

SY20-8520-0

IBM 5218 Printer
Maintenance Information Manual



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IBM 5218 Printer

Maintenance Information Manual

First Edition (March 1981)

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PREFACE

This Maintenance Information Manual (MIM) provides Customer Engineers (CEs) with the operational theory and adjustment procedures for servicing the IBM 5218 Printer. CEs using this manual are assumed to have completed the education course on the IBM 5218 Printer.

Adjustments are numbered sequentially to help in servicing. Arrows are used to show the direction in which the part can be adjusted.

Acronyms used in this MIM are defined in the Acronym List.

RELATED PUBLICATIONS

Related Information can be found in the following manuals:

IBM 5218 Maintenance Analysis Procedures, SY20-8524

IBM 5218 Operator's Guide, GA23-1006

DANGER NOTICES

Through this manual, the word **DANGER** is used to inform the CE of an action that could cause a personal injury. The word **CAUTION** is used to give notice of an unsafe condition which is potentially dangerous if proper operating or servicing procedures are not used.

Ensure that you understand and observe the safety precautions printed on the **CE Safety Practices** card that is used in the country where you work. A copy of the card that is used by customer engineers who work in the United States follows.

Some MIM pages have **DANGER** or **CAUTION** notices. If desired, translate the notices and write your own words on the blank lines provided below the notice.

CE SAFETY PRACTICES CARD

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 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

USING THE IBM 5218 MAINTENANCE INFORMATION MANUAL

The information in this manual is to be used as reference material when diagnosing machine failures. The maintenance information manual (MIM) contains maintenance procedures, diagnostic aids, and theory.

The format for page numbering is X.YYY.2. X is the section number, YYY is the page number, and 2 (although, not normally used) is for expansion when it is not practical to give new numbers to all pages.

The reference method used in this maintenance information manual is the MAP three-digit reference numbers. The numbers are assigned to location figures and maintenance procedures to refer from the MAPs. For example, 127 indicates the carrier eccentric adjustments.

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 figures and maintenance procedures for repairing or installing field-replaceable units (FRUs) that the MAPs diagnosed as failing. Maintenance procedures are service checks, removals and replacements, and adjustments. All procedures have a three-digit reference numbers assigned to refer from the MAPs.

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 more detail, a list of 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.

GLOSSARY

This list includes terms and abbreviations used in the MAPs and the maintenance (MIM).

amplifier. A device to increase the size of a signal.

BAT. Basic assurance test

DAC. Digital to analog converter

detent. Lock

eccentric shafts. Shafts that allow the selection motor to be adjusted vertically.

escapement. The horizontal movement of the carrier assembly

exception condition. Error or stop condition.

FRU. Field-replaceable unit.

full duplex. Receive and transmit at the same time.

GND. Ground.

MAPs. Maintenance analysis procedures.

MIM. Maintenance information manual.

paper curl. A condition in which paper tends to curve.

PPI. Programmable peripheral interface.

POR. Power on reset.

restraint pawls. Mechanical arms that restrict the feeding of more than one sheet of paper at a time.

sequencer cylinders. Cylinders that turn the paper at the output paper tray.

static test. A test that occurs at an idle condition.

summation check. The sum of individual digits composed to a value already computed.

Vdc. Volts direct current.

RAM. Random access memory

ROS. Read-only storage

VTL. Vendor transistor logic

CONTENTS

Maintenance	1-2
Locations	1-2
100 Front and Right Side Locations	1-2
101 Top Locations	1-4
102 Back Locations	1-6
103 Printer Mechanism Bottom Locations (Printer Mechanism in Service Position)	1-7
Electronic Cards	1-8
104 A-A1 Distribution Board	1-8
105 I/O Connectors	1-10
Adjustments	1-14
115 Covers	1-14
116 Control Panel	1-17
117 Power Switch Assembly	1-18
118 Printer Attachment Panel Assembly	1-19
119 Fan Assembly	1-20
Paper Feed	1-21
120 Platen Gear	1-21
121 Platen Pulley	1-22
122 Index Motor	1-23
123 Index Motor Pulley	1-24
124 First Writing Line Sensor	1-25
125 Cam Motor and Reed Switch Brackets	1-26
Carrier	1-27
126 Leadscrew Follower	1-27
127 Carrier Eccentrics	1-28
128 Selection Motor Pull-Back Cable Length	1-30
Print Wheel	1-32
129 Carrier Assembly	1-32
130 Print Wheel Hub to Platen	1-34
131 Print Hammer Assembly	1-36
132 Print Wheel Homing	1-37
Ribbon	1-38
133 Ribbon Plate	1-38
134 Ribbon Lift Arm.....	1-39
135 Drive Pinion Gear.....	1-40
136 Ribbon Cartridge Holder	1-41
137 Cardholder	1-42
138 Print Wheel Hub	1-43
139 Left Margin Switch	1-44
Service Checks	1-46
150 Ribbon Movement	1-46
151 Left and Right Carrier Cables	1-47
152 CE Service Position	1-48

Removals and Replacements	2-1
Cover	2-1
200 Top Cover	2-1
Control Panel and Cable Assembly	2-2
202 Control Panel	2-2
203 Control Panel Logic Card and Switch Assembly	2-3
204 Power Switch and Cable Assembly	2-4
205 AC Line Filter	2-5
Paper Feed	2-6
210 Index Motor	2-6
211 Cam Motor	2-7
212 Cam	2-8
213 Deflector Arm and Spring Comb	2-9
214 Cam Motor Idler Gear	2-10
215 Platen	2-11
216 Feed Rollers Assembly	2-12
Carrier	2-13
217 Escapement Motor	2-13
218 Leadscrew	2-14
219 Leadscrew Follower	2-15
220 Carrier Assembly	2-16
221 Selection Motor Pull-Back Cable	2-18
Print Wheel	2-20
222 Selection Motor	2-20
223 Print Hammer Assembly	2-22
224 Print Wheel Hub	2-24
225 Print Wheel	2-26
Ribbon	2-27
226 Ribbon Motor Drive Assembly	2-27
227 Ribbon Sensor Assembly	2-28
228 Ribbon Plate	2-29
230 Ribbon Belt	2-30
231 A-A1 Distribution Board	2-31
232 Sheet Feed Cable (Printer Side)	2-32
233 Printer Mechanism	2-34
234 Power Supply	2-36
235 Power Supply Fuse	2-36
236 First Writing Line Sensor	2-38
237 Left Margin Switch	2-39
Diagnostic Aids	3-1
301 Diagnostic Mode	3-1
Switch Function	3-2
Indicators	3-3
302 Control Mode Selection	3-4
303 Selecting a Diagnostic Test	3-5
304 Diagnostic Tests	3-6
305 Error Codes	3-17
306 Maintenance Statistics	3-22
307 Verify	3-25
308 Background ROS Test	3-26
309 Print Test	3-26

310 Power-On Diagnostic Sequence	3-27
Processor Card Test	3-27
Operator Interface Test	3-27
Printer Test	3-28
311 Exception Handler	3-29
312 Non-Recoverable Errors	3-29
313 Soft Non-Recoverable Errors	3-30
314 Hard Non-Recoverable Errors	3-30
315 Recoverable Errors	3-30
316 Response ID	3-30
317 Status Byte 0	3-32
318 Status Byte 1	3-33
319 Status Byte 2	3-34
320 Status Byte 3	3-34
321 Status Byte 4	3-35
322 Status Byte 5	3-35
323 Rules for Using MAPs	3-36
324 EBCIDIC Tables	3-38
325 Decimal/Hexadecimal Integer Conversion Chart	3-57
Preventive Maintenance	4-1
Tools and Test Equipment	5-1
Print Alignment Tool	5-1
Cover Adjustment Tool	5-1
Standard CE Tool Kit	5-1
Metric Tool Kit	5-1
Communicating Wrap Plug	5-1
Diagnostic Jumpers	5-2
Theory	6-1
Introduction	6-1
Processor Card	6-4
Universal Synchronous/Asynchronous Receiver/Transmitter	6-4
Attachment Processor	6-5
Programmable Peripheral Interface	6-5
Printer Logic Card	6-6
Interface Processor	6-6
Device Processors	6-6
Analog Card 1	6-7
Analog Card 2	6-7
Memory Patch Card	6-8
Control Panel	6-9
Cover	6-12
Operator Access Cover	6-12
Expected Cover Open	6-12
Unexpected Cover Open	6-12

Functional Parts	6-13
Escapement	6-14
Paper Feed/Indexing	6-15
Character Selection	6-16
Ribbon	6-17
Print Hammer Assembly	6-18
First Writing Line Sensor (FWL)	6-19
Power Supply	6-20
Interface	6-23
Printer Attachment Panel	6-23
Command Language	6-25
Print Image	6-25
Escape Command	6-26
Index Command	6-27
Print Command	6-28
Escape/Print Command	6-29
Paper Handling Commands	6-29
Print Idle Commands	6-30
Interface Protocol	6-31
Power-On Protocol	6-31
Command Exchange Protocol	6-32
Printer Exception Protocol	6-32
Transmission Error Protocol	6-33
Features	7-1
TRACTOR FEED	7-1
Tractor Feed Adjustments	7-2
Spline Shaft End Play	7-2
Drive Belt Tension	7-3
Sheet Feed Maintenance	7-4
Sheet Feed Locations	7-4
700 Front Locations	7-4
701 Left Side Locations	7-6
702 Right Side Locations	7-8
703 Back Locations	7-9
705 I/O Connector and Sheet Feed Analog Card Connections	7-10
Sheet Feed Adjustments	7-11
Power Application	7-11
720 Timing Belt	7-11
721 Shaft End Play	7-12
Paper Feed	7-13
723 Paper Tray Detent	7-13
724 Picker/Separator Assembly	7-14
725 Picker/Separator Lift Mechanism	7-15
726 Second Sheet Restraint Assembly	7-16
728 Picker/Separator Drive Disk	7-18
729 Paper Sensor Assembly	7-20

730 Transport Aligner Pulleys	7-22
731 Lower Inner Wire Rack	7-23
732 Splitter Assembly	7-24
Exit Mechanism	7-26
740 Sequencer Cylinders	7-26
741 Reed Switch	7-28
742 Sequencer Magnet Assembly	7-30
743 Ratchet	7-31
744 Drive Wheel and Roller	7-32
745 Gate Down Stop	7-33
746 Gate Cam	7-34
748 Gate Latch	7-35
749 Gate	7-36
750 Upper Kick Roller	7-37
751 Trip Spring	7-38
Sheet Feed Removals and Replacements	7-39
Covers	7-39
760 Left Side Cover	7-39
761 Right Side Cover	7-40
762 Center Cover	7-41
763 Sheet Feed Cable and Analog Card	7-42
Sheet Feed Analog Card	7-43
Paper Feed	7-44
764 Picker/Separator Assembly	7-44
765 Picker/Separator Lift Mechanism	7-45
766 Paper Tray Support Rail	7-46
767 Lower Second Sheet Restraint Paper Pawl	7-47
768 Upper Second Sheet Restraint Paper Pawl	7-48
769 Second Sheet Restraint Solenoid	7-49
Exit Mechanism	7-50
770 Ratchet	7-50
771 Sequencer Magnet Assembly	7-51
772 Sequencer Cylinders	7-52
773 Sequencer Pulley	7-54
774 Pulley	7-55
775 Cone Roller	7-56
776 Back Up Roller	7-57
777 Left Side Mounting Plate	7-58
778 Right Side Mounting Plate	7-59
779 Manual Paper Insertion Deflector	7-60
780 Wire Racks	7-61
781 Rocker	7-62
Sheet Feed Preventive Maintenance	7-64
Tools and Test Equipment	7-66
Standard CE Tool Kit	7-66
Metric Tool Kit	7-66

Sheet Feed Theory	7-67
Introduction	7-67
Sheet Feed Operation Summary	7-68
Signals	7-69
Picker/Separator Mechanism	7-70
Second Sheet Restraint Mechanism	7-71
Paper Sensors	7-72
Sequencer Mechanism	7-73

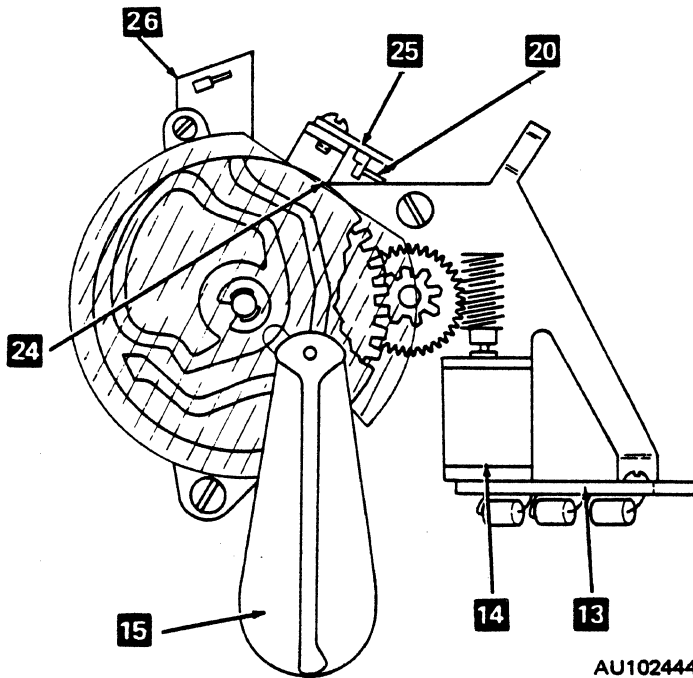
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MAINTENANCE

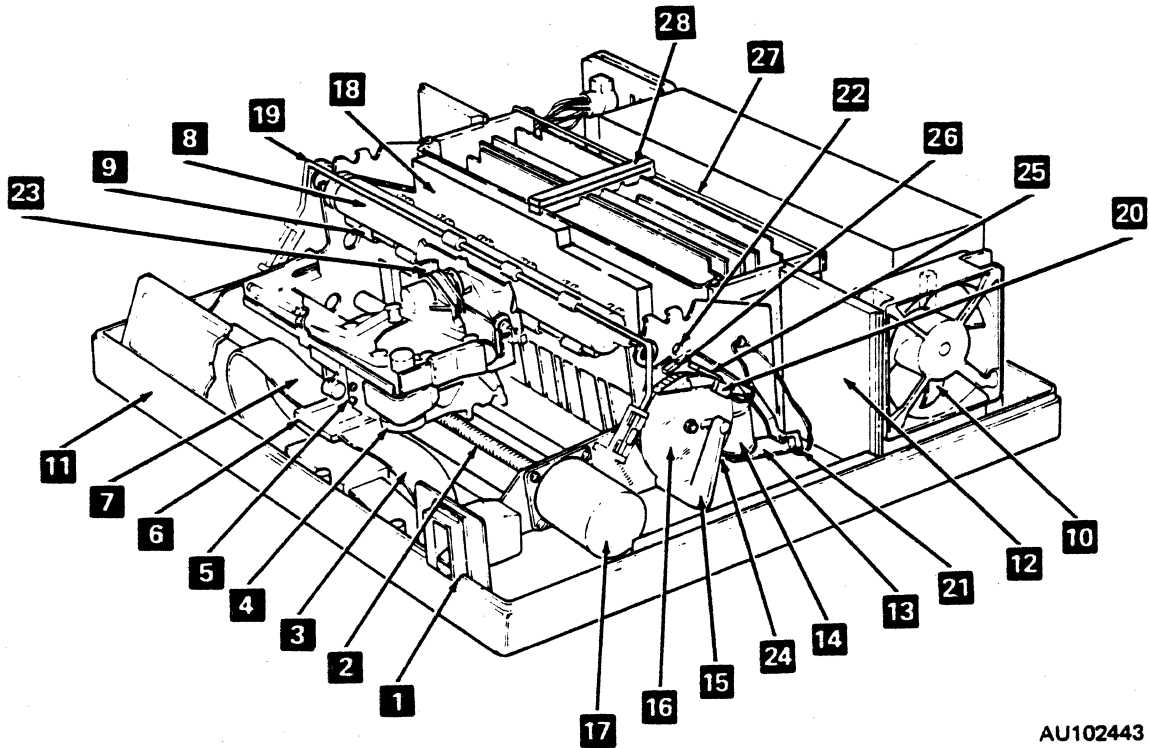
LOCATIONS

100 FRONT AND RIGHT SIDE LOCATIONS

1. Power switch assembly
2. Leadscrew
3. Right carrier cable
4. Ribbon motor
5. Ribbon plate
6. Carrier assembly
7. Left carrier cable
8. Platen
9. Feed rollers
10. Printer fan
11. Bottom printer cover
12. Right baffle
13. Cam motor filter board
14. Cam motor
15. Deflector arm
16. Cam and safety shield
17. Escapement motor
18. Center Baffle
19. Paper bail
20. Cam home plug
21. Cam motor plug
22. Cam position plug
23. Ribbon sensor
24. Cam home magnet
25. Cam home switch
26. Cam position switch
27. Logic card stiffner
28. Logic card separator



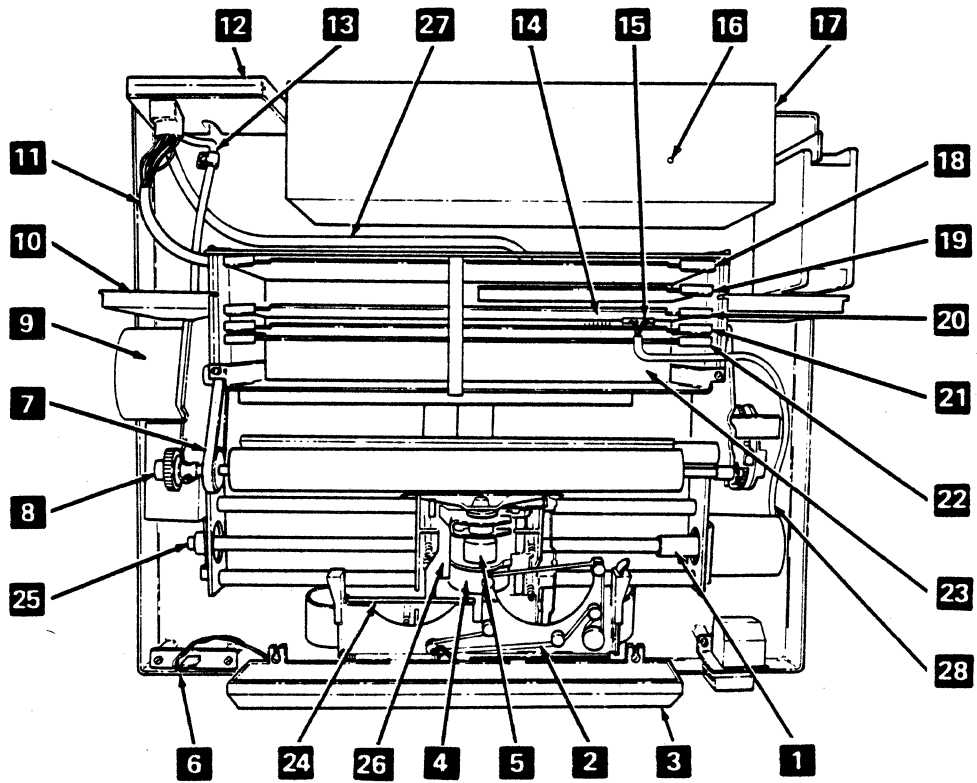
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101 TOP LOCATIONS

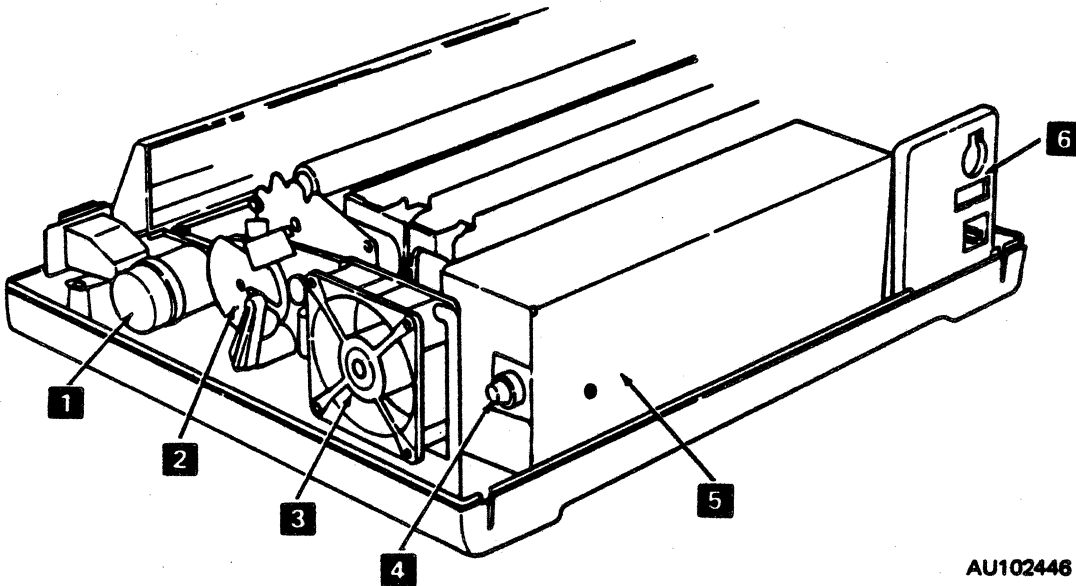
1. Leadscrew coupler
2. Ribbon belt
3. Control panel
4. Selection motor
5. Hammer assembly
6. Cover interlock connector
7. Index motor belt
8. Platen gear
9. Index motor
10. Left baffle
11. Sheet feed cable
12. Printer attachment panel assembly
13. Power cable
14. Escapement feedback test socket (A02 printers only)
15. Escapement feedback normal socket (A02 printers only)
16. Power supply check light
17. Power supply
18. Analog card 1 (A-A1F1)
19. Memory patch card (A-A1E1)
20. Processor card (A-A1D1)
21. Printer logic card (A-A1C1)
22. Analog card 2 (A-A1B1)
23. A-A1 Distribution Board
24. Selection motor pull-back latch
25. Leadscrew bearing
26. Selection home lever
27. Controller attachment cable
28. Escapement motor feedback cable



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102 BACK LOCATIONS

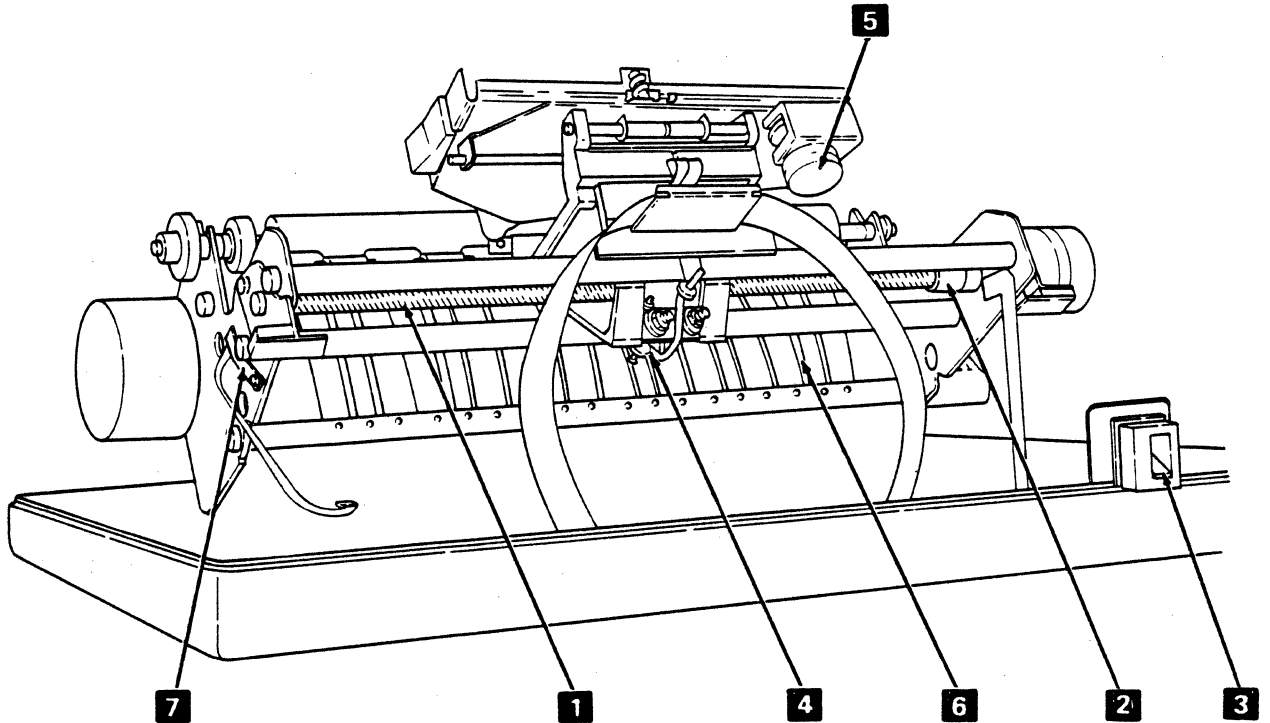
1. Escapement motor
2. Cam assembly
3. Printer fan
4. Power supply fuse
5. Power supply
6. Printer attachment panel



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

1. Leadscrew
2. Leadscrew coupler
3. Power switch
4. Bottom bearing
5. Ribbon motor drive assembly
6. Spring/comb deflector arm
7. Left margin switch (A01 printers only)

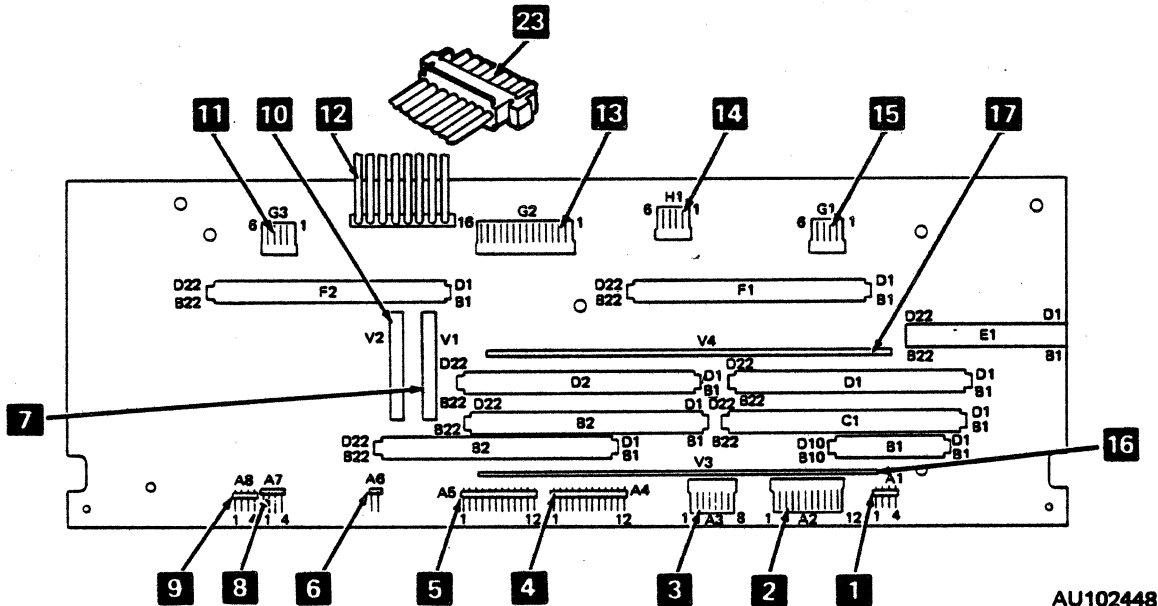


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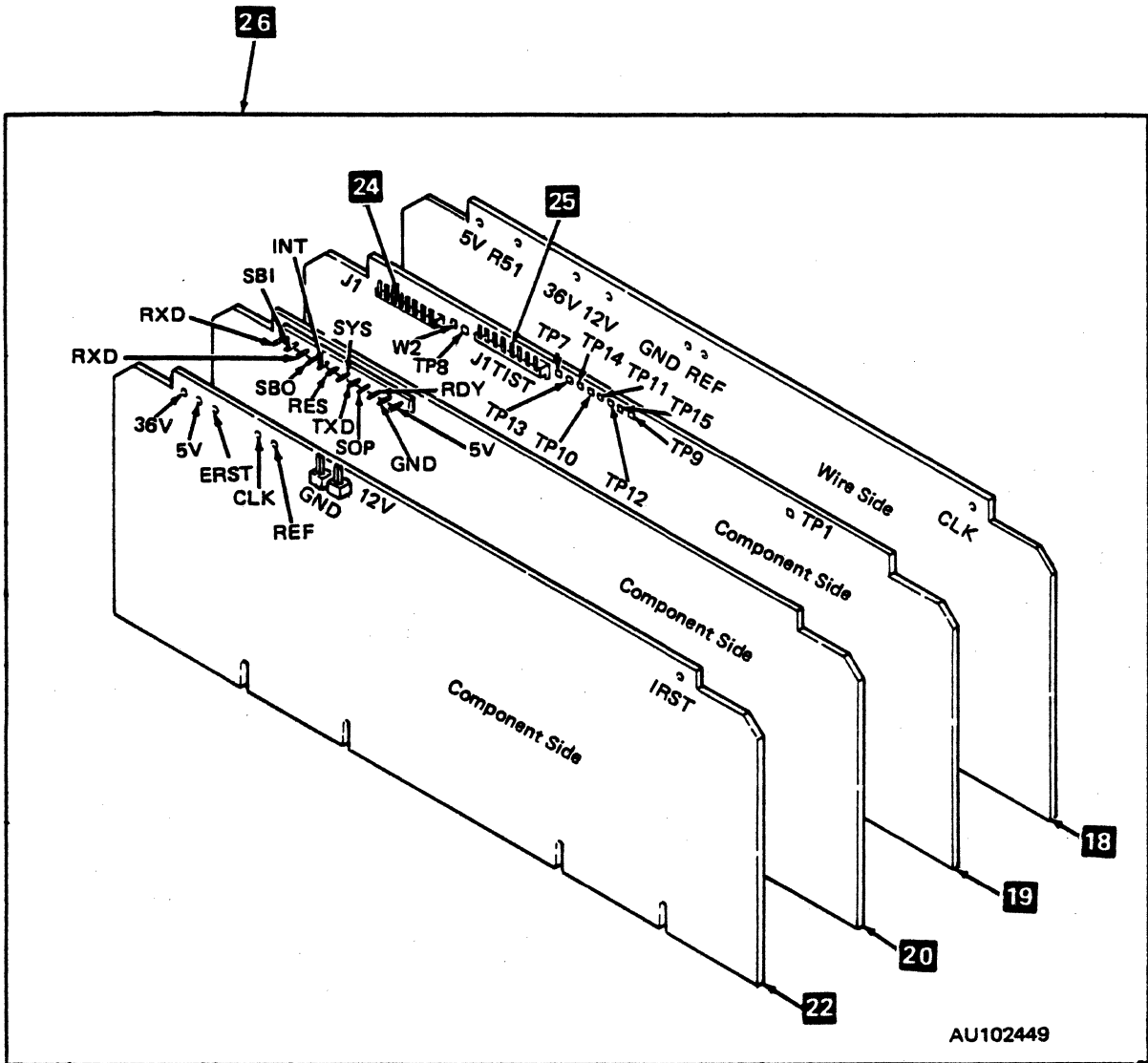
ELECTRONIC CARDS

104 A-A1 DISTRIBUTION BOARD

1. A-A1A1 Right margin switch connector
2. A-A1A2 Control panel connector
3. A-A1A3 Cam module signal connector
4. A-A1A4 Right carrier cable connector
5. A-A1A5 Left carrier cable connector
6. A-A1A6 Unused
7. V1 Bus bar for analog ground and +5 Vdc
8. A-A1A7 First writing line sensor connector
9. A-A1A8 Left margin switch connector (used on A01 printers only)
10. V2 Bus bar for analog ground and +36 Vdc
11. A-A1G3 Index motor connector
12. A-A1H2 Power supply connector
13. A-A1G2 Sheet feed connector
14. A-A1H1 Controller attachment connector
15. A-A1A1 Escapement motor connector
16. V3 Bus bar for logic ground and +5 Vdc
17. V4 Bus bar for logic ground and +5 Vdc
18. A-A1B1 card (Analog card 2)
19. A-A1C1 card (Printer logic card)
20. A-A1D1 card (Processor card)
21. A-A1E1 card (Memory patch card)
22. A-A1F1 card (Analog card 1)
23. J4 Power supply connector
24. Escapement feedback normal socket (Used only on A02 printers)
25. Escapement feedback test socket (Used only on A02 printers)
26. Test points



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105 I/O CONNECTORS

CONNECTOR	NAME	PIN	SIGNAL	INTERCONNECTIONS
A1	Margin Switch	1	-GNDL	
		2	GNDL	
		3	MARSW	C107
		4	MARSW	C107
A2	Control Panel	1	ENC3W3	D1013
		2	ENC3W2	D1012
		3	ENC3W1	D1011
		4	Stop	D1010
		5	Dat	D182
		6	Strobe	D181
		7	+5V	
		8	GNDL	
		9	COSW	C2816, D1014
		10	LAMPBL	D2822
		11	N.C.	
		12	N.C.	
A3	Cam Signal	1	DCM+	F1019
		2	DCM-	F1020
		3	Home	C207
		4	CAMPOS	C208
		5	GNDL	
		6	WIDCAR	D1021
		7	Spare	D1021
		8	Spare	D1022
A4	Carrier	1	R1BMD	C1022
		2	R1BMC	C1020
		3	R1BMB	C1021
		4	R1BMA	C1019
		5	HAMMIN	B184
		6	HAMPLS	B183
		7	CW	B2020
		8	BW	B2021
		9	AW	B2022
		10	ACW	B2822
		11	BCW	B2821
		12	CCW	B2820
A5	Carrier	1	+12V	
		2	+5V	
		3	EORC	C1821
		4	EOREMIT	C1822
		5	HITPLS	B187
		6	HITMIN	B186
		7	GNDAC	A9-1, C287, G2-12
		8	TA	B286
		9	TB	B287
		10	TC	B288
		11	TH	B2811
		12	GNDR	B289

CONNECTOR	NAME	PIN	SIGNAL	INTERCONNECTIONS
A6	Unused	1		
		2		
A7	FWL	1	LEDHI	C204 (Red)
		2	PTLDLO	A7-4, C202 (Black)
		3	PTXHI	C203 (Yellow)
		4	PTLDLO	A7-2, C202 (Black)
A8	Margin Switch	1	GNDL	
		2	GNDL	
		3	MARSW	C107
		4	MARSW	C107
A9	Gnd Strap	1	GNDAC	A5-7, C287, G2-12
G1	EXC. MTR.	1	MTRB	F108
		2	CHOPB	F109
		3	MTRB	F1010
		4	MTRA	F107
		5	CHOPA	F106
		6	MTRA	F105
G2	Sheet Feed	1	SF*	D1818
		2	APOR*	B102, C205, F1811
		3	R1MO*	C2018
		4	R2MO*	C2017
		5	SFCUR	C2019
		6	H2S	C2016
		7	(IDB1)HIS	C2015
		8	TF*	D1817
		9	+12V	
		10	+5V	
		11	+36V	
		12	GNDAC	A5-7, A8-1, C287
		13	GNDL	
		14	GNDAC	
		15	Spare	
		16	SAB	D109
G3	Index Motor	1	IBDW	F2012
		2	IACW	F2013
		3	IDW	F2014
		4	IBW	F2015
		5	ICW	F2016
		6	IAW	F2017

CONNECTOR	NAME	PIN	SIGNAL	INTERCONNECTIONS
H1	Controller Attachment	1	RXDP	D102
		2	RXON	D101
		3	TXDP	D1017
		4	TXO	D1016
		5	DSR	D1015
H2	Power Supply	1	+36V	J4-1
		2	+12V	J4-4
		3	GNDAC	J4-5
		4	+5V	J4-2
		5	+5V	J4-3
		6	GNDL	J4-6
		7	GNDL	J4-7
		8	-24V	J4-8
J1	Power Supply Fan	1	115 Vac	
		2	Ground	
		3	Neutral	
J2	Power Switch	1	115 Vac	
		2	Ground	
		3	Neutral	
		4	Not used	

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A-A1H1 CONNECTOR	PRINTER ATTACHMENT PANEL CONTROLLER CONNECTOR
PIN	PIN
1-----RXDP-----	1
2-----RXDN-----	2
3-----TXDP-----	8
4-----TXDX-----	9
5-----NOT USED	
6-----NOT USED	
FRAME GROUND-6	

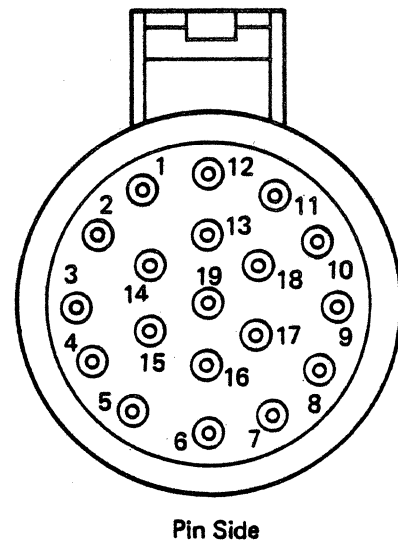
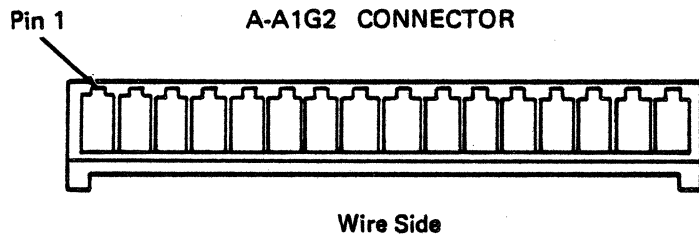
AU102451

**A-A1G2
CONNECTOR**

**PAPER HANDLING
CONNECTOR**

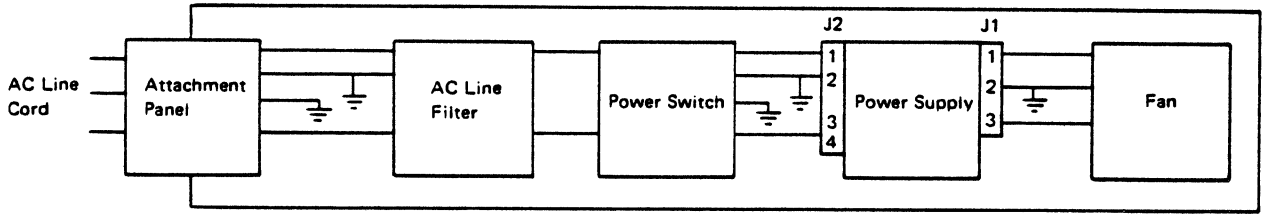
PIN		PIN
1	SF*	8
2	APOR*	14
3	RIMO	2
4	R2MO*	3
5	SFCUR	15
6	H2S	18
7	HIS	17
8	TF*	9
9	+12VDC	16
10	+5VDC	13
11	+36VDC	19
12	GNDAC	
13	GNDL	7, 1
14	GND	4, 10
15	SPARE	5
16	SAB	11

**PAPER HANDLING CONNECTOR
ON ATTACHMENT PANEL**

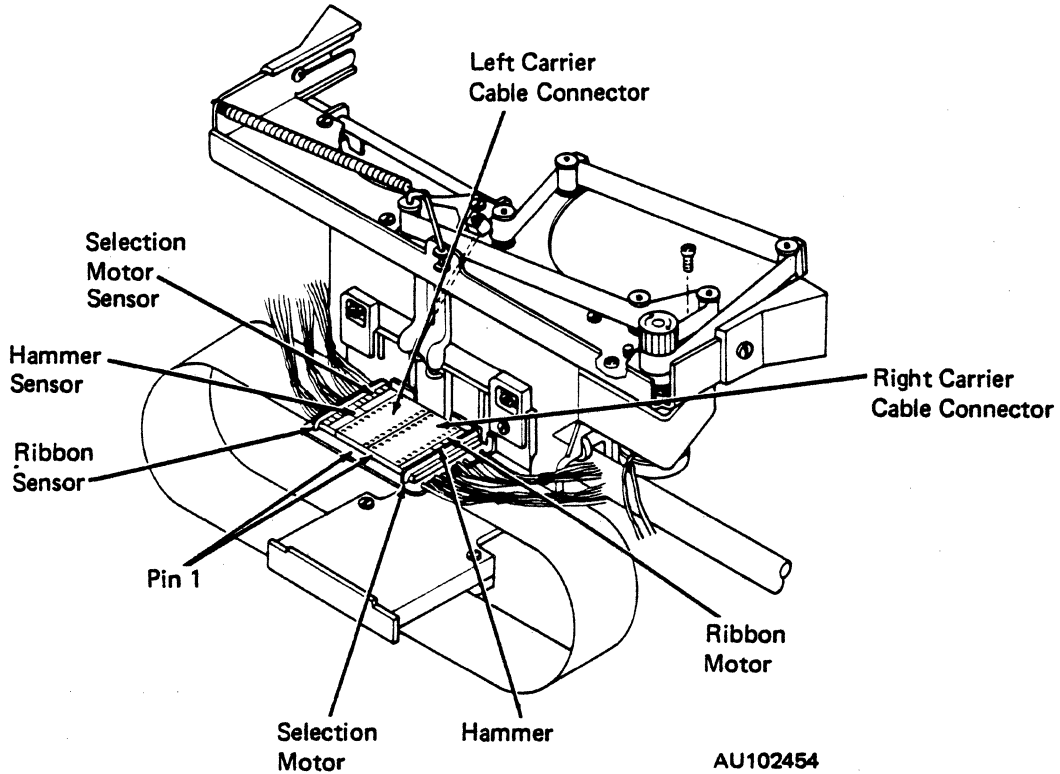


AU102452

AC Distribution



AU102453



AU102454

LEFT CARRIER CABLE CONNECTOR

PIN		PIN
1	+12 VDC (EORA)	1
2	+5 VDC (EORCOL)	2
3	EORC	3
4	EOREMIT	4
5	HITPLS	5
6	HITMIN	6
7	GNDAC	7
8	TA	8
9	TB	9
10	TC	10
11	TH	11
12	GNDTR	12

A-A1A5 CONNECTOR

A-A1A4 CONNECTOR

RIGHT CARRIER CABLE CONNECTOR

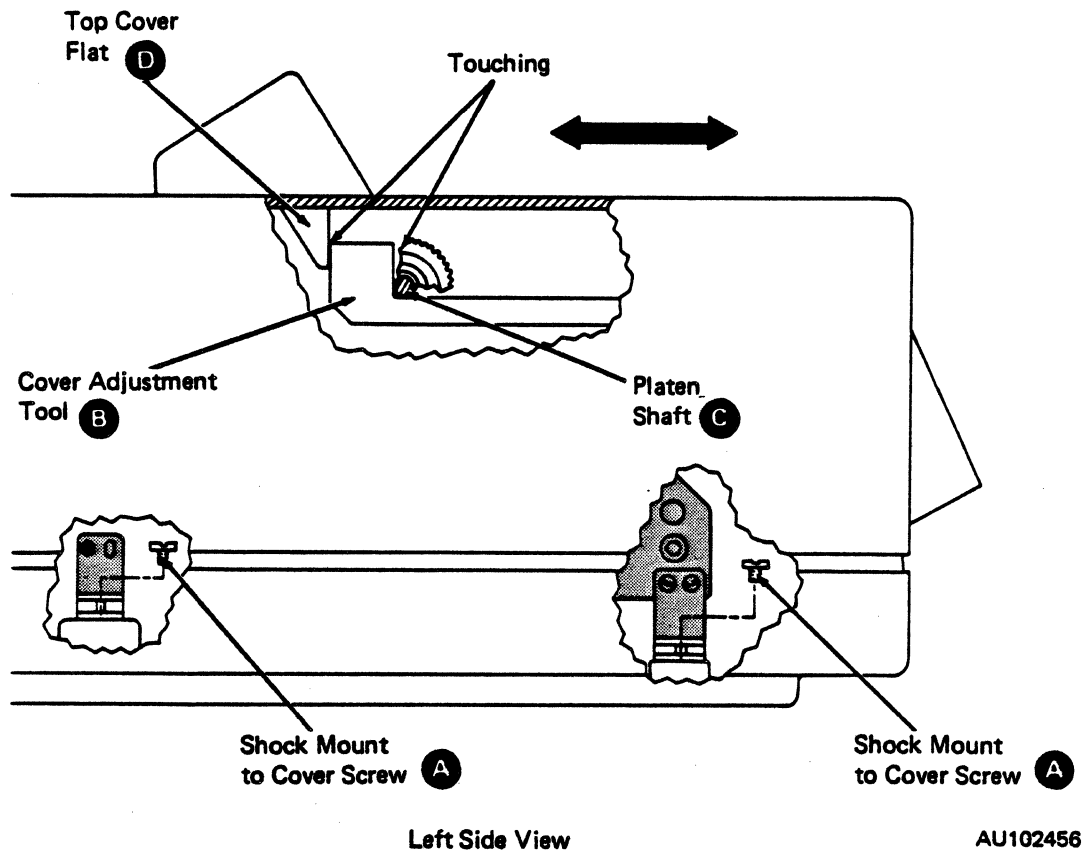
PIN		PIN
1	RIBMD	12
2	RIBMC	11
3	RIBMB	10
4	RIBMA	9
5	HAMMIN	8
6	HAMPLS	7
7	CW	6
8	BW	5
9	AW	4
10	ACW	3
11	BCW	2
12	CCW	1

AU102455

115 COVERS

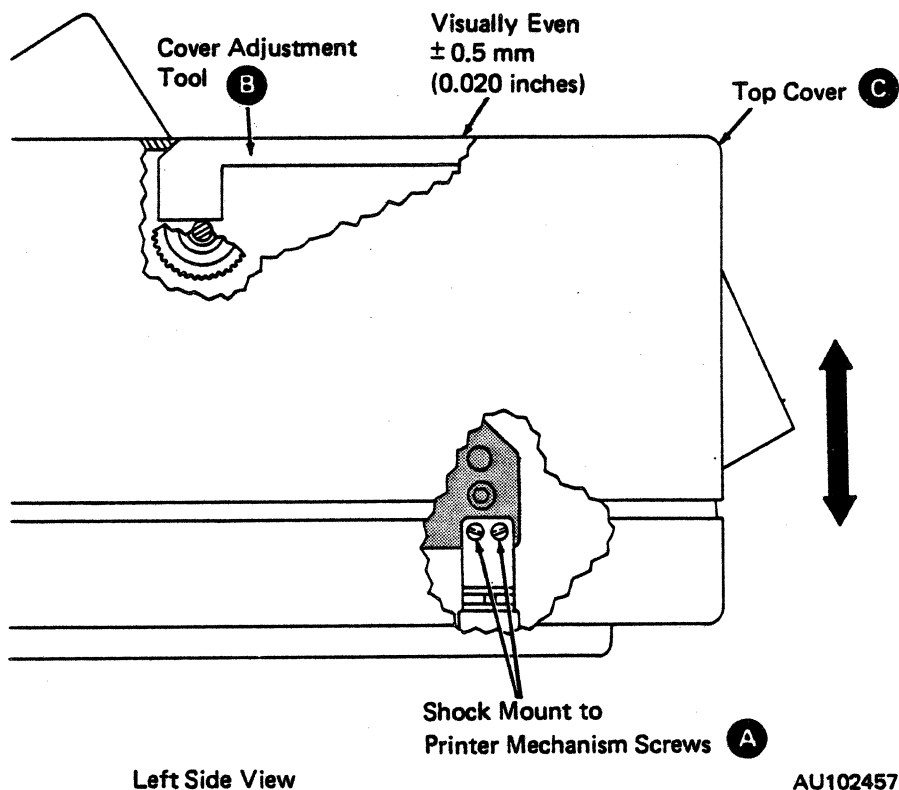
Printer-to-Cover Front/Rear Adjustment

1. Power off.
2. Lift the top cover (200).
3. Loosen the front and rear shock mount to cover screws **A**.
4. Close the top cover.
5. Lift the operator access cover.
6. Pull the printer mechanism forward.
7. Insert the cover adjustment tool **B** on the left side of the printer between the platen shaft **C** and the flat of the top cover **D**.
8. Slide the printer mechanism to the rear until the platen shaft and the top cover flat touch the cover adjustment tool.
9. Lift the top cover.
10. Tighten the left front and rear shock mount to cover screws.
11. Close the top cover and repeat steps 7, 8, 9, and 10 for the right side of the printer mechanism.
12. Close the top cover.



Printer-to-Cover Height Adjustment

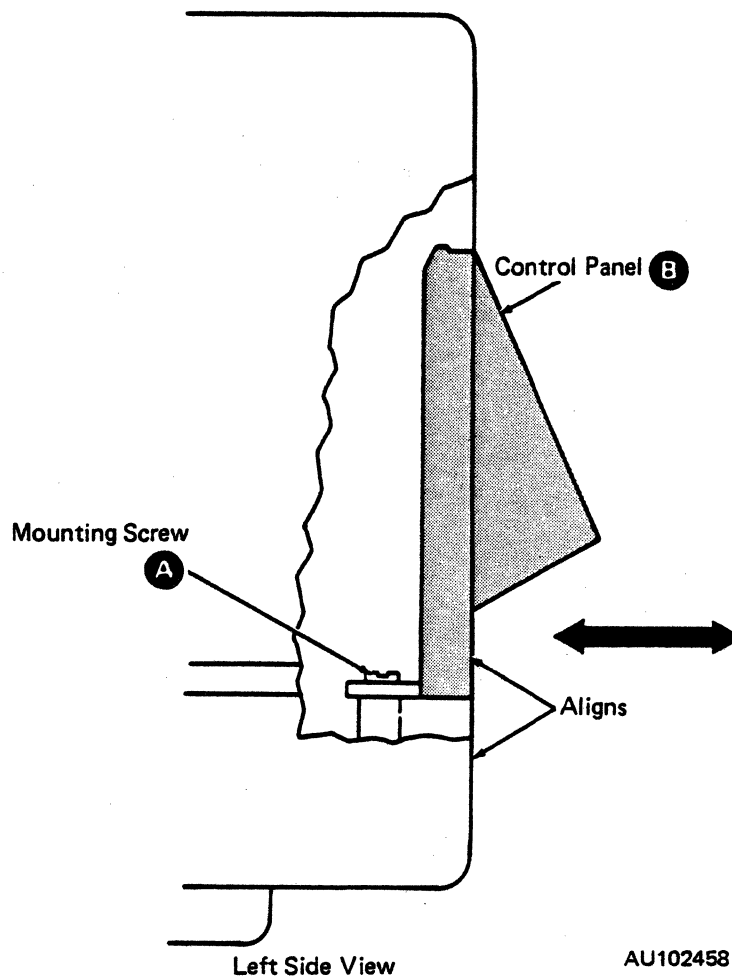
1. Power off.
2. Remove the top cover (200).
3. Loosen the four front shock mount to printer mechanism screws **A**.
- Note:** Ensure that the rear shock mount to printer mechanism screws are in the center of the adjustment range.
4. Lift the front of the printer mechanism to its highest point.
5. Lightly tighten one shock mount screw on each side of the printer.
6. Close the top cover and install the cover adjustment tool **B**.
7. Move the printer mechanism down until the top of the cover adjustment tool **B** is visually even within 0.5 mm (0.020 inches) with the top of the top cover **C**.
8. Check both sides of the printer.
9. Remove the top cover.
10. Tighten the shock mount screws.
11. Reinstall the top cover.



116 CONTROL PANEL

Adjustment

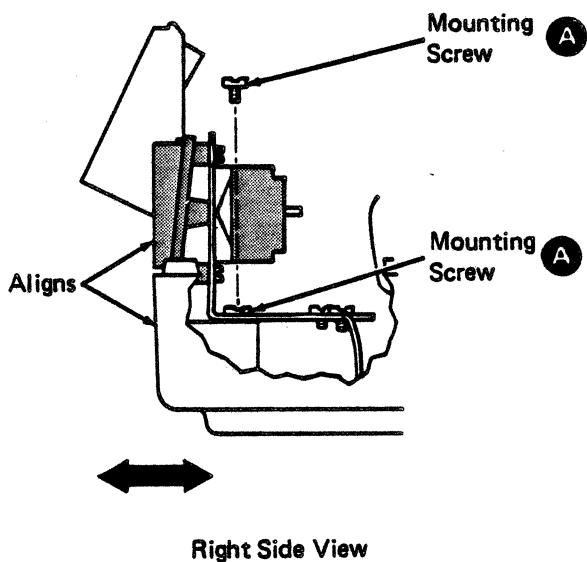
1. Power off.
2. Remove the top cover (200).
3. Loosen the four control panel mounting screws **A**.
4. Adjust the control panel **B** so that the top cover seats tightly and evenly on the bottom cover. Ensure that the front of the control panel aligns with the outside of bottom cover.
5. Tighten the four control panel mounting screws.
6. Reinstall the top cover.



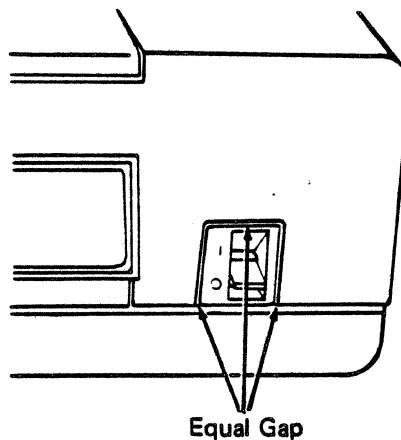
117 POWER SWITCH ASSEMBLY

Adjustment

1. Power off and disconnect the ac line cord from the outlet.
2. Remove the top cover (200).
3. Loosen the two power switch assembly mounting screws **A**.
4. Adjust the power switch assembly so the faceplate is even with the front surface of the covers. Ensure that there is an even gap between the faceplate and the covers.
5. Tighten the two power switch assembly mounting screws. Ensure that the ground screws are tight.
6. Reinstall the top cover.



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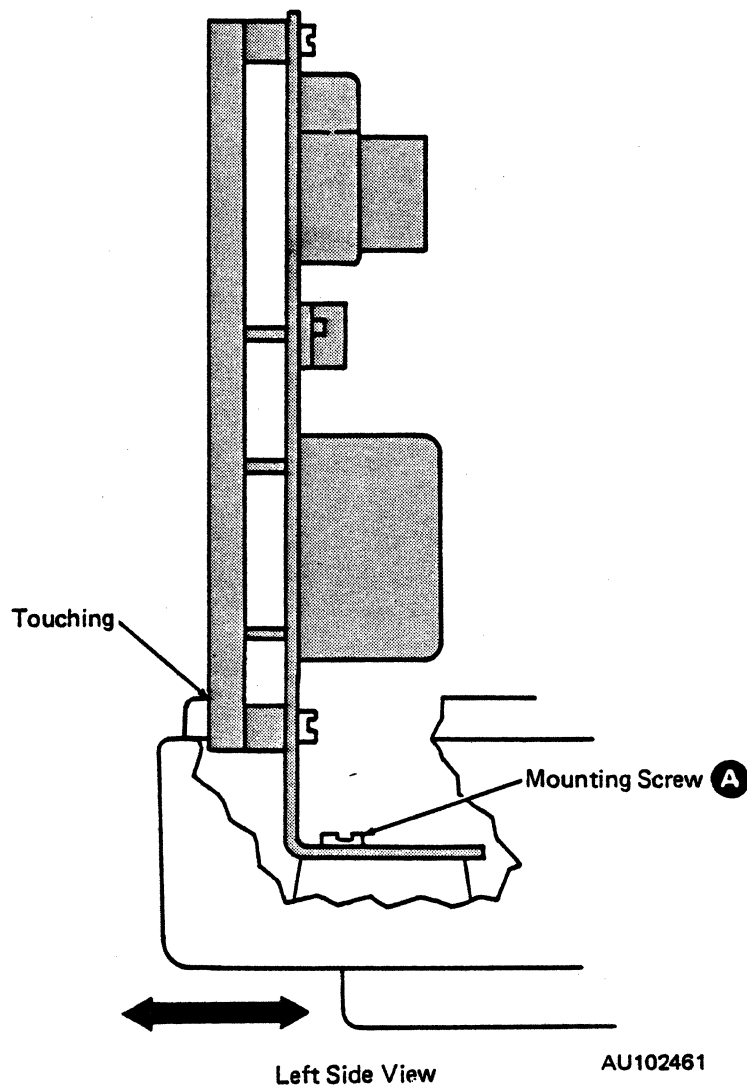
Front View

AU102460

118 PRINTER ATTACHMENT PANEL ASSEMBLY

Adjustment

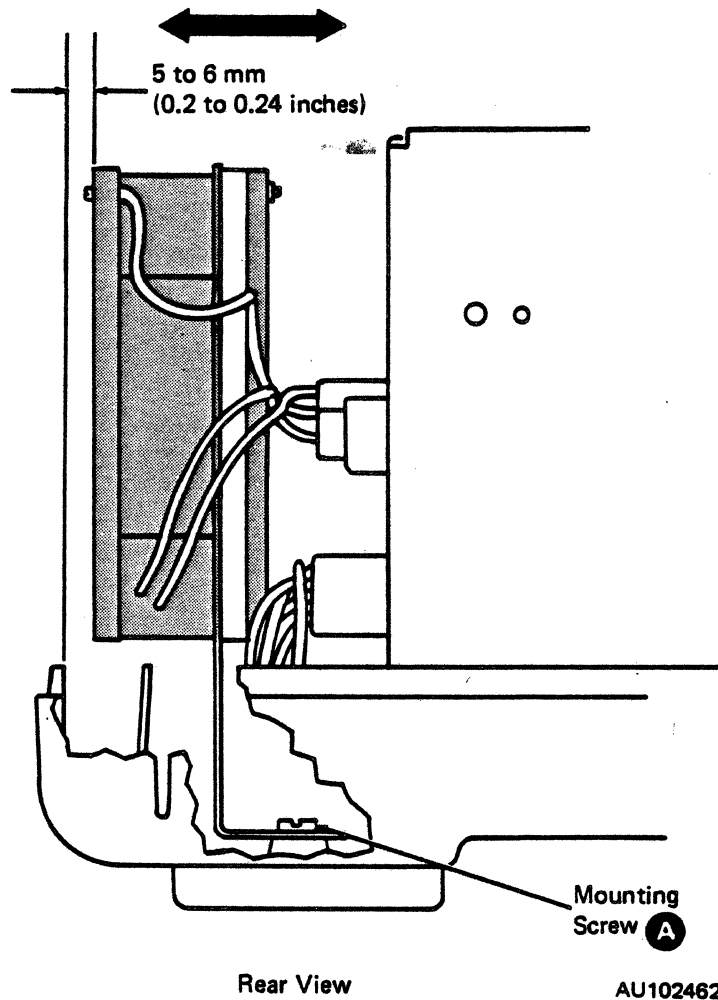
1. Power off and disconnect the ac line cord from the outlet.
2. Remove the top cover (200).
3. Loosen the two printer attachment panel mounting screws **A**.
4. Adjust the attachment panel so that it is even against the back of the bottom cover.
5. Tighten the two printer attachment panel mounting screws.
6. Reinstall the top cover.



119 FAN ASSEMBLY

Adjustment

1. Power off and disconnect the ac line cord from the outlet.
2. Remove the top cover (200).
3. Loosen the two fan assembly mounting screws **A**.
4. Adjust the fan assembly 5 to 6 mm (0.20 to 0.24 inches) from the right side of the bottom cover.
5. Tighten the two fan assembly mounting screws.
6. Reinstall the top cover.

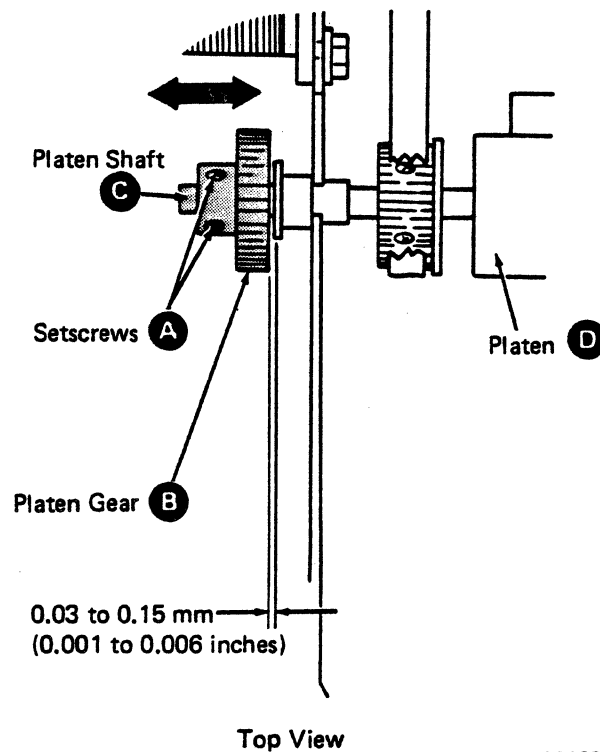


PAPER FEED

120 PLATEN GEAR

Adjustment

1. Power off.
2. Remove the top cover (200).
3. Loosen the two platen gear setscrews **A**.
4. Adjust the platen gear **B** on the platen shaft **C** so that the platen **D** has 0.03 to 0.15 mm (0.001 to 0.006 inches) of end play.
5. Tighten the two platen gear setscrews.
6. Reinstall the top cover.

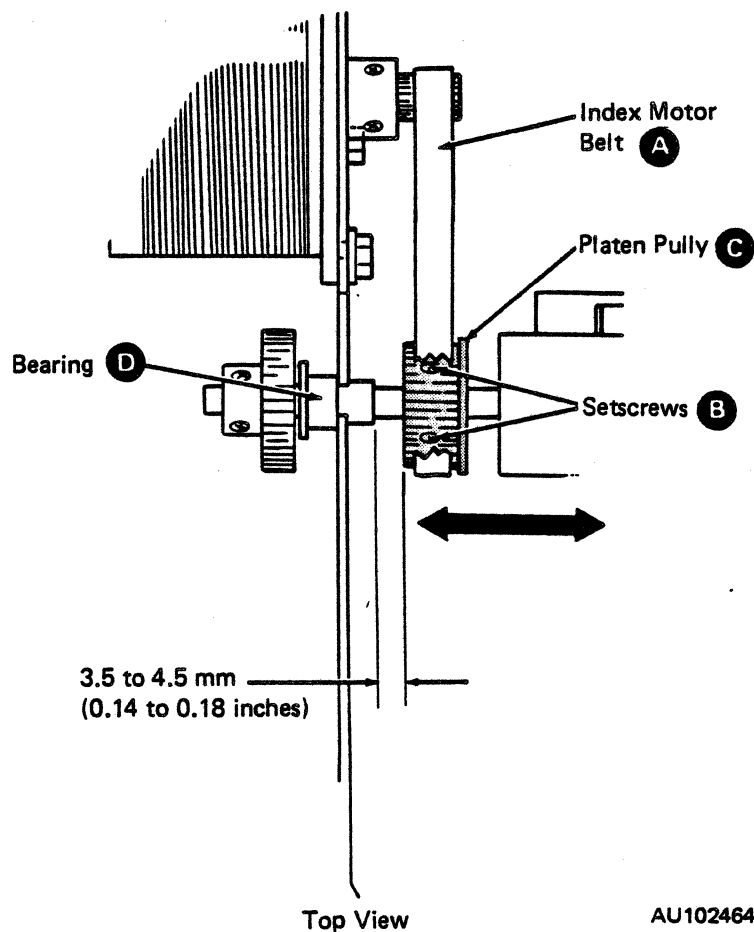


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121 PLATEN PULLEY

Adjustment

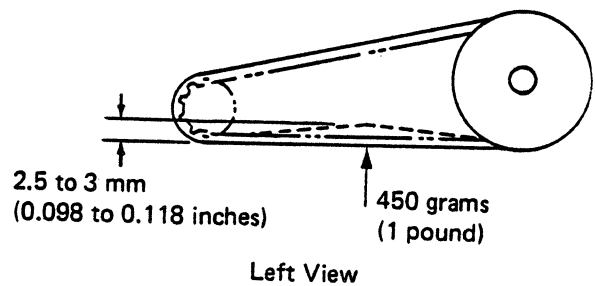
1. Power off.
2. Remove the top cover (200).
3. Remove the index motor belt **A**, by turning the platen by hand and pushing the belt off of the pulley.
4. Loosen the two platen pulley setscrews **B**.
5. Adjust the platen pulley **C** for a 3.5 to 4.5 mm (0.14 to 0.18 inches) gap from the left end platen bearing **D**.
6. Tighten the platen pulley setscrews **B**.
7. Reinstall the index motor belt.
8. Reinstall the top cover.



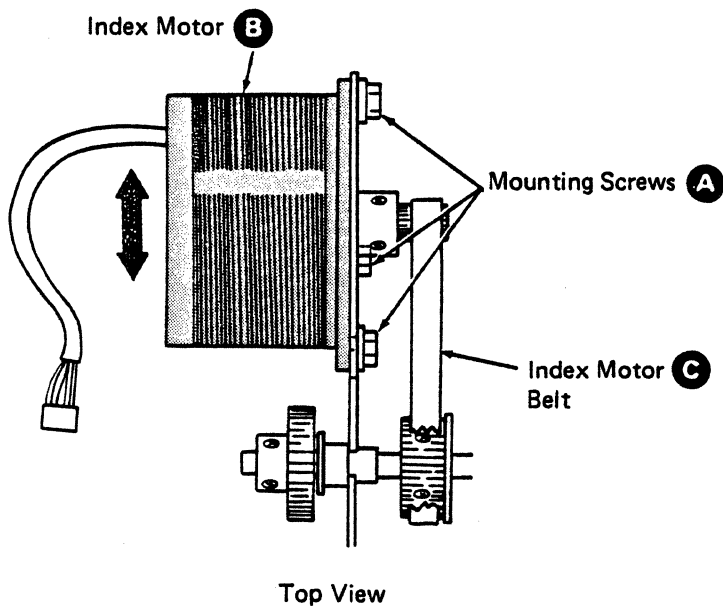
122 INDEX MOTOR

Adjustment

1. Power off.
2. Remove the top cover (200).
3. Loosen the three index motor mounting screws **A**.
4. Adjust the index motor **B** so that the index motor belt **C** deflects only 2.5 to 3 mm (0.098 to 0.118 inches) with 450 grams (1 pound) of force put at the midway point.
5. Tighten the index motor mounting screws.
6. Reinstall the top cover.



AU102466



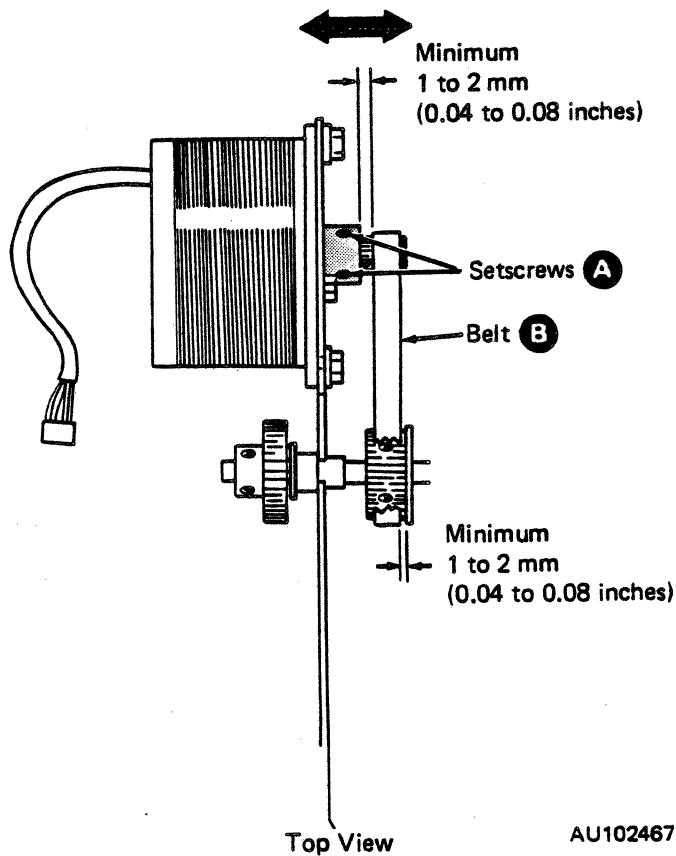
AU102465

123 INDEX MOTOR PULLEY

Note: Verify the platen pulley adjustment (121) before performing this adjustment.

Adjustment

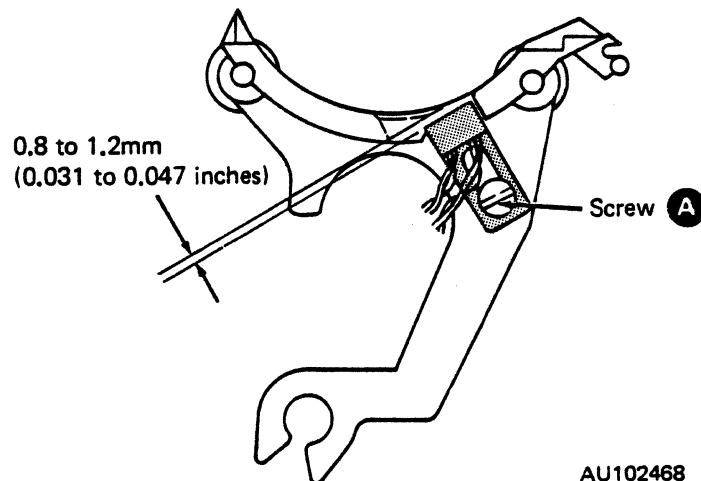
1. Power off.
2. Remove the top cover (200).
3. Loosen the two index motor pulley setscrews **A**.
4. Adjust the index motor pulley so that the belt **B** will clear the index motor pulley and platen pulley flanges by a minimum of 1 to 2 mm (0.04 to 0.08 inches) depending on the direction the motor is turning.
5. Tighten the two index motor pulley setscrews.
6. Reinstall the top cover.



124 FIRST WRITING LINE SENSOR

Adjustment

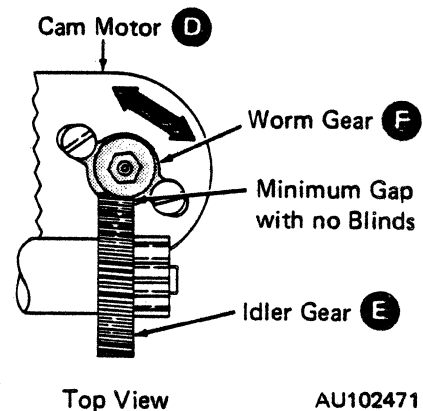
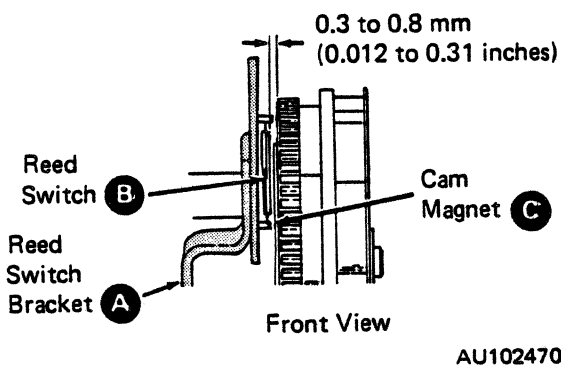
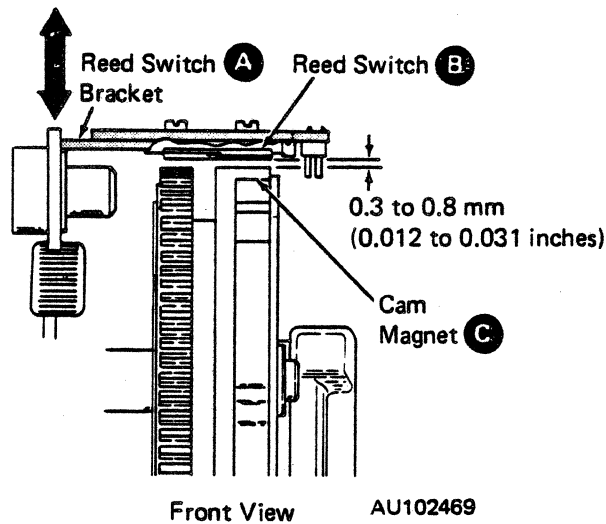
1. Power off.
2. Remove the platen (215).
3. Loosen the sensor screw **A**.
4. Adjust the sensor so that the face of the sensor is 0.8 to 1.2 mm (.031 to .047 inches) below the surface of the feed roller assembly at the closest point.



125 CAM MOTOR AND REED SWITCH BRACKETS

Adjustments

1. Power off.
2. Remove the top cover (200).
3. Shape the reed switch brackets **A** for 0.3 to 0.8 mm (0.012 to 0.031 inches) gap between the reed switch **B** and the magnets on the cam **C** at the nearest point.
4. Jumper the cover interlock (101).
5. Power on.
6. Press the Release switch.
7. Power off.
8. Adjust the cam motor **D** for minimum gap, without binds, between the idler gear **E** and the worm gear **F**.
9. Reinstall the top cover.

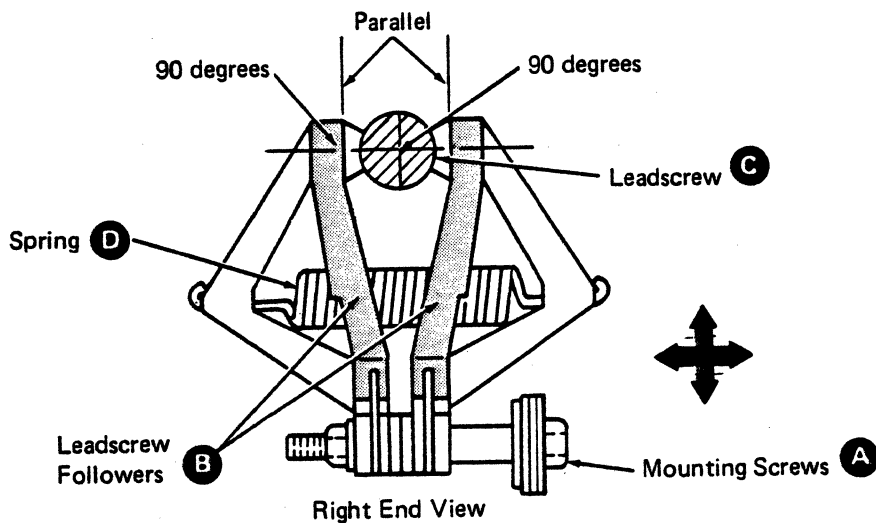


CARRIER

126 LEADSCREW FOLLOWER

Adjustment

1. Power off.
2. Remove the top cover (200).
3. Place the printer mechanism in the CE service position (152).
4. Loosen the two leadscrew follower mounting screws **A**. Ensure that the screws are loose enough for the spring **D** to pull the follower tight.
5. Align the leadscrew followers **B** so that they are parallel with each other and at 90 degrees to the leadscrew center line.
6. Tighten the mounting screws.
7. Turn the leadscrew **C** several times by hand to ensure that there are no binds. Ensure that the leadscrew follower is correctly seated on the leadscrew.
8. Repeat steps 4 through 6 as necessary.
9. Reinstall the top cover.

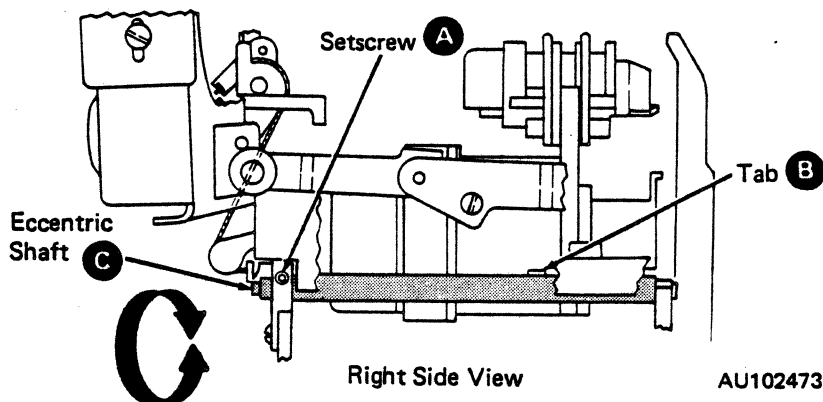


127 CARRIER ECCENTRICS

Adjustment

If the top or bottom of the characters appears to be too light, perform this adjustment.

1. Power off.
2. Remove the top cover (200).
3. Remove the control panel (202).
4. Loosen the left and right eccentric shaft setscrews **A**.
5. Adjust for maximum coverage of the printed characters as follows:
 - If the bottom of the printed characters are too light, turn the eccentric shafts **C** clockwise. This adjustment moves the carrier higher.
 - If the top of the printed characters are too light, turn the eccentric shafts **C** counterclockwise. This adjustment lowers the carrier.
6. When the adjustments are completed, both tabs **B** of the eccentric shafts **C** should point in the same direction.
7. Tighten the two eccentric shaft setscrews.
8. Reinstall the control panel.
9. Reinstall the top cover.
10. Perform the control panel adjustment (116).

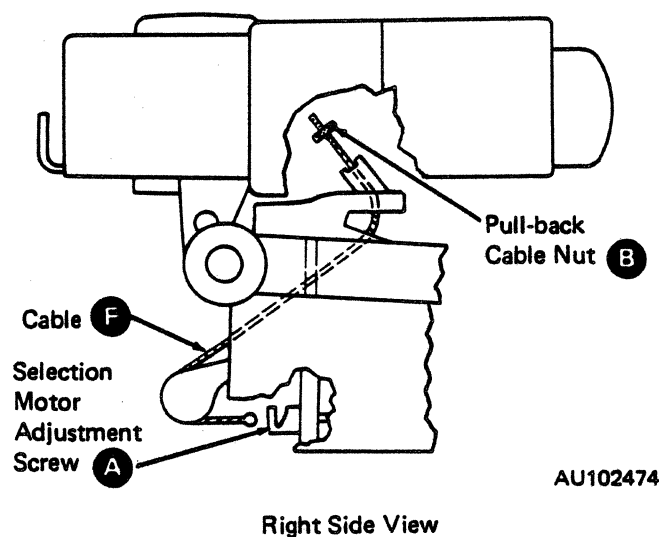


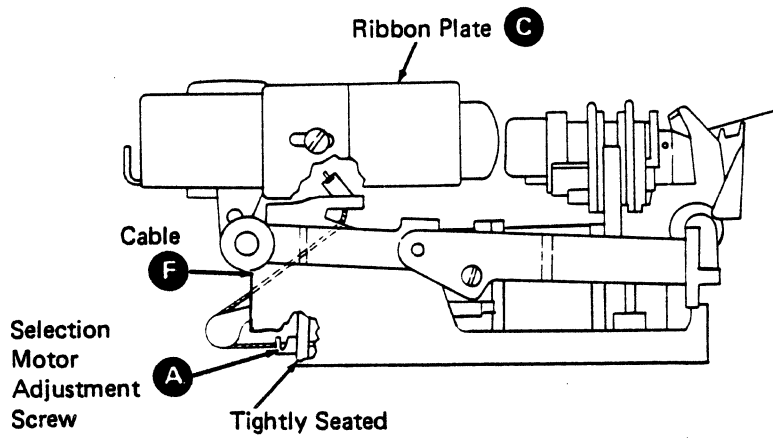
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128 SELECTION MOTOR PULL-BACK CABLE LENGTH

Adjustment

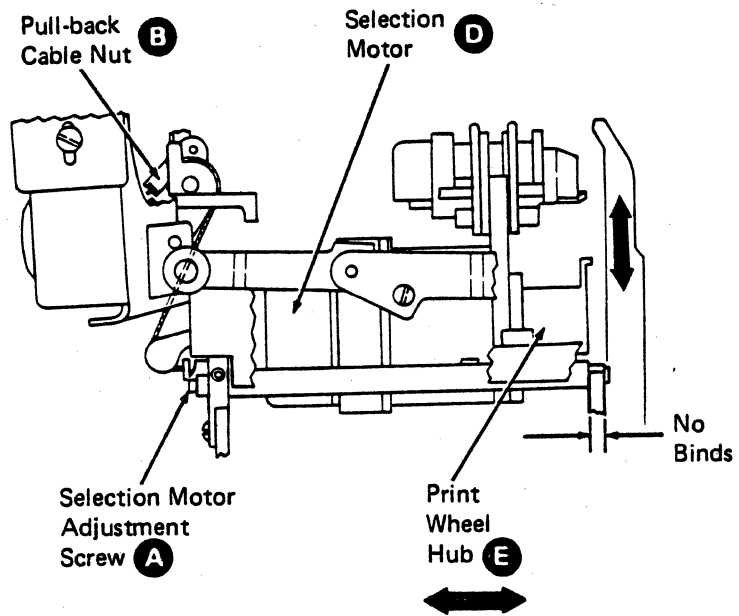
1. Power off.
2. Remove the top cover (200).
3. Remove one end of each selection motor pull-back spring (222, step 8) and pull the selection motor back by hand. Remove the pull-back cable end from the selection motor adjustment screw **A**.
4. Push the cable upward so that the pull-back cable nut **B** can be adjusted.
5. Turn the pull-back cable nut **B** to adjust the cable length.
6. Reinstall the pull-back cable in the selection motor adjustment screw.
7. When the ribbon plate **C** is down, the cable **F** should be loose enough so that the selection motor adjust screw **A** can be tightly seated against the carrier body.
8. When the ribbon plate is lifted and the selection motor **D** is pulled back, the print wheel hub **E** must be pulled back far enough so the print wheel cartridge can be removed or inserted freely.
9. Repeat steps 3 through 6 as necessary.
10. Reinstall the selection motor pull-back springs.
11. Reinstall the top cover.





Right Side View

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Right Side View

AU102476

PRINT WHEEL

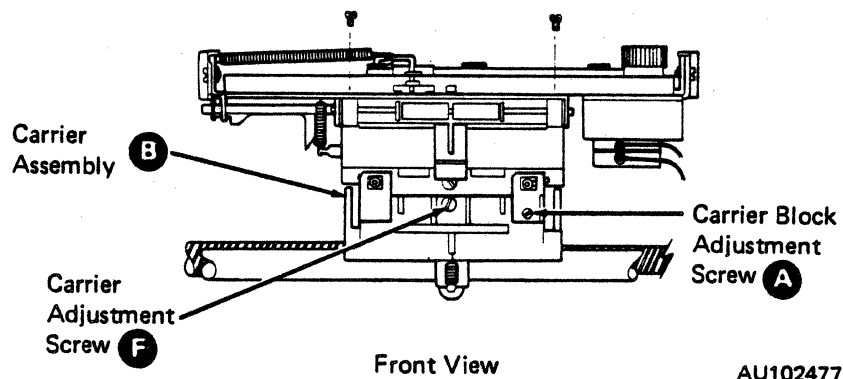
129 CARRIER ASSEMBLY

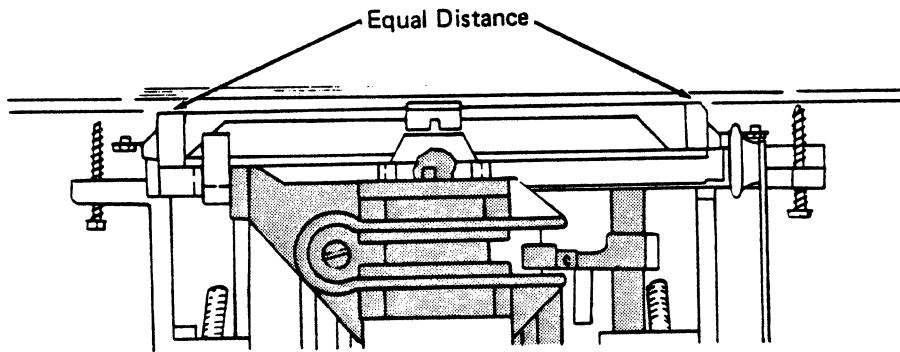
Adjustment

1. Power off.
2. Remove the top cover (200).
3. Remove the control panel (202).
4. Remove the ribbon, print wheel, and cardholder.
5. Install the print alignment tool **D** and place the ribbon plate in the down position.
6. Loosen the carrier block adjustment screw **A**. Turn the complete carrier assembly **B** until there is an equal gap between the platen **C** and the left and right vertical tabs **E** of the print alignment tool. Tighten the carrier block adjustment screw.
7. Adjust for 0.05 to 0.15 mm (0.002 to 0.006 inches) gap between the left and right vertical tabs **E** of the print alignment tool and the platen **C** with the carrier assembly centered.

Note: This adjustment should always be made by turning the carrier adjustment screw **F** clockwise to pull the carrier assembly **B** away from the platen. If the carrier adjustment screw is turned too far over the 0.05 to 0.15 mm (0.002 to 0.006 inches) adjustment, then the screw must be turned counterclockwise until the print alignment tool touches the platen. Then turn the carrier adjustment screw clockwise again to obtain the correct adjustment.

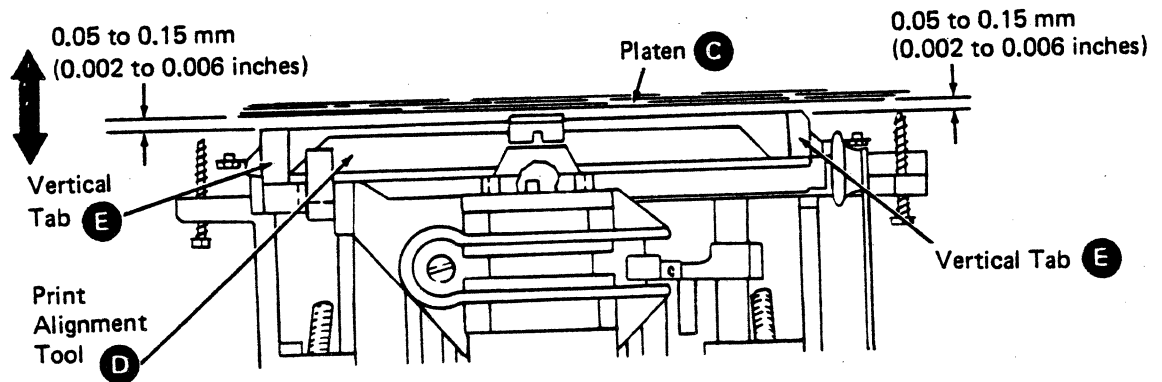
8. Perform the print wheel hub to platen (130) and print hammer assembly (131) adjustments.





Top View

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Top View

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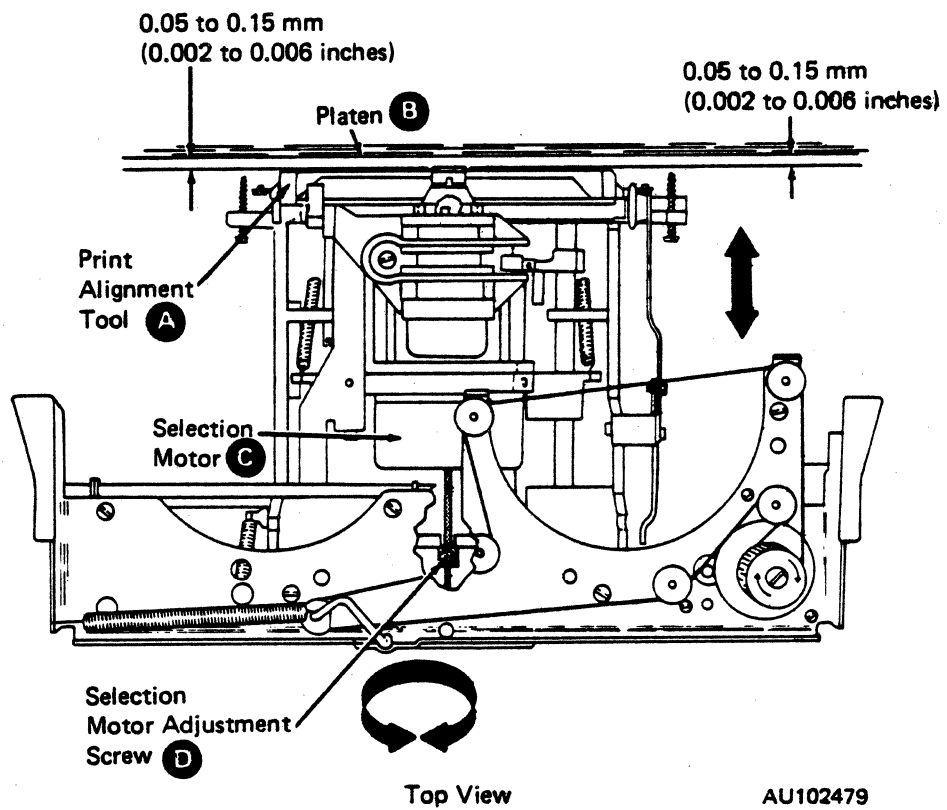
130 PRINT WHEEL HUB TO PLATEN

Adjustment

1. Power off.
2. Remove the top cover (200).
3. Remove the ribbon, print wheel, and cardholder.
4. Install the print alignment tool **A**.
5. Place the ribbon plate in the down position. The print alignment tool and print hammer assembly should not touch. If necessary, loosen the hammer bracket screw and move hammer away from the tool.
6. Remove the control panel (202).
7. Center the carrier assembly.
8. Turn the selection motor adjustment screw **D** clockwise to move the selection motor **C** away from the platen **B**. Adjust for a 0.05 to 0.15 mm (0.002 to 0.006 inches) gap between the back of the alignment tool **A** and the platen **B**.
9. If the selection motor **C** is to be moved toward the platen **B**, turn the selection motor screw **D** counterclockwise.
10. Perform the Print Hammer Assembly Adjustment (131)

Notes:

1. Spacing between the selection motor shaft and the print hub must be correct before this adjustment is performed (138).
2. Carrier assembly adjustment (129) must be correct before this adjustment is performed.
3. Hold the selection motor by hand toward the rear of the printer when performing this adjustment.

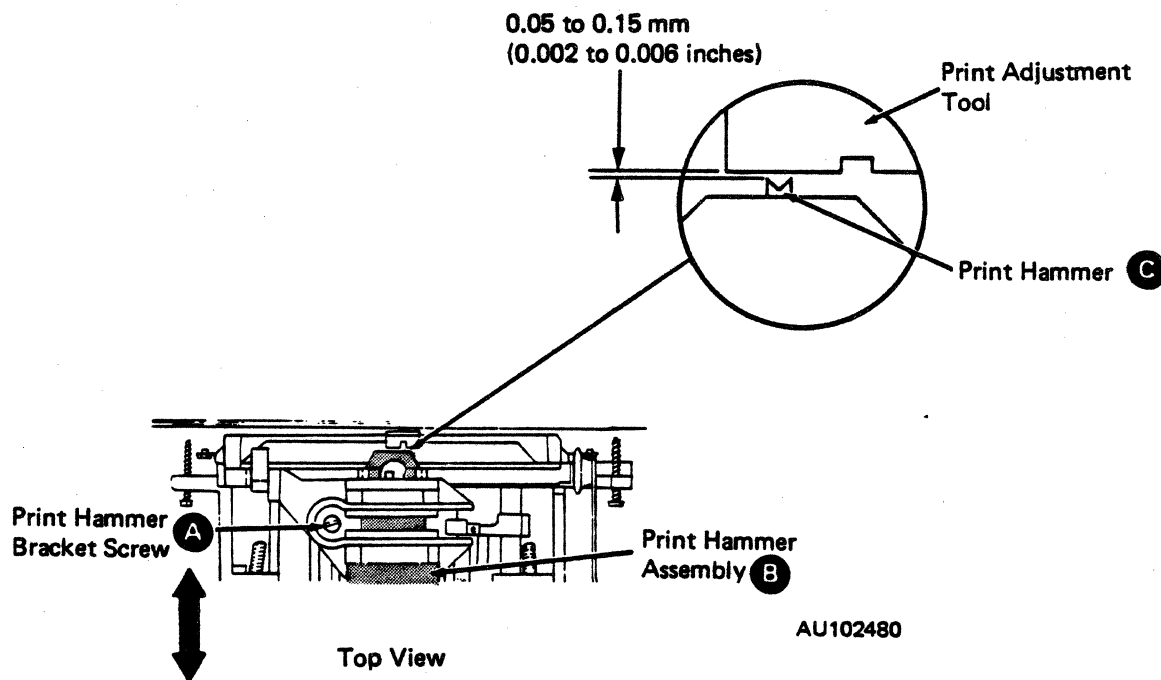


131 PRINT HAMMER ASSEMBLY

Adjustment

1. Power off.
2. Remove the top cover (200).
3. Remove the ribbon, the print wheel, and cardholder.
4. Install the print alignment tool.
5. Place the ribbon plate in the down position.
6. Loosen the print hammer bracket screw **A**.
7. Center the carrier assembly.
8. Move the print hammer assembly **B** (front to rear) to obtain 0.05 to 0.15 mm (0.002 to 0.006 inches) between the front surface of the print alignment tool and the tip of the print hammer **C**. To obtain a better measurement surface, offset the print alignment tool as shown.
9. Reverse steps 2 through 6 to complete the procedure.

Note: This adjustment may affect the print wheel homing adjustment (132).

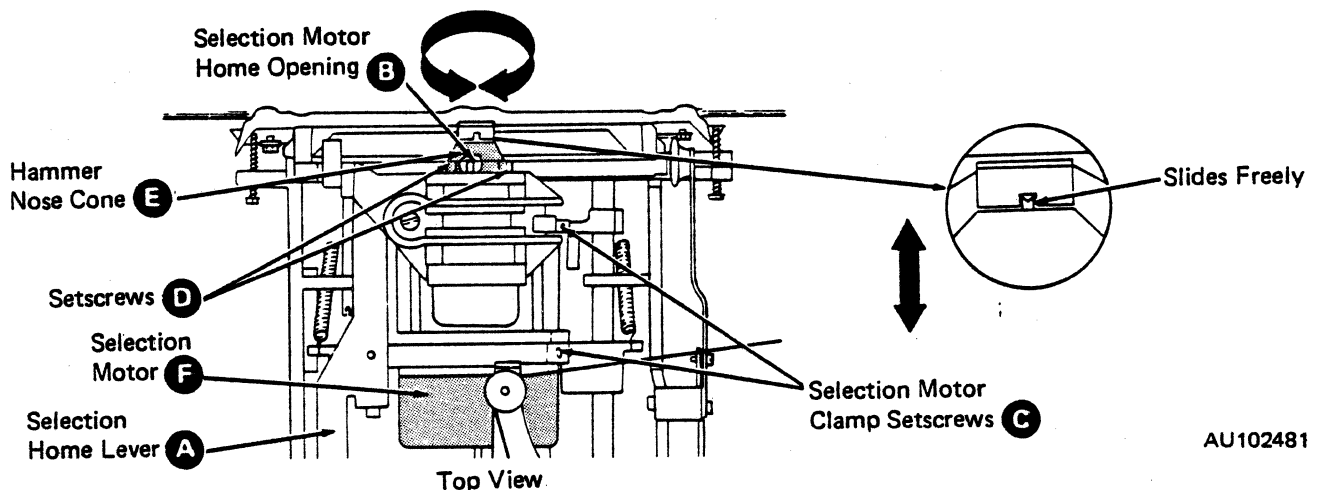


132 PRINT WHEEL HOMING

Adjustment

1. Power off.
2. Remove the top cover (200) and jumper the cover interlock.
3. Home the print wheel by pushing the selection home lever **A** to the right while turning the print wheel by hand. Continue turning the print wheel until the lever enters the selection motor home opening **B**.
4. Remove the ribbon and the print wheel.
5. Loosen the two setscrews **C** on the front and rear selection motor clamps.
6. Loosen the two setscrews **D** of the hammer nose cone **E**.
- Note:** The print hammer is spring loaded. Ensure that you loosen the two hammer nose cone setscrews only enough to turn the nose cone.
7. Power on.
8. Install the print alignment tool.
9. Place the ribbon plate in the down position.
10. Rotate the selection motor **F** and nose cone **E** until the hammer slides freely in and out of the opening of the print alignment tool.
11. Tighten all setscrews. Apply a downward force with your hand, to the selection motor clamp while tightening the selection motor clamp setscrews. Ensure that all four support arms of the selection motor clamp seat tightly on the eccentric shafts.

Note: This adjustment may affect the print hammer adjustment (131).



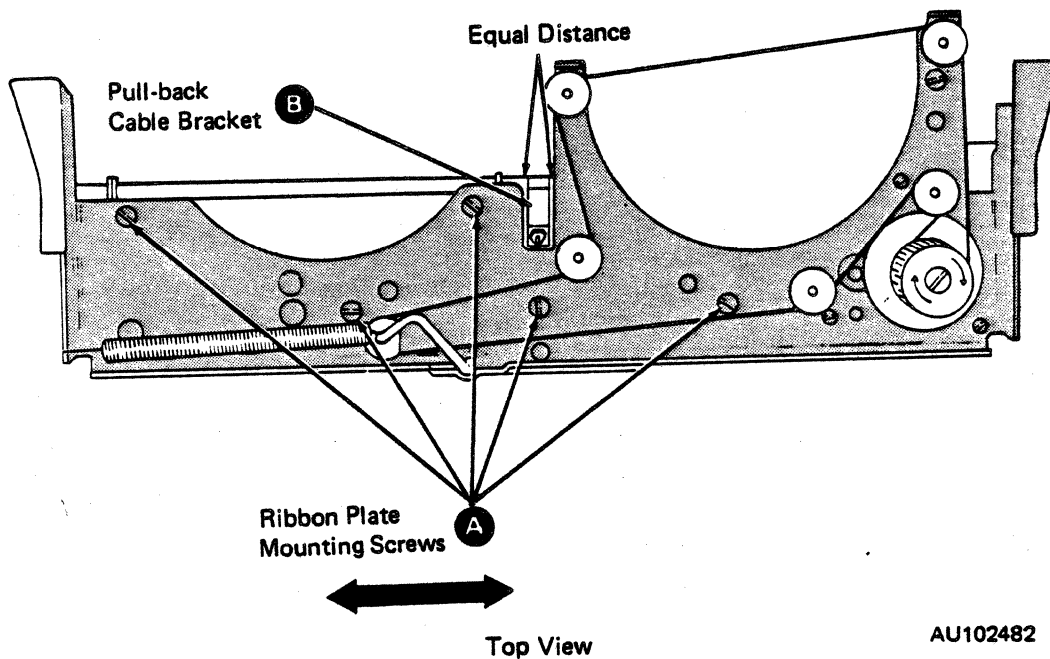
AU102481

RIBBON

133 RIBBON PLATE

Adjustment

1. Power off.
2. Lift the operator access cover.
3. Move the carrier assembly to the center of the printer mechanism.
4. Loosen the five ribbon plate mounting screws **A**.
5. Visually center the ribbon plate (left to right) over the pull-back cable bracket **B**.
6. Tighten the five ribbon plate mounting screws.



AU102482

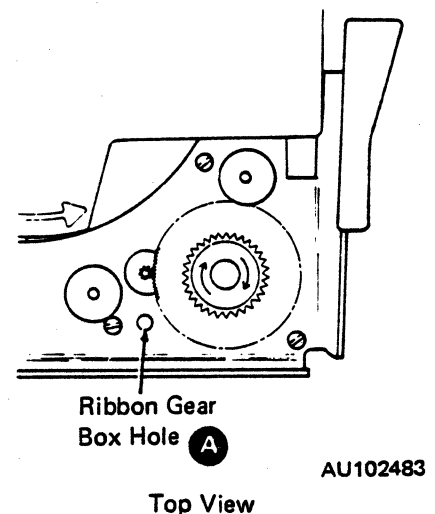
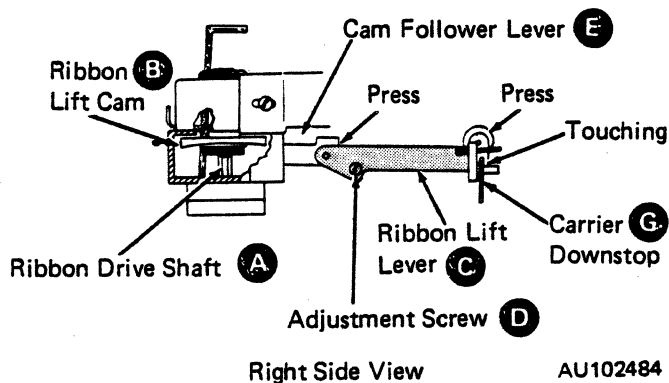
134 RIBBON LIFT ARM

Adjustment

1. Power off.
2. Lift the operator access cover.
3. Move the carrier assembly to the center of the printer mechanism.
4. Remove the ribbon cartridge.

Note: Check to ensure that the ribbon lift lever does not bind on the carrier downstop guide and that the ribbon drive shaft **A** setscrew is tight.

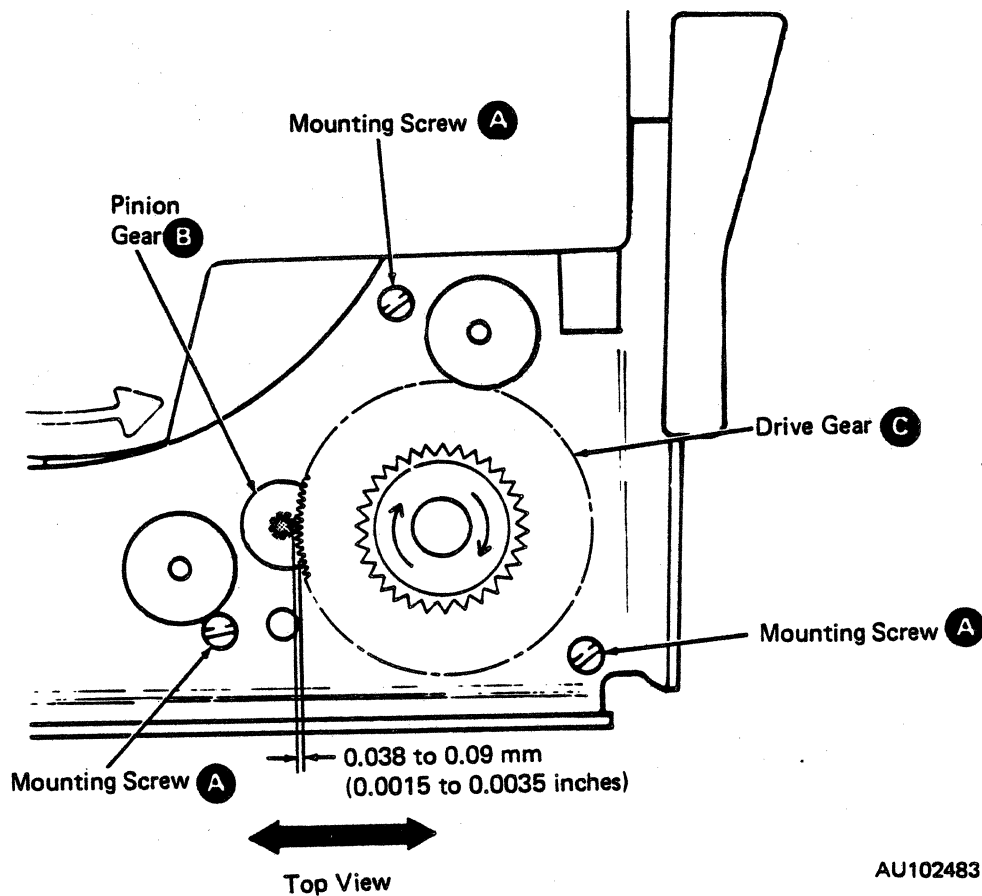
5. Place a number 133 6-flute socket key (part 9900255 used on the SELECTRIC[®] idler gear mounting stud) in the ribbon gear box hole **A** in front of the drive pinion gear.
6. Turn the ribbon lift cam **B** until the flute socket key passes through a similar hole in the ribbon lift cam. This keeps the ribbon lift cam from moving while the adjustment is being made and puts the cam follower on the low side of the cam.
7. Place a number 8 6-flute socket key (part 9900102 used on the type-bar platen knobs) through the hole in the ribbon lift lever **C**.
8. Loosen the ribbon lift arm adjustment screw **D**.
9. Press down on the cam follower lever **E** directly above the holding screw and on the ribbon lift lever **C** above the carrier downstop **F**.
10. Tighten the ribbon lift arm adjustment screw.
11. Remove both 6-flute socket keys.



135 DRIVE PINION GEAR

Adjustment

1. Power off.
2. Remove the top cover (200).
3. Loosen the ribbon motor drive assembly mounting screws **A**.
4. Adjust the small drive pinion gear **B** for 0.038 to 0.09 mm (0.0015 to 0.0035 inches) backlash to the drive gear **C**.
5. Tighten the ribbon motor drive assembly mounting screws.
6. Reinstall the top cover.

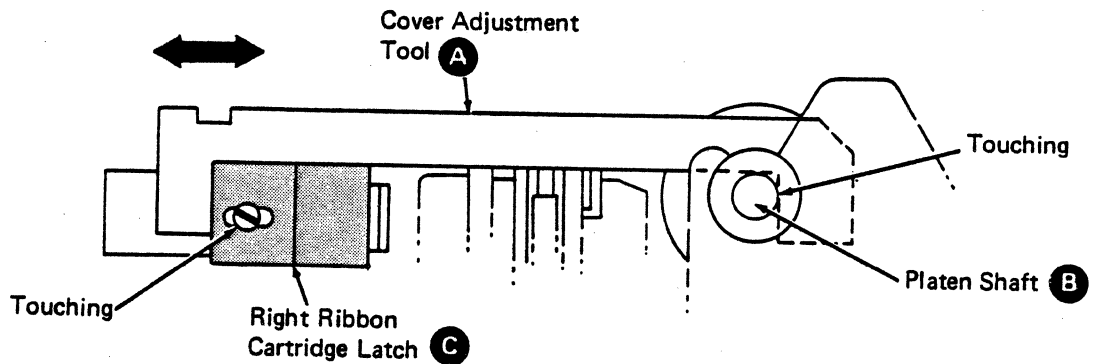


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136 RIBBON CARTRIDGE HOLDER

Adjustment

1. Power off.
2. Remove top cover (200).
3. Move the carrier assembly to the right so that the right edge of the ribbon plate is in line with the right edge of the platen.
4. Loosen the right ribbon cartridge latch screws.
5. Position the cover adjustment tool **A** behind the platen shaft **B** as shown.
6. Position the right ribbon cartridge latch **C** against the cover adjustment tool as shown.
7. Tighten the right cartridge latch screws.
8. Repeat steps 3, 4, 5, 6 and 7 for the left side.
9. Reinstall the top cover.



Right Side View

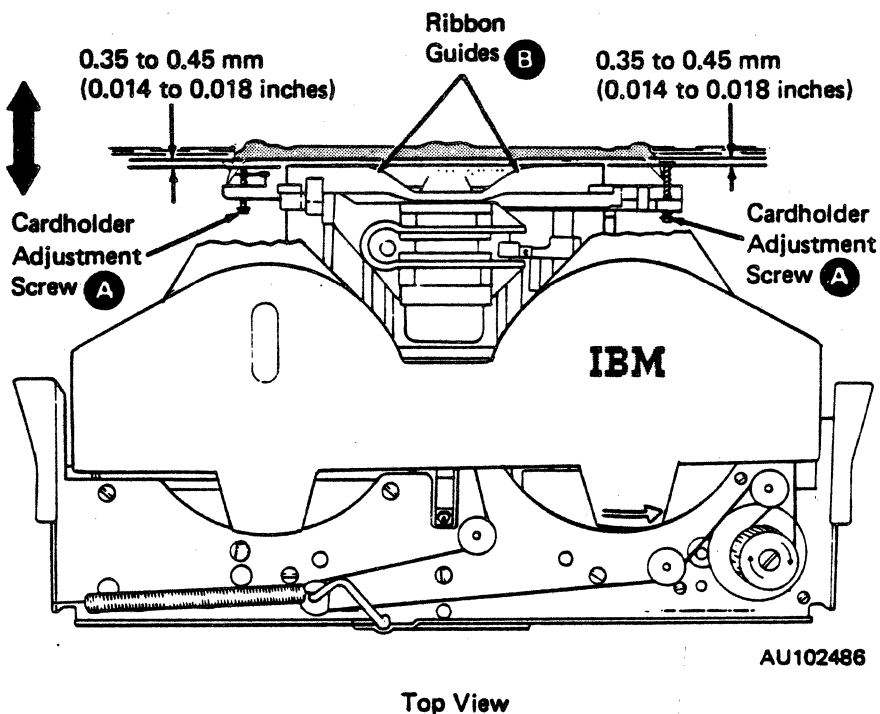
AU102485

137 CARDHOLDER

Adjustment

1. Power off.
2. Lift the operator access cover.
3. Move the carrier assembly to the center of the printer mechanism.
4. Adjust the cardholder adjustment screws **A** for a gap of 0.35 to 0.45 mm (0.014 to 0.018 inches) between the cardholder and the ribbon guides **B** on the print wheel cartridge.
5. Check for approximately 0.76 mm (0.030 inches) gap between the cardholder and the platen.

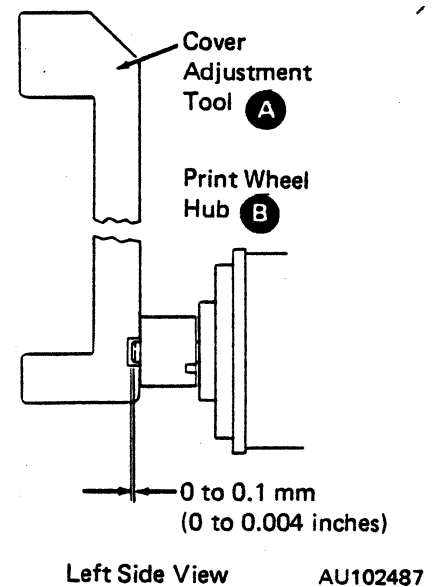
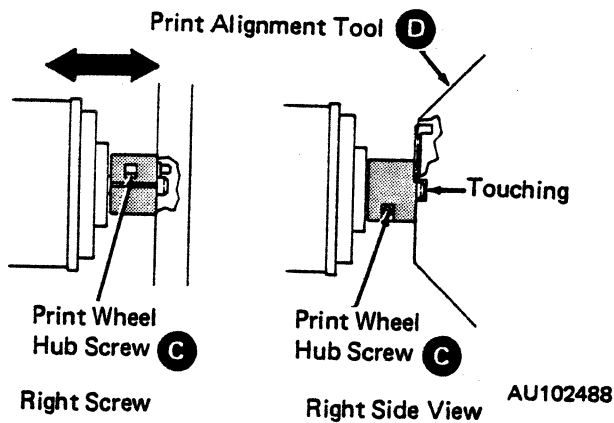
Note: If this clearance is not correct check the carrier assembly adjustment (129) and for a defective print wheel cartridge. The gap between the ribbon guides on a good print wheel cartridge and the platen should be 1.54 to 1.83 mm (0.061 to 0.071 inches).



138 PRINT WHEEL HUB

Adjustment

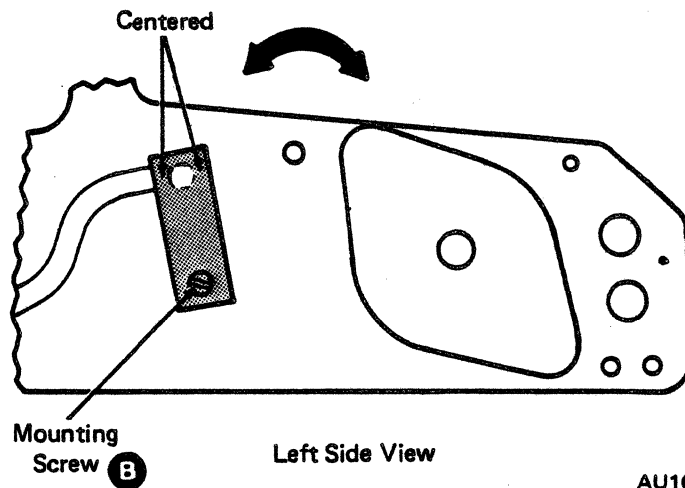
1. Power off.
2. Open the operator access door.
3. Remove the ribbon and print wheel cartridge. Do not lower the ribbon plate.
4. Insert the cover adjustment tool **A** into the carrier assembly so that the slot in the tool is directly to the rear of the selection motor shaft.
5. Lower the ribbon plate only enough to allow the selection motor shaft to enter the slot in the cover adjustment tool. The tool should seat on the face of the print wheel hub **B**.
6. There should be a small gap 0 to 0.1 mm (0 to 0.004 inches) between the end of the motor shaft and the bottom of the slot in the tool. If not, proceed with the adjustment as follows:
7. Remove the selection motor (222)
8. Loosen the print wheel hub screw **C** until the hub just slides on the motor shaft.
9. Place the print alignment tool **D** opening on the selection motor shaft.
10. Press the selection motor and the print wheel hub so that both are touching the alignment tool.
11. Tighten the screw 1/4 turn more.
12. Reinstall the selection motor (222).



139 LEFT MARGIN SWITCH

Adjustment.

1. Power off.
2. Remove the top cover (200).
3. Place the printer in the CE service position (152).
4. Loosen the left margin switch mounting screw **A**.
5. Adjust the left margin switch so that it is visually centered over the plunger.
6. Tighten the left margin switch mounting screw.
7. Return the printer to the normal operating position.
8. Close the top cover.



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150 RIBBON MOVEMENT

Service Check

1. Power off.
2. Remove the top cover (200).
3. Jumper the cover interlock.
4. Power on.
5. Load paper.
6. Select and run diagnostic test 52 (304).

Note: Early level machines may not run diagnostic test 52. If this test does not run, select and run diagnostic test 22.

7. Observe the ribbon movement. (Both ribbon spools should be turning and the ribbon should move up and down.)
8. Select and run diagnostic test 48 (303).
9. Observe the up and down movement of the ribbon.
10. Inspect the placement of printed characters on the ribbon. Used area of ribbon should be visually centered on the ribbon.
11. If the ribbon is not working correctly perform the ribbon lift arm adjustment (134), the ribbon cartridge holder adjustment (136), and the cardholder adjustment (137). If the ribbon is working correctly, continue as follows:
 - a. Power off.
 - b. Reinstall the top cover.

151 LEFT AND RIGHT CARRIER CABLES

Service Check

1. Power off.
2. Remove the top cover (200).
3. Move the carrier assembly to the left side frame of the printer.
4. Check the right carrier cables (100,104) to ensure they are plugged in and seated correctly.
5. Check for any obstruction that would inhibit free movement of the cables.
6. Check the continuity of the right carrier cable (105).
7. Move the carrier to the right side frame of the printer.
8. Check the left carrier cable to ensure it is plugged in and seated correctly.
9. Check for any obstruction that would inhibit free movement of the cables.
10. Check the continuity of the left carrier cable (105).

152 CE SERVICE POSITION

To place the printer in the CE service position, do the following:

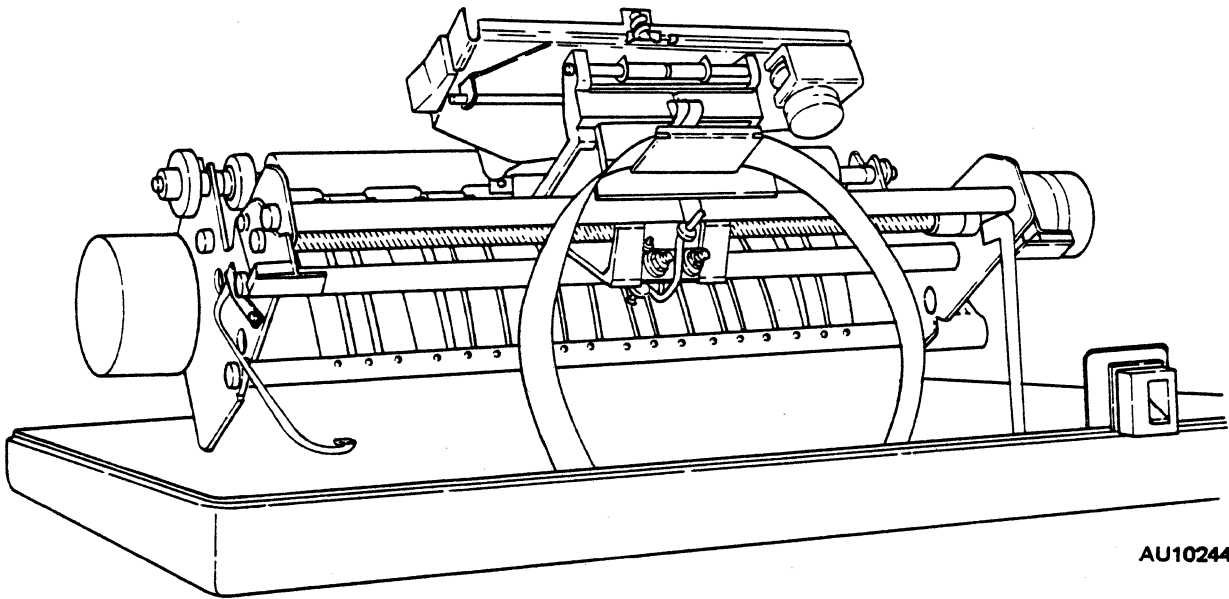
1. Power off.
2. Remove the top cover (200).
3. Remove the left and right baffle (100, 101).
4. Remove the A-A1B1 card (analog card 1). (104)
5. Remove the two center baffle (100) mounting screws and remove the center baffle.
6. Remove the two front shock mount screws from the bottom cover.
7. Remove the cover adjustment tool from the center baffle.
8. Lift the front of the printer mechanism until the paper feed support shaft touches the right and left card end guides. Use the cover adjustment tool to hold the printer in the service position:
 - a. Place the cover adjustment tool against the right side frame between the front carrier support shaft and the leadscrew coupler.
 - b. Locate the opposite end of the tool on the acoustic material in the bottom cover, to ensure that it does not slip.
9. Complete the operation by reversing the preceding steps.

Note: For additional access remove the control panel (202).

CAUTION: Extreme care should be taken when placing the printer in the CE service position so as not to damage the carrier signal cables.

DANGER:

Never turn power on when the printer is in the CE service position.



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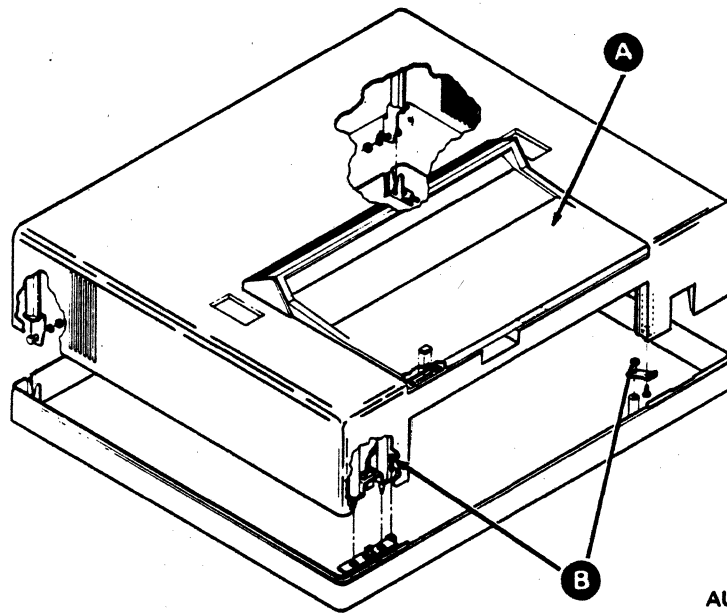
REMOVALS AND REPLACEMENTS

COVER

200 TOP COVER

Removal and Replacement

1. Power off.
2. Remove the sheet feed or tractor feed if installed.
3. Lift the operator access cover **A**.
4. Loosen the two top cover mounting screws **B**.
5. Pivot the top cover up and pull up on the rear pivots to remove the top cover.
6. For replacement of the top cover, reverse this procedure.



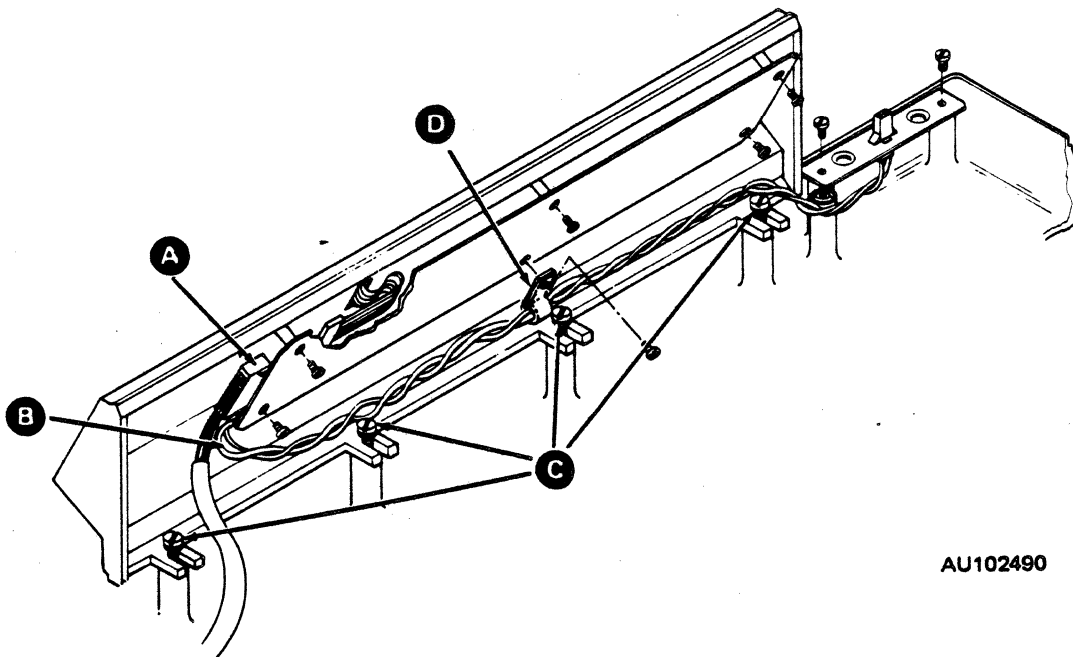
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CONTROL PANEL AND CABLE ASSEMBLY

202 CONTROL PANEL

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Disconnect the control panel signal cable **A**.
4. Disconnect the cover interlock cable connector **B** at the control panel logic card.
5. Loosen the four control panel mounting screws **C** and remove the cable clamp **D**.
6. Remove the control panel.
7. For replacement of the control panel, reverse this procedure.
8. Perform the control panel adjustment (116).

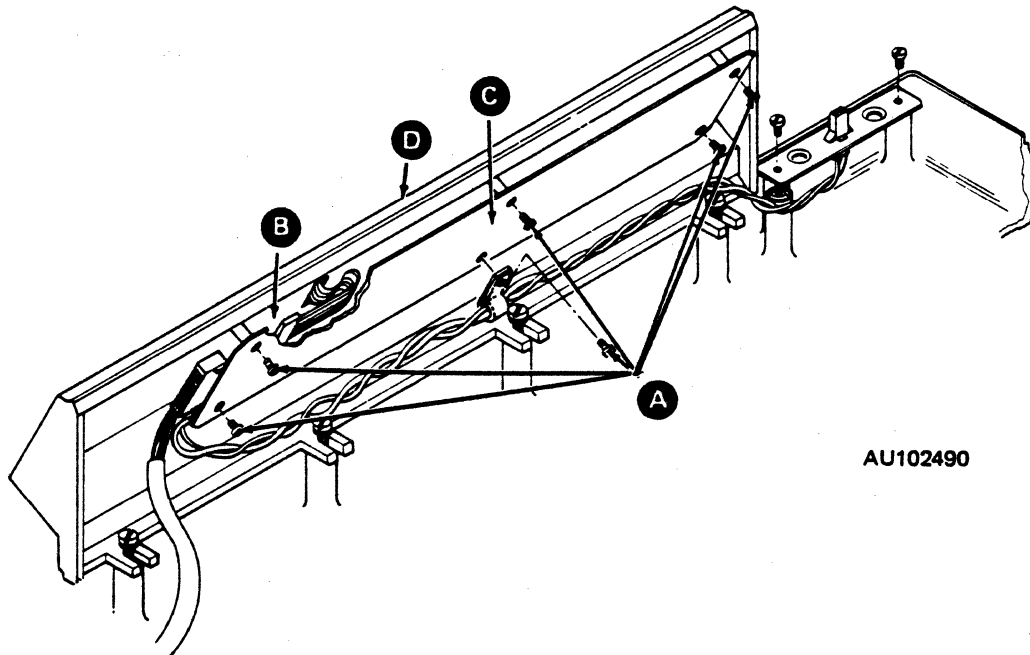


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203 CONTROL PANEL LOGIC CARD AND SWITCH ASSEMBLY

Removal and Replacement

1. Perform steps 1 through 6 of the control panel removal (202).
2. Remove the six control panel logic card mounting screws **A**.
3. Remove the control panel logic card shield.
4. Separate the control panel logic card **C** and the switch assembly **D**.
5. Disconnect the control panel switch cable **B** from the control panel logic card.
6. For replacement of the control panel and switch assembly, reverse this procedure.
7. Perform the control panel adjustment (116).

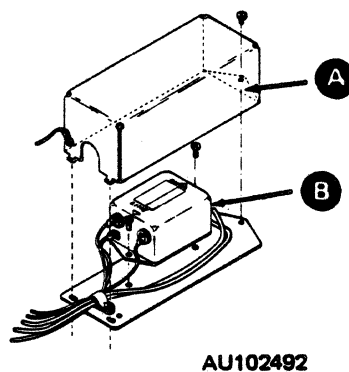
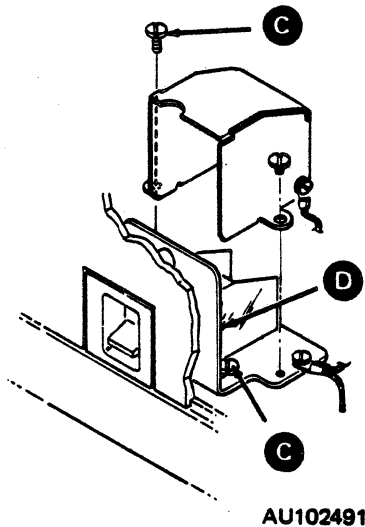


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204 POWER SWITCH AND CABLE ASSEMBLY

Removal and Replacement

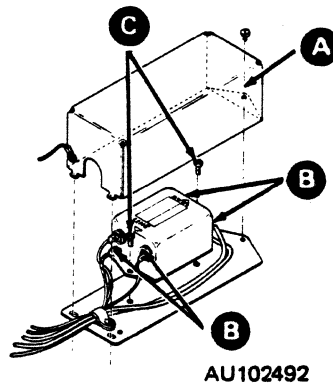
1. Power off.
2. Disconnect the ac line cord from the outlet.
3. Place the printer in the C:E. service position (152).
4. Remove the fan (119).
5. Disconnect the power switch cable J2 from the power supply (234).
6. Remove the ground wires from the right side frame.
7. Remove the ac filter shield **A**.
8. Remove the two wires on the load side **B** of the ac filter.
9. Loosen the two power switch mounting screws **C**.
10. Remove the power switch assembly **D**.
11. For replacement of the power switch, reverse this procedure.
12. Perform the power switch adjustment (117).



205 AC LINE FILTER

Removal and Replacement

1. Power off.
2. Disconnect the ac line cable from the outlet.
3. Place the printer in the C.E. service position (152).
4. Remove the ac filter shield **A**.
5. Disconnect the ground wire from the printer mechanism left side frame.
6. Remove and label the wires from the ac filter **B**.
7. Remove the two ac filter mounting screws **C**.
8. Remove the ac filter.
9. For replacement of the ac line filter, reverse this procedure.

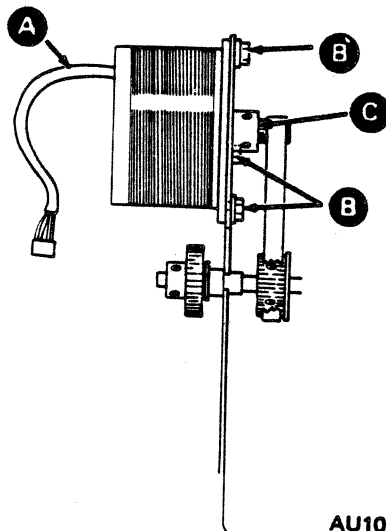


PAPER FEED

210 INDEX MOTOR

Removal and Replacement

1. Power off and disconnect the ac line cord.
2. Remove the top cover (200).
3. Remove the power supply (234).
4. Remove the left baffle.
5. Disconnect the index motor cable **A** (connector A-A1G3) from the A-A1 distribution board (104).
6. Remove the three index motor mounting screws **B**.
7. Remove the index motor.
8. Remove the index motor pulley **C** and install the pulley on the new index motor shaft.
9. For replacement of the index motor, reverse this procedure.
10. Perform the index motor and index motor pulley adjustments (122, 123).



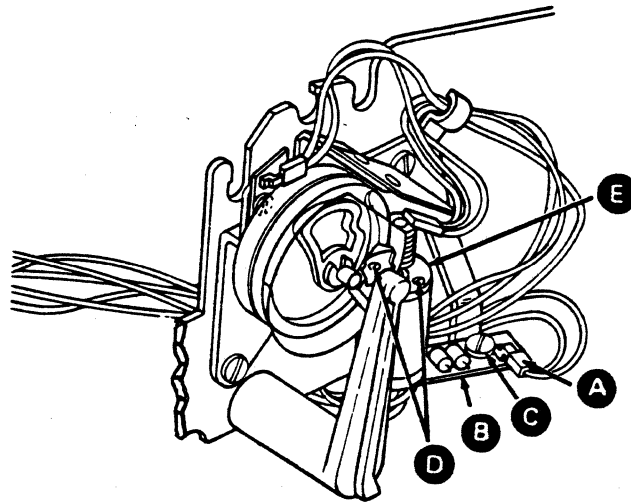
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Top View

211 CAM MOTOR

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Disconnect the cam motor cable **A** from the cam motor filter board **B**.
4. Remove the screw **C** from cam motor filter board.
5. Remove the two screws **D** from the top of the cam motor.
6. Remove the motor **E**.
7. For replacement of the cam motor, reverse this procedure.
8. Perform the cam motor adjustment (125.4).

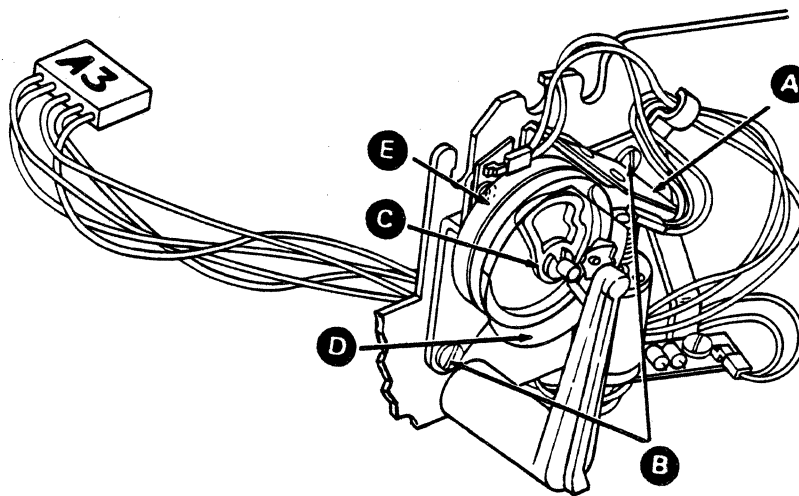


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212 CAM

Removal and Replacement

1. Power on.
2. Press Release.
3. Power off.
4. Remove the top cover (200).
5. Remove the cam guard.
6. Remove the home position reed switch board **A**.
7. Disconnect the paper bail springs and move the paper bail forward.
8. Remove the two screws from the cam and motor assembly **B**.
9. Remove the cam and motor assembly. If necessary remove the cam motor (211).
10. Remove the c-clip from the shaft **C**.
11. Remove the cam safety shield **D**.
12. Remove the cam from the shaft **E**.
13. For replacement of the cam, reverse the procedure.
14. Perform the cam motor and reed switch bracket adjustment (125).

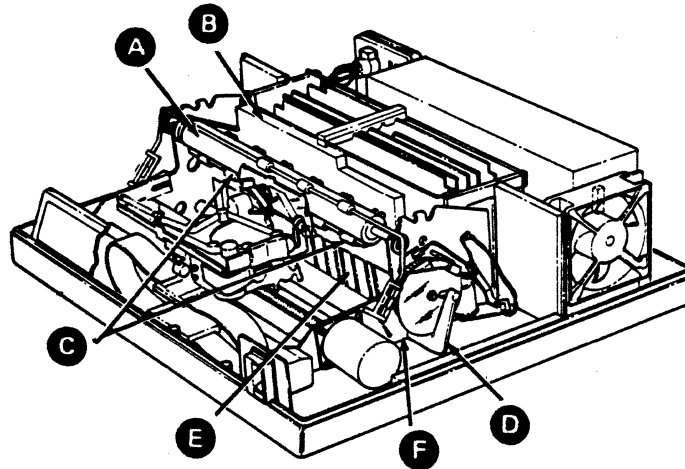


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213 DEFLECTOR ARM AND SPRING COMB

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Remove the platen (215) **A** and center baffle **B**.
4. Remove the feed roller assembly **C** (216).
5. Lift the printer mechanism to the CE service position (152).
6. Turn the cam motor worm gear until the deflector arm disengages from the cam.
7. Turn the deflector arm **D** 180 degrees so that the spring comb deflectors **E** will slide through the opening **F** of the right side frame of the printer mechanism.
8. For replacement of the deflector arm and spring comb, reverse this procedure.

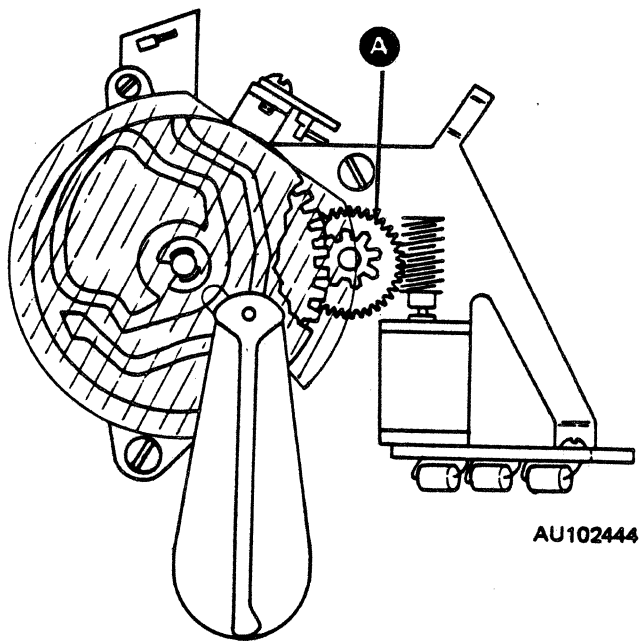


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214 CAM MOTOR IDLER GEAR

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Remove the safety shield and cam (212).
4. Remove the cam motor idler gear **A**.
5. For replacement of the cam motor idler gear, reverse this procedure.



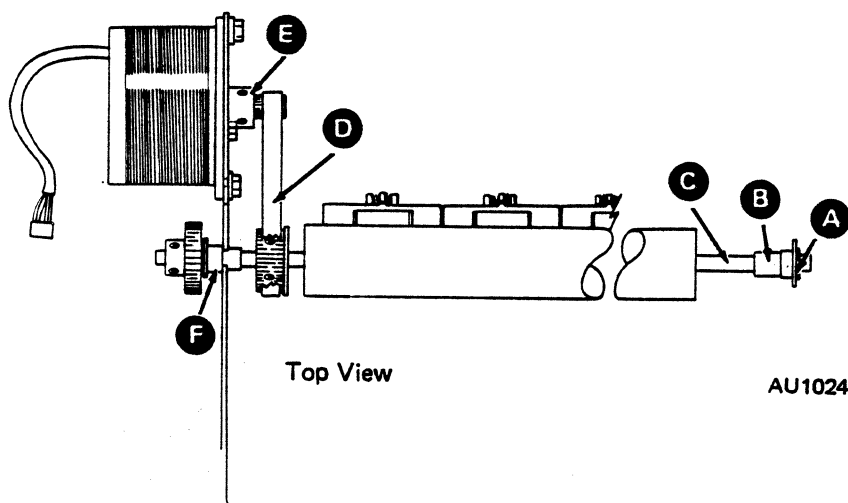
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Right Side View

215 PLATEN

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Turn the cam motor worm gear (212) until the paper bail and feed rollers disengage from the platen.
4. Remove the c-clip **A** from the right side of the platen.
5. Pull the right platen shaft bearing **B** to the right to free the right end of the platen shaft **C**.
6. Remove the index motor belt **D** from the index motor pulley **E**.
7. Push the platen to the left.
8. Pull the left platen shaft bearing **F** outward and lift the left end of the platen.
9. Lift the platen out of the printer mechanism.
10. For replacement of the platen, reverse this procedure.
11. Perform the following adjustments:
 - a. Index motor (122)
 - b. Platen pulley (121)
 - c. Index motor pulley (123)

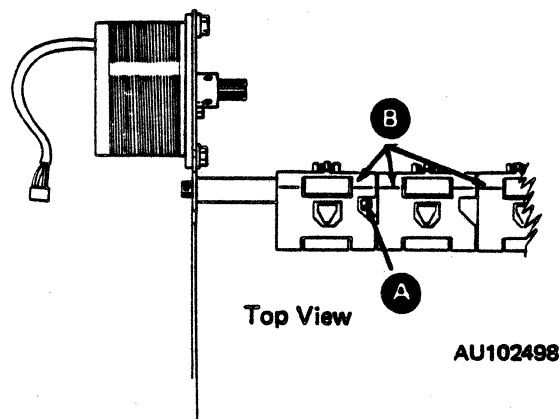


216 FEED ROLLERS ASSEMBLY

Removal and Replacement

1. Perform steps 1 through 8 of the platen removal (215).
2. If the leftmost feed roller has the first writing line sensor **A** installed, disconnect the A-A1A7 connector from the A-A1 distribution board (104).
3. Pull the feed rollers assembly **B** from the shaft.
4. If the first writing line sensor was installed, remove it from the old feed roller and install it on the new feed roller. Adjust the sensor so that the face of the sensor is 0.8 to 1.2 mm (0.031 to 0.047 inches) below the surface of the feed roller assembly (124).
5. For replacement of the feed rollers assembly, reverse steps 1, 2, and 3.

Note: The spring comb assembly must align with deflector arm slots.



CARRIER

217 ESCAPEMENT MOTOR

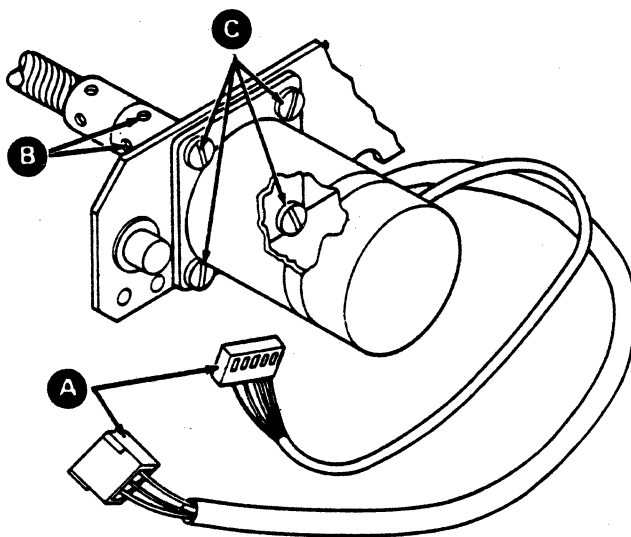
Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Remove the right side baffle (100).
4. Disconnect the escapement motor cables **A** (101) (104).

Note: A01 printers have one escapement motor cable.

5. Loosen the two setscrews **B** that attach the leadscrew coupler and the escapement motor shaft.
6. Remove the four escapement motor mounting screws **C**.
7. Remove the escapement motor.
8. For replacement of the escapement motor, reverse this procedure.

Note: The leadscrew coupler should be positioned with a small gap, 1 mm (0.040 inches) maximum, between the escapement motor and the coupler to prevent binds.

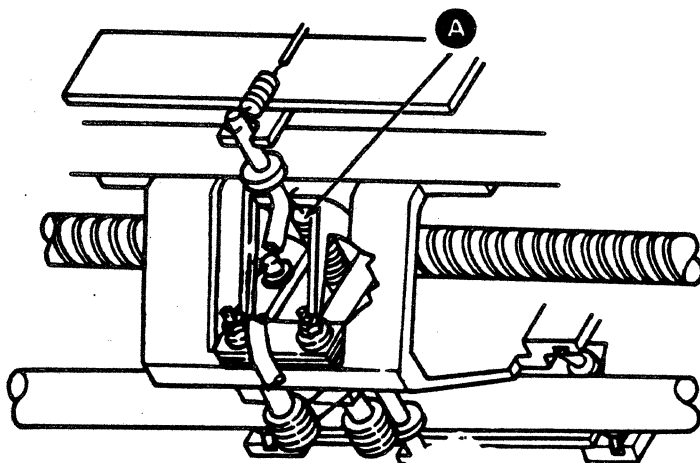


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218 LEADSCREW

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Place the printer mechanism in the CE service position (152).
4. Loosen the two setscrews that attach the leadscrew to the leadscrew coupler.
5. Disconnect one end of the leadscrew follower spring **A**.
6. Turn the leadscrew through the left side of the printer mechanism.
7. For replacement of the leadscrew, reverse this procedure.

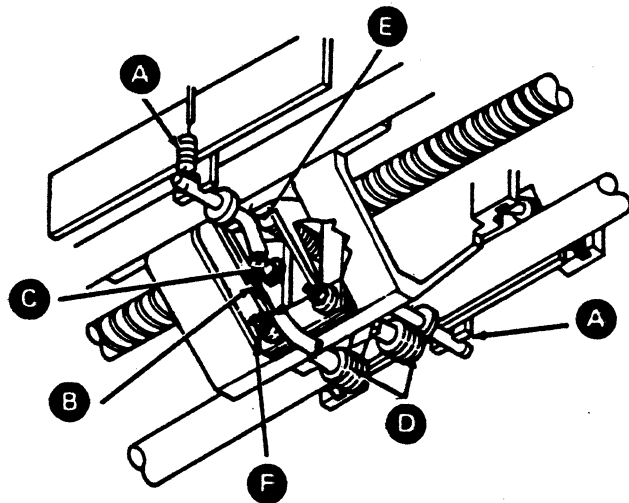


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219 LEADSCREW FOLLOWER

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Loosen the two setscrews that attach the leadscrew to the leadscrew coupler.
4. Place the printer mechanism in the CE service position (152).
5. Remove the bottom bearing/shaft assembly by removing the two bottom roller springs **A**. Remove the c-clip **B** and the stop shaft **C**.
6. Loosen the two leadscrew follower screws **D**.
7. Remove the leadscrew follower spring **E**.
8. Remove the leadscrew follower **F**.
9. For replacement of the leadscrew follower, reverse this procedure.
10. Perform the leadscrew follower adjustment (126).



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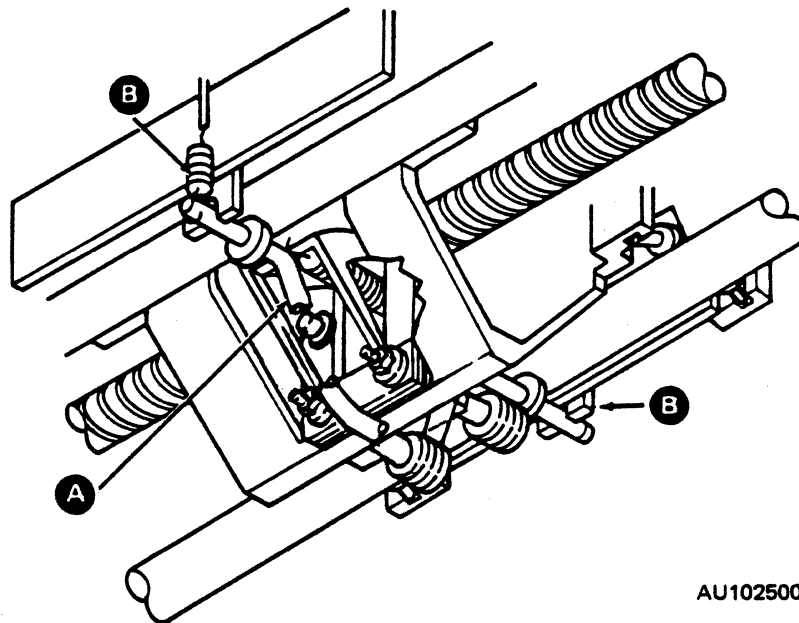
220 CARRIER ASSEMBLY

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Remove the ribbon, print wheel, and cardholder.
4. Remove the ribbon plate (228).
5. Remove all cables from the carrier assembly (105).
6. Remove the selection motor (222 steps 7 through 10).
7. Place the printer mechanism in the CE service position (152).
8. Remove the carrier roller shaft **A** by removing the springs **B** on each side.
9. Remove the leadscrew (218 steps 4 through 7)
10. Place the printer mechanism in the normal operating position.
11. Lift the carrier assembly from the printer mechanism.
12. Remove the old ribbon lift arm (134), and install it on the new carrier assembly.
13. For replacement of the carrier assembly, reverse this procedure.

14. Check or perform the following adjustments in order:

- a. Leadscrew follower (126)
- b. Carrier Assembly (129)
- c. Ribbon cartridge holder (136)
- d. Cardholder (137)
- e. Print wheel hub to platen (130)
- f. Print wheel homing (132)
- g. Print hammer assembly (131)
- h. Carrier eccentrics (127)
- i. Selection motor pull-back cable (128)
- j. Ribbon lift arm (134)

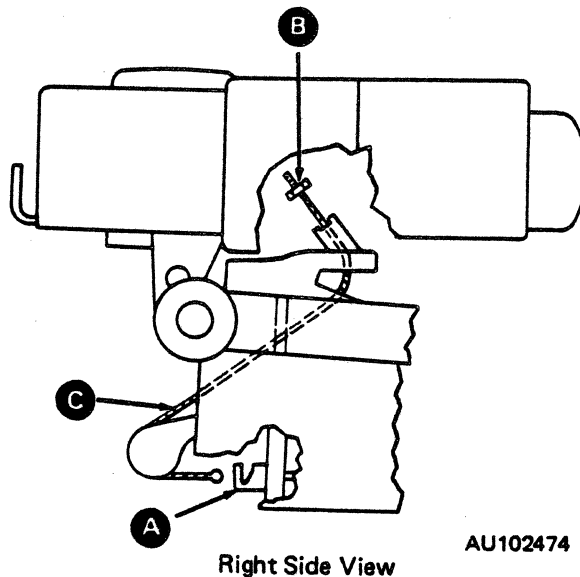


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221 SELECTION MOTOR PULL-BACK CABLE

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Push the carrier assembly to the left side frame.
4. Remove one end of each selection motor pull-back spring (222.9), pull the selection motor back by hand and remove the pull-back cable end from the selection motor adjustment screw **A**.
5. Push the cable upward so that the pull cable nut **B** can be removed.
6. Remove the pull-back cable **C**.
7. For replacement of the selection motor pull-back cable, reverse this procedure.
8. Perform the selection motor pull-back cable adjustment (128).



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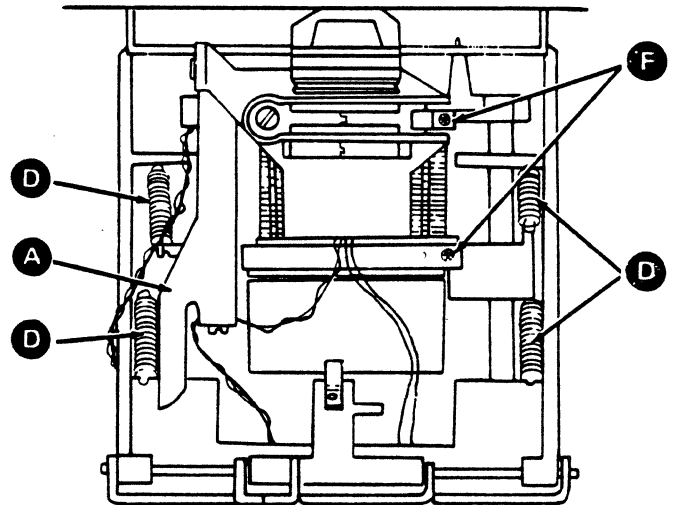
PRINT WHEEL

222 SELECTION MOTOR

Removal and Replacement

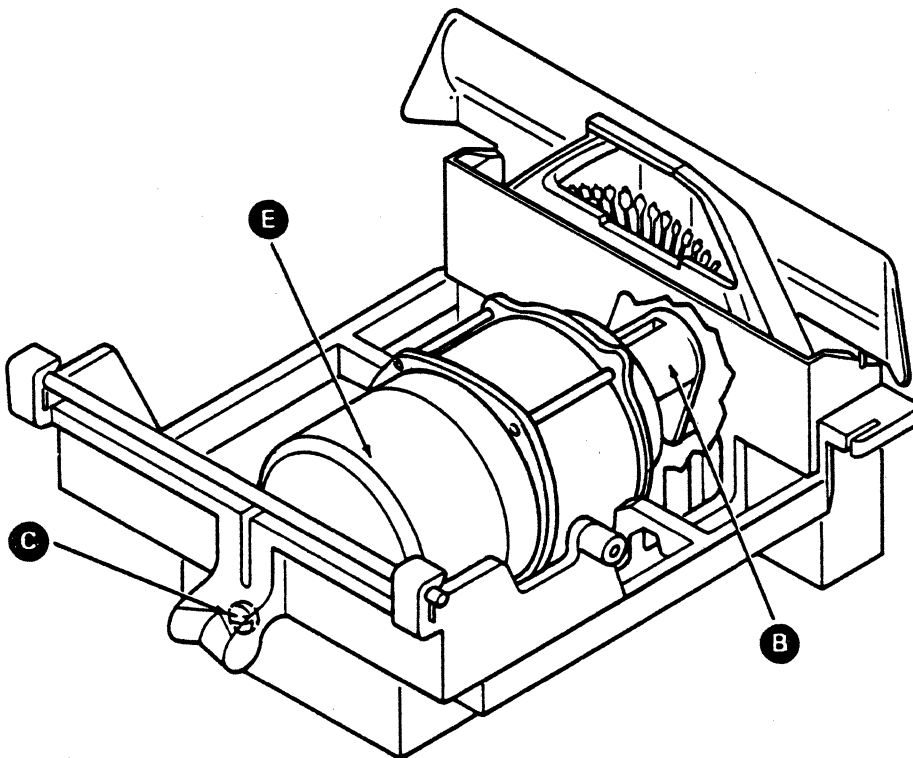
1. Power off.
2. Remove the top cover (200).
3. Move the carrier assembly to the center of the printer mechanism.
4. To home the print wheel, push the selection home lever **A** to the right. Turn the print wheel by hand until the lever enters the selection motor home opening.
5. Remove the ribbon and print wheel.
6. Remove the carrier cable clamp and disconnect the selection motor cable connectors (105).
7. Remove the cable clamp securing the hammer and ribbon sensor cables and disconnect the cable connectors (105).
8. Place the print wheel hub **B** so that the extended part of the print wheel hub points down.
9. Disconnect one end of each selection motor pull-back spring **D**. Lift off the motor end only.
10. Remove the selection motor adjustment screw **C**.
11. Tilt the selection motor **E** forward slightly and lift the selection motor out of the printer mechanism.
12. Remove the selection home lever **A** by disconnecting the return spring and removing the two lever studs.
13. Remove the two selection motor clamps **F** and the selection motor adjustment screw **C** from the old selection motor, and install them on the new selection motor.
14. Before reinstalling the selection motor, check the print wheel hub adjustment (138).
15. For replacement of the selection motor, reverse this procedure.

16. After installing the new selection motor perform the following adjustments in order:
- a. Print Wheel Hub to Platen (130)
 - b. Print Wheel Homing (132)
 - c. Print Hammer Assembly (131)
 - d. Carrier Eccentric (127)
 - e. Selection Motor Pull-Back Cable (128)



Top View

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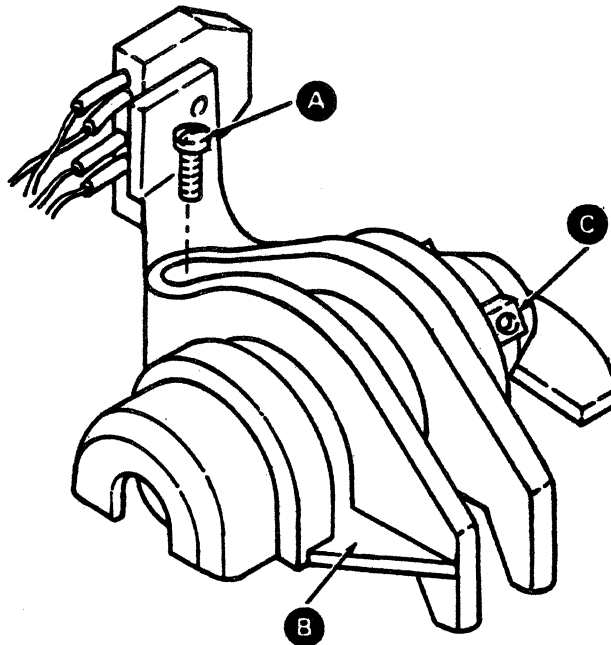


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223 PRINT HAMMER ASSEMBLY

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Remove the print wheel and ribbon.
4. Disconnect the carrier cable clamp and the hammer cables (105).
5. Remove the cable clamp on the side of the carrier.
6. Remove the hammer clamp screw **A** and hammer clamp **B**.
7. Remove the hammer assembly **C**.
8. For replacement of the print wheel assembly, reverse this procedure.
9. After installing a new hammer assembly perform the print wheel homing (132) and print hammer assembly adjustments (131).



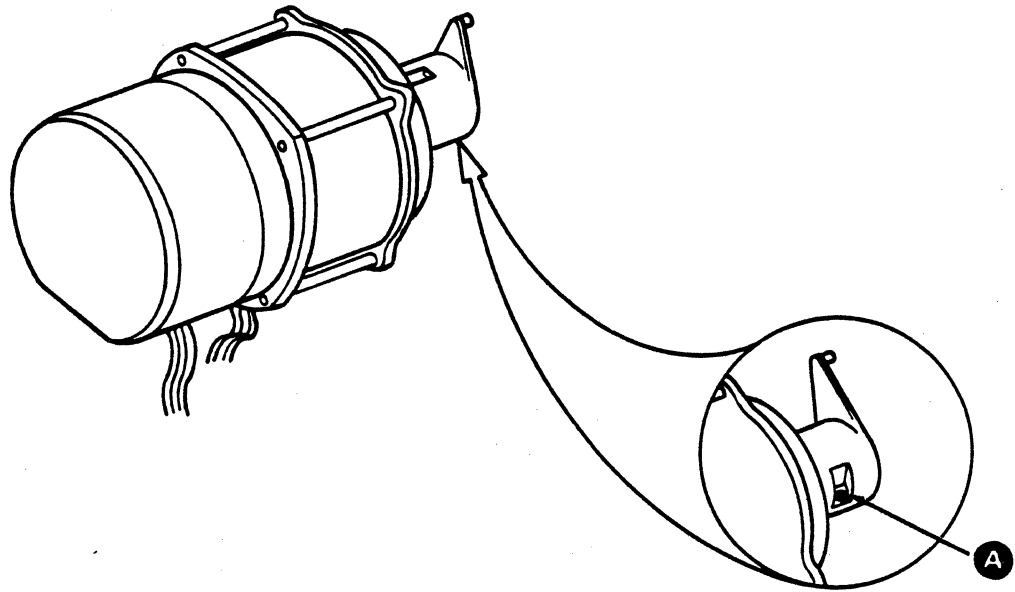
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224 PRINT WHEEL HUB

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Home the selection motor by hand (222.4).
4. Remove the ribbon and print wheel.
5. Remove one end of each selection motor pull-back spring (222.9).
6. Turn the print wheel hub so that the extended part points down.
7. Lift the motor out of the carrier and turn the motor so that the print wheel hub is pointing up.
8. Loosen the screw **A** in the print wheel hub.
9. Remove the old print wheel hub and install the new one.
10. Perform the print wheel hub adjustment (138).
11. Install the selection motor.
12. After installing the selection motor, perform the following adjustments in order:
 - a. Print Wheel Hub to Platen (130)
 - b. Print Wheel Homing (132)
 - c. Print Hammer (131)
 - d. Carrier Eccentric (127)
 - e. Selection Motor Pull-Back Cable (128)



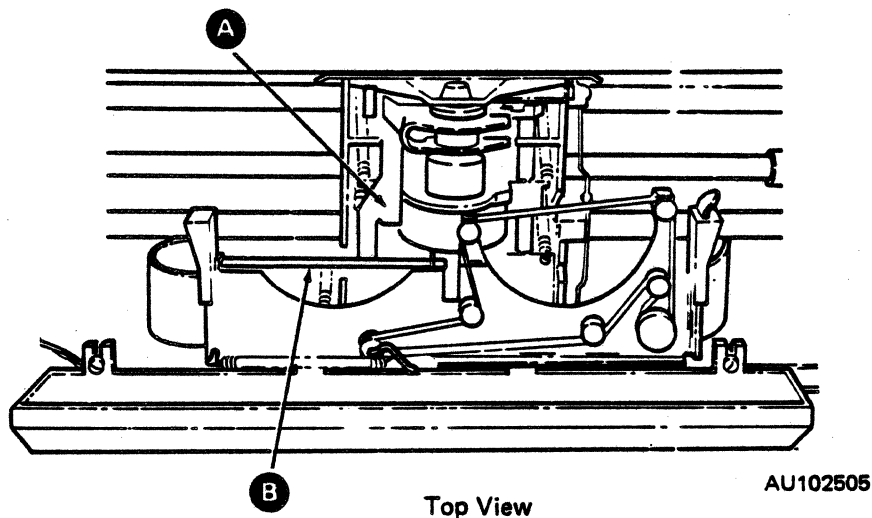
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225 PRINT WHEEL

Removal and Replacement

CAUTION: The selection motor must be in the home position.

1. Power off.
2. Open the operator access cover.
3. To home the print wheel, push the selection home lever **A** to the right and turn the print wheel by hand. Continue turning the print wheel until the lever enters the selection motor home opening.
4. Press the selection motor pull-back latch to the right **B** and lift the ribbon plate up.
5. Remove the print wheel.
6. For replacement of the print wheel, reverse this procedure.

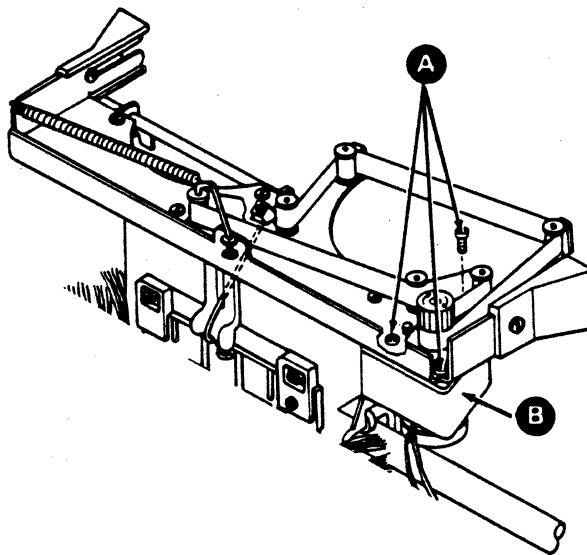


RIBBON

226 RIBBON MOTOR DRIVE ASSEMBLY

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Disconnect the right carrier cable clamp and ribbon motor cable (105).
4. Remove the three ribbon motor drive assembly mounting screws **A**.
5. Remove the ribbon motor drive assembly **B**.
6. For replacement of the ribbon motor drive assembly, reverse this procedure.
7. Perform the following adjustments:
 - a. Drive Pinion Gear (135)
 - b. Ribbon Lift Arm (134)

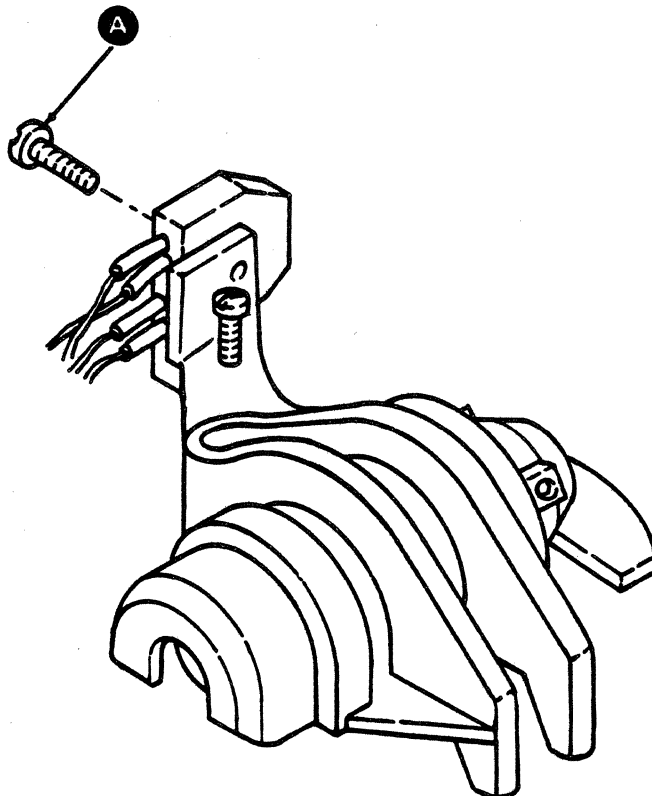


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227 RIBBON SENSOR ASSEMBLY

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Disconnect the left carrier cable clamp and the ribbon sensor cable (105).
4. Lift the ribbon plate and remove the ribbon cartridge.
5. Remove the ribbon sensor screw **A** and the ribbon sensor assembly.
6. For replacement of the ribbon sensor, reverse this procedure.
7. Shape the leads on the ribbon sensor so they do not inhibit the ribbon cartridge up and down movement.

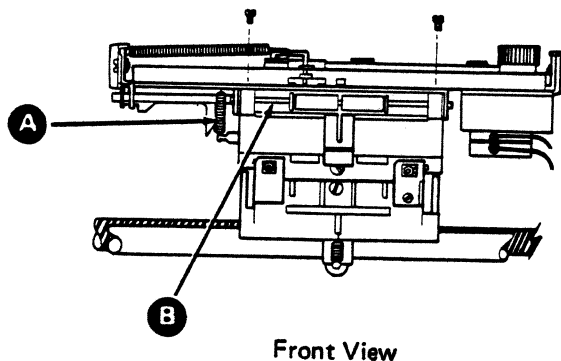


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228 RIBBON PLATE

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Remove the ribbon cartridge.
4. Remove the three screws for the ribbon motor drive assembly (226).
5. Disconnect the ribbon plate spring **A**.
6. Remove the ribbon plate by loosening the two screws holding the small restraint plates against the ribbon plate shaft **B**. Turn the plates off the shaft and lift the ribbon plate off the carrier.
7. Remove the selection motor pull-back cable (221).
8. For replacement of the ribbon plate, reverse this procedure doing step 6 first.
9. Perform the following adjustments:
 - a. Ribbon Plate (133)
 - b. Drive Pinion Gear (135)
 - c. Ribbon Lift Arm (134)
 - d. Ribbon Cartridge Holder (136)



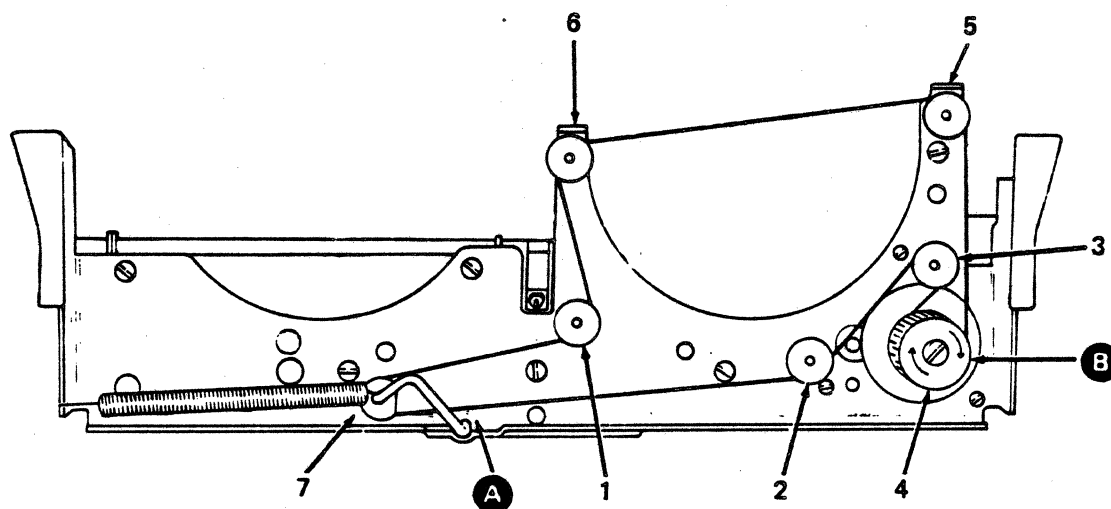
Front View

AU102507

230 RIBBON BELT

Removal and Replacement

1. Power off.
2. Remove the ribbon cartridge.
3. Remove the ribbon belt **A** in sequence from rollers 1, 2, 3, 4, 5, 6, and 7. The ribbon belt will slide under roller 7.
4. For replacement of the ribbon belt, reverse this procedure.
5. The smooth surface of the new ribbon belt touches the drive capstan part of the ribbon advance knob **B**.



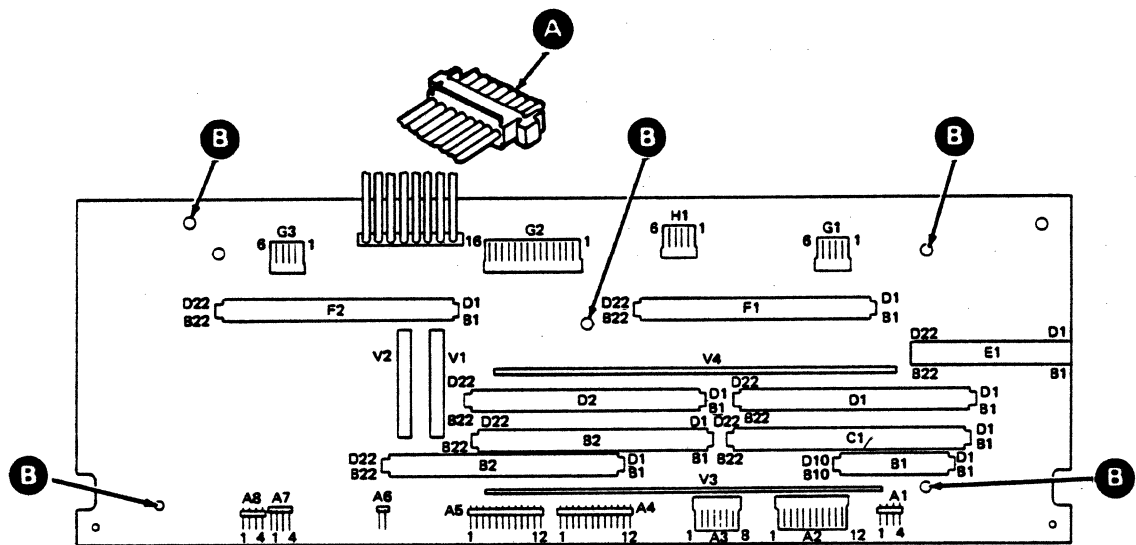
Top View

AU102482

231 A-A1 DISTRIBUTION BOARD

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Remove the card separator from the top of the logic card.
4. Remove all of the cards from the A-A1 distribution board (104).
5. Remove the center baffle (100) between the platen and cards.
6. Remove all connectors from the distribution board.
7. Disconnect the J4 connector from the power supply **A** (234).
8. Remove the five mounting screws **B** from the distribution board.
9. Lift the A-A1 distribution board out of the bottom cover.
10. For replacement of the A-A1 distribution board, reverse this procedure.

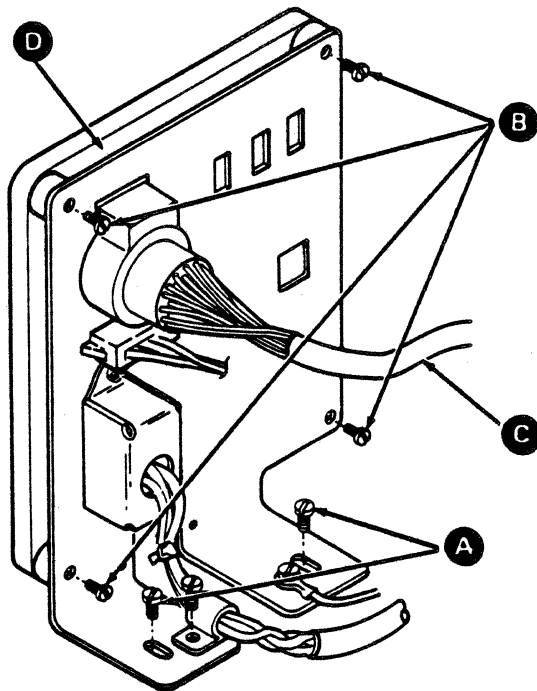


AU102448

232 SHEET FEED CABLE (PRINTER SIDE)

Removal and Replacement

1. Power off and disconnect the line cord from the outlet and the attachment panel.
2. Remove the top cover (200).
3. Remove the printer attachment panel mounting screws **A**.
4. Remove the printer attachment panel.
5. Remove the four printer attachment panel frame mounting screws **B**.
6. Remove the black cover from the printer attachment panel assembly.
7. Disconnect the A-A1G2 connector (sheet feed cable) **C** from the A-A1 distribution board.
8. Slide the cable through the printer attachment panel frame **D**.
9. For replacement of the sheet feed cable, reverse this procedure.
10. Perform the printer attachment panel assembly adjustment (118).



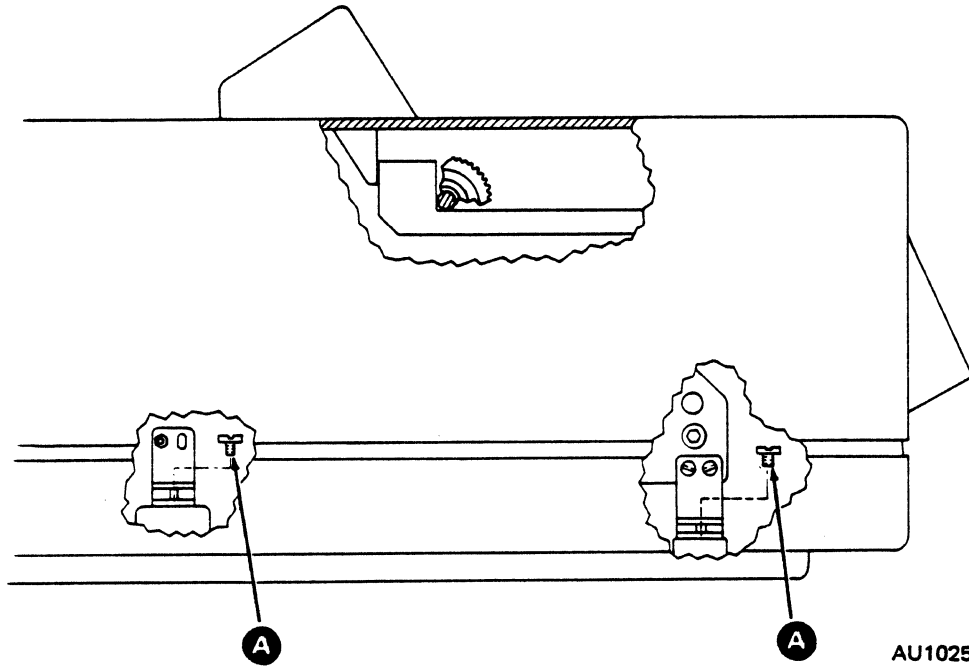
AU102508

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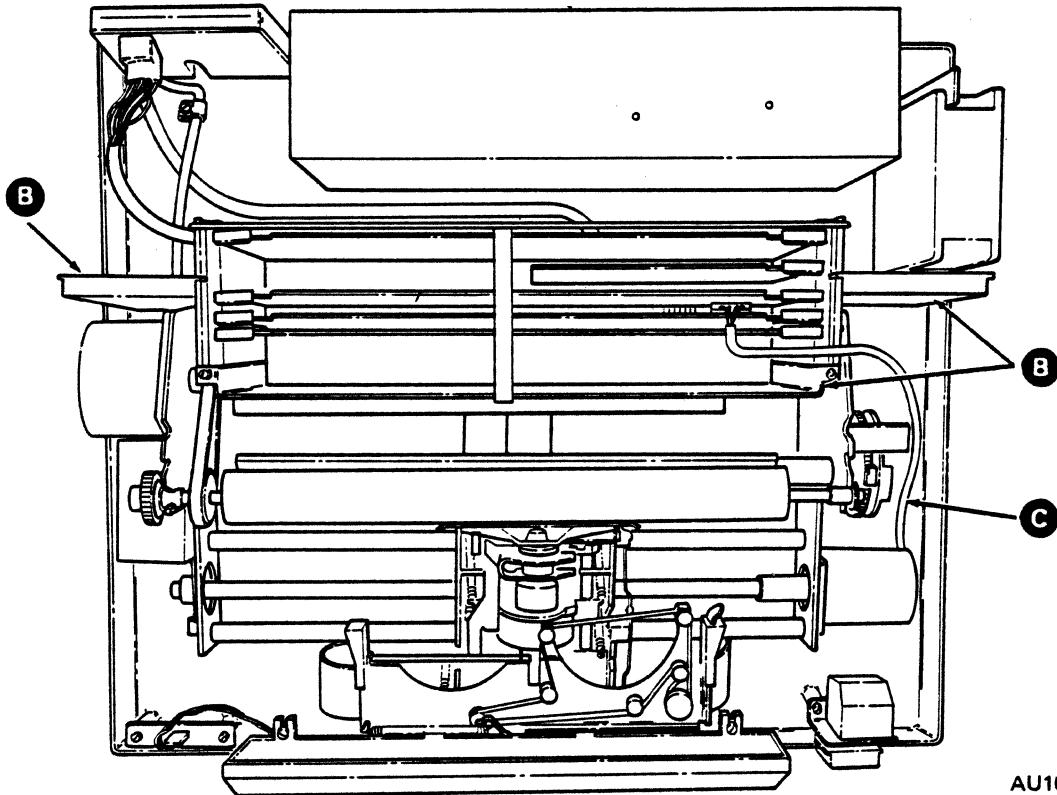
233 PRINTER MECHANISM

Removal and Replacement

1. Power off and disconnect the ac line cord from the outlet.
2. Remove the top cover (200).
3. Loosen the four power supply screws and place the power supply behind the bottom cover.
4. Remove the front and rear shock mount to cover screws **(A)**, two on each side.
5. Remove the left, right, and center baffle **(B)** between the platen and the electronic boards.
6. Disconnect the first writing line (FWL) sensor cable A-A1A7 and the left margin switch cable A-A1A8 from the A-A1 distribution board, if installed.
7. Disconnect and remove the carrier cables, A-A1A4 and A-A1A5, from the carrier.
8. Disconnect the cam assembly cable, A-A1A3, from the A-A1 distribution board.
9. Disconnect the escapement motor cables, (A-A1G1 and the escapement motor feedback cable) **(C)**. Disconnect the index motor cable A-A1G3 from the A-A1 distribution board.
10. Disconnect the ground wires located on the left and right sides of the printer frame.
11. Lift the printer mechanism out of the bottom cover.
12. For replacement of the printer mechanism, reverse this procedure.



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234 POWER SUPPLY

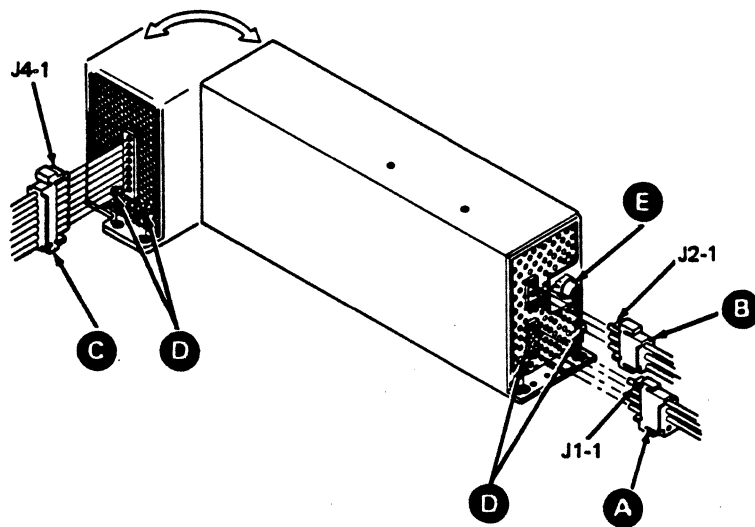
Removal and Replacement

1. Power off.
2. Disconnect the ac line cord from the electrical outlet.
3. Remove the top cover (200).
4. Disconnect connectors J1 **A**, J2 **B**, and J4 **C** from the power supply.
5. Loosen the four power supply mounting screws **D**.
6. Remove the ground wire from the power supply.
7. Remove the power supply.
8. For replacement of the power supply, reverse this procedure.

235 POWER SUPPLY FUSE

Removal and Replacement

1. Power off.
2. Disconnect the ac line cord from the electrical outlet.
3. Remove the top cover (200).
4. Facing the printer from the rear, push the power supply fuse cap **E** inward slightly and turn the cap counterclockwise.
5. Remove cap and fuse.
6. For replacement of the power supply fuse, reverse this procedure.

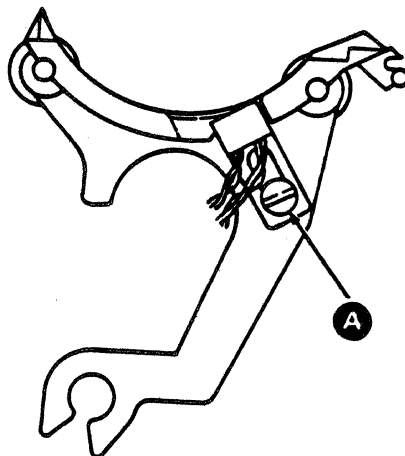


AU102511

236 FIRST WRITING LINE SENSOR

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Remove the platen (215).
4. Remove the A-A1A7 connector from the A-A1 distribution board.
5. Remove the leftmost feed roller assembly (216).
6. Remove the first writing line sensor **A**.
7. For replacement of the first writing line sensor, reverse this procedure.

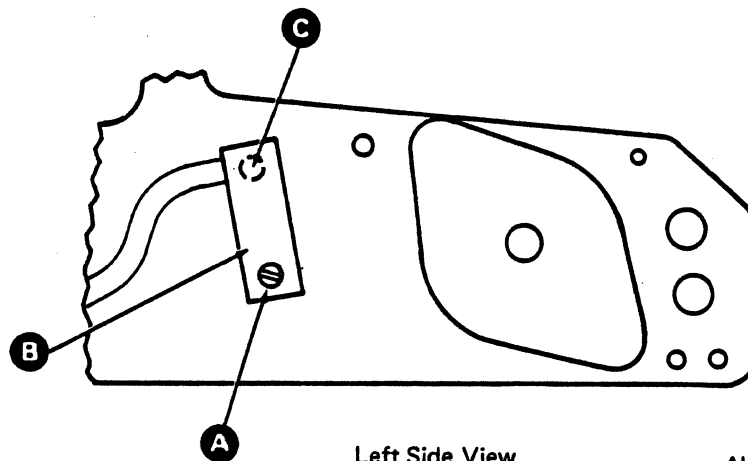


AU102468

237 LEFT MARGIN SWITCH

Removal and Replacement

1. Power off.
2. Remove the top cover (200).
3. Place the printer mechanism in the CE service position (152).
4. Disconnect the left margin switch, A-A1A8, from the A-A1 distribution board.
5. Remove the left margin switch mounting screw **A** and remove the left margin switch **B**.
6. Remove the plunger **C** by pushing it out of the left side frame.
7. For replacement of the left margin switch, reverse steps 4 through 6.
8. Adjust the left margin switch so that it is visually centered over the plunger.



Left Side View

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The diagnostic package for the IBM 5218 Printer test contains power-on diagnostics, selectable diagnostic tests, a background read-only storage (ROS) test, a control panel, maintenance information manual (MIM) and maintenance analysis procedures (MAPs) to aid the CE in isolating a failing field-replaceable unit (FRU). It lets the CE service the IBM 5218 Printer without using the controller.

A power-on diagnostic sequence tests all functional parts of the printer which can be checked automatically and without the help of the controller. These diagnostic tests along with operator observed symptoms supply the CE with information to lead the CE to the failing area.

The Print Test and Verify function aid the operator in problem determination procedures. Printer status is indicated by the 10 indicator lights. Printer errors are indicated by an error code in the LED display, and the Printer Excep and Setup indicator lights.

301 DIAGNOSTIC MODE

In the diagnostic mode, the CE can select and run printer diagnostic tests. With the aid of the MAPs and the MIM, the diagnostic tests can be used to isolate the failing FRU.

To enter the diagnostic mode, press the Stop switch and wait for the Ready indicator to go off. With the Ready indicator off, press and hold the Stop switch while you press and release the Paper Up switch and then the Release switch. This sequence leaves the printer in the diagnostic mode with only the Power On and Diag Mode indicators on, and 00 showing in the LED displays.

In the diagnostic mode the control panel is redefined as follows:

SWITCH FUNCTION

Start - used to start or continue a diagnostic test and to receive data from the display digits.

Stop - used to stop diagnostic test in progress.

Cancel - used for three purposes depending on the number of times pressed. Press Cancel once and the LED display will be set to zero; the test in progress will stop and the loop counter is reset. Press Cancel twice the LED display will be cleared, and the test number indicator will be cleared. Press Cancel three times and leave the diagnostic mode.

Restore - causes the printer to execute a Restore command. The Restore command causes the printer to run part of the Basic Assurance Test. Then the index, selection, and escapement motors are homed, and the carrier assembly is centered. Normally this is the Print Test switch.

MSD - (most significant digit) used to increase the leftmost digit of the LED display. Normally this is the paper up switch.

LSD - (least significant digit) used to increase the rightmost digit of the LED display. Normally this is the paper down switch.

Load - used to load and index paper. This switch causes the printer to feed paper to the first writing line, open the paper bail, feed paper past the paper bail, and close the paper bail.

SCM - (set control mode) used for selection of the control mode (1, 2, or 3) which determine how to run the selected diagnostic test (302). Normally this is the Release switch.

INDICATORS

Power On - indicates power is on.

On Line - indicates the current status of the communication line with the controller.

Input Data - indicates to the CE to enter data from the panel for a diagnostic test.

Ready - indicates that the printer is in the ready state. It should be off in the diagnostic mode.

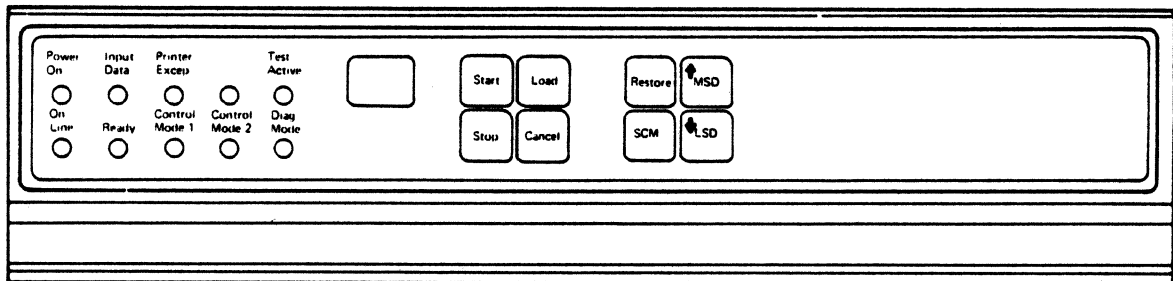
Printer Excep - indicates an error was sensed and the code in the display is the error code.

Test Active - indicates a diagnostic test is running.

Control Mode 1 and Control Mode 2 - indicates the mode in which a diagnostic test is running.

Diag Mode - indicates the printer is in the diagnostic mode.

LED Display - With the leftmost digit blank, the rightmost digit is used to display the control mode being selected. When both digits are lighted, the information is either a test number, error code, output information or input value. The decimal points indicate that the information in the display is output information from a diagnostic test.



AU102513

Control panel diagnostic mode

302 CONTROL MODE SELECTION

There are three control modes available for running a diagnostic test. The desired control mode is selected by using the SCM switch. To select a control mode, the printer must be in the diagnostic mode not running a diagnostic test. To reach this condition, wait for the diagnostic test running to stop, press Stop, or Cancel. Enter the control mode selection by pressing the SCM switch. This will enter a zero in the right LED display and leave the left LED display blank. By continuing to press the SCM switch, any of three control modes can be selected. When the control mode desired is displayed, press Start to have that mode entered. This causes the Control Mode lights to indicate the selected control mode and leaves both LED display digits blank. The following chart describes the control mode and the status of the Control Mode 1 and Control Mode 2 lights.

Control Mode	Control Mode 1 light	Control Mode 2 light	Definition
0			No change - last mode number still used.
1	on	off	Runs test once, stops on any error.
2	off	on	If the diagnostic test number is more than 18, the test runs in a loop mode 256 times or until the Stop or Cancel switch is pressed or an error occurs. If the diagnostic test number is less than or equal to 18, the test runs in a loop mode continuously until the Stop or Cancel switch is pressed or until an error occurs.
3	on	on	Runs test in loop mode. Stops only with the Stop switch, at the end of the test, or after 256 loops. If an error is sensed the test will stop for approximately two seconds, display the error and then continue to loop.

303 SELECTING A DIAGNOSTIC TEST

To select a diagnostic test, the printer must be in the diagnostic mode and not running a diagnostic test. Select the diagnostic test by pressing the MSD and LSD switch until the desired diagnostic test number is in the LED display. Both LED display digits increase by one each time the MSD or LSD switches are pressed, until they reach nine, then the LED displays go back to zero. Pressing the Start switch causes the diagnostic test to run in the mode that was selected by the control mode selection function.

When an error is sensed, the Printer Excep light comes on to indicate that the number in the display is an error code.

304 DIAGNOSTIC TESTS

The following list describes the diagnostic tests that can be selected for the IBM 5218 Printer.

Test Number	Description
01	Printer Test and Initialization This test performs a complete basic assurance test (BAT) of the printer mechanism. Then the index, selection, and escapement motors are homed, and the carrier assembly is centered.
02	Index Area Test and Initialization This test performs a BAT for the index area.
03	Interface Initialization, Printer Test and Initialization This test first initializes the interface between the printer logic card and the processor card. The test then performs a complete BAT for the printer mechanism. Then the index, selection, and escapement motors are homed, and the carrier assembly is centered.
04	Interface Initialization This test initializes the interface between the printer logic card and the processor card so that the printer logic card can store data from the processor card.
05	Control Panel Test This test checks the control panel logic card. It checks the continuity of the wires from the switches and the control panel, and checks to ensure that no switches are held down. All control panel indicator lights and both LED display digits will be turned on.
06	USART Test The universal synchronous/asynchronous receiver/transmitter (USART) initialization test readys the USART for communication (between the printer and the controller).

07 USART Loop Test

This test verifies the ability of the USART to send and receive serial data. It is performed with the IBM 5218 Printer offline and disconnected from the controller, and can check both the IBM 5218 Printer and the cable to the controller.

To check the printer, disconnect the communication cable from the printer attachment panel and install the wrap plug.

Run the USART loop test. Reconnect the communication cable.

To check the communication cable to the controller disconnect the cable from the controller bulkhead and install the wrap plug on the end of the cable. Run the USART loop test.

08 Read Only Storage (ROS) Test

This test checks each ROS module on the printer logic card to verify that it can be addressed by the processor card. This test is the same as the background ROS test (308). If a module fails, run diagnostic test 28 to identify the failing module.

09 Random Access Memory (RAM) Test and Initialization

This test does a read/write of the RAM addresses. Then it initializes the RAM for printer operation. This test will not clear the maintenance statistics area.

10 Interface Processor Group

This test does a complete BAT for the interface processor on the printer logic card.

11 Escapement Group

This test does a complete BAT for the escapement area.

12 Selection Group

This test does a complete BAT for the selection area.

13 Index Group

This test does a complete BAT for the index area.

14 Escapement Home

Escapement home moves the carrier slowly to the left side frame then moves it back to the right to the logical left margin. If this test is operated in loop mode, the carrier will continuously attempt to re-home from the logical left margin.

15 Escapement Center

This test centers the carrier assembly. If the carrier is already in the center, it will not move. However, if movement is desired, escapement home (diagnostic test number 14) can be requested and the carrier assembly will home. Then, escapement center can be requested to move the carrier assembly back to the center. In loop mode, the test will run only once, and the Stop switch should be pressed to end the test.

16 Selection Home

Selection home moves the print wheel to the home position and checks the selection home sensor.

17 Cam Home

Cam home moves the cam to the home position. If the cam is already home, the cam will not move. In loop mode, the test will run only once, and the Stop switch should be pressed to end the test.

18 Cam Move

Cam move will move the cam one position in the following sequence: home, tractor, load, release, and open bail. If an input parameter is supplied (diagnostic test number 63), the cam move will move once in a cyclic pattern between home and the cam position specified in the parameter.

19 Clear Maintenance Statistics

This function clears all information out of the maintenance statistics area.

20 Print Test

This is the same as the operator print test (309).

21 Print Test and Stop

Same as diagnostic test number 20, but with the added function of stopping on auto recoverable errors.

22 Storage Printout

This test operates in two ways. The first way is the default mode which supplies a printout of the maintenance statistics the same as the printout at the end of a verify function (307).

The second way, diagnostic test 61 is used to enter the start address for the storage printout test. If diagnostic test 61 is used to enter a start address, the 1025 bytes of data in memory, beginning at that start address, will be printed.

23 Display Maintenance Statistics

This test displays the maintenance statistics to the CE one byte at a time in the following sequence:

Identification label (lower character only)
Low byte
High byte

The identification label for the USART statistics, C0 through C3, are shown in the right LED display. The left LED display will be blank. The identification label for all other statistics will be shown in the left LED display with the right LED display blank. The data follows each label and uses both displays.

This test executes only once in the loop mode.

24 Switch Port

This test displays a byte that describes the printer configuration, switch status, and cover open status.

- FE = Cover closed, no paper handling device, and no switch pressed
- BE = Cover closed, sheet feed attached, and no switch pressed
- 7E = Cover closed, tractor feed attached, and no switch pressed
- E6 = Cover closed, no paper handling, Start switch pressed
- FA = Cover closed, no paper handling, Print Test switch pressed
- F6 = Cover closed, no paper handling, Load switch pressed
- EE = Cover closed, no paper handling, Paper Up switch pressed
- FC = Cover closed, no paper handling, Stop switch pressed
- E2 = Cover closed, no paper handling, Cancel switch pressed
- EA = Cover closed, no paper handling, Release switch pressed
- F2 = Cover closed, no paper handling, Paper Down switch pressed
- FF = Cover open, no paper handling, no switch pressed

This test executes only once in loop mode.

25 Escapement Status 1

Status byte 1 of the escapement processor is displayed on the control panel.

26 Index Status 1

Status byte 1 of the index processor is displayed on the control panel.

27 Index Status 2

Status byte 2 of the index processor is displayed on the control panel.

28 Failed ROS Identification Byte

This test displays the results of the last complete background ROS test (308). If the last background ROS test executed correctly, the LED display will indicate CF. If the test indicated an error the following will be displayed:

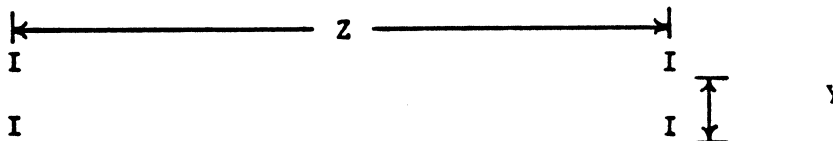
- C0 = ROS module 0 failed
 - C1 = ROS module 1 failed
 - C2 = ROS module 2 failed
 - C3 = ROS module 3 failed
 - C4 = ROS module 4 failed
-] Located on Processor Card

29 IBM 5218 Printer Configuration Port

Unused.

36* Box of I's

The printer does a restore and prints four I's.



Escapement distance, Z, and index distance, Y, default to 7 inches and 1 inch respectively. The default pitch, X, is 10 pitch.

AU102514

Tests 60, 64, and 62 are used to change the parameters for X, Y, and Z respectively.

37* Print % Character

This test executes the Restore command and prints a %. Other characters will print if diagnostic Text 60 is used to change the default parameter.

38 CE Index

This test indexes paper up 25 mm (1 inch). Diagnostic test 80 can be used to index longer or shorter lengths.

39 Execute Command Storage

This test executes queued commands that are entered by the CE. The first command to be executed is entered with diagnostic test 66 for the low byte and diagnostic test 67 for the high byte. The second command is entered with diagnostic test 68 for the low byte and diagnostic test 69 for the high byte. This is repeated for the next ten diagnostic tests with a maximum of seven 2-byte command to be executed. Use diagnostic test 65 to enter the number of commands to be executed.

*Ensure that paper is in the printer before running this test.

When this is complete diagnostic test 39 is started and the queued command executes.

WARNING: This test could damage the printer mechanism.

40 Sheet Feed Paper Tray 1 Test

This test feeds and ejects a sheet from the sheet feed paper tray with a Restore command resetting the printer before every feed. If the sheet feed is not attached, d6 will be displayed.

41 Sheet Feed Paper Tray 2 Test

Same as test 40, but feeds from paper tray 2.

42 Sheet Feed Paper Tray 1 Feed Test

This test feeds a sheet from paper tray 1. This test runs only once in loop mode.

43 Sheet Feed Paper Tray 2 Feed Test

Same as test 42, but feeds from paper tray 2.

44 Sheet Feed Eject

This test ejects paper from the sheet feed. If there is no paper present, a sheet feed jam will be sensed.

In loop mode, this test executes only once.

45* Low Velocity Hammer Test

This test executes a Restore command and then prints five low velocity characters. With a U.S. print wheel installed the five characters are:

, - : .

*Ensure that paper is in the printer before running this test.

46* Medium Velocity Hammer Test

This test executes a Restore command and then prints 27 medium velocity characters. With a U.S. print wheel installed, the following characters are printed:

anrcslf)LIJ(/17+?=xvzjytoe

47* High Velocity Hammer Test

This test executes a Restore command and then prints 29 high velocity characters with a U.S. print wheel installed, the following characters are printed:

mdhkvGUFBZHPRSNCTDEAOMYW9K3X2

48* Ribbon Coverage Test

This test executes a Restore command and then prints the following to test the ribbon mechanism for correct coverage:

)()()()()()()()()()()()()()()()()()()
yyyyyyyyyyyyMMMMMMMMMMMM

49 Restore

This test sends a Restore command through the controller interface

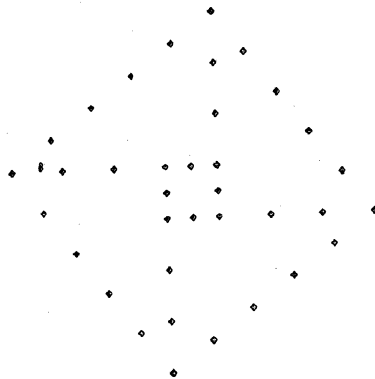
50 Restore

Same as Test 49.

*Ensure that paper is in the printer before running this test.

51* Diamond Pattern

This test executes a Restore command and then prints a diamond pattern for determining tilt, skew, and other print quality characteristics. This test should not be run with paper handling devices attached.



AU102515

52 Ribbon Move

Executes a Restore command and then advances the ribbon approximately 8.5 mm (1/3 inch).

60 Box of I's Pitch

This is an input data test used for Box of I's (Test 36) and print % character (test 37).

The pitch for test 36 is specified by dividing the desired pitch into 120, converting the result into hex, and entering the hex value.

The character to be printed with test 37 is specified by taking the EBCDIC code for the desired character, subtracting X '60', and entering the resulting hex value.

Note: A parameter change will affect both test 36 and 37.

61 Storage Printout Start Address

This is an input data test used for storage printout test (test 22).

Specify the start address for Test 22 by entering, in hex, the high byte of the 2-byte address. The low byte is not entered and is assumed to be X '001'. The stop address cannot be specified and will always be 1024 (X '0400') more than the start address.

RAM addresses range from X 'E000' to 'EFFF'.

*Ensure that paper is in the printer before running this test.

62 Box of I's Tab

This is an input data test used for the box of I's (test 36) that lets the escapement tab distance, parameter Z, be changed. The desired tab distance is entered in steps of 0.85 mm (1/30 inch). This number is converted into hex and entered. The default is 175mm (7 inches) (X 'D2').

63 Cam Position

This is an input data test used for the cam move test (test 18). The parameter that is associated with a specified cam position is entered, and when test 18 is executed the cam motor will move between home position and the cam position specified. The following parameters can be entered:

C8 - Tractor
CC - First Writing Line
D0 - Release
D4 - Bail Open

64 Box of I's Index

An input data test used for the index distance, parameter Y, on the box of I's test (test 36).

The desired index distance, in steps of 0.26mm (1/96 inch), is converted into hex and entered. The default is 25mm (1 inch) (X'60').

65 Command Number

An input data test used with the execute command storage (test 39) that specifies the number of commands to be executed.

The parameter is entered in hex and should be from X'00' to X'07'. The default parameter is X'00'.

66-79 Command Storage

An input data test used for entering commands into the command storage, which is used with test 39.

80 CE Index Distance

An input data test used to specify the index distance for the CE index test (test 38).

The desired index distance, in steps of 0.26mm (1/96 inch), is converted into hex and entered using test 80, the default is 25 mm (1 inch) (X'60').

305 ERROR CODES

The following list of error codes is displayed for the operator:

Error Code	Description of the Error
01	Sheet feed paper tray 1 (lower) empty.
02	Sheet feed paper tray 2 (upper) empty.
05	Paper Jam - Only for sheet feed.
06	Cover was opened when the printer was in the ready condition or when the printer diagnostics were being run.
30	Illegal Exception Call - The exception handler called with a code that was not valid.
31	Processor card test failed.
32	Processor card ROS test failed.
33	Processor card RAM test failed.
34	Because of some hardware problem the software branched to a ROS location that is not used.
35	Control panel wrap test failed. Either the control panel signal lines are bad or one or more control panel switches are held down.
36	An illegal command was sent to the printer logic card.
37	A summation check error or a time-out error was sensed by the printer logic card.
38	A device processor reports unexpected preset mode.
41	No current was sensed in the the escapement motor winding during the printer tests.
43	The wrap test to the analog card 1 failed when executing the printer tests.
44	No emitter pulses sensed after an escapement motor advance had been issued and too much time has passed.

- 45 The print hammer fire was canceled because of print hammer and escapement motor timing. This error is recoverable during normal printing.
- 46 Escapement mechanism failed to reach home after the longest possible escapement move was issued.
- 47 The escapement processor did not have new print data available at the end of a print on the move. This error is also recoverable during normal printing.
- 51 No current sensed in the selection motor winding during the print test.
- 53 The wrap test to analog card 2 failed when executing the printer tests.
- 54 No emitter pulses sensed after a selection motor advance has been issued and too much time has been passed. This is checked only during the printer tests at power on or Verify.
- 55 The print hammer fire was canceled because of print hammer and selection motor timing. This error is recoverable during normal printing.
- 56 The selection mechanism failed to reach home after 32 three-step moves were issued.
- 57 Possible failure was sensed in the home sensor of the selection mechanism. After the selection motor was homed it failed to show no home on a three-step move.
- 58 A periodic check for the selection motor position detected that the motor was not in the proper position.
- 60 No print hammer impact is sensed after a specified time period following the desired impact point.
- 61 No current was sensed in the print hammer driver during the printer tests.
- 63 Hammer adaptive circuits cannot properly control the hammer impact force.
- 64 A late print hammer hit on the last character caused a recoverable error.
- 65 Print hammer feedback failure.
- 69 A failure was sensed in the ribbon area (motor or drive) during the printer test.

- 71 No current sensed in the index motor winding during the printer test.
- 73 The wrap test to the analog card 1 failed during the printer tests.
- 74 No current sensed in the cam motor driver circuit during the printer tests.
- 75 Cam motor was moved to home position but the home position was not sensed after the cam was stopped, indicating a possible driver circuit failure.
- 76 No feedback was sensed after the cam motor was started and one second passed.
- 77 Home position of the cam was sensed unexpectedly.
- 78 The wrap test to the sheet feed analog card failed when executing the BAT.
- 79 Paper was sensed under the sheet feed (paper tray 1 or paper tray 2) paper sensor at power on.
- 80 A failure was sensed in the printer logic card.
- 81 Port check failed on the printer logic card.
- 82 The wrap test through the interface processor to one of the device processors failed.
- 83 Printer mechanism initialization failed.
- 84 Response from the printer logic card to the processor card was not recognized.
- 85 A wrong response was sent from printer logic card to the processor card.
- 86 Wrap test to the printer logic card from the processor card failed.
- 87 Reset to the printer logic card did not generate the right response.
- 89 Processor card timed out waiting for a response from printer logic card.

- 8A* Printer mechanism not ready.
- 8C* Illegal test group.
- 90 USART initialization failed.
- 93 USART did not respond to the attachment processor command.
- 9A* USART loop test failed.
- 9C* A command was received from the controller that was not defined.
- 9d* Transmission error (parity error, frame error or overrun error) was sensed from the controller.
- C0* CE entered a diagnostic test number that is not valid.
- C1* Test ran correctly after correction of an escapement failure.
- C2* Test ran correctly after the print hammer caused selection synchronization error.
- C3* Test ran correctly after correction of an escapement overlap error.
- C4* Test ran correctly after correction of a selection synchronization error.
- C5* Test ran correctly after a summation check error.
- C6* Test ran correctly after a printer mechanism time-out error.
- CA* Paper status locked.
- d0* DBH error not known.
- d1* Ribbon out.
- d2* Load tractor paper.
- d3* Load paper into the sheet feed input hopper.

*Use only in the diagnostic mode.

d4* Load paper (sheet feed not installed).

d6* Command reject.

d7* Cam move error.

*Used only in the diagnostic mode.

306 MAINTENANCE STATISTICS

Maintenance statistics is information which is useful for finding intermittent printer problems and communication problems. Maintenance statistics are printed with the verify function or they can be printed in the diagnostic mode by selecting diagnostic test 22.

The maintenance statistics area is divided into a communication error section and a hardware error section. The hardware error section contains printer usage information as well as counts of several types of printer errors.

Data in the maintenance statistics printout is in 3-byte groups. The first byte in each 3-byte group is the identification label, and the last two bytes in each 3-byte group are the data; the data is always four characters in length. When looking for a specific label, always ensure that the labels follow the correct sequence. The exact location of the label and associated data may be different from the example shown.

The Send Statistics command can be used by the controller to request maintenance statistics.

	Label D2	Label D3	Label D4	Label D5	Label D6	Label C0	Label C1	Label C2	Label C3	Label D0	Label D1					
E18E	Statistics	Start	Address													
E180	5FB	79BE	6901	0000	540C	2A06	3000	C000	00C1	0000	C200	00C3	0000	D000	00D1	0000
E180	D200	00D3	0000	D400	00D5	0000	D600	00D7	0000	D800	00D9	0000	DA00	00DB	0000	DC00
E1C0	00DD	0000	DE00	00DF	009A	E000	00E1	0000	0000	0001	0000	FE00	0000	0000	0000	8005
	Label DD	Label DE	Label DF	Label E0	Label E1	Label D7	Label D8	Label D9	Label DA	Label DB	Label DC					

AU102516

Block	Label	Description
1 (USART Statistics)	C0	Count of not valid commands from the controller
	C1	USART frame error count
	C2	USART overrun error count
	C3	USART parity error count
2 (Hardware and software errors)	*D0	Error code 47 count
	*D1	Error code 64 count
	*D2	Error code 55 count
	*D3	Error code 36 count
	*D4	Error code 45 count
	D5	Error code 05 count
	D6	Sheet feed count at the second to last paper jam (only counted with the sheet feed attached)
	D7	Sheet feed count at the last paper jam
	D8	Last soft non-recoverable error and hammer count byte 0.
	D9	Hammer count bytes 1 and 2**
	DA	Second to last soft non-recoverable error and hammer count byte 0.
	DB	Hammer count bytes 1 and 2**
	DC	Last hard non-recoverable error and hammer count byte 0.
	DD	Hammer count bytes 1 and 2**
	DE	Soft non-recoverable error count
	DF	Dummy byte and total hammer count byte 0
E0	Total hammer count bytes 1 and 2	
E1	Total sheet feed count	

*Auto recoverable errors

**Hammer counts represent number of hammer fires from power-on time to the time of the error.

A description of the information located in each byte of the 18 groups in block 2 of the maintenance statistics are:

Label	Second Byte	Third Byte
D0	Low byte of count	High byte of count
D1	Low byte of count	High byte of count
D2	Low byte of count	High byte of count
D3	Low byte of count	High byte of count
D4	Low byte of count	High byte of count
D5	Low byte of count	High byte of count
D6	Low byte of count	High byte of count
D7	Low byte of count	High byte of count
D8	Last soft non-recoverable error number	Hammer count byte 0
D9	Hammer count byte 1	Hammer count byte 2
DA	Second-to-last soft non-recoverable error number	Hammer count byte 0
DB	Hammer count byte 1	Hammer count byte 2
DC	Last hard non-recoverable error number	Hammer count byte 0
DD	Hammer count byte 1	Hammer count byte 2
DE	Low byte of count	High byte of count
DF	Dummy byte (00)	Total hammer count byte 0
E0	Total hammer count byte 1	Total hammer count byte 2
E1	Low byte of total sheet feed count	High byte of total sheet feed count

A description of the information located in each byte of block 3 of the maintenance statistics is:

Block Number	Name and Description
3	Original Return Code - The last return code from a procedure that sensed a failure.
	Procedure Error Code - The last return code from a procedure that sensed a failure.
	Original Printer Mechanism Status - The last printer mechanism priority status from when the exception handler requested.
	Printer Mechanism Command Response Status Byte - The last response to a command sent by the exception handler.
	Original Error Code - The last error code generated by the exception handler.
	DMS Error Code - The last error code generated by the diagnostic menu select (DMS) module.

307 VERIFY

The verify function is the same as the power on diagnostic sequence except for the RAM check out. In the verify function only a segment of the RAM is tested and initialized so that the maintenance statistics area is not erased. When the verify function is completed, the results are sensed the same as the power on diagnostic results. If no errors are sensed, the maintenance statistics are printed.

To enter the verify function press and hold the Stop switch while pressing the Print Test switch.

308 BACKGROUND ROS TEST

When the IBM 5218 Printer is idle, the read-only storage (ROS) on the processor card is checked. This check verifies the ability of the processor card to address each ROS module and verifies the content of each module. If an error is sensed on one of the modules, that module is checked again before an error is displayed. The controller is informed of a hard non-recoverable error. Diagnostic test 28 can be used to identify the failing module.

309 PRINT TEST

The Print Test prints all petals on the print wheel. The characters are printed in alphabetic order. All alphanumeric characters are printed in the forward direction, the printer indexes, and then prints all other characters in the reverse direction.

Start the print test by pressing the Print Test switch when the printer is not ready or by running diagnostic test 20 or 21.

Print Test

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
, ± ° ½ \$ % & ' " ' : . ? _ % , # / - [;) * \$ & ! + (. % @

AU102517

310 POWER-ON DIAGNOSTIC SEQUENCE

When power is first turned on or when a verify function is run a power-on diagnostic sequence occurs. The only difference between how the power-on diagnostic sequence runs is that in the verify function only a part of the RAM is checked. This keeps the maintenance statistic area from being erased.

Processor Card Test

- The programmable peripheral interface, between the processor card and the printer logic card, is prepared, the printer mechanism is reset, and status of the control panel switches, paper handling configuration and cover open status bit is read.
- All indicators and the LED display, on the control panel, are turned on.
- Each ROS module is checked to ensure that it can be addressed.
- The random access memory (RAM) is tested.

Operator Interface Test

The events of the power on diagnostic sequence are as follows:

- The USART is initialized and made ready for communications to start.
- The control panel is checked to ensure continuity of wires from the Stop switch and the switch encoder and also checks that no switches are held down.
- All indicators except Power On, Ready and Diag Mode are turned off.

Printer Test

- The printer logic card is reset.
- The parallel data lines between the processor card and printer logic card are wrapped.
- The interface processor, on the printer logic card, is tested.
- The device processors, on the printer logic card, are tested.
- The device processor's basic assurance tests are executed.
- The printer mechanism is activated to ensure correct function of the mechanism and associated drive circuits, and then homed.

If an error is sensed during power on diagnostic, an error code will be displayed in the LED displays. If more than one error is sensed, the error with the highest priority will be displayed. The priorities, from highest to lowest are cover open, printer failure, and communication failure.

311 EXCEPTION HANDLER

Most of error handling for the IBM 5218 Printer is performed by the exception handler software module, which is located in ROS on the processor card.

The exception handler has several duties. It observes auto recoverable, soft non-recoverable, and hard non-recoverable errors. It records errors in the maintenance statistics. It displays error information on the control panel to the operator. It communicates error status to the controller and controls the printer in some error conditions so that the printer might continue printing a job.

When an error occurs in the printer, the exception handler checks to see if the error sensed is a recoverable error, a non-recoverable error, or a special error.

Error code numbers 32, 33, 90, 93, and 05 are special errors and are not processed or retried by the exception handler. All other errors are processed by the exception handler.

Error 32 indicates that the processor card ROS test failed.

Error 33 indicates that the processor card RAM test failed.

Error 90 indicates that the USART initialization failed.

Error 93 indicates that the USART failed to respond to commands from the attachment processor.

Error 05 indicates a paper jam.

312 NON-RECOVERABLE ERRORS

Non-recoverable errors are errors that might cause an error on the printed page. When the printer senses a non-recoverable error, it executes a series of diagnostic tests and then homes the escapement, cam, and selection mechanism to determine if the error is intermittent or solid. Non-recoverable are reported to the controller by the exception response ID where bit 7 is always on.

Recovery commands sent by the controller are Ready Restore and Not Ready Restore. The Ready Restore command causes the printer to initialize, clears the control panel, and runs the diagnostic test. The escapement, cam, and the selection mechanism are homed and the carrier assembly is centered. It also clears the print image data being printed from the printer storage.

The Not Ready Restore command performs all of the functions of the Ready Restore command but does not cause any mechanical movement or clear the control panel. This lets the operator look for any obvious mechanical failure and the error code for the failure.

313 SOFT NON-RECOVERABLE ERRORS

Soft non-recoverable errors are intermittent errors and are cleared by running the printer diagnostic test. The error code for the error sensed is displayed on the control panel, and the last two soft non-recoverable errors sensed and the print hammer count are logged in the maintenance statistics. When the printer receives a Restore command from the controller, the error is cleared. The printer sends the receive ready response ID indicating that the error is cleared and when the Start switch is pressed, the controller can start sending the failing page.

314 HARD NON-RECOVERABLE ERRORS

Hard non-recoverable errors are errors that are solid and will not clear when the diagnostic test is run. In this case, the error code from the diagnostic test that failed is displayed on the control panel. Most, but not all hard non-recoverable errors are sensed when a Restore command is executed. Status byte 1 and status byte 4 are read to determine the type of error.

315 RECOVERABLE ERRORS

Recoverable errors are not sensed by the operator or controller. These errors are corrected automatically by the exception handler and are logged in the maintenance statistics.

316 RESPONSE ID

The Response ID is sent automatically by the printer to the controller to report the following

- the printer status changed
- an exception condition occurred
- a switch was pressed
- the last command was received

When any of these conditions occur, the comparable bit in the Response ID is set to a 1 and sent to the controller.

The format for the Response ID is the same as that of the status byte 0 except for bit 7 and receive ready. Bit 7 is always a 0 in the response ID.

Bit	7	6	5	4	3	2	1	0
Format	0	Printer Not Ready	Receive Ready	Block Buffer Empty	Status 3 Line Check	Status 2 Switches	Status 1 Exceptions	Counter Overflow

Response ID Format

When a bit is sent by the response ID, the comparable bit is set in status byte 0. The controller interprets the Response ID as follows:

Printer Not Ready - the printer is not ready because of:

- executing the End-of-Data command
- the Stop switch being pressed
- a non-recoverable error occurred
- executing the control command 0 with the ready printer bit off.

Receive Ready - a positive response to a 2-byte command relative to its the last command received.

Block Storage Empty - this bit is a pacing response. It is returned after an Execute Block command is received and indicates that the printer is ready to receive another block of data.

Status 3 (Line Check) - This bit indicates that an exception condition occurred on the communication line. The controller may determine the type of line error by reading status byte 3.

Status 2 (Switches) - This bit indicates that an enabled switches has been pressed and that details are found in status byte 2.

Counter Overflow - This bit indicates that a maintenance statistic counter has gone over X'8000' or has wrapped to X'0000'. The controller should respond with a Send Statistics command.

Status 1 (Exception) - This bit indicates that an exception condition has taken place and that details are found in status byte 1.

The response ID may have more than one bit on at a time and it will not repeat a bit in the next response ID unless the condition repeats. If an error occurs in the transmission of the Response ID the controller can issue a Freeze Status command and request status byte 0.

317 STATUS BYTE 0

Status byte 0 describes the status of the printer at the time the Response ID is transmitted and 6 bits are a duplicate of the Response ID.

The meaning of the bits are as follows:

Printer Not Ready - This bit describes the ready condition of the printer. With this bit off the printer is ready, with it on the printer is in the not ready state. This bit will be on if one of the following occurs:

- End-of-Data command executed
- The Stop switch is pressed
- Control command 0 is executed with the printer not ready bit off
- A non-recoverable error occurred.

This bit will be off when one of the following conditions occur:

- Control command 0 is executed with the printer not ready bit on.
- The Start switch is pressed.

When this bit is on a response ID with the printer not ready bit on will be sent to the controller.

Printer Idle - This bit indicates that the printer has no work to do.

Block Storage Empty - This bit indicates that the block transfer storage is free and that the printer is ready to receive an Execute Block command. The controller is informed by the response ID with the block storage empty bit set.

Status 3 (Line Check) - This bit indicates an exception condition on the line. The controller can determine the type of error by reading status byte 3 which will reset this bit. The controller is informed of the line check by the response ID with line check set.

Status 2 (Switches) - This bit is set when any disabled switch is pressed. Status byte 2 contains the code representing the switch. The response ID indicating status 2 is sent to the controller.

Status 1 (Exception) - This bit is set when an exception occurs in the printer mechanism. Status byte 1 contains information about the exception.

Counter Overflow - This bit is set when the maintenance statistics counters reaches X'8000' or wraps to zero. It will be reset when the maintenance statistics are read.

318 STATUS BYTE 1

Status byte 1 contains information about exception conditions in the printer mechanism. When a bit in this byte is set, the exception bit in status byte 0 is set and the response ID indicating Status 1 is sent to the controller. Bit 7 of status byte 1 will always be set to 1.

Paper Out - This bit is set when the bottom edge of the paper is 38.9 mm (1.56 inch) from the current writing line.

Print Check - This bit indicates that a printer mechanism failure has occurred. The controller determines the type of error by reading status byte 4.

Ribbon Out - This bit indicates that there is enough ribbon to print a minimum of 200 characters. It is reset when a new ribbon cartridge is installed.

Cover Open - This bit is set when the operator access cover is opened. The printer will not receive any print image command with the cover open.

Command Reject - This bit is set when a valid command has been rejected, and is reset when status byte 1 is read.

Continue - This bit is set when a valid switch is sensed, and is reset when status byte 1 is read.

Status 5 - This bit is set when information has been placed in status byte 5, and is reset when status byte 5 is read.

319 STATUS BYTE 2

Status byte 2 indicates which enabled switches have been pressed. When any bit in this byte is set the switch bit in status byte 2 is set and a response ID is sent to the controller indicating status 2. Bit 7 of this byte is always set to 1.

Bit 0 = Cancel switch
Bit 1 = Paper UP switch
Bit 2 = Stop switch
Bit 3 = Start switch
Bit 4 = Print Test switch
Bit 5 = Paper Down switch
Bit 6 = Load switch

320 STATUS BYTE 3

Status byte 3 describes the reason for line check (bit 3, status 0).

Bits 0,1,2, and 6		Reserved
Bit 3	=	Parity error
Bit 4	=	Overrun error
Bit 5	=	Frame error

321 STATUS BYTE 4

Status byte 4 describes print check (bit 1, status 1). It can be read when the receive ready condition is present but the data is only valid when the exception bit is set in status byte 1. Byte 6 of status byte 4 is used for intervention required.

Bit	7	6	5	4	3	2	1	0	
	1		1	0	0	0	1	0	Power on diagnostic failure
	1		1	0	0	0	1	1	Processor card failure
	1		1	0	0	1	0	0	Escapement failure
	1		1	0	0	1	0	1	Selection failure
	1		1	0	0	1	1	0	Hammer/Ribbon failure
	1		1	0	0	1	1	1	Index/sheet feed failure
	1		1	0	1	0	0	0	Printer logic failure
	1		1	0	1	0	0	1	Communication failure
	1		1	1	0	0	0	0	Cancel switch interrupt
	1		1	1	0	0	0	1	Paper jam
	1		1	1	0	0	1	0	Unexpected cover open
	1		0	0	0	0	1	1	Processor card intermittent failure
	1		0	0	0	1	0	0	Escapement intermittent failure
	1		0	0	0	1	0	1	Selection intermittent failure
	1		0	0	0	1	1	0	Hammer/Ribbon intermittent failure
	1		0	0	0	1	1	1	Index/sheet feed intermittent failure
	1		0	0	1	0	0	0	Printer logic intermittent failure
	1		0	0	1	0	0	1	Communication intermittent failure
	1		0	1	0	0	0	1	Paper trays empty
	1		0	0	0	0	0	1	POR console failure
	1		0	0	0	0	1	0	POR paper sensor check

322 STATUS BYTE 5

Status byte 5 is set by executing an Echo command. It will cause the lower seven bits of the command to be placed in the low-order 7 bits of the status byte.

323 RULES FOR USING MAPS

MAPs are used to diagnose single failures with symptoms that remain constant. MAPs used in this way should identify a failing FRU. Also, MAPs can be used to isolate single problems where the failure symptom is not constant.

Always probe all lines indicated by a MAP. Observe and record status of each line before answering the question that follows in the MAP.

The MAPs describe how to operate the switches needed to answer the MAP questions. All switches and indicators are named in the MAPs the same way that they are shown on the control panel unless you are in the diagnostic mode. In the diagnostic mode the switches and indicators are named in the MAPs the way that they are shown in Paragraph 301.

You should observe the following procedures when using the IBM 5218 Printer MAPs:

1. Always analyze and record, for future reference any unusual noise or distinct error. If any printer part is broken, repair or exchange that part before continuing with the MAPs. If the cause of the failure cannot be easily determined, go to the State of Call MAP 0010 to analyze the problem.
2. Always power off and wait 30 seconds before removing or installing a fuse, card, board, or cable.
3. Always power off and wait 30 seconds before making resistance checks.
4. All voltage measurements must be made with power on, if not instructed differently. When the MAPs direct you to a service check, and the service check isolates the problem, use the adjustments or the removal/replacement procedure to repair the problem. If the service check does not isolate the problem, or you cannot complete the service check, return to the MAP that sent you to the service check. Ensure that the printer is in the same condition when returning to the MAPs as when you left the MAPs.

5. When a MAP indicates that a card, board, or cable is bad, do the following:
 - a. Inspect the card and socket, then reseal the card and run the diagnostic test that failed.
 - b. Check for correct voltage to the failing card or board.
 - c. Remove the bad card, board, or cable; install a good one, and run the diagnostic test that failed.
 - d. If the FRUs listed in the MAPs are separated by or; exchange the FRUs in the order listed. If the FRUs listed in the MAPs are separated by and; exchange all the FRUs at the same time.
6. If the diagnostic test still fails, do the following:
 - a. Exchange the remaining FRUs called out in the FRUs Tested section of the MAP.
 - b. Go to the Printer Intermittent Failures MAP for possible alternate failure or intermittent failures.
7. After you diagnose and repair a problem, run the diagnostic test or MAP that failed and verify printer operation by going to the Start of Call MAP and going through the good machine path.

324 EBCDIC TABLES

The code set used by the IBM 5218 Printer for representation of print characters are shown below. The hexadecimal representation graphic symbol and name of each character in the range of X'40' to X'FF' is listed.

LISTING OF EBCDIC SYMBOLS 256

Column	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Row Bit-Pat. ↓	00				01				10				11			
	00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11
0	0000				SP	&	-	ø	ø	°	μ	é	{	}	\	0
1	0001				RSP	é	/	É	a	j	~	£	A	J	NSP	1
2	0010				â	ê	Â	Ê	b	k	s	≠	B	K	S	2
3	0011				ä	ë	Ä	Ë	c	l	t	Pts	C	L	T	3
4	0100				à	è	À	È	d	m	u	f	D	M	U	4
5	0101				á	í	Á	Í	e	n	v	§	E	N	V	5
6	0110				ã	î	Ã	Î	f	o	w	¶	F	O	W	6
7	0111				ä	ï	Ä	Ï	g	p	æ	¼	G	P	X	7
8	1000				ç	ì	Ç	Ì	h	q	y	½	H	Q	Y	8
9	1001				ñ	β	Ñ	`	i	r	z	¾	I	R	Z	9
A	1010				[	]	:	:	<<	ä	i	¬	SHY	ı	²	³
B	1011				.	\$	,	#	>>	ö	ı	|	ô	û	ô	û
C	1100				<	*	%	@	đ	æ	ð	-	ö	ü	ö	ü
D	1101				(	)	-	°	ý	ı	ý	¨	ò	ù	ò	ù
E	1110				+	;	>	=	þ	Æ	ƒ	'	ó	ú	ó	ú
F	1111				!	^	?	"	±	⊗	®	=	õ	ÿ	õ	EO

Identifier 256

AU102131

LISTING OF EBCDIC SYMBOLS 256 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
40	SP	Space	50	&	Ampersand
41	RSP	Required Space	51	é	e Acute, Small
42	â	a Circumflex, Small	52	ê	e Circumflex, Small
43	ä	a Diaeresis, Small	53	ë	e Diaeresis, Small
44	à	a Grave, Small	54	è	e Grave, Small
45	á	a Acute, Small	55	í	i Acute, Small
46	ã	a Tilde, Small	56	î	i Circumflex, Small
47	å	a Overcircle, Small	57	ï	i Diaeresis, Small
48	ç	c Cedilla, Small	58	ì	i Grave, Small
49	ñ	n Tilde, Small	59	β	Sharpe s
4A	[	Opening Bracket	5A	]	Closing Bracket
4B	.	Period	5B	\$	Dollar Sign
4C	<	Less Than Sign	5C	*	Asterisk
4D	(	Opening Parenthesis	5D	)	Closing Parenthesis
4E	+	Plus Sign	5E	;	Semicolon
4F	!	Exclamation Point	5F	^	Circumflex Accent

AU102132

LISTING OF EBCDIC SYMBOLS 256 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
60	-	Minus Sign, Hyphen	70	ø	o Slash, Small
61	/	Slash	71	É	E Acute, Cap.
62	Â	A Circumflex, Cap.	72	Ê	E Circumflex, Cap.
63	Ä	A Diaeresis, Cap.	73	Ë	E Diaeresis, Cap.
64	À	A Grave, Cap.	74	È	E Grave, Cap.
65	Á	A Acute, Cap.	75	Í	I Acute, Cap.
66	Ã	A Tilde, Cap.	76	Î	I Circumflex, Cap.
67	Å	A Overcircle, Cap.	77	Ï	I Diaeresis, Cap.
68	Ç	C Cedilla, Cap.	78	Ì	I Grave, Cap.
69	Ñ	N Tilde, Cap.	79	`	Grave Accent
6A	;	Vertical Line	7A	:	Colon
6B	,	Comma	7B	#	Number Sign
6C	%	Percent Sign	7C	@	At Sign
6D	_	Underscore	7D	'	Apostrophe
6E	>	Greater Than Sign	7E	=	Equal Sign
6F	?	Question Mark	7F	"	Quotation Mark

AU102133

LISTING OF EBCDIC SYMBOLS 256 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
80	Ø	O Slash, Cap.	90	°	Degree, Overcircle
81	a	a, Small	91	j	j, Small
82	b	b, Small	92	k	k, Small
83	c	c, Small	93	l	l, Small
84	d	d, Small	94	m	m, Small
85	e	e, Small	95	n	n, Small
86	f	f, Small	96	o	o, Small
87	g	g, Small	97	p	p, Small
88	h	h, Small	98	q	q, Small
89	i	i, Small	99	r	r, Small
8A	<<	Opening Quote, European	9A	ā	a Underscore, Small
8B	>>	Closing Quote, European	9B	ō	o Underscore, Small
8C	ð	d, Icelandic, Small	9C	æ	ae Diphthong, Small
8D	ý	Y Acute, Small	9D	¸	Cedilla
8E	þ	Thorn, Small	9E	Æ	AE Diphthong, Cap.
8F	±	Plus Minus Sign	9F	₣	International Currency Symbol

AU102135

LISTING OF EBCDIC SYMBOLS 256 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
A0	μ	Micro, Mu	B0	¢	Cent Sign
A1	~	Tilde Accent	B1	£	Pound Sign, Lira
A2	s	s, Small	B2	¥	Yen Sign
A3	t	t, Small	B3	Pts	Peseta
A4	u	u, Small	B4	f	Florin, Guilder
A5	v	v, Small	B5	§	Section Sign
A6	w	w, Small	B6	¶	Paragraph Sign
A7	x	x, Small	B7	¼	One Quarter
A8	y	y, Small	B8	½	One Half
A9	z	z, Small	B9	¾	Three Quarters
AA	¡	Spanish Opening Exclamation Point	BA	¬	Logical NOT
AB	¿	Spanish Opening Question Mark	BB	|	Logical OR
AC	Ð	D Stroke, Cap.	BC	—	Overbar
AD	Ÿ	Y Acute, Cap	BD	¨	Diaeresis, Umlau Accent
AE	Ð	Thorn, Cap.	BE	'	Acute Accent
AF	®	Circle R	BF	=	Double Underscore

AU102136

LISTING OF EBCDIC SYMBOLS 256 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
C0	{	Opening Brace	D0	}	Closing Brace
C1	A	A, Cap.	D1	J	J, Cap.
C2	B	B, Cap.	D2	K	K, Cap.
C3	C	C, Cap.	D3	L	L, Cap.
C4	D	D, Cap.	D4	M	M, Cap.
C5	E	E, Cap.	D5	N	N, Cap.
C6	F	F, Cap.	D6	O	O, Cap.
C7	G	G, Cap.	D7	P	P, Cap.
C8	H	H, Cap.	D8	Q	Q, Cap.
C9	I	I, Cap.	D9	R	R, Cap.
CA	SHY	Syllable Hyphen	DA	ı	ı Dotless, Small
CB	ô	o Circumflex, Small	DB	û	u Circumflex, Small
CC	ö	o Diaeresis, Small	DC	ü	u Diaeresis, Small
CD	ò	o Grave, Small	DD	ù	u Grave, Small
CE	ó	o Acute, Small	DE	ú	u Acute, Small
CF	õ	o Tilde, Small	DF	ÿ	y Diaeresis, Small

AU102137

LISTING OF EBCDIC SYMBOLS 256 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
E0	\	Reverse Slash	F0	0	Zero
E1	NSP	Numeric Space	F1	1	One
E2	S	S, Cap.	F2	2	Two
E3	T	T, Cap.	F3	3	Three
E4	U	U, Cap.	F4	4	Four
E5	V	V, Cap.	F5	5	Five
E6	W	W, Cap.	F6	6	Six
E7	X	X, Cap.	F7	7	Seven
E8	Y	Y, Cap.	F8	8	Eight
E9	Z	Z, Cap.	F9	9	Nine
EA	²	Two, Superscript	FA	³	Three, Superscript
EB	Ô	O Circumflex, Cap.	FB	Û	U Circumflex, Cap.
EC	Ö	O Diaeresis, Cap.	FC	Ü	U Diaeresis, Cap.
ED	Ò	O Grave, Cap.	FD	Ù	U Grave, Cap.
EE	Ó	O Acute, Cap.	FE	Ú	U Acute, Cap.
EF	Õ	O Tilde, Cap.	FF	EO	Eight Ones

AU102138

LISTING OF EBCDIC SYMBOLS 258

Column	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
Row	Bit-Pat. ↓	00				01				10				11			
		00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11
0	0000					SP	&	-		°	μ	.	{	}	\	0	
1	0001					RSP	é	/	É	a	j	~	£	A	J	NSP	1
2	0010					â	ê	Â	Ê	b	k	s		B	K	S	2
3	0011					ä	ë	Ä	Ë	c	l	t		C	L	T	3
4	0100					à	è	À	È	d	m	u		D	M	U	4
5	0101					á	í	Á	Í	e	n	v	§	E	N	V	5
6	0110					â	î	Ë	Î	f	o	w		F	O	W	6
7	0111					ä	ï	Ä	Ï	g	p	x		G	P	X	7
8	1000					ç	ì	Ç	Ì	h	q	y	½	H	Q	Y	8
9	1001					ç	ï	Ç	Ï	i	r	z		I	R	Z	9
A	1010					[	]	:	:					SHY	1	2	3
B	1011					.	\$	.	#					ô	û	ô	û
C	1100					<	*	%	@	¢		Ð		ö	ü	Ö	Ü
D	1101					(	)	-	'	'	'	'	'	ò	ù	Ò	Ù
E	1110					+	;	>	=	÷	ℓ	'n	'	ó	ú	Ó	Ú
F	1111					!	^	?	"	§	⌘	§	†		T		EO

Identifier 258

AU102139

LISTING OF EBCDIC SYMBOLS 258 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
40	SP	Space	50	&	Ampersand
41	RSP	Required Space	51	é	e Acute, Small
42	â	a Circumflex, Small	52	ê	e Circumflex, Small
43	ä	a Diaeresis, Small	53	ë	e Diaeresis, Small
44	à	a Grave, Small	54	è	e Grave, Small
45	á	a Acute, Small	55	í	i Acute, Small
46	á	a Breve, Small	56	î	i Circumflex, Small
47	â	a Overcircle, Small	57	ï	i Diaeresis, Small
48	ç	c Cedilla, Small	58	ì	i Grave, Small
49	ğ	g Breve, Small	59	ï	I Overdot, Cap.
4A	[	Opening Bracket	5A	]	Closing Bracket
4B	.	Period	5B	\$	Dollar Sign
4C	<	Less Than Sign	5C	*	Asterisk
4D	(	Opening Parenthesis	5D	)	Closing Parenthesis
4E	+	Plus Sign	5E	;	Semicolon
4F	!	Exclamation Point	5F	^	Circumflex Accent

AU102140

LISTING OF EBCDIC SYMBOLS 258 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
60	-	Minus Sign, Hyphen	70	É	E Acute, Cap.
61	/	Slash	71	Ê	E Circumflex, Cap.
62	Â	A Circumflex, Cap.	72	Ë	E Diaeresis, Cap.
63	Ä	A Diaeresis, Cap.	73	È	E Grave, Cap.
64	À	A Grave, Cap.	74	Í	I Acute, Cap.
65	Á	A Acute, Cap.	75	Î	I Circumflex, Cap.
66	Ả	A Breve, Cap.	76	Ï	I Diaeresis, Cap.
67	Å	A Overcircle, Cap.	77	Ì	I Grave, Cap.
68	Ç	C Cedilla, Cap.	78	˘	Grave Accent
69	Ġ	G Breve, Cap.	79	:	Colon
6A	|	Vertical Line	7A	#	Number Sign
6B	,	Comma	7B	@	At Sign
6C	%	Percent Sign	7C	'	Apostrophe
6D	_	Underscore	7D	=	Equal Sign
6E	>	Greater Than Sign	7E	"	Quotation Mark
6F	?	Question Mark	7F		

AU102141

LISTING OF EBCDIC SYMBOLS 258 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
80			90	°	Degree, Overcircle
81	a	a, Small	91	j	j, Small
82	b	b, Small	92	k	k, Small
83	c	c, Small	93	l	l, Small
84	d	d, Small	94	m	m, Small
85	e	e, Small	95	n	n, Small
86	f	f, Small	96	o	o, Small
87	g	g, Small	97	p	p, Small
88	h	h, Small	98	q	q, Small
89	i	i, Small	99	r	r, Small
8A			9A		
8B			9B		
8C	đ	d Stroke, Small	9C		
8D			9D	ſ	Cedilla, Sedila
8E	÷	Divide Sign	9E	ℓ	Liter
8F	§	s Sedila, Small	9F	⌘	International Currency Symbol

AU102142

LISTING OF EBCDIC SYMBOLS 258 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
A0	μ	Micro, Mu	B0	·	Overdot Accent
A1	~	Tilde Accent	B1	£	Pound Sign, Lira
A2	s	s, Small	B2		
A3	t	t, Small	B3		
A4	u	u, Small	B4		
A5	v	v, Small	B5	§	Section Sign
A6	w	w, Small	B6		
A7	x	x, Small	B7		
A8	y	y, Small	B8	½	One Half
A9	z	z, Small	B9		
AA			BA		
AB			BB		
AC	Ð	D Stroke, Cap.	BC		
AD			BD	¨	Diaeresis Accent
AE	'n	Apostrophe n, Small	BE	'	Acute Accent
AF	§	S Sedila, Cap.	BF	t	t Sedila, Small

AU102143

LISTING OF EBCDIC SYMBOLS 258 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
C0	{	Opening Brace	D0	}	Closing Brace
C1	A	A, Cap.	D1	J	J, Cap.
C2	B	B, Cap.	D2	K	K, Cap.
C3	C	C, Cap.	D3	L	L, Cap.
C4	D	D, Cap.	D4	M	M, Cap.
C5	E	E, Cap.	D5	N	N, Cap.
C6	F	F, Cap.	D6	O	O, Cap.
C7	G	G, Cap.	D7	P	P, Cap.
C8	H	H, Cap.	D8	Q	Q, Cap.
C9	I	I, Cap.	D9	R	R, Cap.
CA	SHY	Syllable Hyphen	DA	ı	i Dotless, Small
CB	ô	o Circumflex, Small	DB	û	u Circumflex, Small
CC	ö	o Diaeresis, Small	DC	ü	u Diaeresis, Small
CD	ò	o Grave, Small	DD	ù	u Grave, Small
CE	ó	o Acute, Small	DE	ú	u Acute, Small
CF			DF	ŧ	T Sedila, Cap.

AU102144

LISTING OF EBCDIC SYMBOLS 258 (Continued)

Hex	Graphic	Name	Hex	Graphic	Name
E0	\	Reverse Slash	F0	0	Zero
E1	NSP	Numeric Space	F1	1	One
E2	S	S, Cap.	F2	2	Two
E3	T	T, Cap.	F3	3	Three
E4	U	U, Cap.	F4	4	Four
E5	V	V, Cap.	F5	5	Five
E6	W	W, Cap.	F6	6	Six
E7	X	X, Cap.	F7	7	Seven
E8	Y	Y, Cap.	F8	8	Eight
E9	Z	Z, Cap.	F9	9	Nine
EA	²	Two, Superscript	FA	³	Three, Superscript
EB	Ô	O Circumflex, Cap.	FB	Û	U Circumflex, Cap.
EC	Ö	O Diaeresis, Cap.	FC	Ü	U Diaeresis, Cap.
ED	Ò	O Grave, Cap.	FD	Ù	U Grave, Cap.
EE	Ó	O Acute, Cap.	FE	Ú	U Acute, Cap.
EF			FF	EO	Eight Ones

AU102145

LISTING OF EBCDIC SYMBOLS 259

		High Half-Byte															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Low Half-Byte	Bit →																
	↑ Pattern	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL				SP	≡	.	∩	=	α/∞	≡	∅	{	}	\	°
1	0001					RSP	'	≡	U	α	∅	~	1	∇	=	NSP	1
2	0010					"	<	∇	C	β	κ	σ	2	∞	§	Σ	2
3	0011			WUS	IRE	'	>	∧	∩	ψ	ω	τ	3	ψ	Ω	→	3
4	0100					+	R	∥	∅	Φ	μ	ξ	4	Φ	∅	∅	4
5	0101	HT	CRE	INX		"	ε	∠	L	e	v	X	5	←	~	α	5
6	0110	RCR	BS		NBS	π	∴	<	'	π	∅	δ	6	Π	↓	Δ	6
7	0111					Δ	∫	>	'	λ	ρ	X	7	∧	∅	≡	7
8	1000				SBC	→	∫	∫	∪	η	T	U	8	∫	Γ	T	8
9	1001	SPS			IT	/	≠	∩	\	∫	θ	ξ	9	↑	Θ	≡	9
A	1010	RPT	UBS	SW	RPE	[	]	|	+	Γ	T	∫	∫	SHY	∅	~	∅
B	1011			MBC		†	∅	∅	±	∫	+	∫	∅	∅	∅	∫	1/8
C	1100	PE				<	≠	∅	°	L	∫	∫	∅	∫	∫	∫	3/8
D	1101	ZIRC				(	)	-	'	'	TM	-	∫	∅	-	∫	5/8
E	1110					©	"	>	"	'	∫	∫	∫	∫	∫	∫	7/8
F	1111			STP	SUB	√	∫	∫	@	∫	∫	∫	∫	∫	∫	∫	

AU102146

LISTING OF EBCDIC SYMBOLS 259 (Continued)

CODE POINT	GRAPHIC	DESCRIPTION
40		Space
41		Required space
42	=	Superscript equal
43	-	Superscript minue
44	+	Superscript plus
45	∞	Superscript infinity
46	π	Superscript pi
47	Δ	Superscript delta
48	→	Superscript right arrow
49	/	Superscript diagonal
4A	{	Left bracket
4B	†	Dagger
4C	<	Less than
4D	(	Left parenthesis
4E	©	Copyright
4F	√	Radical
50	≤	Less than or equal to (may be printed as ≤ or as ≧)
51	¯	Short overbar (also called macron)
52	⟨	Superscript left square parenthesis
53	⟩	Superscript right square parenthesis
54	℞	Prescription (also called Recipe or Receipt)
55	∉	Is not an element
56	∴	Therefore
57	↗	Increase
58	↘	Decrease
59	‡	Double dagger
5A	]	Right bracket
5B	•	Bullet (also called multiply sign)
5C	≠	Not equal
5D	)	Right parenthesis
5E	¨	Diaeresis
5F	ˆ	Circumflex
60	·	Hyphen (also called minus sign)
61	≥	Greater than or equal to (may also be printed ≥ or ≤)
62	∨	Or
63	∧	And (may also be printed as &)
64	∥	Parallel
65	∟	Anfle (may also be printed as ⊥)
66	⟨	Left square parenthesis
67	⟩	Right square parenthesis
68	±	Minus or plus
69	◻	Lozenge
6A	|	Vertical line
6B	♀	Female
6C	♂	Male
6D	˘	Underscore
6E	>	Greater than
6F	∫	Integral

AU102147C

LISTING OF EBCDIC SYMBOLS 259 (Continued)

CODE POINT	GRAPHIC	DESCRIPTION
70	\cap	Intersection (also called logical product)
71	\cup	Union (also called logicam sum)
72	\subset	Is included in (also called is subset of) (may also be printed \subseteq)
73	\supset	Includes (also called is superset of) (may also be printed \supseteq)
74	\oplus	Circle plus (also called direct sum)
75	\perp	Right angle
76	\smile	Smoothe breathing
77	\frown	Rough breathing
78	\breve	Breve
79	\diagdown	Grave
7A	\div	Divide sign
7B	\pm	Plus or minus
7C	$^\circ$	Degree (also called overcircle)
7D	$'$	Acute
7E	$"$	Seconds (also may be printed as s)
7F	$\text{\textcircled{R}}$	Registered trademark
80	$\overline{\overline{\quad}}$	Double overbar
81	α	Alpha (lc)
82	β	Beta (lc)
83	ψ	Psi (lc)
84	Φ	Phi (lc) (may also be printed ϕ)
85	ϵ	Epsilon (lc) (also called element)
86	π	Pi (lc)
87	λ	Lambda (lc)
88	η	Eta (lc)
89	ι	Iota (lc)
8A	\ulcorner	Upper left box corner
8B	\lrcorner	Left middle box side
8C	\llcorner	Lower left box corner
8D	$'$	Minutes
8E	$($	Upper left parenthesis
8F	$($	Lower left parenthesis
90	o/oo	Pro mile
91	ϑ	Script theta (also called modern theta)
92	κ	Kappa (lc)
93	ω	Omega (lc)
94	μ	Mu (lc)
95	ν	Nu (lc)
96	\omicron	Omicron (lc)
97	ρ	Rho (lc)
98	Υ	Gamma (lc)
99	θ	Theta (lc)
9A	\top	Middle box top
9B	$+$	Box cross
9C	\perp	Middle box bottom
9D	TM	Trademark
9E	$)$	Upper right parenthesis
9F	$)$	Lower right parenthesis

AU102147A

LISTING OF EBCDIC SYMBOLS 259 (Continued)

CODE POINT	GRAPHIC	DESCRIPTION
A0	\cong	Congruent
A1	~	Tilde
A2	σ	Sigma (lc)
A3	τ	Tau (lc)
A4	ξ	Xi (lc)
A5	X	Multiply sign
A6	δ	Delta (lc)
A7	χ	Chi (lc)
A8	U	Upsilon (lc)
A9	ζ	Zeta (lc)
AA	┐	Upper right box corner
AB	┌	Middle right box side
AC	└	Lower right box corner (also called continued product)
AD	—	Throughscore
AE	┌	Upper left/lower right brace
AF	└	Lower left/upper right brace
B0	0	Subscript 0
B1	1	Subscript 1
B2	2	Subscript 2
B3	3	Subscript 3
B4	4	Subscript 4
B5	5	Subscript 5
B6	6	Subscript 6
B7	7	Subscript 7
B8	8	Subscript 8
B9	9	Subscript 9
BA	⊥	Perpendicular
BB	⊕	Total
BC	●	Closed circle (also called large bullet)
BD	£	Pound sterling
BE	⌘	International monetary symbol
BF	¥	Yen
C0	{	Left brace
C1	∇	Delta (also called Del or Nabla)
C2	∞	Infinity
C3	Ψ	Psi (uc)
C4	Φ	Phi (uc)
C5	←	Left arrow
C6	Π	Pi (uc)
C7	Λ	Lambda (uc)
C8	¶	Paragraph
C9	↑	Up arrow
CA	·	Syllable hyphen
CB	◆	Solid diamond
CC	┘	OCR Hook
CD	o	Beaker (also called bottle)
CE	⋈	OCR Fork
CF	b	Blank substitute

AU102147D

LISTING OF EBCDIC SYMBOLS 259 (Continued)

CODE POINT	GRAPHIC	DESCRIPTION
D0	}	Right brace
D1	=	Double underscore
D2	§	Section
D3	Ω	Omega (uc)
D4	∂	Partial differential
D5	~	Sine
D6	↓	Down arrow
D7	ℓ	Script ell (lc)
D8	Γ	Gamma (uc)
D9	Θ	Theta (uc)
DA	□	Open box (also called square)
DB	■	Closed box
DC	⊠	Cancelled box
DD	—	Over bar
DE	∑	Upper summation
DF	∑	Lower summation
E0	\	Reverse slash
E1		Numeric space
E2	Σ	Sigma (uc)
E3	→	Right arrow
E4	ϖ	Xi (uc)
E5	∝	Varies directly as (also called is directly proportional to)
E6	Δ	Delta (uc)
E7	≡	Identical with (also called equivalent to)
E8	Υ	Upsilon (uc)
E9	≈	Approximately equals (may also be printed ≈)
EA	~	Cycle (also called similar and called equivalent)
EB	¬	Logical not
EC	⌘	OCR Chair
ED	▲	Solid triangle
EE	∫	Upper integral
EF	∫	Lower integral
F0	0	Superscript zero
F1	1	Superscript one
F2	2	Superscript two
F3	3	Superscript three
F4	4	Superscript four
F5	5	Superscript five
F6	6	Superscript six
F7	7	Superscript seven
F8	8	Superscript eight
F9	9	Superscript nine
FA	0	Slash zero
FB	1/8	One-eighth
FC	3/8	Three-eighths
FD	5/8	Five-eighths
FE	7/8	Seven-eighths
FF		Eight ones

AU102147B

325 DECIMAL/HEXADECIMAL INTEGER CONVERSION CHART

This chart is used to convert decimal numbers to hexadecimal and hexadecimal numbers to decimal.

The chart covers the range of integers from 0000 to 4095. Additional instructions are provided to convert decimal and hexadecimal numbers beyond this range.

An additional chart, form X26-1588-0, is used to count fractions in the range of 0.00000000 to 0.99975586.

The tables are used to convert decimal numbers to hexadecimal and hexadecimal numbers to decimal. In the descriptions that follow, the explanation of each step is followed by an example in parentheses.

Decimal to Hexadecimal Conversion. Locate the decimal number (0489) in the body of the table. The two high-order digits (1E) of the hexadecimal number are in the left column on the same line, and the low-order digit (9) is at the top of the column. Thus, the hexadecimal number 1E9 is equal to the decimal number 0489.

Hexadecimal to Decimal Conversion. Locate the first two digits (1E) of the hexadecimal number (1E9) in the left column. Follow the line of figures across the page to the column headed by the low-order digit (9). The decimal number (0489) located at the junction of the horizontal line and the vertical column is the equivalent of the hexadecimal number.

The chart below gives the decimal, binary, and hexadecimal coding for the full range of four binary bits, from zero through F_{16} and 15_{10} .

Dec	Bin	Hex	Dec	Bin	Hex
0	0000	0	8	1000	8
1	0001	1	9	1001	9
2	0010	2	10	1010	A
3	0011	3	11	1011	B
4	0100	4	12	1100	C
5	0101	5	13	1101	D
6	0110	6	14	1110	E
7	0111	7	15	1111	F

0000 to 0319 Decimal
000 to 13F Hexadecimal

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	0000	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	0011	0012	0013	0014	0015
01	0016	0017	0018	0019	0020	0021	0022	0023	0024	0025	0026	0027	0028	0029	0030	0031
02	0032	0033	0034	0035	0036	0037	0038	0039	0040	0041	0042	0043	0044	0045	0046	0047
03	0048	0049	0050	0051	0052	0053	0054	0055	0056	0057	0058	0059	0060	0061	0062	0063
04	0064	0065	0066	0067	0068	0069	0070	0071	0072	0073	0074	0075	0076	0077	0078	0079
05	0080	0081	0082	0083	0084	0085	0086	0087	0088	0089	0090	0091	0092	0093	0094	0095
06	0096	0097	0098	0099	0100	0101	0102	0103	0104	0105	0106	0107	0108	0109	0110	0111
07	0112	0113	0114	0115	0116	0117	0118	0119	0120	0121	0122	0123	0124	0125	0126	0127
08	0128	0129	0130	0131	0132	0133	0134	0135	0136	0137	0138	0139	0140	0141	0142	0143
09	0144	0145	0146	0147	0148	0149	0150	0151	0152	0153	0154	0155	0156	0157	0158	0159
0A	0160	0161	0162	0163	0164	0165	0166	0167	0168	0169	0170	0171	0172	0173	0174	0175
0B	0176	0177	0178	0179	0180	0181	0182	0183	0184	0185	0186	0187	0188	0189	0190	0191
0C	0192	0193	0194	0195	0196	0197	0198	0199	0200	0201	0202	0203	0204	0205	0206	0207
0D	0208	0209	0210	0211	0212	0213	0214	0215	0216	0217	0218	0219	0220	0221	0222	0223
0E	0224	0225	0226	0227	0228	0229	0230	0231	0232	0233	0234	0235	0236	0237	0238	0239
0F	0240	0241	0242	0243	0244	0245	0246	0247	0248	0249	0250	0251	0252	0253	0254	0255
10	0256	0257	0258	0259	0260	0261	0262	0263	0264	0265	0266	0267	0268	0269	0270	0271
11	0272	0273	0274	0275	0276	0277	0278	0279	0280	0281	0282	0283	0284	0285	0286	0287
12	0288	0289	0290	0291	0292	0293	0294	0295	0296	0297	0298	0299	0300	0301	0302	0303
13	0304	0305	0306	0307	0308	0309	0310	0311	0312	0313	0314	0315	0316	0317	0318	0319

To convert a four-digit hexadecimal number to decimal, determine the decimal value of the three low-order hexadecimal digits in the main table, and add the value for the high-order digit, as shown in the chart below.

Hex	Dec	Hex	Dec
1000	4096	9000	36864
2000	8192	A000	40960
3000	12288	B000	45056
4000	16384	C000	49152
5000	20480	D000	53248
6000	24576	E000	57344
7000	28672	F000	61440
8000	32768		

For conversion of decimal values beyond the main table, deduct the largest number in the chart above that will yield a positive result. The related digit is the high-order hexadecimal digit. Determine the three remaining hexadecimal digits by converting the product of the above subtraction in the main table.

AU101709

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PREVENTIVE MAINTENANCE

No scheduled preventive maintenance is needed for the IBM 5218 Printer. Perform preventive maintenance at the time of a service call.

- Clean the platen, feed rollers, paper bail rollers, ribbon feed belt, and ribbon belt rollers.
- Use a thin film of IBM No. 10 oil over the full length of the lead screw.

Use lubrication only in quantities enough to lubricate the specified area.

Take special care to prevent lubrication from touching the platen, feed rollers, paper bail rollers, or ribbon drive belt.

Use the specified lubricant only at the first installation of the following hardware.

IBM No. 23 grease for:

- Cam motor worm
- Cam motor worm gear
- Cam gear
- Cam follower
- Spring comb pivots
- Paper bail pivots
- Worm gear stud
- Ribbon lift pivot and guide stud
- Drive stud
- Cam stud
- Carrier body adjustment screw
- Front cover screw

Use IBM No. 10 oil for:

- Platen bushing
- Cam motor
- Working length of lead screw
- Leadscrew bearing

TOOLS AND TEST EQUIPMENT

Tools and test equipment needed to service the IBM 5218 Printer are listed below:

- Print alignment tool
- Cover adjustment tool
- Standard CE tool kit
- Metric tool kit
- Communication wrap plug
- Diagnostic jumpers

PRINT ALIGNMENT TOOL

The print alignment tool is a special tool designed for the IBM 5218 Printer. The tool is needed to perform some of the adjustments in the printer mechanism. Order part number 1495090.

COVER ADJUSTMENT TOOL

The cover adjustment tool is a special tool shipped with each IBM 5218 Printer that is used to adjust the printer to the covers, print wheel hub and the ribbon cartridge holder. Order part number 1495347.

STANDARD CE TOOL KIT

Tools normally used by the CE are in this kit.

METRIC TOOL KIT

Order part number 1749235

COMMUNICATION WRAP PLUG

The communication wrap plug is used to verify the ability of the IBM 5218 Printer to send and receive data. It can check both the printer and cable to the controller. Order part number 1494851.

DIAGNOSTIC JUMPERS

Order part number 829118, 450 mm (18 inches) female. Order part number 1470857, 450 mm (18 inches) male.

INTRODUCTION

The IBM 5218 Printer is daisy wheel printer that prints left-to-right or right-to-left. The IBM 5218 Printer is available in two models. The IBM 5218 A01 Printer prints at 40 characters per second, supplies no feedback from the escapement motor, and senses the left margin by a left margin switch mounted on the left side plate. The IBM 5218 A02 Printer prints at 60 characters per second, has an optical feedback encoder on the escapement motor, and senses the left margin through the feedback supplied by the escapement motor. Except for these differences, both printers operate the same.

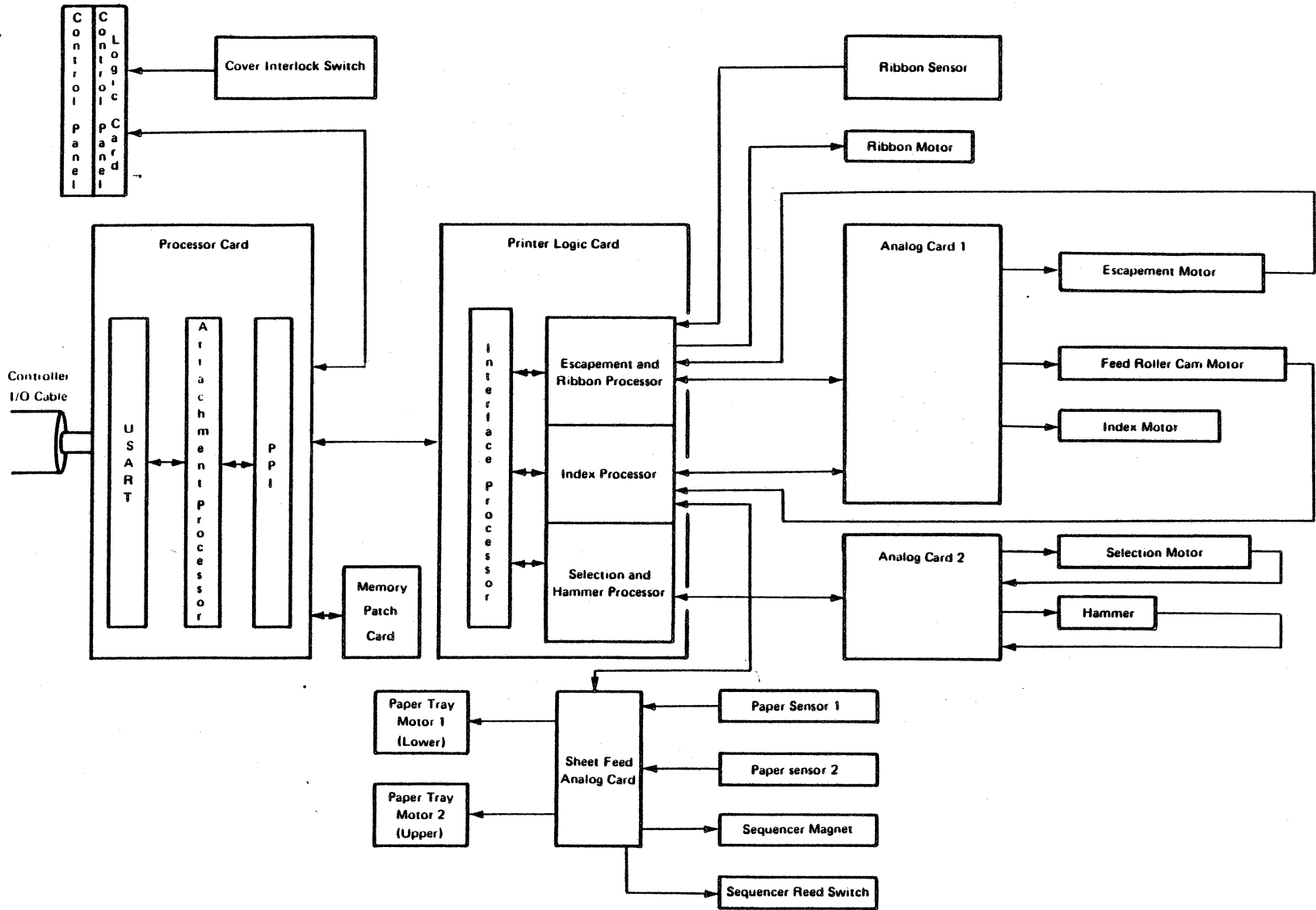
The printer is designed for table top use and has a stand-alone maintenance package.

The IBM 5218 Printer is made up of the printer mechanism, power supply, distribution board, control panel, two analog cards, processor card, printer logic card, and a memory patch card.

The printer mechanism control and logic voltages are supplied in the IBM 5218 Printer. The data and control signals are received on a cable from the controller.

The IBM 5218 Printer does the following:

- Supports 10 pitch, 12 pitch, and proportional spacing margin (PSM).
- Prints as many as 96 different characters using a daisy wheel print element.
- Has vertical spacing in steps of 0.26 mm (1/96 inch).
- Has horizontal spacing in steps of 0.11 mm (1/240 inch).
- Supports a maximum writing line of 335 mm (13 inches) and permits handling of paper up to 392 mm (15.68 inches).
- Has, as a feature, a tractor feed unit for continuous forms feed.
- Has, as a feature, a sheet feed unit that feeds cut sheets automatically into the IBM 5218 Printer.
- Permits printing while the carrier is moving either to the right or to the left.



Serial data is received from the controller by the attachment panel. Data passes from the attachment panel to the distribution board. There the data is sent to the processor card. On the processor card, the data is converted from serial, communication line signals into parallel, logic level signals. The data is assembled, and checked for errors by the USART. The USART sends an interrupt to the attachment processor that causes the attachment processor to read the USART status to determine if an error occurred. The attachment processor is also located on the processor card. If the data is error free, the attachment processor reads the data to clear the USART receiver register, and translates the data into print packets. The print packets describe the index, escapement, selection, and print hammer actions needed to print a character.

The print packets are passed by the programmable peripheral interface (PPI), located on the processor card, to the printer logic card. The PPI supplies storing and synchronization function between the attachment processor and the interface processor.

The printer logic card contains the interface processor and the three device processors. The interface processor receives the print packets from the attachment processor and sends the commands in each print packet to the desired device processor. The function of the device processors is as follows:

- Selection processor - controls print wheel rotation and print hammer firing.
- Escapement processor - controls the escapement, and ribbon advance.
- Index processor - controls the index motor that runs the platen and the cam motor that controls the feed rollers, and the paper bail. When the sheet feed feature is attached, the index processor controls it also.

From the device processors, commands are sent to one of the analog cards. The analog card contains the drive circuits for the mechanisms. Analog card 1 contains the drive circuits for the escapement and index motors. Analog card 2 contains the drive circuits for the selection motor and hammer solenoid.

PROCESSOR CARD

The processor card has three major areas, the universal/synchronous/asynchronous receiver/transmitter (USART) and optoisolator, the attachment processor, and the programmable peripheral interface. The processor card also contains read-only storage (ROS) for storing the operational software and tables, and random access memory (RAM) which is used in support of the operational software and the control panel support logic.

UNIVERSAL SYNCHRONOUS/ASYNCHRONOUS RECEIVER/TRANSMITTER

The universal synchronous/asynchronous receiver/transmitter (USART) is used in an asynchronous start/stop mode. Each data frame will be 11 bits long. This includes a start bit, 8 data bits, a parity bit, and 1 stop bit. The USART is used in a full duplex environment and is initialized to odd parity (but the polarity can be changed by the controller).

Incoming serial data is checked for parity, frame, and overrun errors. When a byte is assembled, the attachment processor reads the USART status to determine if the byte was received correctly, or caused one of the errors. The attachment processor then reads in the data byte to clear the USART receive register.

Data, from the IBM 5218 Printer, to be transmitted to the controller is written into the USART by the attachment processor one byte at a time. The USART generates the correct parity for this byte and transmits it in serial form.

The USART transmit and receive rate is fixed at 9600 bits per second. The controller has the ability to select parity. The bit sequence is shown below.

Start	0	1	2	3	4	5	6	7	Parity	Stop
Bit									Bit	Bit

ATTACHMENT PROCESSOR

The attachment processor performs the following functions:

- Responds to USART interrupts by reading and storing received data.
- Responds to PPI input interrupts by reading and interpreting the data sent by the interface processor.
- Starts data flow to the interface processor.
- Responds to PPI signal by sending the next byte of a print packet assembled for the interface processor.
- Responds to control panel switch interrupts.
- Writes to the control panel.
- Decodes controller commands.
- Responds to the controller
- Processes print data to form print packets
- Modifies printer status
- Performs error correction and diagnostic functions.

PROGRAMMABLE PERIPHERAL INTERFACE

The programmable peripheral interface (PPI) is used as a full duplex buffer between the attachment processor and the interface processor. The attachment processor communicates with the PPI through the common address and data bus. The interface processor communicates with the PPI through port A. The PPI stores a byte of data sent between the interface processor and the attachment processor. This lets the two processors work separately of one another.

The PPI reads paper handling device status and control panel switches through port B. It also provides limited control over the control panel interrupts.

PRINTER LOGIC CARD

The printer logic card contains the interface processor, three device processors, clocking circuits for the analog cards, and the drive circuits for ribbon motor.

INTERFACE PROCESSOR

This processor receives print packets from the attachment processor (through the PPI) and sends the various commands in each packet to the specified device processors. Information from the device processors passes through the interface processor on its way to the attachment processor.

DEVICE PROCESSORS

There are three device processors. The function of the three processors is as follows:

- Selection processor - controls print wheel rotation and print hammer firing.
- Escapement processor - controls the escapement, and ribbon advance.
- Index processor - controls the index motor that runs the platen and the cam motor that controls the feed rollers, and the paper bail. When the sheet feed feature is attached, the index processor controls it also.

Each of these processors interface with analog circuits which control the mechanical devices. Feedback circuits supply information on the actions of the hammer, selection motor and the A02 escapement motor.

ANALOG CARD 1

Analog card 1 contains the drive circuits for the escapement, index, and cam motors.

ANALOG CARD 2

Analog card 2 contains the driver circuits for selection motor and the print hammer. The selection motor's inductive feedback is processed and fed back to the driver circuitry and also the selection processor on the printer logic card. The hammer feedback is processed in analog card 2 and fed back to the selection processor. Analog card 2 also contains the power on reset circuits for the printer electronics.

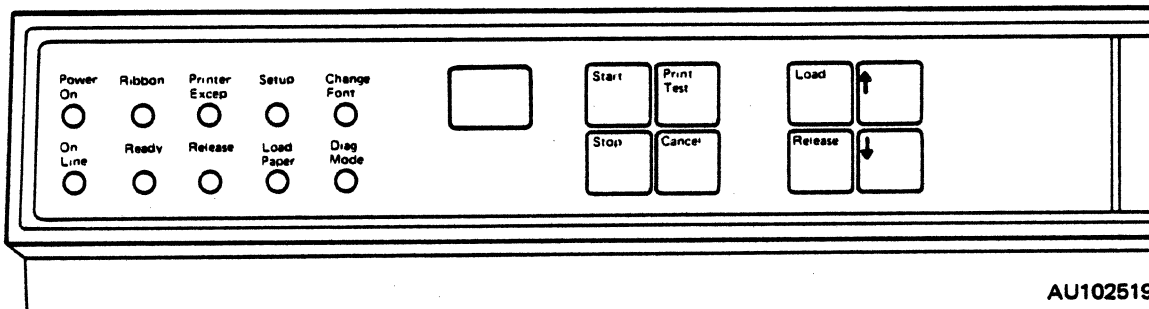
MEMORY PATCH CARD

The memory patch card is used in the printer to change the ROS program in the processor card. The memory patch card monitors the address bus of the processor card to sense a match between the address bus and a target address stored in the memory patch card. When a match occurs the memory patch card causes the processor card to execute code stored on the memory patch card instead of the code contained on the processor card. The memory patch card then gives control back to the processor card's ROS.

CONTROL PANEL

The operator and CE communicate with the printer by use of eight switches, two LED displays, and 10 light-emitting diodes (LEDs) located on the control panel (see the following figure). The display data is sent to the panel serially and is stored there in a 25 bit register. Each bit controls a LED segment or an indicator. While new data is shifted into the register, the display is blanked.

The stop switch and cover open switch have a dedicated wire back to the processor card. The other 7 switches go into an 8 to 3 priority encoder and the three output lines go back to the processor card. The switches are masked and their interrupt is delayed for debouncing purposes on the processor card.



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During normal operation, the switch functions provided by the printer are:

- **Release** - This switch reverses the condition of the feed rollers and opens the paper bail. It is active only in the printer not ready condition. The Release indicator is on when the feed rollers are disengaged, and the paper bail is open.
- **Load** - This switch is used to feed a single sheet of paper by hand, into the printer mechanism. The Load switch is active only when the printer is in the not ready condition. The Load switch places the first writing line at the top edge of the paper. If a tractor feed is electrically connected to the printer, the load cycle is immediately followed by a 250 mm (10inch) paper advance.
- **Paper Up** - This switch causes the platen to move in the forward direction. The paper up function is executed only when the printer is in the not ready condition. When the switch is first pressed, paper will be moved up 0.52 mm (1/48 inch). If the switch is active after 250 milliseconds, paper will be moved up 3.65 mm (7/48 inch). If the switch is active after an additional 350 milliseconds the platen will be moved in steps 4.175 mm (8/48 inch) with 66 milliseconds between each step. Paper will continue to move up until the switch is released.
- **Paper Down** - The paper down function is executed only when the printer is in the not ready condition. The function supplied by the Paper Down switch is the same as the Paper Up switch with the exception that the platen moves in the reverse direction.
- **Stop** - This switch causes an End-of-Data Control command to be executed. All of the stored characters are printed, the carrier is centered, and the Ready indicator is turned off. Printer not ready and exception will be send to the controller, and a print check condition will be set in status bytes 1 and 4.
- **Start** - This switch is accepted only if the printer is not ready and the cover is closed. It causes an exception response ID to be sent to the controller, and the continue bit to be set in status byte 1. The printer is made ready and a Resume command is executed, followed by a Proceed Block command.
- **Cancel** - This switch causes a non-recoverable (cancel switch interrupt) error status to be placed in status byte 4, print check in status byte 1, and sends exception bit in the response ID.
- **Print Test** - This switch causes the operator print test to be executed and is active only in the printer not ready state.

The 10 LEDs may be used by the controller, operator, or the CE. Their function is described below.

- **Power On** - This indicates that primary power is supplied to the printer and that the power supply is supplying +5 Vdc to the printer.
- **On Line** - This indicates that the printer has established communications with the controller.
- **Diag Mode** - This indicates that the printer is in the diagnostic mode.
- **Ready** - This indicates that the printer is ready to print.
- **Printer Exception** - This indicates that an error has occurred in the printer. The two LED displays will display an error code.
- **Release** - This indicates that the feed rollers are disengaged.
- **Set Up** - This indicates that the current sheet should be removed from the printer. If this indicator is on with the Printer Excep indicator, the current page has not completed correctly and must be restarted.
- **Load Paper** - This indicates to either load a single sheet, place or change paper in the sheet feed or tractor feed, or change from sheet feed to tractor feed or reverse. The LED display will indicate which operation is needed.
- **Change Font** - This indicates that a different print wheel is needed. The LED display specifies which print wheel is needed.
- **Ribbon** - This indicates that there is only enough ribbon left to print 200 characters. This indicator will also be on if the ribbon cartridge is removed.

OPERATOR ACCESS COVER

The operator access cover is held in the closed position by a magnetic latch. The cover may be opened at any time by pulling up on the cover with enough force to overcome the magnet. Opening the operator access cover while the printer is printing is not recommended. The effect of opening the cover opening, relies on the ready/not ready state.

EXPECTED COVER OPEN

Opening of the operator access cover is expected when the printer is not ready. In this condition, the printer is not active and will not move the escapement mechanism. All print image commands and the Ready Printer command are rejected when the cover is opened.

UNEXPECTED COVER OPEN

Opening of the operator access cover is unexpected when the printer is ready. In this condition, the escapement and selection mechanisms may be running. To prevent injury to the operator or CE, the escapement mechanism is immediately stopped when the cover is opened, causing loss of escapement relativity. The controller is informed of the unexpected cover open condition. The page being printed when the cover is opened must be re-started by the controller.

To recover from the unexpected cover open, close the cover and press the Cancel switch. The controller should respond with a Restore command.

FUNCTIONAL PARTS

The IBM 5218 Printer is powered, by four stepper motors: the escapement motor, the index motor, the selection motor, and the ribbon motor. A solenoid is used for the print hammer assembly and a dc motor is used for the cam motor assembly.

The escapement motor is a permanent magnet stepper motor coupled directly to a leadscrew. The escapement motor in the IBM 5218 A01 Printer is driven open loop (no feedback pulses). The escapement motor in the IBM 5218 A02 Printer supplies emitter pulses for motor location.

The index motor is also a permanent magnet stepper motor that drives the platen through a belt. The index motor is driven open loop (no feedback pulses), and has enough torque to drive the IBM 5218 Printer sheet feed or the tractor feed mechanism.

The selection motor is a three-phase stepper that drives the print wheel with four reluctance pickup devices for feedback.

The ribbon take up reel is driven by a rubber belt powered through a gear train from the ribbon stepper motor.

The print hammer assembly is a solenoid with the armature being the print hammer. Print hammer feed back comes from a hammer impact sensor and associated circuits.

ESCAPEMENT

The escapement assembly, controlled by the escapement processor, includes an escapement motor, a leadscrew, and the carrier assembly. For A01 there are 2 margin switches and for A02 an optical position encoder is attached to the escapement motor.

The escapement motor is a 200-step per revolution permanent magnet stepper motor, coupled directly to the leadscrew. One complete revolution of the leadscrew is 21.16 mm (0.833 inches). This gives the carrier assembly horizontal movement of 0.106 mm (1/240 inches) per step of the escapement motor. Position feedback information is obtained from a two-photo transducers attached to the back of the escapement motor. Each transducer ideally outputs a square wave with one half cycle per step. The sensors are located so that the output signals are 90 degrees out of phase.

PAPER FEED/INDEXING

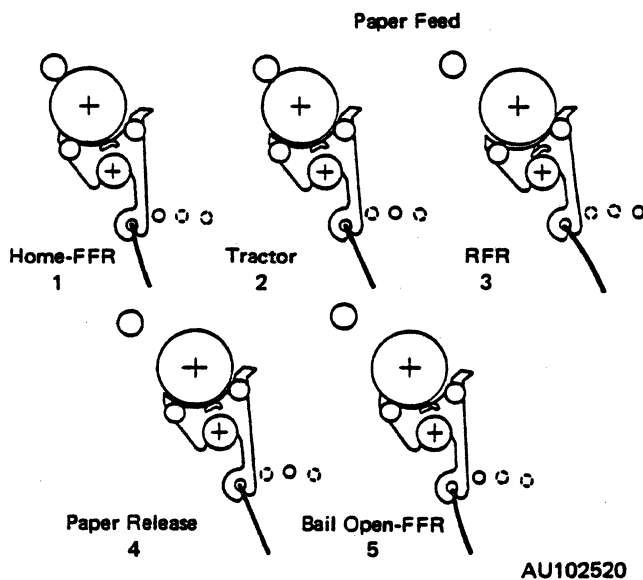
The paper feed area includes the index motor, platen, feed rollers, paper bail and cam motor assembly. The paper feed area is controlled by the index processor located on the printer logic card and the motor drivers are on the analog 1 card.

The index motor is a 180-step per revolution permanent magnet stepper motor that drives the platen through a timing belt. The index motor also supplies the drive through a gear for the sheet feed or tractor feed mechanism (if either is attached to the printer). The index motor steps equal 0.2646 mm (1/96 of an inch) and may be driven in either direction for forward or reverse indexing.

The feed roller assemblies that press the paper against the platen are located on a rod below the platen. There are six separate modules and each module contains one front and one rear feed roller, plus 1 paper aligner assembly. The feed rollers are driven by the cam deflector arm. The spring fingers of the cam deflector arm turn the modules (front to rear) letting the paper be either engage or disengage from the platen. The cam deflector arm is driven by the cam motor through the cam.

The index processor receives two feedback signals from the cam. The cam has a round magnet located on the inside of the cam. This magnet and a reed switch controls the cam position 2, 3, 4, 5. Another reed switch and magnet located on the cam indicates the home position (1) of the cam.

The paper bail pawl moved by the cam, controls opening and closing of the paper bail. The paper bail opens automatically when the Load or Release switch is pressed.



CHARACTER SELECTION

The character selection hardware includes the selection motor and position encoder and the print wheel.

The selection motor is a three-phase, 96-step per revolution variable reluctance stepper motor controlled by the selection processor. Located on the back of the selection motor shaft are four reluctance pick up devices. Three of the reluctance pick up devices (one for each phase) supply feedback information to the motor driver. The fourth reluctance pick up device supplies home feedback information for the selection processor. Home position is a lowercase "a" on the print wheel.

The print wheel is turned by the selection motor. The distance and direction to turn the print wheel is calculated in the number of steps from the present print wheel location to the desired character. The print wheel will then turn the shortest direction to the desired character and detent.

RIBBON

The printer ribbon cartridge permits easy removal and replacement by the operator or CE without touching the ribbon itself. The ribbon is 11.6 mm (0.453 inches) wide by 122 meters (402 feet) long, and prints an average of one million characters per cartridge.

Ribbon feed is maintained by two reels in the ribbon cartridge. The take up reel is driven by a belt that is powered through a gear train from the ribbon stepper motor. The ribbon stepper motor is driven by the escapement processor. The ribbon motor driver is on the processor card.

An end-of-ribbon sensor (an optical transducer) is supplied on the printer to sense when there is less than 200 characters that may be printed on the remaining ribbon. The ribbon contains a transparent material that is sensed by the ribbon sensor when this material passes in front of the card holder. The controller and operator are informed of an end of ribbon condition. However, the printer can operate without the ribbon cartridge installed.

PRINT HAMMER ASSEMBLY

The print hammer assembly is a solenoid device. The armature of the solenoid is the print hammer. Supplying power to the print hammer assembly will cause the armature to move toward the platen and hit the print wheel.

Attached to the rear of the armature is a magnet that moves in a coil attached to the rear of the print hammer assembly to sense the flight time and direction of travel of the armature. The force of the armature is controlled by the amount of current and the length of time that current is supplied to the armature. The armature force will automatically be adjusted to reach the correct print hammer flight time.

The printer groups all of the print wheel characters in three force groups. The lowest group includes the punctuation and symbols character on the print wheel. The medium force group includes most of the average or medium height characters. The highest force is used for larger characters such as the M and W, which need a higher force for correct impression on the paper when printing.

At power on, the first 6 to 8 characters in each force group may vary in density while the printer is adjusting print hammer force to reach correct hammer flight time. For this reason, when diagnosing a print quality problem, select a print sample that was printed after the print force compensation has taken place.

The armature velocity for each character on the print wheel is sent from the attachment processor with the selection move information.

FIRST WRITING LINE SENSOR (FWL)

The first writing line (FWL) sensor is located under the platen to sense the correct location of paper in the paper path when operating with the sheet feed. The sensor is read by the index processor.

The FWL sensor is a reflective phototransistor/LED pair that supplies maximum sensing of various paper colors. No paper in the paper path causes the phototransistor to cut off.

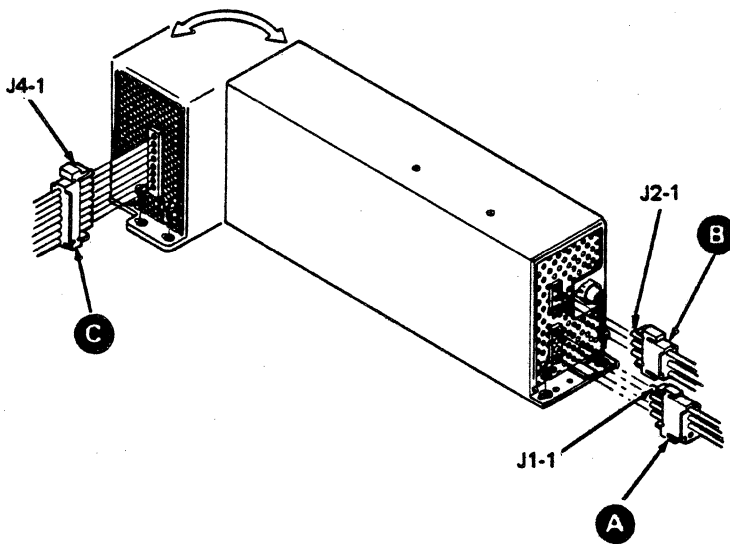
POWER SUPPLY

The IBM 5218 Printer power supply is a switching regulator power supply. The power supply has overvoltage, undervoltage, over current, and overload protection. The power supply contains a fuse for the ac input voltage and a check light for diagnostic purposes.

The check light on indicates a failure condition or an overload of the power supply. The check light remains on as long as the input ac voltage is present. Therefore, when the power supply needs to be reset the input ac voltage must be turned off for 10 seconds.

The power supply has three connectors supplying the input and output voltages. Connector J1 **A** is a four pin connector supplying ac voltage to the power supply. Connector J2 **B** is a three pin connector supplying ac voltage to the printer fan. Connector J4 **C** is an eight-pin connector supplying the dc voltages for the entire printer.

CAUTION: The power supply potentiometer is already set for the correct output voltage and must not be adjusted in the field.



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J4
Pin

1	-----	+36Vdc
2	-----	+5Vdc
3	-----	+5Vdc
4	-----	+12Vdc
5	-----	GND A
6	-----	GND L
7	-----	GND L
8	-----	-24Vdc

J1
Pin

1	-----	115Vac
2	-----	GND
3	-----	Neutral
4	-----	Not Used

J2
Pin

1	-----	115 Vac
2	-----	GND
3	-----	Neutral

AU102521

Three types of power supplies are available for use with the IBM 5218 Printer, the U.S. power supply, the low voltage world trade power supply, and the high voltage power supply.

Listed below are the names of the power supplies, their part numbers, and their input voltages and frequencies.

NAME	PART NUMBER	NORMAL VOLTAGE	MINIMUM	MAXIMUM	FREQUENCY	TOLERANCE
U.S. power supply	1495610	120	104	127	60	± .5HZ
Low Voltage power supply	6819525	110	96.5	119	50	± .5HZ
		100	90	110	60	± .5HZ
		110	96.5	119	60	± .5HZ
		120	104	127	60	± .5HZ
		127	111	137	60	± .5HZ
High Voltage power supply	6819526	220	194	238	50	± .5HZ
		230	202	249	50	± .5HZ
		240	210	259	50	± .5HZ
		200	180	220	60	± .5HZ
		220	193	238	60	± .5HZ
		240	208	254	60	± .5HZ

AU102522

Listed below are the normal operating maximum current limit, the startup limit, and the fuse rating for each power supply:

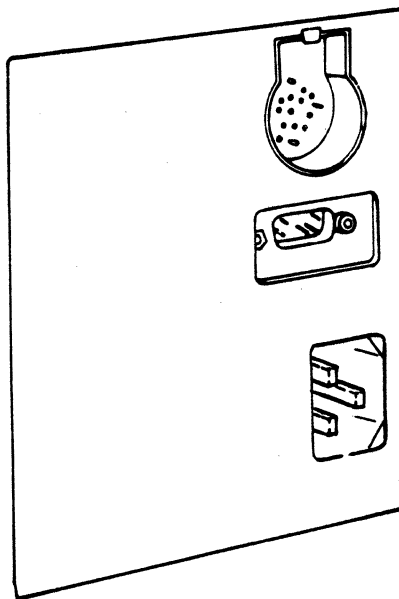
POWER SUPPLY	NORMAL OPERATION MAX. RMS CURRENT (AMPS)	STARTUP SURGE CURRENT (AMPS)	FUSE RATING	FUSE TYPE
1495610	4.7	97	7A	250V SLO BLO
6819525	5.83	97	7A	250V SLO BLO
6819526	3.02	97	4A	250V SLO BLO

AU102523

The IBM 5218 Printer communicates with the controller over a twisted pair of transmission lines in a 9600 bits per second full duplex mode. Data movement is a 2-byte command from the controller with a 1-byte response from the printer and is controlled by a start/stop protocol.

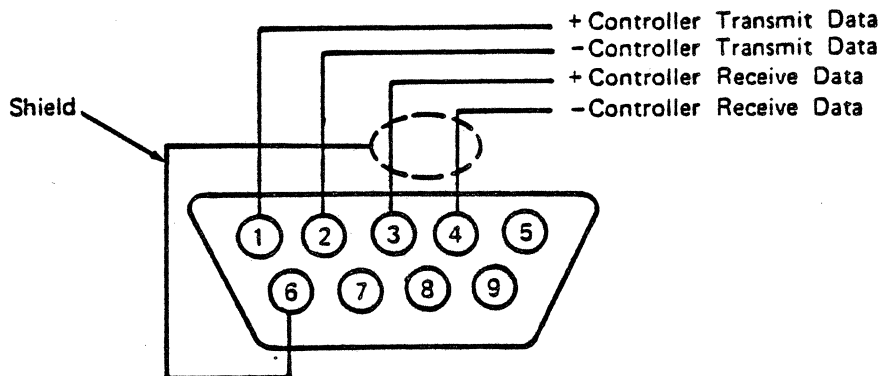
PRINTER ATTACHMENT PANEL

The printer attachment panel is in a customer accessible location on the rear of the printer. The panel contains the user connector to the controller and if the optional paper handling feature is ordered, it also contains a connector for the sheet feed or tractor feed.



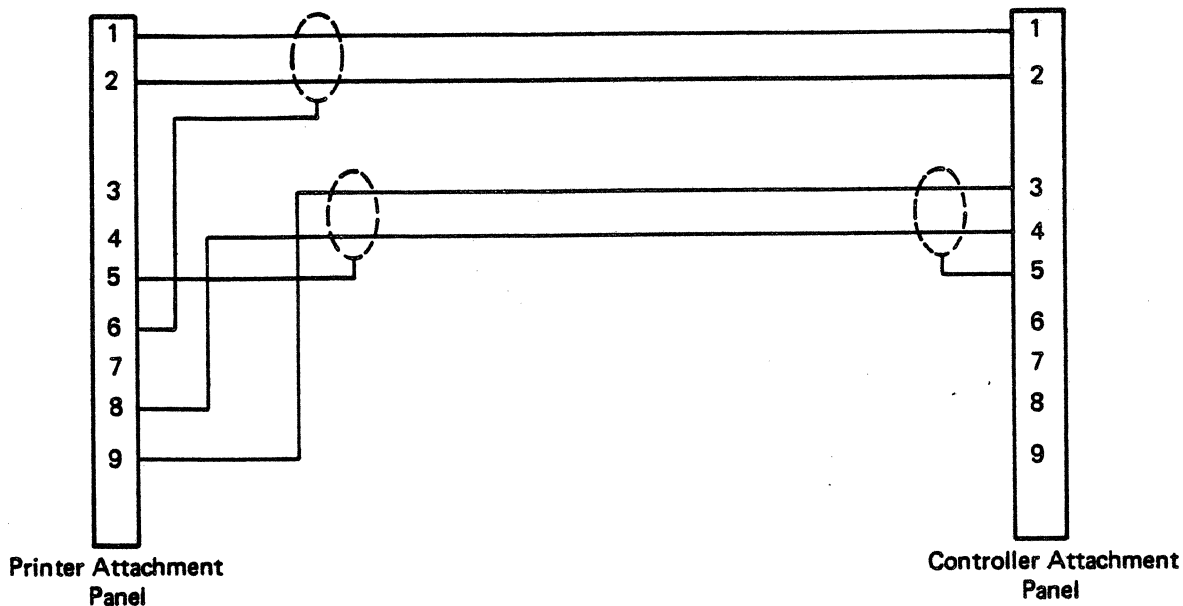
AU102524

The shield connections, on the user connector, are separated for electrical noise reduction. The shield for controller TX data, pin 6, is connected to the IBM 5218 Printer frame ground. The shield for controller RX data, pin 5, is connected to the controller frame ground.



AU102525

Communication cable lengths of 6, 30, and 60 meters (19.8, 99, and 198 feet) are available to connect the IBM 5218 Printer to the controller. Pin configuration and cable connectors are different for each end of the cable. The printer end of the cable is marked with a P; the controller end is marked with an O. The controller end of the cable is configured with pin 6 connected to pin 7.



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COMMAND LANGUAGE

Data transmitted by the controller contains all print control commands needed for the IBM 5218 Printer. These controls, called the print image, describe the character to be printed, direction of printing, relative horizontal and vertical position of the character, and the hammer force for special cases.

PRINT IMAGE

The print image contains commands that describe each character to be printed. These commands are as follows:

- Relative horizontal carrier position (Escape command)
- Relative vertical paper position (Index commands)
- Absolute character address plus the hammer force (Print command)
- Combined horizontal position and character address (Escape/Print Command)
- Paper feed and eject (Paper Handling control command)
- Control commands

Escape Command

The Escape command describes the direction and distance of carrier movement. The distance is specified in steps of 0.1 mm (1/240 inch) with a range from 0 mm (0/240 inch) to 213.25 mm (2047/240 inch). The distance and direction specified by an Escape command is relative to the carrier location resulting from the last Escape command or Escape/Print command and is carried from the end of one page to the start of the next page. Escape commands are not executed until the printer receives a Print, Escape/Print or End-of-Data or Pause command. Escape commands not executed are added causing a sequence of Escape commands to be executed as one combined escapement. Therefore, a sequence of escape commands that contain an equal number of spaces and backspaces results in no escapement. The escape command moves the carrier to the location of the next character to be printed.

Escape Command

7	6	5	4	3	2	1	0	
1	0	0	1	DIR 1=L 0=R	D1024	D512	D256	High Byte
D128	D64	D32	D16	D8	D4	D2	D1	Low Byte

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Index Command

The Index command lets the controller specify the direction and distance of index operations relative to the writing line resulting from the last Index command. The vertical distance is specified in steps of 0.26 mm (1/96 inch) and range from 0 mm (0/96 inch) to 533 mm (2047/96 inch). The direction specified can be forward (advance the writing line toward the bottom of the page) or reverse (advance the writing line toward the top of the page). With reverse index registration is not ensured, and should not be done with a paper handling feature attached.

The relative writing line will be reset when a paper handling command or load operation is performed. As with the Escape command, Index values are added until a Print, Escape/Print, or End-of-Data or Pause command is received. These commands are then executed as one combined index.

Index Command

7	6	5	4	3	2	1	0	
1	0	0	0	DIR 0=U 1=D	D1024	D512	D256	High Byte
D128	D64	D32	D16	D8	D4	D2	D1	Low Byte

AU102528

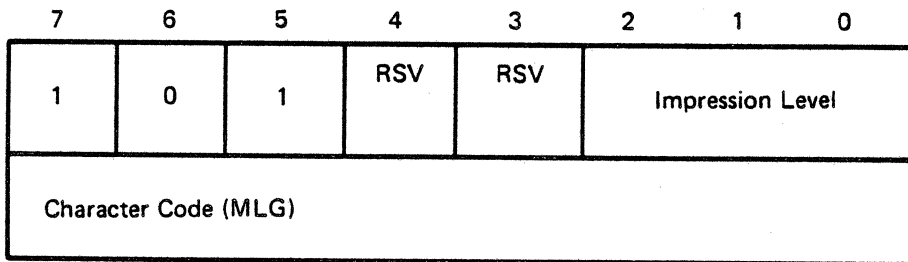
Print Command

The Print command specifies the character to be printed plus the hammer force (impression level) for that character. Character codes that are sent by the controller that are not in the range of multi-lingual EBCDIC (X'00' through X'3F') are ignored by the printer. If the character is not in the current print wheel table the printer will print an underscore.

Four print impression levels may be specified by the controller. If the controller wants to use the impression level in the IBM 5218 Printer for the current coded graphic character set ID, an impression level of zero will be specified.

When a print command is received, the carrier escapes the distance equal to the total of all escape values received since the last Print, Escape/Print, or End-of-Data or Pause commands. The platen indexes the distance equal to the total all index values received since the last Print, Escape/Print, or End-of-Data command. The character specified is selected and the print hammer fires.

Print Command



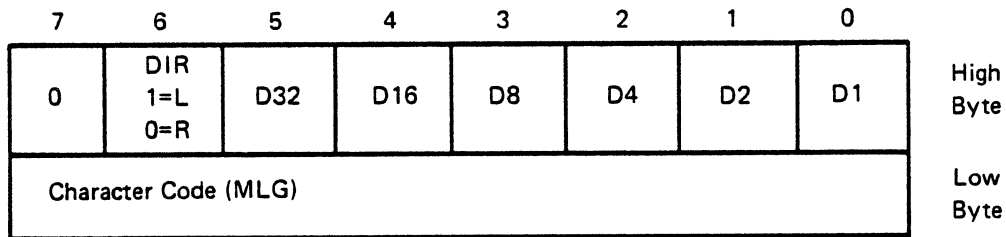
AU102529

Escape/Print Command

The Escape/Print command is executed as if an escape command was issued followed by a print command. It is used when escapement is less than 13.33 mm (64/120 inch) and the printer specifies the hammer impression level.

The escapement distance is specified in steps of 0.208 mm (1/120 inch) and range from 0 mm (0/120 inch) to 13.13 mm (63/120 inch).

Escape / Print Command



AU102530

Paper Handling Commands

Paper Handling commands are executed only when the sheet feed is attached. If a Paper Handling command is received when other paper handling devices are used, it will be rejected. The Paper Handling Feed command moves the paper from the sheet feed paper tray to the platen, so that the first writing line will be at the top of the page. The Paper Handling Eject command moves the paper from the paper path to the sheet feed output tray.

Printer Idle Commands

Printer idle commands are used to ensure that all commands received are executed. They cause the printer to stop and respond to the controller when all activity is complete. The printer idle commands are End-of-Data and Pause.

The Pause command is used as a temporary stop command. It causes the printer to execute all print commands that have been received. No command of any type should be sent after the Pause command, until that pause command has been executed. The response ID indicating receive ready will indicate that all commands received have been executed correctly. Printing continues when the controller starts sending the print image commands.

The End-of-Data command is used when a print operation is ending or when operator access to the printer is needed. The printer enters the not ready condition when the End-of-Data command is executed. The Ready command is required after the End-of-Data command before more print image commands will be received.

INTERFACE PROTOCOL

The IBM 5218 Printer interface protocol is separated into five parts; power-on sequence, command exchange, printer exception, transmission error.

POWER-ON PROTOCOL

The IBM 5218 Printer power-on sequence contains a set of basic assurance tests (BAT) that test all functional parts of the printer that can be checked without any operator or CE aid. When these tests are completed the printer transmits an initialization byte (X'80') to the controller every 2 to 100 milliseconds. The controller responds with a Wrap Data command; any other command will be ignored. The printer responds to the Wrap Data command with a response ID, indicating receive ready and returns the next 8 bytes received to the controller without interpretation. If an error is sensed by the printer during the Wrap Data sequence, an exception response ID is reserved and sent to the controller 5 milliseconds after the printer returns the eighth wrap data byte. If the wrap data sequence is successful, the printer will enter the command exchange protocol.

The power-on protocol is also activated if the printer receives a break character at any time, or a frame error or overrun during a wrap data sequence. In these cases the initialization byte is X'CO' instead of X'80'.

COMMAND EXCHANGE PROTOCOL

The Command Exchange Protocol is used to send the print image commands and printer control commands to the IBM 5218 Printer. Two bytes of data are received from the controller and are stored until they can be executed. When they are received, the IBM 5218 Printer sends a 1-byte response. When a Read Status command or Read Device ID command is received the requested status byte is transmitted as the response. If a status byte is requested that is not supported, X'80' is returned. In all other cases, a response ID is returned. The controller may continue to send one more command as long as receive ready is indicated in the response ID.

Subsets of this protocol result from the Send Statistic and Wrap Data commands. A Receive Ready response to Send Statistic indicates that a maintenance statistic transmission follows. A Receive Ready to Wrap Data command indicates that the printer is ready to wrap. The printer remains in this mode until 8-bytes have been received and returned.

Note: The Response ID Receive Ready normally indicates that the command has been received and execution of the command will be attempted. It does not indicate acceptable execution of the command. The only exceptions to this are responses to Pause and End-of-Data.

PRINTER EXCEPTION PROTOCOL

The Printer Exception Protocol sends the Response ID to the controller as a result of a printer mechanism error or a change in printer mechanism status. The exception is also posted to the LED display. The controller determines the reason for the asynchronous transmission of the response ID through use of Read Status commands.

TRANSMISSION ERROR PROTOCOL

Three transmission errors, parity error, frame error, and data overrun, can occur. A response ID indicating receive ready/communication line error is sent to the controller as a result of a transmission error. Status byte 3 contains a transmission error ID. The transmission error IDs are as follows:

X'88'=Parity error
X'90'=Data overrun
X'A0'=Frame error

The controller may decide to retransmit the failing command or start communication line diagnostic procedure.

If the controller senses a transmission error it may send a Freeze Status command. This will freeze all status indications to the value last transmitted. The controller can then read any of the Status Bytes by the normal commands. The only acceptable commands honored for freeze status are Read Status (or Device ID), Ready, Parity Restore, and Resume. Restore returns the printer to the command exchange protocol. Resume will un-freeze the status indications.

If a Break character is sensed, it is interpreted as an open line and causes the printer to go through its power on sequence in an attempt to establish the communication line.

TRACTOR FEED

The tractor feed unit is required for printing on continuous forms. The unit can easily be installed or removed from the IBM 5218 Printer by the operator. The tractor feed supports the forward index mode only. The tractor feed forms must be new and without paper damage.

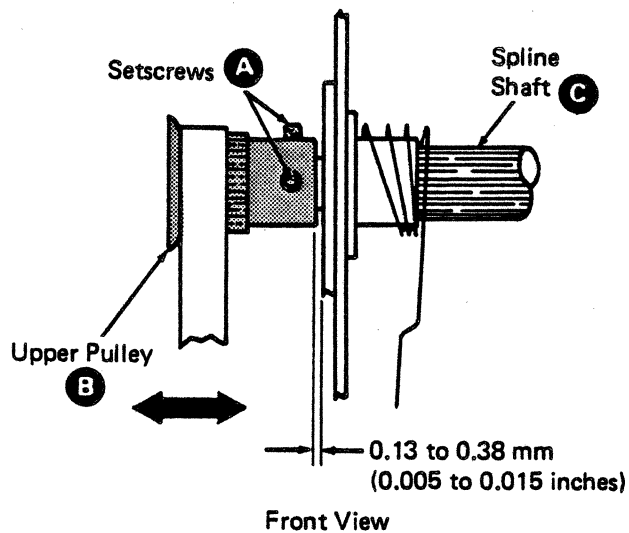
The tractor feed unit supports forms with a maximum width of 370 mm (14.5 inches) and a minimum width of 51 mm (2.0 inches). These measurements are from hole to hole of the forms. If the forms are measured from edge to edge, the forms would have a maximum width of 381 mm (15.0 inches) and a minimum width of 64 mm (2.5 inches).

Single part or multipart forms, up to a maximum of one original and five copies, can be supplied from 915 mm (3.0 feet) below the platen. Single part forms should be 60 to 90 gm/m² (16 to 24 lb.) paper. Multipart forms should be 45 to 90 gm/m² (12-24 lb.) paper. Both single and multipart forms thickness should not be more than 0.6 mm (0.024 inches). All copies of multipart forms must be "positive" fastened along at least one edge so that they do not separate prior to reaching the exit tractor drive pins. The carbon paper must be securely fastened such as to be kept in line with the form. "Semi-positive" fastened forms are subject to ply separation and are not recommended.

TRACTOR FEED ADJUSTMENTS

SPLINE SHAFT END PLAY

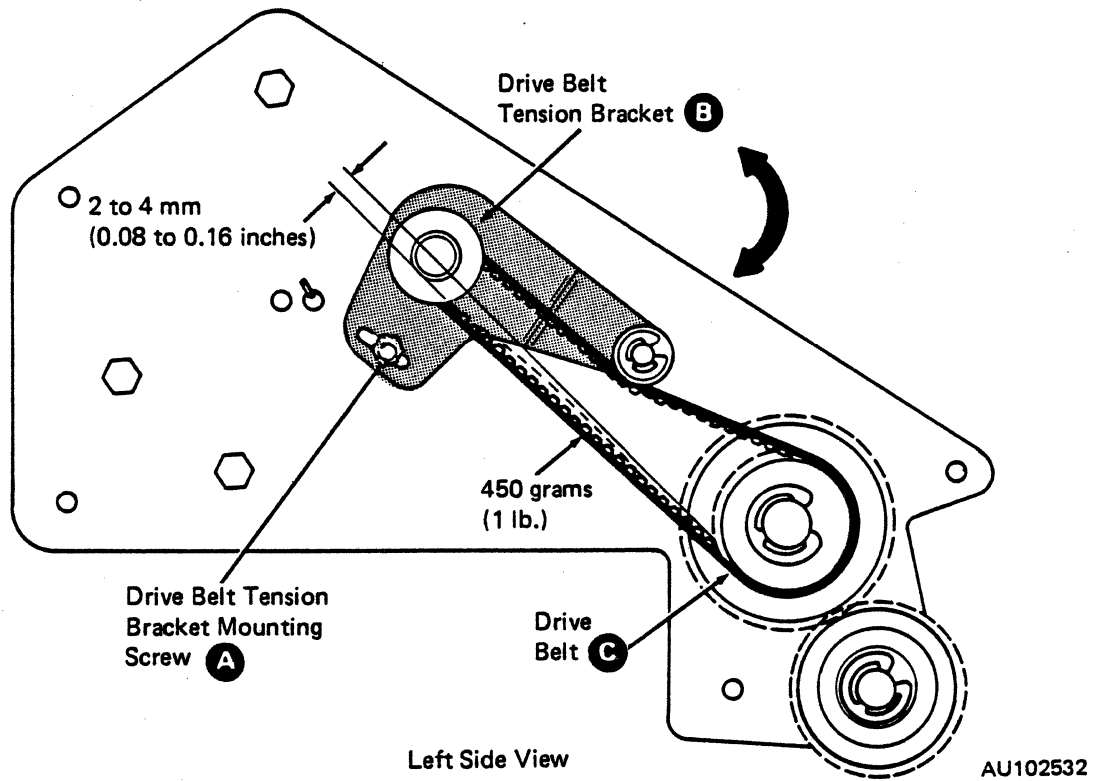
1. Power off.
2. Remove the tractor feed from the printer.
3. Remove the left tractor feed end cover.
4. Loosen the upper pulley setscrews **A**.
5. Place the upper pulley **B** so that the spline shaft **C** has 0.13 to 0.38 mm (0.005 to 0.015 inches) end play.
6. Tighten the upper pulley setscrews.
7. Check the drive belt tension.
8. Reinstall the left tractor feed cover.



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DRIVE BELT TENSION

1. Power off.
2. Remove the tractor feed from the printer.
3. Remove the left tractor feed end cover.
4. Loosen the drive belt tension bracket mounting screw **A**.
5. Adjust the drive belt tension bracket **B** so that 450 grams (1 lb) applied at 90 degrees to the straight part of the drive belt **C** deflects the drive belt 2 to 4 mm (0.08 to 0.16 inches).
6. Tighten the drive belt tension bracket mounting screw.
7. Reinstall the left tractor feed end cover.

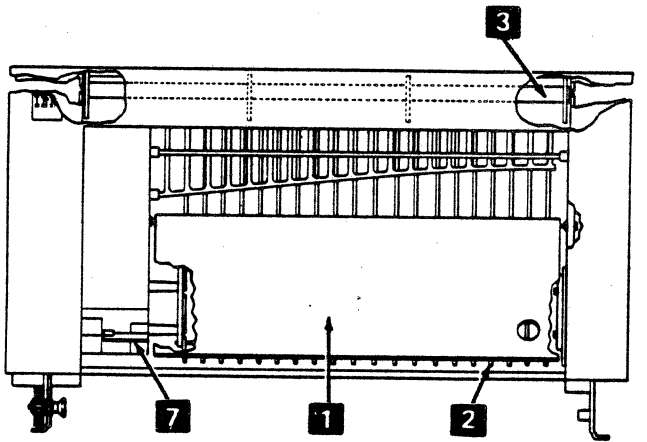


SHEET FEED MAINTENANCE

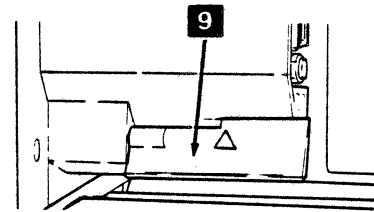
SHEET FEED LOCATIONS

700 FRONT LOCATIONS

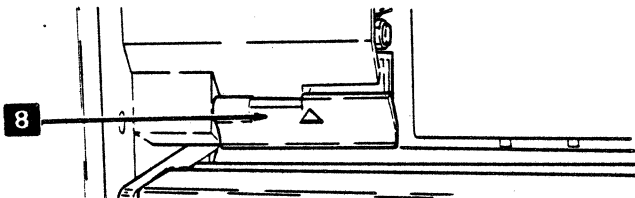
1. Splitter
2. Lower inner wire rack
3. Support bar
4. Eject backup roller
5. Gate
6. Reed switch
7. Manual paper insertion deflector
8. Manual paper insertion deflector (manual feed position)
9. Manual paper insertion deflector (automatic feed position)



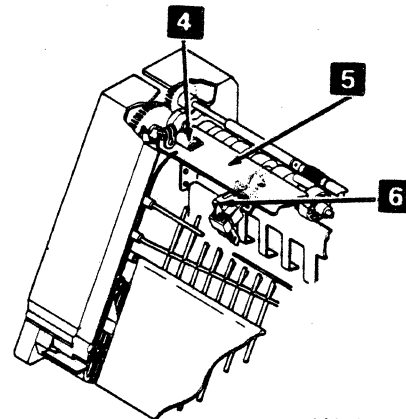
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AU102536



AU102537

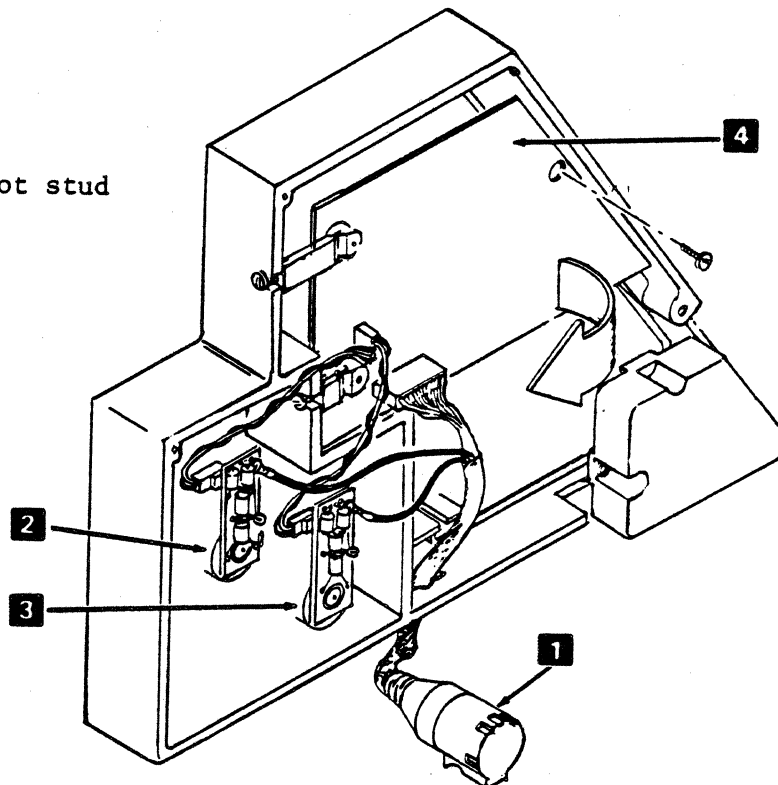


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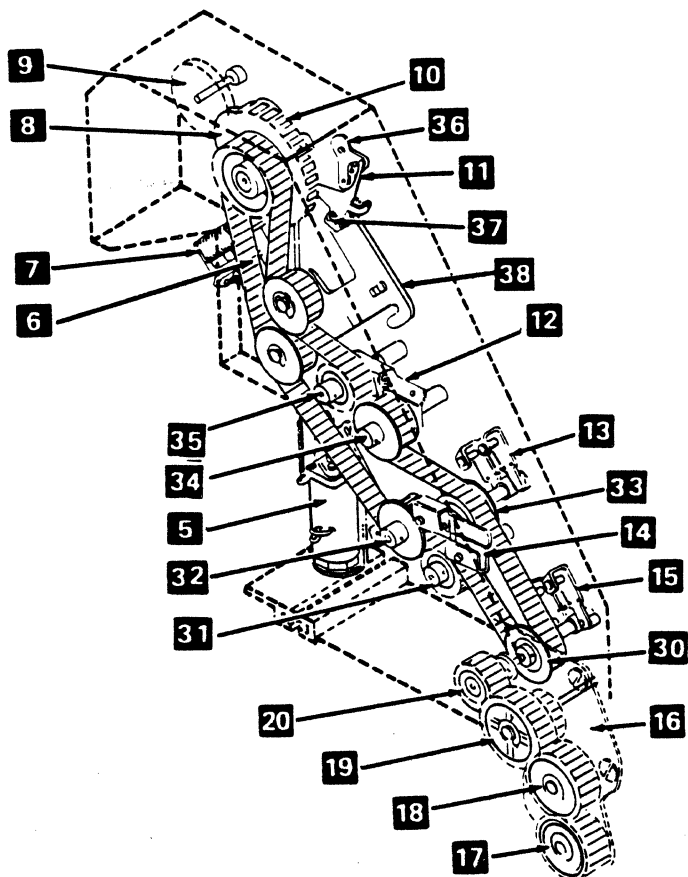
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701 LEFT SIDE LOCATIONS

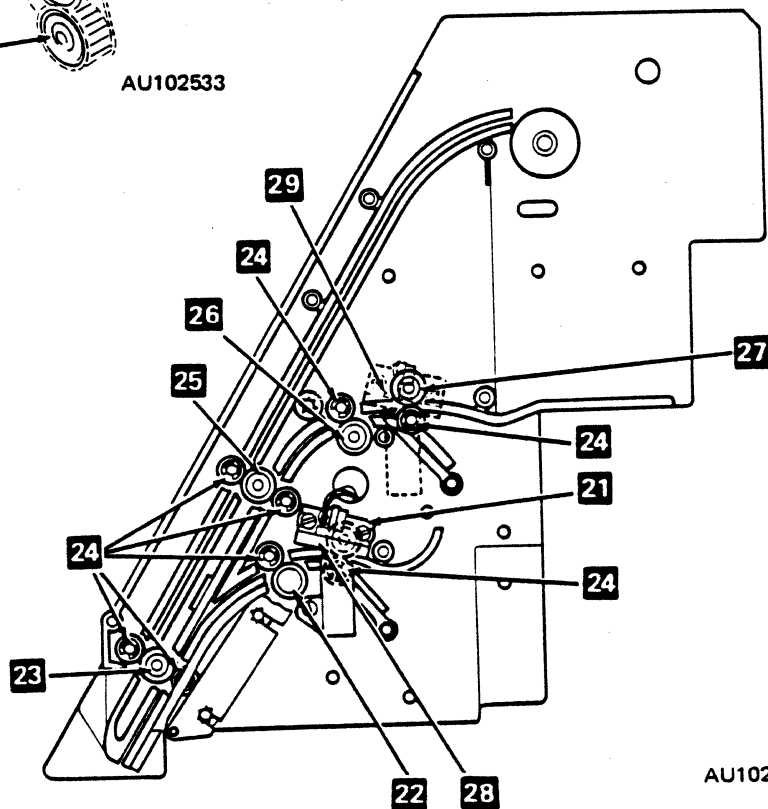
1. Printer attachment sheet feed cable
2. Picker/Separator motor 2 (upper)
3. Picker/Separator motor 1 (lower)
4. Sheet feed analog card
5. Second sheet restraint solenoid
6. Timing belt
7. Sequencer magnet
8. Ratchet
9. Sequencer gear
10. Sequencer pulley
11. Gate latch
12. Rocker 5 and 6
13. Rocker 4
14. Rocker 2 and 3
15. Rocker 1
16. Left mounting plate assembly
17. Platen driven gear
18. Idler gear
19. Cluster idler gear
20. Lower drive gear
21. Cone roller C3
22. Cone roller C2
23. Cone roller C1
24. Back up roller
25. Cone roller C4
26. Cone roller C5
27. Cone roller C6
28. Paper sensor 1 (lower)
29. Paper sensor 2 (upper)
30. Pulley P1
31. Pulley P2
32. Pulley P3
33. Pulley P4
34. Pulley P5
35. Pulley P6
36. Gate latch plate
37. Gate latch plate pivot stud
38. Idler bracket



AU102538



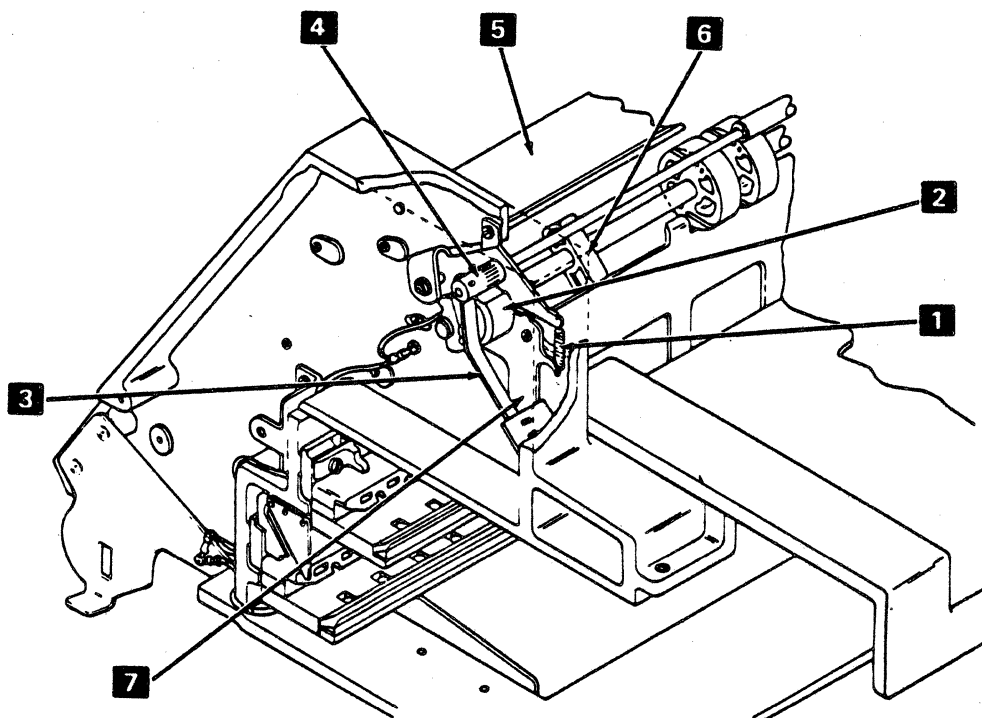
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AU102539

702 RIGHT SIDE LOCATIONS

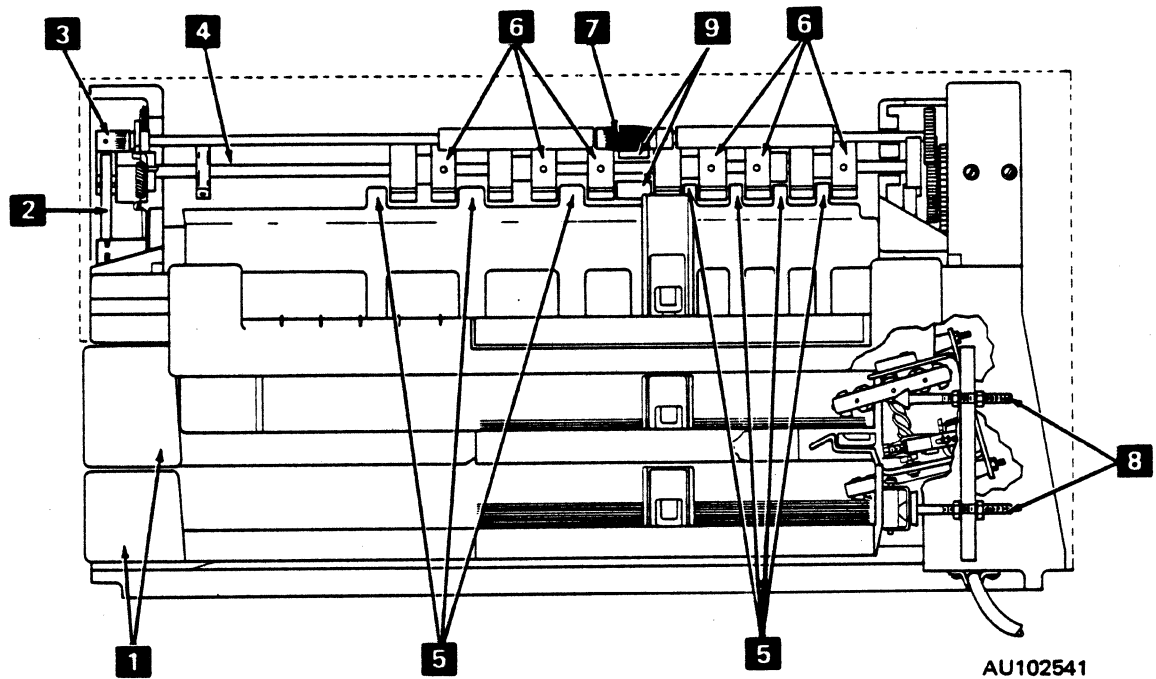
1. Tension spring
2. Drive wheel
3. Trip spring
4. Drive roller
5. Gate
6. Gate cam
7. Sequencer plate



AU102540

703 BACK LOCATIONS

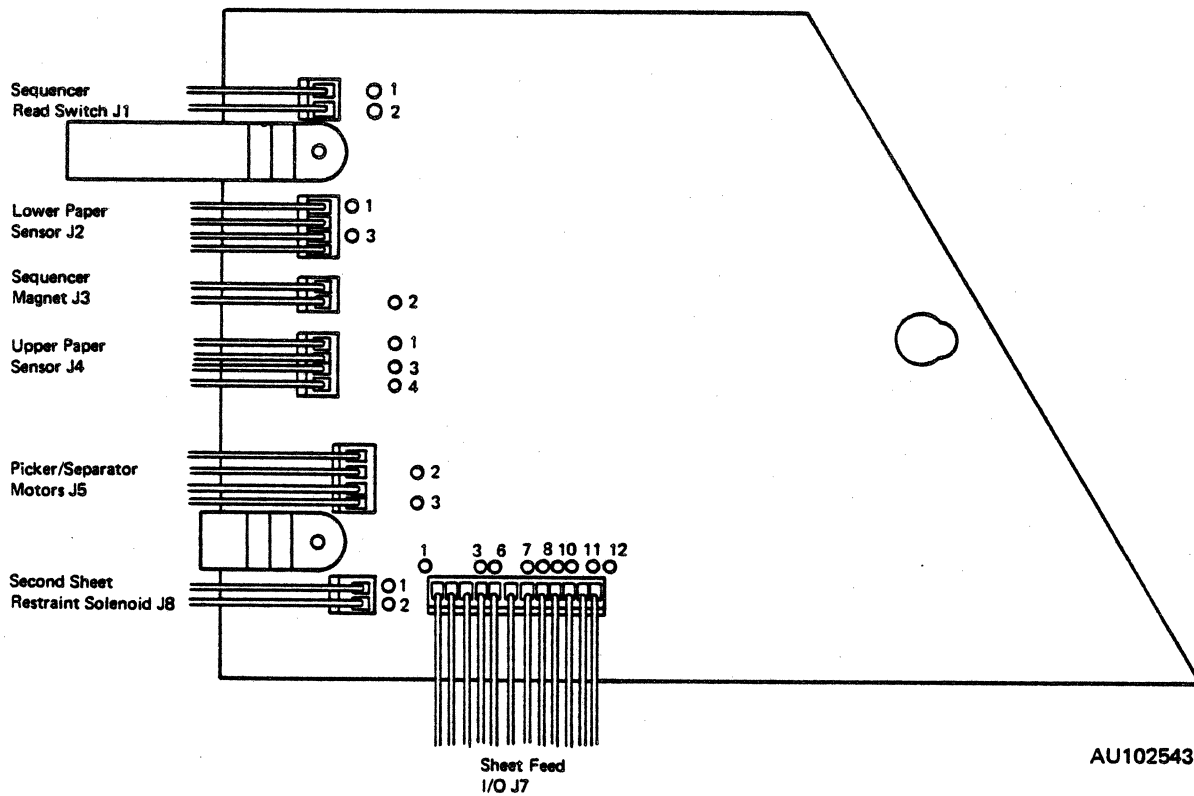
1. Paper trays
2. Trip spring
3. Drive roller
4. Sequencer cylinder shaft
5. Stripper fingers
6. Sequencer cylinders
7. Upper kick roller
8. Detent screws
9. Lower kick rollers



705 I/O CONNECTOR AND SHEET FEED ANALOG CARD CONNECTIONS

Sheet Feed Analog Card J7 Pin	Printer Attachment Panel Connector Pin
1-----	Not Used
2-----	Motor GND-----4 & 10
3-----	Logic GND-----1 & 7
4-----	+12 Vdc-----16
5-----	+36 Vdc-----19
6-----	SF*-----8
7-----	APOR*-----14
8-----	R2MO*-----3
9-----	R1MO*-----2
10-----	SFCUR-----15
11-----	H2S-----18
12-----	H1S-----17
13-----	+5Vdc-----13
14-----	GND-----6
	TF*-----9

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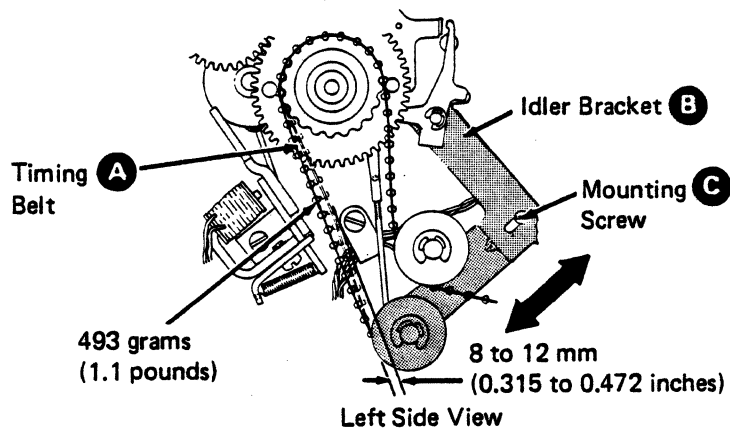
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POWER APPLICATION

720 TIMING BELT

Adjustment

1. Power off.
2. Remove the left side cover (760).
3. Remove the sheet feed analog card support screw (763).
4. Check the timing belt tension. A 493 gram (1.1 pound) force on the halfway point of the timing belt **A**, between the sequencer pulley and the rear idler pulley, deflects the timing belt 8 to 12 mm (0.315 to 0.472 inches).
5. If adjustment is necessary, loosen the idler bracket **B** mounting screw **C**.
6. Move the idler bracket, tighten the screw, and check the timing belt tension.
7. Repeat steps 5 and 6 as necessary.
8. Reinstall the sheet feed analog card support screw.
9. Reinstall the left side cover.



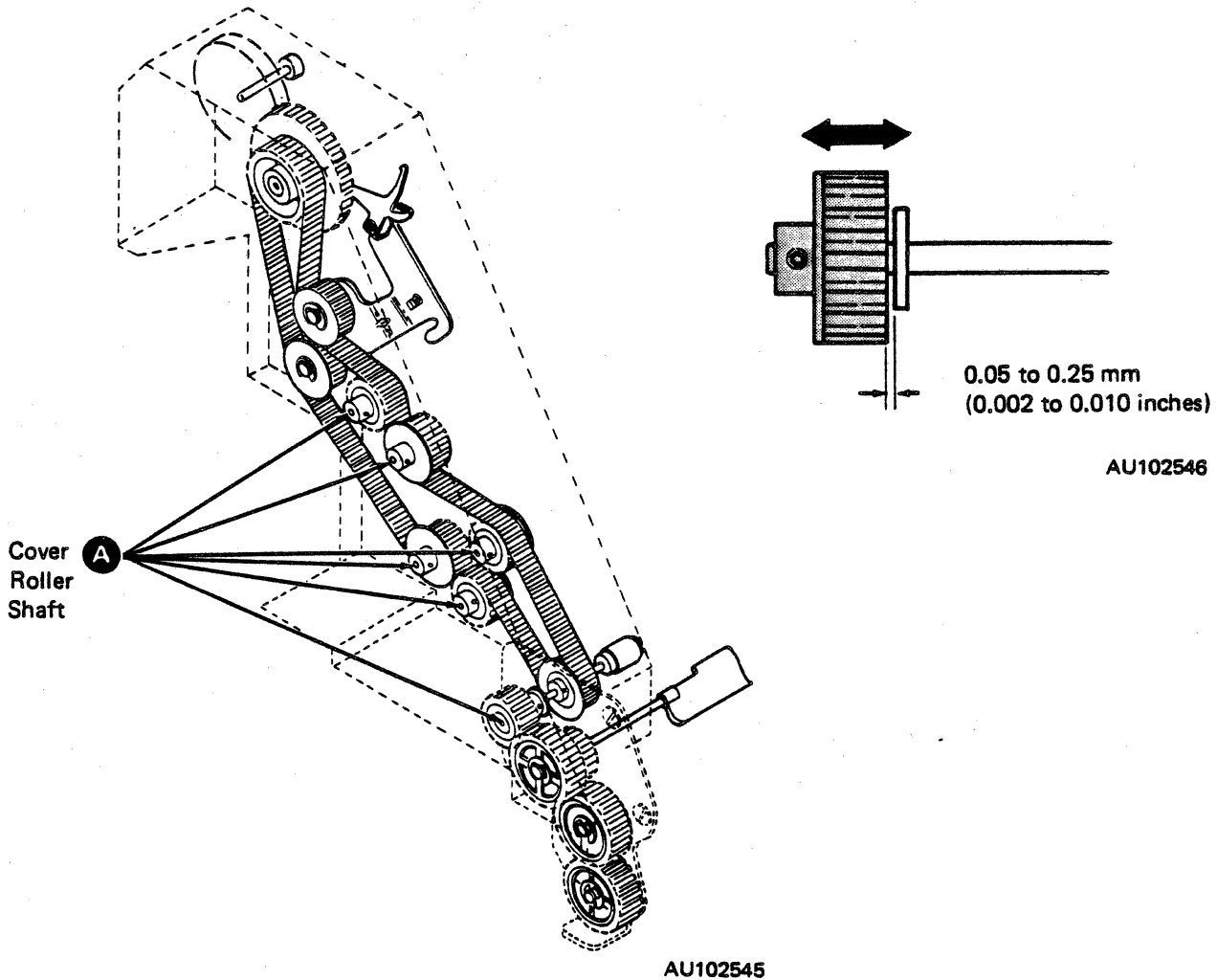
AU102544

721 SHAFT END PLAY

Adjustment

1. Power off.
2. Remove the right and left side covers (760, 761).
3. Adjust the sequencer cylinder shaft and all cone roller shafts **A** for 0.05 to 0.25 mm (0.002 to 0.010 inches) end play.
4. Adjust all other shafts for 0.1 to 0.5 mm (0.004 to 0.197 inches) end play.
5. Reinstall the right and left side covers.

Note: The center cover must be installed when checking the end play of the sequencer cylinder shaft, upper kick roller shaft, and sequencer pulley shaft.

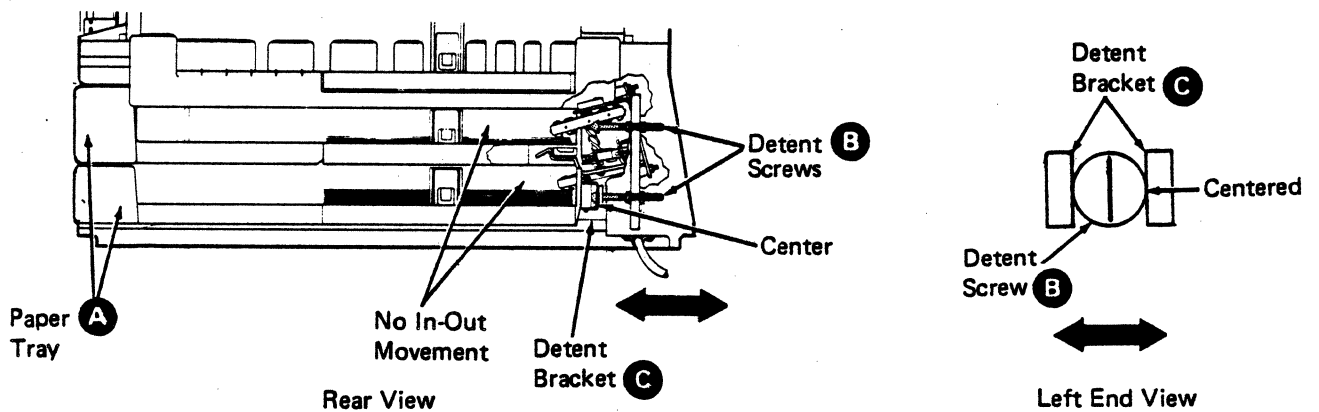


PAPER FEED

723 PAPER TRAY DETENT

Adjustment

1. Power off.
2. Place the paper trays **A** in the normal operating position (as shown).
3. Remove the left, right, and center covers (760, 761, 762).
4. Place the paper tray so that the front of the paper tray is flush with the paper path surface of the transport aligner block. Check to ensure that the picker/separator lift mechanism does not limit the travel of the paper tray.
5. Adjust the two detent screws **B** so that there is no in-out movement of the paper trays when the paper trays are in the normal operating position. Check to ensure that the two detent screws **B** are centered (front to rear) between the detent brackets **C**.
6. Check the picker/separator lift mechanism adjustment (725).
7. Reinstall the right, left, and center covers.

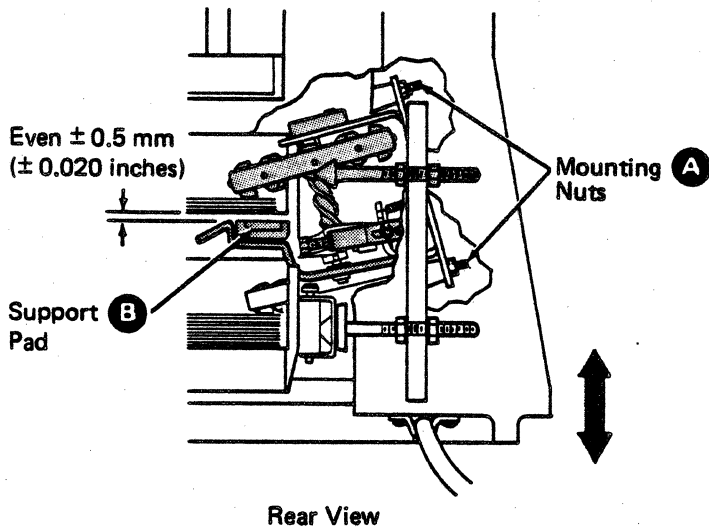


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724 PICKER/SEPARATOR ASSEMBLY

Adjustment

1. Power off.
2. Remove the left side cover (760).
3. Remove paper from the paper tray.
4. Loosen the three mounting nuts **A** for the picker/separator mechanism.
5. Adjust the picker/separator mechanism so that the support pad **B** and the top surface of the paper tray are even to ± 0.5 mm (± 0.02 inches).
6. Tighten the three mounting nuts.
7. Check the picker/separator lift mechanism adjustment (725).
8. Reinstall the left side cover.



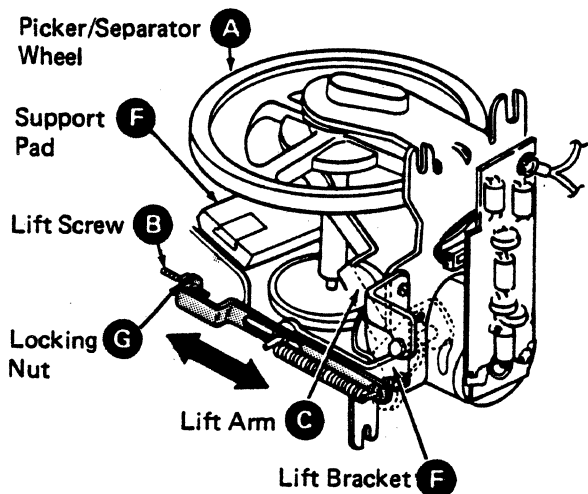
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725 PICKER/SEPARATOR LIFT MECHANISM

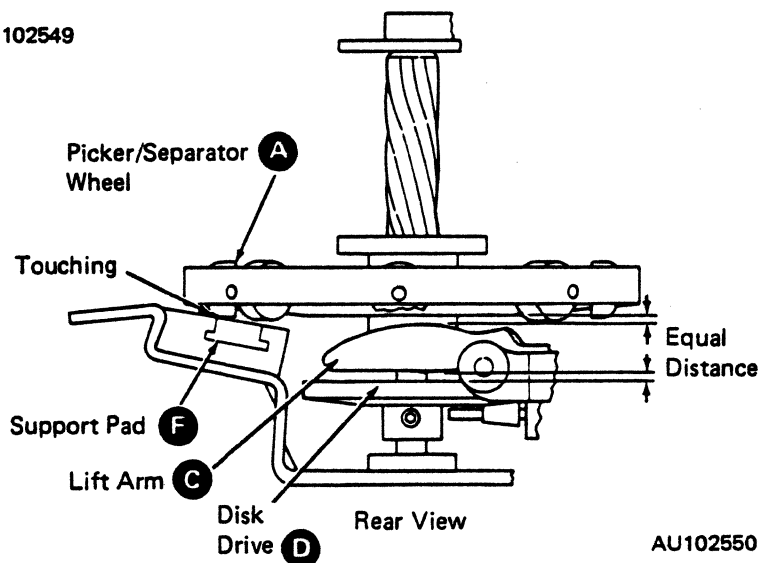
Adjustment

Note: The picker/separator assembly adjustment (724) must be performed before performing the picker/separator lift mechanism adjustment.

1. Power off.
2. Remove the left side cover (760).
3. Remove paper from the paper tray.
4. With the paper tray in the normal operating position (723), lower the picker/separator wheel **A** until it touches the support pad **F**.
5. Adjust the picker/separator lift mechanism screw **B** so that the picker/separator lift arm **C** is centered between the picker/separator wheel **A** and the drive disk **D**. Ensure that the lift arm **C** does not touch the lift bracket **F**. Tighten in place with the locking nut **G**.
6. Reinstall the left side cover.



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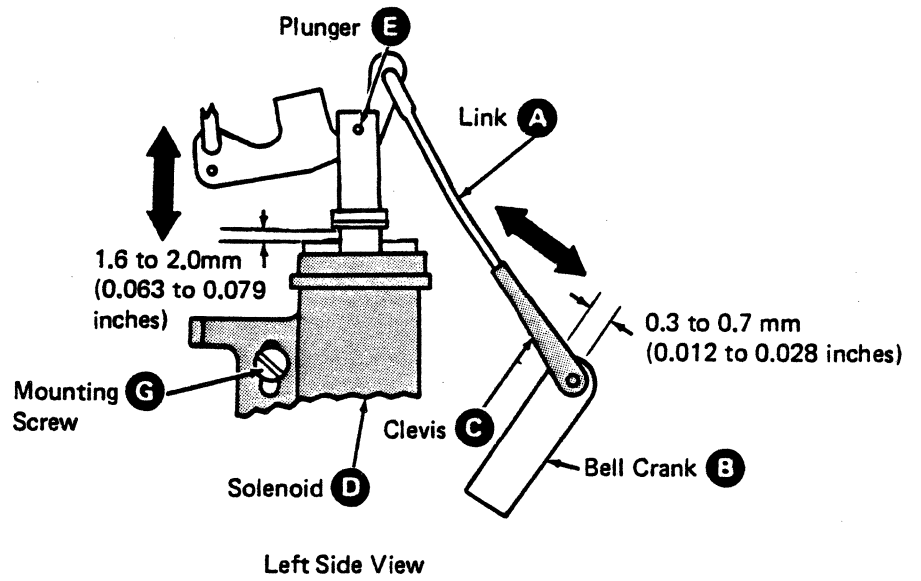
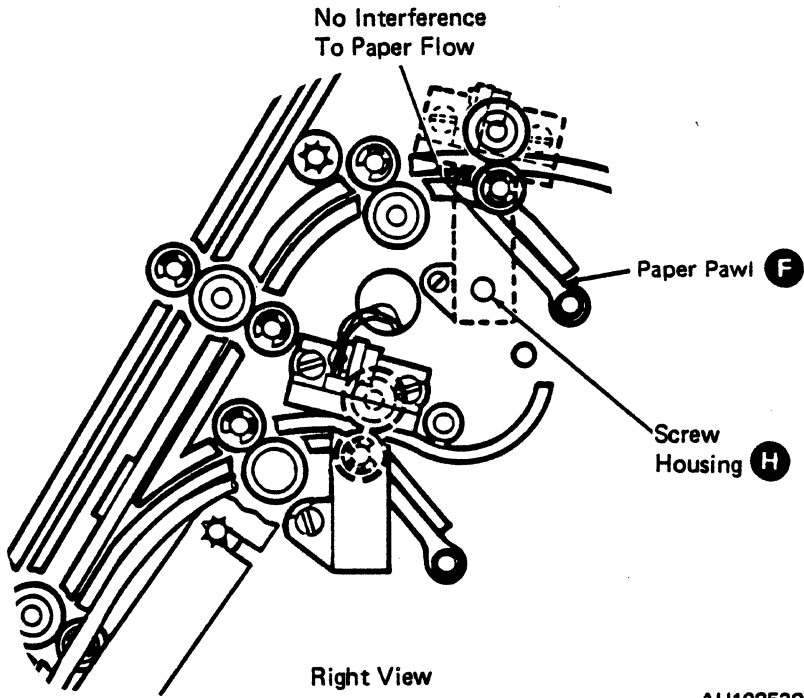
726 SECOND SHEET RESTRAINT ASSEMBLY

Adjustment

1. Power off.
2. Remove the left side cover (760).
3. Adjust the link **A** for 0.3 to 0.7 mm (0.012 to 0.028 inches) of movement before the clevis moves the lower bell crank **B**.

To perform this adjustment remove the lower part of the clevis **C** from the lower bell crank **B**. Turn the clevis clockwise or counterclockwise for the needed length.

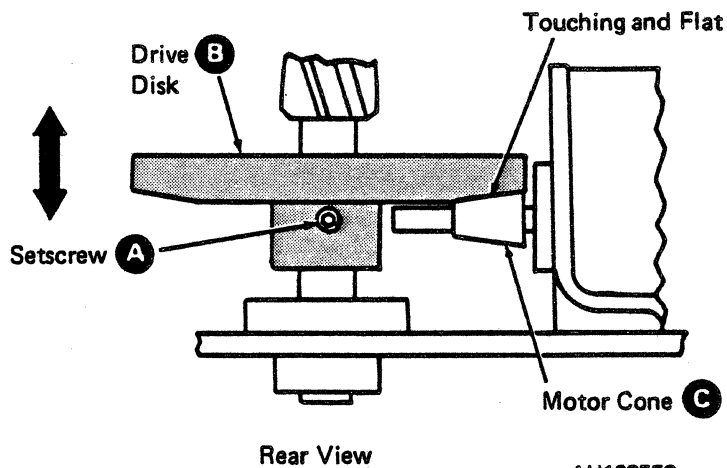
4. Loosen the second sheet restraint solenoid mounting screw **G**.
5. Locate the second sheet restraint solenoid **D** so that the second sheet restraint solenoid plunger **E** will move 1.6 to 2.0 mm (0.063 to 0.079 inches) when the solenoid is activated.
6. Feed a sheet of paper by hand.
7. Activate the solenoid by hand.
8. Ensure that the paper pawls **F** do not interfere with the paper flow.
9. If there is an interference, the second sheet restraint solenoid needs to be moved lower.
10. Check to ensure that neither paper pawl touches any screw housing **H** when the solenoid is activated.
11. If there is interference, the second sheet restraint solenoid needs to be moved higher.
12. Check the gate latch adjustment (748).
13. Reinstall the left side cover.



728 PICKER/SEPARATOR DRIVE DISK

Adjustment

1. Power off.
2. Remove the left side cover (760).
3. Remove the picker/separator assembly (764).
4. Loosen the setscrew **A** located in the drive disk **B**.
5. Adjust the drive disk so that the drive disk is flat on the motor cone surface **C**.
6. Tighten the setscrew.
7. Perform the following adjustment after the picker/separator has been reinstalled.
 - a. Picker/Separator assembly (724).
 - b. Picker/Separator lift mechanism (725).
8. Reinstall the left side cover.



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729 PAPER SENSOR ASSEMBLY

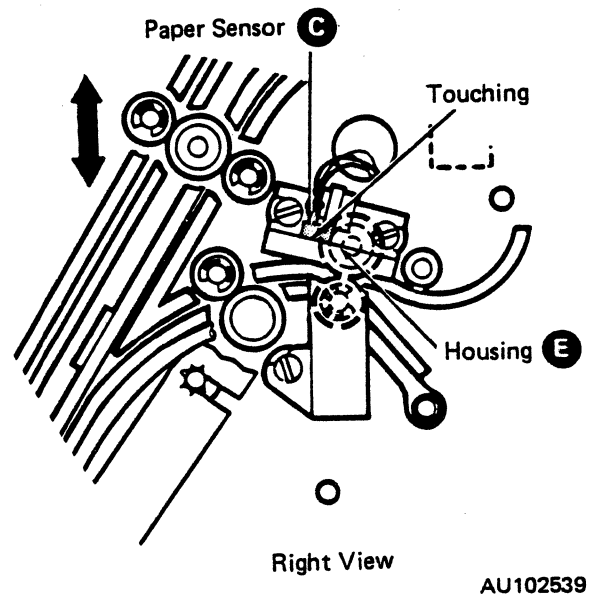
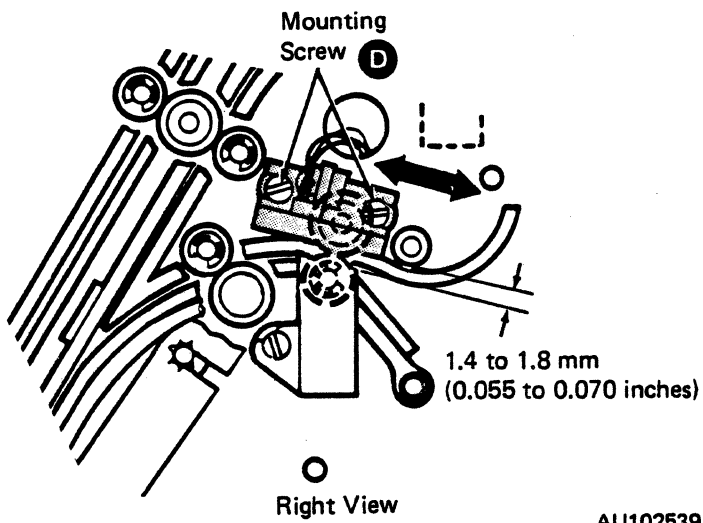
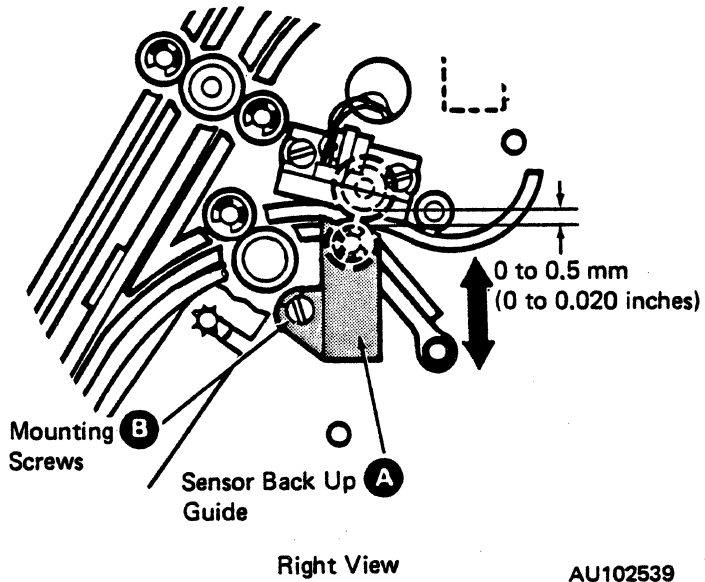
Adjustment

1. Power off.
2. Remove the left and right side cover (760, 761), and any necessary wire racks (780).
3. Check to ensure that the top surface of the sensor backup guide **(A)** is even to 0.5 mm (0.020 inches) below the bottom of the paper path. Loosen the sensor backup guide mounting screw **(B)** to make this adjustment.
4. Tighten the backup guide mounting screw **(B)**.
5. Loosen the sensor mounting screw.
6. Locate the paper sensor **(C)** in the housing **(E)** so that the sensor is against the downstop at the bottom of the housing.
7. Tighten the sensor mounting screw.
8. Loosen the housing mounting screws **(D)**.
9. Locate the housing vertically to obtain a gap of 1.4 to 1.8 mm (0.055 to 0.070 inches) between the housing and the sensor backup guide.
10. Tighten the two housing mounting screws.
11. To ensure that paper is sensed 1 to 3 mm (0.040 to 0.118 inches) beyond the pinch point of the first cone roller, do the following:
 - a. Connect a meter between J7-12 and J7-3 (ground) for the lower sensor and J7-11 and J7-3 (ground) for the upper sensor.
 - b. Power on.
 - c. Activate by hand the second sheet restraint solenoid and feed a sheet of paper to the pinch point of the cone roller.
 - d. While looking at the meter, press the Paper Up switch lightly two to six times. The meter should indicate +5 Vdc between the second and sixth time the switch is pressed.
 - e. Repeat steps 9 and 10 until both the vertically and horizontal adjustments are correct.

Note: Each time the Paper Up switch is pressed, the paper moves 0.5 mm (0.020 inches).

12. Reinstall the wire racks.

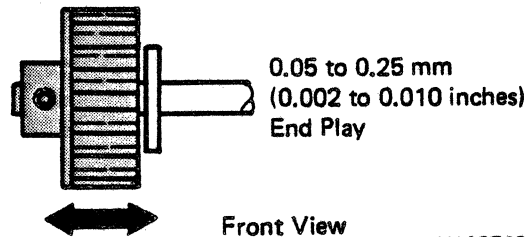
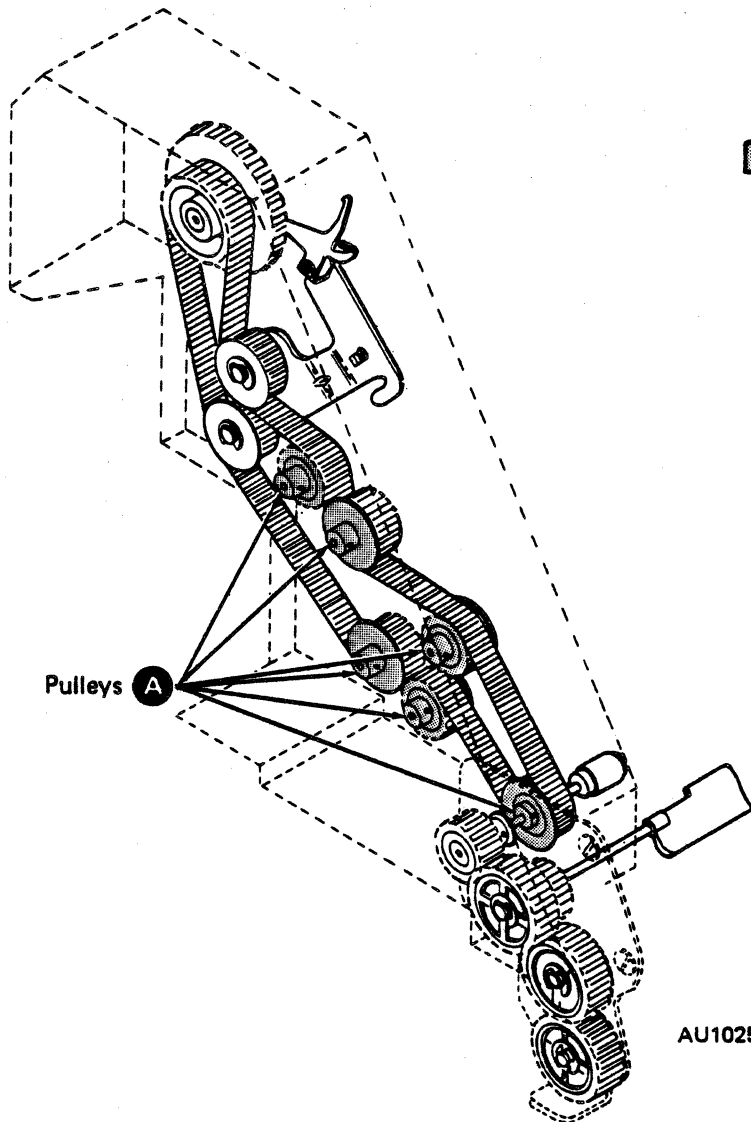
13. Reinstall the covers.



730 TRANSPORT ALIGNER PULLEYS

Adjustment

1. Power off.
2. Remove the left side cover (760) and the sheet feed analog card support screw (763).
3. Loosen the setscrews on the transport aligner pulleys **A**.
4. Adjust the transport aligner pulleys for 0.05 to 0.25 mm (0.002 to 0.010 inches) of end play.
5. Tighten the setscrews.
6. Reinstall the sheet feed analog card support screw.
7. Reinstall the left side cover.



Front View

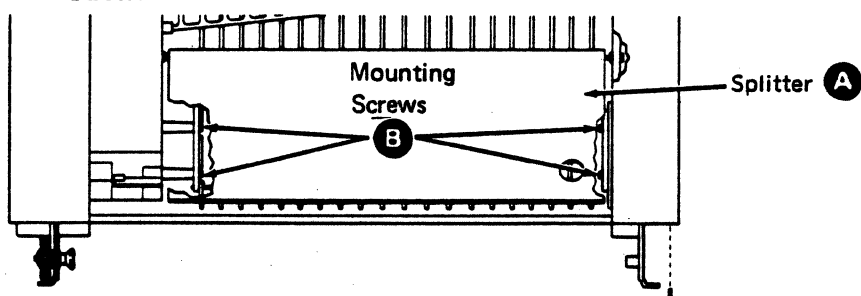
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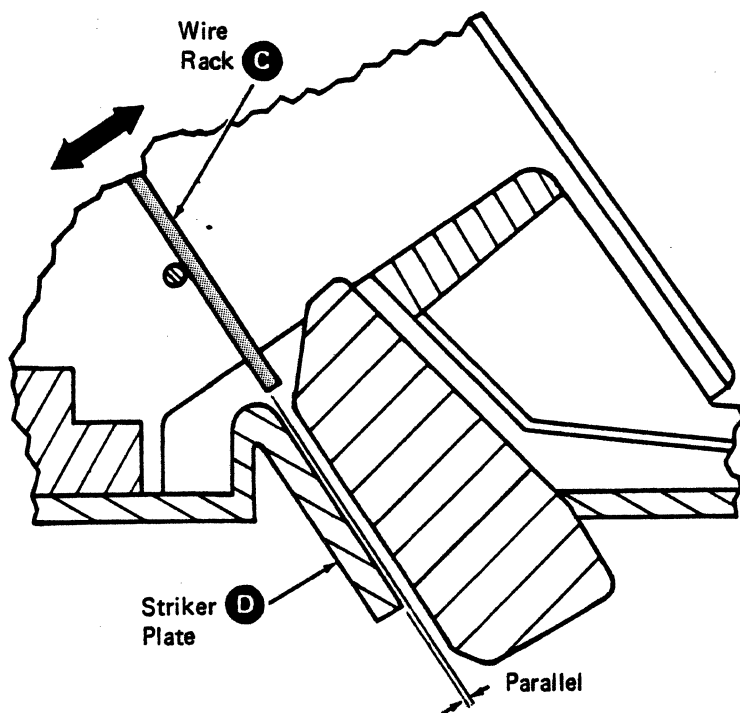
731 LOWER INNER WIRE RACK

Adjustment

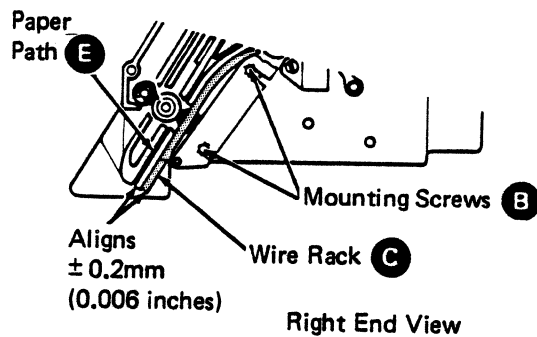
1. Power off.
2. Lift the splitter **A**.
3. Loosen the wire rack mounting screws **B**.
4. Adjust the left side of the wire rack **C** so that it is even ± 0.2 mm (0.008 inches) with the bottom of the paper path **E**.
5. Adjust the right side so that the wire rack is parallel to the printer striker plate **D**.
6. Tighten the wire rack mounting screws.
7. Close the splitter and ensure that it does not touch the lower inner wire rack.



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Left View



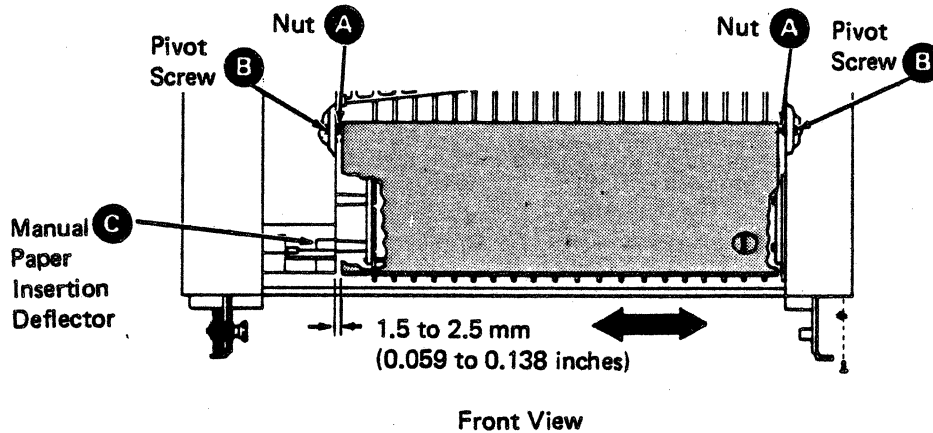
Right End View

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732 SPLITTER ASSEMBLY

Adjustments

1. Power off.
2. Remove the left and right side covers (760, 761).
3. Loosen the splitter assembly pivot screws nuts **A**.
4. Adjust the splitter pivot screws **B** so that there is 1.5 to 2.5 mm (0.059 to 0.138 inches) gap between the manual paper insertion deflector **C** and the splitter. Ensure that the splitter has 0.2 to 0.5 mm (0.008 to 0.020 inches) end play.
5. Tighten the splitter assembly nuts.
6. Reinstall the covers.



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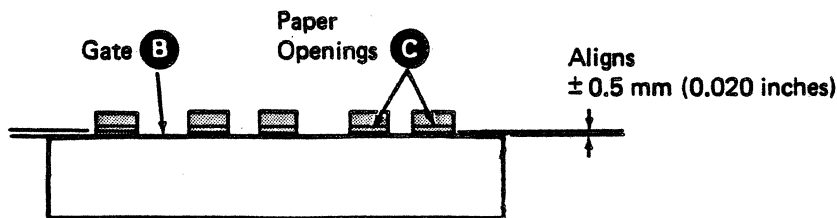
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EXIT MECHANISM

740 SEQUENCER CYLINDERS

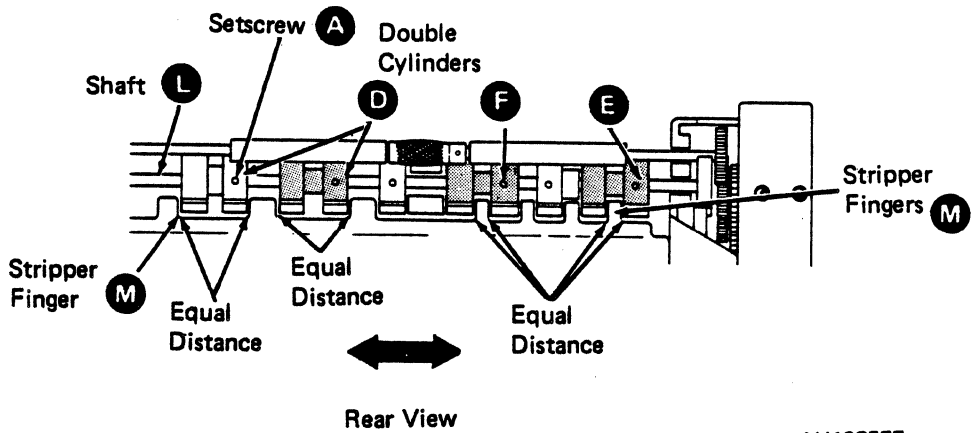
Adjustment

1. Power off.
2. Remove the left, right, and center covers (760, 761, 762).
3. To adjust any of the sequencer cylinders, loosen the setscrews **A**.
4. Place the gate **B** in the downward position by releasing the gate latch.
5. To align the sequencer cylinders, locate the paper openings **C** of the sequencer cylinders in line to 0.5 mm (0.020 inches), using the gate as the reference line.
6. Adjust the double sequencer cylinders **D**, **E**, **F** on the shaft **L** so that they are visually centered between the stripper fingers **M**.
7. Adjust the second sequencer cylinder **G** so there is 0.5 to 1.0 mm (0.020 to 0.040 inches) gap between sequencer cylinder 1 **E** and the clamp **H**. This will allow free movement of the clamp.
8. Adjust sequencer cylinder 4 **J** to allow 0.2 to 0.7 mm (0.008 to 0.028 inches) of end play for both lower kick rollers **K**.
9. Perform the ratchet adjustment (743).
10. Reinstall the covers.

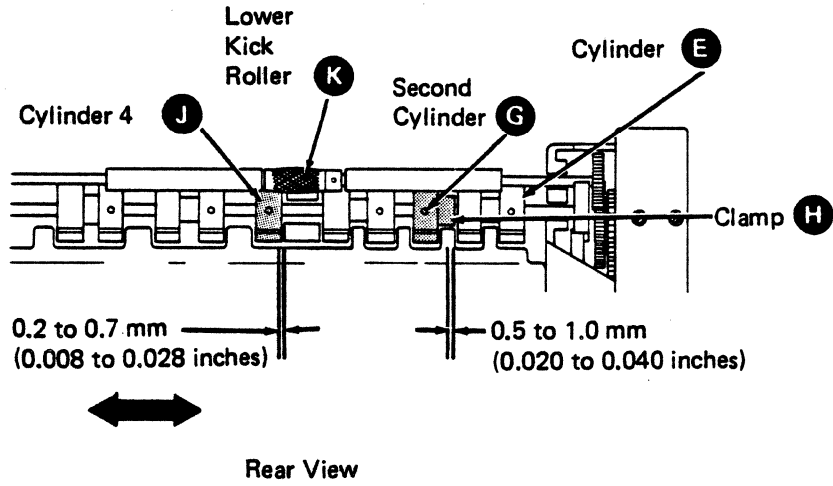


Top View

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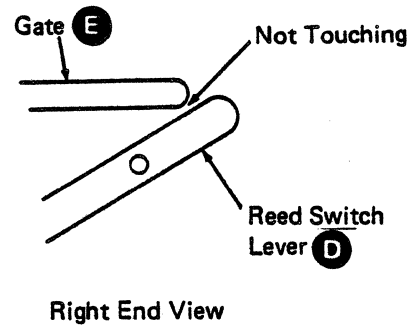
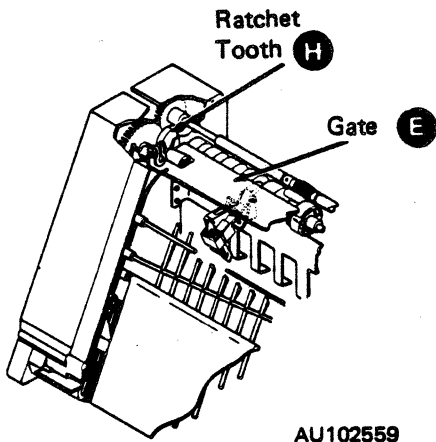


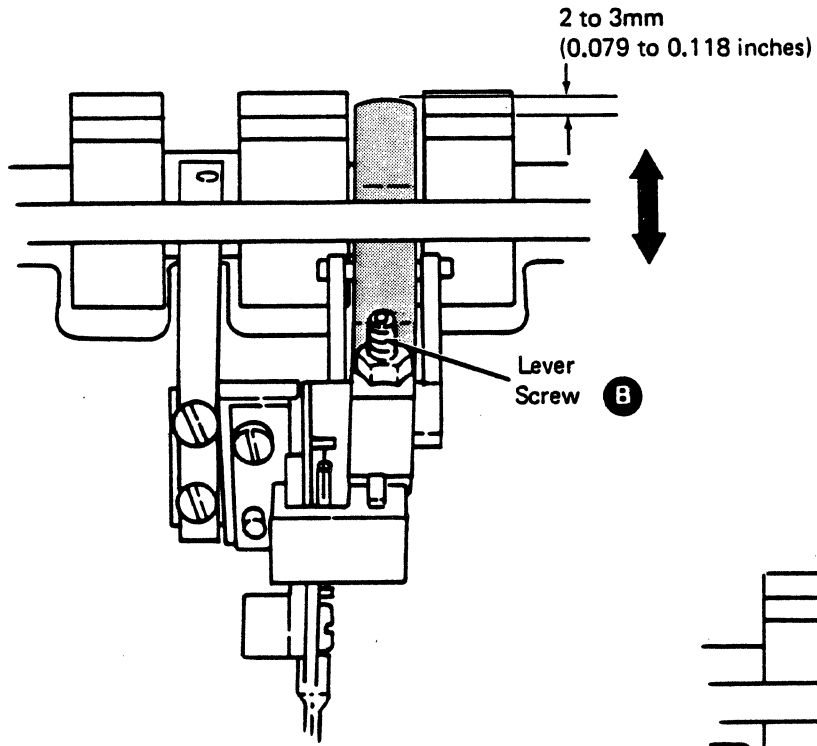
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741 REED SWITCH

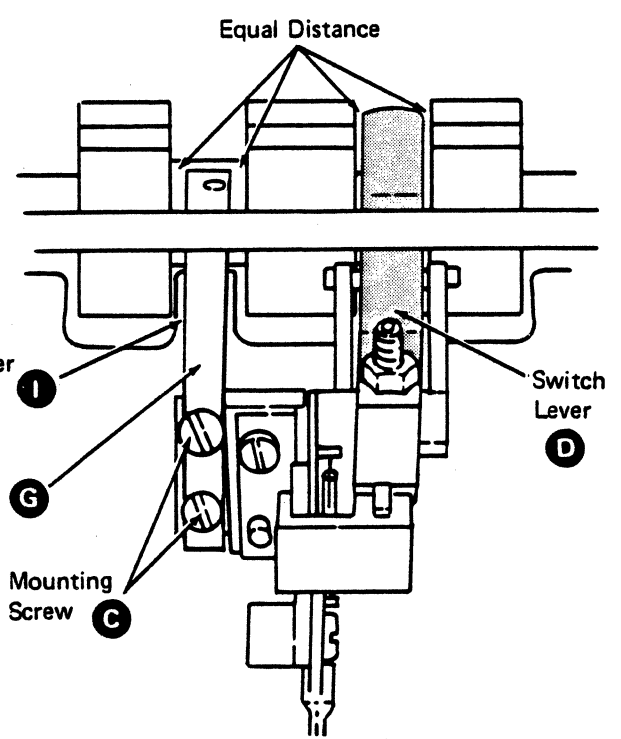
Adjustment

1. Power off.
2. Remove the left, right, and center covers (760, 761, 762).
3. Loosen the mounting screw **C** and center the reed switch lever **D** and the clamp spring **G** on their respective stripper fingers **I**.
4. Adjust the reed switch lever screw **B** so that the top of the lever is 2 to 3 mm (0.079 to 0.118 inches) above the top of the paper openings.
5. Power on.
6. Activate, by hand, the second sheet restraint solenoid to drop the gate **E**.
7. With the ratchet tooth **H** latched against the sequencer magnet armature, insert a sheet of paper by hand into the paper openings of the sequencer cylinders.
8. When the paper is in the middle of the paper openings of the sequencer cylinders, the sequencer magnet should activate.
9. Loosen the reed switch mounting screw **F** and adjust the reed switch **A** up and down until this occurs.
10. Check to ensure that the reed switch lever travels 0.5 to 1.5 mm (0.020 to 0.059 inches) after the reed switch opens again. Ensure that the gate **E** does not touch the reed switch lever **D**.
11. When completed, tighten the reed switch mounting screw and the reed switch lever screw locking nut **J**.
12. Reinstall the covers.

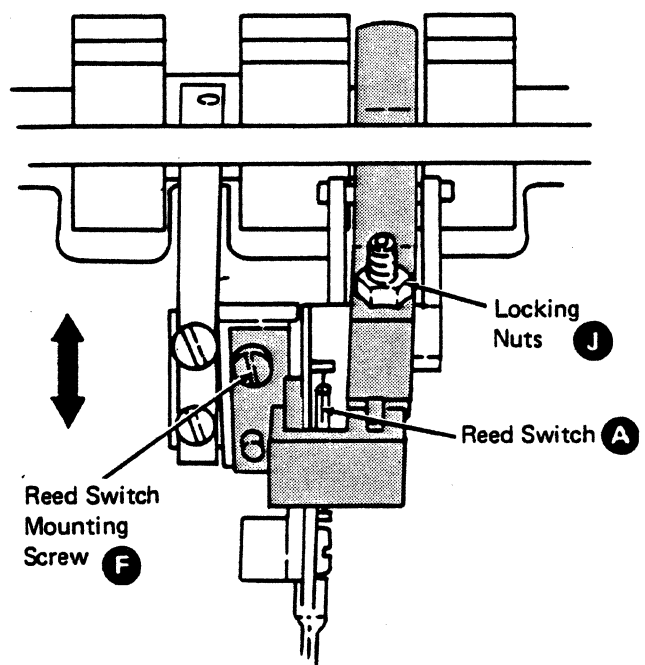




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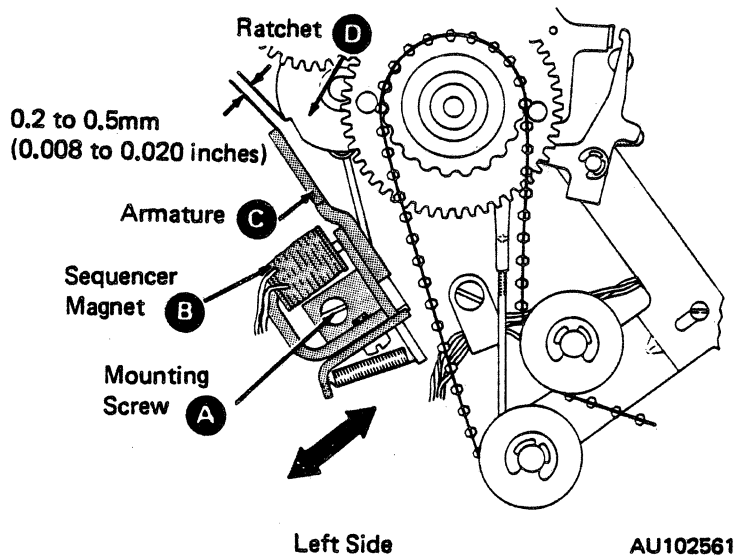


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742 SEQUENCER MAGNET ASSEMBLY

Adjustment

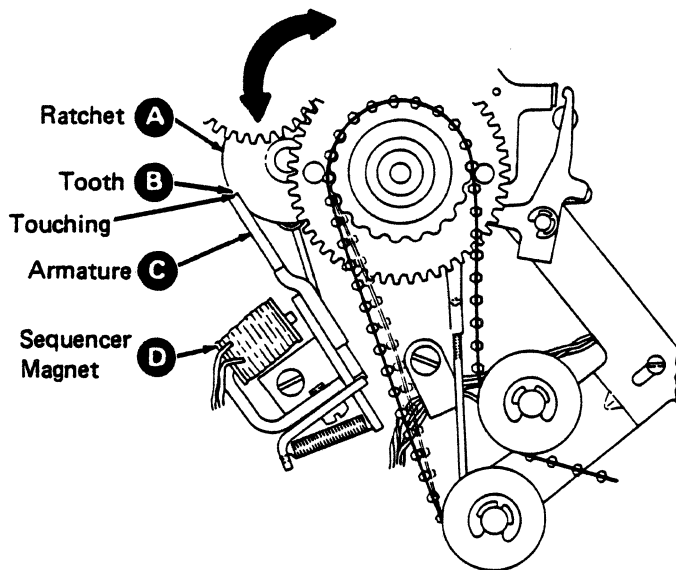
1. Power off.
2. Remove the left side cover (760).
3. Remove the sheet feed analog card support screw (763).
4. Loosen the sequencer magnet mounting screw **A**.
5. Locate the sequencer magnet **B** so that when activated, the sequencer magnet armature **C** clears the ratchet **D** by 0.2 to 0.5 mm (0.008 to 0.020 inches).
6. Reinstall the sheet feed analog card support screw.
7. Reinstall the left side cover.



743 RATCHET

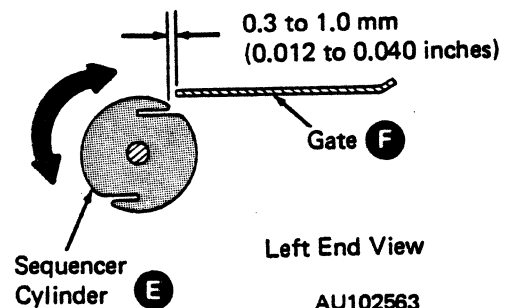
Adjustment

1. Power off.
2. Remove the left, right, and center covers (760, 761, 762).
3. Remove the sheet feed analog card support screw (763).
4. Check the sequencer cylinders adjustment (740).
5. Loosen the ratchet **A** setscrew.
6. Place the ratchet tooth **B** against the armature **C** of the sequencer magnet **D**.
7. Place the sequencer cylinders **E** so that the front of the paper openings of the sequencer cylinders is 0.3 to 1.0 mm (0.012 to 0.040 inches) from the rear edge of the gate **F**.
8. Tighten the ratchet setscrew.
9. Pick the magnet and turn the sequencer cylinder 180 degrees (ensure that step 7 is maintained).
10. Check the drive wheel and roller adjustment (744).
11. Reinstall the sheet feed analog card support screw.
12. Reinstall the covers.



Left Side View

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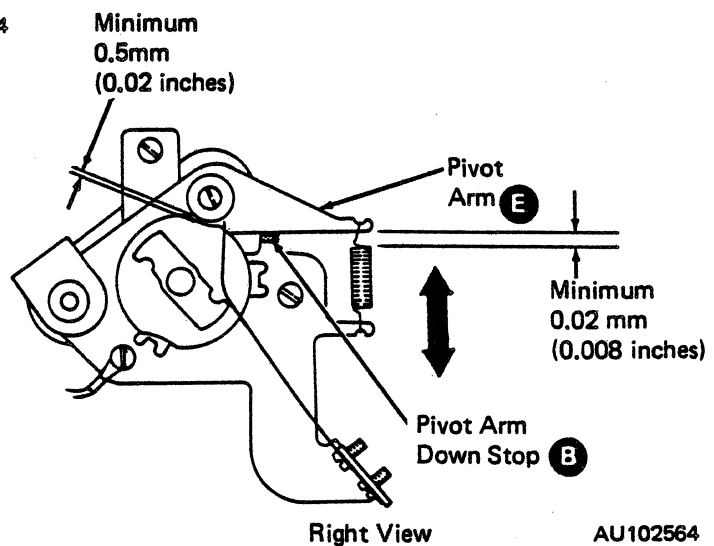
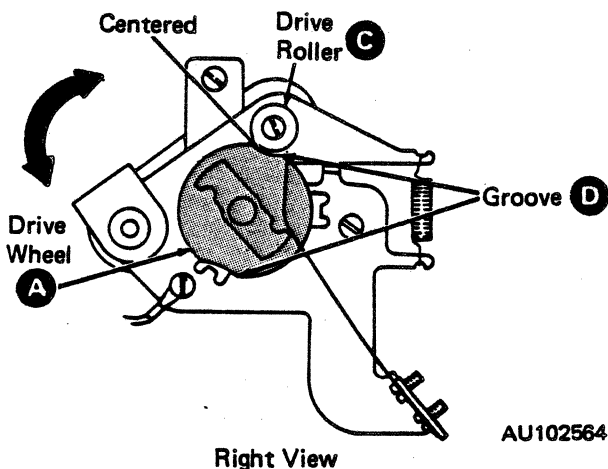
Left End View

AU102563

744 DRIVE WHEEL AND ROLLER

Adjustment

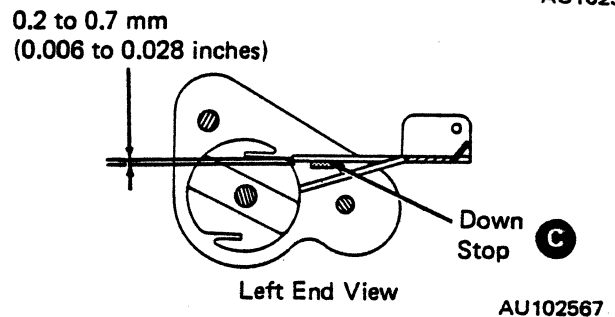
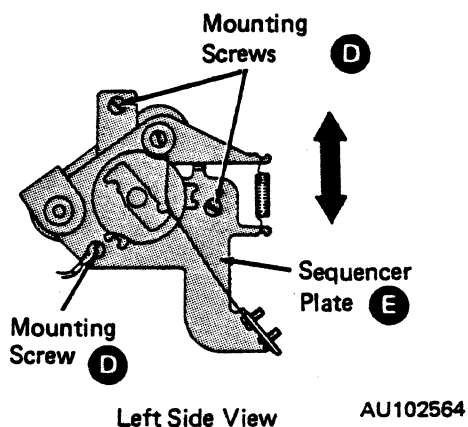
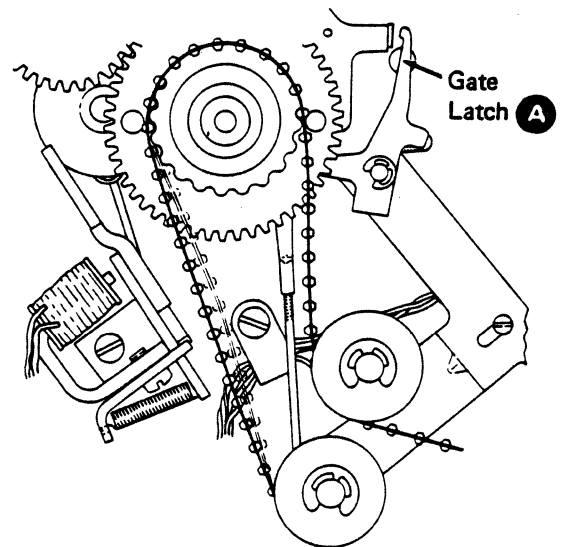
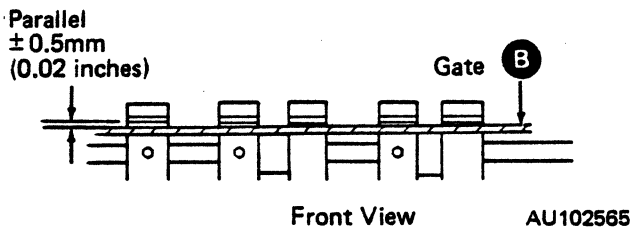
1. Power off.
2. Remove the right side cover (761).
3. Ensure the ratchet tooth is latched against the sequencer magnet armature. Maintain this condition throughout this adjustment.
4. Loosen the drive wheel **A** setscrew.
5. Turn the drive wheel **A** so that the drive roller **C** is centered in a drive wheel groove **D**.
6. Tighten the drive wheel setscrew.
7. Shape the pivot arm down stop **B** to obtain at least a 0.5 mm (0.02 inches) gap between the drive roller **C** and the bottom of the drive wheel groove **D** in the latched position.
8. Pick the sequencer magnet and turn the ratchet approximately 90 degrees.
9. Ensure that there is at least 0.2 mm (0.008 inches) gap between the pivot arm **E** and the pivot arm down stop **B**.



745 GATE DOWN STOP

Adjustment

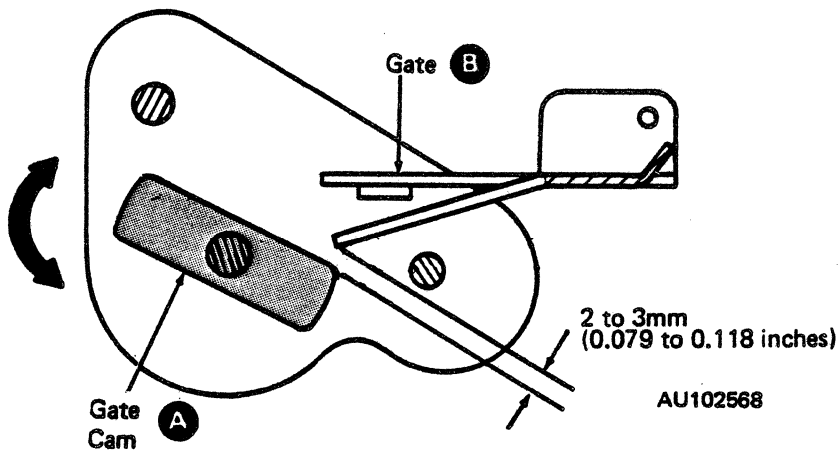
1. Power off.
2. Remove the left, right, and center covers (760, 761, 762).
3. Check the ratchet and sequencer cylinders adjustments (743 and 740).
4. Loosen the three sequencer plate mounting screws **D**.
5. Adjust the sequencer plate **E** up and down so that the sequencer cylinders are parallel to the rear edge of the gate **B ± 0.5 mm (0.02 inches).**
6. Release the gate latch **A** so that the gate **B** is on the gate down stop **C**.
7. Adjust the down stop (by bending with pliers) so that the bottom of the gate is 0.2 to 0.7 mm (0.008 to 0.028 inches) from the bottom of the paper slots of the sequencer cylinders on both the left and right sides.
8. Check the gate cam adjustment (746) and the reed switch adjustment (741).
9. Reinstall the covers.



746 GATE CAM

Adjustment

1. Power off.
2. Remove the left side cover (760).
3. Check the gate down stop adjustment (745).
4. With the ratchet tooth latched up against the sequencer magnet armature, loosen the gate cam **A** setscrew.
5. With the gate **B** in its downward position, turn the cam on the shaft until there is a 2 to 3 mm (0.079 to 0.118 inches) gap between the cam and the gate. This lets the clutch engage before the cam **A** starts to lift the gate.
6. Tighten the cam setscrew.
7. Reinstall the left side cover.



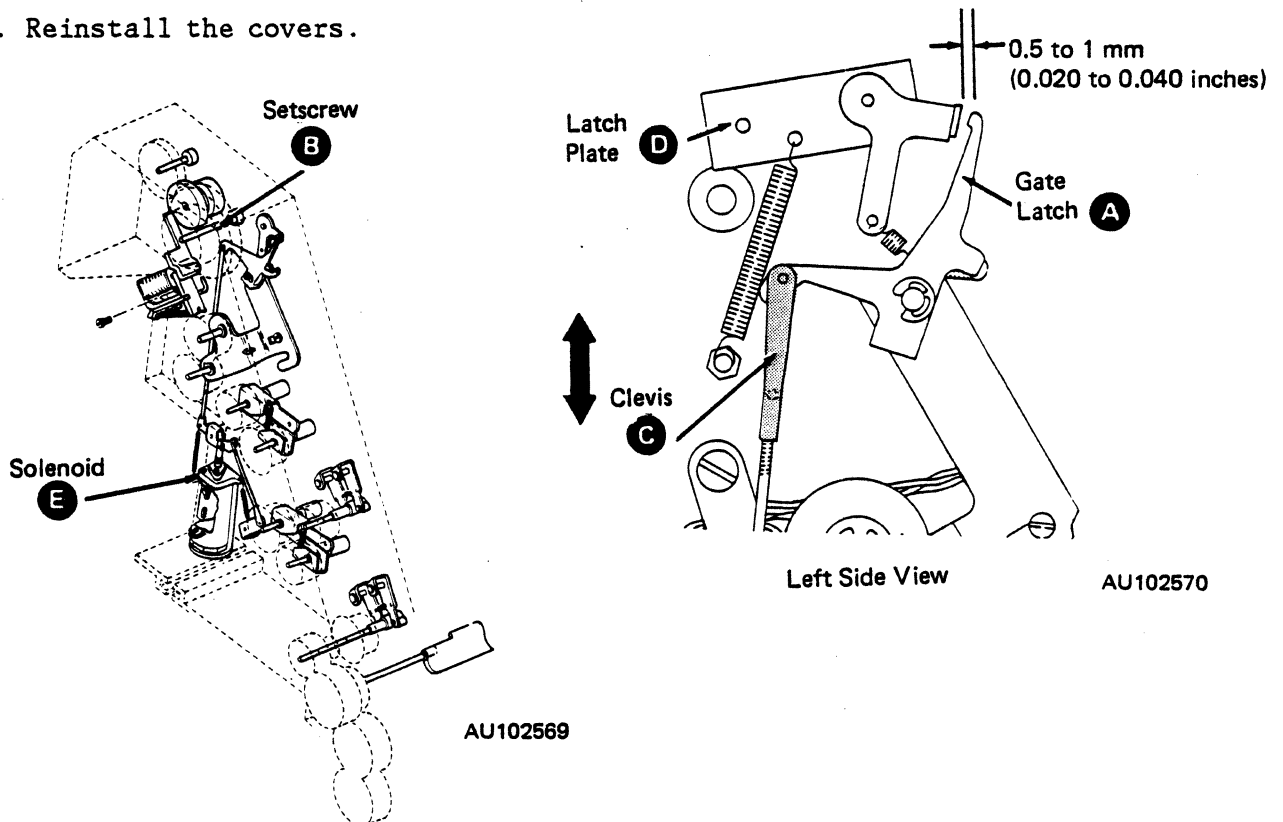
748 GATE LATCH

Adjustment

1. Power off.
2. Remove the left, right, and center covers (760, 761, 762).
3. Remove the sheet feed analog card support screw (763).
4. Remove the timing belt from around the sequencer pulley.
5. Loosen the sequencer pulley setscrew **B**.
6. Remove the sequencer pulley.
7. Adjust the gate latch clevis so that the gate latch **A** clears the latch plate **D** by 0.5 to 1 mm (0.020 to 0.040 inches), when the solenoid **E** is activated.

To perform this adjustment remove the upper part of the clevis **C** from the gate latch. Turn the clevis clockwise or counter-clockwise for the needed length.

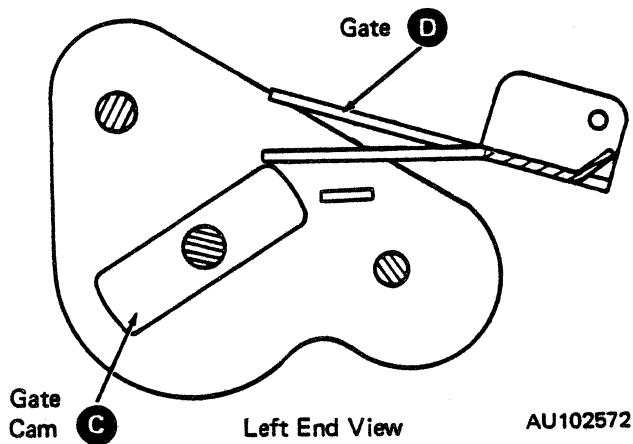
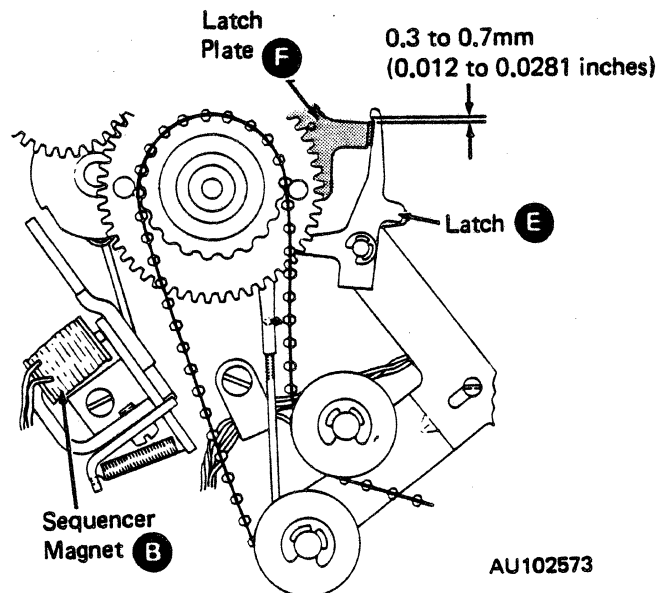
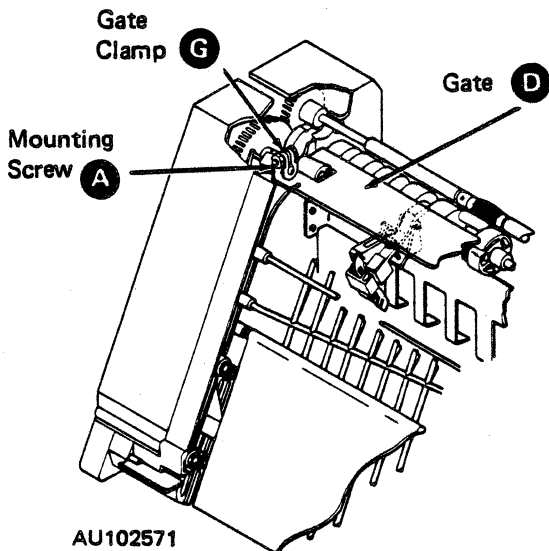
8. Reinstall the sequencer pulley and the timing belt.
9. Reinstall the sheet feed analog card support screw.
10. Reinstall the covers.



749 GATE

Adjustment

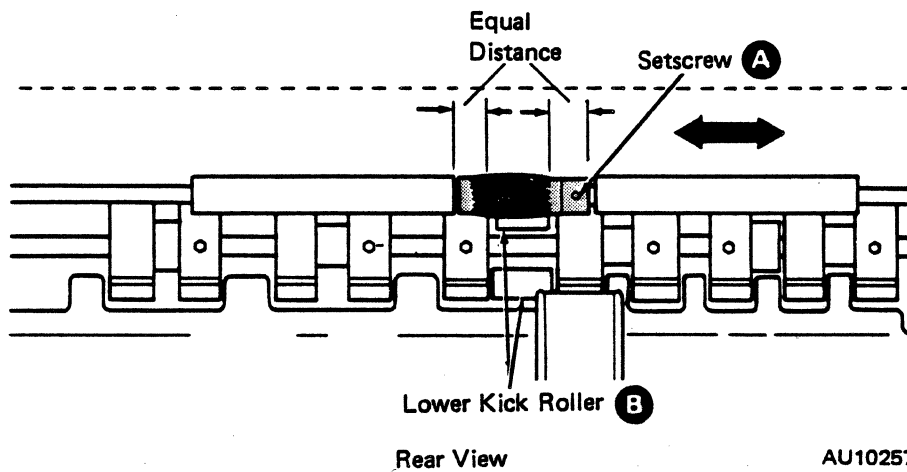
1. Power off.
2. Remove the left, right, and center covers (760, 761, 762), and sheet feed analog card support screw (763).
3. Loosen the left gate mounting screw **A** and open the gate clamp **G** to free the gate from the latch plate.
4. Activate the sequencer magnet **B** by hand.
5. Turn the platen driven gear until the gate **D** is at its highest point on the gate cam **C**.
6. Adjust the latch plate **F** so that it clears the latch **E** by 0.3 to 0.7 mm (0.012 to 0.028 inches).
7. Tighten the gate mounting screw.
8. Reinstall the sheet feed analog support screw.
9. Reinstall the covers.



750 UPPER KICK ROLLER

Adjustment

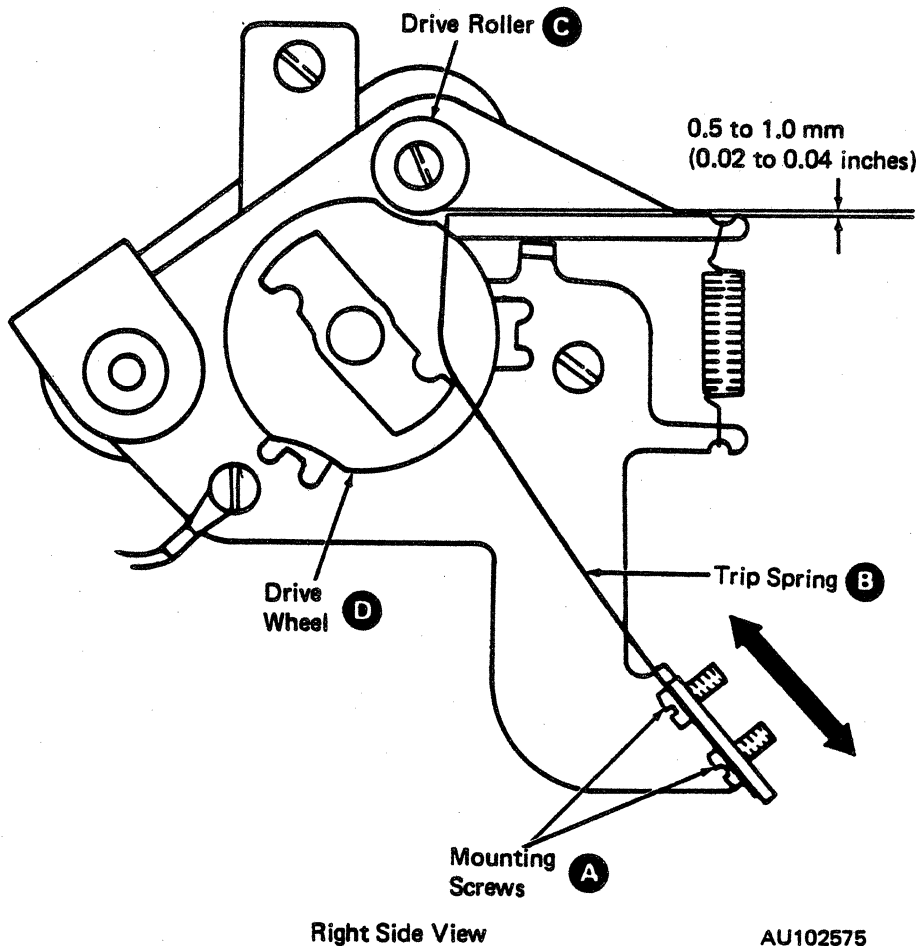
1. Power off.
2. Loosen the upper kick roller setscrew **A**.
3. Center the upper kick roller on the lower kick rollers **B**. Ensure that the upper kick roller does not touch the sequencer cylinders.



751 TRIP SPRING

Adjustment

1. Power off.
2. Remove the right side cover (761).
3. Loosen the trip spring mounting screws **A**.
4. Adjust the trip spring for 0.5 to 1.0 mm (0.02 to 0.04 inches) gap between the top of the trip spring **B** and the drive roller **C**. Ensure that the drive wheel **D** is turned so that the trip spring and drive wheel are at their nearest point.
5. Tighten the trip spring mounting screws.
6. Reinstall the right side cover.



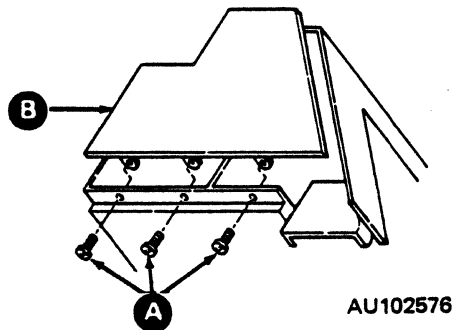
SHEET FEED REMOVALS AND REPLACEMENTS

COVERS

760 LEFT SIDE COVER

Removal and Replacement

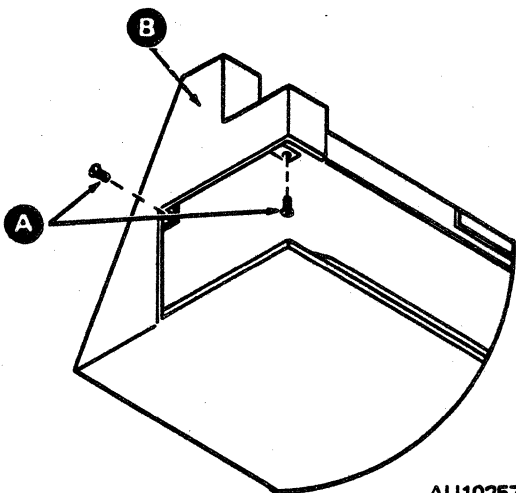
1. Power off.
2. Disconnect the sheet feed cable from the printer.
3. Remove the two paper trays and paper from the output paper tray.
4. Remove the sheet feed from the printer.
5. Place the sheet feed right side on a flat surface.
6. Remove the three left cover mounting screws **A**.
7. Remove the left side cover **B**.
8. For replacement of the left side cover, reverse this procedure.



761 RIGHT SIDE COVER

Removal and Replacement

1. Power off.
2. Disconnect the sheet feed cable from the printer.
3. Remove the two paper trays and paper from the output paper tray.
4. Remove the sheet feed from the printer.
5. Place the sheet feed left side on a flat surface.
6. Remove the two right cover mounting screws **A**.
7. Remove the right side cover **B**.
8. For replacement of the right side cover, reverse this procedure.



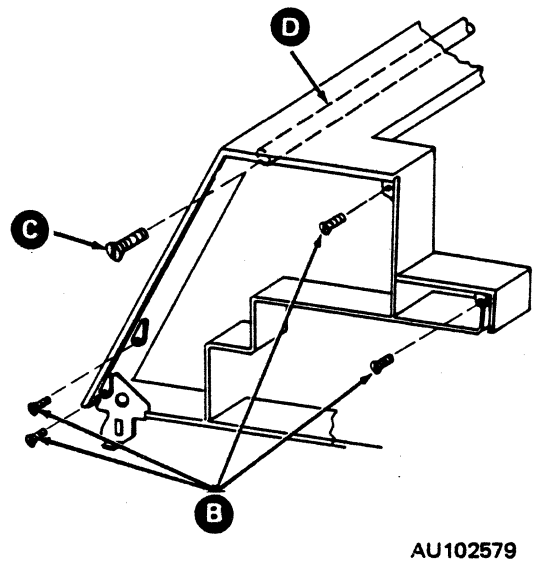
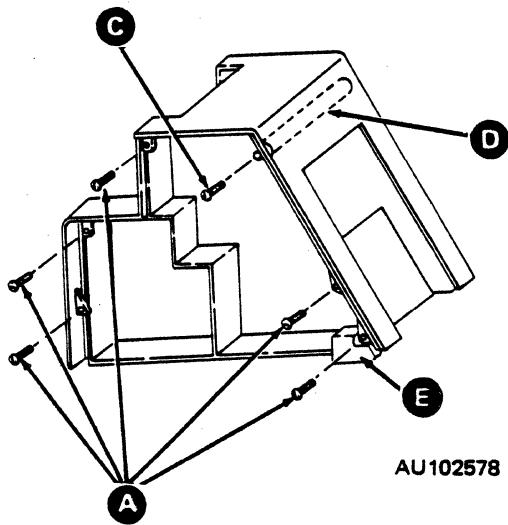
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762 CENTER COVER

Removal and Replacement

1. Remove the left and right side covers (760, 761).
2. Remove the sheet feed analog card support screw (763).
3. Remove the gear guard **E**.
4. Remove the five mounting screws **A** on the left side of the center cover.
5. Remove the four mounting screws **B** on the right side of the center cover.
6. Remove the two support bar mounting screws **C**.
7. Remove the center cover.
8. Remove the support bar **D**.
9. For replacement of the center cover, reverse this procedure.

Note: When performing adjustments that require the removal of the center cover, the support bar and gear guard must be reinstalled.

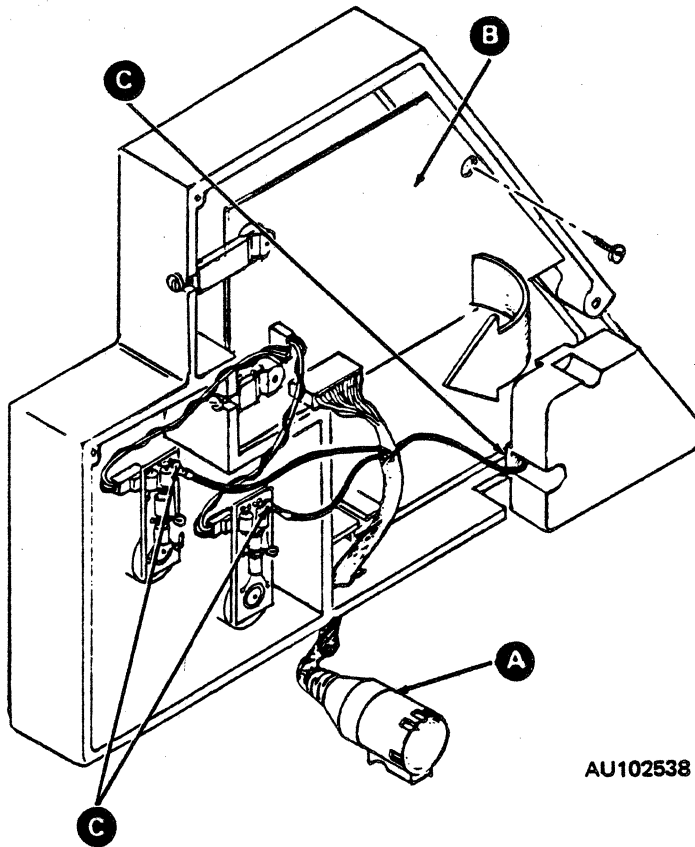


763 SHEET FEED CABLE AND ANALOG CARD

Sheet Feed Cable

Removal and Replacement

1. Power off.
2. Disconnect the sheet feed cable **A** from the printer.
3. Remove the left side cover (760).
4. Remove the two cable clamps that attach the sheet feed cable to the sheet feed. Remove the screws **C** that attach the cable to the filter boards on both picker/separator motors and to the left side mounting plate.
5. Disconnect the sheet feed cable from the sheet feed analog card **B**.
6. Remove the sheet feed cable.
7. For replacement of the sheet feed cable, reverse this procedure.



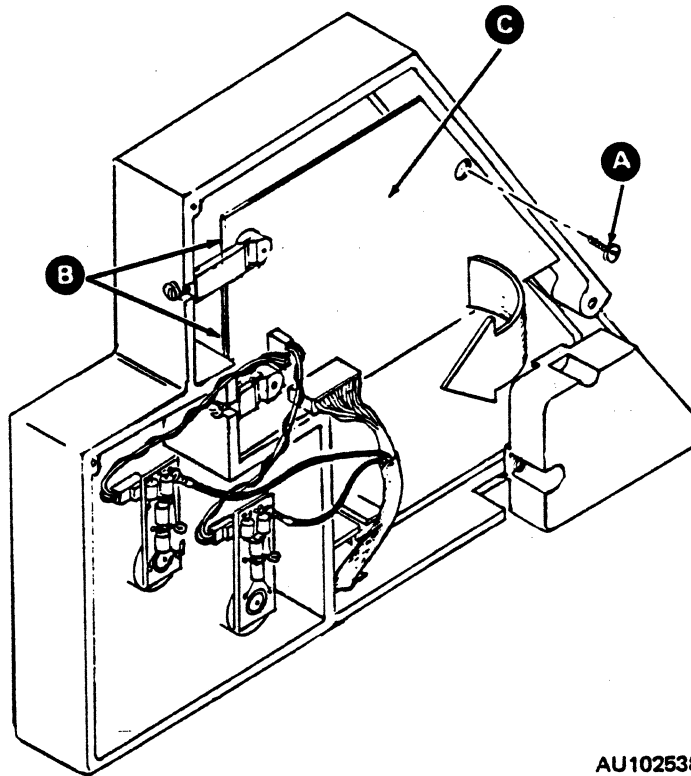
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SHEET FEED ANALOG CARD

Removal and Replacement

1. Power off.
2. Remove the left side cover (760).
3. Remove all connectors that attach to the sheet feed analog card.
4. Remove the sheet feed analog card support screw **A** and pivot the card back.
5. Remove the two sheet feed analog card mounting screws **B**.
6. Remove the sheet feed analog card **C**.
7. Complete the operation by reversing the preceding steps.

WARNING: Ensure that connectors J2, J4, and J5 (705) are not swapped when exchanging the sheet feed analog card.



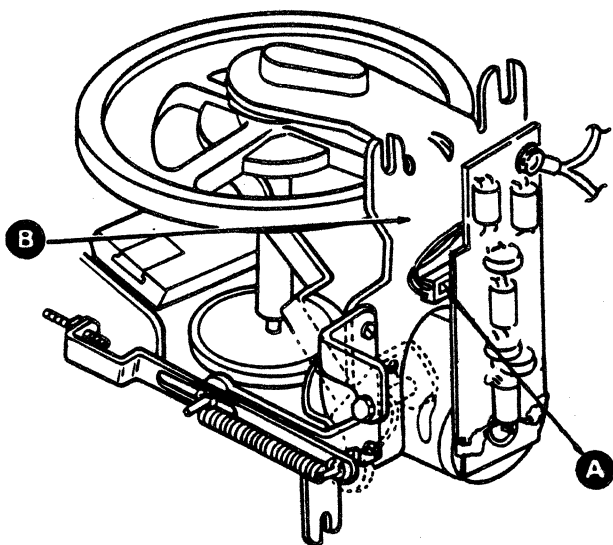
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PAPER FEED

764 PICKER/SEPARATOR ASSEMBLY

Removal and Replacement

1. Power off.
2. Remove the left side cover (760).
3. Remove the two pin connector **A** from the filter board of the picker/separator assembly.
4. Loosen the three support nuts. One or more nuts must be removed.
5. Remove the picker/separator assembly **B**.
6. Remove the ground wire from the filter board.
7. For replacement of the picker/separator assembly, reverse this procedure.
8. Perform the picker/separator assembly adjustment (724).
9. Perform the picker/separator lift mechanism adjustment (725).

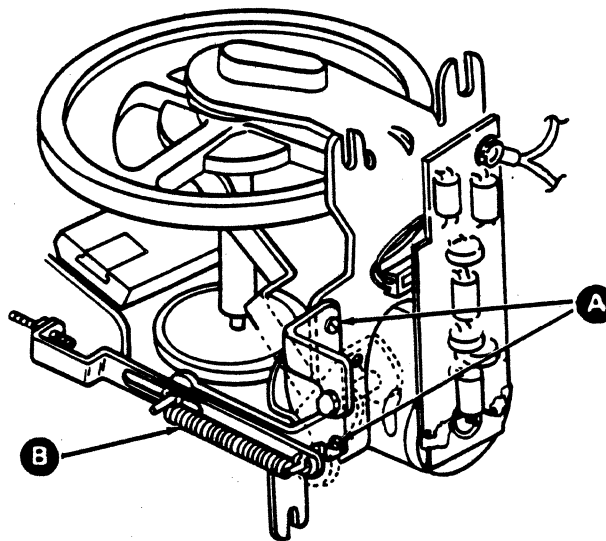


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765 PICKER/SEPARATOR LIFT MECHANISM

Removal and Replacement

1. Power off.
2. Remove the left side cover (760).
3. Remove the two picker/separator lift mechanism mounting screws **A**.
4. Remove the picker/separator lift mechanism **B**.
5. For replacement of the picker/separator lift mechanism, reverse this procedure.
6. Perform the picker/separator lift mechanism adjustment (725).
7. Reinstall the left side cover.



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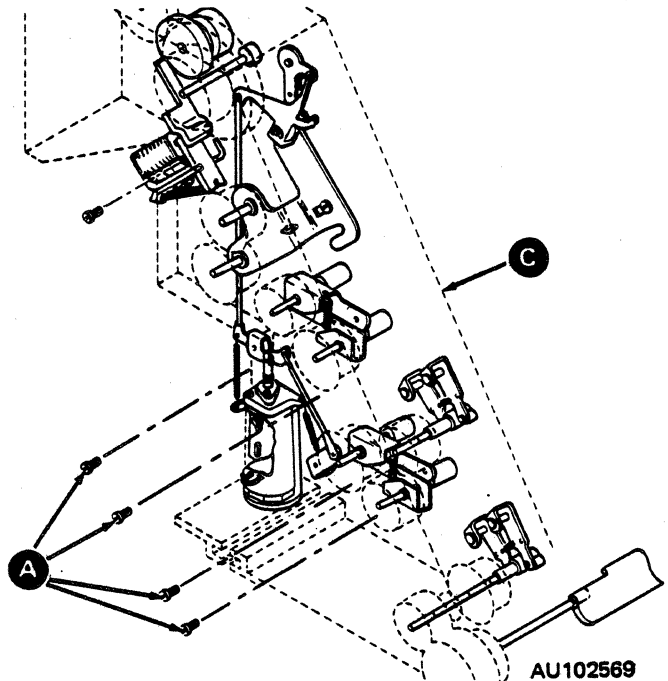
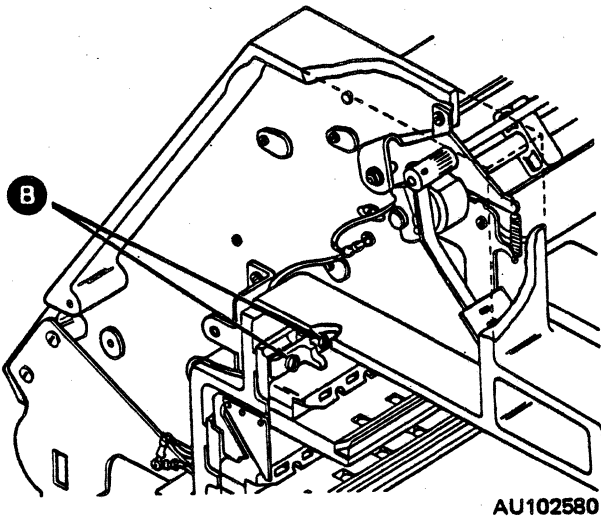
766 PAPER TRAY SUPPORT RAIL

Removal and Replacement

WARNING: Never remove the upper and lower paper tray support rails at the same time.

1. Power off.
2. Remove the paper trays from the sheet feed.
3. Remove the left side cover (760).
4. Remove the two left paper tray support rail mounting screws **A**.
5. Remove the two right paper tray support rail mounting screws **B** and the tray inhibitor.
6. Remove the paper tray support rail.
7. Complete the operation by reversing the preceding steps. Before tightening the right side screws, push up on the support rail.

Note: Ensure that the rail is against the paper path block **C** before the right screws **B** are tightened.

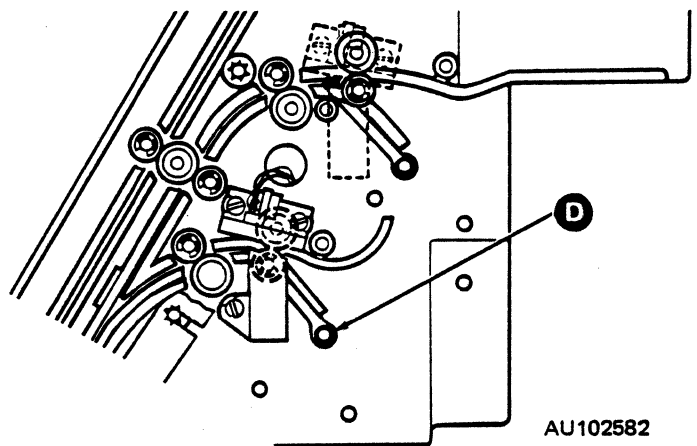
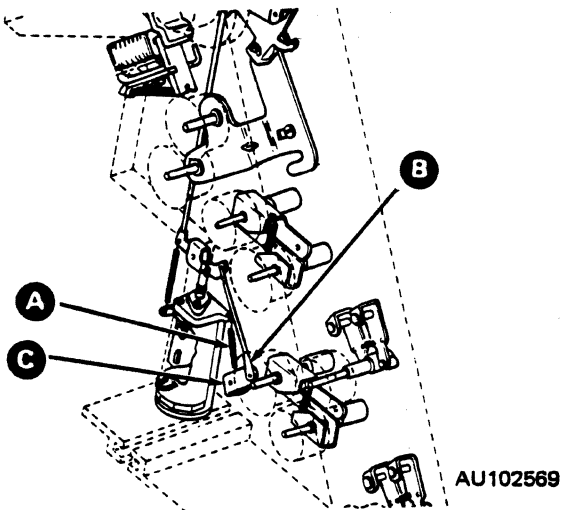


767 LOWER SECOND SHEET RESTRAINT PAPER PAWL

Removal and Replacement

1. Power off.
2. Remove the left side cover (760).
3. Remove the lower bellcrank spring **A**.
4. Remove the lower part of the clevis **B** that connects to the lower bellcrank **C**.
5. Remove the lower paper tray support rail (766).
6. Loosen the lower second sheet restraint paper pawl **D** setscrew.
7. Remove the lower bellcrank **C** so that the lower second sheet restraint paper pawl can be removed.
8. For replacement of the lower second sheet restraint paper pawl, reverse this procedure.
9. Perform the second sheet restraint assembly adjustment (726).

Note: When the lower second sheet restraint paper pawl is screwed to the shaft, the paper pawl should be in the up position and the bellcrank should be at a 45 degree angle. The shaft should have 0.1 to 0.5 mm (0.004 to 0.02 inches) end play.

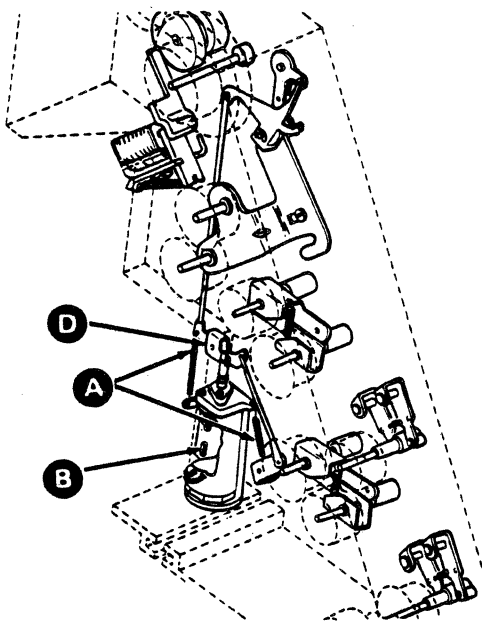


768 UPPER SECOND SHEET RESTRAINT PAPER PAWL

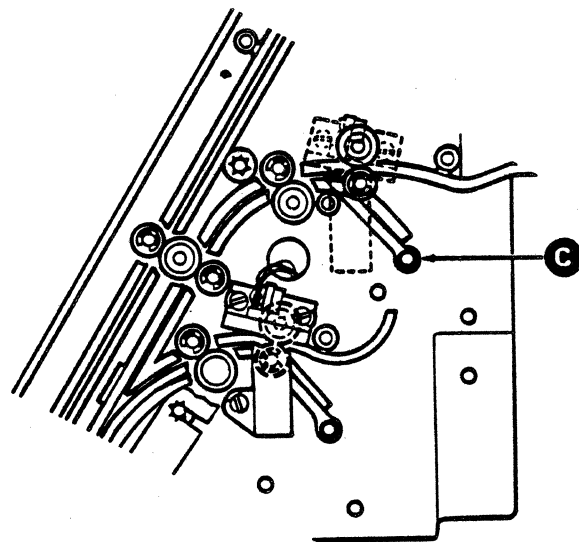
Removal and Replacement

1. Power off.
2. Remove the left side cover (760).
3. Remove the upper and lower springs **A**.
4. Remove the second sheet restraint solenoid **B** (769).
5. Remove the upper paper tray support rail (766).
6. Loosen the upper second sheet restraint paper pawl **C** setscrew.
7. Remove the upper bellcrank **D** so that the upper second sheet restraint paper pawl can be removed.
8. For replacement of the upper second sheet restraint paper pawl, reverse this procedure.
9. Perform the second sheet restraint assembly adjustment (726).

Note: When the upper second sheet restraint paper pawl is screwed to the shaft, the paper pawl should be in the up position and the bellcrank should be approximately horizontal. The shaft should have 0.1 to 0.5 mm (0.004 to 0.020 inches) end play.



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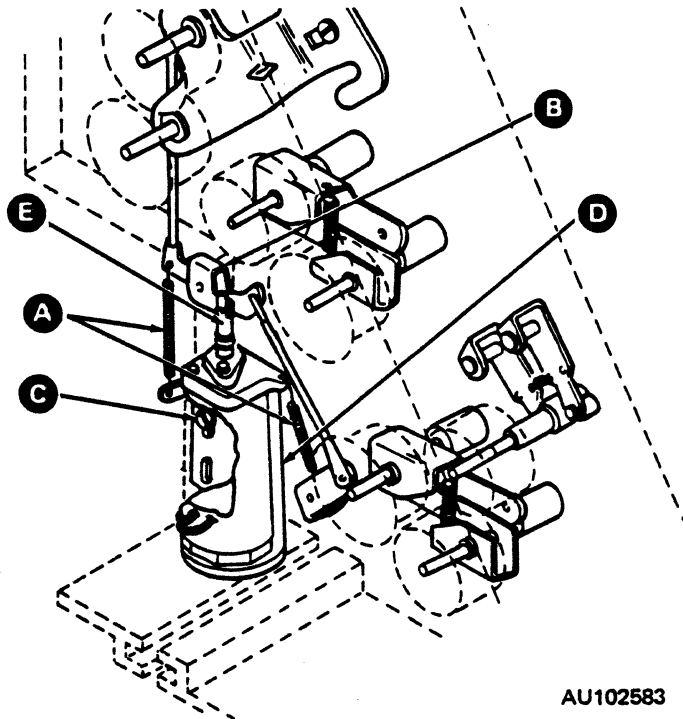


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769 SECOND SHEET RESTRAINT SOLENOID

Removal and Replacement

1. Power off.
2. Remove the left side cover (760).
3. Remove the sheet feed analog support screw (763).
4. Remove the two bellcrank springs **A**.
5. Remove the second sheet restraint solenoid cable connector J6 (705) from the sheet feed analog card and separate the second sheet restraint solenoid cable from the others by removing the cable clamp mounting screw.
6. Remove the second sheet restraint solenoid mounting screw **C**.
7. Turn the second sheet restraint solenoid **D** counterclockwise so that the plunger **E** can be separated from the upper bellcrank **B**.
8. For replacement of the second sheet restraint solenoid, reverse this procedure.
9. Perform the second sheet restraint assembly adjustment (726).



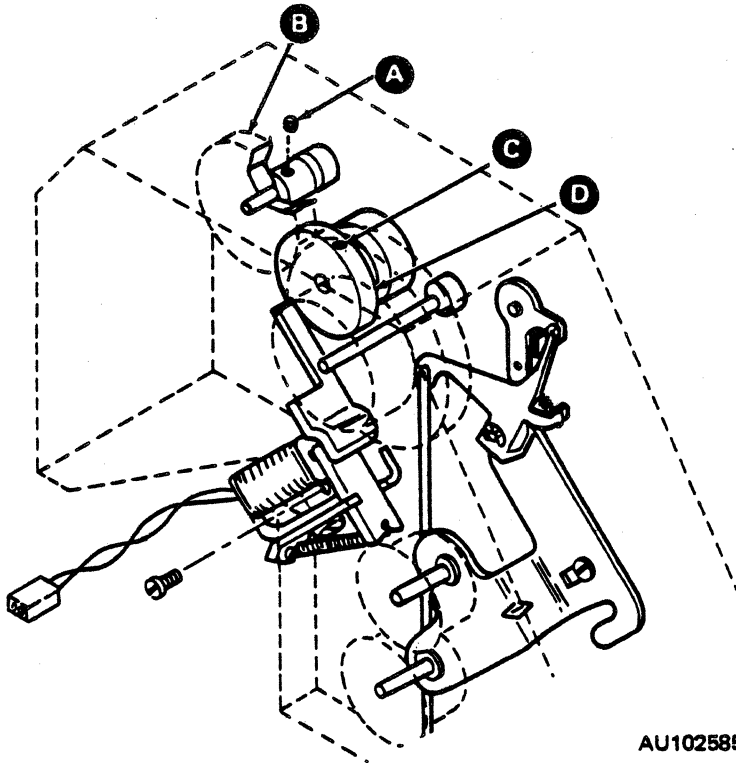
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EXIT MECHANISM

770 RATCHET

Removal and Replacement

1. Power off.
2. Remove the left, right, and center covers (760, 761, 762).
3. Remove the sequencer pulley (773 steps 3, 4, and 6).
4. Loosen the sequencer gear setscrew **A**.
5. Remove the sequencer gear **B**.
6. Loosen the ratchet setscrew **C**.
7. Remove the ratchet **D**.
8. For replacement of the ratchet, reverse this procedure.
9. Perform the ratchet adjustment (743), and check the drive wheel and roller adjustment (744).

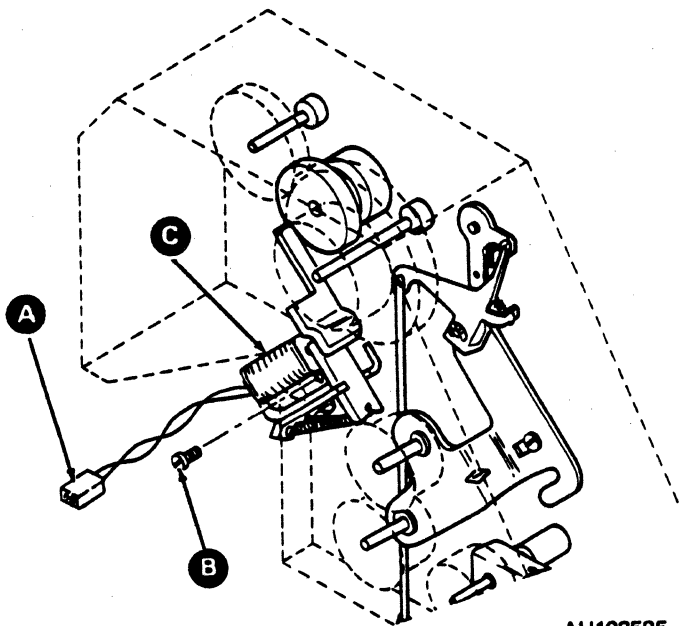


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771 SEQUENCER MAGNET ASSEMBLY

Removal and Replacement

1. Power off.
2. Remove the left side cover (760).
3. Disconnect the sequencer magnet assembly cable **A** from the sheet feed analog card connector J3 (705).
4. Remove the sheet feed analog card support screw (763).
5. Remove the sequencer magnet assembly screw **B**.
6. Remove the sequencer magnet assembly **C**.
7. For replacement of the sequencer magnet assembly, reverse this procedure.
8. Perform the sequencer magnet assembly adjustment (742).

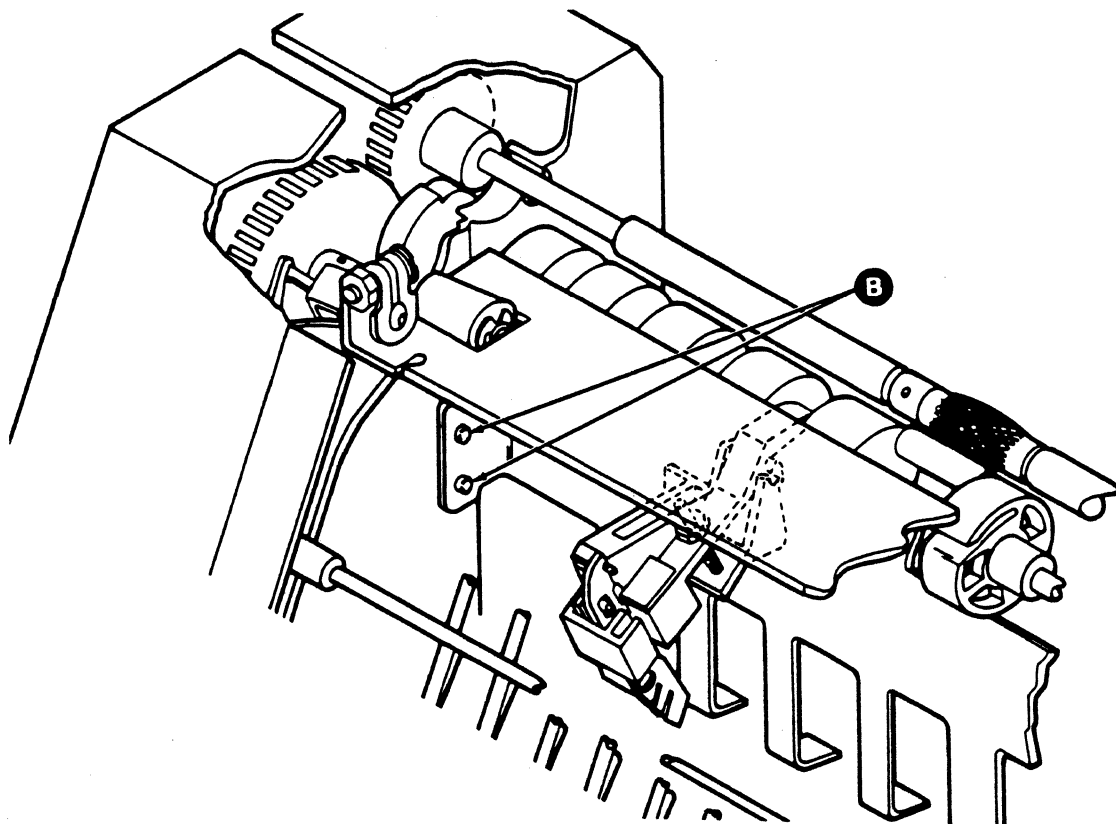


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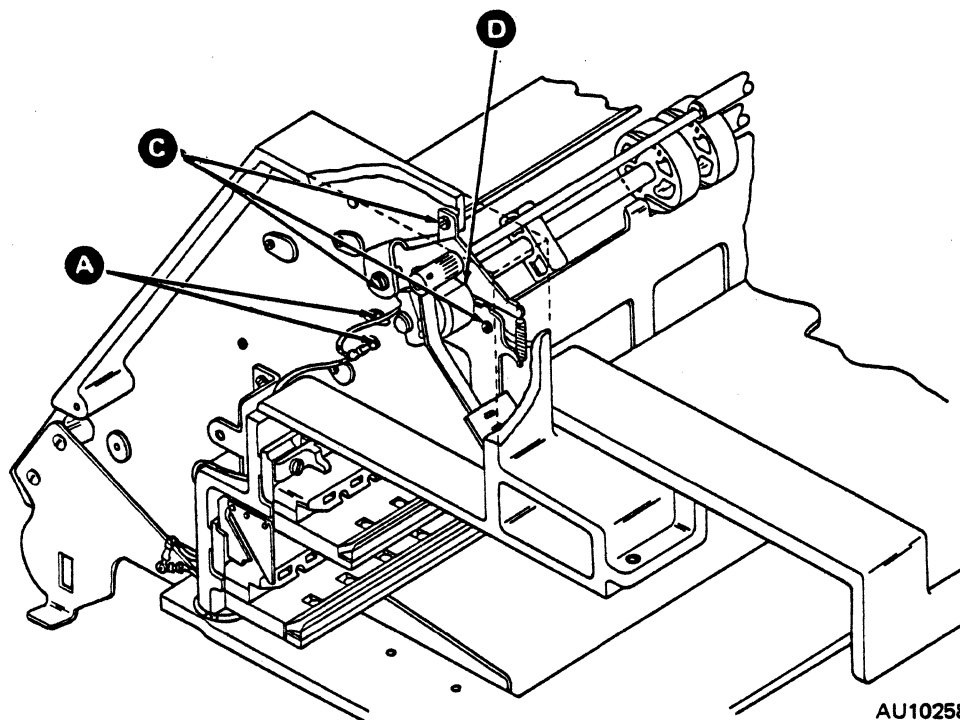
772 SEQUENCER CYLINDERS

Removal and Replacement

1. Power off.
2. Remove the left, right, and center covers (760, 761, 762).
3. Perform the ratchet removal (770, steps 3, 4, 5, 6, and 7).
4. Remove the two left side stripper plate support screws **B**, and the two right side stripper plate support screws **A**.
5. Remove the three sequencer assembly **C** support screws.
6. Remove the complete sequencer assembly **D** from the right side.
7. For replacement of the sequencer cylinders, reverse this procedure.
8. Perform the following adjustments in order:
 - a. Sequencer cylinders (740)
 - b. Ratchet (743)
 - c. Drive wheel and roller (744).
 - d. Gate down stop (745).
 - e. Trip spring (751).
9. Check the following adjustments:
 - a. Reed switch (741)
 - b. Gate cam (746).
 - c. Upper kick roller (750).
 - d. Gate (749).



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773 SEQUENCER PULLEY

Removal and Replacement

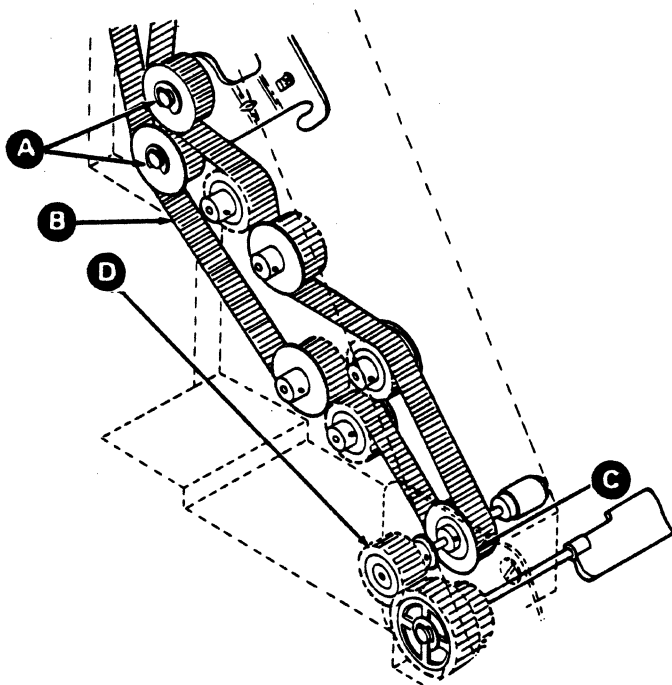
1. Power off.
2. Remove the left, right, and center covers (760, 761, 762).
3. Remove the sheet feed analog card support screw (763).
4. Loosen the sequencer pulley setscrew **A**.
5. Remove the timing belt **B**.
6. Remove the sequencer pulley **C**.
7. For replacement of the sequencer pulley, reverse this procedure.

774 PULLEY

Removal and Replacement

1. Power off.
2. Remove the left side cover (760).
3. Remove the sheet feed analog card support screw (763).
4. Remove the c-clip if the pulleys **A** have one.
5. Remove the setscrew if the pulleys have one.
6. Remove the timing belt **B**.
7. Remove the pulley.
8. For replacement of the pulley, reverse this procedure.
9. If step 4 was performed, lubricate the stud with IBM No. 23 grease.

Note: If the lower drive pulley **C** is to be removed, the lower drive gear **D** must be removed. The shaft end play must be reset with the pulley **C** and not with the drive gear **D**.



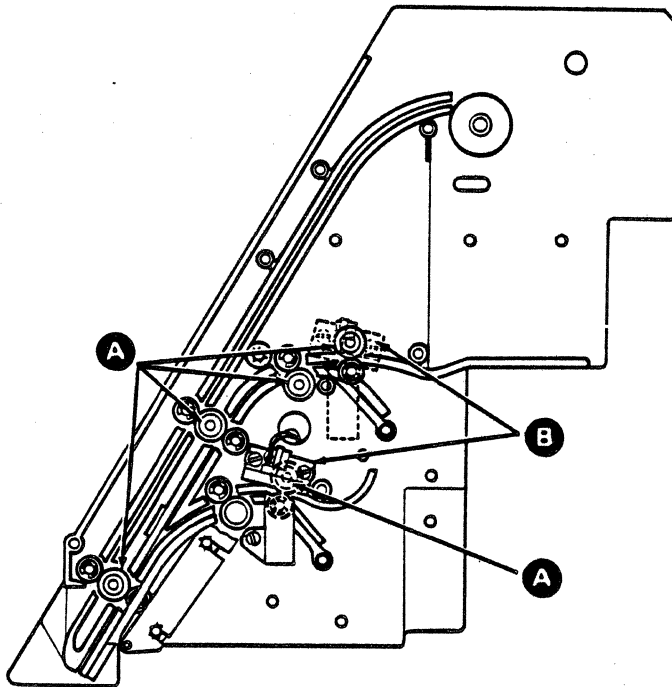
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775 CONE ROLLER

Removal and Replacement

1. Power off.
2. Remove left side cover (760).
3. Remove the sheet feed analog card support screw (763).
4. Remove the pulley (774) from the shaft of the cone roller **A** that is to be removed.
5. Remove the cone roller by pushing the shaft to the right side.
6. For replacement of the cone roller, reverse this procedure.

Note: Some cone rollers need the sensor housing **B** (729) and/or the wire racks removed (780).



AU102582

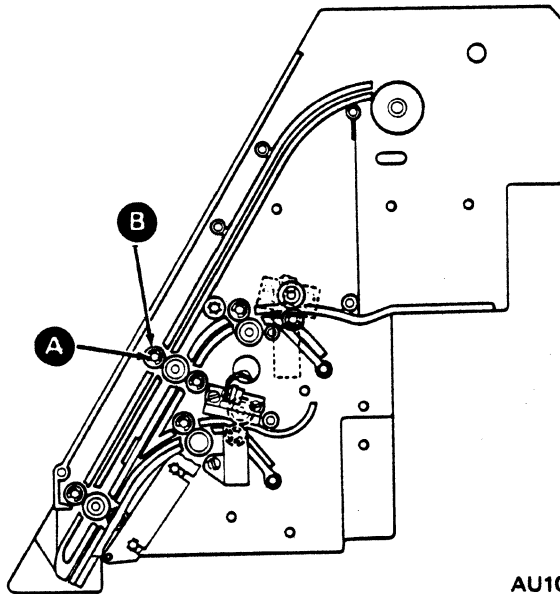
776 BACK UP ROLLER

Removal and Replacement

1. Power off.
2. Remove any necessary wire racks (780).
3. Remove the C-clip **A** from the back up roller **B**.
4. Remove back up roller.

Note: If back up rollers contacting cone rollers C3 or C6 are not to be replaced then skip to step 11.

5. Remove the left side cover (760).
6. Remove the sheet feed analog card support screw (763).
7. Remove the timing belt.
8. Remove pulleys P2 and P3, or P5 and P6 (701).
9. Remove the backup roller rocker assembly.
10. Remove the sensor backup guide.
11. For replacement of the backup roller, reverse this procedure.

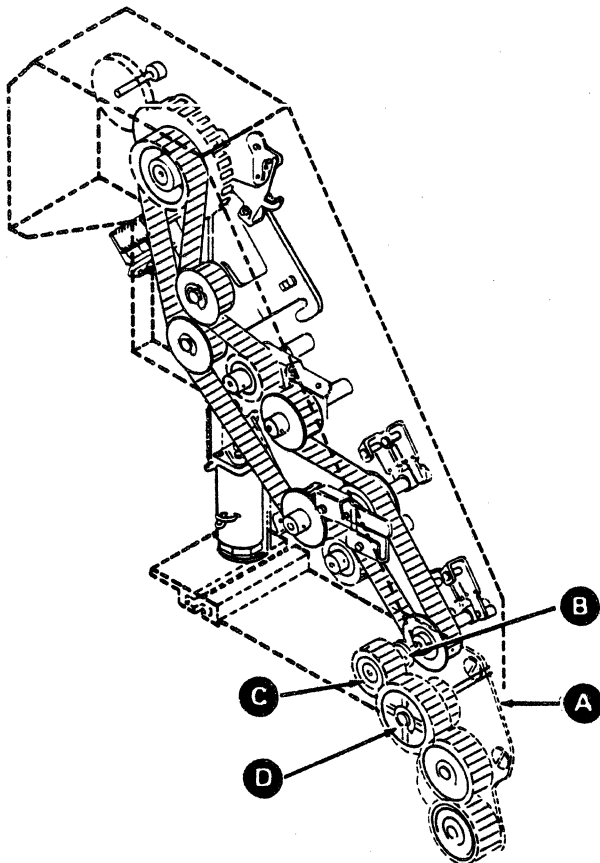


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777 LEFT SIDE MOUNTING PLATE

Removal and Replacement

1. Power off.
2. Remove the left side cover (760).
3. Remove the safety shield and ground strap from the mounting plate.
4. Remove the gear guard.
5. Scribe around the mounting plate.
6. Remove the setscrew **B** from the lower drive gear **C**, and remove the lower drive gear.
7. Remove the screws from the mounting plate **A**.
8. Install the mounting plate ensuring that the mounting plate aligns with the scribe marks.
9. Reinstall the lower drive gear so that it engages with the cluster idler gear **D**.
10. Reinstall the gear guard, ground strap and left side cover.

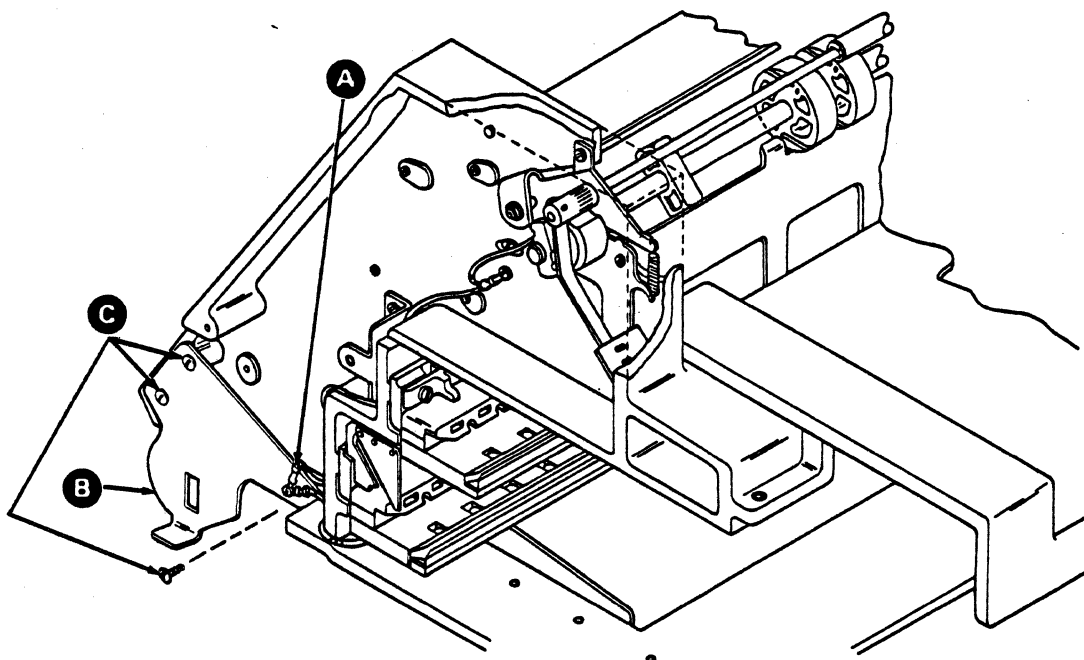


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778 RIGHT SIDE MOUNTING PLATE

Removal and Replacement

1. Power off.
2. Remove the right side cover (761).
3. Remove the ground straps **A** from the mounting plate **B**.
4. Scribe around the mounting plate.
5. Remove the mounting plate screws **C**.
6. Remove the mounting plate.
7. Install the mounting plate, ensuring that the plate aligns with the scribe marks.
8. Reinstall the ground straps and right side cover.

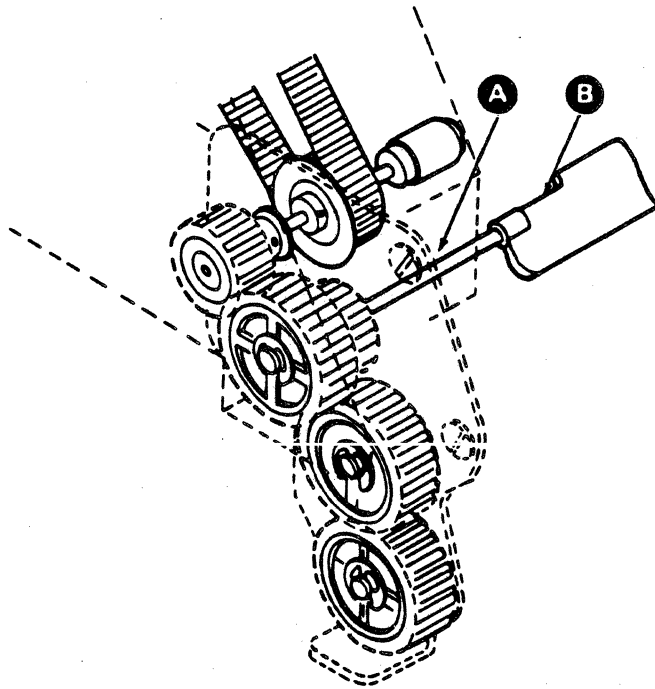


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779 MANUAL PAPER INSERTION DEFLECTOR

Removal and Replacement

1. Power off.
2. Remove the left side cover (760).
3. Remove the left side mounting plate (777).
4. Remove the C-clip from the deflector shaft **A**.
5. Remove the spring and the manual paper insertion deflector **B**.
6. For replacement of the manual paper insertion deflector, reverse this procedure.



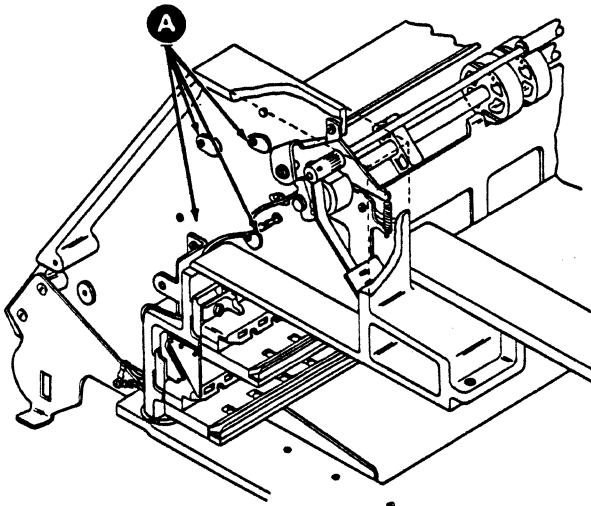
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780 WIRE RACKS

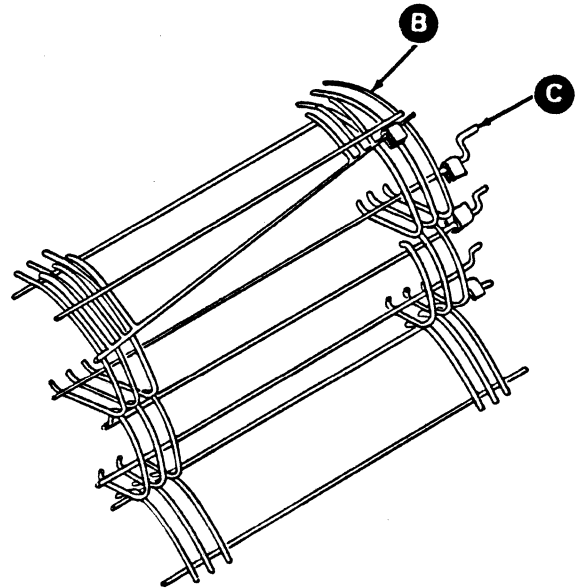
Removal and Replacement

1. Power off.
2. Remove the right side cover (761).
3. Remove the ground strap from each wire rack.
4. Remove the wire rack mounting screw and the mount **A**.
5. Remove the wire rack by sliding it to the right.
6. For replacement of the wire rack, reverse this procedure.
7. Check the lower inner wire rack adjustment (731).
8. Reinstall the right side cover.

Note: To remove the upper inner wire rack **C**, the upper outer wire rack **B** must be removed first.



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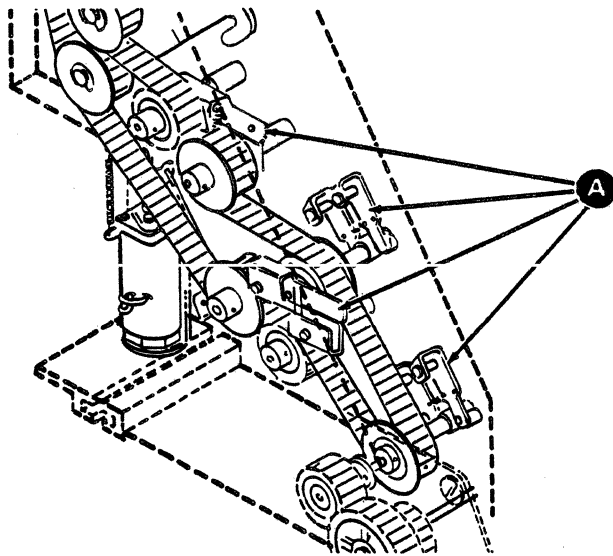


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781 ROCKER

Removal and Replacement

1. Power off.
2. Remove the left side cover (760).
3. Remove the sheet feed analog card support screw (763).
4. Remove the timing belt and necessary pulley (774).
5. Remove the necessary back up roller (776).
6. Remove the rockers **A**.
7. For replacement of the rocker, reverse this procedure.



AU102593

782 CABLE ROUTING

1. The reed switch cable is routed from the reed switch, through the clearance hole in the transport/aligner block above the upper paper sensor, then through the cable clamp behind the gate latch link, under the sequencer magnet, and around the back of the sheet feed analog card to connector J1.
2. The lower paper sensor cable is routed from the lower sensor, through the clearance hole in the transport/aligner block above its housing; then vertically along the inside of the block to above the idler bracket mounting screw, under the idler bracket, through the cable clamp behind the gate latch link, under the sequencer magnet, and around the back of the sheet feed analog card, to connector J2.
3. The sequencer magnet cable is routed around the back of the sheet feed analog card connector J3.
4. The upper paper sensor cable is routed from the upper sensor, through the clearance hole in the transport/aligner block, along the inside of the block toward the front of the machine, then around and under the idler bracket, through the cable clamp behind the gate latch link, under the sequencer magnet, and around the back of the analog card to connector J4. (Excess cable is to be looped around the tab at the bottom of the idler bracket.)
5. The picker/separator motor cable is routed from the connector on the back side of each picker/separator motor filter board straight to the J5 connector of the analog card. The two-pin connector marked 8 attaches to the lower picker/separator motor filter board and connector 9 attaches to the upper board.
6. The second sheet restraint solenoid cable is routed from the solenoid, behind its rear spring mounting tab, and up the back edge of the transport/aligner block; then through the cable clamp behind the gate latch link, under the bottom of the sequencer magnet, and around the back of the analog board to connector J6.

SHEET FEED PREVENTIVE MAINTENANCE

No scheduled preventive maintenance is needed for the sheet feed. Preventive maintenance is performed at the time of a service call.

Lubrication should be used only in quantities enough to lubricate the specified area.

Ensure that the lubricant does not touch the picker/separator, paper trays, paper paths, sheet feed analog card, or the rubber part of the cone rollers or drive wheel.

Lubrication should only be used at the first installation and as necessary to any of the following hardware.

Use IBM No. 23 grease for:

- All gears
- All spring contact points (except the picker/separator springs)
- All clevis contact points
- Gate latch pivot stud
- Gate latch/latch plate contact point
- Trip spring/drive wheel contact point
- Second sheet restraint solenoid plunger/upper bell crank attachment point
- Ratchet surface
- Timing belt idler pulley studs
- Gear studs on the left mounting plate
- Back up roller arm pivot studs

Use IBM No. 10 oil for:

- Cone roller shafts
- Cone roller backup shafts

TOOLS AND TEST EQUIPMENT

The tools and test equipment needed to service the IBM 5218 Printer sheet feed are listed below:

- Standard CE tool kit
- Metric tool kit

STANDARD CE TOOL KIT

Tools normally used by the CE are in this kit.

METRIC TOOL KIT

A kit of metric tools is available. Order part number 1749235.

INTRODUCTION

The IBM 5218 Printer sheet feed is an automatic cut sheet paper feed mechanism that can be installed or removed from the IBM 5218 Printer by two operators.

The sheet feed automatically supplies paper both lengthwise and sideways from either paper supply tray. Also, if a document of more than one page is being printed, the sheet feed will sequence the pages in correct order in the output paper tray.

The control and status signals plus the voltages are supplied by a cable from the IBM 5218 Printer.

The sheet feed does the following:

- Supports paper length ranges from a minimum of 197 mm (7.75 inches) to a maximum of 364 mm (14.33 inches) and width ranges from a minimum of 148 mm (5.83 inches) to a maximum of 297 mm (11.69 inches).
- Has two separate paper supply trays, each containing a maximum stack of paper 28 mm (1.1 inches) high (approximately 200 sheets of 754gm/m² (20 lb.) paper).
- Has sensors to sense when the paper supply trays are empty and when there is a paper jam.

SHEET FEED OPERATION SUMMARY

The circuits used to drive the electromechanical devices and sensors are contained on one analog card located in the sheet feed.

The circuits include two photo detector circuits, two solenoid drive circuits, and two dc motor drive circuits. The voltages present on the sheet feed analog card are +5 Vdc, +12 Vdc, and +36 Vdc and are supplied by the power supply located in the IBM 5218 Printer.

Test points are supplied to measure all voltage and signal lines at the connectors without removing the connectors.

The sensing circuits power two reflective sensors (one for each paper path) that sense the paper in the paper path. This information is monitored by the IBM 5218 Printer.

The solenoids and motors are driven by +36 Vdc. The drive circuits take a logic level signal which is used to activate increased current carrying devices that drive the solenoids and motors. In the case of the picker/separator motors and second sheet restraint solenoid, the logic signals are controlled by the printer.

The paper sequencer logic level is determined internal to the sheet feed by the opening and closing of a reed switch. This reed switch is used to sense the paper entry into the sequence mechanism. This sensor is also used in sensing a paper jam in the output path between the platen and the sequencer mechanism.

Sheet Feed Analog Card J7 Pin	Printer Attachment Panel Connector Pin
1-----	Not Used
2-----	Motor GND-----4 & 10
3-----	Logic GND-----1 & 7
4-----	+12 Vdc-----16
5-----	+36 Vdc-----19
6-----	SF*-----8
7-----	APOR*-----14
8-----	R2MO*-----3
9-----	R1MO*-----2
10-----	SFCUR-----15
11-----	H2S-----18
12-----	H1S-----17
13-----	+5Vdc-----13
14-----	GND-----6
	TF*-----9

Sheet feed interface

AU102542

SIGNALS

The sheet feed control signals are:

SF* - SHEET FEED ATTACHED: This signal goes low when the sheet feed cable has been correctly plugged into the printer. No sheet feed operations can be activated unless this signal is in the correct condition.

H1S, H2S - PAPER SENSORS 1 AND 2: These signals are the increased outputs of two reflective type LED/phototransistors that sense paper in the two input paper paths. The sensors are located in line with the first cone roller in their respective input paper paths. Paper entering the sensor means the picking/separating process is completed, and the picker/separator motor and the second restraint solenoid must be turned off.

SFCUR - CURRENT SENSE: This signal goes high when either picker/separator motor or either solenoid (second sheet restraint solenoid or sequencer magnet) is energized. It may diagnose a problem with the motors, solenoids, or drive circuits.

R1MO*, R2MO* - PICKER/SEPARATOR 1 AND 2: Either signal going low activates the comparable picker/separator dc motor and the second sheet restraint solenoid. The motor is turned on at the start of a sheet feed insert cycle. It picks the top sheet off the selected input paper tray and transports it to the point where the comparable paper sensor (H1S or H2S) senses it. Once the paper is sensed by the paper sensor, the rollwave motors are de-activated. No motor should be on for more than 8 seconds. Both motors may not be activated at the same time. The second sheet restraint solenoid is activated when either rollwave motor is activated. When active, the solenoid moves both restraint pawls from the input paper paths (upper and lower) and lets the top sheet from either input stack enter the cone rollers. When de-activated, the spring loaded pawls enter the input paths and prevent a second sheet from being sent with the first.

APOR* POWER ON RESET: This signal should be low until full power has been supplied to the sheet feed analog card. It then should go high for normal operation. When this line is low the sheet feed is not active.

PICKER/SEPARATOR MECHANISM

The picker/separator mechanism is a shipswheel shingling device. There is a picker/separator mechanism for each paper tray, that is self-retracting when not in use, but only one motor can be on at any time.

In the following text, all reference is made to the lower picker/separator mechanism; however, the upper picker/separator mechanism operates exactly the same. Only the signal names are different.

The picker/separator motor is used to drive a leadscrew through a friction coupling. The shipswheel rollers move on the leadscrew. The stop position of the shipswheel is at the top of the leadscrew where it is held in position with a permanent magnet.

The picker/separator motor is turned on when it receives a logic low level signal (R1MO*) from the printer. This signal is located at J7 pin 9 of the sheet feed analog card.

When the picker/separator motor is turned on, the shipswheel and its rollers move down the leadscrew until the rollers touch the top sheet in the paper tray. When the top sheet has been driven into the paper path, the picker/separator motor is turned off. This occurs when the logic level signal R1MO* is high.

When the picker/separator motor is turned off the shipswheel moves up the leadscrew to its stop position, decreasing the chance of a double feed.

Once the picker/separator motor is turned on, paper must be sensed in paper path in 8 seconds. If paper sensing does not occur the picker/separator motor is turned off, with the assumption that there is no paper in the paper tray.

SECOND SHEET RESTRAINT MECHANISM

The second sheet restraint solenoid works with the picker/separator motors. The second sheet restraint solenoid is activated when either picker/separator motor is activated.

When activated, the second sheet restraint solenoid moves both restraint pawls from the input paper paths and let the top sheet enter the cone rollers from the paper tray.

When de-activated, the spring loaded restraint pawls enter the input paper paths to prevent a second sheet from being sent with the first sheet.

PAPER SENSORS

The paper sensors sense paper presence in the two input paper paths. The sensors are located in line with the first cone roller in each input paper path. Paper sensed by these sensors signals that the picking/separating process is completed, and the picker/separator motor and second sheet restraint solenoid must be turned off.

In the following text, all reference is made to the lower paper sensor, however, the upper paper sensor operates exactly the same. The signal names are the only difference.

When paper is present at the lower paper sensor, light generated by the light-emitting diode (LED) is reflected by the paper back to the phototransistor. This light reflection causes the phototransistor to conduct.

The phototransistor conducting lets the signal H1S (connector J7 pin 12) go high. This signal is sent back to the printer, indicating that a sheet of paper was sensed in the paper path and the motor can be turned off.

When paper is not present, the light generated by the LED is transmitted into a black cylinder surface and not reflected into the phototransistor. When paper is not present at the paper sensors the signal H2S is low.

SEQUENCER MECHANISM

The sequencer mechanism, located in the exit path, supplies the method for ejecting the printed document into the output paper tray. The mechanism contains six sequencer cylinders on a friction clutch operated shaft, a ratchet, a reed switch, a toggle clamp, a sequencer magnet, and a paper gate.

The paper gate is placed in its down position to guide the paper into the cylinders by a clevis being pushed up when the second sheet restraint solenoid is activated. This action releases the latch that is holding the paper gate in its upward position.

The leading edge of the paper is guided (by the paper gate) into the paper openings in the cylinders. When the paper trips the lever for the reed switch, the sequencer magnet activates, letting the friction clutch that controls the cylinders to turn 180 degrees. During the rotation, a toggle clamp engages the paper and holds the paper in the openings.

After the sequencer cylinders are turned 180 degrees the ratchet latches, stopping the ratchet and the sequencer cylinders from turning. The remainder of the paper is driven out over the clamped leading edge by the upper kick roller.

The leading edge of the paper remains in the sequencer cylinders until the next sheet enters the sequencer mechanism. As the cylinders start to turn, the first sheet is stripped out of the openings and placed face down in the output paper tray.

If the reed switch remains closed for longer than 2.5 seconds, the sequencer magnet will de-activate.

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A

A-A1 Distribution Board
 Removals and Replacements 2-31
 Adjustments
 Carrier
 Carrier eccentrics 1-28
 Leadscrew follower 1-27
 Left margin switch 1-44
 Selection motor pull-back cable length 1-30
 Control panel 1-17
 Covers
 Front/rear 1-14
 Height 1-16
 Fan assembly 1-20
 Paper Feed
 Cam motor and reed switch brackets 1-26
 First writing line sensor 1-25
 Index motor 1-23
 Index motor pulley 1-24
 Platen gear 1-21
 Platen pulley 1-22
 Power switch assembly 1-18
 Print Wheel
 Carrier assembly 1-32
 Print hammer assembly 1-36
 Print wheel homing 1-37
 Print wheel hub 1-43
 Print wheel hub to platen 1-34
 Printer attachment panel assembly 1-19
 Ribbon
 Cardholder 1-42
 Drive pinion gear 1-40
 Ribbon cartridge holder 1-41
 Ribbon lift arm 1-39
 Ribbon plate 1-38
 Sheet feed 7-11
 Tractor feed 7-2

B

Background ROS test 3-26

C

Carrier
 Adjustments
 Carrier eccentrics 1-28
 Leadscrew follower 1-27
 Left margin switch 1-44
 Selection motor pull-back cable length 1-30
 Removals and Replacements
 Carrier assembly 2-16
 Escapement motor 2-13
 Leadscrew 2-14

Leadscrew follower 2-15
 Left margin switch 2-39
 Selection motor pull-back cable 2-18
 Character selection 6-16
 Control mode selection 3-4
 Control Panel
 Adjustment 1-17
 Control Panel and Cable Assembly
 Removals and Replacements
 AC line filter 2-5
 Control panel 2-2
 Control panel logic card and switch assembly 2-3
 Power switch and cable assembly 2-4
 Control panel theory 6-9
 Covers
 Adjustments
 Front/rear 1-14
 Height 1-16
 Removals and Replacements
 Top cover 2-1

D

Decimal/Hexadecimal Conversion
 Chart 3-57
 Diagnostic aids 3-1
 Diagnostic mode 3-1
 Diagnostic tests 3-6
 Diagnostic Modes
 Indicators 3-3
 Switch function 3-2

E

EBCIDIC Tables 3-38
 Error codes 3-17
 Escapement 6-14
 Exception handler 3-29

F

Fan Assembly
 Adjustment 1-20
 Features
 Sheet feed 7-4
 Tractor feed 7-1
 First writing line sensor 6-19
 Functional parts 6-13
 Character selection 6-16
 Escapement 6-14
 Paper feed/indexing 6-15
 Print hammer assembly 6-18
 Ribbon 6-17

H

Hard non-recoverable errors 3-30
Hex Conversion Chart 3-57

I

Interface 6-23
 Command language 6-25, 6-26, 6-27,
 6-28, 6-29, 6-30
 Escape command 6-26
 Escape/print command 6-29
 Index command 6-27
 Print command 6-28
 Print image 6-25
 Printer idle commands 6-30
 Printer attachment panel 6-23
Interface Protocol
 Command exchange protocol 6-32
 Power-on protocol 6-31
 Printer exception protocol 6-32
 Transmission error protocol 6-33

L

Locations
 A-A1 distribution board 1-8
 Back 1-6
 Bottom 1-7
 Front and right side 1-2
 I/O connectors 1-10
 Sheet feed 7-4
 Top 1-4

M

Maintenance statistics 3-22
MAP rules 3-36

N

Non-recoverable errors 3-29

O

Operator Access Cover
 Expected cover open 6-12
 Unexpected cover open 6-12

P

Paper Feed
 Adjustments
 Cam motor and reed switch
 bracket 1-26
 First writing line sensor 1-25
 Index motor 1-23
 Index motor pulley 1-24
 Platen gear 1-21
 Platen pulley 1-22
 Removals and Replacements
 Cam 2-8
 Cam motor 2-7
 Cam motor idler gear 2-10
 Deflector arm and spring comb 2-9
 Feed rollers assembly 2-12
 First writing line sensor 2-38
 Index motor 2-6
 Platen 2-11
 Paper feed/indexing 6-15
 Power Supply 6-20
 Removals and Replacements 2-36
 Power Supply Fuse
 Removals and Replacements 2-36
 Power Switch Assembly
 Adjustment 1-18
 Power-on diagnostic sequence 3-27
 Preventive maintenance 4-1
 Print hammer assembly 6-18
 Print test 3-26
 Print Wheel
 Adjustments
 Carrier assembly 1-32
 Print hammer assembly 1-36
 Print wheel homing 1-37
 Print wheel hub 1-43
 Print wheel hub to platen 1-34
 Removals and Replacements
 Print hammer assembly 2-22
 Print wheel 2-26
 Print wheel hub 2-24
 Selection motor 2-20
 Printer Attachment Panel Assembly
 Adjustment 1-19
 Printer Logic Card
 Device processors 6-6
 Interface processor 6-6
 Printer Mechanism
 Removals and Replacements 2-34
 Processor Card
 Attachment processor 6-5
 Programmable peripheral
 interface 6-5
 USART 6-4

R

Recoverable errors 3-30
Removals and Replacements
 A-A1 distribution board 2-31
 Carrier
 Carrier assembly 2-16
 Escapement motor 2-13
 Leadscrew 2-14
 Leadscrew follower 2-15
 Left margin switch 2-39

- Selection motor pull-back cable 2-18
- Cover
 - Top cover 2-1
- Paper Feed
 - Cam 2-8
 - Cam motor 2-7
 - Cam motor idler gear 2-10
 - Deflector arm and spring comb 2-9
 - Feed rollers assembly 2-12
 - First writing line sensor 2-38
 - Index motor 2-6
 - Platen 2-11
- Power supply 2-36
- Power supply fuse 2-36
- Print Wheel
 - Print hammer assembly 2-22
 - Print wheel 2-26
 - Print wheel hub 2-24
 - Selection motor 2-20
- Printer mechanism 2-34
- Ribbon
 - Ribbon belt 2-30
 - Ribbon motor drive assembly 2-27
 - Ribbon plate 2-29
 - Ribbon sensor assembly 2-28
- Sheet feed 7-39
- Sheet Feed Cable (Printer Side) 2-32
- Response ID 3-30
- Ribbon 6-17
- Adjustments
 - Cardholder 1-42
 - Drive pinion gear 1-40
 - Ribbon cartridge holder 1-41
 - Ribbon lift arm 1-39
 - Ribbon plate 1-38
- Removals and Replacements
 - Ribbon belt 2-30
 - Ribbon motor drive assembly 2-27
 - Ribbon plate 2-29
 - Ribbon sensor assembly 2-28
- Rules for using MAPs 3-36

S

- Selecting diagnostic test 3-5
- Service Checks
 - CE service position 1-48
 - Left and right carrier cables 1-47
 - Ribbon movement 1-46
- Sheet Feed Adjustments
 - Drive wheel and roller 7-32
 - Gate 7-36
 - Gate cam 7-34
 - Gate down stop 7-33
 - Gate latch 7-35
 - Lower inner wire rack 7-23
 - Paper sensor assembly 7-20
 - Paper tray detent 7-13
 - Picker/separator assembly 7-14
 - Picker/separator drive disk 7-18
 - Picker/separator lift mechanism 7-15
 - Ratchet 7-31
 - Reed switch 7-28
 - Second sheet restraint assembly 7-16
 - Sequencer cylinders 7-26
 - Sequencer magnet assembly 7-30
 - Shaft end play 7-12
 - Splitter assembly 7-24
 - Timing belt 7-11

- Transport aligner pulleys 7-22
- Trip spring 7-38
- Upper kick roller 7-37
- Sheet Feed Cable (Printer Side)
 - Removals and Replacements 2-32
- Sheet feed cable routing 7-63
- Sheet Feed Locations
 - Back 7-9
 - Front 7-4
 - I/O connector and sheet feed analog card connections 7-10
 - Left side 7-6
 - Right side 7-8
- Sheet feed preventive maintenance 7-64
- Sheet Feed Removals and Replacements
 - Backup roller 7-57
 - Cable routing 7-63
 - Center cover 7-41
 - Cone roller 7-56
 - Left side cover 7-39
 - Left side mounting plate 7-58
 - Lower second sheet restraint paper pawl 7-47
 - Manual paper insertion deflector 7-60
 - Paper tray support rail 7-46
 - Picker/separator assembly 7-44
 - Picker/separator lift mechanism 7-45
 - Pulley 7-55
 - Ratchet 7-50
 - Right side cover 7-40
 - Right side mounting plate 7-59
 - Rocker 7-62
 - Second sheet restraint solenoid 7-49
 - Sequencer cylinders 7-52
 - Sequencer magnet assembly 7-51
 - Sequencer pulley 7-54
 - Sheet feed analog card 7-43
 - Sheet feed I/O cable 7-42
 - Upper second sheet restraint paper pawl 7-48
 - Wire racks 7-61
- Sheet Feed Theory
 - Introduction 7-67
 - Operation summary 7-68
 - Paper sensors 7-72
 - Picker/separator mechanism 7-70
 - Second sheet restraint mechanism 7-71
 - Sequencer mechanism 7-73
 - Signals 7-69
 - Sheet feed tools and test equipment 7-66
 - Soft non-recoverable errors 3-30
 - Status byte 0 3-32
 - Status byte 1 3-33
 - Status byte 2 3-34
 - Status byte 3 3-34
 - Status byte 4 3-35

T

- Theory
 - Analog Card 1 6-7
 - Analog Card 2 6-7
 - Control panel 6-9
 - Cover 6-12
 - Introduction 6-1
 - Memory patch card 6-8
 - Printer logic card 6-6
 - Processor card 6-4

Sheet feed 7-67
Tools and test equipment 5-1
Tractor feed 7-1
Tractor Feed Adjustments
Drive belt tension 7-3
Spline shaft end play 7-2



Verify 3-25

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IBM 5218 Printer
Maintenance Information Manual

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Page	Comment
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