

the **43 teleprinter**

Installation & Routine Servicing
for
BASIC KSR AND ASR TERMINALS

MANUAL 368



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THE 43 TELEPRINTER
BASIC KSR AND ASR
INSTALLATION AND ROUTINE SERVICING MANUAL

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THE 43 TELEPRINTER
BASIC KSR AND ASR
INSTALLATION AND ROUTINE SERVICING MANUAL

PART 1 -- INTRODUCTION

This manual provides information on the installation and routine servicing of the 43 Teleprinter Basic KSR and ASR Terminals. Instructions are provided for service personnel, with a minimum of training, tools and spare parts, to enable options, connect the proper interface, correct minor troubles and periodically inspect, lubricate and clean the terminal during extended service intervals.

These 43 Teleprinter Basic KSR and ASR Terminals provide character at a time keyboard-printer, send-receive operation. Paper is 12 inch wide sprocket feed or variable width (3-1/2 to 12 inch) tractor feed, or 8-1/2 inch wide friction feed.

The 43 Teleprinter Basic ASR Terminals also include a Paper Tape Unit (reader and punch) for off-line preparation of messages for later on-line batch transmission or for permanent storage of messages received on-line.

Transmission speeds are attendant controlled at 100 or 300 characters per second. KSR terminals are equipped with either an internal modem or with one of three types of digital communication interfaces.* ASR terminals are equipped with EIA or 20/60 mA current loop interface only.

KSR terminals with an internal modem for data transmission, interface electrically with the telephone switched network and with a modular jack telephone for originating calls and talking. Terminals with digital interfaces are furnished to operate on EIA voltage levels, TTL voltage levels, or on a 20/60 mA current loop and exchange data and control signals with external modems such as Bell System 103, 108, 113 and 212 type Data Sets or equivalent, or other devices for communication over switched or private lines.

Depending upon the set code, a terminal power source may be 115 Vac or 230 Vac. The power cord for 230 Vac terminals must be ordered separately.

Information on how to check proper operation, change the ribbon cartridge, install paper, and install paper tape (ASR) is included in the How To Operate Manual furnished with each terminal.

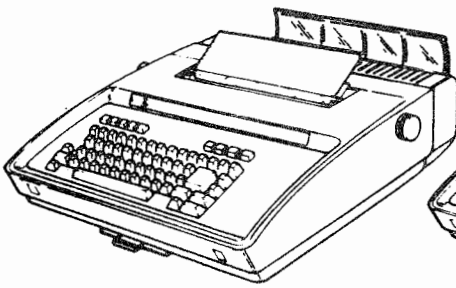
NOTE: When ordering replaceable components, prefix each part number with the letters "TP" (ie, TP129534), unless specified otherwise.

Tools and spare parts that may be required are as follows:

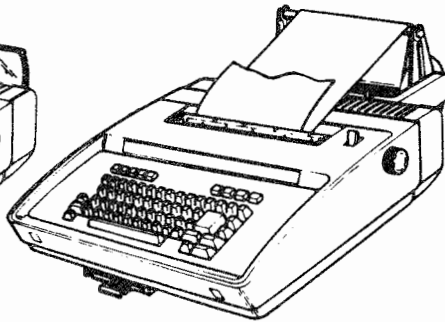
<u>DESCRIPTION</u>	<u>TELETYPE CORP. PART NO.</u>
3/16" and 1/4" Open-End Wrench	129534
1/4", 6" Blade, Screwdriver	100982
1/16" Allen Wrench	124682
1.0 A SLO-BLO Fuse	143306
1.0 A Fuse	120139
1.5 A SLO-BLO Fuse	341686
Lubricants	See Page 3-5

For tools and spare parts that may be required for the paper tape unit (ASR) refer to Installation and Routine Servicing Manual 421 furnished with the paper tape unit.

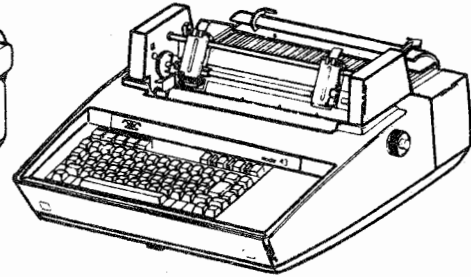
*Digital Interfaces: (Teletype Corporation Technical Reference for 43 Teleprinter Basic ASR/KSR/RO Terminals).

PART 1 -- INTRODUCTION (Contd)

KSR (Pin Feed)



KSR (Friction Feed)



KSR (Tractor Feed)

EIA — Electronics Industries Association (Spec RS-232C) +25 Vdc to -25 Vdc
(On-Off Range)

TTL — Transistor Logic 0 Vdc to +5 Vdc (On-Off Range)
20/60 mA Current Loop — Current, No Current (Mark, Space)

In the event that troubles occur that cannot be corrected with the information in this manual, refer to the applicable 43 Teleprinter Manuals listed below (can be purchased from Teletype Corporation):

Service Manual 369

Circuit Diagram Manual 385

Repair Manual 391 (Covers Early Design 12 inch Pin and Friction Feed Teleprinters Only)

Product Support Manual 416

Logic Card Repair Manual 522

Power Supply Repair Manual 523

Keyboard Repair Manual 525

Enclosures, Paper Handling, and Misc. Accessories Parts Manual 533

Interfaces, Controllers and Mod Kit Circuit Cards Repair Manual 534

Printer Repair Manual 539

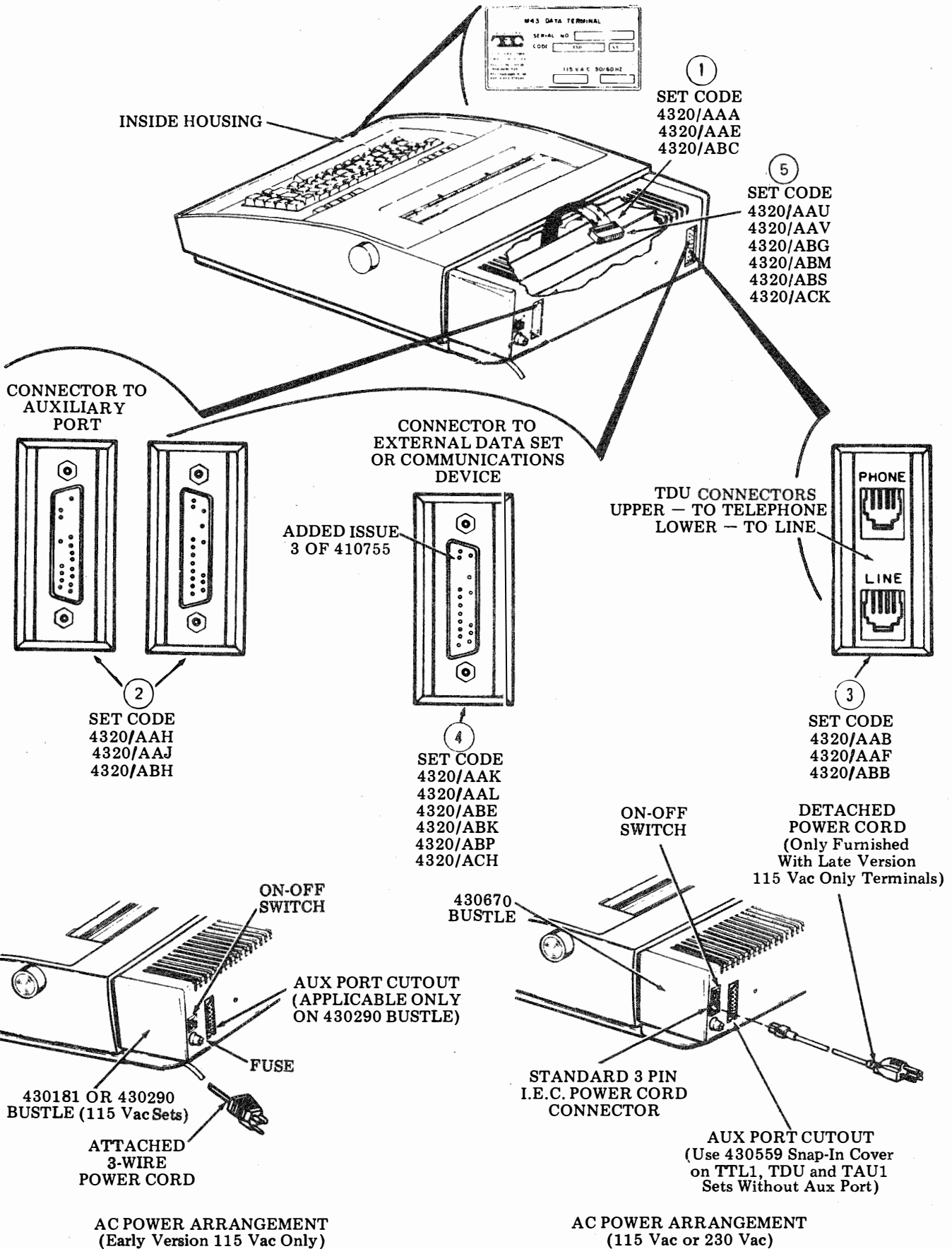
Note: Other alternatives are to replace the terminal or contact the nearest Teletype Product Service Center.

The five types of interfaces and the twenty-one basic KSR sets can be identified as shown below:

<u>TELEPRINTER CODE</u>	<u>DESCRIPTION</u>	<u>LOGIC CARD</u>	<u>INTERFACE</u>
4320/AAA	PIN	410740	① TTL
4320/AAB	PIN	410740	③ TDU
4320/AAE	FRICITION	410740	① TTL
4320/AAF	FRICITION	410740	③ TDU
4320/AAH	PIN	410742	② TAU2
4320/AAJ	FRICITION	410742	② TAU2
4320/AAK	PIN	410740	④ TAU1
4320/AAL	FRICITION	410740	④ TAU1
4320/AAU	PIN	410742	⑤ TTL2
4320/AAV	FRICITION	410742	⑤ TTL2
4320/ABB	TRACTOR	410786	③ TDU
4320/ABC	TRACTOR	410786	① TTL1
4320/ABE	TRACTOR	410786	④ TAU1
4320/ABG	TRACTOR	410788	⑤ TTL2
4320/ABH	TRACTOR	410788	② TAU2
4320/ABK†	PIN	410740	④ TAU1
4320/ABM†	PIN	410742	⑤ TTL2
4320/ABP†	FRICITION	410740	④ TAU1
4320/ABS†	FRICITION	410742	⑤ TTL2
4320/ACH†	TRACTOR	410786	④ TAU1
4320/ACK†	TRACTOR	410788	⑤ TTL2

† 230/115 Vac Supply

CODE PLATE LOCATION



PART 1 -- INTRODUCTION (Contd)

The six basic 115 Vac ASR catalog code numbers can be identified as shown below:

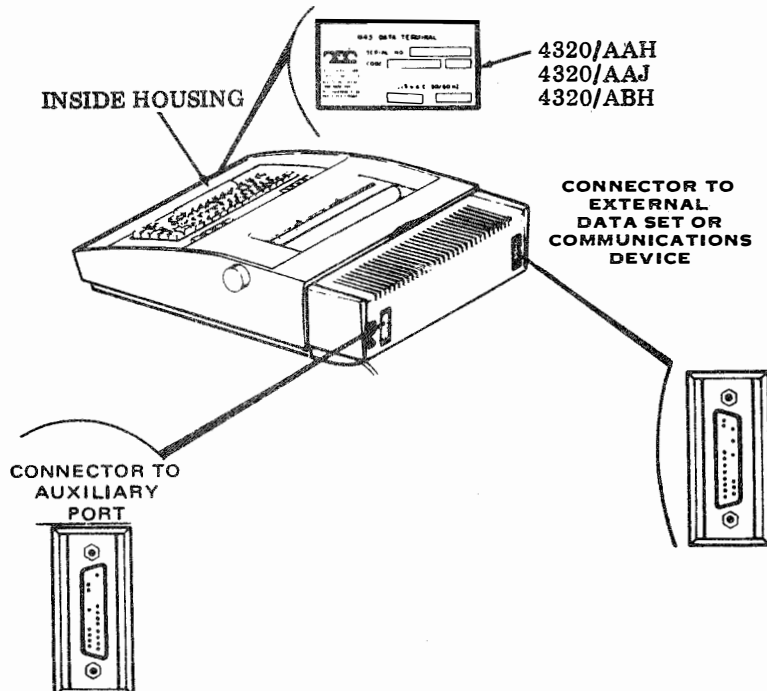
<u>ASR CATALOG NO.</u>	<u>DESCRIPTION</u>	<u>KP SET</u>	<u>PT UNIT</u>
4330-2BCA	PIN KP AND AUTO-MATIC/MANUAL PT	4320-AAH	4350/AAA
4330-2BDA	PIN KP AND AUTO-MATIC PT	4320/AAH	4350/AAC
4330-2ACA	FRICITION KP AND AUTOMATIC/MANUAL PT	4320/AAJ	4350/AAA
4330-2ADA	FRICITION KP AND AUTOMATIC PT	4320/AAJ	4350/AAC
4330-2CCA	TRACTOR KP AND AUTOMATIC/MANUAL PT	4320/ABH	4350/AAA
4330-2CDA	TRACTOR KP AND AUTOMATIC PT	4320/ABH	4350/AAC

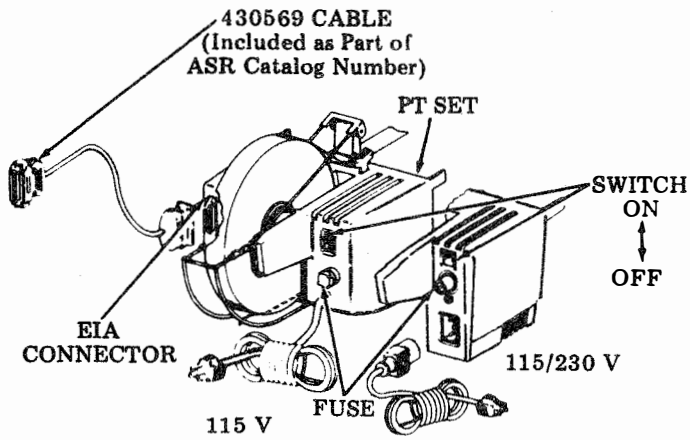
The six basic 230/115 Vac ASR catalog code numbers can be identified as shown below:

<u>ASR CATALOG NO.</u>	<u>DESCRIPTION</u>	<u>KP SET#</u>	<u>PT SET</u>
4330-2BCQ	PIN KP AND AUTO-MATIC/MANUAL PT	4320/ABM	4350/AAD
4330-2BDQ	PIN KP AND AUTO-MATIC PT	4320/ABM	4350/AAF
4330-2ACQ	FRICITION KP AND AUTOMATIC/MANUAL PT	4320/ABS	4350/AAD
4330-2ADQ	FRICITION KP AND AUTOMATIC PT	4320/ABS	4350/AAF
4330-2CCQ	TRACTOR KP AND AUTO-MATIC/MANUAL PT	4320/ACK	4350/AAD
4330-2CDQ	TRACTOR KP AND AUTOMATIC PT	4320/ACK	4350/AAF

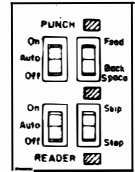
#410754 TAU2 (included as part of ASR catalog number.)

KP CODE PLATE LOCATION

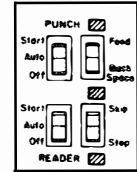




4350/AAA
4350/AAD

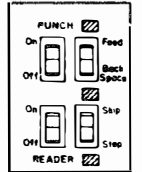


4350/AAC
4350/AAF



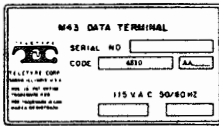
Not part of
ASR catalog
number.

4350/AAB



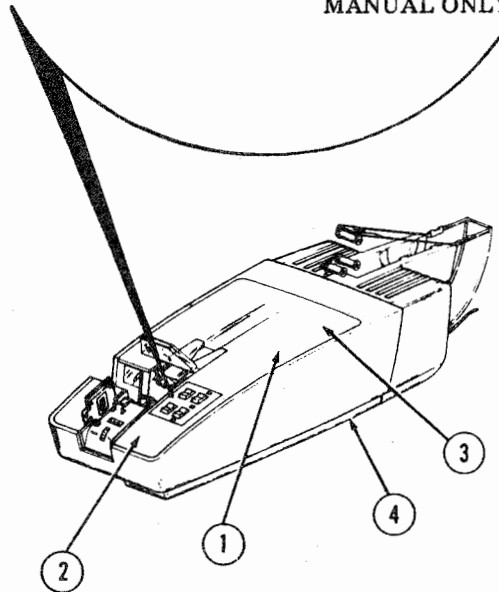
MANUAL ONLY

PT CODE PLATE LOCATION

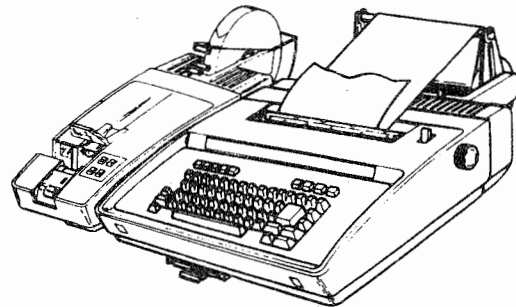


Code Plate Locations:

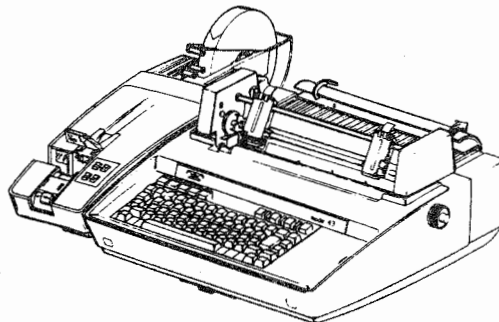
- ① Underside of cover.
- ② On center frame below switch.
- ③ On power supply frame.
- ④ On bottom of housing.



ASR (Pin Feed)



ASR (Friction Feed)

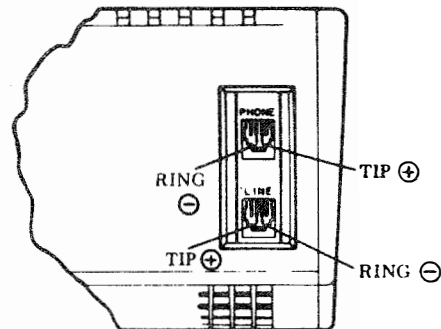


ASR (Tractor Feed)

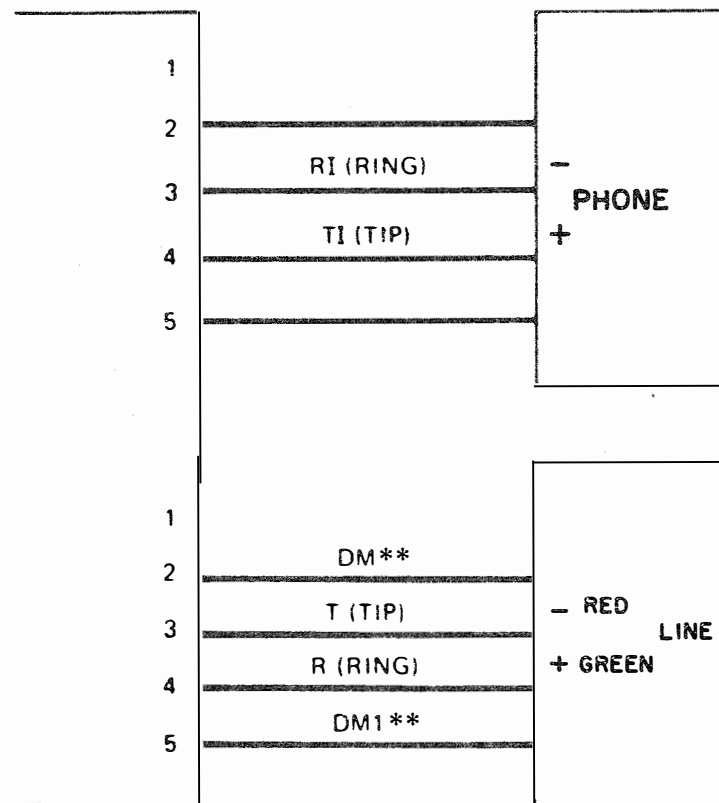
Pages 2-1 and 2-2 (Section 2.A
OPTIONS) are missing from the
original -

B. INTERFACES

The 4320 Teleprinters equipped with a 430750 Terminal Data Unit (TDU) provide two modular telephone jacks for connection to the telephone equipment using modular cords. These jacks are labeled line (bottom) and phone (top) and the pin assignments are as shown:



TDU Interface Pin Assignments



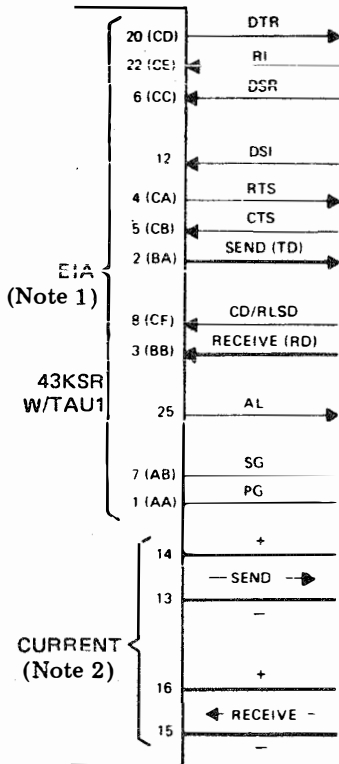
**Control leads for line exclusion on key telephones. Connected together whenever TDU is in the data mode. (Not carried through to the telephone.)

FSK (Analog) Interface	Sent when 43 Originating	Sent when 43 Answering
	f1	f2
State 0 (space)	1070 Hz	2025 Hz
State 1 (mark)	1270 Hz	2225 Hz

B. INTERFACES (Contd)

The 4320 Teleprinters equipped with a 410755 Terminal Auxiliary Unit (TAU1) provide a 25-pin receptacle with male pins for connection to an external communications device or distant terminal (EIA or 20/60 mA current loop) or modem. The EIA interface meets the requirements of EIA - RS-232C. (Refer to Page 2-19 for EIA cables available from Teletype Corporation.) The pin assignments are given below.

TAU1 Pin Assignments



Electrical

EIA (RS232)	
State 0 (space) On	+3 to +25 VDC
State 1 (mark) Off	-3 to -25 VDC

Current (20/60 maDC)	
State 1 (mark) On	20/60 maDC ††
State 0 (space) Off	0 maDC

††20 to 60 mA dc at approximately 12 Vdc to maximum 125 Vdc.

TAU1 Pin Assignment Descriptions

EIA

DTR (Data Terminal Ready) - Off if KSR in local mode. Turns off for 50 ms if EOT (option) received or TERM READY depressed when in data mode. Alarm condition turns off DTR if in term ready mode. Alarm does not turn off DTR if in data mode except paper out on pin feed and eight line feeds received.

RI (Ring Indicator) - On causes KSR to send answer-back (if present and so optioned).

DSR (Data Set Ready) - On puts KSR in data mode if DTR, CTS & CD on. Off > 450 ms switches KSR from data to term ready mode.

DSI (Data Speed Indicator) - Wired in TAU1, not functional in terminal. For future use.

RTS (Request To Send) - Always on when power on.

CTS (Clear To Send) - On puts KSR in data mode if DTR, DSR & CD on.

SEND (TD) Transmit Data - Off if KSR in local or term ready mode. Off if in data mode until varied per sent data.

CD (Carrier Detect)/RLSD (Received Line Signal Detector) - On puts KSR in data mode if DTR, DSR & CTS on.

RECEIVE (RD) (Receive Data) - Off when KSR in data mode until varied per received data.

AL (Analog Loopback) - On when ESC > entered on keyboard.

SG - Signal Ground

PG - Protected Ground

CURRENT

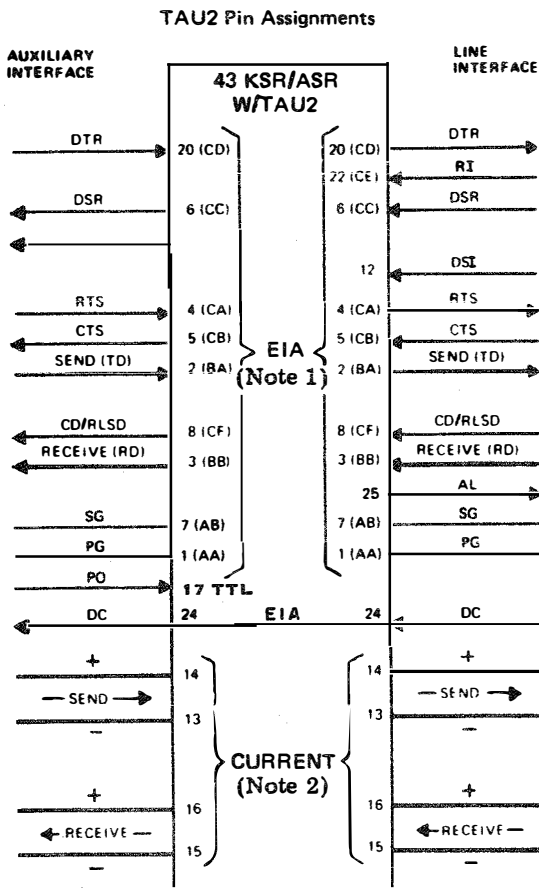
SEND - On until varied per sent data.

RECEIVE - On until varied per received data.

Note 1: For limited EIA applications connect pins 5, 6, 8 and 20 together to place terminal in data mode.

Note 2: For current applications connect pins 4, 5, 6 and 8 together to place terminal in data mode. Only if pins 15 and 16 are used connect pin 3 to pin 4.

The 4320 Teleprinters equipped with a 410754 Terminal Auxiliary Unit with Auxiliary Port (TAU2) provide two 25-pin interface connectors. The line interface receptacle with male pins located at the left rear of the terminal interfaces to an external communications device or distant terminal (EIA or 20/60 mA current loop) or modem. The auxiliary port plug with female pins located at the right rear of the terminal is intended to interface to a separate send-receive device such as a paper tape reader, tape punch, or a magnetic tape of (EIA or 20/60 mA current loop). The EIA interface meets the requirements of EIA - RS-232C (see Page 2-19 for cables available from Teletype Corporation). The pin assignments are given below.



Electrical

EIA (RS232)		
ON (SPACE)		+3 to +25 VDC
OFF (MARK)		-3 to -25 VDC
TTL		
PO	On	+2.5 to +5.0 VDC
	Off	+0.0 to +0.4 VDC

Current (20/60 maDC)	
ON (MARK)	20/60 maDC††
OFF (SPACE)	0 maDC

††20 to 60 mA dc at approximately 12 Vdc to maximum 125 Vdc.

Note 1: For limited EIA applications connect pins 5, 6, 8 and 20 together, line interface to place terminal in data mode.

Note 2: For current applications connect pins 4, 5, 6 and 8 together, line interface to place terminal in data mode. Only if pins 15 and 16 are used connect pin 3 to pin 4.

TAU2 Pin Assignment Descriptions (Refer to Page 2-14)

LINE INTERFACE

EIA

DTR (Data Terminal Ready) — Off if KSR/ASR in local mode or auxiliary interface DTR off. Turns off for 50 ms if EOT (option) received or term ready depressed when in data mode. Alarm condition turns off DTR if in term ready mode. Alarm does not turn off DTR if in data mode except paper out on sprocket feed and eight line feeds received.

RI (Ring Indicator) — On causes KSR/ASR to send answer-back (if present and so optioned)

DSR (Data Set Ready) — On puts KSR/ASR in data mode if DTR, CTS and CD on. Off > 450 ms switches KSR/ASR from data to term ready mode.

DSI (Data Speed Indicator) — Wired in TAU2, not functional in terminal. For future use.

RTS (Request to Send) — Always On when power on.

CTS (Clear to Send) — On puts KSR/ASR in data mode if DTR, DSR and CD on.

SEND (TD) (Transmit Data) — Off in all modes. Varies per sent data in local or data mode.

CD (Carrier Detect)/RLSD (Received Line Signal Detector) — On puts KSR/ASR in data mode if DTR, DSR and CTS on.

B. INTERFACES (Contd)

RECEIVE (RD) (Receive Data) — Off until varied per received data.

AL (Analog Loopback) — Turns on when ESC> entered on keyboard.

SG — Signal Ground

PG — Protective Ground

CURRENT

SEND — On until varied per sent data.

RECEIVE — On until varied per received data.

OTHER

DC (Device Control) — Can be used to control auxiliary device.

AUXILIARY INTERFACE

EIA

DTR (Data Terminal Ready) — Off turns off line interface DTR.

DSR (Data Set Ready) — On if KSR/ASR in local mode or if line interface DSR, CTS and CD on.

DSS (Data Speed Selector) — On or off respectively, indicates selection of 10 or 30 cps on KSR/ASR.

RTS (Request to Send) — On prevents 43 KSR/ASR from sending answer-back, if present, in response to ENQ.

CTS (Clear to Send) — On if KSR/ASR power on.

SEND (TD) (Transmit Data) — Must be off until varied per sent data.

CD (Carrier Detect)/RLSD (Receive Line Signal Detector) — On if KSR/ASR power on.

RECEIVE (RD) (Receive Data) — Off until varied per received data.

SG — Signal Ground

PG — Protective Ground

CURRENT

SEND — On until varied per sent data

RECEIVE — On until varied per received data.

TTL

PO (Printer On-Off) — Off prevents print-out of data except keyboard entered.

OTHER

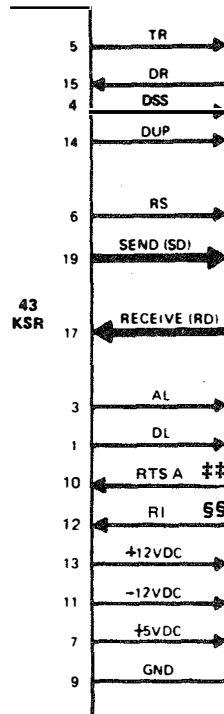
DC (Device Control) — Controlled by line interface DC. May be used to control auxiliary device.

When used with a 43 Paper Tape Unit, must be ON to allow Paper Tape Reader operation.

For character-by-character reader control — must be ON for 2 milliseconds minimum and go OFF at least 800 microseconds before the end of the stop bit.

For 4320 Teleprinters which are furnished without the interface signaling unit, connection to the external communications device (provided by the customer) is made through a 20 pin connector at the end of a short ribbon cable. Mating cable connectors are Teletype Corporation 341802 (solder type), alpha FCC-161-120 (straight solder type) or Scotchflex 3326-0001 (crimp type). No provision is made for adding additional cable length. The pin assignments are given below.

TTL Interface Pin Assignments



TTL INTERFACE PIN DESCRIPTIONS

TR (Data Terminal Ready) — Off if KSR in LOCAL mode, on if in TERM READY or DATA mode. Receipt of EOT (option) or depression of TERM READY in DATA mode turns off TR for 50 ms. Alarm condition turns off TR if in term ready mode. Alarm does not turn off TR if in data mode except paper out on sprocket feed and eight line feeds received.

DR (Data Set Ready) — On puts KSR in DATA mode if TR on. Off > 450 ms switches KSR from DATA to TERM READY mode.

DSS¶¶ (Data Speed Select) — Off or on, respectively, indicates selection of 10 or 30 cps on KSR.

DUP (Duplex) — Off if KSR in half-duplex mode, on if in full duplex; if supplied with +5 V dc. Current limited to 25 mA.

RS (Request to Send) (late design KSR) — Grounded.

SEND (SD) (Send Data) — Off in all modes. If KSR in data mode, then varies per sent data. TTL2 send data also varies in local mode per keyboarded data.

RECEIVE (RD) (Receive Data) — Must be off if KSR in data mode, until varied per received data. TTL2 receive data must also be off in local mode until varied per received data.

AL (Analog Loopback) — On if ESC > entered on keyboard.

DL (Digital Loopback) — On if ESC < entered on keyboard in LOCAL mode or received in DATA mode.

+12 V dc (235 mA max)
 -12 V dc (110 mA max) all on if power on
 +5 V dc (55 mA max)

GND (Ground) — Logic ground

Electrical Characteristics

TTL Interface	Electrical Characteristics	
	From 43 (Drivers)	To 43 (Terminators)
State 0 (Space) On	0 to 0.4VDC	0 to 0.7VDC
State 1 (Mark) Off	2.4 to 5.25VDC	2 to 5.25VDC

¶¶ RTS A (Request to Send Auxiliary) not wired in TTL cable.

§§ RI (Ring Indicator) not wired in TTL cable. Refer to Specification 50944S if 410710 answer-back circuit card is present.

¶¶ Present on TTL 2 sets. May be present on TTL sets if 410710 answer-back card is present. Refer to Specification 50944S.

C. ASSEMBLY

The basic 43 KSR Teleprinter set is furnished fully assembled and tested with one of the signal interfaces described on Page 2-3, B. INTERFACES.

The basic 43 ASR Teleprinter, when ordered as an ASR catalog number, has a basic KSR teleprinter furnished fully assembled and tested, a paper tape unit furnished fully assembled and tested and an interconnecting EIA cable (430569 -- 3 feet). The ASR is furnished with the TAU2 interface described on Page 2-6.

If Paper Tape Unit was ordered separately to add to a KSR (4320/AAH, AAJ or ABH) teleprinter to be used as an ASR, an interconnecting EIA cable (430569) must be ordered separately to connect the paper tape unit to the KSR. See Page 2-19 for recommended data set cables.

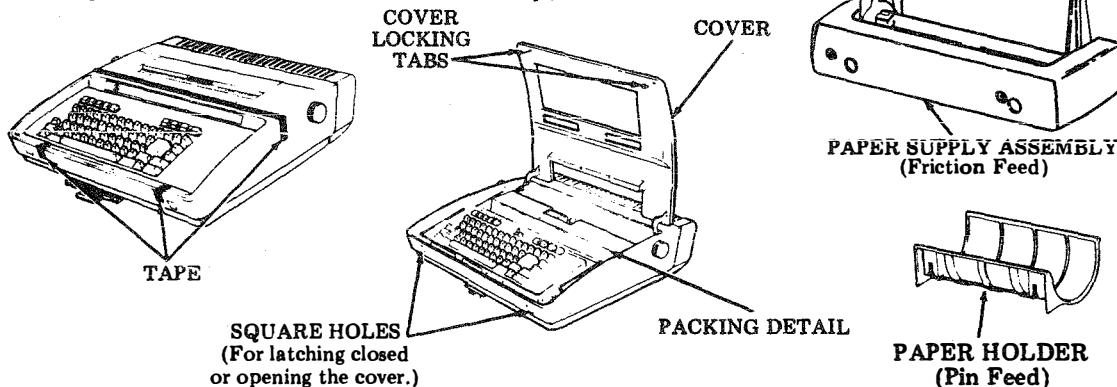
If the KSR or ASR is to be mounted to a 43 Pedestal refer to Specification 51006S.

CAUTION: To avoid condensation on the electrical components, the terminal should be allowed to assume room temperature before unpacking, for example, when brought into a warm humid room from outside subzero temperatures.

1. UNPACKING KSR

- a. The teleprinter carton was opened by referring to instructions on the container.
- b. Remove tape securing the cover to the housing (see below).
- c. Depress the cover locking tabs on the lower front of the cabinet and lift the cover. Remove the packing detail securing the print head (see below).
- d. Verify that the following items are included in the box:

- 1 - Set -- 43 Teleprinter (4320_--)
- 1 - Ribbon
- 1 - Manual, Installation and Routine Servicing, 368
- 2 - Manual, Attendant, 367 and 441 (4320/AAH, and AAJ and ABH Only)
- 1 - Manual, Attendant. 367 (All Other KSRs)
- 1 - Paper Holder (Pin Feed Only)
- 1 - Paper Supply Assembly (Friction Feed Only)
- 1 - Power Cord (Late Design 115 Vac Terminals Only)
- 2 - Paper Guides (Tractor Feed Only)



NOTE: Fan-fold 12 by 8-1/2 inch paper (pin feed), 8-1/2 inch wide by 5 inch diameter rolls (friction feed), or paper for tractor feed and EIA and modular telephone cords must be obtained locally or ordered separately. Refer to HTO for paper suppliers. EIA and modular telephone cords can be ordered from Teletype Corporation (see Page 2-11). Power cords for 230 Vac terminals must be ordered separately.

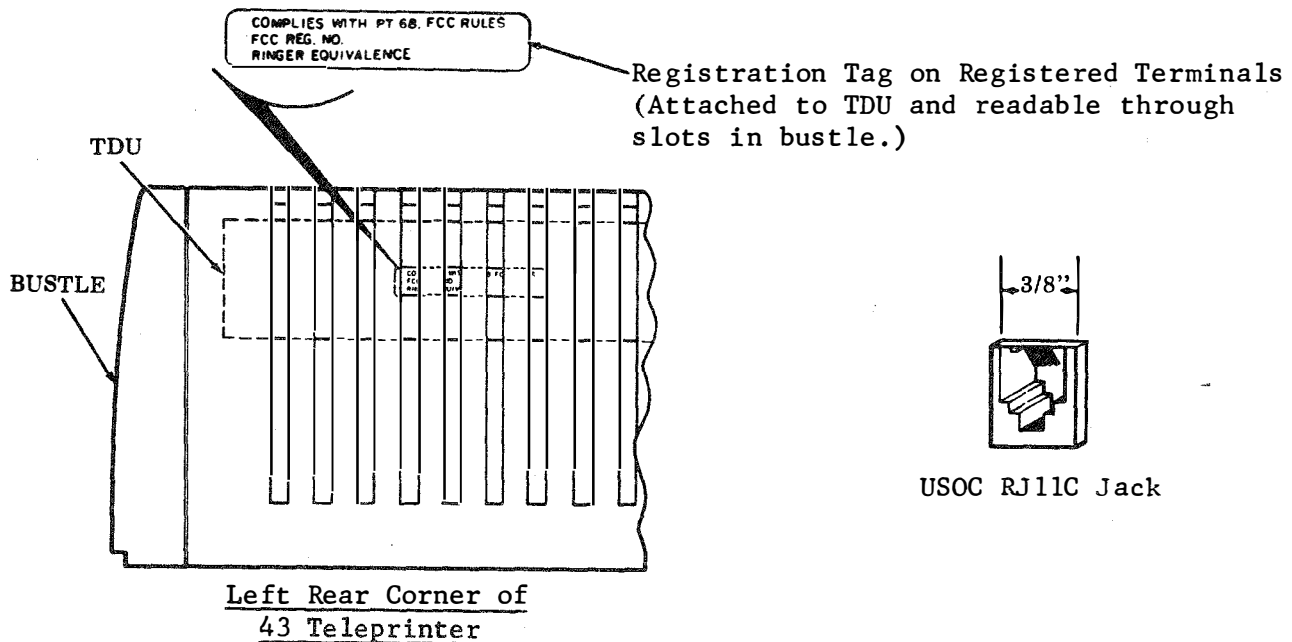
2. UNPACKING PAPER TAPE UNIT (ASR)

Open the carton referring to instructions on the container and refer to Installation and Routine Servicing Manual 421 included with the paper tape unit.

3. TELEPHONE AND LINE CONNECTION

NOTICE: In the U.S.A., under the FCC registration program, the 43 Teleprinters with 430750 terminal data units (TDU) may be connected directly to the telephone switched network subject to the following conditions:

- a. Connection must be through a standard six-pin miniature jack (USOC RJ11C) installed by the Telephone Company.
- b. The telephone, if any is to be connected to the teleprinter, must be registered or grandfathered (Bell System 500 or 2500 type or equivalent) and be reported as such to the local Telephone Company.



C. ASSEMBLY (Contd)3. TELEPHONE AND LINE CONNECTION (Contd)

- c. Before connection or reconnection to the switched network, the local Telephone Company must be advised of the following:

<u>Registered Terminals Only</u> (With Registration Tag)	<u>Grandfathered Terminals Only</u> (No Registration Tag)+
(1) Registration Number (from tag)	(1) Teleprinter model number 4310 (RO) or 4320 (KSR) with suffix AAB (sprocket feed) or AAF (friction feed). Includes built-in Western Electric 153A1 modem (TDU).
(2) Ringer Equivalence (from tag)	(2) Telephone number where terminal will be connected.
(3) Telephone number where terminal will be connected.	(3) Ringer Equivalence: 0.3
	(4) Ringer Type: A
	(5) Voice baud metallic signal power: Nonadjustable -9 dbm max.
	(6) Baud Rate: 300 max.

+First time connection must take place before July 1, 1979. The teleprinter may remain connected and be reconnected for its life.

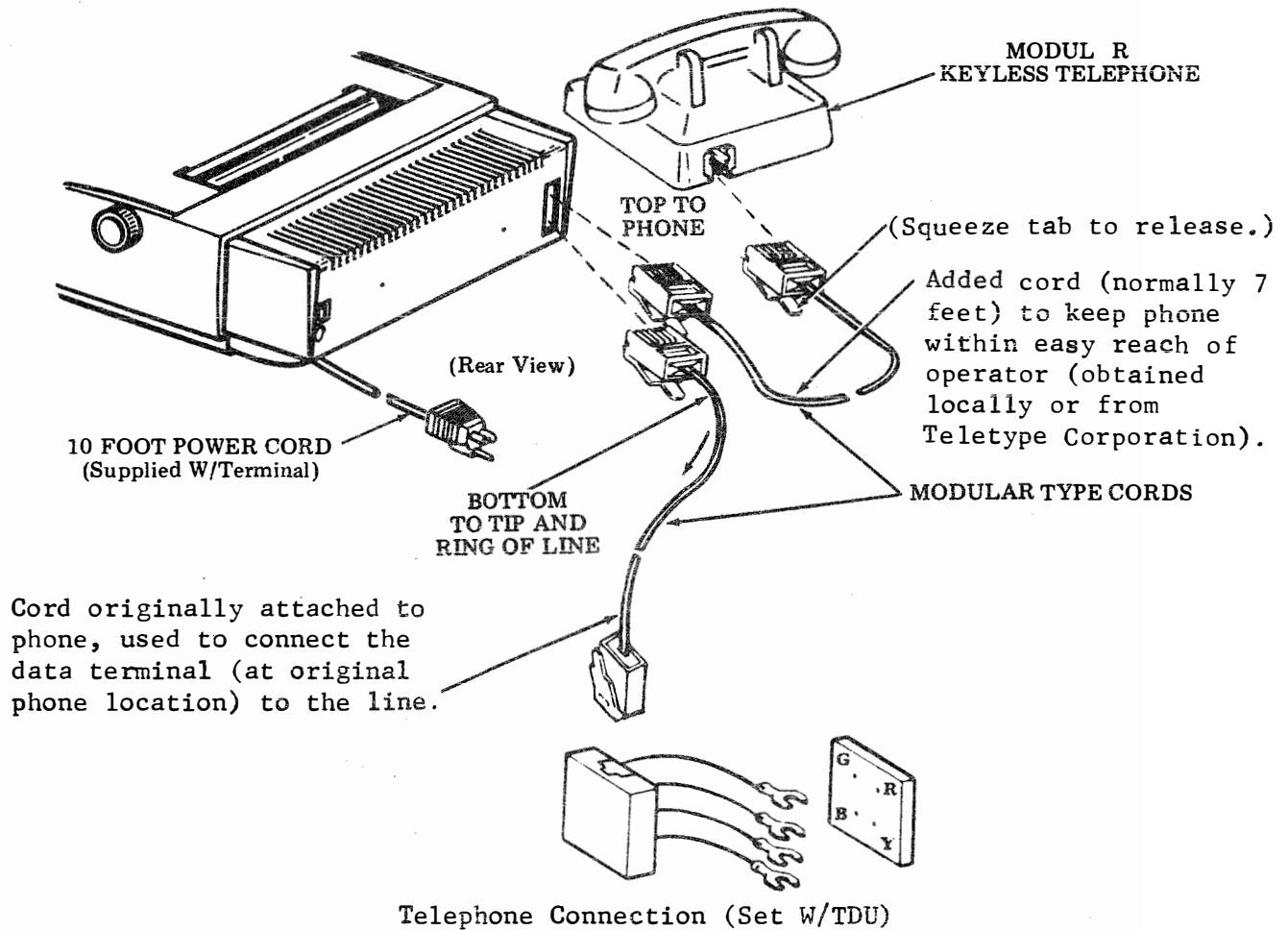
- Refer to Manual 407 for additional registration instructions.

4320/AAB, AAF and ABB Sets With TDU

- a. Remove the modular cord plug from the modular jack associated with the keyless telephone to be used with the teleprinter (squeeze tab to release). Connect the plug to the lower connector marked LINE on the rear of the TDU accessible through the opening in the left rear of the bustle cover (Page 2-12).
- b. Connect the additional modular cord between the upper connector on the TDU marked PHONE and the telephone jack (Page 2-11).

- c. The modular telephone cord connected between the upper connector on the TDU and the telephone jack must be furnished by the installer. The following cables are available from Teletype Corporation.

7 foot length	430581
14 foot length	430582
25 foot length	430583



4320/AAK, AAL, ABE, ABK, ABP and ACH Sets With TAU1

EIA Interface Connection

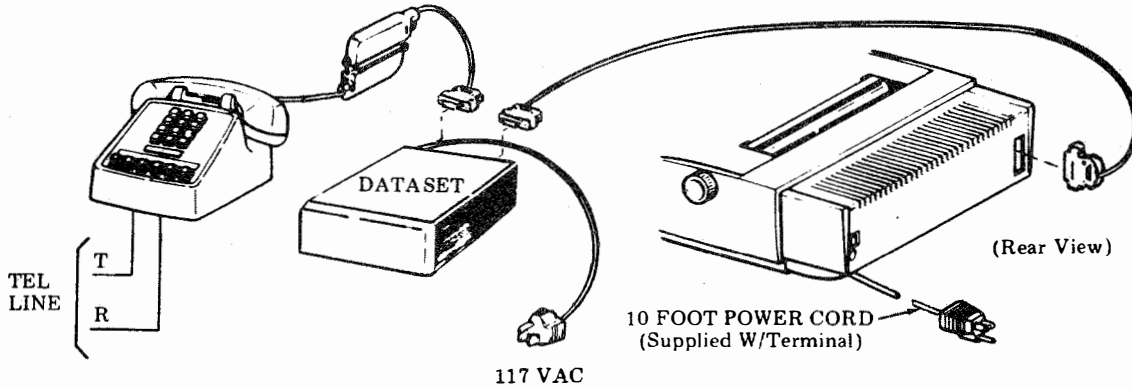
- a. The connecting cables between the terminal and the data set must be furnished by the installer and should employ shielded cable. The following cables are available from Teletype Corporation. See Page 2-18 for cable wiring.

3 foot length	430569
7 foot length	408065
12 foot length	408066
25 foot length	408067
50 foot length	408068

C. ASSEMBLY (Contd)

3. TELEPHONE AND LINE CONNECTION (Contd)

- b. The connection to the data set and telephone should be made following the instructions for the particular data set involved.

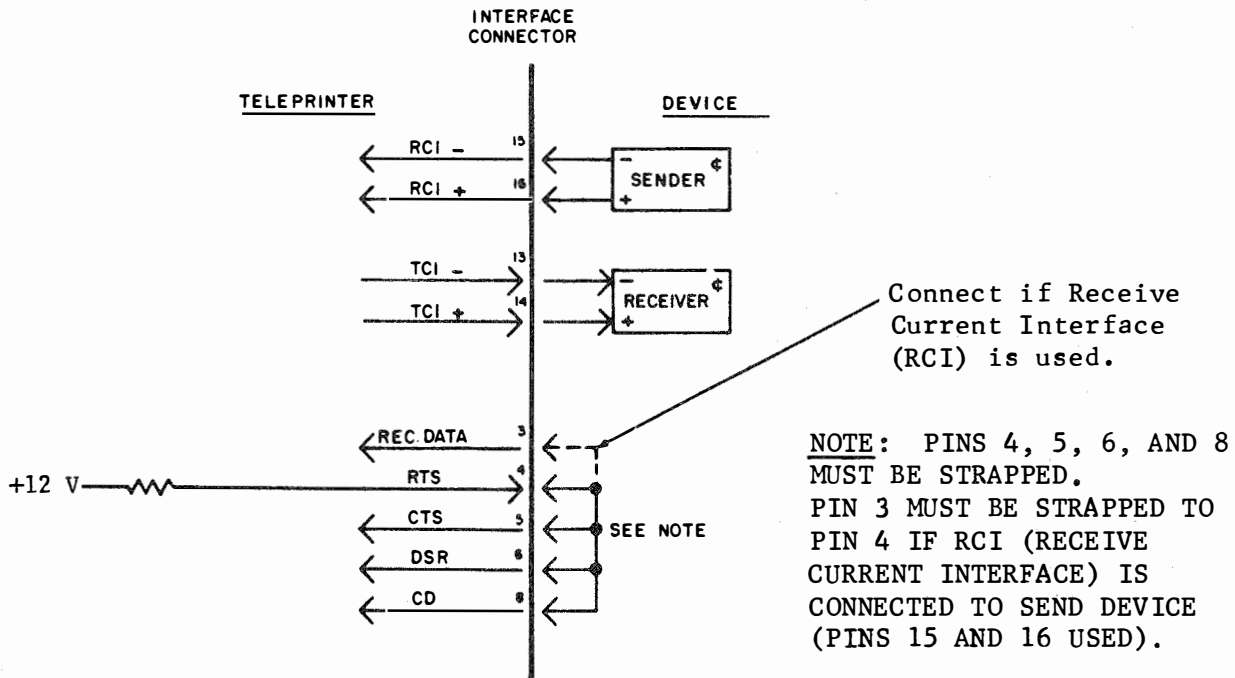


Telephone Connection (Set W/TAU, TAU1 or TAU2)

4320/AAK, AAL, ABE, ABK, ABP and ACH Sets With TAU1

20/60 mA Current Loop Connection:

- a. Determine the terminal configuration desired and connect the send and/or receive current device as shown below following any local instructions for the particular device involved. Terminal configurations are shown on Page 2-17. Refer to 8. Cable Wiring. The recommended cables accommodate EIA operation.



⊘Externally limit current between 20 mA and 60 mA for MARK. Voltage must be between 12 Vdc and 125 Vdc and supplied by the customer.

Refer to dc current arrangements shown on Page 2-16 to provide operation as shown in the desired terminal configuration.

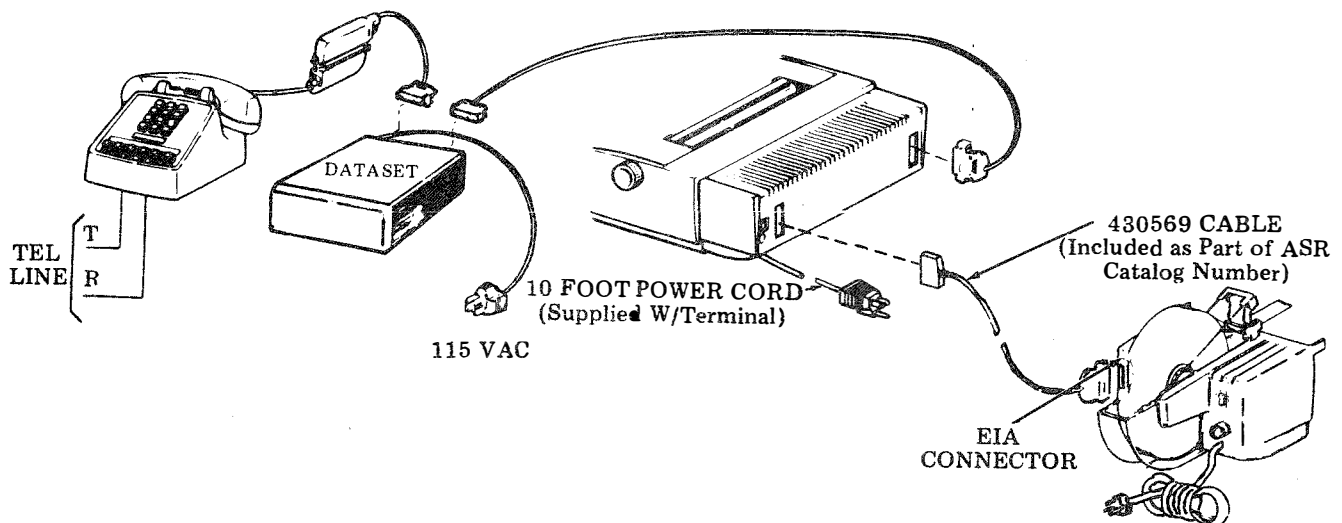
4320/AAH, AAJ, and ABH Sets With TAU2 and Sets Ordered as an ASR Catalog Number
(see Page 1-3 and 1-4)

EIA Interface Connection

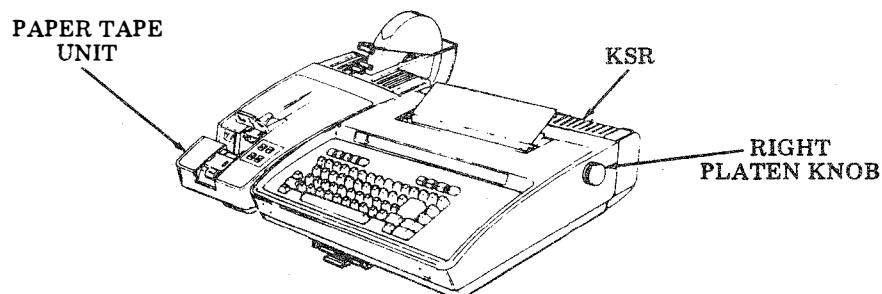
- a. The connecting cables between the terminal and the data set or auxiliary sender-receiver must be furnished by the installer (if ordered as ASR catalog number, EIA cable from KSR to Paper Tape Unit is provided) and employ shielded cable. Refer to Page 2-19 for cables available from Teletype Corporation.
- b. The connection to the Paper Tape Unit (ASR) is an EIA connection and is shown below. For more information on the Paper Tape Unit interface refer to Installation and Routine Servicing Manual 421.
- c. The connection to an auxiliary sender-receiver other than the Paper Tape Unit, or data set and the telephone should be performed following the instructions for the particular data set or device involved. Refer to the diagram below for data set and telephone connection. The diagram on Page 2-15 describes the interface connections.

20/60 mA Current Loop Connection

- a. Connect the send and/or receive current device using the diagram on Page 2-15 and following any local instructions for the particular device involved. Terminal configurations are shown on Page 2-16. Refer to 8. Cable Wiring. The recommended cables accommodate EIA operation.



NOTE: The Paper Tape Unit is usually located on the left side and flush against the KSR. To do this, remove the left platen knob, if present, by pulling straight off.



C. ASSEMBLY (Contd)

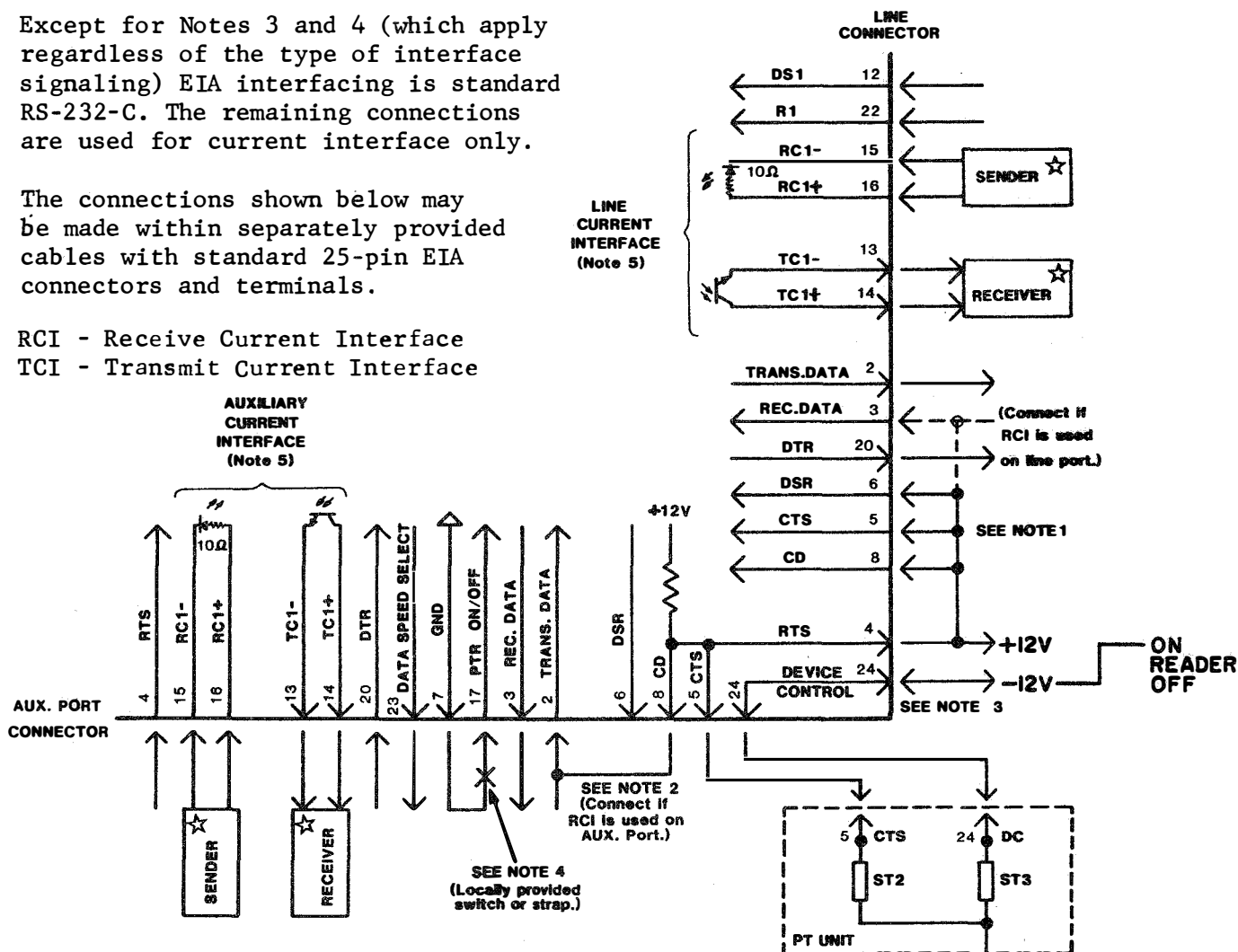
3. TELEPHONE AND LINE CONNECTION (Contd)

INTERFACE CONNECTIONS

Except for Notes 3 and 4 (which apply regardless of the type of interface signaling) EIA interfacing is standard RS-232-C. The remaining connections are used for current interface only.

The connections shown below may be made within separately provided cables with standard 25-pin EIA connectors and terminals.

RCI - Receive Current Interface
TCI - Transmit Current Interface



NOTE 1: Pins 4, 5, 6 and 8 must be strapped when using 20/60 mA current loop at the line connector. Pin 3 must also be strapped to pin 4 when using RCI interface, (pins 15 and 16) at the line connector.

NOTE 2: Pins 2 and 8 must be strapped when using RCI auxiliary current loop.

NOTE 3: Provided for customer use. If used with Paper Tape Unit, ST2 strap on PT Unit logic card must be removed. Refer to Option 454 in Installation and Routine Service Manual 421 provided with PT Unit. (See Page 2-6).

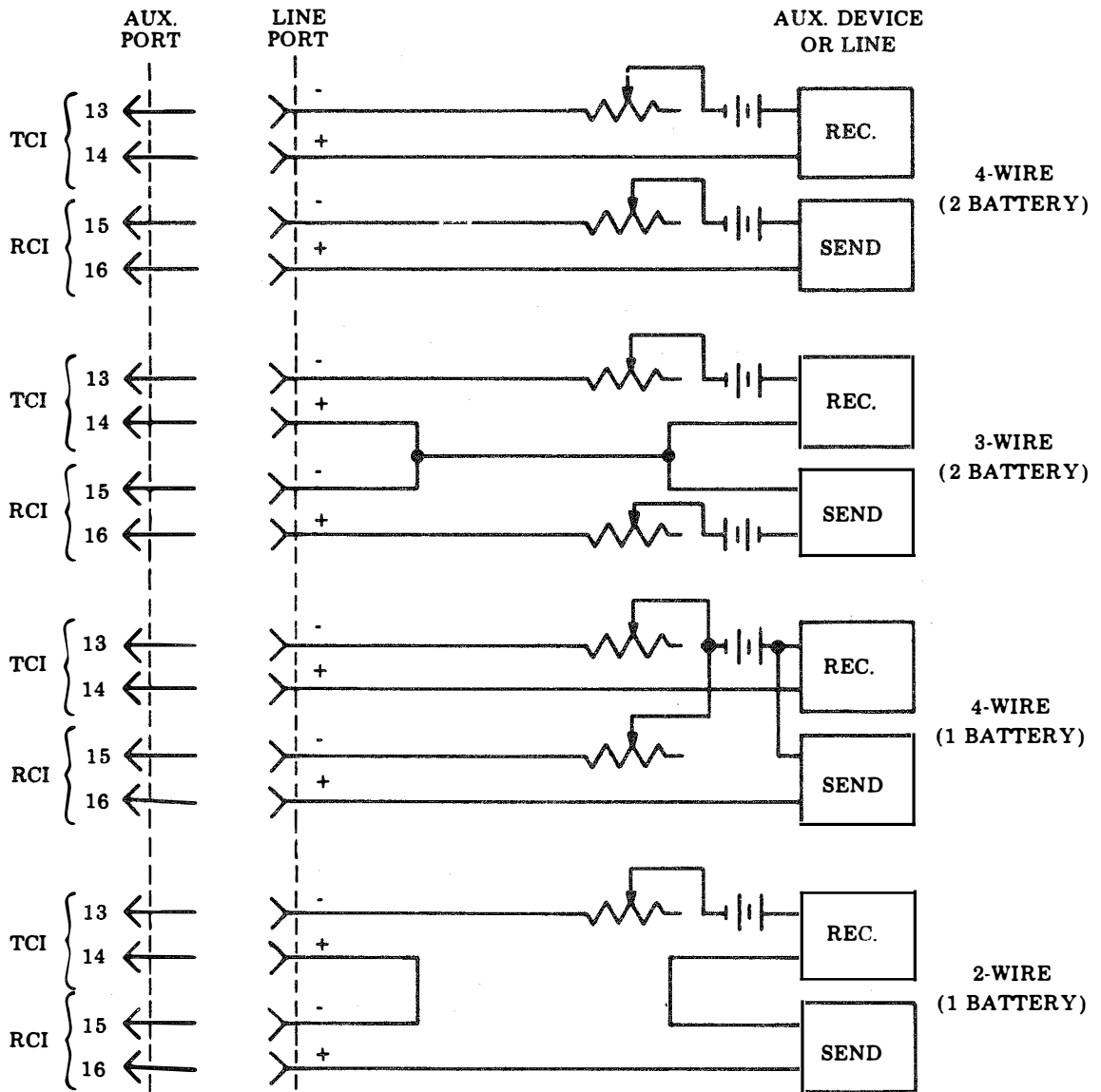
NOTE 4: Connect pins 7 and 17 to blind received data to the printer (current or EIA connections).

NOTE 5: Current can be used on either or both ports (line and auxiliary) but current and EIA cannot be used simultaneously on the same port.

*Externally limit current between 20 mA and 60 mA for mark.

Voltage must be between 12 Vdc and 125 Vdc and supplied by the customer.

Refer to dc current arrangements shown on following page to provide operation as shown in the desired terminal configuration (Page 2-16).



RCI = Receive Current Interface
 TCI = Transmit Current Interface

DC Current Arrangements

C. ASSEMBLY (Contd)

3. TELEPHONE AND LINE CONNECTION (Contd)

<u>TYPE OF OPERATION</u>		<u>KEY POSITION AND WIRING</u>	<u>TYPE OF TERMINAL AND COMMUNICATIONS MODE</u>
Half-Duplex		HDX or FDX Wiring Not Applicable	KSR LOCAL
Half-Duplex		HDX Line - 3- or 4-wire or EIA Aux - 3- or 4-wire or EIA	KSR DATA
Half-Duplex (Modified)		HDX Line - 2-wire Aux - 3- or 4-wire or EIA	KSR TAU 2 only DATA
		FDX Line - 2-wire Aux - 3- or 4-wire or EIA	KSR DATA
Full Duplex		FDX Line - 3- or 4-wire or EIA Aux - 3- or 4-wire or EIA	KSR DATA
Full Duplex (Echoplex)		FDX Line - 3- or 4-wire or EIA Aux - 2-wire	KSR DATA

£ PTR ON/OFF External Switch (TAU2)
Always On -- Open Lead (TAU1)

Terminal Configurations and Data Flow Chart

4320/AAA, AAE, AAU AAV, ABM, ABS and ACK Sets Without Interface Signaling Unit

Connection to the 43 Teleprinter interface cable requires the removal of the paper holder or paper supply assembly, and bustle cover. Refer to Page 3-10, C. COMPONENT ACCESS for removal instructions.

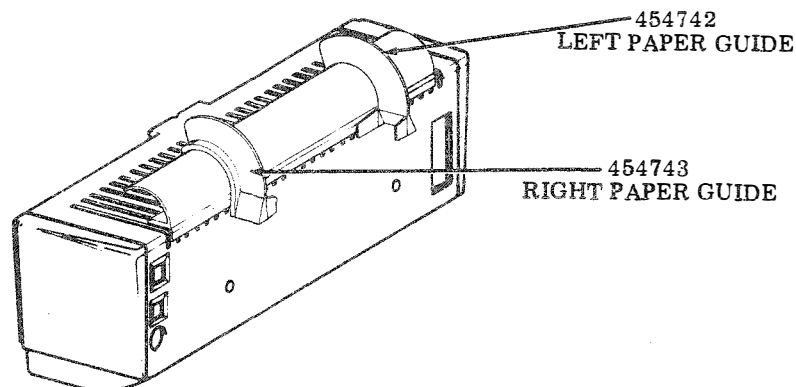
This set is not equipped with a communications unit and telephone and line connections cannot be made until the KSR set is provided with an appropriate communications device. The connections to the telephone, data set or communications device should be performed following the instructions for the particular device involved.

4. TERMINAL ASSEMBLY

- a. Install the friction feed paper supply assembly or the pin feed paper holder, if desired. If the paper holder is not installed, provide to attendant for possible future use. Refer to Page 3-10.
- b. On tractor feed sets, install the left and right paper guides as shown below:
- c. Install the ribbon and paper. Refer to the KSR or ASR How to Operate.
- d. Install paper tape (ASR). Refer to ASR How to Operate.
- e. Record any nonstandard options enabled in the space provided on the directory card. (Write in any not listed on card.) (See Page 3-14 for removing directory card.)
- f. Fill out remaining information on the directory card in accordance with local procedures, (ie, provide attendant with HTO Manual).
- g. Install the directory card in the holder provided, "Frequently Called Numbers" side up. Refer to Page 3-14.

5. INITIATE SERVICE

- a. Clean up the unpacking area, wipe off any finger prints on the teleprinter and turn the 43 KSR or ASR over to the subscriber.
- b. Provide the customer with the How to Operate Manual 367. Place all other documents in the shipping containers and retain for future use.
- c. Advise the customer to order spare ribbons, using order form provided with terminal, and paper as soon as possible (quantities depending upon usage).
- d. Advise the customer of the "Trouble Number" location on the directory card.



6. STATION TESTING

After installation, the station shall perform as stated in the appropriate How to Operate Manual.

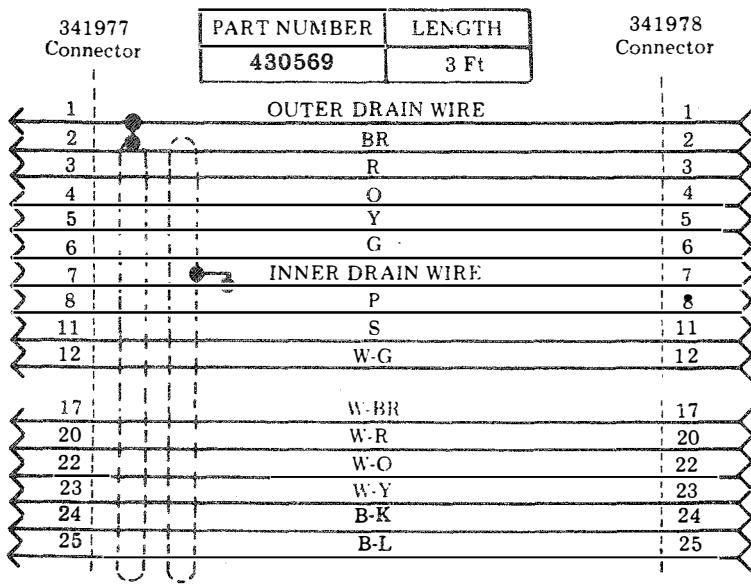
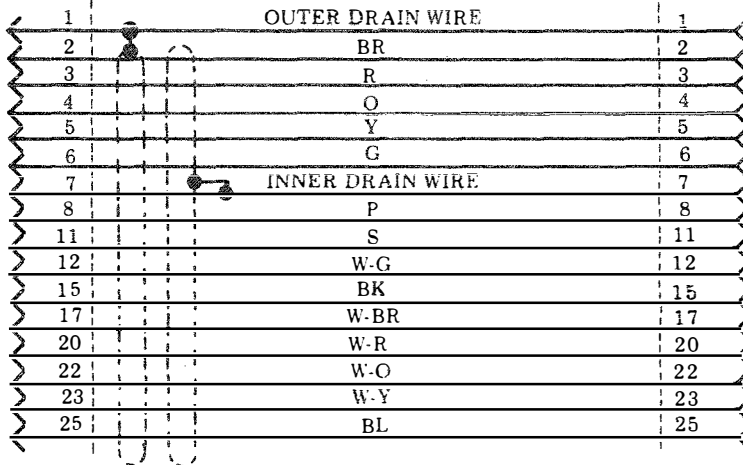
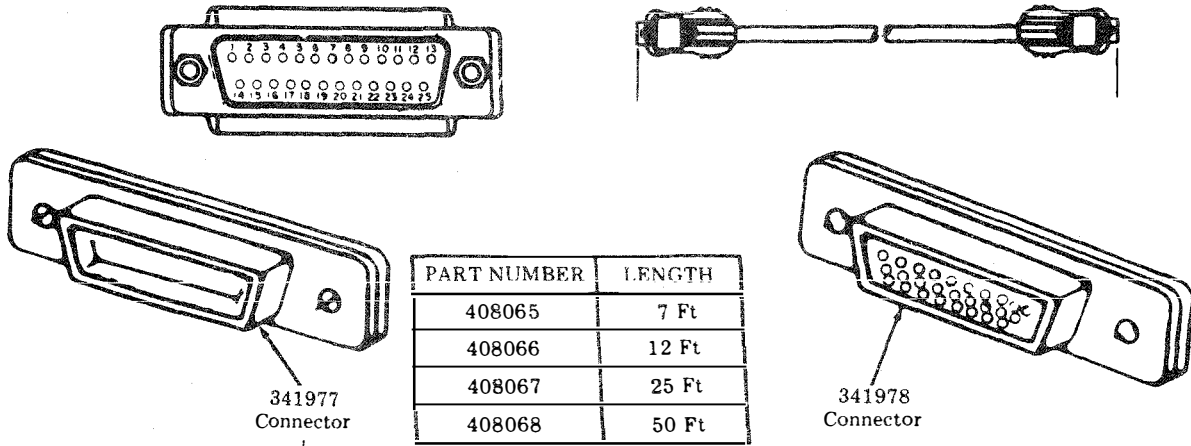
7. ACCESSORIES

The following 43 KSR Terminal accessories in the form of parts or modification kits are available to the customer. For a complete description of the accessory, refer to the applicable specification (if present).

<u>ACCESSORY</u>	<u>PART NO.</u>	<u>SPECIFICATION NO.</u>
EIA Cable, 3 Foot Length	430569	
EIA Cable, 7 Foot Length	408065	
EIA Cable, 12 Foot Length	408066	
EIA Cable, 25 Foot Length	408067	
EIA Cable, 50 Foot Length	408068	
Ribbon Shield (Pin and Friction Feed)	454630	51059S
Paper Deflector, Anti Static	454744	51076S
Paper Guides (Used With 454744)	454742 and	
Paper Deflector on Tractor Feed)	454743	
Copy Holder (Pin and Friction Feed Only)	430310	50994S
Pedestal	430311	51006S
Answer-Back	430900	50944S
Paper Winder (Friction Feed)	430400	51035S
Current Interface Line Shunt (TAU1 Interface)	430647	51073S
APL (A Programming Language) Font	430899	51063S
Electronic Top-of-Form and Other Enhancements	454668	51053S
12 Inch to 8-1/2 Inch Platen	454774	51079S
Paper Separator (Pin Feed)	455036	51083S

8. CABLE WIRING

An EIA cable and a connector with pin numbers are shown below.



NOTES

PART 3 -- ROUTINE SERVICING
A. TROUBLE ISOLATION AND CORRECTION

QUESTIONS	YES	NO
1. Are any of the three communications mode keys 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? (Lamps flash when power is turned on and off, red lamp on power supply, etc). (See Page 3-10.)	Go to 1b.	Check and replace set fuse (F1) if blown. Trouble is in terminal if fuse blows again. If not blown go to 1b.
1b. Is red lamp on power supply lit?	Check power supply output cable. Check keyboard cable connector. (See Page 3-10.)	Check fuse (F2) on power supply. If blown, check for foreign objects between circuit lands or terminals and replace fuse. Trouble is in terminal if fuse blows again.
2. Does printer print test message while the PRINTER TEST key is depressed? (ie, character set printed repeatedly within margin restraints.)	Go to 2a.	Turn off power for several seconds and retry. Trouble is in terminal.
2a. Are any of the following characters substituted in copy? <div style="text-align: center;"> O Ø ^ ↑ - ← </div>	Check Page 2-1, <u>A. OPTIONS</u> , 431.	Go to 2b.
2b. Are undesired line lengths set as follows when power is turned on? <div style="text-align: center;"> 72 80 132 </div>	Check Page 2-1, <u>A. OPTIONS</u> , 432.	Go to 2c.

A. TROUBLE ISOLATION AND CORRECTION (Contd)

QUESTIONS	YES	NO
<p>2c. Is printed copy properly centered or aligned with edges of paper? Pin and Tractor Feed - Parallel to edge and not printing on fold or form line.</p> <p>Friction Feed - Properly centered on roll paper.</p>	Go to 2d.	<p>Pin Feed - Check <u>PRINTED LINE POSITION</u> adjustment. (See Page 3-15.) Tractor Feed - Check <u>HORIZONTAL LINE ADJUSTMENT</u>. (See Page 3-18.) Friction Feed - Check <u>LEFT-HAND MARGIN</u> adjustment. (See Page 3-16.)</p>
<p>2d. Is print density acceptable (including any carbons)?</p>	Go to 3.	<p>Replace ribbon.</p> <p>Check proper density multicopy paper.</p>
<p>3. Are data messages properly sent and received (KSR or KSR part of ASR.)</p>	Go to 4.	Go to 3a.
<p>3a. Do PARITY, DUPLEX and CPS keys alternately lock down and release up when depressed?</p>	Go to 3b.	Trouble is in terminal.
<p>3b. Does substitute character <input checked="" type="checkbox"/> appear with PARITY key on?</p>	Go to 3c.	Go to 4.
<p>3c. Are both stations operating at same speed, is local copy obtained and is remote station sending even parity?</p>	Go to 4.	<p>Select proper speed and DUPLEX keys.</p> <p>Operate with PARITY switch off or check Page 2-1, <u>A. OPTIONS</u>, 434 if remote station is printing the <input checked="" type="checkbox"/> character.</p>
<p>4. Does terminal have a directly connected modular telephone?</p>	Go to 5.	<p>Communications troubles encountered using externally connected data sets and telephones or other arrangements may be isolated by observing signals at the interface connector. See Page 2-4, <u>B. INTERFACES</u>.</p> <p>Go to 11.</p>

QUESTIONS	YES	NO
5. Does AUTO ANSW key light when power is turned on and do LOCAL-TALK, AUTO ANSW and DATA keys each light when depressed?	Go to 6.	Trouble is in terminal.
6. Does telephone operate normally with LOCAL-TALK key lit?	Go to 7.	Check proper connection of modular cords at rear of set. See Page 2-3, <u>B. INTERFACES</u> . Connect phone directly to line. Go to 6a.
6a. Does phone now operate normally?	Check cord that was between phone and terminal. If OK, trouble is in terminal.	Check connections to line and cord between phone and line. Replace phone.
7. When originating a call (answering tone heard) and DATA key depressed, does DATA key light steadily?	Go to 8.	Go to 9.
8. Does phone ring only once and the DATA key light following a received call in the AUTO ANSW mode?	Go to 10.	Originating station must send originating frequency tones, ie, go to data mode. If OK, trouble is in terminal.
9. Does station echo-back characters (print twice) in ANALOG LOOPBACK -- HALF DUPLEX mode? (ie, depress AUTO ANSW key, ESC key and shifted > key.) (Alarm lamp flashes.)	Remote station may be sending incorrect frequencies or signal levels.	Trouble is in terminal.
10. Does carriage return automatically when line lengths beyond the right margin are received on-line and does station disconnect when EOT is received?	Place in service.	Check Page 2-1, <u>A. OPTIONS</u> , 433 or 435. If OK, trouble is in station.

A. TROUBLE ISOLATION AND CORRECTION (Contd)

QUESTIONS	YES	NO
11. Does terminal have a 43 Paper Tape Unit?	Go to 12.	Place in service.
12. Can reader send locally to printer and keyboard send locally to punch?	Go to 13.	Go to 12a.
12a. Can reader send locally to punch and pass local diagnostics of the Paper Tape Unit specified in Manual 421?	Troubles encountered between the KSR and the paper tape unit can be isolated by observing signals at the auxiliary interface connector. See Page 2-3 <u>B. INTERFACES.</u>	Trouble is in Paper Tape Unit. Refer to Manual 421.
13. Can reader send on-line and punch receive on-line properly?	Place in service.	Troubles encountered sending or receiving on-line can be isolated to the KSR or paper tape unit by observing signals at the auxiliary interface connector. See Page 2-3 <u>B. INTERFACES.</u>

B. PERIODIC CHECKS, LUBRICATION AND CLEANING1. GENERAL

This part provides routine servicing procedures for the 43 Teleprinter Basic KSR Station.

Periodic checks, lubrication and cleaning for the paper tape unit (ASR) can be found in the Installation and Routine Servicing Manual 421.

Routine servicing should be performed, at the convenience of the customer, at least once a year.

Routine servicing consists of visual checks, lubrication, and cleaning. When performed at routine intervals, the possibility of later troubles will be reduced.

Following the routine servicing, a local and on-line installation checkout should be performed. The routine servicing date should be filled out on the bottom side of the directory card holder.

2. VISUAL CHECKS

The following areas should be checked for mechanical condition.

- a. Frayed belts on spacing and line feed motors.
- b. Worn or frayed ribbon.
- c. All cable connectors fully seated (Page 3-10).
- d. Print head cover fully seated.

3. CLEANING AND APPEARANCE

Examine exterior areas for smudges, dust, etc.

Check proper fit of cover. Replace extremely damaged or discolored cover, housing, bustle, etc.

Exterior cleaning should normally be limited to wiping with a soft cloth moistened with a mild detergent. However, in case of ink stained plastic surfaces, a waterless (nonabrasive) hand cleaner or a lather from abrasive bar soap applied with a cloth should be used.

Interior areas should be examined with the cover opened and accumulations of paper dust or ribbon fragments cleaned by carefully brushing loose material onto a cloth. Ink stains or deposits on interior surfaces, ribbon rollers, platen, etc., can be wiped with a cloth dampened in mineral spirits.

WARNING: DO NOT ALLOW MINERAL SPIRITS OR SOLVENTS TO CONTACT PLASTIC SURFACES.

4. LUBRICATION PROCEDURES

The printer can be lubricated by opening the cabinet cover (and side covers on tractor). Apply lubricant to points as indicated.

Routine Servicing should be performed, at the convenience of the customer, at least once a year.

On small parts, a minimum amount of lubricant should be applied so that the lubricant remains on the parts and does not run off.

Excessive lubricant should be removed with a dry, lint-free cloth.

The following areas must be kept dry, free of all lubricant: All electrical components, including terminals, inner armature and pole plate area of print head. All parts normally touched by the operator, including exposed surfaces in ribbon, paper handling areas, and all large flat areas.

The following symbols indicate the quantity of lubricant to be used in a specified area: Symbols 01, 02, 03, etc., refer to 1, 2, 3, etc., drops of oil.

The following list of symbols applies to the lubrication instructions and the type of lubricant to be used:

- O Oil 88970 (1 qt), 88971 (1 gal).
- G-A Apply thin film of 454641 (14 oz) or 301313 (1-3/4 oz) grease.
- G-B Apply thin film of Syn-Tech grease (use 430836 tube with grease and 430838 brush).
- G-C Fill with Poly Oil grease (use 430837 injector with grease).
- S Saturate felt oilers, washers, and wicks with oil.
- D Keep dry, no lubricant permitted.

B. PERIODIC CHECKS, LUBRICATION AND CLEANING

Lubrication Check List: (See Pages 3-7, 3-8 and 3-9)

Lead Screw -- Film of grease over entire threaded portion of lead screw.
 Carriage Wicks -- Saturate with oil (4 places).
 Carriage Oiler -- Saturate with oil.
 Ribbon Guide Rollers -- 2 drops of oil (2 places).
 Ribbon Rollers -- 2 drops of oil (2 places).
 Ribbon Tension Arm Pivot and Spring -- 2 drops of oil each (4 places).
 Spacing Tension Arm Pivot, Roller and Spring -- 2 drops of oil each (4 places).
 Platen Bearing -- 5 drops of oil each side (2 places).
 Finger Pivots -- 2 drops of oil each side (2 places).
 Paper-Out Arm Pivot -- 2 drops of oil on both pivot points (sprocket and tractor feed only).
 Lead Screw Pulley Clip -- Grease between clip and lead screw shaft.
 Pressure Roller Bail Spring -- 2 drops of oil each end (2 places - friction feed and tractor feed only).
 Platen Tray Shaft -- 2 drops of oil each end at the side plates (2 places - friction feed and tractor feed only).
 Pressure Roller Bail -- 2 drops of oil each end at pivot points on each side of bail (2 places - friction feed and tractor feed only).
 All Spring Eyeloops at the Anchor Points -- 1 drop of oil.
 Line Feed Intermediate Gear and Shaft -- Light film of grease (tractor feed only).
 Inner Platen Shaft and Roll Pin -- Light film of grease (tractor feed only).
 Platen Pressure Roller Release Arm Pivot and Working Surface -- Light film of grease (tractor feed only).
 Line Feed Motor Mounting Points -- 1 drop of oil on each mounting point (sprocket and friction feed with floating motor).

Carriage and Nut Engaging Surfaces:

- a. Two Nut Drive Arms -- Grease four bearing surfaces.
- b. Nut Keying Arm -- Lubricate by packing carriage engaging slot with grease.

Print Head:

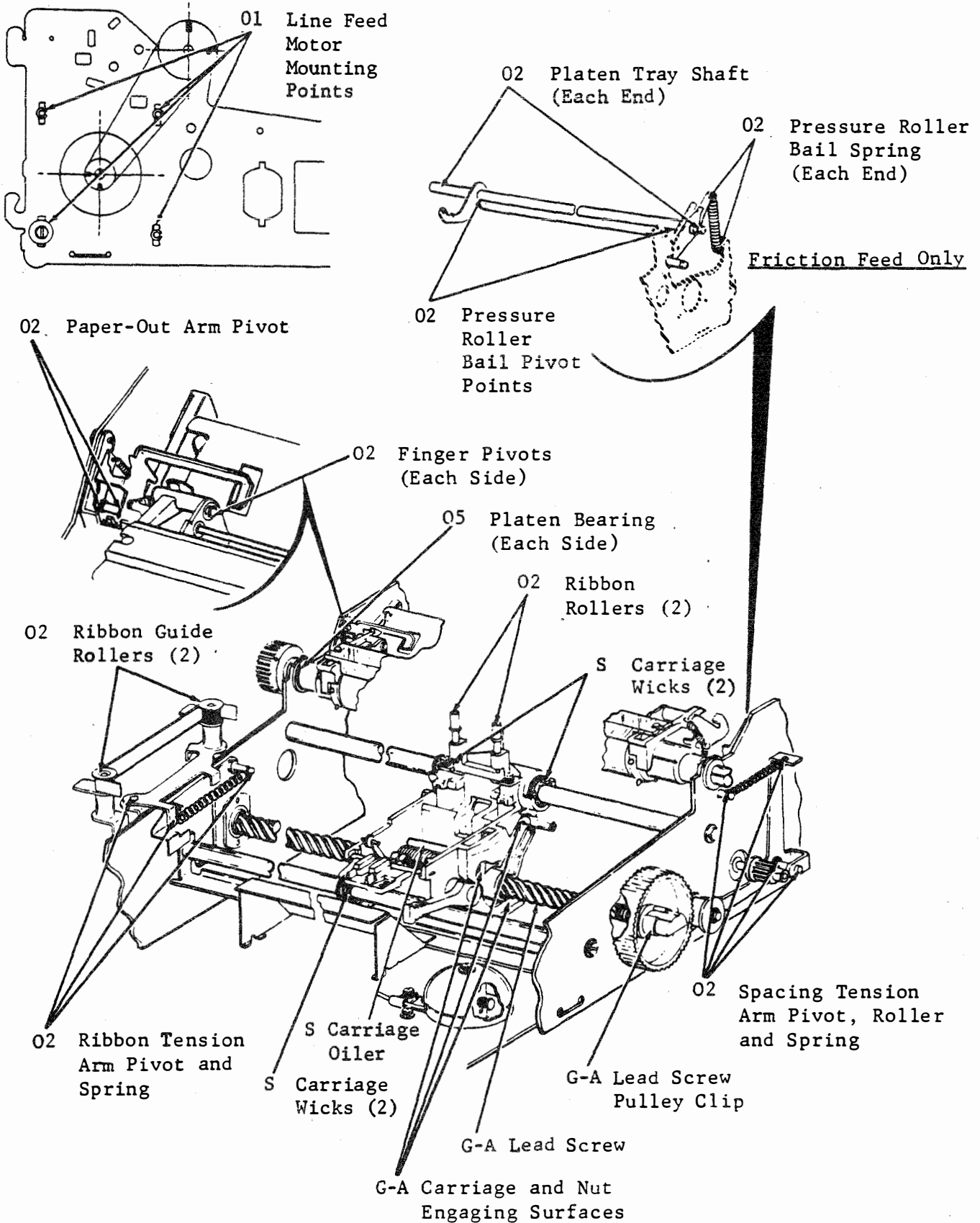
- a. Active Armatures and Outer Pole Plate -- Grease at the upper pivot area as well as the lower locator area (9 places).
- b. Print Wire Well Area -- Completely fill with grease.

Tractor:

- a. Spline Shaft -- 1 drop of oil on each bearing (2 places).
- b. Margin Adjust Wheel -- Oil light coating on threads.
- c. Release Lever Pivots -- 1 drop of oil on each pivot (2 places).
- d. Idler Gear Shaft -- Light film of grease.
- e. Gear Surfaces -- Light film of grease on drive surfaces.

5. LUBRICATION POINTS

Pin and Friction Feed



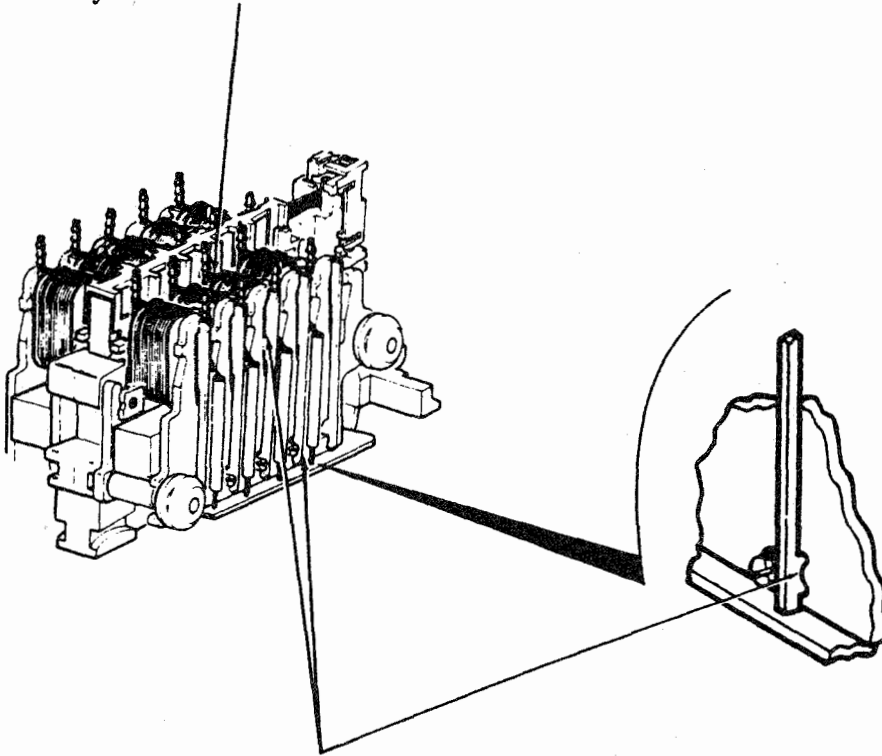
B. PERIODIC CHECKS, LUBRICATION AND CLEANING (Contd)

5. LUBRICATION POINTS (Cont)

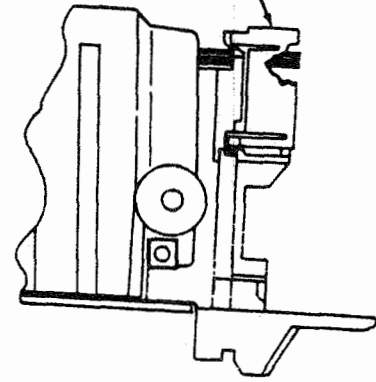
Print Head

NOTE: Keep inner armature and pole plate dry and free of all lubricant.

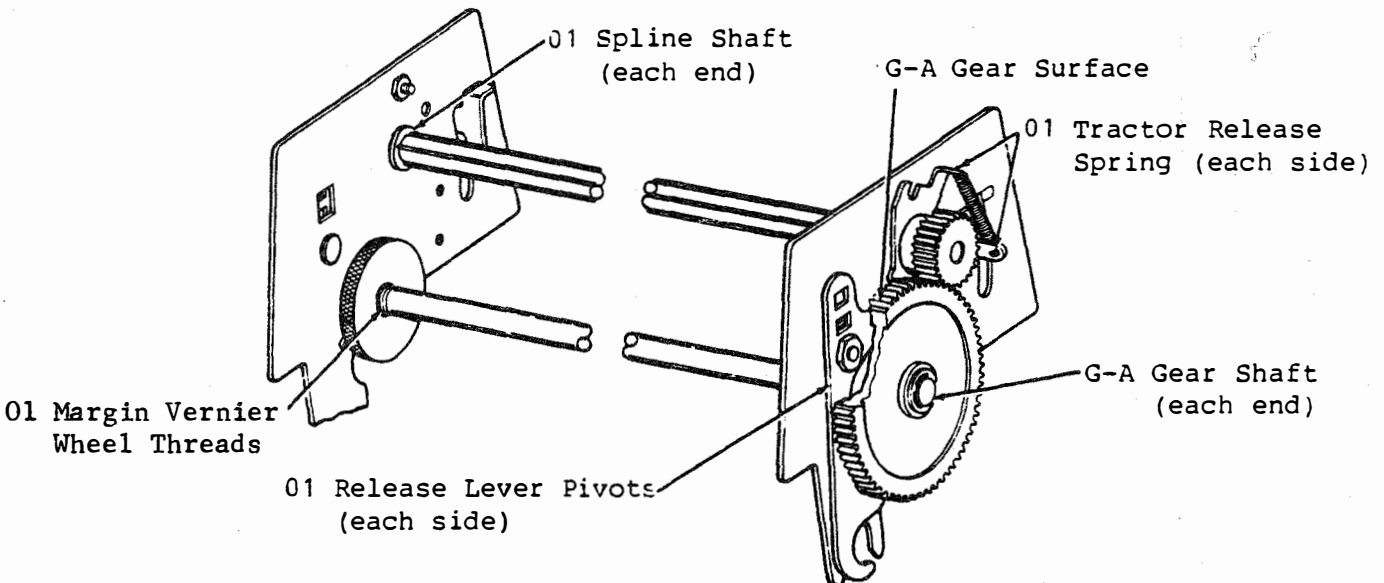
G-C Print Head Well Area



G-B Print Head Active Armatures and Outer Pole Plates



Tractor



01 Margin Vernier Wheel Threads

01 Release Lever Pivots (each side)

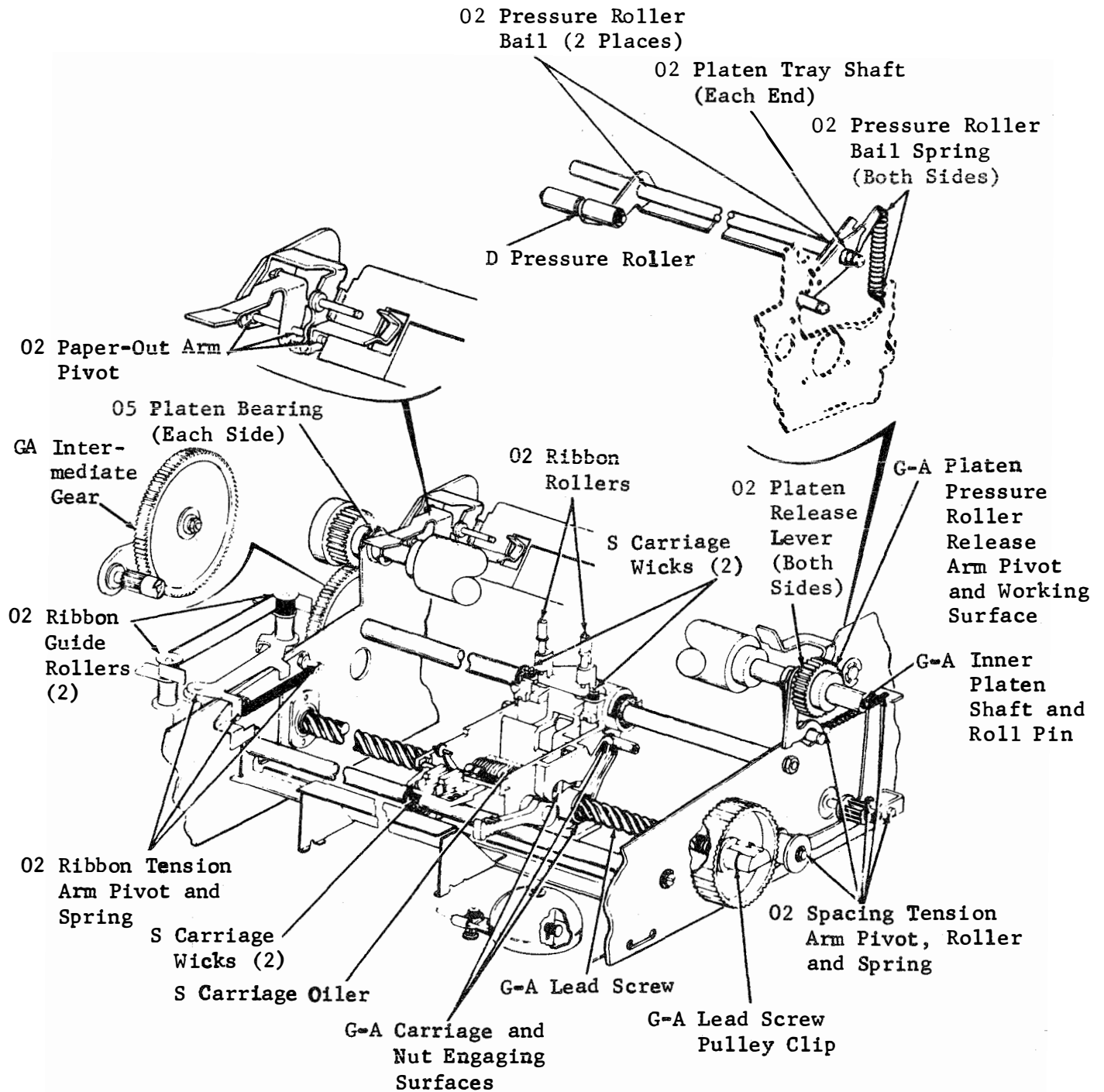
01 Spline Shaft (each end)

G-A Gear Surface

01 Tractor Release Spring (each side)

G-A Gear Shaft (each end)

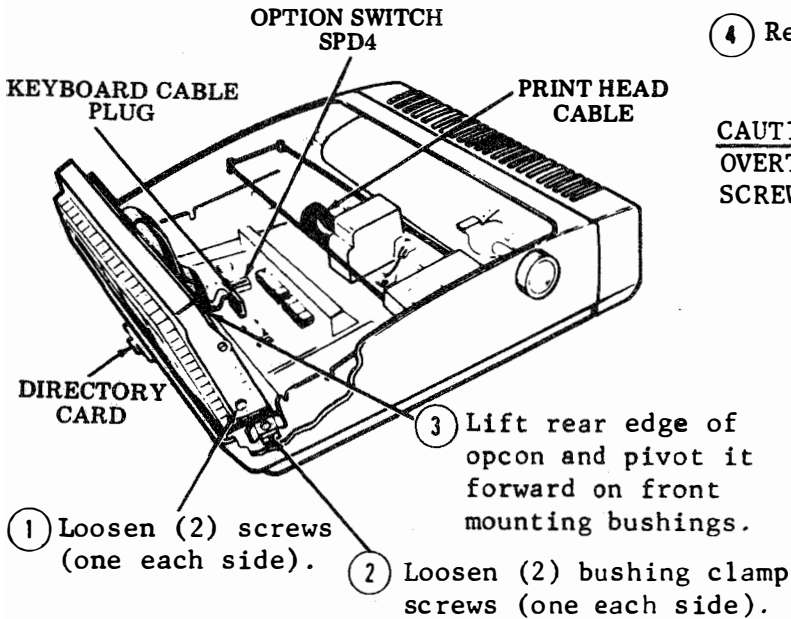
Tractor Feed



C. COMPONENT ACCESS

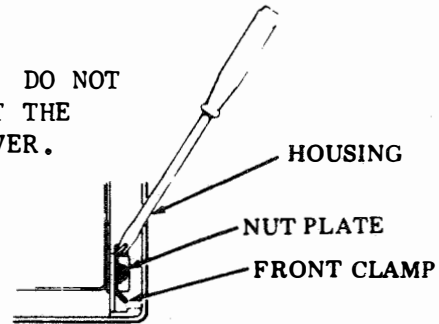
For Paper Tape Unit component access, refer to Installation and Routing Servicing Manual 421.

1. KEYBOARD, CABLES, AND OPTION SWITCH



④ Reverse steps to reposition keyboard.

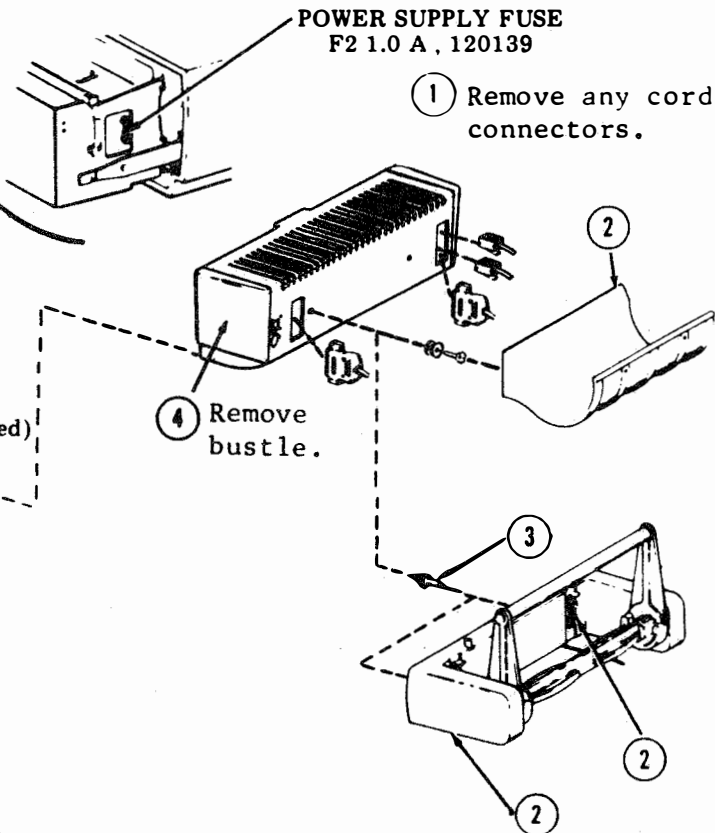
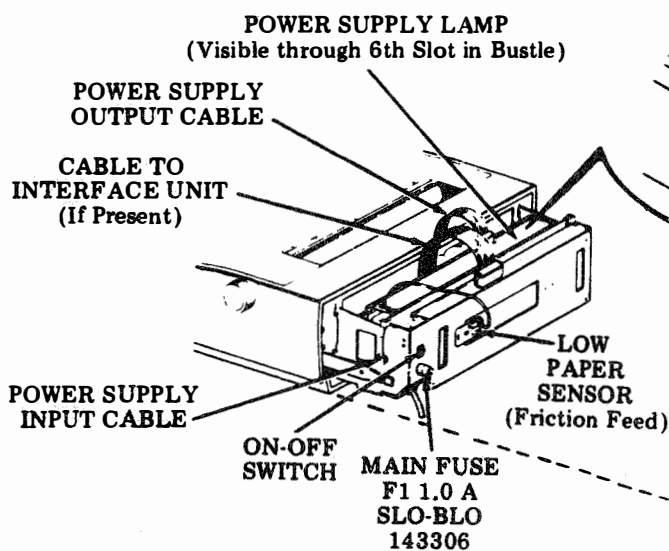
CAUTION: DO NOT OVERTWIST THE SCREWDRIVER.



NOTE: When repositioning option switch, 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.

Tighten the clamp screws.

2. POWER SUPPLY LAMP, CABLES AND FUSES



② Remove paper and paper holder or paper supply assembly, if present. To remove paper supply assembly, disengage latch from mounting posts and pull straight up. Slide off of mounting posts.

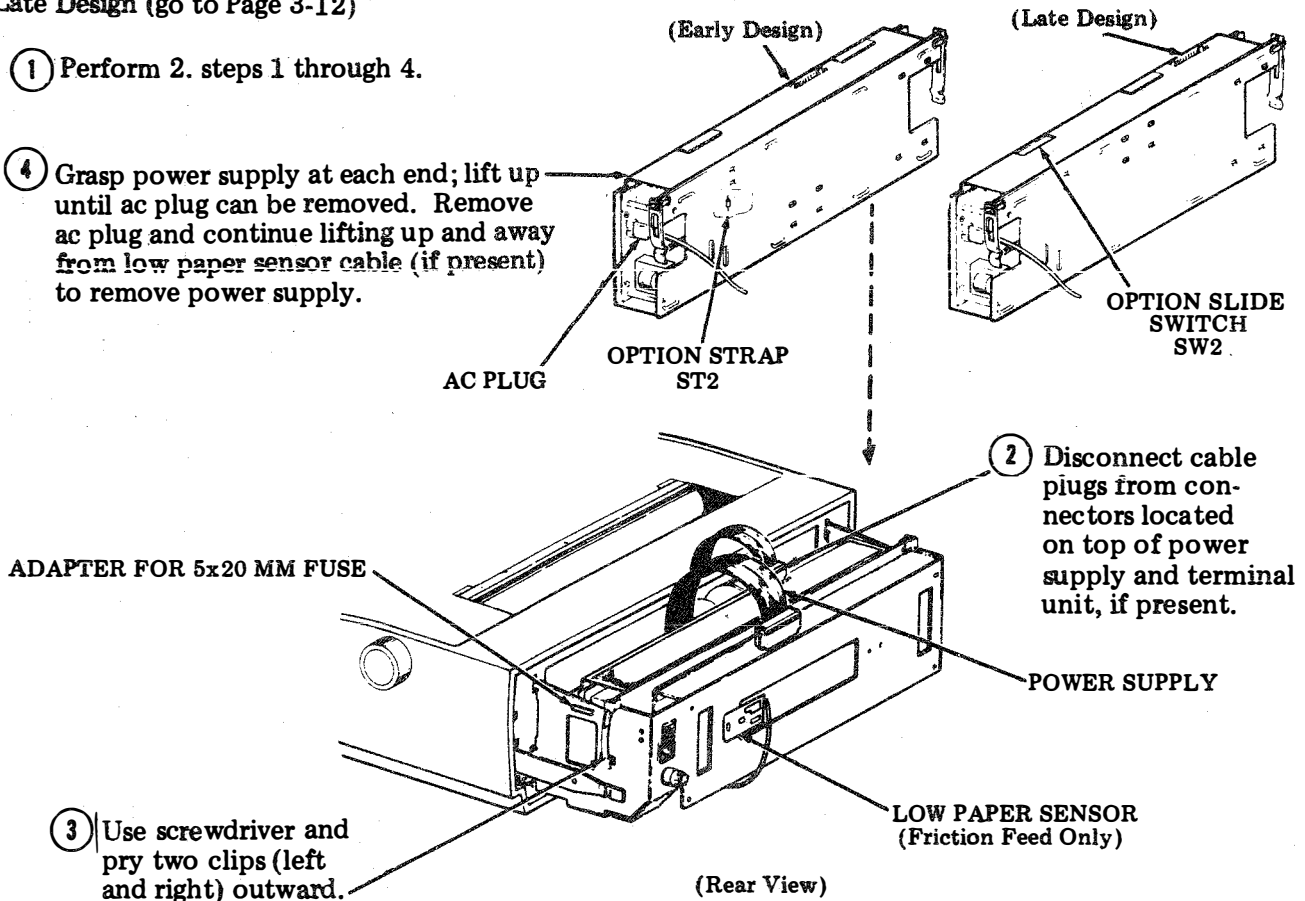
③ Remove screws and bushings or mounting posts.

3. POWER SUPPLY 115/230 Vac OPTION

Remove power supply: (Early Design Only)
Late Design (go to Page 3-12)

① Perform 2. steps 1 through 4.

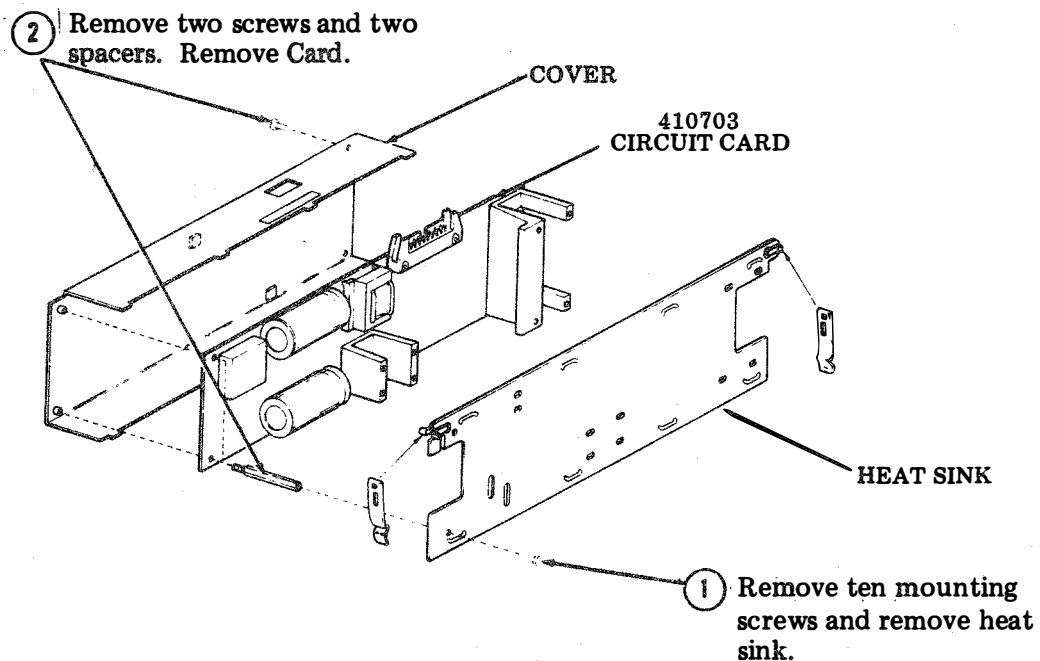
④ Grasp power supply at each end; lift up until ac plug can be removed. Remove ac plug and continue lifting up and away from low paper sensor cable (if present) to remove power supply.



② Disconnect cable plugs from connectors located on top of power supply and terminal unit, if present.

③ Use screwdriver and pry two clips (left and right) outward.

To remove 410703 circuit card from 430760 power supply:



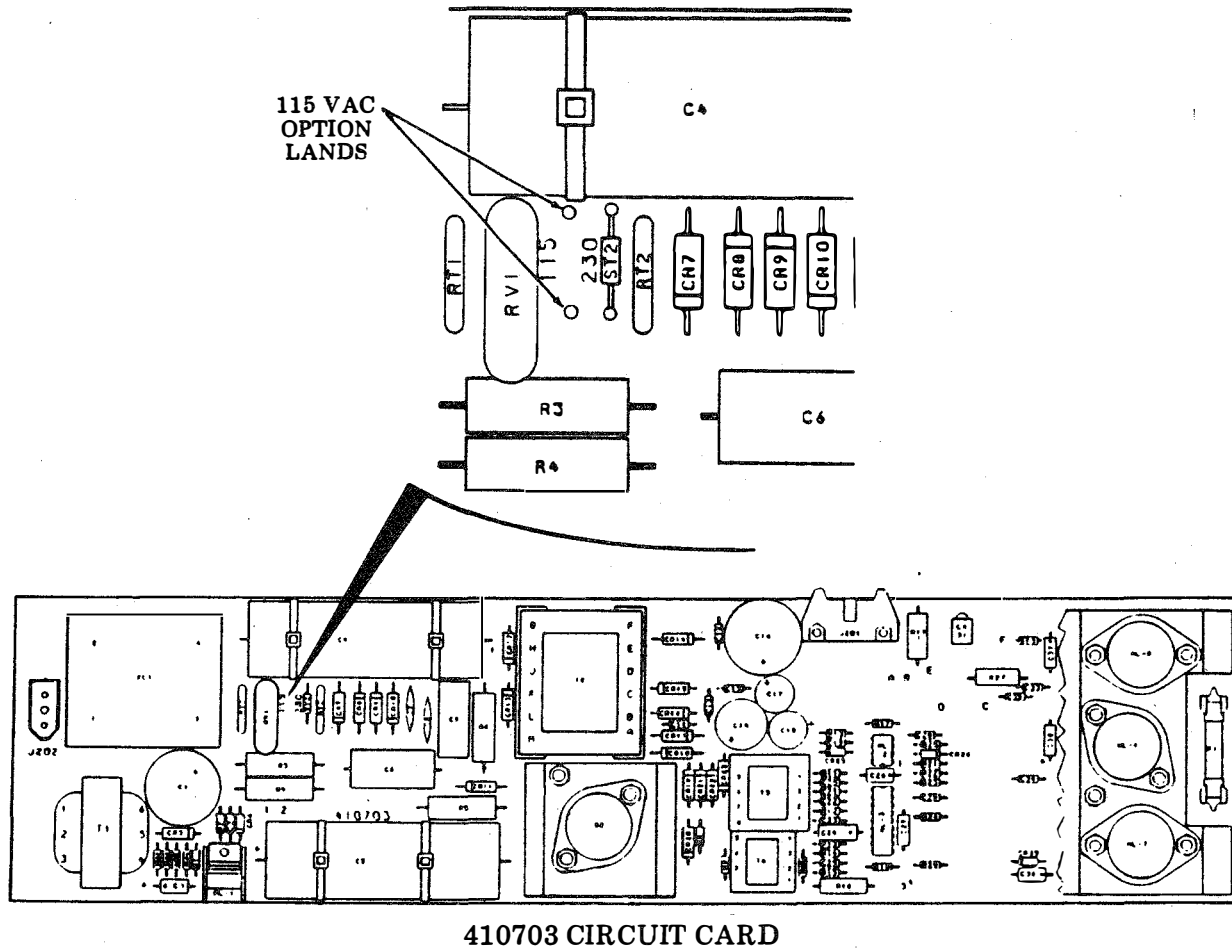
① Remove ten mounting screws and remove heat sink.

C. COMPONENT ACCESS (Contd)

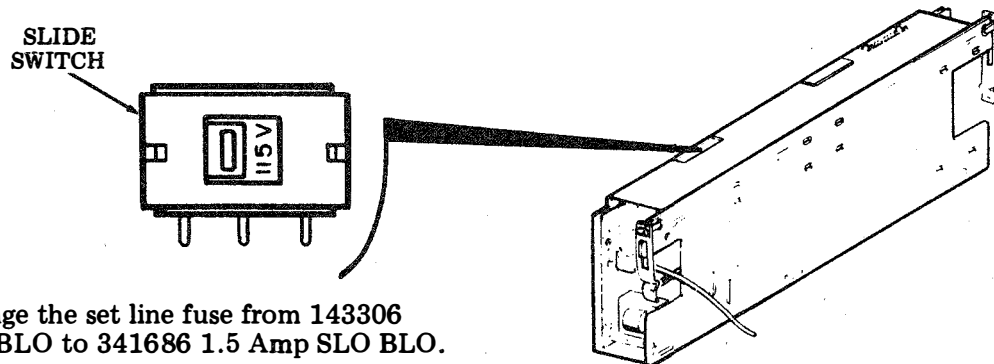
3. POWER SUPPLY 115/230 Vac OPTION (Contd)

To change the option from 230 Vac to 115 Vac (410703 circuit card)

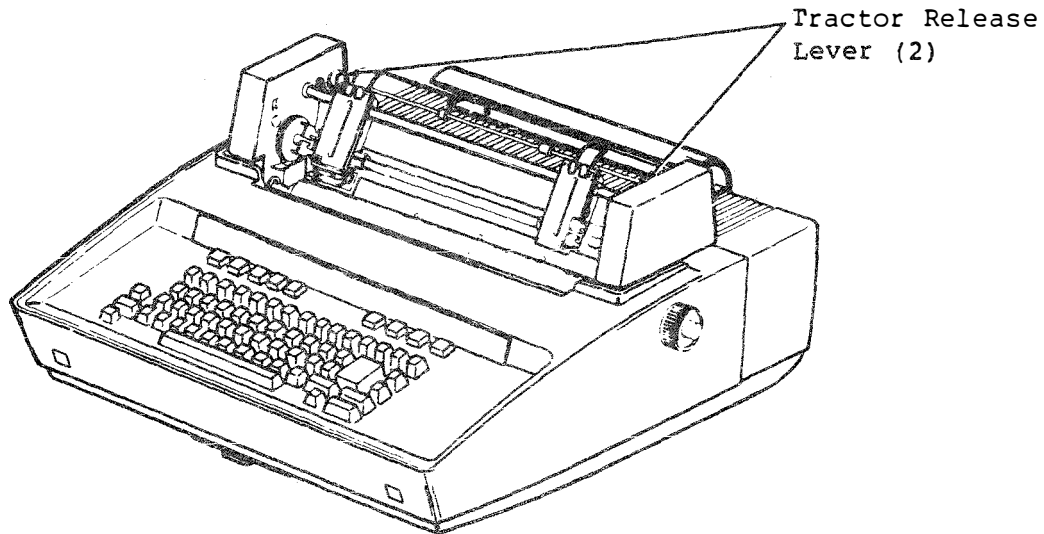
The 410703 circuit card is shown optioned for 230 Vac. To option the 410703 circuit card for 115 Vac, remove strap ST2 from its 230 Vac location and solder it into the 115 Vac position. Mark the power supply to show the option change.



To change the option from 230 Vac to 115 Vac (410704 circuit card) operate the slide switch on top of the power supply card to the 115 V position.



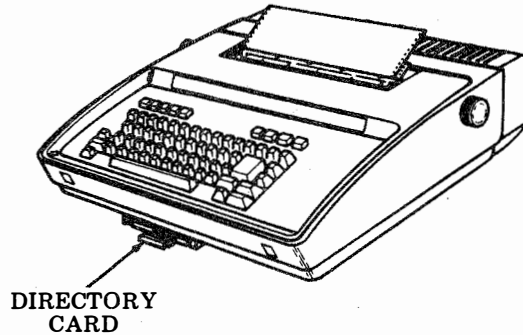
Note: Change the set line fuse from 143306 1.0 Amp SL BLO to 341686 1.5 Amp SLO BLO.

4. TRACTOR

- ① To remove tractor, press down both tractor release levers as you lift the entire tractor mechanism. To replace, press tractor release levers down and seat in position.
- ② To gain access to the mechanism on the right and left side plates, first remove the tractor from the teleprinter, then depress the cover latches (at the lower corners of the side plate) and swing cover out and lift to remove. To replace the covers, seat the top edge of the cover on the top of the side plate and snap the lower portion in position.

C. COMPONENT ACCESS (Contd)

5. DIRECTORY CARD



- ① Pull directory card out as far as it will go.
- ② Hold card at edges and move it slightly to one side and pivot to clear the opposite latch.

D. ADJUSTMENTS

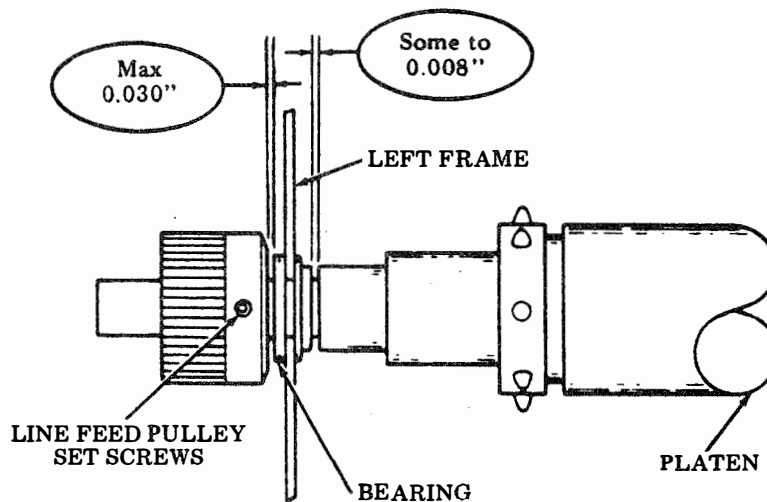
For Paper Tape Unit adjustments, refer to Installation and Routing Servicing Manual 421.

1. PLATEN ENDPLAY (Friction and Pin Feed)

The following two requirements must be met:

Requirement

Platen Endplay -- With the platen biased to the right, there should be
Min Some---Max 0.008 inch
clearance between the left bearing and the platen hub, at the closest point, and
Max 0.030 inch
between the left bearing and the pulley at the closest point.



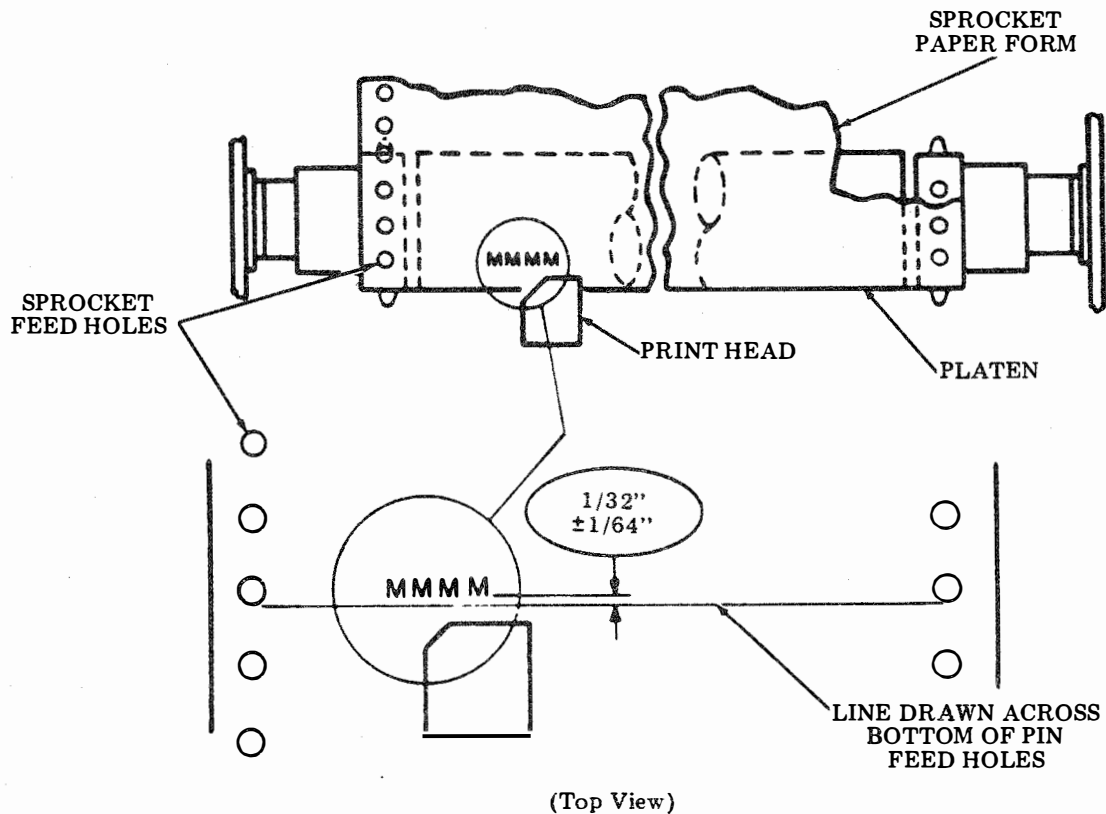
2. PRINTED LINE POSITION (Pin Feed Only)

Requirement

Printed Line Position -- The lower edge of a typed line of M characters should be Min $1/32$ ---Max $\pm 1/64$ 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.)



To Adjust

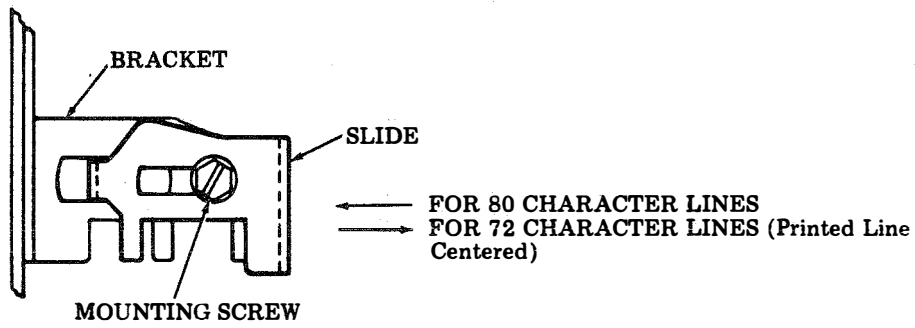
Loosen the line feed pulley (at platen) set screws and position. Print the character "M" across the line and check (2) Requirement. If necessary, loosen setscrew on right sprocket to meet alignment requirement (early design).

D. ADJUSTMENTS (Contd)3. 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 (Option 432c), 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.



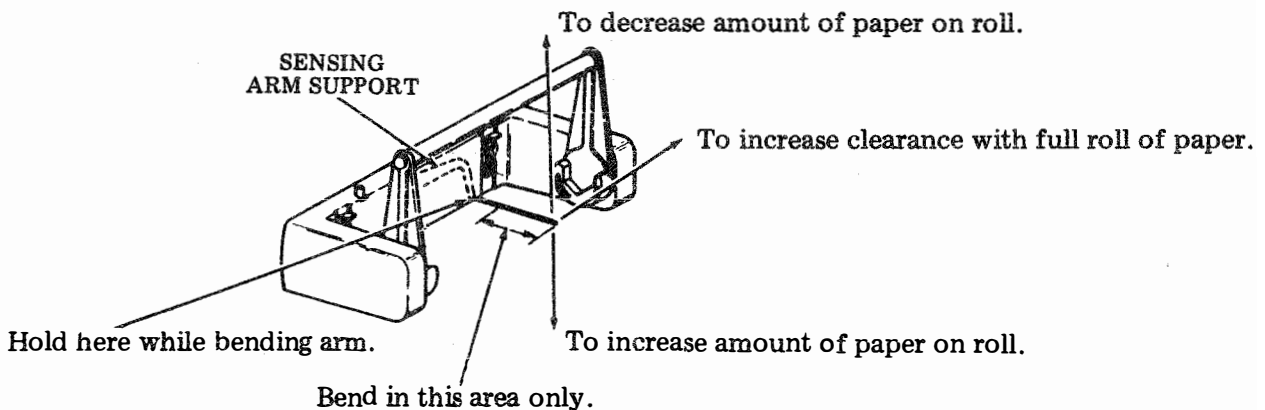
4. LOW PAPER SENSING ARM (Friction Feed Only)

Requirement

- (1) Preliminary -- Under normal operation, the alarm indicator shall light when there is approximately 2 inch diameter (40 feet) of paper left on the spindle.
- (2) Final -- May be set at more or less than 2 inch diameter as long as alarm indicator lights before paper runs out and sensing arm does not touch full roll of paper when depressed downward to end of its travel.

To Check

When the Low Paper Sensing Arm is depressed downward to the end of its travel and then allowed to slowly return upward, the alarm indicator shall light when there is approximately 2 inch diameter (40 feet) of paper left on the spindle.



To Adjust

Grasp the sensing arm support (when the wire arm is attached) and bend the sensing arm.

CAUTION: THIS ADJUSTMENT IS SET AT THE FACTORY AND NORMALLY DOES NOT REQUIRE READJUSTMENT. IF THE ADJUSTMENT IS PERFORMED, CARE SHOULD BE TAKEN NOT TO BEND THE SENSING ARM SUPPORT. CHECK TO VERIFY THAT THE SENSOR ARM MOVES THROUGH ITS ENTIRE RANGE WITHOUT BENDING.

D. ADJUSTMENTS (Contd)5. IDLER GEAR TO PRINTER PLATEN GEAR (Tractor Feed Only)

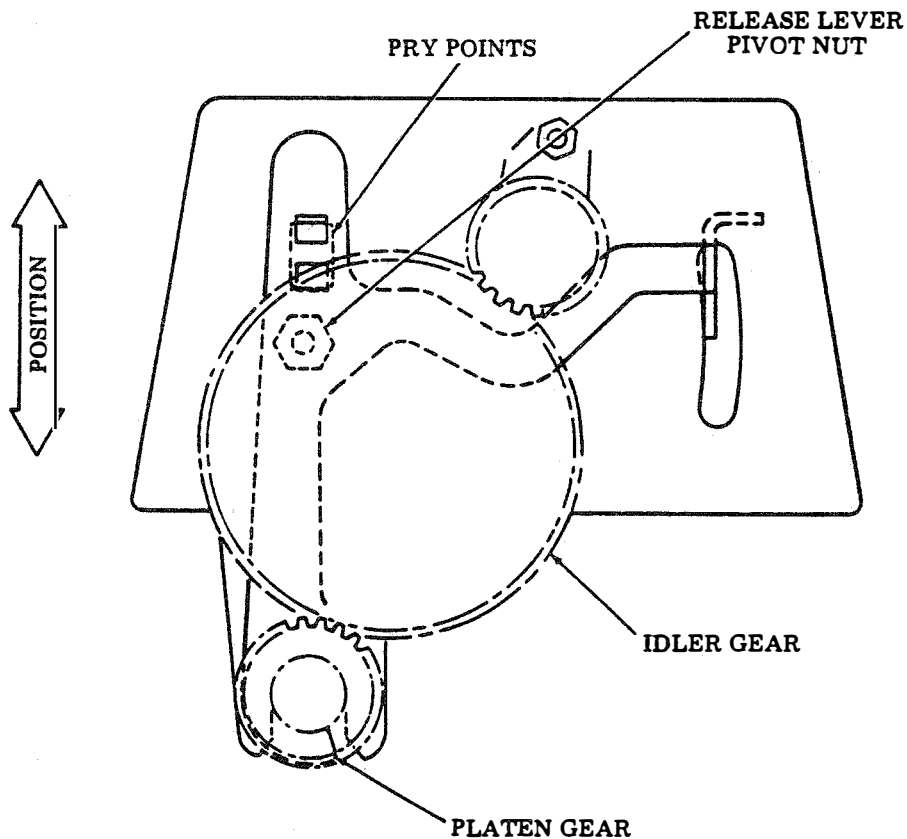
Requirement

With the tractor mechanism installed on the printer (latched on the platen bushings) there should be minimum backlash between the platen drive gear and the tractor idler gear.

To Adjust

Remove the end cover from the right tractor frame, loosen the release lever pivot shoulder nut, and use the pry points to make the adjustment. Retighten the shoulder nut and rotate the platen with the line feed motor declutched (soft roll) to insure the mechanism rotates freely and there is no binding. Remake the adjustment, if necessary.

NOTE: This adjustment may be made on a fixture which simulates the printer.



6. HORIZONTAL LINE ADJUSTMENT (Tractor Feed Only)**Requirement**

The printed line should not vary more than ± 0.031 from an arbitrary horizontal reference line (lined paper) when a line is drawn even with the bottom of the first and last character of a 10 inch long printed line.

To Adjust

Remove the left end cover, loosen the shoulder nut and position latch to meet the requirement. Retighten the shoulder nut and recheck the requirement.

NOTE: It is recommended that a single character such as M be repeated on the entire page for the above adjustment if done on a printer.

