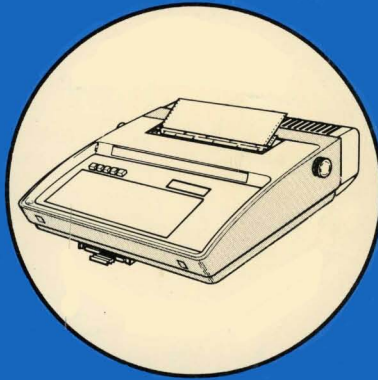


BASIC KSR



BASIC RO

# the 43 teleprinter

## REPAIR MANUAL

for BASIC TERMINALS  
without an Internal Data Set



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The 43 TELEPRINTER REPAIR MANUAL

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## The 43 TELEPRINTER

### REPAIR MANUAL

#### INTRODUCTION

This manual provides complete repair information for 43 Basic Teleprinter Terminals without an internal data set (modem) and major components. The manual is intended for field or shop use and is arranged into various parts that include repair, servicing and how to operate instructions for the 43 Basic KSR and RO Sprocket or Friction Feed Teleprinters, with an EIA interface or a TTL interface. Manual 369 provides complete servicing information for all versions of the Basic 43 Teleprinter.

All replaceable components are identified in the manual along with disassembly, adjustments and troubleshooting information. Waveforms are included on wiring diagrams and charts are provided for additional trouble isolation using an oscilloscope or volt-ohmmeter. No specially designed tools or shop facilities are required for repair operations, however standard 43 teleprinter terminals or components or local strapping may be required to perform or simulate on-line and interface testing when the teleprinter is not installed on location.

The 43 Teleprinter Circuit Diagram, Manual 385, provides circuit information extracted from this manual. The component layouts, lead designations and schematic diagrams for each circuit are combined into single fold-out sheets for the convenience of field or shop personnel when repairing major components.

The task flow chart on the next page illustrates the intended repair or servicing activities and the associated manual parts.

Spare units and parts for repair are available from Teletype Corporation. Service personnel should be properly trained and have access to these spares before attempting service or repair of the 43 Teleprinter. Contact Teletype Corporation Technical Training Center, 312-982-3940, for courses available on 43 Teleprinters.

The 43 TELEPRINTER REPAIR MANUAL

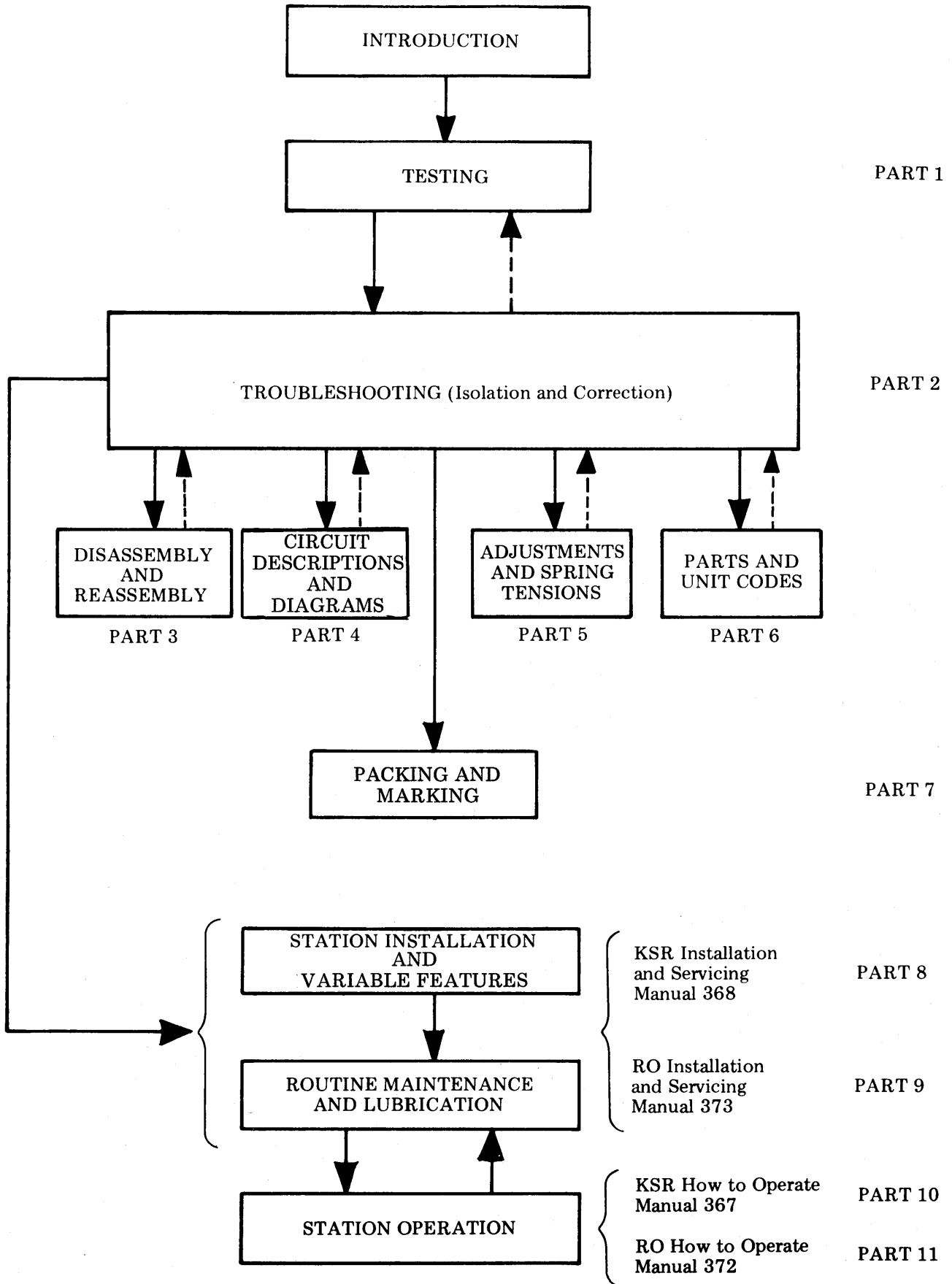
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PART 6	PARTS AND UNIT CODES
PART 7	PACKING AND MARKING

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TASK FLOW CHART



PART 1 — TESTING

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1. GENERAL

1.01 This part provides testing requirements and procedures for the 43 Basic KSR and RO Teleprinter.

1.02 The information in this part is intended to determine if the terminal and its components are operating properly and will continue to operate for extended periods under normal operating conditions.

1.03 Endurance, environmental extreme or electrical parameter testing information is not provided in this part. This type of information is found to some extent in Part 2, Troubleshooting and is used to isolate and correct troubles indicated in this part.

1.04 The testing information provided herein should normally be used to determine if:

- (a) A repaired teleprinter is operating properly before being returned to a customer or placed in service.

(b) A questionable component installed in the teleprinter operates properly or requires repair.

(c) A questionable teleprinter, in service or received from a customer, is operating properly or requires repair.

1.05 Following installation or routine maintenance calls at a location, either the testing in this part or an installation checkout using the HTO manual should be performed to make sure the teleprinter is operational.

1.06 On trouble calls, a local test or a trouble verification test under the direction of a test station (if available) should be performed to isolate the trouble within or to the teleprinter. After correction of a trouble, the test may be confined to the specific area that was failing.

1.07 The checkout routines are presented in table form with test conditions arranged in a specific sequence. A response is given to verify the test condition has passed.

1.08 Always perform the tests in the order given. The test steps are based on satisfactory results of all previous steps.

1.09 If the indicated response is not obtained in any step of a test procedure, repeat the step to make sure that the procedure has been performed properly. If the results are still unsatisfactory, refer to Page 2-1, Troubleshooting.

1.10 Teleprinters with TAUs or with no Terminal Data Unit must be associated with locally developed external testing arrangements and procedures to perform actual On-Line Tests. If test station is remote, a copy of the testing procedure should be available at the test station.

*Note:* The local tests specified in this part simulate most on-line tests for these teleprinters.

1.11 Before an on-line test can be performed, the remote testing station must be provided with advance details about the teleprinter under test, such as, telephone number, type of terminal (KSR or RO) (friction or sprocket) option exceptions present, speed, etc.

1.12 Before proceeding with the checkout procedure, check the following:

- (a) Is teleprinter connected to a properly grounded and polarized ac outlet?
- (b) Are all cable connectors fully seated?
- (c) Are printer paper and ribbon properly installed?
- (d) Are any option exceptions present? Refer to Manuals 368 (KSR) and 373 (RO), Page 2-1. (Part 8 or 9)

Procedures in Off-Line Tests are based on standard factory furnished options being present. If option exceptions are present, the test response will be as shown in the KSR or RO Variable Features Checkout.

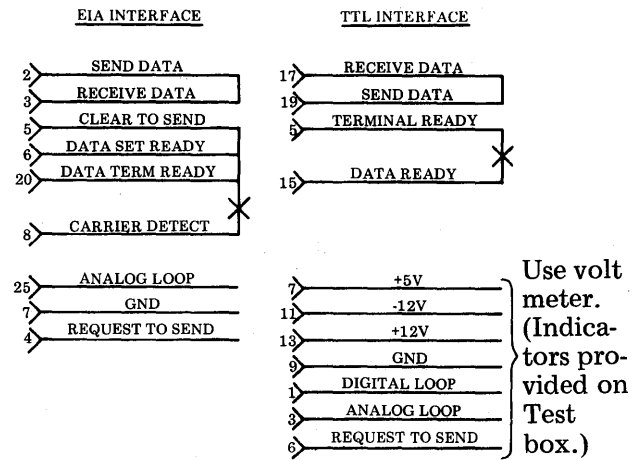
1.13 All references to columns are after a one-second delay, to allow the print head to index two character spaces to the right. The print head indicates the next character position to be printed.

## 2. TEST EQUIPMENT

2.01 Off-Line and Variable Feature Test procedures are provided to simulate On-Line Tests where external communication test devices are not available. To perform these tests, the connector terminals, as follows, should be strapped

before proceeding with the tests. The remaining terminals should be connected or measured as specified during the test steps.

*Note:* Contact Teletype Corporation Sales Department, 312-982-2000, for availability of a 43 Teleprinter Interface Test Box, which provides both arrangements shown as follows:



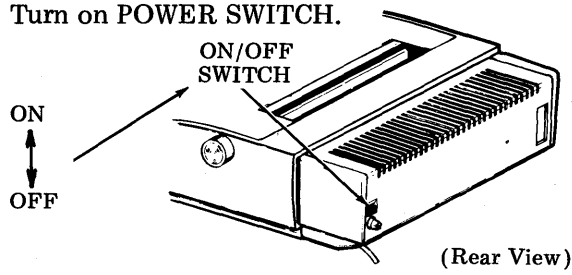
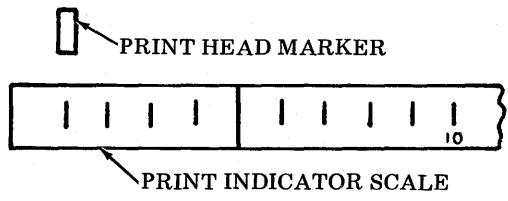
2.02 A 43 KSR Operator Console, 43K101/CAA or CAB can be substituted in RO Teleprinters to perform tests and variable feature checks off-line when external communication test devices are not available for on-line operation.

2.03 A volt-ohmmeter or equivalent means to measure  $\pm 12$  volts and +5 volts and perform continuity checks is required.



3. KSR TESTING  
OFF-LINE TESTS

TABLE A  
OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Power On/Off	1.	Turn on POWER SWITCH.  (Rear View)	Print head returns to the left-hand margin.  Paper feeds to next line.  TERM READY (AUTO ANSW) turns on.
	2.	 PRINT HEAD MARKER  PRINT INDICATOR SCALE	Print head marker points to first mark on indicator scale.
Printer Option 431.a. 432.a.	3.	Hold PRINTER TEST key depressed until approximately eight lines are printed.	ALARM and LOCAL (LOCAL-TALK) turn on. Characters printed as in Fig. 1. (Refer to Options 431 and 432b and c for any exceptions.)  Bell rings at end of each line. (Right-Hand Margin and Test Message.)

Note 1: First line may start with any character for sprocket or friction feed printers.

```

Innopqrstuvwxyz{!}"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

```

Sprocket Feed — 13 Characters per inch

See Note 1.

```

tuvwxyz{!}"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

```

Note 2: The lower case "o" does not print on 80 character line.

Friction Feed — 10 Characters per inch

Fig. 1

KSR OFF-LINE TEST (Cont)

TABLE A (Cont)

OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Printer (Cont)	4.	Release PRINTER TEST key.	ALARM turns off. Character printing stops.
Operator Console	5.	Hold CTRL key depressed and depress RETURN key.	Print head is returned to left-hand margin and paper feeds to next line.
	6.	Place CAPS LOCK key in DOWN position. Starting with top row and moving from left to right, depress unshaded keys in Fig. 2.	Characters printed as in Fig. 3.

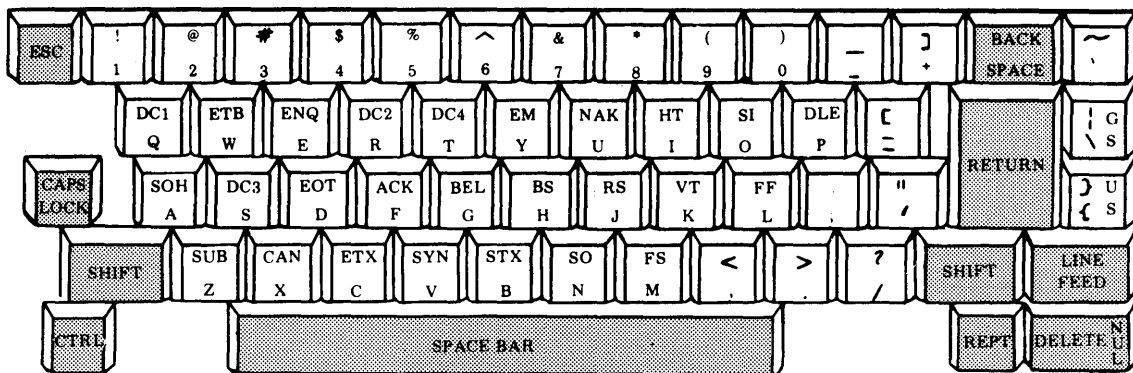


Fig. 2

1234567890-+`QWERTYUIOP=\ASDFGHJKL;`CZXCVBNM,./

Fig. 3

1234567890-+`qwertyuiop=\asdfghjkl;`czxcvbnm,./

Fig. 4


TABLE A (Cont)

OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Operator Console (Cont)	7.	Depress RETURN and then LINE FEED key.	Print head is returned to left-hand margin and paper feeds to next line.
	8.	Depress and release CAPS LOCK key so it returns to UP position. Starting with top row and moving left to right, depress each unshaded key in Fig. 2.	Characters printed as in Fig. 4.
	9.	Depress RETURN and then LINE FEED key.	Print head returns to left-hand margin and paper feeds to next line.

TABLE A (Cont)

OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Operator Console (Cont)	10.	Hold left SHIFT key depressed and starting with top row and moving from left to right, depress each unshaded key in Fig. 5. Hold right SHIFT key depressed and depress  key.	Characters printed as in Fig. 6.

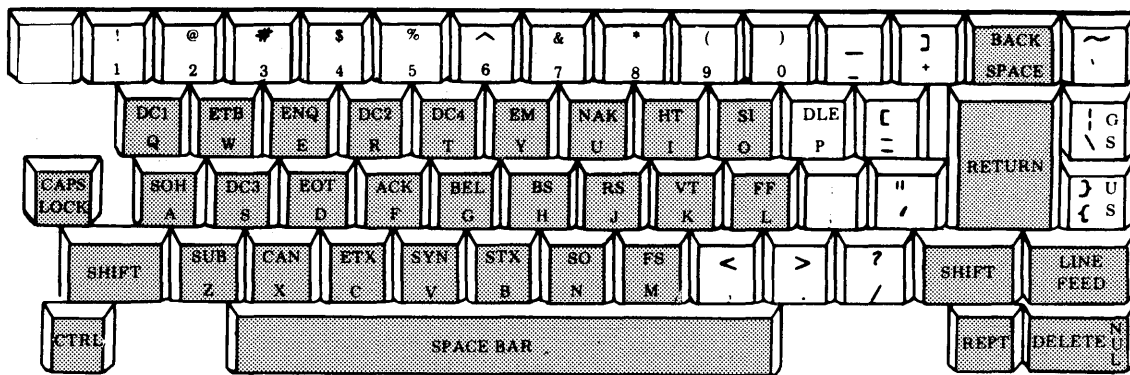





Fig. 5

!@#%&\*+()\_[]"{}:;'"<>??

Fig. 6

TABLE A (Cont)

OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Operator Console (Cont)	11.	Depress RETURN and then LINE FEED key.	Print head returns to left-hand margin and paper feeds to next line.
	12.	Hold CTRL key depressed and depress  key.	SUB prints ■
	13.	Hold CTRL key depressed and depress  key.	Signal bell rings.
	14.	Hold CTRL key depressed and depress  key.	Print head moves one character position to the left.
	15.	Depress SPACE BAR.	Print head moves one character position to the right.

## KSR OFF-LINE TESTS (Cont)

TABLE A (Cont)  
OFF-LINE TEST PROCEDURES








TEST	STEP	PROCEDURE	RESPONSE
Operator Console (Cont)	16.	Depress BACK SPACE key.	Print head moves one character position to the left.
	17.	Depress LINE FEED key. Depress and hold REPT and  keys.	Paper feeds to next line. The k is printed until end of line is reached. Signal bell rings at end of line.
Cover Inter-lock	18.	Depress TERM READY (AUTO ANSW) key. Raise cover.	TERM READY (AUTO ANSW) goes off. LOCAL (LOCAL-TALK) and ALARM turns on.
	19.	Close cover.	ALARM goes off.
Right Margin and Signal Bell	20.	Depress RETURN and the LINE FEED key.	Print head returns to left-hand margin and paper feeds to next line.
	21.	Space print head to column 125 (sprocket feed). (See 1.13) Space print head to column 73 (friction feed). Depress  key.	Signal bell operates as character b is being printed.
	22.	Depress SPACE BAR six times.	Signal bell does not operate. Print head moves six character positions to the right.
	23.	Depress SPACE BAR two times.	Signal bell operates two times.
Margin Set and Clear	24.	Depress ESC and then  key. (ESC <sub>x</sub> )	Print head returns to left-hand margin and indicates beginning of line.
(Remember Lower Case)	25.	Depress SPACE BAR nine times. Depress ESC and then  key. (ESC <sub>L</sub> lower case.)	Print head moves to Column 10.

TABLE A (Cont)  
OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Margin Set and Clear (Cont)	26.	Space print head to Column 51. Depress ESC and then  key. (ESC <sub>T</sub> ) Depress RETURN key.	Print head returns to left margin (Column 10).
	27.	Depress BACK SPACE key.	Signal bell rings.
	28.	Space print head to Column 50. Depress SPACE BAR.	Signal bell operates. Print head indicates Column 51.
	29.	Depress SPACE BAR.	Signal bell rings. Print head remains at Column 51.
	30.	Depress ESC and then  key (ESC <sub>m</sub> ). Depress SPACE BAR four times.	Print head moves to Column 55.
31.	Depress ESC and then  key (ESC <sub>w</sub> ).	Print head returns to left-hand margin (Column 10) and paper feeds to next line.	

Turn off POWER switch and connect the test arrangement shown on Page 1-2 to the interface connector before proceeding to Step 32.

If the 43 Teleprinter Interface Test Box is available, connect the test box to the teleprinter interface connector (TTL or EIA). See instructions furnished with test box.

TABLE A (Cont)  
OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Loopback	32.	Place teleprinter in loopback mode: Perform 32 a or 32 b.	
	32.a.	EIA INTERFACE — Connect Carrier Detect to Data Term Ready.  Turn on Teleprinter POWER switch.	Print head is returned to left-hand margin. Paper feeds to next line. DATA turns on. <u>EIA INTERFACE CONNECTOR</u> +12 V will be present on pin 4 (Issue 2A Logic Card) GND will be present on pin 7.

## KSR OFF-LINE TESTS (Cont)

TABLE A (Cont)  
OFF-LINE TEST PROCEDURES


TEST	STEP	PROCEDURE	RESPONSE
Loopback (Cont)	32.b.	<p>TTL INTERFACE — Connect Terminal Ready to Data Ready. Measure continuity between pins 6 and 9 on TTL interface connector.</p> <p>Turn on Teleprinter POWER switch.</p>	<p>Print head is returned to left-hand margin. Paper feeds to next line. Meter should read 0 ohms (Issue 2A Logic Card). DATA turns on.</p> <p><u>INTERFACE CONNECTOR</u> +5 V dc will be present on pin 7. -12 V dc will be present on pin 11. +12 V dc will be present on pin 13. GND will be present on pin 9.</p>
Option 434.a.	33.	<p>Depress and release PARITY key to UP position (PARITY ON).</p> <p>Place DUPLEX key in UP position (HALF-DUPLEX).</p> <p>Place CAPS LOCK key in DOWN position.</p> <p>Type the following: ANALOG Depress SPACE BAR.</p>	AANNAALLOOGG is printed. (Refer to Option 434b for any exceptions).
	34.	<p>Place DUPLEX key in DOWN position (FULL DUPLEX).</p> <p>Type the following: TEST</p>	TEST is printed.
Option 433.a.	35.	<p>Watch TERM READY (AUTO ANSW) key, then hold CTRL key depressed and depress  key.</p>	DATA and TERM READY (AUTO ANSW) indicators flash as EOT key is depressed. (Refer to Option 433b for any exceptions.)
	36.	Depress INTRPT key.	<p>INTRPT turns on momentarily.</p> <p>Signal bell rings.</p>
	37.	Hold CTRL key depressed and depress RETURN key.	Print head does not return.

TABLE A (Cont)  
OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Loopback (Cont)  Option 435.a.	38.	Depress RETURN and then LINE FEED key.  Depress REPT and K keys.  Hold down until two lines of Ks are printed. (Check time to print line.)	Continuous Ks will be printed across entire new line.  Bell rings at end of line and automatic return and line feed will be performed. One printed line plus return will occur in approximately: 4 seconds (sprocket feed) 2.5 seconds (friction feed) (Refer to Option 435b for any exceptions.)
Option 435.a.	39.	Place CPS key in DOWN position. (10 CPS.)  Depress REPT and K keys.  Hold down until two lines of Ks are printed. (Check time to print line.)	Continuous Ks will be printed across entire line. Bell rings at end of line and automatic return and line feed will be performed. One printed line plus return will occur in approximately: 14 seconds (sprocket feed) 8.5 seconds (friction feed)  First part of second line (approximately 18 characters) will be printed at a faster rate of speed. (Refer to Option 435b for any exceptions.)
Low Paper (Friction Feed) Paper-Out (Sprocket Feed)	40.	Remove the paper — paper-out (sprocket feed). Lift paper roll from paper support — (friction feed).	Signal Bell rings (sprocket feed only).  Alarm turns on.
	41.	Watch DATA key and depress LINE FEED key eight times.	<u>Sprocket Feed</u> DATA turns off. LOCAL (LOCAL-TALK) turns on as 8th LINE FEED is received.  <u>Friction Feed</u> DATA remains on. LOCAL (LOCAL-TALK) remains off.

## KSR OFF-LINE TESTS (Cont)

TABLE A (Cont)  
OFF-LINE TEST PROCEDURES





TEST	STEP	PROCEDURE	RESPONSE
Low Paper (Friction Feed) Paper-Out (Sprocket Feed) (Cont)	42.	Depress TERM READY (AUTO ANSW) key.	<u>Sprocket Feed</u> DATA remains off. LOCAL (LOCAL-TALK) remains on.  <u>Friction Feed</u> DATA turns off. LOCAL (LOCAL-TALK) turns on.
	43.	Replace the paper.	Alarm turns off.
	44.	Depress DATA key.	DATA turns on. LOCAL (LOCAL-TALK) turns off.
Loopback Clear	45.a.	EIA INTERFACE — Disconnect strap between Data Term Ready and Carrier Detect.	TERM READY (AUTO ANSW) turns on. DATA turns off.
	45.b.	TTL INTERFACE — Disconnect strap between Data Ready and Terminal Ready.	
Analog Loop	46.	Depress ESC key.  Hold SHIFT key depressed and depress  key.	<u>ALARM</u> flashes <u>EIA INTERFACE CONNECTOR</u> DATA turns on. TERM READY (AUTO ANSW) turns off. +12 V will be present on interface pin 25 (Analog Loop). <u>TTL INTERFACE CONNECTOR</u> 0 V will be present on TTL interface pin 3 (Analog Loop).
	47.	Depress ESC key and then  key.	<u>ALARM</u> turns off. <u>EIA INTERFACE CONNECTOR</u> DATA turns off. TERM READY (AUTO ANSW) turns on. -12 V will be present on interface pin 25 (Analog Loop). <u>TTL INTERFACE</u> +5 V dc will be present on interface pin 3 (Analog Loop).



TABLE A (Cont)  
OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Digital Loop	48.	TTL INTERFACE — Depress ESC key. Hold SHIFT key depressed and depress  key	0 V will be present on TTL interface pin 1 (Digital Loop).
	49.	TTL INTERFACE — Depress ESC key then  key.	+5 V dc will be present on TTL interface pin 1 (Digital Loop).
Low Paper (Friction Feed) Paper-Out (Sprocket Feed)	50.	Sprocket Feed — Remove paper. Friction Feed — Lift paper roll from paper roll support.	Signal bell rings (sprocket feed only). TERM READY (AUTO ANSW) turns off. LOCAL (LOCAL-TALK) and ALARM turn on.
	51.	Depress TERM READY (AUTO ANSW) key.	TERM READY (AUTO ANSW) remains off. LOCAL (LOCAL-TALK) and ALARM remain on.
	52.	Replace the paper.	ALARM turns off.
	53.	Place CPS key in UP position (30 CPS) Place DUPLEX key in UP position (HALF-DUPLEX).	

This completes the OFF-LINE test of the 43 KSR Teleprinter. Use local procedures and arrangements for ON-LINE testing.

KSR VARIABLE FEATURES CHECKOUT

the factory are checked in the Off-Line Tests in Table A.

3.01 The procedures in Tables B and C verify proper operation of variable features exceptions only. The features as furnished from

3.02 Off-line checkout of Options 433b, 434b, and 435b will require placing the teleprinter into the loopback mode (see Table B).

A. Loopback Mode

TABLE B  
LOOPBACK MODE PROCEDURES

PROCEDURE	RESPONSE
EIA INTERFACE — Connect the test arrangement shown on Page 1-2 to the interface connector. Connect Carrier Detect to Data Term Ready. Turn on Teleprinter POWER switch.	Print head returns to left-hand margin. Printer performs one line feed. DATA turns on.
TTL INTERFACE — Connect the test arrangement shown on Page 1-2 to the interface connector. Connect Terminal Ready to Data Ready. Turn on Teleprinter POWER switch.	

B. Variable Features Checkout

TABLE C  
VARIABLE FEATURES CHECKOUT PROCEDURES

CHECK	PROCEDURE	RESPONSE
Option 431.b. and c.	Depress and hold PRINTER TEST key.	Characters printed as in Fig. 6. Bell sounds at end of each line.

(Option 431.b.)

!"#%&'()\*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN0PQRSTUVWXYZ[\]^\_`abcdefghijklmnopqrstuvwxyz{|}~

(Option 431.c.)

!"#%&'()\*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN0PQRSTUVWXYZ[\]^\_`abcdefghijklmnopqrstuvwxyz{|}~

Fig. 6—Printer Test Message

TABLE C (Cont)  
 VARIABLE FEATURES CHECKOUT PROCEDURES

CHECK	PROCEDURE	RESPONSE
Option 432.b. and c.	Depress and hold PRINTER TEST key.	Line length will be: 432 b — 72 characters 432 c — 80 characters Characters printed as in Fig. 7. Bell sounds at end of each line.

*Note:* The lower case "g" does not print on 72 character lines.

\*(Option 432.b.)

```
■ !"#%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN
OPQRSTUVWXYZ[\]^_`abcdef
hijklmnopqrstuvwxyz{!}"
■ !"#%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN
OPQRSTUVWXYZ[\]^_`abcdef
hijklmnopqrstuvwxyz{!}"
```

*Note:* The lower case "o" does not print on 80 character lines.

\*(Option 432.c.)

```
■ !"#%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN
OPQRSTUVWXYZ[\]^_`abcdefghijklm
nopqrstuvwxyz{!}"
■ !"#%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN
OPQRSTUVWXYZ[\]^_`abcdefghijklm
nopqrstuvwxyz{!}"
```

\*Sprocket Feed (13 characters per inch), Friction Feed (10 characters per inch)

Fig. 7—Printer Test Message

TABLE C (Cont)  
 VARIABLE FEATURES CHECKOUT PROCEDURES


CHECK	PROCEDURE	RESPONSE
Option 433.b.	Place teleprinter in loopback mode. Depress DUPLEX key to DOWN position (FULL DUPLEX). Depress the following keys: ABC Hold CTRL key depressed and depress  key.	Printer will print ABC. DATA remains on (does not flash). TERM READY (AUTO ANSW) remains off (does not flash) as EOT key is depressed.

TABLE C (Cont)

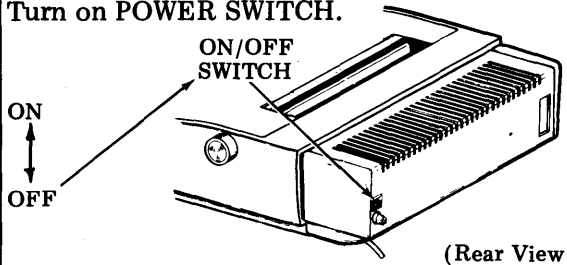
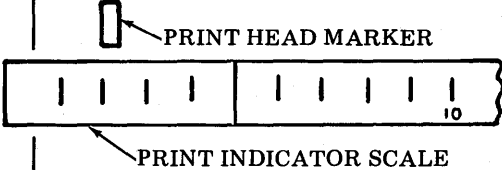
## VARIABLE FEATURES CHECKOUT PROCEDURES

CHECK	PROCEDURE	RESPONSE
Option 434.b.	Place teleprinter in loopback mode. Depress DUPLEX key to DOWN position (FULL DUPLEX).  Depress and release PARITY key to UP position (PARITY ON). Place CAPS LOCK key in DOWN position. Depress the following keys:  PARITY TEST	Printer will print: ■■RIT■ TE■T
Option 435.b.	Place teleprinter in loopback mode. Place DUPLEX key in DOWN position (FULL DUPLEX).  Depress REPT and K keys. Hold down until end of line is reached.	Characters will be printed until end of line is reached. Automatic return and line feed will not be performed. Bell will sound continuously until keys are released.

*Note:* Options 433, 434, and 435 — Depress LOCAL (LOCAL-TALK) key to terminate checkout procedure. Disconnect Interface Test Arrangement if present.

4. RO TESTING  
OFF-LINE TESTS (Cont)

TABLE D  
OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Power On/Off	1.	Turn on POWER SWITCH.  (Rear View)	Print head returns to the left-hand margin. Paper feeds to next line. TERM READY turns on.
	2.		Print head marker points to first mark on indicator scale.
Printer Option 431.a. 432.a.	3.	Hold PRINTER TEST key depressed until approximately eight lines are printed.	ALARM turns on. Characters printed as in Fig. 6. (Refer to Option 431 or 432b and c for any exceptions.) Bell rings at end of each line. (R.H. Margin or Test Message.)

Note: First line may start with any character.

```

lnopqrstuvwxyz{ }~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

```

(Sprocket Feed — 13 Characters per inch)

Note 1: First line may start with any character.

Note 2: The lower case "o" does not print on 80 character lines.

```

tuvwxyz{ }~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstu
pqrstuvwxyz{ }~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstu
pqrstuvwxyz{ }~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstu
pqrstuvwxyz{ }~
■ !"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_`abcdefghijklmnopqrstu
pqrstuvwxyz{ }~

```

(Friction Feed — 10 Characters per inch)


Fig. 8

4. RO TESTING  
OFF-LINE TESTS (Cont)

TABLE D (Cont)  
OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Printer (Cont)	4.	Release PRINTER TEST key.	ALARM turns off. Character printing stops. Print head returns to left-hand margin. Paper feeds to next line.
Cover Interlock	5.	Raise cover.	ALARM turns on. TERM READY turns off.
	6.	Close cover.	ALARM remains on.
	7.	Depress RESET key.	ALARM turns off. TERM READY turns on.
Loopback	8.	Turn off POWER switch and connect the test arrangement shown on Page 1-2 to the interface connector.	
	8.a.	TTL INTERFACE — Connect Terminal Ready to Data Ready. Turn on Teleprinter POWER switch.	Print head returns to left-hand margin. Paper feeds to next line. DATA turns on.
	8.b.	EIA INTERFACE — Connect Carrier Detect to Data Term Ready. Turn on Teleprinter POWER switch.	Print head returns to left-hand margin. Paper feeds to next line. DATA turns on. <u>EIA INTERFACE CONNECTOR</u> +12 V will be present on pin 4 (Issue 2A Logic Card). GND will be present on pin 7.
	8.c.	Measure continuity between pins 6 and 9 on TTL Interface Connector. TTL INTERFACE — Connect Terminal Ready to Data Ready. Turn on Teleprinter POWER switch.	Meter should read 0 ohms (Issue 2A Logic Card). Print head returns to left-hand margin. Paper feeds to next line. DATA turns on.
	9.	Turn off POWER switch. Remove RO Operator Console and install KSR Operator Console. Remove cover and manually depress INTERLOCK Switch during test procedure.	

TABLE D (Cont)  
OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Loopback (Cont)	10.	Turn on POWER switch.	TERM READY (AUTO ANSW) turns on.
	10.a.		<u>W/TTL Interface Only</u> +5 V will be present on pin 7. -12 V will be present on pin 11. +12 V will be present on pin 13. GND will be present on pin 9.
	11.	Depress and release PARITY key to UP position (PARITY ON). Place DUPLEX key in UP position (HALF-DUPLEX). Place CAPS LOCK key in DOWN position. Type the following: ANALOG Depress SPACE BAR.	AANNAALLOOGG is printed.
	12.	Place DUPLEX key in DOWN position (FULL DUPLEX). Type the following: TEST	TEST is printed.
Option 433.a.	Watch TERM READY (AUTO ANSW) key then hold CTRL key depressed and depress  key.	DATA and TERM READY (AUTO ANSW) flash as EOT key is depressed. (Refer to Option 433b for any exceptions.)	
	13.	Depress INTRPT key.	INTRPT turns on momentarily. Signal bell rings.
	14.	Hold CTRL key depressed and depress RETURN key.	Print head does not return.

4. RO TESTING  
OFF-LINE TESTS (Cont)

TABLE D (Cont)

## OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Loopback (Cont)  Option 435.a. 436.a.	15.	Depress RETURN and then LINE FEED key.  Depress REPT and K keys.  Hold down until two lines of Ks are printed (check time to print line).	Continuous Ks will be printed across entire new line.  Bell rings at end of line and automatic return and line feed will be performed.  One printed line plus return will occur in approximately: 4 seconds (sprocket feed) 2.5 seconds (friction feed) (Refer to Option 435b or 436b for any exceptions.)
Option 436.a.		Measure continuity between pins 4 and 7 on connector of RO opcon that was removed.	Meter should read an open circuit. (Refer to Option 435b or 436b for any exceptions.)
Option 437.a.	16.	Enable Option 434b.  Depress the following keys: PARITY TEST	Printer will print: ■■RIT■ TE■T (Refer to Option 437b for any exceptions.)
		Measure continuity between pins 4 and 20 on connector of RO opcon that was removed.	Meter should read an open circuit.  (Refer to Option 437b for for any exceptions.)
Low-Paper (Friction Feed) Paper-Out (Sprocket Feed)	17.	Remove the paper — Paper-out (sprocket feed). Lift paper roll from paper support — (friction feed).	Signal bell rings (sprocket feed only).  Alarm turns on.
	18.	Watch DATA key and depress LINE FEED key eight times.	<u>Sprocket Feed</u> DATA turns off. LOCAL (LOCAL-TALK) turns on as 8th LINE FEED is received.  <u>Friction Feed</u> DATA remains on. LOCAL (LOCAL-TALK) remains off.



TABLE D (Cont)  
OFF-LINE TEST PROCEDURES

TEST	STEP	PROCEDURE	RESPONSE
Low-Paper (Friction Feed) Paper-Out (Sprocket Feed) (Cont)	19.	Depress TERM READY (AUTO ANSW) key.	<u>Sprocket Feed</u> DATA remains off. LOCAL (LOCAL-TALK) remains on.  <u>Friction Feed</u> DATA turns off. LOCAL (LOCAL-TALK) turns on.
	20.	Replace the paper.	ALARM flashes (sets W/TDU). ALARM turns off (sets W/O TDU).
	21.	Depress DATA key.	DATA turns on. LOCAL (LOCAL-TALK) turns off.
Loopback Clear	21.a.	EIA INTERFACE — Disconnect strap between Data Term Ready and Carrier Detect.	DATA turns off. TERM READY (AUTO ANSW) turns on.
	21.b.	TTL INTERFACE — Disconnect strap between Data Ready and Terminal Ready.	
Low-Paper (Friction Feed) Paper-Out (Sprocket Feed)	22.	Sprocket Feed — Remove paper.  Friction Feed — Lift paper roll from paper roll support.	Signal bell rings (sprocket feed only). TERM READY (AUTO ANSW) turns off. LOCAL (LOCAL-TALK) and ALARM turn on.
	23.	Depress TERM READY (AUTO ANSW) key.	TERM READY (AUTO ANSW) remains off. LOCAL (LOCAL-TALK) and ALARM remain on.
	24.	Replace the paper.	ALARM turns off.

This completes the OFF-LINE test of the 43 RO Teleprinter.

Remove the KSR Operator Console and replace the RO Operator Console.

Remove the Interface Test Arrangement (if present) and replace the bustle cover and paper holder.

Use local procedures and arrangements for ON-LINE testing.

RO VARIABLE FEATURES CHECKOUT

4.01 The procedures in Table F verify proper operation of variable feature exceptions only. The features as furnished from the factory are checked in the off-line tests in Table D.

4.02 Off-line checkout of Options 433b through 437b will require placing the teleprinter into the loopback mode and replacing the RO Operator Console with a KSR Operator Console (See Table E.)

A. Loopback Mode

TABLE E

LOOPBACK MODE PROCEDURES

PROCEDURE	RESPONSE
Remove RO Operator Console and install KSR Operator Console.  EIA INTERFACE — Connect the test arrangement shown on Page 1-2 to the interface connector. Connect Carrier Detect to Data Term Ready. Turn on Teleprinter POWER switch.  TTL INTERFACE — Connect the test arrangement shown on Page 1-2 to the interface connector. Connect Terminal Ready to Data Ready. Turn on Teleprinter POWER switch.	Print head returns to left-hand margin. Printer performs one line feed. DATA turns on.

B. Variable Features Checkout

TABLE F

VARIABLE FEATURES CHECKOUT PROCEDURES

CHECK	PROCEDURE	RESPONSE
Option 431.b. and c.	Depress and hold PRINTER TEST key.	Characters printed as in Fig. 9. Bell sounds at end of each line.

(Option 431.b.)

■ !"#\$%&'()\*+,-./0123456789:;<=>?@ABCDEFGHIJKL<sup>↓</sup>MNOPQRSTUVWXYZ[\]^\_`<sup>↓ ↓</sup>abcdefghijklmnopqrstu<sup>↓ ↓</sup>vwxyz{|}~

(Option 431.c.)

■ !"#\$%&'()\*+,-./0123456789:;<=>?@ABCDEFGHIJKL<sup>↓</sup>MNOPQRSTUVWXYZ[\]^\_`<sup>↓ ↓</sup>abcdefghijklmnopqrstu<sup>↓ ↓</sup>vwxyz{|}~

Fig. 9—Printer Test Message

TABLE H (Cont)  
VARIABLE FEATURES CHECKOUT PROCEDURES

CHECK	PROCEDURE	RESPONSE
Option 432.b. and c.	Depress and hold PRINTER TEST key.	Line length will be: 432 b — 72 characters 432 c — 80 characters Characters printed as in Fig. 10. Bell sounds at end of each line.

\*(Option 432.b.)

Note: The lower case "g" does not print on 72 character lines.

```
■ !"#%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN
OPQRSTUVWXYZ[\]^_`abcdef
hijklmnopqrstuvwxyz{!}"
■ !"#%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN
OPQRSTUVWXYZ[\]^_`abcdef
hijklmnopqrstuvwxyz{!}"
```

\*(Option 432.c.)


Note: The lower case "o" does not print on 80 character lines.

```
■ !"#%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN
OPQRSTUVWXYZ[\]^_`abcdefghijklmnop
qrstuvwxyz{!}"
■ !"#%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN
OPQRSTUVWXYZ[\]^_`abcdefghijklmnop
qrstuvwxyz{!}"
```

\*Sprocket Feed (13 characters per inch), Friction Feed (10 characters per inch)

Fig. 10—Printer Test Message

TABLE H (Cont)  
VARIABLE FEATURES CHECKOUT PROCEDURES

CHECK	PROCEDURE	RESPONSE
Option 433.b.	Place teleprinter in loopback mode. Depress DUPLEX key to DOWN position (FULL DUPLEX). Depress the following keys: ABC Hold CTRL key depressed and depress  key.	Printer will print ABC. DATA remains on (does not flash). TERM READY (AUTO ANSW) remains off (does not flash) as EOT key is depressed.
Option 434.b.	NOT APPLICABLE	Checked in Step 16 of Off-Line Tests.
Option 435.b.	Place teleprinter in loopback mode. Depress DUPLEX key to DOWN position (FULL DUPLEX).  Depress REPT and K keys. Hold down until end of line is reached.	Characters will be printed until end of line is reached. Automatic return and line feed will not be performed. Bell will sound continuously until keys are released.

## RO VARIABLE FEATURES CHECKOUT (Cont)

TABLE H (Cont)

## VARIABLE FEATURES CHECKOUT PROCEDURES

CHECK	PROCEDURE	RESPONSE
Option 436.b.	<p>Place teleprinter in loopback mode.</p> <p>Depress DUPLEX key to DOWN position (FULL DUPLEX).</p> <p>Place CPS key in DOWN position (10 CPS).</p> <p>Depress REPT and K keys.</p> <p>Hold down until two lines of Ks are printed.</p> <p>Measure continuity between pins 4 and 17 on RO opcon connector.</p>	<p>Continuous Ks will be printed across entire line.</p> <p>Bell rings at end of line and automatic return and line feed will be performed.</p> <p>One printed line plus return will occur in approximately: 14 seconds (sprocket feed) 8.5 seconds (friction feed)</p> <p>First part of second line (approximately 18 characters) will be printed at a faster rate of speed.</p> <p>Meter should read 0 ohms.</p>
Option 437.b.	<p>Enable Option 434b.</p> <p>Place teleprinter in loopback mode.</p> <p>Place CAPS LOCK key in DOWN position.</p> <p>Depress DUPLEX key to DOWN position (FULL DUPLEX).</p> <p>Depress the following keys: PARITY TEST</p> <p>Measure continuity between pins 4 and 20 on RO opcon connector.</p>	<p>Printer will print: PARITY TEST.</p> <p>Meter should read 0 ohms.</p>

*Note:* Disconnect Interface Test arrangement, if present. Replace RO operator console.

PART 2 — TROUBLESHOOTING

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4. RO TROUBLESHOOTING.....	10	COMPONENT IDENTIFICATION AND LEAD DESIGNATION .....	32
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410700 CIRCUIT CARD COM- PONENT LAYOUT.....	16	9. RO OPERATOR CONSOLE TROUBLESHOOTING .....	35
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7. LOGIC CARD TROUBLE- SHOOTING.....	20	1. GENERAL	
TROUBLESHOOTING GUIDE.....	20	1.01 This part provides troubleshooting infor- mation for the 43 KSR and RO teleprinter, power supply, friction or sprocket feed printer, including the print head and logic cards, and the KSR and RO operator console. Defective TAUs should be sent to the Teletype Product Service Center for repair.	
410740 AND 410742 CIRCUIT CARD COMPONENT LAYOUT.....	23	1.02 Teleprinter troubleshooting is based on isolation of troubles to major components, and the correction of troubles, by replacement of these components in the teleprinter or by repairing the component. Isolation of troubles within the component is provided in the major component paragraphs.	
COMPONENT IDENTIFICATION AND LEAD DESIGNATION .....	23		
TEST POINTS AND VOLTAGE READINGS.....	24		
SEMICONDUCTOR IN-CIRCUIT STATIC FORWARD RESIST- ANCE .....	26		

1.03 Major component troubleshooting is initiated either by the KSR or RO teleprinter troubleshooting paragraph or when trouble in the major component is "suspected" from symptoms observed.

1.04 Analysis in the major component paragraph is limited to isolating the trouble within the major component up to its electrical interface.

1.05 When replacement of a major component does not correct the trouble, the original component should be reinstalled before going to the next step of the trouble analysis. If there are no more steps provided, go to the last step.

1.06 When a trouble is verified to be in a major component (by replacement of that component) the major component paragraph should be used to help isolate and correct the trouble within the component. Where analysis indicates the trouble is not in the component, return to the teleprinter paragraph for further analysis.

1.07 When returned to the Teletype Product Service Center for repair, the teleprinter or major components shall be packed in the container in which the replacement is received. This includes the conductive (black) plastic bag used with the KSR opcon and the logic card for static protection. Refer to Packing, Part 7 for packing information.

1.08 The KSR operator console circuitry can be damaged by static discharge. The 346392 static discharge ground strap is available for use by service personnel. Maintenance spares are provided in anti static bags which should be saved for reuse when returning components for repair.

1.09 Check and verify proper static circuit resistance of defective major components before connecting them to the teleprinter, to prevent overloading the power supply and blowing the fuse when power is turned on.

1.10 Before disconnecting internal cables or replacing circuit cards, turn off ac power. Make certain power cord is connected to a properly polarized and grounded ac outlet. Replace cables before turning on power.

1.11 When replacing the power supply fuse, wait 10 seconds after turning off power before removing the fuse.

1.12 The printer is not considered a field replaceable item. Any trouble can be corrected by adjustments or by replacement with maintenance spares or other replaceable parts.

1.13 Use meter RX1 scale when making resistance readings. Resistance readings shown are approximate and may be higher or lower than those specified, depending on meter used.

1.14 Verify proper operating voltages are present and correct before troubleshooting circuit cards or replacing integrated circuit packs.

1.15 Before applying power with cover or heat sink removed or attempting repair of the power supply, check the identification number located on the circuit board next to the ac connector or on the end of the line filter (see Fig. 1).

1.16 If the number is 9300 or less, check for either of the following identification marks (see Fig. 1):

- (a) Red line under fuse.
- (b) Red dot on top of capacitors C7, C8 and C9.

1.17 If the ID number is 9300 or greater or if the mark is present under the fuse or on each of the three capacitors, proceed with the troubleshooting or repair procedures.

1.18 If one of the marks is not present remove the heat sink and check capacitors C7, C8 and C9 for vent mark. Replace capacitors if vent mark is not present(see Fig. 1).

1.19 Replacement vented capacitors for this purpose can be obtained at no charge from Teletype Corporation by indicating "No charge per Manual 391" on the order for the 430704 capacitor.

1.20 Mark top of vented capacitors with red dot and draw a red line under fuse (use indelible felt tip marker). Replace heat sink and proceed with the troubleshooting or repair procedures.

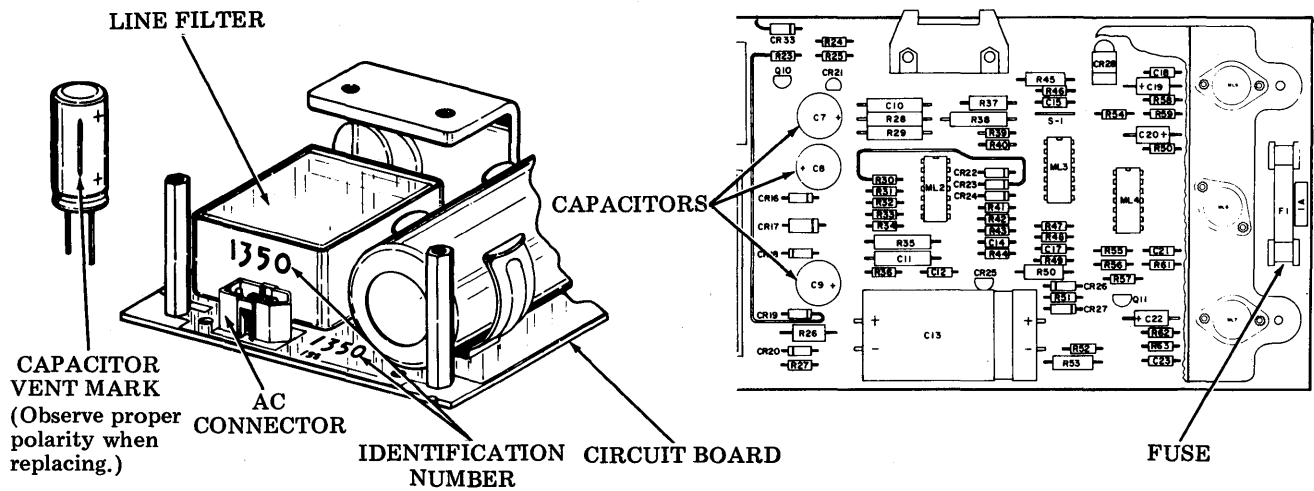
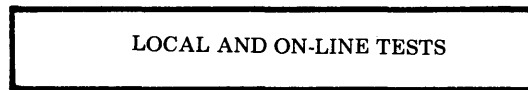


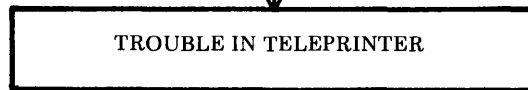
Fig. 1—430704 Capacitor Replacement

2. TROUBLESHOOTING FLOW DIAGRAM

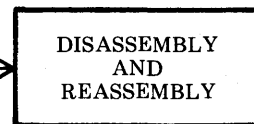
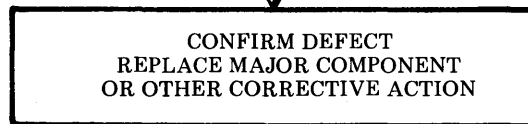
PART 1



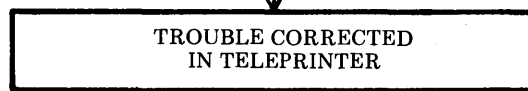
Paragraph 3 and 4 in this Part.



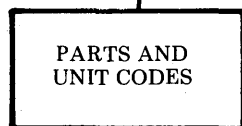
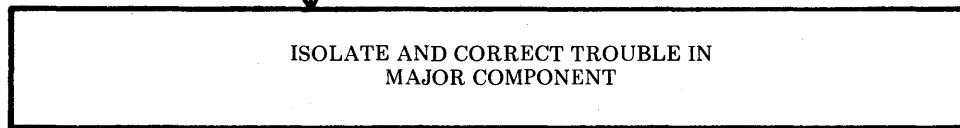
As directed in Paragraph 3 and 4 in this Part.



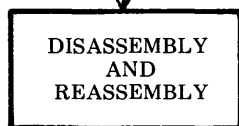
PART 3



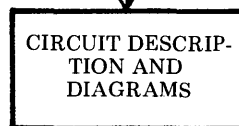
Paragraph 5, 6, 7, 8, and 9 in this Part.



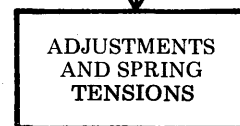
PART 6



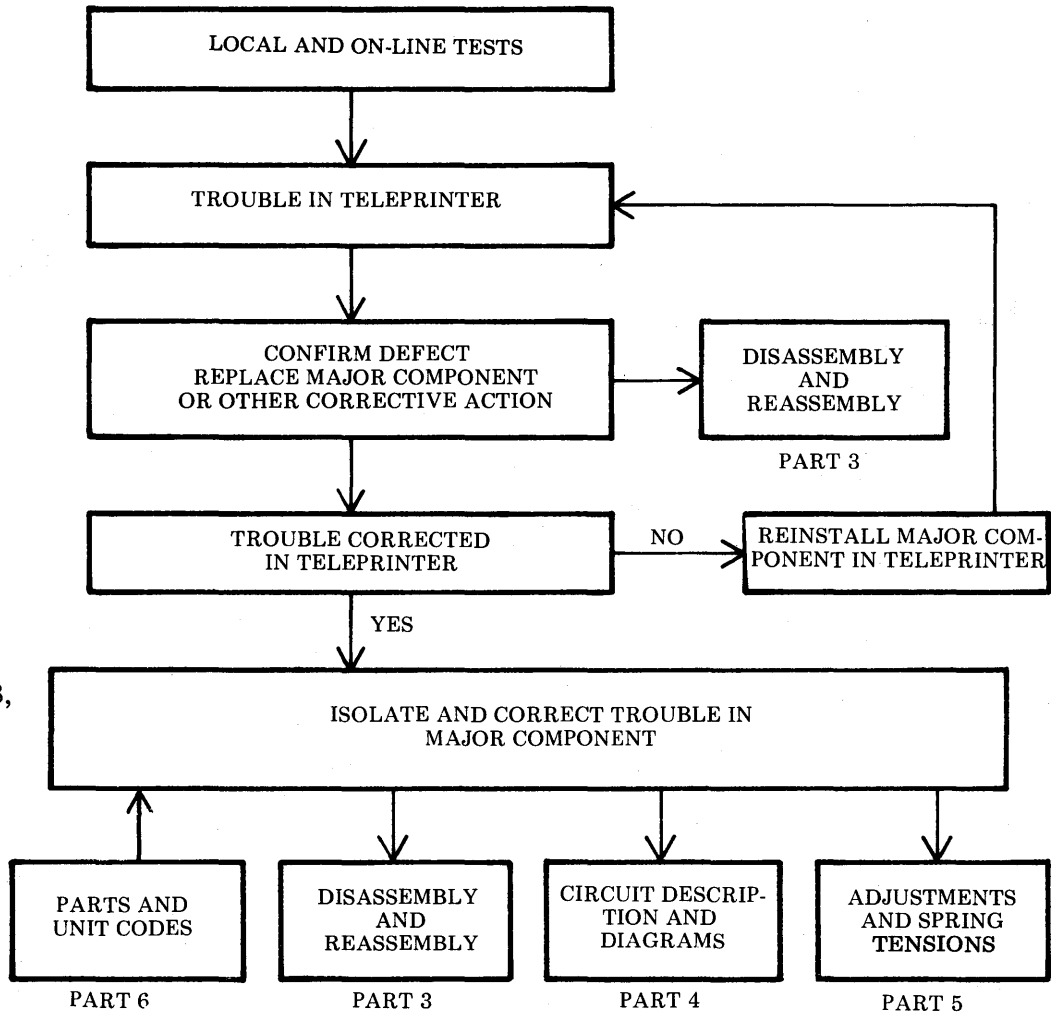
PART 3



PART 4



PART 5



## 3. KSR TROUBLESHOOTING

## TROUBLESHOOTING GUIDE (Teleprinter without TDU)

QUESTIONS	YES	NO
1. Are any of the three communications mode indicators lit? (Power available and set power on.) (Depress other keys if proper indicator not lit.)	Go to 2.	Go to 1a.
1a. Is there any indication of power in the set? (Indicators flash when power is turned on and off, red lamp on power supply, etc.)	Go to 1b.	Check and replace set F1 fuse if blown.  Replace power supply if fuse blows again.  If not blown go to 1b.
1b. Is red lamp on power supply lit?	Check P107 opcon cable connector.  Replace logic card.  Replace opcon.	Disconnect power supply cable.  Go to 1c.
1c. Does red lamp on power supply now light?	Unplug TAU, if present, opcon and printer (6) cables. Reconnect power supply cable.  Go to 1d.	Check F2 fuse on power supply. Replace if blown.  Replace power supply.  Replace rear frame assembly.
1d. Does red lamp on power supply still light?	Go to 1e.	Replace logic card.
1e. Does red lamp on power supply go out after the TAU, opcon and printer cables are reconnected one at a time?	Replace the TAU, opcon or the printer component (refer to printer troubleshooting) that caused lamp to extinguish.	Intermittent short. Check for foreign objects between circuit lands or terminals.
2. Does ALARM indicator: 1. Flash? 2. Light (cover closed and paper installed)?	1. Replace logic card.  2. Replace opcon or refer to printer troubleshooting.	Go to 3.



QUESTIONS	YES	NO
3. Does LOCAL indicator light when depressed?	Go to 4.	Go to 3a.
3a. Does DATA indicator go out?	Replace logic card.	Replace opcon.
4. Does test message print and perform properly while the PRINTER TEST key is depressed?	Go to 5.	Check option 431 and 432. Go to 4a
4a. Is red lamp on power supply lit?	Go to 4c.	Disconnect power supply cable. Go to 4b.
4b. Does red lamp on power supply now light?	Reconnect power supply cable.  Unplug print head and motor cables then reconnect one at a time to isolate cause of lamp not lit.  Replace defective component (refer to printer troubleshooting).	Replace power supply.
4c. Does anything print or perform?	Go to 4d.	Place printer test bypass switch SPD4-2 on logic card to ON position. If ok replace opcon.  Replace logic card.
4d. Does anything print?	Go to 4e.	Replace logic card.  Refer to printer troubleshooting.
4e. Are characters properly formed?	Go to 4f.	Refer to printer troubleshooting.  Replace logic card.
4f. Are the proper characters printed?	Go to 4g.	Replace logic card.
4g. Is print density acceptable (good ribbon)?	May be undefined printing problem.  Refer to printer troubleshooting.  Replace logic card.  Go to 4h.	Refer to printer troubleshooting.

## 3. KSR TROUBLESHOOTING (Cont)

## TROUBLESHOOTING GUIDE (Teleprinter without TDU) (Cont)

QUESTION	YES	NO
4h. Does paper feed properly (paper supply free)?	Go to 4i.	Check F3 fuse on logic card. Replace line feed motor if fuse blows again.  Refer to printer troubleshooting.  Replace logic card.
4i. Does print head space and return properly?	Undefined problem in printer test functions.  Refer to printer troubleshooting.	Refer to printer troubleshooting.  Replace logic card.
5. Did ALARM indicator light during printer test?	Go to 6.	Go to 5a.
5a. Does ALARM indicator light when cover is opened?	Replace logic card.	Replace opcon.
6. Does ALARM indicator light when 1. paper is out and when 2. cover is opened?	Go to 7.	1. Check printer troubleshooting. 2. Replace opcon. 3. Replace logic card.
7. Do all characters print and functions (except bell and margin set) perform when the keys on the keyboard are operated (local mode)?	Go to 8.	Replace opcon.  Replace logic card.
8. Does signal bell ring on CTRL G?	Go to 9.	Go to 8a.
8a. Did signal bell ring during printer test?	Replace logic card.  Replace opcon.	Check P106 bell connector.  Refer to printer (bell) troubleshooting.  Replace logic card.
9. Does signal bell ring eight characters before right margin and at left and right margins?	Go to 10.	Replace logic card.
10. Are margins set and cleared properly?	Go to 11.	Check column indicator positioning adjustment. Replace logic card.

QUESTION	YES	NO
11. Does printer respond properly to keyboard operation in loopback mode (interface connector strapped)?	Go to 12.	Check P301 connector. Replace logic card. Replace Terminal Aux. Unit (if present).
12. Did ALARM indicator flash and DATA indicator light during loopback?	Go to 13.	Replace logic card. Replace opcon.
13. Does external device connected to interface connector go to data mode (DATA indicator depressed, exclusion key lifted, etc)?  (TTL interface — Data Ready, pin 15 on, 0 V) (EIA interface — Carrier Detect, pin 8 on, +3 V)	Go to 14.	Go to 13a.
13a. Is Terminal Ready pin 5, TTL interface on, 0 V? TERM READY (AUTO ANSWER) on?	Go to 13b.	Replace logic card.
13b. Does external device require Request to Send (EIA interface) to be on?	Use issue 2A logic card or strap ON in cable.  Sets with TAU — go to 13c.	Sets without TAU — trouble is in external device.
13c. Is Data Term Ready pin 20 EIA interface on, +3 V?	Trouble is in external device.	Replace TAU.
14. Does DATA indicator on opcon light when external device is in data mode?	Go to 15.	Go to 14a.
14a. Is EIA interface Clear to Send, pin 5, Carrier Detect pin 8, and Data Set Ready, pin 6 on, +3 V?  (Request to Send on if required by external device — strapped or Issue 2A logic card present.)	Go to 14b.	Trouble is external device.
14b. Is TTL interface Data Ready, pin 15 on?	Replace logic card.	Replace TAU.
15. Are data messages properly sent and received in the data mode?	Go to 18.	Go to 15a.
15a. Do PARITY, DUPLEX and CPS keys alternately lock down and release up when depressed.	Go to 16.	Replace opcon.
16. Can any data be received?	Go to 17.	Go to 25.

## 3. KSR TROUBLESHOOTING (Cont)

## TROUBLESHOOTING GUIDE (Teleprinter without TDU) (Cont)

QUESTION	YES	NO
17. Does substitute character print on some characters (PARITY key on)?	Remote station may be sending incorrect parity or be at different speed.  Go to 22.	Go to 18.
18. Does printer copy and data transmit properly in half-duplex (DATA indicator lit)?	Go to 19.	Check option 434.  Replace opcon.  Replace logic card.  Go to 25.
19. Is printer blinded to keyboard transmission in full duplex (DATA indicator lit)?	Go to 20.	Replace opcon.  Replace logic card.
20. Does the carriage return automatically when characters to the right of the right hand margin are received (DATA indicator lit)?	Go to 21.	Check option 435.  Replace logic card.
21. Does Term Ready turn off momentarily on received EOT and when carrier is not received (in data mode) (call disconnect on switched network)?	Go to 22.	Check option 433.  Replace logic card.  Replace TAU if present.
22. Is INTRPT indicator lit?	(Interrupt received) Go to 22a.	Go to 23.
22a. Does INTRPT indicator go off when depressed?	Go to 23.	Replace opcon.  Replace logic card.  Go to 25.
23. Does INTRPT indicator light briefly and bell ring when INTRPT indicator is depressed?	Go to 24.	Replace opcon.  Replace logic card.

QUESTION	YES	NO
24. Does remote station receive interrupt?	Go to 26.	Go to 25.
25. Does station pass on-line end-to-end tests with Testing Station?	Trouble (if any) is in remote station.	Perform distortion, dBm level, or other locally developed tests including digital loop-back under control of Testing Station to isolate trouble to line, TAU or logic card.
26. Is trouble present but not defined by Questions 1 to 25?	Refer to printer or opcon troubleshooting for other symptoms.  Replace opcon, power supply, TAU, logic card and/or print head to correct trouble.	

## 4. RO TROUBLESHOOTING

## TROUBLESHOOTING GUIDE (Teleprinter without TDU)

QUESTIONS	YES	NO
1. Are any of the 3 mode indicators lit? (Power available and set power on.) (Depress other keys if proper key not lit.)	Go to 2.	Go to 1a.
1a. Is there any indication of power in the set? (Indicators flash when power is turned on and off, red lamp on power supply, etc.)	Go to 1b.	Check and replace set F1 fuse if blown.  Replace power supply if fuse blows again.  If not blown go to 1b.
1b. Is red lamp on power supply lit?	Check P107 opcon cable connector.  Replace logic card.  Replace opcon.	Disconnect power supply cable.  Go to 1c.
1c. Does red lamp on power supply now light?	Unplug TAU if present, opcon and printer (6) cables.  Reconnect power supply cable.  Go to 1d.	Check F2 fuse on power supply. Replace if blown.  Replace power supply.  Replace rear frame assembly.
1d. Does red lamp on power supply still light?	Go to 1e.	Replace logic card.
1e. Does red lamp on power supply go out after the TAU, opcon and printer cables are reconnected one at a time?	Replace the TAU, opcon or the printer component (refer to printer troubleshooting) that caused lamp to extinguish.	Intermittent short. Check for foreign objects between circuit lands or terminals.
2. Does ALARM indicator: 1. Flash? 2. Light (cover closed and paper installed)?	1. Replace logic card.  2. Replace opcon or refer to printer troubleshooting.	Go to 3.

QUESTIONS	YES	NO
3. Does RESET key cause the printer to carriage return line feed and turn on the TERM READY indicator when depressed (ALARM indicator off)?	Go to 4.	Replace opcon. Replace logic card.
4. Does PRINTER TEST key cause the printer to carriage return and line feed and turn on the TERM READY indicator when released?	Go to 5.	Replace opcon. Replace logic card.
5. Does test message print and perform properly while the PRINTER TEST key is depressed?	Go to 6.	Check option 431 and 432. Go to 5a.
5a. Is red lamp on power supply lit?	Go to 5c.	Disconnect power supply cable. Go to 5b.
5b. Does red lamp on power supply now light?	Reconnect power supply cable.  Unplug print head and motor cables then reconnect one at a time to isolate cause of lamp not lit.  Replace defective component (refer to printer troubleshooting).	Replace power supply.
5c. Does anything print or perform?	Go to 5d.	Place the printer test bypass switch SPD4-2 on logic card to ON position. If ok, replace opcon. Replace logic card.
5d. Does anything print?	Go to 5e.	Replace logic card.  Refer to printer troubleshooting.
5e. Are characters properly formed?	Go to 5f.	Refer to printer troubleshooting.  Replace logic card.
5f. Are the proper characters printed?	Go to 5g.	Replace logic card.
5g. Is print density acceptable (good ribbon)?	May be undefined printing problem.  Refer to printer troubleshooting.  Replace logic card.  Go to 5h.	Refer to printer troubleshooting.

## 4. RO TROUBLESHOOTING (Cont)

## TROUBLESHOOTING GUIDE (Teleprinter without TDU) (Cont)

QUESTION	YES	NO
5h. Does paper feed properly (paper supply free)?	Go to 5i.	Check F3 fuse on logic card. Replace line feed motor if fuse blows again.  Refer to printer troubleshooting.  Replace logic card.
5i. Does print head space and return properly?	Undefined problem in printer test functions.  Refer to printer troubleshooting.	Refer to printer troubleshooting.  Replace logic card.
6. Did ALARM indicator light during printer test?	Go to 7.	Go to 6a.
6a. Does ALARM indicator light when cover is opened?	Replace logic card.	Replace opcon.
7. Does ALARM indicator light when 1. paper is out and when 2. cover is opened?	Go to 8.	1. Check printer troubleshooting.  2. Replace opcon.  3. Replace logic card.
8. Does signal bell ring on received CTRL G?	Go to 9.	Go to 8a.
8a. Did signal bell ring during printer test?	Replace logic card.  Replace opcon.	Check P106 bell connector.  Refer to printer (bell) troubleshooting.  Replace logic card.
9. Does signal bell ring eight characters before right margin and at left and right margins?	Go to 10.	Replace logic card.
10. Are margins set and cleared properly on-line?	Go to 11.	Replace logic card.



QUESTION	YES	NO
<p>11. Does external device connected to interface connector go to data mode (data key depressed, exclusion key lifted, etc)?</p> <p>(TTL interface — Data Ready, pin 15 on, 0 V)(EIA interface — Carrier Detect, pin 8 on, +3 V)</p>	Go to 12.	Go to 11a.
<p>11a. Is Terminal Ready pin 5, TTL interface on, 0 V, TERM READY (AUTO ANSW) indicator on?</p>	Go to 11b.	Replace logic card.
<p>11b. Does external device require Request to Send (EIA interface) to be on?</p>	<p>Use issue 2A logic card or strap ON in cable.</p> <p>Sets with TAU if present, Go to 11c.</p>	Sets without TAU — Trouble is in external device.
<p>11c. Is Data Term Ready pin 20, EIA interface on, +3 V?</p>	Trouble is in external device.	Replace TAU if present.
<p>12. Does DATA indicator on opcon light when external device in data mode?</p>	Go to 13.	Go to 12a.
<p>12a. Is EIA interface Clear to Send, pin 5, Carrier Detect pin 8, and Data Set Ready, pin 6 on, +3 V.</p> <p>(Request to Send on if required by external device — strapped or Issue 2A logic card present.)</p>	Go to 12b.	Trouble is external device.
<p>12b. Is TTL interface Data Ready, pin 15 on?</p>	Replace logic card.	Replace TAU if present
<p>13. Are data messages properly sent and received in the data mode?</p>	Go to 16.	Go to 13a.
<p>14. Can any data be received?</p>	Go to 15.	<p>Replace logic card.</p> <p>Replace TAU if present.</p> <p>Go to 19.</p>
<p>15. Does substitute character print on some characters (option 437a. enabled)?</p>	<p>Remote station may be sending incorrect parity or be at different speed. (Check option 436).</p> <p>Go to 18.</p>	Go to 16.
<p>16. Does the carriage return automatically when characters to the right of the right hand margin are received (DATA indicator lit)?</p>	Go to 17.	<p>Check option 435.</p> <p>Replace logic card.</p>

## 4. RO TROUBLESHOOTING (Cont)

## TROUBLESHOOTING GUIDE (Teleprinter without TDU) (Cont)

QUESTION	YES	NO
17. Does call disconnect on received EOT and when carrier is not received (in data mode)?	Go to 18.	Check option 433. Replace logic card. Replace TAU if present.
18. Does remote station receive interrupt?	Go to 29.	Go to 28.
19. Does station pass on-line end-to-end tests with Testing Station?	Trouble (if any) is in remote station.	Perform distortion, dBm level, or other locally developed tests, including digital loop-back under control of Testing Station to isolate trouble to line, TAU if present or logic card.
20. Is trouble present but not defined by Questions 1 to 28?	Refer to printer or opcon troubleshooting for other symptoms.  Replace opcon, power supply, TAU, if present, logic card and/or print head to correct trouble.	

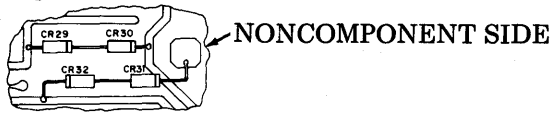
## 5. POWER SUPPLY TROUBLESHOOTING

## TROUBLESHOOTING GUIDE

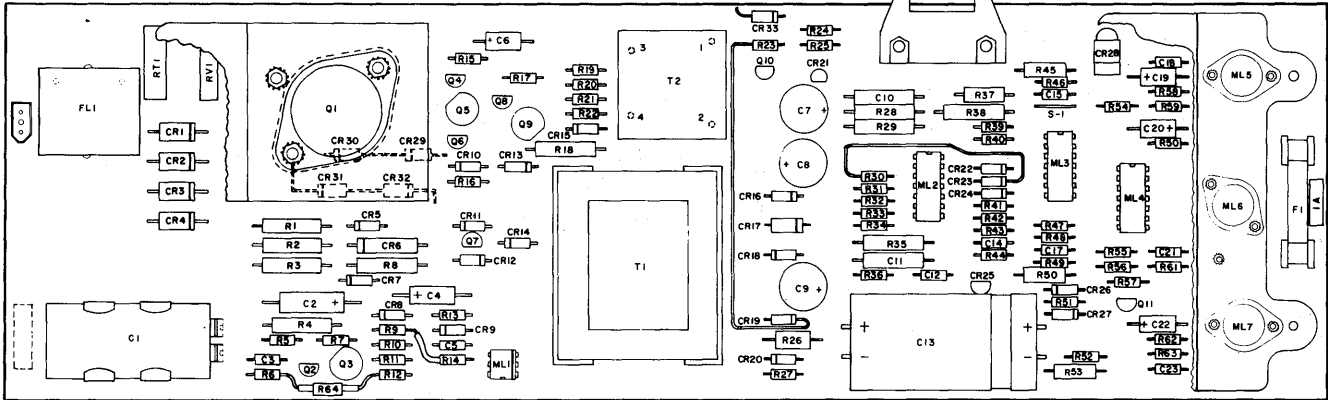
QUESTION	YES	NO
1. Is the red indicator lamp on (Power applied and on)?	Go to 2.	Go to 1a.
1a. Does the red indicator lamp flash (turn on momentarily and then go off) when power is turned on?	Check ML5, ML6, ML7. Apply external voltage source. (See Power Supply Circuit Diagram.) Check components in overvoltage circuit.	Check fuse F2. Go to 1b.
1b. Are any voltages present on J201: pin 5,6 +5 V pin 8 -12 V pin 7 +12 V pin 1,3 +42 V	Go to 1c.	Check components in ac-dc circuit. Check oscillator and control circuit (see Note 202 on circuit diagram). Check components in primary circuit.
1c. Is +5 present and within range on J201 pin 5?	Go to 1d.	Check CR16. Check ML5. Check T1 (F-M).
1d. Is -12 V present and within range on J201 pin 8?	Go to 1e.	Check CR18. Check ML6. Check T1 (C-D).
1e. Is +12 V present and within range on J201 pin 7?	Go to 1f.	Check CR19. Check ML7. Check T1 (B-C).
1f. Is +42 V present and within range J201 pins 1 and 3.	Check ML4. Check CR28.	Check fuse F2. Check CR17. Check T1 (E-A).
2. Are all voltages present and range on J201?	No problem — good power supply.	Check ML4. Check CR28. Go to 1b.

5. POWER SUPPLY TROUBLESHOOTING (Cont)

410700 CIRCUIT CARD COMPONENT LAYOUT



Caution: See paragraphs 1.15 through 1.20 before applying power with cover or heat sink removed or attempting repair of the power supply.



SEMICONDUCTORS AND INTEGRATED CIRCUITS IDENTIFICATION AND LEAD DESIGNATION

<p><b>CR25</b></p> <p>Anode Gate Cathode A G C</p>	<p><b>CR21</b></p> <p>Anode Gate Cathode A G C</p>	<p><b>Q3 Q5 Q9</b></p> <p>Collector Base Emitter C E B</p>	<p><b>Q2 Q4 Q6 Q7 Q8 Q10</b></p> <p>Cathode Base Emitter E B C</p>
<p><b>CR5-CR20 CR22-CR24 CR26 CR27 CR31</b></p> <p>Cathode Anode C A</p>	<p><b>CR1-4 CR29 CR30 CR32</b></p> <p>Cathode Anode C A</p>	<p><b>CR28</b></p> <p>Cathode Anode A C</p>	<p><b>Q1 ML5 ML6 ML7</b></p> <p>C B E</p>
<p><b>ML1</b></p> <p>Top View</p>		<p><b>ML2 ML3 ML4</b></p> <p>Top View</p>	

## SEMICONDUCTOR — IN CIRCUIT STATIC FORWARD RESISTANCE

<u>COMPONENT</u>	<u>RESISTANCE (Approx)</u>	<u>COMPONENT</u>	<u>RESISTANCE (Approx)</u>
CR1	28 ohms	Q1 B-E	24 ohms
CR2	28 ohms	B-C	22 ohms
CR3	28 ohms	Q2 B-E	30 ohms
CR4	28 ohms	B-C	30 ohms
CR5	30 ohms	Q3 B-E	32 ohms
CR6	28 ohms	B-C	32 ohms
CR7	24 ohms	Q4 B-E	30 ohms
CR8	95 ohms	B-C	30 ohms
CR9	24 ohms	Q5 B-E	30 ohms
CR10	24 ohms	B-C	30 ohms
CR11	24 ohms	Q6 B-E	30 ohms
CR12	24 ohms	B-C	30 ohms
CR13	24 ohms	Q7 B-E	30 ohms
CR14	24 ohms	B-C	30 ohms
CR15	26 ohms	Q8 B-E	30 ohms
CR16	24 ohms	B-C	30 ohms
CR17	22 ohms	Q9 B-E	30 ohms
CR18	26 ohms	B-C	30 ohms
CR19	24 ohms	Q10 B-E	30 ohms
CR20	32 ohms	B-C	30 ohms
CR21 G-C	48 ohms	Q11 B-E	30 ohms
G-A	42 ohms	B-C	30 ohms
CR22	32 ohms	ML1 1-2	60 ohms
CR23	34 ohms	4-6	48 ohms
CR24	32 ohms	5-6	48 ohms
CR25 G-C	110 ohms	ML5 B-E	40 ohms
G-A	38 ohms	B-C	25 ohms
CR26	34 ohms	ML6 B-E	70 ohms
CR27	34 ohms	B-C	25 ohms
CR28	110 ohms (LED on)	ML7 B-E	38 ohms
CR29	28 ohms	B-C	25 ohms
CR30	28 ohms		
CR31	28 ohms		
CR32	28 ohms		
CR33	24 ohms		

## STATIC CIRCUIT RESISTANCE (See Note)

<u>CONNECTOR TERMINAL</u>	<u>REFERENCE POINT</u>	<u>RESISTANCE (Approx)</u>	
		<u>LO</u>	<u>HI</u>
J201 — 6 (+5 V)	J201 — 9 (logic gnd)	38 ohms	2K ohms
J201 — 7 (+12 V)	J201 — 9 (logic gnd)	32 ohms	400 ohms
J201 — 8 (-12 V)	J201 — 9 (logic gnd)	70 ohms	8K ohms
J201 — 1 (+42 V)	J201 — 2 (power gnd)	24 ohms	5K ohms

*Note:* Take resistance reading, reverse meter leads and take second resistance reading.

## 6. PRINTER TROUBLESHOOTING

## TROUBLESHOOTING GUIDE

QUESTION	YES	NO
1. Does test message print and paper advance properly while PRINTER TEST key is depressed? (or No. 2 switch on logic card is operated on)	Go to 2.	Go to 1a.
1a. Does carriage space and return properly?	Go to 1b.	<p>Check for mechanical bind by moving carriage manually with power off.</p> <p>Check for proper spacing belt spring tension.</p> <p>Check platen end play adjustment.</p> <p>Check continuity of spacing motor and encoder.</p> <p>Check switch No. 1 on print head.</p> <p>Replace motor and/or encoder or cable.</p> <p>Replace lead screw nut.</p>
1b. Does paper advance properly? (Sucessive lines uniformly spaced)	Go to 1c.	<p>Check line feed belt tension.</p> <p>Check for mechanical bind by rotating platen manually with power off.</p> <p>Check platen end play adjustment.</p> <p>Check line feed follower pulley stop bracket and pressure roller bail adjustment (friction feed).</p> <p>With power on (reset) check platen detenting through full rotation by turning platen knob.</p> <p>Check continuity of line feed motor.</p> <p>Replace motor or cable.</p>
1c. Sprocket Feed — Do sprocket pins on platen line up with paper and with paper guides?	Go to 1d.	<p>Check left and right sprocket adjustment.</p> <p>Check left and right paper guide adjustment.</p>
1d. Are any characters printed?	Go to 1e.	Check continuity of print head and cable.

QUESTION	YES	NO
1e. Are any dots missing from printed characters?	<p>Check print head for: open coil, cracked wire guides, split or missing armature sleeves.</p> <p>Check print head armature adjustment.</p> <p>Replace print head or cable.</p>	Go to 1f.
1f. Are any dots noticeably out of line on characters with vertical segments.	<p>Examine print head wire guides for cracks or wear.</p> <p>Replace print head.</p>	Go to 1g.
1g. Are characters excessively compressed or expanded horizontally?	<p>Check for loose encoder disc.</p> <p>Check for excessive play between lead screw and nut.</p> <p>Replace lead screw nut.</p>	Go to 1h.
1h. Is proper print density obtained (good ribbon, proper multi-copy paper)?	Go to 1i.	<p>Check print head to platen adjustment.</p> <p>With power off and carriage moved manually, check that ribbon moves with carriage without slipping during return and does not move when carriage is moved to the right.</p> <p>Check carriage and left bracket ribbon rollers for "one way" rotation.</p>
1i. Sprocket Feed — Does printed copy align properly with edge of paper (prints equally on each side of page perforation)?	<p>Undefined problem during PRINTER TEST.</p> <p>Go to Teleprinter Troubleshooting.</p>	Check printed line position adjustment.
2. Did bell ring during PRINTER TEST.	Go to 3.	Go to 2a.
2a. Does bell ring under any conditions (CTRL G R.H. margin, etc)?	Go to Teleprinter Troubleshooting.	<p>Check bell coil and cable continuity.</p> <p>Check for freedom of bell plunger.</p>
3. Sprocket Feed — Does ALARM indicator light when a paper out condition is sensed?	<p>Undefined trouble.</p> <p>Go to Teleprinter Troubleshooting.</p>	<p>Check continuity of paper out cable and contacts.</p> <p>Check paper alarm contact adjustment.</p>

## 7. LOGIC CARD TROUBLESHOOTING

## TROUBLESHOOTING GUIDE

QUESTION	YES	NO
1. Do any opcon lamps fail to light (function performed, power applied and on)?	Go to 14.	Go to 2.
2. Are characters improperly formed or not printed (from any source)?	Go to 15.	Go to 3.
3. Does printer line feed properly under any conditions?	Go to 4.	Go to 15.
4. Does carriage space and return properly under any conditions?	Go to 5.	Go to 17.
5. Are characters printed and functions performed when received from keyboard?	Go to 6.	Go to 18.
6. Are data messages properly sent in the data mode (local copy ok)?	Go to 7.	Go to 19.
7. Can data be received and printed properly in the data mode (local and CPS ok)?	Go to 8.	Go to 20.
8. Does printer automatically carriage return and line feed at end of received line?	Go to 9.	Check SPD4-SW5 and SW6. Replace MLC7.
9. Does Terminal Ready turn off momentarily on received EOT and when Carrier is not received in data mode (call disconnect on switched network)?	Go to 10.	Go to 21.
10. Does ALARM indicator light when cover is opened and turn off when cover is closed?	Go to 11.	Go to 22.
11. Do analog and digital loop modes function properly?	Go to 12.	Go to 23.
12. Does ALARM indicator light when paper is out?	Go to 13.	Go to 24.
13. Does test message print and perform properly while the PRINTER TEST indicator is depressed and stop printing when PRINTER TEST key is released?	Go to 26.	Go to 25.



QUESTION	YES	NO
14. Do all lamps fail to light?	Check power on reset circuit.  Check clock circuit.	Check MLC4 lamp driver outputs (replace MLC4 if incorrect).  Check for open circuits.
15. Are signals present and correct on MLC7 print level outputs?	Check print wire driver circuits.	Check SPD4-SW7 and SW8. Go to 15a.
15a. Are data bits present and correct at MLC7 inputs?	Go to 15b.	Go to 15c.
15b. Is LDP pulse present at MLC7-14?	Replace MLC7.	Go to 15c.
15c. Is RNC pulse present at MLC4-18?	Replace MLC4.	Replace MLC7.
16. Are line feed motor phase 1 through 4 signals present and correct at MLC7 outputs?	Check line feed motor phase drivers.	Replace MLC7.
17. Are carriage motor phase 1 through 4 signals present and correct at MLC7 outputs?	Check carriage motor phase drivers.  Check velocity encoder.	Replace MLC7.
18. Is keyboard send data present on MLC4-32?	Replace MLC4.	Check for open circuit.
19. Is correct voltage levels present on MLE3-2?	Go to 19a.	Check continuity to J107 from MLE3-1. Replace MLE3.
19a. Is send data present and correct on MLB5-13?	Check for continuity to P301 from MLB5-12.  Replace MLB5.	Check SPD4-SW3. Replace MLC4.
20. Is correct voltage level present on MLE3-2 and 6?	Go to 20a.	Check continuity to J107. Replace MLE3.
20a. Is receive data present on MLB5-6?	Replace MLC4. Replace MLC7.	Check continuity to P301 from MLB5-5. Replace MLB5.
21. Is correct voltage level present on MLB5-11?	Check continuity to P301 from MLB5-10. Replace MLB5.	Replace MLC4.

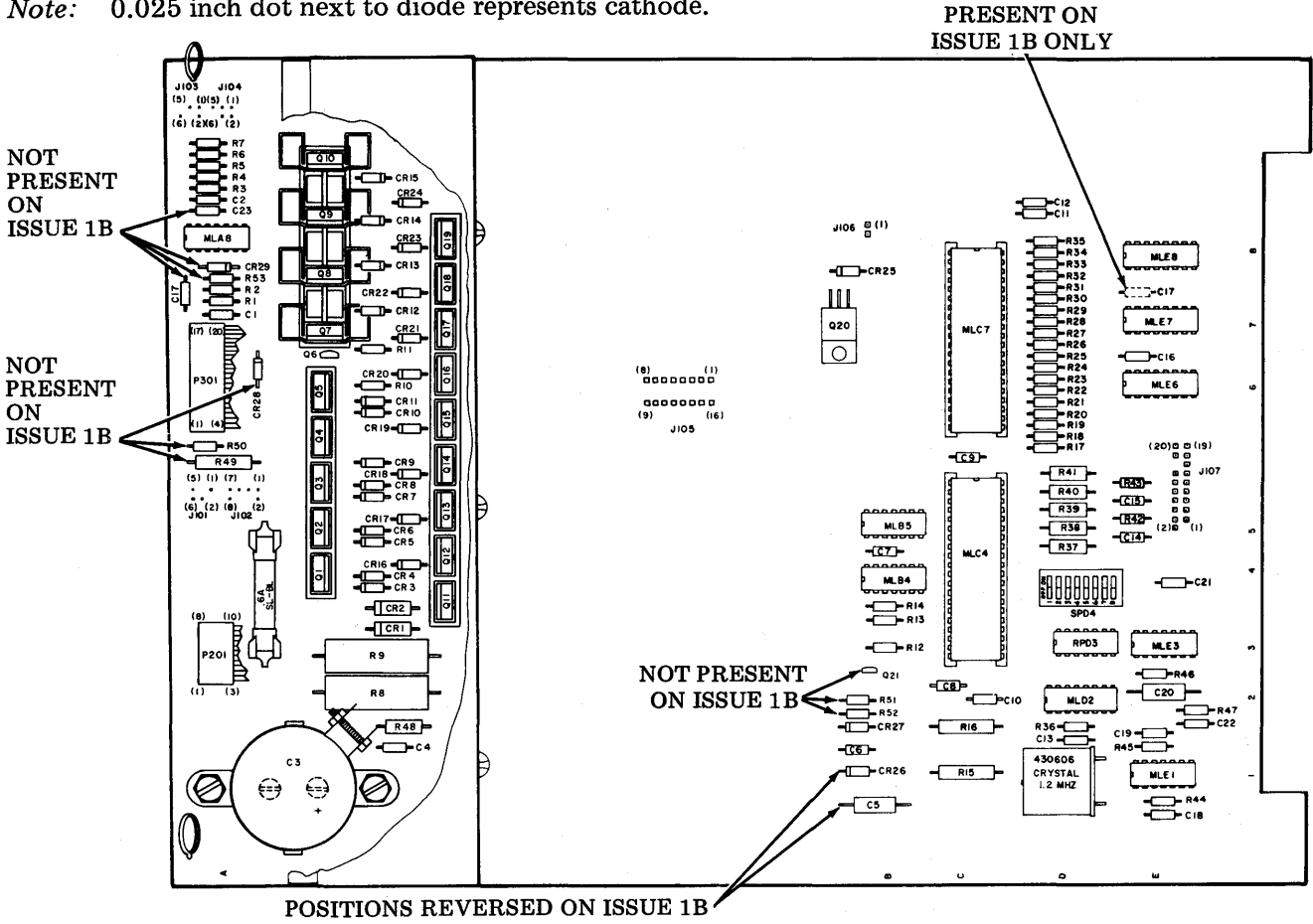
## 7. LOGIC CARD TROUBLESHOOTING (Cont)

## TROUBLESHOOTING GUIDE (Cont)

QUESTION	YES	NO
22. Is correct voltage level present on MLE3-10?	Replace MLC4.	Check continuity from MLE3-11 to J107. Replace MLB4.
23. All voltage levels on MLB5-1 and 9 correct?	Go to 23a.	Replace MLC4.
23a. Are voltages levels on MLB5-2 and 8 correct?	Check cable for open circuit.	Replace MLB5.
24. Is correct voltage level present on MLC4-28 and 22?	Replace MLC4.	Check continuity from MLB4 pins 3 and 5 to J101. Replace MLB4.
25. Is correct voltage level present on MLE3-4?	Replace MLC4.	Check SPD4-SW2. Check continuity from MLE3 pin 3 to J107 Replace MLE3.
26. Is trouble present but not defined by questions 1 through 25?	Undefined trouble — refer to Circuit Descriptions and Diagrams, etc.	Review initial indication of trouble.

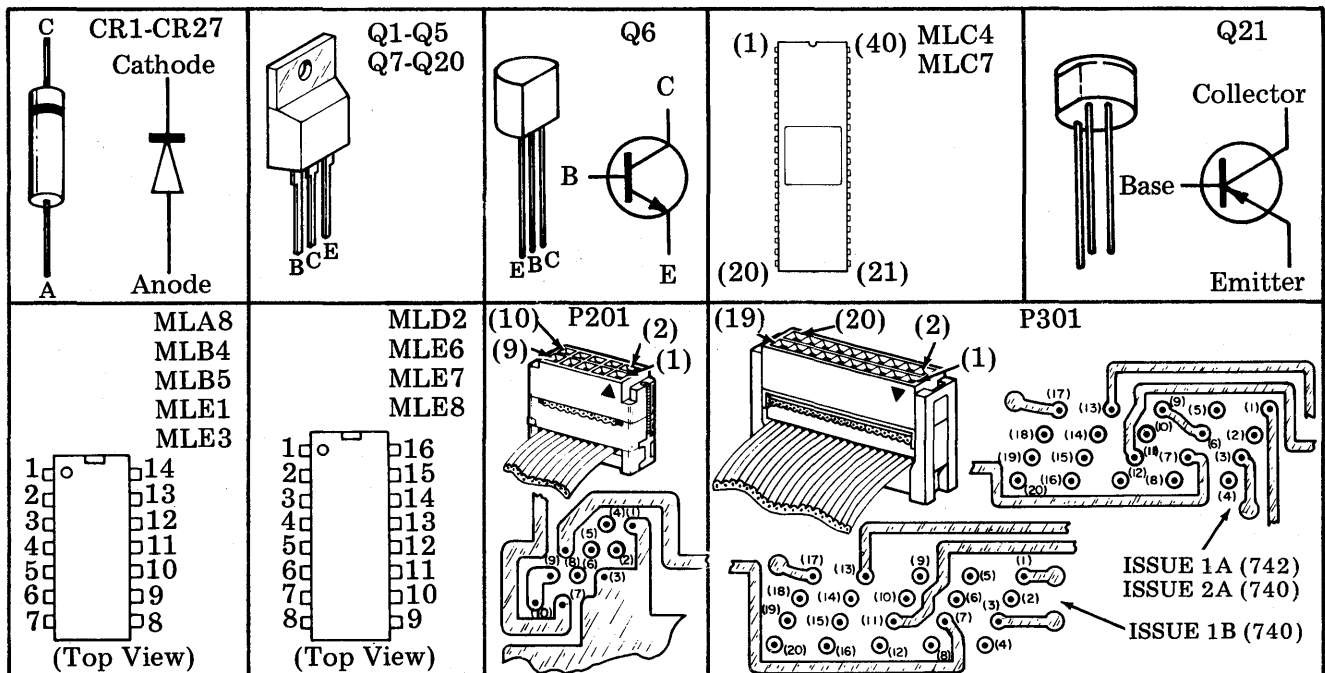
410740 AND 410742 CIRCUIT CARD COMPONENT LAYOUT

Note: 0.025 inch dot next to diode represents cathode.



COMPONENT IDENTIFICATION AND LEAD DESIGNATION

B = Base E = Emitter C = Collector



## 7. LOGIC CARD TROUBLESHOOTING (Cont)

## TEST POINTS AND VOLTAGE READINGS

*Note:* Use Volt-Ohm-Milliammeter dc Volts Scale (use ac Volts Scale for MLA8-9). Voltage readings are approximate and may be higher or lower than those specified, depending on meter used.

B = Base      E = Emitter      C = Collector

Q1-B	Idle = -4 V Repeat line feed = -2.5 V	③ Q10-B*	Even column = -1.75 V Odd column = -4 V
Q1-C	Idle = +42 V Repeat line feed = +37 V	④ Q10-C*	Even column = +53 V Odd column = +45 V
Q2-B	Idle = -4 V Repeat line feed = -2.5 V	Q11 thru Q19-B	Idle = -4 V Repeat character printing = -3.7 V
Q2-C	Idle = +70 V Repeat line feed = +37 V	Q11 thru Q19-C	Idle = +42 V Repeat character printing = +40 V
Q3-B	Idle = -4 V Repeat line feed = -2.5 V	Q20-B	Idle = 0 V Repeat bell = +0.5 V
Q3-C	Idle = +42 V Repeat line feed = +37 V	Q20-C	Idle = +42 V Repeat bell = +30 V
Q4-B	Idle = -3.5 V Repeat line feed = -2.5 V	MLA8-7	Repeat space = +2.4 V
Q4-C	Idle = +42 V Repeat line feed = +37 V	MLA8-8	Manually rotate carriage motor shaft. Motor should alternate between +4.8 V and -4.8 V.
Q5-B	Idle = +43 V Repeat line feed = +51 V	MLB5-6	Idle = 0 V (Data Mode) Receive repeat space = +3 V (Data Mode) Receive repeat null = +0.5 V
Q5-E	Idle = +43 V Repeat line feed = +51 V	MLB5-12	(Data Mode) Idle = +4.2 V (Data Mode) Send repeat space = +1.5 V
Q6-B	Idle = +0.75 V Repeat line feed = -3.5 V	MLB5-13	(Data Mode) Idle = 0 V (Data Mode) Send repeat space = +3 V
⑦ Q7-B*	Idle = -3.75 V Repeat space = -2 V	MLC4-32	Idle = +4.8 V Repeat space = +3.5 V
⑧ Q7-C*	Idle = +49 V Repeat space = +50 V Carriage returning = +37 V	MLC7-15	Idle = +4.8 V Repeat character printing
③ Q8-B*	Odd column = -1.75 V Even column = -4 V	MLD2-6	+7.5 V
④ Q8-C*	Odd Column = +53 V Even column = +45 V	MLE1-2	+7.5 V
⑦ Q9-B*	Idle = -3.75 V Repeat space = -2 V	MLE1-6 and 7	+6 V
⑧ Q9-C*	Idle = +49 V Repeat space = +50 V Carriage returning = +37 V		

MLE1-9	+2.75 V	MLE7-3	Idle = -3 V Repeat line feed = -1.25 V
MLE1-13	+9.5 V		
MLE1-14	+6.5 V	② MLE7-4*	Even column = -1.75 V Odd column = -4 V
② MLE6-2*	Odd column = -1.75 V Even column = -4 V	① MLE7-5*	Even column = +0.8 V Odd column = -3 V
① MLE6-3*	Odd column = +0.8 V Even column = -3 V	⑥ MLE7-6*	Idle = -3.75 V Repeat space = -2 V
⑥ MLE6-4*	Idle = -3.75 V Repeat space = -2 V	⑤ MLE7-7*	Idle = -3 V Repeat space = -2 V
⑤ MLE6-5*	Idle = -3 V Repeat space = -2 V	MLE7-14	Idle = -3 V Repeat printing = -2.75 V
MLE6-6	Idle = +0.75 V Repeat line feed = -3.5 V	MLE7-15	Idle = -4 V Repeat printing = -3.7 V
MLE6-7	Idle = +5 V Repeat line feed = -3.5 V	MLE8-4	Idle = -3.5 V Repeat line feed = -2.5 V
MLE6-9	Idle = -3 V Repeat line feed = -1.25 V	MLE8-5	Idle = -2.1 V Repeat line feed = -1.25 V
MLE6-10	Idle = -4 V Repeat line feed = -2.5 V	MLE8-6	Idle = -4 V Repeat line feed = -2.5 V
MLE7-2	Idle = -4 V Repeat line feed = -2.5 V	MLE8-7	Idle = -3 V Repeat line feed = -1.25 V

\*Voltage readings shown are typical.

Readings at ①, ②, ③, ④ (phase 1 and 3) may appear on ④, ⑤, ⑥, ⑦ (phase 2 and 4) respectively.

## 7. LOGIC CARD TROUBLESHOOTING (Cont)

## SEMICONDUCTOR IN-CIRCUIT STATIC FORWARD RESISTANCE

<u>COMPONENTS</u>	<u>RESISTANCE (Approx)</u>
CR1-CR27	30 ohms
CR28, CR29	20 ohms
Q1-Q5, Q7-Q20	B-E 70 ohms
	B-C 30 ohms
Q6	B-E 35 ohms
	B-C 35 ohms
Q21	B-E 30 ohms
	B-C 30 ohms

## STATIC CIRCUIT RESISTANCE (See Note)

<u>CONNECTOR TERMINAL</u>	<u>REFERENCE POINT</u>	<u>RESISTANCE (Approx)</u>	
		<u>LO</u>	<u>HI</u>
P201-6 (+5 V)	P201-9 (logic gnd)	24 ohms	110 ohms
P201-7 (+12 V)	P201-9 (logic gnd)	Infinity	Infinity
P201-8 (-12 V)	P201-9 (logic gnd)	95 ohms	600 ohms
P201-1 (+42 V)	P201-2 (power gnd)	55 ohms	8K ohms

*Note:* Take resistance reading, reverse meter leads and take second resistance reading.

8. KSR OPERATOR CONSOLE TROUBLESHOOTING

TRUBLESHOOTING GUIDE

QUESTION	YES	NO
1. Does failure involve either an operational control or a station indicator?	Go to 2.	Go to 12.
2. With power applied are any of the communications mode indicators; LOCAL (LOCAL TALK), DATA, TERM READY (AUTO ANSW) lit?	Go to 5.	Go to 3.
3. Is ALARM indicator lit (paper installed, cover closed)?	Go to 20.	Go to 4.
4. Do any indicators light under any conditions, ie, depressing indicator keyswitch, ALARM indicator on paper-out, LOCAL (LOCAL TALK) on by depressing PRINTER TEST key?	Go to 6.	Go to 18.
5. Do each of the three communications mode keyswitch indicators light when its keyswitch is depressed?	Go to 9.	Go to 6.
6. Does LOCAL (LOCAL-TALK) indicator light when its keyswitch is depressed?	Go to 7.	Go to 6a.
6a. Does LOCAL (LOCAL-TALK) indicator light when PRINTER TEST key is depressed?	Go to 20.	Go to 18a.
7. Does DATA indicator light or flash when its keyswitch is depressed?	Go to 8.	Go to 7a.
7a. Does DATA indicator light under any conditions, ie, loop-back, automatically from TERM READY (AUTO ANSW) mode?	Go to 20.	Go to 18a.
8. Does TERM READY (AUTO ANSW) indicator light when its keyswitch is depressed following depression of LOCAL (LOCAL-TALK) keyswitch?	Go to 9.	Go to 8a.
8a. Does TERM READY (AUTO ANSW) indicator light when power to the set is first turned on (no alarm conditions)?	Go to 20.	Go to 18a.
9. Does INTRPT indicator flash when INTRPT keyswitch is depressed while in loop-back mode?	Go to 10.	Go to 9a.

## 8. KSR OPERATOR CONSOLE TROUBLESHOOTING (Cont)

## TROUBLESHOOTING GUIDE (Cont)

QUESTION	YES	NO
9a. Does INTRPT indicator light when remote station sends an on-line interrupt?	Go to 20.	Go to 18a.
10. Does ALARM indicator light when the INTERLOCK keyswitch is released up (cover open)?	Go to 11.	Go to 10a.
10a. Does ALARM indicator light when a paper-out condition exists?	Go to 20.	Go to 18a.
11. Do PRINTER TEST, PARITY, DUPLEX and CPS keyswitch operate properly under all conditions?	Go to 12.	Go to 20.
12. Do any keys generate characters?	Go to 13.	Go to 21a.
13. Are any characters generated when only REPT key is depressed?	Go to 27.	Go to 14.
14. Do any characters repeat, shift to upper case, or become a control function when only that key is depressed (CAPS LOCK key released up)?	Go to 28.	Go to 15.
15. Are any erroneous characters generated when the corresponding keyswitch is not depressed (ie, tapping on keyboard or depressing any other keyswitch)?	Go to 28a.	Go to 16.
16. Do all data keys generate characters (Shift, Control, Upper and Lower Case)?	Go to 16a.	Go to 17.
16a. Are proper characters generated for each key?	Review original failure symptom.	(1) Check for proper keytop. (2) Replace keyswitch logic.
17. Does more than one keyswitch within only one of the Sense Amp groups fail?  See Part 4, KSR Operator Console Circuit Diagram.	Go to 25.	Go to 24.



QUESTION	YES	NO
18. Is -12 V present on pin 2 of circuit card cable connector P107 (if any keyswitches light go to Step 18a)?	Go to 18a.	Check for open circuit in cable.
18a. Is -12 V present on pin 4 of key-switch in question ?	Go to 18b.	Check for broken or open circuit land or defective solder connection on circuit board.
18b. Is -10 V or +5 V present on pin 3 of keyswitch in question?	Replace defective key-switch.	If voltage is -12 V dc, go to 19.
19. Is +5 V present on circuit card cable connection of keyswitch in question?	Check for broken or open circuit land to pin 3 of keyswitch in question.	Go to 19a.
19a. Is +5 V on the corresponding connector pin at P107?	Check for open circuit in cable.	Replace defective keyswitch.
20. Does keyswitch in question meet the mechanical requirements (depress and release properly, latch click, etc)?	Go to 20a.	Replace defective keyswitch.
20a. Is keyswitch in question: PRINTER TEST, PARITY, Interlock, DUPLEX or CPS?	Go to 20b.	Go to 21.
20b. Is +5 V present on pin 1 of keyswitch when keyswitch is open (released up position)?	Go to 20c.	Check cable for open circuit.
20c. Is 0 V present on pin 1 of keyswitch in question when keyswitch is closed (depressed down position)?	Go to 29.	Check for open circuit to P107 pin 4. Check for open connection at pins of keyswitch. Replace keyswitch.
21. Are any characters printed when several "data" keys are depressed?	Go to 24.	Go to 21a.
21a. Are supply voltages present on circuit card cable connection?	Go to 21b.	Check cable for open circuit.
21b. Is -8 V present on the cathode of CR1?	Go to 21d.	Go to 21c.
21c. Is -12 V present on the anode of CR1?	Replace CR1.	Check for open circuit on circuit board.
21d. Are supply voltages preset at all integrated circuit packs?	Check for open circuit on circuit board.	Go to 22.
22. Are Ø1L and Ø2L clocks present and correct at MLA5 and Ø1 and Ø2 clocks present and correct at MLA1, MLA6 and MLB4?	Go to 24.	Go to 23.

## 8. KSR OPERATOR CONSOLE TROUBLESHOOTING (Cont)

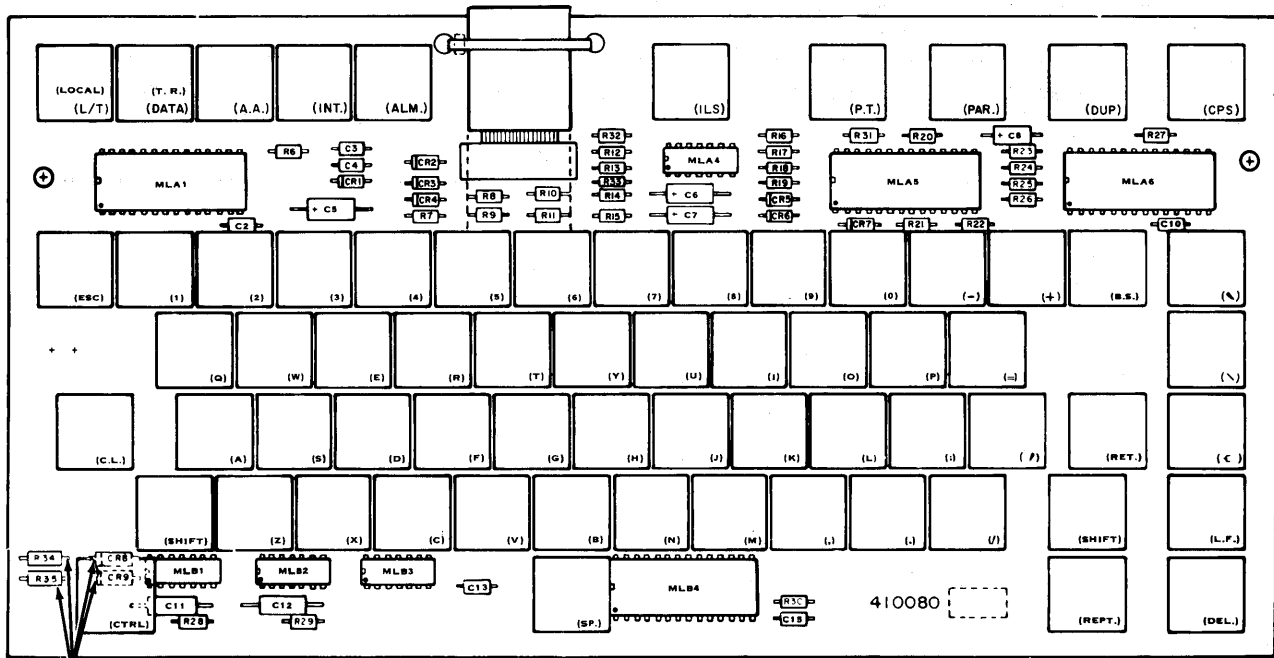
## TROUBLESHOOTING GUIDE (Cont)

QUESTION	YES	NO
23. Is 560 KHz clock present on pin 1 of MLB3?	Check clock generation and driver circuitry.	Check cable for open circuit.
24. Is depression pulse present on Sense Amp input with keyswitch in question depressed?	Go to 25.	Check visually for a short between terminals of the keyswitch. If there is no short visible, remove the keyswitch and check signal again at input to sense amp. If a depression signal is not present, replace defective sense amp. If a depression signal is present, replace defective keyswitch.
25. Is depression pulse present on keyswitch logic input MLA5-10, 11 or 12 with key or one of the keys in question depressed.	Go to 26.	Replace defective sense amp.
26. With REPT key and keyswitch in question depressed, is serial data on MLA5-2 present?	Check cable P107-6 for continuity. Check CR2 and CR4.	Replace MLA5.
27. Does keyswitch in question meet the mechanical requirements (depress and release properly, latch, click, etc)?	Go to 27a.	Replace defective keyswitch.
27a. Is depression pulse present on keyswitch logic MLA5-10, 11 or 12 with no keys depressed?	Go to 27b.	Replace MLA5.
27b. Is depression pulse present on Sense Amp — logic inputs with no keys depressed?	Check for open connection to keyswitch, ie, depression pulse does not appear at associated keyswitch, pin 1. Check for cold solder connections at terminals of keyswitch. Replace keyswitch.	Replace defective sense amp.
28. Does keyswitch in question; REPT left and right SHIFT, CAPS LOCK or CTRL meet the mechanical requirements (depress and release properly, latch, click, etc)?	Go to 28a.	Replace defective keyswitch.
28a. With jumper strap connected from pin 2 of keyswitch in question to its associated sense amp input, is failure corrected?	Check for cold solder joint or broken land from sense amp to keyswitch. Replace keyswitch.	Go to 28b.

QUESTION	YES	NO
28b. Is depression pulse present on keyswitch logic inputs MLA5-10, 11 or 12 with no keys depressed?	Replace defective sense amp.	Replace MLA5.
29. Is trouble present but not defined?	Undefined trouble — refer to Circuit Descriptions and Diagrams, etc.	Review initial indication of trouble.

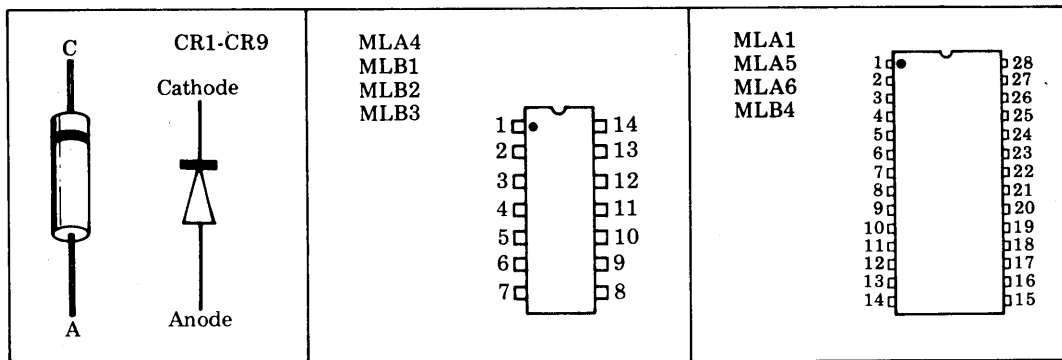
8. KSR OPERATOR CONSOLE TROUBLESHOOTING (Cont)

410080 CIRCUIT CARD COMPONENT LAYOUT



Not present on Issue 1A.

COMPONENT IDENTIFICATION AND LEAD DESIGNATION



SEMICONDUCTOR IN CIRCUIT STATIC FORWARD RESISTANCE

<u>COMPONENT</u>	<u>RESISTANCE (Approx)</u>
CR1-CR9	30 ohms

STATIC CIRCUIT RESISTANCE (See Note)

<u>CONNECTOR TERMINAL</u>	<u>REFERENCE POINT</u>	<u>RESISTANCE (Approx)</u>	
		<u>LO</u>	<u>HI</u>
P107-3 (+12 V)	P107-4 (logic gnd)	30 ohms	Infinity
P107-2 (-12 V)	P107-4 (logic gnd)	1.5K ohms	Infinity
P107-8 (+5 V)	P107-4 (logic gnd)	28 ohms	150 ohms

Note: Take resistance reading, reverse meter leads and take second resistance reading.

SENSE AMPS			Switch Address	UNSHIFT		SHIFT		CONTROL		Positive Logic Mark = 1 Space = 0 Hexadecimal Code Shown where <u>No</u> Character is Assigned.
Sense Amp Pin No.	Sense Amp No.	Data Enable No.		B <sub>8</sub> B <sub>7</sub> B <sub>6</sub> B <sub>5</sub> B <sub>4</sub> B <sub>3</sub> B <sub>2</sub> B <sub>1</sub> B <sub>0</sub>	Character	B <sub>8</sub> B <sub>7</sub> B <sub>6</sub> B <sub>5</sub> B <sub>4</sub> B <sub>3</sub> B <sub>2</sub> B <sub>1</sub> B <sub>0</sub>	Character	B <sub>8</sub> B <sub>7</sub> B <sub>6</sub> B <sub>5</sub> B <sub>4</sub> B <sub>3</sub> B <sub>2</sub> B <sub>1</sub> B <sub>0</sub>	Character	
11	1	1	0	NON-SEND	Shift (RH)	NON-SEND	Shift (RH)	NON-SEND	Shift (RH)	
11	2	1	1	NON-SEND	CTRL	NON-SEND	CTRL	NON-SEND	CTRL	
11	3	1	2	NON-SEND	Shift (LH)	NON-SEND	Shift (LH)	NON-SEND	Shift (LH)	
10	1	2	3	1 0 0 1 0 1 1 1 1	/	0 0 0 1 1 1 1 1 1	?	1 1 1 1 1 1 1 1 1		
10	2	2	4	1 0 1 1 0 1 0 1 1	k	0 0 1 0 0 1 0 1 1	K	1 0 0 0 0 1 0 1 1	VT	
10	3	2	5	1 0 1 1 1 0 0 0 1 1	.	0 0 1 0 1 0 0 1 1	S	1 0 0 0 1 0 0 1 1	DC3	
9	1	3	6	0 0 0 1 0 1 1 1 0	s	1 0 0 0 1 1 1 1 0	>	1 1 1 1 1 1 1 1 1		
9	2	3	7	1 0 1 1 1 0 1 0 1	u	0 0 1 0 1 0 1 0 1	U	1 0 0 0 1 0 1 0 1	NAK	
9	3	3	8	1 0 0 1 1 1 0 0 0 1 0	2	1 0 1 0 0 0 0 0 0 0	@	1 1 0 0 1 0 0 0 0 1	(91)	
8	1	4	9	0 0 0 1 0 0 0 1 1 1	✓	0 0 0 1 0 0 0 0 1 0	"	1 1 1 1 1 1 1 1 1		
8	2	4	10	0 0 0 1 1 0 1 0 1	5	1 0 0 1 0 0 1 0 1	%	1 1 0 0 1 0 1 0 0	(94)	
8	3	4	11	1 0 1 1 1 1 0 1 0	z	0 0 1 0 1 1 0 1 0	Z	1 0 0 0 1 1 0 1 0	SUB	
7	1	5	12	1 0 0 0 1 1 1 0 1 1	;	0 0 0 0 1 1 1 0 1 0	:	1 1 1 1 1 1 1 1 1		
7	2	5	13	0 0 1 1 1 0 0 0 1 0	r	1 0 1 0 1 0 0 1 0	R	0 0 0 0 1 0 0 1 0	DC2	
7	3	5	14	0 0 1 1 1 0 0 0 0 1	q	1 0 1 0 1 0 0 0 0 1	Q	0 0 0 0 1 0 0 0 1	DC1	
6	1	6	15	1 0 0 1 0 1 1 1 0 0	,	0 0 0 0 1 1 1 1 0 0	<	1 1 1 1 1 1 1 1 1		
6	2	6	16	0 0 1 1 1 0 0 0 1 1 0	f	1 0 1 0 1 0 0 0 1 1 0	F	0 0 0 0 0 0 0 1 1 0	ACK	
6	3	6	17	1 0 1 1 1 0 0 0 0 0 1	a	0 0 1 0 1 0 0 0 0 0 1	A	1 0 0 0 0 0 0 0 0 1	SOH	
5	1	7	18	1 0 0 0 0 1 0 0 0 0	Back Space	1 0 0 0 0 1 0 0 0 0	Back Space	0 1 0 0 1 1 1 0 0	(9C)	
5	2	7	19	1 0 0 1 0 0 0 0 0 0	Space	1 0 0 1 0 0 0 0 0 0	Space	1 0 0 1 0 0 0 0 0	Space	
5	3	7	20	0 0 1 1 1 0 0 1 1 1	w	1 0 1 0 1 0 1 1 1 1	W	0 0 0 0 1 0 1 1 1	ETB	
3	1	8	21	0 0 1 1 0 1 1 0 0 0	l	1 0 1 0 0 0 1 1 0 0	L	0 0 0 0 0 0 1 1 0 0	FF	
3	2	8	22	1 0 1 1 1 0 1 0 1 0	v	0 0 1 0 1 0 1 0 1 0	V	1 0 0 0 1 0 0 1 1 0	SYN	
3	3	8	23	1 0 0 1 1 1 0 0 0 0 1	l	0 0 0 0 1 0 0 0 0 0 1	!	0 1 0 0 1 0 0 0 0 0	(90)	
2	1	9	24	0 0 1 1 0 1 1 1 1 1	o (alpha)	1 0 1 0 0 0 1 1 1 1 1	O (alpha)	0 0 0 0 0 0 1 1 1 1 1	SI	
2	2	9	25	0 0 1 1 0 0 0 0 1 1	c	1 0 1 0 0 0 0 0 1 1 1	C	0 0 0 0 0 0 0 0 1 1 1	ETX	
2	3	9	26	0 0 0 1 1 1 1 0 0 0 0	x	1 0 1 0 1 0 1 1 0 0 0	X	0 0 0 0 0 1 1 0 0 0 0	CAN	
28	1	10	27	0 0 0 0 1 0 1 1 0 1	-	0 0 1 0 1 1 1 1 1 1	_	0 1 0 0 1 1 1 0 1 0	(9A)	
28	2	10	28	1 0 1 1 1 0 0 0 0 1 0	b	0 0 1 0 0 0 0 0 1 0	B	1 0 0 0 0 0 0 0 1 0	STX	
28	3	10	29	1 1 0 0 0 0 0 0 0 0	LO (Local/Talk)	1 1 0 0 0 0 0 0 0 0	LO	1 1 0 0 0 0 0 0 0 0	LO	
27	1	11	30	0 0 0 1 1 0 0 0 0 0	0 (zero)	1 0 0 1 0 1 0 0 0 1	)	0 1 0 0 1 1 0 0 0 1	(99)	
27	2	11	31	1 0 1 1 1 0 0 0 1 1 1	g	0 0 1 0 0 0 0 1 1 1	G	1 0 0 0 0 0 0 1 1 1	BEL	
27	3	11	32	0 1 0 0 0 0 0 0 0 1	L1 (Data)	0 1 0 0 0 0 0 0 0 1	L1	0 1 0 0 0 0 0 0 0 1	L1	
26	1	12	33	1 0 1 1 1 0 0 0 0 0	p	0 0 1 0 1 0 0 0 0 0	P	1 0 0 0 1 0 0 0 0 0	DLE	
26	2	12	34	0 0 1 1 1 0 1 0 0 0	t	1 0 1 0 1 0 1 0 0 0	T	0 0 0 0 1 0 1 0 0 0	DC4	
26	3	12	35	0 1 0 0 0 0 0 0 1 0	L2 (Auto Ans)	0 1 0 0 0 0 0 0 1 0	L2	0 1 0 0 0 0 0 0 1 0	L2	
24	1	13	36	0 0 0 1 0 1 0 1 1	+	1 0 1 0 1 1 1 1 0 1	]	1 1 0 0 0 1 1 0 1 1	(9B)	
24	2	13	37	0 0 0 1 1 0 1 1 1 0	6	1 0 1 0 1 1 1 1 1 0	^	0 1 0 0 1 0 1 0 1 0	(95)	
24	3	13	38	0 0 0 0 1 1 0 1 1	ESC	0 0 0 0 1 1 0 1 1	ESC	1 1 0 0 0 0 1 1 1 1	(8F)	
23	1	14	39	1 0 0 1 1 1 1 0 1	=	1 0 1 0 1 1 1 0 1 1	[	1 1 1 1 1 1 1 1 1 1		



## 9. RO OPERATOR CONSOLE TROUBLESHOOTING

## TROUBLESHOOTING GUIDE

QUESTION	YES	NO
1. Do any indicators fail to light?	Go to 6.	Go to 2.
2. Is the test message printed while the PRINTER TEST key is depressed?	Go to 3.	Go to 7.
3. Does the TERM READY indicator turn on and ALARM turn off when the PRINTER TEST key is released (cover closed and paper installed)?	Go to 4.	Go to 8.
4. Does the ALARM indicator turn off (if on) and TERM READY turn on when the RESET key is depressed (cover closed and paper installed)?	Go to 5.	Go to 9.
5. Does ALARM indicator light when cover is opened?	Go to 12.	Go to 11.
6. Is -10 V or +5 V present on pin 3 of keyswitch in question?	Replace defective key-switch.	If voltage is -12 V dc go to 6a.
6a. Is +5 V present on circuit card cable connection of keyswitch in question?	Check for broken or open circuit land to pin 3 of keyswitch in question.	Go to 6b.
6b. Is +5 V present on the corresponding connector pin at P107?	Check for open circuit in cable.	Replace defective keyswitch.
7. Does pin 1 of PRINTER TEST key-switch toggle from +5 V to 0 V when keyswitch is depressed?	Check cable for open circuit.	Replace defective keyswitch.
8. Is negative pulse present on MLA3-3 when PRINTER TEST key is released?	Go to 10.	Check START CONTROL circuitry.
9. Does voltage on MLA3-3 toggle from +5 V to 0 V when RESET key is depressed and toggle from 0 V to +5 V when RESET key is released?	Go to 10.	Check START CONTROL circuitry.
10. With no keyswitch depressed, is MLB4-10 and 12 at +5 V?	Go to 10b.	Go to 10a.
10a. Is 0 V present on MLB4-1, 2, 3, 4, 5, 6, 7, and 15?	Replace MLB4.	Go to 10b.
10b. With MLA3-11 and 8 connected to GND, are clock pulses present on MLB2-5?	Go to 10c.	Check CLOCK DIVIDER circuitry.
<i>Note:</i> Printer may line feed when MLA3-11 and 8 are connected to GND.		

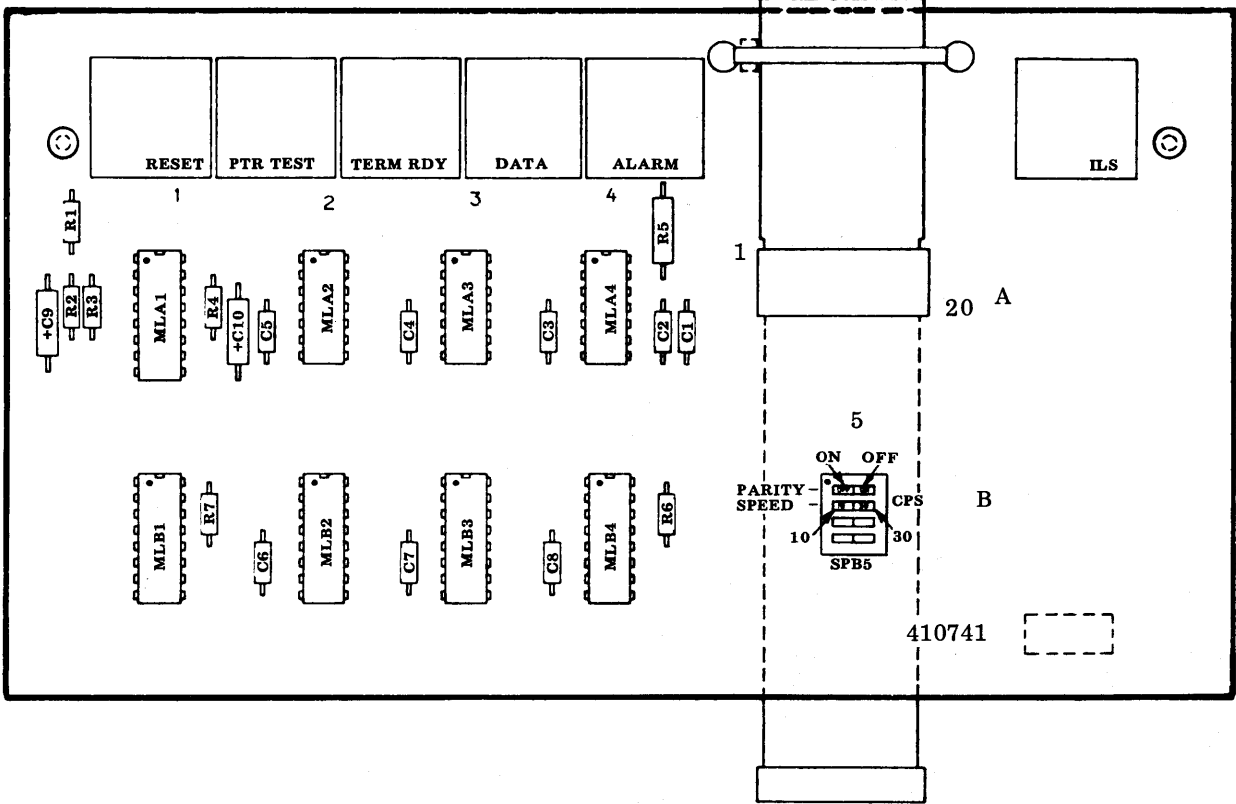
## 9. RO OPERATOR CONSOLE TROUBLESHOOTING (Cont)

## TROUBLESHOOTING GUIDE (Cont)

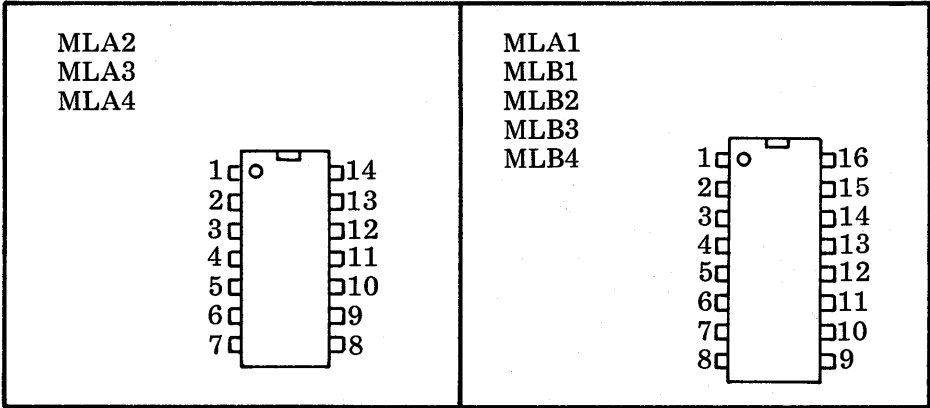
QUESTION	YES	NO
10c. With MLA3-11 and 8 connected to GND, are MLB2 and MLB3 counting in binary?	Go to 10d.	Check ADDRESS COUNTER.
10d. With MLA3-11 and 8 connected to GND, are waveforms at MLB4-12 and 10 present and correct?	Go to 10e.	Replace MLB4.
10e. With MLA3-11 and 8 connected to GND are pulses present on MLA2-8?	Check START LATCH Replace MLB4.	Replace MLA2.
11. Is 0 V present on INTERLOCK SWITCH, pin 1 when INTERLOCK SWITCH is closed (depressed)?	Check cable for open circuit.	Replace defective keyswitch.
12. Is trouble present but not defined by question 1 through 11?	Undefined trouble — refer to Circuit Description and Diagrams, etc.	Review initial indication of trouble.
<i>Note:</i> Remove GND from MLA3-11 and 8 after correcting trouble (if strapped in Step 10b).		



410741 CIRCUIT CARD COMPONENT LAYOUT



COMPONENT IDENTIFICATION AND LEAD DESIGNATION



STATIC CIRCUIT RESISTANCE (See Note)

CONNECTOR TERMINAL	REFERENCE POINT	RESISTANCE (Approx)	
		LO	HI
P107-8 (+5 V)	P107-4 (logic gnd)	22 ohms	80 ohms
P107-2 (-12 V)	P107-4 (logic gnd)	Infinity	Infinity

Note: Take resistance reading, reverse meter leads and take second resistance reading.

## 9. RO OPERATOR CONSOLE TROUBLESHOOTING (Cont)

## TEST POINTS AND VOLTAGE READINGS

*Note:* Use Volt-Ohm-Milliammeter dc Volts Scale. Voltage readings are approximate and may be higher or lower than those specified, depending on meter used.

MLA1-7	Depress Reset Switch. Meter will momentarily deflect from +4 V to +3.9 V.
MLA1-9	Depress and release Printer Test Switch. Meter will momentarily deflect from +4 V to +3.9 V as switch is released.
MLA2-11	Depress and release Printer Test Switch. Meter will momentarily deflect from 0 V to +0.1 V as switch is released.
	Depress Reset Switch = +4 V Release Reset Switch = 0 V
MLA3-3	Depress and release Printer Test Switch. Meter will momentarily deflect from +4 V to +3.9 V.
	Depress Reset Switch = 0 V Release Reset Switch = +4 V
MLA3-6	Depress Reset Switch = +4 V Release Reset Switch = 0 V
MLA3-8	Depress Reset Switch = 0 V Release Reset Switch = +4 V
MLA4-1 = +7.5 V MLA4-12 = +3.5 V	
MLB1-6	Depress Reset Switch = +4 V Release Reset Switch = 0 V
MLB1-14	Depress Reset Switch = 0 V Release Reset Switch = +4 V
MLB4-2, 3, 6 and 7	Depress Reset Switch = +4 V Release Reset Switch = 0 V
MLB4-12	Depress Reset Switch = 0 V Release Reset Switch = +3.5 V

PART 3 — DISASSEMBLY/REASSEMBLY

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3. DISASSEMBLY/REASSEMBLY .....	3	B. Circuit Card Assembly Notes ..	37
KSR AND RO TELEPRINTER .....	3	ENCLOSURES AND PAPER	
A. Terminal Auxiliary Unit (TAU) .....	3	HANDLING .....	37
B. Power Supply .....	5	1. GENERAL	
C. Power Supply Fuse .....	5	1.01 This part provides disassembly and reassembly procedures for the 43 KSR and RO Teleprinter and their major components.	
D. Operator Console .....	6	1.02 The procedures provided in this part break the terminal down into major components and subcomponents. Part 6, Parts and Unit Codes illustrate the arrangements of components and parts.	
E. Logic Card Fuse .....	7	<i>Caution: Remove all power from the set before performing any component replacement.</i>	
F. Logic Card .....	8	1.03 When removing a major component or part from the terminal, do not pry or force parts to provide the necessary clearance for removal. Follow the removal procedure and note how each part is removed and the sequence of its removal so that proper reassembly can be accomplished. For reassembly, reverse the removal procedure except where different instructions are given.	
G. Printer .....	9	1.04 Reference in the procedures to left and right and up or down and top or bottom, etc, refer to the KSR terminal in its normal operating position.	
H. Print Head .....	12	1.05 When ordering replaceable parts, unless otherwise specified, prefix each part number with the letters "TP" (ie, TP430047).	
4. DISASSEMBLY/REASSEMBLY OF MAJOR COMPONENTS .....	15	1.06 Containers and packing materials retained from maintenance spares should be saved and reused when transporting components.	
PRINTER .....	15	1.07 The MOS circuitry in the KSR Operator Console can be damaged by static discharge. The 346392 static discharge ground strap	
A. Print Head .....	15		
B. Spacing Motor Belt .....	18		
C. Spacing Motor .....	19		
D. Line Feed Motor .....	20		
E. Platen .....	21		
F. Lead Screw .....	22		
G. Carriage With Post Assembly .....	23		
H. Lead Screw Nut .....	23		
I. Collar With Link .....	24		
J. Paper Tray .....	24		
K. Paper Guides .....	26		
L. Signal Bell .....	27		
OPERATOR CONSOLE .....	27		
A. Spacebar Mechanism .....	27		
B. Keys .....	28		
C. Key Spacer .....	29		
D. Keyswitches .....	29		
E. Cable (KSR) .....	29		
F. Cable (RO) .....	30		
G. Channel (KSR) .....	31		
H. Channel (RO) .....	33		
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J. Keyboard Layout .....	35		

is available for service personnel. Some maintenance spares are provided in antistatic bags which should be saved for reuse when returning components for repair.

1.08 Disassembly of printer parts, except the print head, will require the removal of the set housing and rear frame.

1.09 Disassembly of the printer motors will require the removal of the logic card.

1.10 Disassembly of the printer lead screw, carriage with post assembly, lead screw nut and collar with link will require the removal of the operator console, if present.

1.11 After replacing printer parts, refer to the lubrication procedures in Part 8 or 9 and lubricate any parts requiring lubrication.

1.12 Disassembly and reassembly information for additional enclosures and paper handling parts is provided in the following paragraphs:

<u>Part</u>	<u>Paragraph</u>
Bustle Cover (Sprocket Feed)	3.01
Bustle Cover (Friction Feed)	3.01
Deflector (Sprocket Feed)	3.01
Paper Holder (Sprocket Feed)	3.01
Paper Holder (Friction Feed)	3.01
Set Cover	3.04
Rear Frame	3.05

## 2. TOOLS REQUIRED

2.01 The following tools may be required when performing the printer disassembly and reassembly procedures. Most of these items should normally be present in standard maintenance tool kits.

<u>Part No.</u>	<u>Description</u>
75765	Hook, Pull Spring
94646	Stick, Orangewood
95368	Screwdriver, 1/8 Inch, 2 Inch Blade
96364	Gauge, 0.010 Inch
100704	Screwdriver w/Clip, 10 Inch Blade
100982	Screwdriver w/Clip, 1/4 Inch, 6 Inch Blade
108285	Pliers, Long-Nose
110271	Wrench, Hex Key
124682	Wrench, Hex Key
125752	Wrench, 3/16 Inch Socket
129534	Wrench, Open End, 3/16 Inch and 1/4 Inch
135676	Handle
135677	Bit, 1/4 Inch Socket
135678	Bit, 5/16 Inch Socket
142554	Hook, Pull Spring
142555	Hook, Push Spring
151392	Tweezers
152835	Wrench, Open End, 5/16 Inch and 3/8 Inch
346257	Extractor
346260	Extractor, Keytop
346392	Strap, Static Discharge

### Customer Provided Tools

Soldering Iron (Low Wattage, Grounded)  
Desoldering Tool

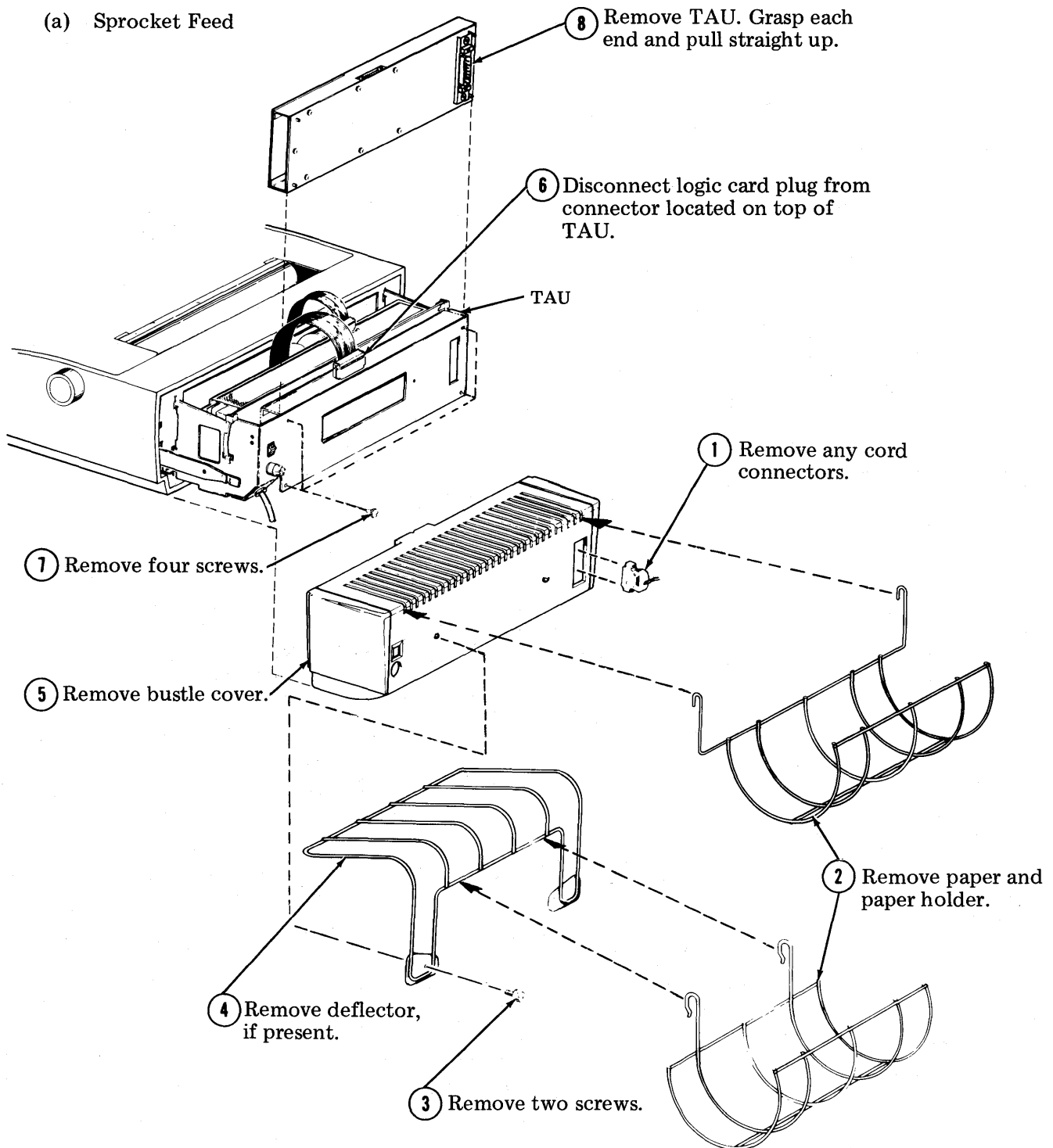
3. DISASSEMBLY/REASSEMBLY

KSR AND RO TELEPRINTERS

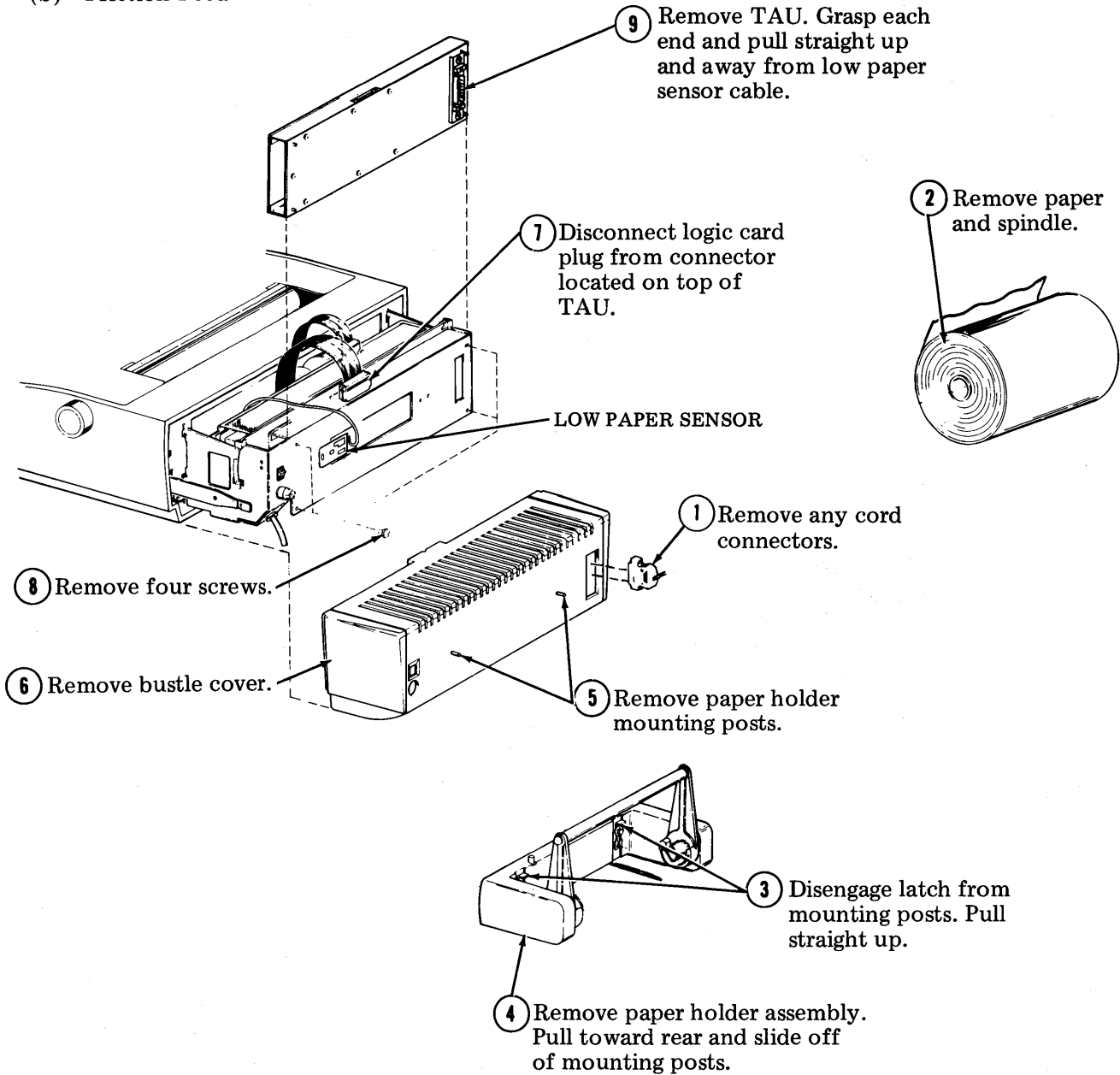
A. Terminal Auxiliary Unit (TAU)

3.01 To remove the terminal auxiliary unit:

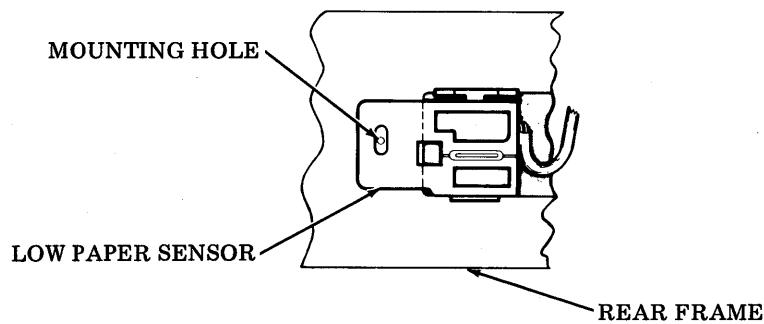
(a) Sprocket Feed



(b) Friction Feed



Note: In reassembly, align low paper sensor mounting hole with mounting hole in rear frame.



B. Power Supply

3.02 To remove power supply:

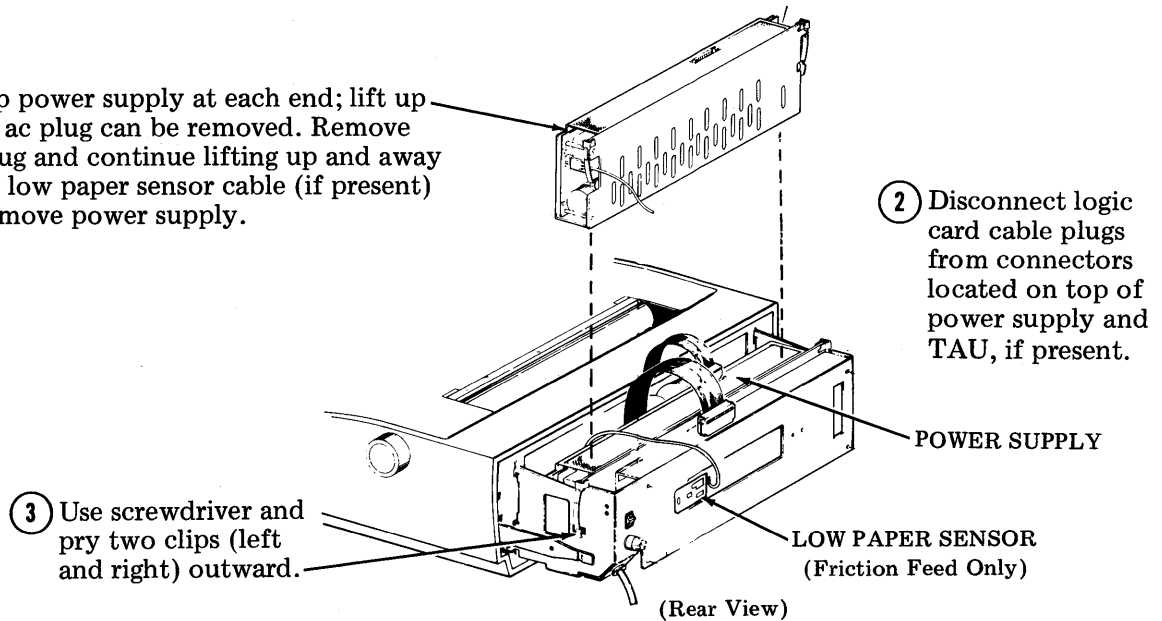
(a) Sprocket Feed

① Remove paper holder, deflector, if present, and bustle cover. Perform 3.01, steps 1 through 5.

(b) Friction Feed

① Remove paper holder and bustle cover. Perform 3.01, steps 1 through 6.

④ Grasp power supply at each end; lift up until ac plug can be removed. Remove ac plug and continue lifting up and away from low paper sensor cable (if present) to remove power supply.



C. Power Supply Fuse

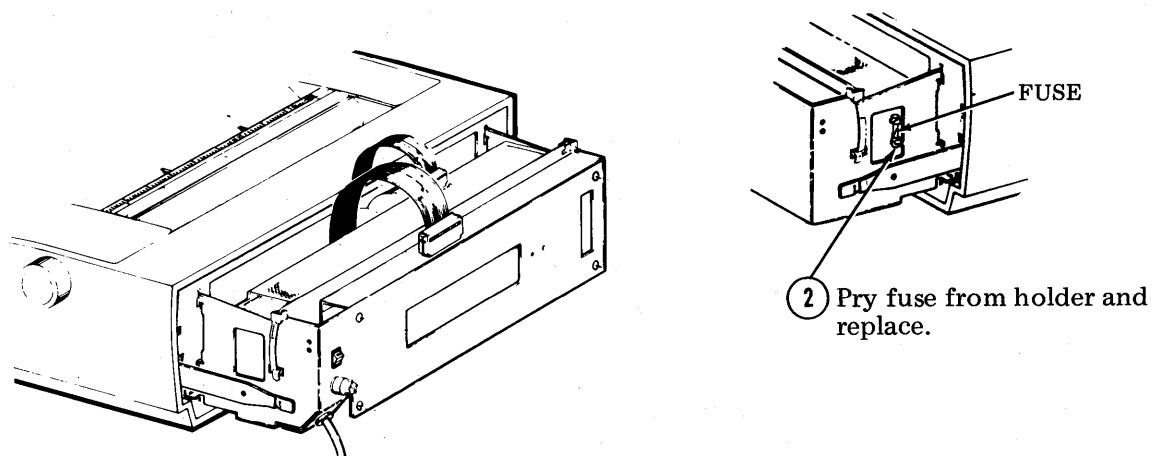
3.03 To remove the power supply fuse:

(a) Sprocket Feed

① Remove paper holder, deflector and bustle cover. Perform 3.01, steps 1 through 5.

(b) Friction Feed

① Remove paper holder and bustle cover. Perform 3.01, steps 1 through 6.



## D. Operator Console

## 3.04 To remove the operator console:

- ② If cover is being removed, disengage the button end of one of the arms from the dovetail slot by pushing inward. Disengage the other side and remove cover.

Some keys on KSR opcon shown are not present on RO opcons.

- ① Depress locking tabs (part of cover) to release and lift cover. If cover is being removed, open to 45 degree angle and hold, otherwise open fully to rear.

- ⑥ Disconnect P107 opcon cable plug from logic card.

- ③ Loosen two screws (one each side).

HOUSING

- ④ Loosen two screws (one each side).

ISOLATOR

(Top View)

- ⑦ Tilt top of clamps outward, releasing front isolators connected to the opcon.

- ⑤ Lift rear edge of opcon and pivot it forward on front mounting bushings.

SPACER

- ⑧ Move lower edge of opcon rearward until isolators are free. Remove opcon.

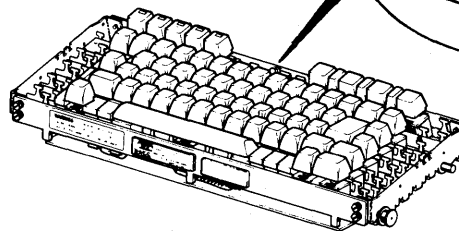
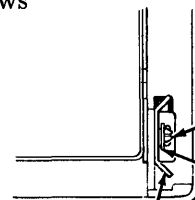
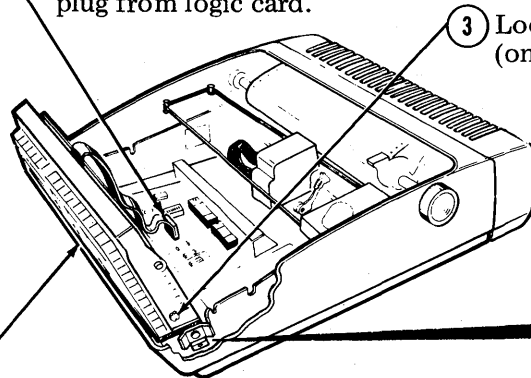
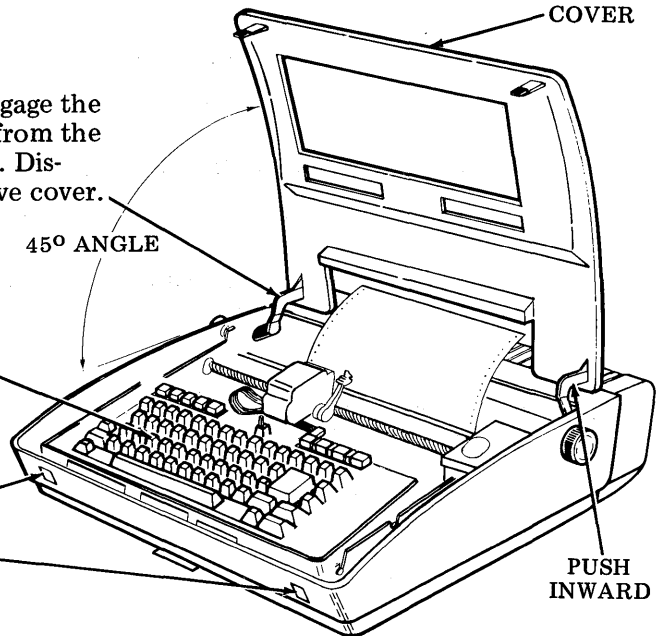
REAR RAIL

*Note 1:* In reassembly, perform the KEYBOARD TO COVER ALIGNMENT adjustment.

*Note 2:* When replacing the cover or indicator scale, perform the COLUMN INDICATOR POSITIONING adjustment.

*Note 3:* Loose operator consoles are shipped with 184056 screws and 346397 isolators furnished in a loose envelope. These parts must be assembled to the operator console before installing into the printer side frames.

*Note 4:* Two 346409 spacers, also furnished in the loose envelope with KSR operator consoles, should be retained and attached to the rear rail and taped.





E. Logic Card Fuse

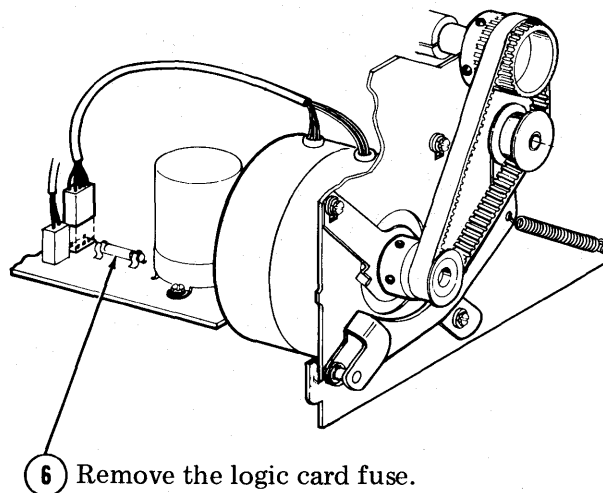
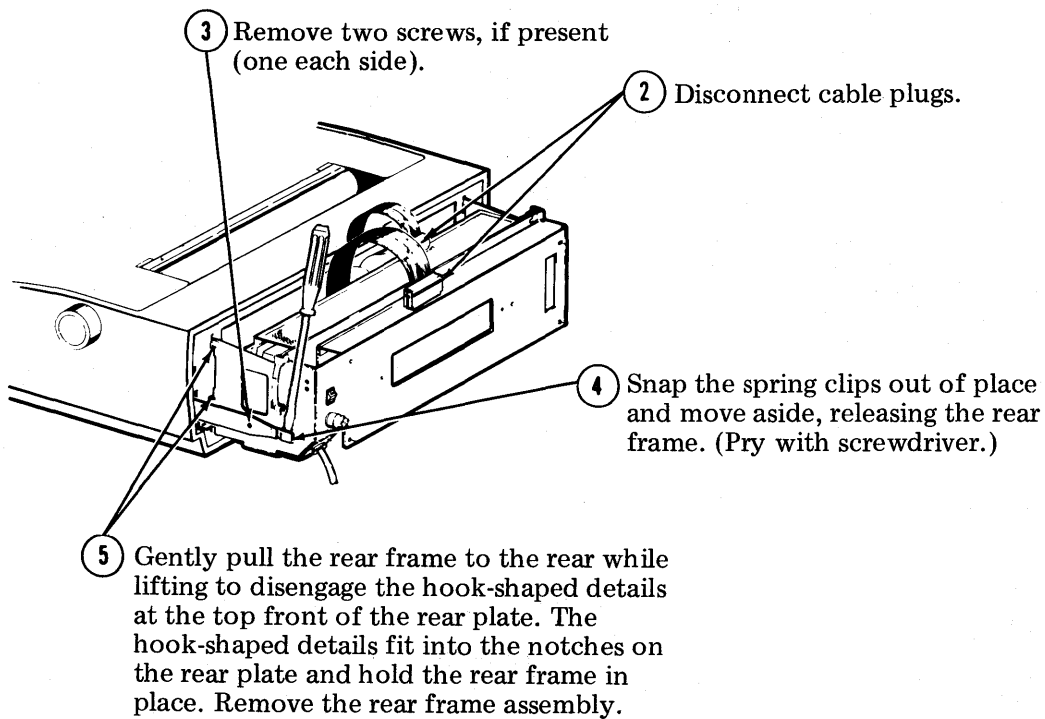
3.05 To remove the logic card fuse:

(a) Sprocket Feed

① Remove paper holder, deflector and bustle cover. Perform 3.01, steps 1 through 5.

(b) Friction Feed

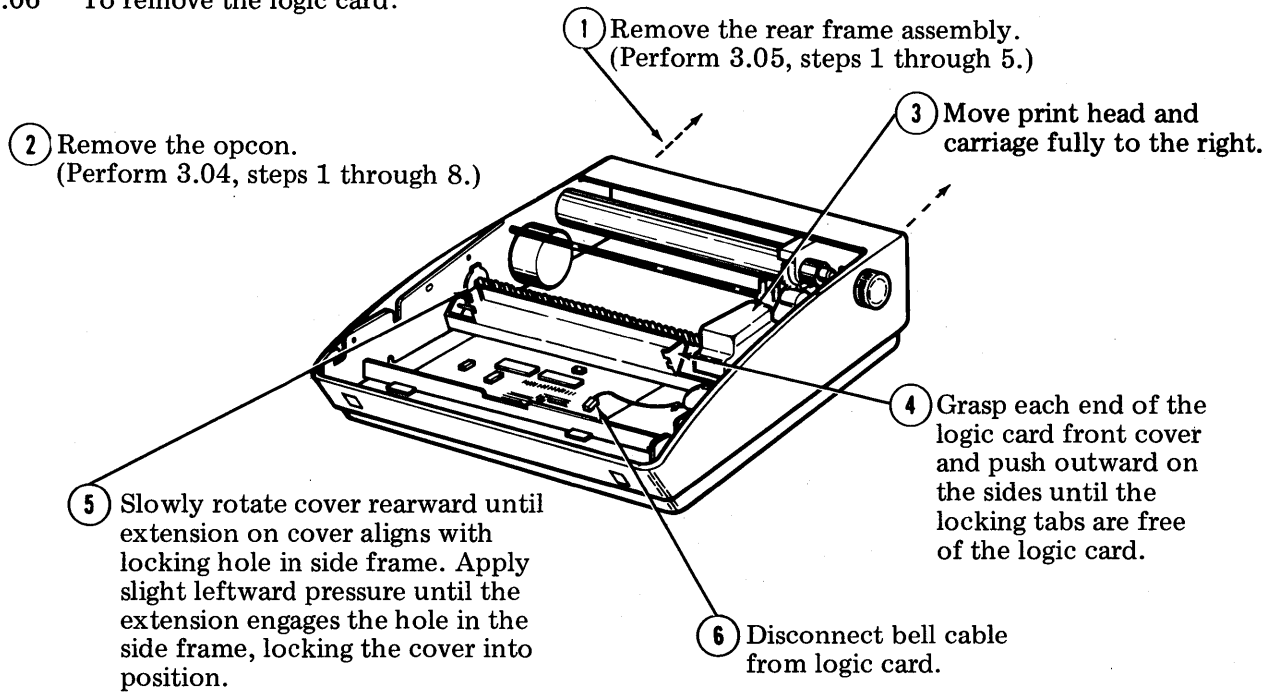
① Remove paper holder and bustle cover. Perform 3.01, steps 1 through 6.



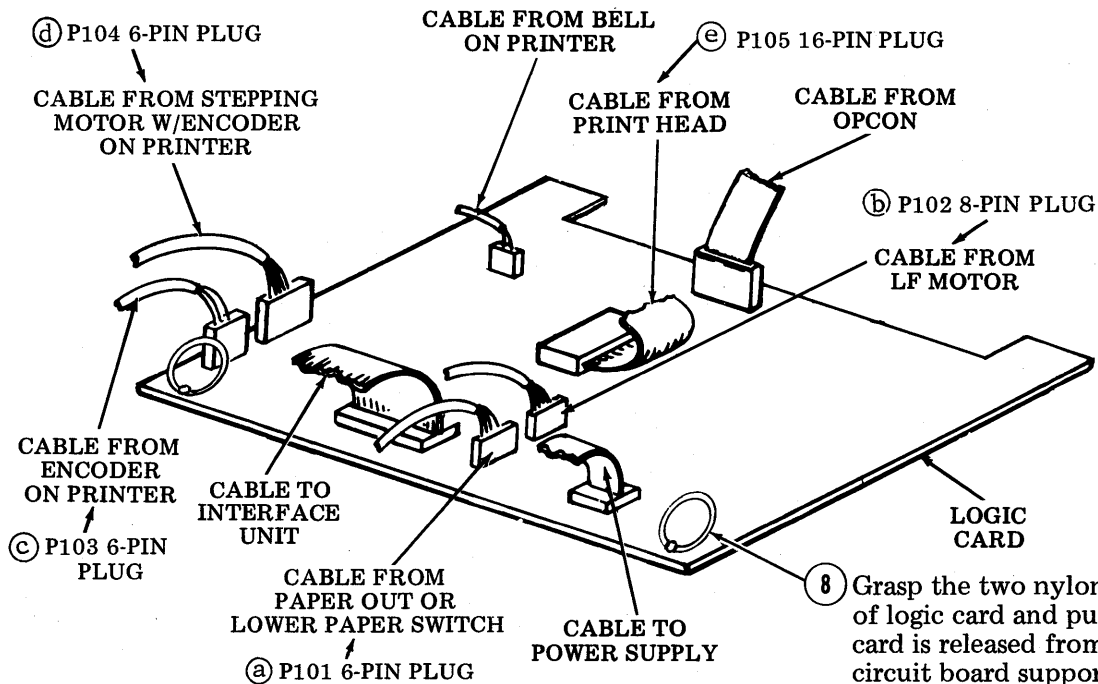
(Rear View)

F. Logic Card

3.06 To remove the logic card:



7 Disconnect the following plugs located on the logic card:



(Rear View)

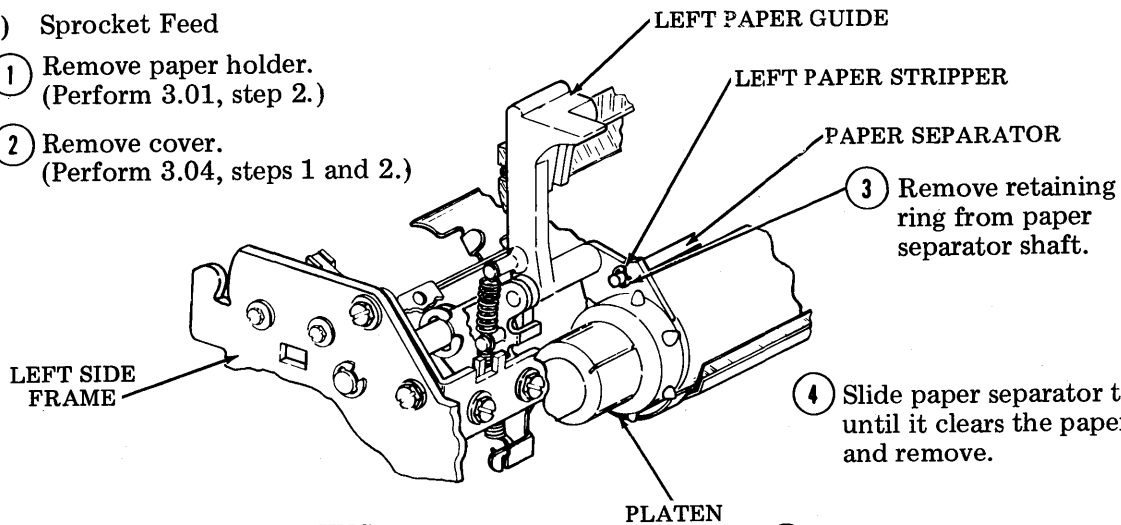
G. Printer

3.07 To remove the printer:

(a) Sprocket Feed

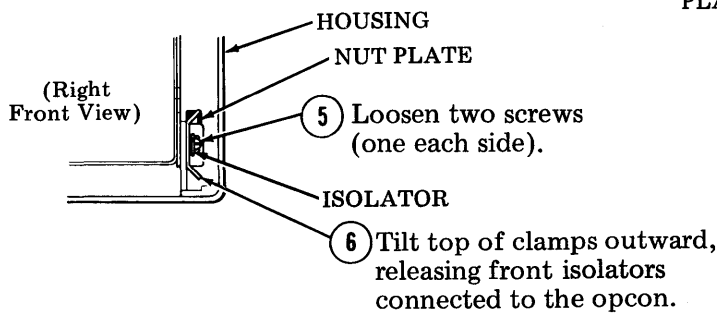
① Remove paper holder.  
(Perform 3.01, step 2.)

② Remove cover.  
(Perform 3.04, steps 1 and 2.)



③ Remove retaining ring from paper separator shaft.

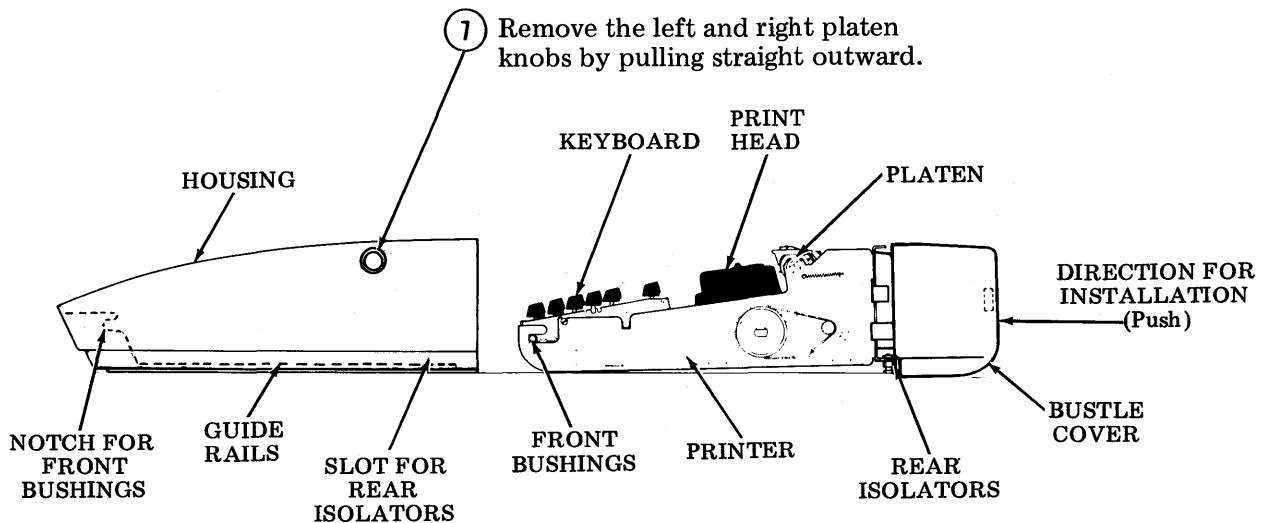
④ Slide paper separator to the right until it clears the paper stripper, and remove.



⑤ Loosen two screws (one each side).

⑥ Tilt top of clamps outward, releasing front isolators connected to the opcon.

⑧ Grasp the bustle cover and slide the printer and rear frame assembly from the housing through the rear opening.

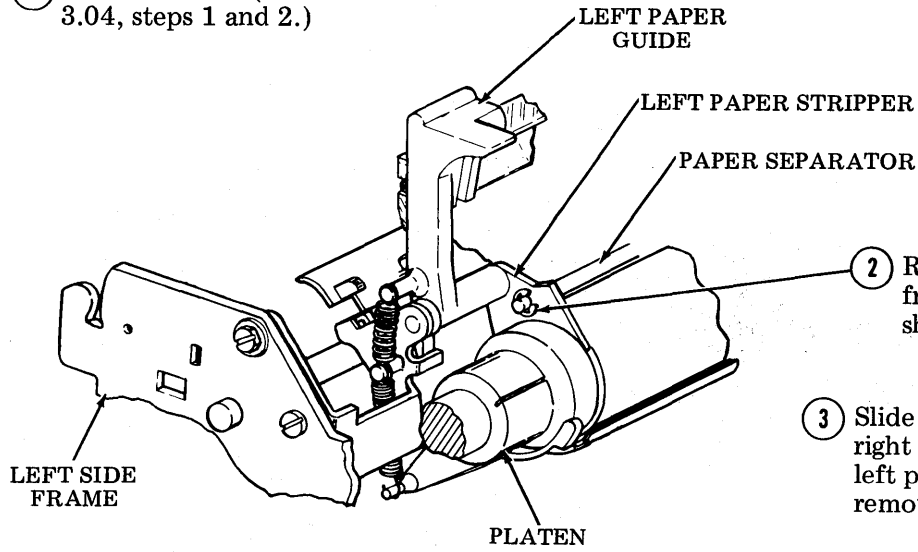


⑦ Remove the left and right platen knobs by pulling straight outward.

DIRECTION FOR INSTALLATION (Push)

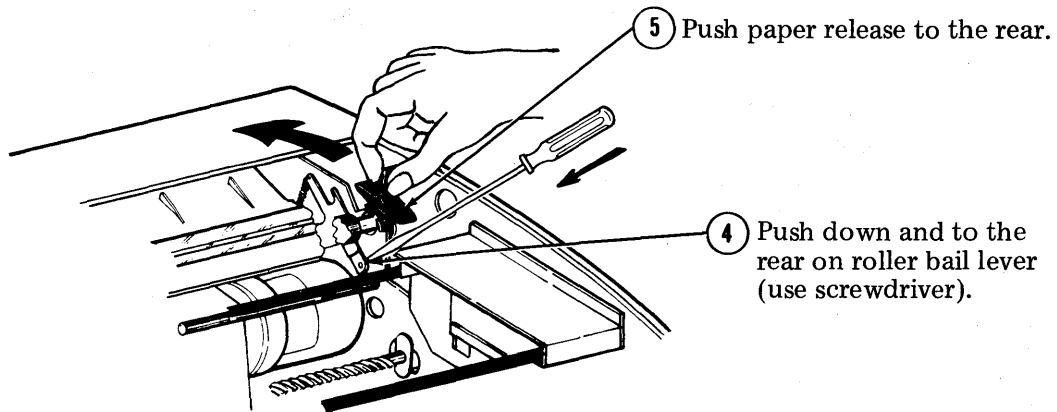
(b) Friction Feed

- ① Remove cover. (Perform 3.04, steps 1 and 2.)



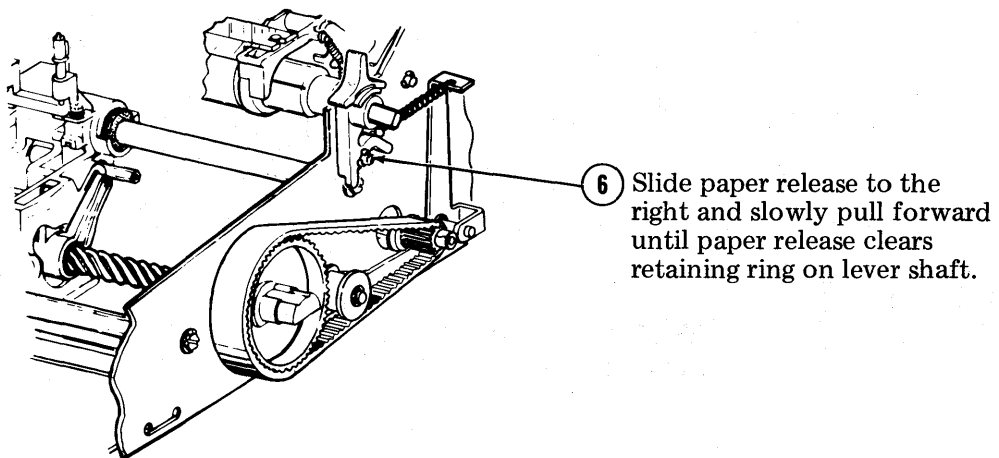
- ② Remove retaining ring from paper separator shaft.

- ③ Slide paper separator to the right until it clears the left paper stripper, and remove.

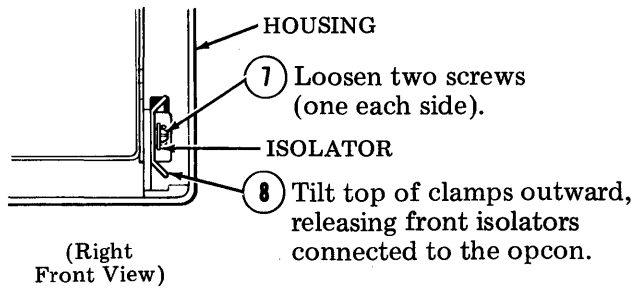


- ④ Push down and to the rear on roller bail lever (use screwdriver).

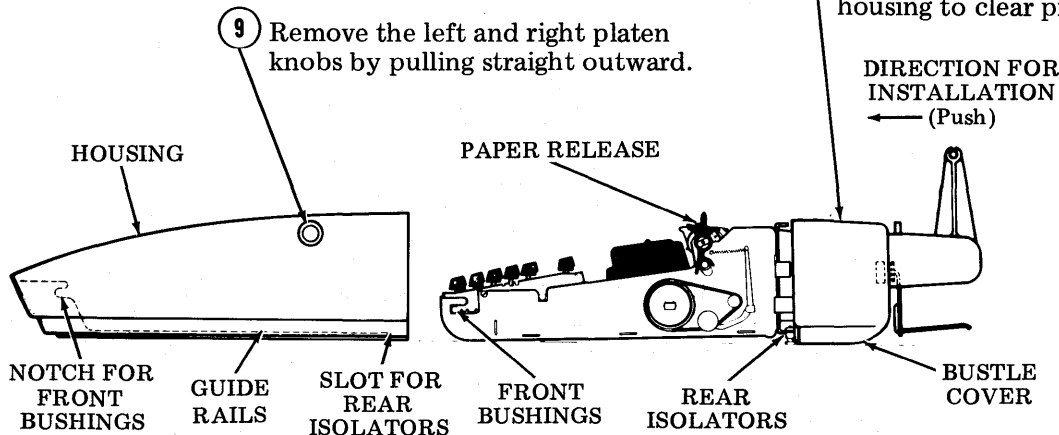
- ⑤ Push paper release to the rear.



- ⑥ Slide paper release to the right and slowly pull forward until paper release clears retaining ring on lever shaft.



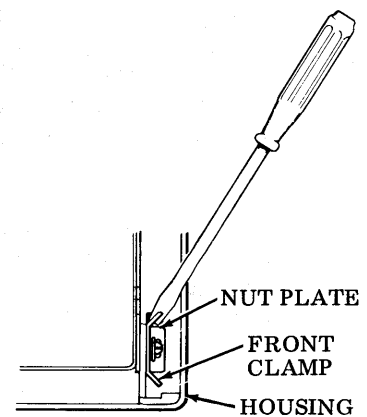
⑪ Remove the rear frame assembly. (Perform 3.05, steps 1 through 5.)



3.08 To replace the printer:

- ① Install the operator console, if previously removed.
- ② Install the rear frame assembly, bustle cover and deflector, if present.
- ③ Push the printer and rear frame assembly into the housing through the opening in the rear of the housing. There are two molded guide rails in the bottom of the housing to steer the assembly into position.
- ④ Lock the printer and rear frame assembly into position. Insert a screwdriver into the square hole in the nut plate and gently twist (or pry) the screwdriver with enough force to draw the assembly forward.

*Caution: Do not overtwist the screwdriver.*



(Right Front View)

- ⑤ Tighten the clamp screws.

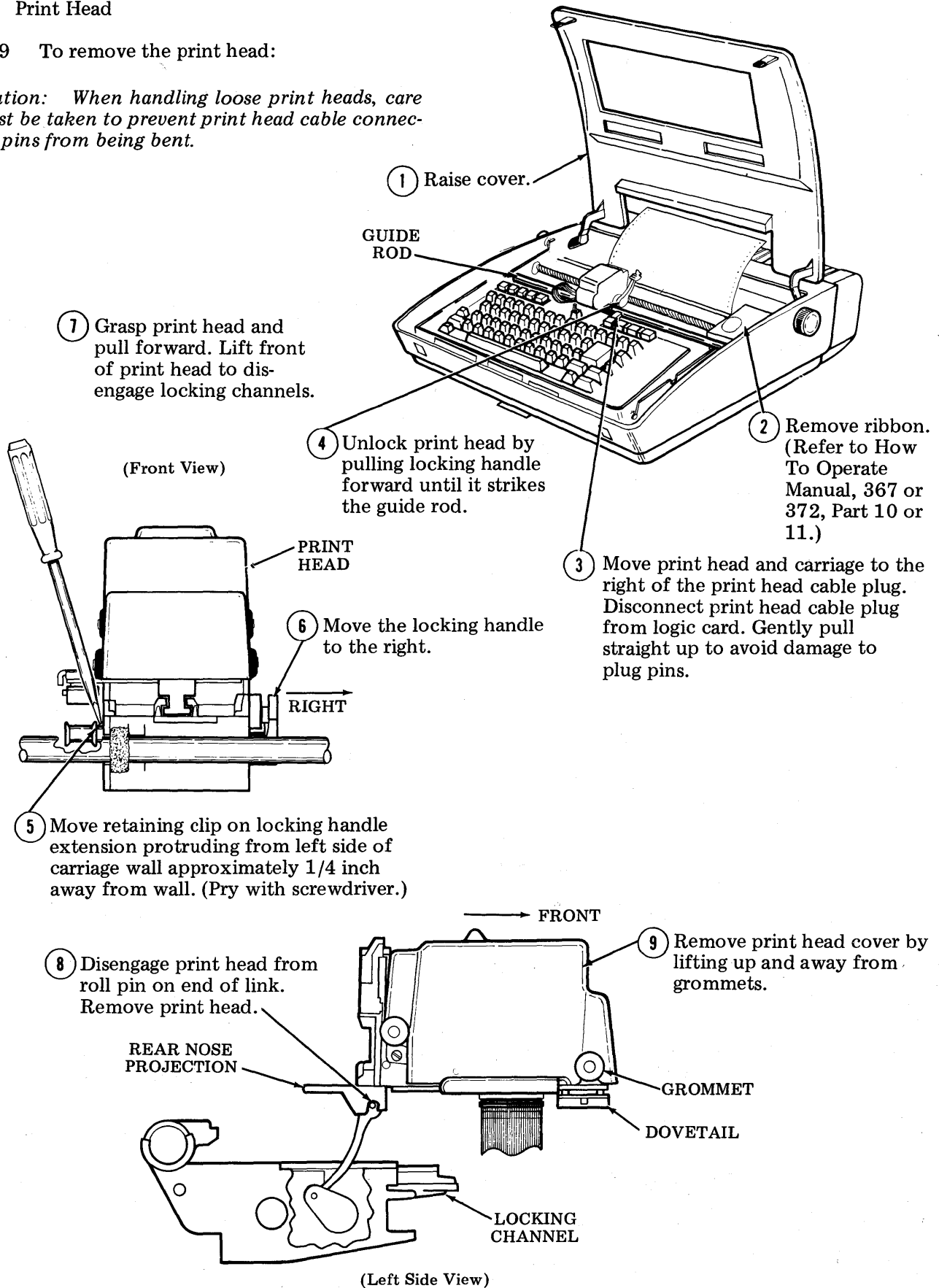
*Note:* The two front clamps should be loosely fastened to the nut plate before the assembly is pushed into the housing. Position each clamp so that the front bushings (operator console) protrude through the large holes in their respective clamps.

- ⑥ Replace the paper separator and platen knobs.
- ⑦ Replace the paper release (friction-feed only).
- ⑧ Replace the cover and paper holder.
- ⑨ Perform the KEYBOARD TO COVER ALIGNMENT adjustment.

H. Print Head

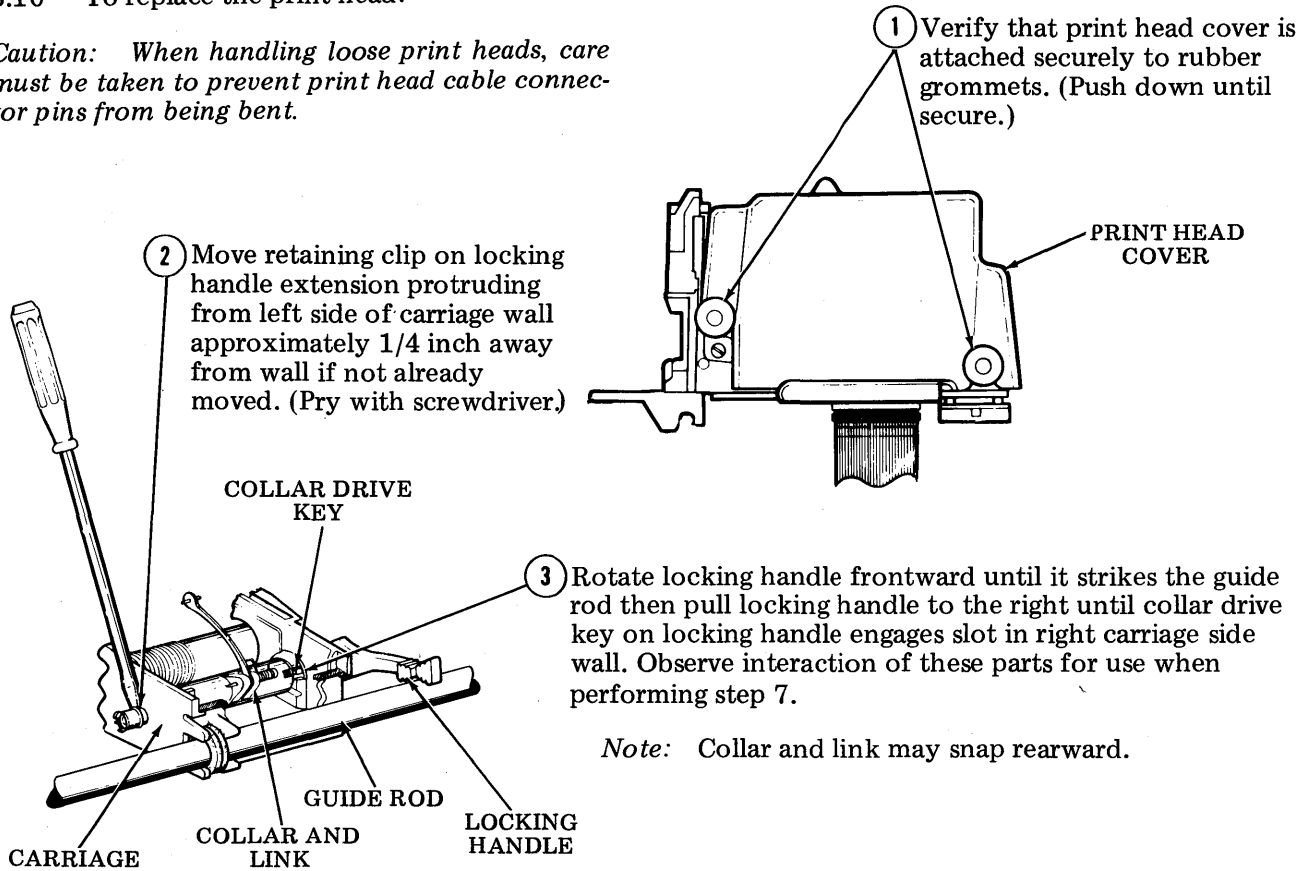
3.09 To remove the print head:

*Caution: When handling loose print heads, care must be taken to prevent print head cable connector pins from being bent.*



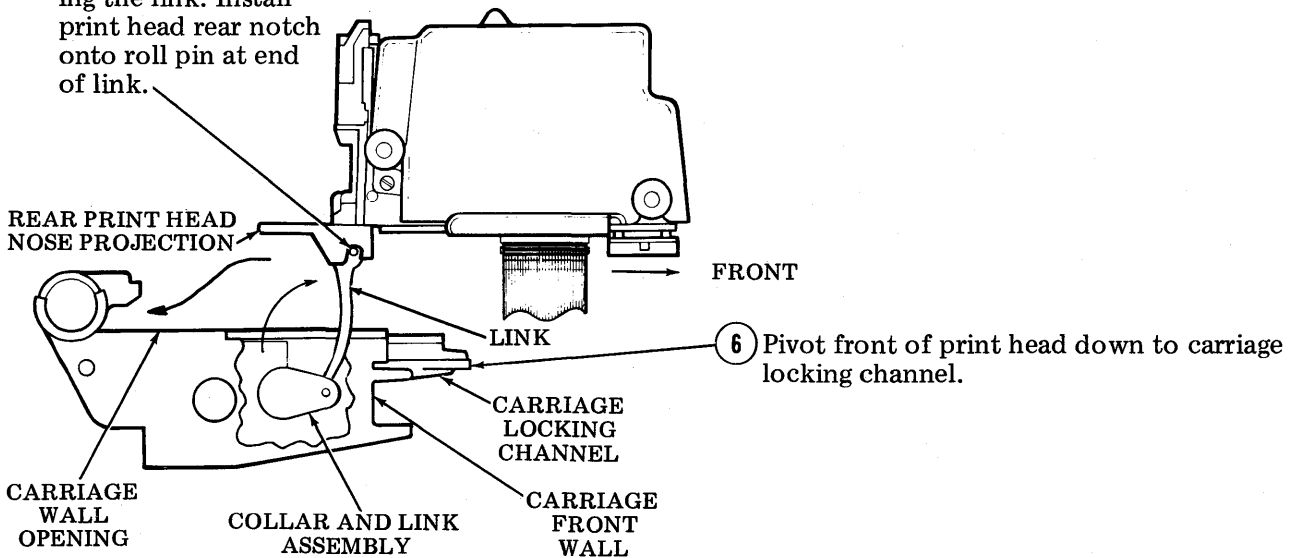
3.10 To replace the print head:

*Caution:* When handling loose print heads, care must be taken to prevent print head cable connector pins from being bent.



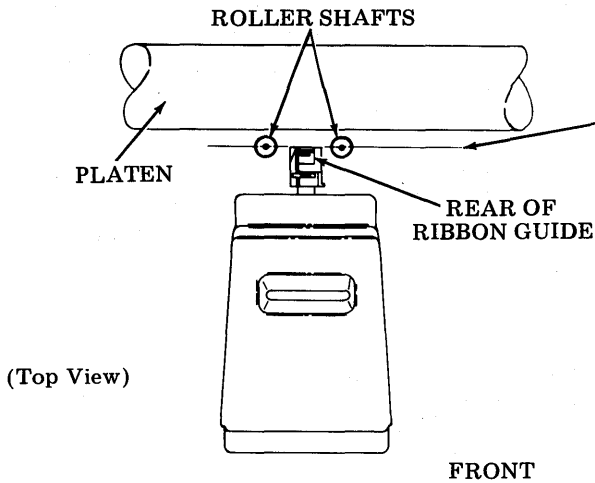
4 Collar and link must be manually rotated and held toward front of carriage wall by grasping the link. Install print head rear notch onto roll pin at end of link.

5 Hold collar and link forward (by pressing down on the print head) while inserting nose projection in carriage wall opening.



(Left View)

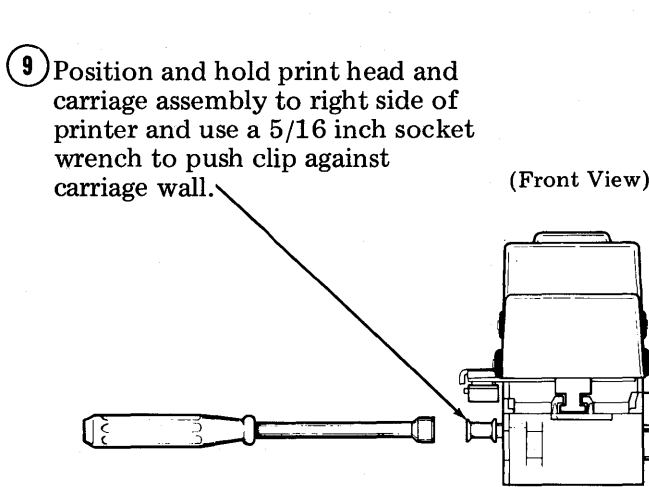
3.10 (Cont)



(Top View)

7 Slowly push print head rearward and further into the carriage locking channel until the rear of the ribbon guide is even with center of roller shafts. Apply continuous leftward pressure to locking handle at its pivot shaft, while slowly pulling print head forward until collar drive key on handle engages (snaps) into slot in collar.

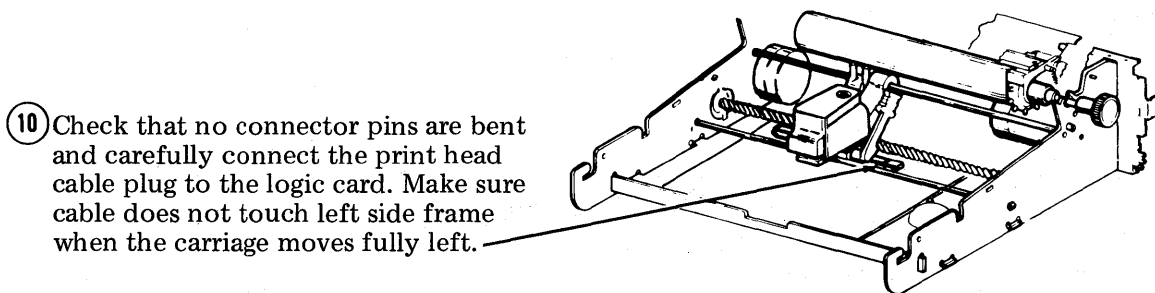
Note: Parts referred to were visible in step 3.



9 Position and hold print head and carriage assembly to right side of printer and use a 5/16 inch socket wrench to push clip against carriage wall.

8 Move the handle all the way to the rear, locking the print head in close proximity to the platen by the additional force necessary to detent the handle. If handle does not move to rear, the drive key did not properly engage the collar slot (step 7).

Note: Check to make sure there is some clearance between print head and platen before detenting handle. Check PRINT HEAD TO PLATEN adjustment.



10 Check that no connector pins are bent and carefully connect the print head cable plug to the logic card. Make sure cable does not touch left side frame when the carriage moves fully left.

11 Install ribbon. (Refer to Part 10 or 11 of this manual.)



4. DISASSEMBLY/REASSEMBLY OF MAJOR COMPONENTS

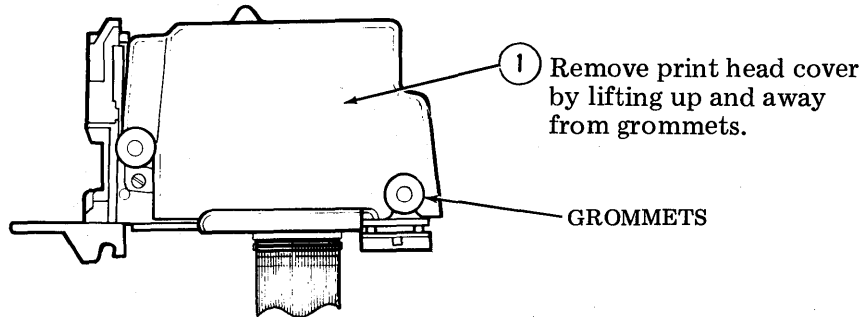
PRINTER

A. Print Head

4.01 To remove and replace the print head, perform 3.09 and 3.10.

Cover

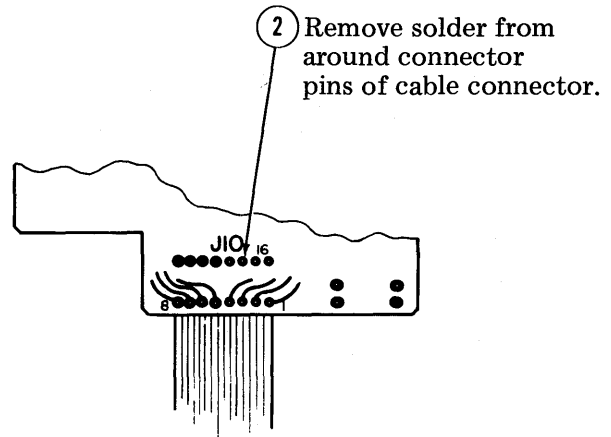
4.02 To remove the cover:



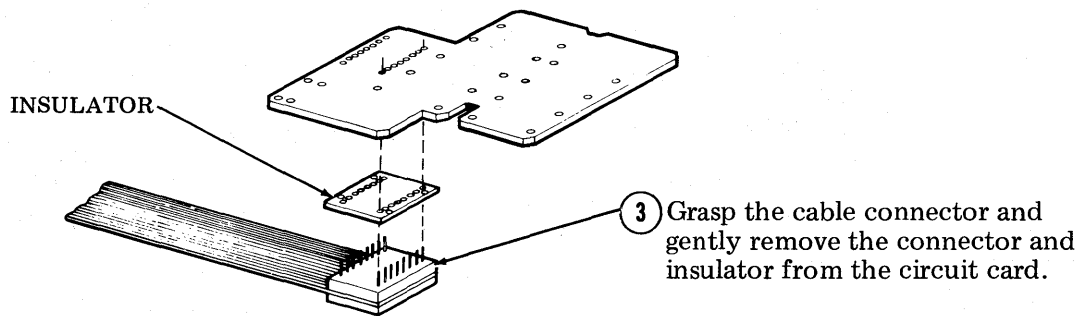
Cable

4.03 To remove the cable:

① Remove print head cover (perform 4.02, step 1).



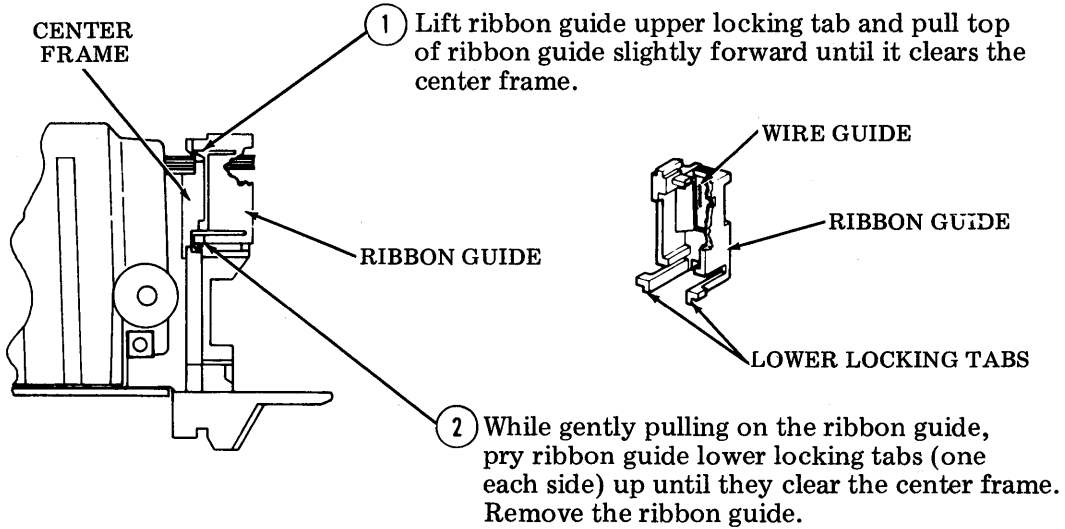
*Warning: Use a grounded, low-wattage soldering iron (avoid prolonged contact with pins) along with a desoldering tool to prevent damage to card circuits and components.*



*Note: In reassembly, make sure insulator is positioned between cable connector and circuit card as shown.*

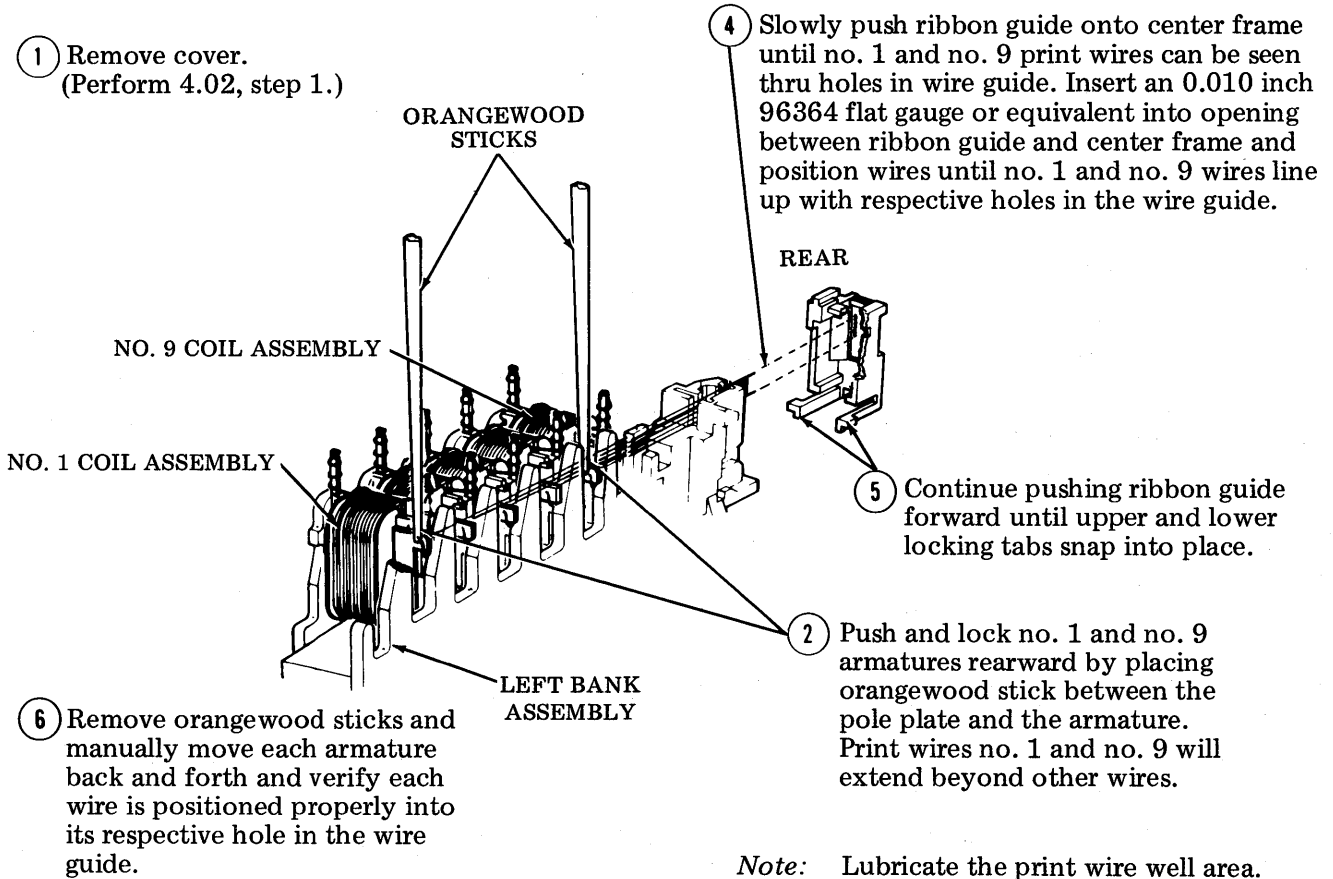
Ribbon Guide

4.04 To remove the ribbon guide:



Note: Visually inspect the wire guide for cracks or damage whenever the ribbon guide is removed, and replace if damaged.

4.05 To replace the ribbon guide:

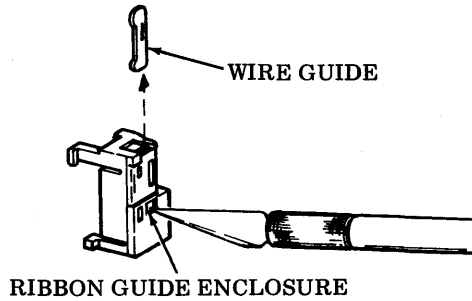


Note: Lubricate the print wire well area.

Wire Guide

4.06 To remove the wire guide:

- ① Remove the ribbon guide (perform 4.04, steps 1 and 2).



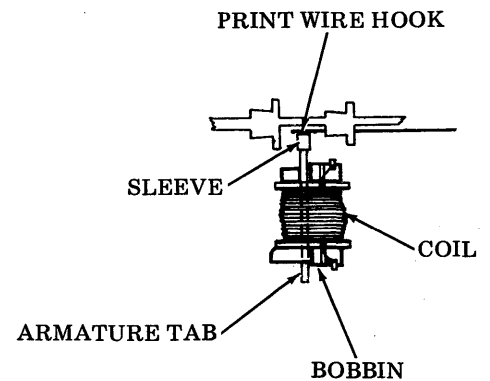
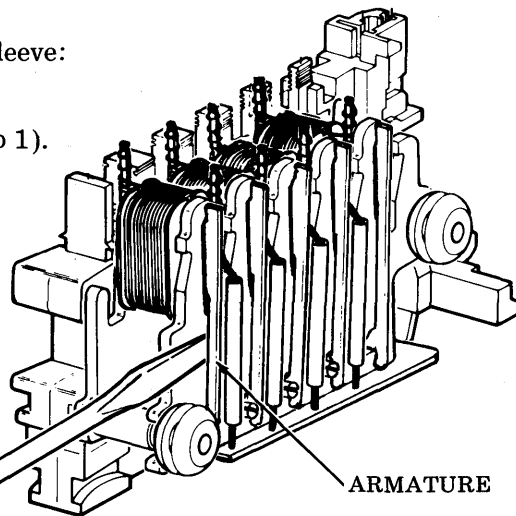
- ② Insert pointed flat blade (hobby knife) under wire guide and gently pry up until bottom of wire guide clears ribbon guide enclosure. Grasp wire guide and pull straight up to remove.

*Note:* In reassembly, insert wire guide into ribbon guide as shown above and push down until bottom of wire guide is against bottom of ribbon guide enclosure.

Sleeve

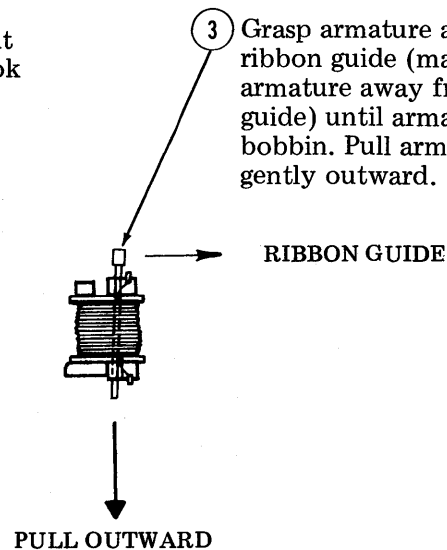
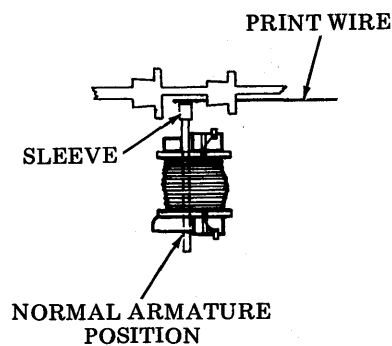
4.07 To remove the sleeve:

- ① Remove the cover (perform 4.02, step 1).



- ② Pry armature gently outward (away from print wires) until sleeve slides free of print wire hook and armature tab clears bobbin.

- ③ Grasp armature and push toward ribbon guide (magnet will pull armature away from ribbon guide) until armature touches bobbin. Pull armature and sleeve gently outward.



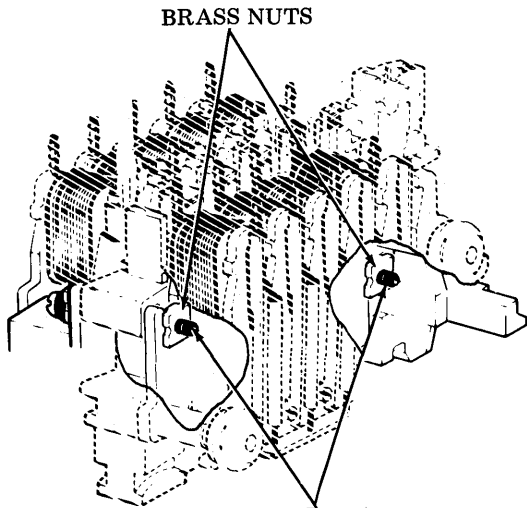
- ④ Remove sleeve from armature extension.

*Note:* In reassembly, make sure sleeve is positioned over grooves in armature extension and flush with extension edge. Lubricate any armatures removed and replaced.

Coil Assembly

4.08 To remove the coil assembly:

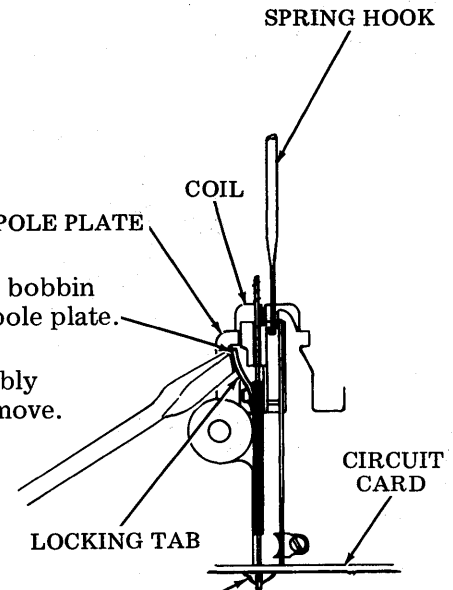
- ① Remove print head cover (perform 4.02, step 1).



- ② Loosen two pole plate screws.

- ③ Remove armature (perform 4.07, steps 2 and 3).

*Note:* In reassembly, note positioning of brass nuts and verify correct position as shown before tightening screws. Lubricate any armatures removed and replaced.



- ⑤ Pry locking tab on bobbin until it clears the pole plate.

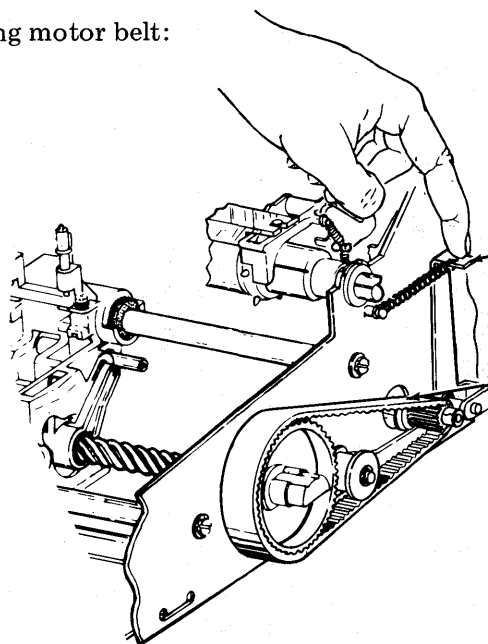
- ⑥ Pull the coil assembly straight up and remove. Use a spring hook.

- ④ Remove solder from around coil assembly terminals.

*Warning:* Use a low wattage soldering iron (avoid prolonged contact with terminals) along with a desoldering tool to prevent damage to circuitry.

B. Spacing Motor Belt

4.09 To remove the spacing motor belt:



- ① Push top of spring tension arm rearward to remove belt tension.

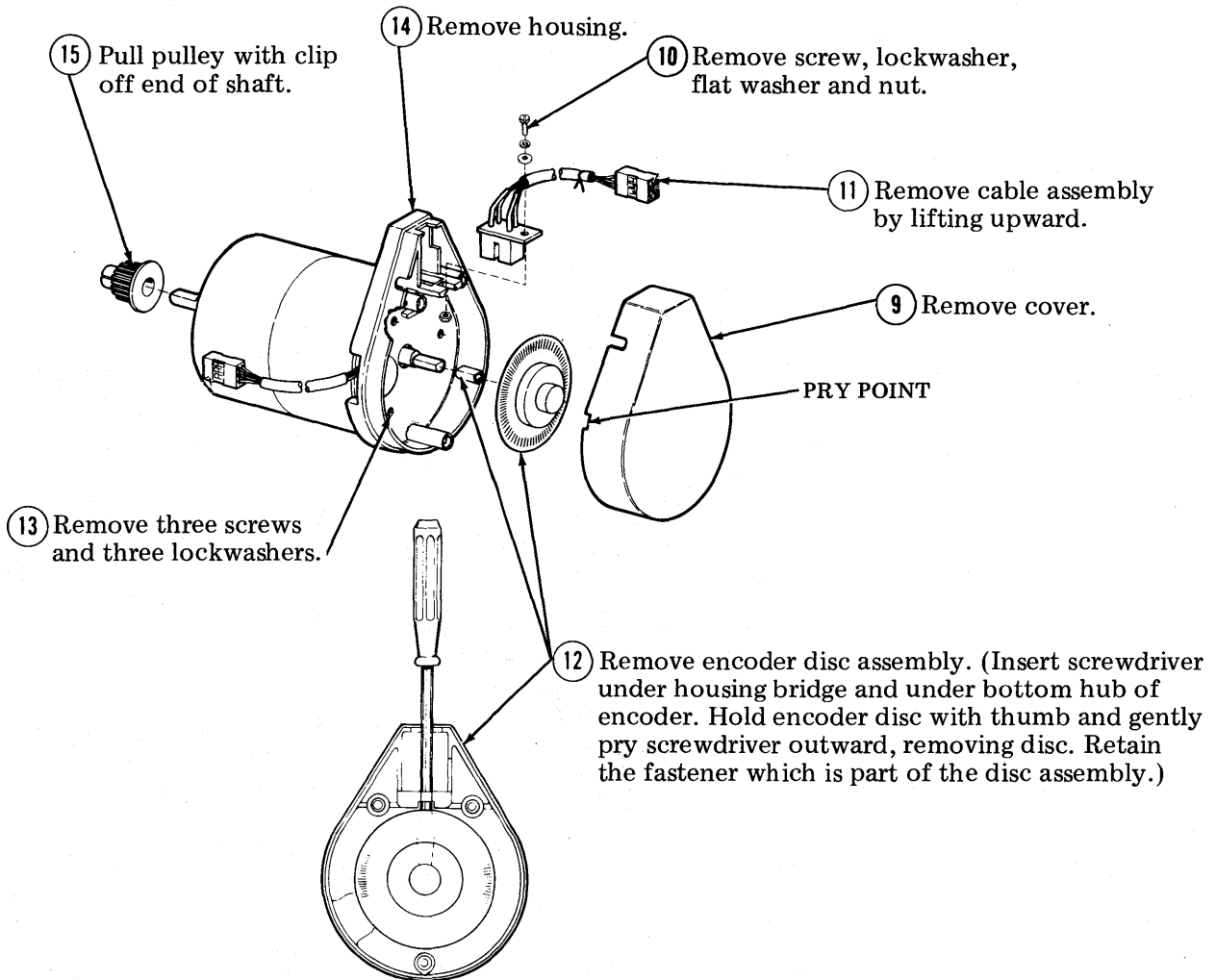
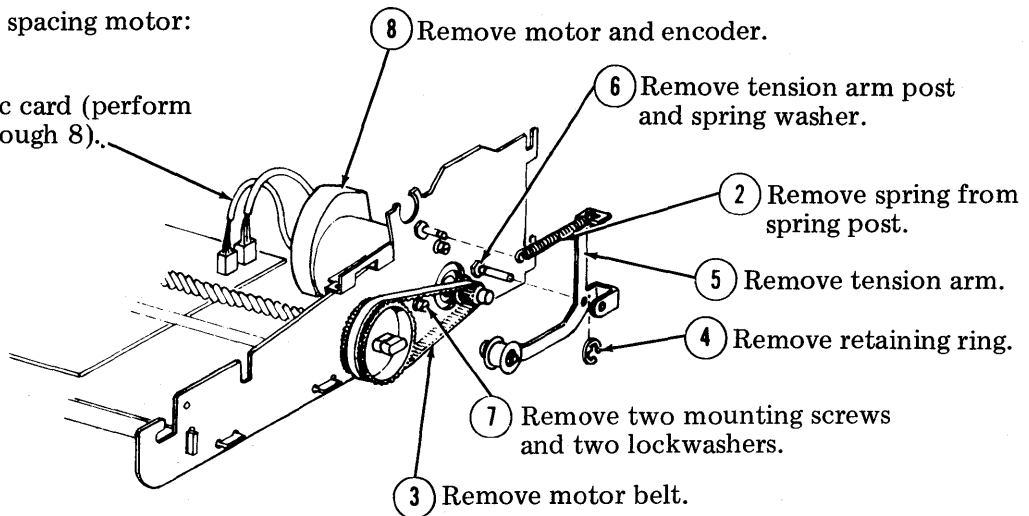
- ② Remove belt.

C. Spacing Motor

4.10 To remove the spacing motor:

① Remove the logic card (perform 3.06, steps 2 through 8).

(Right Side View)



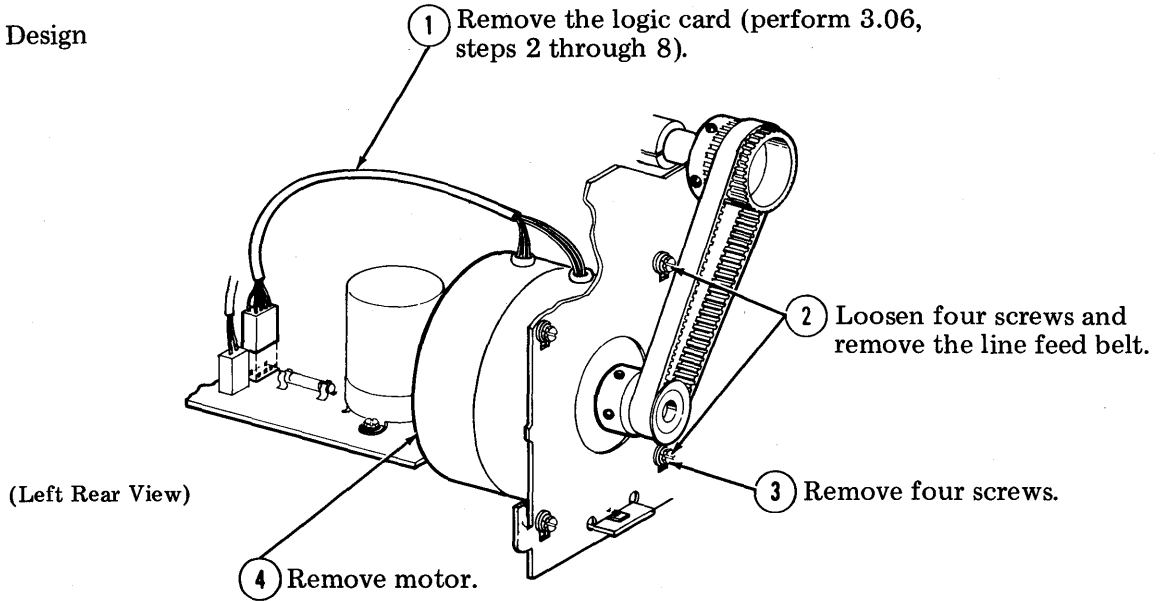
*Note:* In reassembly, make sure disc does not rub on encoder assembly.

*Warning:* Do not pull on metal disc edges as this will deform encoder disc causing it to rub against the encoder.

D. Line Feed Motor

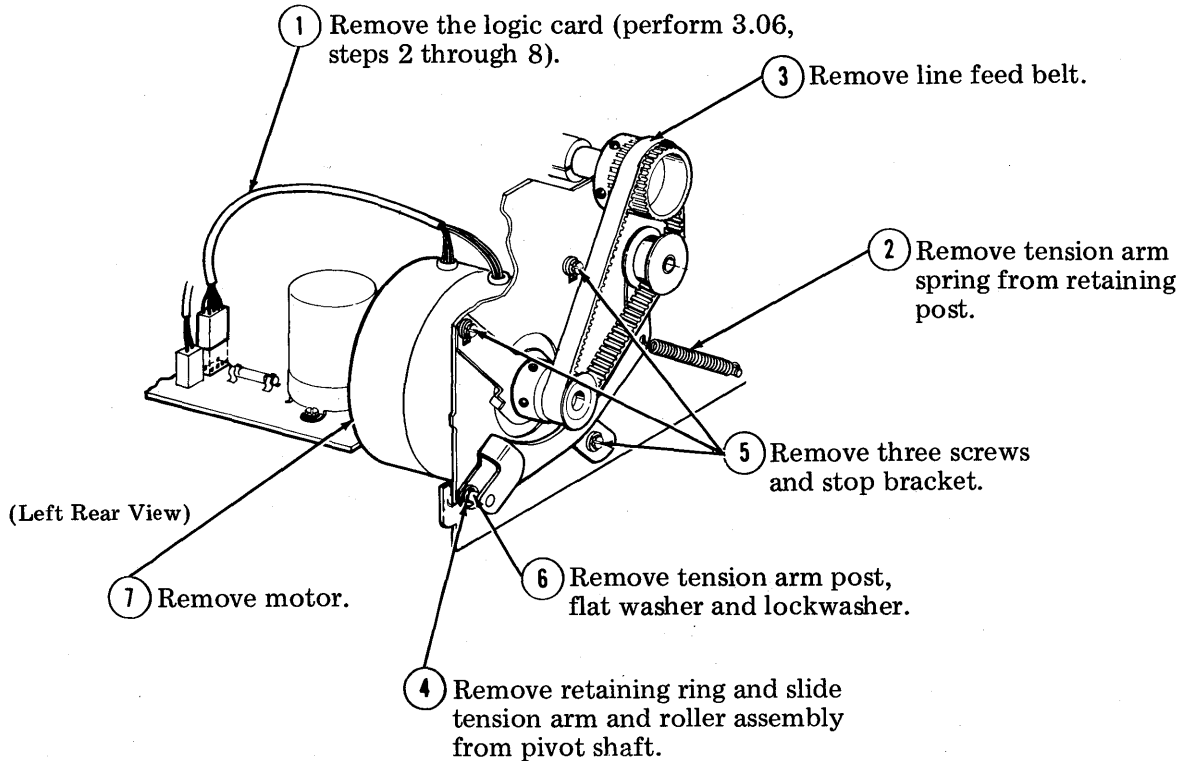
4.11 To remove the line feed motor:

(a) Early Design



Note: In reassembly, make LINE FEED BELT TENSION adjustment

(b) Late Design

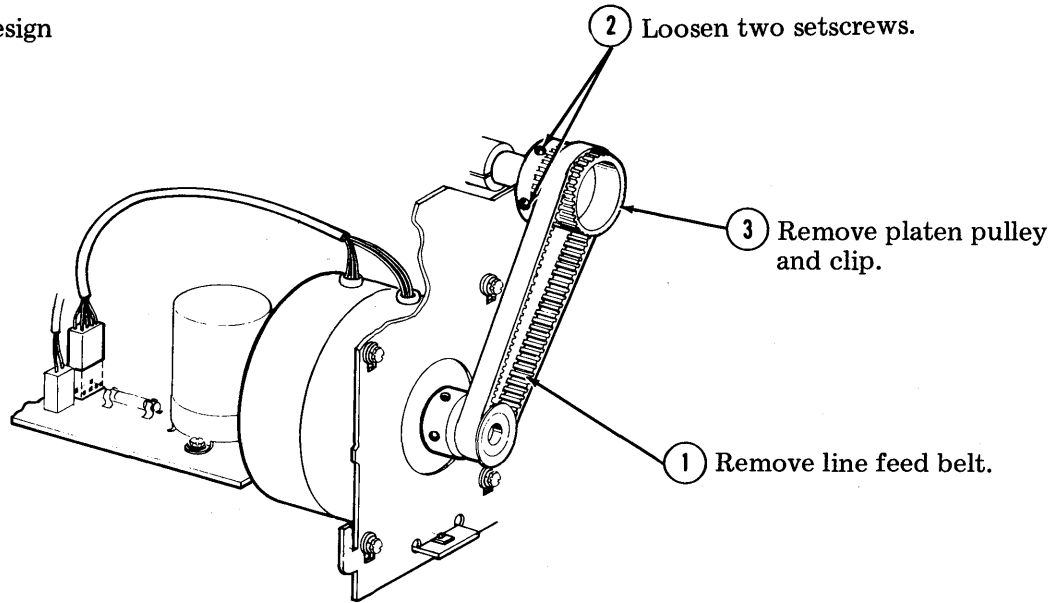


Note: In reassembly, make STOP BRACKET adjustment.

E. Platen

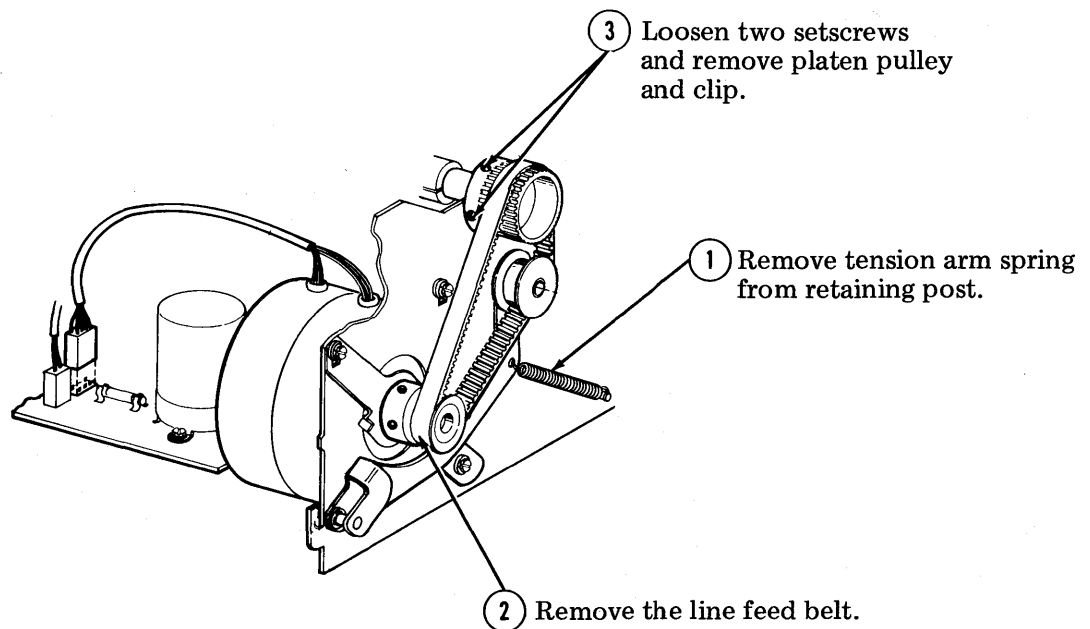
4.12 To remove the platen:

(a) Early Design

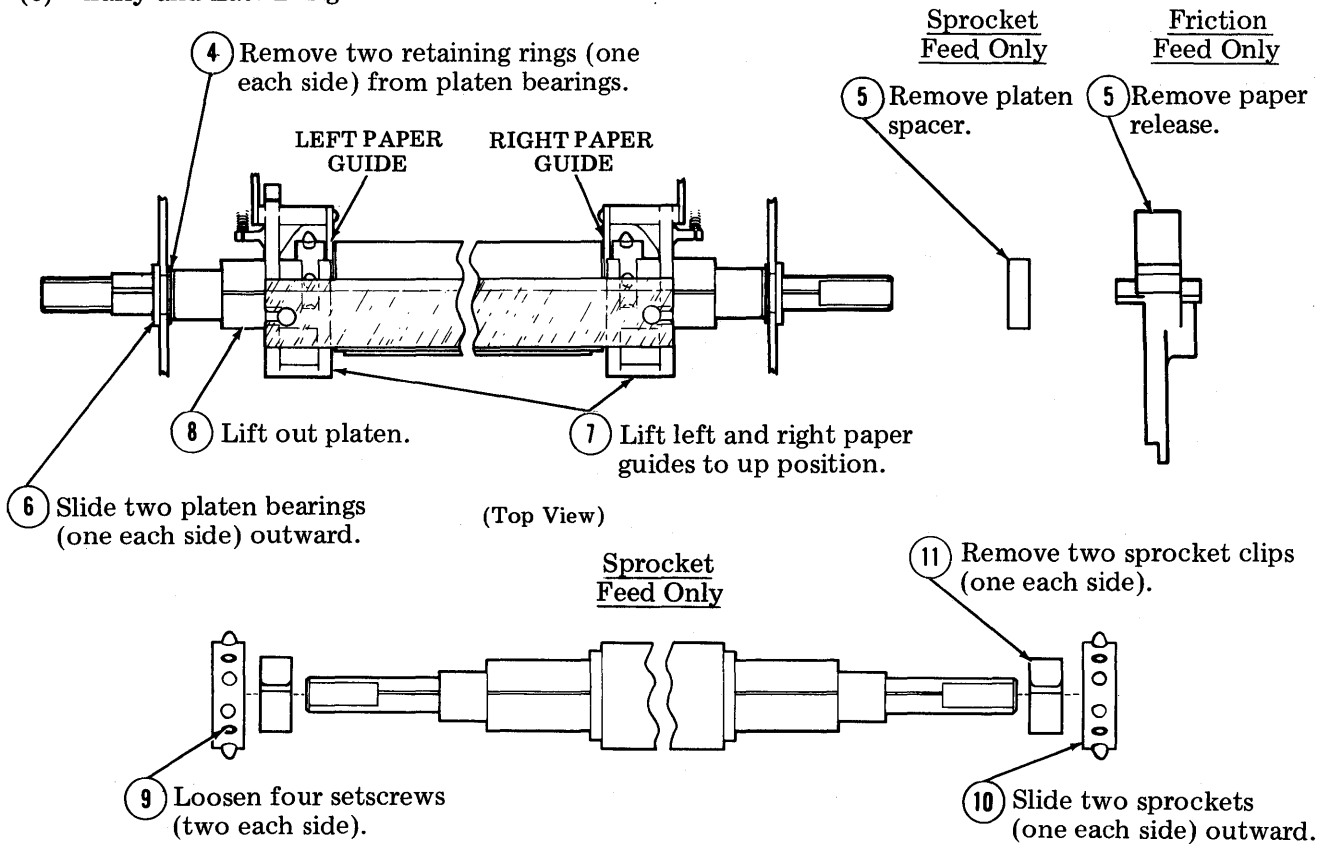


*Note:* In reassembly, position the setscrews away from the slot in the platen clip.

(b) Late Design



(c) Early and Late Design

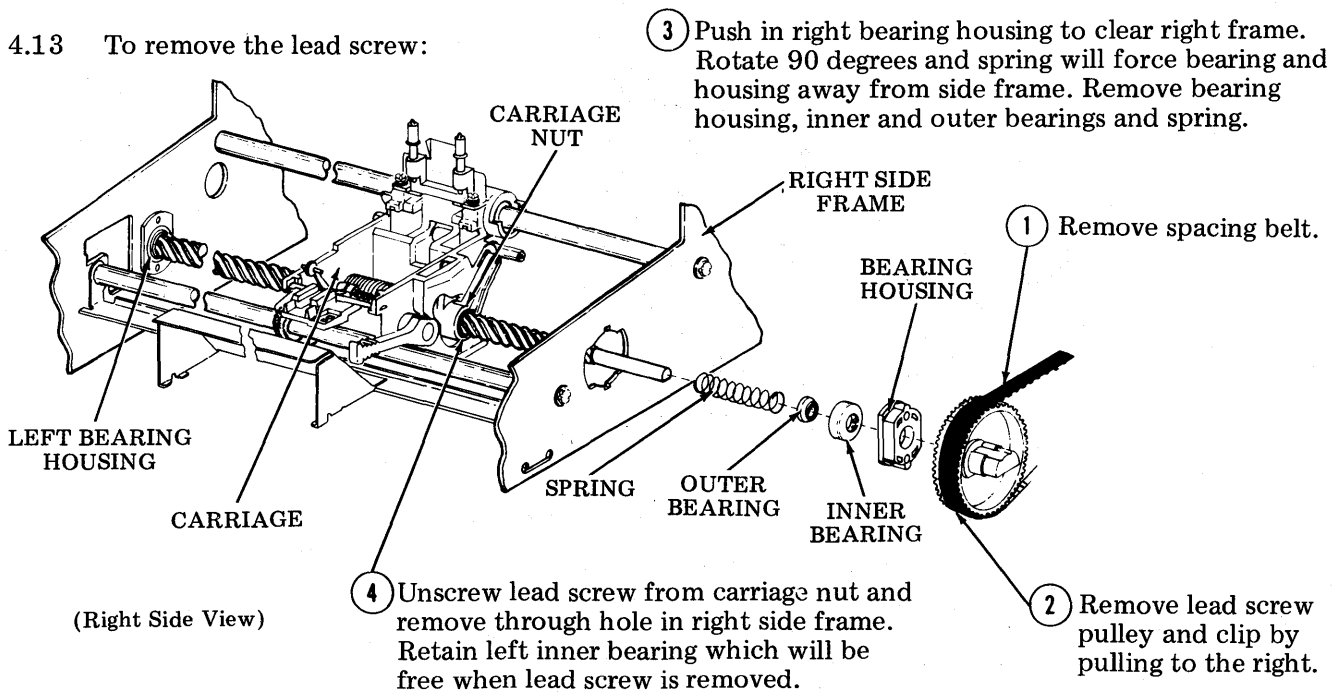


Note: In reassembly, position the setscrews away from the slot in the sprocket clip.

Perform the LEFT and RIGHT SPROCKET adjustments and PRINTED LINE POSITION and PLATEN ENDPLAY adjustments.

F. Lead Screw

4.13 To remove the lead screw:

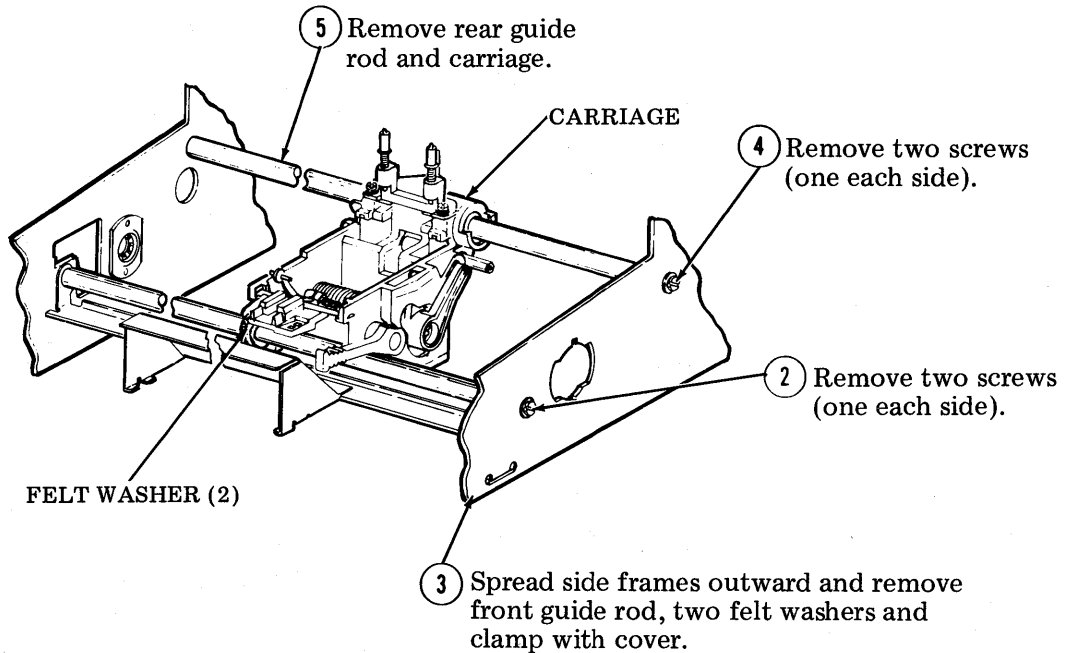




G. Carriage With Post Assembly

4.14 To remove the carriage with post assembly:

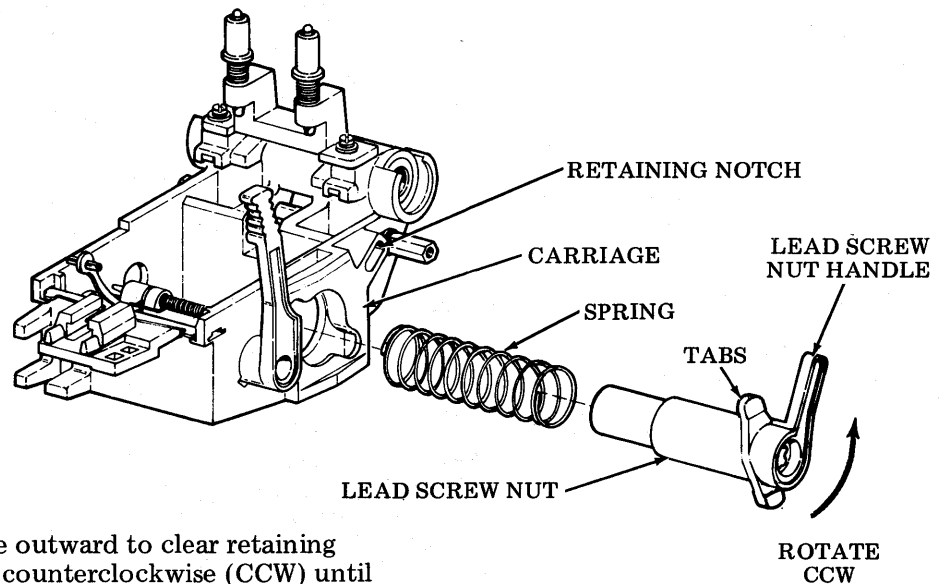
- ① Remove print head and lead screw (perform 3.09 and 4.13).



H. Lead Screw Nut

4.15 To remove the lead screw nut:

- ① Remove print head (perform 3.09).
- ② Remove lead screw (perform 4.13).



- ③ Tilt lead screw nut handle outward to clear retaining notch in carriage. Rotate counterclockwise (CCW) until tabs on nut align with opening in carriage. Spring will force nut away from carriage.
- ④ Remove spring and nut.

I. Collar With Link

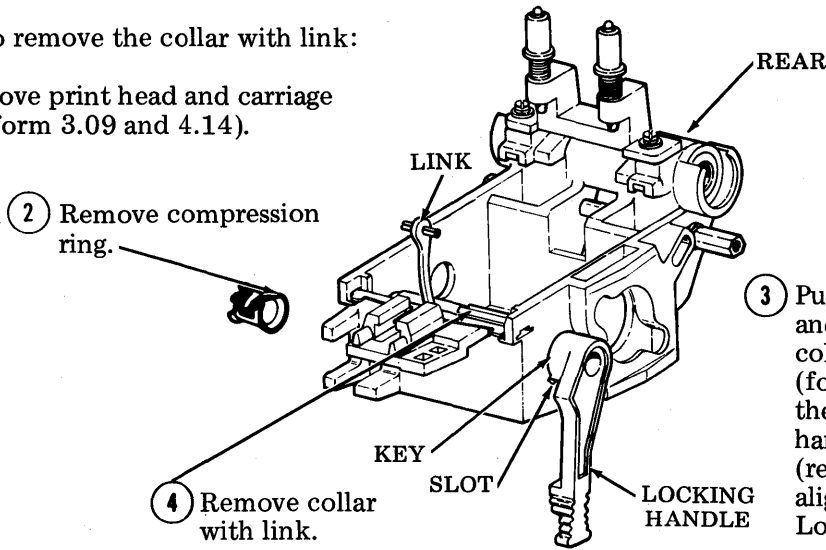
4.16 To remove the collar with link:

① Remove print head and carriage (perform 3.09 and 4.14).

② Remove compression ring.

④ Remove collar with link.

③ Push locking handle to the left and rotate locking handle and collar fully counterclockwise (forward). Pull the handle to the right while slowly rotating handle and collar clockwise (rearward) until key on handle aligns with slot in carriage. Locking handle will pop out.



J. Paper Tray

4.17 To remove the paper tray:

(a) Sprocket Feed

Note 1: Parts on left and right sides are similar.

① Remove two retaining rings from paper tray shaft.

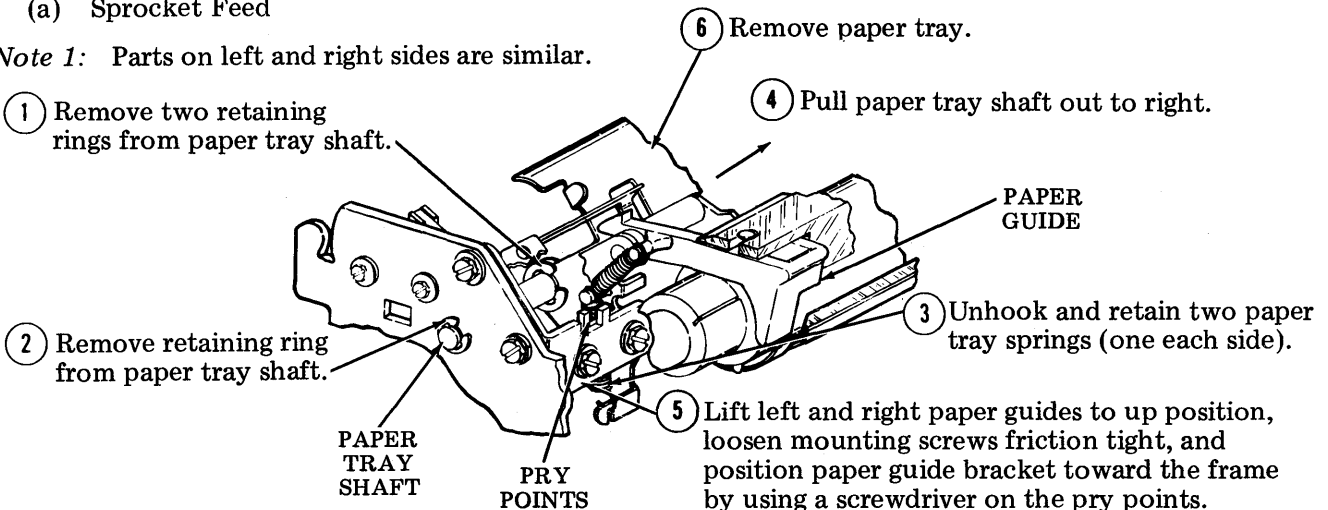
② Remove retaining ring from paper tray shaft.

⑥ Remove paper tray.

④ Pull paper tray shaft out to right.

③ Unhook and retain two paper tray springs (one each side).

⑤ Lift left and right paper guides to up position, loosen mounting screws friction tight, and position paper guide bracket toward the frame by using a screwdriver on the pry points.

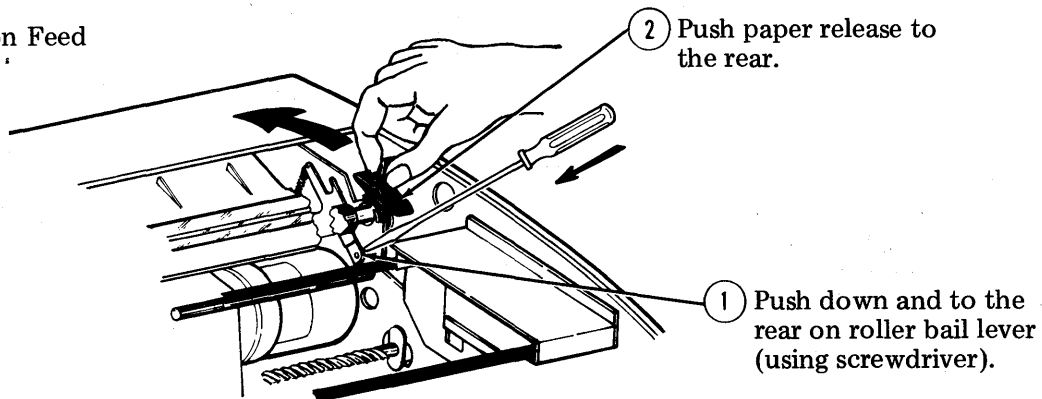


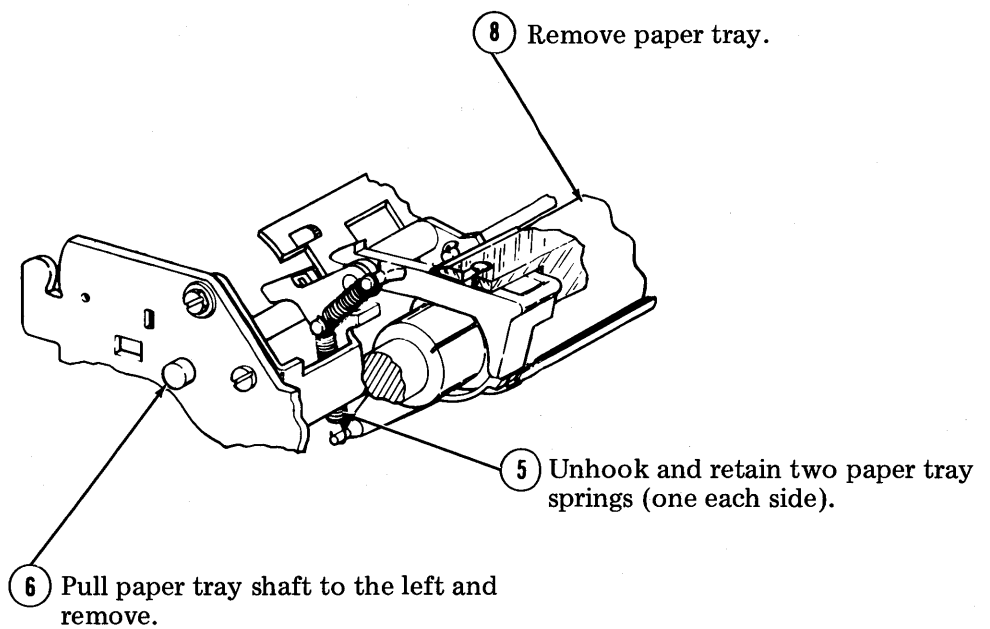
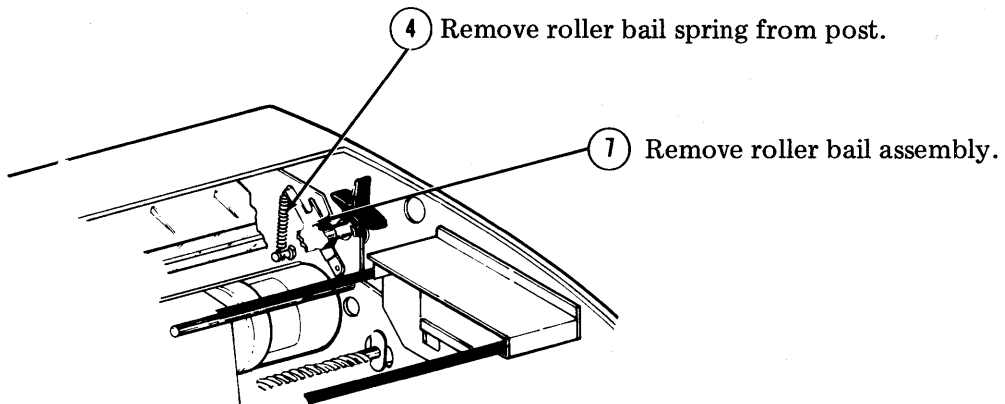
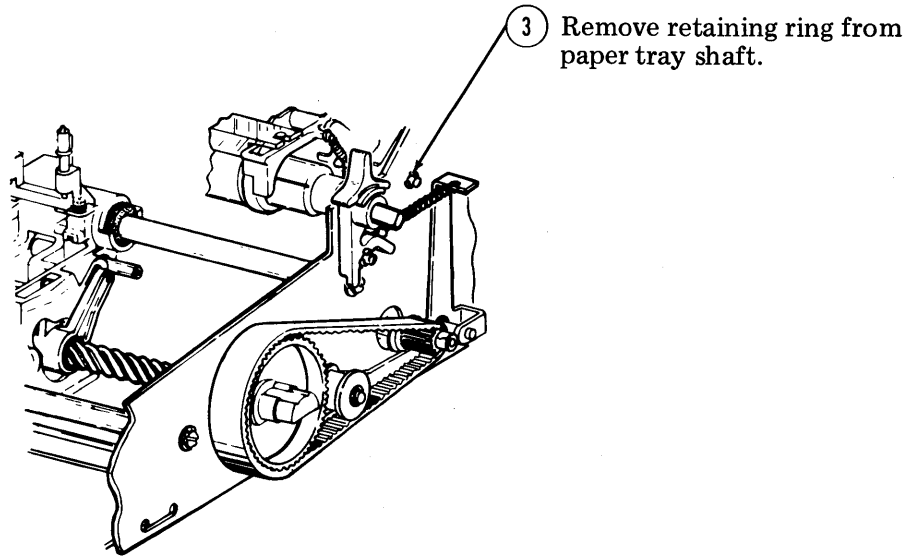
Note 2: In reassembly, LEFT AND RIGHT PAPER GUIDE adjustments must be made.

(b) Friction Feed

② Push paper release to the rear.

① Push down and to the rear on roller bail lever (using screwdriver).



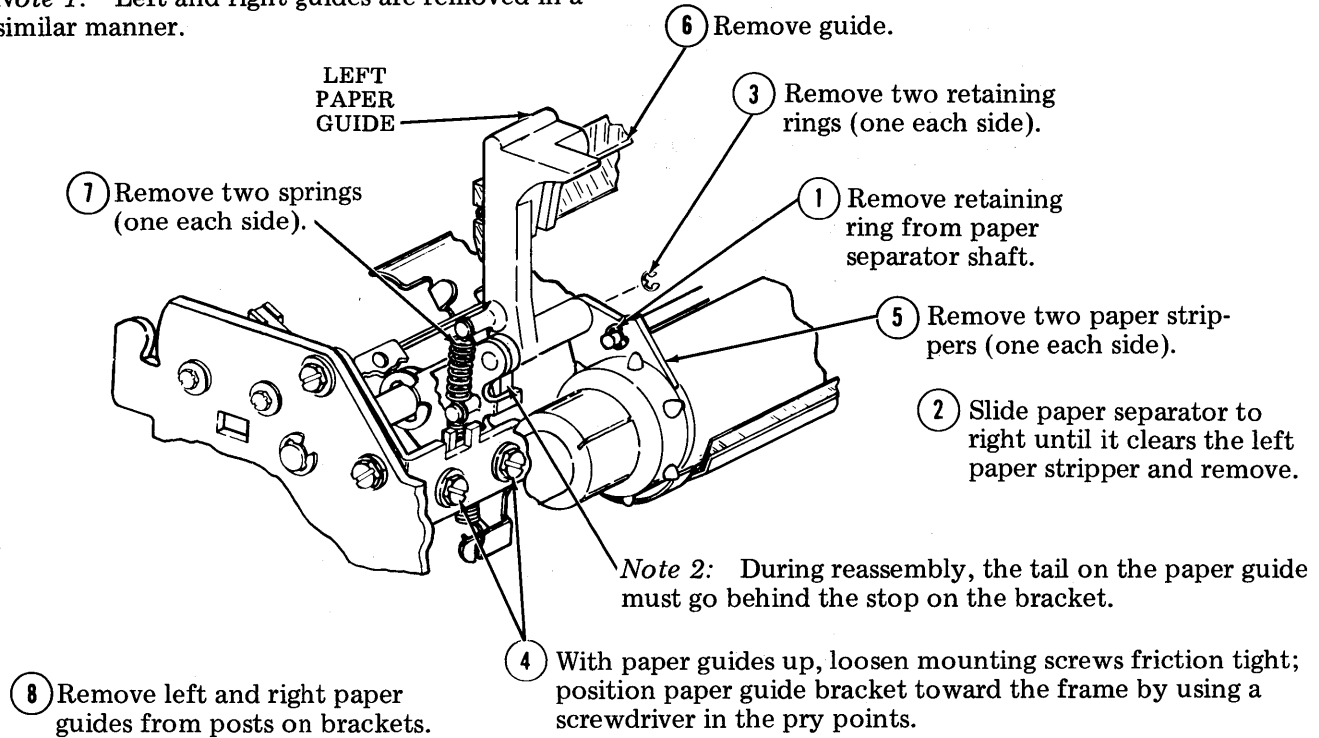


K. Paper Guides

4.18 To remove the paper guide:

(a) Sprocket Feed

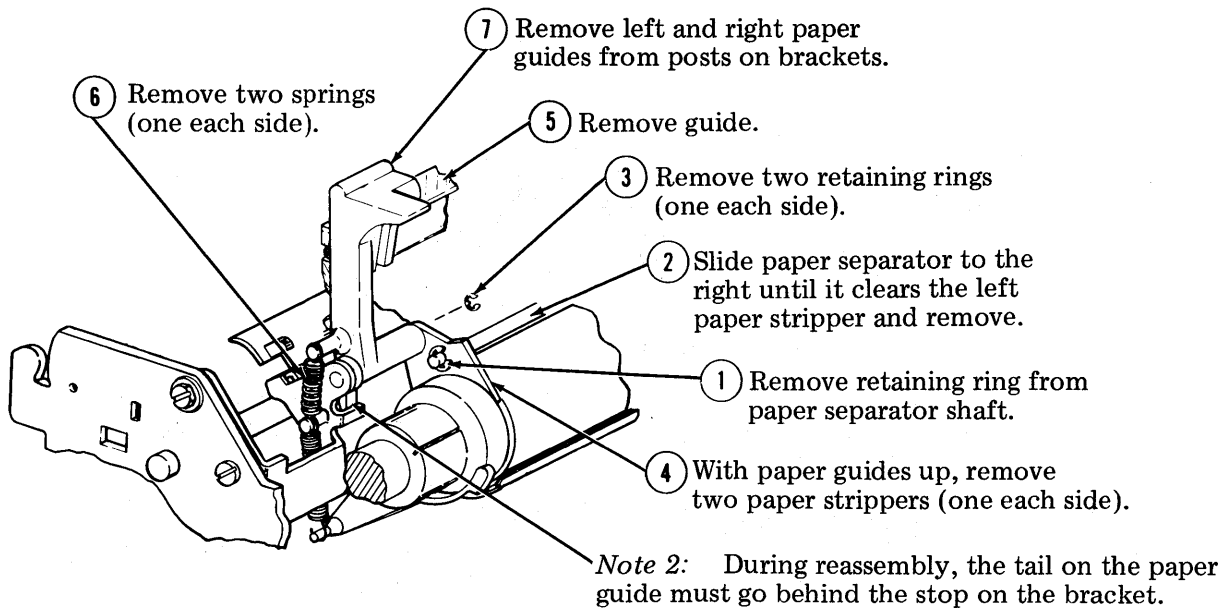
*Note 1:* Left and right guides are removed in a similar manner.



*Note 3:* In reassembly LEFT AND RIGHT PAPER GUIDE adjustments must be made.

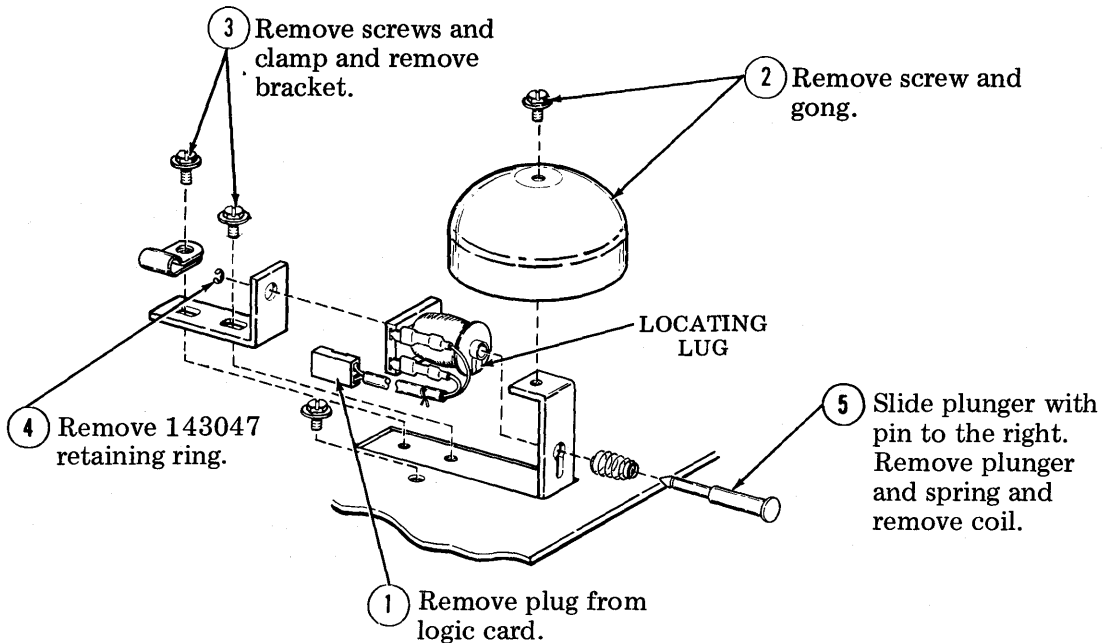
(b) Friction Feed

*Note 1:* Left and right guides are removed in a similar manner.



L. Signal Bell

4.19 To remove the signal bell:



OPERATOR CONSOLE

A. Spacebar Mechanism

4.20 To remove the spacebar mechanism:

- (a) Disengage the leaf spring (bronze colored) from the wire bail using a spring hook and pull toward the front (Fig. 2).

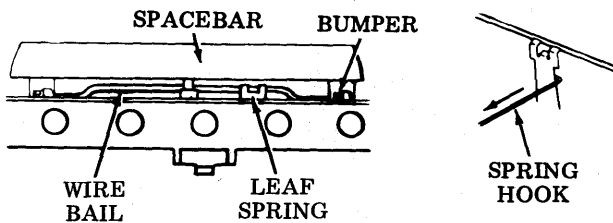


Fig. 2—Leaf Spring Disengagement

- (b) Disengage the two rear tines (one at each end of spacebar) with a small screwdriver while pulling the spacebar up and toward the front (Fig. 3).

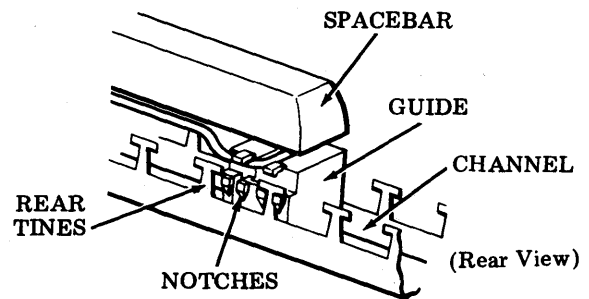


Fig. 3—Spacebar Removal

- (c) Continue applying upward pressure to the spacebar and disengage the two front tines.
- (d) Remove the wire bail from the left and right spacebar guides (snaps in and out) (Fig. 4).

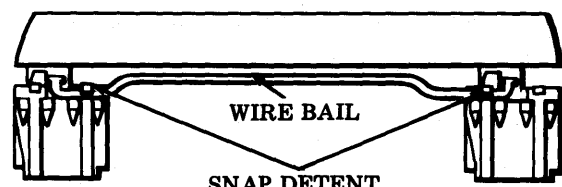


Fig. 4—Wire Bail Removal

4.21 To reassemble the spacebar mechanism:

- (a) Make sure the four tines engage the notches in the spacebar housing and the leaf spring is engaged to the wire bail.
- (b) Check mechanical operation of the spacebar so that it returns to its unoperated position freely when depressed and released slowly.

B. Keys

4.22 To remove the keys (Fig. 5):

- (a) There are two types of keys used on the operator console.



- (1) Control Key 
- Indicator
- Nonindicator 
- (2) Data Key

Fig. 5—Keys

- (b) To remove data keys, place 346260 tool over key and pull up to remove (Fig. 6).

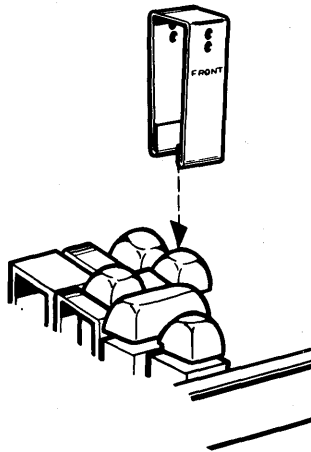


Fig. 6—Data Key Removal

*Warning: CAPS LOCK, PARITY, DUPLEX, and CPS keys must be in the fully extended, unlatched position before attempting to remove the key. Failure to observe this precaution will result in a damaged keyswitch.*

- (c) To remove control keys (Fig. 7):

- (1) Grasp key using thumb and index finger.
- (2) Exert upward force until key releases.

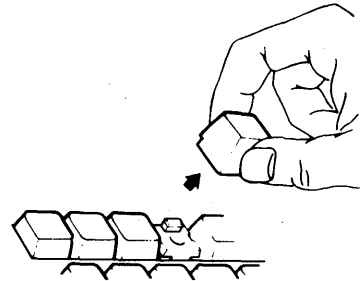


Fig. 7—Control Key Removal

- (d) To remove RETURN key with housing:

- (1) Remove keys BACK SPACE, OVERLINE, GS, US, LINE FEED, SHIFT, and QUOTES that surround the RETURN key using 346260 tool.
- (2) Disengage the rear tines from housing with a small screwdriver while pulling the RETURN key up and toward the front (Fig. 8).

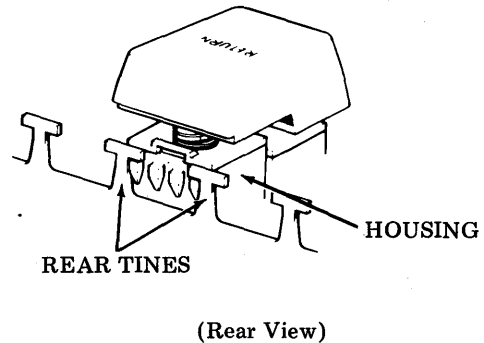


Fig. 8—Rear Tine Disengagement

- (3) Continue applying upward pressure to the RETURN key and disengage the front tine from housing using a spring hook. Remove key with housing from channel (Fig. 9).

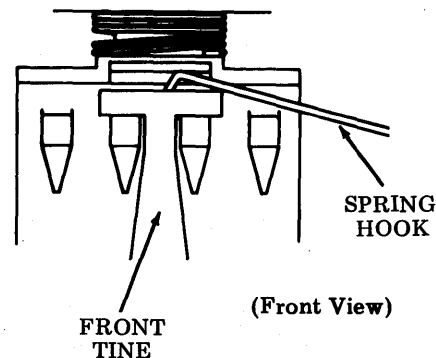


Fig. 9—Front Tine Disengagement

4.23 To reassemble the key:

Insert housing with key; observe position of locating lug on housing and press into channel. Housing must snap fully into front and rear channel tines.

C. Key Spacer

4.24 To remove the key spacer:

- (a) Remove key associated with spacer, and first key to the left (if present). (Refer to B. Keys.)
- (b) Slide spacer to the left as far as it will go and then pull rearward.

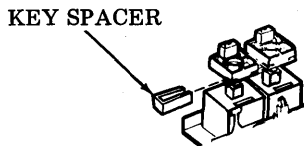


Fig. 10—Key Spacer Removal

4.25 To reassemble the key spacer:

- (a) Insert spacer from the left and while pushing to the right, observe that the spacer encloses the key push rod and the rear spring.
- (b) Replace keys.

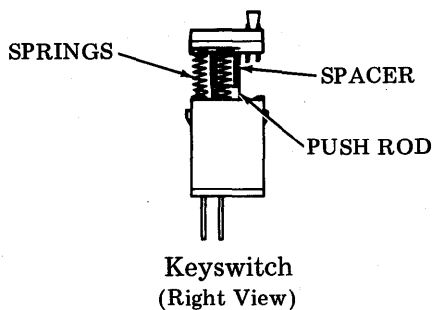


Fig. 11—Key Spacer Alignment

D. Keyswitches

4.26 To remove the keyswitches:

- (a) Remove key.
- (b) Remove four screws and circuit card shield.
- (c) Remove solder from around terminal pins of keyswitch to be removed (Fig. 12).

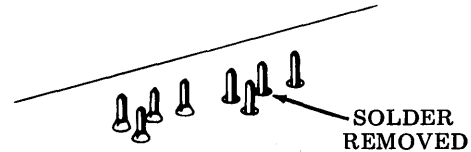


Fig. 12—Solder Removal

*Warning:* Use a grounded low-wattage soldering iron (avoid prolonged contact with pins) along with a desoldering tool to prevent damage to keyswitch card circuits and components.

- (d) Place 346257 tool over the keyswitch and press downward. When the tool bottoms and embossed projections snap into notches on keyswitch, squeeze and pull back on the tool to lift keyswitch out (Fig. 13).

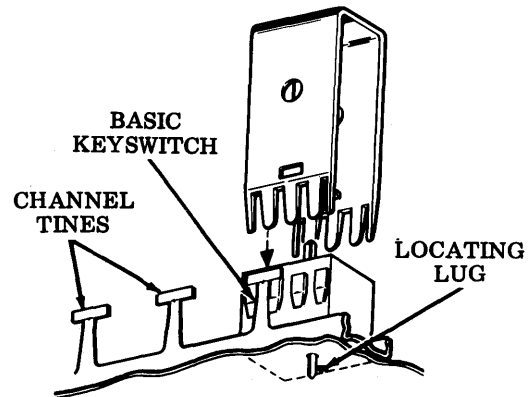


Fig. 13—Keyswitch Removal

*Note:* The tines of the tool must pass between the keyswitch housing and the inside of the tines on the channel.

4.27 To reassemble the keyswitch:

Insert new keyswitch, observe position of the locating lug, and press keyswitch into channel. Switch must snap fully into front and rear channel tines. Hold keyswitch in place and resolder.

E. Cable (KSR)

4.28 To remove the cable:

- (a) Remove the PRINTER TEST, PARITY, DUPLEX and CPS keys. (Refer to B. Keys.)
- (b) Remove INTERLOCK, PRINTER TEST, PARITY, DUPLEX and CPS keyswitches (Fig. 14). (Refer to D. Keyswitches.)

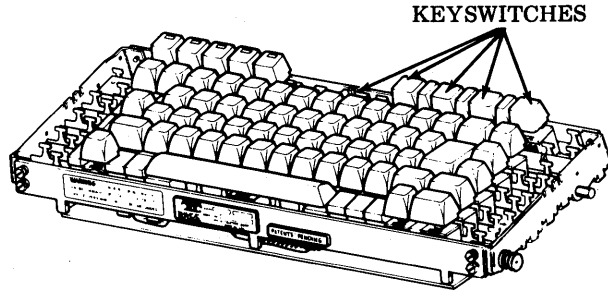


Fig. 14—Keyswitch Identification

- (c) Remove solder from around connector pins of cable to be removed (Fig. 15).

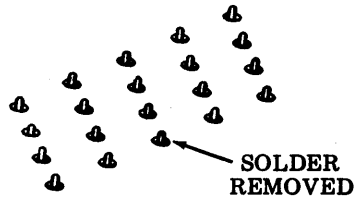


Fig. 15—Connector Pins

*Warning: Use a grounded, low-wattage soldering iron (avoid prolonged contact with pins) along with a desoldering tool to prevent damage to card circuits and components.*

- (d) Remove the circuit card cover located in front of the control keys from the channel. Use a spring hook to remove the cover from the mounting posts (Fig. 16).

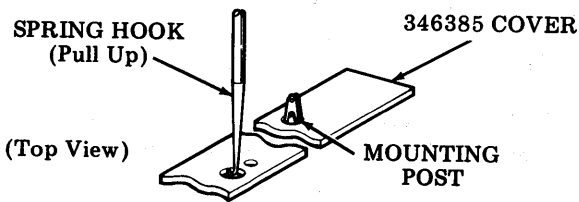


Fig. 16—Cover Removal

- (e) Cut the cable tie securing the cable to the circuit card.
- (f) Grasp the cable connector using thumb and index finger.
- (g) Exert upward force until cable connector releases (Fig. 17).

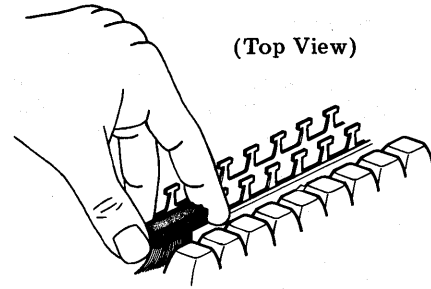


Fig. 17—Cable Connector Removal

- (h) Remove rear plate (Fig. 18).
- (i) Slide cable to the right until it clears the circuit card. Remove through opening between channels (Fig. 18).

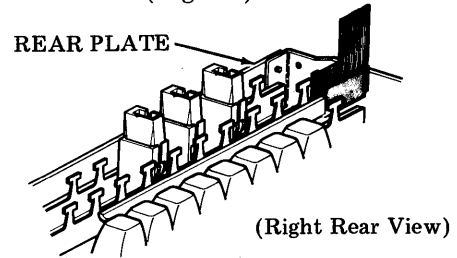


Fig. 18—Cable Removal

4.29 To reassemble the cable :

- (a) Insert new cable connector into circuit card holes and press into place. Hold cable connector in place and resolder.
- (b) Fasten cable to card using locally furnished cable tie.
- (c) Reassemble the keyswitches and key removed in 4.28 (a) and (b).
- (d) Replace circuit card cover removed in 4.28 (d).
- (e) Replace rear plate.
- (f) Replace circuit card shield.

F. Cable (RO)

4.30 To remove the cable:

- (a) Remove the interlock keyswitch (Fig. 19) (refer to D. Keyswitches.)



Fig. 19—Interlock Switch



- (b) Remove solder from around connector pins of cable to be removed (Fig. 20).

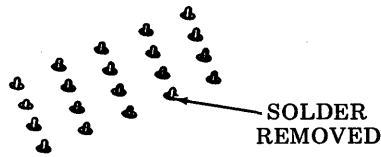


Fig. 20—Connector Pins

*Warning: Use a grounded, low-wattage soldering iron (avoid prolonged contact with pins) along with a desoldering tool to prevent damage to card circuits and components.*

- (c) Cut the cable tie securing the cable to the circuit card.
- (d) Remove the screw securing the right rear corner of the circuit card to the channel (Fig. 21).

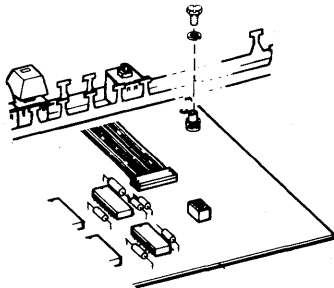


Fig. 21—Screw Removal

- (e) Grasp the cable connector using thumb and index finger (Fig. 22).
- (f) Exert upward force until cable connector releases.
- (g) While biasing the right rear corner of the circuit card downward, slide the cable to the right until it clears the circuit card. Remove the cable.

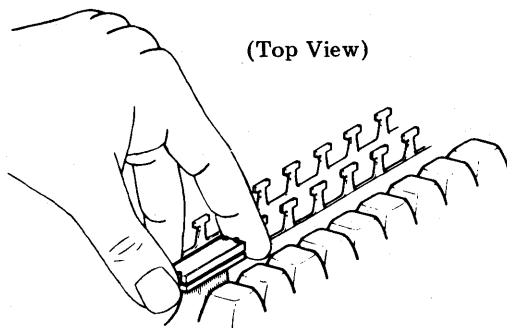


Fig. 22—Cable Connector Removal

G. Channel (KSR)

4.31 To remove the channel:

- (a) Remove all keytops associated with channel to be replaced. (Refer to B. Keys.)
- (b) Remove all keyswitches associated with channel to be replaced. (Refer to D. Key-switches.)
- (c) Remove right side frame by removing four screws and loosening one screw (Fig. 23).

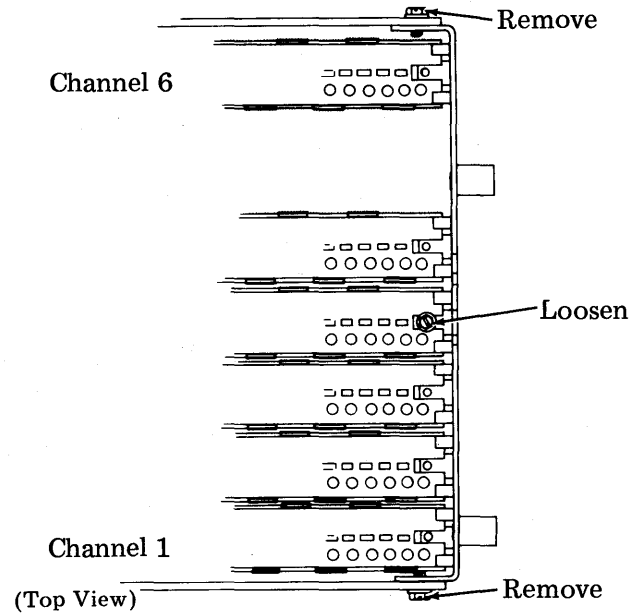


Fig. 23—Right Side Frame Removal

- (d) If removing Channel No. 4, remove screw and locating plate from left side of operator console (Fig. 24).

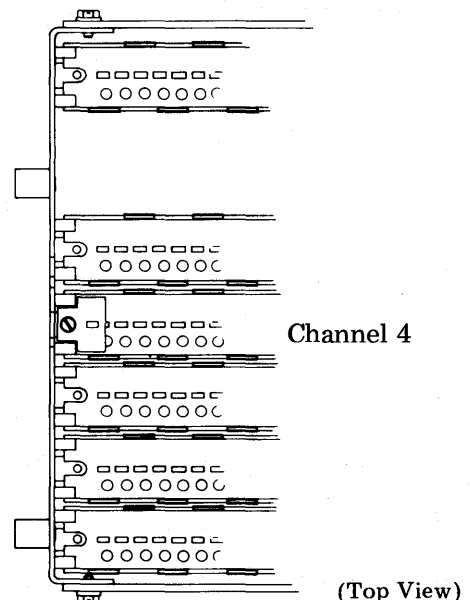
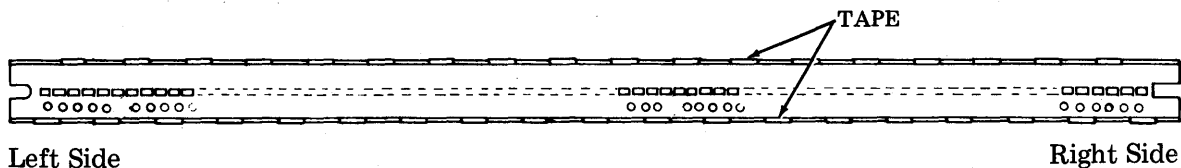


Fig. 24—Locating Plate

(e) Pull channel to the right and lift out.

4.32 To reassemble the channel:

(a) If channel being replaced has tape on one or both sides, apply tape to new channel.



Note 1: Left side has curved slot; right side has square slot.

Note 2: Remove backing paper from one side only, if applying RM79324 vinyl tape.

Fig. 25—Channel and Tape

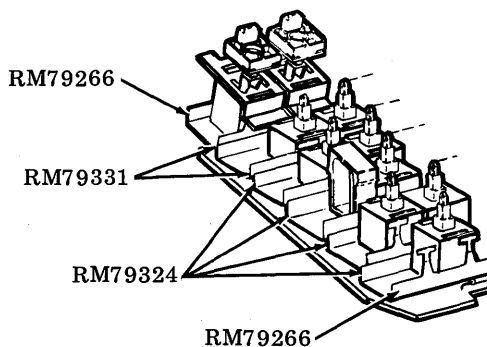


Fig. 26—Tape Identification

(b) Slide channel to the left and engage tines on left side frame.

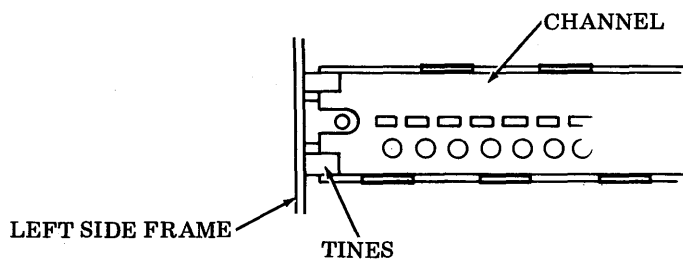


Fig. 27—Channel Engagement

(c) Replace right side frame with all channels engaging side frame tines.

(d) If removed, replace channel locating plate on left side.

(e) Replace keyswitches removed.

(f) Replace keys removed.

H. Channel (RO)

4.33 To remove the channel:

- (a) Remove all keys (refer to B. Keys).
- (b) Remove all keyswitches (refer to D. Keyswitches).
- (c) Remove the two screws securing the circuit card to the channel (Fig. 28).

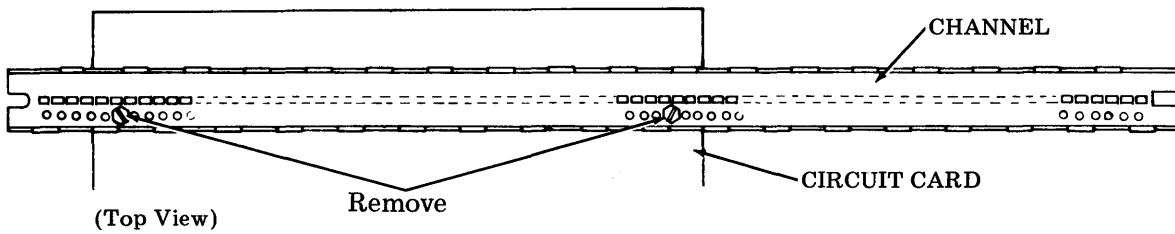


Fig. 28—Channel Removal

- (d) Remove the right side frame by removing four screws (Fig. 29).

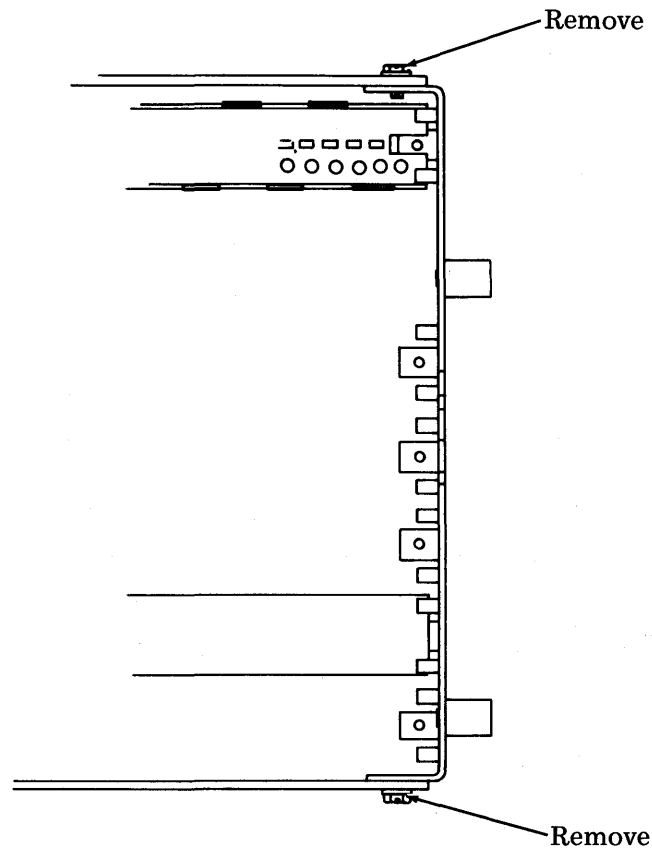


Fig. 29—Right Side Frame Removal

- (e) Pull channel to the right and lift out.

4.34 To reassemble the channel:

(a) Slide channel to the left and engage tines on left side frame (Fig. 30).

*Note:* Left side has curved slot; right side has square slot (Fig. 31).

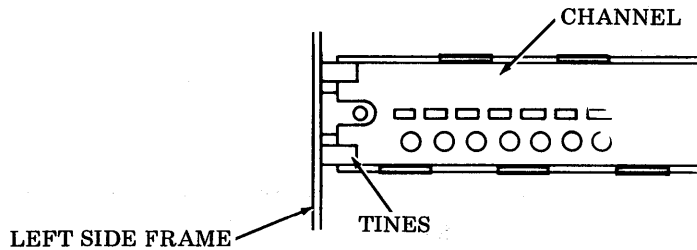


Fig. 30—Channel Engagement

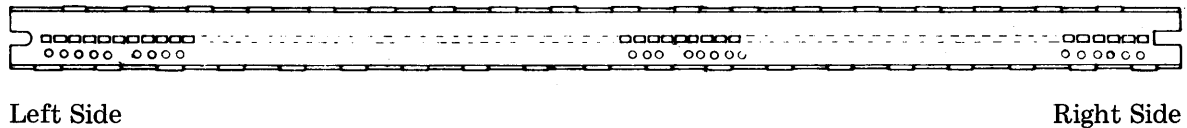


Fig. 31—Channel

- (b) Replace right side frame with channels engaging side frame tines.
- (c) Replace the two screws that secure the channel to the circuit card.
- (d) Replace all keyswitches previously removed.
- (e) Replace all keys previously removed.

#### I. Circuit Card Components

4.35 To disassemble the circuit card components:

- (a) Remove circuit card shield by removing four screws.
- (b) KSR Only — If circuit card components to be replaced are located in Row A of circuit card, remove circuit card cover (perform 4.28 (d)).
- (c) KSR Only — If circuit card components to be replaced are located in Row B of circuit card, remove Channel No. 1 (perform G. Channel (KSR)).

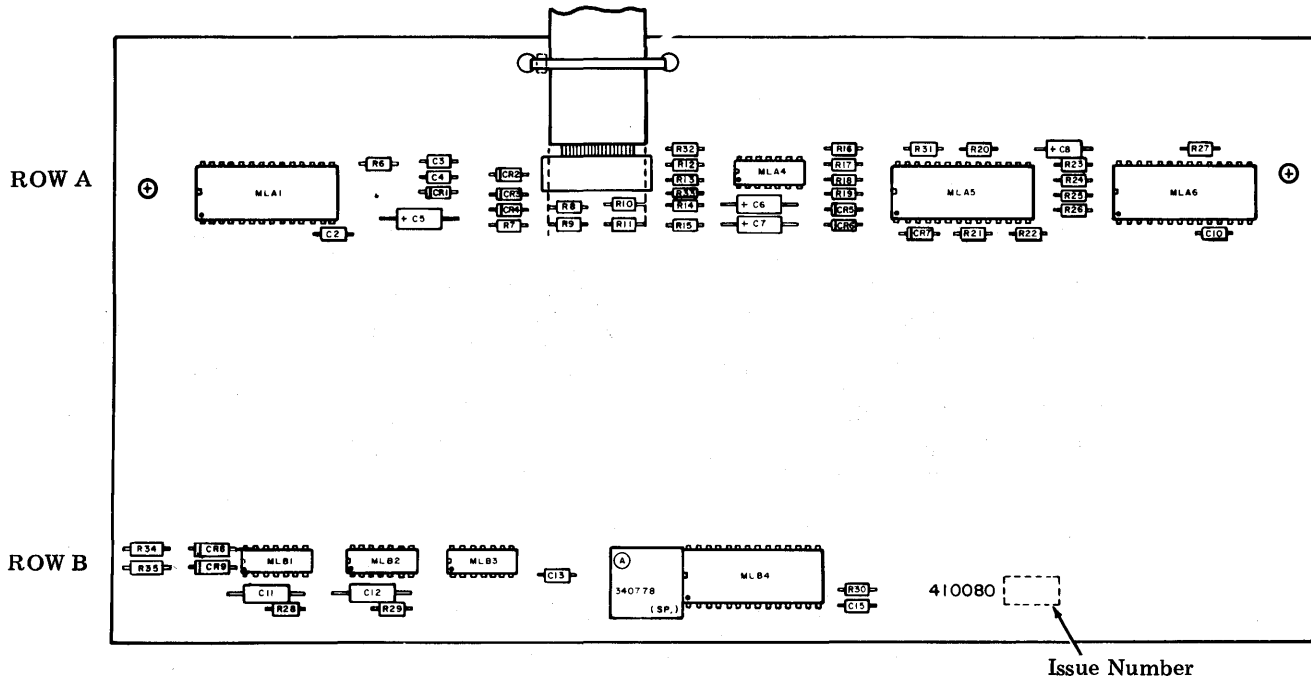


Fig. 32—Component Identification — KSR Operator Console

(d) Remove solder from around terminal pins or leads of component to be removed.

*Warning: Use a grounded low-wattage soldering iron (avoid prolonged contact with pins) along with a desoldering tool to prevent damage to card circuits and components.*

(e) Lift up and remove component.

J. Keyboard Layout

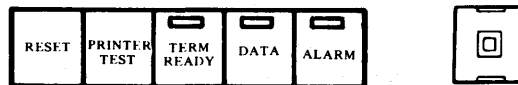


Fig. 33—43K001/AAA (RO)

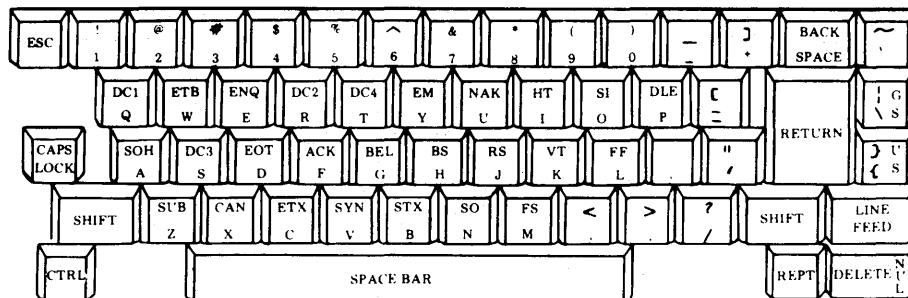


Fig. 34—43K101/CAA (KSR)

J. Keyboard Layout (Cont)

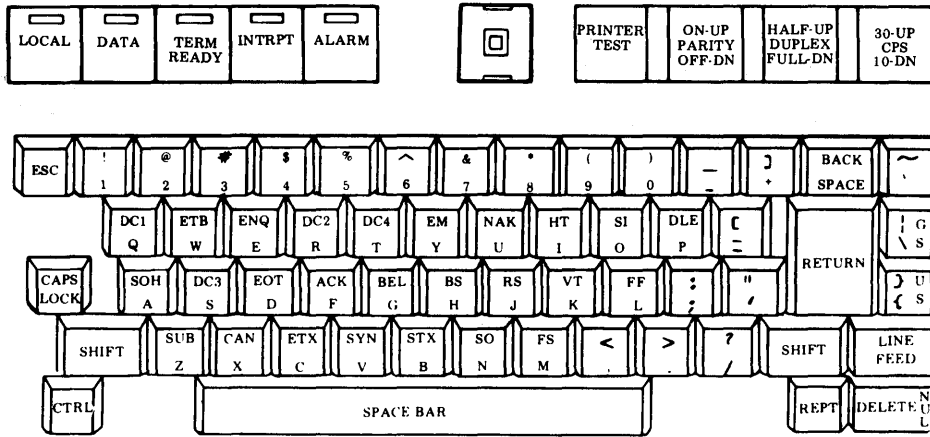
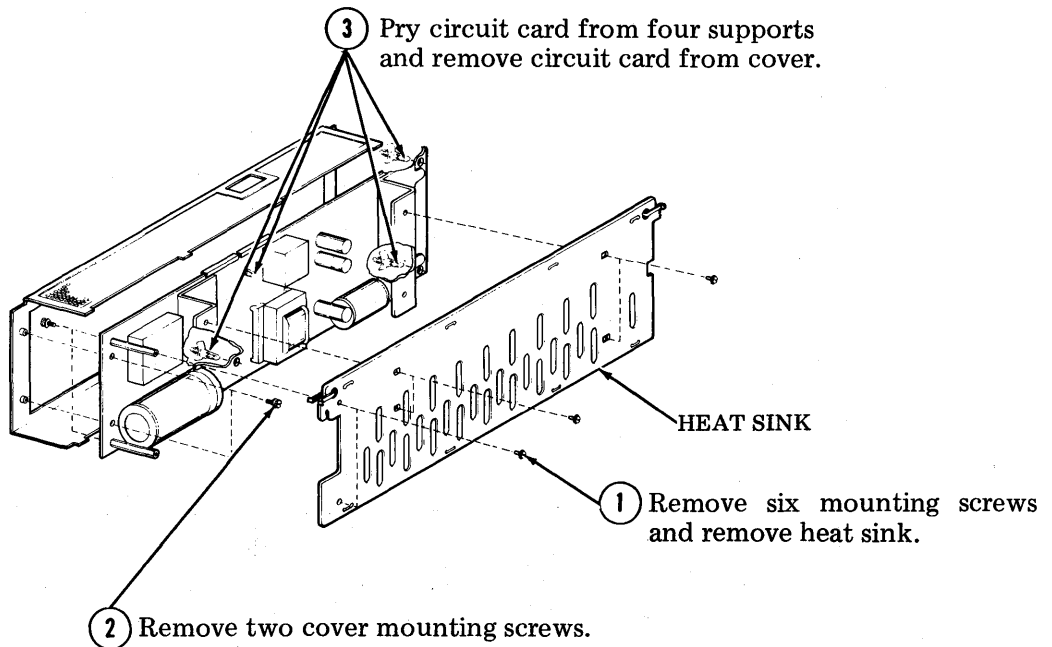


Fig. 35-43K101/CAB (KSR)

POWER SUPPLY

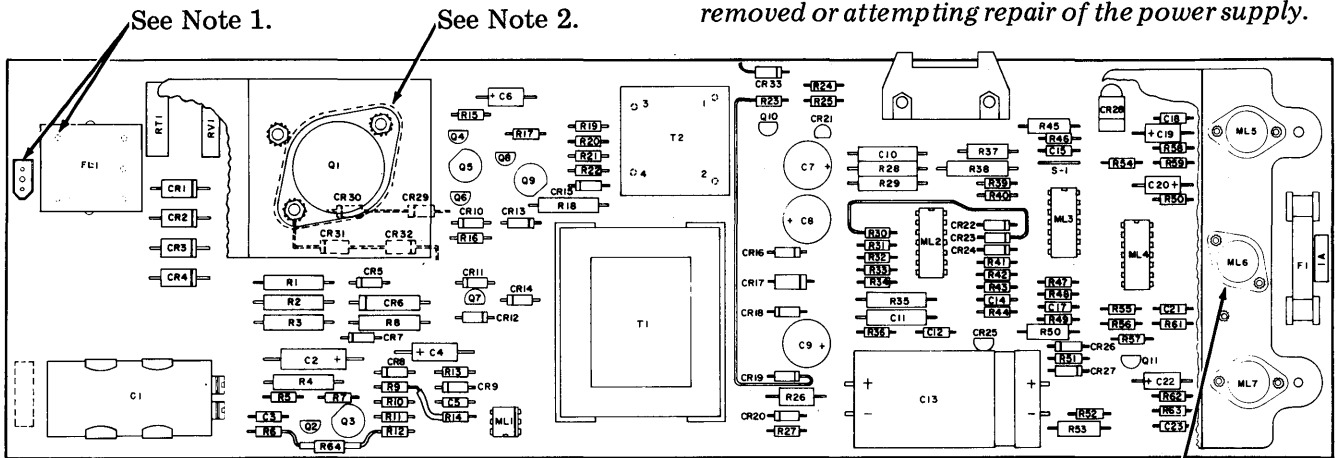
A. Circuit Card

4.36 To remove the circuit card:



B. Circuit Card Assembly Notes

*Caution: See Part 2 paragraphs 1.15 through 1.20 before applying power with cover or heat sink removed or attempting repair of the power supply.*

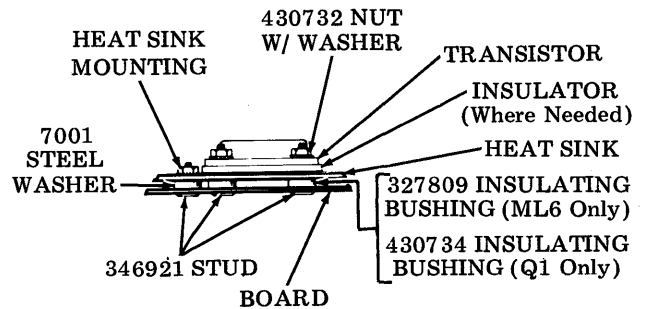


See Note 3.

**Note 1:** Mount FL1 with two-pin side adjacent to connector and bend side tabs on underside toward each other. A minimum of 0.020 inch clearance must be maintained between circuit board and case of filter. Use 131228 insulating washers over mounting tabs, if required.

**Note 2:** Mount the 430710 insulating washer between heat sink and transistor Q1.

**Note 3:** Use suitable heat sink compound under Q1, ML5, ML6 and ML7. Compound to be applied between insulator and heat sink of Q1 and ML6.



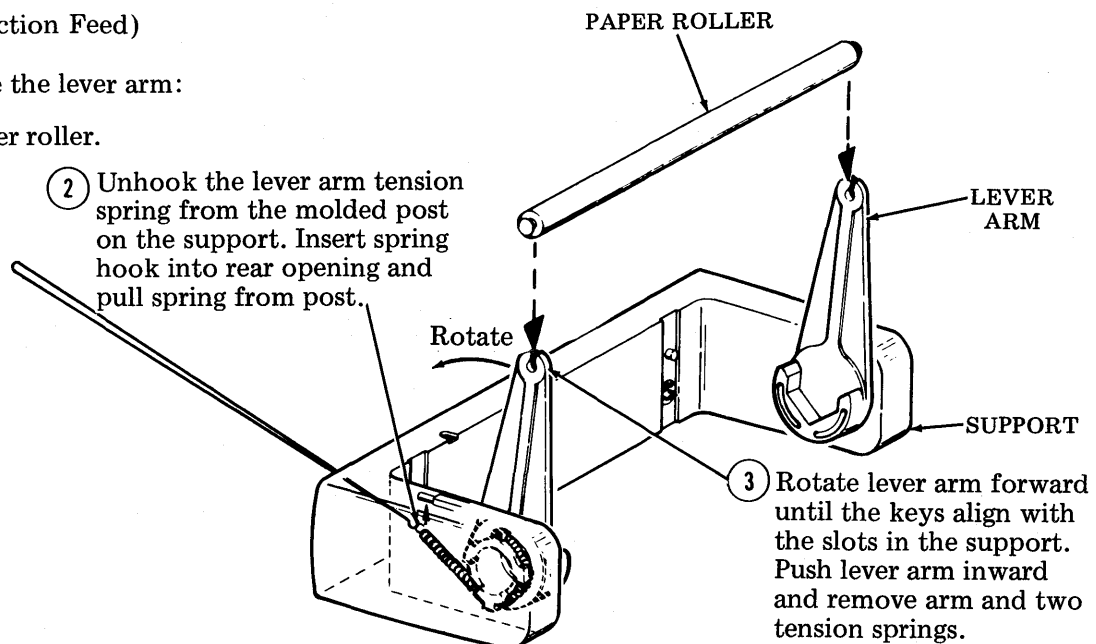
Typical Heat Sink Assembly

ENCLOSURES AND PAPER HANDLING

Paper Supply (Friction Feed)

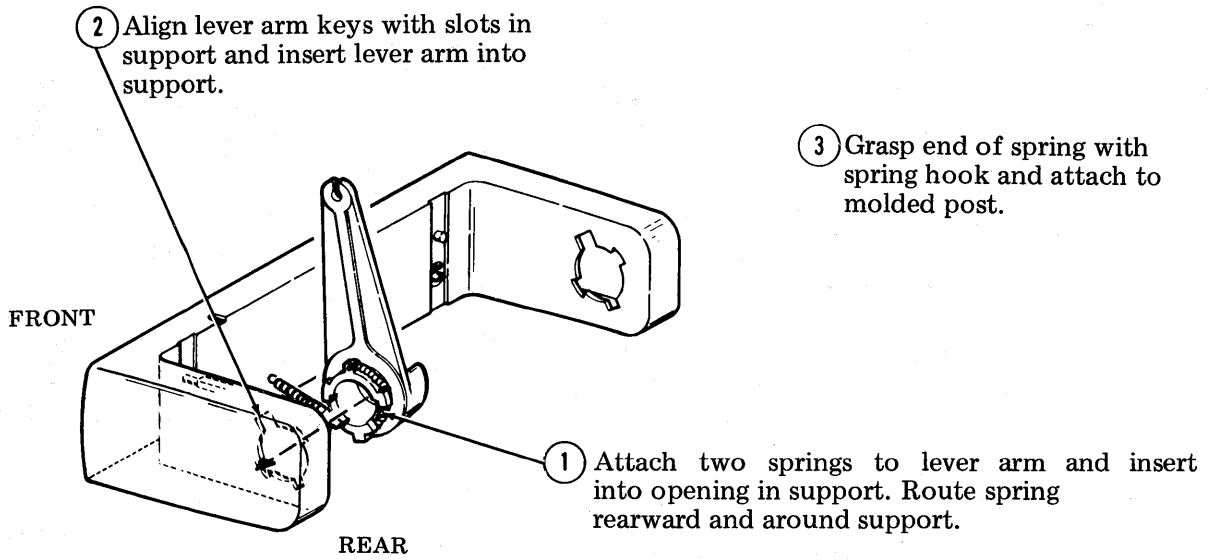
4.37 To remove the lever arm:

- ① Remove paper roller.
- ② Unhook the lever arm tension spring from the molded post on the support. Insert spring hook into rear opening and pull spring from post.

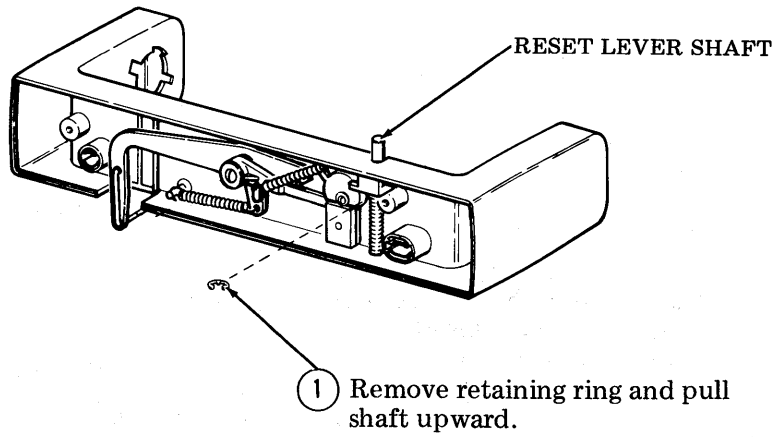


- ③ Rotate lever arm forward until the keys align with the slots in the support. Push lever arm inward and remove arm and two tension springs.

4.38 To reassemble the lever arm:



4.39 To remove the reset lever shaft:





PART 4 — CIRCUIT DESCRIPTION AND DIAGRAMS

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A. Opcon Interface .....	2	1. GENERAL	
B. MACON and MAPL Interface ..	2	1.01 This part provides circuit descriptions and combined schematic and troubleshooting circuit diagrams for the 43 Basic KSR and RO teleprinters and their major components except for the internal data units.	
C. System Clock .....	2	1.02 Wave forms and voltage levels are shown on the diagrams wherever possible to aid in troubleshooting and understanding of the circuit theory. Circuit descriptions refer to coordinates on the schematic, ie, (C2) to locate the circuit being described.	
D. POR Circuit .....	2	1.03 For additional troubleshooting information associated with these circuit drawings, refer to PART 2 — TROUBLESHOOTING which includes:	
E. Velocity Encoder .....	2	• Troubleshooting charts.	
F. Print Head and Bell Drivers ..	2	• Tables for dynamic and static VOM measurements.	
G. Line Feed Motor Drivers .....	2	• Illustrated layouts of circuits and physical location of component and connector leads.	
H. Carriage Motor Drivers .....	2	1.04 For part number identification of components and unit codes shown on circuit diagrams refer to PART 6 — PARTS AND UNIT CODES.	
POWER SUPPLY .....	3	1.05 Most numbers shown on various leads, components and connectors on the circuit drawings are not actually marked on the equipment. They are required for identification purposes when referring to other parts of the manual.	
A. Blocking Oscillator .....	3	1.06 The circuit diagrams in the part (with added information on circuit layouts and physical location of component leads from PART 2) are also available as a separate package of diagrams with each major component on a single sheet. The package of diagrams can be ordered from Teletype Corporation as Manual 385, 43 Teleprinter Circuit Diagrams.	
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## 2. CIRCUIT DESCRIPTIONS

### PRINTER LOGIC CARD

#### A. Opcon Interface

2.01 The serial data lead J107-6 (F2) is normally marking. The transmission code consists of eleven bits — one start bit, eight data bits, one parity bit and one stop bit. One bit time = 143 microseconds.

2.02 The clock signal is 560 KHz. RC filters R42, C14 and R43, C15 minimize noise pickup.

2.03 The parallel interface (D3) consists of five dc contact switch leads and five LED drive signals. The five LED drivers in MACON pull their respective leads to +4.2 V when activating a LED. The 1K resistors (R37-R41) limit the LED forward current to 15 milliamperes.

#### B. MACON and MAPL Interface

2.04 Eleven parallel data leads MLC4-9 through 19 (D5) interface the MACON logic with the printer timing logic (MAPL). The eight data leads transmit coded information to MAPL, +5 V represents a binary 1.

2.05 The Request Next Character signal MLC4-18 (C5) goes to +5 V when MAPL is ready to accept more information.

2.06 The Load Data Printer signal MLC4-9 (E5) drives momentarily to 0 V when information is to be transferred (via data leads) to MAPL. The trailing edge of this pulse causes Request Next Character to go to 0 V.

2.07 Right-hand Margin is a bi-directional signal which, during normal operation, is an input to MACON MLC4-19 (C5). This signal goes to +5 V coincident with Request Next Character whenever the print head is at the right-hand margin. This signal is driven to +5 V by MACON whenever the power is turned on with the INTERLOCK switch J107-14 (D2) open. It remains at +5 V until the INTERLOCK switch is closed.

#### C. System Clock

2.08 The clock circuit (G2) consists of a 1.12 MHz crystal controlled oscillator and a divide-by-2 squaring circuit with power-on gating. The output is a symmetrical 560 KHz clock.

#### D. POR Circuit

2.09 The Power On Reset circuit, if present (G4) delays the application of ground to MACON and MAPL after power turn-on for 50 milliseconds.

#### E. Velocity Encoder

2.10 This circuit is comprised of an OPTICAL switch, feedback amplifier and hysteresis amplifier which produce a pulse train with repetition rates proportional to the average carriage motor rotor velocity. This signal is used by MAPL to modulate the carriage motor drive signals.

#### F. Print Head and Bell Drivers

2.11 When Q20-B (B10) is driven to +1.25 V by MAPL, Q20-C goes to 0 V driving 175 milliamperes through the bell coil. CR25 clamps the collector of Q20 to +43 V when the drive signal is turned off.

2.12 When the print level predriver (MLE6, MLE7 or MLE8) input is driven to +5 V it drives Q11-19-B to +1.5 V. The power driver then turns on to +1 V causing a current pulse in the associated print head coil. CR16 through CR24 clamp the collectors to +43 V when the driver is turned off.

#### G. Line Feed Motor Drivers

2.13 When the line feed mechanism is idle, MAPL drives MLE6-7 (E9) to +5 V. MLE6-6 drives Q6 into saturation which turns on Q-5, clamping the phase 1 coil to +45 V via CR11. During this idle state, the phase 1 drive signal is pulse width modulated at a 20 KHz rate keeping the motor in a detented position. When stepping the line feed motor, MAPL releases the clamp switch input causing Q5 to turn off.

2.14 To energize a coil, MAPL drives the pre-driver input (MLE6, MLE7 or MLE8) to +5 V which in turn drives the associated power driver base to +1.5 V. This turns on the power driver to +1 V causing current flow in the coil. CR1 and CR3, CR5, CR7 or CR9 clamp the inductive kick to +68 V when the drivers are turned off. Blocking diodes CR4, CR6, CR8 and CR10 are used to prevent induced negative voltages from turning on the power drivers.

#### H. Carriage Motor Drivers

2.15 The predrivers and driver circuits operate as described for the line feed motor. R8 and R9 (G11) help CR2 dissipate the kickback energy.

## POWER SUPPLY

### A. Blocking Oscillator

2.16 When power is initially applied, the oscillator and control circuitry are not operational. An auxiliary mode of operation is provided which is operational only during startup. In this mode, Q1 (D8) is driven by an extra winding (J-H) on transformer T1 which is connected such that positive feedback is provided to its base. This results in a blocking oscillator type mode of operation during startup.

2.17 As long as Q7 (B7) is off, Q1 has base drive through Q11, T1 (J-H) and R8. As Q1 turns on, current flows through the power transformer T1. Since the transformer is tightly coupled, an equivalent voltage is applied across the secondary windings according to the dot notation shown. CR14 and CR12 clamp the collector of Q1 during turnoff to twice the dc supply voltage. Diode CR7 prevents C2 from being reverse biased.

### B. Oscillator and Control

2.18 The output of ML-2-2 (H12) will be a voltage independent frequency of 20 KHz. This output is connected to the noninverting input of the ramp generator, pin 9. When the oscillator output is low, the output, pin 14, is held low. Whenever the oscillator output is high, C10 charges to approximately 3.5 V.

### C. Pulse Width Modulator

2.19 During startup, transistor Q10 (D3) will not receive drive pulses until CR21 (G15) becomes conducting. CR21 is nonconducting until the +16 V supply exceeds 8 volts.

2.20 Whenever an output is produced on pin 9 of ML3 (G12) that exceeds .6 V, the pulse width modulator output will be high for the time that the ramp generator output exceeds the voltage on ML3-9.

### D. Voltage Reference and Error Amplifier

2.21 The +42 V supply is sensed by means of R49 and R50 and compared in the error amplifier with the voltage reference established by divider R37 and R45. Whenever +42 V increases, the output of ML3-9 increases, which has the effect of reducing the pulse width supplied to drive Q1. As a result, the rectified secondary voltage will decrease. Consequently, the outputs are regulated against line and load changes.

### E. Primary Power Conversion

2.22 Drive pulses to the base of Q10 will cause pulse transformer T2 to produce a positive pulse of similar duration on its secondary. This pulse is connected through R18 and CR10 to the base of the primary switching transistor Q1.

2.23 The positive drive on the base of Q1 causes current to flow in the collector of Q1 and the primary winding (P1) of transformer T1.

2.24 Whenever Q10 turns off, a negative pulse generated on the secondary of T2 is coupled to the base of Q5 through R22. Q5 is turned on which grounds the base of Q1, resulting in rapid turnoff of Q1.

### F. Optical Coupler

2.25 The purpose of the optical coupler is to deactivate the blocking oscillator mode of operation used for startup in the event there is a failure in the oscillator drive and/or regulating control loop. Whenever the LED in the optical isolator conducts, Q3 (B4) latches on and keeps Q7 on. In the event that the LED in the isolator loses its drive, Q7 will continue to be driven. As long as Q7 is on, blocking oscillator operation will be prevented. Zener diode CR5 is provided to permit the latch to clear whenever the rectified primary dc voltage drops below 50 volts.

### G. Primary Circuit Overcurrent Protection

2.26 Whenever there is an overcurrent condition during the pulse drive period, the voltage developed across R4 (D8) turns on Q8, Q9 and Q4 (D5). Whenever Q4 conducts, the base drive current of Q1 is shunted, effectively terminating the primary switching transistor current pulse for that cycle. Whenever the drive pulse of transformer T2 terminates, Q8, Q7 and Q4 turn off.

### H. Primary Circuit Overvoltage Protection

2.27 In the event that a transient spike occurs on the ac line that exceeds the nominal voltage range, CR6 (B6) will conduct and turn on Q2 and Q6, keeping Q1 in the nonconducting state even though base drive pulses are being generated.

### I. Output Voltage Indicator

2.28 Each dc output voltage has a divider network which senses the output level. The sensed output level is compared with a voltage

reference derived by a divided network composed of R56 and R61 (C14). The comparison is done using four comparators in ML4. If all four comparator outputs are in the high state, CR28 will be on. If any output should fail, its associated comparator will go to a low state, turning CR28 off.

## KSR OPERATOR CONSOLE

### A. Keyswitches and Sense Amplifiers

2.29 Each capacitive keyswitch is connected to a single input of a sense amplifier MLA1, MLA6 or MLB4 (F2). These sense amplifier determines the logic state applied to an input by comparing the charging time of the keyswitch connected to an input to the charging time of a reference capacitor (C2, C10 or C15). Charging current for the sense amplifiers is provided by reference resistors (R6, R27 or R3).

2.30 The keyswitch logic transmits Data Enable (DE) pulses which advance the sense amplifiers to their keyswitch input and places the keyswitches under test. When a DE pulse is received by the sense amplifiers, they will respond by transmitting two data bits if a keyswitch being sensed is depressed. Data bit 1 (1st depression) will go high when the keyswitch being sensed is first encountered as "depressed". Data bit 2 (2nd depression) will be high as long as the keyswitch continues to be depressed. This action continues until the sense amplifiers have tested all inputs (21 keyswitches). The keyswitch logic will then retransmit the 21 DE pulses plus 22 extra Data Enable pulses (while internal logic functions are being performed) and the cycle repeats.

### B. Keyswitch Logic

2.31 Once each scan, the keyswitch logic transmits a SYNC pulse to establish synchronization. The keyswitch logic will then send a series of DE pulses, one pulse per every 12 clock cycles. A test signal, End of Scan (EOS/Alarm) is provided for use as a timing reference. End of Scan is active twenty-four  $\emptyset$ 1 periods after the Sync pulse.

2.32 When a keyswitch has been sensed as "depressed", the keyswitch logic will determine if it is to be sent as a character or is to modify the code of another keyswitch (ie, CAPS LOCK, SHIFT, CTRL or REPT). If the code is to be sent, it will appear as mark-space data on the serial send data lead. The mark (high) level of Send Data and Repeat Mode (RPMD) is limited to +5 V by CR2, CR3, CR4 and R7 (F7). The code consists of 11 bits: One start bit, 8 code bits, one

parity bit and one stop bit. One bit time = 143 milliseconds.

### C. Clock Generation and Drivers

2.33 The 560 KHz clock from pin 12 of P107 (C1) is divided by 5 by MLB3. R28, R29, C11 and C12 delay appropriate edges of the 110 KHz signal and are recombined by MLB1 and MLB2 to produce nonoverlapping  $\emptyset$ 1 and  $\emptyset$ 2 pre-drive signals at pin 11 of MLB1 and MLB2. The nonoverlap time is .3 microseconds minimum to 1.2 microseconds maximum for both nonoverlaps.

2.34 The predrive signals are coupled to MLA4 by C6 and C7. R14 and R15 limit the current levels. CR8, R34 and CR9, R35 insure a proper voltage swing for the clock driver. Clock driver MLA4 is a high voltage dual inverter. R16 and R17 prevent inductive ringing of the fast transitions on  $\emptyset$ 1 and  $\emptyset$ 2.

## RO OPERATOR CONSOLE

### A. Send Data Output

2.35 Depressing the RESET key or releasing the PRINTER TEST key causes the opcon to serially transmit a four character sequence to the printer logic via the send data output pin 6. The character information is mark-space data encoded in ASCII\* or extended ASCII conforming to the following sequence of characters: LOCAL, CARRIAGE RETURN (CR), LINE FEED (LF) and AUTO ANSWER.

2.36 Each transmitted character consists of a start bit followed by nine bits of information defined as bits "0" through "8" and ending with a stop bit. The opcon inserts three additional stop time intervals between each transmitted character. The data is transmitted at a 7 kilobits per second rate at TTL signal levels whereby a high is defined as a mark and a low is a space.

2.37 The four-character mark-space sequence is stored in the opcon ROM whereby the total number of bits serially transmitted is 53 over a time interval of approximately 7.6 milliseconds. Internal opcon control signals are also stored in the ROM.

### B. Start Control

2.38 The RESET keyswitch, when depressed, initiates the start sequence. Its signal is gated with the one-shot, MLA1-7 (F4) to eliminate noise spikes due to contact bounce, thus providing a clean signal to set the start latch to the "1" state.

\*American National Standard Code for Information Interchange

2.39 The PRINTER TEST keyswitch, when depressed, applies a ground signal to the printer logic causing the printer to print out a test message. Upon the release of the PRINTER TEST keyswitch, the one-shot MLA1-9 (D3) is triggered presenting a low signal for approximately 12 milliseconds to gate input MLA2-12. This signal is used to set the start latch to the "1" state.

#### C. Start Latch

2.40 The start latch (E7), when in the set "1" state, removes the "MR" signal from the address counters MLB2 and MLB3 (F9) and the divide by 8 frequency counter. At this time, the output of the latch MLA3-6 goes high, the gate MLA3-11 is enabled, and its output goes low, removing the reset (R0 and R9) on the decade counter, MLA4.

#### D. Clock Divider

2.41 The input to the decade counter is a 560 KHz square wave free running clock signal from the printer logic card. With the decade counter enabled, the input clock is divided by 10 and its output drives the second counter stage which is enabled by a low on the master reset (MR) input. The output of the second stage is a 7 KHz square wave signal that drives an address counter.

#### E. Address Counter

2.42 The address counter consists of two four-bit counters, MLB2 and MLB3. The address counter in turn drives the ROM address inputs. In the reset or idle state, the address counter is at count 0, all outputs low (0 V). With

the clock logic enabled, the address counter is advanced at a 7 KHz rate and proceeds to count up until a count of 54 is reached.

#### F. ROM — Stored Data

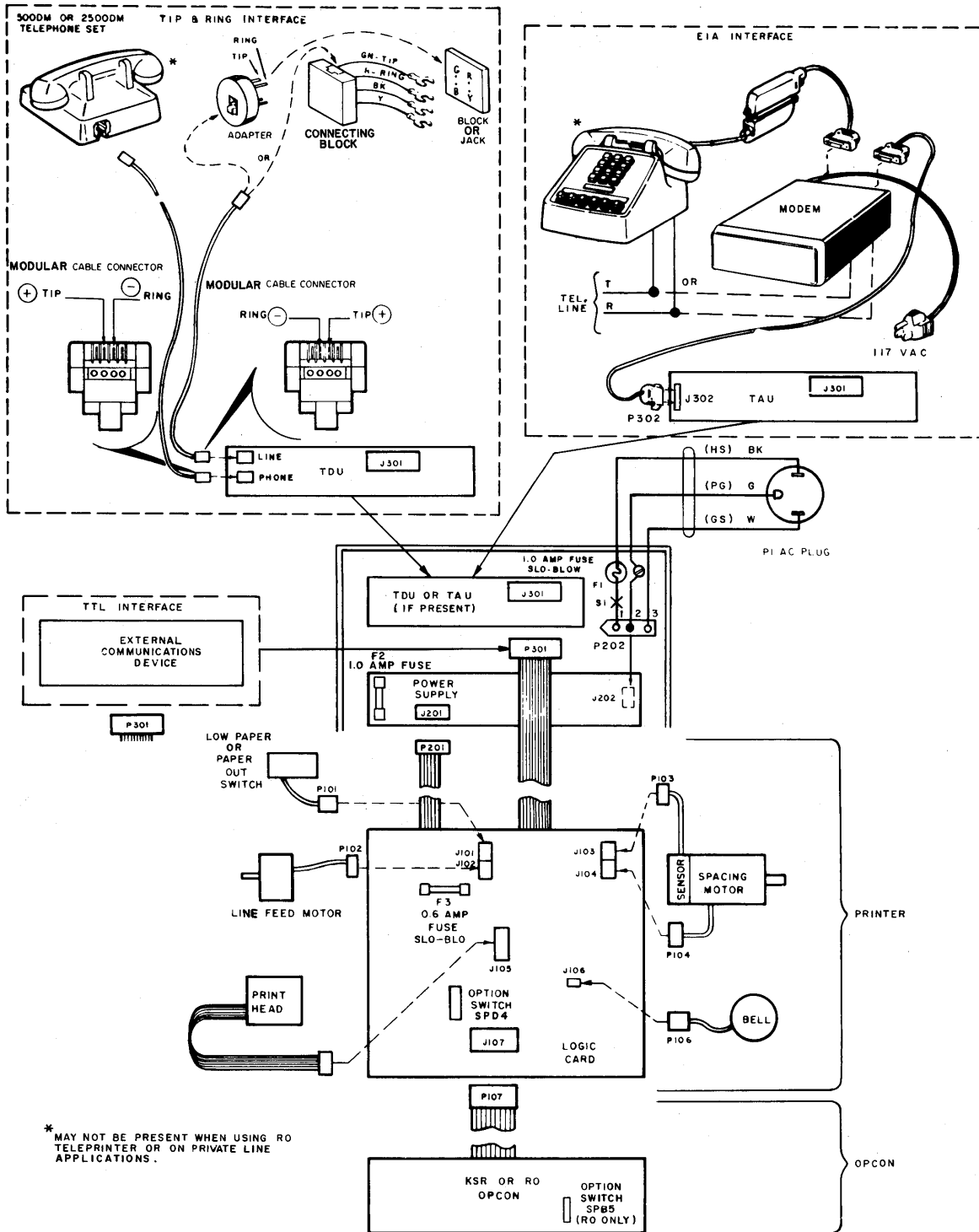
2.43 As the address counter is advanced, bit information that is stored in level 2 of the ROM (F10) is serially shifted out via pin 11 at a 7 KHz rate to the printer logic.

2.44 When address count 54 is reached, the level 1 output of the ROM goes to 0 V causing gate MLA3-11 to go high. The high signal from gate MLA3-11 resets the decode counter via pins 2 and 6 thereby inhibiting its output, stopping the address counter at count 54. The address counter remains at count 54 until the RESET key is released at which time the start latch is reset to the 0 state. This causes MLA3-8 to go high resetting the address counter to count 0. The send data lead is always marking during the idle state and after the four-character sequence has been transmitted.

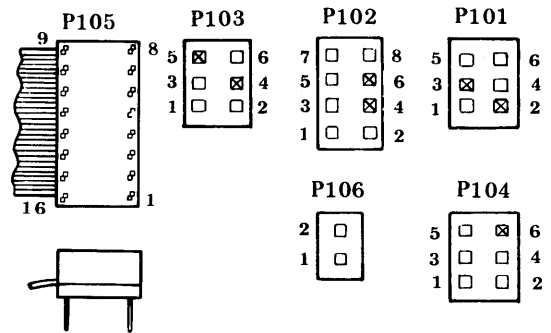
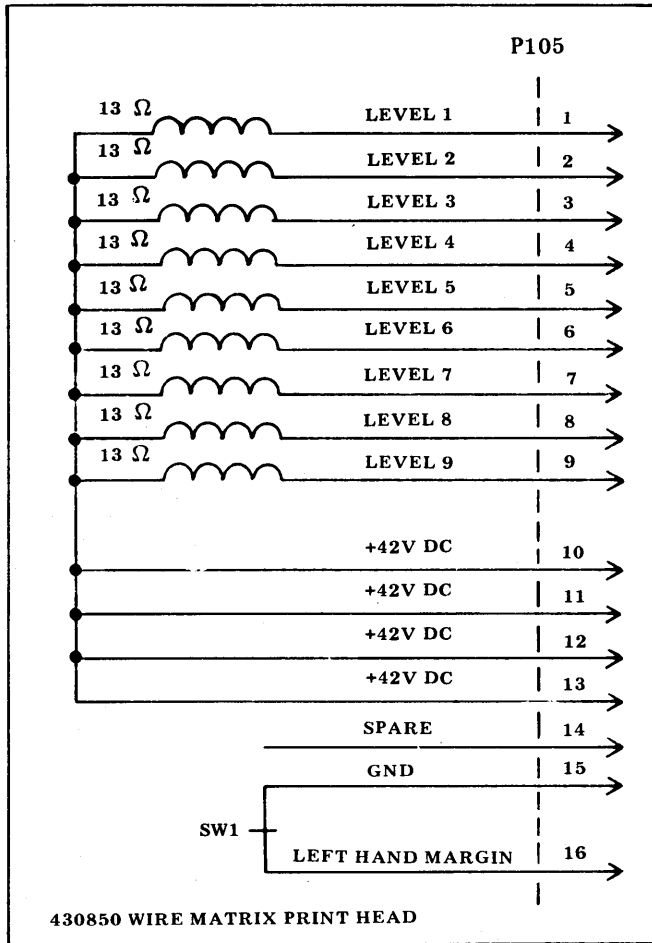
2.45 ROM level 3, pin 10, is connected to MLA2, pin 10. This control input prevents premature resetting of the start latch once the four-character sequence has been started. When the address counter steps from count 0 to 1, the ROM level 3 output goes from a high to a low keeping a high on gate output MLA2-8. When count 54 is reached, level 3 output goes high and if the gate input MLA2-9 is high at this time, the start latch will be reset. If the gate input is low, the start latch will not be reset until the RESET keyswitch is released or the one-shot MLA1-9 times out. It takes approximately 7.6 milliseconds to send the four-character sequence.

3. CIRCUIT DIAGRAMS

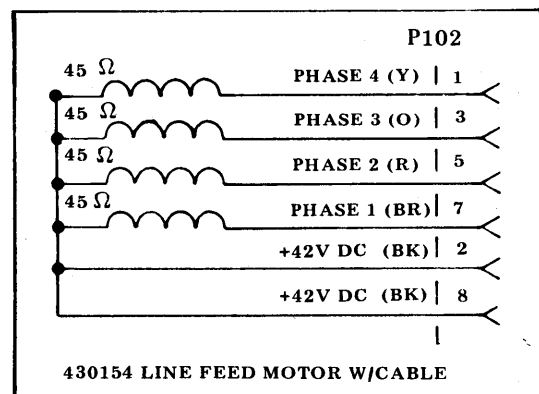
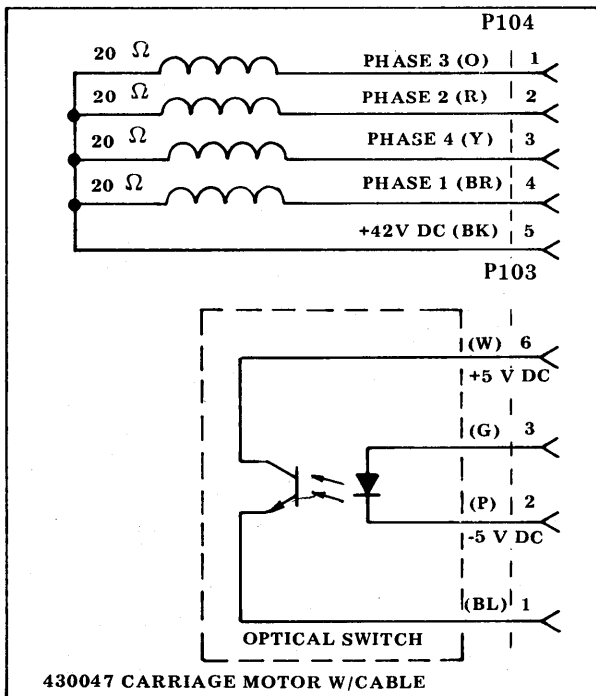
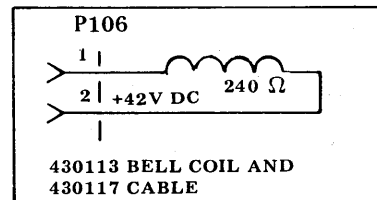
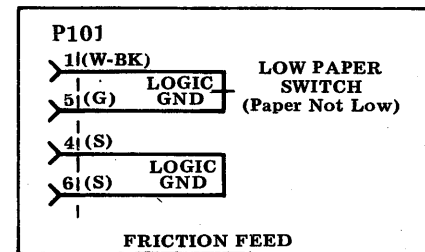
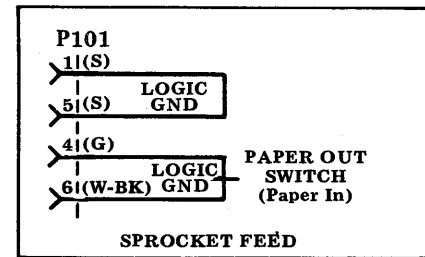
STATION BLOCK DIAGRAM AND INTERFACING



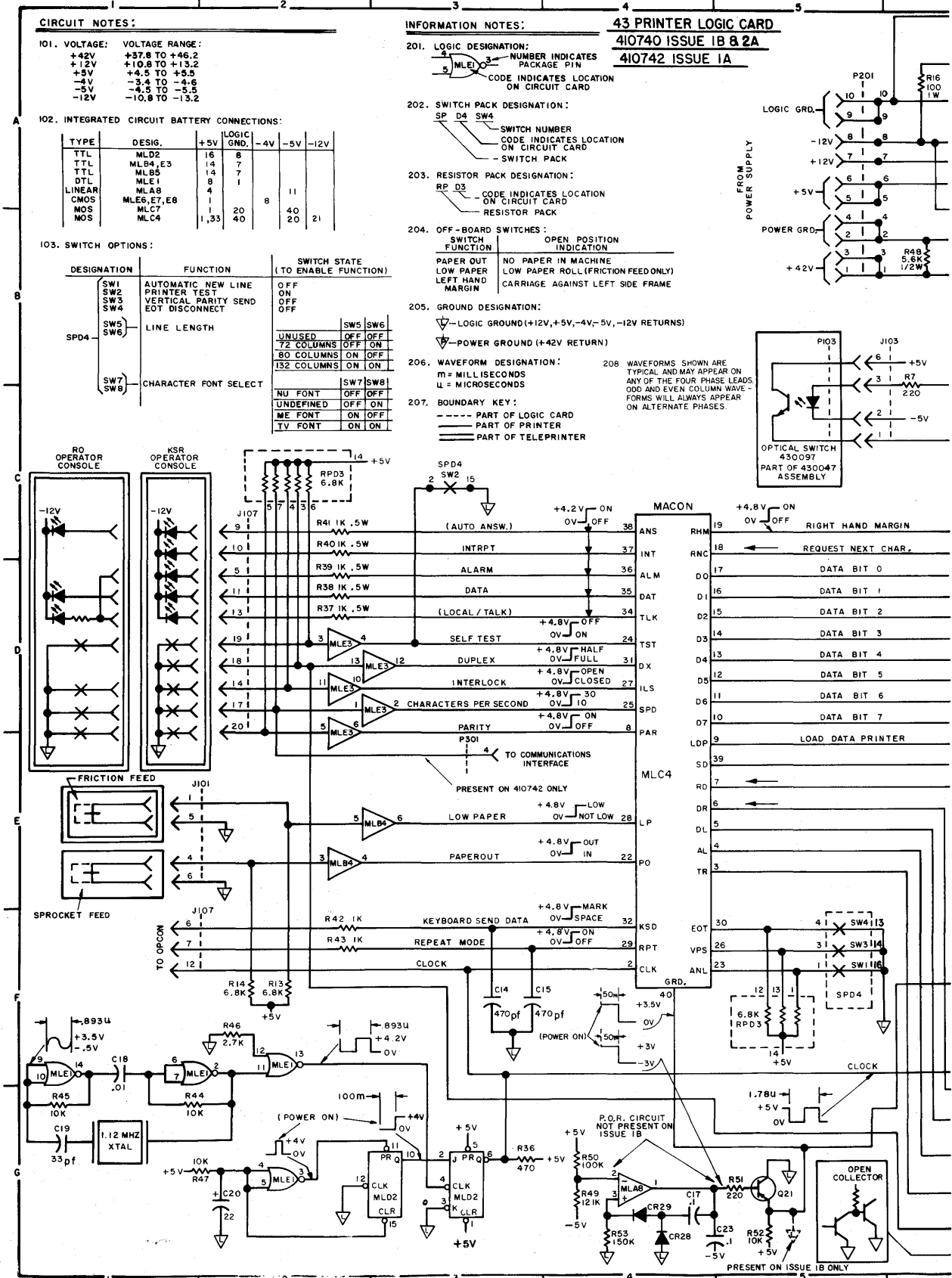
PRINTER



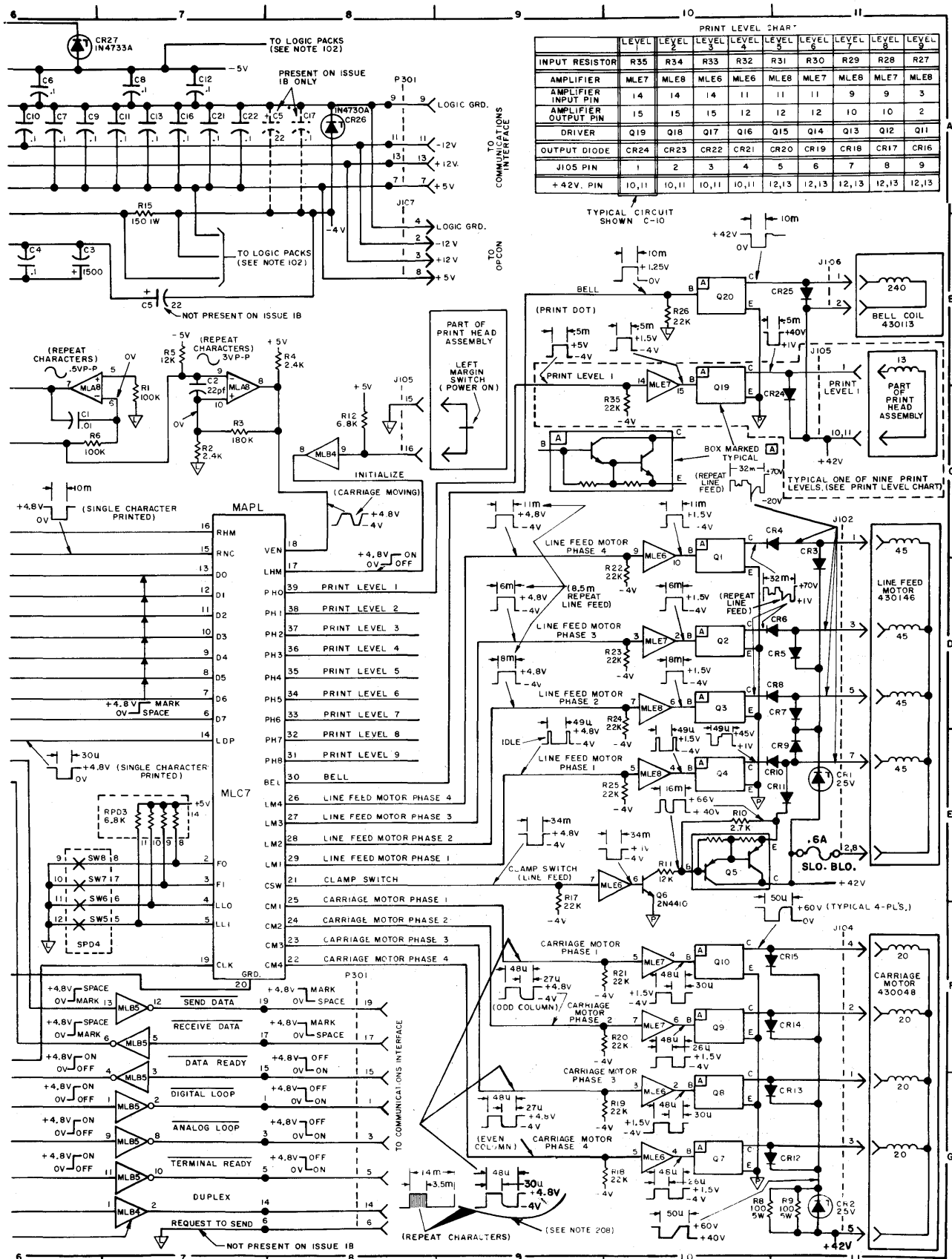
FRONT VIEW



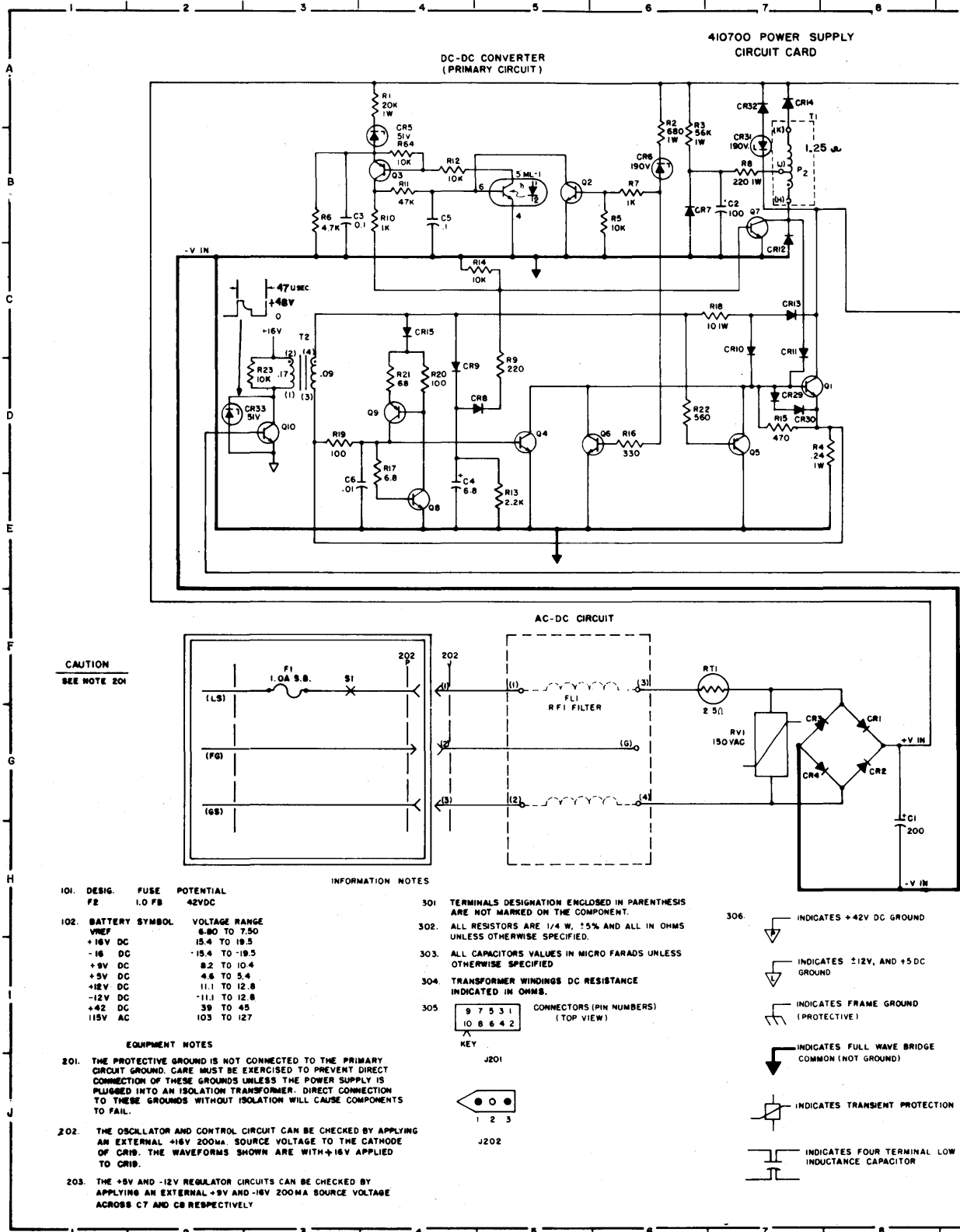
PRINTER LOGIC CARD

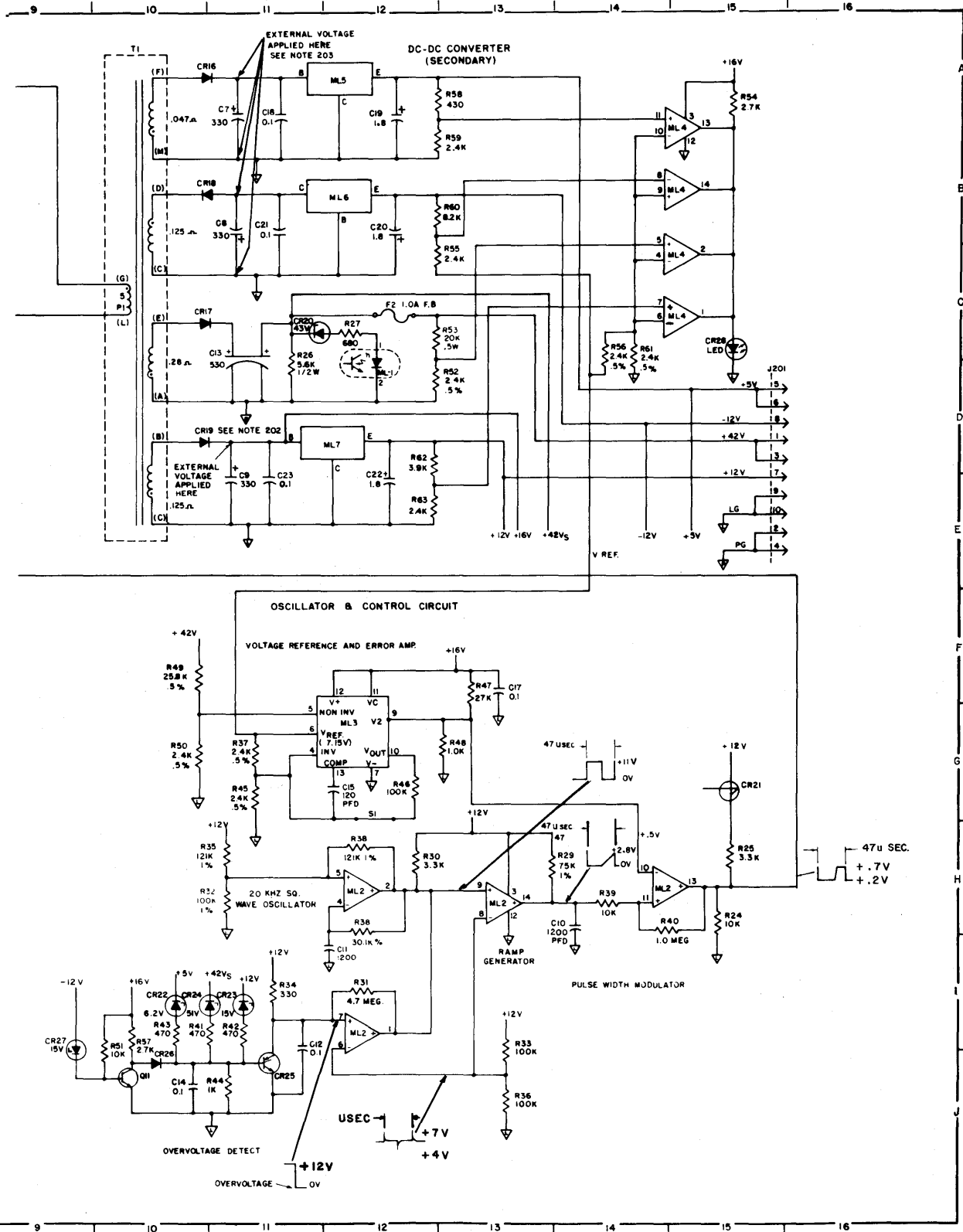




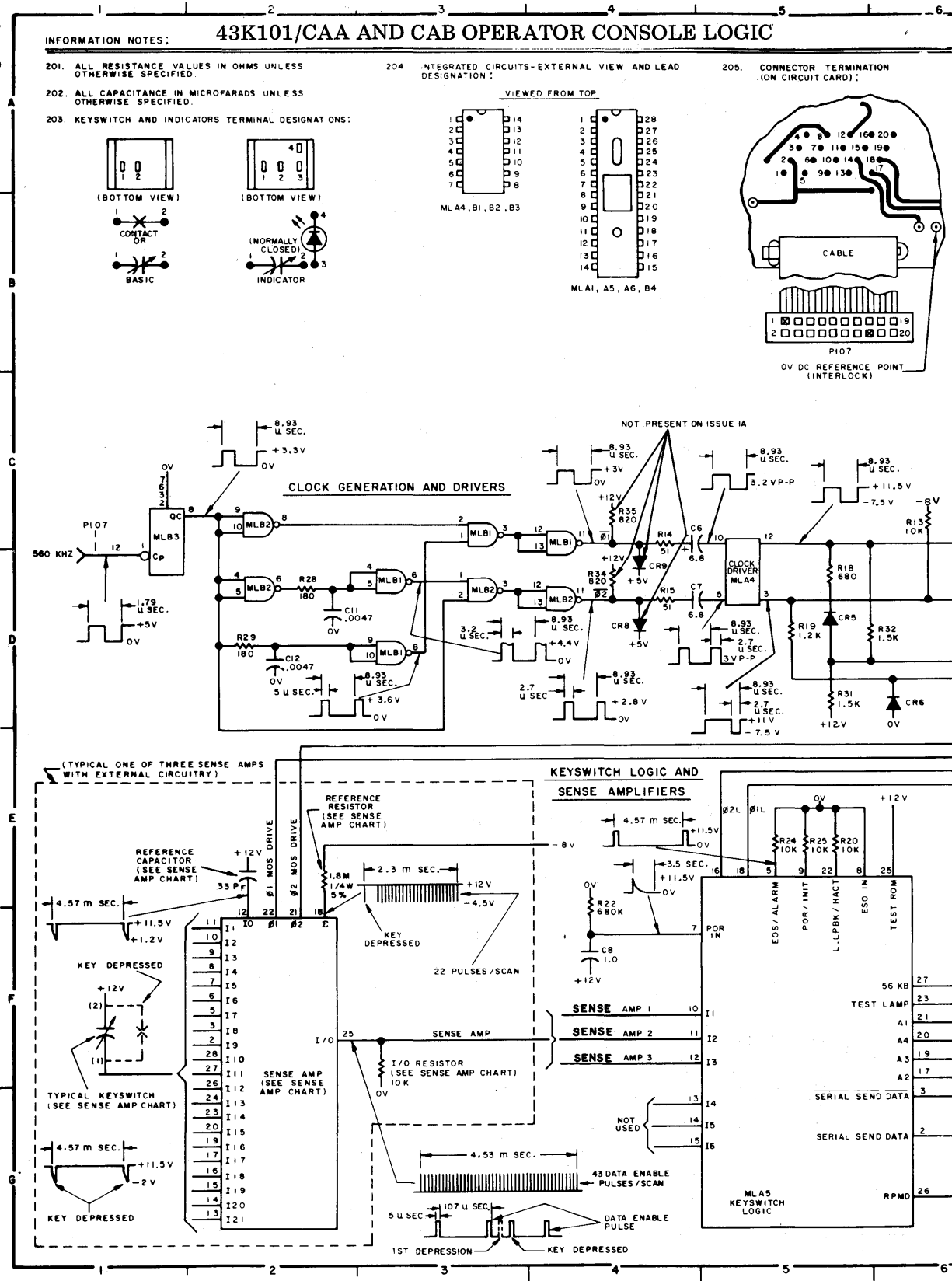


POWER SUPPLY



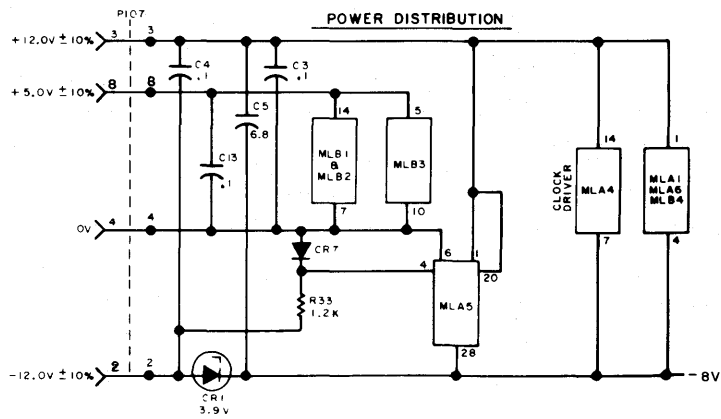
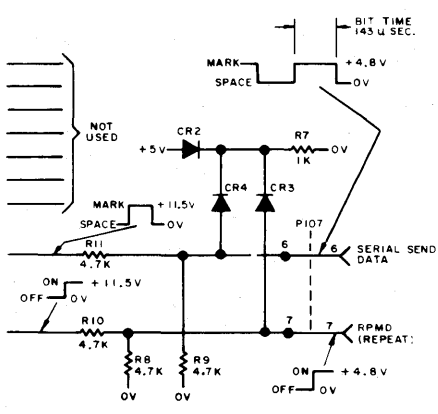
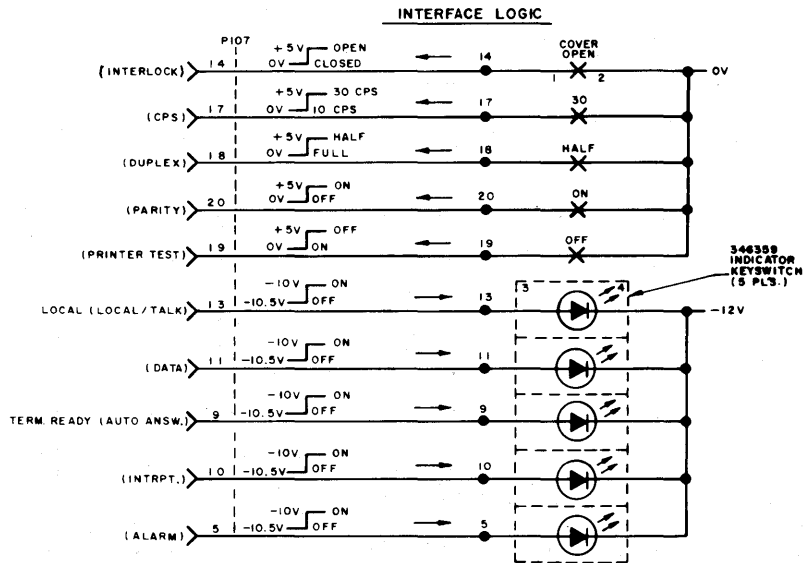
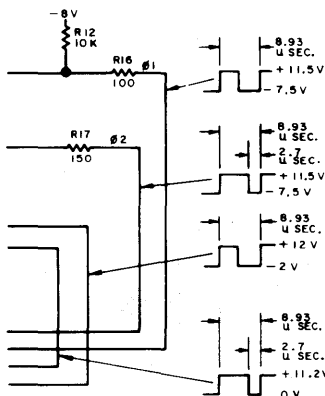


KSR OPERATOR CONSOLE



206. SENSE AMP CHART :

SENSE AMP PIN NO.	SENSE AMP 1 (MLA6)	SENSE AMP 2 (MLB4)	SENSE AMP 3 (MLA1)
KEYTOP CHARACTER			
11	SHIFT (RIGHT)	CONTROL	SHIFT (LEFT)
10	/	K	S
9	.	U	Z
8	/	S	O
7	;	R	Q
6	'	F	A
5	BACK SPACE	SPACE	W
3	L	V	I
2	O	C	X
28	-	B	LOCAL (LOCAL TALK)
27	O (ZERO)	G	(DATA)
26	P	T	TERM. READY (AUTO. ANSW.)
24	+	G	ESCAPE
23	=	N	(OPT. SPARE)
20	RETURN	H	(INTRPT.)
19	(	Y	3
17	\	7	E
16	DELETE	M	D
15	LINE FEED	J	4
14	8	9	7
13	\	REPEAT	CAPS LOCK
REFERENCE RESISTOR			
18	R27	R30	R6
I/O RESISTOR			
25	R26	R21	R22
KEYSWITCH LOGIC (MLA5) INPUT PIN NO.			
10			12
REFERENCE CAPACITOR			
12	C10	C15	C2



RO OPERATOR CONSOLE

43K001/AAA OPERATOR CONSOLE LOGIC

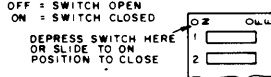
CIRCUIT NOTES:

101. VOLTAGE VOLTAGE RANGE  
 +5V +4.5 TO 5.5  
 -12V -10.8 TO -13.2

102. INTEGRATED CIRCUITS POWER CONNECTIONS:

TYPE	DESIGN	+5V	LOGIC GRD
TTL (LS)	MLA2, A3	14	7
TTL (LS)	MLB1, B2, B3	16	8
TTL	MLA1	16	8
TTL	MLA4	5	10
ROM (BIPOLAR)	MLB4	16	8

103. SWITCH OPTIONS:

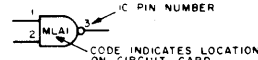


- (a) PARITY OPTION  
 \* SW-1 OFF (OPEN) PARITY DETECT ON EVEN ON (CLOSED) PARITY DETECT OFF
- (b) SPEED SELECT  
 \* SW-2 OFF (OPEN) 30 CHAR. PER SECOND ON (CLOSED) 10 CHAR. PER SECOND  
 \* FACTORY FURNISHED STATE

INFORMATION NOTES:

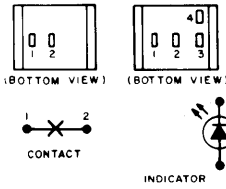
201. ALL RESISTORS 1/4 WATT AND VALUES IN OHMS UNLESS OTHERWISE SPECIFIED. ALL CAPACITORS VALUES IN MICROFARADS.

202. LOGIC DESIGNATION:



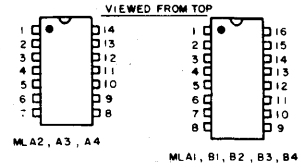
203. SWITCH PACK DESIGNATION:  
 SWITCH PACK LOCATION SWITCH NO.  
 SP B5 SW1

204. KEYSWITCH AND INDICATORS TERMINAL DESIGNATIONS:



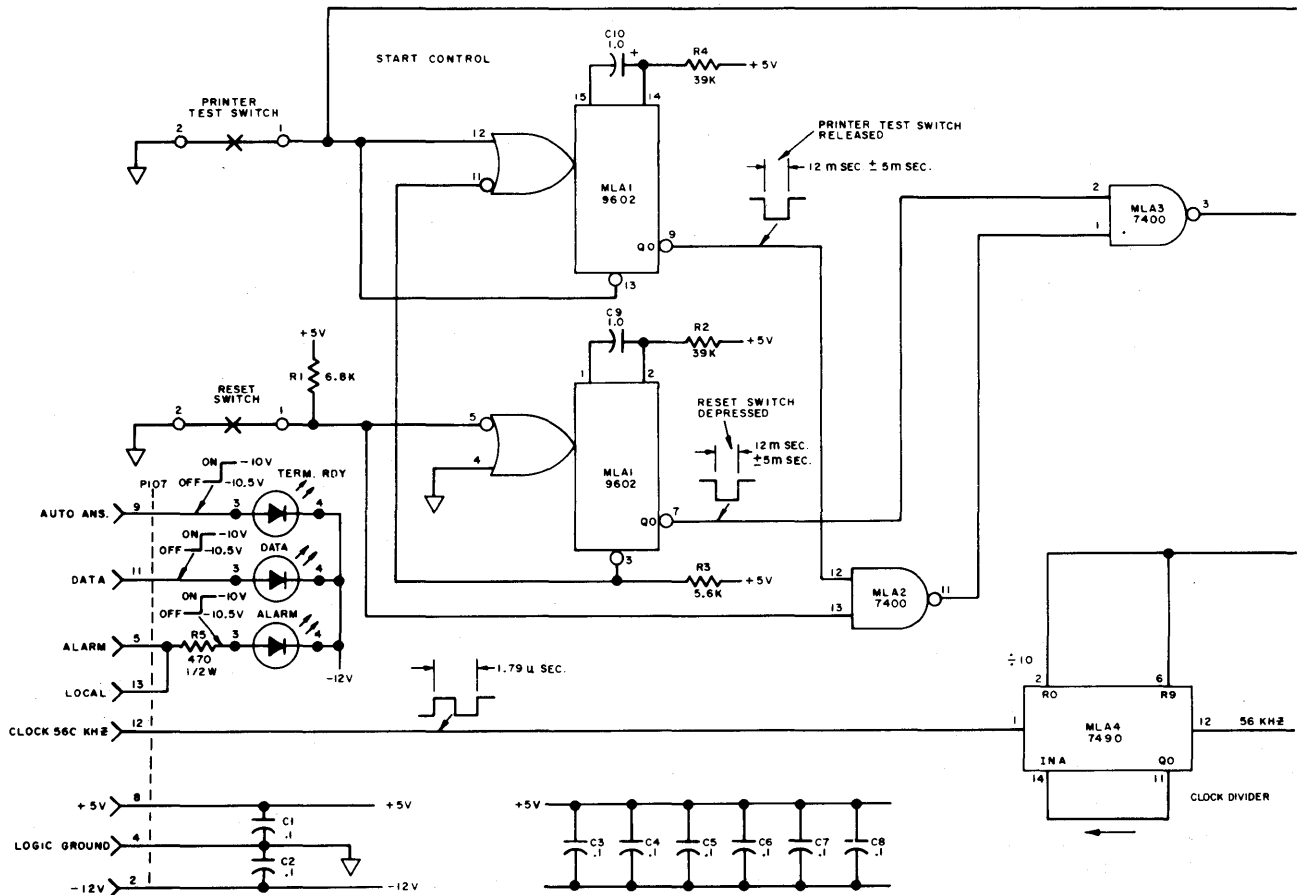
INFORMATION NOTES CONT.

205. INTEGRATED CIRCUITS- EXTERNAL VIEW AND LEAD DESIGNATION:



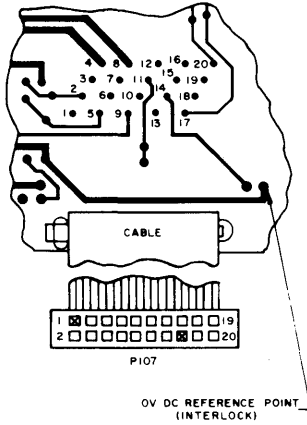
206. CONNECTOR INFORMATION PI07 (FEMALE PLUG):

PIN NO.	DESIGNATION	INPUT	OUTPUT
2	KEY POSITION	X	
3	-12V		
4	LOGIC GROUND	X	
5	ALARM	X	
6	SEND DATA	X	
7	REPEAT		X
8	+5V		X
9	AUTO ANSWER	X	
10			
11	DATA	X	
12	CLOCK	X	
13	LOCAL	X	
14	INTERLOCK	X	
15			
16	KEY POSITION		X
17	CHARACTERS PER SECOND		X
18			
19	PRINTER TEST		X
20	PARITY		X



INFORMATION NOTES CONT.

207. CONNECTOR TERMINATION (ON CIRCUIT CARD):



INFORMATION NOTES CONT.

208. MLB4 ROM ENCODING TABLE:

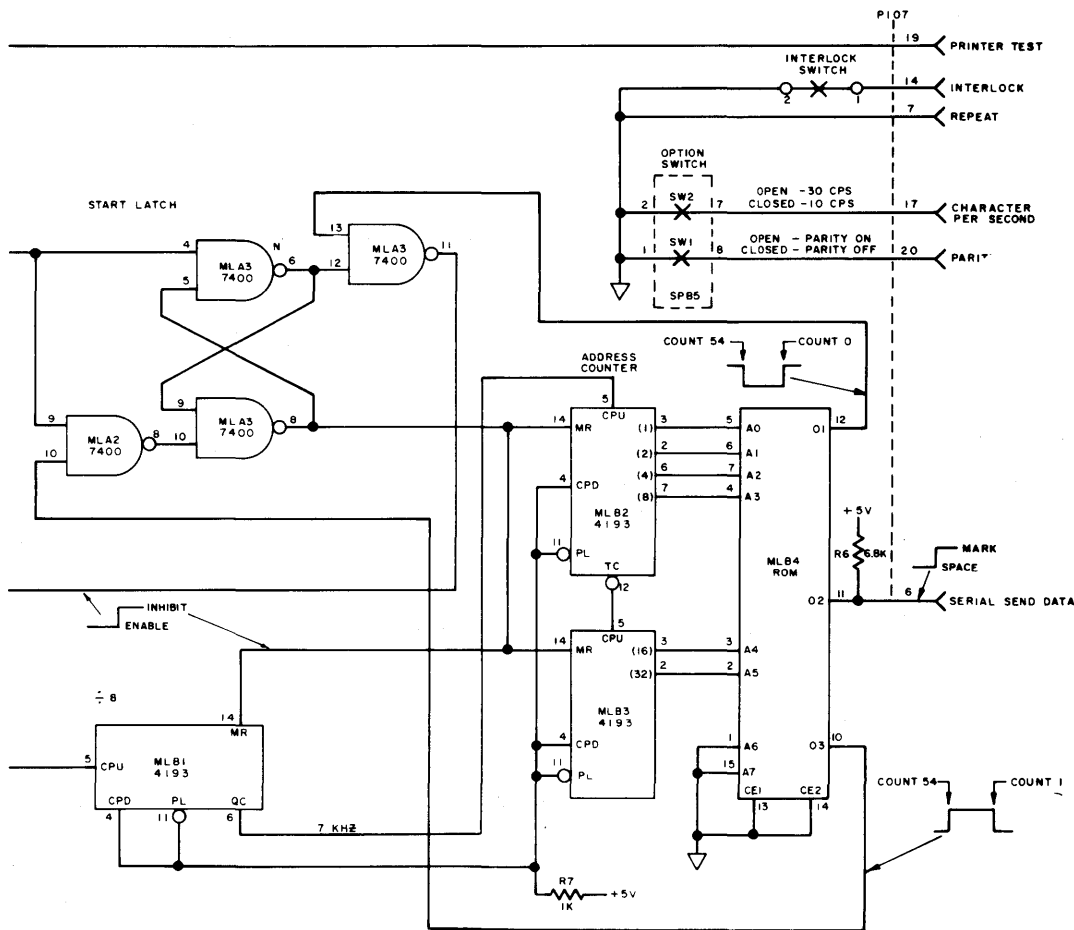
ADDRESS COUNT	OUTPUT 432I	ADDRESS COUNT	OUTPUT 432I	ADDRESS COUNT	OUTPUT 432I
0	0111	19	0011	38	0001
1	0001	20	0001	39	0011
2	0001	21	0001	40	0011
3	0001	22	0001	41	0011
4	0001	23	0001	42	0011
5	0001	24	0011	43	0001
6	0001	25	0011	44	0001
7	0001	26	0011	45	0011
8	0001	27	0011	46	0001
9	0011	28	0011	47	0001
10	0011	29	0001	48	0001
11	0011	30	0001	49	0001
12	0011	31	0011	50	0001
13	0011	32	0001	51	0011
14	0011	33	0011	52	0001
15	0001	34	0001	53	0011
16	0011	35	0001	54	0110
17	0001	36	0001		
18	0011	37	0001		

0 = LO  
1 = HI

209. SERIAL SEND DATA BITS:

CHARACTER	0	1	2	3	4	5	6	7	8
LOCAL	0	0	0	0	0	0	0	1	1
CARRIAGE RETURN	1	0	1	1	0	0	0	0	1
LINE FEED	0	1	0	1	0	0	0	0	0
AUTO. ANS.	0	1	0	0	0	0	0	1	0

0 = SPACE  
1 = MARK



## PART 5 — ADJUSTMENTS AND SPRING TENSIONS

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2. TOOLS REQUIRED .....	2	PRINT HEAD ARMATURE .....	9
3. PRINTER ADJUSTMENTS .....	2	4. ENCLOSURES AND PAPER HANDLING .....	10
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LEFT AND RIGHT PAPER GUIDES (Angular Positioning) (Friction Feed Only) .....	3	1. GENERAL	
LINE FEED BELT TENSION (Sprocket Feed Only) .....	4	1.01 This part provides adjustments for the printer, enclosures, paper handling and spring tensions.	
PRINT HEAD TO PLATEN .....	4	1.02 Belt tensions are checked with a spring scale held at the angle shown in the adjust- ment illustration.	
RIBBON CARTRIDGE MAGNETIC LATCH .....	5	1.03 After an adjustment is completed, tighten any screws or nuts loosened to make the adjustment.	
LINE FEED FOLLOWER PULLEY STOP BRACKET .....	5	1.04 Reference in the procedure to left or right and up or down and top or bottom, etc, refer to the printer in its normal operating position.	
LEFT HAND MARGIN (Friction Feed Only) .....	6	1.05 Adjustments should be checked and per- formed when a trouble indicates a specific adjustment may be out of tolerance or when an adjustment is disturbed to enable a part to be removed or replaced.	
PRESSURE ROLLER BAIL (Friction Feed Only) .....	6	1.06 Spring tension checks should be performed when a trouble indicates a possible defec- tive spring or to verify proper part numbers.	
PAPER GUIDE PLATE CLEARANCE (Sprocket Feed Only) .....	7	1.07 Springs that do not meet the tension requirements should be replaced.	
PAPER ALARM CONTACT LEVER (Sprocket Feed Only) .....	7		



2. TOOLS REQUIRED

2.01 The following tools may be required when performing adjustments or spring tension checks. Most of these items should normally be present in standard maintenance tool kits.

Tools

Bit, 1/4 Inch Socket	135677
Bit, 5/16 Inch Socket	135678
Gauge Set	117781
Gauge, Tape	95960
Handle	135676
Hook, Pull Spring	75765
Hook, Pull Spring	142554
Hook, Push Spring	142555
Scale, Spring (64 Ounce)	82711
Scale, Spring (8 Ounce)	110443
Scale, Spring (32 Ounce)	110444
Scale, 15 Pound Spring	135059
Screwdriver, 3-1/2 Inch Blade	94647
Screwdriver	95368
Screwdriver With Clip	100982
Tweezers	151392
Wrench, Hex Key	124682
Wrench, 3/16 Inch Socket	125752
Wrench, 3/16 Inch and 1/4 Inch Open End	129534
Wrench, 5/16 Inch and 3/8 Inch Open End	152835

3. PRINTER ADJUSTMENTS

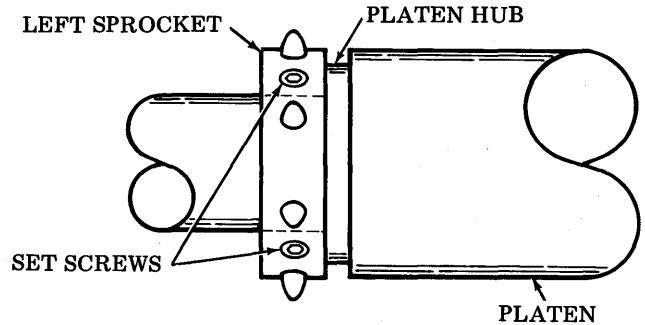
LEFT PAPER SPROCKET (Sprocket Feed Only)

Requirement

The left sprocket should be biased against the collar of the platen hub.

To Adjust

Loosen set screws and position left sprocket to meet requirement.



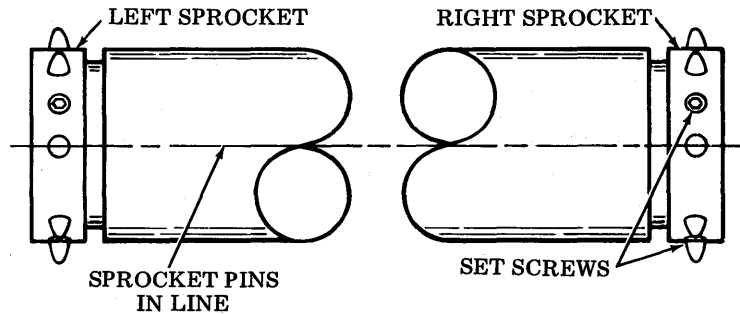
RIGHT PAPER SPROCKET (Sprocket Feed Only)

Requirement

The right sprocket should be biased against the collar of the platen hub and the pins should be in line with the pins of the left sprocket.

To Adjust

Loosen set screws and position right sprocket to meet requirement.



*Note:* This adjustment to be refined when making the PRINTED LINE POSITION adjustment.

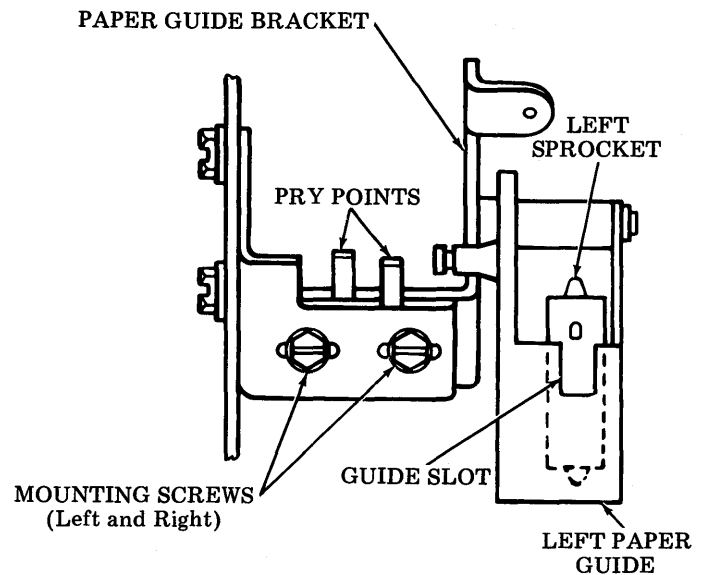
**LEFT AND RIGHT PAPER GUIDES**  
(Horizontal Positioning) (Sprocket Feed Only)

**Requirement**

There should be some clearance between the base of the sprocket pins and either side of the paper guide slot.

**To Adjust**

Loosen screws friction tight and position paper guide bracket by using a screwdriver on the pry points.



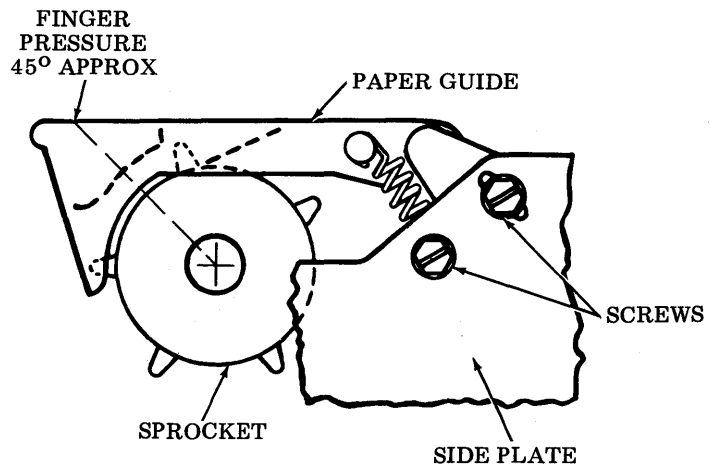
**LEFT AND RIGHT PAPER GUIDES**  
(Angular Positioning) (Sprocket Feed Only)

**Requirement**

The paper guides should seat fully on the paper sprockets (left and right sides).

**To Adjust**

Loosen screws. To seat the paper guides, apply finger pressure to top of paper guides at 45 degrees and toward center of platen. With finger pressure applied at approximately 45 degrees; tighten screws.



**LEFT AND RIGHT PAPER GUIDES**  
(Angular Positioning) (Friction Feed Only)

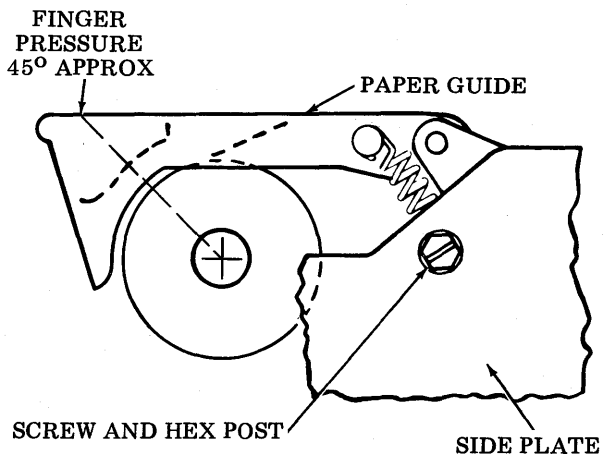
**Requirement**

The left paper guide should seat fully on the hub. The right paper guide should also be fully seated against the hub and the center paper guide should just touch the platen in the middle.

**To Adjust**

On left side, loosen the two mounting screws friction tight and move the left paper guide mounting bracket to meet the adjustment. With finger pressure applied, tighten screws.

On right side, loosen one mounting screw and with an open end wrench applied to the hex post, rotate bracket until adjustment is met. While holding the post, retighten the screw.



3. PRINTER ADJUSTMENTS (Cont)

LINE FEED BELT TENSION (Sprocket Feed Only)

Note: This adjustment applies to Sprocket Feed (Early Design) only, without follower pulley.

Requirement

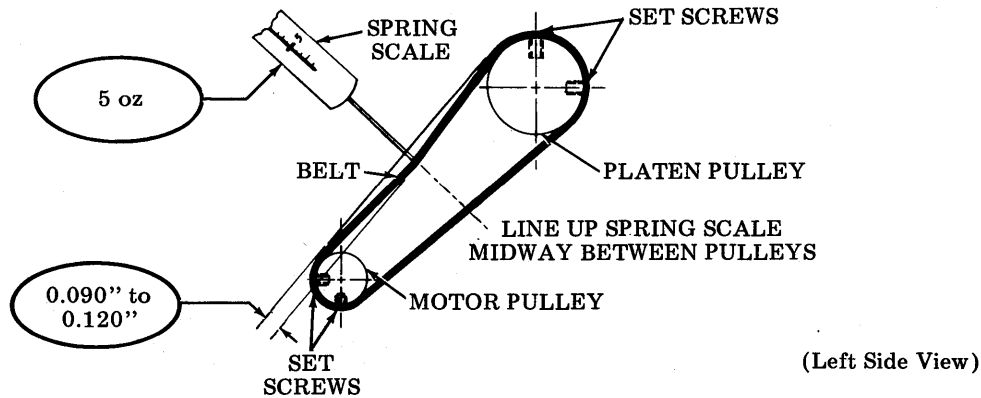
When the belt and sprocket system is at the point of least slack; a force of 5 ounces applied with a spring scale midway between the sprockets the belt should deflect between

Min 0.090 inch--Max 0.120 inch

The point of least slack is the point where the set screws on the platen pulley and those on the motor pulley are set as shown below.

To Adjust

Rotate the platen until the set screws on the platen pulley and the set screws on the motor pulley are aligned as shown below. Loosen motor screws, position motor to meet requirement at the point of least slack. Tighten screws.



PRINT HEAD TO PLATEN

Requirement

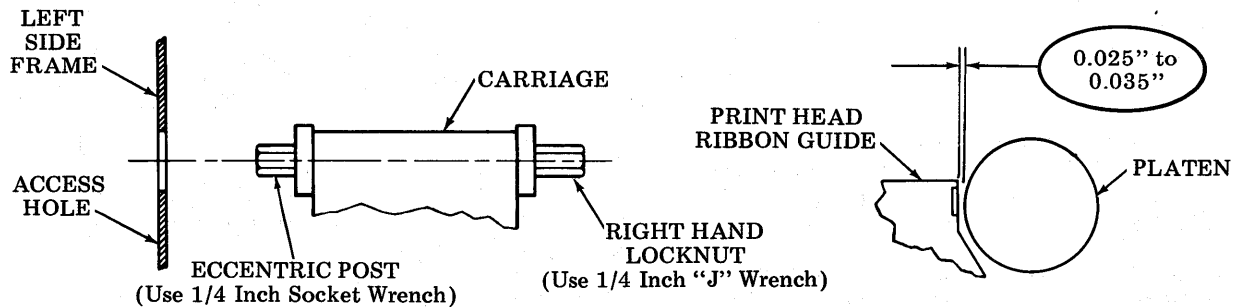
There should be

Min 0.025 inch--Max 0.035 inch

gap between the ribbon guide of the print head and the platen (without paper or ribbon) and at all positions of the carriage and platen, when platen play at the right end is biased down and to the rear and the print head is locked.

To Adjust

Position carriage to the extreme left position. Unlock locking handle, use 1/4 inch "J" wrench to loosen right-hand locknut and with carriage biased rearward, insert 1/4 inch socket wrench through access hole in left side frame and rotate eccentric post to adjust. Tighten locknut. Check adjustment with carriage locked. Check adjustment on extreme right end of platen, while biasing platen down and to the rear. Refine adjustment, if necessary.



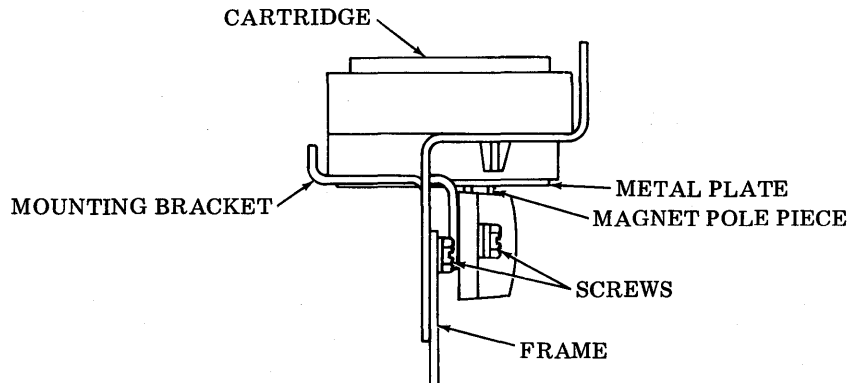
RIBBON CARTRIDGE MAGNETIC LATCH

Requirement

The magnetic pole pieces of the magnetic latch should be firmly engaged with the cartridge lower metal plate when the cartridge is installed in the right-hand cartridge mounting bracket.

To Adjust

Loosen the two magnetic latch mounting screws. Install cartridge onto the mounting bracket. While holding the cartridge down firmly, allow the magnetic latch to fully engage the lower metal plate of the cartridge. Tighten the latch mounting screws.



LINE FEED FOLLOWER PULLEY STOP BRACKET

Note: For units with line feed pulleys only.

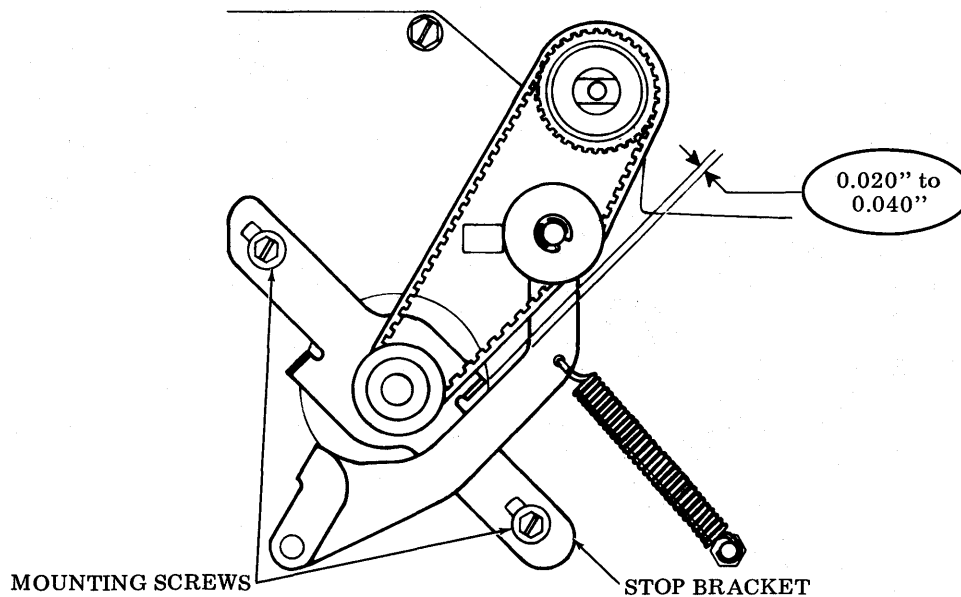
Requirement

With the follower pulley resting on the belt, push the pulley against the belt to take up all friction. Slowly release pressure. Measuring between the follower lever and the adjacent tab of the stop bracket there should be

Min 0.020 inch--Max 0.040 inch gap between them.

To Adjust

Loosen the two mounting screws on the stop bracket to friction tight and move bracket to meet the adjustment.



3. PRINTER ADJUSTMENTS (Cont)

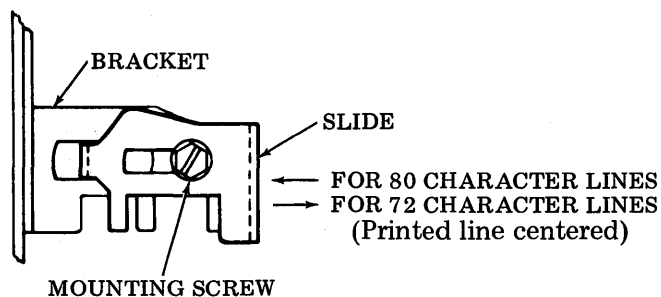
LEFT HAND MARGIN (Friction Feed Only)

Requirement

When the variable feature switch arrangement on the printer logic card has been enabled for 80 character lines, the slide should be located all the way to the left. When the switch arrangement has been enabled for 72 character lines and printed line centering (Option 432d) is required, then the slide must be located all the way to the right.

To Adjust

Loosen the single mounting screw holding the slide to the bracket and move the slide to meet the adjustment.



PRESSURE ROLLER BAIL (Friction Feed Only)

Requirement

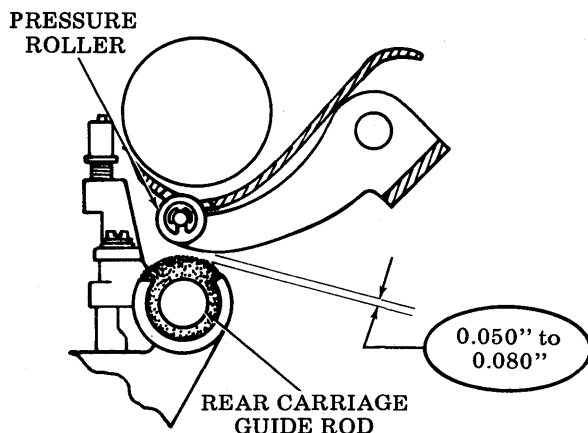
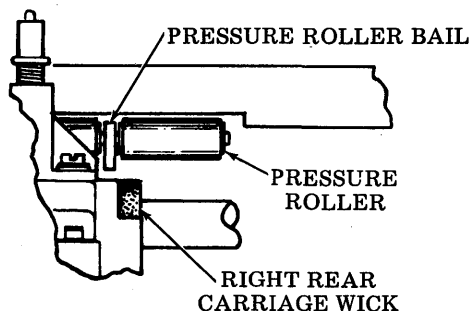
With the paper release lever in the forward position and the right end of the carriage next to the right rear carriage wick located immediately under the arm of the pressure roller bail (between the two pressure rollers) there should be from

Min 0.050 inch--Max 0.080 inch

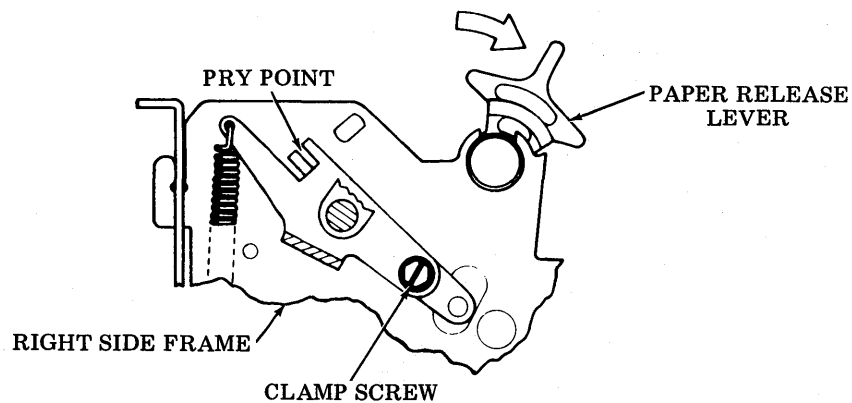
gap between the carriage and the bail arm when measured at the closest point.

To Adjust

Loosen the clamp screw to friction tight. Move pry point down to increase gap or up to decrease gap.



(Right Side View)



PAPER GUIDE PLATE CLEARANCE (Sprocket Feed Only)

*Note:* For sprocket feed (Early Design) with metal paper guide only.

(1) Requirement

With no sprocket forms in the platen mechanism and the platen oriented with the slot, or rib, on the right platen hub in the top uppermost position there should be

Min 0.008 inch--Max 0.025 inch between the platen and the left and right ends of the paper guideplate. Record the two clearances.

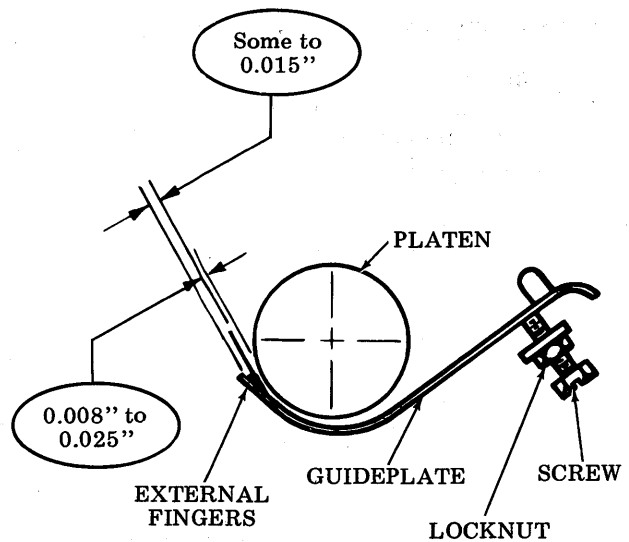
To Adjust

Loosen locknut and adjust screw. Tighten locknut.

(2) Requirement

The fingers at both the left and right ends of the platen should be

Min Some--Max 0.015 inch beyond the recorded gap between the platen and the left and right ends of the paper guideplate.



To Adjust

Bend fingers to meet requirement.

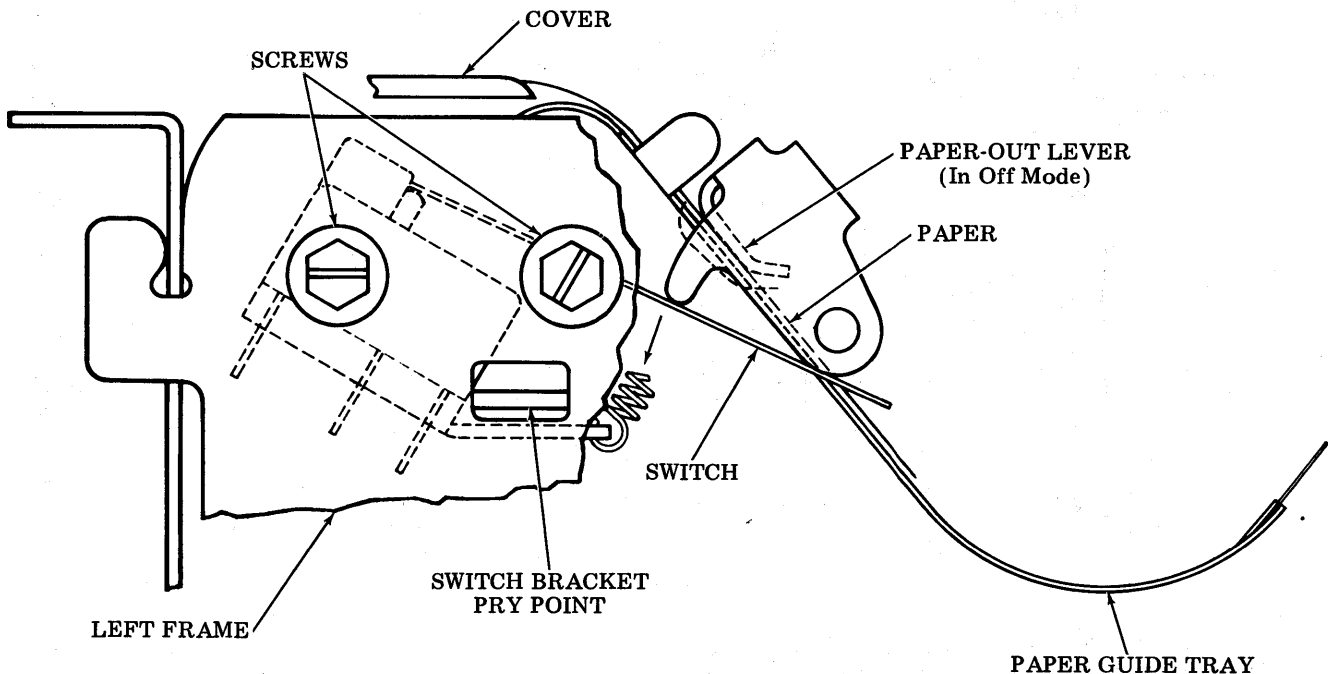
PAPER ALARM CONTACT LEVER (Sprocket Feed Only)

Requirement

With the paper alarm contact lever resting on the paper and the paper held taut over the cutout in the paper guide tray, the switch will be in the off mode (nonalarm). With the paper out, the lever should activate the switch (alarm mode).

To Adjust

Loosen screws and position switch bracket to meet requirement.



(Left Side View)

3. PRINTER ADJUSTMENTS (Cont)

PLATEN ENDPLAY AND PRINTED LINE POSITION

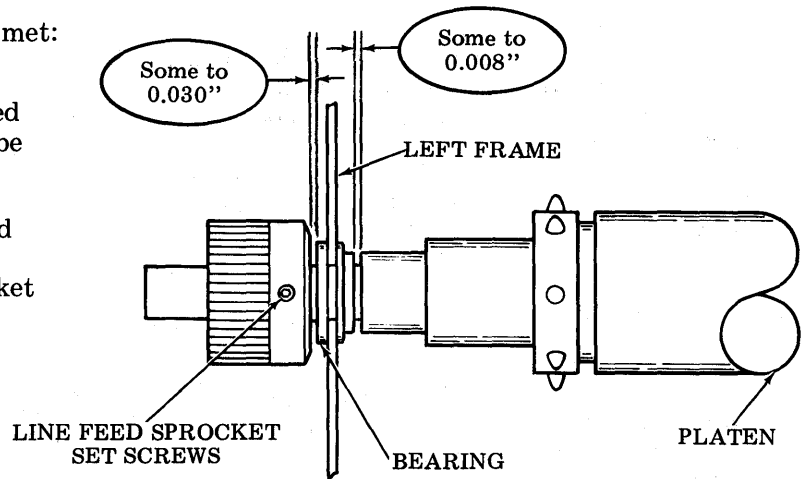
The following two requirements must be met:

(1) Requirement

Platen Endplay — With the platen biased against the right bearing, there should be

Min Some--Max 0.008 inch clearance between the left bearing and the platen hub, at the closest point, and

Min Some--Max 0.030 between the left bearing and the sprocket at the closest point.

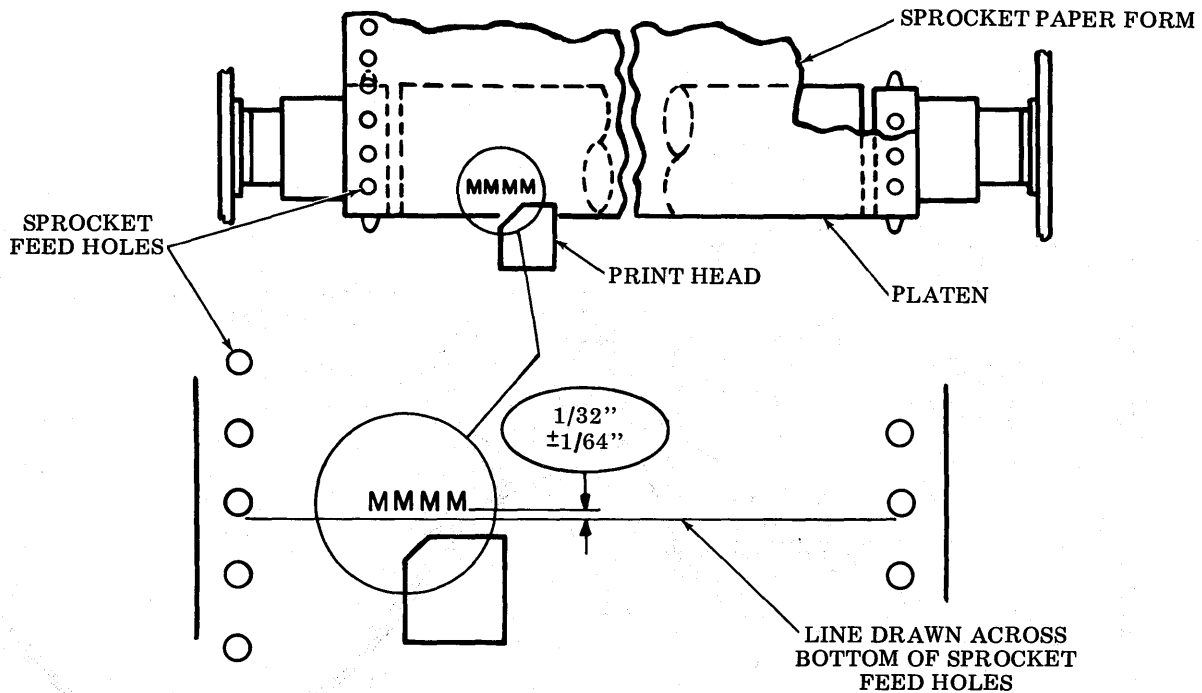


(2) Requirement (Sprocket Feed Only)

Printed Line Position — The lower edge of a typed line of M characters should be  $1/32 \pm 1/64$  inch above a horizontal line located by any of the following methods:

1. A line drawn between the lower edges of two opposite sprocket holes.
2. A preprinted line on the form the same as in 1. above or in  $1/6$  inch multiples.
3. A fold midway between two sprocket holes on fanfold paper.

(Power must be on line feed motor for this adjustment.)

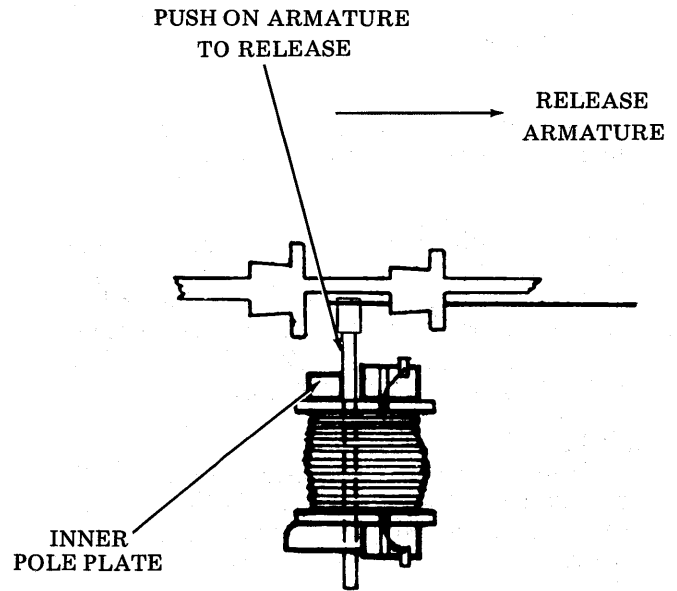
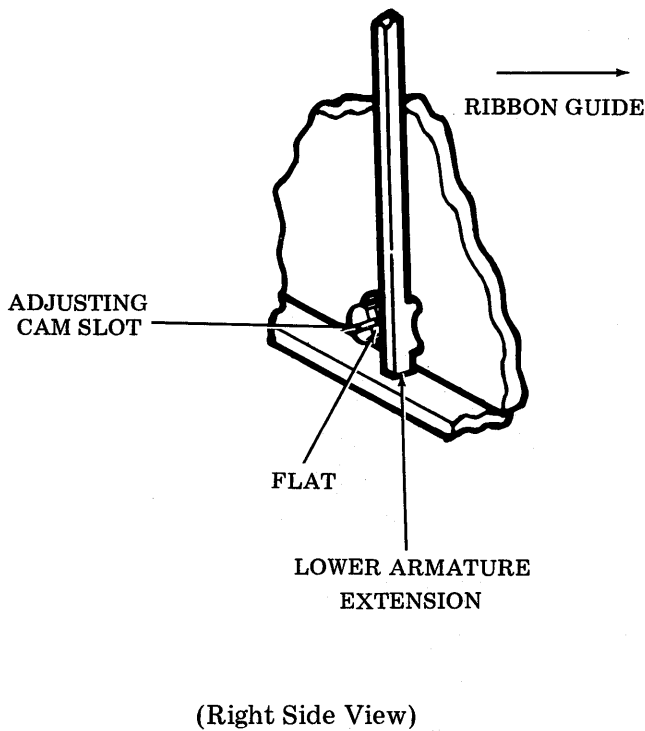


(Top View)

To Adjust

Loosen the line feed sprocket (at platen) set screws and position. Print the character "M" across the line and check (2) Requirement. If necessary, loosen set screw on right sprocket to meet alignment requirement.

PRINT HEAD ARMATURE



**Requirement**

With the ribbon removed, the print head cover removed, the print head released and positioned away from the platen, the lower armature extension on the high part of the cam (adjusting cam slot horizontal and the flat facing toward the ribbon guide) and the armature released from the inner pole plate, rotate the adjusting cam slowly clockwise until the armature is magnetically pulled up. Continue rotating cam clockwise for 3 more clicks.

**Adjustment**

Rotate the adjusting cam to meet the requirement.

*Note:* This adjustment must be made for all 9 levels.  
(Power must be off for this adjustment)



#### 4. ENCLOSURES AND PAPER HANDLING

##### KEYBOARD TO COVER ALIGNMENT

The following two requirements must be met:

(1) Requirement

Left to Right Positioning — When the free play movement of the cover (left to right) is taken up lightly in each direction, the cover should not touch any opcon keytops.

To Adjust

Loosen two screws and position the printer and rear frame assembly to meet the requirement.

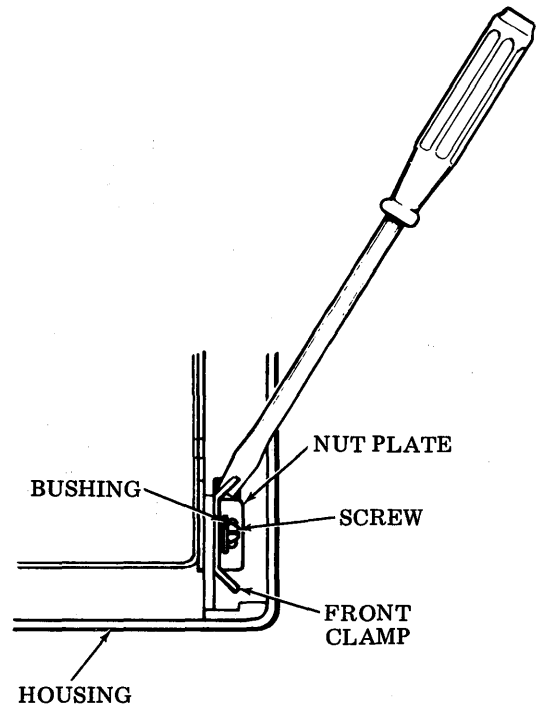
(2) Requirement

Forward Positioning — The two front bushing clamps should firmly engage the opcon bushings and hold the printer and rear frame assembly fully forward into the housing. There should be no front to rear play between the bushing and clamp (left and right sides).

To Adjust

Insert a screwdriver into the square hole in the nut plate and gently twist (or pry) the screwdriver with enough force to meet the requirement.

*Warning: Do not overtwist the screwdriver.*



(Top View — Right Corner)

##### COLUMN INDICATOR POSITIONING

Requirement

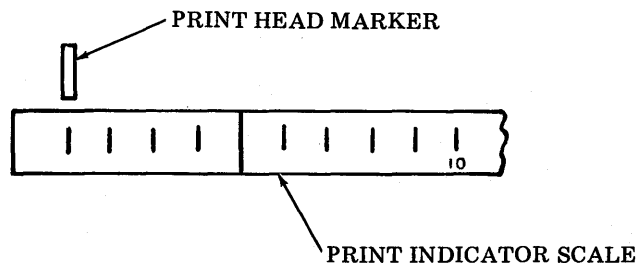
With power applied, the cover closed, and the print head positioned to column one (1), the print head marker should point to the first mark on the indicator scale.

To Adjust

Reposition scale to meet the requirement.

*Note 1:* Various means are used to hold the indicator scale in position. If glue is present, gently remove, perform adjustment and reglue indicator scale using household cement or equivalent.

*Note 2:* This adjustment to be refined when making the KEYBOARD TO COVER ALIGNMENT adjustment.



## 5. SPRING TENSIONS

① 430028 Lead Screw Spring

On left side of lead screw, push to start to compress spring — 9 to 11 pounds.

② 430030 Carriage Nut Spring

Place carriage on left side of unit. Hold lead screw pulley. Insert spring scale through top hole of left bearing housing. Push carriage with  $46 \pm 8$  ounces to compress carriage nut spring.

③ 430242 Ribbon Tension Spring

4-1/2 to 6-1/2 ounces to pull spring to installed length with ribbon installed.

④ 101386 Paper Finger Springs (Left and Right) (2)

2 to 4 ounces to start to lift paper fingers at front edge of fingers (with center paper guide installed).

⑤ 430021 SP Belt Tension Arm Spring

18 to 22 ounces to pull spring to installed length.

⑥ 110437 Paper-Out Spring (Sprocket Feed Only)

1/2 to 1 ounce to start paper-out lever moving.

⑦ 430118 Bell Plunger Spring

1/2 to 1 ounce to seat plunger.

⑧ Link Spring (Part of 430216)

3/4 to 1-1/4 ounces at roll pin to hold spring in lowest position with locking handle in the most forward position.

⑨ 4708 Paper Tray Springs (Left and Right) (2)

On sprocket feed units, lift paper out contact bail to latched position. Move the printhead away from the platen. With a spring scale hooked over the center of the top edge of the tray, and pulling at right angles to the main surface of the tray, it should require 5 to 9 ounces to start the tray moving forward.

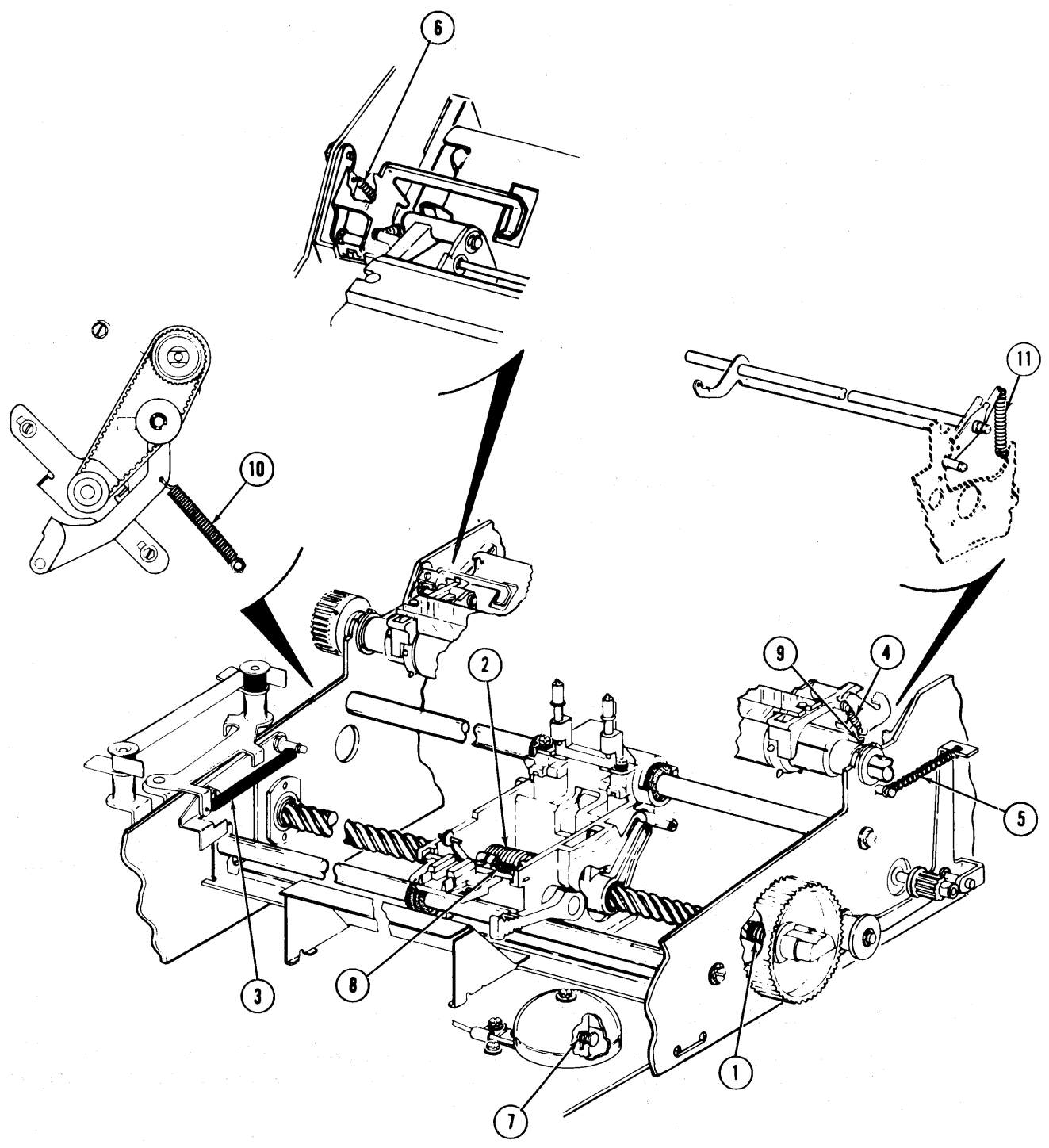
⑩ 430021 Line Feed Belt Tension Arm Spring

10 to 14 ounces to pull spring to installed length.

⑪ 82727 Pressure Roller Bail Spring (Friction Feed Only)

With the paper release lever in the rear position and pulling the pressure roller bail at the spring mounting hole at a right angle to the bail arm, it should take 40 to 44 ounces to start the roller bail moving.

SPRING IDENTIFICATION



PART 6 — PARTS AND UNIT CODES

CONTENTS	PAGE	1. GENERAL
1. GENERAL .....	1	1.01 Parts and unit identification and numbering information for the 43 KSR and RO Friction Feed and Sprocket Feed Terminals are provided in this part.
2. TERMINAL CODES .....	2	
3. CODED UNITS AND TERMINAL PARTS .....	3	1.02 All replaceable parts and units are included. Examples of nonreplaceable parts not shown but included in higher order assemblies are as follows:
4. POWER SUPPLY .....	5	
A. 430700 Power Supply Assembly .....	5	(a) Part as supplied would not fit if installed.
B. 410700 Power Supply Circuit Card .....	6	(b) May require manufacturing as shop methods not provided in this manual.
5. PRINTER .....	8	(c) Part of crimped, riveted, pressed or welded assembly.
A. Platen Assembly .....	8	(d) Serial number or registration plates.
B. Carriage Assembly .....	9	
C. Spacing Motor .....	10	
D. Line Feed Motor (Sprocket Feed, Early Design Drive) and Bell Assembly .....	11	
E. Line Feed Motor (Friction Feed and Late Design Drive Sprocket Feed) .....	12	
F. Left Side Frame .....	13	1.03 Units and parts are listed in the index in numerical order and indicate the page on which the parts appear. Asterisks are used to denote the units or parts that are considered maintenance spares, ie, the minimum selection of parts that can be readily identified as the cause of a trouble and can be used to correct any trouble in the field. The single asterisk indicates major components, fuses, etc. The double asterisk indicates maintenance spares less likely to be needed. Parts or units with no asterisks are not considered readily replaceable or are mostly used for major component repair.
G. Right Side Frame (Sprocket Feed) and Rear Frame .....	14	
H. Right Side Frame (Friction Feed) .....	15	
I. Paper Tray .....	16	
J. Spacing Drive and Lead Screw Assembly .....	17	
K. 430850 Print Head Assembly .....	18	
6. 410740 PRINTER LOGIC CIRCUIT CARD .....	19	
7. KSR OPERATOR CONSOLE .....	21	1.04 When ordering replaceable components, unless otherwise specified, prefix each part number with the letters "TP" (ie, TP430019).
A. 410080 Circuit Card .....	21	
B. Miscellaneous Parts .....	24	
C. Keytops .....	26	
8. RO OPERATOR CONSOLE .....	27	1.05 Troubleshooting and disassembly/reassembly information for these parts is provided in PARTS 2 and 3, respectively.
A. 410741 Circuit Card Assembly .....	27	
B. Keytops and Miscellaneous Parts .....	29	
9. ENCLOSURES AND PAPER HANDLING .....	30	1.06 Where disassembly/reassembly information is not shown, the illustrations in PART 6 — PARTS AND UNIT CODES provide sufficient information.
10. NUMERICAL INDEX .....	33	

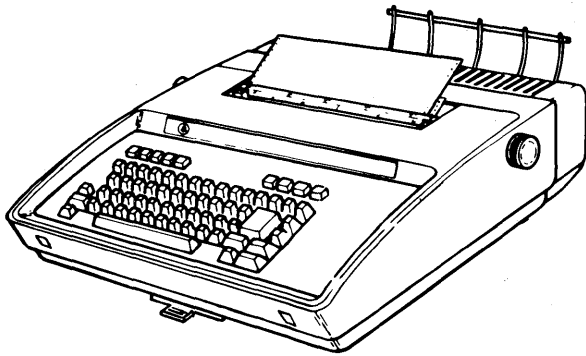
2. TERMINAL CODES

RO TELEPRINTERS

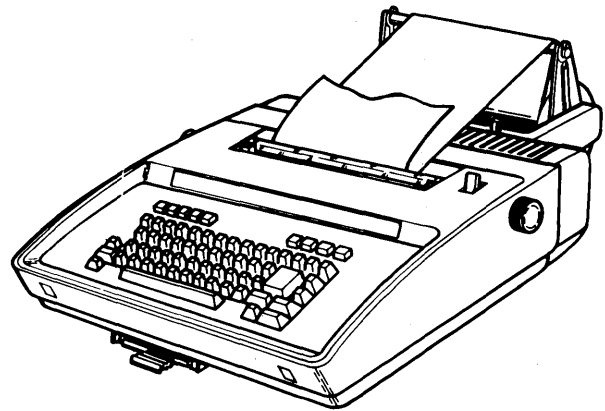
Sprocket Feed With TAU — 4310/AAC  
Sprocket Feed With TTL — 4310/AAA  
Friction Feed With TAU — 4310/AAD  
Friction Feed With TTL — 4310/AAE

KSR TELEPRINTERS

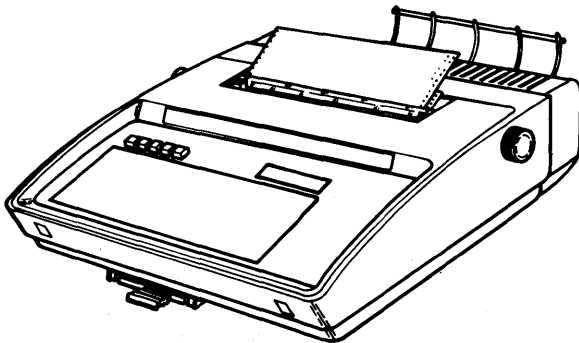
Sprocket Feed With TAU — 4320/AAC  
Sprocket Feed With TTL — 4320/AAA  
Friction Feed With TAU — 4320/AAD  
Friction Feed With TTL — 4320/AAE



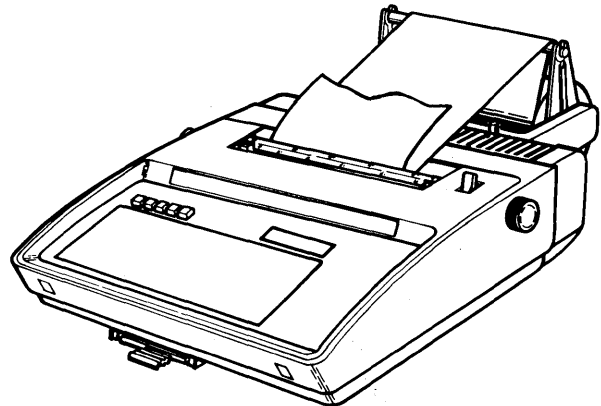
43 KSR — Sprocket Feed



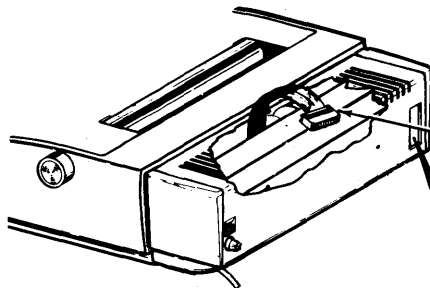
43 KSR — Friction Feed



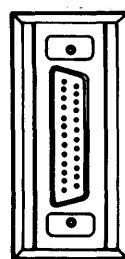
43 RO — Sprocket Feed



43 RO — Friction Feed

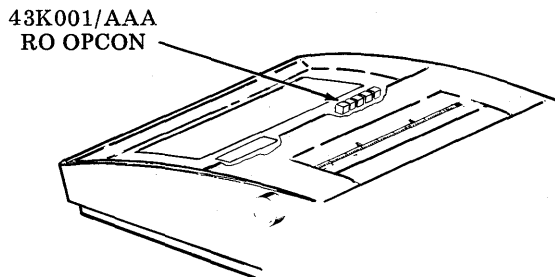
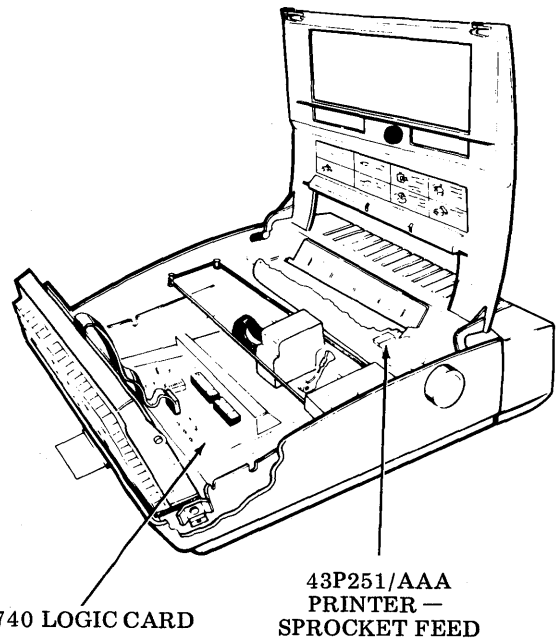
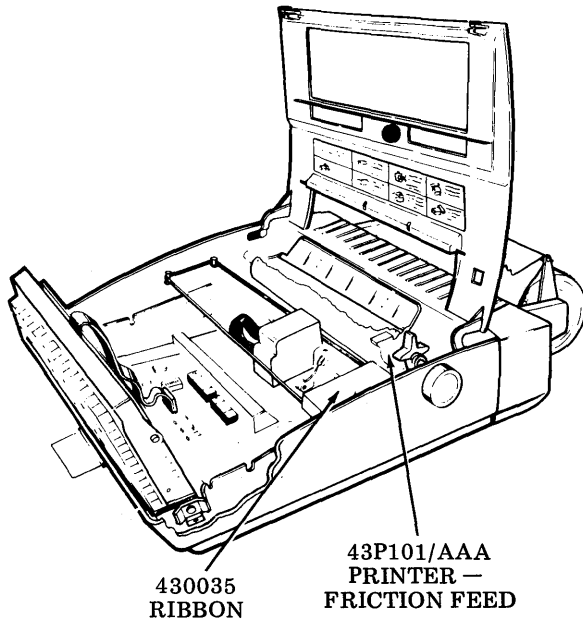


Internal Interface  
Connector — TTL

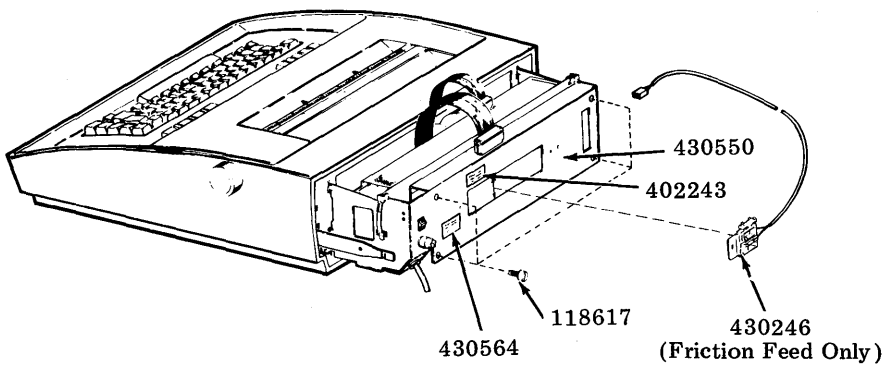
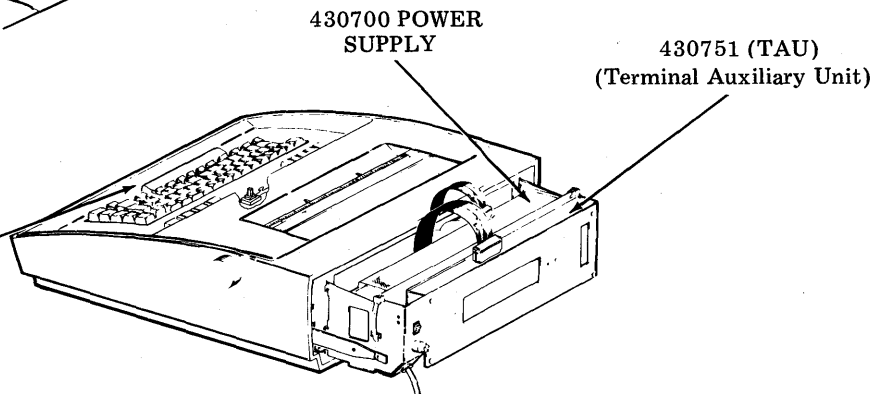


TAU Connector

3. CODED UNITS AND TERMINAL PARTS

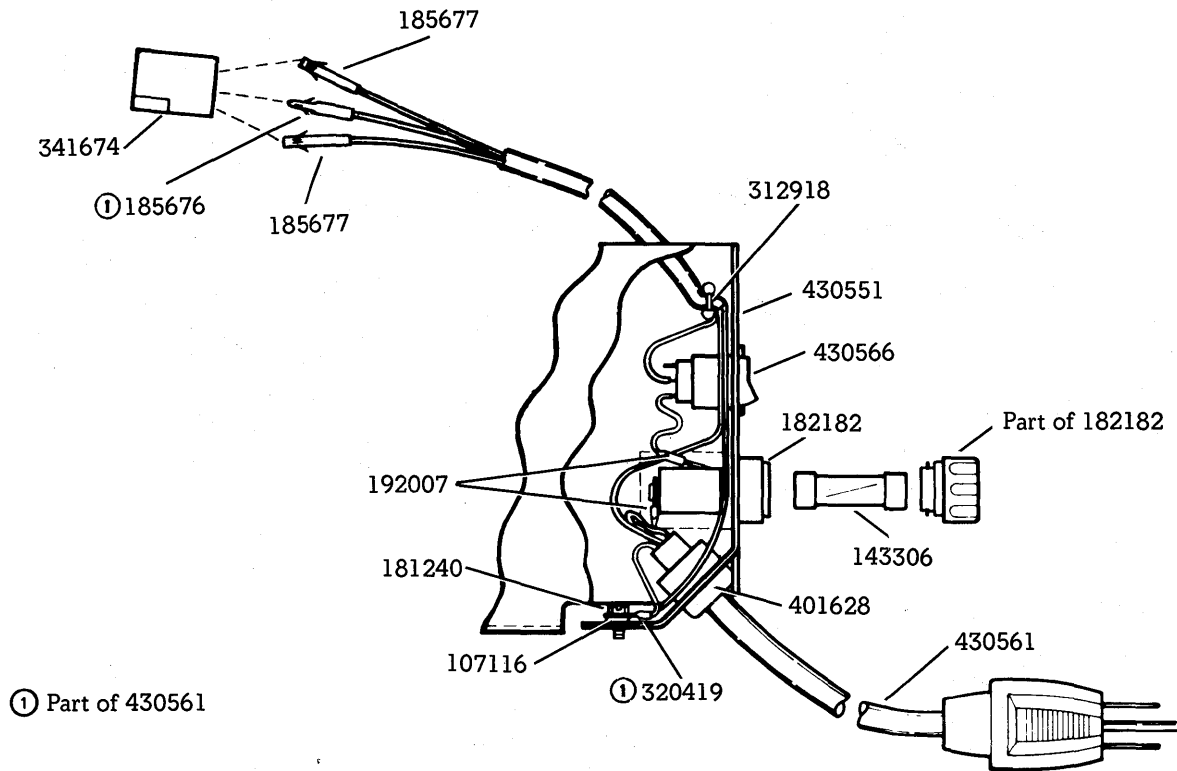


43K101/CAA KSR OPCON OR  
43K101/CAB KSR OPCON



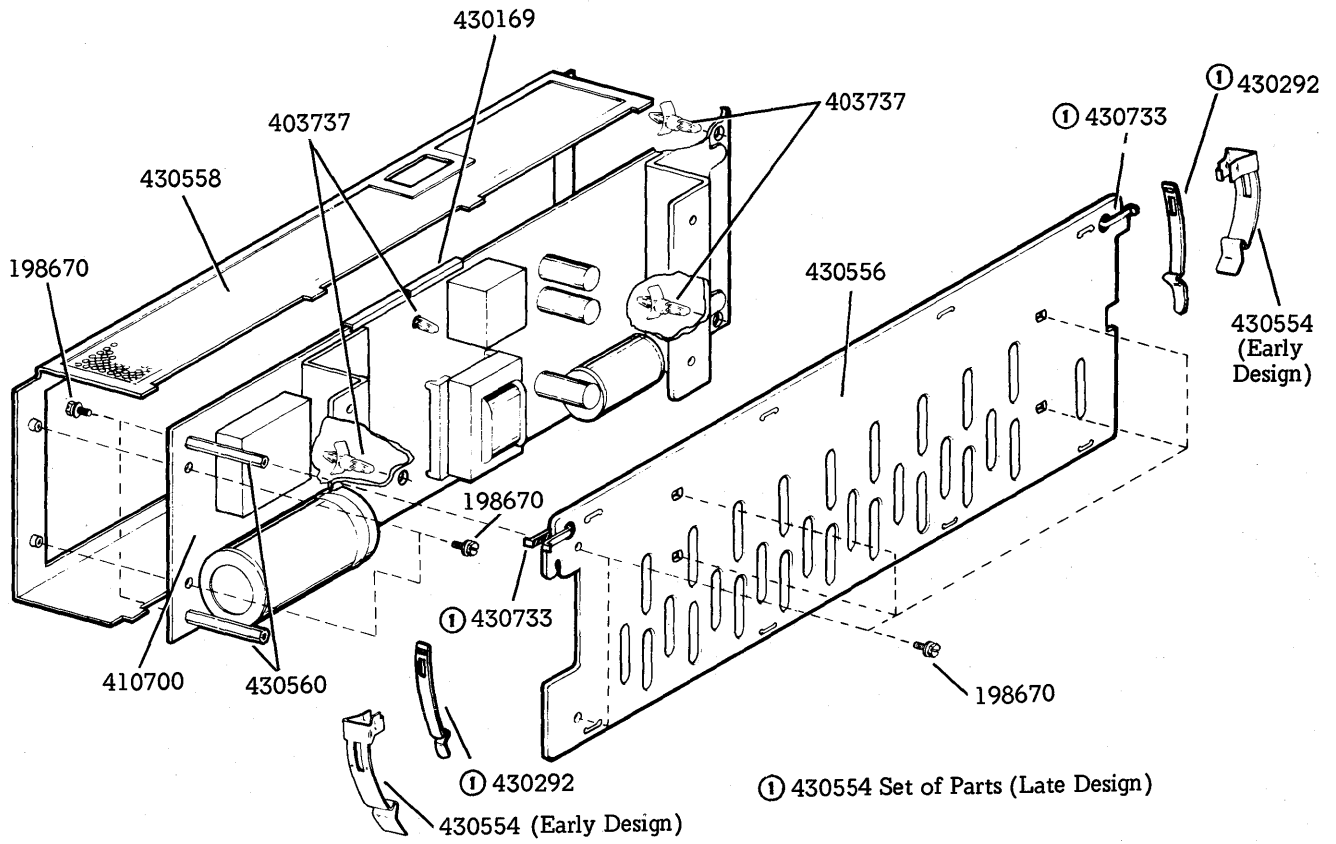
3. KSR AND RO TELEPRINTER TERMINAL (Cont)

430550 Rear Frame Assembly



4. POWER SUPPLY

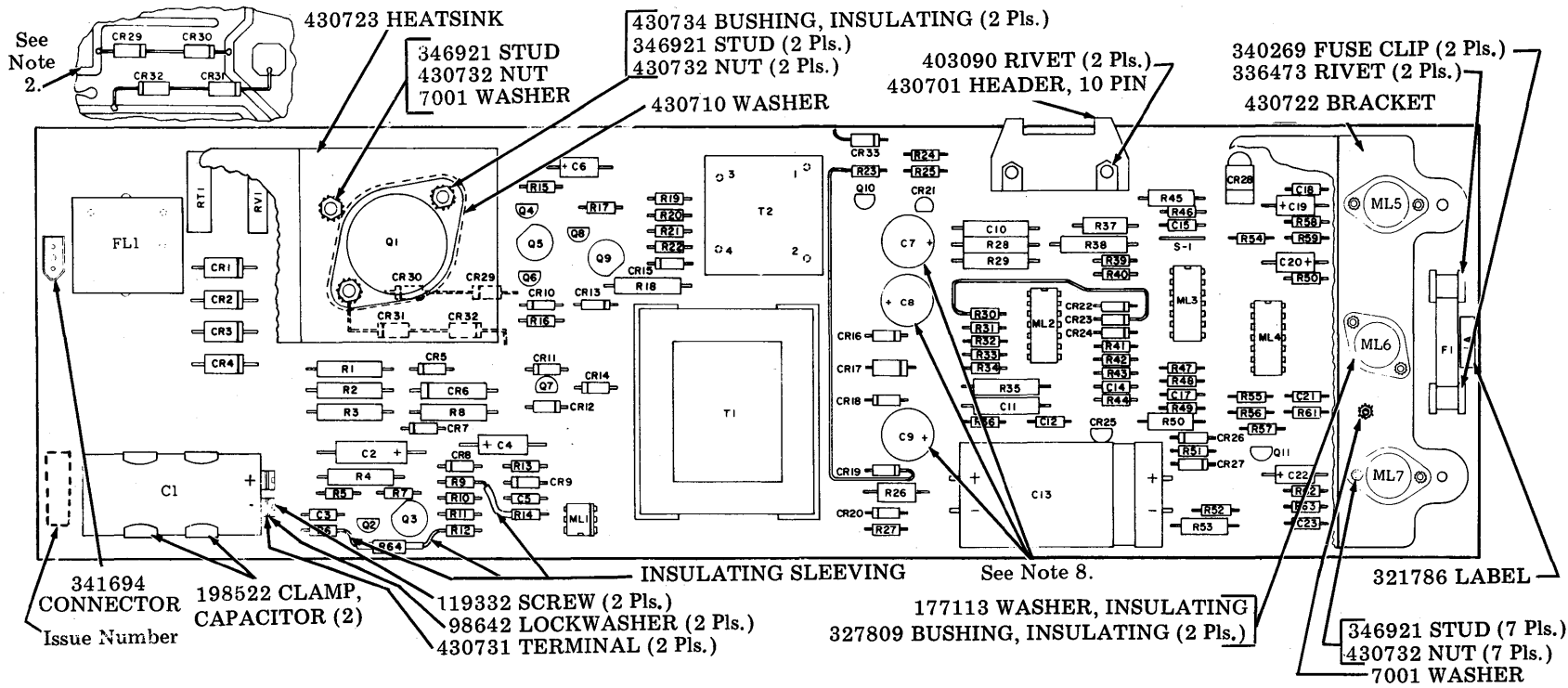
A. 430700 Power Supply Assembly





4. POWER SUPPLY (Cont)

B. 410700 Power Supply Circuit Card



REF. DESIG.	PART NO. REQ.	QTY	DESCRIPTION	REF. DESIG.	PART NO. REQ.	QTY	DESCRIPTION	REF. DESIG.	PART NO. REQ.	QTY	DESCRIPTION
C1	430706		CAPACITOR, 200 MFD	CR1	408037		DIODE, 400 V	CR24	430725		DIODE, ZENER 51 V
C2	310930		CAPACITOR, 100 MFD	CR2	408037		DIODE, 400 V	CR25	336694		THYRISTOR, SCR .8A
C3	405324		CAPACITOR, .1 MFD	CR3	408037		DIODE, 400 V	CR26	197464		DIODE, IN4148
C4	333727		CAPACITOR, 6.8 MFD	CR4	408037		DIODE, 400 V	CR27	430724		DIODE, ZENER 15 V
C5	405324		CAPACITOR, .1 MFD	CR5	430725		DIODE, ZENER 51 V	CR28	405029		LED, PCB MOUNTABLE
C6	300057		CAPACITOR, .01 MFD	CR6	430713		DIODE, ZENER 190 V	CR29	430605		DIODE, IN4936
C7	430704		CAPACITOR, 330 MFD	CR7	430605		DIODE, IN4936	CR30	430605		DIODE, IN4936
C8	430704		CAPACITOR, 330 MFD	CR8	300102		DIODE, IN4156	CR31	430713		DIODE, ZENER 190 V
C9	430704		CAPACITOR, 330 MFD	CR9	430605		DIODE, IN4936	CR32	430605		DIODE, IN4936
C10	430721		CAPACITOR, 1200 PFD	CR10	430605		DIODE, IN4936	CR33	430725		DIODE, ZENER 51 V
C11	430721		CAPACITOR, 1200 PFD	CR11	430605		DIODE, IN4936	FL1	430709		FILTER, RFI
C12	405324		CAPACITOR, .1 MFD	CR12	430605		DIODE, IN4936	FL	120139		FUSE, 1A
C13	430705		CAPACITOR, 530 MFD	CR13	430605		DIODE, IN4936				
C14	405324		CAPACITOR, .1 MFD	CR14	430605		DIODE, IN4936	ML1	335522		IC, OPTICAL COUPLER
C15	325034		CAPACITOR, 120 PFD	CR15	430605		DIODE, IN4936	ML2	404239		QUAD VOLT COMPARATOR
				CR16	430605		DIODE, IN4936	ML3	326823		REGULATOR, VOLTAGE
C17	405324		CAPACITOR, .1 MFD	CR17	430715		DIODE, 200 V 3A FR	ML4	404239		QUAD VOLT COMPARATOR
C18	405324		CAPACITOR, .1 MFD	CR18	430605		DIODE, IN4936	ML5	402202		REGULATOR, +5 V
C19	310929		CAPACITOR, 1.8 MFD	CR19	430605		DIODE, IN4936	ML6	402204		REGULATOR, -12 V
C20	310929		CAPACITOR, 1.8 MFD	CR20	312401		DIODE, ZENER IN4755A	ML7	402201		REGULATOR, +12 V
C21	405324		CAPACITOR, .1 MFD	CR21	430729		DIODE, 4 LAYER				
C22	310929		CAPACITOR, 1.8 MFD	CR22	321135		DIODE, ZENER IN4735A				
C23	405324		CAPACITOR, .1 MFD	CR23	430724		DIODE, ZENER 15 V				

\*See Note 8.

REF. DESIG.	PART NO. REQ.	QTY	DESCRIPTION	REF. DESIG.	PART NO. REQ.	QTY	DESCRIPTION	REF. DESIG.	PART NO. REQ.	QTY	DESCRIPTION
Q1	430711		TRANSISTOR, 450 V	R17	177101		RESISTOR, 6.8 1/2 W	R45	401067		RESISTOR, 2400 .5%
Q2	400909		TRANSISTOR, 60 V NPN	R18	178862		RESISTOR, 10 1 W	R46	321508		RESISTOR, 100 K 1/4 W
Q3	325077		TRANSISTOR, 2N4355	R19	315948		RESISTOR, 100 1/4 W	R47	315988		RESISTOR, 27 K 1/4 W
Q4	400909		TRANSISTOR, 60 V NPN	R20	315948		RESISTOR, 100 1/4 W	R48	321213		RESISTOR, 1 K 1/4 W
Q5	325077		TRANSISTOR, 2N4355	R21	335622		RESISTOR, 68 1/4 W	R49	430719		RESISTOR, 25.8 K .5%
Q6	400909		TRANSISTOR, 60 V NPN	R22	315951		RESISTOR, 560 1/4 W	R50	401067		RESISTOR, 2400 .5%
Q7	400909		TRANSISTOR, 60 V NPN	R23	320275		RESISTOR, 10 K 1/4 W	R51	320275		RESISTOR, 10 K 1/4 W
Q8	400909		TRANSISTOR, 60 V NPN	R24	320275		RESISTOR, 10 K 1/4 W	R52	318803		RESISTOR, 2400 1/4 W
Q9	325077		TRANSISTOR, 2N4355	R25	315957		RESISTOR, 3300 1/4 W	R53	321258		RESISTOR, 20 K 1/2 W
Q10	400909		TRANSISTOR, 60 V NPN	R26	118186		RESISTOR, 5600 1/2 W	R54	315956		RESISTOR, 2700 1/4 W
Q11	400909		TRANSISTOR, 60 V NPN	R27	315971		RESISTOR, 680 1/4 W	R55	318803		RESISTOR, 2400 1/4 W
				R28	341596		RESISTOR, 121 K 1%	R56	401067		RESISTOR, 2400 .5%
R1	120211		RESISTOR 20 K 1 W	R29	341592		RESISTOR, 75 K 1%	R57	315956		RESISTOR, 2700 1/4 W
R2	182763		RESISTOR, 680 1 W	R30	315957		RESISTOR, 3300 1/4 W	R58	336697		RESISTOR, 430 1/4 W
R3	118198		RESISTOR, 56 K 1 W	R31	327721		RESISTOR, 4.7 MEG. 1/4 W	R59	318803		RESISTOR, 2400 1/4 W
R4	430714		RESISTOR, .24 K 1 W	R32	324902		RESISTOR, 100 K 1%	R60	315961		RESISTOR, 8200 1/4 W
R5	320275		RESISTOR, 10 K 1/4 W	R33	321508		RESISTOR, 100 K 1/4 W	R61	401067		RESISTOR, 2400 .5%
R6	315959		RESISTOR, 4700 1/4 W	R34	328785		RESISTOR, 330 1/4 W	R62	320026		RESISTOR, 3900 1/4 W
R7	321213		RESISTOR, 1 K 1/4 W	R35	341596		RESISTOR, 121 K 1%	R63	318803		RESISTOR, 2400 1/4 W
R8	144464		RESISTOR, 220 1 W	R36	321508		RESISTOR, 100 K 1/4 W	R64	320275		RESISTOR, 10 K 1/4 W
R9	318802		RESISTOR, 220 1/4 W	R37	401067		RESISTOR, 2400 .5%				
R10	321213		RESISTOR, 1 K 1/4 W	R38	324908		RESISTOR, 30.1 K 1%	RT1	430707		THERMISTOR
R11	318801		RESISTOR, 47 K 1/4 W	R39	320275		RESISTOR, 10 K 1/4 W				
R12	320275		RESISTOR, 10 K 1/4 W	R40	330641		RESISTOR, 1 MEG. 1/4 W				
R13	315955		RESISTOR, 2200 1/4 W	R41	320276		RESISTOR, 470 1/4 W	RV1	430708		VARISTOR
R14	320275		RESISTOR, 10 K 1/4 W	R42	320276		RESISTOR, 470 1/4 W				
R15	320276		RESISTOR, 470 1/4 W	R43	320276		RESISTOR, 470 1/4 W				
R16	328785		RESISTOR, 330 1/4 W	R44	321213		RESISTOR, 1 K 1/4 W	T1	430702		TRANSFORMER, POWER
								T2	430703		TRANSFORMER, PULSE
								S1	336470		STRAP

Note 1: Typical heat sink assembly.

Note 2: At customer identification Issue 2A, C19, C20, C22 was changed from 1 MFD, R23 was changed from 3.3K, R44 was changed from 10K, CR31, CR32 and CR33 were added, as shown above.

Note 3: At customer identification Issue 3A, the following changes were made, CR20 was changed from 328696, R11 changed from 320275, R27 changed from 321213, R64 was added, and one lead of R14 was moved from ML-1 to base of Q7.

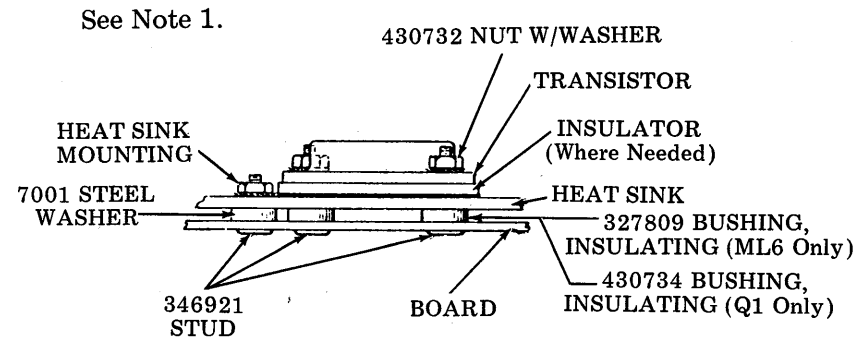
Note 4: At customer identification Issue 4A, conductor on noncomponent side from CR21 to R23 and pin 2 of 430703 transformer was cut at CR21. Conductor from R29 to C9 was cut on component side, strap added from left side of R23 to cathode of CR19 and strap added from left side of R30 to cathode of CR22. S1 replaced C16.

Note 5: At customer identification Issue 4B, ML1 was changed from 404325.

Note 6: At customer identification Issue 4C, the following change was made: bushing under Q1 changed from 327809 to 430734.

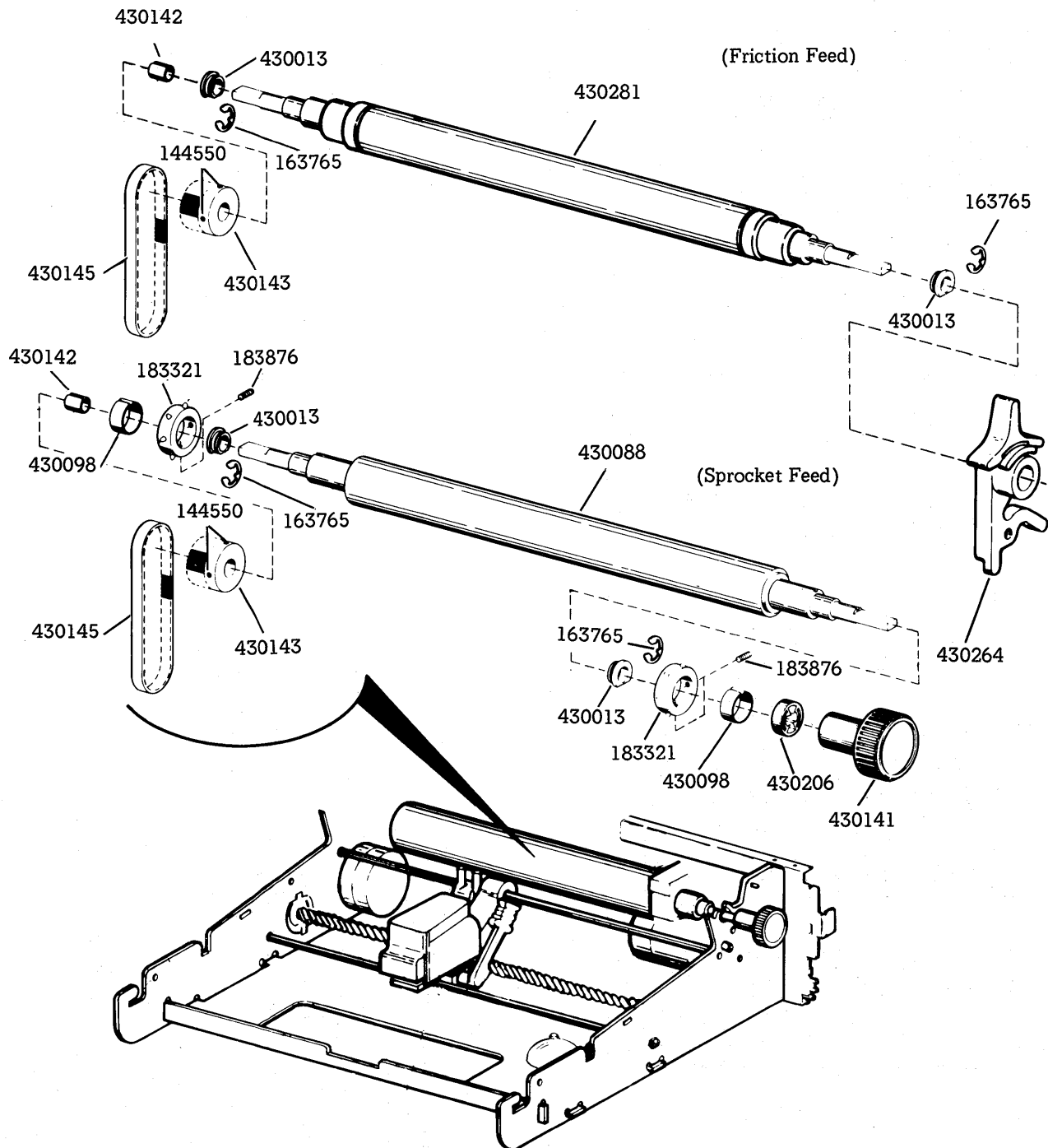
Note 7: At customer identification Issue 4D, R34 was changed from 321213.

\* Note 8: Capacitors must be vented (see Part 2, Paragraphs 1.15 through 1.20).

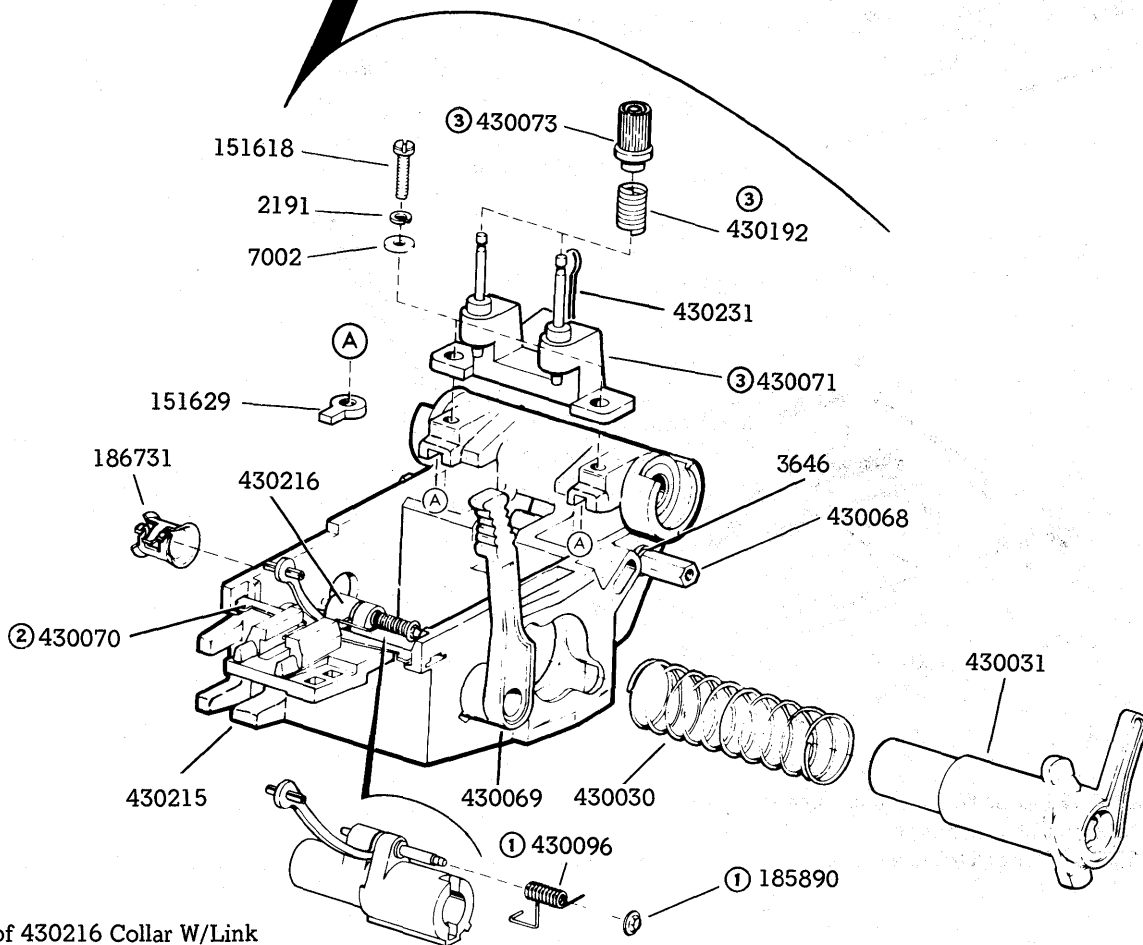
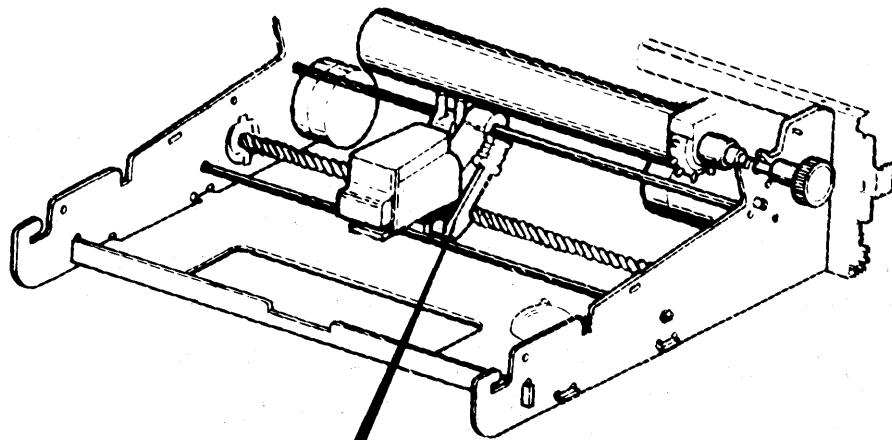


5. PRINTER

A. Platen Assembly



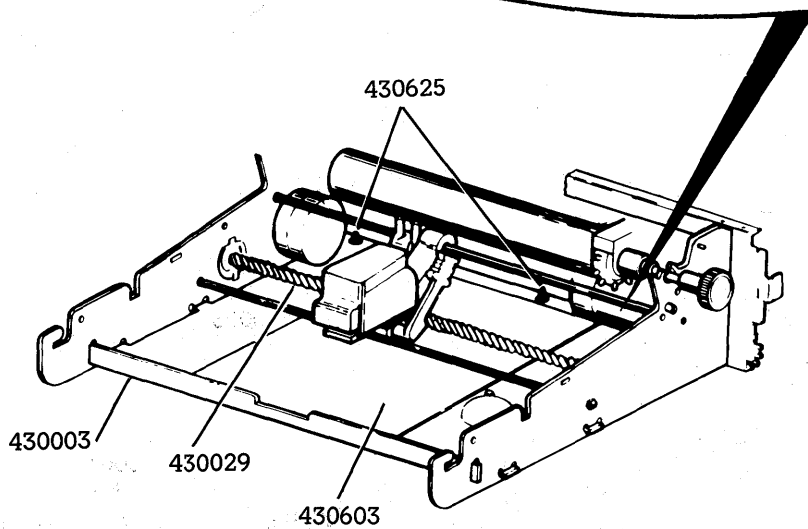
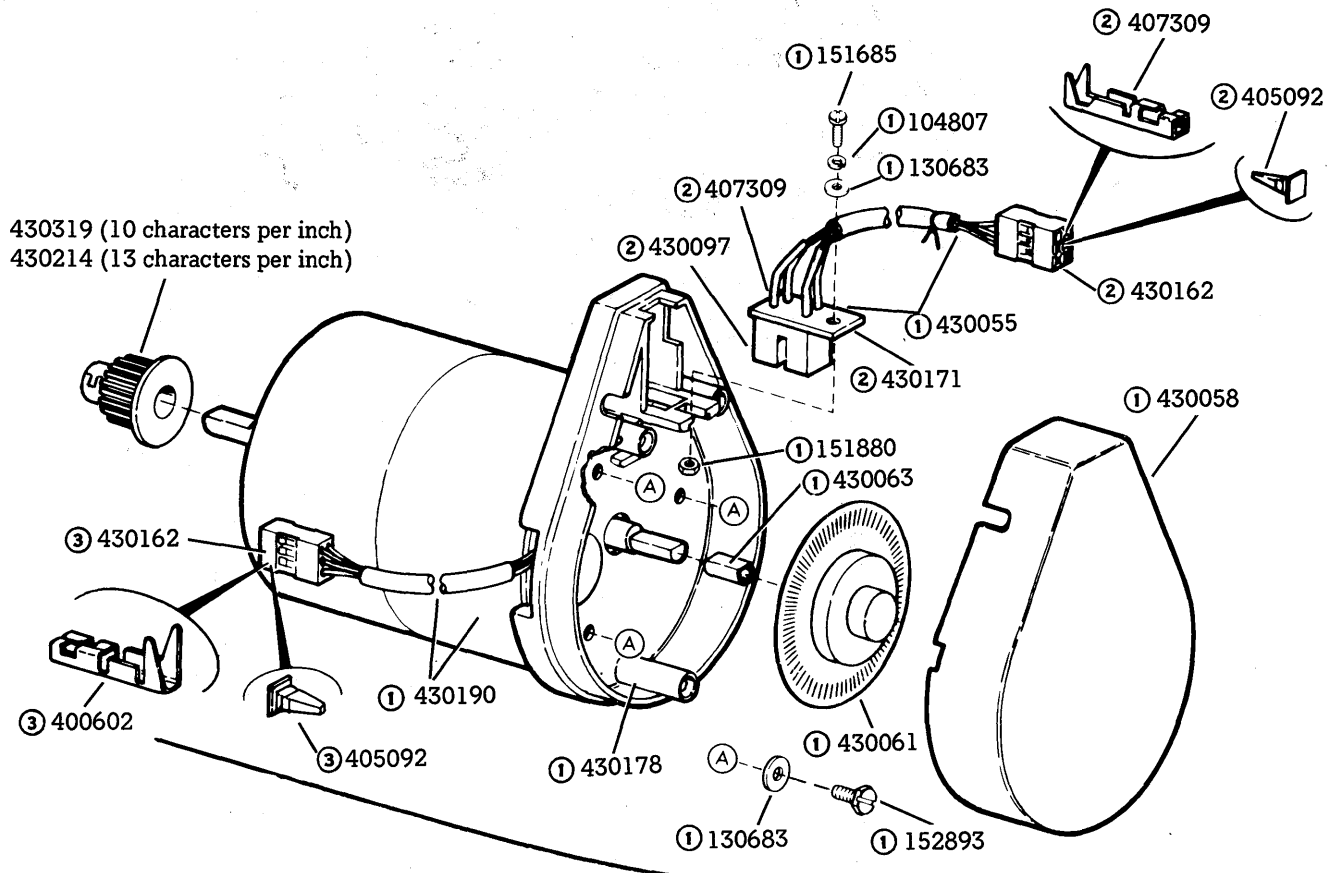
B. Carriage Assembly



- ① Part of 430216 Collar W/Link
- ② Part of 430215 Carriage W/Post
- ③ Part of 430217 Bridge Assembly

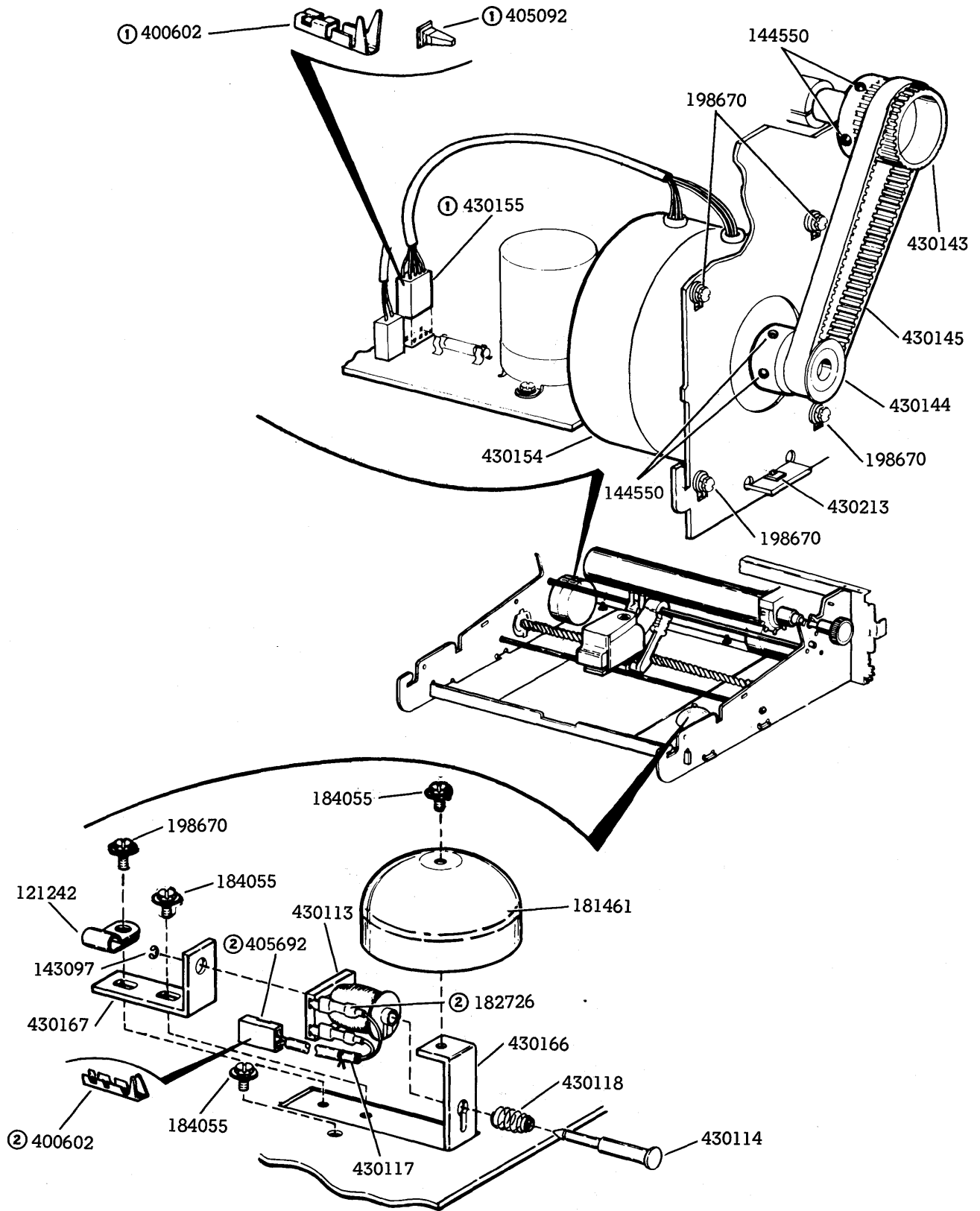
5. PRINTER (Cont)

C. Spacing Motor



- ① Part of 430047 Motor W/Cable and Encoder
- ② Part of 430055 Cable Assembly
- ③ Part of 430190 Motor W/Cable

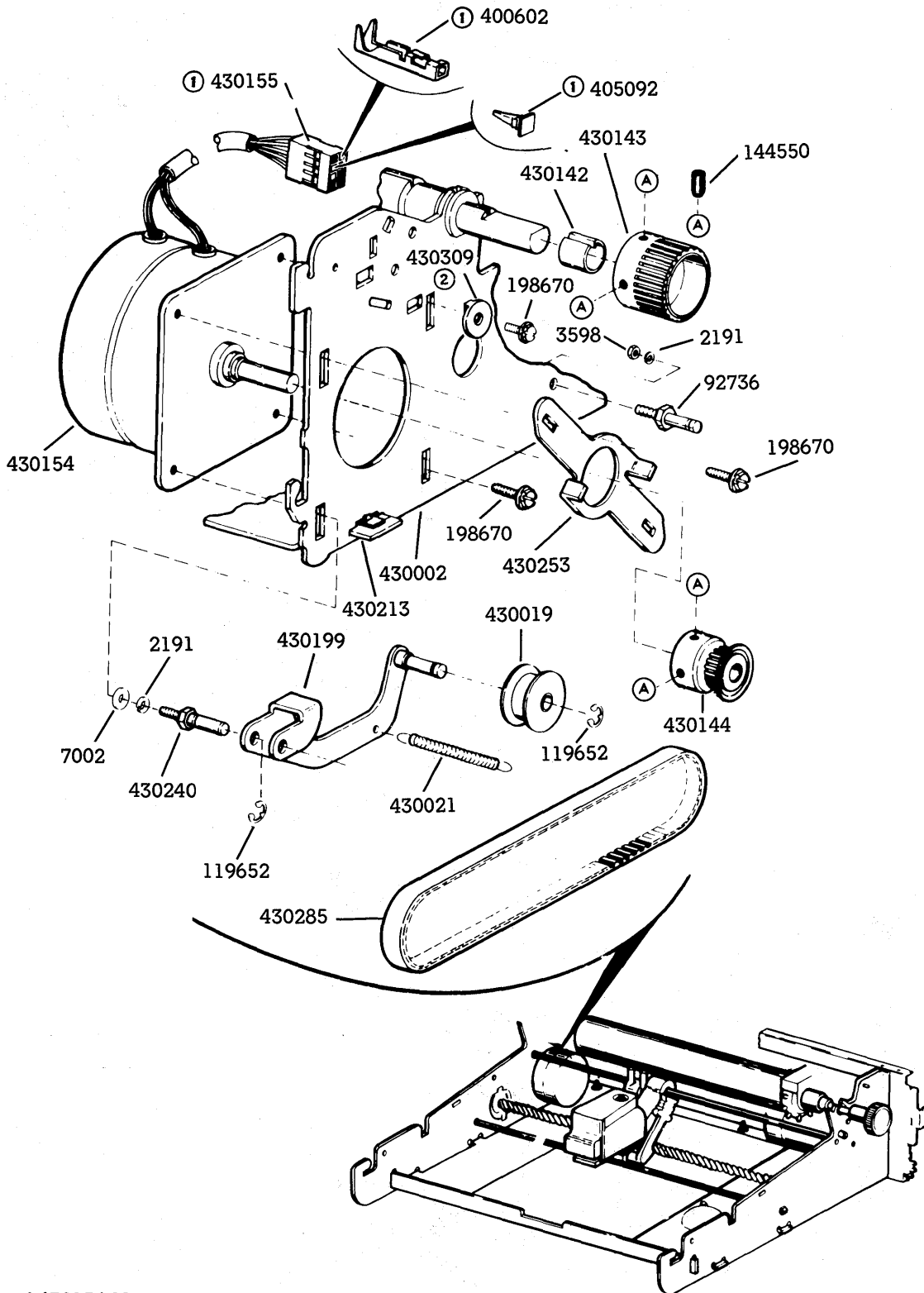
D. Line Feed Motor (Sprocket Feed, Early Design Drive) and Bell Assembly



- ① Part of 430154 Motor Assembly
- ② Part of 430117 Cable Assembly

5. PRINTER (Cont)

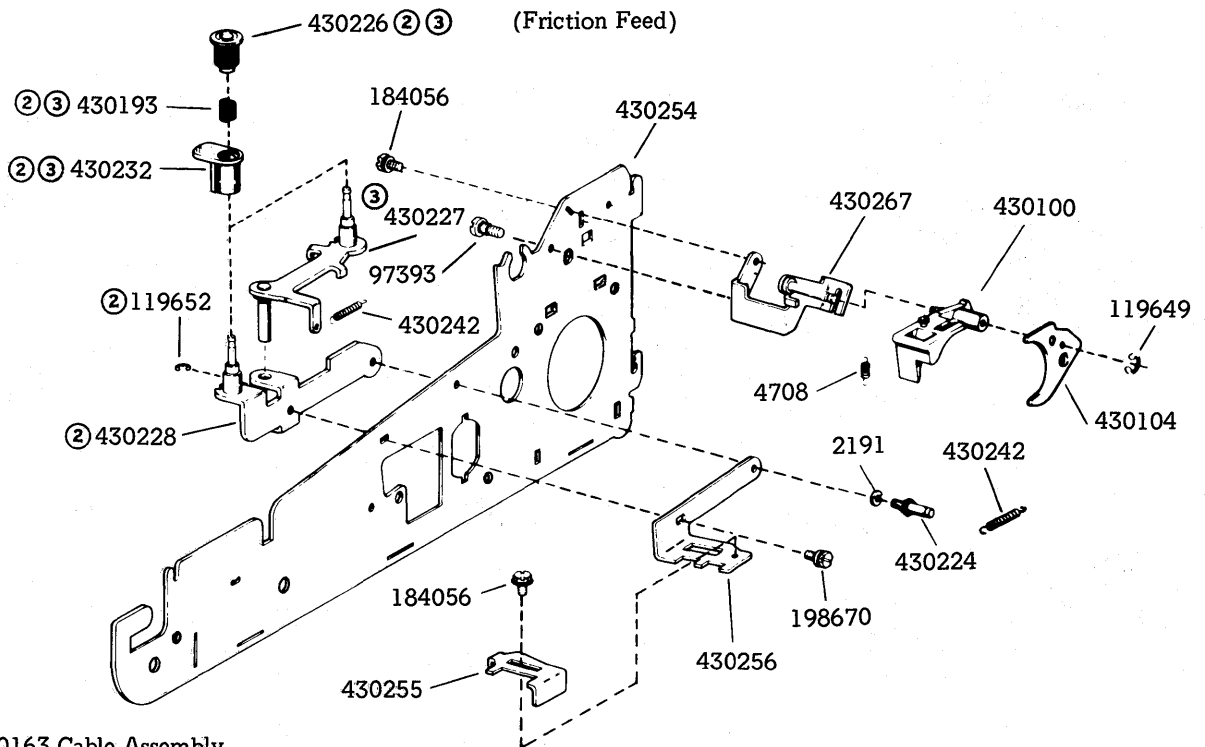
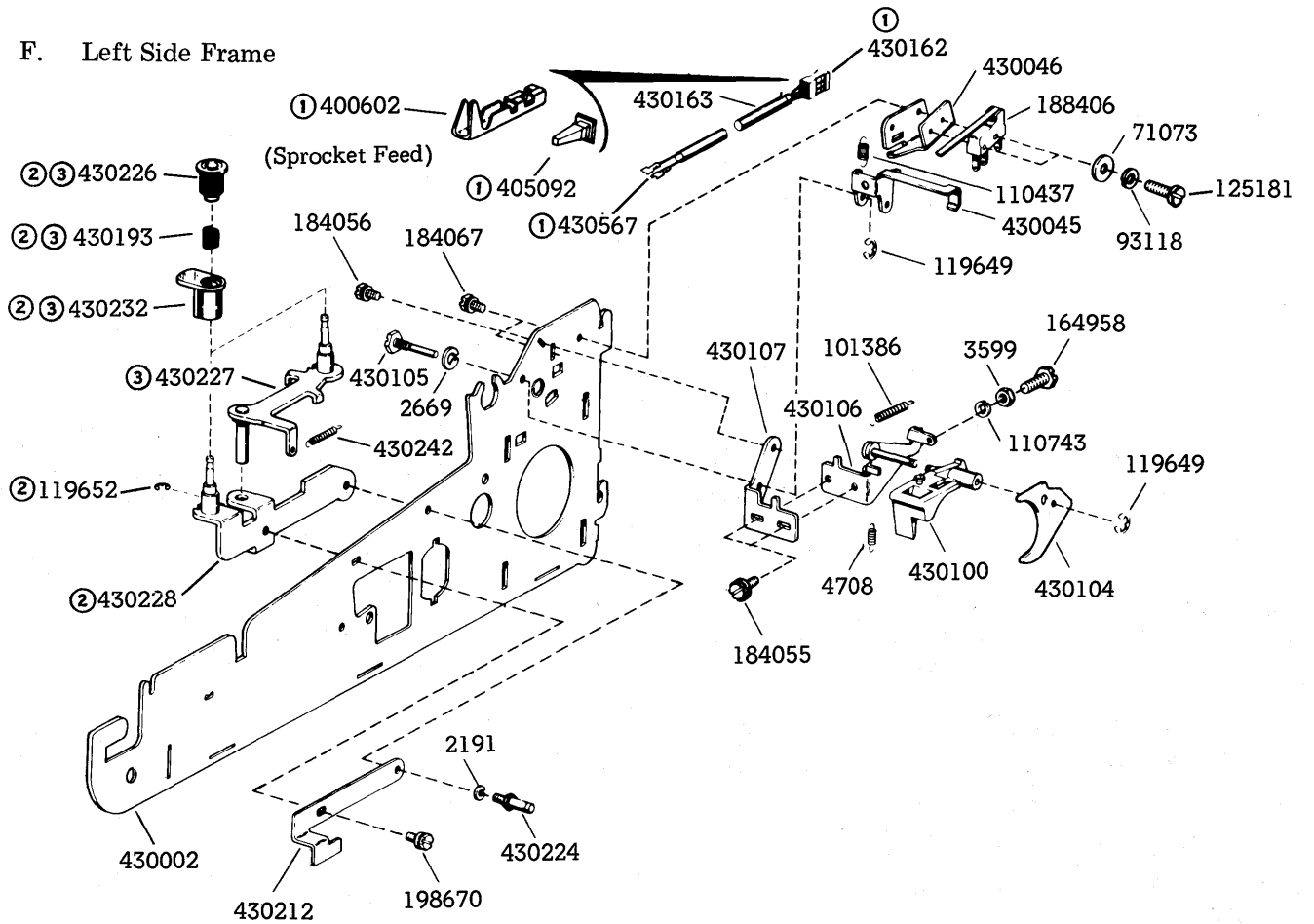
E. Line Feed Motor (Friction Feed and Late Design Drive Sprocket Feed)



① Part of 430154 Motor Assembly

② Present only when Early Design 430002 Left Side Plate is used.

F. Left Side Frame

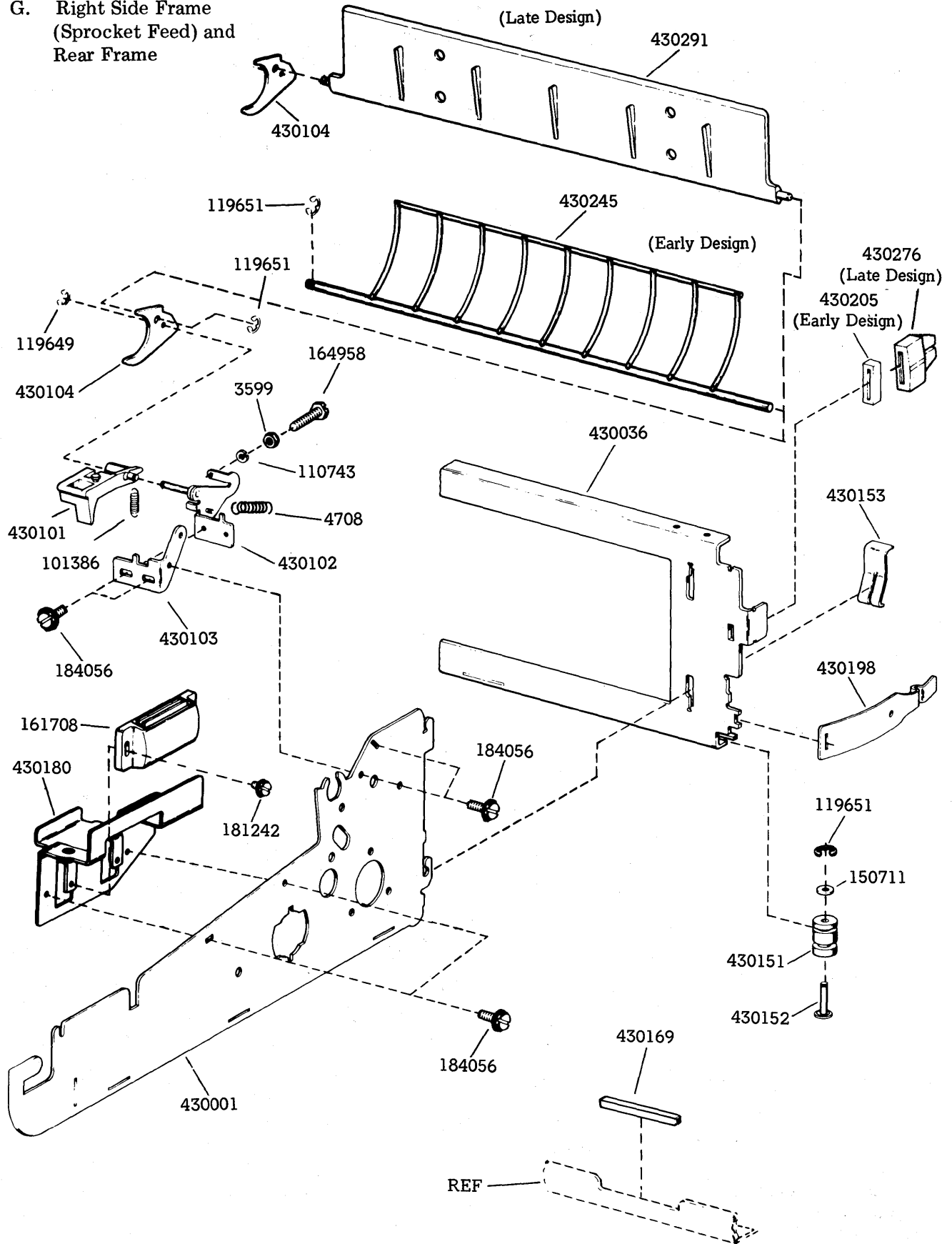


- ① Part of 430163 Cable Assembly
- ② Part of 430218
- ③ Part of 430219

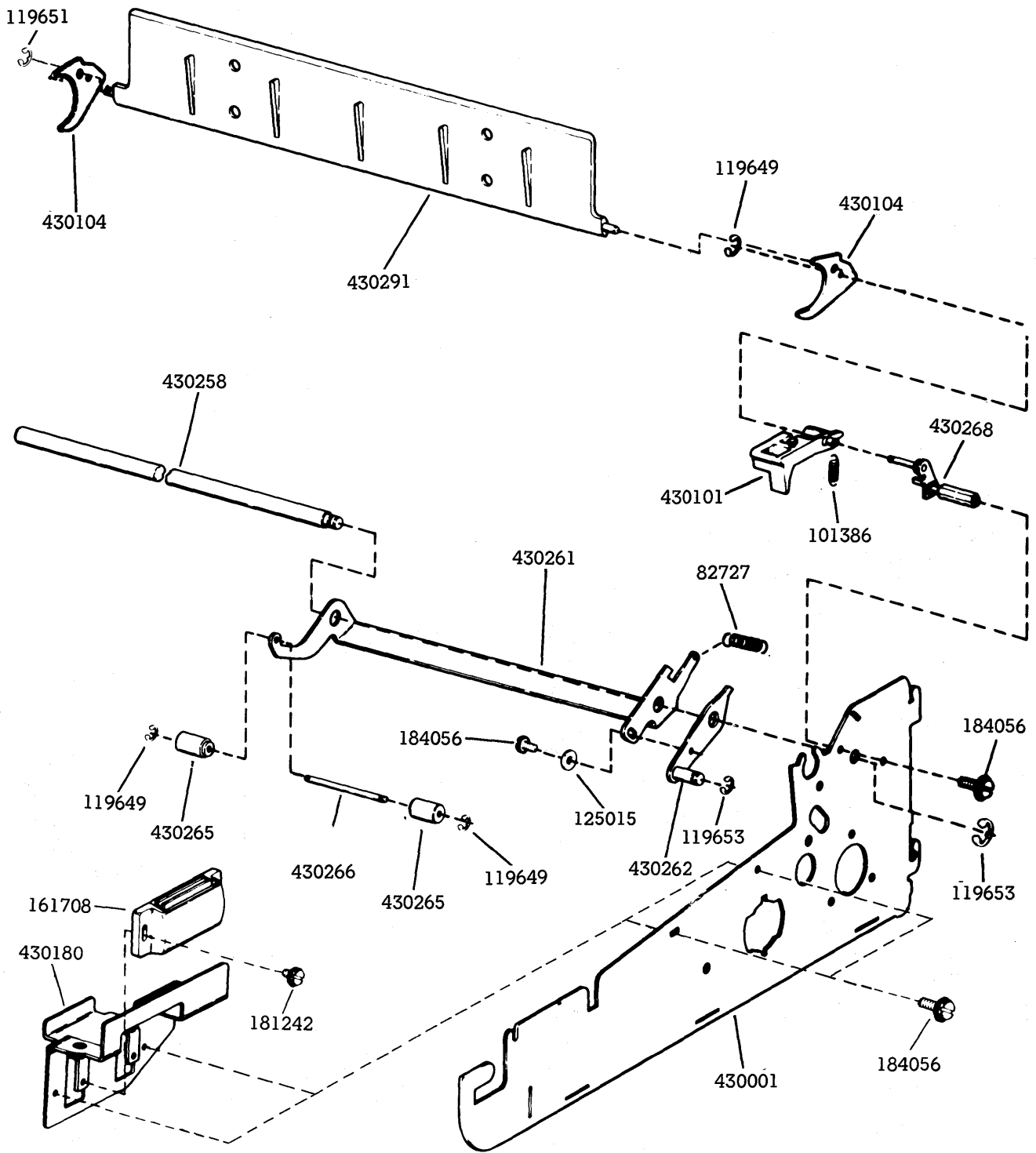


5. PRINTER (Cont)

G. Right Side Frame (Sprocket Feed) and Rear Frame



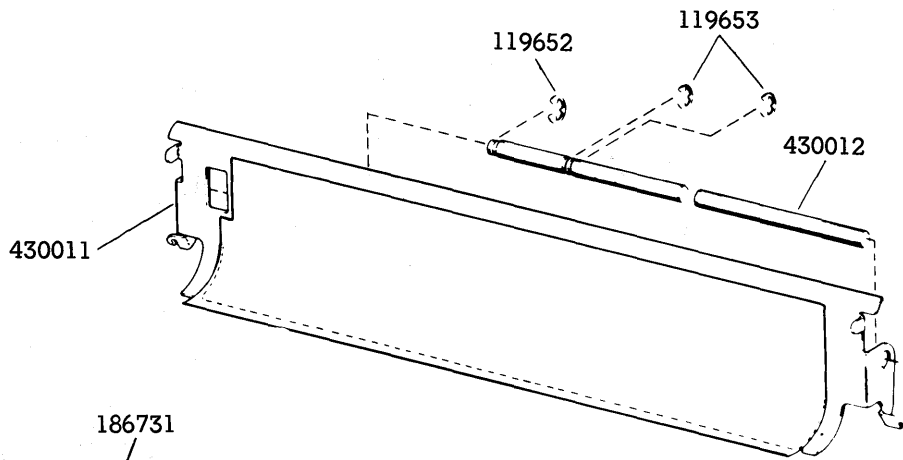
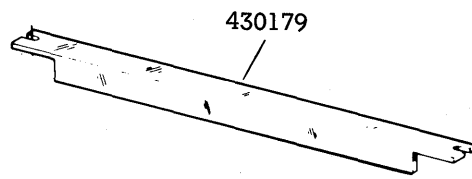
H. Right Side Frame (Friction Feed)



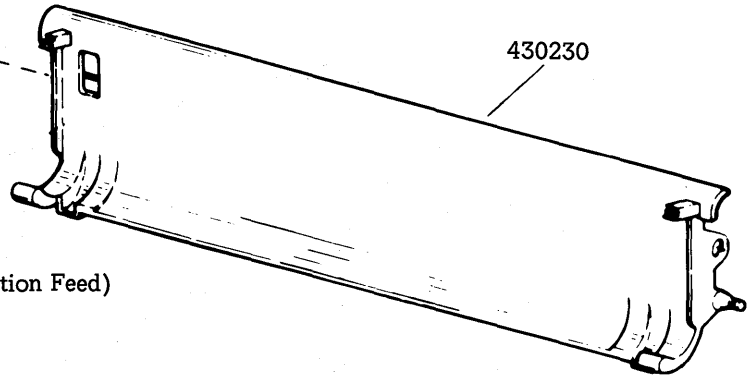
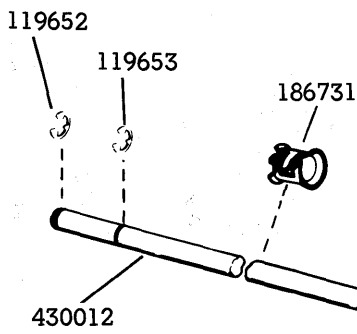
5. PRINTER (Cont)

I. Paper Tray

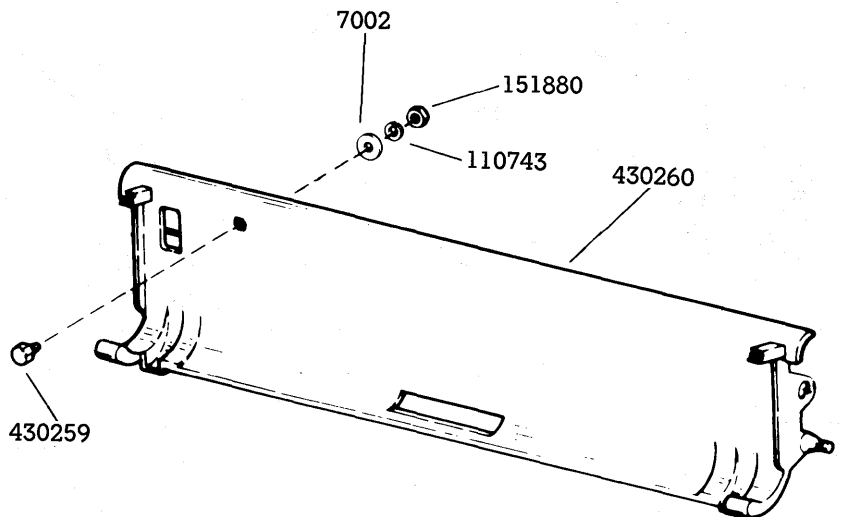
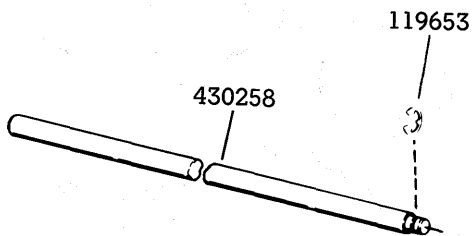
(Sprocket Feed, Early Design)



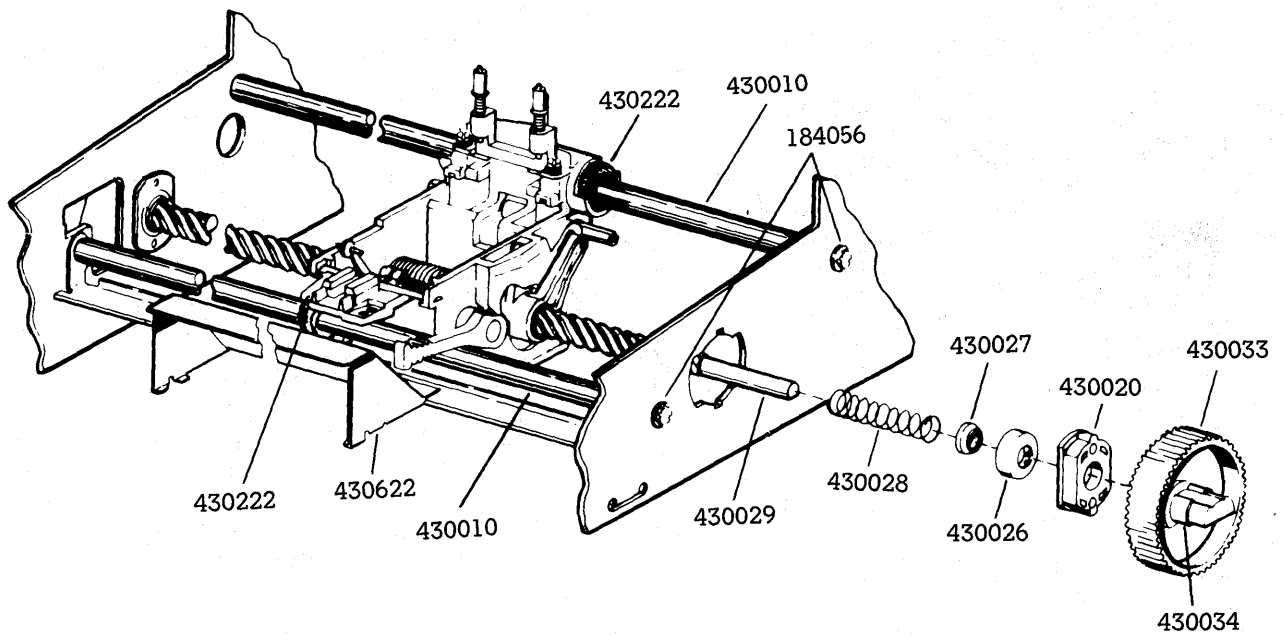
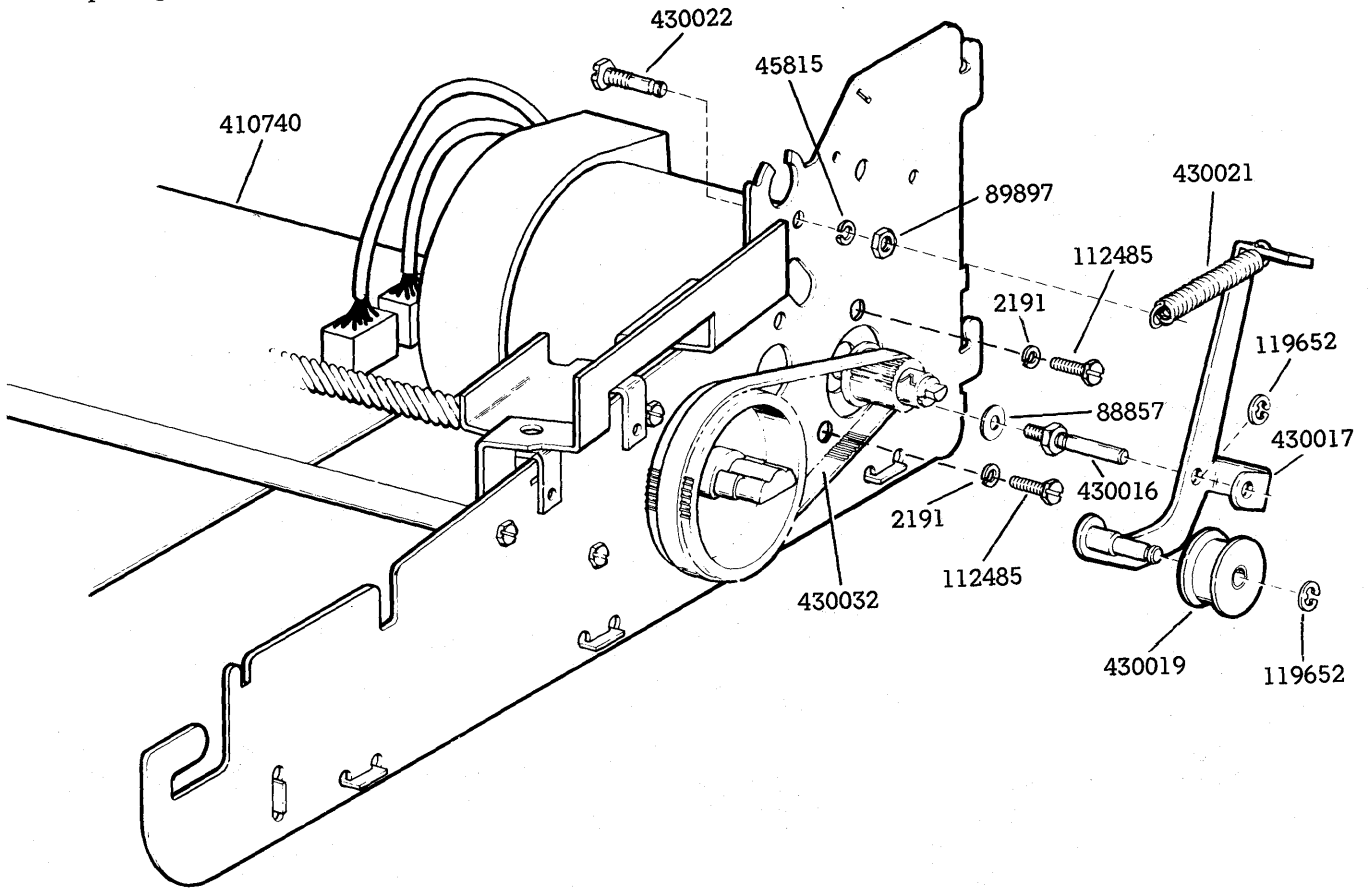
(Sprocket Feed, Interim Design)



(Sprocket Feed, Late Design and Friction Feed)

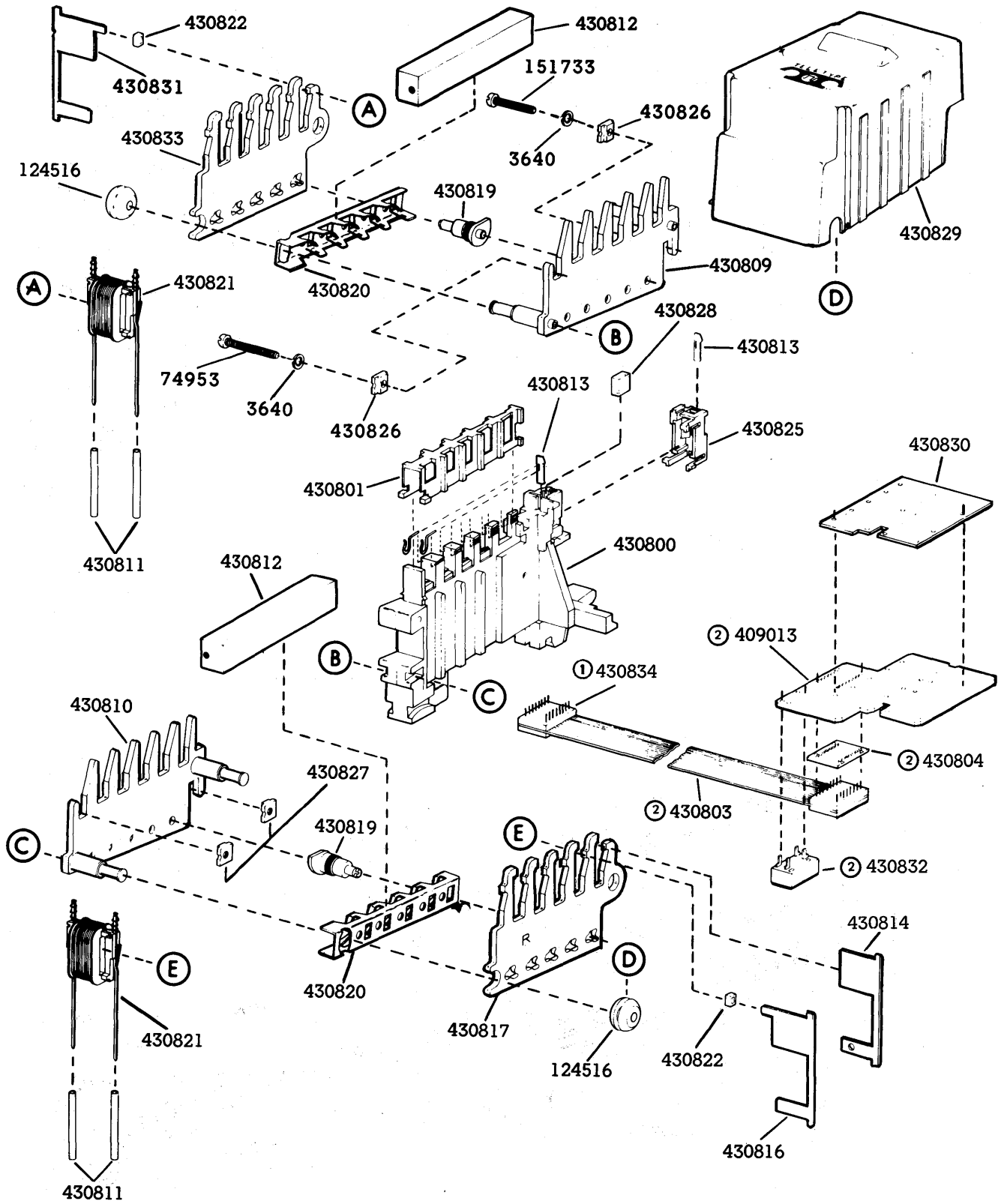


J. Spacing Drive and Lead Screw Assembly



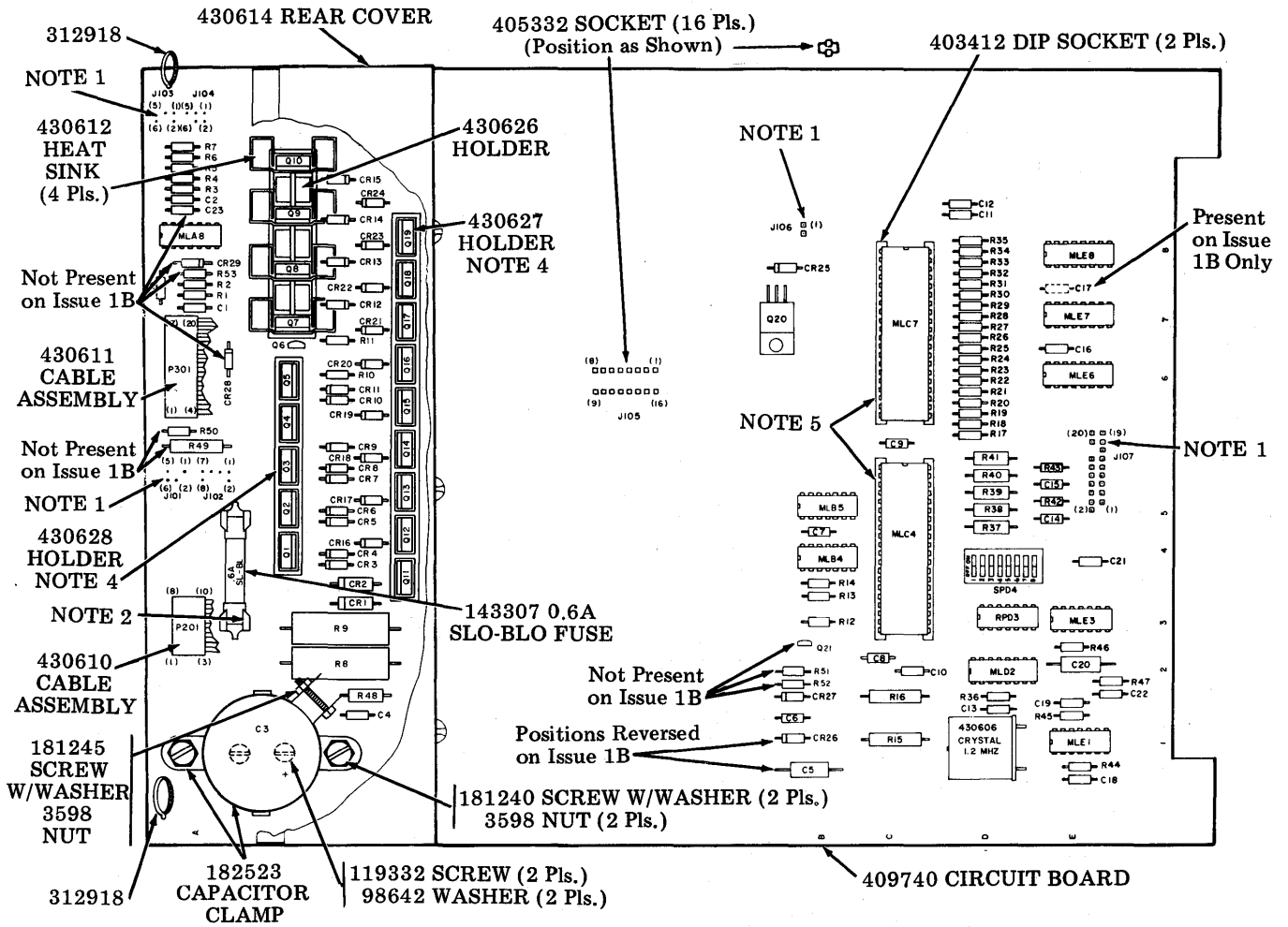
5. PRINTER (Cont)

K. 430850 Print Head Assembly



① 430803 Cable Assembly  
② 410013 Card W/Cable

6. 410740 PRINTER LOGIC CIRCUIT CARD



6. 410740 PRINTER LOGIC CIRCUIT CARD (Cont)

REF DESIG	PART NO REC	QTY	DESCRIPTION
C1	322257		CAPACITOR, .01 MFD
C2	335801		CAPACITOR, 22 PFD
C3	430627		CAPACITOR, 1500 MFD
C4	425324		CAPACITOR, .1 MFD
C5	337333		CAPACITOR, 22 MFD
C6			SAME AS C4
C7			SAME AS C4
C8			SAME AS C4
C9			SAME AS C4
C10			SAME AS C4
C11			SAME AS C4
C12			SAME AS C4
C13			SAME AS C4
C14	323714		CAPACITOR, 470 PFD
C15			SAME AS C14
C16			SAME AS C4
C17			SAME AS C4
C18			SAME AS C1
C19	346238		CAPACITOR, 33 PFD
C20			SAME AS C5
C21			SAME AS C4
C22			SAME AS C4
C23			SAME AS C4
R1	321508		RESISTOR, 100K, 1/4W
R2	318803		RESISTOR, 2.4K, 1/4W
R3	333412		RESISTOR, 180K, 1/4W
R4			SAME AS R2
R5	321545		RESISTOR, 12K, 1/4W
R6			SAME AS R1
R7	318802		RESISTOR, 220, 1/4W
R8	171521		RESISTOR, 100, 5W
R9			SAME AS R8
R10	315956		RESISTOR, 2.7K, 1/4W
R11			SAME AS R5
R12	300092		RESISTOR, 6.8K, 1/4W
R13			SAME AS R12
R14			SAME AS R12
R15	310988		RESISTOR, 150, 1W
R16	171469		RESISTOR, 100, 1W
R17	315972		RESISTOR, 22K, 1/4W
R18			SAME AS R17
R19			SAME AS R17
R20			SAME AS R17
R21			SAME AS R17
R22			SAME AS R17
R23			SAME AS R17
R24			SAME AS R17
R25			SAME AS R17
R26			SAME AS R17
R27			SAME AS R17
R28			SAME AS R17
R29			SAME AS R17
R30			SAME AS R17
R31			SAME AS R17
R32			SAME AS R17
R33			SAME AS R17
R34			SAME AS R17
R35			SAME AS R17
R36	320276		RESISTOR, 470, 1/4W
R37	137440		RESISTOR, 1K, 1/2W
R38			SAME AS R37
R39			SAME AS R37
R40			SAME AS R37
R41			SAME AS R37
R42	321213		RESISTOR, 1K, 1/4W
R43			SAME AS R42
R44	320275		RESISTOR, 10K, 1/4W

REF DESIG	PART NO REC	QTY	DESCRIPTION
R45			SAME AS R44
R46			SAME AS R10
R47			SAME AS R44
R48	118186		RESISTOR, 5.6K, 1/2W
R49	341596		RESISTOR, 121K, 1/8W
R50	324902		RESISTOR, 100K, 1/8W
R51			SAME AS R7
R52			SAME AS R44
R53	326601		RESISTOR, 150K, 1/4W
CR19			SAME AS CR3
CR20			SAME AS CR3
CR21			SAME AS CR3
CR22			SAME AS CR3
CR23			SAME AS CR3
CR24			SAME AS CR3
CR25			SAME AS CR3
CR26	346394		DIODE, IN4730A
CR27	320010		DIODE, ZENER, 1%
CR28	177108		DIODE, D2
CR29			SAME AS CR28
Q1	430604		TRNSTR, 80V, NPN, DARL
Q2			SAME AS Q1
Q3			SAME AS Q1
Q4			SAME AS Q1
Q5	430608		XISTOR, 40V, PNP, DARL
Q6	334133		XISTOR, 2N4410
Q7			SAME AS Q1
Q8			SAME AS Q1
Q9			SAME AS Q1
Q10			SAME AS Q1
Q11			SAME AS Q1
Q12			SAME AS Q1
Q13			SAME AS Q1
Q14			SAME AS Q1
Q15			SAME AS Q1
Q16			SAME AS Q1
Q17			SAME AS Q1
Q18			SAME AS Q1
Q19			SAME AS Q1
Q20			SAME AS Q1
Q21	325077		XISTOR, 60V, PNP

REF DESIG	PART NO REC	QTY	DESCRIPTION
MLA8	404324		IC, QUAD OP AMP
MLB4	339417		IC, HEX BUFFER
MLB5	474004		IC, HEX INVERTER
MLC4	430651		IC, MACON (TML) *
MLC4	430671		IC, MACON (TML) **
MLC7	430601		IC, MAPL (TML) *
MLC7	430641		IC, MAPL (TML) **
MLD2	339109		IC, DUAL JK FF
MLE1	339380		IC, QUAD NOR
MLE3	339417		IC, HEX BUFFER
MLE6	404050		IC, HEX BUFFER
MLE7			SAME AS MLE6
MLE8			SAME AS MLE6
RPD3	341733		MODULE, RES, 6.8K
SPD4	341808		SWITCH, 8 POS DIP
CR1	400923		DIODE, IN5360A
CR2			SAME AS CR1
CR3	312341		DIODE, IN4004
CR4			SAME AS CR3
CR5			SAME AS CR3
CR6			SAME AS CR3
CR7			SAME AS CR3
CR8			SAME AS CR3
CR9			SAME AS CR3
CR10	430605		DIODE, IN4936
CR11			SAME AS CR10
CR12			SAME AS CR10
CR13			SAME AS CR10
CR14			SAME AS CR10
CR15			SAME AS CR10
CR16			SAME AS CR3
CR17			SAME AS CR3
CR18			SAME AS CR3

Note 1: 341618 pin connector (39 places).

Note 2: 340269 fuse clip (2 places); fasten with 336473 rivet (2 places).

Note 3: 0.025 inch dot next to diode represents cathode.

Note 4: 430627 and 430628 holder should be positioned such that it is approximately flush with the board.

Note 5: Circuit assembly changed at customer ID, Issue 2 to add POR circuitry for MACON and MAPL and to improve noise immunity.

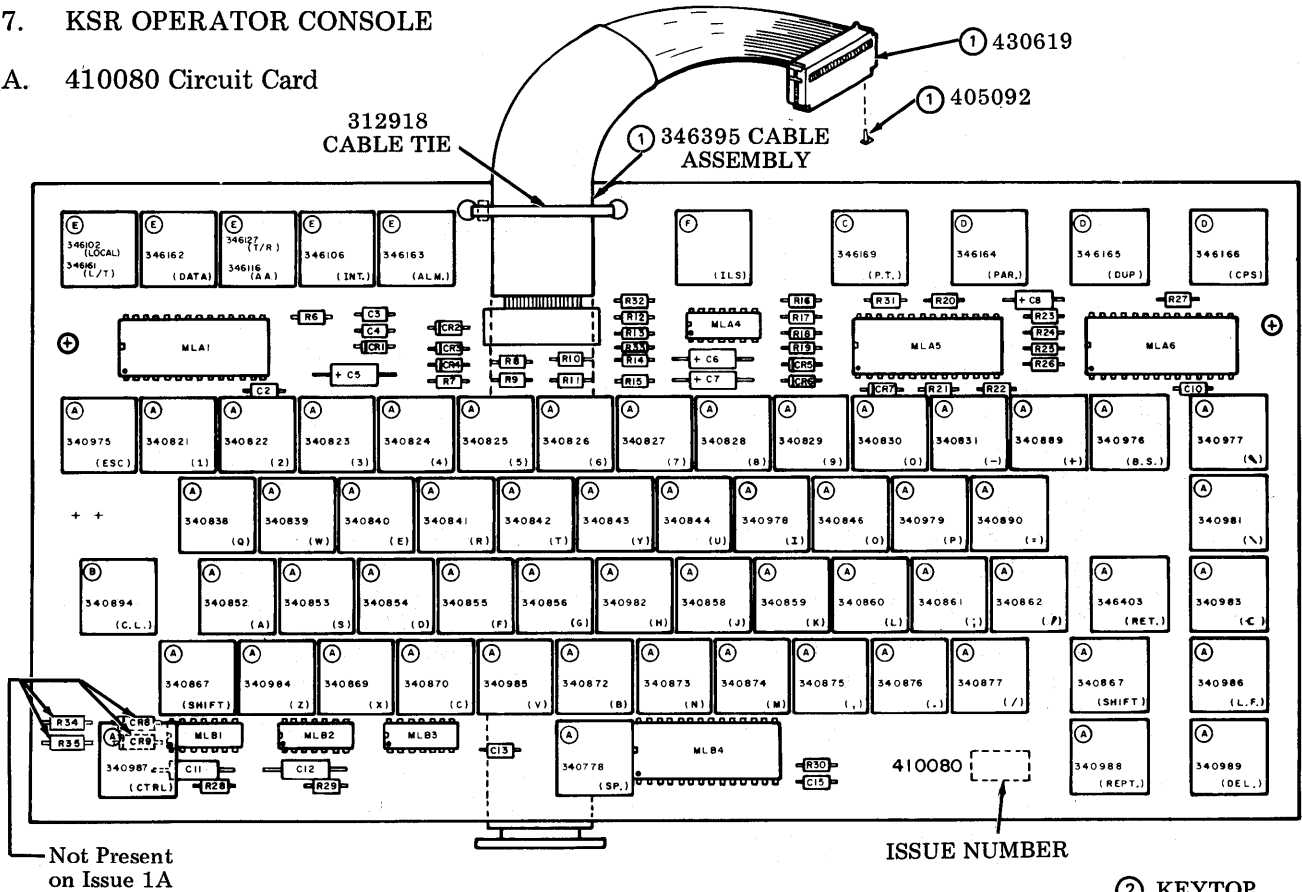
Add new MACON (430671) and MAPL (430641).

Note 6: May be used on Issue 1B or 2A. \*

Note 7: May be used on Issue 2A only. \*\*

7. KSR OPERATOR CONSOLE

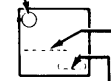
A. 410080 Circuit Card



ISSUE NUMBER

② KEYTOP PART NO. (Not Part of 410080)

SWITCH TYPE (See Chart Below.)



KEYTOP DESIGNATION

REF. DESIG.	PART NO.	QTY.	DESCRIPTION	REF. DESIG.	PART NO.	QTY.	DESCRIPTION
MLA1	342280	3	SENSE AMP TSA-2L	R16	315948	1	RESISTOR, 100 OHM 1/4W
MLB1	339002	2	QUAD 2 INPUT GATE (9002)	R18	315971	1	RESISTOR, 680 OHM 1/4W
MLB2			SAME AS MLB1	R19	315953	2	RESISTOR, 1.2K OHM 1/4W
MLB3	315990	1	DECADE COUNTER (7490)	R20-22			SAME AS R12
MLA4	404027	1	CLOCK DRIVER	R23	333417	1	RESISTOR 680K OHM 1/4W
MLB4			SAME AS MLA1	R24-26			SAME AS R12
MLA5	342238	1	KEYSWITCH LOGIC TKL-2KP	R27			SAME AS R6
MLA6			SAME AS MLA1	R28-29	328783	2	RESISTOR 180 OHM 1/4W
CR1	346394	1	DIODE, ZENER 1N4730A	R30			SAME AS R6
CR2-9	197464	8	DIODE 1N4148	R17	330640	1	RESISTOR 150 OHM 1/4W
				R31-32	315954	2	RESISTOR 1.5K OHM 1/4 W
				R33			SAME AS R19
C2	346238	3	CAPACITOR 33 pf	R34-35	315952	2	RESISTOR, 820 OHM 1/4W
C3-4	405324	3	CAPACITOR 0.1 MFD				
C5-7	333727	3	CAPACITOR 6.8 MFD				
C8	336948	1	CAPACITOR 1.0 MFD				
C10			SAME AS C2				
C11-12	300334	2	CAPACITOR, .0047 MFD				
C13			SAME AS C3				
C15			SAME AS C2				
R6	326573	3	RESISTOR, 1.8M OHM 1/4W				
R7	321213	1	RESISTOR, 1K OHM 1/4W				
R8-11	315959	4	RESISTOR, 4.7K OHM 1/4W				
R12-13	320275	8	RESISTOR, 10K OHM 1/4W				
R14-15	315947	2	RESISTOR, 51 OHM 1/4W				

SWITCH NO.	TYPES	PUSH ROD COLOR	QTY
Ⓐ 340720	BASIC	WHITE	57
Ⓑ 340722	LATCHING	BLACK	1
Ⓒ 340779	DC CONTACT	PINK	1
Ⓓ 341098	LATCHING	GREY	3
Ⓔ 346359	INDICATOR	ORANGE	5
Ⓕ 346432	DC CONTACT	BLACK (Cut-OFF)	1

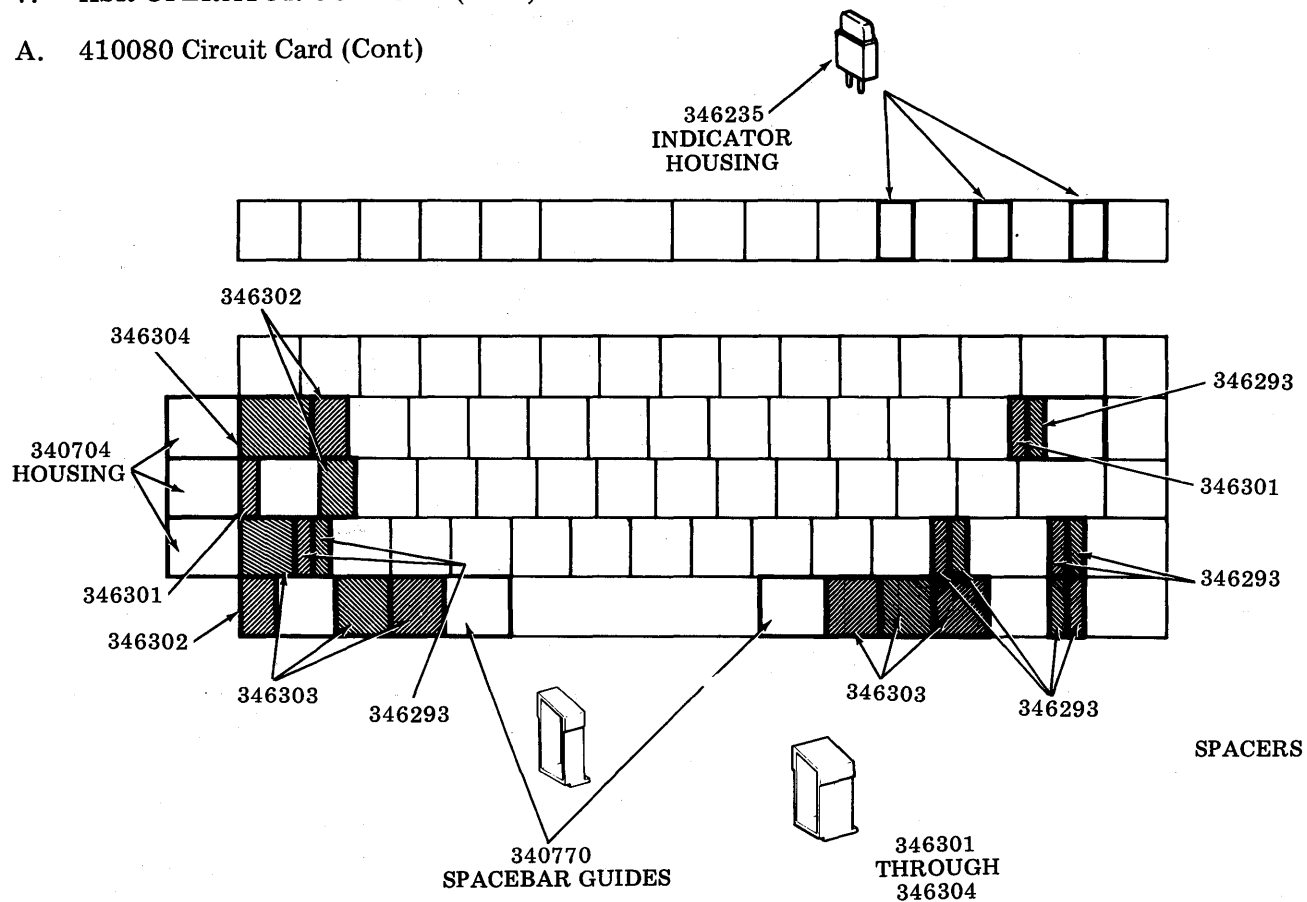
① Part of 346395 Cable Assembly

② Refer to Page 6-26.

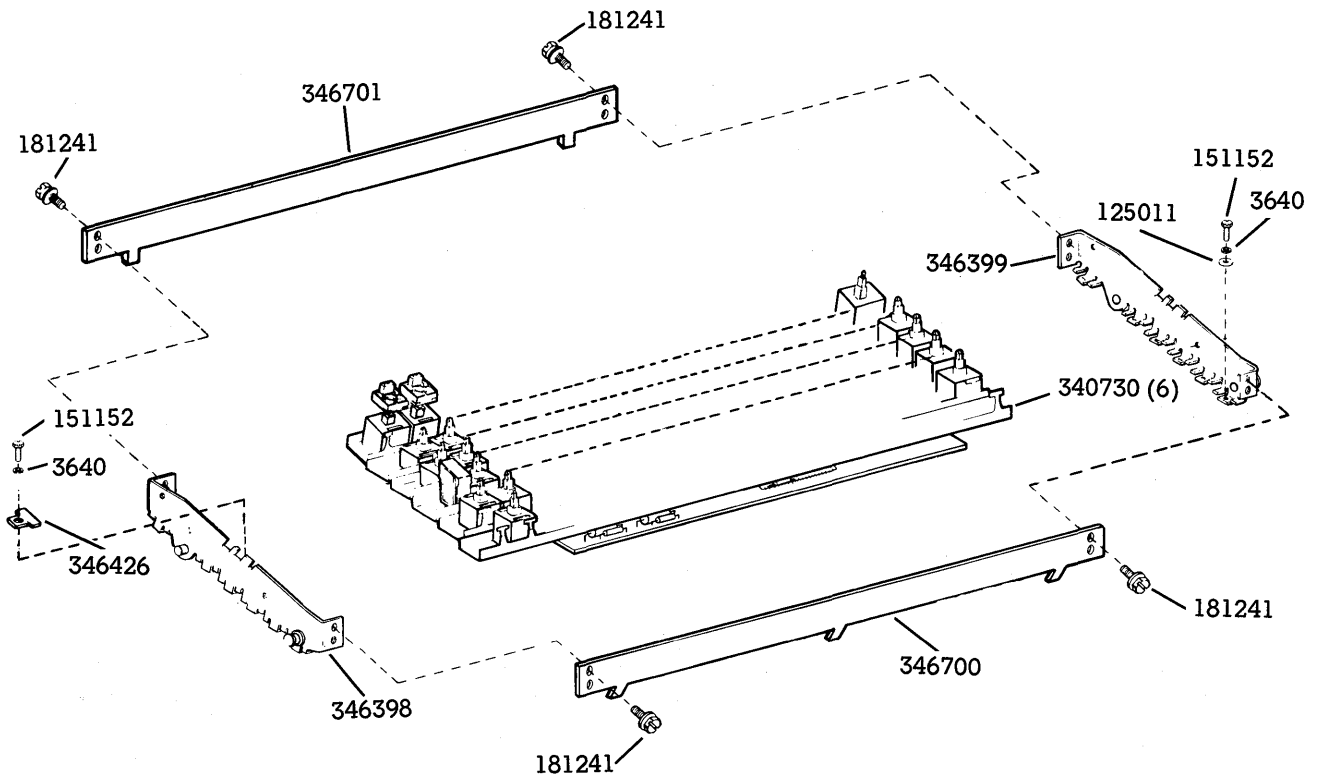


7. KSR OPERATOR CONSOLE (Cont)

A. 410080 Circuit Card (Cont)

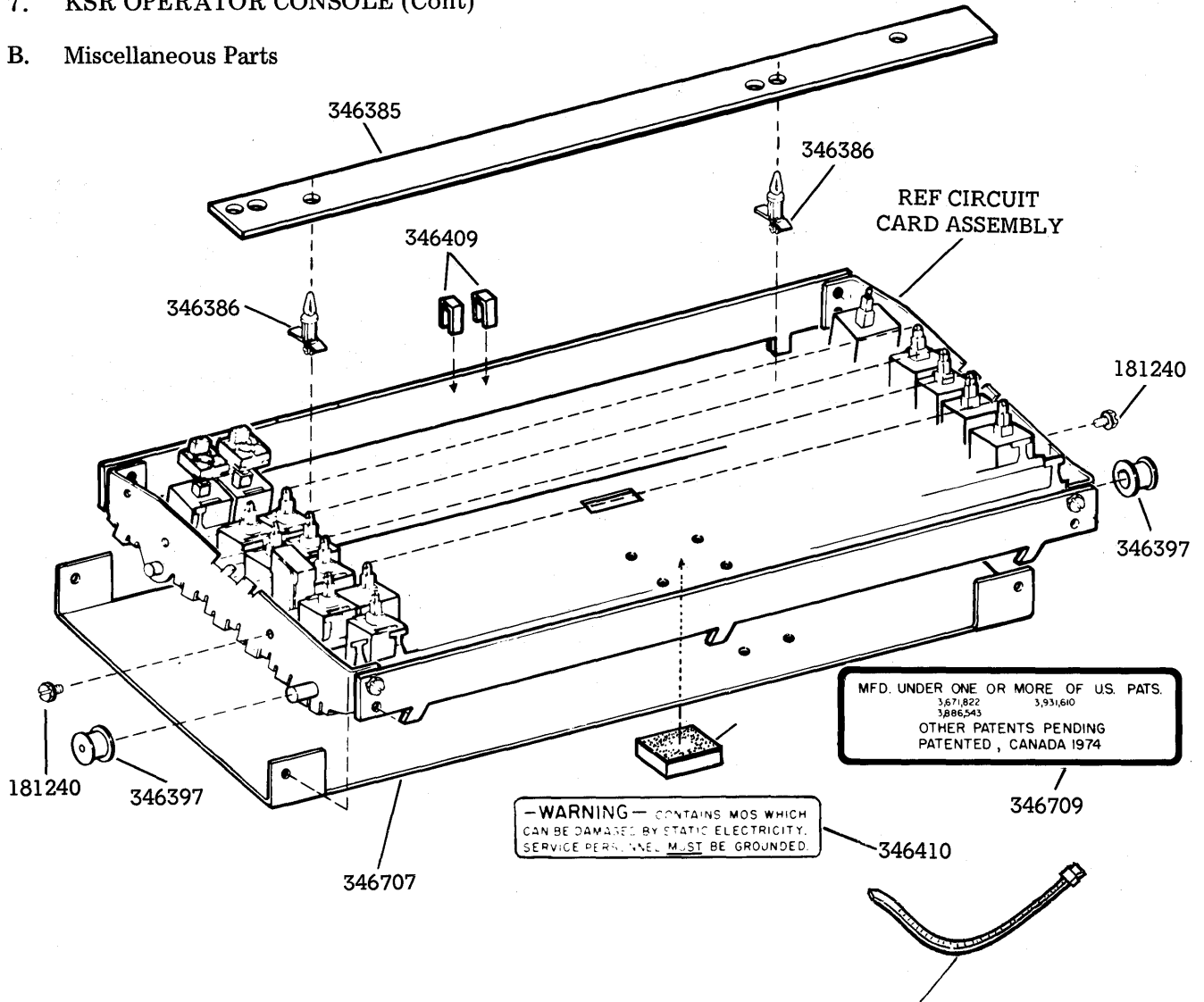


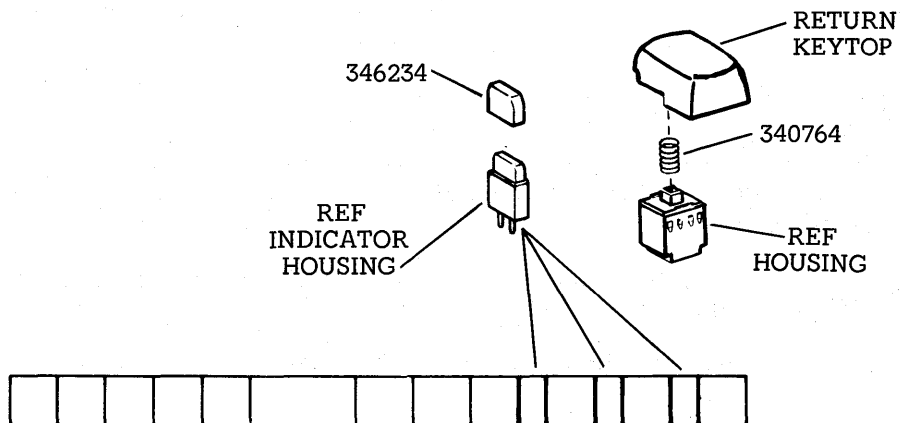
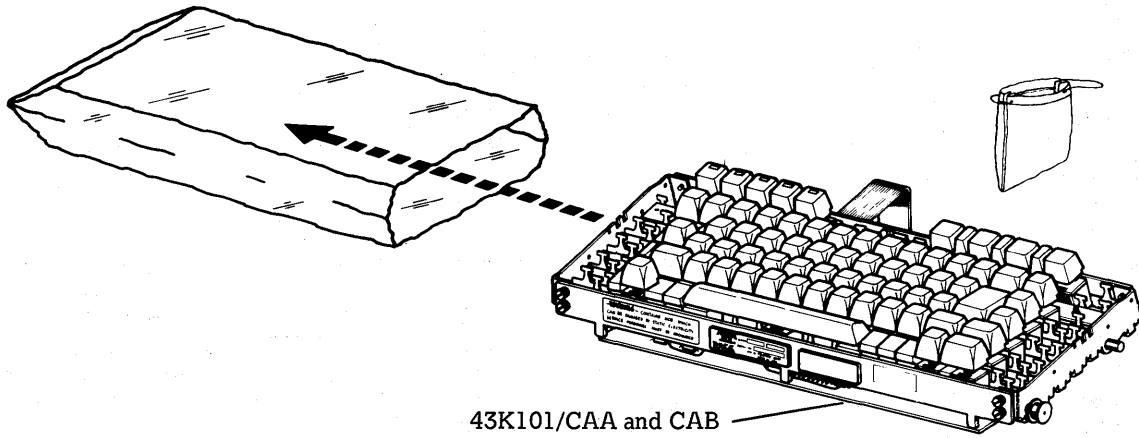
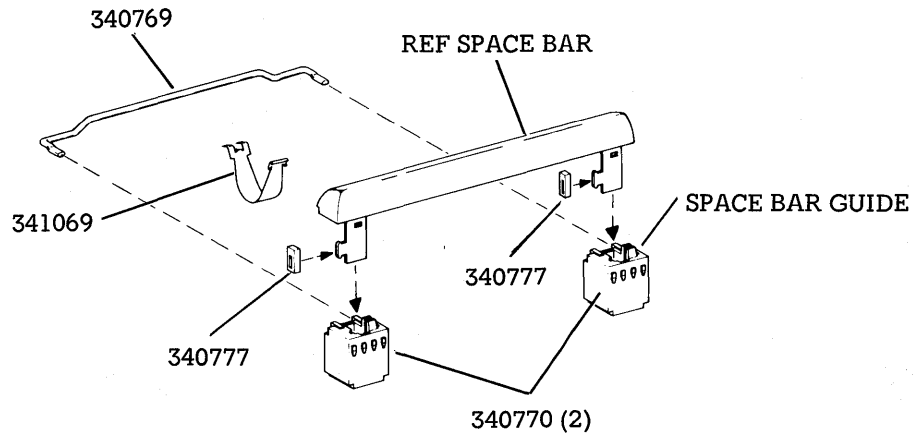
A. 410080 Circuit Card (Cont)



7. KSR OPERATOR CONSOLE (Cont)

B. Miscellaneous Parts





7. KSR OPERATOR CONSOLE (Cont)

C. Keytops

TP PART NO.	KEYTOP DESCRIPTION	TP PART NO.	KEYTOP DESCRIPTION
340701	BLOCKING — CONTROL (See Note 6)	340872	STX B
340714	BLOCKING — DATA (See Note 6)	340873	SO N
340778	SPACEBAR	340874	FS M
340821	! 1	340875	< ,
340822	@ 2	340876	> .
340823	# 3	340877	? /
340824	\$ 4	340889	] +
340825	% 5	340890	[ =
340826	^ 6	340894	CAPS LOCK
340827	& 7	340975	ESC
340828	* 8	340976	BACKSPACE
340829	( 9	340977	~ \
340830	) 0	340978	HT
340831	- -	340979	DLE P
340838	DC1 Q	340981	! GS /
340839	ETB W	340982	BS H
340840	ENQ E	340983	} US
340841	DC2 R	340984	SUB Z
340842	DC4 T	340985	SYN V
340843	EM Y	340986	LINE FEED
340844	NAK U	340987	CTRL
340846	SI O	340988	REPT
340852	SOH A	340989	DELETE NUL
340853	DC3 S	346102	LOCAL (See Note 5)
340854	EOT D	346106	INTRPT
340855	ACK F	346116	AUTO ANSW (See Note 4)
340856	BEL G	346127	TERM READY (See Note 5)
340858	RS J	346161	LOCAL — TALK (See Note 4)
340859	VT K	346162	DATA (See Note 2)
340860	FF L	346163	ALARM (See Notes 1 and 2)
340861	: ;	346164	ON-UP PARITY OFF-DN
340862	" /	346165	HALF-UP DUPLEX FULL-DN
340867	SHIFT	346166	30-UP CPS 10-DN
340869	CAN X	346169	PRINTER TEST
340870	ETX C	346403	RETURN (See Note 3)

Note 1: 346409 spacer must be installed under the 346163 keytop to block the action of the ALARM keyswitch on 43K101/CAA opcon.

Note 2: 346409 spacer must be uninstalled under the 346162 and 346163 keytop to block the action of the DATA and ALARM keyswitches on the 43K101/CAB opcon.

Note 3: The 340764 compression spring between the 346403 keytop and the housing must be ordered separately.

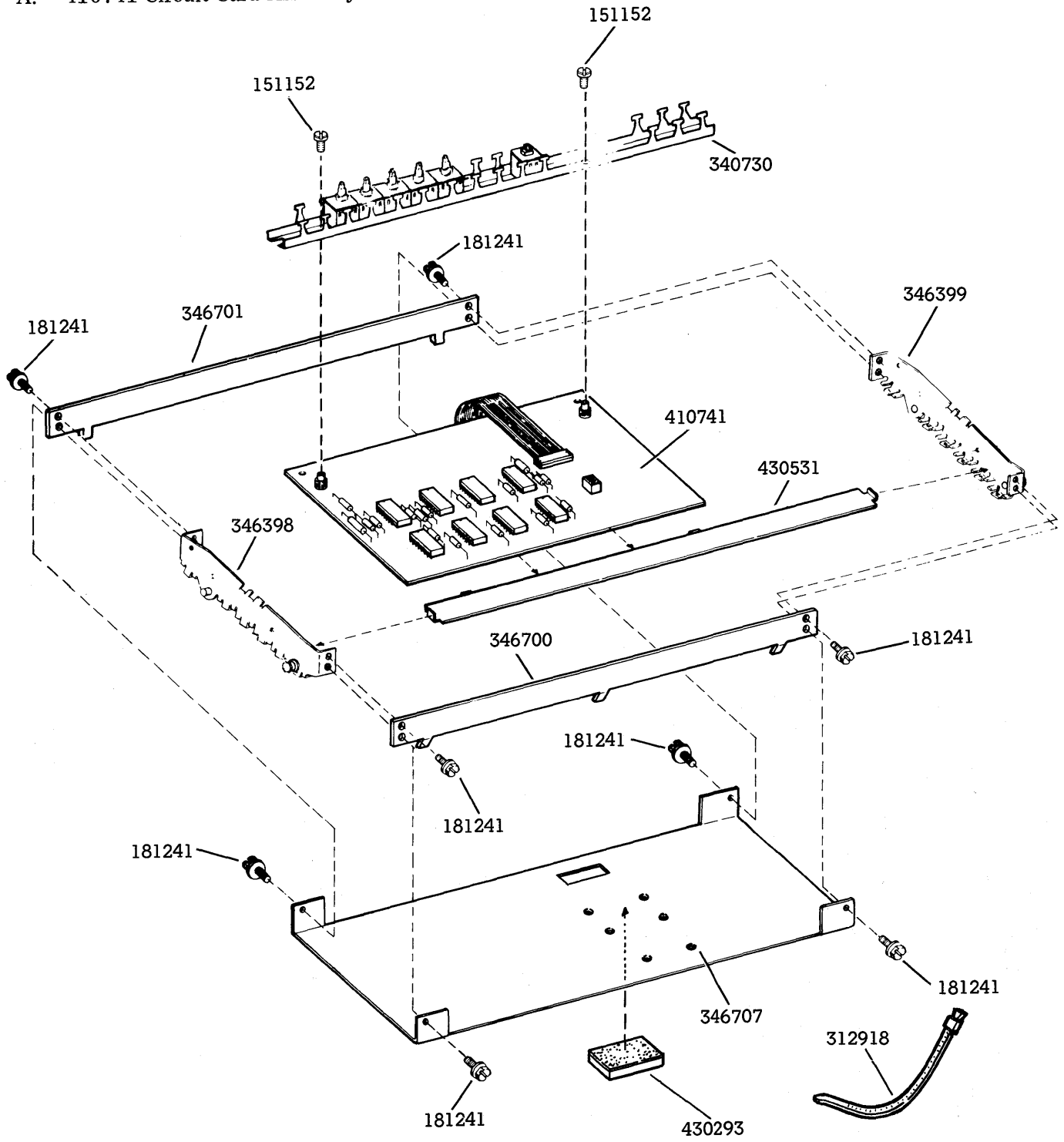
Note 4: 346116 and 346161 keytops are used on 43K101/CAA opcon only.

Note 5: 346102 and 346127 keytops are used on 43K101/CAB opcon only.

Note 6: 340701 and 340714 keytops are not part of the opcon but may be used for local engineering requirements to block the action of keyswitches.

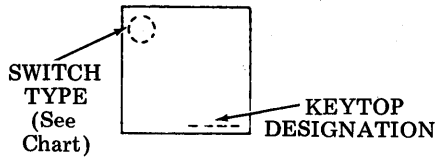
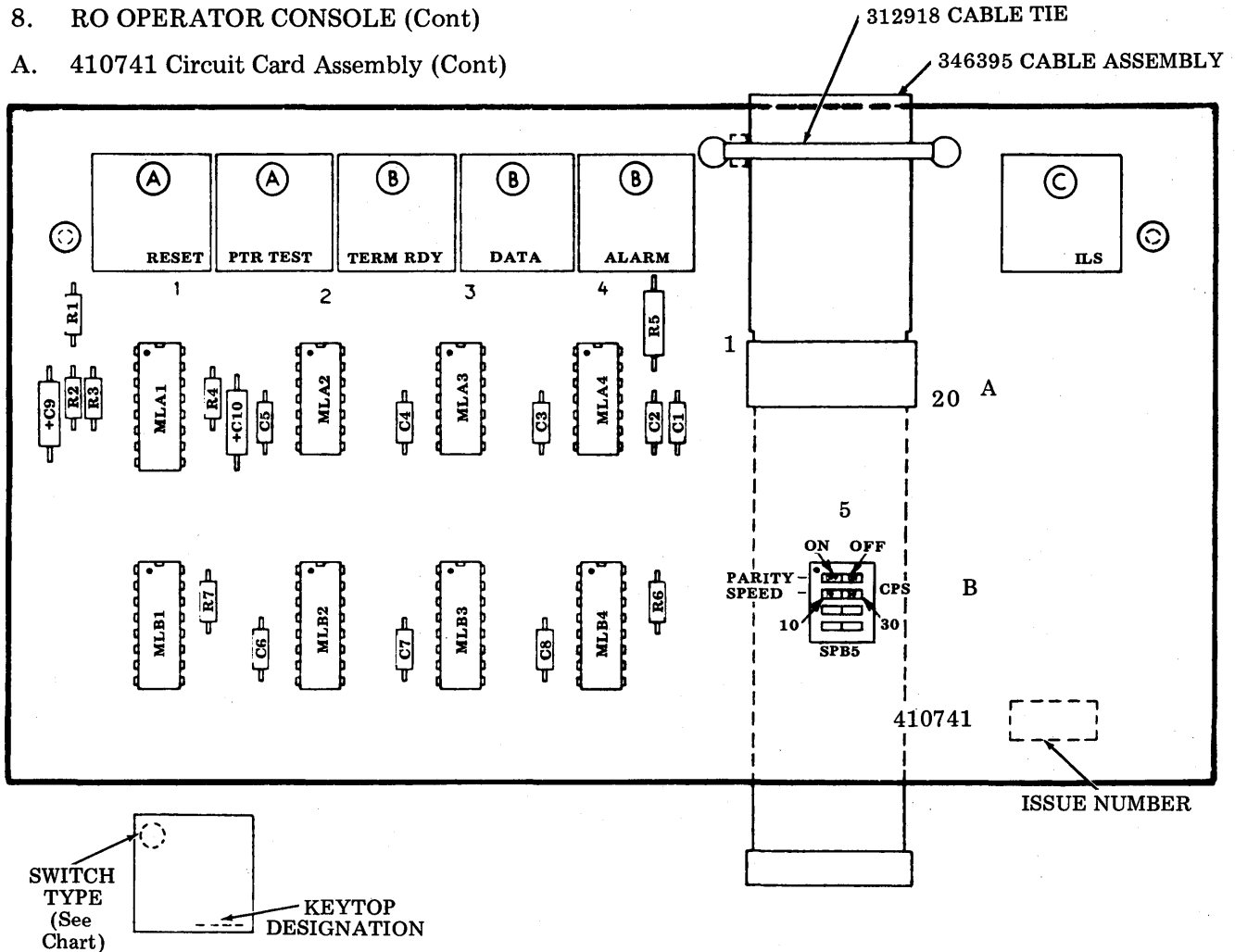
8. RO OPERATOR CONSOLE

A. 410741 Circuit Card Assembly



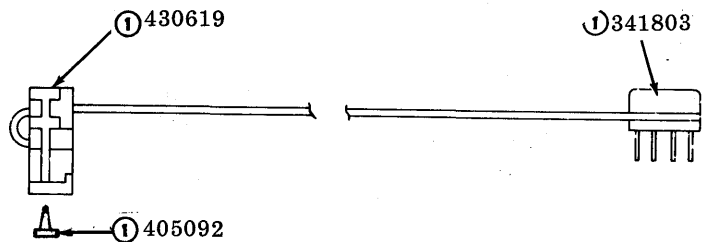
8. RO OPERATOR CONSOLE (Cont)

A. 410741 Circuit Card Assembly (Cont)



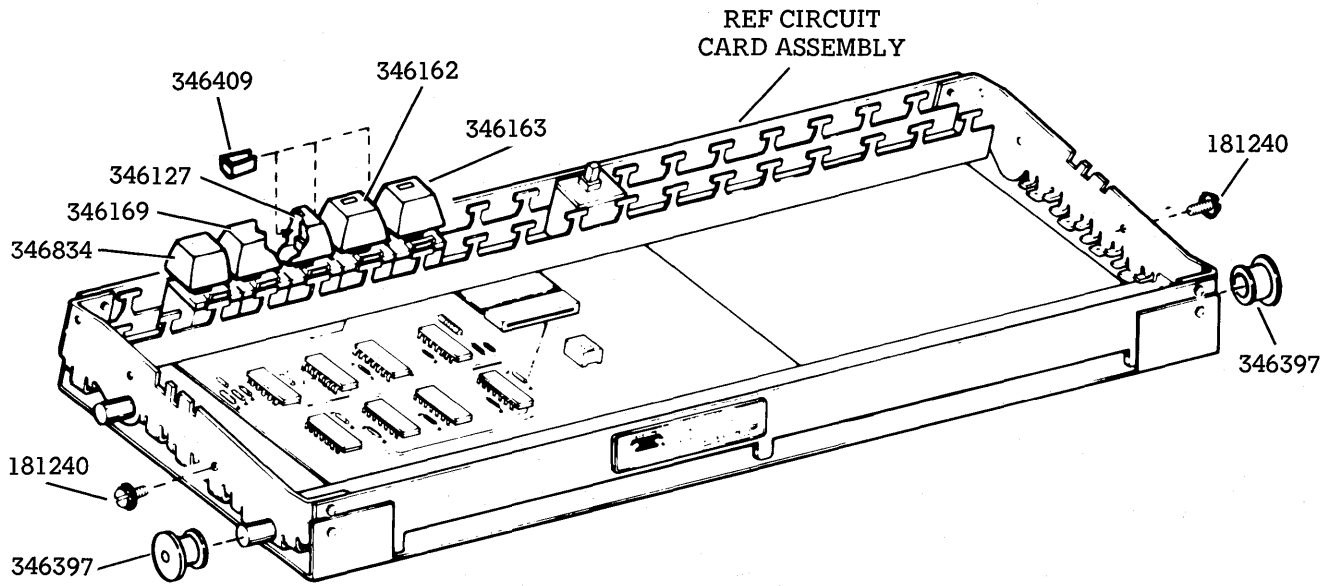
REF DESIGN	PART NO. REQ	QTY	DESCRIPTION
MLA1	339602	1	DUAL ONE SHOT
MLA2	474000	2	QUAD 2 INPUT GATE
MLA3			SAME AS MLA2
MLA4	315990	1	DECADE COUNTER (7490)
MLB1	474193	3	4 BIT UP/DOWN CTR
MLB2			SAME AS MLB1
MLB3			SAME AS MLB2
MLB4	430506	1	ROM 256 X 4
SPB5	341804	1	SWITCH, 4 POS.
C1-C8	405324	8	CAPACITOR, 0.1 MFD
C9-C10	336948	2	CAPACITOR, 1.0 MFD
R1	300092	2	RESISTOR, 6.8K 1/4W
R2	333409	2	RESISTOR, 39K 1/4W
R3	315960	1	RESISTOR, 5.6K 1/4W
R4			SAME AS R2
R5	137602	1	RESISTOR 470 1/2W
R6			SAME AS R1
R7	321213	1	RESISTOR 1K 1/4W

SWITCH NO.	TYPES	PUSH ROD COLOR	QTY
(A) 340779	DC CONTACT	PINK	2
(B) 346359	INDICATOR	ORANGE	3
(C) 346432	DC CONTACT	BLACK (CUT-OFF)	1



① Part of 346395 Cable Assembly

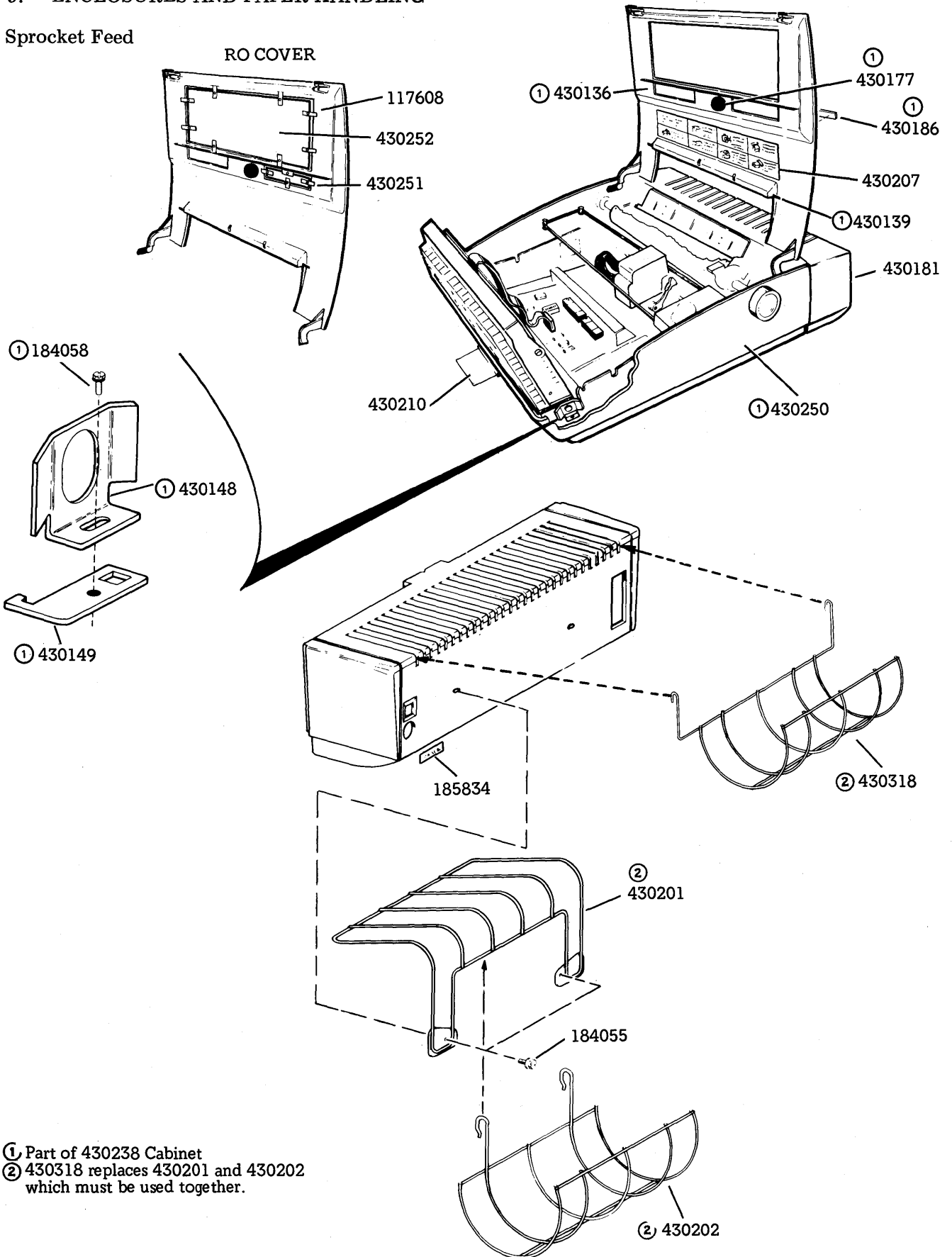
B. Keytops and Miscellaneous Parts





9. ENCLOSURES AND PAPER HANDLING

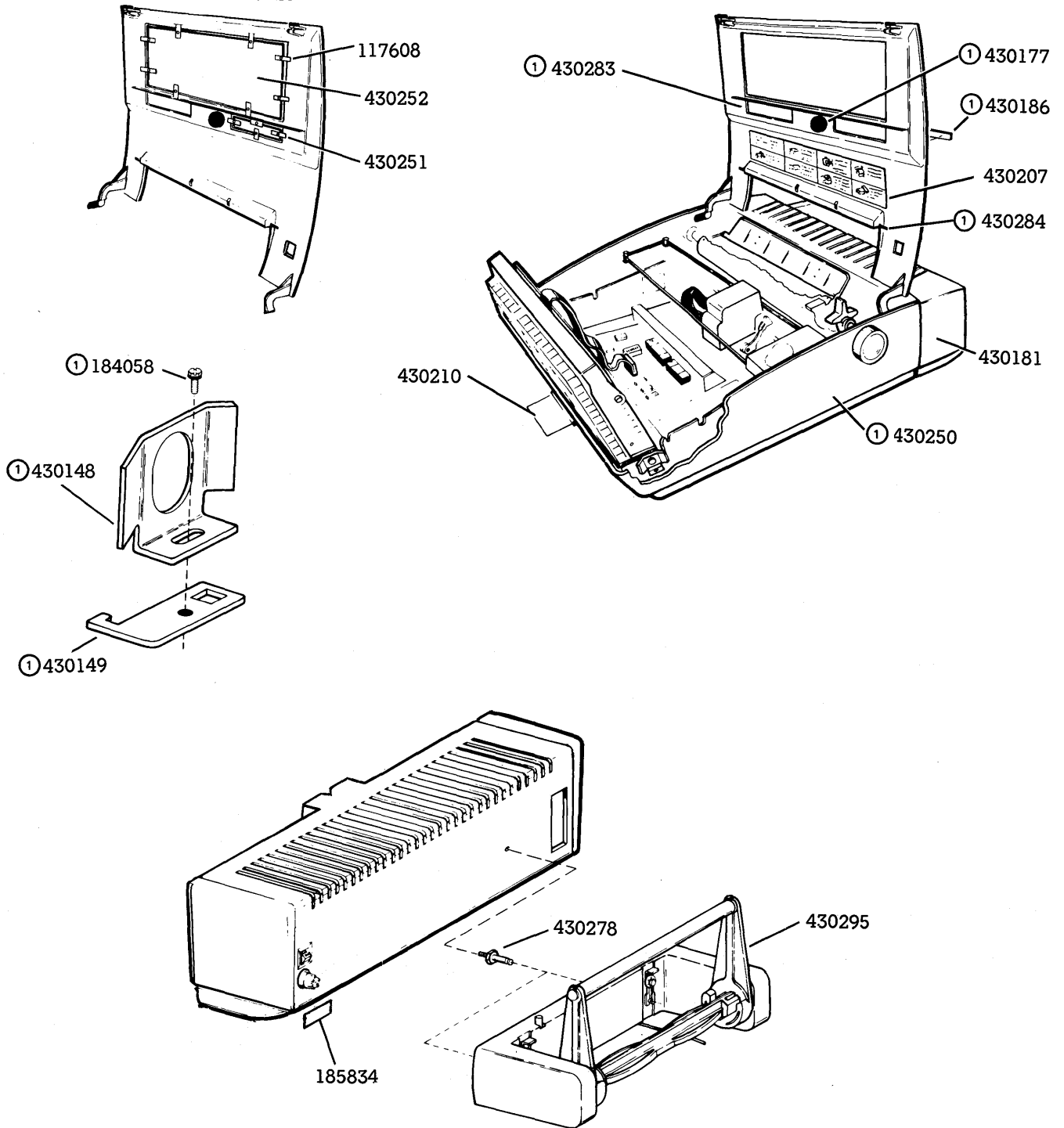
Sprocket Feed



① Part of 430238 Cabinet  
 ② 430318 replaces 430201 and 430202 which must be used together.

Friction Feed

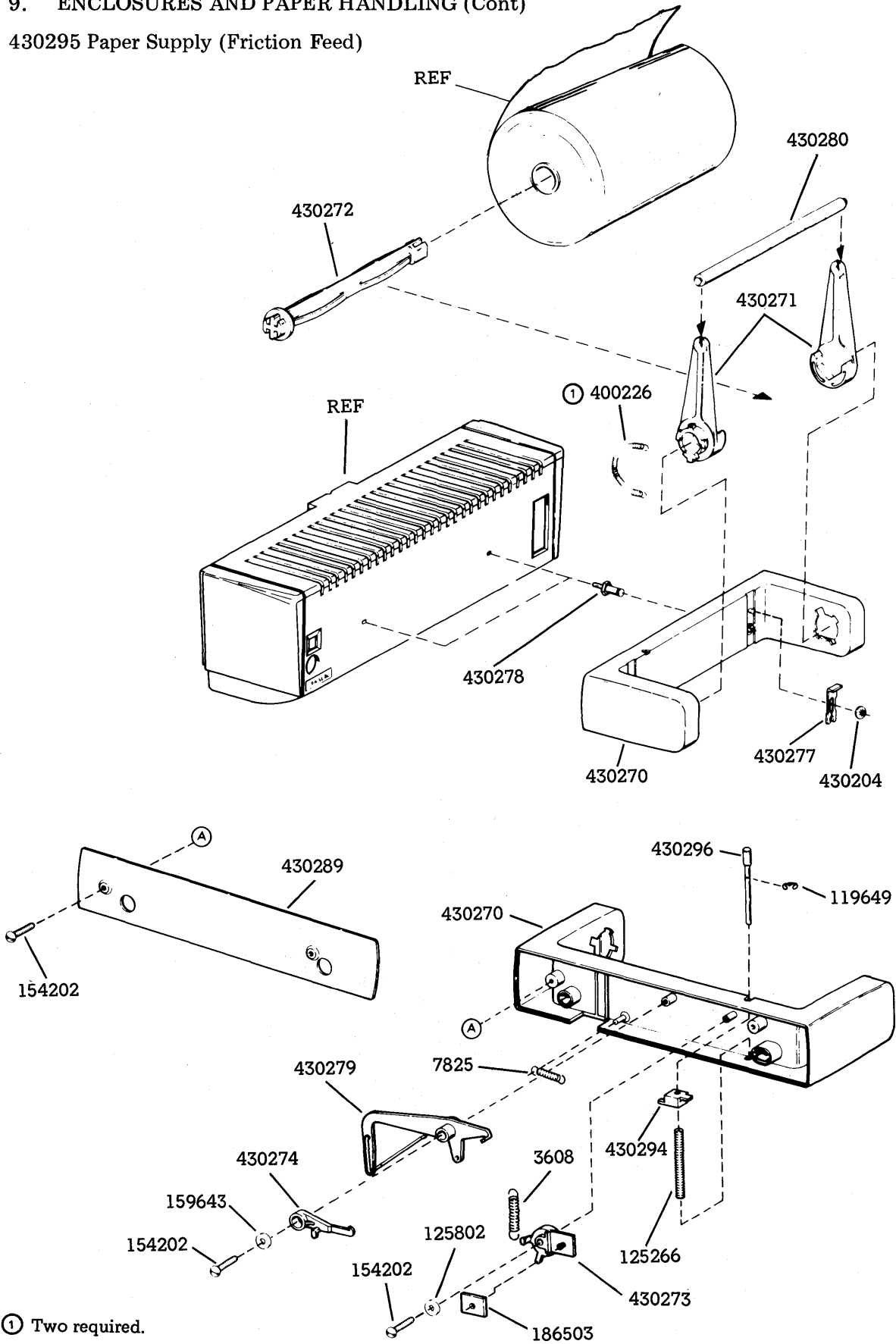
RO COVER



① Part of 430299 Cabinet

9. ENCLOSURES AND PAPER HANDLING (Cont)

430295 Paper Supply (Friction Feed)



## 10. NUMERICAL INDEX

Part Number	Description and Page Number	Part Number	Description and Page Number	Part Number	Description and Page Number
2191	Lockwasher 9,12,13,17	151152	Screw, 4-40 x 3/16 Hex 23,27	300092	Resistor 20,28
2669	Lockwasher 13	151618	Screw, 6-40 x 7/16 Fil 9	300102	Diode 6
3598	Nut, 6-40 Hex 12,19	151629	Nut, 6-40 Lug 9	300384	Capacitor, .0047 MFD 21
3599	Nut, 4-40 Hex 13,14	151685	Screw, 4-40 x 5/16 Fil 10	310929	Capacitor, 1.8 MFD 6
3608	Spring 32	151733	Screw, 4-40 x 9/16 Fil 18	310930	Capacitor, 100 MFD 6
3640	Lockwasher 18,23	151880	Nut, 4-40 Hex 10,16	310988	Resistor, 150 Ohm 20
3646	Lockwasher 9	152893	Screw, 4-40 x 1/4 Hex 10	312341	Diode 20
4708	Spring 13,14	154202	Screw, No. 4 Spl 32	312401	Diode 6
7001	Washer 6,7	159643	Shim, .008" Thk 32	312918	Strap 4,19,21,27
7002	Washer, Flat 9,12,16	**161708	Latch, Magnetic 14,15	315947	Resistor, 51 Ohm 21
7825	Spring 32	163765	Ring, Retaining 8	315948	Resistor, 100 Ohm 7,21
45815	Lockwasher 17	164958	Screw, 4-40 x 1/2 Hex 13,14	315951	Resistor, 560 Ohm 7
71073	Washer, Flat 13	171469	Resistor, 100 Ohm 20	315952	Resistor, 820 Ohm 21
74953	Screw, 4-40 x 13/16 Fil 18	171521	Resistor, 100 Ohm 20	315953	Resistor, 1200 Ohm 21
82727	Spring 15	177101	Resistor, 6.8 Ohm 7	315954	Resistor 21
88857	Washer, Spring 17	177108	Diode 20	315955	Resistor, 3300 Ohm 7
89897	Nut, 10-32 Hex 17	177113	Insulator 6	315956	Resistor, 2700 Ohm 7,20
92736	Post, Spring 12	178862	Resistor, 10 Ohm 7	315957	Resistor, 3300 Ohm 7
93118	Spring 13	181240	Screw w/Lockwasher, 6-40 x 3/16 Hex 4,19,23,24,29	315959	Resistor 4700 Ohm 7,21
97393	Screw, 6-40 Shoulder 13	181241	Screw w/Lockwasher, 6-40 x 1/4 Hex 23,27	315960	Resistor, 5600 Ohm 28
98642	Lockwasher 6,19	181242	Screw w/Lockwasher, 6-40 x 5/16 Hex 14,15	315961	Resistor, 9200 Ohm 7
101386	Spring 13,14,15	181245	Screw w/Washer 19	315967	Resistor, 3300 Ohm 7
104807	Washer, Flat 10	181461	Gong 11	315971	Resistor, 680 Ohm 7,21
107116	Lockwasher 4	182182	Holder, Fuse 4	315972	Resistor, 22,000 Ohm 20
110437	Spring 13	182523	Clamp, 1-3/8 In ID Mounting 19	315988	Resistor, 27000 Ohm 7
110743	Lockwasher 13,14,16	182726	Terminal, Receptacle Type 11	315990	Counter, Decade 21, '8
112485	Screw, 6-32 x 1/4 Fil 17	182763	Resistor 7	318801	Resistor, 47000 Ohm 7
117608	Nut, Speed 30,31	**183321	Sprocket Feed 8	318802	Resistor, 220 Ohm 7,20
118186	Resistor, 56000 Ohm 7,20	183876	Setscrew, 6-32 8	318803	Resistor, 2400 Ohm 7,20
118198	Resistor, 56000 Ohm 7	184055	Screw w/Lockwasher, 6-40 x 3/16 Hex 11,13,30	320010	Diode 20
118617	Screw w/Sems Fastener 3	184056	Screw w/Lockwasher, 6-40 x 1/4 Hex 13,14,15,17	320026	Resistor, 3900 Ohm 7
119332	Screw, 10-32 x 1/4 Rd 6,19	184058	Screw w/Lockwasher, 6-40 x 7/16 Hex 30,31	320275	Resistor, 10000 Ohm 7,20,21
119649	Ring, Retaining 13,14,15,32 **	184067	Screw w/Lockwasher, 4-40 x 5/16 Hex 13	320276	Resistor, 470 Ohm 7,20
119651	Ring, Retaining 14,30,31	185676	Terminal, Plug Type 4	320419	Terminal, Ring Type 4
119652	Ring, Retaining 12,13,16,17	185677	Terminal, Receptacle Type 4	321135	Diode 6
119653	Ring, Retaining 15,16	**185834	Plate, Fuse 30,31	321213	Resistor 7,20,21,28
*120139	Fuse, 1 Amp 6	185890	Pushnut 9	321258	Resistor, 20,000 Ohm 7
120211	Resistor, 20,000 Ohm 7	186503	Magnet 32	321508	Resistor, 100000 Ohm 7,20
121242	Clamp, 1/8 ID Cable 11	186731	Ring, Compression 9,16	321545	Resistor, 12000 Ohm 20
124516	Grommet, Rubber 18	**188406	Switch 13	321786	Plate, Fuse 6
125011	Washer, Flat 23	192007	Terminal, Tab Type 4	323714	Capacitor, 470 MFD 20
125015	Washer, Flat 15	197464	Diodoe 6,21	324902	Resistor, 100000 Ohm 7,20
125181	Screw, 2-56 x 3/8 Fil 13	198522	Clip, Spring 6	324908	Resistor, 30,000 Ohm 7
125266	Spring, Compression 32	198670	Screw w/Lockwasher, 6-40 x 5/16 Hex 5,11,12,13	325034	Capacitor, 120 MFD 6
125802	Washer, Flat 32	300057	Capacitor, .01 MFD 6,20	325077	Transistor 7,20
130683	Lockwasher 10			326573	Resistor, 1.8 Meg Ohm 21
137440	Resistor, 1,000 Ohm 20			326601	Resistor, 150000 Ohm 20
137602	Resistor, 470 Ohm 28			326823	Regulator, Voltage 6
143097	Ring, Retaining 11			327721	Resistor 4.7 Meg Ohm 7
*143306	Fuse, SL-BL 1 Amp 4			327809	Bushing, Insulating 6,7
*143307	Fuse, .6 Amp 19			328783	Resistor 180 Ohm 21
144464	Resistor, 220 Ohm 7			328785	Resistor, 330 Ohm 7
144550	Setscrew, 6-40 8,11,12			328786	Resistor, 330 Ohm 7
150711	Washer, Flat 14			330640	Resistor, 150 Ohm 21
				330641	Resistor, 1 Meg Ohm 7

10. NUMERICAL INDEX (Cont)

Part Number	Description and Page Number	Part Number	Description and Page Number	Part Number	Description and Page Number
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333412	Resistor, 180000 Ohm 20	thru		346921	Stud 6,7
333417	Resistor 680000 Ohm 21	340979	Keytop 21,26	400226	Spring 32
333727	Capacitor, 6.8 Ohm 6,21	340981	thru	400602	Terminal 10 to 13
334133	Transistor 20	340989	Keytop 21,26	400909	Transistor 7
335522	Coupler 6	341069	Spring, Leaf 25	400923	Diode 20
335622	Resistor, 68 Ohm 7	** 341098	Keypad 21	401067	Resistor, 24000 Ohm 7
335801	Capacitor 20	341592	Resistor, 75000 Ohm 7	401628	Bushing 4
336470	Strap 7	341596	Resistor, 121000 Ohm 7,20	402201	Casting Assembly, Front 6
336473	Rivet 6,20	341618	Pin, Connector 20	402202	Regulator 6
336694	Thyristor 6	341674	Connector, 3Pt Receptacle 4	402204	Regulator 6
336697	Resistor, 430 Ohm 7	341694	Connector 6	402243	Label, Warning 3
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339002	Gate, Input 21	341804	Switch 28	403737	Support 5
339109	Circuit, Integrated 20	341808	Switch 20	404027	Driver, Clock 21
339380	Circuit, Integrated 20	342238	Keypad 21	404050	Buffer, Hex 20
339417	Circuit, Integrated 20	342280	Amplifier 21	404239	Comparator, Quad Volt 6
339602	Circuit, Integrated 28	346102	Keytop 21,26	404324	Amplifier 20
340269	Clip, Fuse 6,20	346106	Keytop 21,26	405029	Led 6
340701	Keytop 26	346116	Keytop 26	405092	Plug, Polarizing 10 to 13,21,28
340704	Housing 22	346127	Keytop 29	405324	Capacitor, .1 MFD 6,20,21,28
340714	Keytop 26	346161	Keytop 21,26	405332	Socket 19
** 340720	Keypad 21	346162	Keytop 21,26,29	405692	Connector 11
** 340722	Keypad 21	346163	Keytop 21,26,29	407309	Terminal 10
340730	Channel 23,27	346164	thru	408037	Diode 6
340764	Spring, Compression 25	346166	Keytop 21,26	409013	Board, Circuit 18
340769	Bail, Wire 25	346169	Keytop 21,26,29	409740	Board, Circuit 19
340770	Guide 22,25	346234	Cap 25	** 410013	Card Assembly, Circuit 18
340777	Bumper 25	346235	Housing 22	410080	Card, Circuit 21,22,23
340778	Keytop 26	346238	Capacitor, 33 PFD 20,21	410700	Card, Power Supply 5,6
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340821	thru	346301	Spacer 22	410741	Card Assembly, Circuit 27,28
340831	Keytop 21,26	346302	Spacer 22	430001	Plate, Right Side 14,15
340838	thru	346303	Spacer 22	430002	Plate, Left Side 13
340844	Keytop 21,26	346304	Spacer 22	430003	Pan 10
340846	Keytop 21,26	** 346359	Keypad 21,28	** 430010	Rod, Guide 17
340852	thru	346385	Cover 24	** 430011	Tray Assembly, Paper 16
340856	Keytop 21,26	346386	Support 24	** 430012	Shaft, Paper Tray 16
340858	thru	346394	Diode 20,21	** 430013	Bearing, Platen 8
340862	Keytop 21,26	** 346395	Cable Assembly 21,28	** 430016	Post 17
340867	Keytop 21,26	** 346397	Bushing 24,29,31	** 430017	Lever 17
340869	Keytop 26	346398	Frame w/Post, Left 23,27	* 430019	Roller w/Bearing 12,17
340870	Keytop 26	346399	Frame w/Post, Right 23,27	** 430020	Housing, Bearing 17
340872	thru	346403	Keytop 21,26	* 430021	Spring, 12,17
340877	Keytop	346409	Spacer 24,29	430022	Post, Spring 17
340889	Keytop 21,26	346410	Label, Warning 24	* 430026	Bearing, Outer 17
340890	Keytop 21,26	346426	Plate, Locating 23	* 430027	Bearing, Inner 17
340892	Keytop 21,26	** 346432	Keypad 21,28	** 430028	Spring, Compression 17
340894	Keytop 26	346700	Rail, Front 23	** 430029	Screw, Lead 10,17
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		346707	Shield 24,27	* 430031	Nut, Lead Screw 9
		346709	Label 24	* 430032	Belt, Timing 17
				* 430033	Pulley, 81T 17
				** 430034	Fastener 17
				* 430035	Ribbon 3

Part Number	Description and Page Number	Part Number	Description and Page Number	Part Number	Description and Page Number
430036	Plate, Back 14	430193	Band, Left 13	**430279	Lever 32
**430045	Lever, Switch 13	**430198	Clamp 14	**430280	Roller 32
**430046	Bracket, Switch 13	**430199	Lever w/Stud 12	**430281	Platen 8
*430047	Motor w/Cable & Encoder 10	430201	Deflector, Paper 30	**430283	Cover 31
**430055	Cable Assembly 10	430202	Holder, Paper 30	**430284	Scale 31
**430058	Cover 10	430204	Nut, Push 32	**430285	Belt, Timing 12
**430061	Disc Assembly, Encoder 10	430205	Bumper 14	**430289	Plate 32
**430063	Fastener 10	**430206	Spacer 8	**430291	Separator, Paper 14,15,31
**430068	Nut, 8-32 Spl 9	**430207	Label 30,31	430292	Clamp 5
**430069	Handle, Locking 9	**430210	Card Assembly, Directory 30,31	430293	Retainer 24,27
430070	Spring 9	**430212	Bracket, Margin 13	**430294	Lever, Reset 32
430071	Bridge w/Post 9	**430213	Nut, Speed 11,12	**430295	Supply Assembly, Paper 31
430073	Roller 9	**430214	Pulley w/Clip 10	**430296	Shaft 32
**430088	Platen 8	*430215	Carriage w/Post 9	430299	Cabinet 31
430096	Spring, Torsion 9	**430216	Collar w/Link 9	**430309	Bushing 12
430097	Switch 10	**430217	Bridge Assembly 9	**430318	Holder, Paper 30
**430098	Clip, Sprocket Feed 8	*430218	Bracket Assembly, Left 13	*430319	Pulley w/Clip 10
**430100	Guide, Left Paper 13	**430219	Plate Assembly, Left 13,15	430506	Rom 28
**430101	Guide, Right Paper 14,15	**430222	Washer, Felt 17	430531	Channel 27
**430102	Bracket, Right 14	**430224	Post, Spring 13	**430550	Frame Assembly, Rear 3,4
**430103	Bracket, Left 14	430226	Roller, Left Guide 13	430551	Frame Assembly, Rear 4
**430104	Stripper, Paper 13,14,15	430227	Plate w/Post 13	**430554	Clip 5
**430105	Post 13	430228	Bracket 13	430556	Sink, Heat 5
**430106	Bracket w/Post, Left 13	430230	Tray, Paper 16	430558	Cover 5
**430107	Bracket, Left 13	430231	Shield, Ribbon 9	430560	Post 5
*430113	Coil Assembly 11 <i>BELL</i>	**430232	Rotor 14	430561	Cord, Power 4
**430114	Plunger w/Pin 11	430238	Cabinet 30	430564	Plate, Identification 3
**430117	Cable Assembly 11	**430240	Stud 12	430566	Switch, Rocker 4
*430118	Spring, Compression 11	**430242	Spring 13	430567	Terminal 13
**430136	Cover 30	430245	Separator, Paper 14	430601	Circuit, Integrated 20
**430139	Scale 30	**430246	Switch Bracket Assembly 3	430603	Insulator 10
**430141	Knob w/Insert 8	**430250	Housing 30,31	430604	Transistor 20
**430142	Clip, Platen 8,12	**430251	Plate 30,31	430605	Diode, 1N4936 6,20
*430143	Pulley, 42T Platen 8,11,12	**430252	Plate 30,31	430607	Capacitor, 1500 MFD 20
*430144	Pulley w/Flange 24T 11,12	**430253	Bracket 12	430608	Transistor 20
*430145	Belt, 106T Timing 8,11	430254	Plate, Left Side 13	**430610	Cable Assembly 19
**430148	Clamp 30,31	**430255	Slide 13	**430611	Cable Assembly 19
**430149	Plate, Nut 30,31	**430256	Bracket 13	430612	Sink, Heat 19
**430151	Mount, Rear 14	**430258	Shaft 15,16	430614	Cover, Rear 19
**430152	Stud, Rear Mount 14	**430259	Stud 16	430619	Connector 21,28
**430153	Clip 14	**430260	Tray, Paper 16	430622	Clamp 17
*430154	Motor w/Cable 11,12	**430261	Bail 15	**430625	Support 10
430155	Connector, 8Pt 11,12	**430262	Plate w/Post 15	430626	Holder 19
430162	Connector, 6Pt 10,13	**430264	Lever 8	430627	Holder 19
**430163	Cable Assembly 13	**430265	Roller 15	430628	Holder 19
**430166	Bracket, Bell 11	**430266	Shaft 15	430641	Circuit, Integrated 20
**430167	Bracket, Bell 11	**430267	Bracket, Left 13	430651	Circuit, Integrated 20
**430169	Strip, Insulator 5,14	**430268	Bracket w/Post 15	430671	Circuit, Integrated 20
430171	Plate 10	**430270	Support 32	*430700	Power Supply 3,5
**430177	Button Actuator 30,31	**430271	Lever 32	430701	Header, 10 Pin 6
**430178	Housing 10	**430272	Spindle, Paper 32	430702	Transformer, Power 7
**430179	Guide 16	**430273	Cam, Low Paper 32	430703	Transformer, Pulse 7
**430180	Bracket, Right 14,15	**430274	Follower, Cam 32	430704	Capacitor, 330 MFD 6
**430181	Bustle 30,31	**430276	Support, Bustle 14	430705	Capacitor, 530 MFD 6
**430186	Nameplate 30,31	**430277	Latch 32	430706	Capacitor, 200 MFD 6
**430190	Motor w/Cable 10	**430278	Post 31,32	430707	Thermistor 7
430192	Band, Right 9				

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Part Number	Description and Page Number	Part Number	Description and Page Number	Part Number	Description and Page Number
430708	Vapistor 7	430800	Frame, Center 18	430827	Clamp, Mounting 18
430709	Filter 6	430801	Cover, Guide 18	430828	Lubricator 18
430710	Washer 6	**430803	Cable Assembly 18	**430829	Cover 18
430711	Transistor 7	**430804	Insulator 18	430830	Insulator 18
430713	Diode 6	430809	Plate w/Post, Left 18	430831	Armature 18
430714	Resistor 7	430810	Plate w/Post, Right 18	**430832	Switch 18
430715	Diode 6	430811	Insulator 18	430833	Plate, Left Pole 18
430719	Resistor 7	430812	Magnet 18	430834	Connector 18
430721	Capacitor, 1200 PFD 6	430813	Guide, Wire 18	*430850	Head Assembly, Print 18
430722	Bracket 6	430814	Armature 18	474000	Circuit, Integrated 28
430723	Sink, Heat 6	430816	Armature 18	474002	Inverter, Hex 20
430724	Diode 6	430817	Plate, Right Pole 18	474004	Inverter 20
430725	Diode 6	430819	Cam, Adjusting 18	474193	Circuit, Integrated 28
430729	Diode 6	430820	Spring, Detent 8	430829	Cover 18
430731	Terminal 6	430821	Coil 18	*43K001/CAA	Operator Console 3
430732	Nut 6,7	430822	Sleeve 18	*43K101/CAA	Operator Console 3,25
**430733	Clip 5	430825	Guide, Ribbon 18	43K101/CAB	Operator Console 3,25
430734	Bushing, Insulating 6,7	430826	Washer, Mounting 18	43P101/AAA	Printer, Friction Feed 3
*430751	Terminal Auxiliary Unit 3			43P251/AAA	Printer, Sprocket Feed 3

\* } See Paragraph 1.03.  
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PART 7 — PACKING AND MARKING

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6. OPERATOR CONSOLE PACKING (KSR and RO).....	3

1. GENERAL

1.01 This part provides packing information for the 43 KSR and RO Teleprinter, the power supply, print head, logic card and KSR and RO operator console.

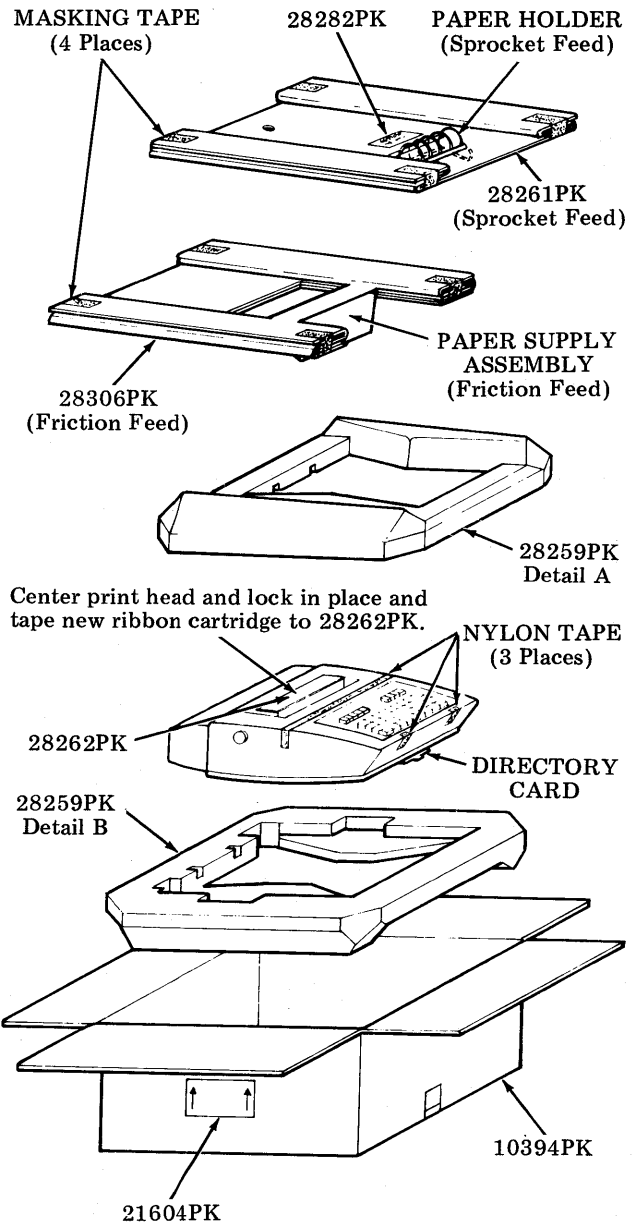
1.02 The teleprinter or loose major components should be properly packed for storage or transportation between service and customer locations. Packing provides protection against damage or contamination and facilitates storage, stock selection and handling.

1.03 The PK packing materials may be obtained from Teletype Corporation. The 18003PK foam folder for the logic card and the 28271PK carton with inserts for the print head may also be obtained from:

REPUBLIC PACKAGING CORP.  
9160 S. Green Street  
Chicago, Illinois 60620

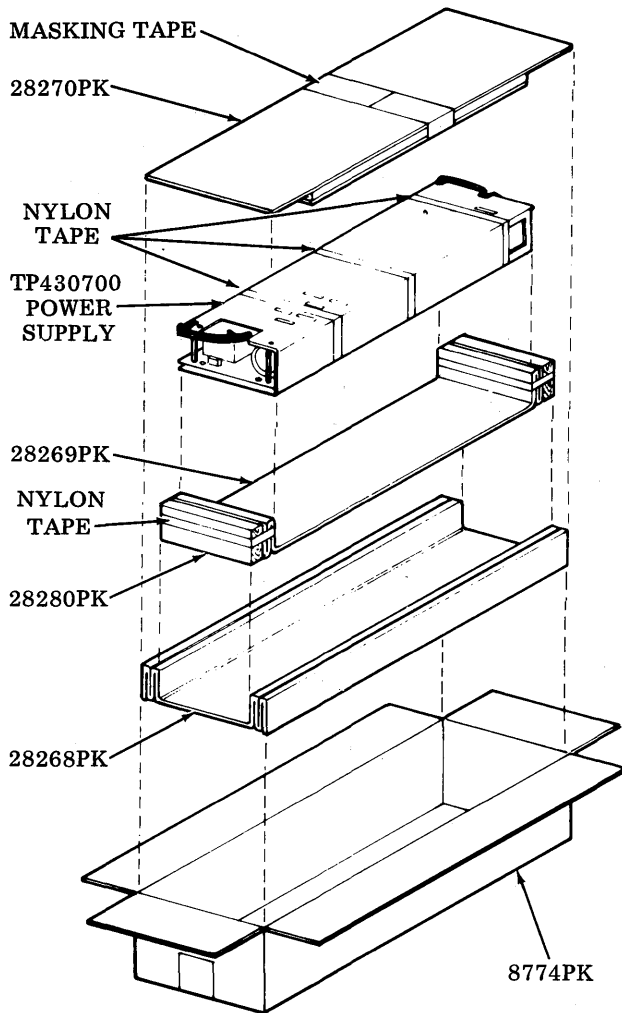
1.04 Identify the contents on the outside of each carton after packing, with the code or part number, using indelible markers or pre-marked adhesive labels.

2. TELEPRINTER PACKING (KSR and RO)

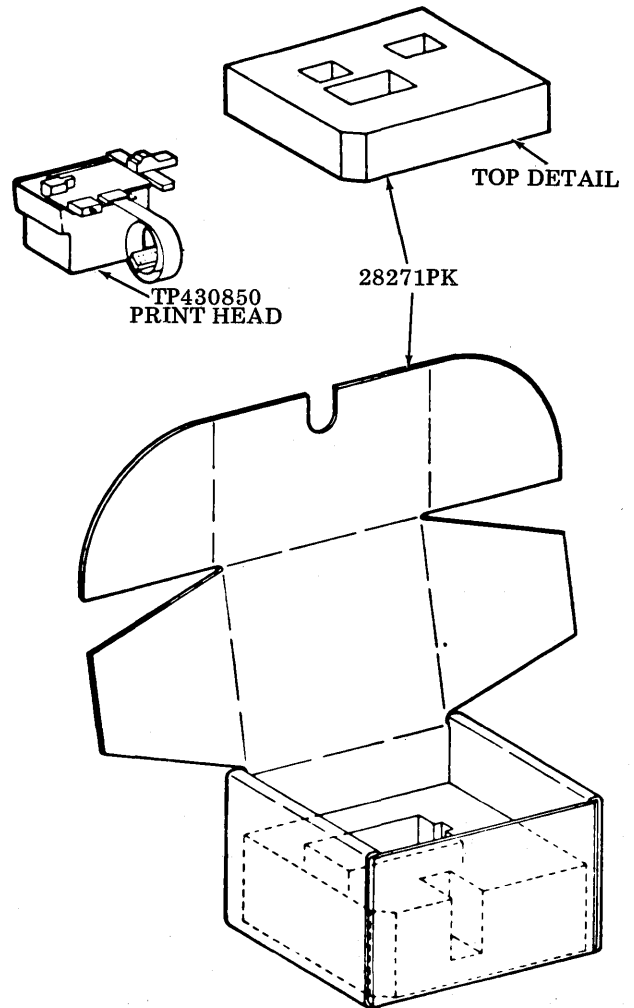




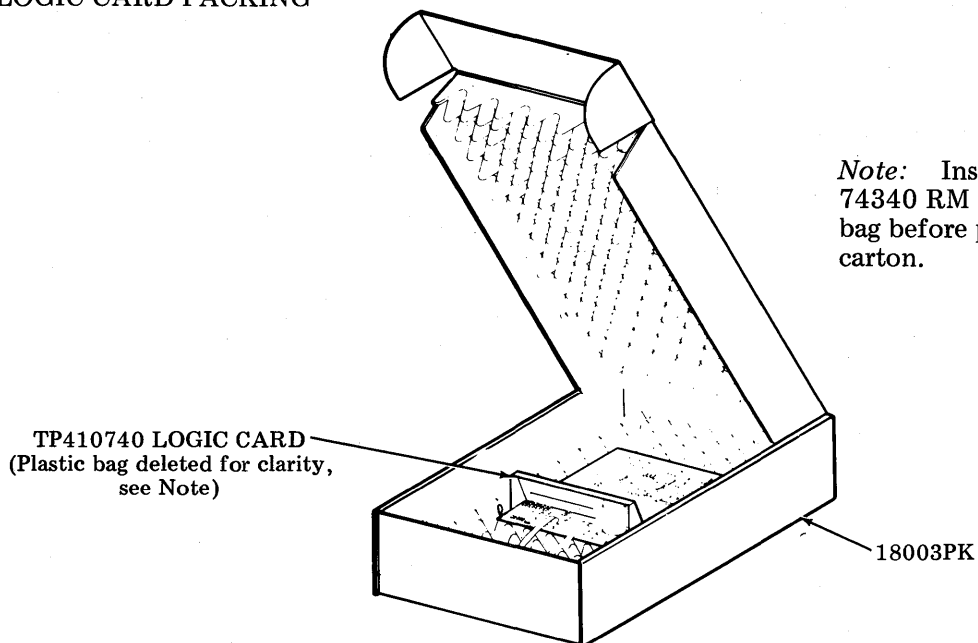
3. POWER SUPPLY PACKING



4. PRINT HEAD PACKING

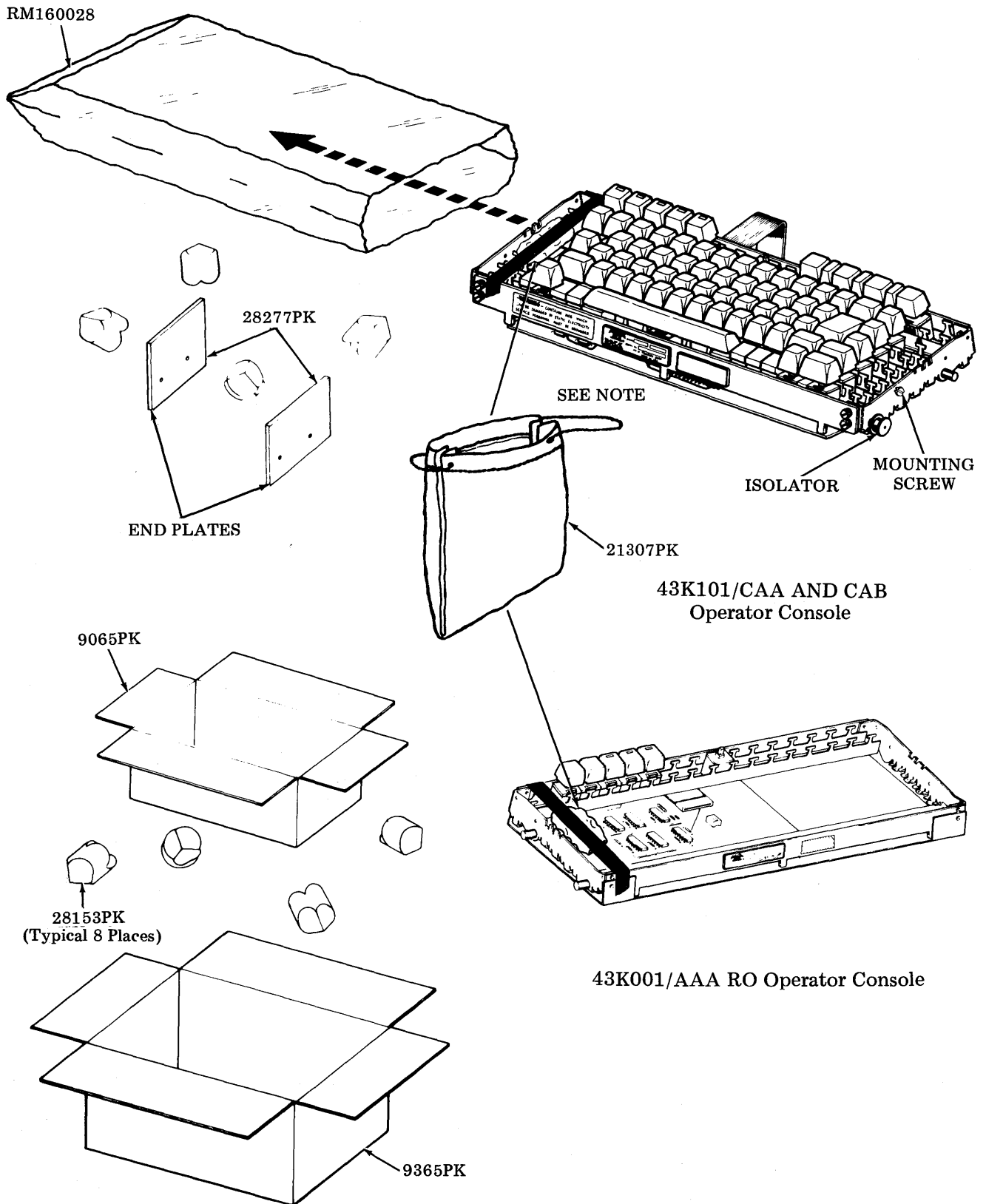


5. LOGIC CARD PACKING



6. OPERATOR CONSOLE PACKING (KSR and RO)

*Note:* Place isolators and mounting screws into 21307PK bag and tape bag to operator console. Insert KSR operator console into RM160028 anti static plastic bag before installing end plates.





TELETYPE CORPORATION  
5555 Touhy Avenue, Skokie Illinois 60076  
Telephone: (312) 982-2000

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