is pressed.

POR is not part of the diagnostic but results from turning on power to the printer.




A
Page 1-68
Diagnostic Microcode
Waits approximately 2 seconds
Turns on lights 3, 4, 5, 6, 7, and 8
Performs the micro-processor test
Checks the micropro-cessor, data paths, registers in the MPU, read/write storage and read only storage
Halt
No
Test OK
Yes
Turns off light 3
Performs the read/write storage test
Checks read/write storage with patterns
Halt
No
Test OK
Yes
Turns off light 4
Performs the cable adapter test
If the Cable Thru feature is installed and the address switches are set to 7, the cable adapter test fails because of an invalid address
Halt
No
Test OK
Yes
Turns off light 5
B
Test
Status switch
Page 1-70
Normal
C
Page 1-72


C
Page 1-71
Normal Microcode
Performs the carrier motion test
The carrier is moved in and out of the left margin
Halt
No
Test OK
Yes
If the Unit Check and Attention lights are on, the printer hardware failed. If the 2 lights are off, the planar failed.
Turns off light 6
Sets the 'power on transition' bit in the status register
Cable adapter goes online
Sends poll response frame 1 (basic status) to the controller
Controller and System
Power on diagnostics will end here if the controller is not polling or if the printer is not connected to the controller
No
Line sync active
Yes
Light 1 (line sync) turns on
Indicates line activity
No
5256 being addressed
Yes
Light 2 (system available) turns on
Indicates that the printer is being polled
D
Page 1-73


D
Page 1-72
Controller acknowledges power on transition status response to a poll command
Acknowledgement is in the next 'poll' command
No
ACK OK
Yes
Turns off light 7
'Set mode' command is received at the printer
Successful host system communications is established
No
'Set mode' command received OK
Yes
Turns off light 8
Press the Start switch
Ready light turns on
End
The 5256 Printer is now online and is available for printing

191 OFFLINE TESTS

The offline tests are tests of the basic printer functions.

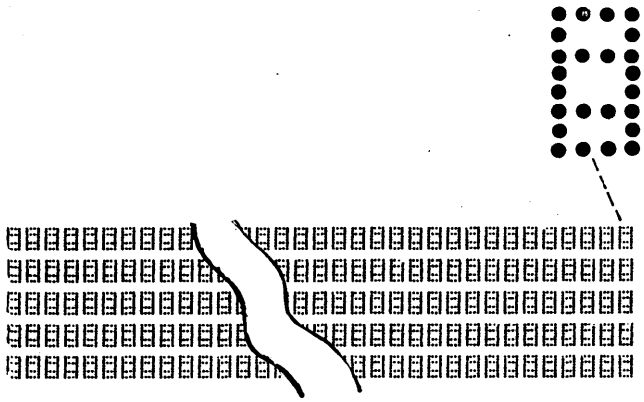
The offline tests are selected and run from the printer control panel by using combinations of the Line Feed (LF), Form Feed (FF), Start (ST), and Stop (SP) switches. To put the printer in offline mode, set the Status switch to Test. This inhibits the normal function of the Form Feed and Line Feed switches. Before selecting any of the tests, press the Stop switch. This stops all machine operation and lets you select a specific offline diagnostic test. The Ready light will be on during a test and remains on if the test runs correctly. (The Ready light also pulses when you press the Start switch while selecting a test.) Pressing the Stop switch while a test is running causes the printer to stop with various lights on. These should be ignored because the MAPs do not use these light conditions. The Stop switch must be pressed after the Status switch is set to Normal in order to end a test. A test can be repeated by pressing the Stop switch and then the Start switch. The following chart shows the switch combinations for selecting the tests:

Test Number	Name	Switch
PRT04	Print	SP FF ST ST
PRT05	Carrier motor	SP FF ST FF ST
PRT06	Forms motor	SP FF ST LF ST
PRT07	Alignment	SP FF ST FF LF ST
PRT08	Print character set	SP LF ST ST
PRT09	Print receive buffers	SP LF ST FF ST
PRT10	Left margin recognition	SP LF ST LF ST
PRT11	Printer characteristics display	SP LF ST FF LF ST
PRT12	Data storage	SP FF LF ST ST
PRT13	Address switches	SP FF LF ST FF ST
PRT14	Set transparent mode	SP FF LF ST LF ST
PRT15	Print wire/tab	SP FF LF ST FF LF ST

Print Test (PRT04)

The print test prints the alignment character repeatedly across a 132-character line, line spaces once, and prints the same character in the opposite direction. This process continues until the Stop switch is pressed. Pressing the Stop switch causes the carrier to move the print head to the left margin at the end of the line being printed. If the test is allowed to continue for 256 lines (5 minutes on the 120 cps model), the test is ended and cannot be restarted until the test is selected again.

The 'printer reset' line (A1A3B12 or B1A1B12) is available as a probe point during the test.



Carrier Motor (PRT05)

The carrier motor test checks the carrier motor phases at low speed and then moves the head to the ramp, out of the left margin, and back to the ramp at normal speed.

The motor phases are tested by generating a series of long pulses with a 50% duty cycle. These move the motor *slowly forward* in equal steps. Failing motor phases move the motor in steps that are not equal. The motor might also move backward. It is normal for the motor to step backward for the first step to locate correct position.

The motor continues in slow speed until the start switch is pressed or until the motor has advanced 256 steps. For either action, the motor returns the head, at normal operating speed, through the left margin to the ramp. From the ramp, the head is moved out of left margin and then back to the ramp. This movement (from ramp, out of left margin, and back to ramp) continues until you press the Stop switch.

The complete test can be repeated from the start by pressing the Stop switch and then the Start switch.

The 'printer reset' line (A1A3B12 or B1A1B12) is available as a probe point during this test.

Forms Motor (PRT06)

This test checks the forms motor phases at slow speed and then operates the motor at normal operating speed to check forms feed and forms emitter operation.

The motor phases are tested by generating a series of long pulses with a 50% duty cycle. These pulses move the motor *slowly (at part of a space per increment) forward* in equal steps. Failing motor phases move the motor in steps that are not equal. The motor might also move backward. It is normal for the motor to step backward for the first step to locate correct position. Too much platen or motor gear backlash (play) might cause steps that are not equal (124, 125).

The low speed test continues until you press the Start switch. Pressing the Start switch causes the forms motor and emitter operation to be tested by running at normal operating speed (high speed forms movement). The forms motor operates smoothly at this speed in a forward direction. The operation continues until you press the Stop switch.

Note: Light 8 might turn on while you are running PRT06. When the Stop switch is pressed while the test is running, various lights will turn on depending on the test status when the switch was pressed. The lights should be ignored for MAP purposes.

The test can be repeated from the start at any time by pressing the Stop Switch and then the Start switch.

The 'printer reset' line (A1A3B12 or B1A1B12) is available as a probe point during this test.

Alignment (PRT07)

The alignment test prints the alignment character across a 132-character line and then prints the same character while returning without a line space. The test continues until you press the Stop switch. At the end of the print line in which the Stop switch was pressed, the head is returned to the left margin.

If the test is allowed to continue for 256 lines (5 minutes on 120 cps models) the test is ended and cannot be restarted until the test is selected again.

The 'printer reset' line (A1A3B12 or B1A1B12) is available as a probe point during this test.

191 OFFLINE TESTS (CONTINUED)

Print Character Set (PRT08)

The print character set test prints each character of the print character set sequentially. All sets are shown in the figure. Hyphens are printed for EBCDIC characters that are not defined. (Some machines might substitute a blank for undefined EBCDIC characters.) The test can be run in transparent mode by first selecting transparent mode (PRT14) and then selecting PRT08. Character set jumpers are shown on reference 106.

U. S. and Canada

```
 ---------¢.<(+|&---------!$*);¬-/---------¦,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz----------
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
```

ASCII (International)

```
 ---------[.<(+!&---------]$*);^-/---------¦,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz----------
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
```

Austria and Germany

```
 ---------Ä.<(+!&---------Ü$*);^-/---------ö,%_>?---------`:#§'="-abcdefghi-------jklmnopqr-----■-ßstuvwxyz----------
äABCDEFGHI------üJKLMNOPQR------Ö-STUVWXYZ------0123456789------
```

Belgium

```
 ---------[.<(+!&---------]$*);^-/---------ù,%_>?---------`:#à'="-abcdefghi-------jklmnopqr-----■-¨stuvwxyz----------
éABCDEFGHI------èJKLMNOPQR------ç-STUVWXYZ------0123456789------
```

Brazil

```
 ---------é.<(+!&---------$Ç*);^-/---------ç,%_>?---------ã:õÃ'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz----------
õABCDEFGHI------éJKLMNOPQR------\-STUVWXYZ------0123456789------
```

Denmark and Norway

```
 ---------£.<(+!&---------¤Å*);^-/---------ø,%_>?---------`:æØ'="-abcdefghi-------jklmnopqr-----■-üstuvwxyz----------
£ABCDEFGHI------åJKLMNOPQR------\-STUVWXYZ------0123456789------
```

Finland and Sweden

```
 ---------§.<(+!&---------¤Å*);^-/---------ö,%_>?---------é:ÄÖ'="-abcdefghi-------jklmnopqr-----■-üstuvwxyz----------
äABCDEFGHI------åJKLMNOPQR------é-STUVWXYZ------0123456789------
```

France

```
 ---------°.<(+!&---------§$*);^-/---------ù,%_>?---------`:£à'="-abcdefghi-------jklmnopqr-----■-¨stuvwxyz----------
éABCDEFGHI------èJKLMNOPQR------ç-STUVWXYZ------0123456789------
```

Italy

```
 ---------°.<(+!&---------é$*);^-/---------ò,%_>?---------ù:£§'="-abcdefghi-------jklmnopqr-----■-ìstuvwxyz----------
àABCDEFGHI------èJKLMNOPQR------ç-STUVWXYZ------0123456789------
```

Japan (English)

```
 ---------£.<(+!&---------!¥*?,¬-/---------¦,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz----------
(ABCDEFGHI------)JKLMNOPQR------$-STUVWXYZ------0123456789------
```

Portugal

```
 ---------[.Ç(+!&---------]$*);^-/---------õ,%_>?---------`:Ãõ'="-abcdefghi-------jklmnopqr-----■-çstuvwxyz----------
ãABCDEFGHI------'JKLMNOPQR------Ç-STUVWXYZ------0123456789------
```

Spain

```
 ---------[.<(+|&---------]R*);¬-/---------ñ,%_>?---------`:Ñ@'="-abcdefghi-------jklmnopqr-----■-¨stuvwxyz----------
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
```

Spanish Speaking

```
 ---------[.<(+|&---------]$*);¬-/---------ñ,%_>?---------`:Ñ@'="-abcdefghi-------jklmnopqr-----■-¨stuvwxyz----------
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
```

United Kingdom

```
 ---------$.<(+|&---------!£*);¬-/---------¦,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz----------
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
```

Canada (French)

```
 ---------à.<(+!&---------'$*);^-/---------ù,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-¨stuvwxyz----------
éABCDEFGHI------èJKLMNOPQR------,-STUVWXYZ------0123456789------
```

Japan (Katakana)

```
 。「」、・ヲァィゥェォャュョッ---!¥*);¬-/----------,%_>?----------:#@'="-アイウエオカキクケコーサシスセソタチツテトナニヌネノ--ハヒフ-ヘホマミムメモヤユ-ヨラリル----------レロワン゛゜
-ABCDEFGHI-------JKLMNOPQR------$-STUVWXYZ------0123456789------
```

Print Receive Buffers (PRT09)

The print receive buffers test, usually run in transparent mode, formats and prints the contents of the receive buffers until the test is stopped by pressing the Stop switch.

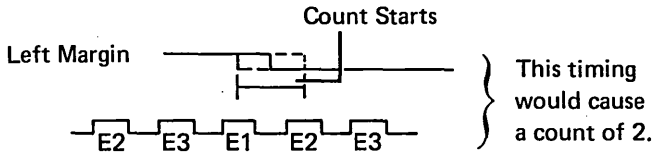
The purpose of the test is to see what the printer has received, including data and formatting information, so that you can compare it with what was sent by the system.

To run the test in transparent mode, first select transparent mode (PRT14) and then select PRT09.

Left Margin Recognition (PRT10)

The left margin recognition test senses the location of the left margin pulse relative to the print emitter pulses.

Left margin recognition testing occurs while the carrier is moving to the right. The microcode checks for the left margin signal after each print emitter pulse. When the left margin signal is sensed, the printer starts counting print emitter pulses. The count, which is reset by the E3 pulse, is printed at the left side of the form.



The location at which the left margin signal is sensed is indicated by the count as follows:

Count	Location
3	Between E3 and E1
2	Between E1 and E2
1	Between E2 and E3

The best position is indicated by a count of 2 or a combination of 2 with sometimes a 1 or a 3. This shows that the left margin pulse is active as far as possible from the print emitter 3 pulses (between emitter pulses 1 and 2 is best, during a 1 or 2 pulse is acceptable).

To obtain the best location, move plug P2B and repeat this test. Details of P2B plugging are on the label on the gray safety cover at the front of the printer mechanism.

Printer Characteristics Display (PRT11)

The printer characteristics are displayed in control panel lights 1 through 8. The lights compare to the planar jumpering that selects the language group and printer speed.

Lights 1 through 5 identify the language group as plugged on planar jumper pins 0 through 4 (see 106).

Language Group
A 1 indicates no jumper; a 0 indicates a jumper.

Lights 1 2 3 4 5	Country
0 0 0 0 0	U.S. and Canada
0 0 0 0 1	ASCII (International)
0 0 0 1 0	Austria and Germany
0 0 0 1 1	Belgium
0 0 1 0 0	Brazil
0 0 1 0 1	Denmark and Norway
0 0 1 1 0	Finland and Sweden
0 0 1 1 1	France
0 1 0 0 0	Italy
0 1 0 0 1	Japan (English)
0 1 0 1 0	Portugal
0 1 0 1 1	Spain
0 1 1 0 0	Spanish-Speaking
0 1 1 0 1	United Kingdom
0 1 1 1 0	Canada (French)
0 1 1 1 1	Reserved
1 0 0 0 0	Japan (Katakana)
1 0 0 0 1 to 1 1 1 1 0	Reserved
1 1 1 1 1	Defaults to U.S. and Canada

Note: All jumpers must be plugged.

Wiring Diagram, Diagnostic Aids

Printer Speed

A 1 indicates no jumper; a 0 indicates a jumper.

Lights 7 8	Characters per Second
0 0	Undefined
0 1	120
1 0	40
1 1	80

Light 6 is not used.

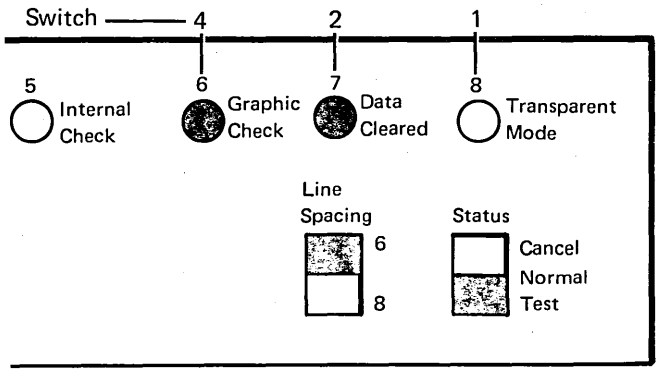
Data Storage (PRT12)

A thorough data storage test writes and reads all bit combinations in all storage positions. The test continues until the Stop switch is pressed. The Storage Check light (4) is on if an error occurs.

Address Switches (PRT13)

The address switches test is used with the Cable Thru feature to check operation of the address switches. Do not change switch settings while the test is running.

The following example shows the control panel when the address switches are set to 6:



Address 7 (all 3 switches on) is invalid. The power on diagnostics will fail with lights 5, 6, 7, and 8 on during the cable adapter part, if the address is 7.

Note: Do not leave the external system cable disconnected when servicing a printer that has the Cable Thru feature. Other work stations are released from the series when the cable is disconnected. An adapter (part 7362230) is available for connecting 2 cables together when it is necessary to bypass a printer. The adapter should be protected against accidental grounding of the connection.

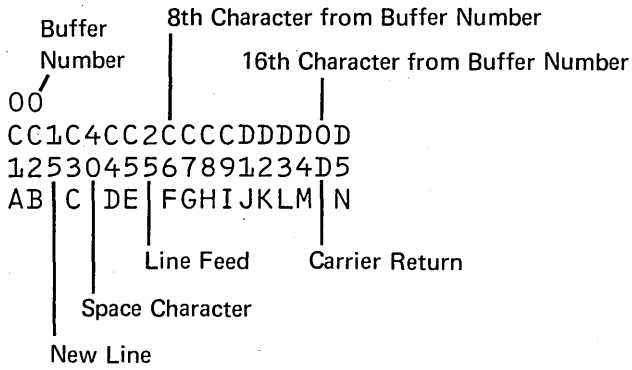
Set Transparent Mode (PRT14)

The set transparent mode test should be used when you or the customer wish to locate problems or debug application programs.

When operating in this mode, all data (characters and formatting control codes) is printed in hexadecimal code with the character representing the code printed below. To aid counting and identification, a hexadecimal count is printed above every 16th character and a vertical bar above every 8th character starting from the 2nd character on the left. The 2nd digit on the left column indicates the print buffer used. One line of data prints out as 4 lines in transparent mode. Formatting control codes are not executed but are treated as data. The default character is printed below the hexadecimal code for the formatting control codes and other unprintable characters.

The Transparent Mode light is turned on when PRT14 is selected. It turns off when the Stop switch is pressed. However, the printer remains in transparent mode and the light comes back on when the Status switch is returned to the Normal position. Transparent mode can be active whether the Status switch is set to Test or Normal. This allows PRT08 and PRT09 to be printed in transparent mode. (Select transparent mode first and then select PRT08 or PRT09.) The 5256 remains in transparent mode until the Status switch is moved from Normal to Test position.

A sample transparent mode printout is as follows:



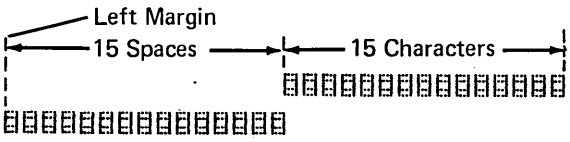
In Normal mode, with the SCS control characters executed, the above would print as:

```
AB
C DE
N    FGHIJKLM
```

A part of the verification test is printed in transparent mode (192).

Print Wires/Tab (PRT15)

The print wire/tab test performs a high-speed tab[1] to the right for 15 spaces, prints 15 alignment characters to the right, line spaces, high-speed tabs to the left for 15 spaces, and then prints 15 alignment characters to the left.

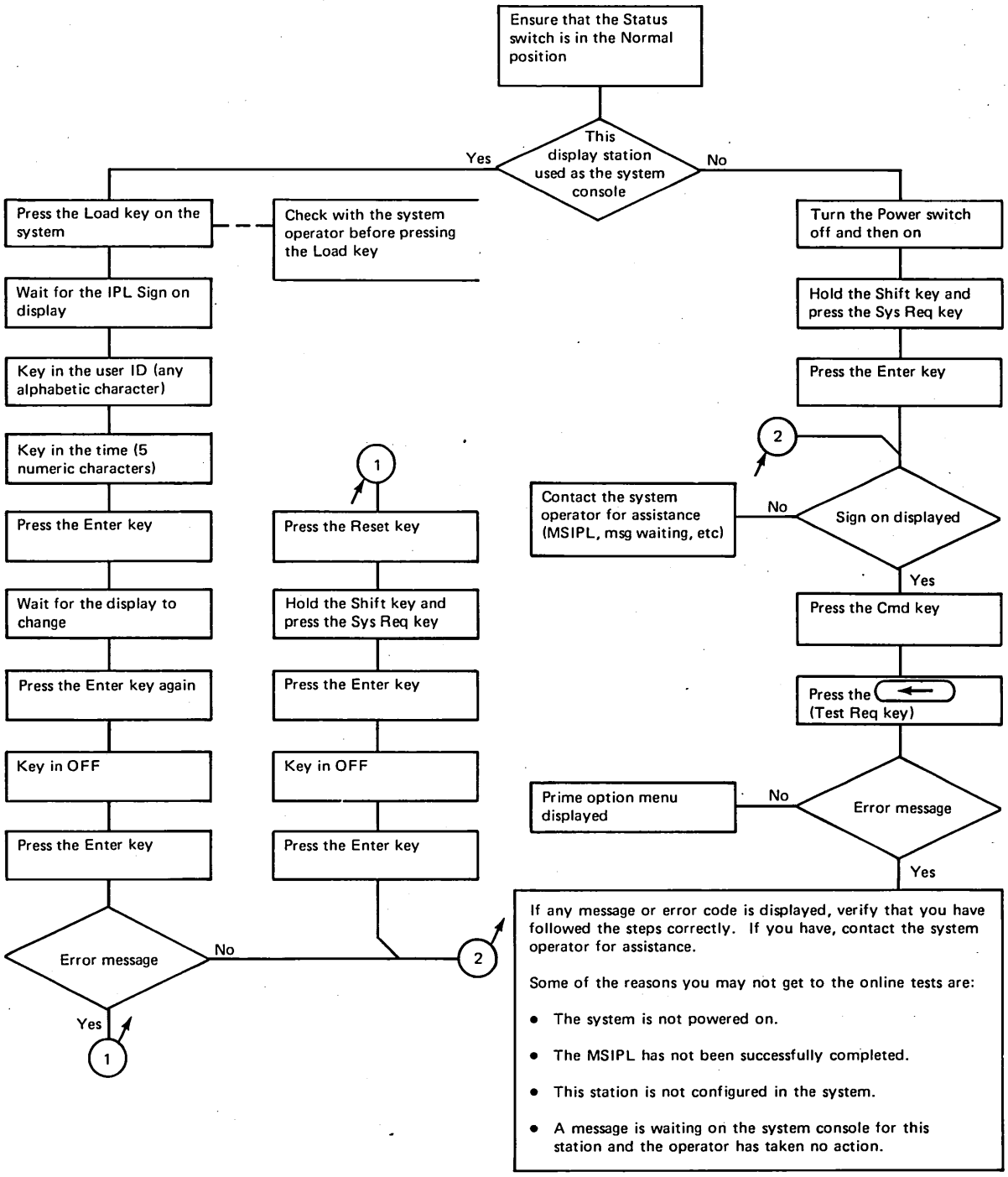


The print wire drivers are off during the line spacing and tabbing operations. This allows the probe to be used in checking for correct print wire operation.

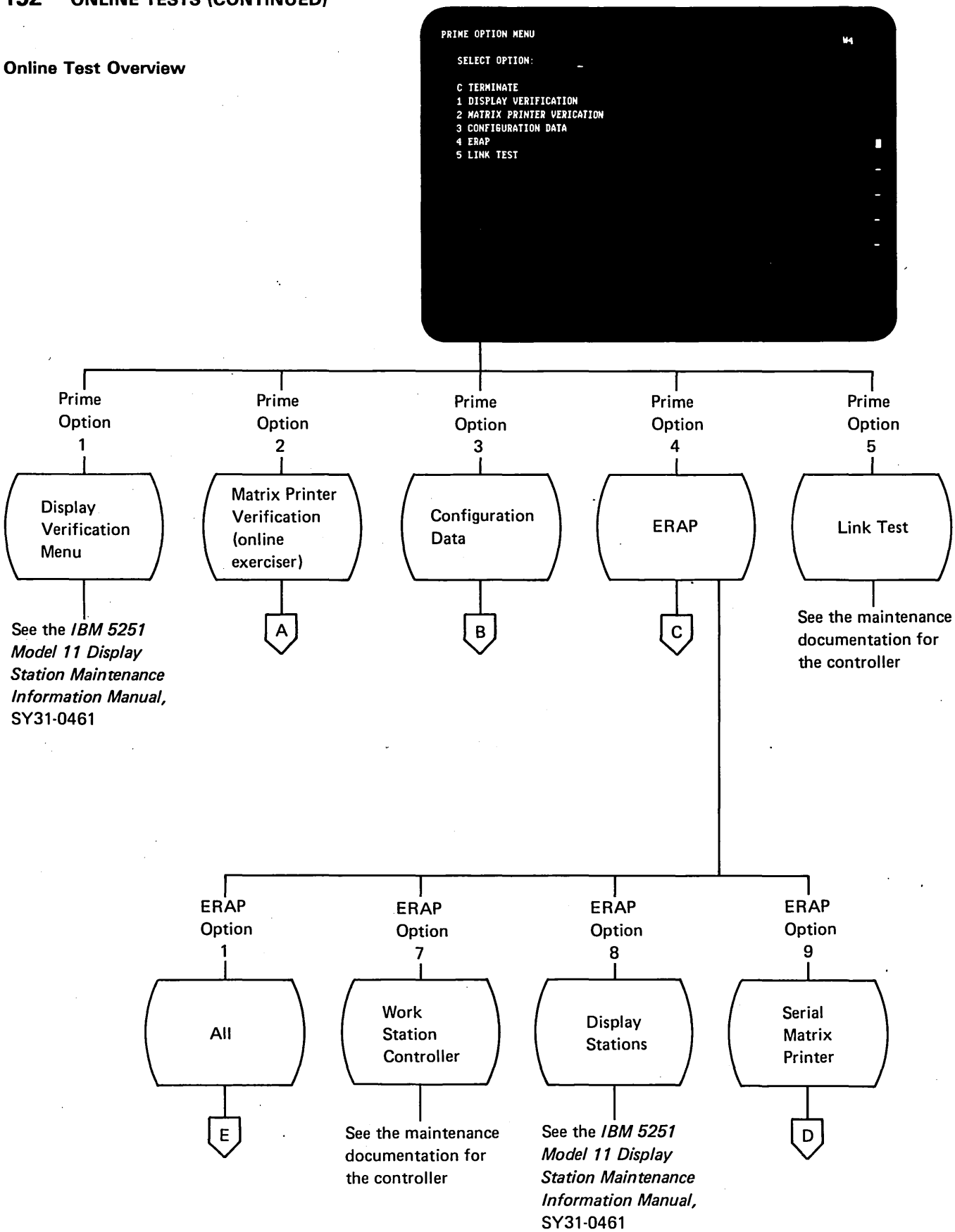
[1]The 120 cps printer does not tab at high speed.

Online tests include work station exerciser routines that are in the system. A prime option menu is displayed that allows you to select display verification, matrix printer verification (online exerciser), configuration data, and error recovery analysis procedures (ERAP). Online tests can be run on the work station while other jobs are being run on the system. However, the work station must be in a signed off state before the online tests can be run on that work station. Various ways can be used to end or sign off a job. Not all methods will be described here because they are system operating procedures. If you do not understand the system, use the procedure in the flowchart below.

If the test is to be printed, set up the printer for normal operation.



Online Test Overview



Wiring Diagram, Diagnostic Aids

192 ONLINE TESTS (CONTINUED)

Matrix Printer Verification Test (Online Exerciser)

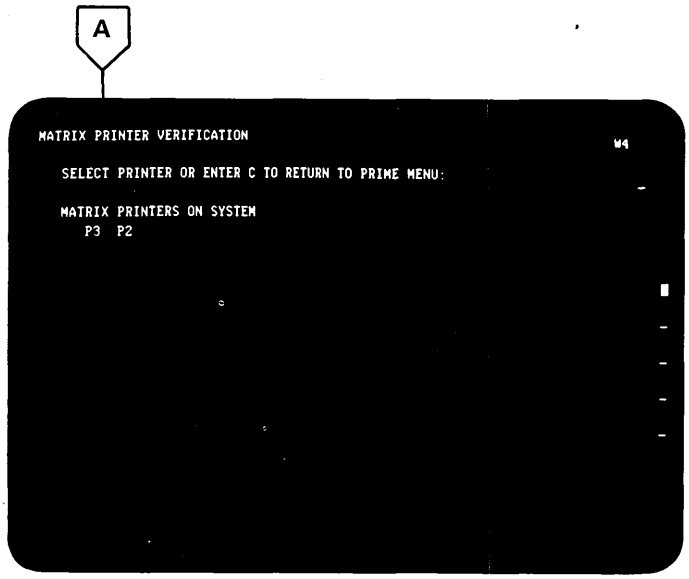
This test exercises the printer by using all characters including the standard character string (SCS) control characters. The controlling program is in the controller. Successful completion of the test verifies that the system, controller, cabling, and the printer operate correctly. All of the following functions are tested 1 or more times:

- Ability to print all valid characters in a ripple pattern
- Suppression of nulls
- Automatic new line
- Formatting
  - Setting horizontal format
  - Setting vertical format
  - Absolute horizontal position
  - Absolute vertical position
  - Relative horizontal position
  - Relative vertical position
  - New line
  - Interchange record separator (IRS)
  - Carrier return
  - Line feed
  - Forms feed
- Graphic error option

A sample printout of the test is at the end of the flowchart.

The following flowchart shows the procedures used in testing the printer along with the available options.

Online Test Displays



To obtain the matrix printer verification (online exerciser) ID select menu:

1. Press the 2 key.
2. Press the Enter key.

192 ONLINE TESTS (CONTINUED)

```
MATRIX PRINTER VERIFICATION                                    W4

   SELECT OPTION:

  C RETURN TO PRIME OPTION MENU
  1 PRINT TEST 1 TIME
  2 PRINT TEST 2 TIMES
  3 PRINT TEST 5 TIMES
  4 PRINT TEST CONTINUOUSLY

  P3 IS THE PRINTER SELECTED
```

1. To obtain the matrix printer verification (online exerciser) menu:
   a. Enter the identification number of the printer (a letter and a number).
   b. Press the Enter key.

2. To select the number of times to run the test:
   a. Enter, from the menu, the number that corresponds to the desired number of times to run the test.
   b. Press the Enter key.

   The display will show when the test is executing, when it is complete, and when a hard error occurs.

3. To repeat the test, press the Enter key.

B

```
  CONFIGURATION DATA - LOCAL STATIONS                          W4
     ENTER C TO RETURN TO PRIME MENU:
 DEVICE ADDR   UNIT ADDR   LOGICAL ID   DESCRIPTION
      E0           00          P1       PRINTER
      C0           33          P3       PRINTER
      C0           22          P2       PRINTER
      C0           00          W1       DISPLAY   1920
      C0           11          W2       DISPLAY   1920
      C0           12          W3       DISPLAY   1920
      C0           21          W4       DISPLAY   1920
      C0           31          W5       DISPLAY   1920
*** END OF LOCAL DATA ***    SYSTEM CONFIGURATION SEE CONFIGSSP ***
```

To select Configuration Data:

1. Press the 3 key.

2. Press the Enter key.

The descriptions for configuration data are:

1. Device Addr is the address of the controller.

2. Unit Addr is the address of station(s) assigned to the controller. The first digit is the port number and the second digit is the station address.

3. Logical ID is the name the system uses to address this station.

4. To return to the prime option menu:
   a. Press the C key.
   b. Press the Enter key.

C

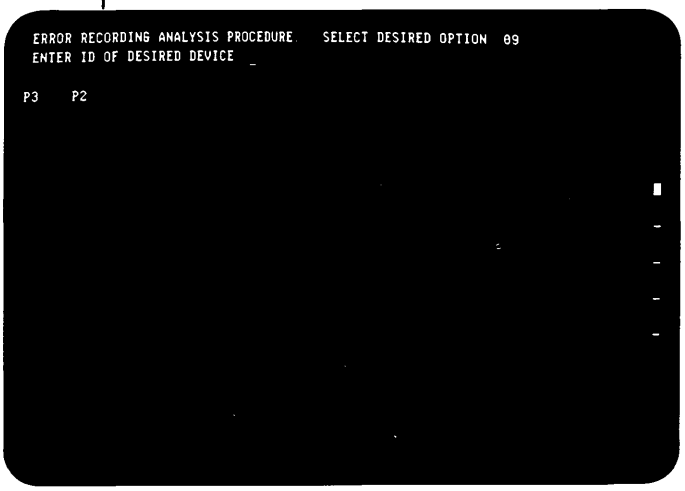
```
ERROR RECORDING ANALYSIS PROCEDURE.  SELECT DESIRED OPTION

 0 END                                 6
 1 ALL                                 7 WORKSTATION CONTROLLER
 2                                     8 DISPLAY STATIONS
 3                                     9 SERIAL MATRIX PRINTERS
 4                                    10
 5
```

1. To select the Error Recording Analysis Procedure (ERAP) menu:
   a. Press the 4 key.
   b. Press the Enter key.

2. To select the serial matrix printer:
   a. Press the 9 key.
   b. Press the Field Exit key.

192 Online Test Displays (continued)

D



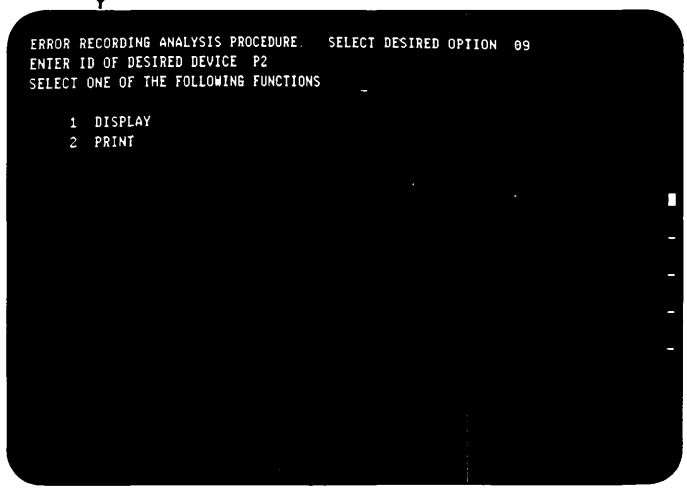
This display does not appear if only one matrix printer is attached to the system.

To select the desired device:

1. Enter the ID of the device that you want the printout for.

2. Press the Enter key.

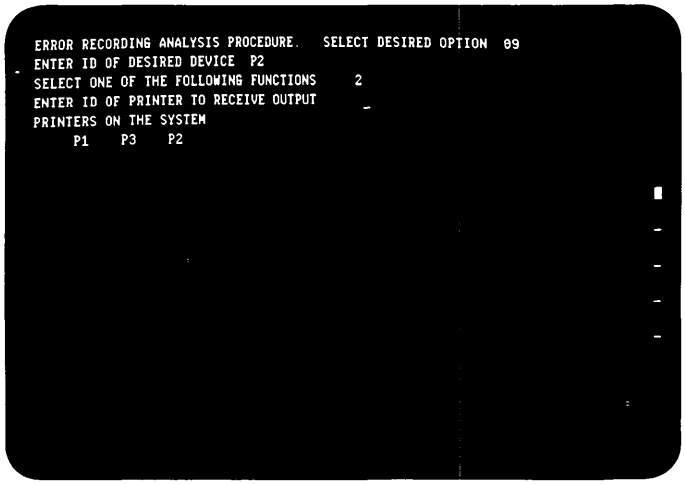
E



Line 2 does not appear if only one matrix printer is attached to the system.

If you only want to look at the error tables on the display screen:
a. Press the 1 key.
b. Press the Enter key.

If you want a printout of the error tables:
a. Press the 2 key.
b. Press the Enter key.



Line 2 does not appear if only one matrix printer is attached to the system.

1. Key the ID (a letter and a number) of the printer that will print the ERAP.

2. Press the Enter key.

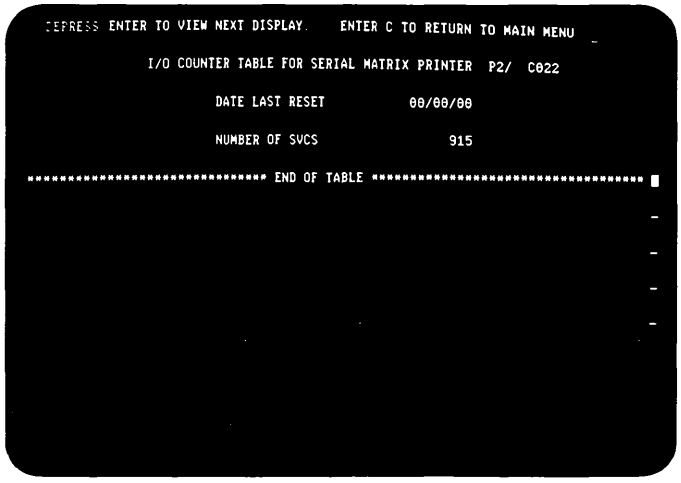
192 ONLINE TESTS (CONTINUED)

If you selected the ALL option, the ERAP tables will be displayed for all devices on the line one at a time. When the error history table for the first device is displayed and the Enter key is pressed, the I/O counter table for the second device will be displayed. This sequence is repeated until the error history table for each device is displayed.

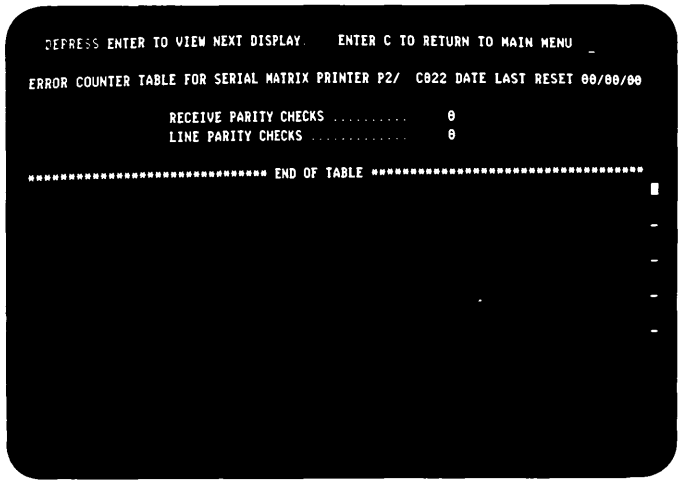
If you select a specific device, the I/O counter, error counter, and error history tables can be redisplayed (in order) as many times as desired by pressing the Enter key after each one has been displayed or printed.

If you are printing the tables, all 3 will print one after the other. You do not have to press the Enter key. The tables can be reprinted by pressing the Enter key when the display screen shows that the printing is completed.

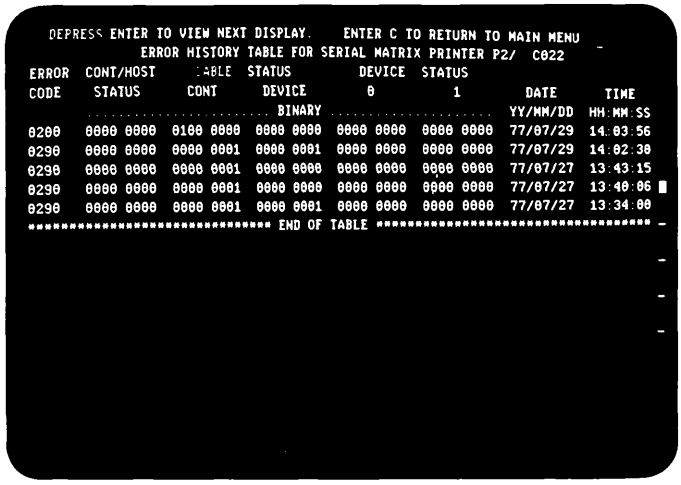
For printer problem identification, see the error history table printout at the end of this diagram.



Press the Enter Key.



Press the Enter Key.



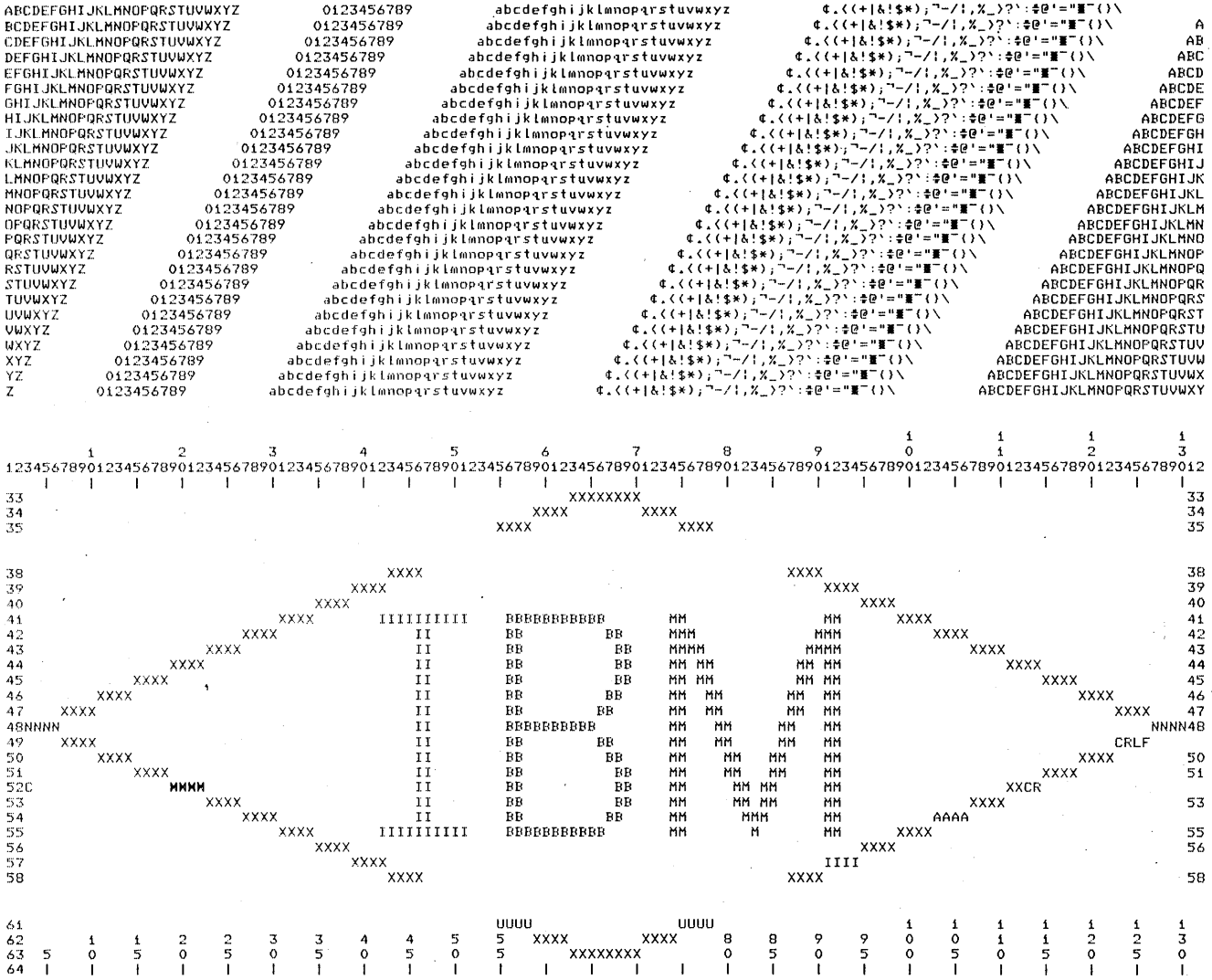
1. To return to the ERAP menu:
   a. Press the C key.
   b. Press the Enter key.

2. To return to the prime option menu:
   a. Press the 0 key.
   b. Press the Field Exit key.

3. To return to the sign on menu:
   a. Press the C key.
   b. Press the Enter key.

192 ONLINE TESTS (CONTINUED)

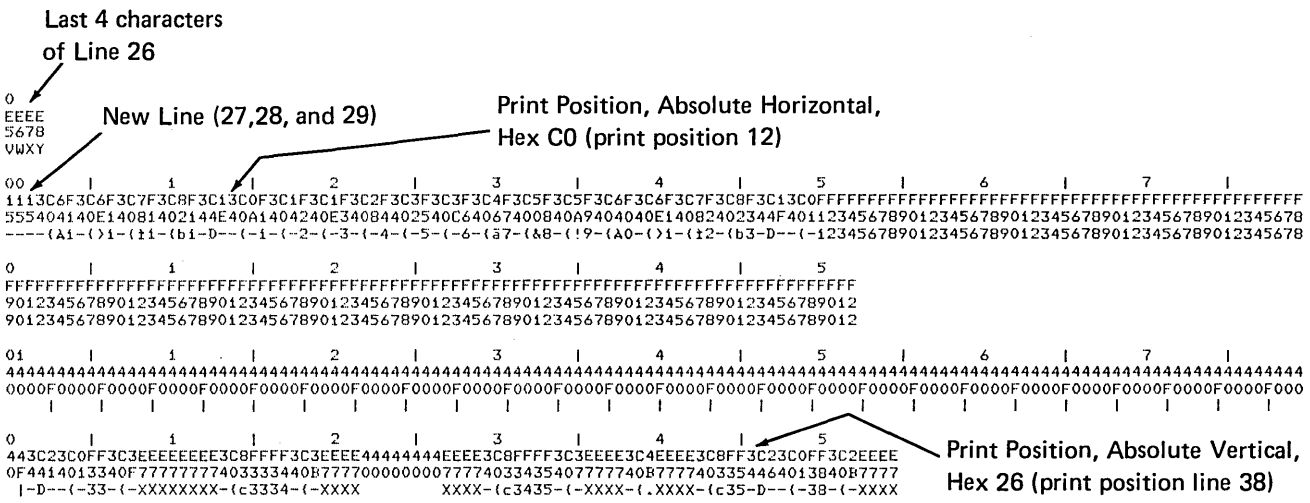
Matrix Printer Verification Test Printout



Line	Explanation
1	New line (3 times).
1-53	Horizontal format = 132; vertical format = 66
1-26	Ripple pattern.
27-29	New line (3 times).
30-48	Absolute horizontal and vertical positioning.
36-37	Skipped using absolute vertical positioning.
48	Null characters (3) between 48 and NNNN on both ends.
49	Carriage return and line feed after CRLF.
49-64	Relative horizontal and vertical positioning.

Line	Explanation
52	Carriage return after last XXCR; print C and overstrike Hs on first 4 Xs.
54	Set horizontal format to 106; allow auto new line to 55; AAAA indicates auto new line.
55	Horizontal format reset to 132.
57	Skip to line 58 after IIII by using IRS.
59-60	Skipped using relative vertical positioning.
61	Unprintable character default is changed from blank to U. Eight B9s are sent as the unprintable character.

Matrix Printer Verification Test (Online Exerciser) Printout in Transparent Mode (Partial)



192 ONLINE TESTS (CONTINUED)

Field Definition of Error History Table (Sample Printout)

Controller and system problems	Controller detected printer error	First poll byte	Second poll byte	Read status byte

ERROR HISTORY TABLE FOR SERIAL MATRIX PRINTER P2/ C010

ERROR CODE	CONT/HOST STATUS	CABLE STATUS CONT	CABLE STATUS DEVICE (BINARY)	DEVICE STATUS 0	DEVICE STATUS 1	DATE YY/MM/DD	TIME HH:MM:SS
0238	0000 0000	0000 0000	0010 0001	0000 0000	0000 0001	77/10/12	09:35:11
0244	0000 0000	0000 0000	0000 0001	0000 0000	0101 0000	77/10/12	09:34:31
0234	0000 0000	0000 0000	0010 0000	0000 0000	0101 0000	77/10/12	09:34:18
0238	0000 0000	0000 0000	0010 0000	0000 0000	0000 0001	77/10/12	09:34:11
0234	0000 0000	0000 0000	0010 0001	0000 0000	0101 0100	77/10/12	09:34:04
0200	0000 0000	0100 0000	0000 0000	0000 0000	0000 0000	77/10/12	09:02:04
0200	0000 0000	0100 0000	0000 0000	0000 0000	0000 0000	77/10/12	08:56:47
0245	0000 0000	0000 0000	0000 0000	0000 0000	0000 1000	77/10/11	06:46:46
0234	0000 0000	0000 0000	0010 0000	0000 0000	0101 1000	77/10/11	04:26:25
0245	0000 0000	0000 0000	0000 0000	0000 0000	0000 1000	77/10/11	03:25:27
0245	0000 0000	0000 0000	0000 0001	0000 0000	0000 1000	77/10/11	01:17:25
0235	0000 0000	0000 0000	0010 0000	0001 0000	0000 1000	77/10/10	21:52:49
0245	0000 0000	0000 0000	0000 0001	0000 0000	0000 1000	77/10/10	20:45:44
0245	0000 0000	0000 0000	0000 0000	0000 0000	0000 1000	77/10/10	20:40:27
0235	0000 0000	0000 0000	0010 0000	0000 0000	0000 1100	77/10/10	16:54:04
0245	0000 0000	0000 0000	0000 0000	0000 0000	0000 1000	77/10/10	15:51:33
0245	0000 0000	0000 0000	0000 0001	0000 0000	0000 1000	77/10/10	15:48:34
0245	0000 0000	0000 0000	0000 0000	0000 0000	0000 1000	77/10/10	15:46:10

********** END OF TABLE **********

Device 02=5256 Error Type

Controller Defined (If an error bit is present, see the Controller/Host MAP).

(reserved)
No Response (timeout) (00)
Transmit Activity Check (01)
(reserved)
Receive Parity Check (03)
Receive Length Check (06)
(reserved)
Even/Odd Timout (90)
Busy (91)
Line Parity (04)
Unit Not Available Status (51)
Outstanding Status

Forms Position Check (38)
Forms Stopped (37)
Left Margin Check (36)
No Emitters (35, 45)
Emitter Sequence Check (34, 44)
Fast Speed Check (33, 43)
Slow Speed Check (42)
Wire Check (31)
Graphic Check (26)
End-of-Forms (50)
Print Mechanism Not Ready (30, 40)
Invalid SCS Parameter (29)
Invalid SCS Control Character (28)
Even/Odd Response Level
0 = Even 1 - Odd

Exception Status
0 0 0 = No exception status
0 0 1 = Activate lost (parity)
0 1 0 = Invalid activate (24)
0 1 1 = (reserved)
1 0 0 = Invalid command or device ID (20)
1 0 1 = Input queue or storage overrun (22)
1 1 0 = (reserved)
1 1 1 = Power on transition (08)

193 ERROR CODES, LIGHTS, SWITCHES, AND TEST POINTS

Error Codes and Descriptions

The error recovery procedures for the following error codes are found in the *5256 Printer Operator's Guide*, GA21-9260.

All errors displayed that pertain to the printer will have a device code of 02 (first 2 positions of the error code).

Error codes are both logged and displayed except as noted.

The following error codes should not occur, but if they do, they indicate one of the following:

- 5256 planar failure
- Transmission errors
- S/34 microcode failure

Error codes 21 and 25 indicate that the controller received status bits from the 5256 that are not used by the 5256. Errors 47 and 48 indicate 'forms stop' or 'forms position check' from the printer with the 'unit not available' bit off (Ready). Error 49 results if the printer indicates outstanding status in poll response frame 1, but the response to the 'read status' command showed none. Error 32 indicates a hard, slow speed check without another print mechanism error.

Error Code Device Error	Priority	Error Description
0200	2	No response timeout
0201	1	Transmit activity check (controller only)
0203	3	Receive parity check (controller detected)
0204	14	Line parity check (printer detected)
0206	5	Receive length check (wrong number of bytes on a poll or read status)
0208	9	Power on transition (in session)
0220	6	Invalid command or device ID
0221	10	Undefined exception status (110) (See note 3.)
0222	7	Input queue or storage overrun
0223	12	'Activate lost' controller problem (should have been reported as 0204) (See note 3.)
0224	8	Invalid activate
0225	11	Undefined exception status (011) (See note 3.)
0226	27	Graphic check (See note 1.)
0228	25	Invalid SCS control character (See note 1.)
0229	26	Invalid SCS parameter (See note 1.)
0230	17	Printer not ready (hard)
0231	16	Wire check (hard)
0232	24	Slow speed check (hard) (See note 3.)
0233	21	Fast speed check (hard)
0234	20	Emitter sequence (hard)
0235	22	No-emitter check (hard)
0236	23	Overrun error (hard)
0237	19	Forms stop (hard)
0238	18	Forms position check (hard)
0240	30	Printer not ready (soft) (See note 2.)
0241	29	Wire check (soft) (See note 2.)
0242	35	Slow speed check (soft) (See note 2.)
0243	32	Fast speed check (soft) (See note 2.)
0244	31	Emitter sequence check (soft) (See note 2.)
0245	33	No-emitter check (soft) (See note 2.)
0246	34	Overrun error (soft) (See note 2.)
0247	37	Forms stop (soft) (See note 3.)
0248	36	Forms position check (soft) (See note 3.)
0249	38	Read status byte empty after operating status (See note 3.)
0250	15	End of forms (See note 1.)
0251	28	Not ready (unit not available status)
0290	13	Even/odd status timeout
0291	4	Hardware busy timeout

Notes:

1. The error code is displayed as a console error message but is not logged.
2. The error code is logged but not displayed as a console error message.
3. Invalid status combination.

Wiring Diagram, Diagnostic Aids

193 ERROR CODES, LIGHTS, SWITCHES, AND TEST POINTS (CONTINUED)

Lights

Normal Mode

Thirteen lights are located on the control panel of the printer for use by the operator and the customer engineer. They are as follows:

Power On–Indicates that power is present at the printer and +5, -5, +8.5, +10.8 Vdc and 24 Vac are OK.

Ready–Indicates that the printer can be used for customer jobs. The light is turned on by pressing the Start switch and is turned off by unrecoverable errors, by an attention message from the host system, or by pressing the Stop switch.

Line Sync (1)–Indicates that the printer has recognized any character, command, or data sent by the controller over the system cable. The command or data characters can be for any printer or display station on the cable (if the Cable Thru feature is installed). The light goes off if there are more than 115 ms between recognizable characters.

System Available (2)–Indicates that the printer has detected its address in a command. The light turns off if the printer does not receive a command for 480 ms.

Line Check (3)–Indicates that the printer has detected a parity error in a command or data sent from the controller. When the Cable Thru feature is installed, all stations turn this light on even if the command or data is not addressed to them. The addressed station returns an error response to the controller. The controller resends the information that contained the error until the information is received with no error. After the information is received without error, the light is turned off.

Storage Check (4)–Indicates that a parity error has been detected in the basic storage located on the logic planar.

Internal Check (5)–Used only during power on sequence and when checking status in test mode.

Graphic Check (6)–Indicates that an unprintable character has been detected by the printer and the printer is set up to stop on this condition by the host program. The Attention light will be on and the Ready light will be off.

Data Cleared (7)–Indicates that a clear command (to reset the input buffers) has been received from the host. (This is part of the error recovery procedure for hard errors.)

Transparent Mode (8)–Indicates that printer is in a mode of operation in which the hexadecimal code for each byte of input data is displayed directly above the output of the character from the character generator. SNA formatting control characters, parameters, and characters not recognized by the character generator will be printed as a hyphen.

Attention–Indicates to the operator that manual intervention is required. Attention is turned on with the Graphic Check, Unit Check, and Forms lights. If the Audible Alarm feature is installed, the alarm also sounds. The light is also turned on by a BEL SCS control character in the data stream.

Forms–Indicates that a forms error was detected by the hardware. If the Forms and Attention lights are on and the Unit Check light is off, the printer is out of paper. If the Forms, Unit Check, and Attention lights are on, the forms were moved manually while the Ready light was on, a failure occurred in the paper movement mechanism, or a forms jam occurred.

Unit Check–Indicates that a hard error was detected while printing. This error is reported to the host in a 'read status' command. The Attention light will be on.

Note: The lights associated with the numbers 1 through 8 have multiple meanings as follows:

During power on sequence, they are turned off sequentially as each segment of the power on diagnostic is completed.

193 ERROR CODES, LIGHTS, SWITCHES, AND TEST POINTS (CONTINUED)

When the Status switch is set to Test, the 8 lights display the contents of the read status byte. See *Test Mode.*

During normal operation, the following lights are on:

Power On
Read
Line Sync
System Available

Test Mode

Select test mode by setting the Status switch to Test. In test mode, the printer is completely offline and will not respond to any commands from the controller. Test mode also changes the meaning of the lights from that described under *Lights,* preceding to the following:

Light Number	Status Switch Set to Normal	Read Status Response Bit	Status Switch Set to Test	Error Code
1	Line Sync	7	Wire Check — A print wire was turned on too long.	31/41
2	System Available	8	Slow Speed Check — The print head moved too slowly.	42
3	Line Check	9	Fast Speed Check — The print head moved too quickly.	33/43
4	Storage Check	10	Emitter Sequence Check — Emitter pulses were missing or occurred in the wrong order.	34/44
5	Internal Check	11	No Emitters — No emitter pulses were detected (the print head was stalled).	35/45
6	Graphic Check	12	Overrun Error — Overrun occurred while printing, and the print position cannot be determined. It can also occur if the print head is bumped.	36/46
7	Data Cleared	13	Forms Stopped — The forms are jammed, stalled, or cannot be moved. Manual intervention is required.	37
8	Transparent Mode	14	Forms Position Lost — The forms have been moved without pressing the Stop switch; forms position cannot be determined.	38

193 ERROR CODES, LIGHTS, SWITCHES, AND TEST POINTS (CONTINUED)

Wire Check (Light 1)–When the part of the printer logic on the voltage regulator card or planar recognizes that a wire has been on too long, the logic activates the 'wire check' line. This line causes the Wire Check light to come on and all printer functions to stop for 1/2 second. The printer logic activates the 'printer reset' line. If the reset does not clear the wire check, the logic signals a hard error by turning on the Unit Check and Attention lights.

Slows Speed Check (Light 2)–The slow speed check occurs when 50 consecutive emitter pulses occur that exceed the maximum allowable spacing:

40 cps	3.45 ms
80 cps	2.08 ms
120 cps	1.50 ms

This error by itself is always a soft error and no recovery is attempted. However, the error might appear hard if it occurs with a hard error. Generally, the only reason for the soft error light is that the last emitter pulse received exceeded the slow speed maximum spacing and was followed by a hard error. See also *Emitter Sequence* and *No Emitters*.

Fast Speed Check (Light 3)–The emitter pulses must conform to the following minimum spacing:

40 cps	728 ms
80 cps	700 ms
120 cps	500 ms

If a second emitter pulse occurs within the spacing, it is considered a fast emitter pulse (fast speed check). Light 3 will not turn on unless the condition occurs on two consecutive emitter pulses. If this happens, light 3 is turned on and the logic performs an automatic retry. If the same condition occurs again on two consecutive emitter pulses during the retry, a hard error results.

Emitter Sequence (Light 4)–This error occurs for any of the 3 following conditions:

1. An emitter pulse occurs in the wrong sequence for the direction the carrier is moving.
2. An emitter pulse was missed because the pickup failed or the pulse came on too soon after the previous pulse.
3. All 3 emitter pulses were on (or off) at the same time. This kind of emitter sequence error is the only one that can occur during the stop-time turnaround.

If lights 3 and 4 are both on, the emitter pulse probably was early and so short that it was gone before the fast speed check (minimum spacing) occurred. If lights 2 and 4 are both on, the emitter pulse probably was not detected (the pulse did not occur).

No Emitters (Light 5)–Light 5 turns on for either of the following conditions:

1. The processor does not recognize an emitter pulse after 125 ms.
2. The processor senses the emitter pulse, but the hardware does not provide the timing checkpoints for minimum spacing.

If lights 3 and 5 are both on, two pulses occurred too close together and no more pulses were recognized. If lights 2 and 5 are both on, the last 2 emitter pulses were too far apart and no pulses were recognized.

Overrun (Light 6)–If the minimum spacing checkpoint is not handled by the processor before the hardware reaches the next minimum spacing point, the processor has been overrun by the hardware. This indicates:

1. Something kept the processor from servicing the emitters.
2. The processor failed for a time.

Forms Stopped (Light 7)–Light 7 turns on if the forms logic was started but no activity occurred for 250 ms.

If the forms move from the detent position by 1 motor phase when the printer is ready, the processor attempts to move it back to the correct position. If this action is not completed in 250 ms, light 7 turns on.

Forms Position Check (Light 8)–Light 8 is turned on if the forms move from the detent position by more than 1 motor phase when the Ready light is on.

Forms overrun occurs if the processor fails to service the forms logic. If this happens, forms motion is stopped and light 7 or 8 (or neither) might be on (depending on the condition within the processor).

193 ERROR CODES, LIGHTS, SWITCHES, AND TEST POINTS (CONTINUED)

Control Panel Switches

The control panel contains the following switches: Power, Start, Stop, Line Feed, Form Feed, Line Spacing, and Status.

Power switch–A 2-position switch that switches on AC power to the printer.

Start switch–A momentary contact switch that causes the printer to become ready if an error condition does not prevent it from doing so. Pressing the Start switch is required after the power on diagnostics in order to make the printer ready. The Start switch also provides the enter and execute functions when offline tests are selected by using the Line Feed and Form Feed switches.

Stop switch–A momentary contact switch that causes the printer to become not ready. The switch must be pressed before operator intervention occurs when changing or aligning forms. As part of the error recovery procedures, the Stop switch turns off the Unit Check, Data Cleared, Graphic Check, and Forms lights as well as the numbered lights and the Attention light (with the Audible Alarm if it is present). The Stop switch also stops execution of the offline tests.

Line Feed switch–A momentary contact switch that can operate in 2 different machine modes:

Normal mode–This switch causes a single line feed if the Stop switch was pressed first; if the Stop switch was not pressed, no action results.

Test mode–This switch is used with the Form Feed and Start switches in selecting offline tests. The line feed action is not done when the printer is in test mode.

Form Feed switch–A momentary contact switch that operates in 2 different machine modes:

Normal mode–This switch causes a series of line feeds to the start of the next logical page if the Stop switch was pressed first; if the Stop switch was not pressed first, no action results. If the forms length has not been set by a 'set vertical format' control character, the forms length defaults to 1 line feed.

Test mode–This switch is used with the Line Feed and Start switches in selecting offline tests. The forms feed action is not done when the printer is in test mode.

Line Spacing switch–A 2-position switch that allows 6 or 8 lines per inch to be selected.

Status switch–A 3-position switch:

Cancel–A momentary position that causes 'cancel request' status to be sent to the controller. The switch has no function when the printer is in test mode.

Normal–Places the 5256 in online mode for operating with the host system.

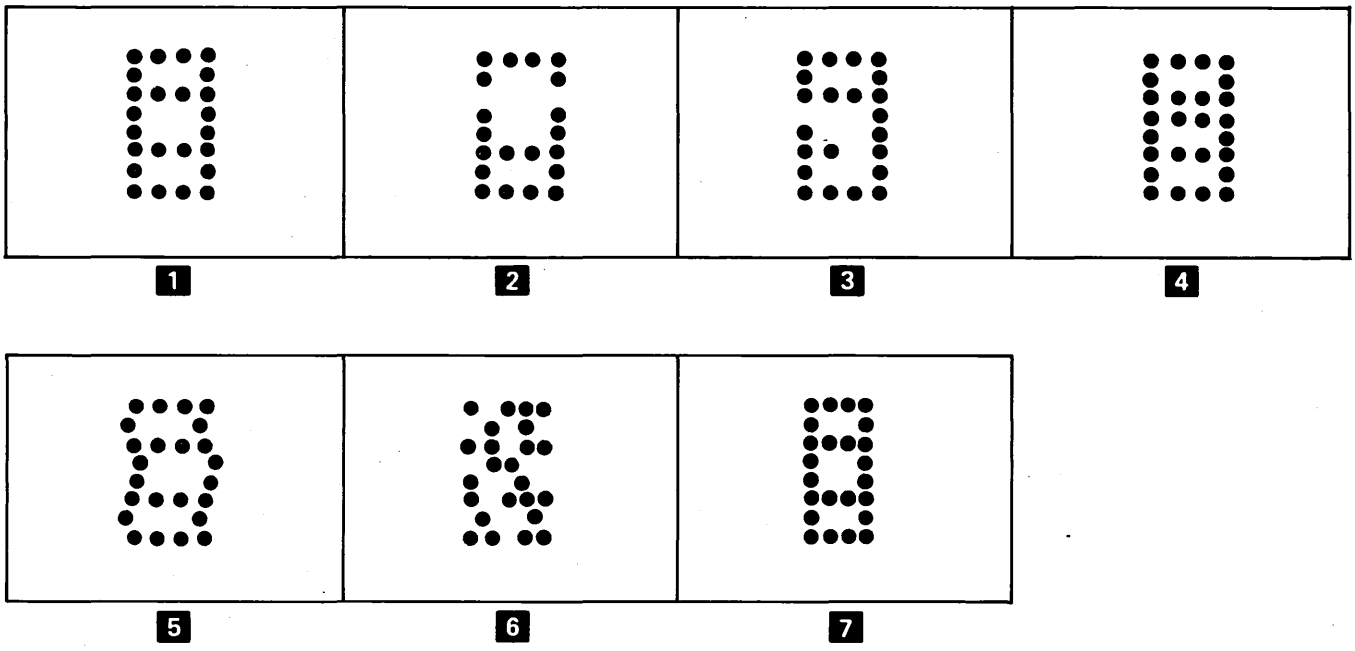
Test–Places the 5256 in offline (test) mode for problem determination or diagnosis.

Test Points

Test points are available on printer board A1 in the left rear corner (viewed from the back) and on the interposers on planar board B1. The points are referenced from the MAPs and service procedures.

195 PRINT QUALITY AND REGISTRATION PROBLEMS

Print Quality Problem Examples



1 Correct character

2 Missing row of dots (all characters have a missing row of dots)

3 Random missing dots (single characters have missing dots)

- Check the platen surface
- Check the print head for binds
- Check the ribbon for damage

4 Extra dots (all characters have extra dots)

5 Dots not aligned vertically

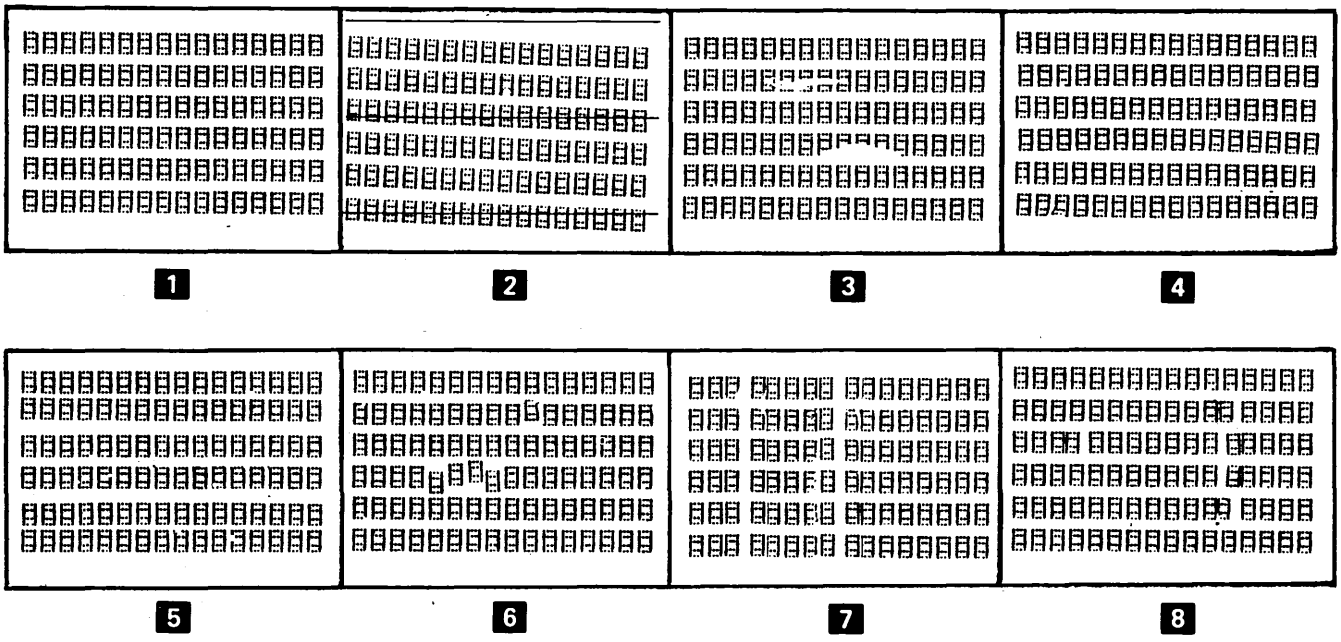
- Check the carrier and ribbon for binds

6 Character cannot be recognized

7 Character width incorrect

195 PRINT QUALITY AND REGISTRATION PROBLEMS (CONTINUED)

Registration Problem Examples



1 Correct registration

2 Print not aligned with the forms (crooked print)
- Check the forms path for binds.

3 Parts of characters missing
- Check ribbon for defects or oil spots.
- Check for a defective platen.

4 Horizontal alignment (complete lines aligned wrong)
- Check the emitter adjustment (140).

5 Vertical registration (variable line spacing)

6 Vertical registration (characters above and/or below the normal line)
- Check the carrier adjustment (150).

7 Horizontal registration (variable column spacing)
- Check the carrier for binds.

8 Horizontal registration (characters left or right of the normal column)
- Check the emitter adjustment (140).

Wiring Diagram, Diagnostic Aids

196 PROBE, PROBING INFORMATION, AND INTERPOSER CHECK

Probe Setup and Accessories

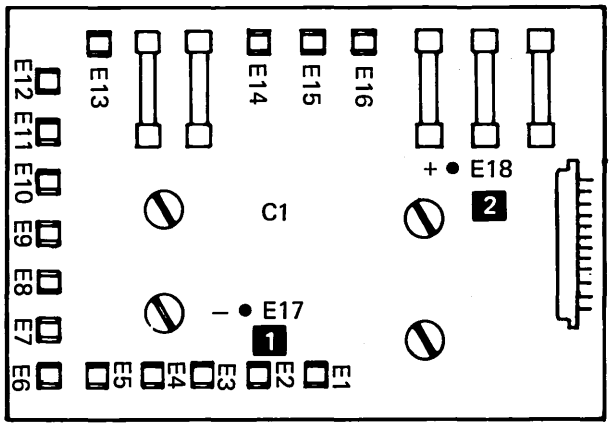
1. Set up the probe as follows:
   a. Set the Technology switch to the Multi position.
   b. Set the Latch switch to the None position.
   c. Set the Gate Ref switch to the Gnd position.

2. Use the following tips and jumpers as required:
   a. GLP extender cable (part 453605)[1]
   b. SLT type probe tip (part 453826)[1]
   c. SLT ground tip (use part 453826)[1]
   d. 6/32 pin tip
   e. Alligator tip

Probe Power

Connect probe power leads to power adapter board C1 as follows:

Black to C1E17 1 (-)
Other to C1E18 2 (+)



[1]Can be ordered from Mechanicsburg.

Probe Test

Ground the probe at B1D1D08 on the planar board. Probe B1D1B02 on the planar board. Both lights should be on.

Probe Light Conditions

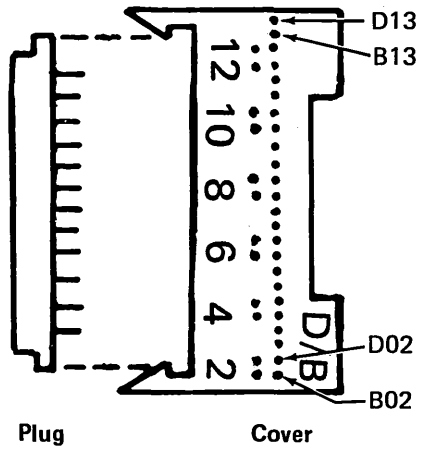
Two lights are used to indicate status. The 2 lights indicate 4 conditions:

Condition	Lights Up	Lights Down
Up light on continuously	On	Off
Down light on continuously	Off	On
Pulsing	On[1]	On[1]
Invalid signal or no power to the probe.	Off	Off

Probing EC1, EC2, and C1A1

The connector caps have holes drilled through to the probe points. Simply insert the probe into the appropriate hole.

C1A1,P-EC1,P-EC2 Pin Locations

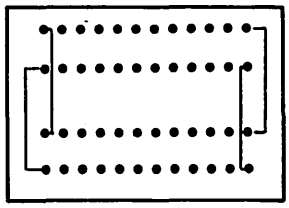


Top View

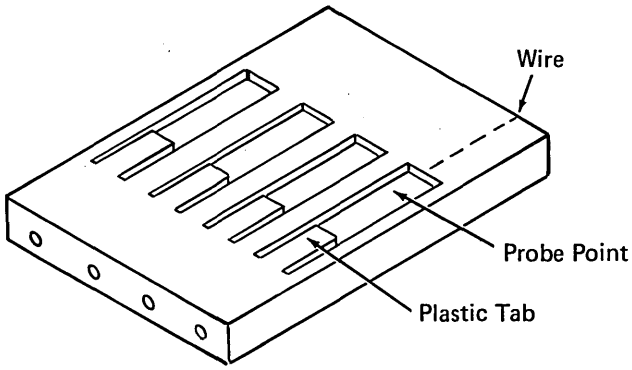
[1]Both lights are on, 1 light is on continously while the other light turns on and off, or both lights turn on and off.

Continuity Check for Interposers

Remove the interposer and make continuity check as chart below indicates:



Removing Wire From Plugs P2, P3, P4, and P5



Lift the plastic tab slightly with a very small screwdriver or knife until the wire can be pulled out.

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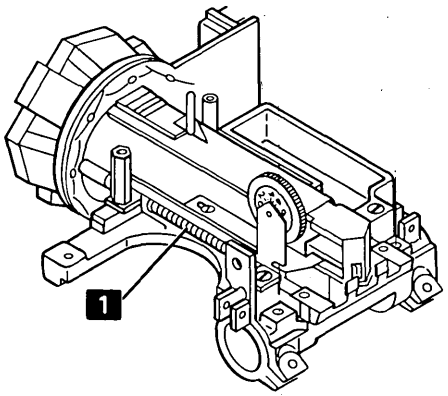
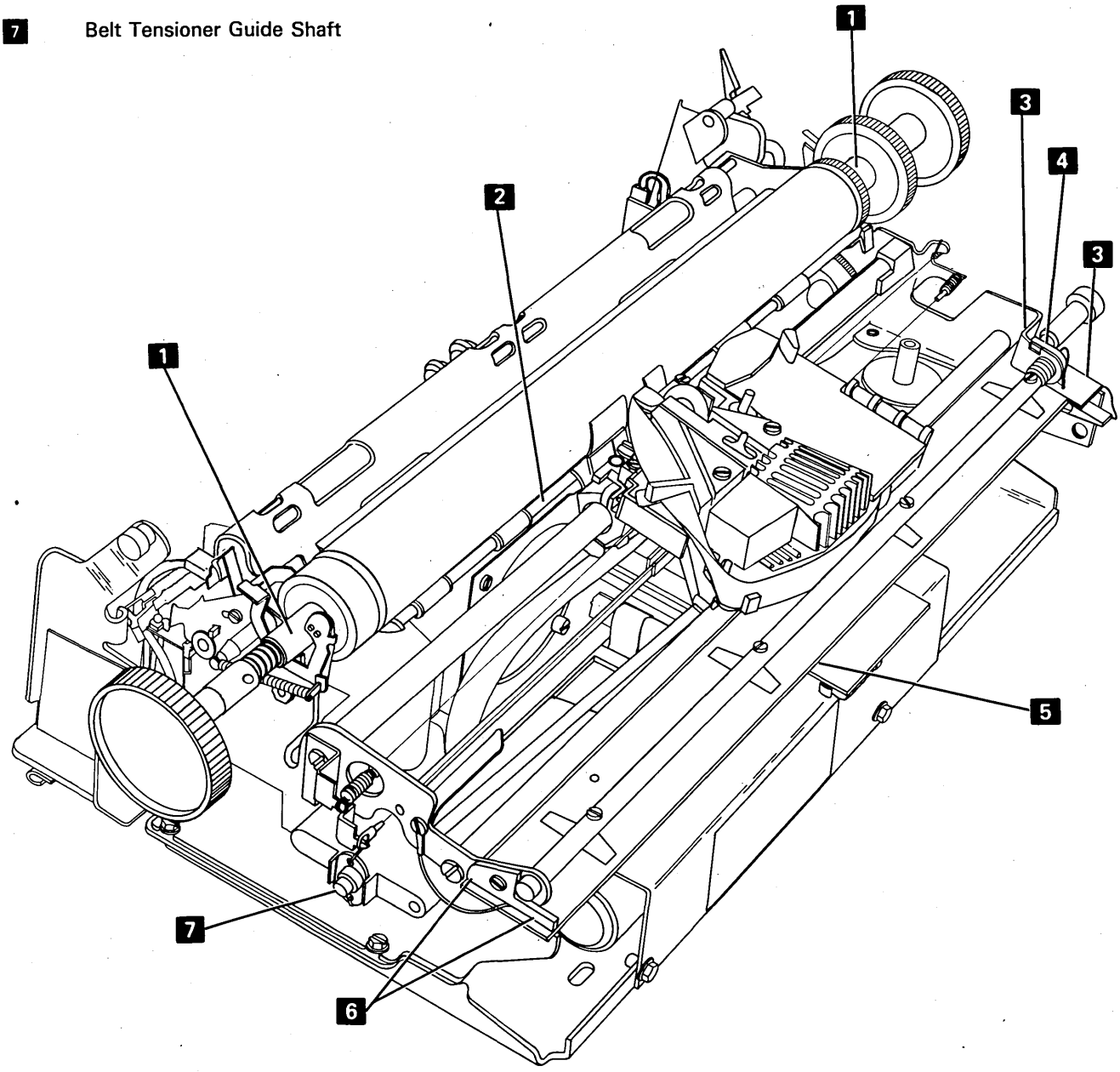
Perform preventive maintenance (PM) for the printer on any 01 call if a check of the incident reports shows that more than 30 months passed since the last PM on 40 and 80 cps models (15 months on 120 cps models).

Unit	Operation	Lubricant	Notes
Ribbon drive	Replace the lines. Lubricate the feed roll shafts. Clean the ink from the ribbon guides. **CAUTION** Excess oil will bleed to the ribbon and cause light and dark printing.	 IBM No. 23	See 173. Light film.
Print head	Clean the wire guide tip and the side grooves. Check the print for variations in density. Lubricate the oil felt. Lubricate the support bars.	 IBM No. 6 IBM No. 6	 Variations could indicate print wire wear. See 163. Drop.
Forms tractor unit	Lubricate the shafts.	IBM No. 23	Light film.
Back cover	Change or clean the filter in the right rear corner (as viewed from the front).		
Print emitter	Lubricate: Pickup pads. Contact points (7) between the emitter board and the side frame. Horizontal fine adjustment threads and shaft sides.	 IBM No. 23 IBM No. 23 IBM No. 23	 Light film. Light film. Light film.
Carrier drive	Lubricate the belt tensioner shaft.	IBM No. 23	Light film.
Forms feed drive	Lubricate the idler gear stud.	IBM No. 6	Drop.
Platen	Lubricate the bushings.	IBM No. 23	Light film.
Power supply	Check the fan operation (2 places).	IBM No. 6	Light film.
Support bars (2) 1		IBM No. 6	Light film.



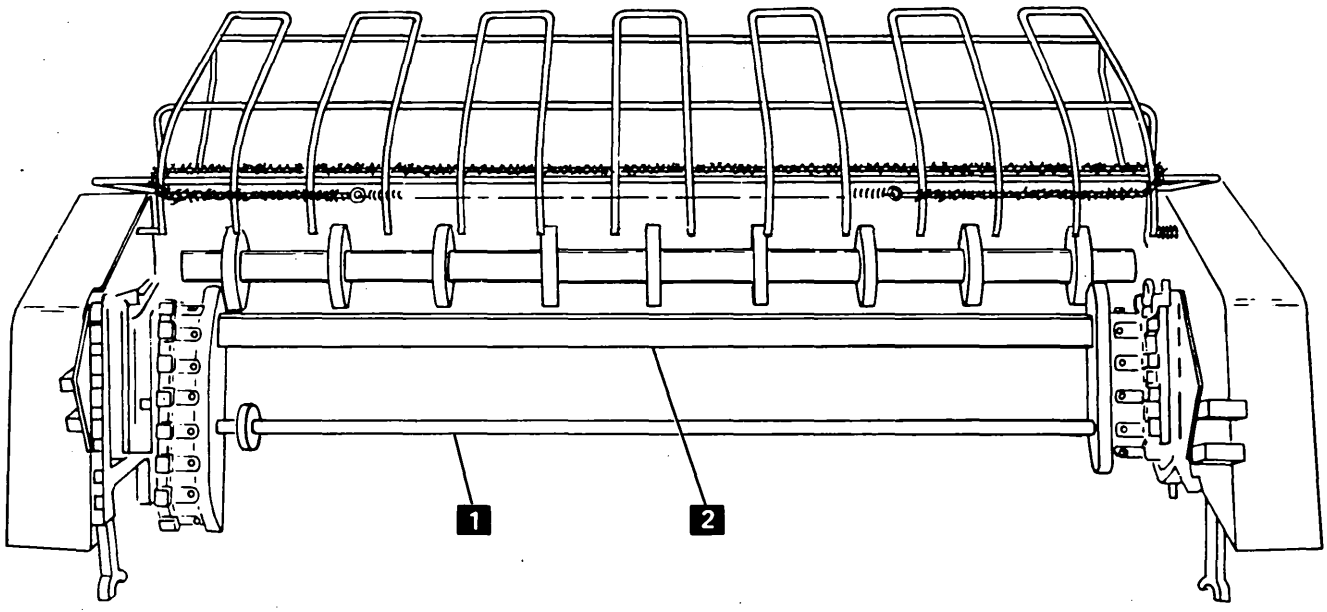
Use IBM No. 23 grease for:

1. Platen Bushings (2)
2. Feed Roller Shafts
3. Contact Points (3) between the Emitter Board and the Right Side of the Frame
4. Horizontal Fine Adjustment Threads
5. Pickup Pads (4) between the Emitter Board and the Pickup Card
6. Contact Points (4) between the Emitter Board and the Left Side of the Frame
7. Belt Tensioner Guide Shaft



Use IBM No. 23 grease for:

1. Bottom Forms Tractor Shaft (light film)
2. Top Forms Tractor Shaft (light film)



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The tools and test equipment needed to service the IBM 5256 Printer are listed below:

- General logic probe kit
- Standard CE tool kit
- Metric tool kit

General Logic Probe

The general logic probe with needed leads and probe tips is available in a kit from Mechanicsburg by ordering part 453212.

Information specific to the use of this probe on the printer is in 196. Refer to the instruction book shipped with the probe for a description of the probe and its operation.

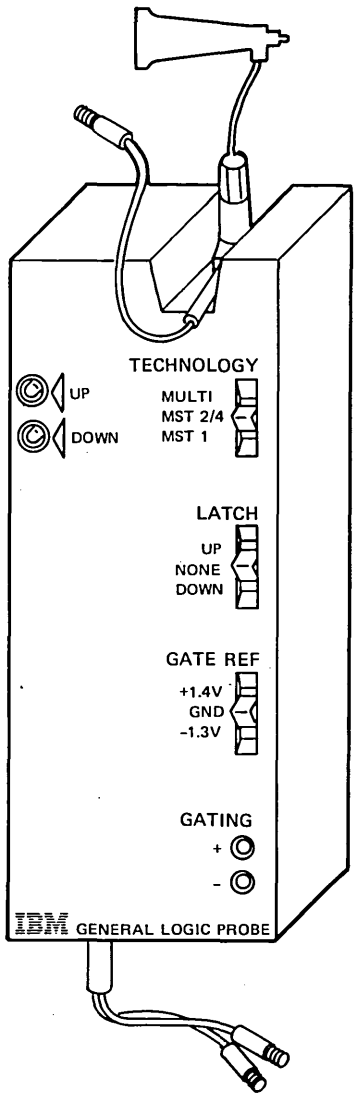
Standard CE Tool Kit

Tools normally used by the CE are in this kit.

Metric Tool Kit

A kit of metric tools is available from Mechanicsburg by ordering bill of material 1749235.

Note: In the 5256 all metric screws are blue.



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INTRODUCTION

The IBM 5256 Printer is a bidirectional (prints left and right) printer that prints at 40, 80, or 120 cps (characters per second).

This printer produces characters by a series of dots within a matrix. Characters are formed by printing a pattern of dots that corresponds to a stored image in the printer adapter.

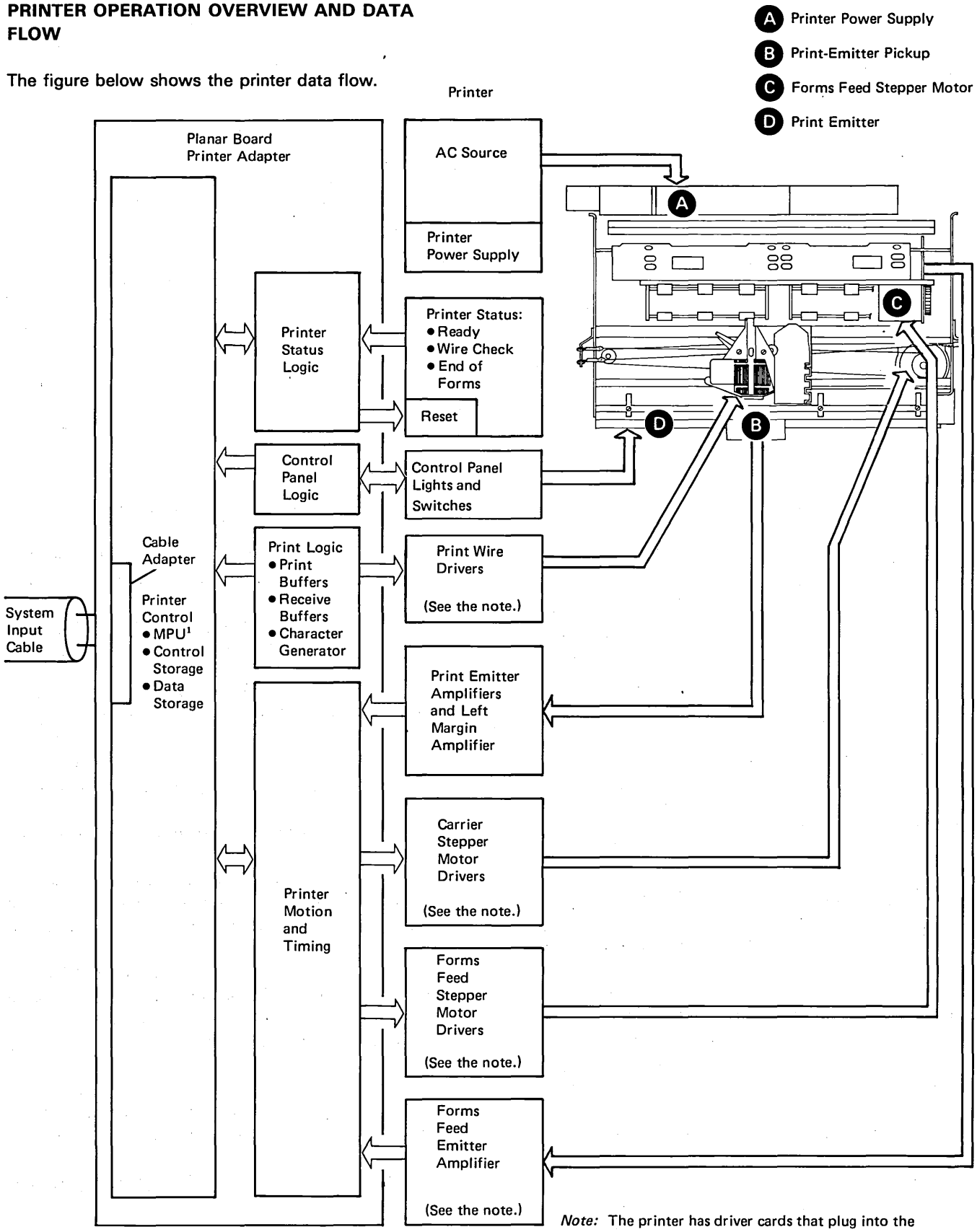
Printer control and logic voltages are provided within the printer. Data and control signals are received on a cable from a controller at a system.

The printer has the following capabilities:

- Prints characters by a series of dots within an 8-high by 7-wide matrix.
- Model 1 prints at 40 characters per second (101.6 mm/second–4 inches/second).
- Model 2 prints at 80 characters per second (203.2 mm/second–8 inches/second).
- Model 3 prints at 120 characters per second (304.8 mm/second–12 inches/second).
- Models 1 and 2 tab at high speed.
- The print line is up to 132 characters long.
- As many as 96 different characters can be printed (128 for Katakana).
- Vertical spacing is 6 or 8 lines per 25.4 mm (1 inch), selected by a switch.
- High speed multiple line feeding.
- Horizontal spacing is 10 characters per 25.4 mm (1 inch).
- Cut forms are advanced by a 381 mm (15-inch) pressure feed platen.
- A forms tractor unit for printing on continuous forms.
- Printing can occur while the print head is moving either to the right or to the left (bidirectional printing).
- High speed tabbing and high speed multiple line feeding can occur at the same time.

PRINTER OPERATION OVERVIEW AND DATA FLOW

The figure below shows the printer data flow.



Note: The printer has driver cards that plug into the printed circuit board located at the rear of the printer assembly.

[1]The MPU interfaces with all units of the planar board.

Printer Logic Flow

The IBM 5256 Printer is powered by two stepper motors: the carrier motor and the forms motor. Each motor is controlled by 4 drive lines: 'A', 'not A', 'B', and 'not B'. Combinations of these drive lines in a prescribed sequence determine the direction the motor turns.

The carrier motor is coupled to a carrier that supports the ribbon box, the ribbon drive mechanism, the print head, and the print emitter pickup.

The ribbon box holds a continuous loop of ribbon. The ribbon is driven by 2 lines through 2 clutches and a series of idler gears.

The print head contains 8 vertically-mounted print wires. Signals from the printer adapter move the print head along the print line and selectively energize the print wires.

The character dot matrix is 8-high and 7-wide. The 8th wire is used for underscoring, for some special characters, and for some lowercase letters.

The print emitter pickup consists of 4 land patterns and 4 associated amplifier detector trigger circuits. Three of the land patterns are vertical; the 4th is horizontal (all reference to land pattern direction in this overview are with the printer in the service position). The print emitter pickup slides along the length of the print emitter board.

The print emitter board is a stationary board with 1 continuous vertical land pattern and a 4.25 MHz oscillator.

A print emitter pulse is produced when the land pattern of the print emitter board and one of the vertical land patterns of the print emitter pickup are at a maximum misalignment (null position). The maximum misalignment of a vertical print emitter pickup land pattern and the vertical part of the print emitter board land pattern occurs every 0.76 mm (0.030 inch). Because each vertical print emitter pickup land pattern is displaced by 0.25 mm (0.010 inch), a print emitter pulse occurs every 0.25 mm (0.010 inch).

When the horizontal land pattern of the print emitter pickup is aligned with the horizonal part of the print emitter board land pattern, a left margin pulse occurs.

The print emitter pulses and the left margin pulses energize 4 lines:

Emitter 1

Emitter 2

Emitter 3

Left margin

When these lines are active, they signal the adapter:

- When the print head is in the left margin area (during initialization only).
- Where the print head is during printing.
- Which direction the print head is moving.
- When to fire the print wires.

The printer adapter is contained on a half planar located within the printer. This planar contains:

- a cable adapter
- control storage (ROS–read only storage)
- data storage (read/write storage)
- a microprocessing unit (MPU)
- printer input registers and a character generator
- emitter control
- forms control
- sense latches
- controls for the operator switches and lights
- counters, decodes, and register selection circuits.

The cable adapter receives commands and data from the host system over the cable. The adapter responds to the poll commands and read activate commands through hard-wired address decodes. For write activate commands, the MPU assigns buffer space and provides the beginning and ending addresses in an address buffer. The cable adapter uses these addresses to locate space in data storage for data that follows the activate command.

After the data is stored, the MPU accesses the data to find, from the formatting control codes within the data, what is to be done. Lines to be printed are formatted and placed in 1 of the 2 print buffers (up to 132 characters each). Control then passes to the printer control routine which addresses the character locations in the character generator to fire the print wires. No formatting is allowed until the print buffer in use is empty (at least 1 line is printed). However, at least once each 25 milliseconds, control transfers to the cable-handler routine that services write data commands and provides addresses for buffer space.

During printer operation the MPU services the printer interface registers, as needed, to keep the printer operating.

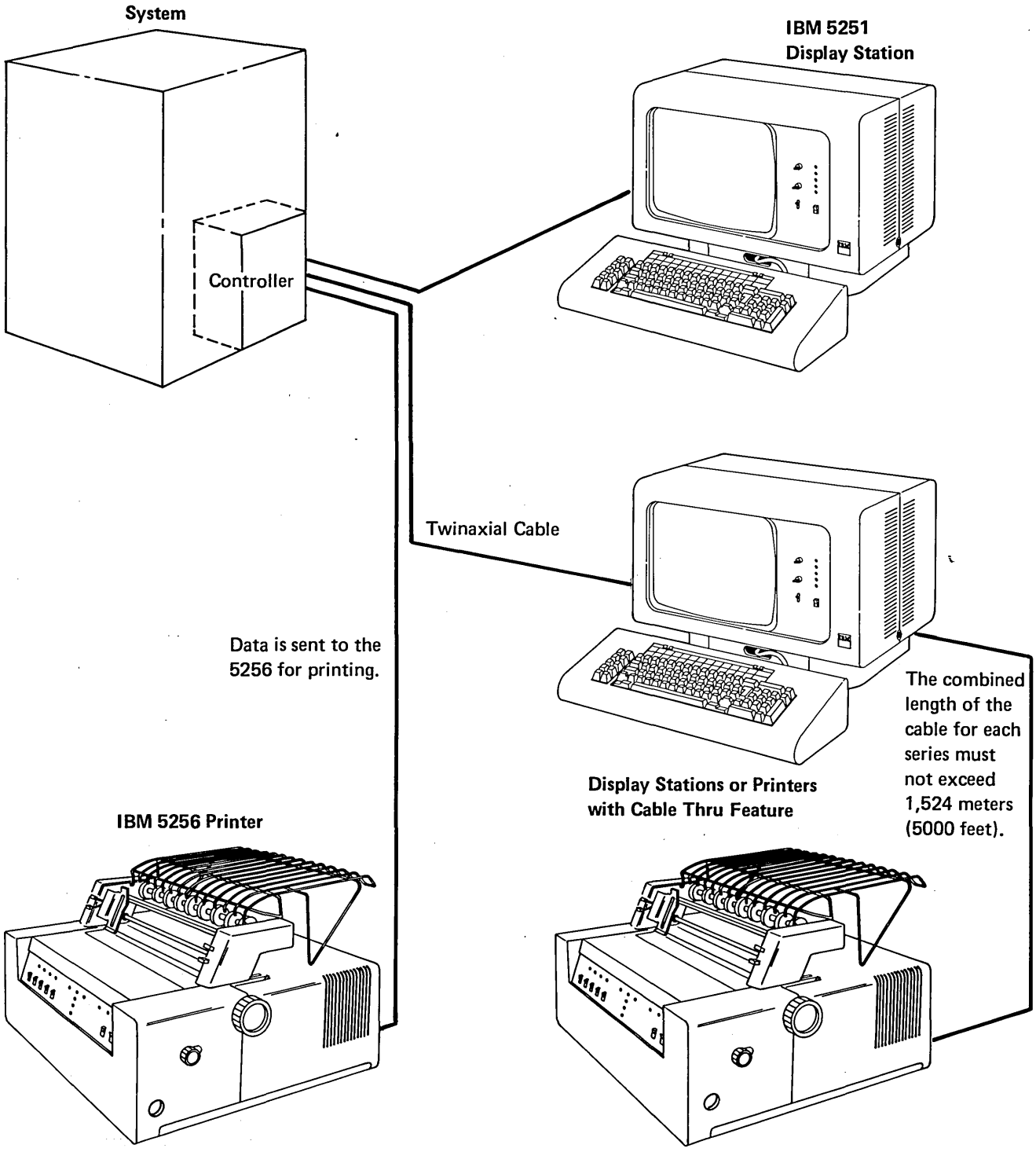
A print routine contains microcode that handles the recognition of print buffer contents, determines in which direction and how far the print head is to move, and controls line feeding, print head motion, starting, and stopping.

The MPU uses the print routine to recognize the starting point of the print line. The MPU determines how far and in what direction the print head must move from its present location. The MPU also determines if the next line to be printed requires a stop, high-speed tab, normal-speed tab, and whether the line feeds can be completed without stopping the print head.

While the wires are firing, the print routine handles loading of the address for the next group of wires to be fired from the character generator.

SYSTEM CONFIGURATION

The printer can attach directly to the controller in a system or, if the Cable Thru feature is used, to a display station or to another printer. The following figure shows the possible arrangements.



CABLE ADAPTER

The cable adapter is the hardware (drivers, receivers, and logic) on the planar board that handles the incoming and outgoing communications between the controller and the printer.

Note: The 5256 is attached to the controller by a twinaxial cable. See *Cabling Locations* (108), and *Cable Thru* in the *Features* section of this manual.

Frame Concept

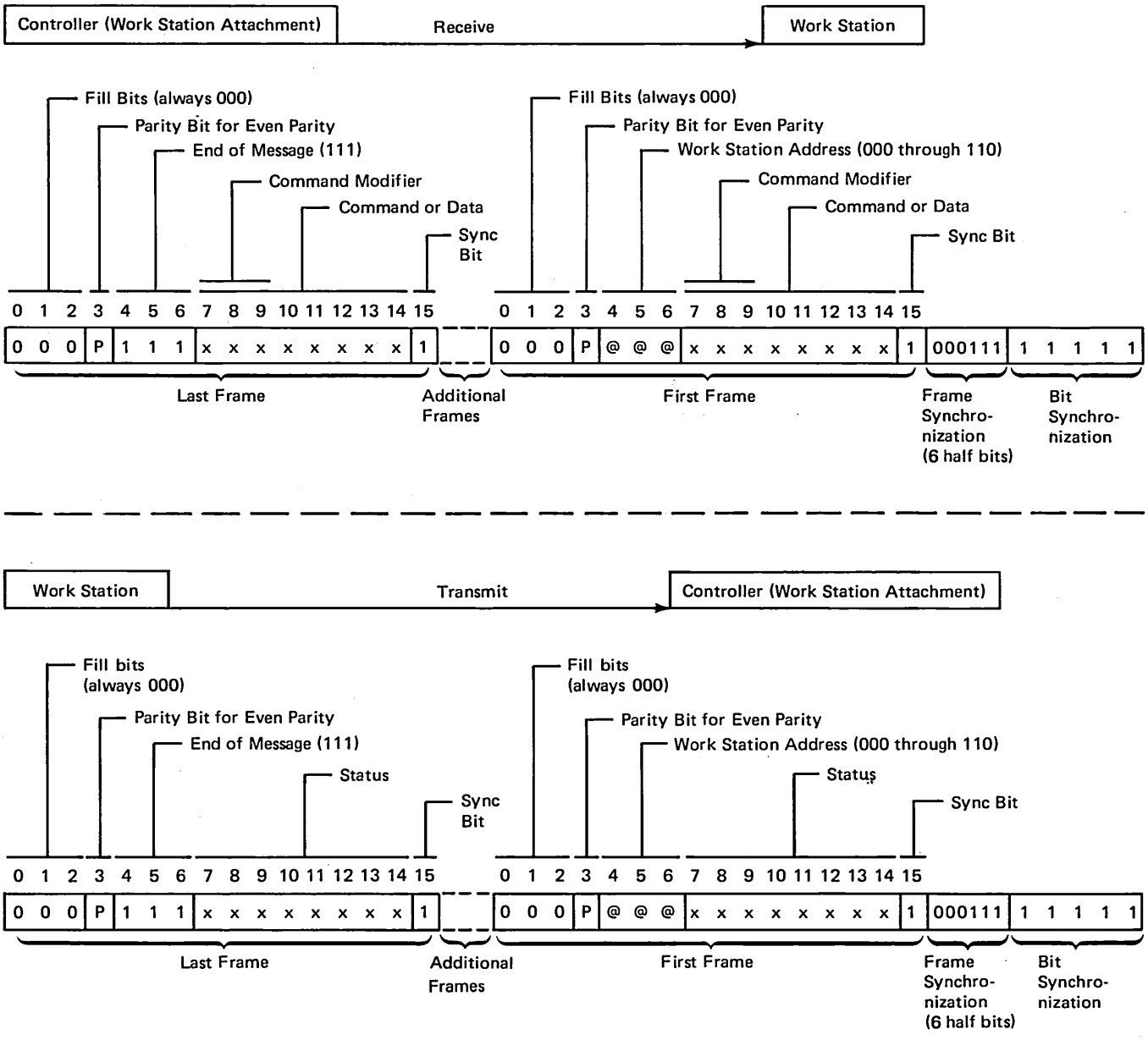
Communications between the controller and the cable adapter at the printer are carried by 16-bit frames that are transmitted to and from the controller on an as-required basis. The cable carries no signal between frames. To understand what is to follow, it is necessary to explain briefly the phase encoding used for sending data on the system cable. The data is phase encoded so that a transition occurs during each bit time (a 0 to 1 transition for a 0 and a 1 to 0 transition for a 1). If no transition occurs during a bit time, a code violation has occurred. Because the transition divides the bit into 2 parts, the term *half bit* will be used in the explanation that follows. (The data sent on the system cable is a 4-level signal. Refer to the system documentation for a further explanation of the phase encoding process.)

When information is to be sent on the cable a group of five 1 bits (1010101010 half bits) is sent to establish bit synchronization. Immediately after the 1 bits, a group of 3 half bit 1's and 3 half bit C's is sent to establish frame synchronization.

After the frame synchronization half bits, the frame is sent, starting with the sync bit.

The transmission rate is 1.0 MHz (16 microseconds per frame). The frame bit assignment during transmit and receive operations is shown in the following diagram:

Transmission Sequences



Note: For scope procedures and pictures, refer to the controller documentation .

The 16-bit frame carries 13 bits of information in each direction. The fill bits, always 000, serve as a timing delay. The parity bit makes the active bits in the frame even. The printer decodes the address bits and responds to a specific address. The printer sends a response frame that contains the station address. A printer address of 111 indicates an end-of-message and causes line turnaround. (At the work station, line turnaround extends from the time the last bit of a frame (bit 0) is received until the same work station starts sending bit and frame synchronization patterns.) Bits 7 through 14 are the data or commands used throughout the printer and storage. Bit 15 (always on) is the synchronization bit for both the controller and the printer.

Commands

The numbers in parentheses are the bit configurations that are in positions 7 through 14 of each command.

Activate Read (0000 0000) is inserted between a 'read status' command and the data frame that follows it. The 'activate read' command should be issued only after a not-busy, no-exception, no-line-parity error response is returned to a 'poll' command.

Activate Write (0000 0001) is inserted between a 'write data' command and the data frame(s). This command initiates the start of the data transfer that follows a 'write data' command. The 'activate write' command should not be issued until a not-busy, no-exception, no-line-parity error response is returned to a 'poll' command.

Clear (0001 0010) is used to clear all printer buffers. No forms motion results from this command. If the printer is not ready, the Data Cleared light is turned on. Pressing the Start switch turns the Data Cleared light off.

EOQ (0110 0010) designates the end of the command queue. Only polls will be accepted until a not-busy status is returned in response to a poll.

Poll (xxx1 0000) is sent from the controller to the printer to start the transfer of 2 status words per poll. At power on time a single frame response is made until the printer receives a 'set mode' command. The bits in the command modifier are:

7 A reserved bit that is normally 0.

8 Acknowledges and resets the line parity error response bit in the printer. This bit is effective after a not-busy status is received from the printer.

9 Acknowledges the last status transmission to allow new status to be sent. If bit 9 is a 1, updated responses are made when they are available. If bit 9 is a 0, the former response frames are resent (except for real time status, which is always at the latest level).

Read Status (1000 1000) initiates the transfer from the printer of one status word that contains information about the condition of the printer. If poll response frame 1 has bit 10 on (indicating outstanding status), the system responds with a 'read status' command.

Reset (0000 0010) allows printing to be completed for any line that was being printed when the 'reset' command was received. The MPU responds as it would for a power on reset that:

- Degates the cable driver and receiver (printer goes offline).
- Turns off the Ready light.
- Runs power on diagnostics, as during power on sequence (190).
- Sets default options (forms length 1 line, line length 132 characters).
- Clears the mode that was set.
- Gates the cable driver and receiver (printer goes online).
- Presents the power on transition status response.

Set Mode (0001 0011) causes the printer to accept 1 mode control byte that specifies the number of times an 8-bit fill increment will be repeated between frames. The fill increments are used to adjust the response timing of stations attached to the controller. The 'set mode' command must be issued before any multiframe response is made by the printer.

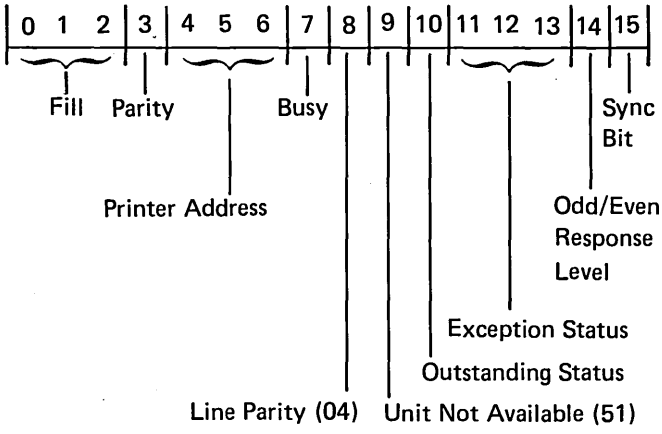
Write Control Data (0000 0101) is followed by a frame that conditionally resets outstanding and exception status.

Write Data (0001 1110), causes the printer to store all the data words that follow the next activate write command.

Poll Response Frames

Frame 1 is a 1-frame response sent to the controller after the printer has been polled following a power on reset. The controller receives frame 1 and returns a 'set mode' command.

A 2-frame response is sent for every 'poll' command following a 'set mode' command defining the interframe fill length. Poll response frame 1 contains the following information:



Bit 7:

0 = Not busy

1 = Busy

Bit 8:

0 = No line parity error

1 = Line parity error (04)

Bit 9:

0 = Unit available (The Ready light is on.)

1 = Unit not available (51)

Bit 10:

0 = No outstanding status

1 = Outstanding status (available by using the 'read status' command)

Bits 11, 12, and 13:

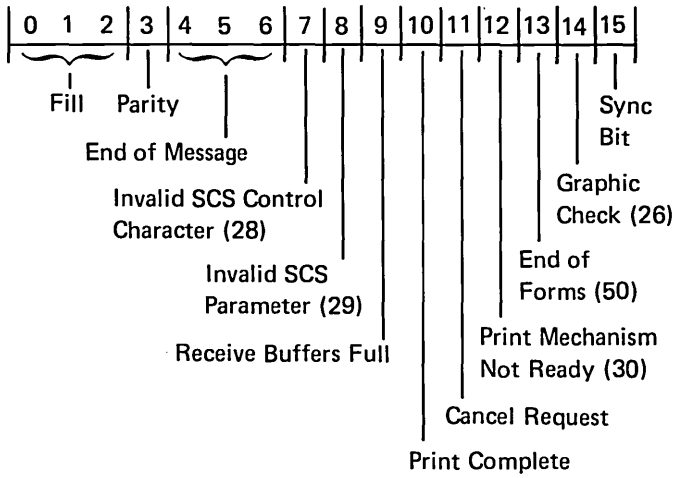
Bits 11, 12, and 13 indicate exception status as follows:

Bit 11	Bit 12	Bit 13	Meaning
0	0	0	No exception status
0	0	1	Activate lost (parity)
0	1	0	Invalid activate command (24)
0	1	1	Not used
1	0	0	Invalid command or device ID (20)
1	0	1	Input queue or storage overrun (22)
1	1	0	Not used
1	1	1	Power on transition (08)

Bit 14:

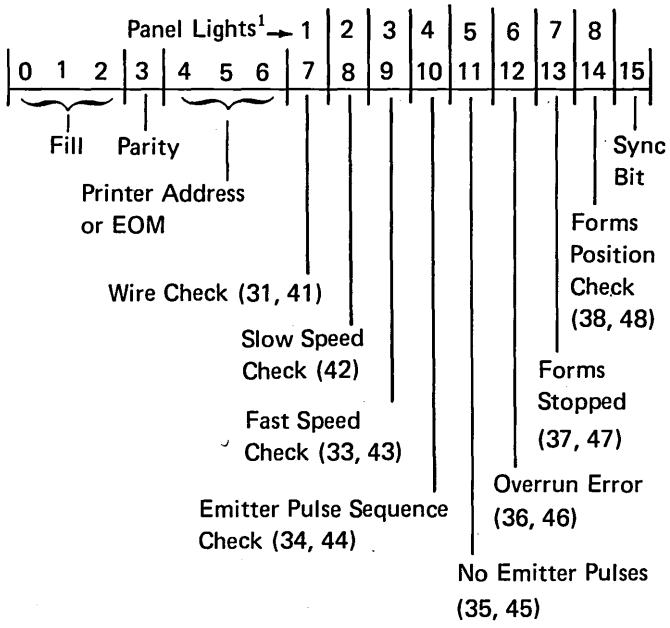
By analyzing bit 14, the controller determines whether the information in the response frame is the same as that in the previous response frame or if the information has changed. Bit 14 is turned off after power on. Any change in the response frame changes bit 14 from its previous state.

Frame 2 contains the following information:



Read Status Response Frame

One response frame is sent for every 'read status' command. The response frame, sent only after the 'activate read' command is received, contains the following information:



[1] Displayed when the Status switch is set to the Test position.

Refer to 193 for more information about status bits.

Printer SCS Formatting Control Characters

Formatting information is within the data stream as SCS control characters. The characters are shown in the following table.

Bytes	Hexadecimal Code	SCS Control Characters	Function (See the note.)
1	0D	CR—Carrier return	Logically moves the print position to the first position on the same line.
1	15	NL—New line	Logically moves the print position to the first position on the line and moves the form to the next line.
1	1E	IRS—Interchange record separator	Logically moves the print position to the first position on the line and moves the form to the next line (same as NL).
1	25	LF—Line feed	Logically moves the form to the next line. Does not move the print head.
1	0C	FF—Forms feed	Moves the forms to the first line of the next page and the print head to the first print position.
1	00	NUL—Null character	A no-operation. No character is printed and no function is performed in the printer.
1	2F	BEL—Bell	Turns the Ready light off and the Attention light on, sounds the audible alarm, and stops printing.
3	34C4AV	PPAV—Print position, absolute vertical 34 = Print position C4 = Absolute vertical AV= Hexadecimal value of the vertical position	Identifies the next print line. The numeric values must not exceed the end of the logical page. If the numeric value is less than the current line, a new page is started.
3	34C0AH	PPAH—Print position, absolute horizontal 34 = Print position C0 = Absolute horizontal AH= Hexadecimal value of the horizontal position	Identifies the next print position. The maximum numeric value must not exceed the end of the logical page. The maximum numeric value cannot exceed 132. If the numeric value is less than the current position, a new line is started.
3	34C8RH	PPRH—Print position, relative horizontal 34 = Print position C8 = Relative horizontal RH= Hexadecimal value of movement from the present position	Identifies the next print position in relation to the present position. The numeric value must not move the print head past the end of the logical line.
3	344CRV	PPRV—Print position, relative vertical 34 = Print position 4C = Relative vertical RV= Hexadecimal value of movement from the present position	Identifies the next print line in relation to the present line. The numeric value must not move the forms past the end of the logical page.

Note: The mechanical action observed might not agree with the stated function because of the look-ahead feature that selects optimum head movement for the best throughput.

Set Graphic Error Action Summary

Set graphic error action defines actions by the printer when the hex code for an unprintable character occurs. If a substitute character is not specifed, a hyphen is printed. If a status option (UU) is not specified, no status is posted and printing continues. The status options are (in hex):

01 No stop; no status.

03 Stop; hard error status (graphic check and unit not available).

Input Hex Data Stream				5256 Results		
SGEA Code	SCS Count NN	Default Graphic GG	Unprintable Character Option UU	Default Graphic	Unprintable Character Option	Error Status
2BC8	00	–	–	–	01	• Invalid SCS parameter
2BC8	01	–	–	–	-1	•
2BC8	02	GG	–	GG[1]	01	•
2BC8	03	GG	01 or 00	GG[1]	01	•
2BC8	03	GG	03	GG[1]	03	•
2BC8	03	GG	05 - FF	GG[1]	01	• Invalid SCS parameter
2BC8	04	GG		–	01	• Invalid SCS parameter

[1] If GG is unprintable, including characters in the EBCDIC control code quadrant, a hyphen (-) is printed.

Set Horizontal Format Summary

Set horizontal format defines the line length which must be between 1 and 132. If HH is not specified, the line length defaults to 132 positions.

Input Hex Data Stream			5256 Results	
SHF Code	SCS Count NN	MPP HH	MPP (Decimal)	Error Status
2BC1	00	–	132	• Invalid SCS parameter
2BC1	01	–	132	•
2BC1	02	00	132	•
2BC1	02	1 - 84	HH	•
2BC1	02	84 - FF	132	• Invalid SCS parameter
2BC1	03 - FF		132	• Invalid SCS parameter

Set Vertical Format Summary

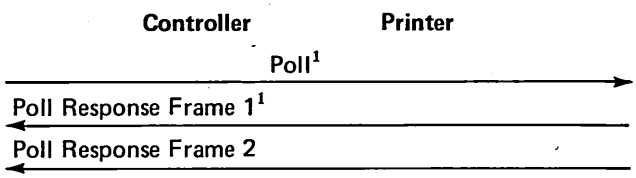
Set vertical format defines the page length. The position must be between 1 and 255 depending on the form size. If VV is not specified, the page length defaults to 1 line.

Input Hex Data Stream			5256 Results	
SVF Code	SCS Count NN	MPL VV	MPL (Decimal)	Error Status
2BC2	00	—	1	• Invalid SCS parameter
2BC2	01	—	1	•
2BC2	02	00	1	•
2BC2	02	1 - FF	VV	•
2BC2	03 - FF		1	• Invalid SCS parameter

Interface

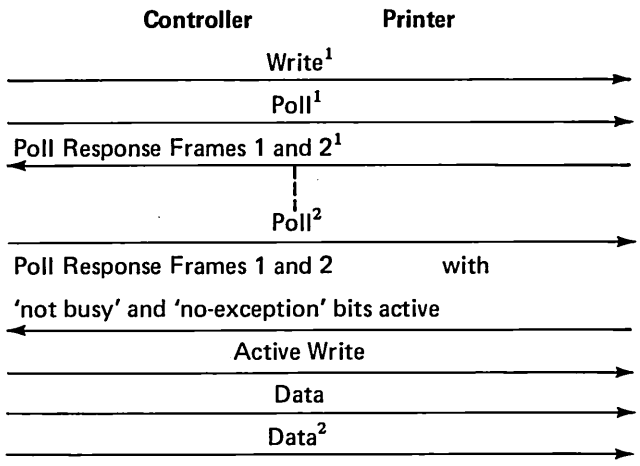
The following illustration shows action and synchronization between a printer and the controller. All exchanges are started from the controller by a command. The flow is in 1 direction at a time. The arrow indicates the exchange on one 16-bit frame in the indicated direction.

Poll for Status



- A poll sequence is always started by the controller.
- Two bytes of status information about the printer adapter, cable adapter, commands, and parameters are returned to the controller. (Before a 'set mode' command is received after a power on reset, only poll response frame 1 is returned.)

Write Data



- A write operation is initiated by the controller.
- The printer receives a poll frame and responds with busy status. At this time, the printer is preparing for the write operation.
- The controller continues to poll until the printer responds with a not-busy status with no-exception status.
- The controller issues an 'activate write' command to start the write operation.
- The controller shifts the data onto the cable to the printer.

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[1] The frame contains synchronization bits and instructions to switch the printer or controller to receive mode (line turnaround).

[2] The frame contains an end of message, a station address of all ones (111).

Data Transfer

For a description of operation when the Power switch is turned on, see reference 190.

The cable adapter has 3 major functions:

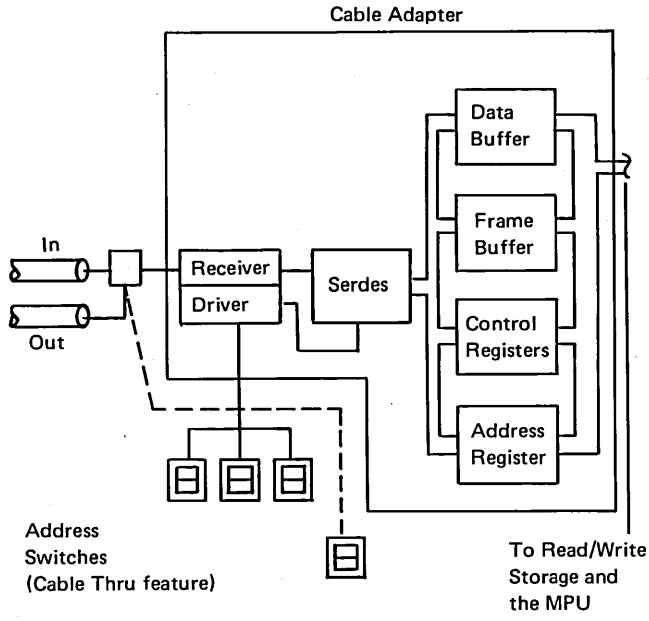
- Responding to polling.
- Shifting data onto the cable for transmission to the controller.
- Receiving data from the cable, decoding it for commands, and/or transferring the data to read/write storage.

The cable adapter detects the printer address on the first frame of a transmitted message. The address for a single online printer is 000. When the Cable Thru feature is installed, addresses ranging from 000 through 110 are set by the customer. When the address is received, recognized, and a response is returned, polling is complete. An address of 111 is invalid.

Data to be transmitted to the controller is moved from read/write storage, through a serializer/deserializer (serdes) register, and onto the cable under control of the cable adapter.

Data that is received is moved into the serdes register until the sync bit is in the high-order position. The serdes is stopped to allow time for the data to be moved into read/write storage.

Cable Adapter Data Flow



MICROPROCESSING UNIT

The microprocessing unit (MPU) is the control center of the printer. The MPU controls the flow of information to and from the controller. It is a microprogram-controlled processor and performs internal machine functions such as testing and comparing data, checking for machine errors, operating the printer, and storing and getting data from read/write storage.

When a block of data is received, the MPU formats the data into print lines using SNA character string (SCS) control characters that are in the data. Formatting is done only at the end of the lines (when the forms are moving and the carrier is stopped). Two buffers are used, ensuring that formatting is 1 line ahead of printing.

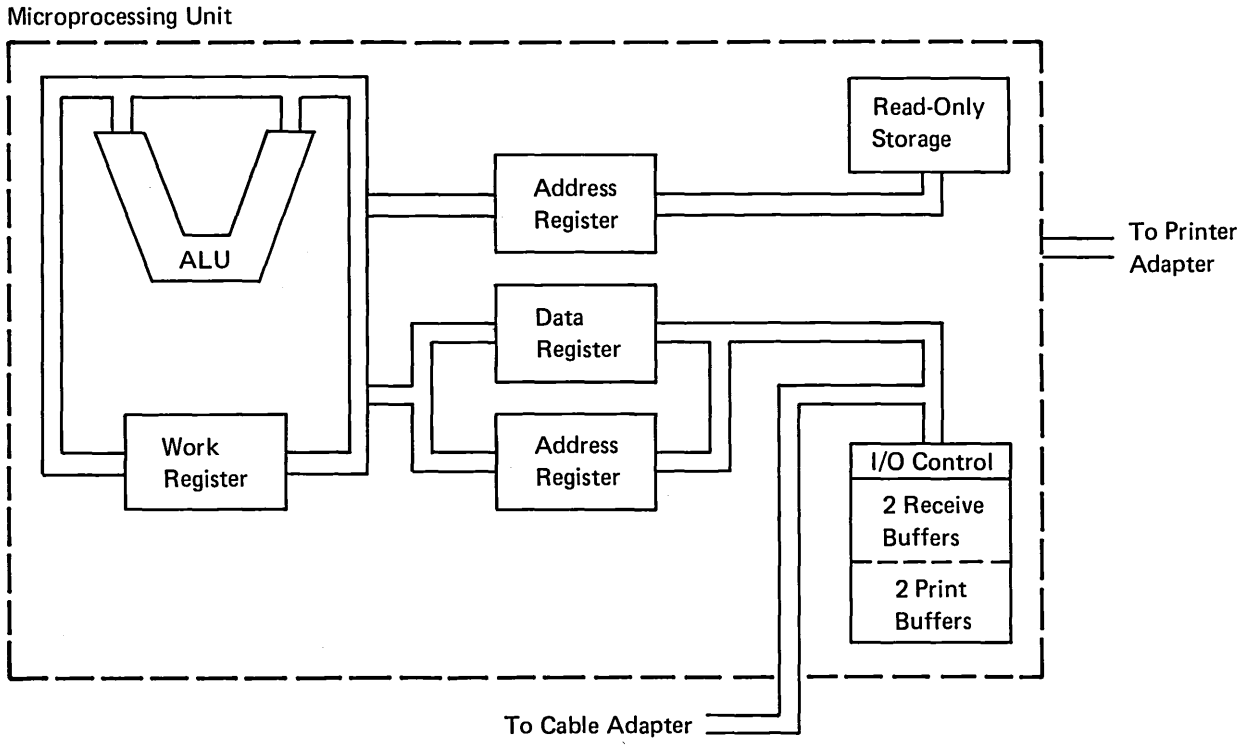
The major parts of the MPU are read/write and read-only storage, storage registers, work registers, and an arithmetic and logic unit (ALU).

Read/Write Storage

Read/write storage is divided into 2 major parts: a data buffer area and an I/O device control area. The data buffer area is composed of two 256-byte receive buffers and two 132-byte print buffers. The receive buffers are used by the cable adapter for storing up to 1 complete block of input data from the controller. One buffer holds data being formatted for printing while the other receive buffer is accepting data from the controller. One print line buffer is used for printing while the other is being loaded with formatted data from a receive buffer. The I/O device control area is divided into parts for cable adapter control and MPU work space.

Internal Processing Queues

Each printer has a work area large enough to hold up to 16 frames of commands or associated data. The commands and data are processed from this queue on a first-in and first-out basis.



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CONTROL PANEL AND CE LIGHTS

The control panel circuit is the interface for operator interaction with the printer. The microprocessor turns indicators off and on, interprets switch settings, and starts the correct reaction to switch changes.

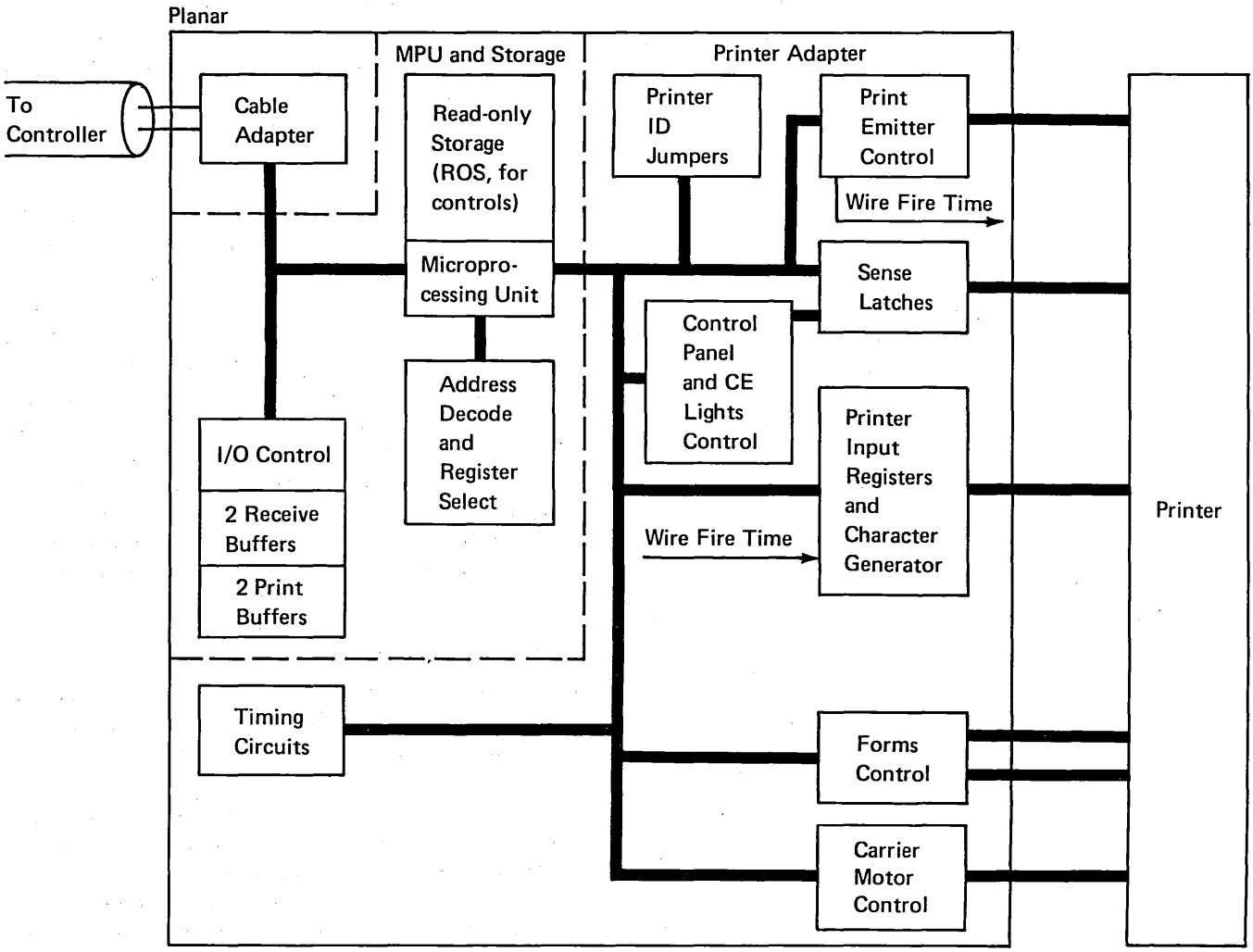
Sense Latches

The sense latches store the status of the control panel momentary contact switches and of the 'printer mechanism ready' signal. The latches are set to zero before each line is printed. The MPU reads the latch status after each line is printed to determine if action is required. The Start, Stop, Form Feed, and Line Feed switches and the Cancel position of the Status switch are all momentary contact switches and are therefore stored in the latches. The Line Spacing switch and the Test and Normal positions of the Status switch are not momentary contact switches. However, the Status switch positions are stored in latches. The Line Spacing switch position is not stored in a latch. Latching is required for the Status switch positions to determine if the switch position was changed while a line was being printed.

If 2 switches are sensed that cannot be serviced at the same time, the switch that would cause the least activity is serviced. For example, if the Form Feed and the Line Feed switches were sensed at the same time, a line feed would occur. The Stop switch always overrides the Start switch if the 2 are sensed together.

The control panel lights are described in reference 193.

Printer Adapter Data Flow



PRINT EMITTER CONTROL AND PRINT TIMINGS

The MPU uses the print emitter control circuits to measure time between emitter pulses (for checking purposes), to measure the time for firing the print wires (approximately 384 ms), and to sense the direction of emitter pickup movement.

Print emitter control circuits include a counter used in checking for emitter pulses too close together (fast-speed check). An elapsed-time counter is used in checking for pulses too far apart (slow-speed check or no-emitter-pulses check).

At each emitter pulse, a counter is incremented (decremented for right-to-left motion) causing the address to the character generator to point to the group of print wires to be fired. The low order 8 bits of the counter address the character. The high-order 4 bits are used as a counter to step through the character. When a character boundary is detected, the MPU changes the counter to address and step through the next character.

Timing relationships of the driver signals vary from those of the left margin, print emitter, and print wires. The timing relationship among left margin, print emitter, and print wire signals do not vary.

The following example shows the '-print emitter 2' as the first active pulse; it could be any of the 3 pulses, depending on where the print emitter pickup is aligned with the print emitter. Print emitter pulses are sent to the adpater to indicate 0.25 mm (0.010 inch) of print head travel along the print line.

Objective: To start print head motion from the left margin, print an A in character position 1 and print a B in character position 2.

1. Carrier stepper motor drive lines '-not A carrier dr' and '-not B carrier dr' are active for 50 ms settling time; '-A carrier dr' and '-B carrier dr' are inactive.

2. Print head left-to-right start sequence begins ('-not A carrier dr' becomes inactive, '-A carrier dr' becomes active).

3. Print emitter pulses are generated when the carrier motor moves the print emitter pickup. Moving left to right generates a count-up sequence (1, 2, 3).

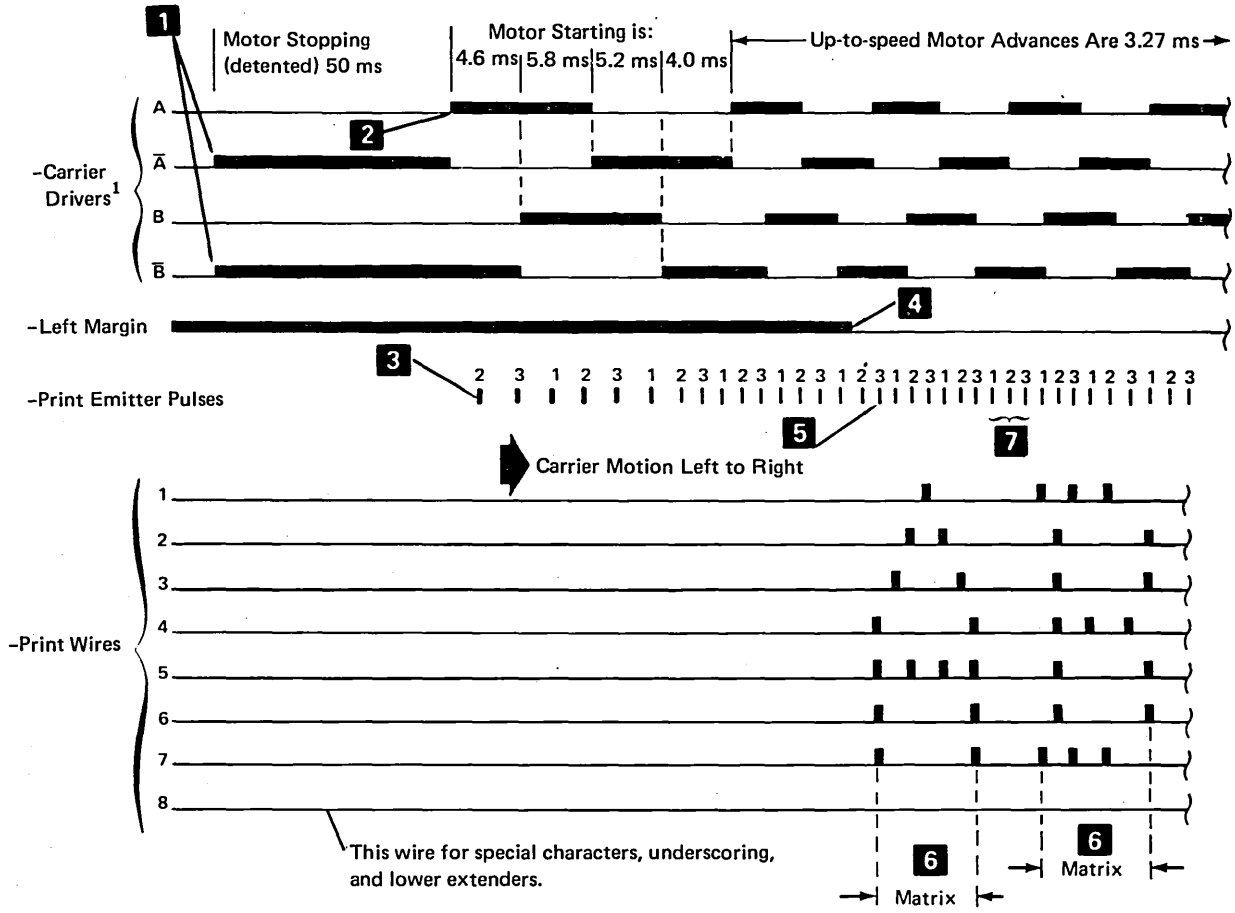
4. The '-left margin' line goes inactive between the '-print emitter 3' pulses.

5. Printing starts (in character position 1) on the next '-print emitter 3' pulse after the '-left margin' line goes inactive. The adapter uses the print emitter pulses to synchronize the firing of the print wire solenoids.

6. The adapter pulses the print wire lines for approximately 384 ms (between 375 and 400 microseconds) in synchronization with the print emitter pulses to form a character within an 8-high by 7-wide matrix.

7. Three print emitter pulses separate a character position.

Print Timings



[1] These lines are shown for reference only. Timing relationship among their active and inactive states and all other signals in this chart will vary. What is important, however, is (1) this chart show that print head motion is continuous throughout printing, and (2) timing relationship among left margin, print emitter pulses, and print wire magnet pulses does not vary.

POWER AND SIGNAL DISTRIBUTION

The printer contains:

- print wire driver card
- motor driver card
- voltage regulator and sense amplifier card (including forms emitter circuits)
- print emitter circuits
- a power supply circuit board (A1) (which produces +24, +30, and +10.8 Vdc)
- a power adapter board (C1) (which produces +8.5 and -5, +5 Vdc)
- an End-of-Forms switch
- a printer adapter on a planar board (B1)

The printer adapter supplies:

- A signal to reset the 'wire check' latch in the printer mechanism.
- Signals to fire the print wires.
- Signals to move the carrier and print head left and right along the print line.
- Signals to advance the forms to the next line or to the next form.

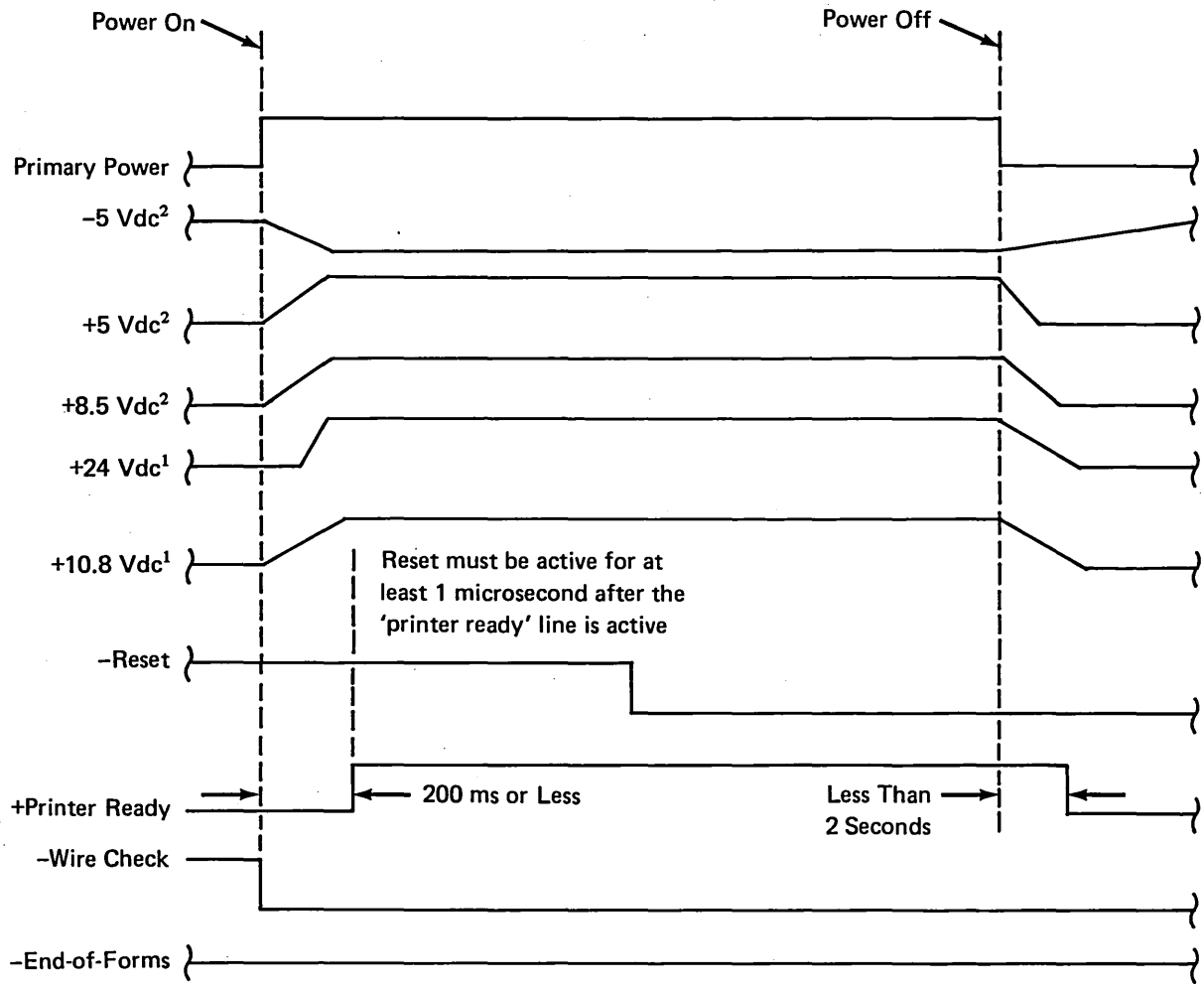
The printer mechanism supplies the adapter with the following:

- A signal ('+printer ready') that the printer mechanism is ready.
- A signal ('-wire check') that a print wire driver is on too long.
- The '-left margin' and '-print emitter 1, 2, and 3' signals so the adapter can determine the position of the print head and the direction it is moving.
- A signal ('-forms emitter A and B') that determines how far the forms have moved.
- A signal ('+end-of-forms') that forms are not present.

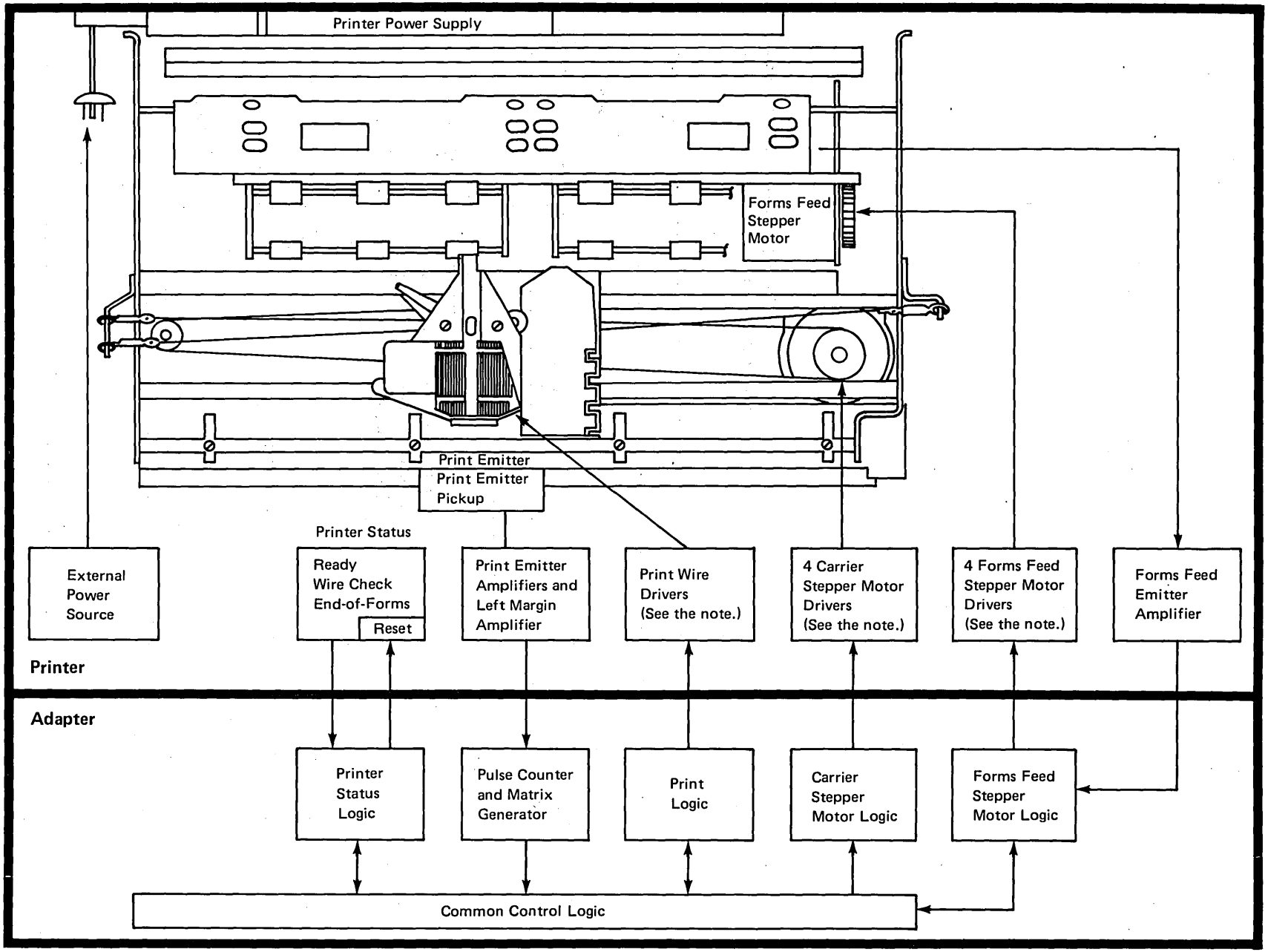
POWER ON AND POWER OFF TIMINGS

The figure below shows the power on and power off timings. The '+printer ready' line becomes active, if no error condition exists, 200 ms after power is supplied to the printer. The 'reset' signal from the printer adapter must be active for at least 1 microsecond after the printer '+printer ready' line becomes active for a positive reset of the 'wire check' latch. However, the 5256 keeps the 'reset' signal active for approximately 16 microseconds after the wire check (minimum). Reset might be active up to 500 ms.

The +5, -5, and +8.5 DC voltages are checked for under voltage. The '-power good' line is activated if the voltages are OK. The '+power on reset' line is activated 1 second after the '-power good' line is detected.



[1] These voltages are developed within printer power supply board A1.
[2] These voltages are developed on power adapter board C1.



Note: The printer has driver cards that plug into a printed circuit board located at the rear of the printer.

FUNCTIONAL PARTS

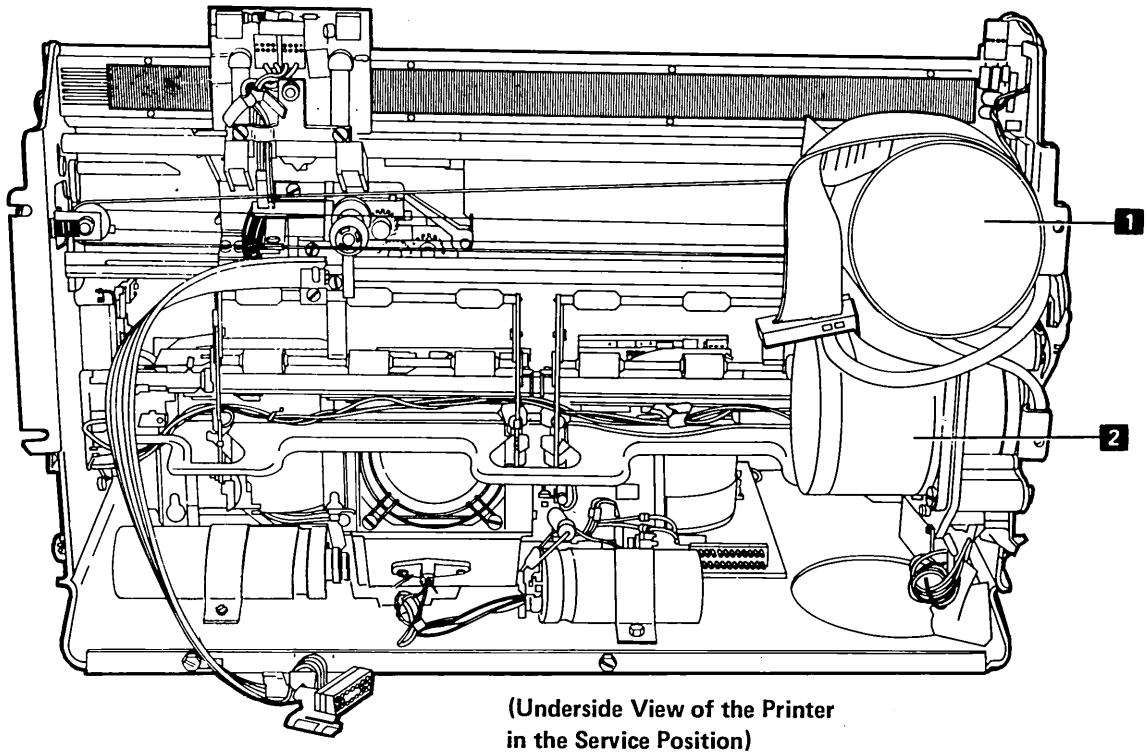
Motors

The forms feed motor 2 and the carrier motor 1 are sealed DC stepper motors consisting of a permanent magnet rotor and 2 pairs of bifilar stator windings.

CAUTION
Stepper motors require no maintenance; they should not be opened or disassembled because the magnetic flux of the rotor will be reduced, which reduces the torque.

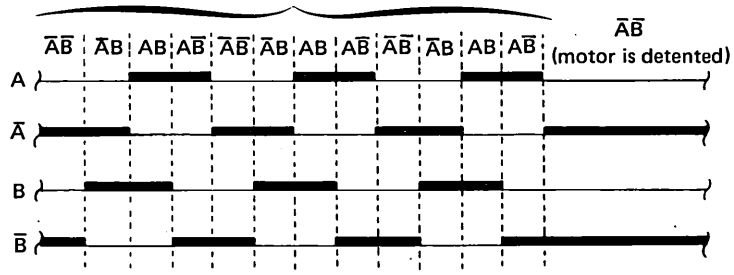
Each stepper motor is controlled by 4 DC control lines. The direction the motor turns is determined by the sequence of the control pulses; each time the phases are shifted, the motor shaft rotates 2 degrees.

The timing chart shows the sequence of pulses to step the motor counterclockwise. The combination of the '-not A' line and '-not B' line at the end of the sequence holds the motor detented during settle time in the example below. Note that the motor can be detented in any one of its motor steps.



(Underside View of the Printer in the Service Position)

Pulse Sequence for 2°
Counterclockwise Increments



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Print Head

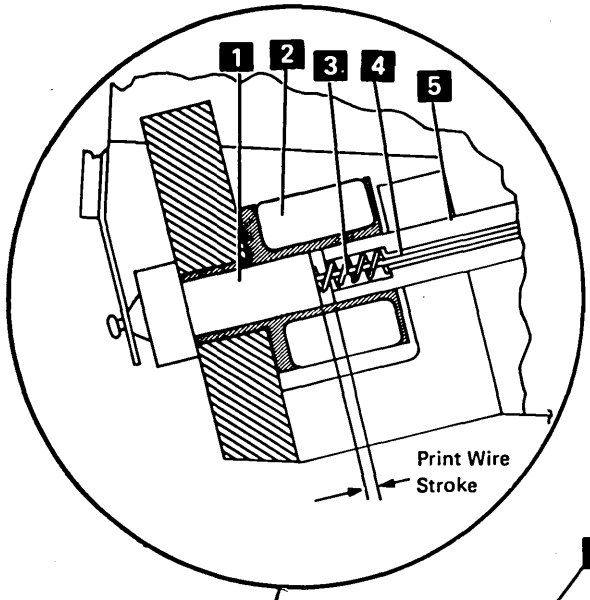
Illustrated at the right is a side view of the print head and an end view of the wire guide. The print head has eight print wires arranged vertically 1 through 8, from top to bottom. The character image dots are made by the print wires as they strike the ribbon.

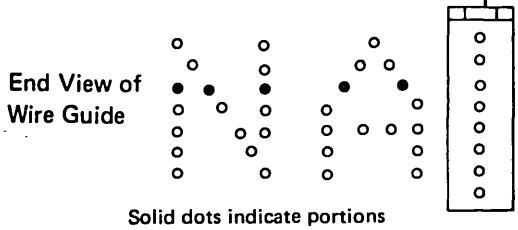
The circled area is a cross-section of a print wire solenoid. The print wire 4 is attached to the armature 1. When the coil 2 is energized by the print wire driver, the armature is driven forward against the print wire guide 5, driving the print wire against the ribbon. The microprocessor pulses the print wire drive to fire the print wire. When the pulse ends and the coil is de-energized, the return spring 3 restores the armature and print wire.

The Copy Control dial 6 on the printer adjusts the distance from the print head to the platen to allow for the thickness of the forms. The dial is set to 0 for single-part forms and adjusted for legibility and reducing ribbon smudging when using multiple-part forms.

As required by the character pattern, each wire can strike the ribbon up to 4 times per character (for example, print wire 5 when printing the character A). Note that the character pattern is determined by the bits that are on in the character generator. Print wires are not fired at successive emitter pulses because time is required to restore the solenoid armatures; at least 1 emitter pulse must intervene between firings of the same wire. No more than 25 dots are used per character.

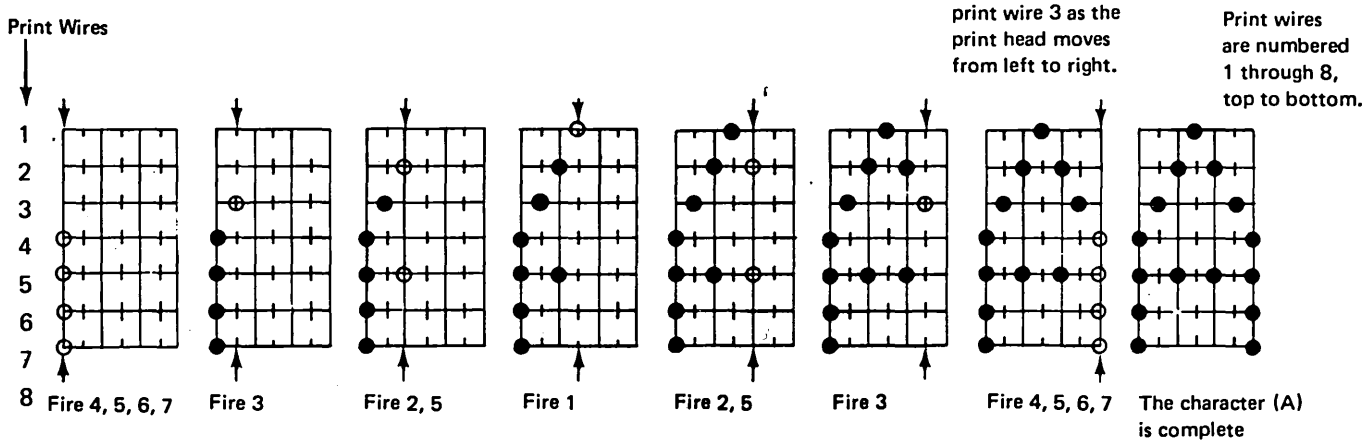
Three emitter pulses are used for the space between the characters.





Solid dots indicate portions of characters printed by print wire 3 as the print head moves from left to right.

Print wires are numbered 1 through 8, top to bottom.



Carrier (Print Head) Movement

The carrier motor, which provides the carrier (print head) movement, is driven by 4 lines from the printer adapter: 'A carrier dr', 'not A carrier dr', 'B carrier dr', and 'not B carrier dr'.

When the print head is starting, printing, stopping, or settling, only 2 of the 4 drive lines are active at one time. When the carrier is stopped for a time greater than the settling time, none of the 4 lines are active.

Each time the status (phase) of the 4 lines is changed, the motor rotates 2 degrees. The time that the lines stay in each phase is controlled by the microprocessor.

After carrier (print head) movement, 2 drive lines stay on during settling time (50 milliseconds). This ensures that movement has stopped and the correct movement occurs when the next printer operation starts. A settle time is also needed at the start of carrier movement.

If there is no printer operation waiting, the carrier drive lines are de-activated after the settling time of the current printer operation. If there is no printer operation for more than 2 minutes and the Ready light is on, the print head is returned to the ramped position. The Ready light remains on. This timeout does not apply when the printer is in a *stop* or *not ready* condition.

Start, Move Left to Right, and Stop

When power is first applied, the carrier drivers 'not A' and 'not B' are activated by the adapter for 50 milliseconds. This locks the motor for a settling time to ensure that the print head is stopped and will move correctly when the carrier stepper motor is advanced.

Other than a power on sequence, the start sequence can begin on any of the 4 active carrier driver conditions ('A' and 'B', 'not A' and 'B', 'not A' and 'not B', 'A' and 'not B'), but the active start condition must be the same as the previous settling time.

To advance the stepper motor clockwise and move the print head left to right, the carrier predrivers are turned on and off in sequence as shown. Up-to-speed motor advance pulses are 3.27 ms apart at 40 and 80 cps. At this motor speed, print emitter pulses are spaced about 2.50 ms apart when printing at 40 cps and about 1.25 ms apart when printing at 80 cps. Up-to-speed motor advances for 120 cps operation are 2.15 ms apart and print emitter pulses are spaced 0.83 ms apart.

To stop the print head movement, the carrier stepper motor must go through a stop sequence that includes slowing the motor and locking it for a settling time.

Move Right to Left

To turn the carrier stepper motor counterclockwise and move the print head right to left, the carrier predrivers are turned on and off in sequence (see the following illustration). The start and stop timings are the same as when moving the print head left to right.

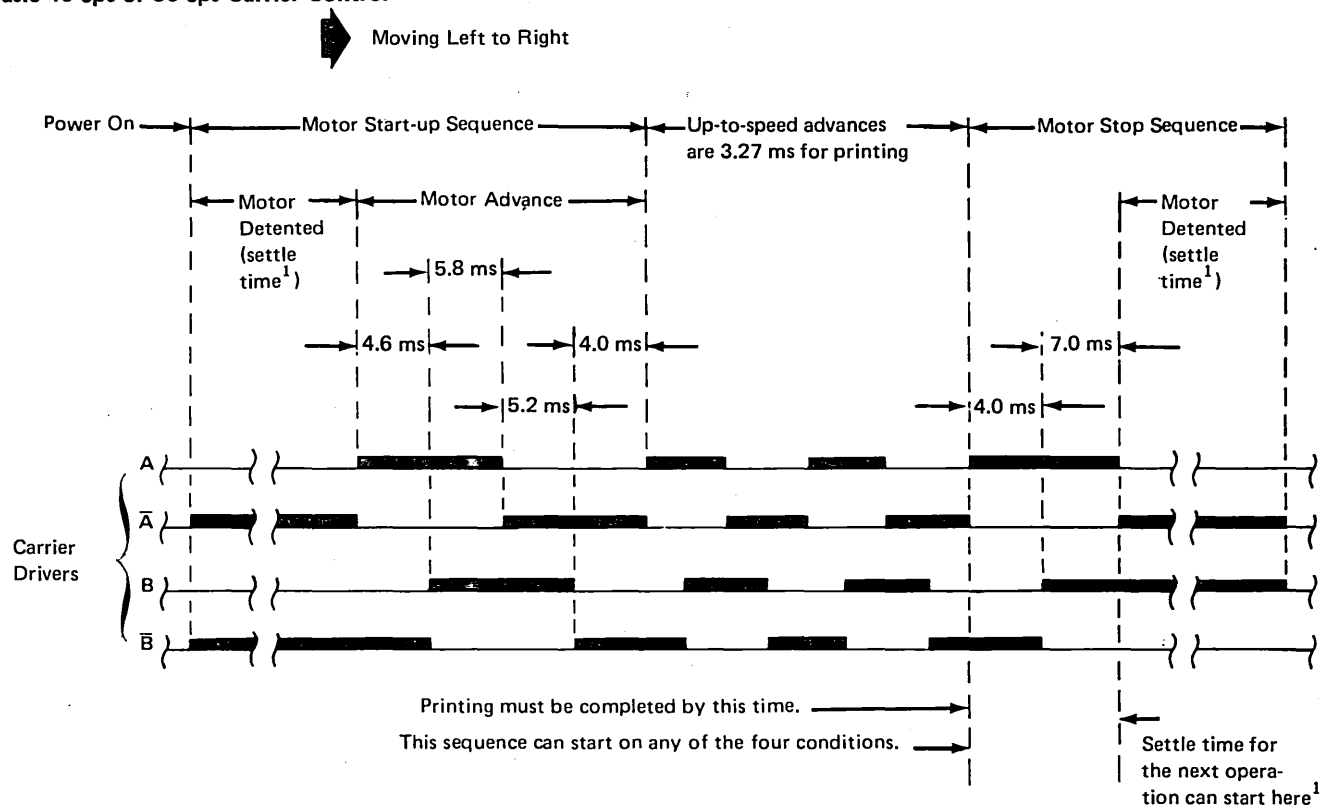
Start and Stop Sequences

The motor is started slowly and slowed before stopping. At the beginning (start sequence) and ending (stop sequence) of print head motion, the carrier stepper motor must be locked for a settling time. This ensures that the print head is not moving and will move correctly when it is restarted. The settling time depends on the frequency of print activity. Settling time is normally 50 ms but it might be as long as 150 ms.

Right Margin Stop

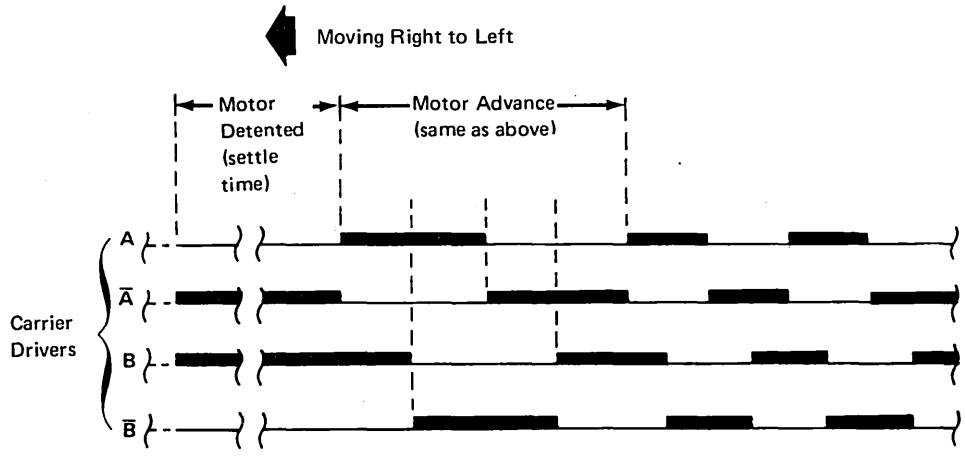
When moving the print head left to right, the adapter must start a stop sequence (see the following figure) immediately after character position 132 to ensure that the print head does not touch the mechanical stop in the right margin.

Basic 40 cps or 80 cps Carrier Control

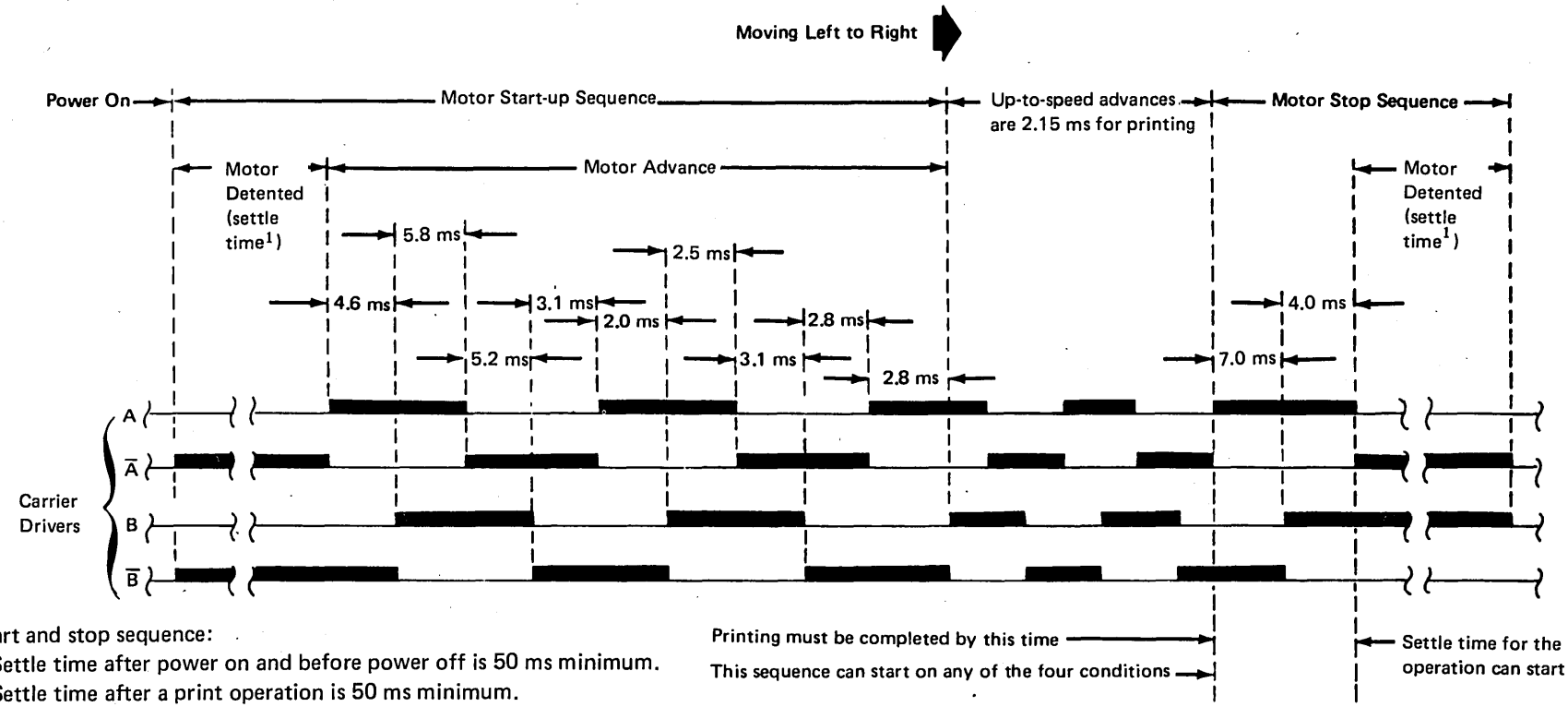


[1] Start and stop sequence:
Settle time after power on and before power off is 50 ms minimum.
Settle time after a print operation, with drivers still active, can be 35 ms minimum if the next operation follows immediately.
Settle time during forms movement is 50 ms to 100 ms normally (150 ms maximum).

Note: Start and stop timings are the same when moving the carrier in either direction.

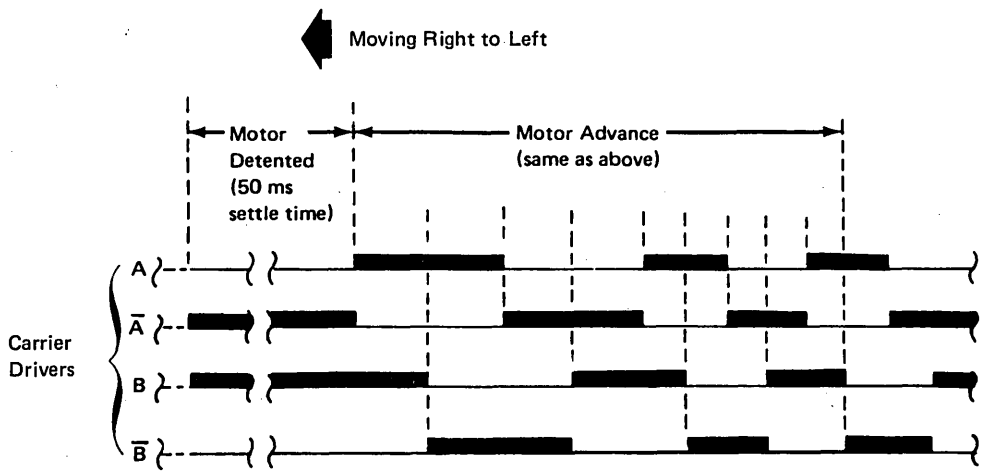


Basic 120 cps Carrier Control



[1] Start and stop sequence:
Settle time after power on and before power off is 50 ms minimum.
Settle time after a print operation is 50 ms minimum.
Settle time during forms movement is 50 ms to 100 ms normally (150 ms maximum).

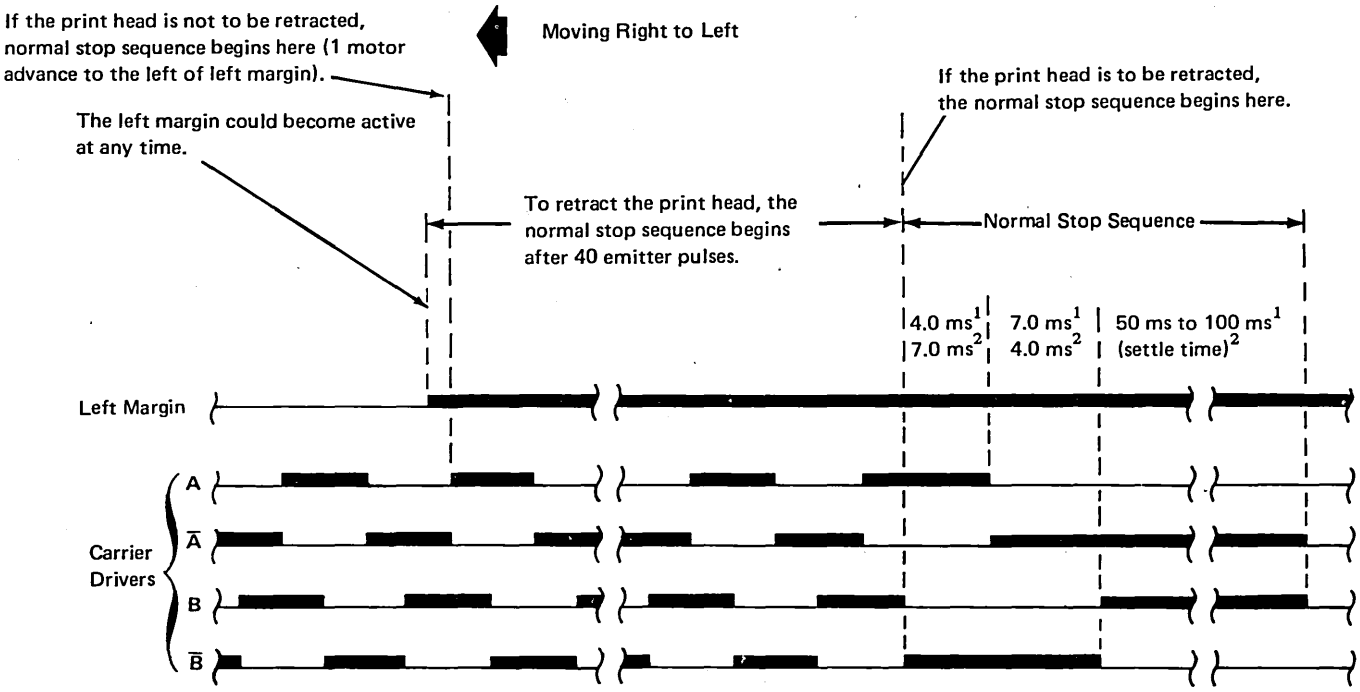
Note: Start and stop timings are the same when moving the carrier in either direction.



Move Into the Left Margin and Retract

The carrier can be moved into the left margin area and stopped or moved into the left margin area until the print head is retracted. In the retracted position clearance is provided for loading forms and the ribbon ink is prevented from bleeding on the paper.

Moving Print Head Into the Left Margin and Retracting It



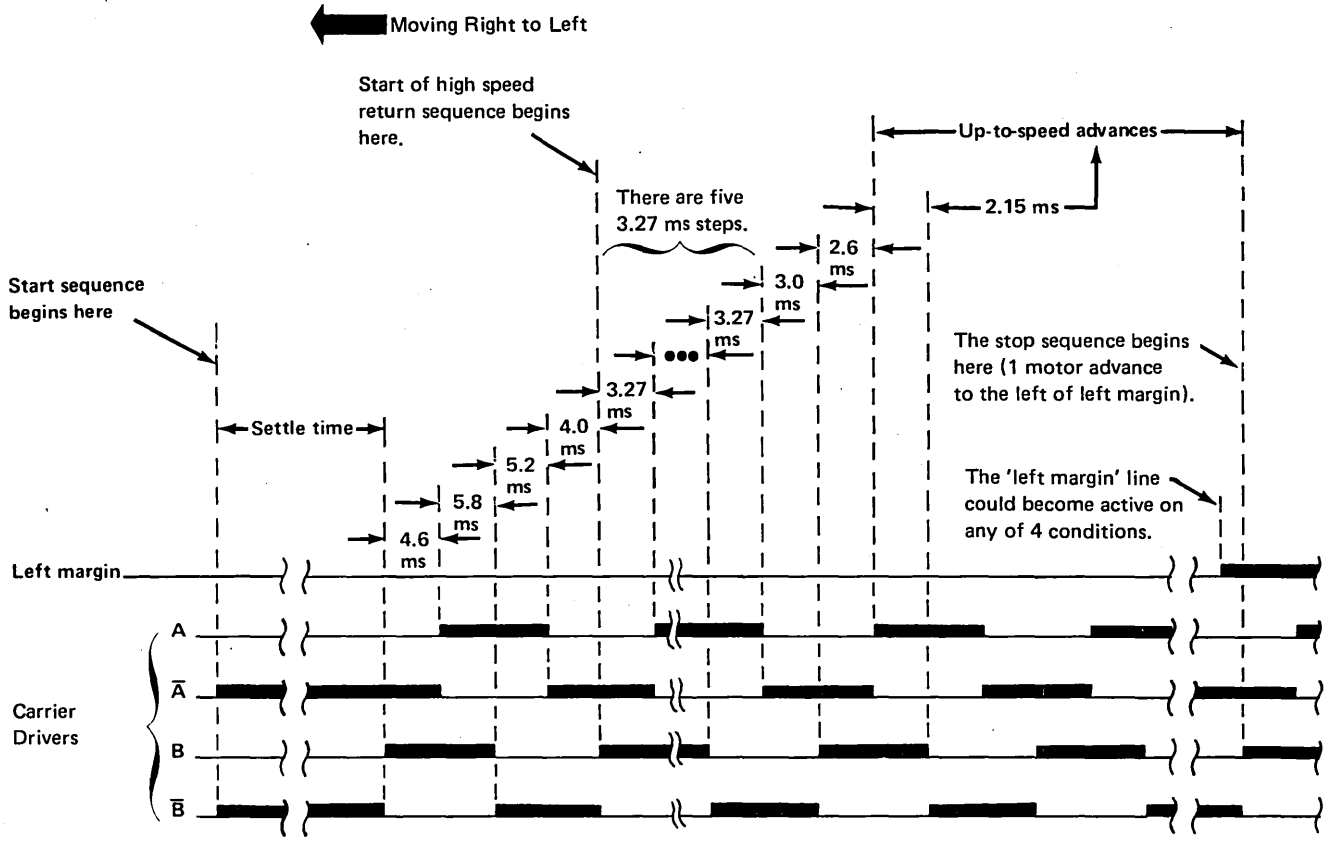
[1] 40 cps and 80 cps
[2] 120 cps

High Speed Movement from Stop (Tab or Skip Operation)

On 40 cps and 80 cps printers, the print head can be moved in either direction at high speed when printing is not in progress; this operation is called a high-speed tab or skip. On 120 cps printers, high speed is the same as printing speed (see *Basic 40 cps and 80 cps Carrier Control and Basic 120 cps Carrier Control* timing charts). A normal start sequence begins the operation. Then, the carrier stepper motor advance pulses are gradually increased to a 2.15 ms rate.

When stopping from a high-speed tab or skip operation, the stepper motor slows to normal speed as described in *High-Speed Print Head Movement from Normal Speed (Tab or Skip Operation)* and then stops normally.

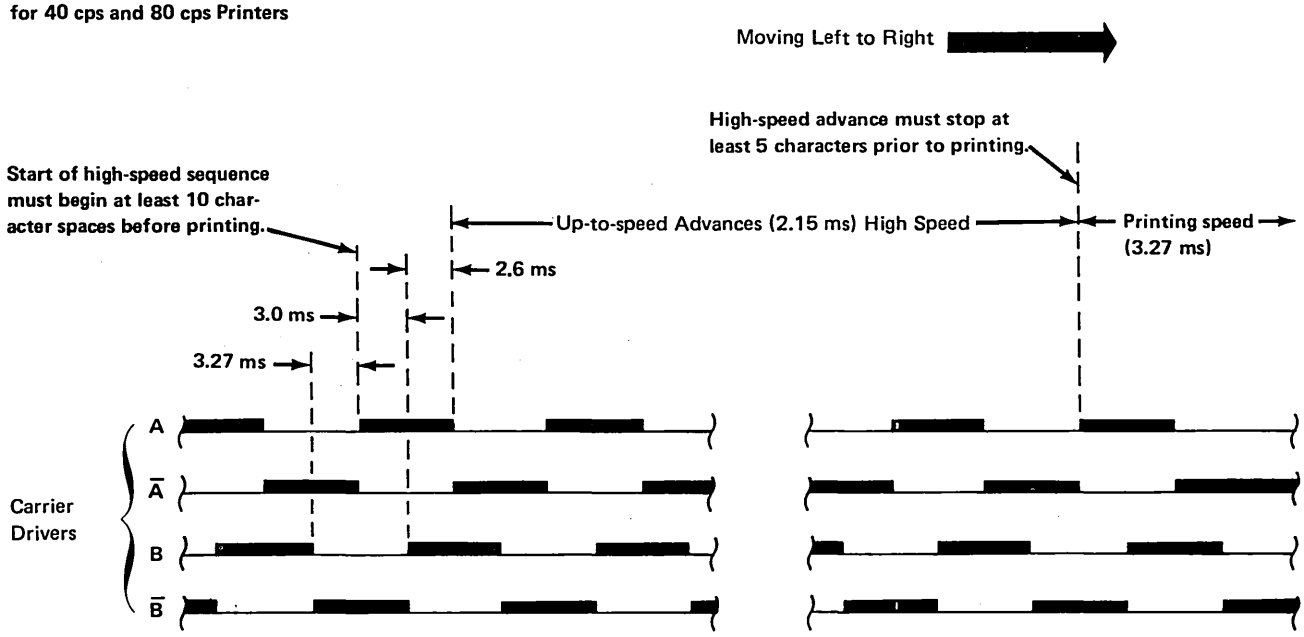
High-Speed Movement from Stop (Tab or Skip Operation) for 40 cps and 80 cps Printers



High Speed Movement from Normal Speed (Tab or Skip Operation)

Between printing operations on 40 and 80 cps printers, the print head can be moved at high speed. The figure below shows the carrier driver advance pulses for left to right operation at high speed. The timings are the same in either direction.

High-Speed Movement from Normal Speed (Tab or Skip Operation) for 40 cps and 80 cps Printers



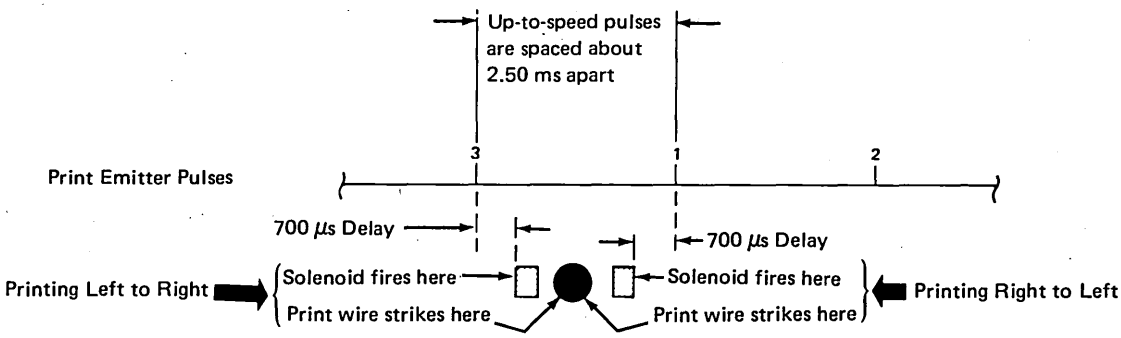
Print Wire Timing

The figure shows dots being printed from right to left and left to right at 40 cps, 80 cps, and 120 cps. If the print head is moving to the right, the dots will be printed to the right of the position where the print emitter pulse occurred. To print to the left on the next line and align the dots vertically, or to overprint to the left on the same line on 40 and 80 cps printers, it is necessary to use the first print emitter pulse that occurs to the right of the position where the original pulse occurred. When printing at 120 cps, it is necessary to use the second print emitter pulse to the right.

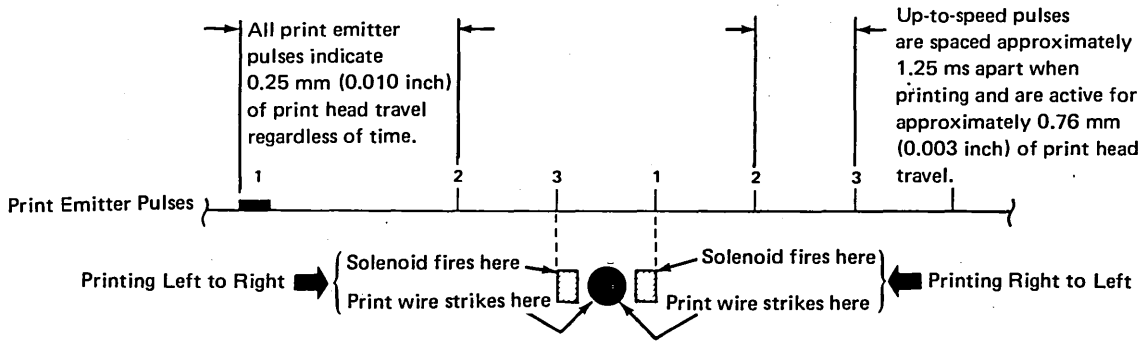
On the 40 cps and 80 cps printers, a time delay is needed between the leading edge of the print emitter pulse and the start of the print wire pulse.

Print Wire Timings

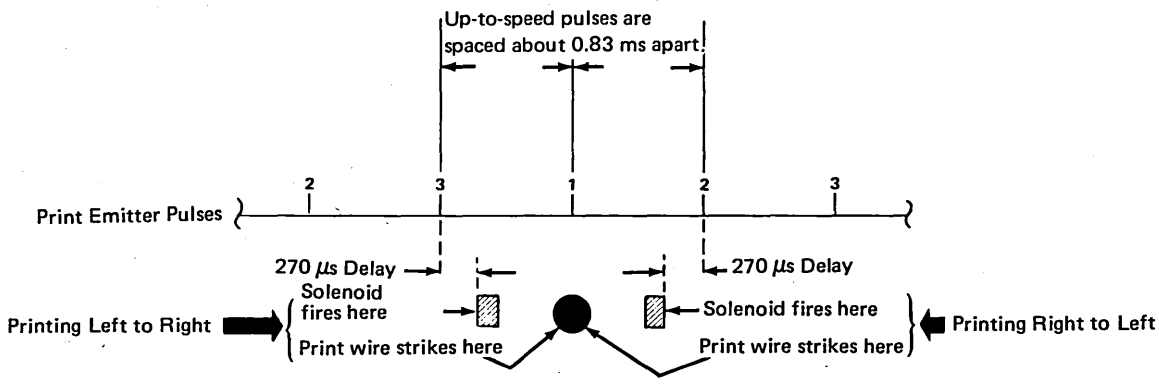
Printing at 40 Characters per Second



Printing at 80 Characters per Second

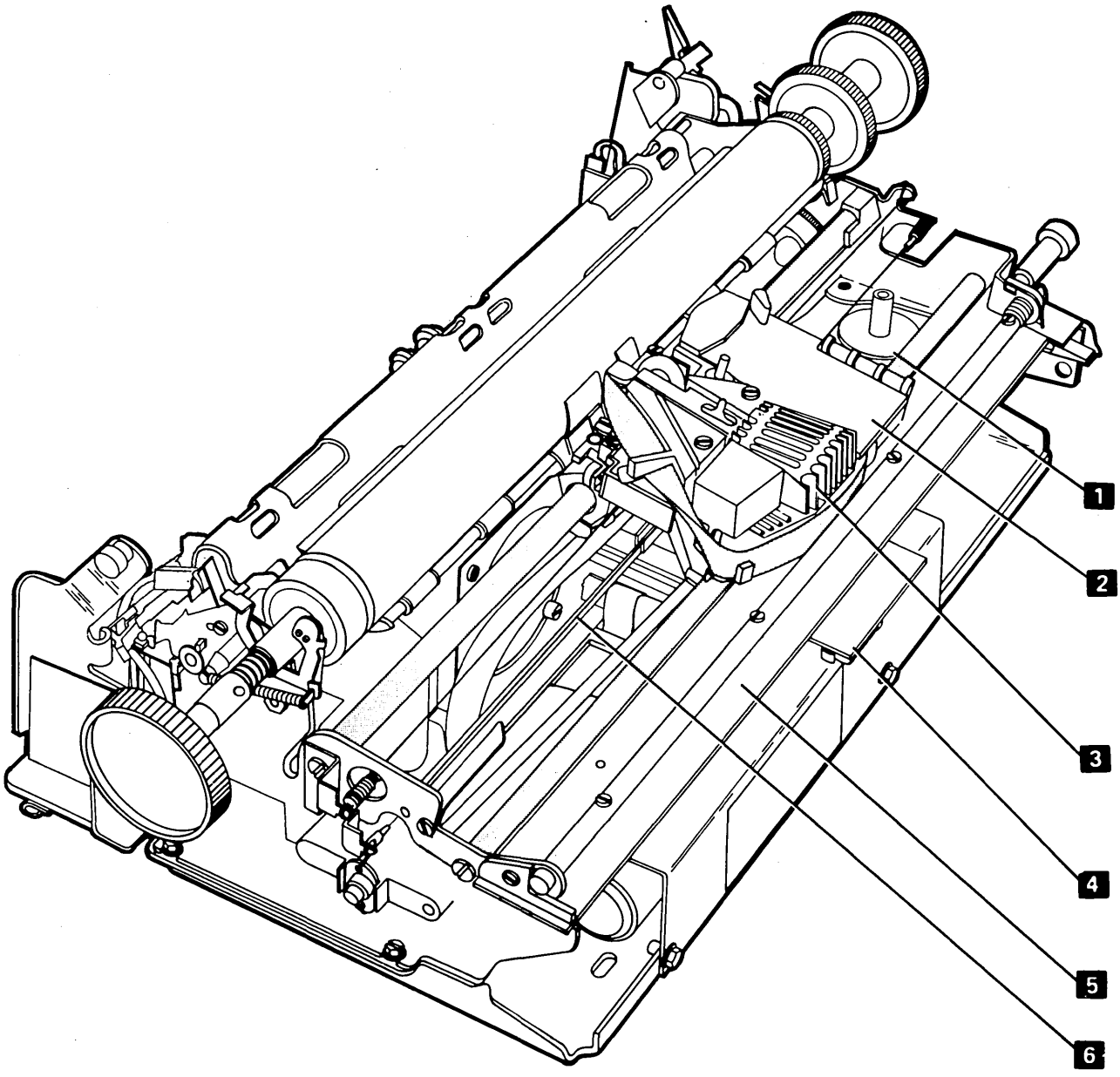


Printing at 120 Characters per Second



Carrier

The carrier supports and transports the print head 3, print emitter pickup 4, and ribbon box 2 horizontally along the print line. The print head carrier is moved by the drive belt 6 coupled to the print head motor 1. Print head movement slides the print emitter pickup along the print emitter 5 to produce print emitter pulses.



Print Emitter and Print Emitter Pickup

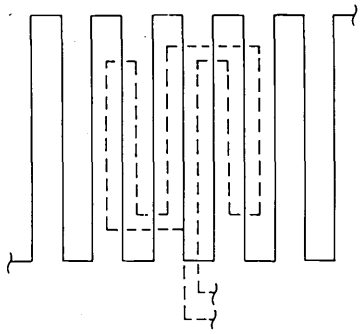
The print emitter 3 is a stationary board with a land pattern and a 4.25 MHz oscillator 4. The land pattern simulates the primary winding of an air core transformer.

The print emitter pickup 2 is mounted on the bottom of the print carrier 1 and slides along the length of the print emitter. The pickup consists of 4 separate land patterns and associated amplifier detector trigger circuits. The land patterns of the print emitter pickup simulate the secondary windings of an air core transformer.

Land patterns denoted by 5 and 6 are at right angles to the patterns denoted by 7, 8, and 9. When the print emitter pickup enters the left margin area, land pattern 6 of the print emitter pickup moves directly underneath land pattern 5 of the print emitter. As a result of this alignment, energy is coupled from the primary winding of the print emitter into the secondary winding of the print emitter pickup and causes a level change at the output of the amplifier detector trigger circuit. This level change signals the microprogram that the print head is in the left margin area.

The amplifier detector trigger circuit of patterns 7, 8, and 9 is set to trigger at the null position (where minimum energy is coupled from the print emitter winding). The null position occurs at the maximum misalignment of the land patterns of the print emitter and land patterns of the print emitter pickup. When the print emitter pickup is moved left or right, land patterns 7, 8, and 9 each produce an output pulse every 0.762 mm (0.030 inch) of print head travel. When the pulses from the 3 circuits are ORed, a pulse is produced every 0.254 mm (0.010 inch) of print head travel.

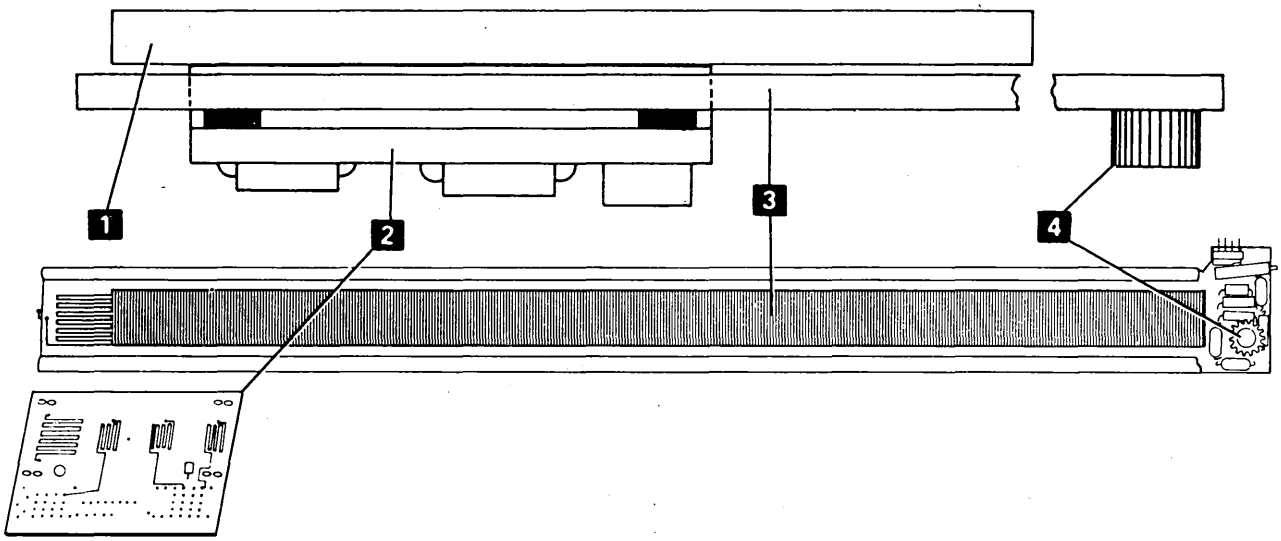
This illustrates the null position of the print emitter land pattern. The land pattern of the print emitter pickup is shown with dotted lines.



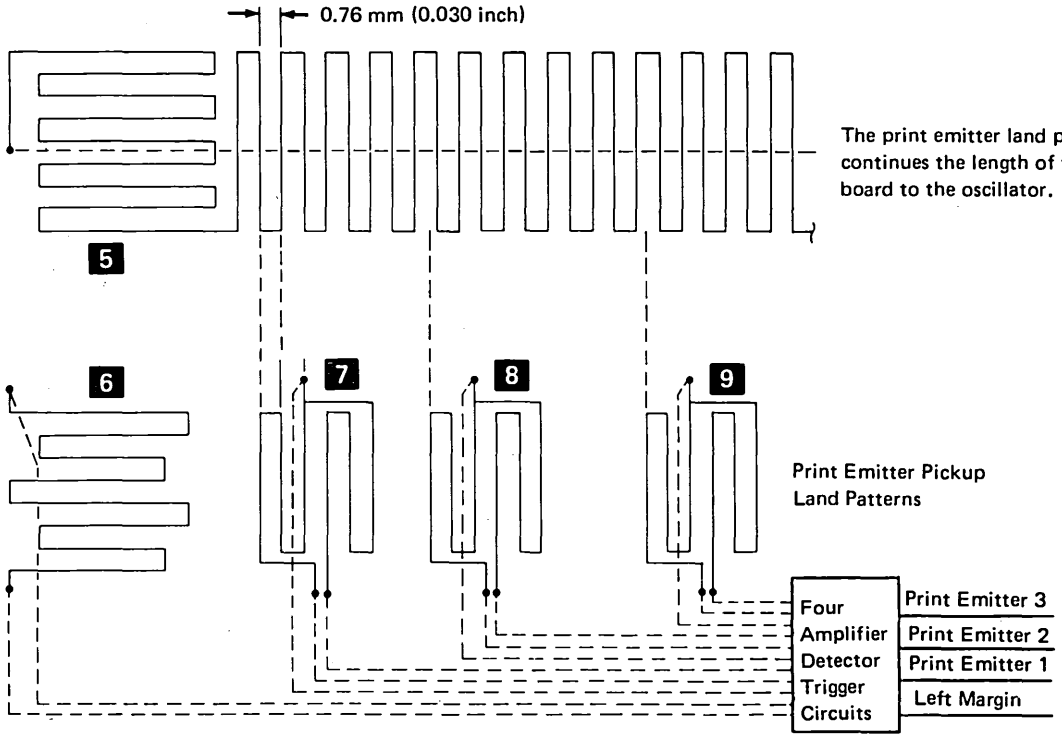
Because character spacing is 10 characters per inch, there is 2.54 mm (0.100 inch) for each character. With the 7 dot positions for each character and 3 positions between characters, there is 0.254 mm (0.010 inch) between dot positions and an emitter pulse for each position.

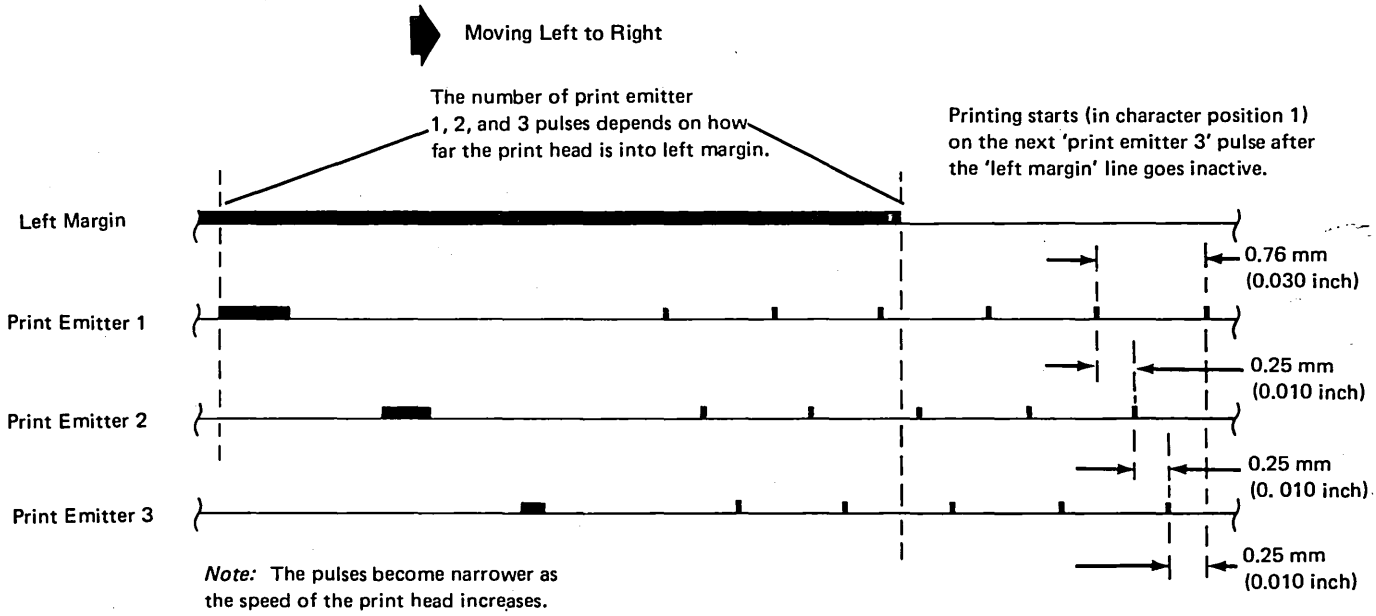
Outputs of the amplifier detector trigger circuits are '-left margin', '-print emitter 1', '-print emitter 2', and '-print emitter 3'. The print emitter pickup moving from left to right produces a sequence of emitter pulses—7, 8, and 9; from right to left produces a sequence of emitter pulses—9, 8, and 7. The '-left margin' signal and the emitter pulses provide the microprogram with enough information to determine:

- The firing time for the wires
- Where the print head is on the print line
- Which direction the print head is moving



Print Emitter Pickup in Left Margin



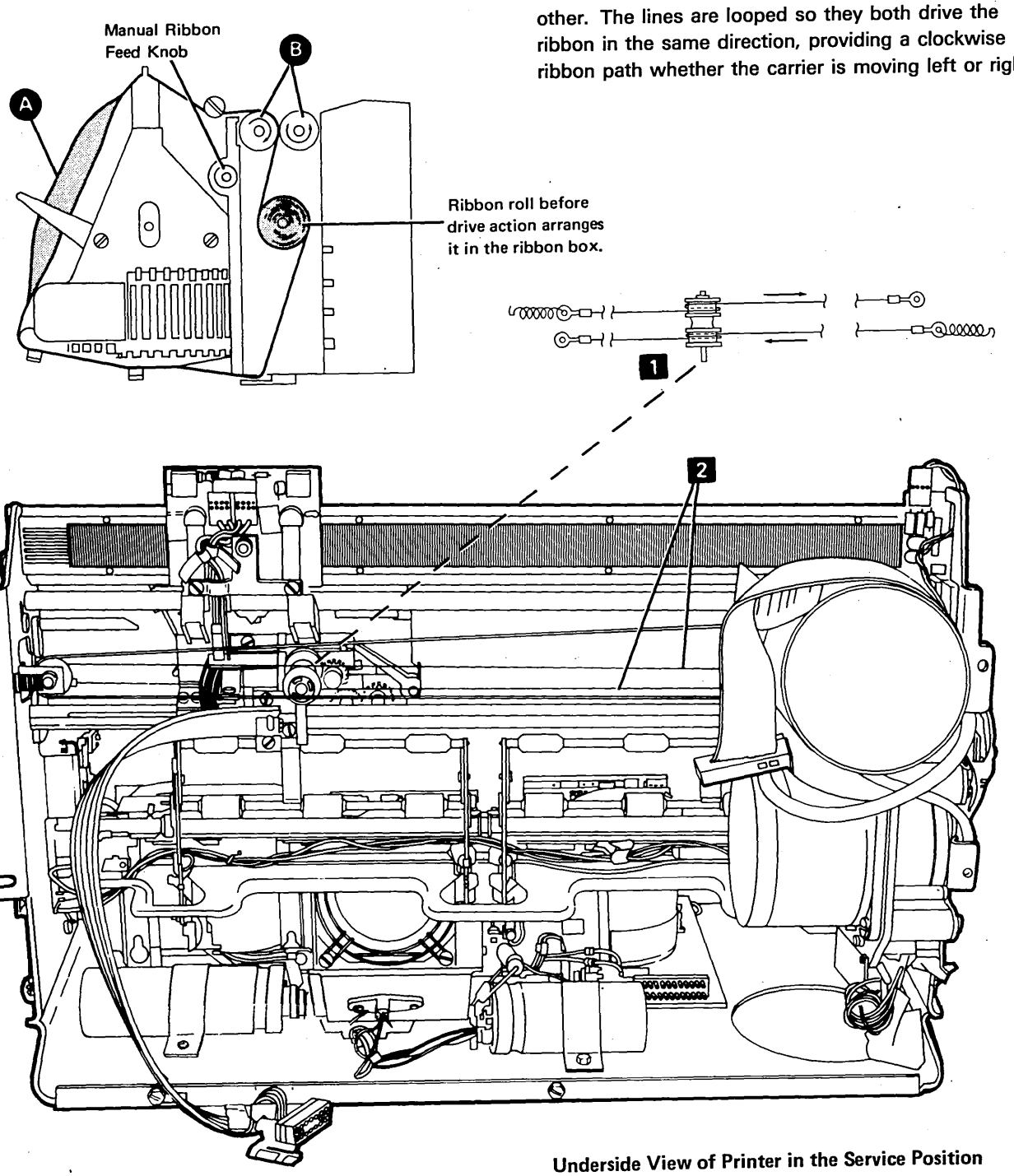


Note: The pulses become narrower as the speed of the print head increases.

Ribbon Drive

The printer uses a continuous ribbon that can be replaced by the operator. Two ribbon feed rolls (B) pull the ribbon through a slot from one end of the ribbon box, around the print head, past the print wires, and feed it into the other end of the box. A half twist (A) is placed in the ribbon during manufacturing so that, as the ribbon passes the print wires, the top half of the ribbon prints on one pass and the bottom half prints on the next pass.

The print head, ribbon box, and ribbon drive mechanism are mounted on the carrier and move left to right under control of the carrier motor. The ribbon feed rolls are driven by 2 lines 2 through a series of idler gears. The lines are looped around a double clutch 1, located underneath the carrier, that drives the ribbon feed rolls. The clutches drive in 1 direction and free-wheel in the other. The lines are looped so they both drive the ribbon in the same direction, providing a clockwise ribbon path whether the carrier is moving left or right.

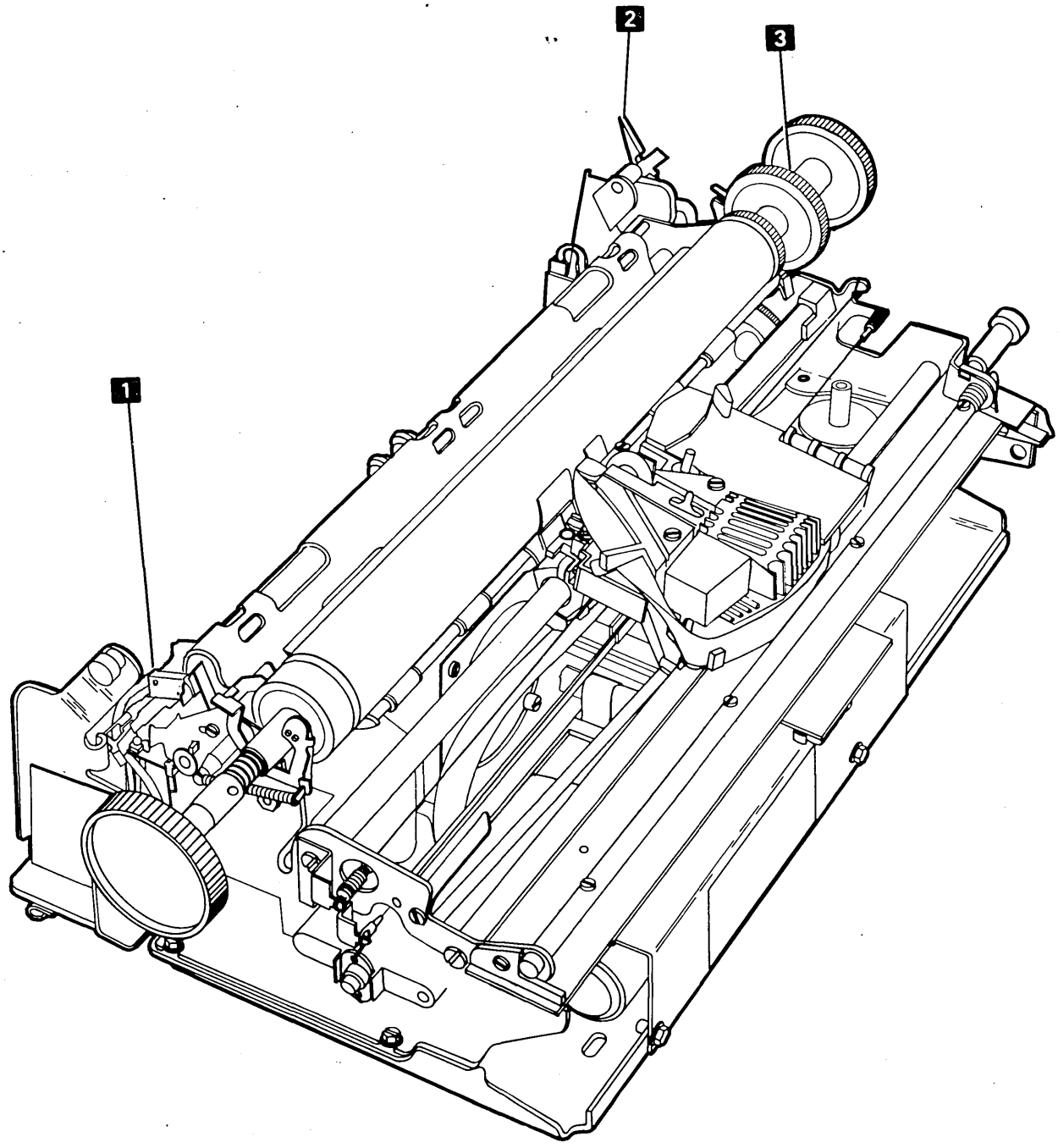


Underside View of Printer in the Service Position

Forms Feed

The platen is driven by the forms motor. For feeding continuous forms, a forms tractor unit is driven by the forms tractor drive gear 3 located on the right end of the platen.

When the end of the form is 50.8 mm ± 25.4 mm (2 inches ± 1 inch) from the line being printed, the End-of-Forms switch 1 closes and signals the adapter. The switch operates only when the Paper Release lever 2 is in the forward position. The switch is used when feeding continuous forms.



Forms Feed Emitter

Below is a conceptual illustration of the forms feed emitter used in the serial printer. An emitter disk 2 is driven by the forms motor 4. The emitter disk has 90 slots, 45 on an outer track, and 45 on an inner track. The slots of the outer track are positioned 2 degrees in advance of the inner track. Each slot is 4 degrees of 1 emitter disk revolution.

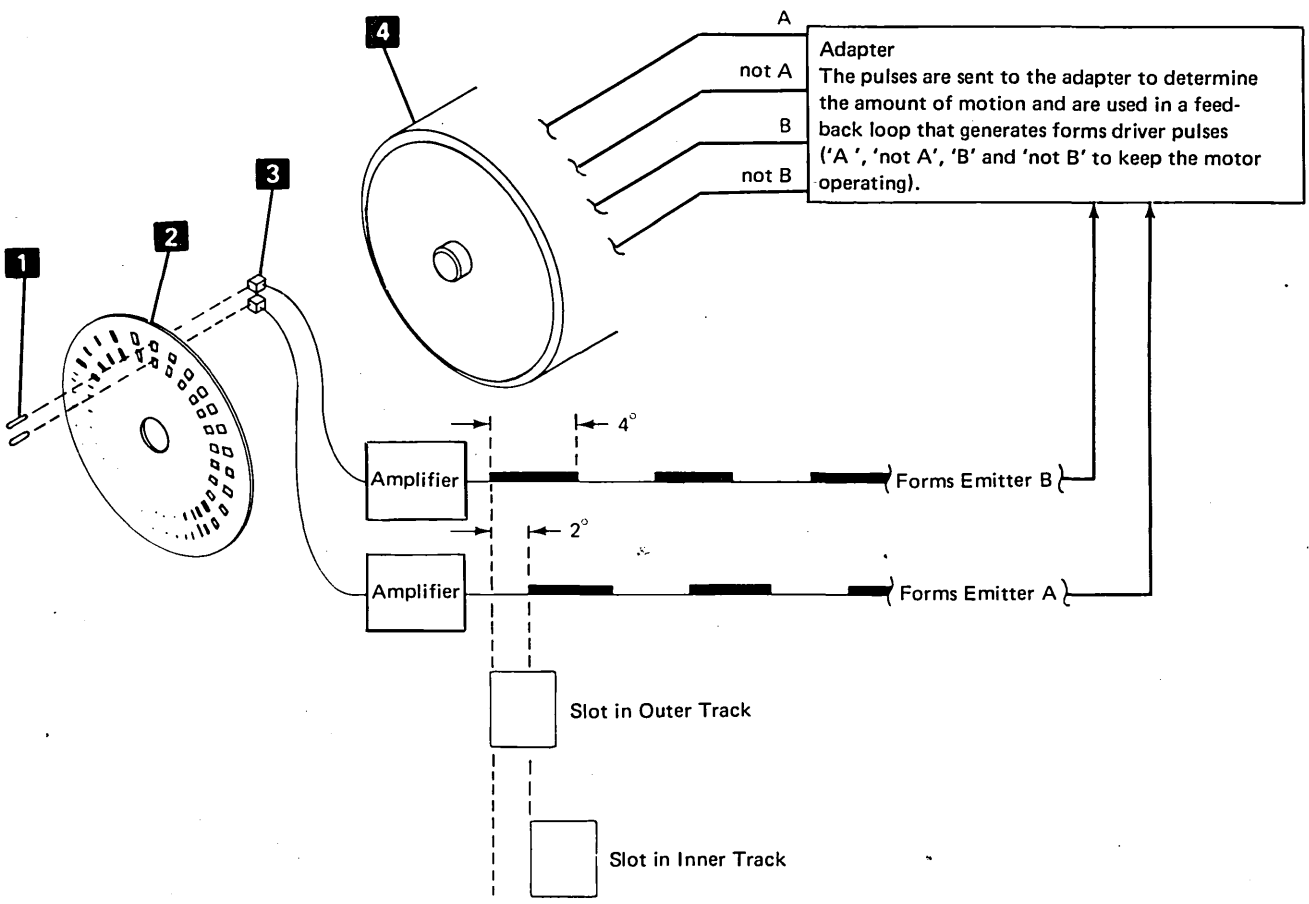
Two LEDs 1 (light emitting diodes) are positioned opposite the 2 tracks. Two photocells 3 face the diodes on the opposite side of the disk. The disk turns freely between the LEDs and the photocells so that light from the LEDs can be sensed by the photocells. When the disk is rotating and a slot appears in front of the LED, light passes through the slot, the photocell senses the light, and current is produced. The photocells drive 2 amplifiers that convert the low level current signal from the photocells to a TTL logic level. The signals from the printer to the adpater are '-forms emitter A' and '-forms emitter B'.

As the forms motor rotates, the forms feed emitter produces 1 pulse for each 2 degrees of rotation. For every 16 pulses the paper advances 1 line at 6 lines per 25.4 mm (1 inch). For every 12 pulses the paper advances 1 line at 8 lines per 25.4 mm (1 inch). These pulses signal the adapter that a line feed is occurring. (The printer adapter uses these pulses to control forms movement.)

This is a closed loop system:

'Forms emitter A' is used by the adapter to control 'forms driver A' and 'forms driver not A'.

'Forms emitter B' is used by the adapter to control 'forms driver B' and 'forms driver not B'.



Forms Movement

Forms movement is controlled by the microprocessor. Forms are moved by a forms motor that is geared to the platen. When the forms are moved, the forms emitter sends pulses to the printer adapter to advance the stepper motor.

When the MPU recognizes a line feed request, it samples the forms emitters. If the printer is in ready state, the emitters are compared to the value of the last detent. If the value is unchanged or only one motor phase different, a pre-detent of up to 250 ms is started to realign the forms. When the emitters are correct, the line feed is started.

If the printer is not in ready state, the emitters are stored as the value to be used for comparison and no pre-detent is needed.

The line feed is started by setting the index bit in the forms register. The output of the register bit latch gates the forms emitter lines to the forms motor drivers.

The proper stepping sequence is as follows:

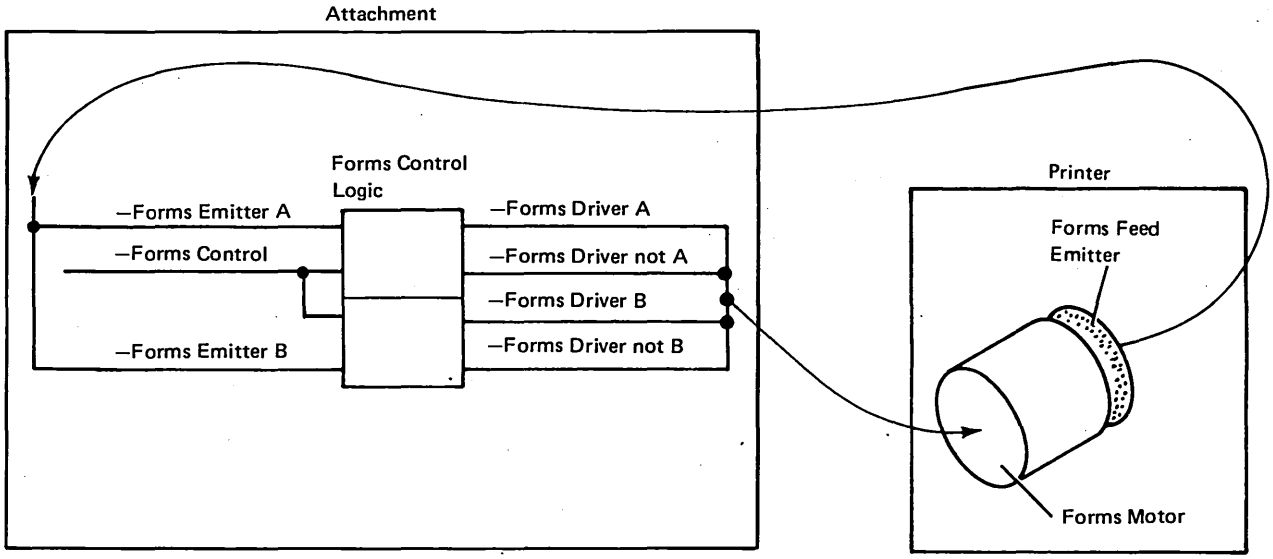
Step 1 - 'A' and 'not B'
Step 2 - 'A' and 'B'
Step 3 - 'not A' and 'B'
Step 4 - 'not A' and 'not B'

For each 1.05 mm (1/24 inch) of forms travel, the motor drive lines will match the value previously stored. These matches are counted and the count is used for stopping the motor for 6 or 8 lines per inch spacing. Stopping after a count of 4 produces the 6-line spacing. Stopping after a count of 3 produces the 8-line spacing.

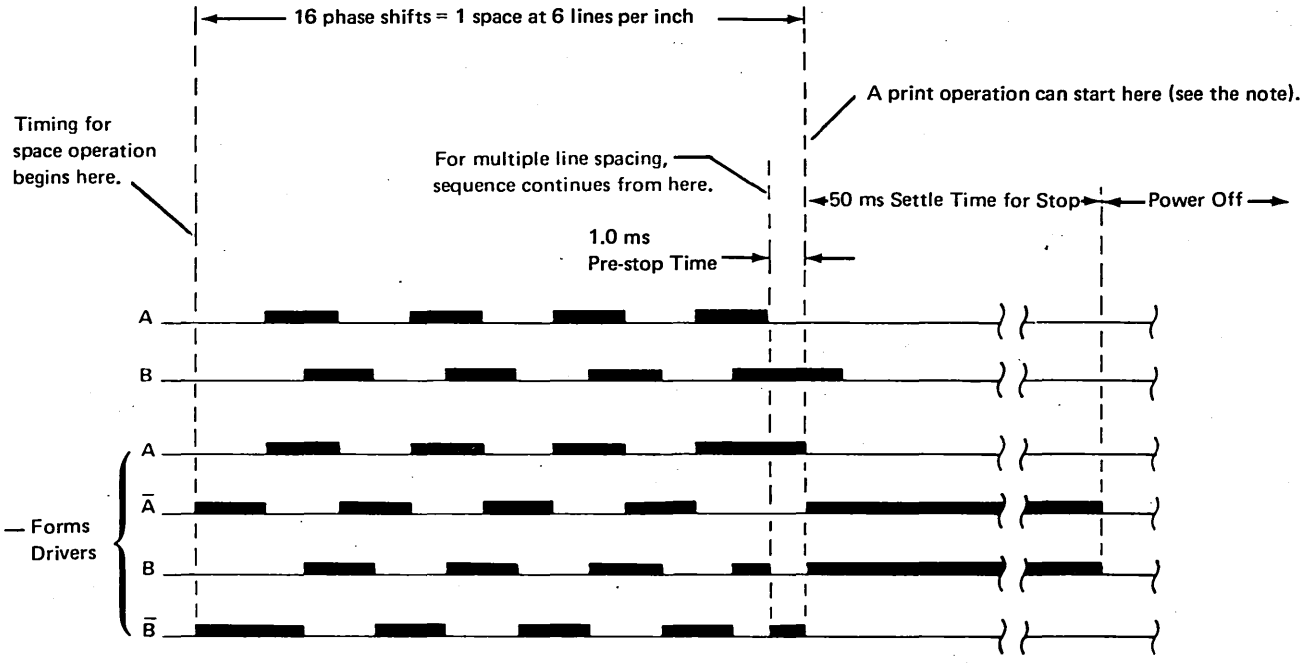
The MPU sets up the forms control logic so that if the motor has been moved 2 or more motor phases (by paper tension or the operator) a forms check is signaled and the MPU displays a forms position check. If the motor has been moved 1 motor phase, the MPU will detent the motor before line feeding starts. If the motor has not moved, line feeding will start immediately.

The normal way to obtain a line feed from the Line Feed switch is to first press the Stop switch and then press the Line Feed switch. If the Stop switch is pressed while a print operation is in progress, the line of printing is completed and the printer stops. The Line Feed switch must then be pressed again to obtain a line feed.

To stop forms movement, the motor stepping sequence is reversed for 1 ms under microprocessor control. Following this, 50 ms of settling time is allowed before starting a print operation. The following timing chart shows the timing for 1 forward space at 6 lines per 25.4 mm (1 inch) and the ending settle time.



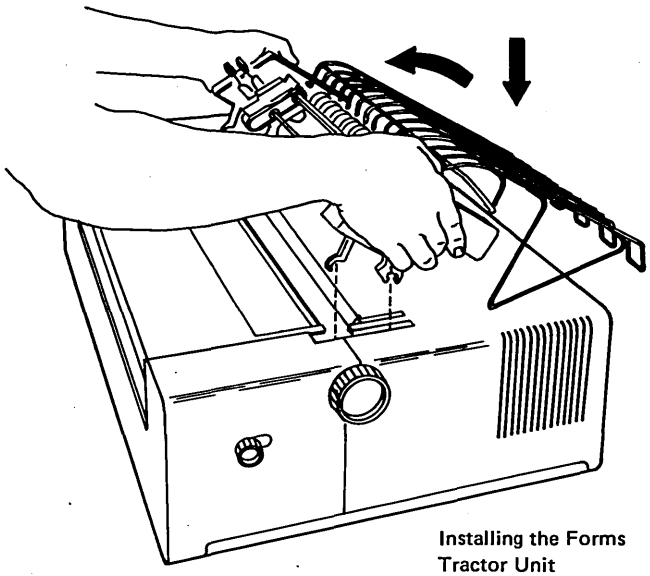
The following chart shows the timing for 1 forward space at 6 lines per 25.4 mm (1 inch):



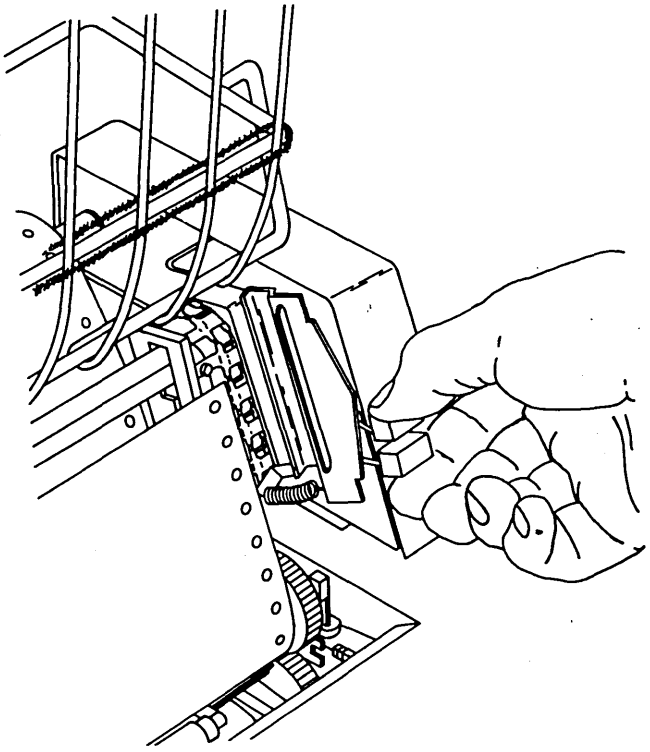
Note: Printing starts with motor settle time.

Forms Tractor Unit

The forms tractor unit is required for printing on continuous forms. The unit snaps into place on top of the printer frame and can be removed to use cut forms. The right tractor is adjustable to handle forms from 76.20 mm to 381.00 mm (3 inches to 15 inches) wide; the left tractor is adjustable to position the forms.



Installing the Forms Tractor Unit



Adjusting the Right Tractor

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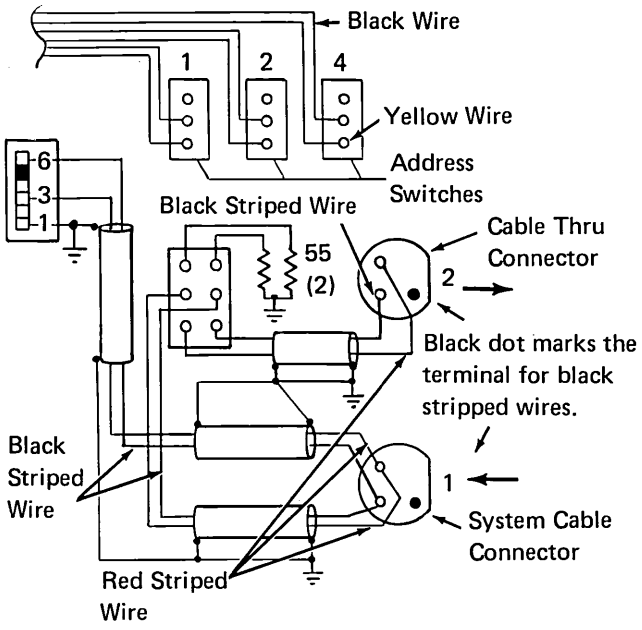
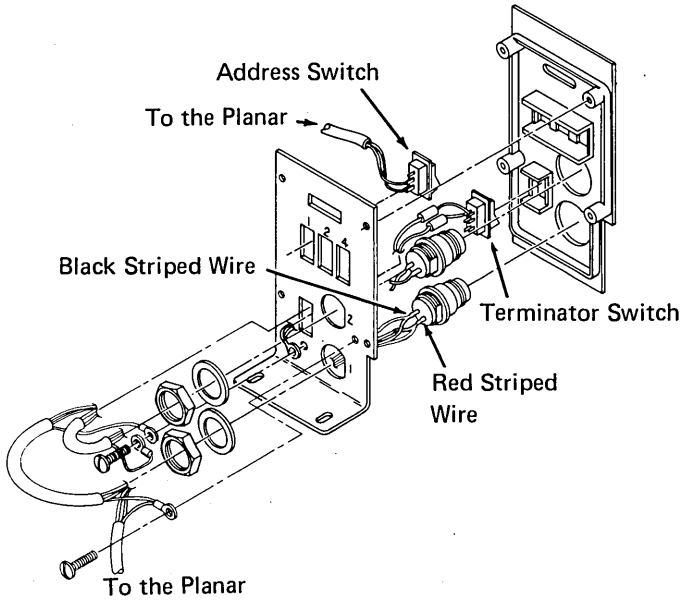
CABLE THRU

If more than one work station (display station or printer) is to be connected in series on the customer twinaxial cable, the Cable Thru feature must be installed on each station or printer to provide connectors for the customer system input cable to the next unit in the series. The feature also provides 4 switches. Three of them provide a unique address (encoded in binary) for the unit. The 4th switch (the Terminator switch), when set to 2, connects the system cable to the next work station in the line. When the switch is set to 1, it connects the system cable to ground through a resistor (termination). The last work station in the series does not need the Cable Thru feature. The basic printer has planar board jumpers that connect terminating resistors into the circuit. The basic printer *always* has an address of 000 whether it is connected to a port or is the last device in a Cable Thru series.



Viewed from the Wiring Side



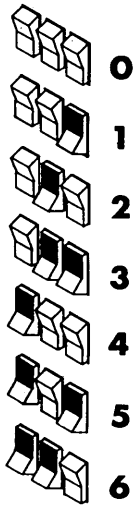
The Cable Thru feature is available only with twinaxial cable. Up to seven work stations can be connected in a series. Addresses range from 000 to 110. Address 111 is invalid and will cause the power on diagnostic to fail with lights 5, 6, 7, and 8 on.

Note: Do not leave the external system cable disconnected when servicing a printer that has the Cable Thru feature. Other work stations are off line when the cable is disconnected. An adapter (part 7362230 or Amphenol part 82-5588) can be used to bypass a disconnected work station.

If only 1 system cable is present, connect it at the lower socket and set the Terminator switch to 1. If 2 cables are present, connect the cable from the controller or work station nearest to the controller to the lower socket and set the terminator switch to 2. The other cable (to the next work station) should be connected to the upper socket.

Phasing is very important for the system cable. Always connect the black-striped wire to the terminal beside the black dot and to the right-hand side of the switch.

Address Switch Setting



AUDIBLE ALARM

This feature is connected in parallel with the Attention light. The alarm produces a tone that alerts the operator to conditions requiring operator intervention.

The alarm is located on the right rear or the printer (viewed from the front) and is supplied with a volume regulator.

Appendix A. Setting up the IBM 5256 Printer

When the following setup procedure refers you to the problem determination procedures or to a service representative, go to the *Start of Call* instead.

Your 5256 Printer is shipped to you fully tested and adjusted. This setup and checkout procedure should be used after your printer is unpacked and placed where you intend to use it, or whenever a printer is disconnected and relocated.

CAUTION
The 5256 Printer weighs approximately 35 kilograms (78 pounds). NEVER LIFT IT BY YOURSELF.

This setup procedure is written in two sections:

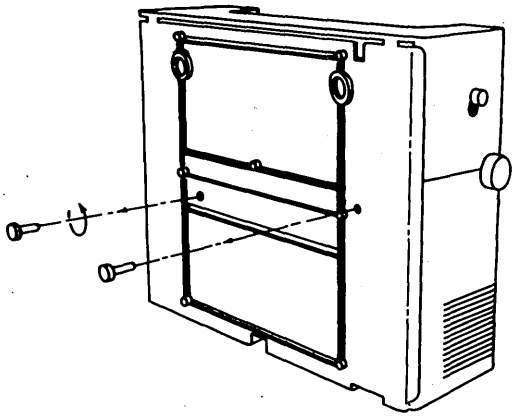
- The steps in Section 1 can be completed without connecting your printer to the system. The steps explain how to set up the forms feeding equipment, how to use printer controls, and how to do a print test.

- The steps in Section 2 explain how to connect the printer to the system and how to use a checkout procedure to make sure the printer and system are communicating properly.

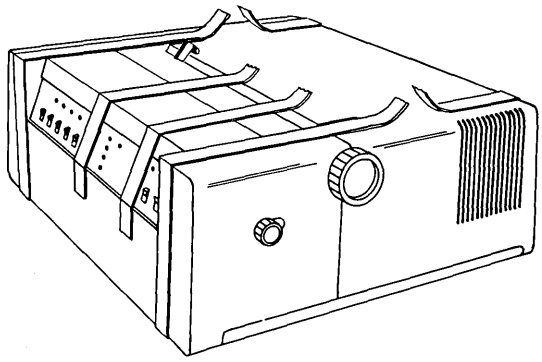
You should inspect the printer for any transit damage. Any damage discovered should be promptly reported to the local IBM branch office.

Section 1. Standalone Checkout

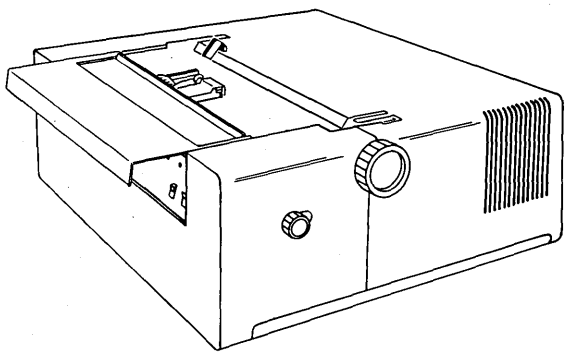
☐ 1. Remove the two red shipping bolts.



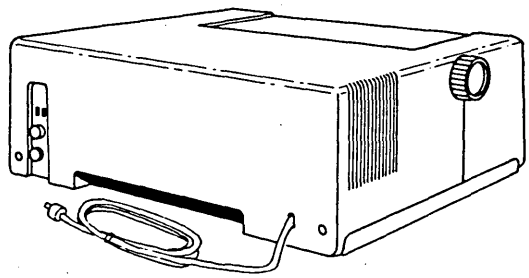
☐ 2. Remove the tape that secures the covers.



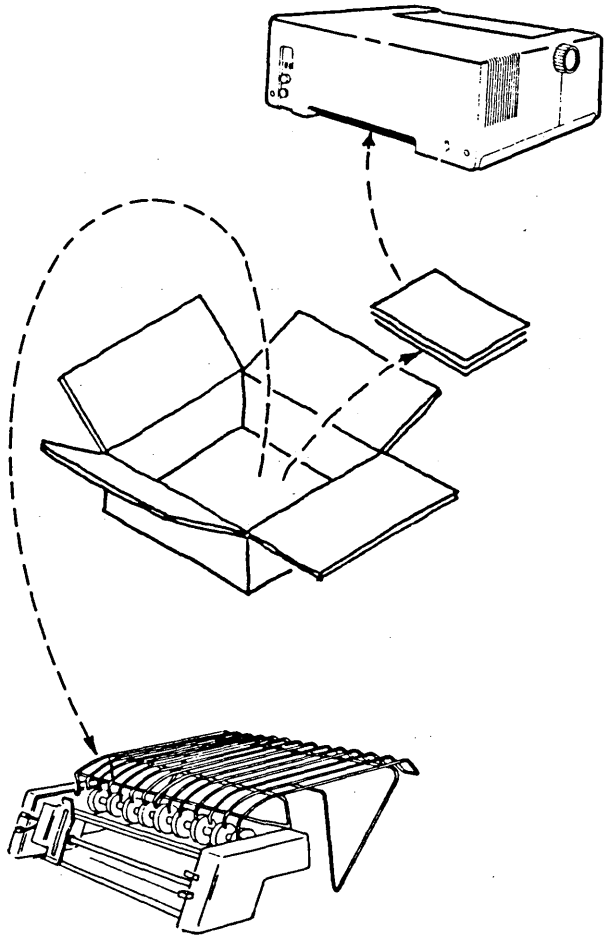
☐ 3. Slide the top cover open. Carefully remove the tape that secures the print head. Close the top cover.



☐ 4. Remove and untape the power cord. DO NOT plug the power cord into a power outlet.

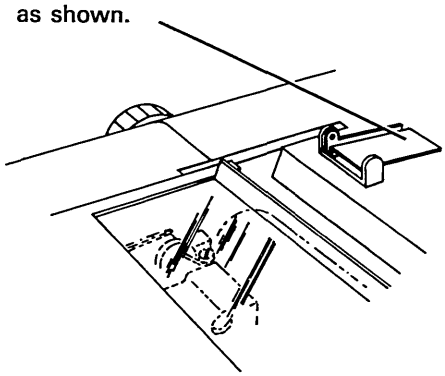


☐ 5. Open the small carton. Remove and save the documentation and any additional items included. Place the documentation that is enclosed in a plastic envelope in the slot at the rear of the machine. Remove the end pieces (packing material) and remove the forms tractor from the box.

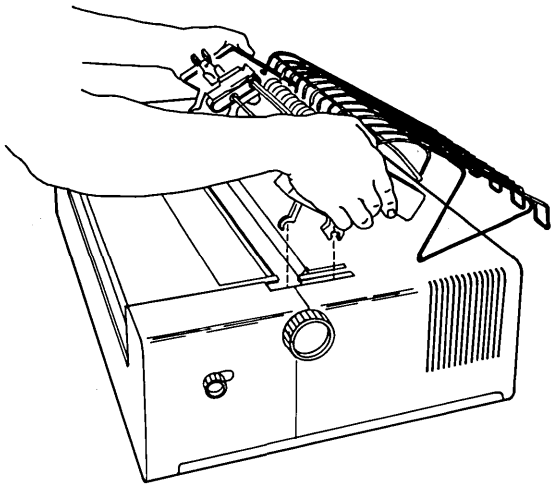


☐ 6. To place the forms tractor in position on the top of the printer, use the following steps:

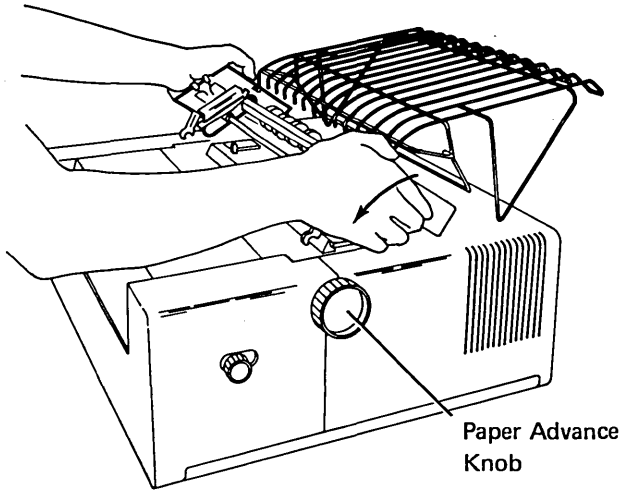
a. Be sure that the cut forms guide is turned back as shown.



b. Insert the back legs of the forms tractor in the back cover slots.



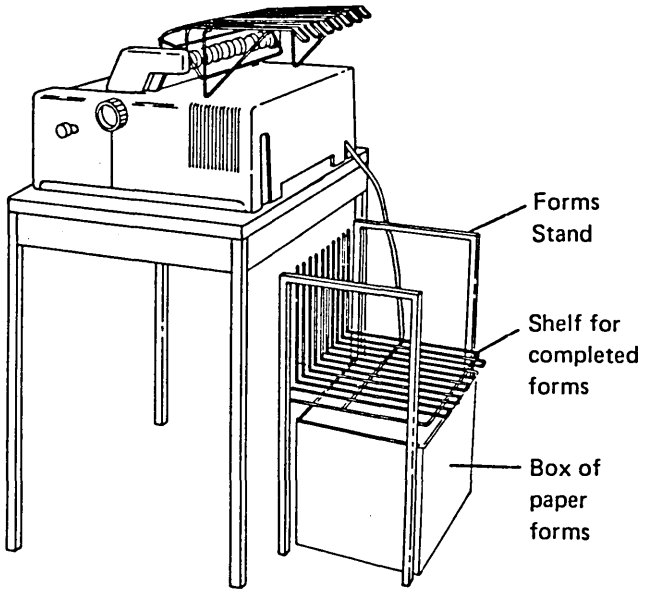
c. Press down firmly until the back legs snap into place. Pivot the forms tractor toward the front of the printer until the front legs move into locking position.



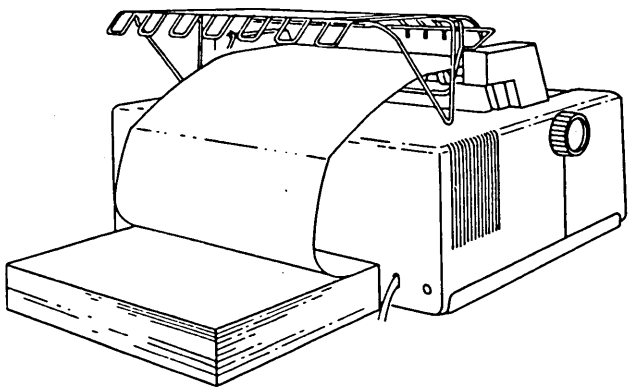
d. Check the final placement by making sure the Paper Advance knobs turn freely and the tractor pins move.

☐ 7. To insert forms into the printer, use the following steps:

a. If your printer has a forms stand, place the stand on the floor behind the printer. A box of forms can be placed under the forms stand shelf.

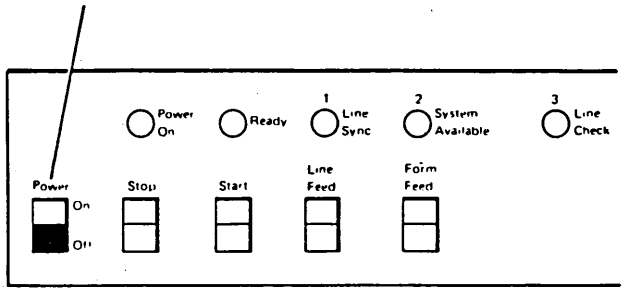


b. If a forms stand is not available, a supply of forms can be placed on a table behind the printer.

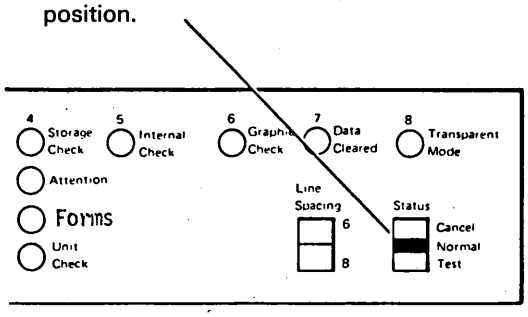


c. Insert forms into the printer. If you need detailed instructions, refer to *Loading Continuous Forms*, in the *IBM 5256 Printer Operators's Guide*, GA21-9260. Follow steps 3 through 16 to load continuous forms, then return to step 8 of this procedure.

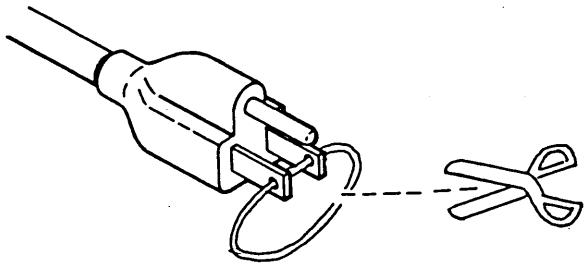
☐ 8. Make sure the Power switch is in the Off position.



☐ 9. Make sure the Status switch is in the Normal position.



☐ 10. Remove the wax string seal from the plug and plug the power cord into a grounded outlet.



☐ 11. Set the Power switch to the On position.

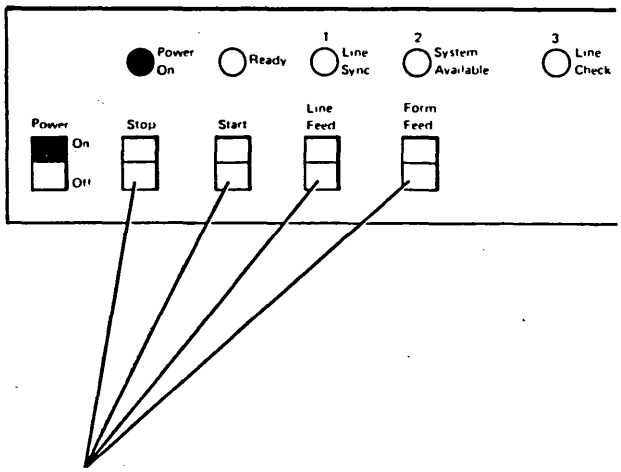
If you have trouble with the lights, switches, or the print test in Section 1, do not go to Section 2. Instead, refer to *Chapter 5. Problem Determination* in the *IBM 5256 Printer Operator's Guide*, GA21-9260.

The Power On light should come on and remain on. The other lights on the control panel will come on for about two seconds and go off in sequence, left to right, as the power-on diagnostic is automatically performed.

The print head, if not already located there, will move to the left margin area as part of this diagnostic.

Upon successful completion of the power-on diagnostic, the only lights remaining on are: Power On, Data Cleared, and Transparent Mode.

☐ 12. After step 11 is completed successfully, press each of the following switches to make sure they are operating properly:

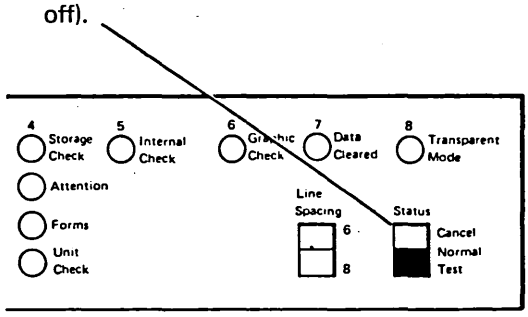


- Line Feed–The paper should advance one line each time the switch is pressed.
- Form Feed–The paper should advance one line each time the switch is pressed.

  Note: After the page length is specified in the system program, the Form Feed switch, when pressed, advances the paper to the beginning of the next page.
- Start–The Ready light should come on and the print head should move the start position when the switch is pressed.
- Stop–The Ready light should go off and the print head should move to the left margin area when the switch is pressed. The Power On light remains on.

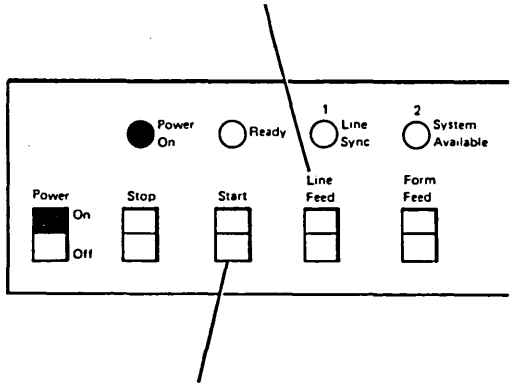
☐ 13. To perform a print test (make sure you have paper loaded in the printer):

a. Set the Status switch to the Test position (the Data Cleared and Transparent Mode lights go off).



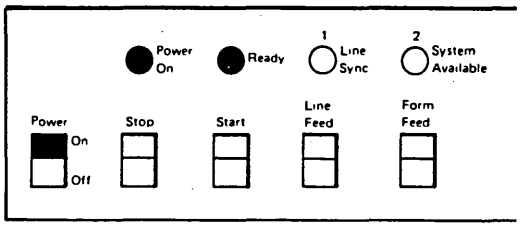
b. Press the Line Feed switch.

Note: When the Status switch is in the Test position, the Line Feed switch does not perform its normal function. Instead, it is used to select the print test.



c. Press the Start switch (the Ready light momentarily comes on).

d. When the Ready light goes off, press the Start switch again to start printing. The Ready light will come on and remain on while the 5256 is printing.



The printout should look like this:

```
 ---------¢.((+|&---------!$*);¬-/--------¦,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz--
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
 ---------¢.((+|&---------!$*);¬-/--------¦,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz--
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
 ---------¢.((+|&---------!$*);¬-/--------¦,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz--
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
 ---------¢.((+|&---------!$*);¬-/--------¦,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz--
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
 ---------¢.((+|&---------!$*);¬-/--------¦,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz--
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
 ---------¢.((+|&---------!$*);¬-/--------¦,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz--
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
 ---------¢.((+|&---------!$*);¬-/--------¦,%_>?---------`:#@'="-abcdefghi-------jklmnopqr-----■-~stuvwxyz--
(ABCDEFGHI------)JKLMNOPQR------\-STUVWXYZ------0123456789------
```

e. Press the Stop switch to stop printing and to turn off the Ready light. The print head will return to the left margin area.

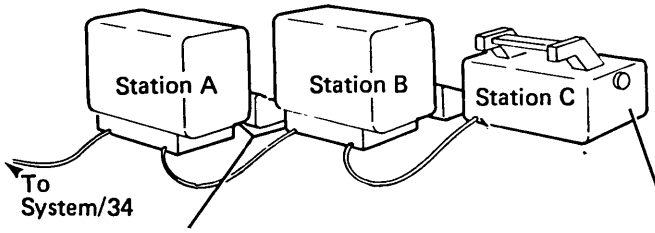
f. Set the Status switch to the Normal position (the Data Cleared and Transparent Mode lights come on.)

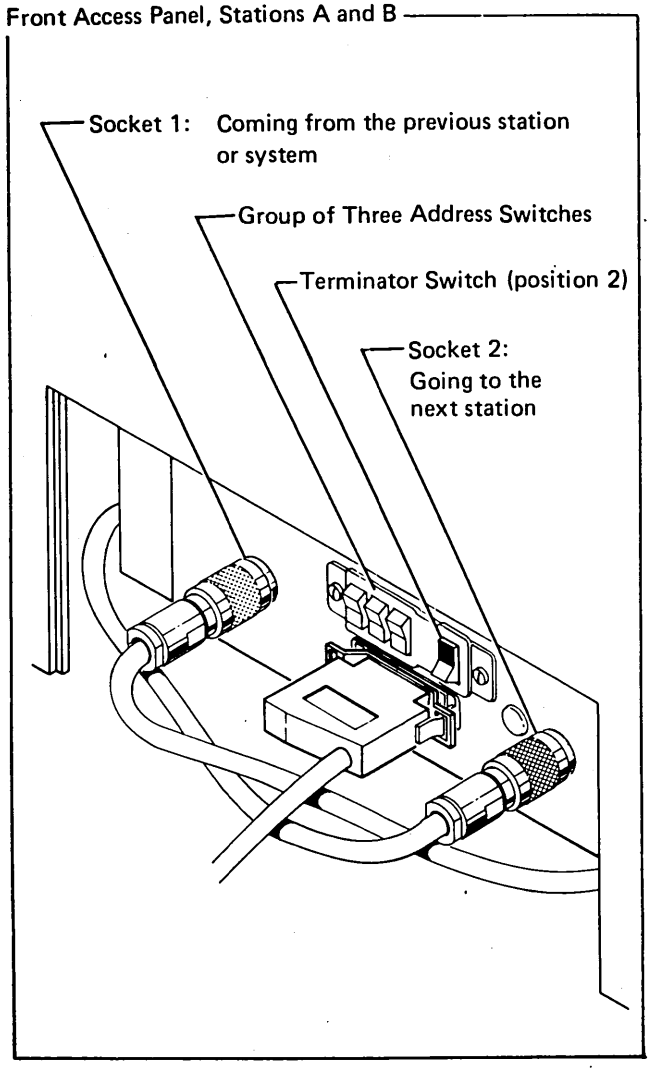
g. Set the Power switch to the Off position.

This is the end of Section 1. If all the steps in the procedure were completed successfully, you are ready for Section 2, which contains instructions for connecting the printer to the system.

Cable Thru Feature

Some display stations and printers have the Cable Thru feature that allows stations to be connected to one another in a line, instead of all stations connecting directly to the system.





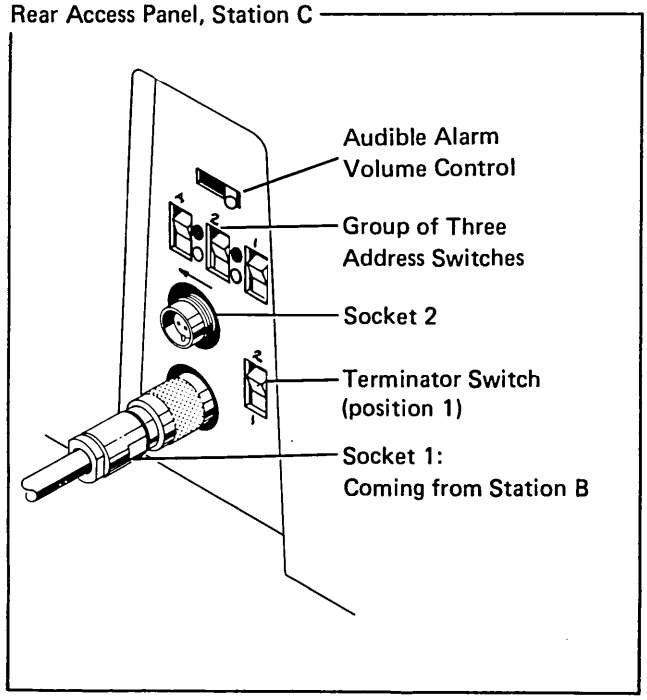
In this example, the system cable for station C will be coming from station B rather than directly from the system.

Both stations A and B must have a front access panel with three white Address switches and a blue Terminator switch to allow this type of setup.

The Terminator switch controls the communications flow from station to station. The switch has two positions:

Position 2 allows communications signals to flow through the station to the next station.

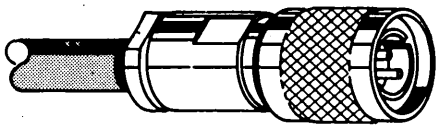
Position 1 stops the communications signal and completes the electrical circuit. Position 1 is the required position when the station is the last one on the line (station C in the example).



Note: Socket 2 would go to the next station on the line if more than 3 were present. The last station on the line might not have a socket 2, three address switches, and a Terminator switch. Stations without a Terminator switch can only be connected directly to the system, or used as the last station on the line when connecting to a preceding station.

Section 2. Connecting to the System

☐ 14. Make sure the system cable (with proper connector) is correctly installed and ready to use. For cable information, refer to the *IBM 5250 Information Display System Installation Manual—Physical Planning*, GA21-9277.



☐ 15. Before connecting your end of the system cable to the printer, make sure the other end of the cable is properly connected to either of the following:

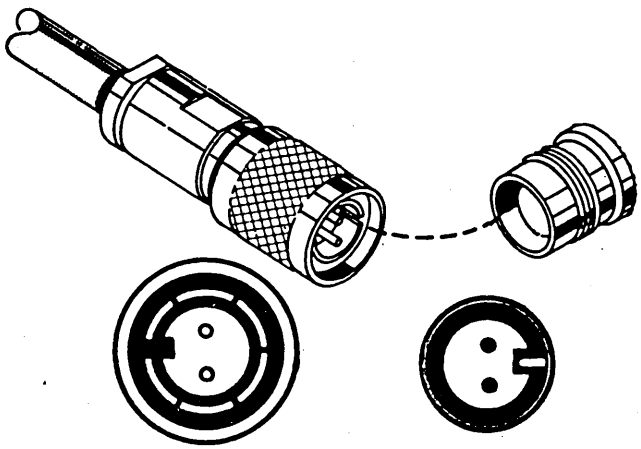
- Directly to the part (system socket)
- To socket 2 of another display station or printer (see *Cable Thru Feature* on the preceding page)

If the system cable originates at socket 2 of another display station or printer, make sure the Terminator switch on the other station is set to position 2.

☐ 16. Set the Power switch to the Off position.

☐ 17. To connect the system cable to the printer:

Note: When you connect cables, be sure to line up the slot inside the cable connector with the key in the socket.



The system cable connects to a socket on the rear access panel on the back of the printer. The rear access panel resembles either illustration A or illustration B.

Illustration A

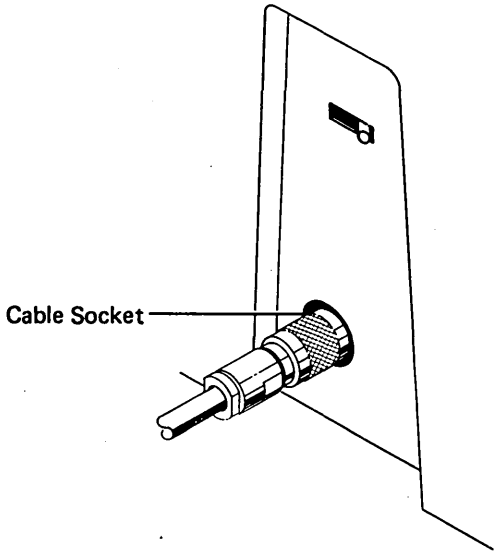
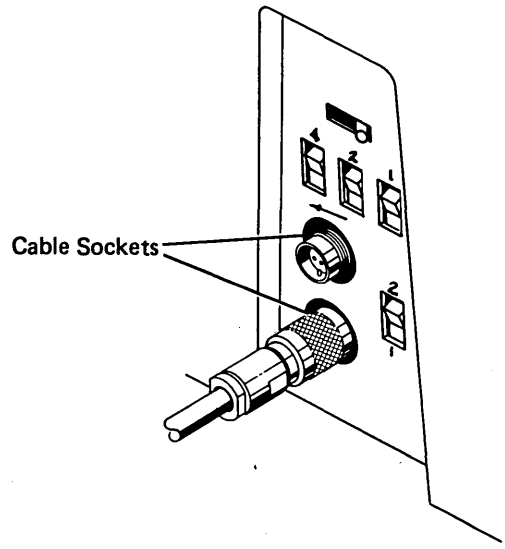


Illustration B



a. If the rear access panel resembles illustration A, plug the system cable into the socket and tighten the retaining ring by turning it clockwise. Proceed to step 19.

b. If the rear access panel resembles illustration B, plug the system cable into the lower socket and tighten the retaining ring by turning it clockwise. Proceed with step 18.

☐ 18. To set the Address switches and the Terminator switch:

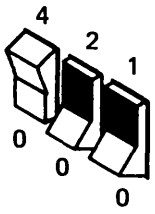
a. To set the three white Address switches to the address assigned to your printer, you must know the address number. Contact your system operator or supervisor and ask for the unit address assigned to your printer, which will be a number from 0 through 6.

Write the address number here:

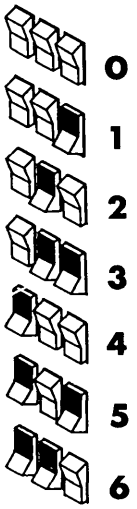
_____

Set the Address switches to the address you have written down.

Example: If the address is 3, the Address switch settings =



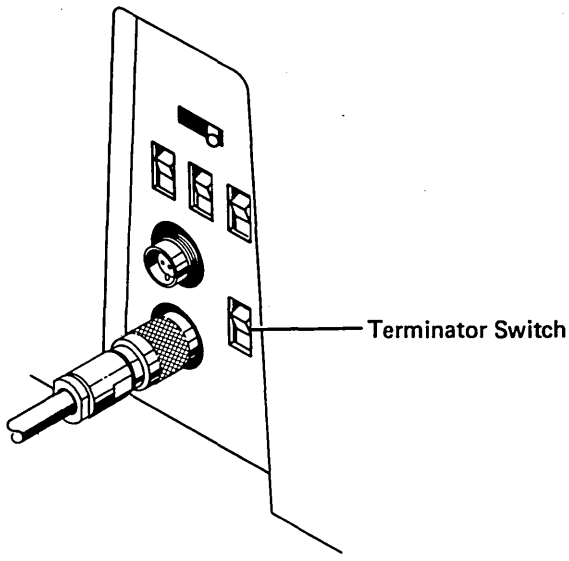
Use the table below to determine the setting of the three white Address switches.



Invalid **7**

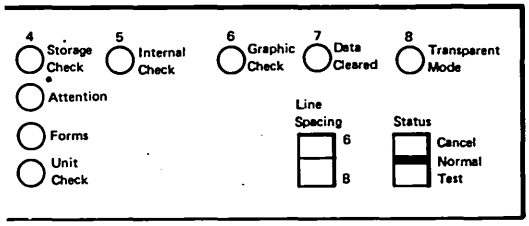
Note: You might find the eraser end of a pencil convenient to use when setting these switches.

b. Set the Terminator switch to position 1.



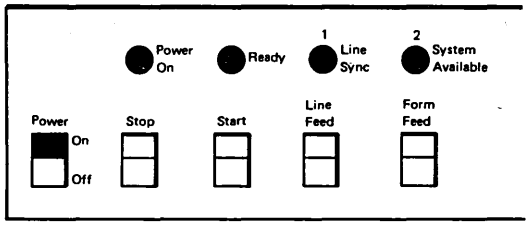
☐ 19. The following checkout procedure ensures that the 5256 Printer is properly set up and communicating with the system:

a. Make sure the Status switch is set to the Normal position.



b. Set the Power switch to the On position. The Power On light comes on and stays on; the other control panel lights will come on and go off in sequence (left to right). When the power-on diagnostic is finished, the Power On, Line Sync, and System Available lights will be the only lights remaining on.

c. Press the Start switch. The Ready light turns on and the print head moves into position to start printing. All four of the lights on the left side of the control panel should now be on.



When step 19 is completed successfully, your printer is properly set up and communicating with the system.

Refer to *Chapter 1. Introduction* in the *IBM 5256 Printer Operator's Guide*, GA21-9260, for further information.

If step 19 is not successful, refer to *Problem Check List* on the next page.

Problem Check List

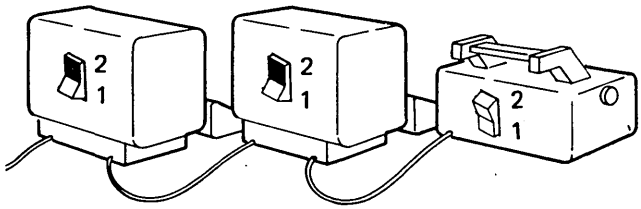
If the conditions in step 19 do not appear:

1. Ask the system operator if the system is operating and if it is configured to recognize the setting of the Address switches. Wait until the system is operational before proceeding.

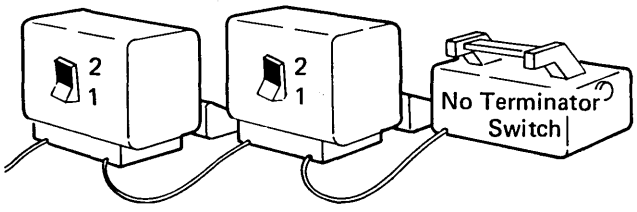
2. Set the Power switch to the Off position and recheck all cable connections to make sure they are properly positioned and tightened. When you have made sure they are, set the Power switch to the On position.

3. If your printer is connected to a preceding station (not connected directly to the system), make sure the blue Terminator switch on the preceding station is set to position 2.

4. If your printer is not connected to a following station (no cable in socket 2), be sure the Terminator switch (if there is one) is set to position 1.



Stations without a Terminator switch can only be used as the last station on the line or connected directly to the system. In either case the address must always be 000.



5. If the conditions still do not appear, refer to *Chapter 5. Problem Determination* in the *IBM 5256 Printer Operator's Guide*, GA21-9260.

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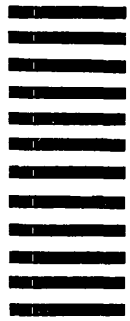

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