

BULLETIN 273B
TECHNICAL MANUAL
MODEL 32 AND 33
SEND-RECEIVE PAGE PRINTER SETS (KSR)
RECEIVE-ONLY PAGE PRINTER SETS (RO)
AUTOMATIC SEND AND RECEIVE SETS (ASR)



TELETYPE[®]
CORPORATION
5555 TOUHY AVENUE, SKOKIE, ILLINOIS

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- Section 2 - Installation
- Section 3 - Operating Instructions
- Section 4 - Adjustments and Spring Tensions
- Section 5 - Disassembly and Reassembly
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Model 32 Send-Receive Page Printer Set

INTRODUCTION

This bulletin provides description, installation, operating instructions, maintenance and principles of operation for the Teletype Model 32 and 33 Send-Receive Page Printer Sets. Parts information is furnished in Teletype Bulletin 1184B.

For the sake of brevity, the equipment is referred to throughout the bulletin simply as a "Printer".

References in the text to left or right indicate the viewer's left or right as he faces the front of the Printer.

In the illustrations, unless they are labeled otherwise, it is assumed the equipment is being viewed from the front.

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SECTION 1
DESCRIPTION

1-1. GENERAL.

a. The Model 32 and 33 equipments described herein are electromechanical apparatus that provide terminal facilities for exchanging recorded communication via appropriate transmission facilities including telegraph lines, telephone networks and radio channels. They are designed for light-duty service in applications where the operation is not expected to exceed two hours per day.

b. The following equipments are covered:

(1) Send-Receive Page Printer Set (KSR Set) - Figure 1-1.

(2) Receive-Only Page Printer Set (R/O Set) - Figure 1-2.

(3) Automatic Send-Receive Set (ASR Set) - Figure 1-3.

c. Transmission and reception are effected by a start-stop signaling code (also referred to as teletypewriter code) which is carried by the transmission facilities. The basic difference between Model 32 and 33 apparatus is that the

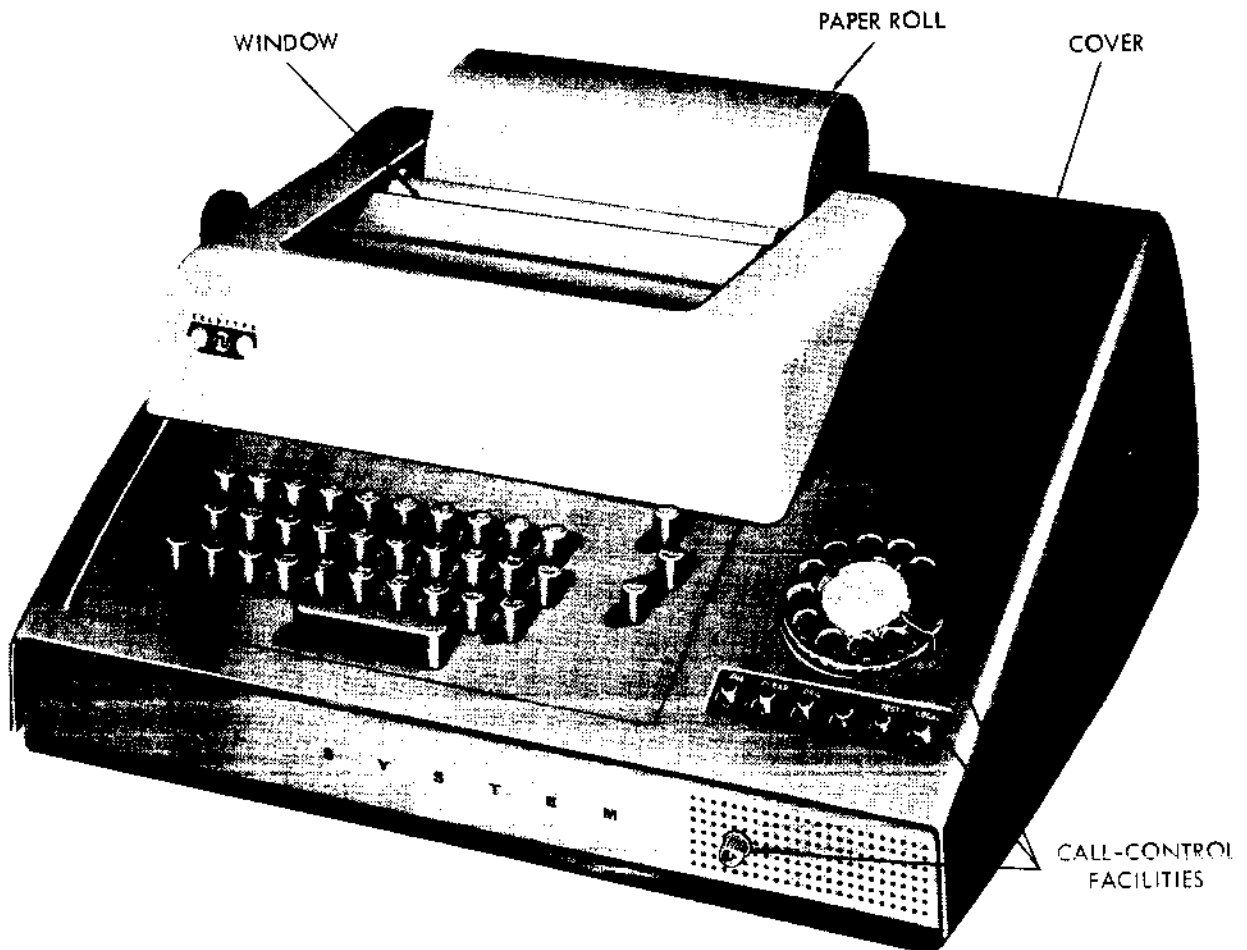


Figure 1-1. Model 32 Send-Receive Page Printer Set (KSR Set)

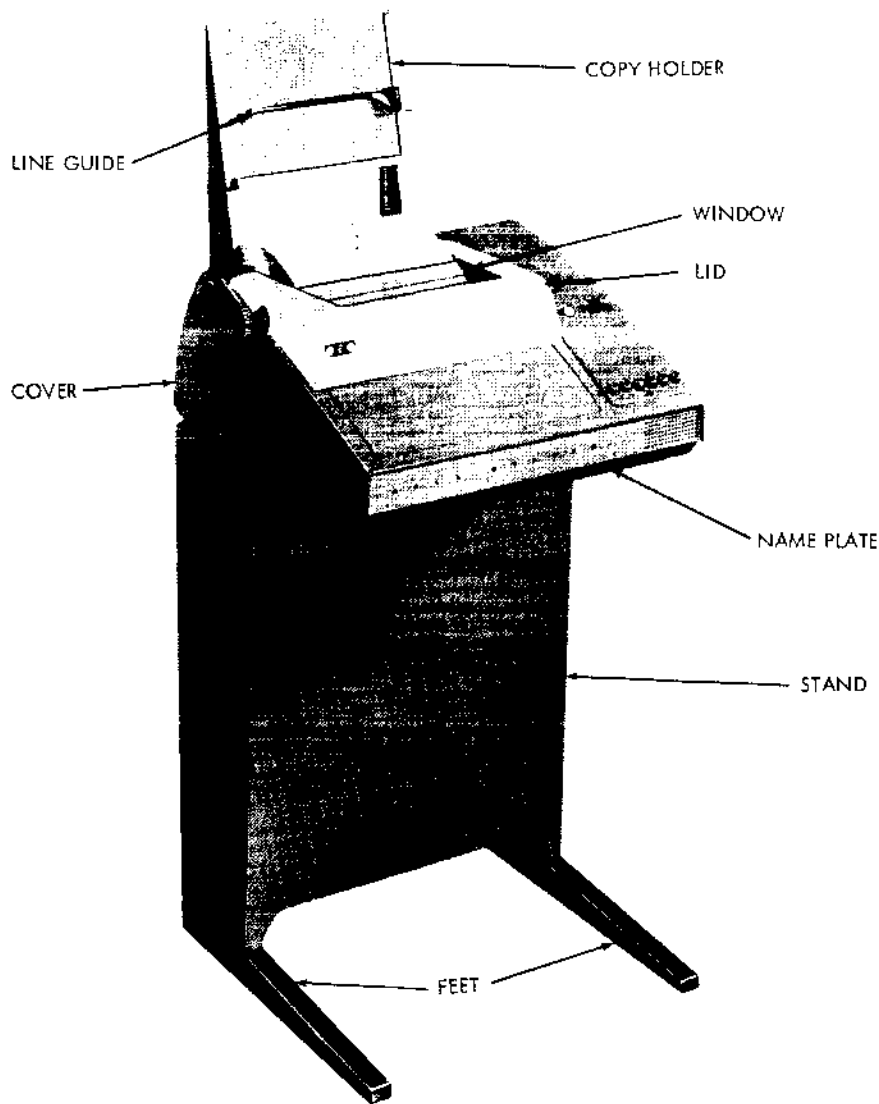


Figure 1-2. Receive Only Page Printer Set (R/O Set)

former utilizes a five-level code and the latter utilizes an eight-level code (See Section 7 for explanation of codes.) The equipment will operate at speeds up to 100 words per minute.

1-2. EQUIPMENTS DEFINED.

a. SEND-RECEIVE PAGE PRINTER SET (KSR Set) - Figure 1-1.

(1) The KSR Sets provide facilities for originating messages for transmission by the manual operation of a keyboard, and for receiving and printing messages, whether originated locally or remotely, on page-width copy paper.

(2) The basic Printer consists of the following major components (Figures 1-1 and 1-4) which are described in the indicated paragraphs:

- (a) Keyboard (par. 1-6).
- (b) Printer Assembly (par. 1-7).
- (c) Motor (par. 1-5).
- (d) Call-Control Assembly (par. 1-12).
- (e) Sub-Base (par. 1-8).
- (f) Cover (par. 1-8).

(3) The keyboard, printer assembly and call-control assembly are mounted on the sub-base (Figure 1-4). The motor is mounted on the printer assembly. The cover encloses the other components and is attached to the sub-base. Paper feeds from a roll at the rear and is led around a platen where it is printed. A window permits viewing the printed copy. Facilities are provided for connecting the set to an a.c. power source and the transmission facilities.

(4) The Model 32 Sets have a three-row Keyboard (Figure 1-1) and use a five-level code. The Model 33 Sets have a four-row Keyboard (Figure 1-13) and use an eight-level code.

(5) The **FOUR ROW FIVE-LEVEL KEYBOARD** - This four-row keyboard accommodates basic five-level operation utilizing the conventional "LETTERS - FIGURES" shift characters.

b. **RECEIVE-ONLY PAGE PRINTER SET (R/O Set)** - Figure 1-2.

(1) The R/O Sets provide facilities for receiving messages and printing them on page-width copy paper.

(2) The basic R/O Set consists of the same components as the KSR Set listed in par. 1-2.a.(2) above. However, the Keyboard is blank and has no facilities for transmission.

(3) Par. 1-2.a.(3) above also applies to the R/O Sets.

(4) The Model 32 R/O Sets use a five-level code, and the Model 33 Sets use an eight-level code.

c. **AUTOMATIC SEND-RECEIVE SET (ASR Set)** - Figure 1-3.

(1) The ASR Sets provide facilities for originating messages for transmission by either the manual operation of a keyboard or the reading of perforated paper tape. They provide facilities for recording messages, whether originated locally or remotely, by perforating them in tape and/or printing them on page-width copy paper. The ASR Sets may be used in the following ways:

(a) To transmit messages from the keyboard while making a printed page copy with or without perforating tape.

(b) To receive messages from line and print them on page copy with or without perforating tape.

(c) To locally perforate messages in tape from keyboard for later transmission while making a printed page copy.

(d) To transmit messages from tape while making a page copy with or without perforating tape.

(2) The basic ASR Sets include the same components as the KSR Sets listed in par. 1-2.a.(2). In addition they have a tape reader (par. 1-10) and a tape punch (par. 1-11).

(3) Par. 1-2a.(3) above also applies to the ASR Sets. The tape punch and tape reader are mounted on the left side of the set. The tape feeds forward from a roll into the punch where it is perforated. It can then be fed into the reader for transmission. Controls are provided for the reader and punch. A removable metallic chad container collects the paper (chad) punched out of the perforations in the tape.

(4) Par. 1-2.a.(4) also applies to the ASR Sets.

1-3. **ACCESSORIES.**

A number of optional accessories are available with the equipment including the following:

a. A sheet metal stand which supports the sets at a convenient operating level (Figure 1-11).

b. A copy holder with line guide (Figure 1-2).

c. Call control facilities including buttons, indicator lamps, motor control relay, speaker, ringer, buzzer, and rotary, touch-tone and card dialers (Figure 1-1 and 1-11).

d. Low paper alarm.

e. An answer back mechanism which will automatically identify a station by transmitting predetermined character sequences (Figure 1-10).

f. Optional functions including unshift on space and automatic carriage-return line feed.

1-4. **TYPICAL APPLICATION** (Figure 1-3).

a. The following is a brief description of how Model 32 or 33 apparatus, equipped with call control and answer-back features, may be used in a typical communication system (see Figure 1-5). When a call is to be made, an operator uses the controls on his Set to gain access to the system's switching and transmission facilities which may be dial telephone or telegraph networks. He then dials the number of the called station.

b. The switching center selects the proper station and signals an incoming call there by visual and/or audible indicators. Using the controls on his Set, the operator at the called station completes the connection and conditions the equipment so that communication can proceed in either direction, a fact that is indicated visually and/or audibly at the calling station (Variations of call control features provide unattended reception of calls.)

c. Ordinarily the stations then identify themselves by the answer-back feature. The operator

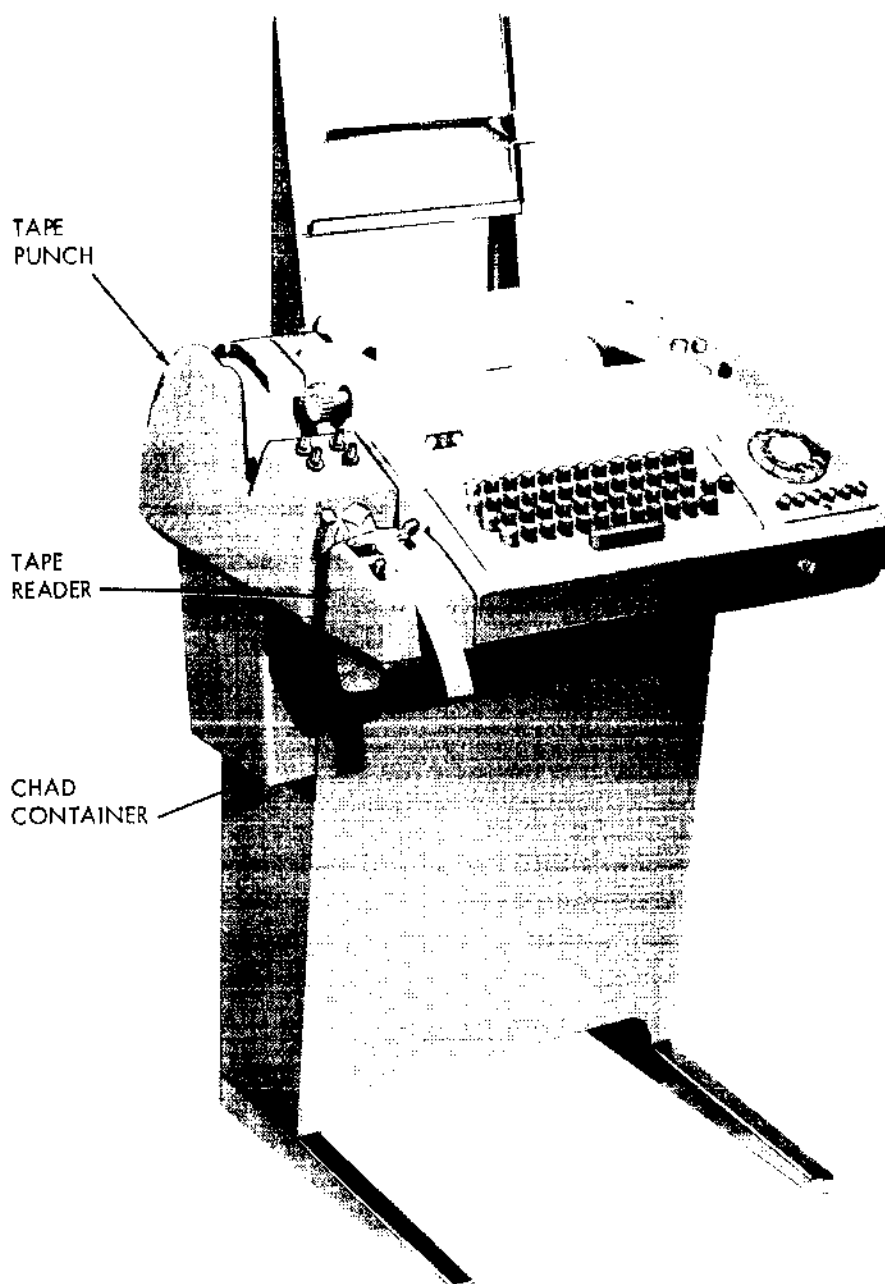


Figure 1-3. Model 33 Automatic Send-Receive Set (ASR Set)

at the calling station can then type the message on his keyboard, or, if he has an ASR Set, can send it from perforated tape. In either case the Set translates the message to d.c. start-stop signals which it applies to the transmission facilities. The Sets at both the sending and receiving stations receive the signals and translate them to mechanical motions which print the message on page copy and/or, in the case of an ASR Set, perforates it in tape. If telephone networks are used, the d.c. signals are converted to tone frequencies for transmission and reconverted to d.c. signals for reception.

d. Finally, the operator at either station can terminate the call and return the equipments to their idle condition by his controls.

1-5. MOTOR AND DRIVE PARTS (Figure 1-6).

a. Mechanical motion for the Model 32 equipment is ordinarily provided by a two-pole, single-phase synchronous motor which operates from 115 v.a.c. source and develops 25 millihorse power at 3600 r.p.m. It consists basically of a housing, end bells, a wound stator, and a squirrel-cage rotor with shaft which rides on

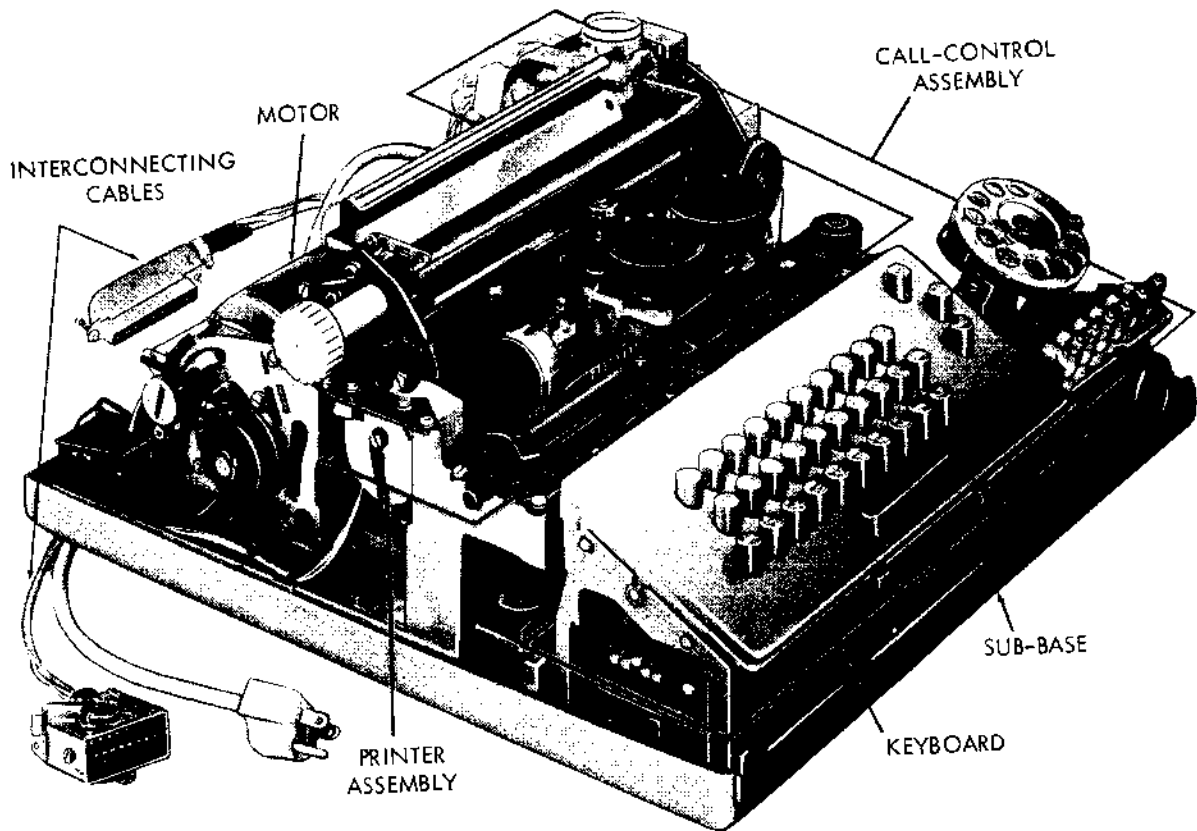


Figure 1-4. Page Printer Set (KSR Set) - Cover Removed

ball bearings. Cooling is provided by three fans - two within the end bells and one at the left end of the shaft. The motor is mounted by rubber vibration mounts which are clamped in a cradle formed by the printer assembly's base. A start capacitor, a current-operated start relay, and a run capacitor are mounted on the base to the left of the motor. A pinion on the right end of the shaft transfers the rotary motion generated by the motor to a set of drive parts which consist of a gear-pulley and motor belt.

b. The motor ordinarily used to provide motion for the Model 33 equipment is similar to the one described above except that it develops 33 milli-horse power, is equipped with sleeve bearings, and is not a capacitor-run motor.

1-6. KEYBOARD (Figures 1-7 and 1-8).

a. KSR and ASR KEYBOARD.

(1) In conjunction with a distributor mechanism on the printer assembly, the keyboard provides facilities for transmitting messages by the manual operation of a group of keys. It includes the following components:

(a) A space bar and keys similar to those on a typewriter.

(b) A code bar mechanism which converts the manual depression of the keys to mechanical positions corresponding to the proper code combinations.

(c) A contact mechanism in which the code bar mechanism sets up the code combinations for conversion to start-stop signals by the distributor.

(d) A frame and two side brackets which support the mechanisms and a cover which serves as a guide for the keys.

(e) A cable with connector which electrically interconnects the keyboard with the call control assembly.

(2) Model 32 (Figure 1-7) - The Model 32 Keyboard (Figure 1-5) has three rows of keys and generates a five-level code that utilizes the letters-figures shift feature. To transmit the characters appearing on the lower part of key-tops, the letters (LTRS) key must first be pressed. To transmit the characters on the up-

per part of keytops, the figures (FIGS) key must first be pressed. Auxiliary keys such as line break (BREAK), repeat (REPT), and answer-back actuation (HERE IS) are located at the upper right of the three-rows.

(3) Model 33 (Figure 1-8) - The Model 33 Keyboard is similar to the Model 32 in appearance, but more closely resembles a typewriter keyboard. It has four rows of keys and generates an eight-level code. The characters on the lower part of the keytops, including the numerals in the upper row, can be transmitted without the use of a shift operation. A SHIFT key is used to transmit the printing characters (such as &, %, and #) appearing on the upper part of the keytops. A control (CTRL) key is used to transmit the control functions (such as WRU, BELL, and TAB) appearing on the upper keytops. The SHIFT or CTRL key must be held down while the character key is depressed.

b. R/O KEYBOARD (Figure 1-2) - The R/O keyboard has the frame and side brackets mentioned in par. 1-6.a.(1)(d) above. However, its cover is blank and it has no facilities for transmission described in par. 1-6.a.(1).

c. FOUR-ROW FIVE-LEVEL KEYBOARD - This four-row keyboard accommodates basic five-level operation utilizing the conventional "Letters - Figures" shift characters. In this keyboard the numbers (1 through 0) have been taken from the third row and put in the fourth row, and in addition to this an added feature has been incorporated, this being the blocking of the fourth row when the keyboard is in the "Letters" condition and the blocking of the third row when the keyboard is in the "Figures" condition.

1-7. PRINTER ASSEMBLY (Figures 1-9 and 1-10).

a. The printer assembly receives start-stop signals from the call control assembly and uses them to control mechanical motions which print the messages, perform functions and, in the case of ASR Sets, perforate tape.

b. Its principal components include the following:

(1) A main shaft which receives motion from the drive parts and distributes it to the various mechanisms through three internal-expansion clutches.

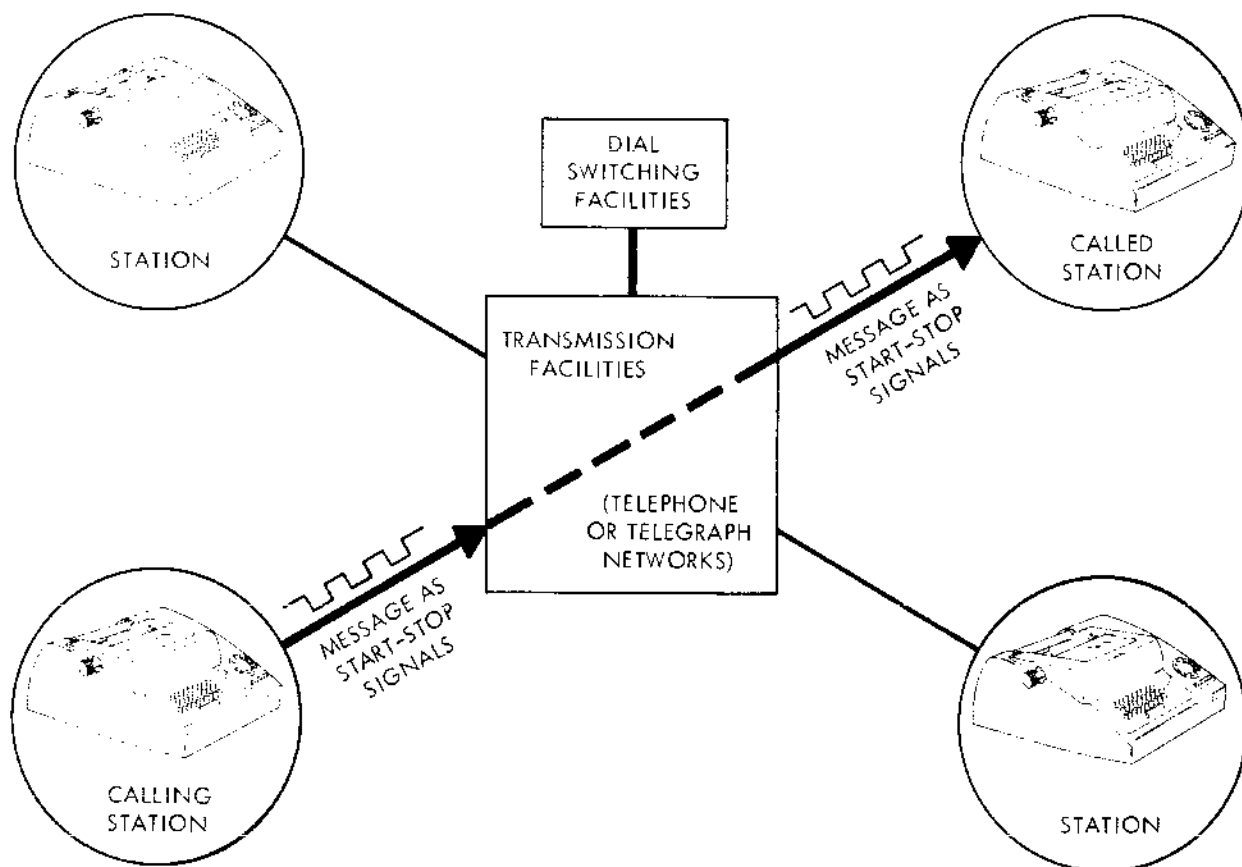


Figure 1-5. Typical Application

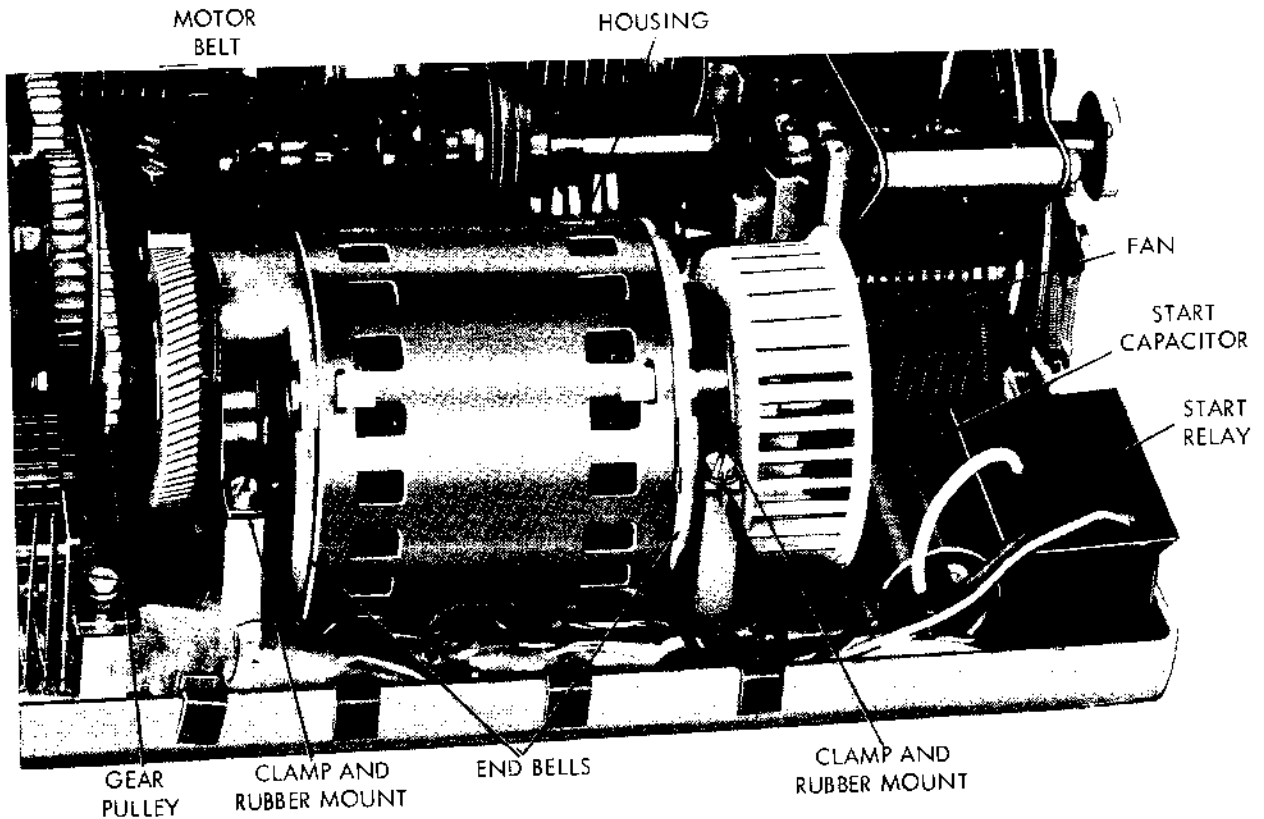


Figure 1-6. Motor and Drive Parts

(2) A selector mechanism which translates the start-stop signals to corresponding mechanical arrangements that control a code bar mechanism. A range finder permits the selector to be adjusted so as to sample the signals at the most favorable time.

(3) A code bar mechanism which controls printing, functions, and, in the case of ASR Sets, tape perforation.

(4) A printing carriage which prints the messages on the paper. The characters are embossed on the cylindrical surface of a type-wheel. The wheel is positioned rotationally and vertically to select the proper characters, and a hammer drives it and an inked ribbon against the paper to effect printing. A ribbon mechanism feeds the ribbon and reverses its direction when one of its spools are depleted.

(5) A function mechanism which enables the equipment to perform functions supplementary to printing. The standard functions are space, carriage return, line feed, blank, bell, and - for the Model 32 letters (lower case) and figures (upper case).

(6) A paper feed mechanism which positions the paper vertically so that the characters are properly located in lines. A platen feeds the paper. A knob permits manual feeding. The mechanism can be adjusted for single or double line feed.

(7) A spacing mechanism which positions the carriage so that the characters are properly located horizontally on the paper. It moves the carriage, which rides on rollers, by a spacing belt. It returns the carriage to the left margin by a carriage return spring. The carriage is pneumatically stopped without shock by a piston and dash-pot cylinder arrangement.

(8) A disk and brush type distributor mechanism which converts the positions of the keyboard contacts (see par. 1-6.a.(3)) to start-stop signals for application to the transmission facilities.

(9) A cast base which provides mounting facilities for the mechanisms.

(10) Two cables with connectors which provide interconnection with the call control assembly.

(11) An answer-back mechanism (optional accessory) which, in conjunction with the distributor, will automatically transmit a sequence of characters for station identification. It may be coded to transmit any sequence of up to 20 characters and may be actuated locally or remotely.

1-8. COVER AND SUB-BASE (Figure 1-2).

a. A plastic cover provides a decorative and protective enclosure of the printer assembly, keyboard and call control assembly. A lid, which is spring-detented in its open position, may be raised to gain access to the printer assembly for replenishing paper and ribbon. A window permits viewing the copy and provides a cutting edge for tearing the paper. Depressions at the rear of the cover hold the spindle for the paper roll. Mounting slots are provided for a copy holder. A name plate is mounted at the front.

b. The cover is mounted at its outer edges on a cast sub-base (see Figure 1-4) which serves as a foundation for the keyboard, printer assembly and call-control assembly. Rubber vibration isolators support the printer assembly.

1-9. STAND (Figure 1-2).

Available as an accessory is a sheet metal stand which will support the equipment at a convenient operating level. It consists of chrome feet and an enclosure which will house auxiliary apparatus such as a Data Set and the reader power pack. A removable rear panel provides access to the enclosure. The feet are equipped with leveling screws and may be bolted to the floor.

1-10. TAPE READER (Figure 1-3).

a. The tape reader, in conjunction with the distributor mechanism on the printer assembly, provides facilities for transmitting messages from perforated tape.

b. The complete reader package includes the following components:

(1) A tape sensing mechanism which converts code holes in the tape to corresponding positions in a set of contacts. The holes are sensed by pins which operate the contacts. The positions of the contacts are converted to start-stop signals by the distributor mechanism.

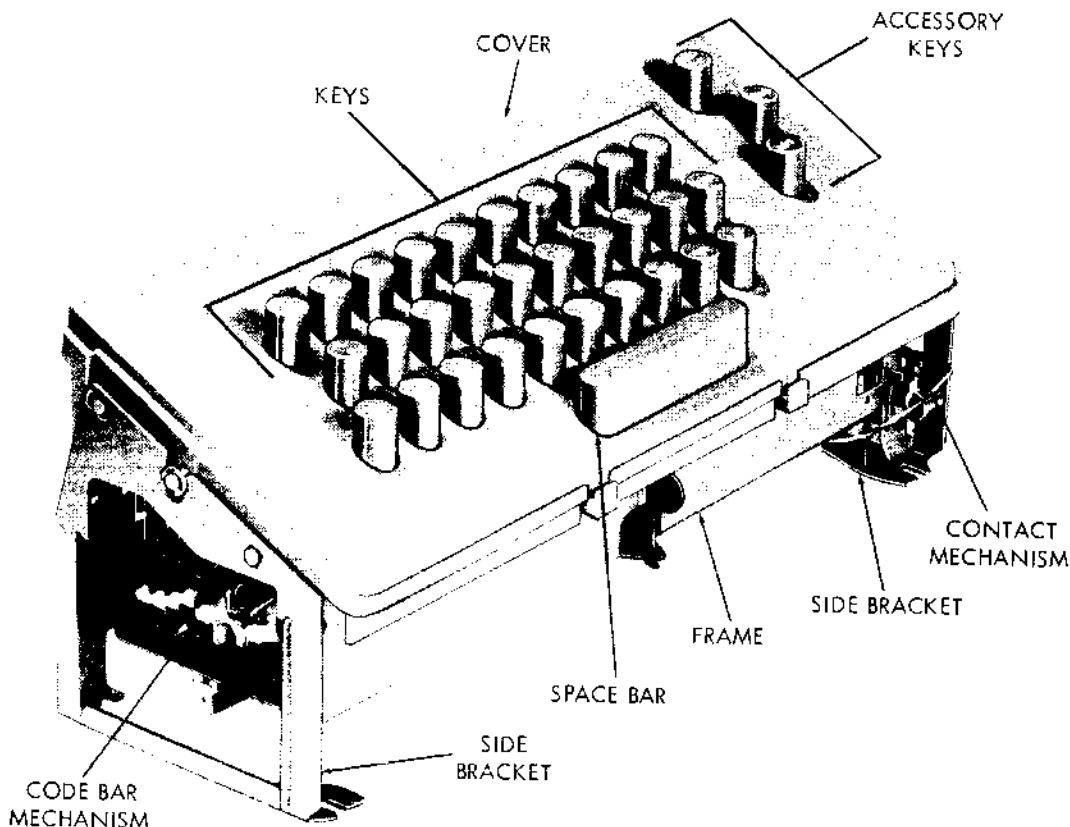


Figure 1-7. Model 32 Keyboard

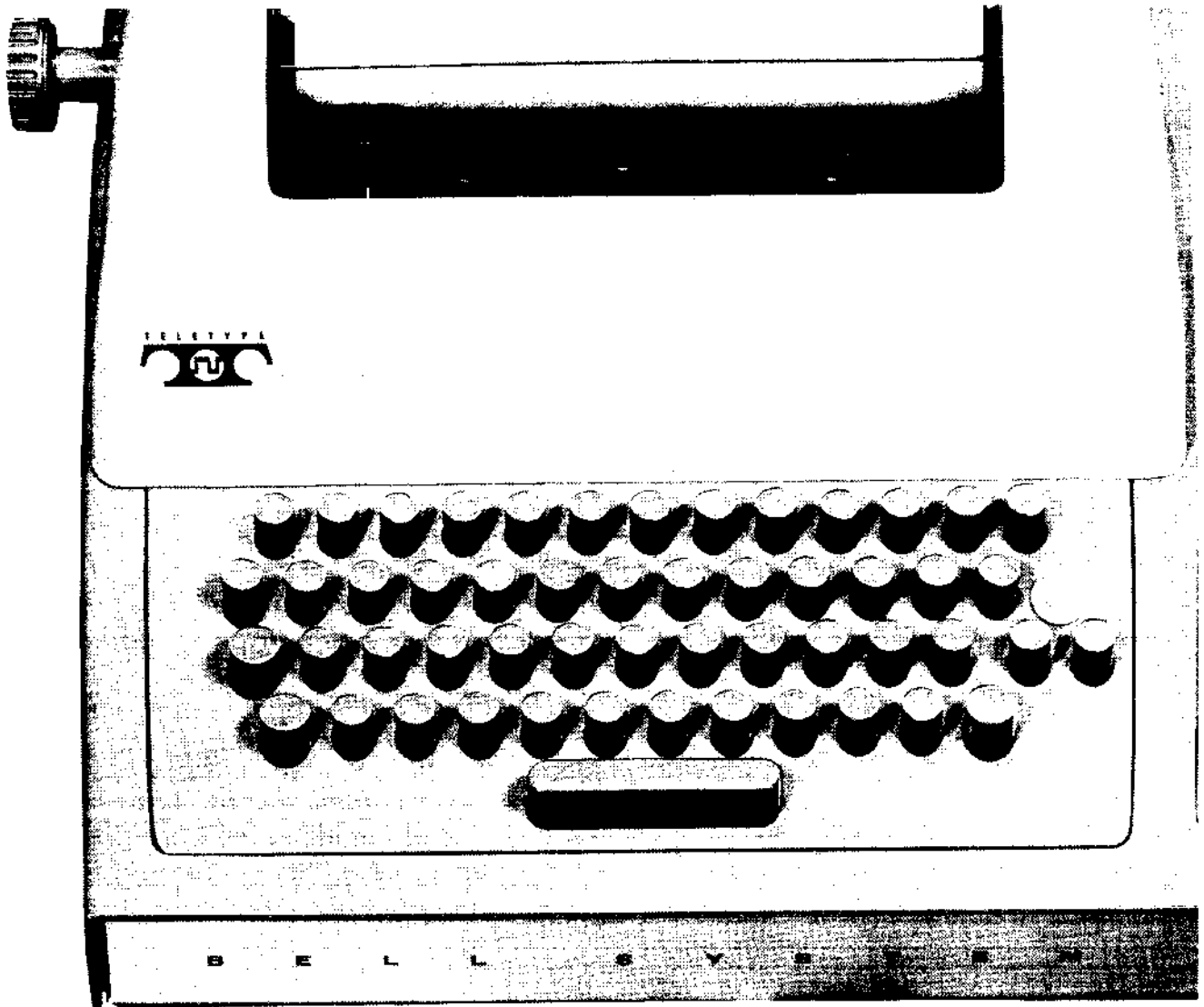


Figure 1-8. Model 33 Keyboard

(2) A feed mechanism which advances the tape after a combination of code holes has been read. A pawl and ratchet arrangement rotates a feed wheel whose pins engage feed holes in the tape. The tape feeds from rear to front and is held down on the sensing pins and feed wheel by a hinged tape lid which may be opened to facilitate tape threading.

(3) A feed magnet and armature arrangement which supplies motion for the sensing and feed mechanisms. It is pulsed by a contact on the distributor mechanism.

(4) A magnet-controlled trip mechanism which actuates the distributor mechanism. It is mounted above the distributor on the printer assembly.

(5) A power pack, mounted in the enclosure of the stand, which provides current rectification for the feed magnet. It is protected by a metallic housing.

(6) A cable which inter-connects the reader with the power pack, the magnet pulsing contact and the call control assembly.

(7) Tape-out and tight-tape mechanisms which will stop the reader when it runs out of tape or when the tape becomes taut.

(8) A free wheeling mechanism which disengages the feed wheel and tape out mechanisms and permits the tape to be moved freely through the reader.

(9) A frame which is mounted on the printer's sub-base and provides mounting facilities for the other mechanisms excluding the power pack and trip mechanism.

(10) A cast sub-base and plastic cover which provide a protective and decorative enclosure for the reader.

(11) The Auxiliary ASR Power Supply is mounted in the enclosure of the stand. It is used in the off line mode, to provide 115V on the Reader Keyboard, Answer-Back and Distributor Contacts only when a Reader is used. When the Reader is not used, a dummy plug with a jumper wire is inserted in position R2 at the rear of the Attendant's Set.

1-11. TAPE PUNCH (Figure 1-3).

a. The tape punch, in conjunction with the selector and code bar mechanisms on the printer assembly, provide facilities for perforating messages in paper tape. The messages are received as start-stop signals from the call-control assembly and are converted to mechanical motions that punch corresponding code holes in the tape.

b. The punch includes the following components:

(1) A drive mechanism and power bail which receive motion from the rocker shaft on the printer assembly and distributes it to the other mechanisms.

(2) A sensing mechanism which receives intelligence from the code bar mechanism on the printer assembly (see par. 1-7.b.(2) and (3)).

(3) A perforating mechanism, which, under the control of the sensing mechanism, perforates feed and code holes in the tape by means of pins in a punch block.

(4) A feed and guide mechanism that advances the tape by means of rollers and pawl and ratchet arrangement.

(5) A cast frame which is attached to the printer base and provides mounting facilities for the various mechanisms.

(6) A supply reel which accommodates a roll of blank tape.

(7) A cast sub-base and two-piece plastic cover which provides a protective and decorative enclosure for the punch.

(8) A metallic chad container which collects the paper (chad) punched out of the code holes.

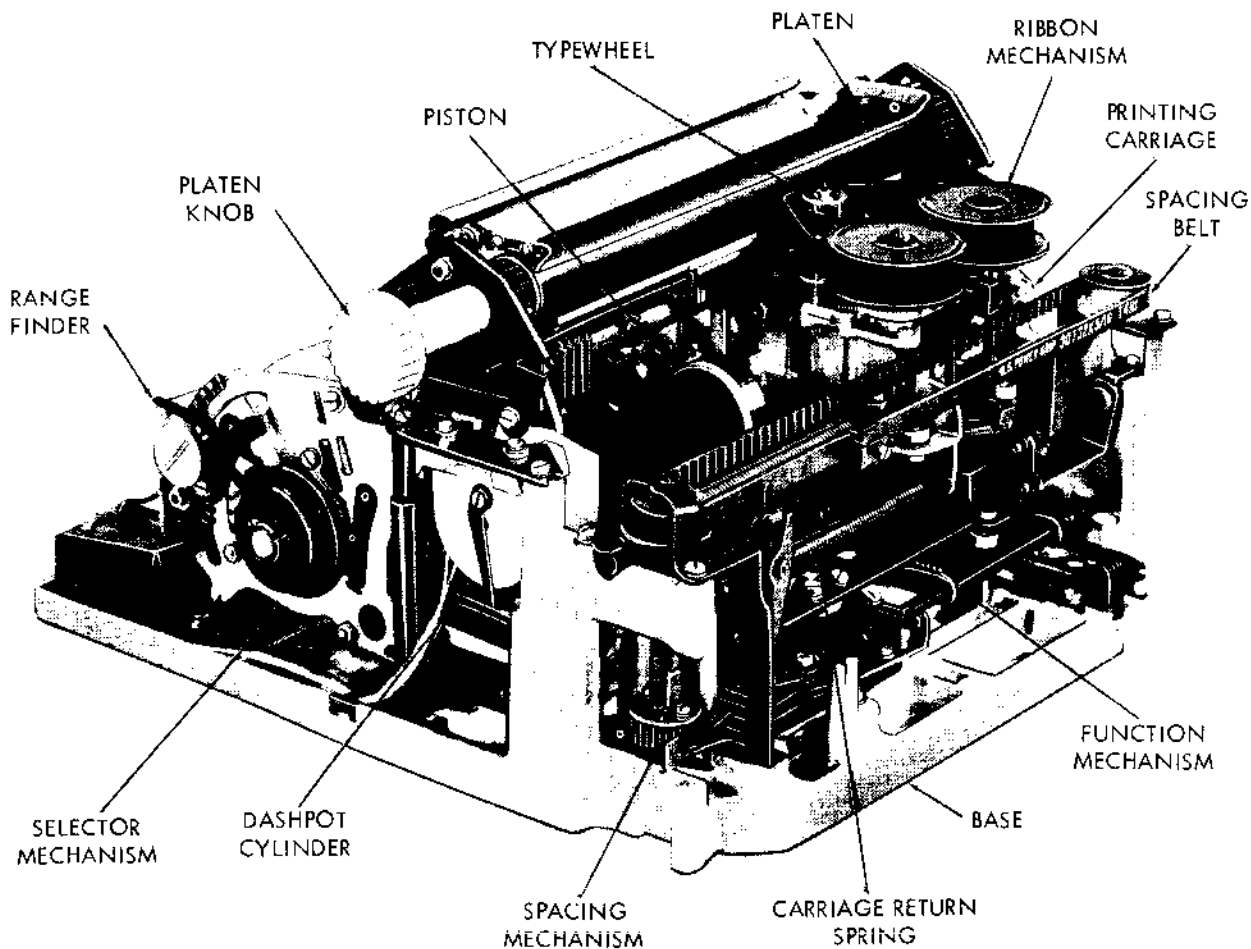


Figure 1-9. Printer Assembly

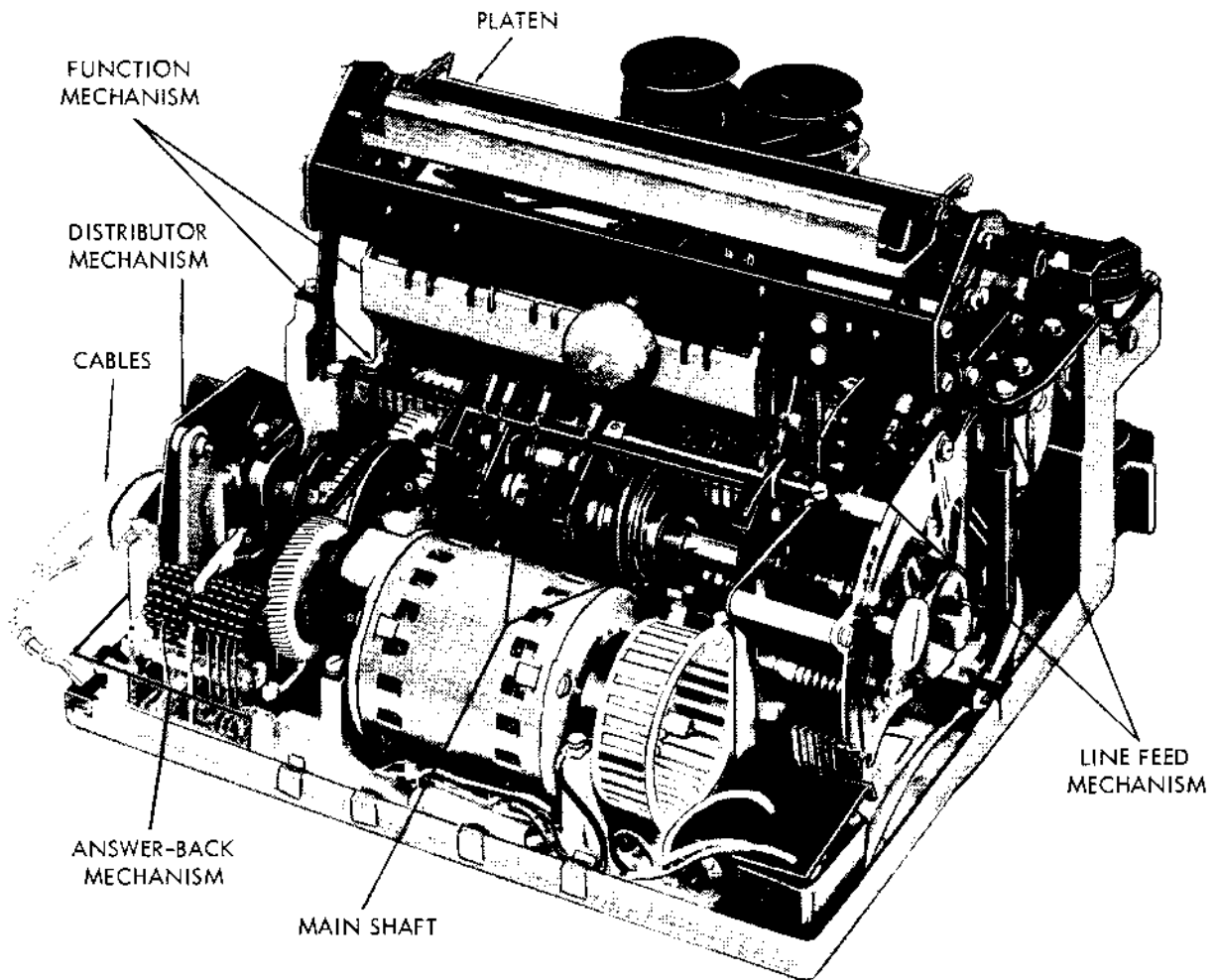


Figure 1-10. Printer Assembly - Rear View

c. The following four push-button contacts are provided:

- (1) ON - Turns punch on.
- (2) OFF - Turns punch off.
- (3) REL. (Release) - Releases feed and guide mechanism so that tape can be easily removed from punch.
- (4) B. SP. (Back Space) - Back spaces tape one combination of code holes.

1-12. CALL CONTROL ASSEMBLIES (Figures 1-12 and 1-13).

a. The call control assemblies couple the equipment to the transmission facilities and serve as an area of convergence for its circuitry. Two typical assemblies are shown in Figures 1-12 and 1-13.

b. A sheet metal plate secured to the sub-base provides mounting facilities.

c. Call control assemblies are available in variations that incorporate certain combinations of the following features:

(1) A selector magnet driver which couples the equipment to the transmission facilities and repeats the line signals in a form that will efficiently operate the selector mechanism on the printer assembly. It includes a transistorized circuit cord, a transformer, a rectifier and a capacitor filter.

(2) Rotary, touch-tone and/or card dialers for making connections with other stations through dial switching facilities (Figures 1-11, 1-12 and 1-13).

(3) A ringer or buzzer which provides an audible indication of incoming calls.

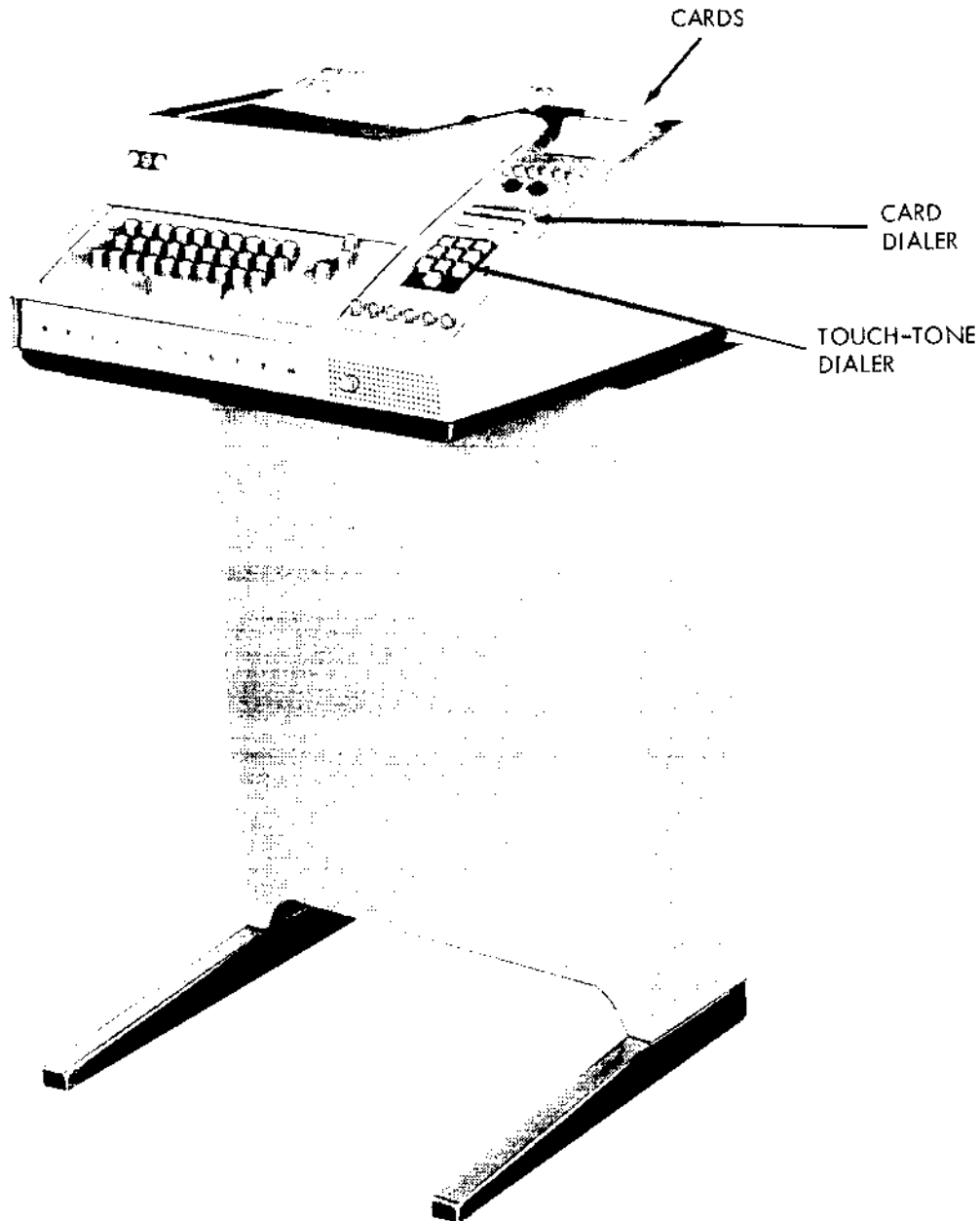


Figure 1-11. Page Printer (KSR Set) with Card and Touch Tone Dialers

(4) A small speaker with volume control for monitoring dial tone, ringing and busy signals on telephone networks. It is driven by a transistorized amplifier card.

(5) Push-buttons and lamps to aid in initiating, accepting, controlling and terminating calls.

(6) A Motor Control relay which will automatically turn the motor on and off.

(7) Fuses which protect the circuitry of the equipment.

(8) Automatic answering circuitry.

(9) Interconnecting facilities including receptacles, cables and a terminal board.

1-13. TECHNICAL DATA.

a. Speeds (words per . . . 60 wpm (364 opm),
minute and operations. 66 wpm (400 opm),
per minute). 100 wpm (600 opm)

b. Transmission Codes

Model 32 . 5-level start-stop signals with
7.5-unit transmission pattern

Model 33 .8-level start-stop signals with
11-unit transmission pattern

c. Dimensions and Weight (Approximate)

(1) KSR Set

Width 18-5/8 inches
Depth 18-1/2 inches
Height 8-3/8 inches
Weight 40 pounds

(2) R/O Set

Width, depth and height same as KSR
Set in par. 1-13.c.(1) above
Weight 39 lbs.

(3) ASR Set

Width 22 inches
Depth 18-1/2 inches
Height 8-3/8 inches
Weight 44 lbs.

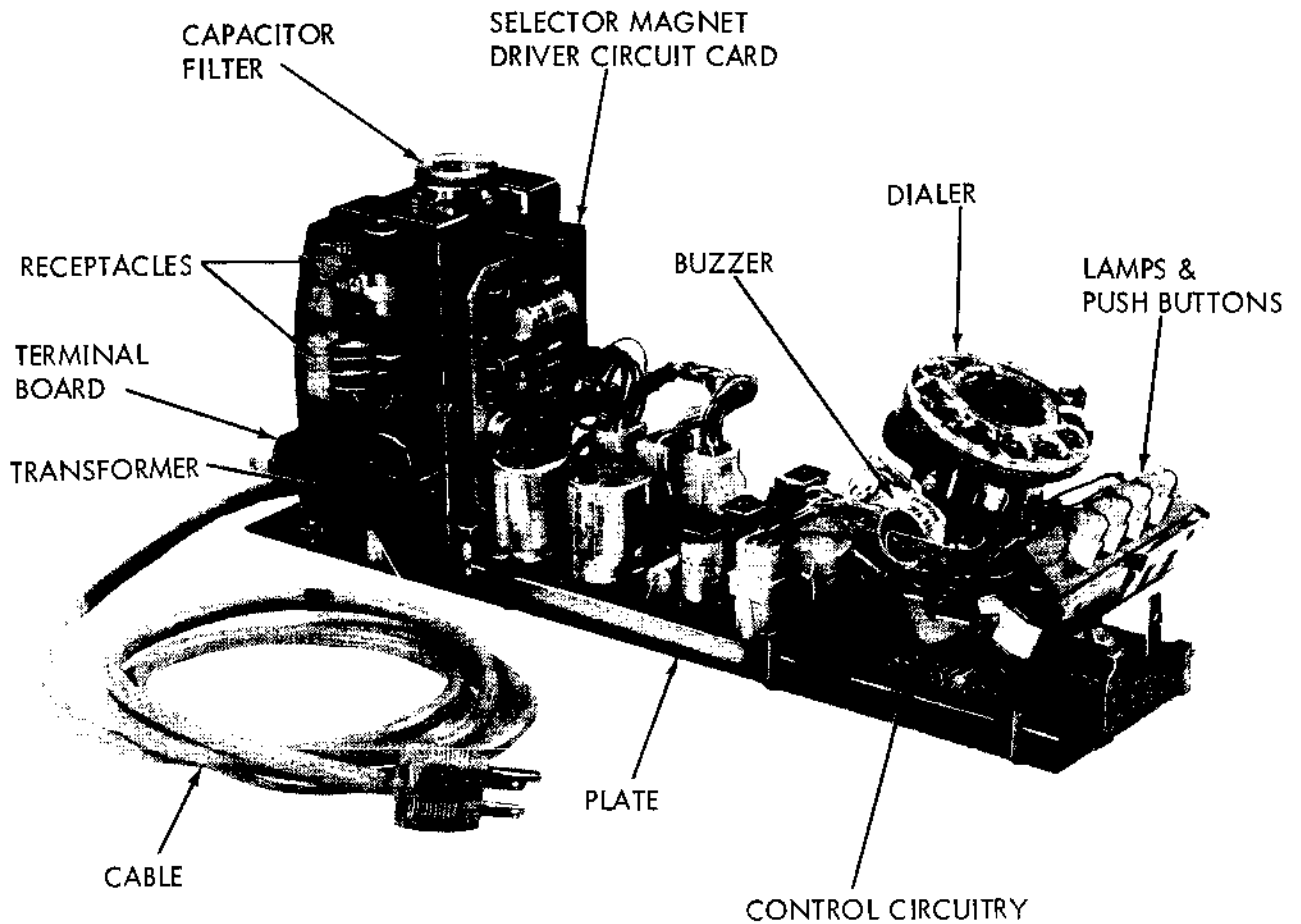


Figure 1-12. Typical Call Control Assembly

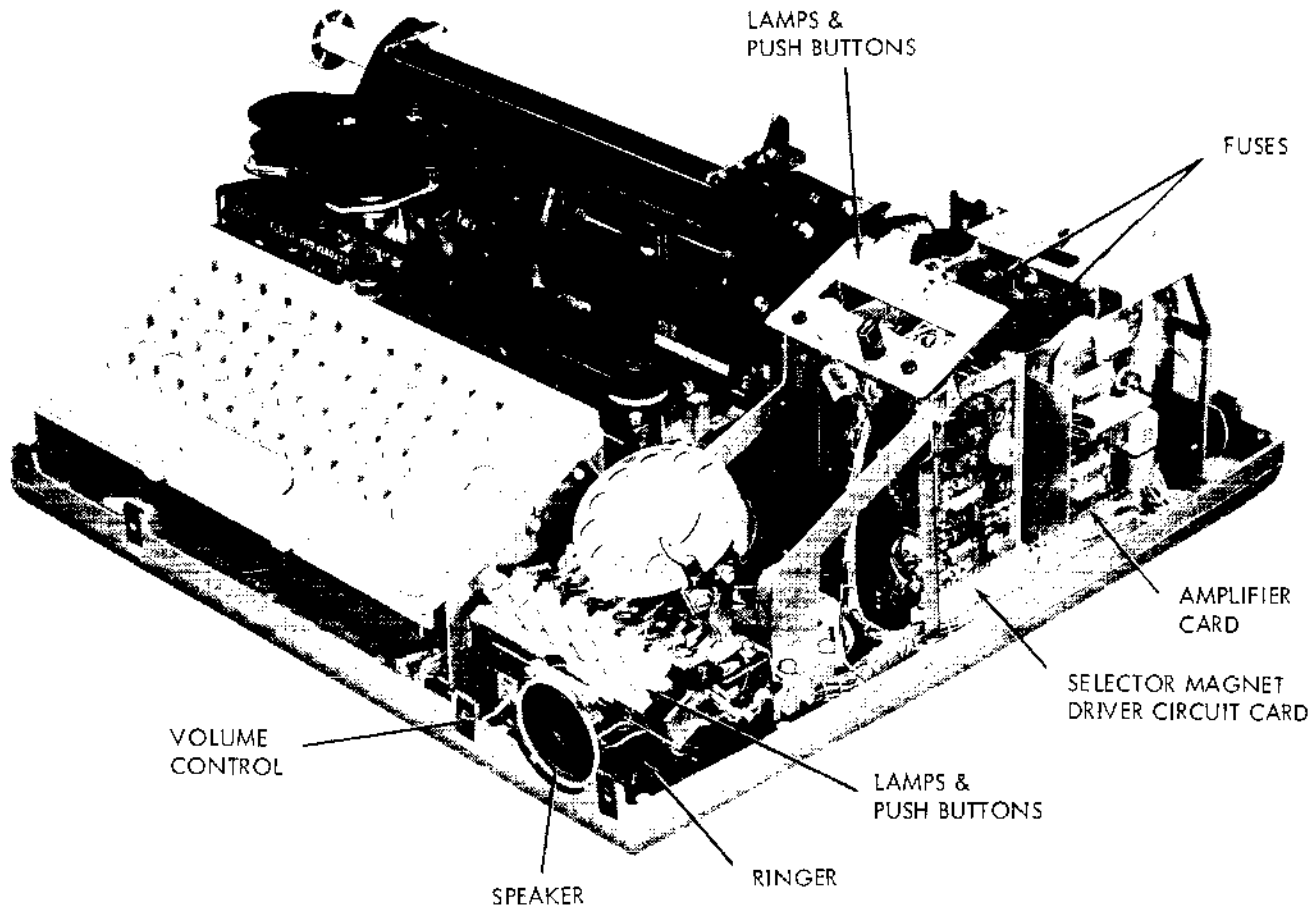


Figure 1-13. Typical Call Control Assembly

(4) Stand

Width 17-3/4 inches
 Height 24-1/2 inches
 Depth at Top of
 Enclosure 8 inches
 Depth of Bottom of
 Enclosure 6-1/2 inches
 Length of Feet 17-3/4 inches
 Weight 12 lbs.

d. Electrical

Power Requirements . . . 115 v.a.c. + 10%,
 60 cps ± 0.45 cycle,
 single phase
 Signal Line Current . . 0.020 or 0.060 amp
 Nominal Input to
 Selector 0.500 ampere at 20 v.d.c.
 Rating-Reader and Keyboard Contacts
 Long Telegraph Loops 0.015 to 0.070
 ampere at 48 to 240 v.d.c. inductive

Short Telegraph Loops . . . 0.058 to 0.072
ampere at 16 to
22 v.d.c. resistive

e. Printing and Paper Handling

Paper 8-1/2 inches wide; max.
5 inch diameter roll
Feed Friction; 6 lines per inch;
adjustable for single or
double line feed
Characters and Line. . . 10 characters per
inch; max. 74 character line
Legible Copies Original and 1 copy

f. Motor (181870 - Ordinarily used on Model 33)

Type Synchronous, capacitor start
Input 115 v.a.c. $\pm 10\%$, 60 cps
 ± 0.45 cycle, single phase
Input Current 2 amperes
Output 33 milli-horse power
Speed 3600 rpm
Temperature Rating 50° C continuous
Power Factor 0.40

g. Motor (181861 - Ordinarily used on Model 32)

Same as par. 1-11.f. above except as follows:

Type Synchronous, capacitor run
Input Current 1.25 amperes
Output 25 milli-horse power

h. Tape Reader

(1) Dimensions and Weights (Approximate)

(a) Feeding and Sensing Portion

Width 3-1/2 inches
Depth 4 inches
Height 3-1/2 inches
Weight 2 lbs.

(b) Power Pack

Width 6-1/4 inches
Depth 2-1/2 inches
Height 2-3/4 inches
Weight 1 lb.

(2) Power Pack

Input 115 v.a.c. (see "Power
Requirements" in par. 1-13.d.above)
Output Min. 145V @ 0.125 amp
Heat Dissipation with
Reader Operating 17 watts

CAUTION

High voltage persists 10 seconds after
power removed.

(3) Feed Magnet

Power Dissipation 2-1/2 watts
Nominal Attract Time . . . 8-11 milli-
seconds at 0.112 amp
Nominal Release Time. . . 7-10 milli-
seconds

i. Tape Punch

(1) Dimensions and Weight (Approximate)

Width 3-1/2 inches
Height 7-1/2 inches
Depth 13-1/4 inches
Weight 1-1/2 pounds

(2) Tape Specifications

Levels 5 or 8 levels
Width - (5-level). 11/16 inch
Width - (8-level) 1 inch
Code Combinations per inch 10
Feed Hole Diameter 0.0465 inch

SECTION 2

INSTALLATION

2-1. GENERAL.

This section provides instructions for unpacking, installing, connecting, and preparing the Printer for use. A 115 v.a.c. power source and signal-line battery and leads must be furnished by the customer. For detailed power and signal line requirements, see Section 1.

2.2 UNPACKING

a. The Printer is packed in one carton. Observe all caution and instruction labels on carton before breaking seals. Remove upper filler pads. Carefully take out Printer, using caution to avoid marring or otherwise damaging plastic cover. Remove remaining carton fillers and take out stand (if used).

b. Printer assembly and sub-base are mounted on a wooden shipping pallet by seven screws. Four of the screws are #14Z self-tapping screws that secure sub-base to pallet. Remaining three are standard machine screws that pass through aluminum bushings into tapped holes in printer assembly's base. Since printer assembly floats on rubber mounts, it is secured with separate screws. Tilt mounted set and take out screw in counter-sunk hole first. Loosen remaining six screws slightly. Return Printer to its upright position. Slide it to edge of the bench and remove six screws by hand. Printer can now be lifted from pallet. Discard seven mounting screws and three aluminum bushings.

CAUTION

Do not tilt the Printer after it has been removed from the pallet. Printer assembly floats on rubber isolators and may pull loose if assembly is tilted.

2-3. PREPARATION FOR INSTALLATION.

a. Remove tape across top of cover and take out cables, platen knob, and paper spindle from paper recess. Unwrap parts.

b. Remove panel cover on call control assembly by removing its mounting screw (Model 33 Printers only). Remove volume control knob by pulling frontward. Remove name plate by pulling frontward and downward (Figure 2-1). This will expose four cover mounting screws. Remove

these screws and three mounting screws from rear of cover. Remove platen knob. Lift cover from sub-base.

c. Remove twist-tie on left side that holds printing carriage and tissue paper below it that retains spacing pawls.

d. If stand is used, place it in an uncrowded area. Remove two mounting screws and take off rear panel. Remove copy holder (if used) from inside stand. Take hardware out of bag tied to stand.

e. Using screws supplied with Data Set (if used), fasten Set to relay rack.

2-4. MOUNTING PRINTER ON STAND (IF USED. (Figure 2-2.))

a. If Printer is to be bolted to floor, remove front screw in each leg of stand (Figure 2-5).

b. Printer is mounted on stand (Figure 2-2) by four #14Z screws with flat washers. (Some Printers may use two #14Z screws and two #10-32 hex head screws. Two #14Z screws are used in two rear mounting holes and two #10-32 screws with flat and lock washers in two front tapped bosses of the sub-base.)

c. Place Printer on top of the stand so that its back edge and sides line up with back edge and sides of the stand. Support Printer at all times until one or preferably both rear screws are inserted and tightened. Insert #14Z screws carefully to avoid dislodging speed nut located in sub-base casting. There are three pairs of holes in top of stand. The most rearward and most forward pairs are used. Secure mounting screws.

2-5. CODING ANSWER-BACK DRUM (IF USED).

a. Remove answer-back drum as follows: Disengage distributor clutch. Stand at rear of Printer and rotate answer-back drum in frontward direction, while pulling toward rear against tension of contact springs and detent lever, until drum shaft is just clear of right and left slots in contact block. Lift feed pawl and remove drum. (Do not over-extend the feed pawl spring.)

b. Code drum in counter-clockwise direction, as viewed from numbered end, beginning with the number 1 row. Drum provided is intended for either 5 or 8-level operation. For 5-level

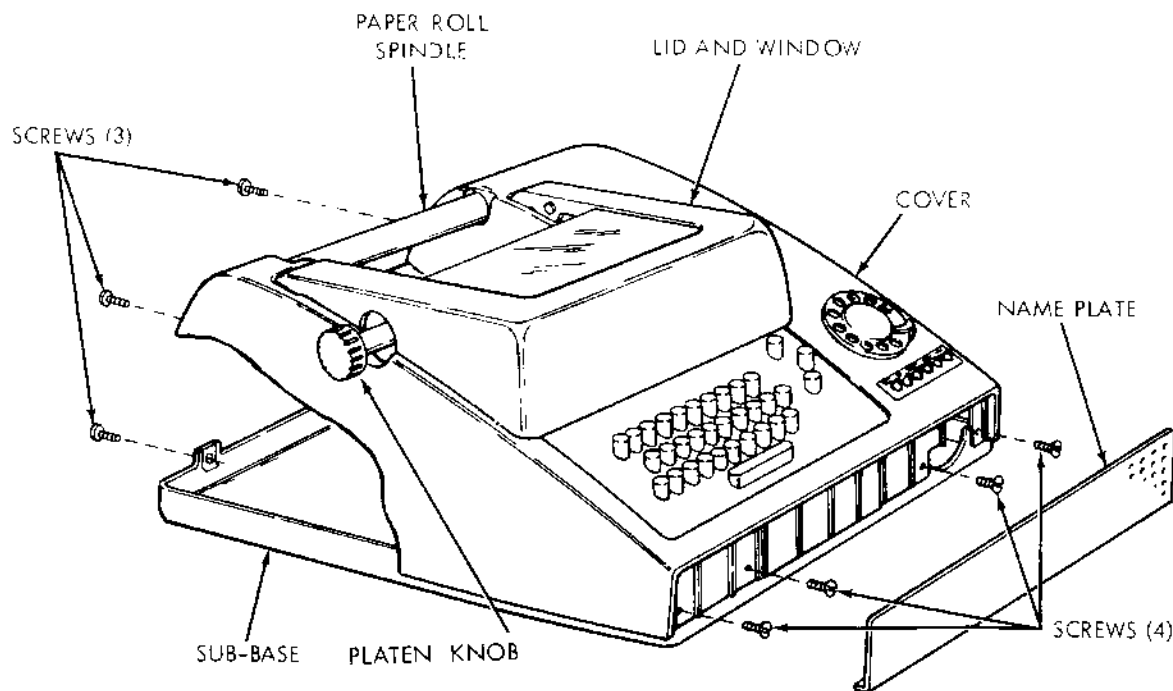


Figure 2-1. Cover Mounting

operation, tines for remaining 3 levels may be left intact since there are no sensing contact springs in these positions. A row is coded by breaking off designated tines. Refer to Figure 2-3 or 2-4 for tines to be removed for a particular character. To remove tine, grasp it firmly with long-nose pliers and break it off near its base, using care not to damage adjacent tines. In addition to this procedure, it should be noted that when removing the tine, the long-nose pliers should be held stationary while rotating the drum back and forth until the tine breaks. Unused character rows may be coded for LETTERS or BLANK or other desired characters, or first character suppression tine can be broken out preventing any character from being transmitted from this row.* If it is necessary to erase a character or if a coding error is made, first character suppression tine can be removed from that row so that nothing will be transmitted from it.*

c. Station identification messages cannot contain more than 20 characters including spaces. Coding message normally begins and ends with CARRIAGE RETURN and LINE FEED. This assures that message will appear at the beginning of a line on distant Printers and that over-printing of message will not occur. For 5-level Printers LETTERS code combination is also included at beginning of message to place all

*Do not remove suppression tine from last row on Model 33 Printers.

Printers on circuit in unshift position. Two levels (see Figure 2-3 or 2-4) must always be coded the same. These are "stop cam" and the "first character suppression level." One, two or three positions in stop cam and first character suppression levels must be broken out depending upon length of answer-back message and whether one, two, or three cycle operation is used. Use two or three cycle operation for short message lengths. Two cycle operation will permit 9 characters to be coded in each half of drum. Three cycle will allow 6 characters to be coded in each third of drum.

d. To replace coded answer-back drum, lift the feed pawl and rest drum shaft on top of right and left sides of contact block. Drop pawl onto drum, and rotate drum frontward while pulling it toward rear against contact springs and detent lever until shaft drops over rear of contact block on right and left sides. Lower drum until shaft seats into right and left slots. Rotate drum against its detent to assure proper seating of associated parts. Check that contact springs are located in their proper slots.

2-6. ADJUSTMENTS

a. Check Dashpot Orifice adjustment since altitude may have some effect on dashpot operation. Also check Distributor Trip Linkage and Here-Is Bell Adjusting Bracket adjustments. See Section 4 for adjusting procedures.

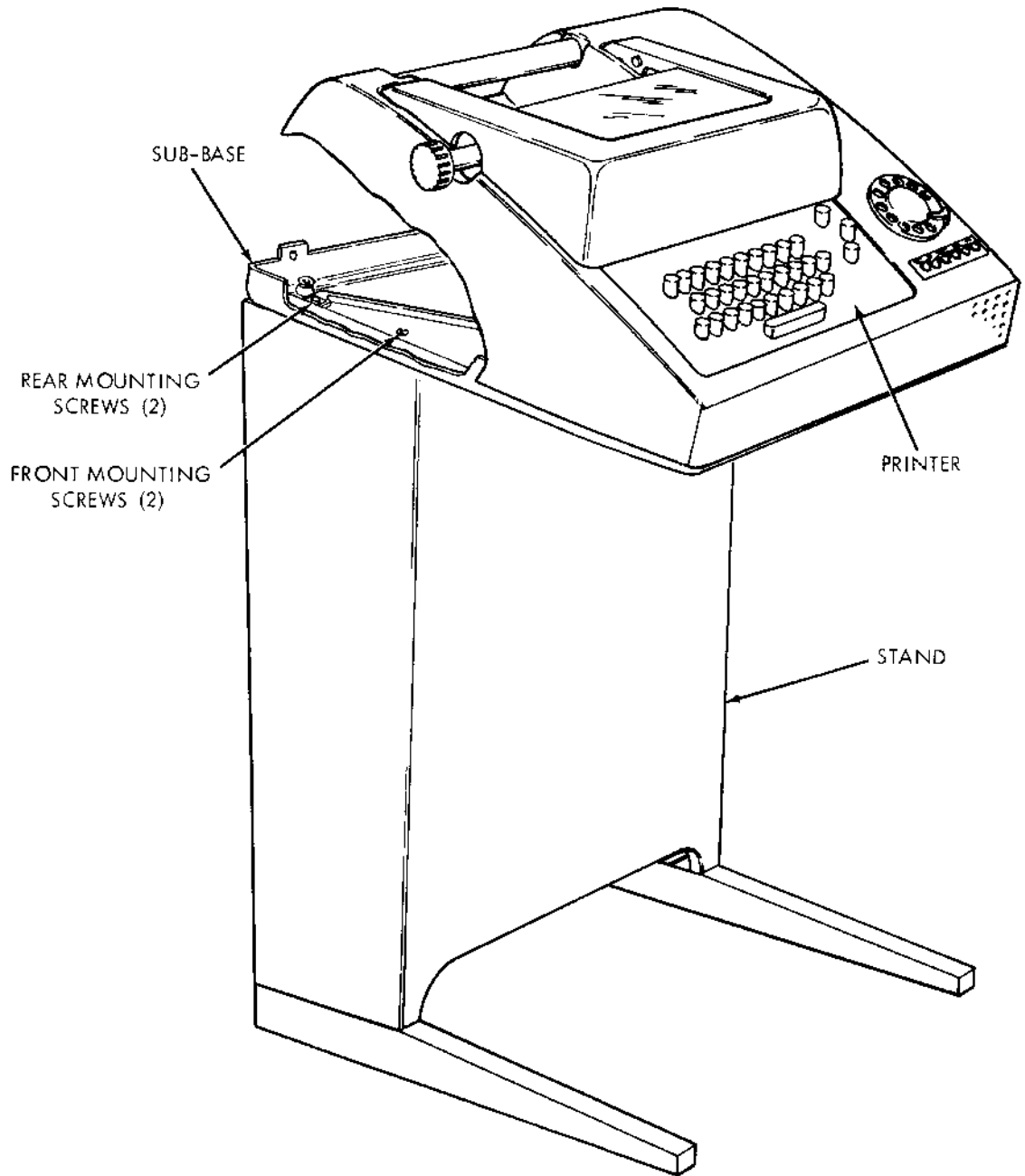
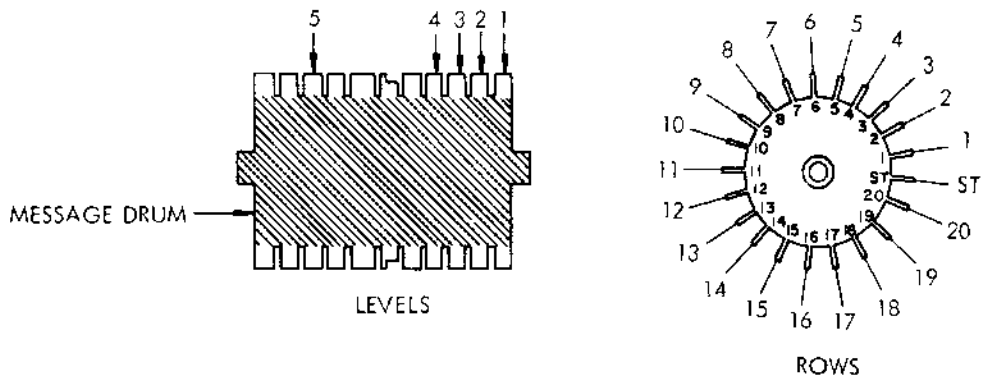


Figure 2-2. Assembly of Printer to Stand.



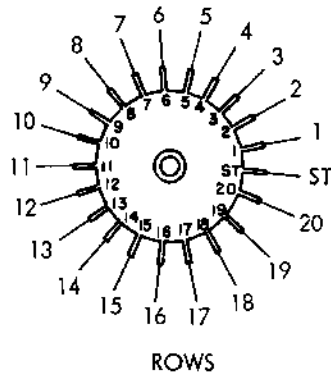
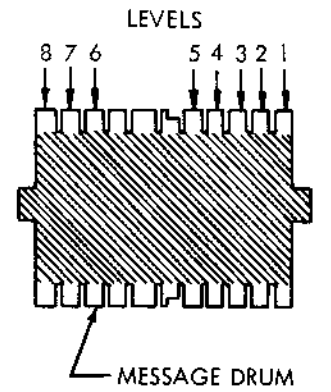
LETTERS TWX & TELEX	FIGURES TWX	FIGURES TELEX	CODE LEVELS					
			5	4	3	2	1	
A	-	-	■	■	■	■	■	■
B	5/8	?	■	■	■	■	■	■
C	WRU	:	■	■	■	■	■	■
D	\$	+	■	■	■	■	■	■
E	3	3	■	■	■	■	■	■
F	1/4	\$	■	■	■	■	■	■
G	&	&	■	■	■	■	■	■
H		#	■	■	■	■	■	■
I	8	8	■	■	■	■	■	■
J	,	BELL	■	■	■	■	■	■
K	1/2	(■	■	■	■	■	■
L	3/4)	■	■	■	■	■	■
M	.	.	■	■	■	■	■	■
N	7/8	,	■	■	■	■	■	■
O	9	9	■	■	■	■	■	■
P	0	0	■	■	■	■	■	■
Q	1	1	■	■	■	■	■	■
R	4	4	■	■	■	■	■	■
S	BELL	'	■	■	■	■	■	■
T	5	5	■	■	■	■	■	■
U	7	7	■	■	■	■	■	■
V	3/8	;	■	■	■	■	■	■
W	2	2	■	■	■	■	■	■
X	/	/	■	■	■	■	■	■
Y	6	6	■	■	■	■	■	■
Z	"	"	■	■	■	■	■	■
CARRIAGE RETURN			■	■	■	■	■	■
LINE FEED			■	■	■	■	■	■
LETTERS SHIFT			■	■	■	■	■	■
FIGURES SHIFT			■	■	■	■	■	■
SPACE			■	■	■	■	■	■
BLANK			■	■	■	■	■	■
1 CYCLE OPER. - ROW 6			■	■	■	■	■	■
1 CYCLE OPER. - ROW ST			■	■	■	■	■	■
2 CYCLE OPER. - ROWS 6 & 17			■	■	■	■	■	■
2 CYCLE OPER. - ROWS ST & 11			■	■	■	■	■	■
3 CYCLE OPER. - ROWS 6, 13, & 20			■	■	■	■	■	■
3 CYCLE OPER. - ROWS ST, 7, & 14			■	■	■	■	■	■

■ LEAVE TINE
 □ REMOVE TINE

CHAR. SUPPRESSION
 STOP CAM
 FEED RATCHET

Figure 2-3. Encoding of Answer-Back Drum - Model 32.

33	CODE LEVELS								33	CODE LEVELS							
	9	7	6	5	4	3	2	1		8	7	6	5	4	3	2	1
NULL	□	■	■	■	■	■	■	■	2	□	■	■	■	■	■	■	■
SOM	□	■	■	■	■	■	■	■	3	□	■	■	■	■	■	■	■
EOA	□	■	■	■	■	■	■	■	4	□	■	■	■	■	■	■	■
EOM	□	■	■	■	■	■	■	■	5	□	■	■	■	■	■	■	■
EOT	□	■	■	■	■	■	■	■	6	□	■	■	■	■	■	■	■
WRU	□	■	■	■	■	■	■	■	7	□	■	■	■	■	■	■	■
RU	□	■	■	■	■	■	■	■	8	□	■	■	■	■	■	■	■
BELL	□	■	■	■	■	■	■	■	9	□	■	■	■	■	■	■	■
FE ₀	□	■	■	■	■	■	■	■	:	□	■	■	■	■	■	■	■
HT	□	■	■	■	■	■	■	■	;	□	■	■	■	■	■	■	■
LF	□	■	■	■	■	■	■	■	<	□	■	■	■	■	■	■	■
VT	□	■	■	■	■	■	■	■	=	□	■	■	■	■	■	■	■
FF	□	■	■	■	■	■	■	■	>	□	■	■	■	■	■	■	■
CR	□	■	■	■	■	■	■	■	?	□	■	■	■	■	■	■	■
SO	□	■	■	■	■	■	■	■	@	□	■	■	■	■	■	■	■
SI	□	■	■	■	■	■	■	■	A	□	■	■	■	■	■	■	■
DC ₀	□	■	■	■	■	■	■	■	B	□	■	■	■	■	■	■	■
XON	□	■	■	■	■	■	■	■	C	□	■	■	■	■	■	■	■
RION	□	■	■	■	■	■	■	■	D	□	■	■	■	■	■	■	■
XOFF	□	■	■	■	■	■	■	■	E	□	■	■	■	■	■	■	■
RIOFF	□	■	■	■	■	■	■	■	F	□	■	■	■	■	■	■	■
ERROR	□	■	■	■	■	■	■	■	G	□	■	■	■	■	■	■	■
SYNCH	□	■	■	■	■	■	■	■	H	□	■	■	■	■	■	■	■
EOB	□	■	■	■	■	■	■	■	I	□	■	■	■	■	■	■	■
S ₀	□	■	■	■	■	■	■	■	J	□	■	■	■	■	■	■	■
S ₁	□	■	■	■	■	■	■	■	K	□	■	■	■	■	■	■	■
S ₂	□	■	■	■	■	■	■	■	L	□	■	■	■	■	■	■	■
S ₃	□	■	■	■	■	■	■	■	M	□	■	■	■	■	■	■	■
S ₄	□	■	■	■	■	■	■	■	N	□	■	■	■	■	■	■	■
S ₅	□	■	■	■	■	■	■	■	O	□	■	■	■	■	■	■	■
S ₆	□	■	■	■	■	■	■	■	P	□	■	■	■	■	■	■	■
S ₇	□	■	■	■	■	■	■	■	Q	□	■	■	■	■	■	■	■
SPACE	□	■	■	■	■	■	■	■	R	□	■	■	■	■	■	■	■
!	□	■	■	■	■	■	■	■	S	□	■	■	■	■	■	■	■
	□	■	■	■	■	■	■	■	T	□	■	■	■	■	■	■	■
#	□	■	■	■	■	■	■	■	U	□	■	■	■	■	■	■	■
\$	□	■	■	■	■	■	■	■	V	□	■	■	■	■	■	■	■
%	□	■	■	■	■	■	■	■	W	□	■	■	■	■	■	■	■
&	□	■	■	■	■	■	■	■	X	□	■	■	■	■	■	■	■
'	□	■	■	■	■	■	■	■	Y	□	■	■	■	■	■	■	■
(□	■	■	■	■	■	■	■	Z	□	■	■	■	■	■	■	■
)	□	■	■	■	■	■	■	■	[□	■	■	■	■	■	■	■
*	□	■	■	■	■	■	■	■	\	□	■	■	■	■	■	■	■
+	□	■	■	■	■	■	■	■]	□	■	■	■	■	■	■	■
,	□	■	■	■	■	■	■	■	^	□	■	■	■	■	■	■	■
-	□	■	■	■	■	■	■	■	_	□	■	■	■	■	■	■	■
.	□	■	■	■	■	■	■	■	←	□	■	■	■	■	■	■	■
/	□	■	■	■	■	■	■	■	ACK	□	■	■	■	■	■	■	■
0	□	■	■	■	■	■	■	■	ALT. MODE	□	■	■	■	■	■	■	■
1	□	■	■	■	■	■	■	■	ESC	□	■	■	■	■	■	■	■
	□	■	■	■	■	■	■	■	DELETE	□	■	■	■	■	■	■	■
									1 CYCLE OPER. ROW 6	■	■	■	■	■	■	■	■
									1 CYCLE OPER. ROW ST	■	■	■	■	■	■	■	■
									2 CYCLE OPER. ROWS 6 & 17	■	■	■	■	■	■	■	■
									2 CYCLE OPER. ROWS ST & 11	■	■	■	■	■	■	■	■
									3 CYCLE OPER. ROWS 6, 13, 20	■	■	■	■	■	■	■	■
									3 CYCLE OPER. ROWS ST, 7, 14	■	■	■	■	■	■	■	■



■ LEAVE TINE
□ REMOVE TINE



Figure 2-4. Encoding of Answer-Back Drum — Model 33

2-7. PLACEMENT (Figure 2-5).

a. **WITHOUT STAND.** If no stand is included in Set, place Printer on surface where it is to be used.

b. **WITH STAND.**

(1) Place partially assembled Set where it is to be used, and check for rocking. This may be corrected by adjusting leveling screws located under rear corners of stand (Figure 2-5). Tip the stand slightly for access.

(2) If Printer is to be bolted to floor, place stand at desired location and drive lag bolts into floor through front holes in legs.

(3) Place relay rack with Data Set inside stand.

2-8. ELECTRICAL CONNECTION.

CAUTION

Make sure power cord is not connected.

a. Refer to appropriate wiring diagrams packed with Printer.

b. Connect signal line leads (supplied by customer) to terminals 8 and 9 on terminal board at rear of call control assembly (Figure 2-6) for Model 32 Printers.

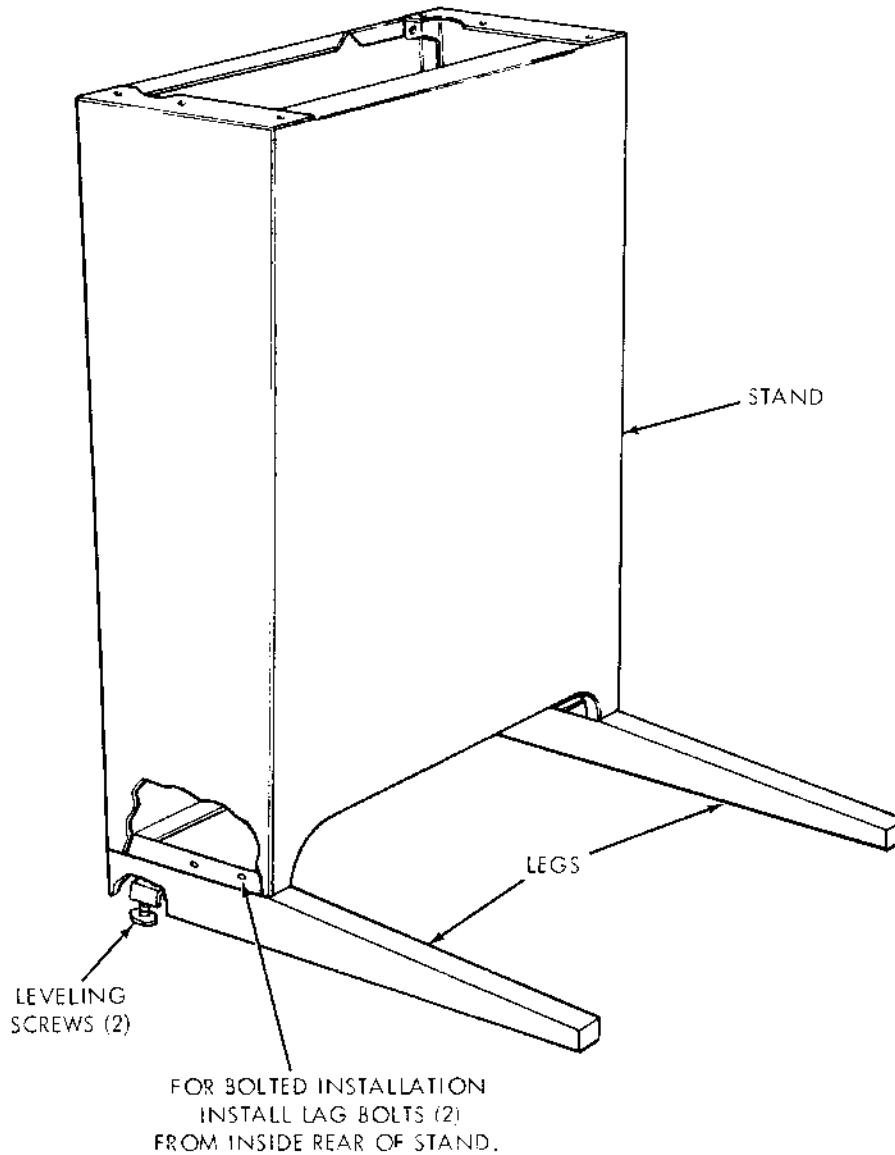


Figure 2-5. Stand Leveling and Anchoring.

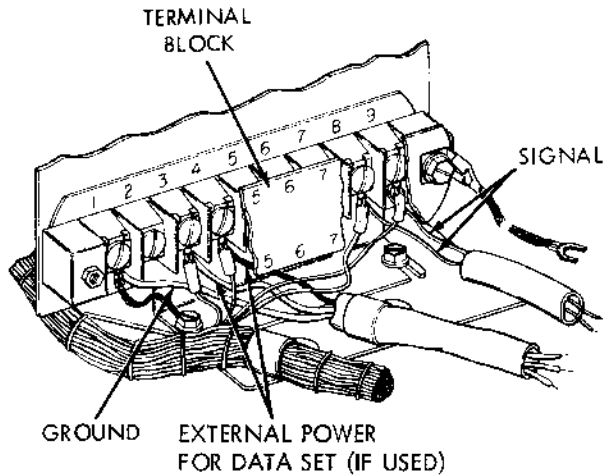


Figure 2-6. Terminal Board - Model 32 Printers

c. Where Data Set is used, connect connectors on cables from Data Set to those on cables from call control assembly. Connect telephone line to terminals 7 and 8 for the Model 33 Printers. Connect Data Set power leads to terminals 3 and 4 for Model 32 Printers; to terminals 1, 2 and 4 for Model 33. Maintain correct polarity.

d. Connect polarized powercord to 115 v. 60-cycle source.

2-9. FINAL ASSEMBLY.

a. Replace back panel on stand (if used) using removed screws.

b. Replace cover over Printer (Figure 2-1), taking care that all seams are tight and that keyboard push buttons, dial, etc., are properly aligned through holes provided. Insert and tighten three flat head screws at back and four hex head screws at front.

c. Replace nameplate making sure formed lip fits around bottom of flange on cover, that top edge is behind small lip on cover, and that bottom of plate rests on top of two small projections on sub-base.

d. With flat sides aligned, push platen knob on left end of platen.

2-10. COPY HOLDER (IF USED) (Figure 2-7).

a. Stand at rear of Printer. Hold copy holder so that line guide faces frontward. Locate four mounting slots in cover, two on either side of

paper roll mounting recess. Tilt copy holder toward rear and partially insert rear right and left tabs on holder into respective rear right and left slots. Pivot copy holder forward until front right and left tabs align with front right and left slots. Push downward on copy holder until tabs are fully seated.

2-11. RIBBON INSTALLATION (Figure 2-8).

a. Raise lid on cover. Pull both spools off friction spindles.

b. Engage hook that is on end of ribbon in hub of empty spool; or if there is no hook, pierce end of ribbon over point of arrow in hub of empty spool. Wind a few turns of ribbon onto empty spool in direction indicated by arrow and make sure that reversing eyelet has been wound up on spool.

c. Place spools on shafts in such a manner that ribbon feeds to rear from right side of right spool and from left side of left spool (Figure 2-8). Turn each spool slightly until driving pin on spool shaft engages hole in spool. Pull ribbon around right vertical post and through slot in reverse arm. Place it in right slot of ribbon guide, around rear of guide on both right and left side and through left slot of guide. Pull it forward on left side, through reverse arm slot and around left side of left vertical post. Rotate the spool to take up any slack.

2-12. PAPER INSTALLATION (Figure 2-9).

a. Printer accommodates a standard roll of paper 8-1/2 inches wide, 5 inches in diameter.

b. Insert spindle into roll so that an equal length of spindle is exposed at either end of roll of paper.

c. Place roll into paper recess of cover so that ends of spindle rest in slots provided and so that paper will unroll forward from bottom.

d. Raise lid on cover. Fold leading edge of paper back and crease it to present smooth edge when threading it. Paper should unroll from bottom of roll, pass forward and up over straightener bail and down and under platen (Figure 2-9). Release pressure roller tension by moving paper lever frontward, and push paper in as far as it will go. Re-apply pressure roller tension and advance paper by turning platen knob clockwise (as viewed from right) until the paper can be passed under paper guide. Release tension on pressure roller again and straighten paper. Re-apply pressure roller tension to hold paper in place. Close cover lid.

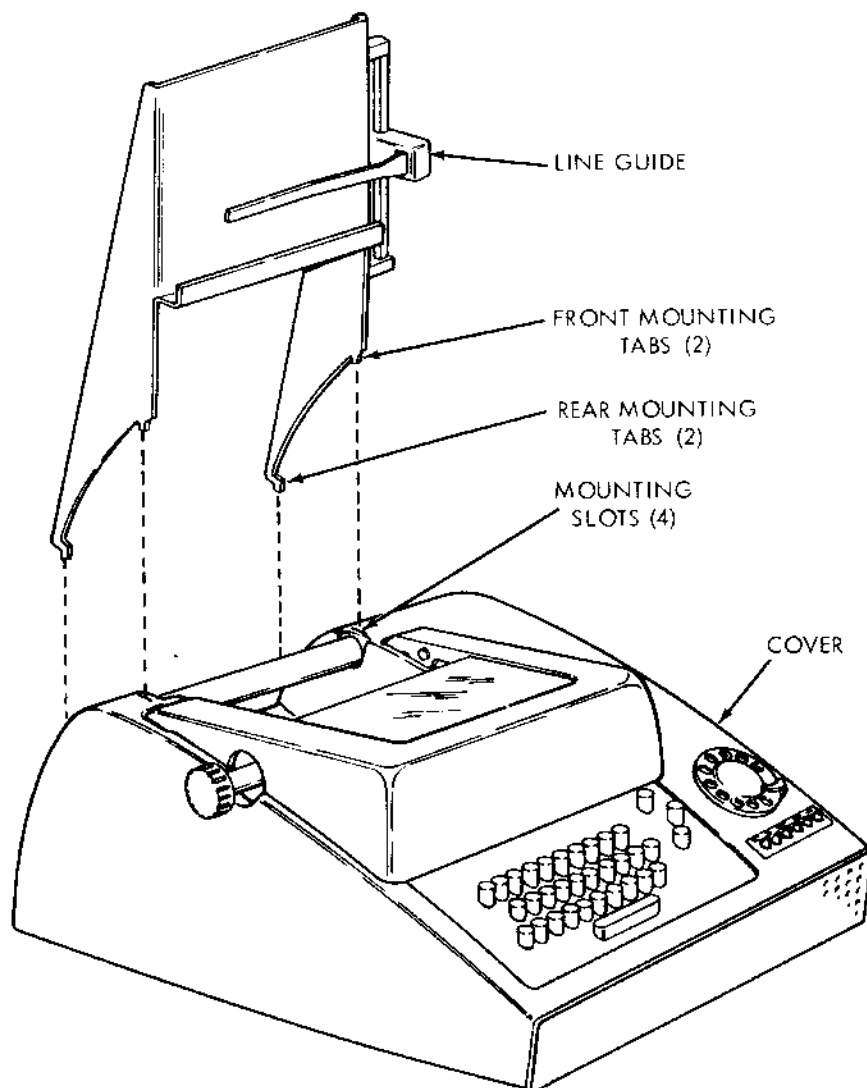


Figure 2-7. Copy Holder.

2-13. HUM SQUELCH (Optional)

When Printer is not in use, the J1D101A Data Set produces a hum through the loudspeaker. Also, the time clock synchronization signals can be heard. To squelch these modify wiring on J1D101A Data Set as follows:

a. Remove from terminal 50 on terminal board black-green lead going to 50-pin connector.

b. Add length of wire to removed lead and connect to common contact No. 7 of CON relay. Insulate splice with tape.

c. Add a lead connecting normally-closed contact No. 7 of CON relay to common contact No. 5 of OR relay.

d. Add lead connecting normally-open contact No. 5 of OR relay to terminal 50 on terminal board.

2-14. MODEL 33 OPTIONAL FEATURES.

a. **BUSY CIRCUIT** - The Model 33 Printer is normally wired in a "do not answer" mode of operation for low-paper alarms and out of service. In this mode, the Printer will not answer an incoming call. To wire the Printer to indicate busy instead of not answering, move the BK-S wire from terminal 2 to terminal 4 on ringer terminal strip.

b. **HAND RECEIVER** - To install hand receiver, connect two white wires to terminals 5 and 6 on nine-point terminal board.

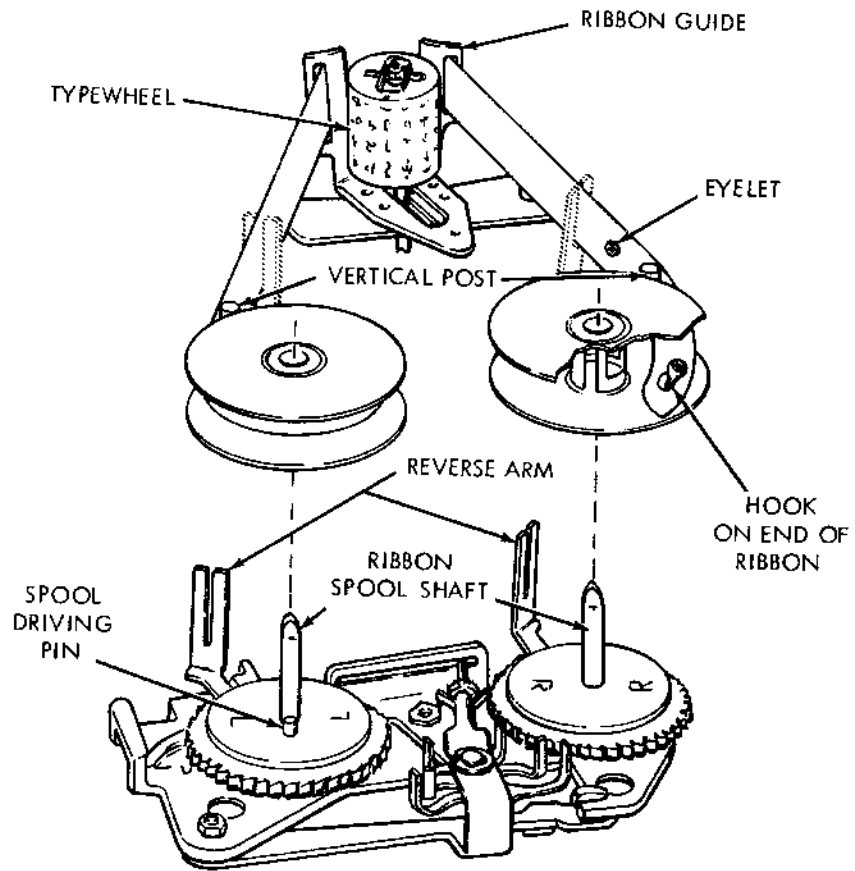


Figure 2-8. Ribbon Threading.

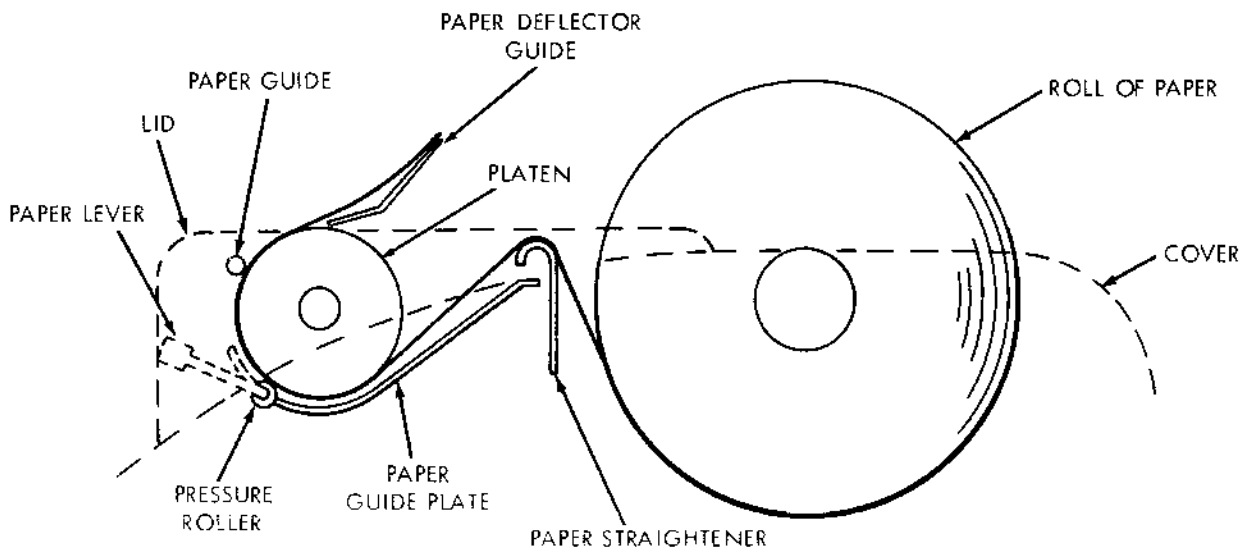


Figure 2-9. Paper Threading.

2-15. TAPE READER.

CAUTION

A Retaining Ring (Figure 2-10) is assembled to the upstop shoulder screw to

prevent the sensing pins from being dislodged during shipment. This retaining ring must be removed before placing the Tape Reader in operation. Check packing instructions.

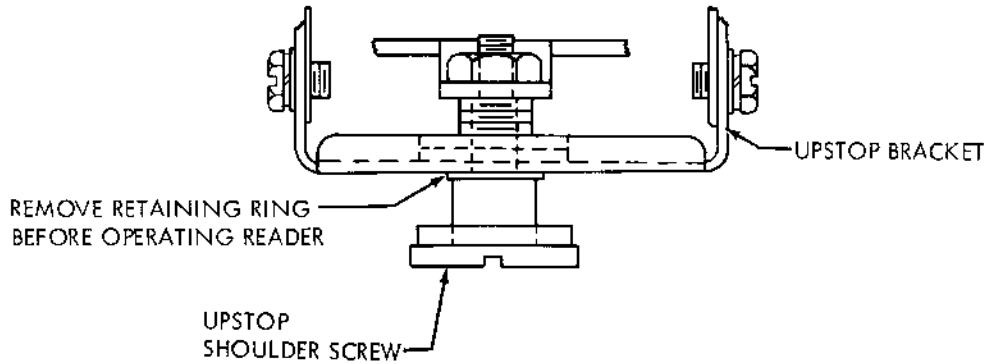


Figure 2-10. Tape Reader Upstop Bracket Retaining Ring

2-16. POWER PACK ASSEMBLY.

a. The Power Pack Assembly (Figure 2-11) is snapped on (with two clips assembled to the power pack), to the front panel of the printer stand. Position power pack so it shall be spaced approximately 1/2 inch from the right panel of the printer stand.

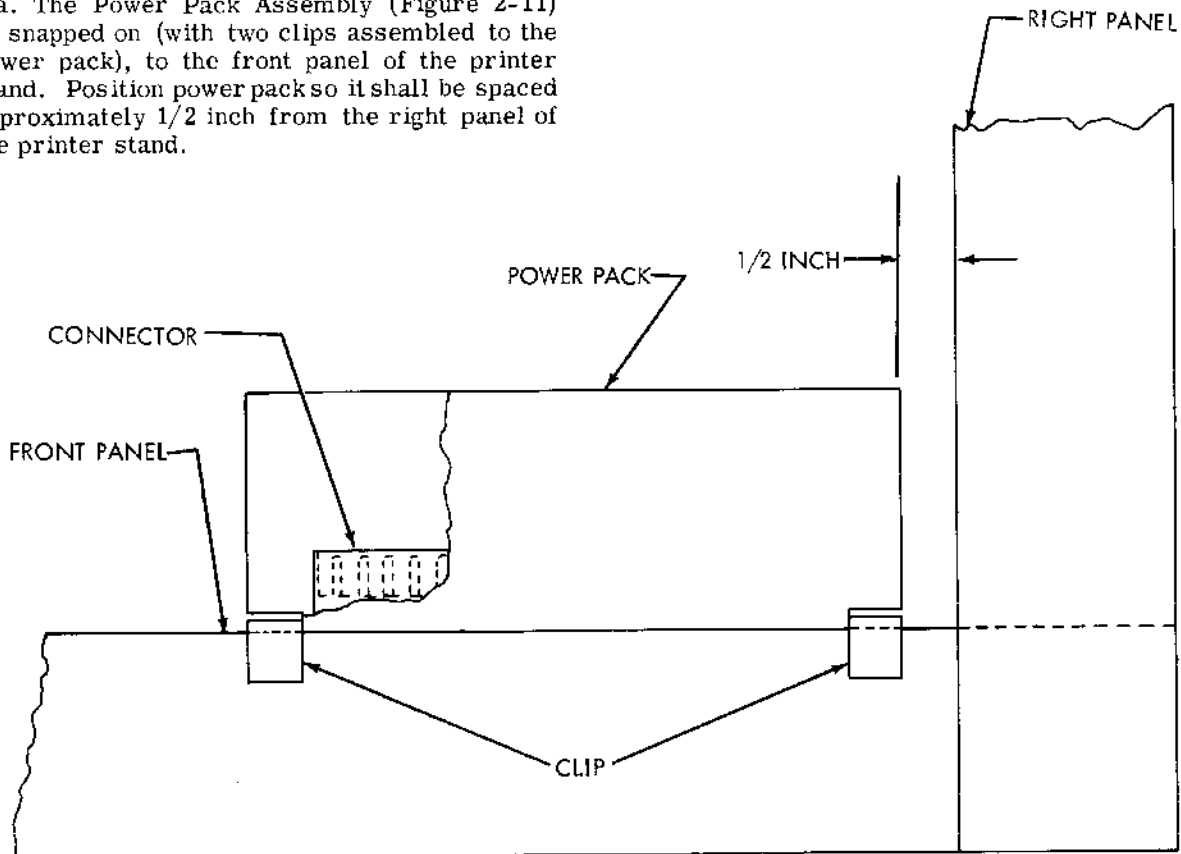


Figure 2-11. Power Pack Assembly

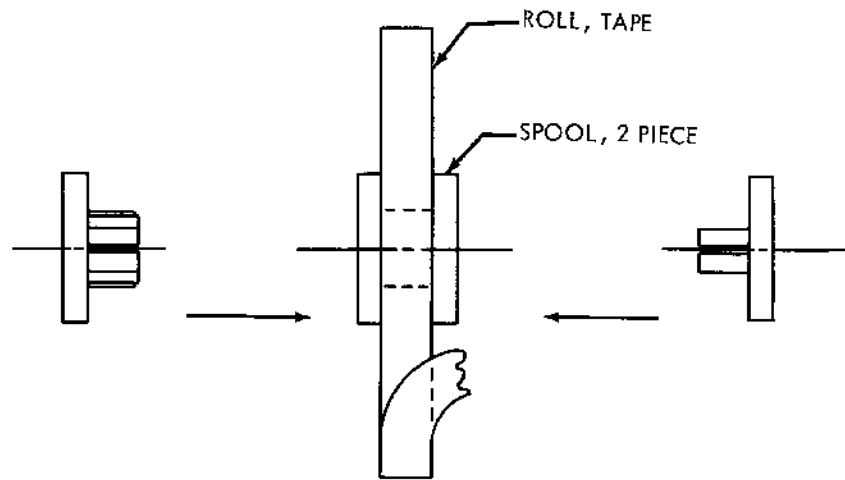
b. The Auxiliary ASR Power Supply is mounted in the enclosure of the stand. It is used in the off line mode, to provide 115V on the Reader Keyboard, Answer-Back and Distributor Contacts only when a Reader is used. When the Reader is not used, a dummy plug with a jumper wire is inserted in position R2 at the rear of the Attendant's Set.

2-17. TAPE PUNCH.

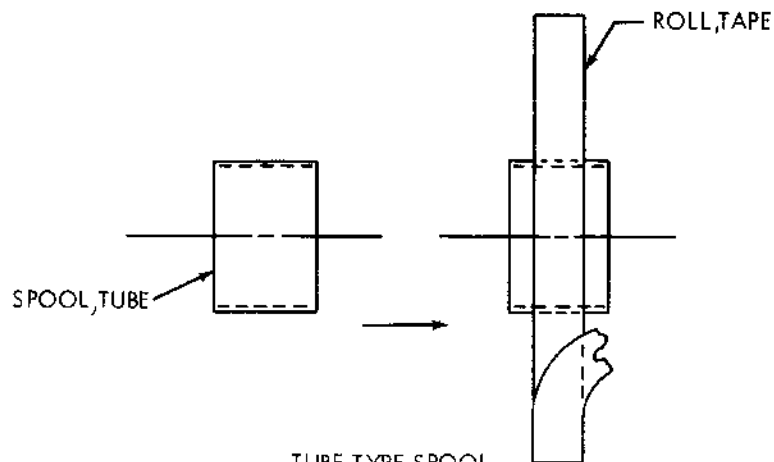
This section provides installation instructions for the Tape Punch. The tape punch, set of drive parts, base and plastic cover assembly are as-

sembled to the Model 32 or Model 33 Printer. However, before the Automatic Send and Receive Set is shipped a yellow packing clip is assembled under the sensing levers and behind the "O" code bar extension between the tape punch base and the left code bar extension guide. The tape punch must be in the "OFF" position. During the installation, remove the printer and tape punch cover assembly and remove yellow clip. It is very important that the clip is removed prior to operating the tape punch. Check packing instructions.

a. Installation of Tape Roll and Tape Spool Assembly (Figure 2-12).



2 PIECE SPOOL
FOR ONE INCH INSIDE DIAMETER TAPE ROLLS



TUBE TYPE SPOOL
FOR TWO INCH INSIDE DIAMETER TAPE ROLLS

Figure 2-12. Tape Roll and Tape Spool Assembly

(1) For the two inch inside diameter tape roll use the tube type spool.

(2) For the one inch inside diameter tape roll use the two piece spool.

(3) Assemble the tape with the spool into the cover so that the leading edge of the tape is always at the top of roll.

b. Installation of Chad Box Assembly (Figure 2-13).

(1) Assemble the Chad Box by inserting the back of the flanged surface between the tape punch base and the printer base.

(2) Push the box towards the rear until a bent surface located at the front of the box engages the printer stand. An embossing located on the front bottom surface of the flanged surface engages an oblong hole in the printer stand and holds the box in place.

(3) To empty the chad box, lift the front slightly and pull the box towards the front until it becomes disengaged.

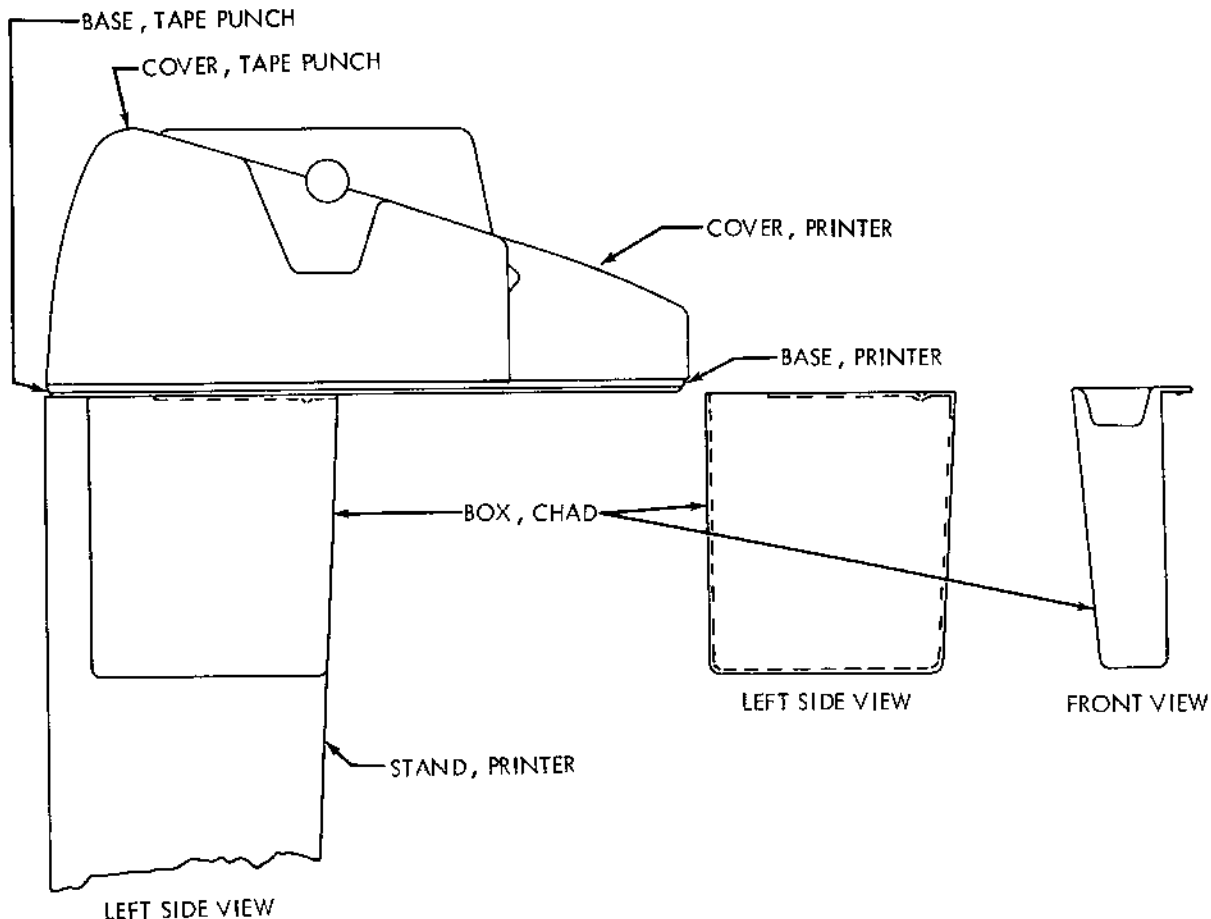


Figure 2-13. Tape Punch Chad Box Assembly

SECTION 3

OPERATING INSTRUCTIONS

3-1. GENERAL.

a. The Model 32 and 33 Printers provide facilities for exchanging printed messages between stations connected by appropriate transmission facilities. After taking certain preliminary steps such as signaling the distant station, etc., an operator types the message on the keyboard of his Printer. The Printer at the distant station prints the message on page-width copy paper. A local copy is made by the Printer at the sending station for record and monitoring

purposes. Certain sets have call-control items such as pushbuttons, indicator lamps, dials, etc. (Figure 3-1). The Printers are described and illustrated in Section 2.

b. Par. 3-2 below lists and describes the items, common to most Printers, that are pertinent to the operation. Par. 3-2 and 3-3 provide instructions for replenishing paper and replacing the ribbon, respectively. Par. 3-4 and up contain detailed instructions for operating specific Printers.

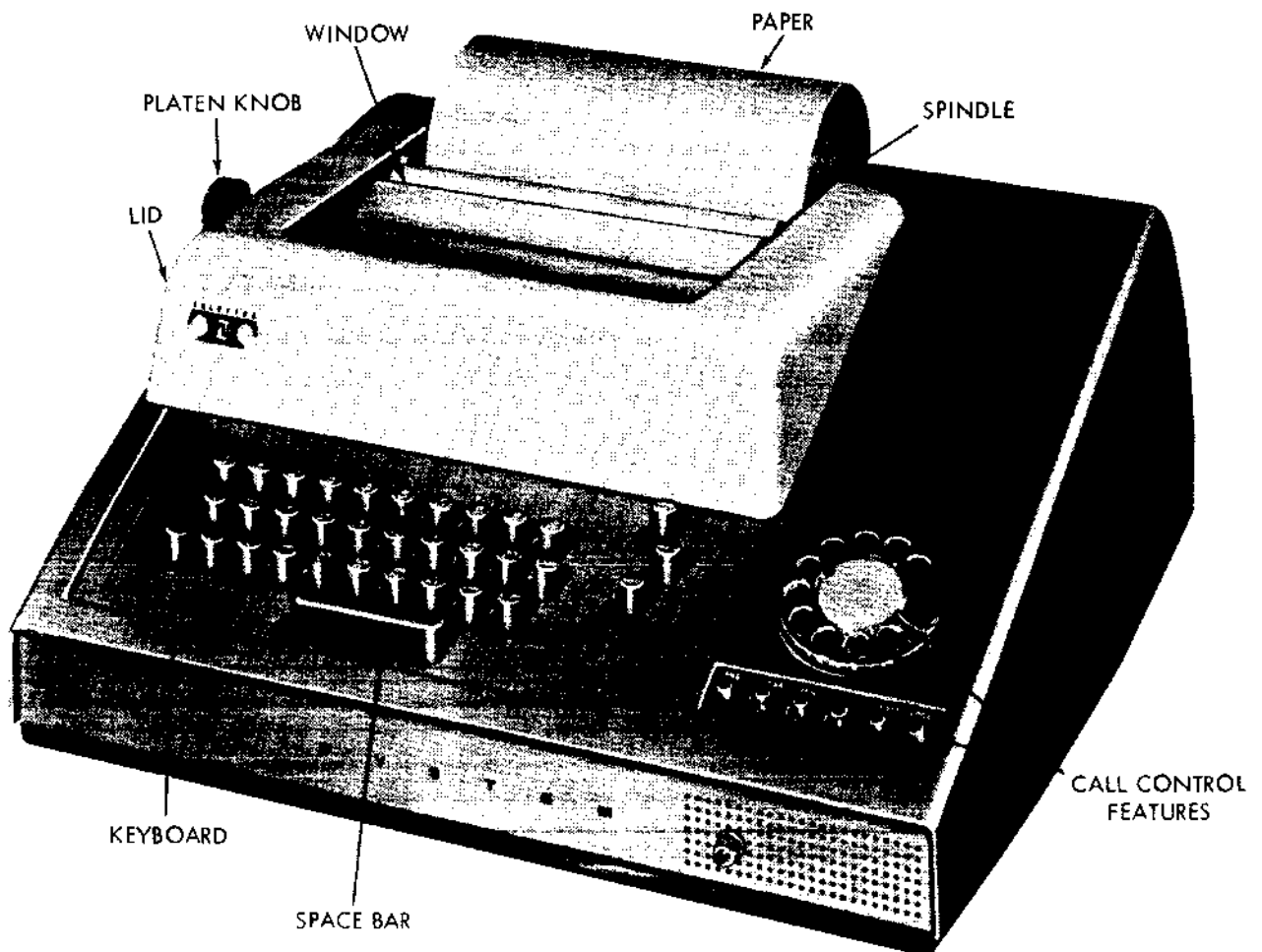


Figure 3-1. Model 32 Printer .

3-2. ITEMS PERTINENT TO OPERATION (Figure 3-1).

- Paper Roll Provides paper on which messages are printed. Supported by a spindle that rests in two depressions in cover. Is fed by a platen.
- Platen Knob Permits platen to be turned by hand to advance paper. Used to replenish paper supply.
- Window Permits viewing the printed messages. Has cutting edge for tearing off copy.
- Lid Provides access for replenishing ribbon and paper. Detented in open position.
- Keyboard Used to transmit messages.
- Space Bar (Figure 3-2) Spaces printing carriage without printing.
- Line Feed (LF) Key (Figure 3-2) Raises paper so that successive lines can be printed.
- Carriage Return (CR) Key (Figure 3-2) Returns printing carriage to left margin so that new line can be started.
- Repeat (REPT) Key (Figure 3-2) Provides repeated transmission of any character when held down with another key.
- HERE IS Key (Figure 3-2) On Printers with answer-back feature, provides automatic transmission of predetermined sequence of characters to identify the station.
- BREAK Key (Figure 3-2) Used to interrupt transmission from distant station.
- Letters (LTRS) Key (Model 32 Conditions all Printers on circuit to print only - Figure 3-2) characters on lower keytops (lower case).
- Figures (FIGS) Key (Model 32 Conditions all Printers on circuit to print only - Figure 3-2) characters on upper keytops (upper case).
- End-Of-Line Bell Rings to indicate that printing line is approaching right margin and that CR and LF keys should be pressed.

3-3. REPLENISHING PAPER (Figure 2-9, Sec. 2).

a. Check the supply of paper at regular intervals. Replacement will depend on how frequently the Set is used. The Printer will accept a standard roll of paper, 8-1/2 inches wide and 5 inches in diameter.

b. To remove the expended roll of paper, tear it off at the window and lift it out of the recess in the cover. Pull the spindle out of the old roll of paper and insert it into the new roll so that an equal length of spindle is exposed at either end of the roll of paper.

c. Place the new roll into the paper recess of the cover so that the ends of the spindle rest in the slots provided and so that the paper will unroll forward from the bottom. Rotate the platen manually to extract the piece of torn off paper.

d. Raise the lid on the cover. Fold the leading edge of the paper back and crease it to present a smooth edge when threading it. The paper should unroll from the bottom of the roll, pass forward and up over the straightener bail, down and under the platen (see Figure 2-9, Sec. 2). Release the pressure roller tension, and push the paper in as far as it will go. Reapply the pressure roller tension and advance

the paper by turning the platen knob in a clockwise direction (backwards) until the paper can be passed under the paper holder bar. Release tension on pressure roller again and straighten the paper. Re-apply the pressure roller tension to hold the paper in place. Close the cover lid. Check to see that the paper feeds properly in operation.

3-4. REPLACING RIBBON (Figure 2-8, Sec. 2).

a. Replace the ribbon on the Printer periodically when it becomes worn or frayed or when the printing becomes too light to make good copy. Raise the lid on the cover. Disengage the old ribbon from the ribbon guides and from around the type wheel. Pull both spools off of their respective friction spindles and roll all the ribbon onto one of the spools. Discard the one spool with the old ribbon and retain the empty spool.

b. Engage the hook that is on the end of the new ribbon in the hub of the empty spool or, if there is no hook, pierce the end of the ribbon over the point of the arrow in the hub of the empty spool. Wind a few turns of the ribbon onto the empty spool in the direction indicated by the arrow and make sure that the reversing eyelet has been wound up on the spool.

c. Place both spools on the ribbon spool shafts in such a manner that the ribbon feeds to the rear from the right side of the right spool and from the left side of the left spool (see Figure 2-8, Sec. 2). Turn each spool slightly until the driving pin on the spool shaft engages the hole in the spool. Pull the ribbon around the right vertical post and through the slot in the reverse arm. Place it in the right

slot of the ribbon guide, around the rear of the guide on both the right and left side and through the left slot of the guide. Now pull the ribbon forward on the left side, through the reverse arm slot and around the left side of the left vertical post. Rotate the spool to take up any slack.

d. Check to see that the ribbon is properly seated and feeding correctly in operation. Return the lid to its closed position.

3-5. MODEL 32 PRINTER FOR DIAL TWX.

a. GENERAL — The Model 32 Printer used in the Bell System Dial TWX Service is equipped with call-control features which permit the operator to initiate, control, and terminate calls on dial telephone networks. These include push-buttons, indicator lamps, a dial, a speaker, and an answer-back feature used in conjunction with a HERE IS and WRU (Figs C) key (see Figures 3-2 and 3-3).

b. TO INITIATE A CALL.

(1) To initiate a call, depress the originate (ORIG) pushbutton. The pushbutton will become illuminated and the Set will be connected to the telephone circuit so that the dial tone will be heard. If the line is busy, evidenced by the familiar telephone busy signal, depress the CLEAR pushbutton to disconnect the Set from the telephone network and initiate the call later.

(2) If the line is open (dial tone), dial the number of the distant called station. The progress of the call, dialing, ringing, busy signals, etc., will be heard over the speaker.

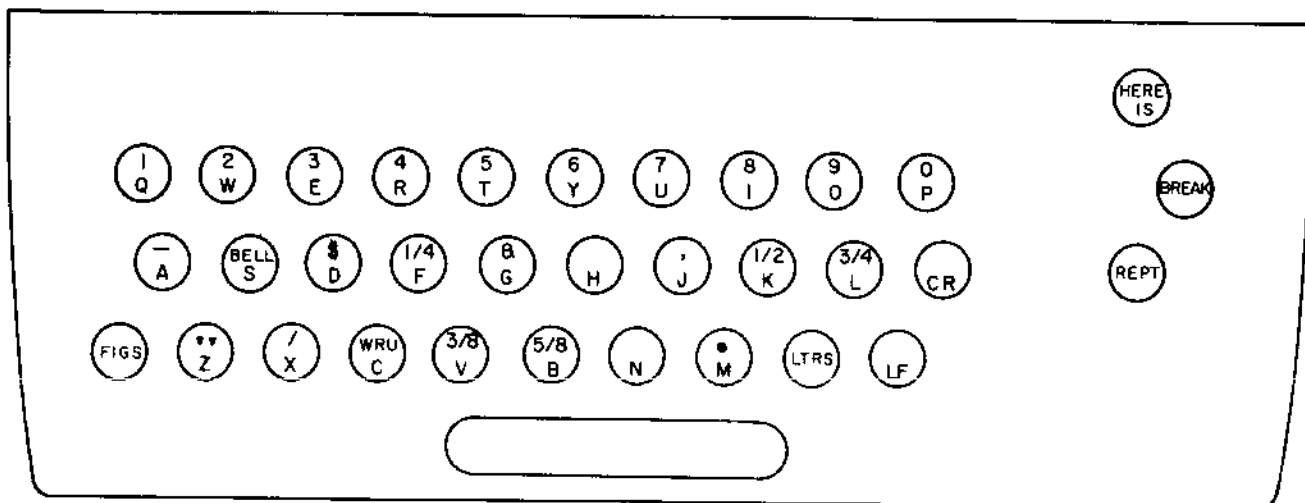


Figure 3-2. Model 32 Keyboard Arrangement - Dial TWX.

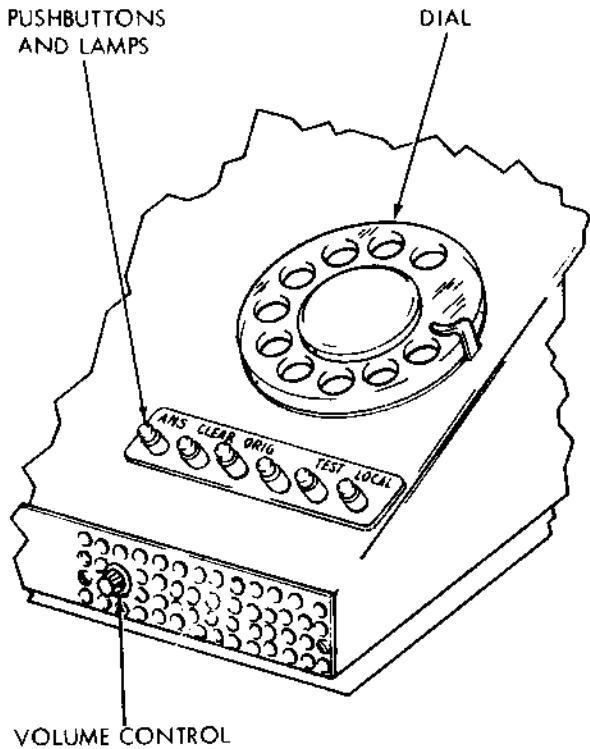


Figure 3-3. Model 32 Call Controls - Dial TWX.

(3) When the called station acknowledges the call (by operation of the ANS pushbutton) a tone will be heard, following which the motor of the calling station will turn on, the speaker will be turned off, and message transmission can begin. No voice transmission is provided. Although it may vary in specific instances, the usual procedure is as follows: Transmit WRU (Figs C). This trips the answer-back mechanism at the distant station, which replies with its identifying code. After the identifying code of the distant station has been received, depress the HERE IS key. This trips the local answer-back mechanism which causes the printing of the calling station's identifying answer-back code at both the local and distant points. Transmission of the message proper can now proceed from either station in turn but not from both simultaneously.

NOTE

Do not attempt to operate the keyboard during sending or receiving of the answer-back code.

(4) At the end of the message, either the local or the distant station may originate the disconnect by pressing the CLEAR pushbutton. The pushbutton will remain illuminated for a short time following the disconnect, after which the Set

will again be idle and ready to receive or transmit again.

c. TO ANSWER A CALL.

(1) An incoming call will manifest itself by sounding on the ringer and flashing or pulsing of the answer (ANS) pushbutton lamp in response to the ringing signal. Depress the ANS pushbutton to complete the connection with the calling station. When the pushbutton is depressed the ringer is turned off and the ANS lamp will light continuously. A tone will be heard for a short interval, following which the motor will turn on. Message transmission can now be carried on. It is usually preceded by the station identification codes initiated at the calling station as covered in paragraph 3-5. b. (3) and typed by the called printer in response to the transmitted signals. Message transmission can now originate from any station on the line.

(2) Following completion of message transmission, disconnect may be originated at either station. See paragraph 3-5. b. (4).

(3) Some Sets may be equipped for automatic answering. In this case, it will respond to ringing signals, turning itself on at the end of a ring interval and proceeding on through to traffic conditions. This will relieve the attending operator from immediate attention to each incoming call. The attention of the operator will be required, however, for message transmission and disconnect procedures. Automatic disconnect is another optional feature. It permits completely unattended reception of calls.

d. Local (LOCAL) operation provides maintenance procedures for off-line (i.e., non-transmitting) preparation of copy for future transmission, and for operator keyboarding practice. Depress the LOCAL pushbutton. The pushbutton will become illuminated, the motor will be turned on, and automatic answering facilities will be disabled. If an incoming signal is received during the time of local operation, the set will respond to the ringing signals and manual operation of the ANS pushbutton as required. Following operation of the Set in the LOCAL mode, operate the CLEAR pushbutton to return the Set to the idle condition.

c. In the test (TEST) position, signals that are received are re-transmitted for test and maintenance purposes. The TEST pushbutton is operated upon request.

f. There is one unmarked pushbutton that is unused in this arrangement of the Set.

g. Two difficulties that may be encountered in normal operation are a disconnect, due to loss

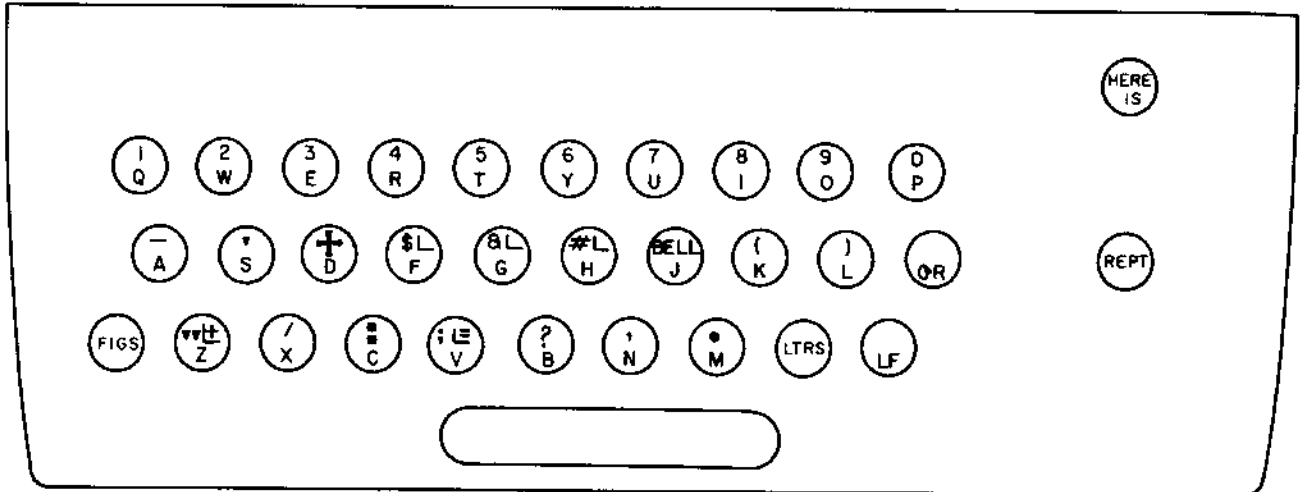


Figure 3-4. Model 32 Keyboard Arrangement - TELEX

of signal line, and dialing error, both of which can be detected by audible sounds or by failure of a called station to respond. These conditions can usually be corrected by pressing the CLEAR pushbutton to allow the telephone lines time to be cleared and then initiate the call again by depressing the ORIG pushbutton and re-dialing.

3-6. MODEL 32 PRINTER FOR TELEX.

a. GENERAL — The Model 32 Printer used in the Western Union TELEX Service is similar to that described in par. 3-5. c. above, except that it operates with dial telegraph networks (see Figures 3-4 and 3-5).

b. TO INITIATE A CALL.

(1) Press the START pushbutton and hold it depressed until the DIAL lamp lights. See paragraph 3-6. d. (2), below, for CAUTION.

(2) The illuminated DIAL lamp indicates that the telegraph exchange is connected. Dial the number of the called station. If the call is completed, the DIAL lamp turns off, the connect (CONN) lamp is illuminated, and the motor is turned on. If the called station is busy, the CONN lamp turns on and the motor starts momentarily, then they both turn off and the Set returns to its idle condition. Place the call again when the line is clear.

(3) Message transmission procedures may differ. However, following the completion of a connect with a called station, identification codes are usually exchanged. Transmit FIGS D. This will trip the answer-back mechanism at the called station which then replies with its identification code. After receiving the code from the

distant station, press the HERE IS key which trips the answer-back mechanism at the local station. Now type the message, which will be recorded by the Printer at each station. Exchange of intelligence, whether answer-back codes or the message proper, can originate from either the calling or called station once connection has been established, but not simultaneously.

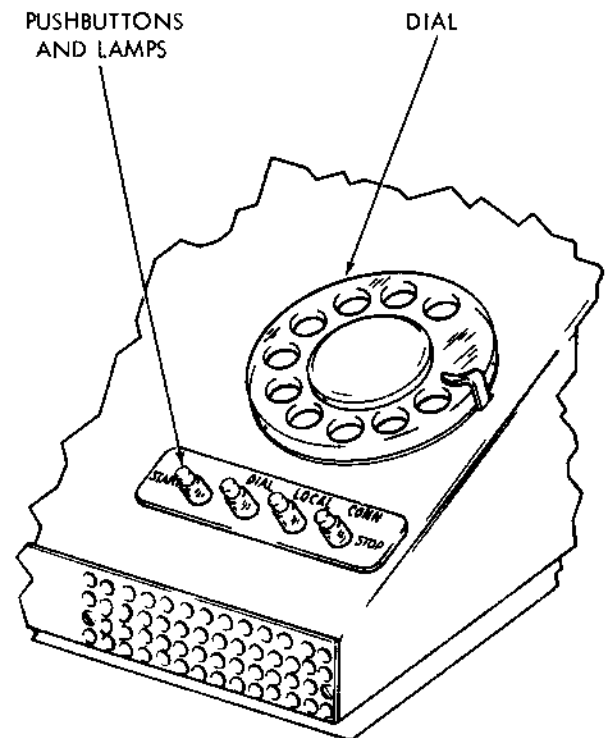


Figure 3-5. Model 32 Call Controls - TELEX

NOTE

Do not attempt to use the keyboard during answer-back procedures or while receiving a message, as this will result in garbling.

(4) To terminate message transmission, press the STOP pushbutton and hold it depressed until the CONN lamp goes out and the motor is turned off. Disconnect can be effected from either station.

(5) Unattended reception of calls is provided. To get the attention of the operator, send FIGS BELL. For repeated ringing of the bell, transmit FIGS, and then hold the BELL and REPT keys down.

(6) Local operation is provided for off-line preparation of copy for future transmission, for operator keyboarding practice, or for maintenance purposes. Depress the LOCAL pushbutton. The LOCAL lamp will light, the motor will be turned on, and copy can be prepared without transmission. If an incoming signal is received during LOCAL operation, the buzzer will sound for approximately 2-1/2 seconds, after which local operation becomes disconnected, the LOCAL lamp goes out, the CONN lamp goes on, and the message will be typed.

c. TO ANSWER A CALL — It is not necessary to have an operator in attendance at the called station. Connection is made automatically, the message is automatically received and printed, and the calling station originates disconnect.

d. Difficulties that may be encountered in operation consist mainly of dialing errors or possible loss of signal line.

(1) Wrong numbers that are dialed can be detected by noting the answer-back code of the called station. To correct the error, operate the STOP pushbutton and originate the call again.

(2) When originating a call, the operator is CAUTIONED to hold the START pushbutton depressed until the DIAL lamp comes on. If the START pushbutton is released before this time, a connection with the exchange will not be effected and the call will have to be initiated again.

(3) If the signal line opens while the Set is in the idle condition, no change will be noted until an attempt is made to transmit a message. At this time, pressing the START button will result in immediate illumination of the DIAL lamp, and the Set will remain in this state, even if a number has been dialed, until correction has been made. To remedy this condition, notify the telegraph exchange. If the trouble is in the local Set, notify maintenance personnel.

(4) If the signal line is lost during message transmission, it will manifest itself by an open line condition in which the motor continues to run and the Printer, receiving no intelligence pulses, operates continuously on blank. This condition cannot be corrected by the operator other than to disconnect the power plug to the Set to stop the unit, and notify the telegraph exchange or maintenance of the condition.

(5) For difficulties that develop at the local station, press the STOP pushbutton to return the set to idle condition and pull the power plug before calling maintenance.

SECTION 4

ADJUSTMENTS AND SPRING TENSIONS

4-1. GENERAL.

a. In the adjustments and spring tensions covered in this section, location of clearances, position of parts, and point and angle of scale applications are illustrated by drawings. Requirements and procedures are set forth in the texts that accompany the drawings.

4-2. LOCATION.

a. To aid locating the adjustments and spring tensions, the Printer is divided into ten areas. These areas are indicated in four photographs on pages 4-6 through 4-9 as follows:

- | | |
|----------------------|------------|
| 1. Distributor Area | Figure 4-1 |
| 2. Main Shaft Area | Figure 4-1 |
| 3. Paper Feed Area | Figure 4-1 |
| 4. Motor Area | Figure 4-1 |
| 5. Selector Area | Figure 4-2 |
| 6. Keyboard Area | Figure 4-2 |
| 7. Carriage Area | Figure 4-3 |
| 8. Spacing Area | Figure 4-3 |
| 9. Function Area | Figure 4-4 |
| 10. Answer-Back Area | Figure 4-4 |

b. The Tape Reader consists basically of three packages. They are sub-assemblies:

1. Tape Reader
2. Clutch Trip Mechanism
3. Power Pack

c. The Tape Punch consists basically of two packages. They are sub-assemblies:

1. Tape Punch Unit
2. Tape Punch Unit Set of Drive Parts

d. The areas that the adjustments and spring tensions are in follow their titles in parenthesis. For example, LEFT BEARING (DISTRIBUTOR) appears on page 4-12. This indicates that the adjustment is in the distributor area. From the list above, it can be seen that the location of this area is shown on Figure 4-1. As a further aid, parts and mechanisms that are especially important to the procedures are indicated on the photographs (e.g., distributor cam clutch on Figure 4-1).

4-3. ADJUSTMENTS.

a. The sequence in which the adjustments appear is that which should be followed when complete readjustment of the Printer is undertaken. On individual pages, the sequence is sometimes indicated by letters of the alphabet in parenthesis ---e.g., (A), (B) etc.

b. Unless specifically stated otherwise, make screws or nuts friction-tight to make an adjustment, and tighten them securely once the adjustment has been made.

c. When a procedure calls for using pry points or slots to make an adjustment (e.g., TRIP LEVER, page 4-14), place a screwdriver between the points or in the slots and pry parts in proper direction.

d. RELATED ADJUSTMENTS - The related adjustments listed in the texts are primarily to aid trouble shooting. As an example, suppose that in searching for a trouble it is discovered that the FUNCTION CAM CLUTCH ADJUSTMENT (page 4-16) does not meet its requirement. Under "RELATED ADJUSTMENTS" it is indicated that this adjustment is affected by the LEFT BEARING and CASTING adjustments. Check these to see if either is the basic cause of the trouble. It is also indicated that the FUNCTION CAM CLUTCH END PLAY adjustment is affected by the FUNCTION CAM-CLUTCH adjustment. If the latter is changed, check the affected adjustment.

4-4. SPRING TENSIONS.

a. The spring tensions are indications, not exact values. Therefore, measure them with Teletype scales in the positions shown in the drawings. Discard springs that do not meet the requirements and replace them with new ones.

b. Only the springs that directly affect the operation of the Set are included. Others may be indirectly measured. First replace the indicated spring. Then, if the requirement is not met, replace any that are indirectly measured in that procedure.

c. The spring tensions can be made in any sequence.

4-5. GENERAL PROCEDURE.

a. Read a procedure all the way through before making an adjustment or checking a spring tension.

b. Required tools, not supplied with the Printer, are listed in Teletype Bulletin 1124B.

c. STOP CONDITION.

(1) All procedures should be started with the Printer in the stop condition. It is in the stop condition when the selector armature is in its attracted (frontward) position (see page 4-24), all clutches are disengaged, and the keyboard universal lever is latched in its down position (see page 4-64).

(2) To place the Printer in the stop condition, hold the selector armature in its frontward position (see page 4-24). Rotate the main shaft clockwise (as viewed from left) until all clutches are in stop position. Fully disengage the clutches as instructed in paragraph 4-5e below.

NOTE

The distributor clutch will not disengage unless the answer-back drum is in its home position as shown on page 4-78.

d. The keyboard is tripped when the universal lever is in its up position.

e. When disengaged, the clutches are latched in their stop position between a trip lever, which bears against a shoe lever, and a latch lever which seats in a clutch cam disk (see page 4-22). The main shaft will then turn freely without the clutch shoes dragging. When the clutch is engaged, or tripped, the shoe lever and a stop lug on the cam disk are moved apart, and the clutch shoes are wedged against the drum so that the clutch turns in unison with the shaft (see page 4-23).

4-6. ALPHABETICAL INDEX.

a. BASIC PRINTER.

(1) Adjustments.

Armature Bracket (Selector)	4-24
Armature Spring (Selector)	4-93
Bearing Alignment (Various Areas)	4-29
Bell Clapper (Function)	4-44
Belt Tension (Motor)	4-11
Blinding Contact Wire (Answer-Back)	4-83
Blocking Follower Lever (Answer-Back)	4-83
Blocking Levers (Selector)	4-34
Brush Holder (Distributor)	4-14

NOTE

If the shaft is turned by hand, a clutch will not fully disengage upon reaching its stop position. Where a procedure calls for disengagement, rotate the clutch to its stop position, apply a screwdriver to the stop lug and turn the disk in the normal direction of shaft rotation until the latch lever seats in its notch in the disk. As a reminder, the word "LATCHED" follows instructions to disengage the clutches.

f. MANUAL OPERATION.

(1) To manually operate the Printer, place it in the stop condition as instructed in paragraph 4-3.c.(2) above. Momentarily permit armature to move to its unattracted (rearward) position to trip the selector clutch. Slowly rotate the main shaft clockwise (as viewed from left) until all push levers have moved under their respective selector levers (see page 4-27). Using spring hook, strip the push levers from under the selector levers corresponding to the spacing elements of the code combination to be set up. Then continue to rotate the shaft until the proper condition is set up or the character is cleared through the Printer.

(2) On Model 32 Printers, the selector levers are numbered 1 through 5 from left to right. To set up the letter "Y", for example, whose teletypewriter code combination is 1-3-5, strip the push levers from the No. 2 and No. 4 selector levers. On Model 33 Printers, the selector levers are numbered 1, 2, 3, 4, 5, 7, 6, 8 from left to right. To set up the letter "Y", for example, whose eight-level code combination is 1--45-78, strip the push levers from the No. 2, 3 and 6 selector levers.

(1) Adjustments (continued).

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Carriage Return Unlatch Lever (Spacing)	4-74
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Clutch Trip Lever (Selector)	4-22
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Code Bar Clutch Follower Arm (Main Shaft)	4-19
Code Bar Clutch Trip Lever (Main Shaft)	4-18
Code Bar Guide (Function)	4-33
Code Bar Reset Lever (Function)	4-32
Code Bar Reset Lever Position (Function)	4-31
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Dashpot Orifice (Spacing)	4-74
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Function Cam-Clutch (Main Shaft) - Preliminary	4-16
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Left Margin (Spacing)	4-72
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Main Shaft Torque (Various Areas)	4-29
No. 1 Code Bar Guide (Function)	4-35
Paper Guide (Paper Feed)	4-71
Platen Detent (Paper Feed)	4-65
Platen Horizontal (Paper Feed)	4-64
Platen - Vertical (Paper Feed)	4-64
Power Ball Roller (Carriage)	4-45
Pressure Roller (Paper Feed)	4-68
Print Drive Lever (Carriage)	4-50
Print Latch Arm (Carriage)	4-52
Print Reset Arm (Carriage)	4-51
Print Suppression Cam Follower (Function)	4-40
Print Suppression Latch (Function)	4-33
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Rear Rail - Left End (Carriage)	4-46
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(1) Adjustments (continued).	Page
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Ribbon Power Lever (Carriage)	4-59
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Right Slide Guide Plate (Carriage).	4-53
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Rocker Shaft End Play (Function)	4-30
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Feed Lever Spring (Answer-Back)	4-91
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"Here Is" Keylever Spring (Keyboard).	4-86
Keylever Spring (Keyboard).	4-84
Latch Lever Springs (Function and Code Bar Clutch)	4-21
Latch Lever Spring (Keyboard).	4-85
Latch Lever Spring (Selector)	4-25

(2) Spring tensions (continued).	Page
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Line Feed Blocking Lever Spring (Paper Feed)	4-69
Line Feed Drive Link Spring - Horizontal (Paper Feed)	4-69
Line Feed Drive Link Spring - Vertical (Paper Feed)	4-69
Line Feed Pawl Spring (Paper Feed)	4-65
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Paper Guide Springs (Paper Feed)	4-70
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Platen Detent Pawl Spring (Paper Feed)	4-67
Print Hammer Bail Spring (Carriage)	4-58
Print Suppression Cam Follower Spring (Function)	4-40
Print Trip Lever Spring (Carriage)	4-58
Push Lever Springs (Selector)	4-27
Reset Bail Spring (Keyboard)	4-87
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Ribbon Drive Lever Spring (Carriage)	4-60
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Space Bar Spring (Keyboard)	4-84
Space Bellcrank Spring (Spacing)	4-51
Space Suppression Lever Spring (Spacing)	4-63A
Spacing Belt Tension (Spacing)	4-71
Spacing Check Pawl Spring (Spacing)	4-63A
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Spacing Lock Lever Spring (Selector)	4-26
Start Lever Spring (Selector)	4-25
Stripper Bail Spring (Selector)	4-27
Trip Bail Spring (Distributor)	4-90
Trip Lever Springs (Main Shaft)	4-20
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b. VARIABLE FEATURES.

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Trip Lever (Answer-Back)	4-98
Trip Lever (Keyboard) (Applicable to Receive Only Units)	4-102
Trip Lever Overtravel (Answer-Back)	4-96
Trip Magnet (Answer-Back)	4-96

(2) Spring Tensions.	Page
Armature Spring (Answer-Back)	4-99
Control Lever Spring (Answer-Back)	4-99
Trip Lever Spring (Answer-Back)	4-100

c. BASIC TAPE READER

(1) Adjustments

Armature Extension (Clutch Trip)	4-106
Blocking Pawl (Tape Reader)	4-112
Contact Gap (Clutch Trip)	4-107
Detent Lever (Tape Reader)	4-108
Feed Pawl (Adjustment with Gage No. 183103) (Tape Reader) . . .	4-109
Feed Pawl (Adjustment without Gage No. 183103) (Final) (Tape Reader)	4-111
Feed Pawl (Adjustment without Gage No. 183103) (Preliminary) (Tape Reader)	4-111
Reader Mounting Bracket (Tape Reader)	4-120
Reader Trip Lever Overtravel (Clutch Trip)	4-105
Sensing Pin (Tape Reader)	4-113
Start-Stop Contact Wire (Tape Reader)	4-114
Stop Arm (Clutch Trip)	4-106
Tape Lid Latch (Tape Reader)	4-115
Trip Magnet (Clutch Trip)	4-105

(2) Spring Tensions

Armature Spring (Tape Reader)	4-118
Blocking Pawl Spring (Tape Reader)	4-109
Detent Lever Spring (Tape Reader)	4-108
Feed Magnet Contact Spring (Clutch Trip)	4-116
Lid Latch Spring Tension (Tape Reader)	4-119
Reader Trip Lever Spring (Clutch Trip)	4-116
Sensing Contact Wire Spring (Tape Reader)	4-115
Sensing Pin Spring (Tape Reader)	4-113
Start-Stop Contact Wire Spring (Tape Reader)	4-114
Start-Stop Detent Spring (Tape Reader)	4-117
Tape Lid Spring (Tape Reader)	4-115
Tape Out Pin Spring (Tape Reader)	4-118
Tight Tape Lever Spring (Tape Reader)	4-117
Trip Magnet Armature Spring (Clutch Trip)	4-105
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d. BASIC TAPE PUNCH

(1) Adjustments

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Chad Chute Extension	4-129
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Feedwheel Ratchet and Pawl (Preliminary)	4-122
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Post, Bracket and Plate (Preliminary)	4-121
Punch Penetration	4-125
Stripper Bail Upstop	4-123
Tape Punch Drive (Preliminary)	4-124
Ten Characters per Inch	4-128

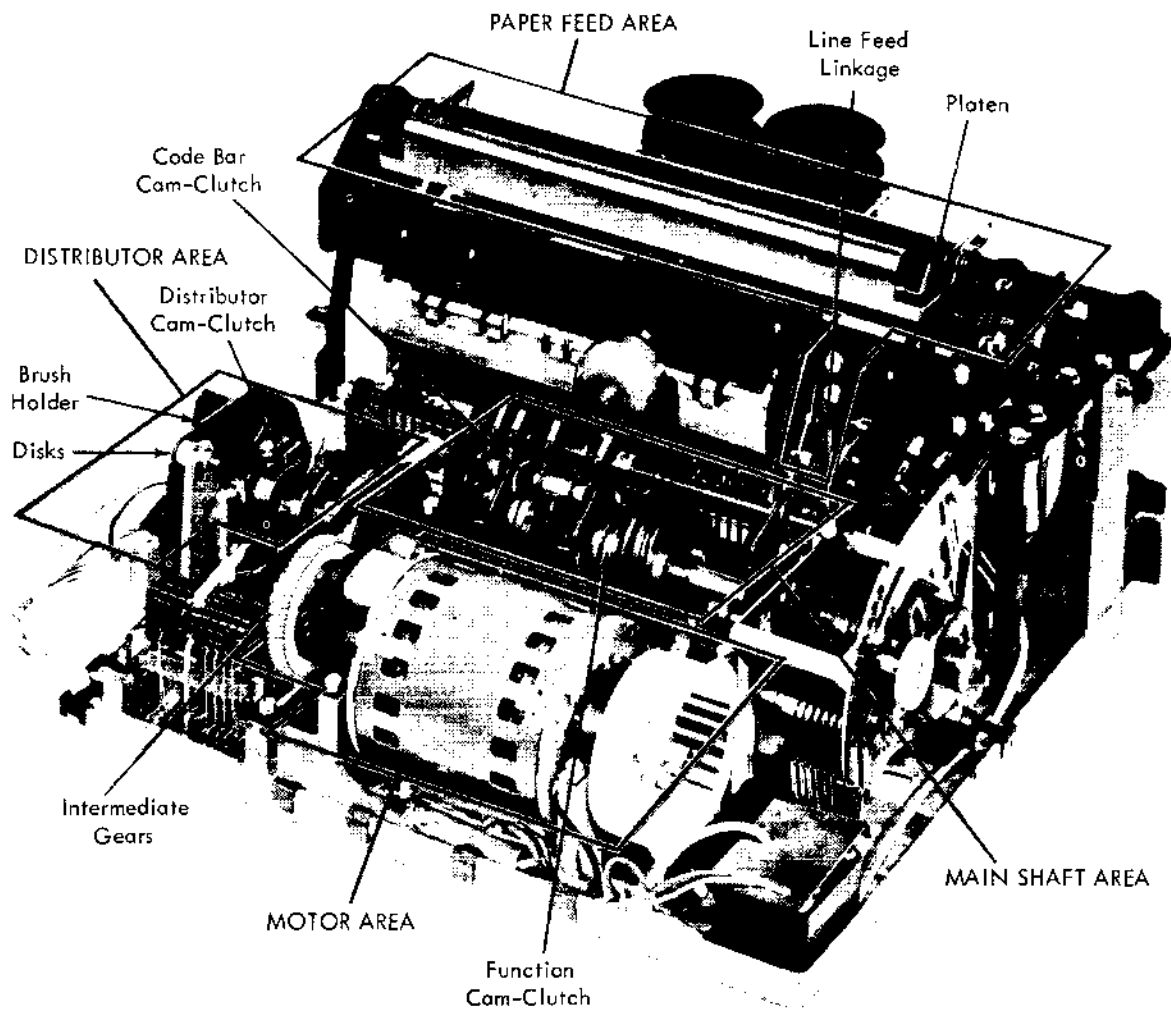


Figure 4-1. Printer Assembly — Rear View

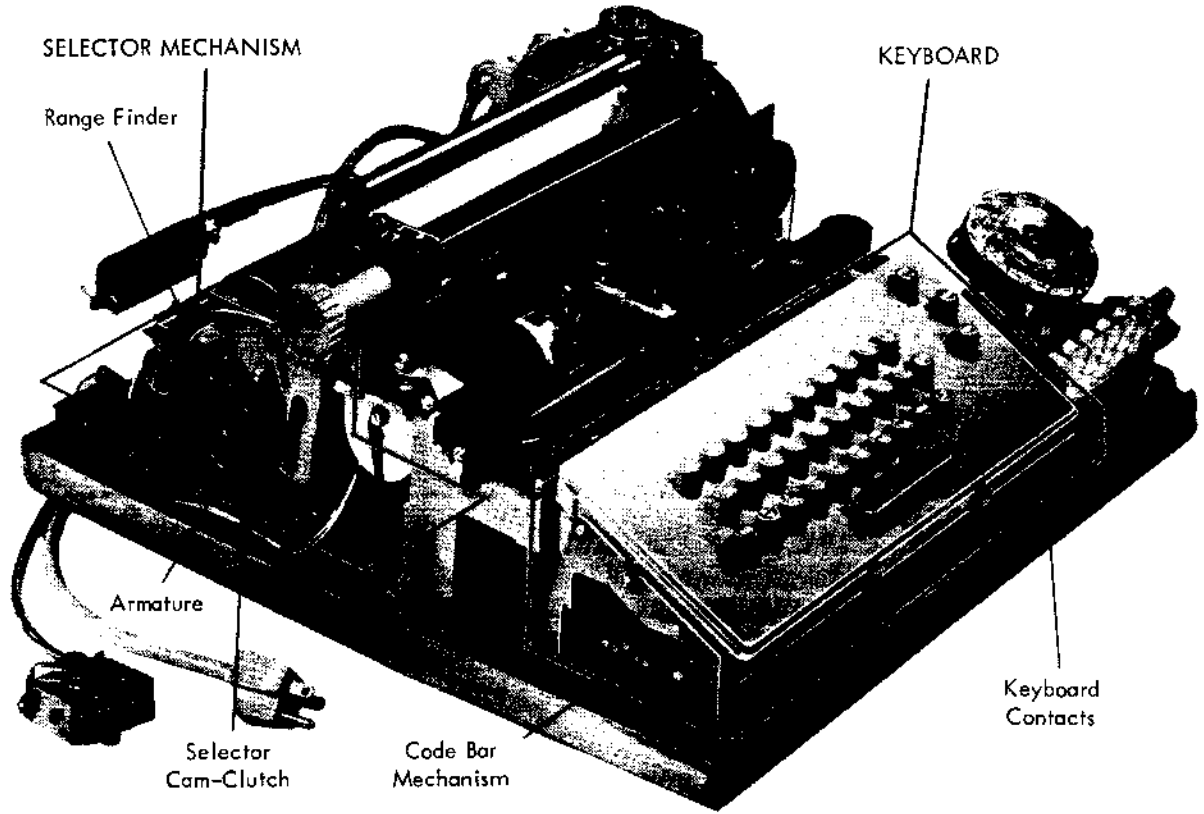


Figure 4-2. Printer Set

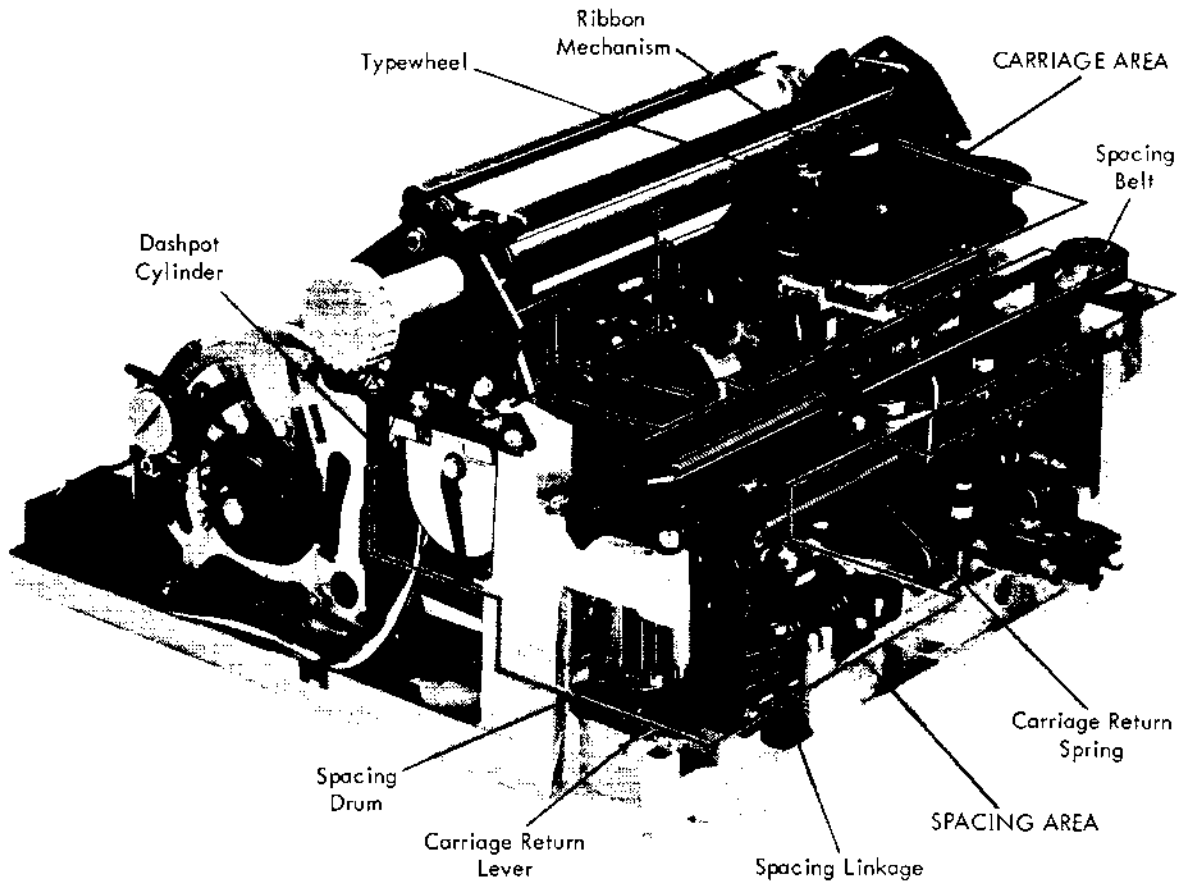


Figure 4-3. Printer Assembly

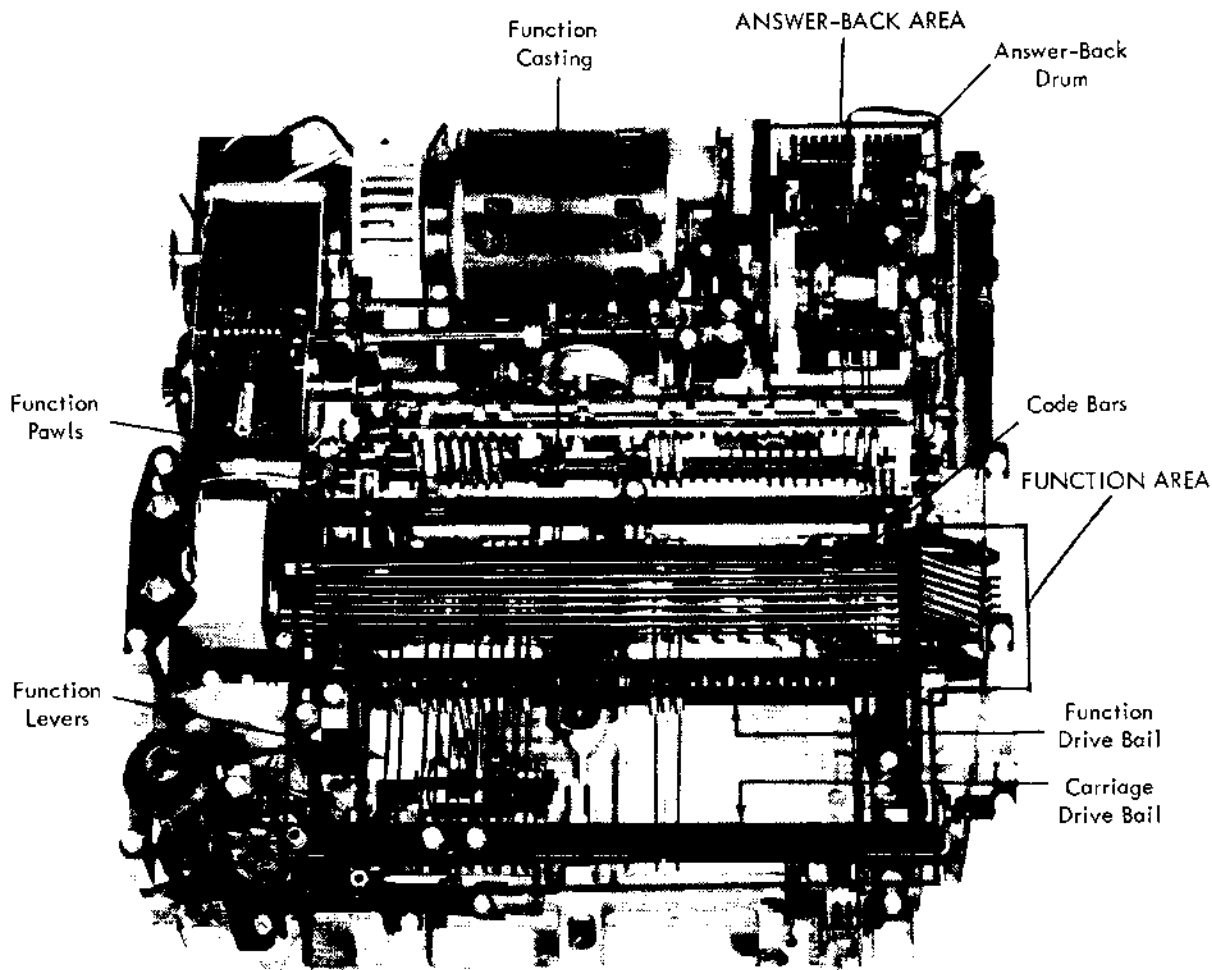


Figure 4-4. Printer Assembly — Carriage and Platen Removed

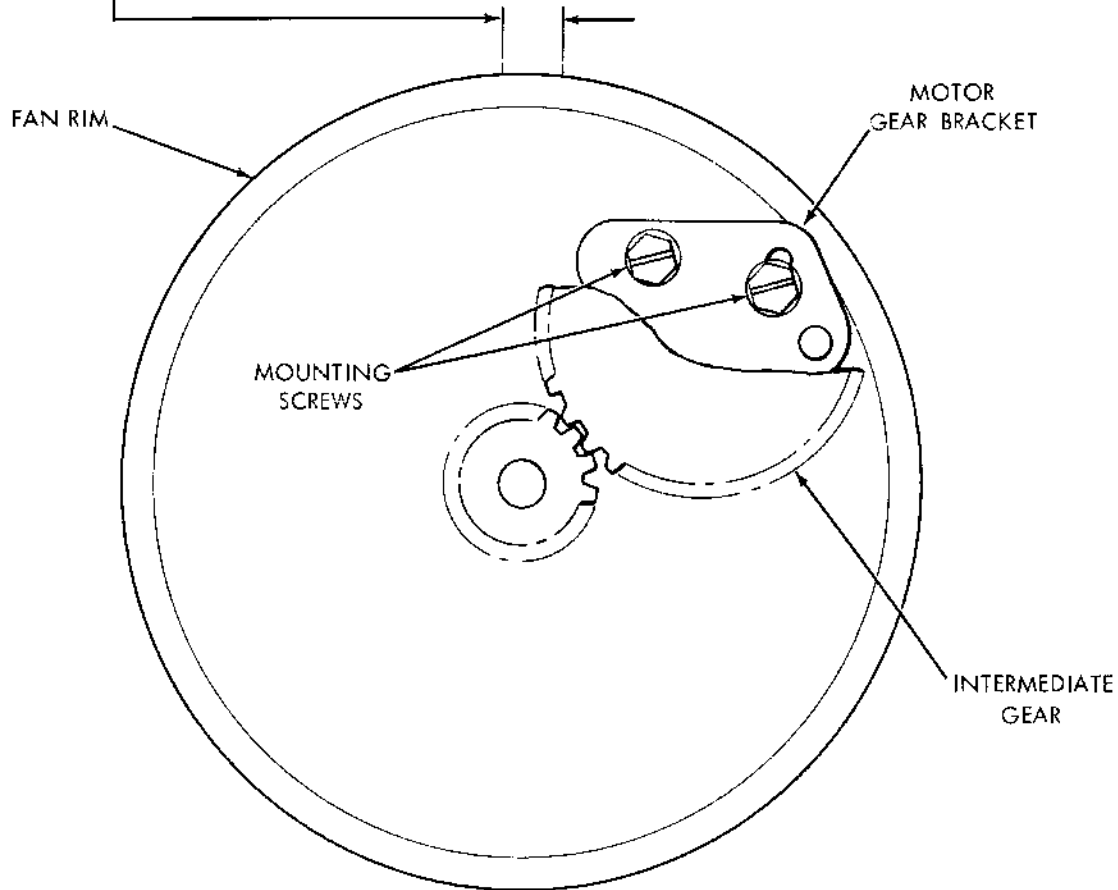
GEAR BRACKET (MOTOR)- PRELIMINARY
REQUIREMENT

WITH HEAD OF MOTOR PINION MOUNTING SCREW
POINTING UPWARD AND INTERMEDIATE GEAR HELD
STATIONARY

— MIN. SOME---MAX. 0.032 INCH
PLAY AT RIM OF FAN.

TO ADJUST
POSITION MOTOR GEAR BRACKET WITH
MOUNTING SCREWS LOOSENED.

RELATED ADJUSTMENT
AFFECTS
BELT TENSION



(RIGHT SIDE VIEW)

BELT TENSION (MOTOR)- PRELIMINARY

REQUIREMENT

MIN. 0.100 INCH-- MAX. 0.135 INCH
DEFLECTION AT CENTER OF MOTOR BELT
WHEN 16 OZS. PRESSURE IS APPLIED AT
CENTER OF BELT.

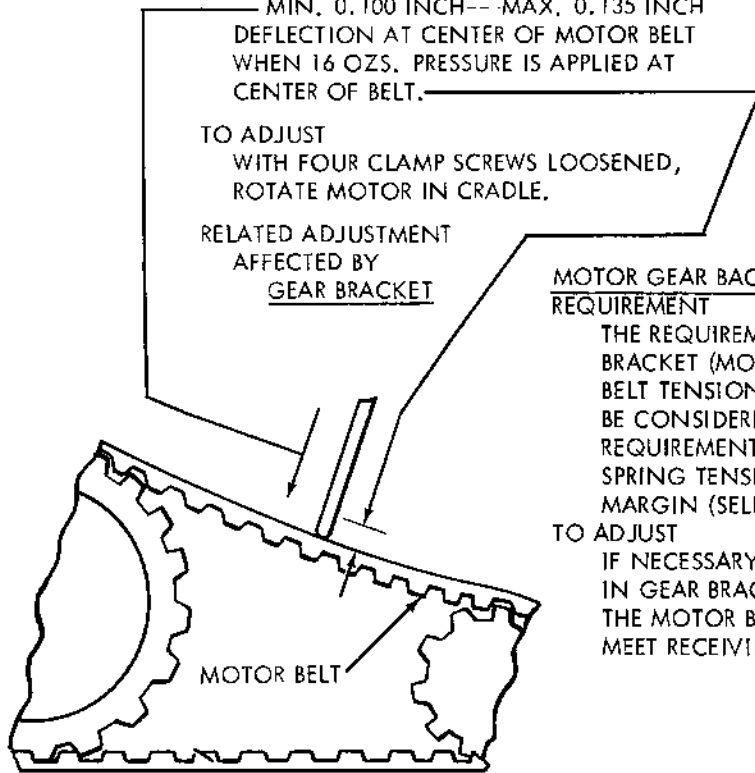
TO ADJUST
WITH FOUR CLAMP SCREWS LOOSENED,
ROTATE MOTOR IN CRADLE.

RELATED ADJUSTMENT
AFFECTED BY
GEAR BRACKET

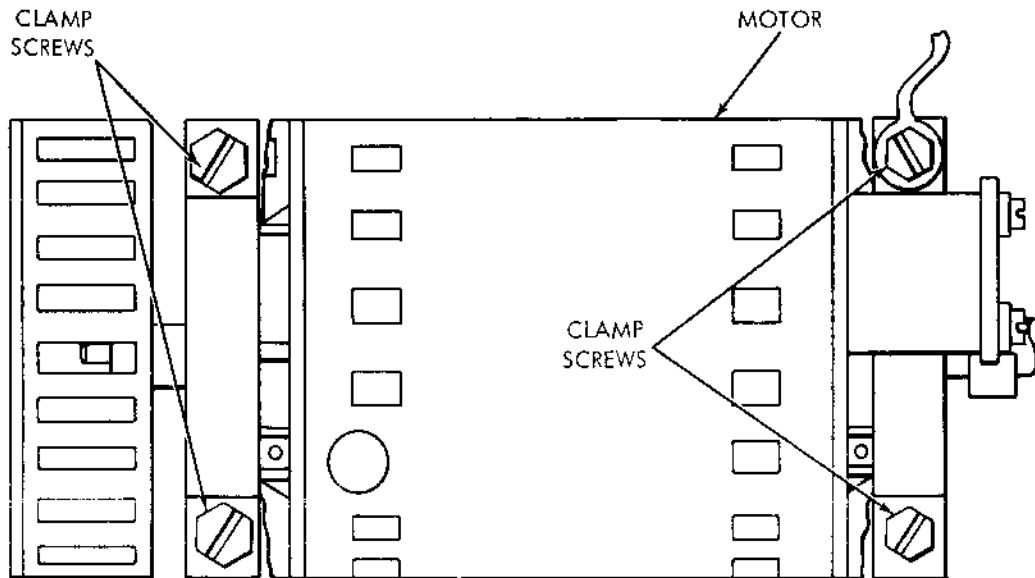
MOTOR GEAR BACKLASH AND BELT TENSION - FINAL REQUIREMENT

THE REQUIREMENTS SPECIFIED IN THE GEAR BRACKET (MOTOR) - PRELIMINARY AND THE MOTOR BELT TENSION - PRELIMINARY ADJUSTMENTS SHALL BE CONSIDERED FINAL IF THE RECEIVING MARGIN REQUIREMENTS SPECIFIED IN THE ARMATURE SPRING TENSION, BRACKET POSITION AND RECEIVING MARGIN (SELECTOR) CAN BE OBTAINED.

TO ADJUST
IF NECESSARY, REFINE ADJUSTMENTS SPECIFIED IN GEAR BRACKET (MOTOR) - PRELIMINARY AND THE MOTOR BELT TENSION - PRELIMINARY TO MEET RECEIVING MARGIN REQUIREMENTS.



(RIGHT SIDE VIEW)



(TOP VIEW)

(B) LEFT BEARING (DISTRIBUTOR)

REQUIREMENT

AS GAGED BY EYE

MIN. SOME---MAX. 0.012 INCH
BETWEEN LEFT BEARING
AND CLUTCH GEAR ASSEMBLY.

TO ADJUST

DISENGAGE (LATCH) CLUTCH. HOLD
CLUTCH GEAR FIRMLY TO RIGHT.
POSITION LEFT BEARING WITH LEFT
BEARING CLAMP SCREWS LOOSENED.

RELATED ADJUSTMENTS

AFFECTED BY

SHAFT

(A) SHAFT (DISTRIBUTOR)

REQUIREMENT

AS GAGED BY EYE

MIN. 0.010 INCH --- MAX. 0.060 INCH
BETWEEN BRUSH HOLDER AND
DISTRIBUTOR DISK AT CLOSEST POINT.

TO ADJUST

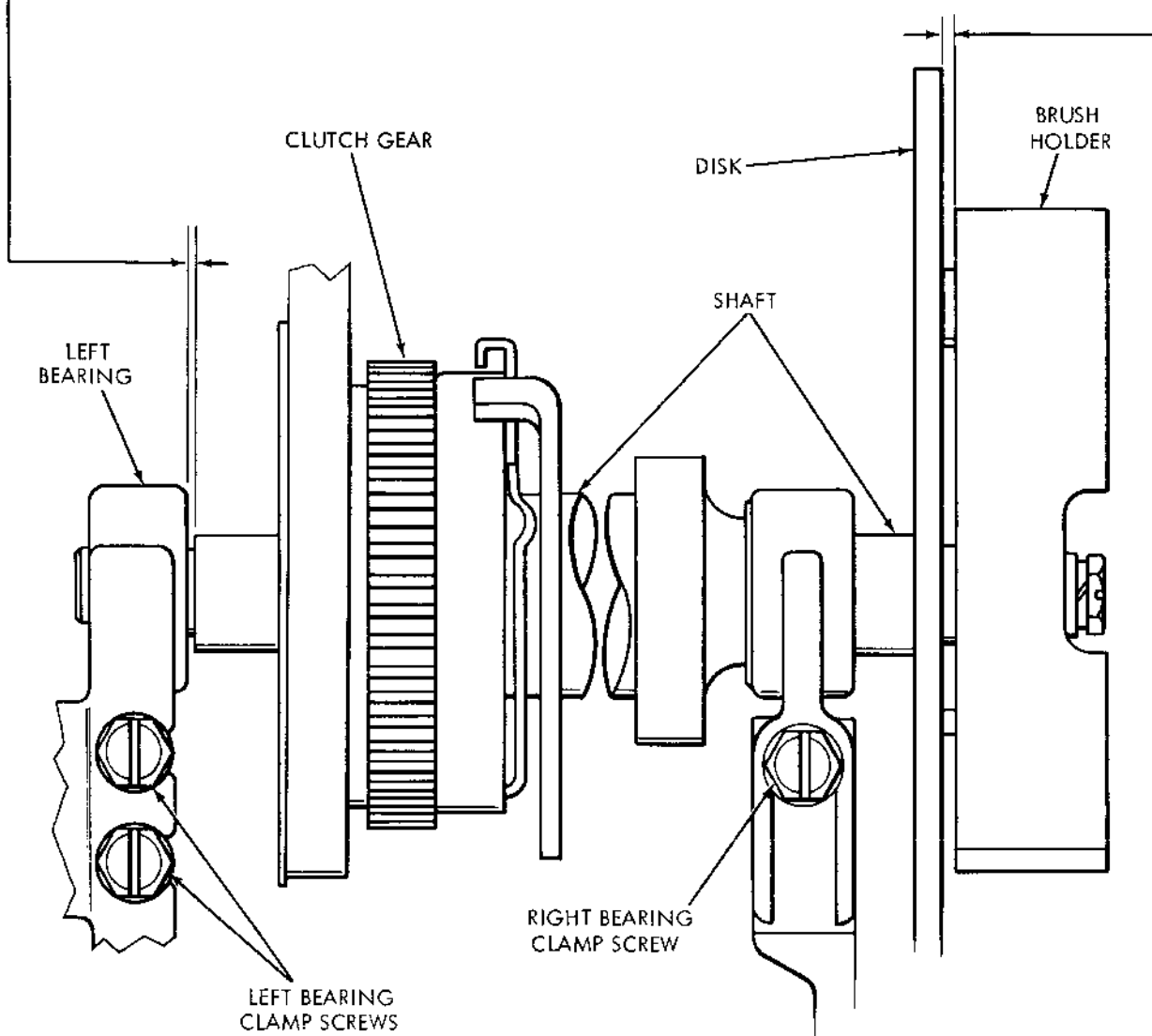
POSITION SHAFT WITH THREE BEARING
CLAMP SCREWS LOOSENED. TIGHTEN
RIGHT, BUT NOT LEFT, CLAMP SCREW
AND PROCEED TO LEFT BEARING ADJUSTMENT.

RELATED ADJUSTMENTS

AFFECTS

LEFT BEARING

TRIP SHAFT



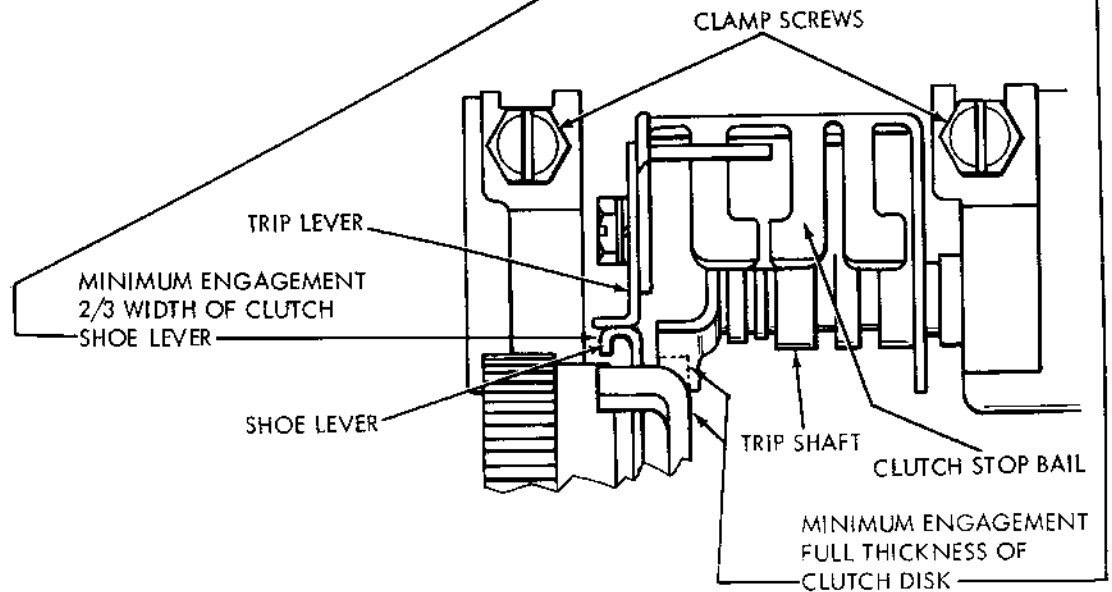
(TOP VIEW)

**TRIP SHAFT (DISTRIBUTOR)
REQUIREMENT**

- (1) WITH DISTRIBUTOR CLUTCH IN STOP POSITION, TAKE UP AND HOLD THE PLAY OF DISTRIBUTOR SHAFT TOWARD LEFT SIDE OF UNIT. TAKE UP PLAY OF CLUTCH LATCH LEVER TOWARDS RIGHT SIDE OF UNIT AND RELEASE. CLUTCH LATCH LEVER SHALL ENGAGE AT LEAST THE FULL THICKNESS OF DISTRIBUTOR CLUTCH DISK. TAKE UP PLAY OF CLUTCH SHOE LEVER TOWARDS LEFT SIDE OF UNIT AND RELEASE. TAKE UP PLAY OF CLUTCH STOP LEVER TOWARDS RIGHT SIDE OF UNIT AND RELEASE, CLUTCH STOP LEVER SHALL ENGAGE AT LEAST 2/3 OF WIDTH OF FORMED END OF CLUTCH SHOE LEVER.
 - (2) TAKE UP PLAY OF DISTRIBUTOR SHAFT TOWARDS RIGHT SIDE OF UNIT AND RELEASE. TAKE UP PLAY OF CLUTCH SHOE LEVER TOWARDS RIGHT SIDE OF UNIT AND RELEASE. TAKE UP PLAY OF CLUTCH STOP LEVER TOWARDS LEFT SIDE OF UNIT AND RELEASE. THE CLUTCH STOP LEVER SHALL ENGAGE AT LEAST 2/3 OF WIDTH OF FORMED END OF CLUTCH SHOE LEVER.
 - (3) THE REAR EXTENSION OF THE CONTROL LEVER SHALL NOT BIND IN ITS SLOT IN THE ANSWER-BACK BLOCK.
- TO ADJUST
POSITION TRIP SHAFT WITH CLAMP SCREWS
LOOSENED.

RELATED ADJUSTMENTS

AFFECTED BY SHAFT



(TOP VIEW)

TRIP LEVER (DISTRIBUTOR)

TO CHECK

DISENGAGE (LATCH) CLUTCH. MAKE SURE KEYBOARD UNIVERSAL LEVER IS IN DOWN POSITION (SEE CONTACT WIRES (KEYBOARD) ADJUSTMENT). MEASURE AND RECORD CLEARANCE BETWEEN SHOE LEVER AND STOP LUG. TRIP CLUTCH BY MOVING TRIP LEVER REARWARD. MEASURE AND RECORD SAME CLEARANCE.

REQUIREMENT

- (1) WITH CLUTCH DISENGAGED (LATCHED)
MIN. 0.015 INCH
BETWEEN STOP LUG AND SHOE LEVER.
- (2) CLEARANCE BETWEEN STOP LUG AND SHOE LEVER
MIN. 0.050 INCH---MAX. 0.080 INCH
GREATER WHEN CLUTCH ENGAGED
THAN WHEN DISENGAGED.

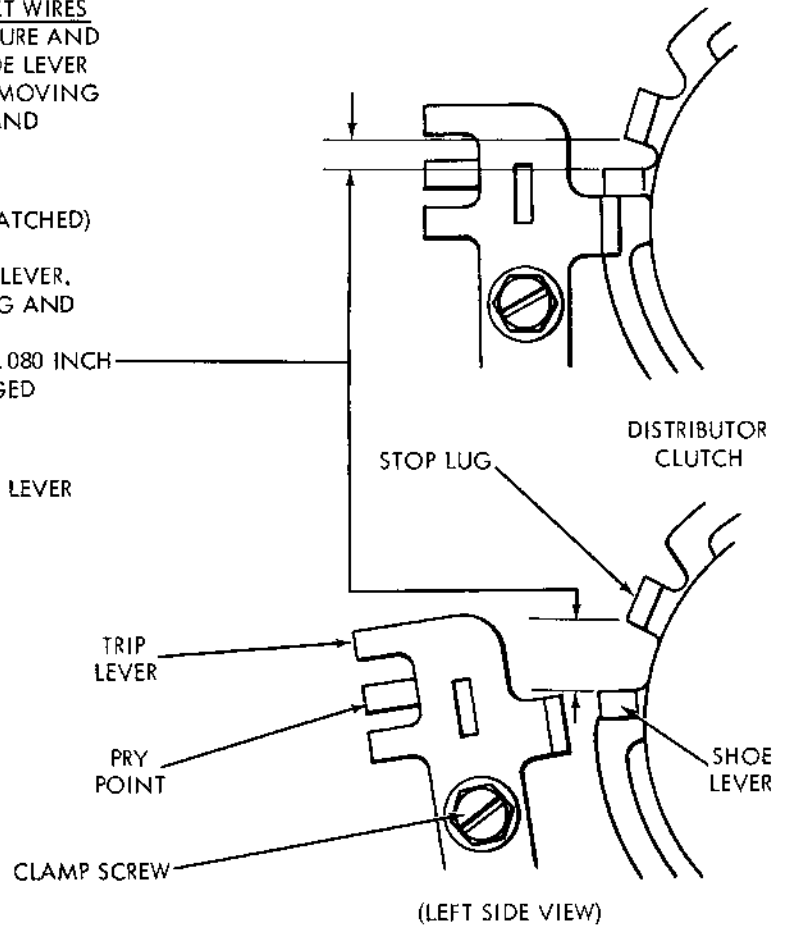
TO ADJUST

USING PRY POINT, POSITION TRIP LEVER WITH CLAMP SCREW LOOSENED.

RELATED ADJUSTMENTS

AFFECTS

BRUSH HOLDER



BRUSH HOLDER (DISTRIBUTOR)

REQUIREMENT

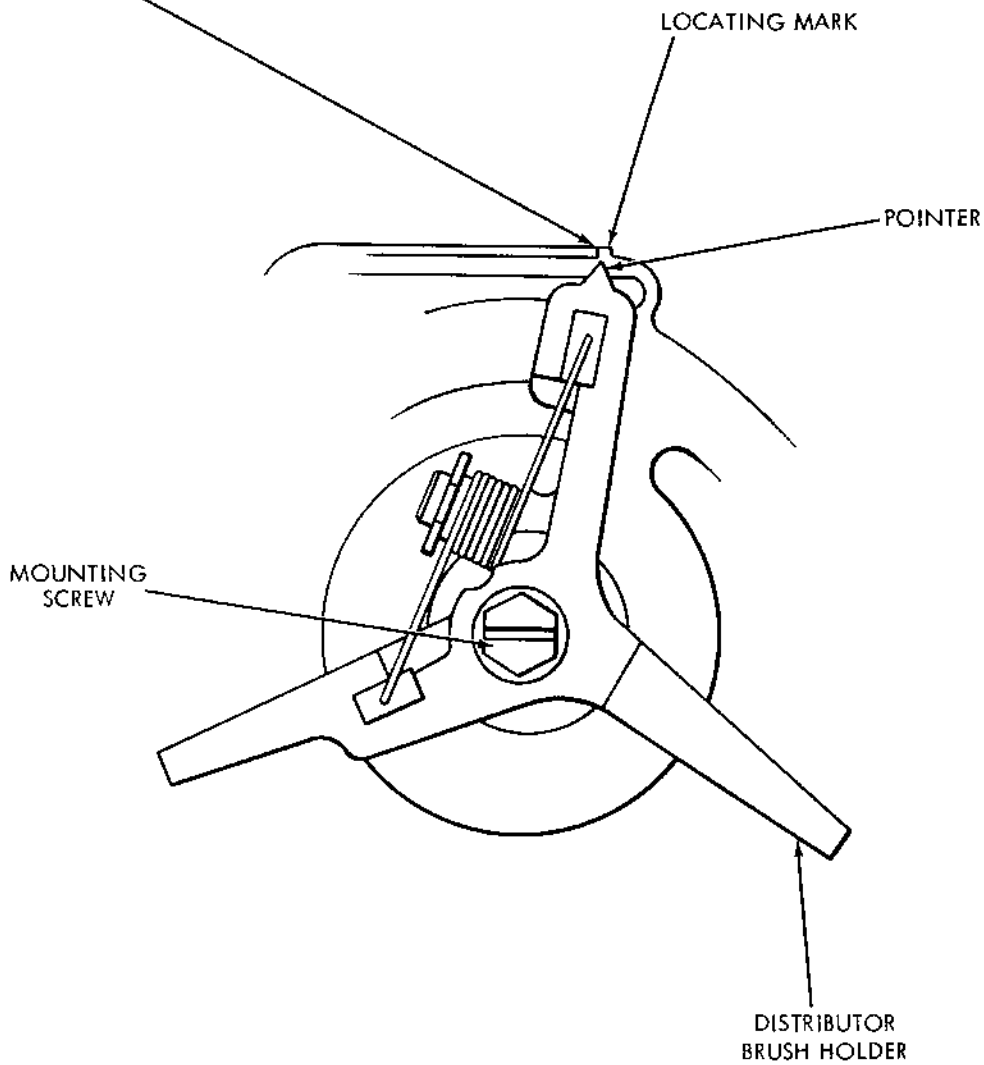
WITH DISTRIBUTOR CLUTCH DISENGAGED (LATCHED), POINTER WITHIN LOCATING MARK.

TO ADJUST

POSITION BRUSH HOLDER WITH MOUNTING SCREWS LOOSENED.

RELATED ADJUSTMENTS

AFFECTED BY
TRIP LEVER



(RIGHT SIDE VIEW)

NOTE

IF COMPLETE READJUSTMENT OF PRINTER IS BEING UNDERTAKEN, LOOSEN ALL SET SCREWS ON MAIN SHAFT EXCEPT FOR ONE IN COLLAR TO RIGHT OF LEFT BEARING.

LEFT BEARING (MAIN SHAFT)

REQUIREMENT

THE SELECTOR LEVERS AND START LEVER SHALL FULLY ENGAGE THEIR CAMS WHEN SELECTOR CAM IS IN CONTACT WITH THE BEARING AND THE LEFT SIDE OF BEARING SHALL PROTRUDE BEYOND SELECTOR MOUNTING PLATE.

TO ADJUST

WITH BEARING CLAMP MOUNTING SCREWS LOOSENED POSITION THE BEARING.

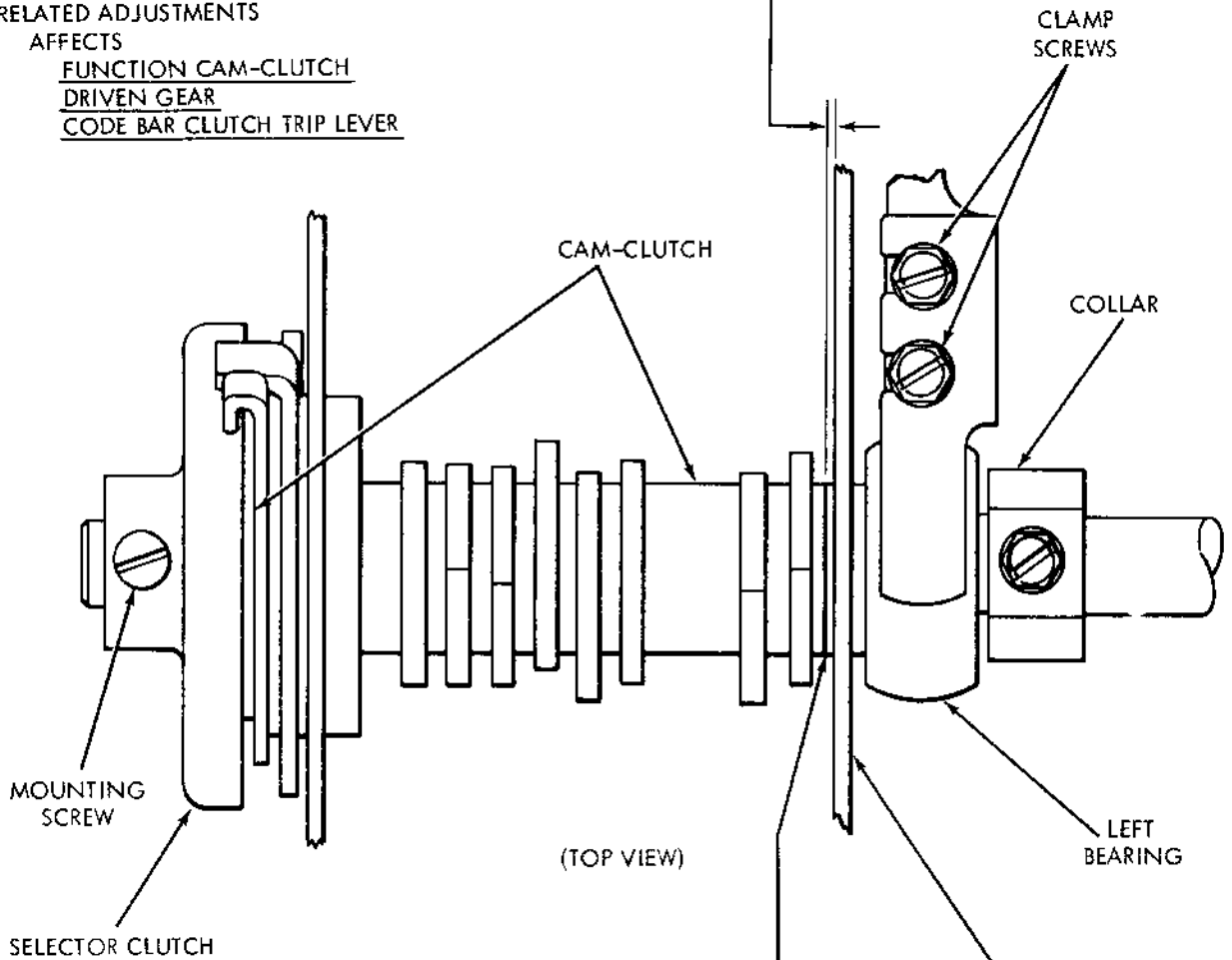
RELATED ADJUSTMENTS

AFFECTS

FUNCTION CAM-CLUTCH

DRIVEN GEAR

CODE BAR CLUTCH TRIP LEVER



(TOP VIEW)

CAM CLUTCH (SELECTOR)

REQUIREMENT

WITH SELECTOR CLUTCH DISENGAGED AND LATCHED, THERE SHALL BE
 MIN. 0.005 INCH --- MAX. 0.012 INCH
 END PLAY IN THE SELECTOR CAM ASSEMBLY.

TO ADJUST

WITH THE SELECTOR CLUTCH DRUM SCREW FRICTION TIGHT POSITION DRUM IN ITS OVERSIZED HOLE. (IF A COMPLETE RE-ADJUSTMENT OF THE MACHINE IS TO BE MADE, LOOSEN ALL SCREWS ON MAIN SHAFT EXCEPT FOR COLLAR TO RIGHT OF LEFT HAND MAIN SHAFT BEARING).

FUNCTION CAM-CLUTCH (MAIN SHAFT) - PRELIMINARY
NOTE

MAKE THIS ADJUSTMENT ONLY WHEN COMPLETE ADJUSTMENT OF THE PRINTER IS BEING UNDERTAKEN
REQUIREMENT

AS GAGED BY EYE CLEARANCE BETWEEN CARRIAGE DRIVE ECCENTRIC AND THE END OF FUNCTION STRIPPER BAIL CAM FOLLOWER ROLLER SHAFT

MIN. 0.020 INCHES --- MAX. 0.040 INCHES

WHEN ALL PLAY IS TAKEN UP TO MAKE THIS CLEARANCE A MINIMUM

TO ADJUST

WITH FUNCTION CASTING MOUNTING SCREWS FRICTION TIGHT (SEE FUNCTION CASTING ADJUSTMENT) POSITION LEFT SIDE OF LOWER PORTION OF FUNCTION CASTING WITH LEFT SIDE OF PROJECTION FROM CODE BAR BASKET REAR TIE BAR BY MOVING THE FUNCTION CASTING. LOOSEN SCREW IN THE COLLAR IMMEDIATELY TO LEFT OF FUNCTION CLUTCH AND FUNCTION CLUTCH DRUM MOUNTING SCREW AND POSITION CAM CLUTCH TO MEET THE REQUIREMENT.

RELATED ADJUSTMENTS

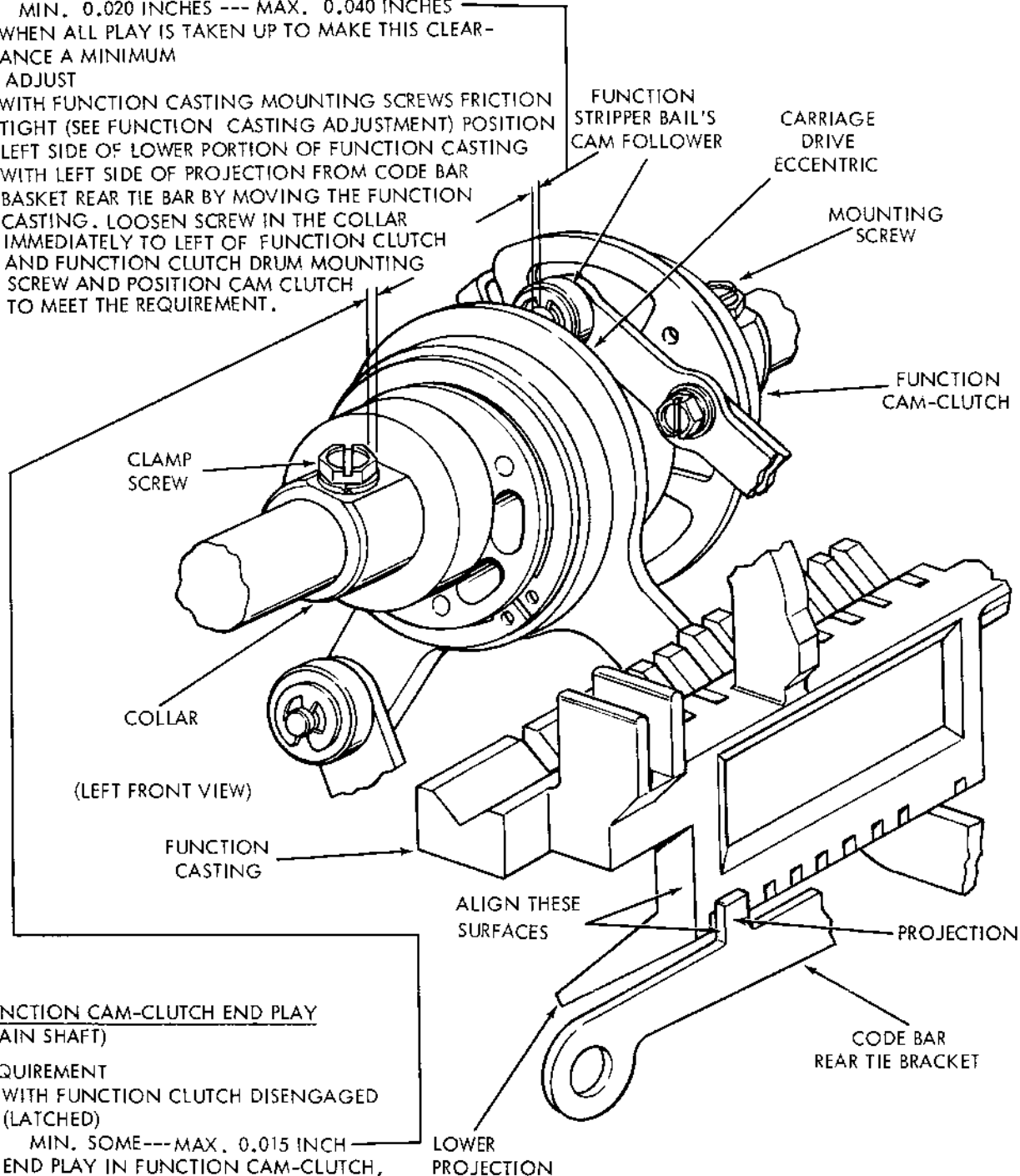
AFFECTS

FUNCTION CAM-CLUTCH END PLAY

AFFECTED BY

LEFT BEARING

CASTING (FUNCTION)



FUNCTION CAM-CLUTCH END PLAY
(MAIN SHAFT)

REQUIREMENT

WITH FUNCTION CLUTCH DISENGAGED (LATCHED)

MIN. SOME --- MAX. 0.015 INCH

END PLAY IN FUNCTION CAM-CLUTCH, AS GAGED BY EYE, WHEN ALL PLAY IS TAKEN UP TO MAKE IT MAXIMUM.

TO ADJUST

POSITION CAM-CLUTCH WITH MOUNTING SCREW LOOSENED.

RELATED ADJUSTMENTS

AFFECTS

CODE BAR CAM-CLUTCH

AFFECTED BY

FUNCTION CAM-CLUTCH

CODE BAR CAM-CLUTCH (MAIN SHAFT)

REQUIREMENT

WITH CLUTCH DISENGAGED (LATCHED)
MIN. SOME---MAX, 0.015 INCH

END PLAY IN CODE BAR CAM-CLUTCH AS
GAGED BY EYE WHEN PLAY IS TAKEN UP
TO MAKE CLEARANCE MAXIMUM.

TO ADJUST

POSITION CAM-CLUTCH WITH MOUNTING
SCREW LOOSENED.

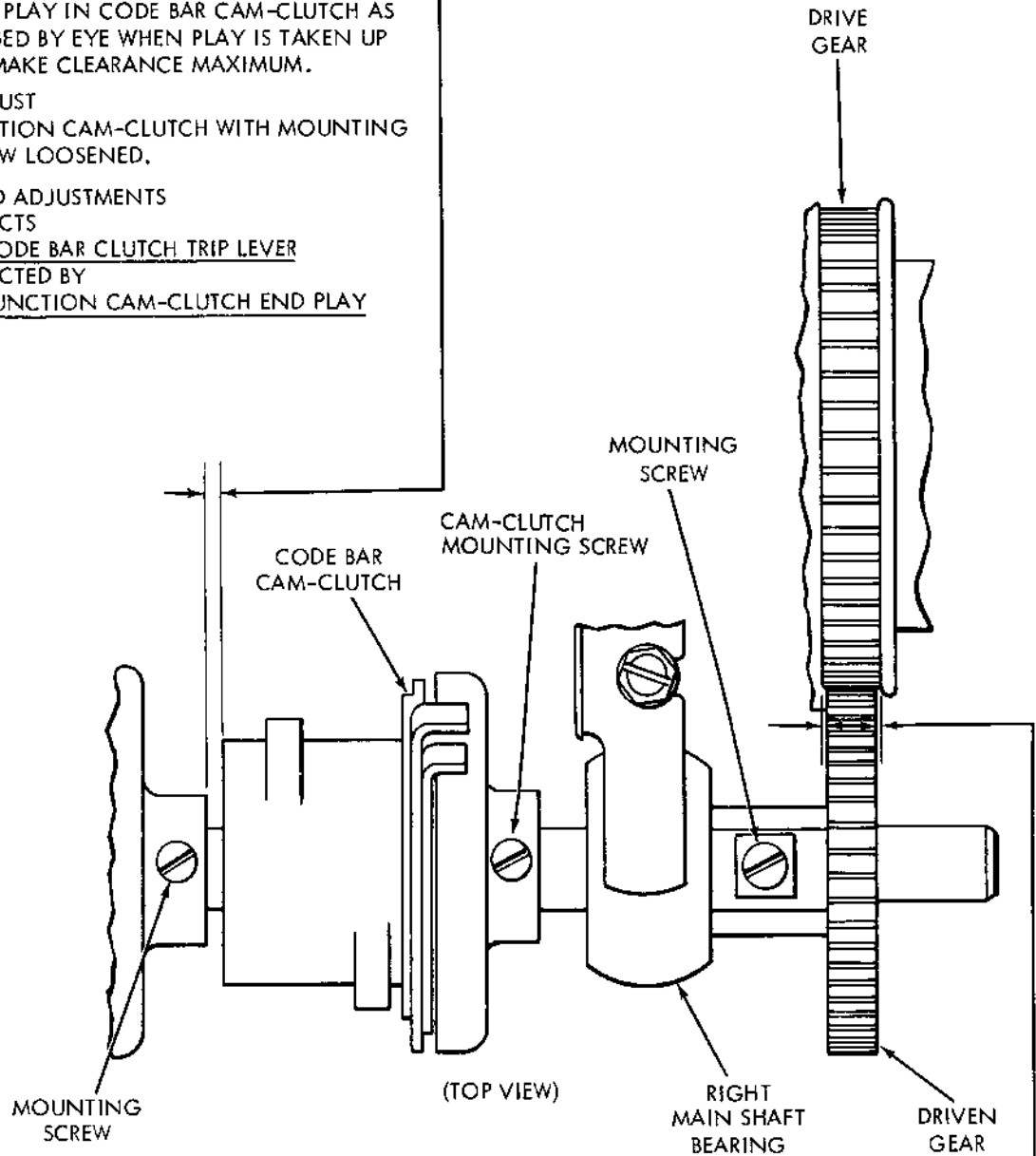
RELATED ADJUSTMENTS

AFFECTS

CODE BAR CLUTCH TRIP LEVER

AFFECTED BY

FUNCTION CAM-CLUTCH END PLAY



DRIVEN GEAR (MAIN SHAFT)

REQUIREMENT

DRIVEN GEAR CENTERED ON DRIVE GEAR.

TO ADJUST

POSITION DRIVEN GEAR WITH MOUNTING
SCREW LOOSENED.

RELATED ADJUSTMENTS

AFFECTED BY

LEFT BEARING (DISTRIBUTOR)

SHAFT (DISTRIBUTOR)

CODE BAR CLUTCH TRIP LEVER (MAIN SHAFT)

REQUIREMENT

- (1) AS GAGED BY EYE, CODE BAR CLUTCH TRIP LEVER APPROXIMATELY ALIGNED WITH SHOE LEVER

WITHIN 0.020 INCH

- (2) MIN. 0.005 INCH BETWEEN FUNCTION CLUTCH TRIP ROLLER'S SHAFT AND CODE BAR RESET CAM WHEN ALL PLAY IS TAKEN UP TO MAKE CLEARANCE MINIMUM.

TO ADJUST

POSITION TRIP LEVER WITH CLAMP SCREW LOOSENED. IT MAY ALSO BE NECESSARY TO LOOSEN SET SCREW IN COLLAR.

RELATED ADJUSTMENTS

AFFECTS

- LATCH LEVERS
- CODE BAR CLUTCH FOLLOWER ARM.

AFFECTED BY

- LEFT BEARING
- CODE BAR CAM-CLUTCH

LATCH LEVERS (MAIN SHAFT)

REQUIREMENT

AS GAGED BY EYE

MIN. SOME---MAX. 0.012 INCH END PLAY IN LATCH LEVERS.

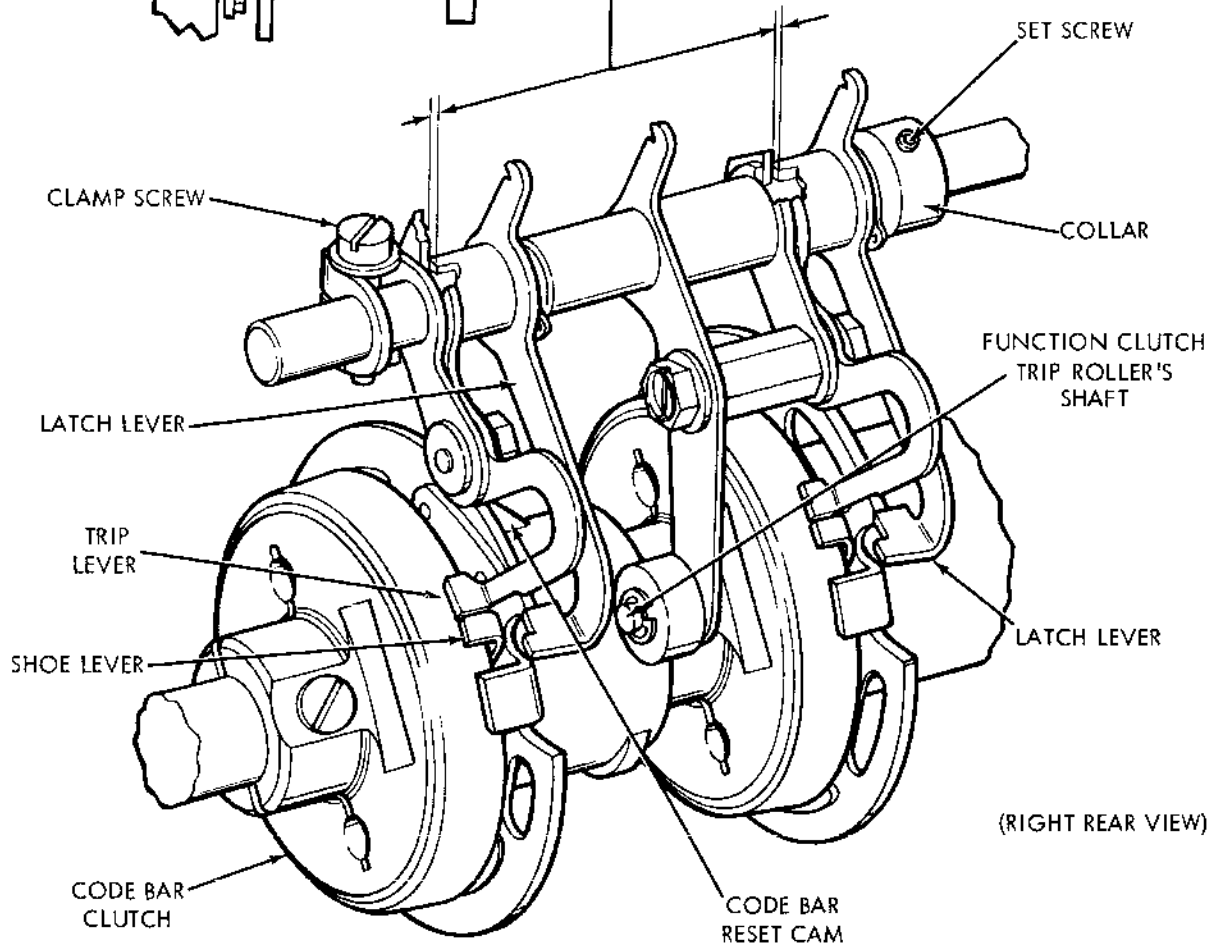
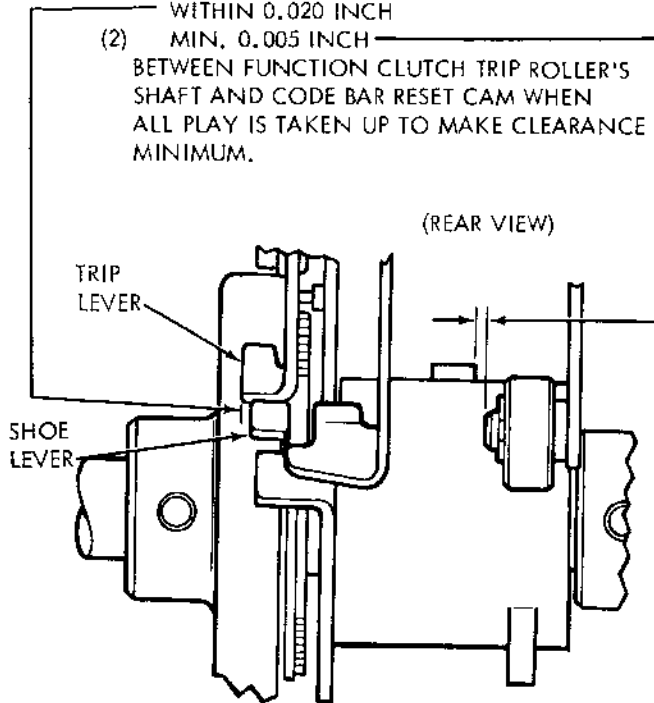
TO ADJUST

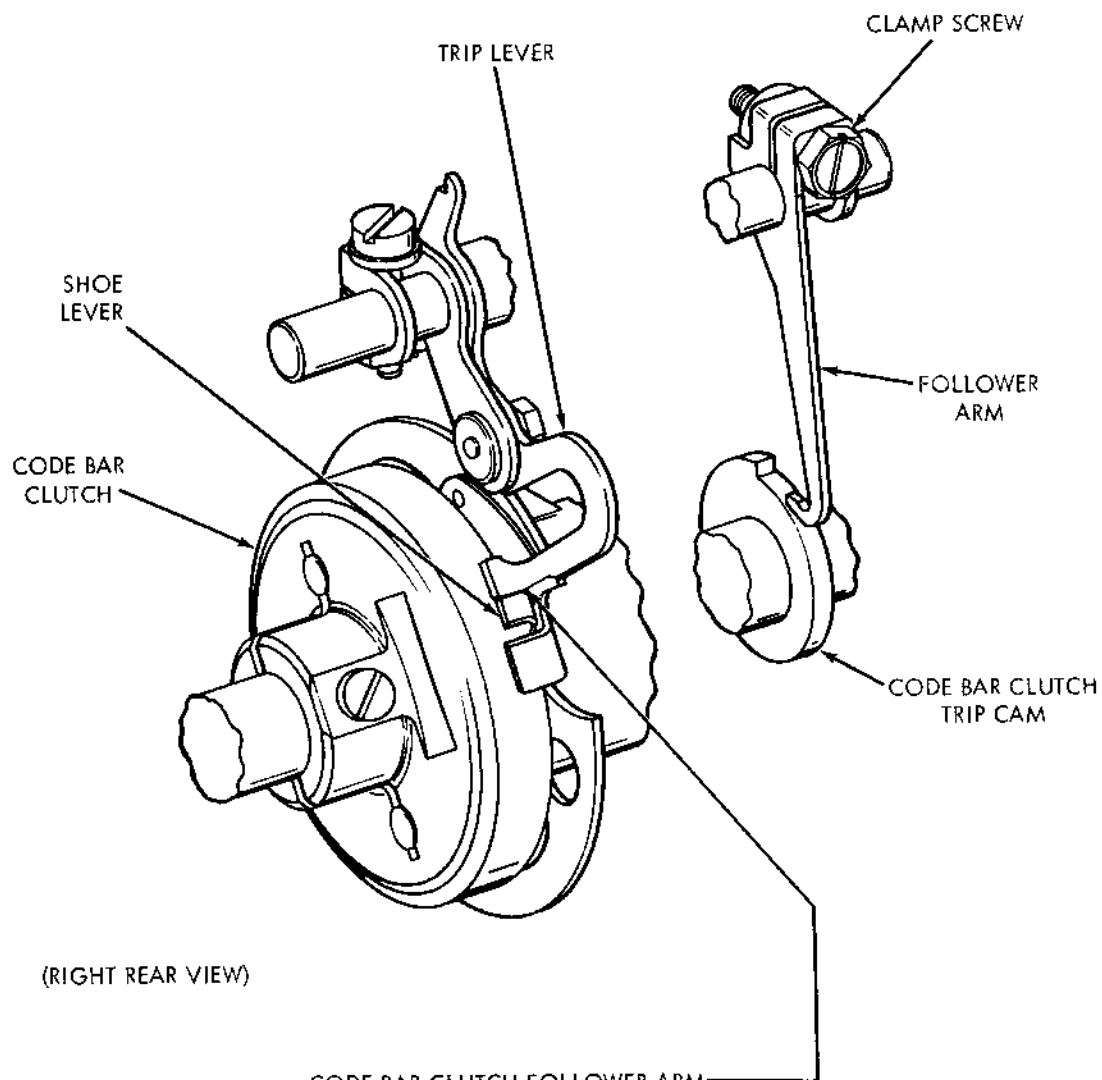
POSITION COLLAR WITH SET SCREW LOOSENED.

RELATED ADJUSTMENTS

AFFECTED BY

- CODE BAR CLUTCH TRIP LEVER





CODE BAR CLUTCH FOLLOWER ARM
(MAIN SHAFT)

REQUIREMENT

WITH PRINTER IN STOP CONDITION,
TRIP LEVER SHOULD FULLY ENGAGE
SHOE LEVER BY APPROXIMATELY FULL
THICKNESS OF CLUTCH SHOE LEVER,
AS GAGED BY EYE.

TO ADJUST

POSITION CODE BAR FOLLOWER ARM
WITH ITS CLAMP SCREW LOOSENED,
MAKE SURE FOLLOWER IS AT CENTER
OF TRIP CAM.

RELATED ADJUSTMENTS

AFFECTED BY
CODE BAR CLUTCH TRIP LEVER

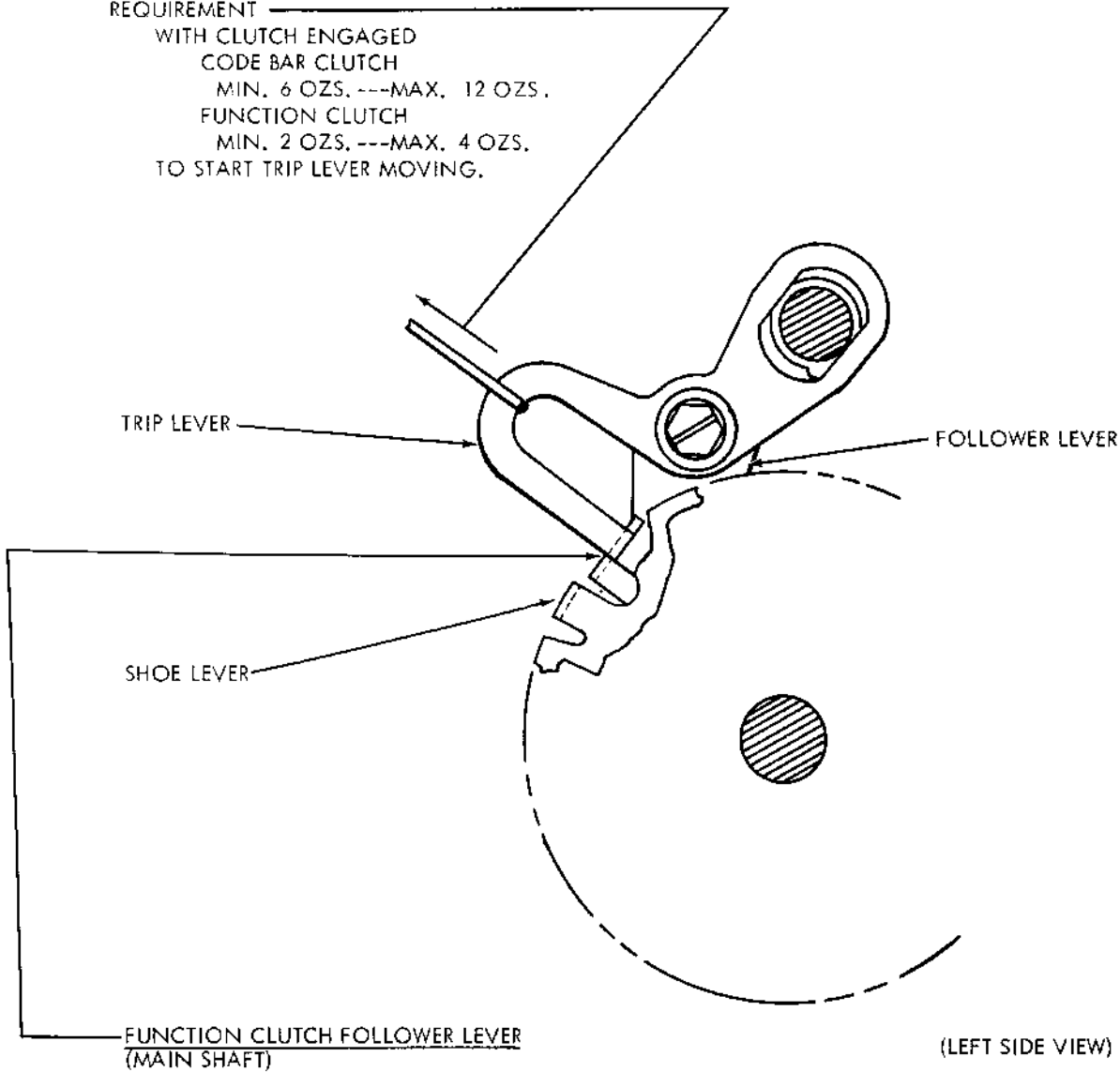
TRIP LEVER SPRINGS (MAIN SHAFT)

NOTE

CHECK FOR BOTH CODE BAR
AND FUNCTION CLUTCHES.

REQUIREMENT

WITH CLUTCH ENGAGED
CODE BAR CLUTCH
MIN. 6 OZS. ---MAX. 12 OZS.
FUNCTION CLUTCH
MIN. 2 OZS. ---MAX. 4 OZS.
TO START TRIP LEVER MOVING.

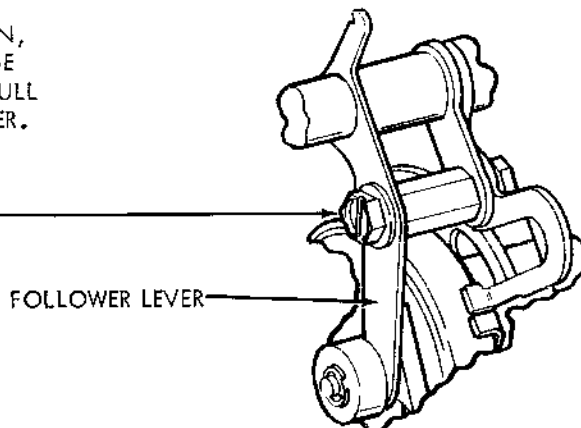


REQUIREMENT

WITH PRINTER IN STOP CONDITION,
TRIP LEVER SHOULD FULLY ENGAGE
SHOE LEVER BY APPROXIMATELY FULL
THICKNESS OF CLUTCH SHOE LEVER.

TO ADJUST

POSITION FOLLOWER LEVER WITH
CLAMP SCREW LOOSENED.



NOTE

MAKE THIS ADJUSTMENT FOR BOTH
FUNCTION AND CODE BAR CLUTCHES.

CODE BAR AND FUNCTION CLUTCH TRIP
LEVERS (MAIN SHAFT)

TO CHECK

DISENGAGE (LATCH) CLUTCH. MEASURE
AND RECORD CLEARANCE BETWEEN SHOE
LEVER AND STOP LUG ON CLUTCH DISK.
TRIP CLUTCH BY MOVING TRIP LEVER
REARWARD. MEASURE AND RECORD SAME
CLEARANCE.

REQUIREMENT

- (1) WITH CLUTCH DISENGAGED (LATCHED)
MIN. 0.015 INCH.
BETWEEN SHOE LEVER AND STOP LUG.
- (2) WITH CLUTCH DISENGAGED AND LATCHED, TRIP
CLUTCH BY LIFTING STOP LEVER PERMITTING
STOP LEVER TO COME TO REST ON CLUTCH
SHOE RELEASE LEVER.
MIN. 0.055 INCH --- MAX. 0.085 INCH
BETWEEN EDGE OF STOP LEVER AND EDGE
OF CLUTCH SHOE RELEASE LEVER CLOSEST TO
DISK STOP LUG.

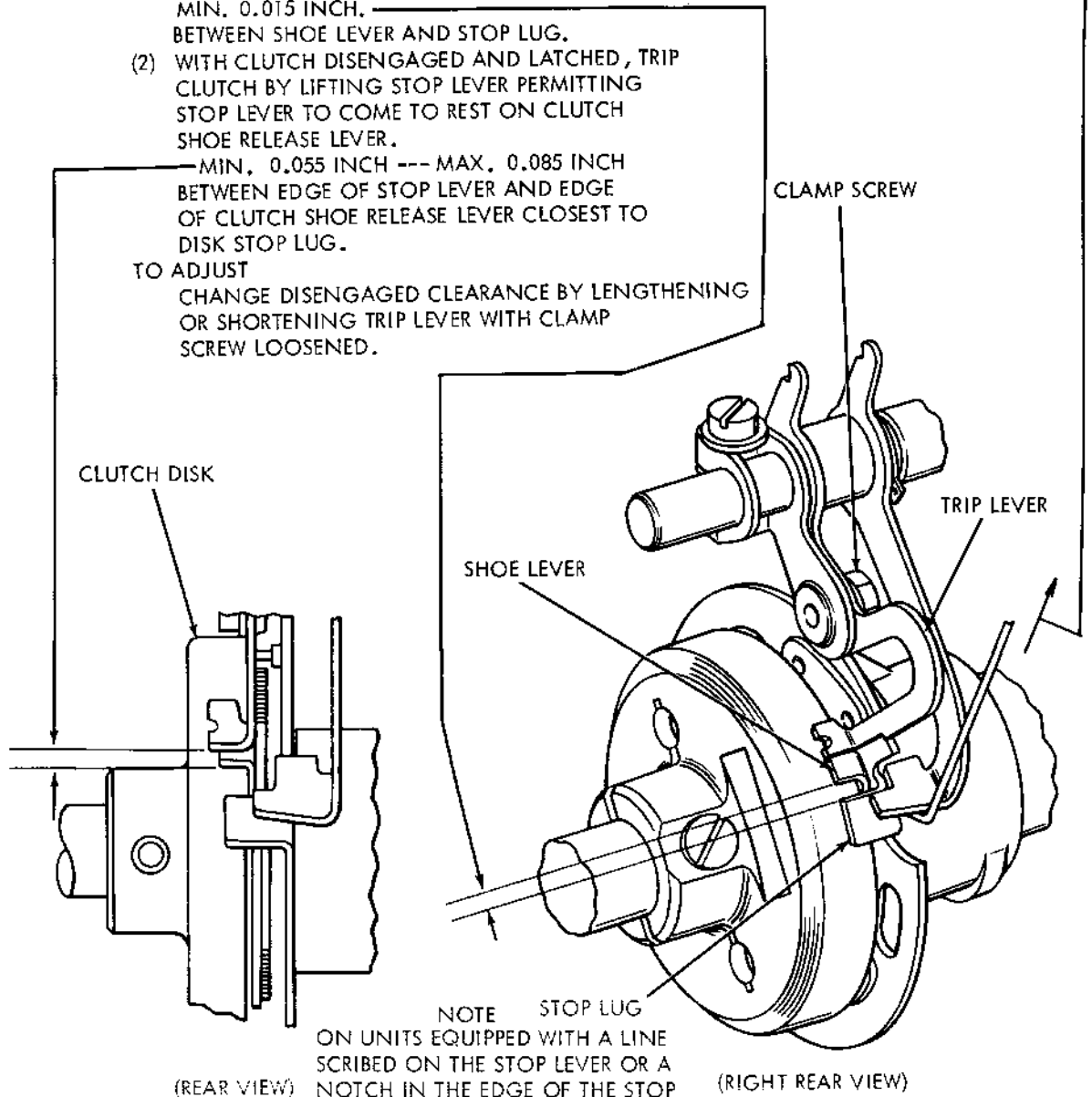
TO ADJUST

CHANGE DISENGAGED CLEARANCE BY LENGTHENING
OR SHORTENING TRIP LEVER WITH CLAMP
SCREW LOOSENED.

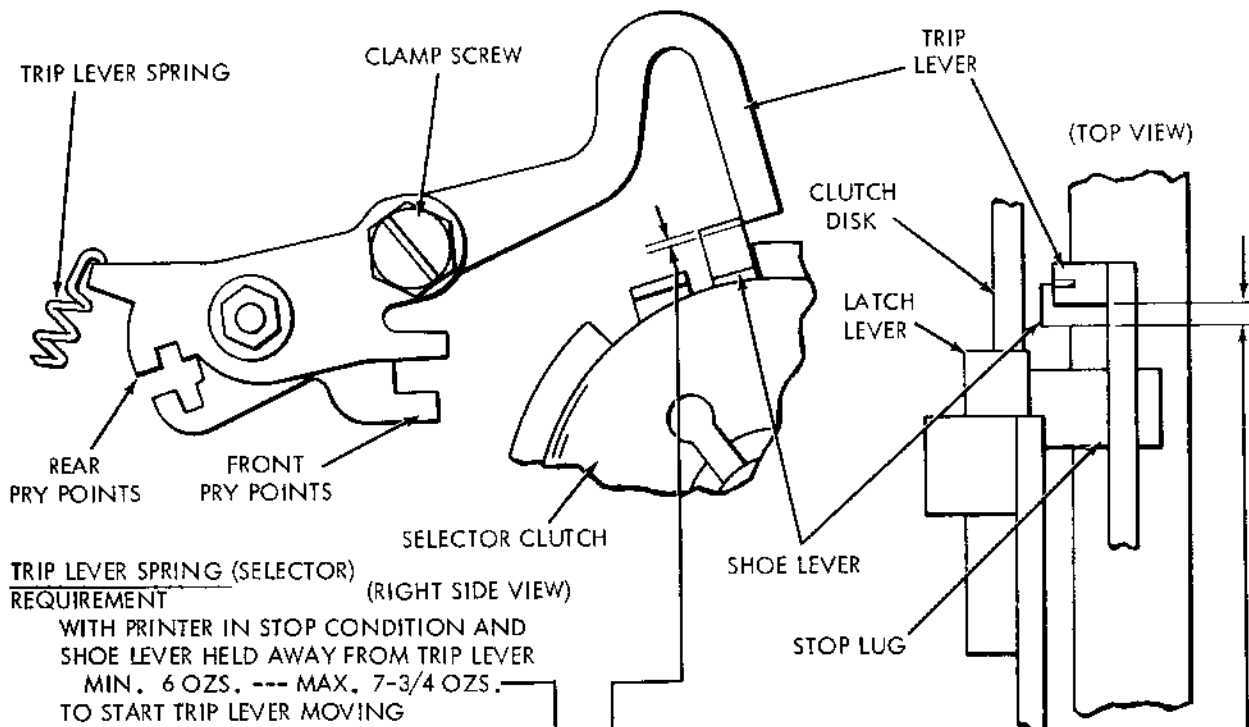
FUNCTION AND CODE BAR CLUTCH
LATCH LEVER SPRING TENSION

REQUIREMENT

WITH LATCH LEVER RESTING ON HIGH
PORTION OF CLUTCH DISC
MIN. 2 OZS. --- MAX. 3 OZS.
TO START LEVER MOVING.



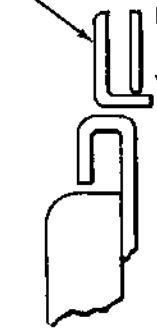
NOTE ON UNITS EQUIPPED WITH A LINE
SCRIBED ON THE STOP LEVER OR A
NOTCH IN THE EDGE OF THE STOP
LEVER, THE LINE SHOULD LINE UP (AS
GAGED BY EYE) WITH THE EDGE OF THE
CLUTCH SHOE LEVER FURTHEST FROM
THE CLUTCH DISK STOP LUG.



**TRIP LEVER SPRING (SELECTOR)
REQUIREMENT**

(RIGHT SIDE VIEW)

WITH PRINTER IN STOP CONDITION AND
SHOE LEVER HELD AWAY FROM TRIP LEVER
MIN. 6 OZS. --- MAX. 7-3/4 OZS.
TO START TRIP LEVER MOVING



NOTE

START LEVER AND LATCH LEVER SPRINGS ALSO
INFLUENCE THIS SPRING TENSION. CHECK
THEM INDIVIDUALLY IF ABOVE REQUIREMENT
IS NOT MET. IF THEY MEET REQUIREMENTS,
REPLACE TRIP LEVER SPRING.

CLUTCH TRIP LEVER (SELECTOR)

TO CHECK

DISENGAGE (LATCH) SELECTOR CLUTCH.
CHECK ENGAGEMENT BETWEEN SHOE LEVER
AND TRIP LEVER (SEE REQUIREMENT (1) BELOW).
MEASURE AND RECORD CLEARANCE BETWEEN
SHOE LEVER AND STOP LUG ON CLUTCH DISK.
TRIP CLUTCH BY MOVING SELECTOR ARMATURE
REARWARD. MAKE SURE CLUTCH DISK IS AGAINST
LATCH LEVER. MEASURE AND RECORD SAME
CLEARANCE.

REQUIREMENT

THE SELECTOR CLUTCH TRIP LEVER SHOULD
(1) ENGAGE CLUTCH SHOE LEVER BY APPROXIMATELY
THE FULL THICKNESS OF CLUTCH SHOE
LEVER.

(2) WITH CLUTCH DISENGAGED (LATCHED)
MIN. 0.015 INCH

BETWEEN SHOE LEVER AND STOP LUG.

(3) WITH CLUTCH IN STOP POSITION (DISENGAGED)
AND LATCHED, TRIP CLUTCH BY LIFTING TRIP LEVER
PERMITTING TRIP LEVER TO COME TO REST ON CLUTCH
SHOE RELEASE LEVER.

MIN. 0.055 INCH --- MAX. 0.085 INCH

BETWEEN THE EDGE OF THE TRIP LEVER AND THE EDGE
OF THE CLUTCH SHOE RELEASE LEVER CLOSEST TO THE
DISK STOP LUG.

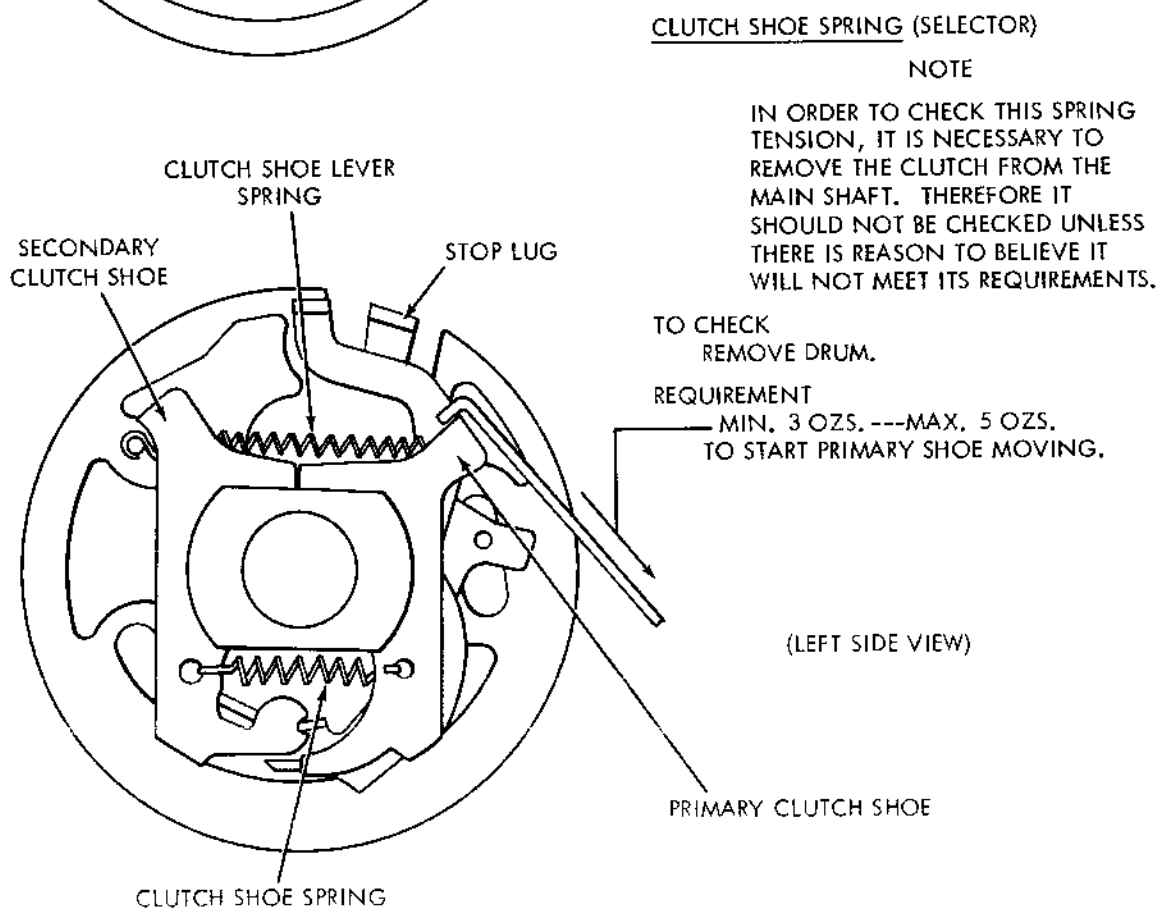
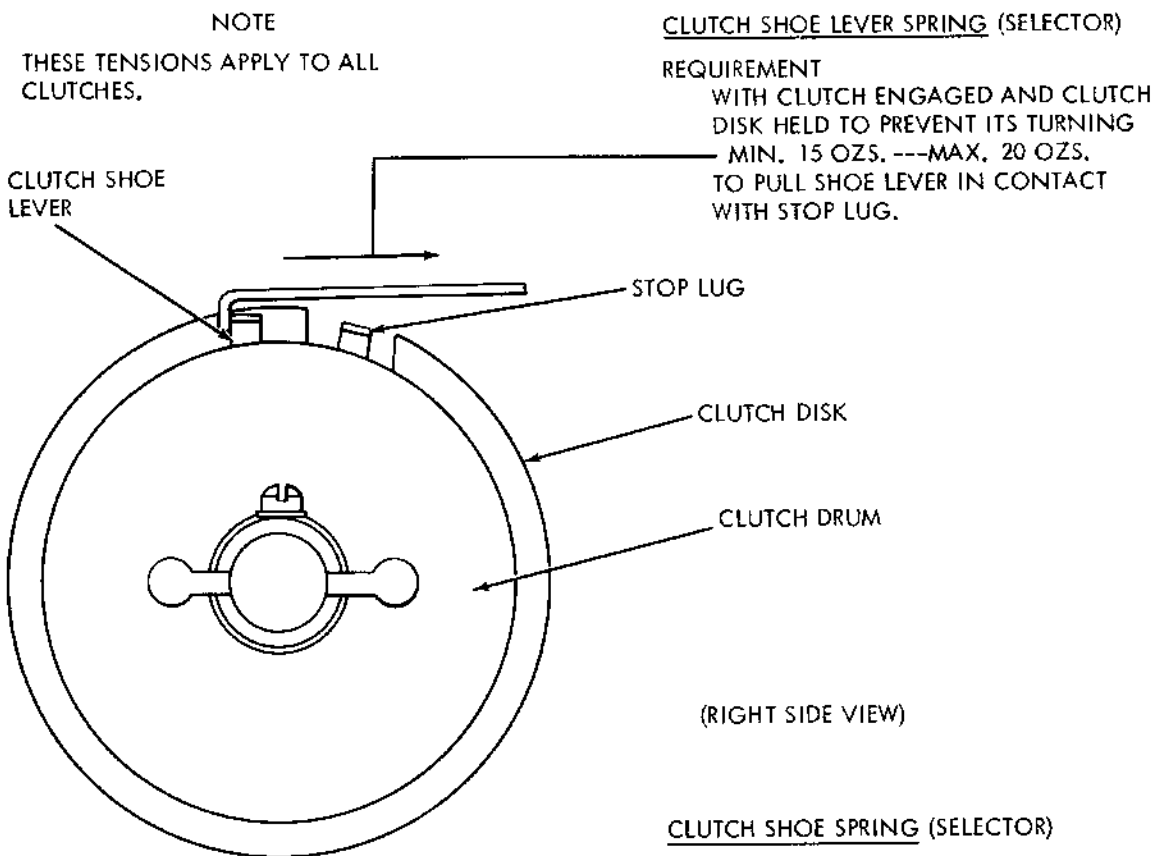
TO ADJUST:

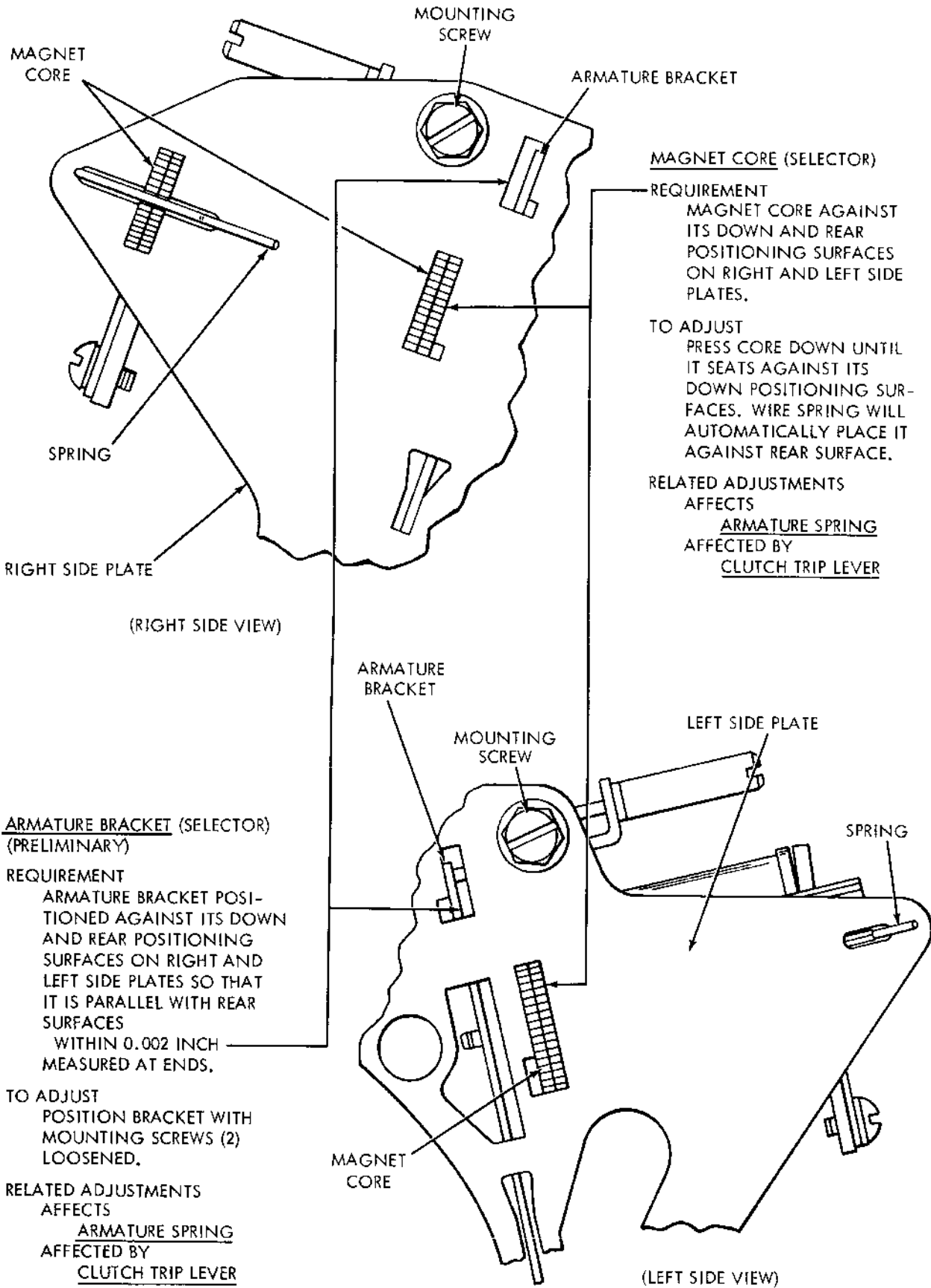
USING REAR PRY POINTS, POSITION TRIP LEVER,
CHANGING THE CLOSED GAP. USING THE FRONT
PRY POINTS, VARY THE CLUTCH "BITE."

RELATED ADJUSTMENTS

AFFECTS

MAGNET CORE
ARMATURE BRACKET

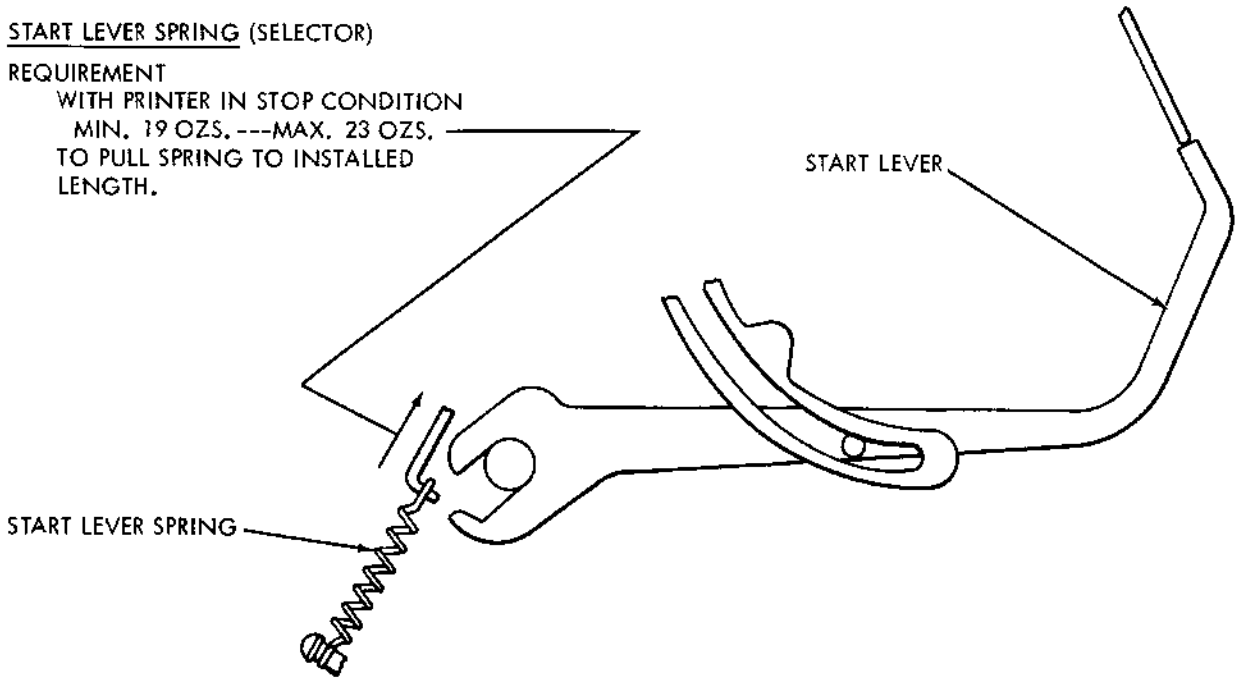




START LEVER SPRING (SELECTOR)

REQUIREMENT

WITH PRINTER IN STOP CONDITION
MIN. 19 OZS. ---MAX. 23 OZS.
TO PULL SPRING TO INSTALLED
LENGTH.

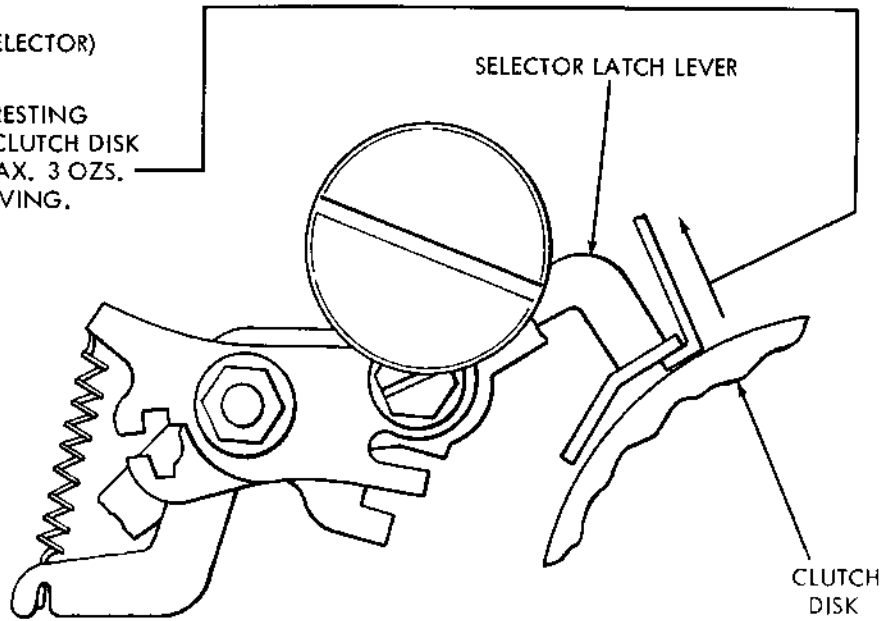


(LEFT SIDE VIEW)

LATCH LEVER SPRING (SELECTOR)

REQUIREMENT

WITH LATCH LEVER RESTING
ON HIGH PART OF CLUTCH DISK
MIN. 2 OZS. ---MAX. 3 OZS.
TO START LEVER MOVING.



(LEFT SIDE VIEW)

SELECTOR LEVER SPRINGS (SELECTOR)

TO CHECK

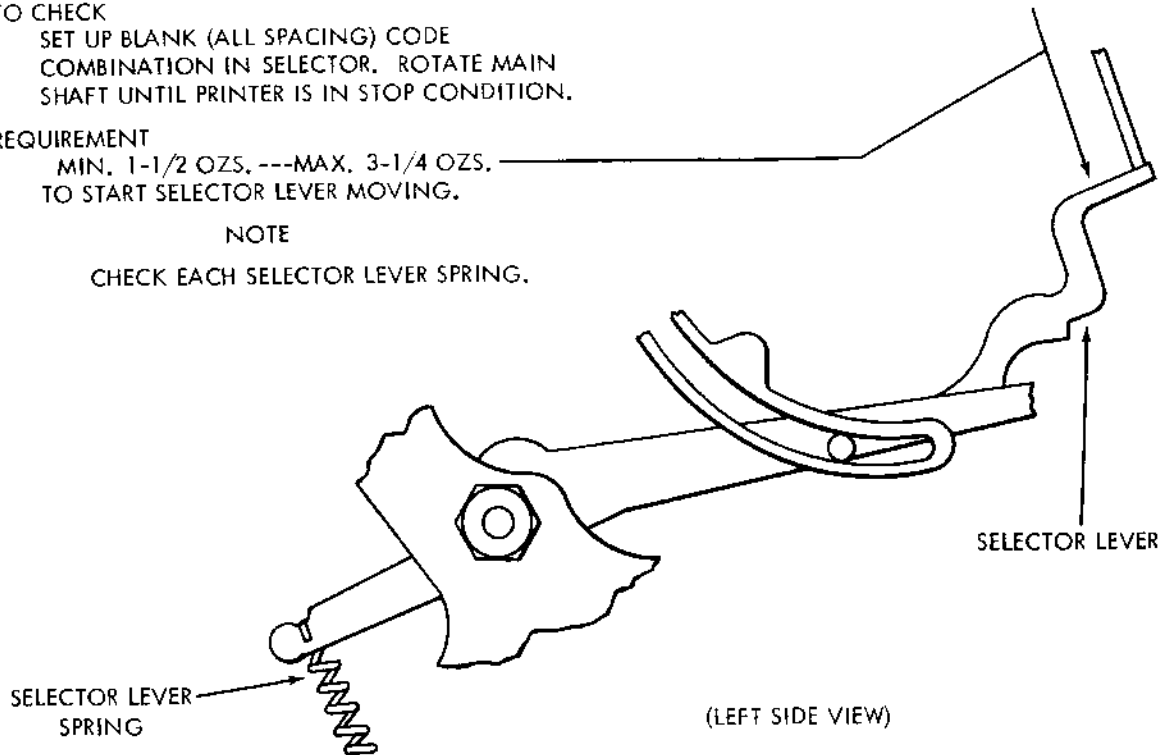
SET UP BLANK (ALL SPACING) CODE
COMBINATION IN SELECTOR. ROTATE MAIN
SHAFT UNTIL PRINTER IS IN STOP CONDITION.

REQUIREMENT

MIN. 1-1/2 OZS. ---MAX. 3-1/4 OZS.
TO START SELECTOR LEVER MOVING.

NOTE

CHECK EACH SELECTOR LEVER SPRING.

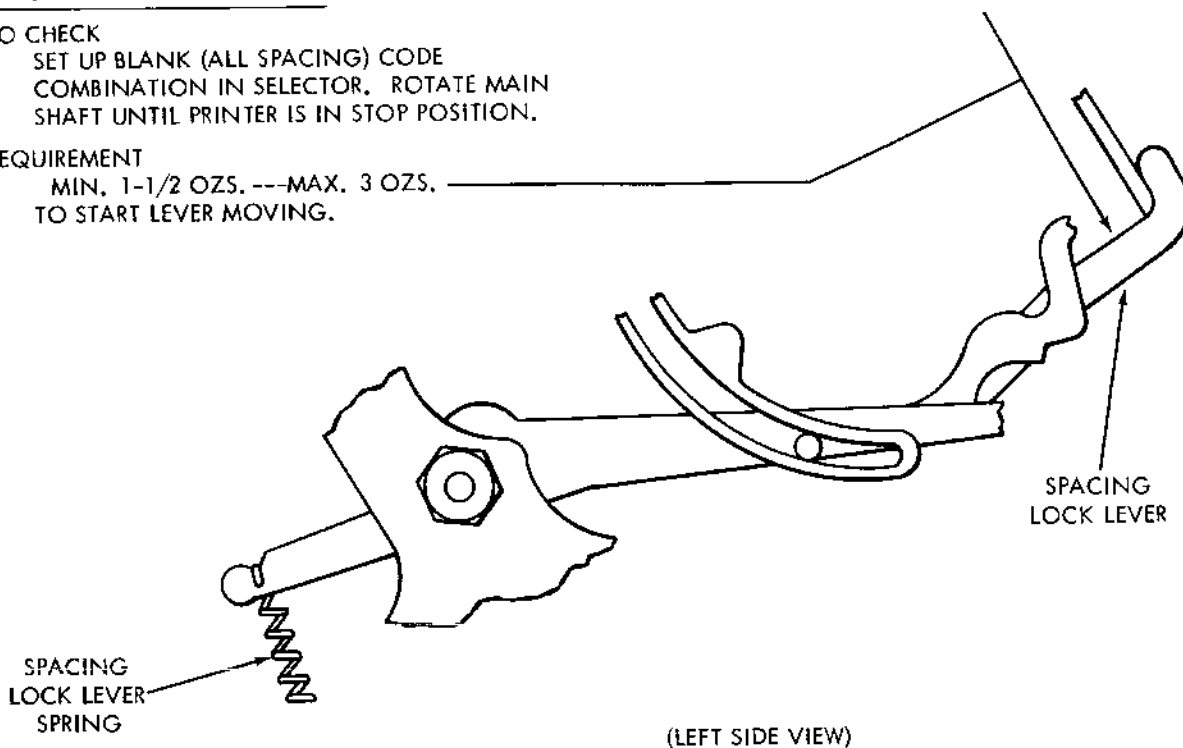
SPACING LOCK LEVER SPRING (SELECTOR)

TO CHECK

SET UP BLANK (ALL SPACING) CODE
COMBINATION IN SELECTOR. ROTATE MAIN
SHAFT UNTIL PRINTER IS IN STOP POSITION.

REQUIREMENT

MIN. 1-1/2 OZS. ---MAX. 3 OZS.
TO START LEVER MOVING.



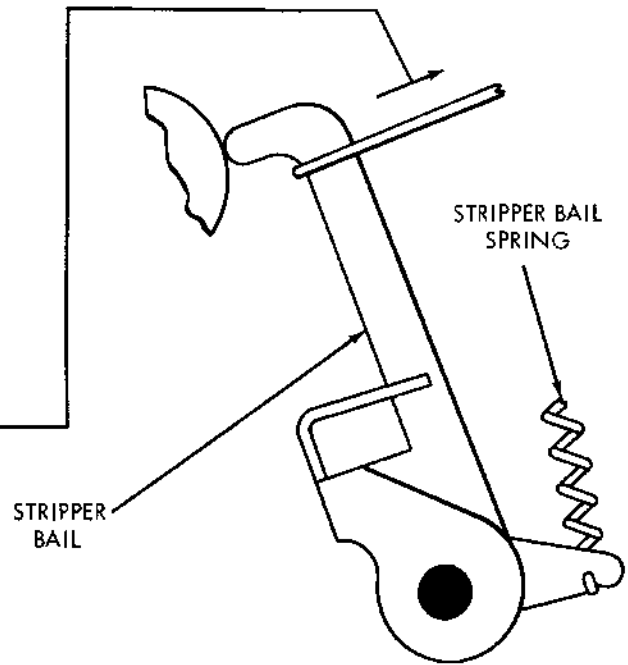
STRIPPER BAIL SPRING (SELECTOR)

TO CHECK

SET RANGE FINDER AT 60. SET UP BLANK CODE COMBINATION (ALL SPACING) IN SELECTOR. ROTATE MAIN SHAFT UNTIL PRINTER IS IN STOP CONDITION.

REQUIREMENT

MIN. 1/4 OZ. ---MAX. 1 OZ. TO START BAIL MOVING.



(LEFT SIDE VIEW)

PUSH LEVER SPRINGS (SELECTOR)

NOTE

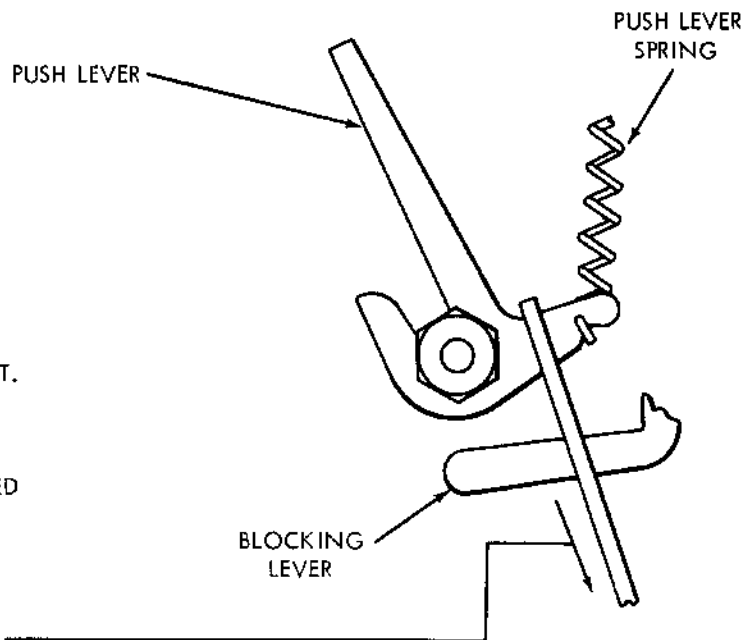
TO MEASURE THIS TENSION, SELECTOR MUST BE REMOVED FROM PRINTER. THEREFORE, DO NOT CHECK IT UNLESS THERE IS CAUSE TO SUSPECT IT WILL NOT MEET REQUIREMENT.

CAUTION

BEFORE REMOVING SELECTOR, MAKE SURE ARMATURE IS LOCKED IN SPACING POSITION.

REQUIREMENT

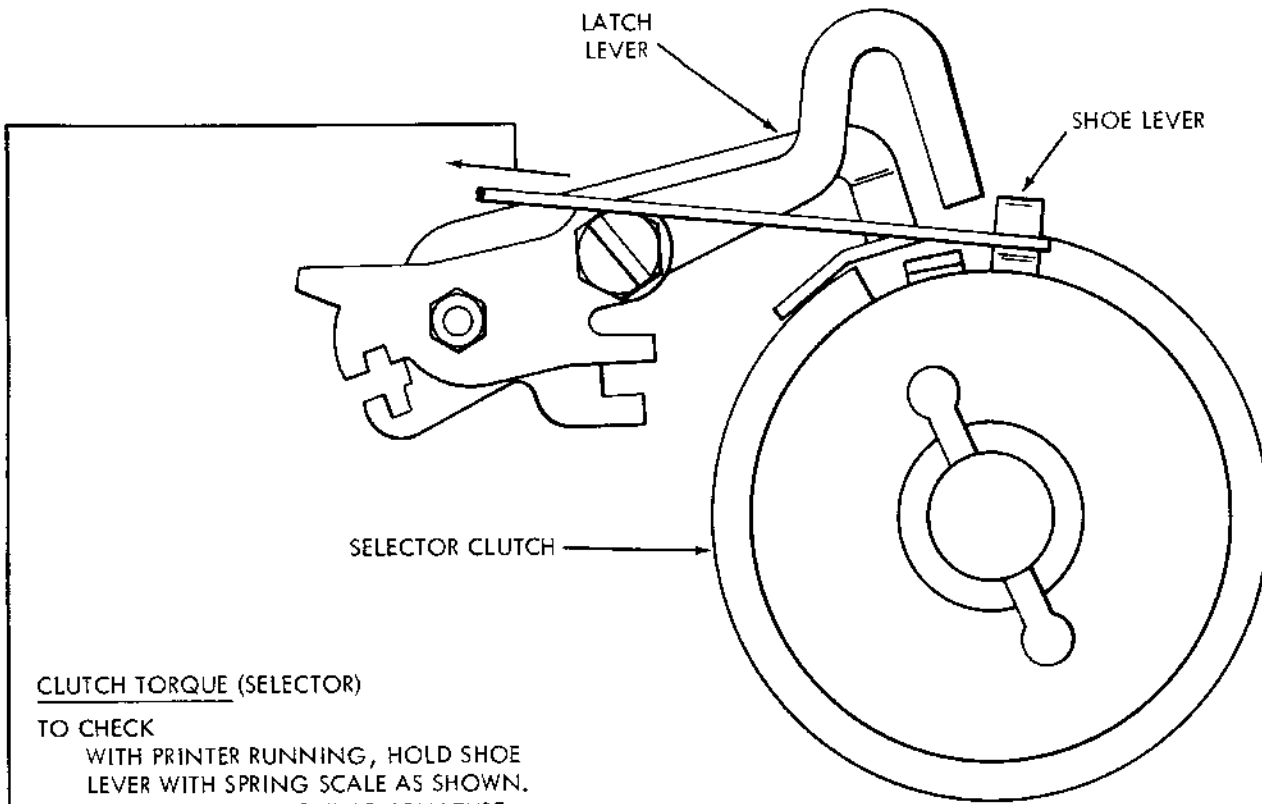
WITH BLOCKING LEVER HELD AWAY FROM PUSH LEVER
MIN. 1-1/2 OZS. ---MAX. 3 OZS. TO START LEVER MOVING.



(LEFT SIDE VIEW)

NOTE

CHECK EACH PUSH LEVER SPRING.



SELECTOR CLUTCH

SHOE LEVER

LATCH LEVER

(LEFT SIDE VIEW)

CLUTCH TORQUE (SELECTOR)

TO CHECK

WITH PRINTER RUNNING, HOLD SHOE LEVER WITH SPRING SCALE AS SHOWN. TRIP CLUTCH BY MOVING ARMATURE REARWARD. ALLOW CLUTCH TO ADVANCE UNTIL LATCH LEVER IS DISENGAGED.

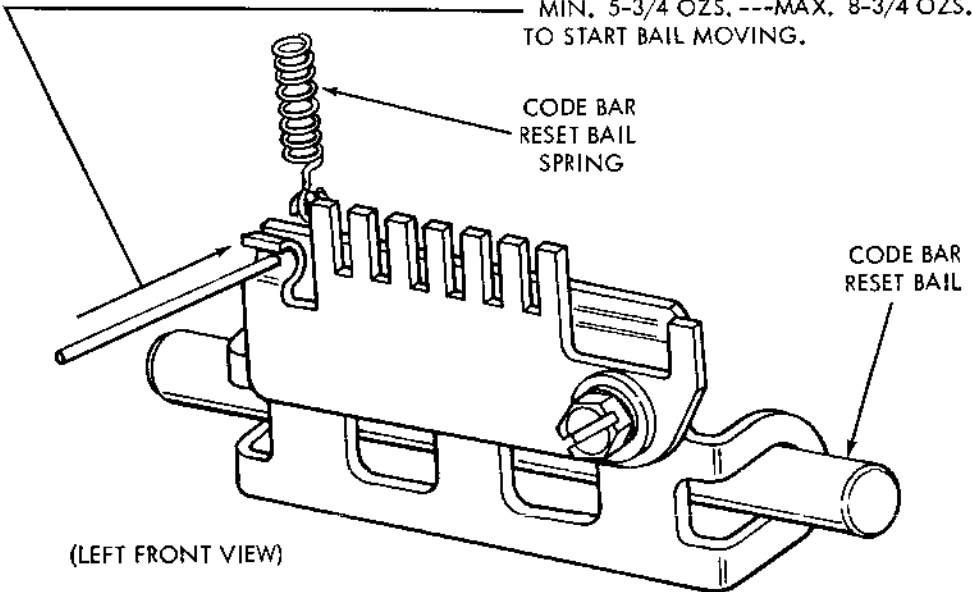
REQUIREMENT

MIN. 13 OZS. ---MAX. 16 OZS. TO HOLD SHOE LEVER.

CODE BAR RESET BAIL SPRING (FUNCTION)

REQUIREMENT

WITH BLANK SELECTED AND MAIN SHAFT ROTATED UNTIL CODE BAR RESET BAIL IS IN HIGHEST POSITION, MIN. 5-3/4 OZS. ---MAX. 8-3/4 OZS. TO START BAIL MOVING.



CODE BAR RESET BAIL SPRING

CODE BAR RESET BAIL

(LEFT FRONT VIEW)

MAIN SHAFT TORQUE (VARIOUS AREAS)

NOTE

THIS ADJUSTMENT REQUIRES USE OF TORQUE WRENCH. IT NEED NOT BE CHECKED UNLESS COMPLETE READJUSTMENT IS BEING UNDERTAKEN OR ADJUSTMENTS AFFECTING DRIVE SYSTEM HAVE BEEN CHANGED.

REQUIREMENT

- (1) WITH MOTOR BELT OFF AND ALL CLUTCHES DISENGAGED (LATCHED)
MAX. 35 IN. -OZS.
TO START MAIN SHAFT ROTATING.
- (2) WITH MOTOR BELT IN PLACE AND ALL CLUTCHES DISENGAGED (LATCHED)
MAX. 45 IN. -OZS.
TO START MAIN SHAFT ROTATING (CHECK IN AT LEAST EIGHT DIFFERENT POSITIONS ON SHAFT).

TO ADJUST

IF REQUIREMENTS ARE NOT MET, CHECK FOLLOWING ADJUSTMENTS:

- (1) GEAR BRACKET (MOTOR)
- (2) BELT TENSION (MOTOR)
- (3) CAM-CLUTCH (SELECTOR)
- (4) LEFT BEARING (MAIN SHAFT)
- (5) BEARING ALIGNMENT (VARIOUS AREAS)
- (6) FUNCTION CAM-CLUTCH END PLAY (MAIN SHAFT)
- (7) CODE BAR CAM-CLUTCH (MAIN SHAFT)
- (8) DRIVEN GEAR (MAIN SHAFT)
- (9) CLUTCH TRIP LEVER (SELECTOR)

IF ANY OF ABOVE ADJUSTMENTS ARE CHANGED, RECHECK BEARING ALIGNMENT (VARIOUS AREAS).

BEARING ALIGNMENT (VARIOUS AREAS)

NOTE

THIS ADJUSTMENT APPLIES TO MAIN SHAFT BEARINGS (PAGE 4-15 AND 4-17), DISTRIBUTOR SHAFT BEARINGS (PAGE 4-12), FUNCTION ROCKER SHAFT BEARINGS (PAGE 4-30), AND CODE BAR RESET BAIL BEARINGS (PAGE 4-31). IT SHOULD ONLY BE MADE IF BEARING CLAMPS HAVE LOOSENED, OR IF A BIND IS DETECTED IN ASSOCIATED SHAFT.

REQUIREMENT

BEARINGS ALIGNED WITH THEIR RESPECTIVE SHAFTS.

TO ADJUST

WITH BEARING CLAMP SCREWS TIGHT, TAP SHAFT WITH SCREWDRIVER HANDLE, PIECE OF WOOD, OR SOFT Mallet IN AREA ADJACENT TO BEARING. WHEN ALIGNING MAIN SHAFT BEARINGS, LOOSEN SELECTOR MOUNTING SCREWS.

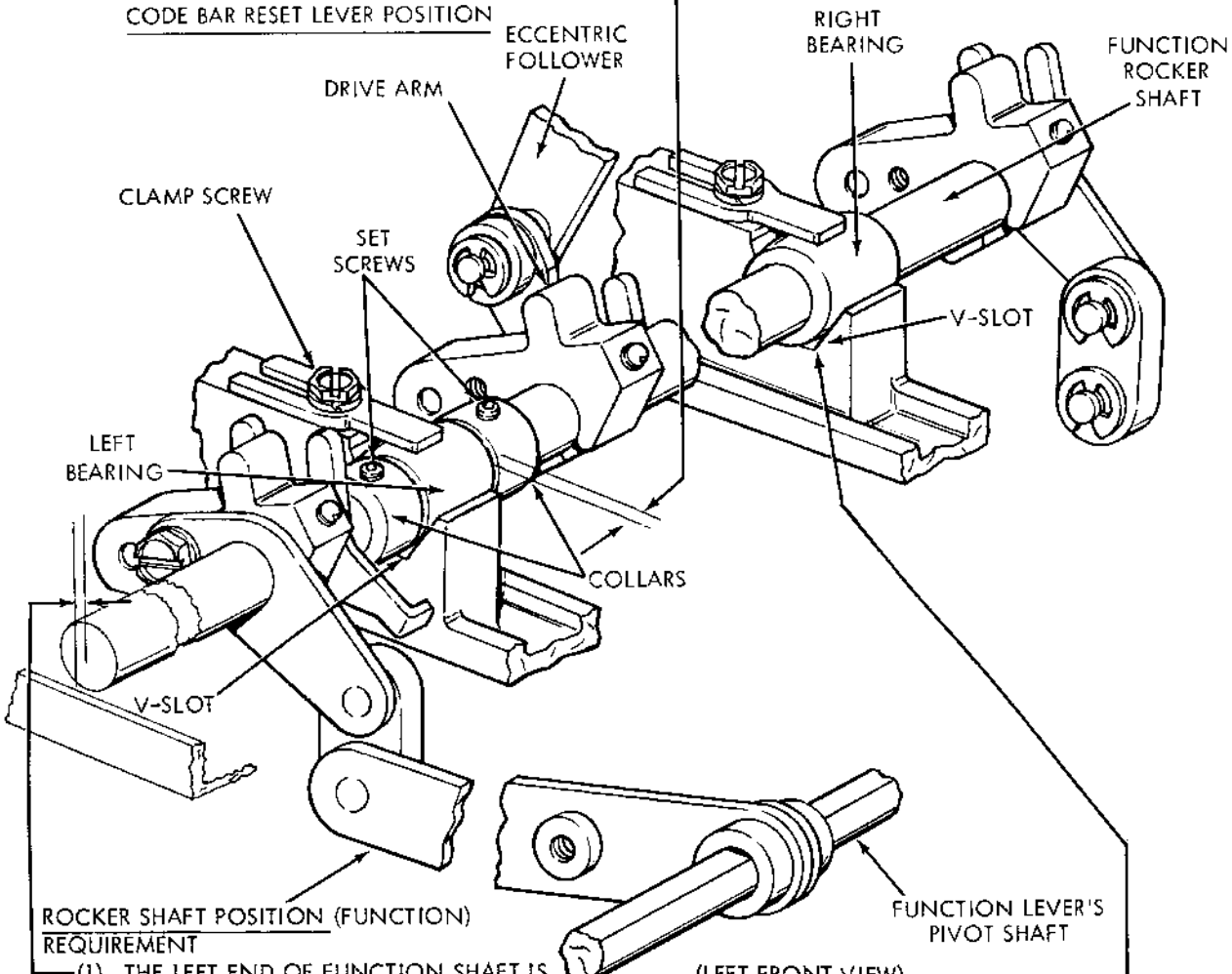
ROCKER SHAFT END PLAY (FUNCTION)

REQUIREMENT

AS GAGED BY EYE
 MIN. SOME---MAX. 0.010 INCH
 END PLAY IN FUNCTION ROCKER SHAFT.

TO ADJUST
 POSITION TWO COLLARS WITH SET
 SCREWS LOOSENED.

RELATED ADJUSTMENT
 AFFECTS
CODE BAR RESET LEVER POSITION



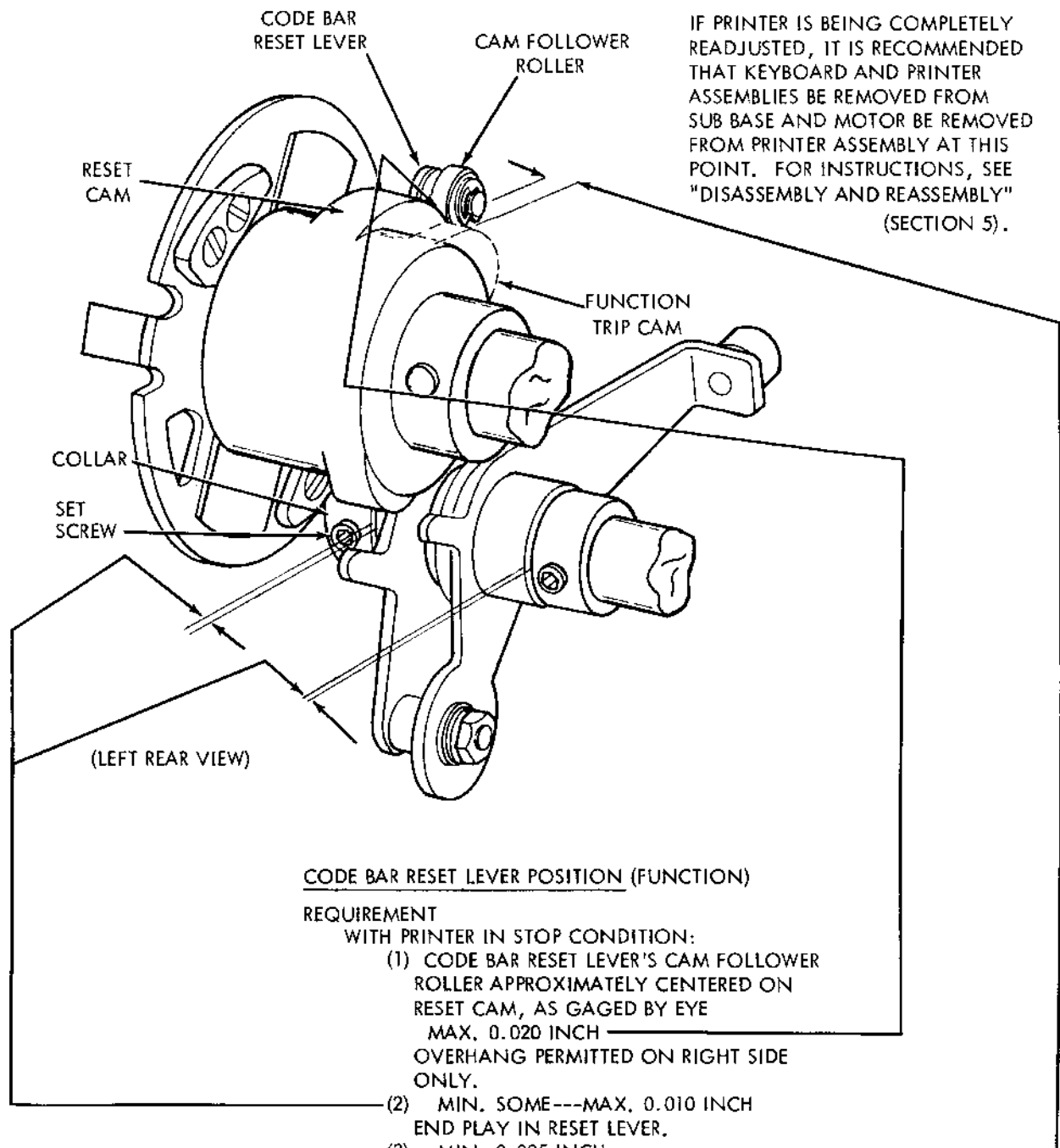
ROCKER SHAFT POSITION (FUNCTION)

REQUIREMENT

- (1) THE LEFT END OF FUNCTION SHAFT IS TO LINE UP WITH INSIDE TOP EDGE OF DIE CASTING "LIP".
 0.020 INCH MISALIGNMENT IS PERMISSIBLE TO THE LEFT.
 0.030 INCH MISALIGNMENT IS PERMISSIBLE TO THE RIGHT.
- (2) BOTH BEARINGS TO BE CENTERED ON BASE CASTING, AS GAGED BY EYE.

TO ADJUST
 POSITION SHAFT WITH LEFT BEARINGS CLAMP
 SCREW LOOSENED.

RELATED ADJUSTMENT
 AFFECTS
CODE BAR RESET LEVER POSITION



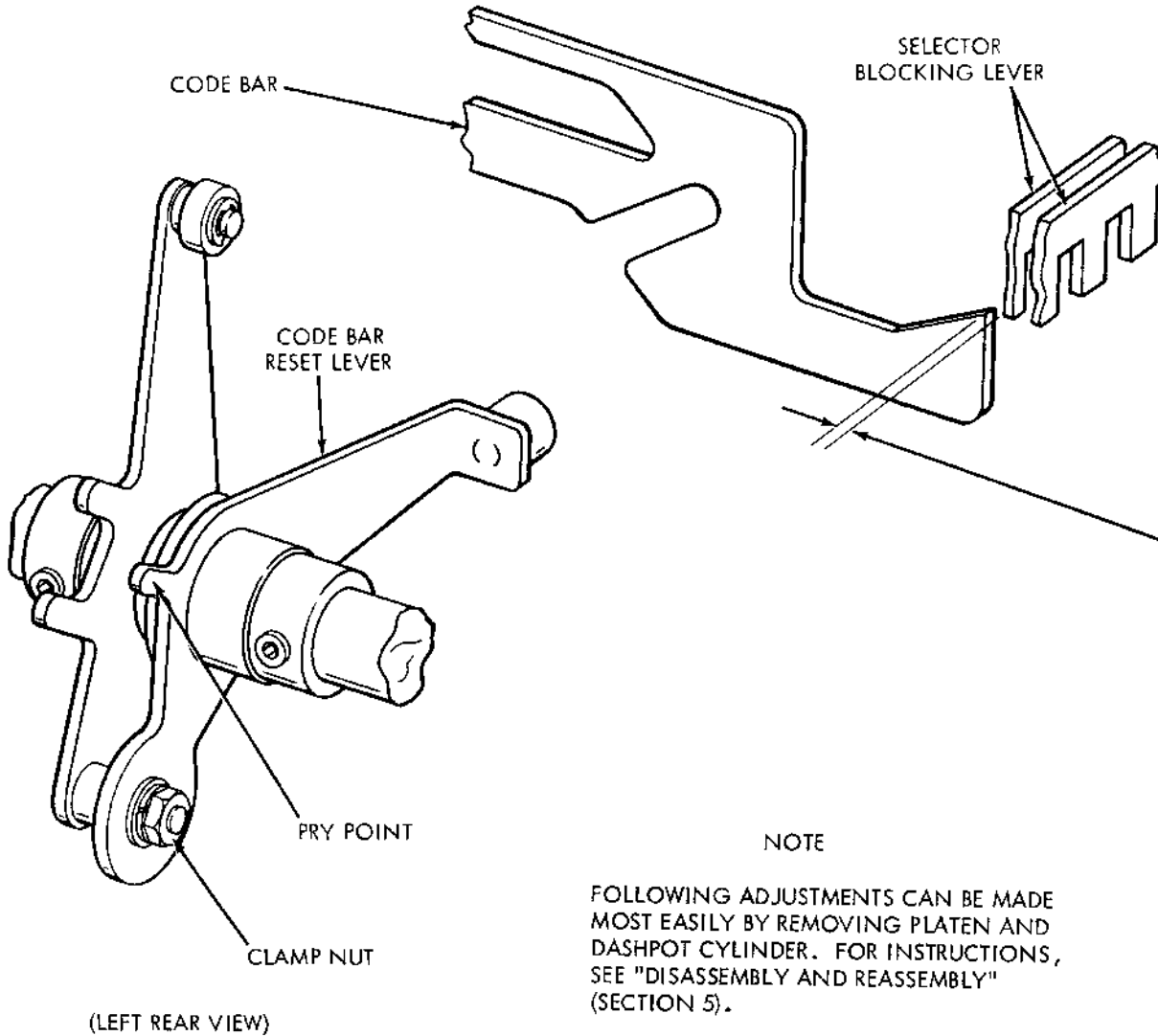
TO ADJUST
POSITION TWO COLLARS WITH SET SCREWS
LOOSENED.

RELATED ADJUSTMENTS
AFFECTS

CODE BAR RESET LEVER

AFFECTED BY

ROCKER SHAFT POSITION
ROCKER SHAFT END PLAY



(LEFT REAR VIEW)

NOTE

FOLLOWING ADJUSTMENTS CAN BE MADE MOST EASILY BY REMOVING PLATEN AND DASHPOT CYLINDER. FOR INSTRUCTIONS, SEE "DISASSEMBLY AND REASSEMBLY" (SECTION 5).

CODE BAR RESET LEVER (FUNCTION)

REQUIREMENT

WITH PRINTER IN STOP CONDITION (ALL CLUTCHES LATCHED)

MIN. 0.012 INCHES --- MAX. 0.030 INCHES
 CLEARANCE BETWEEN CODE BAR CLOSEST TO FRONT OF UNIT AND ITS SELECTING BLOCKING LEVER WHEN ALL PARTS ARE POSITIONED TO MAKE THIS CLEARANCE A MINIMUM.

TO ADJUST

USING PRY POINT, ADJUST CODE BAR RESET LEVER WITH CLAMP NUT LOOSENED.

(1) TO CHECK

PUSH ALL CODE BARS DOWN. IF NO MOVEMENT IS NOTED BETWEEN CODE BARS AND THEIR GUIDE POSTS, REFINE ADJUSTMENT ABOVE.

(2) TO CHECK

IF INTERFERENCE IS NOTED BETWEEN THE CARRIAGE DRIVE LINK AND CODE BARS DURING THE NORMAL OPERATING CYCLE AND/OR IF IT ADDS TO THE PRINTERS INHERENT NOISE, REFINE REQUIREMENT ABOVE.

RELATED ADJUSTMENTS

AFFECTS

- PRINT SUPPRESSION LATCH
- PRINT SUPPRESSION CAM FOLLOWER

AFFECTED BY

CODE BAR RESET LEVER POSITION

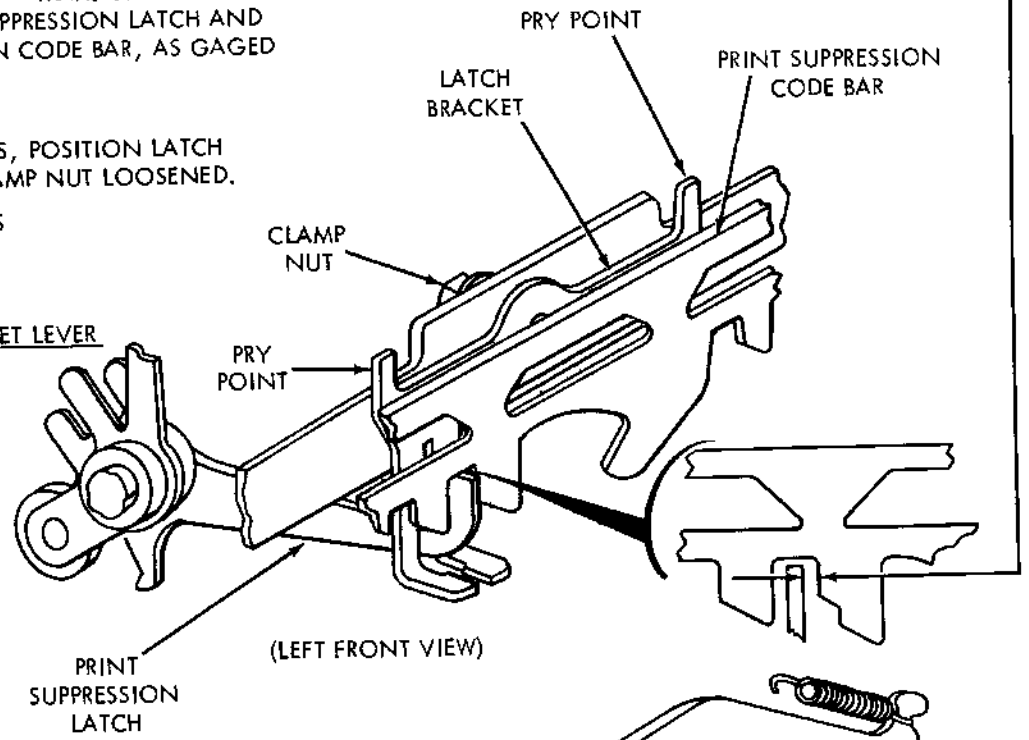
PRINT SUPPRESSION LATCH (FUNCTION)

REQUIREMENT

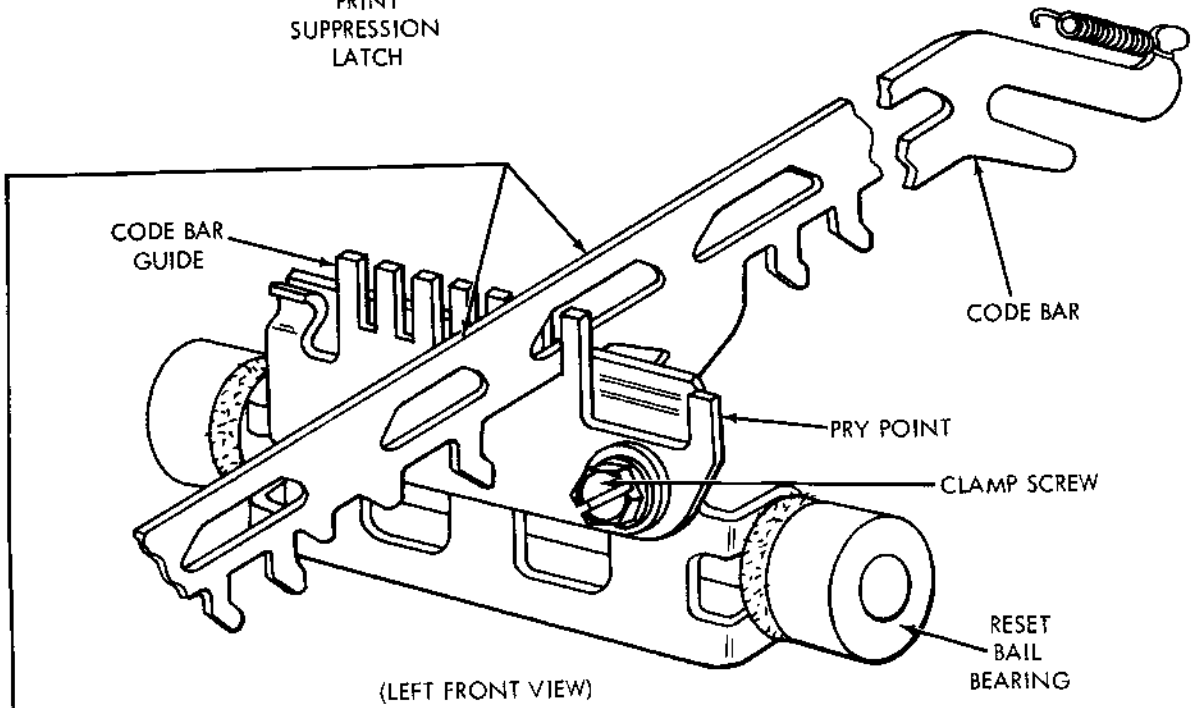
WITH PRINTER IN THE STOP CONDITION
 MIN. 0.010 INCH---MAX. 0.025 INCH
 BETWEEN PRINT SUPPRESSION LATCH AND
 PRINT SUPPRESSION CODE BAR, AS GAGED
 BY EYE.

TO ADJUST
 USING PRY POINTS, POSITION LATCH
 BRACKET WITH CLAMP NUT LOOSENED.

RELATED ADJUSTMENTS
 AFFECTS
CASTING
 AFFECTED BY
CODE BAR RESET LEVER



(LEFT FRONT VIEW)



(LEFT FRONT VIEW)

CODE BAR GUIDE (FUNCTION)

TO CHECK
 POSITION CARRIAGE AT LEFT SIDE OF PRINTER. PUSH AND PULL CODE BARS AT SPRING HOOK END.

REQUIREMENT
 NO EXCESSIVE DEFLECTION IN EITHER DIRECTION OF CODE BARS NEAR THEIR CENTER.

TO ADJUST
 USING PRY POINT, POSITION CODE BAR GUIDE WITH CLAMP SCREW LOOSENED.

BLOCKING LEVERS (SELECTOR)REQUIREMENT

WITH THE "RUB-OUT" CODE COMBINATION SET UP IN SELECTOR, SELECTOR LEVERS ON PEAK OF THEIR RESPECTIVE CAMS, AND CODE BAR ENDS APPROXIMATELY FLUSH WITH THE LEFT (OUTER) EDGE OF THE BLOCKING LEVERS,

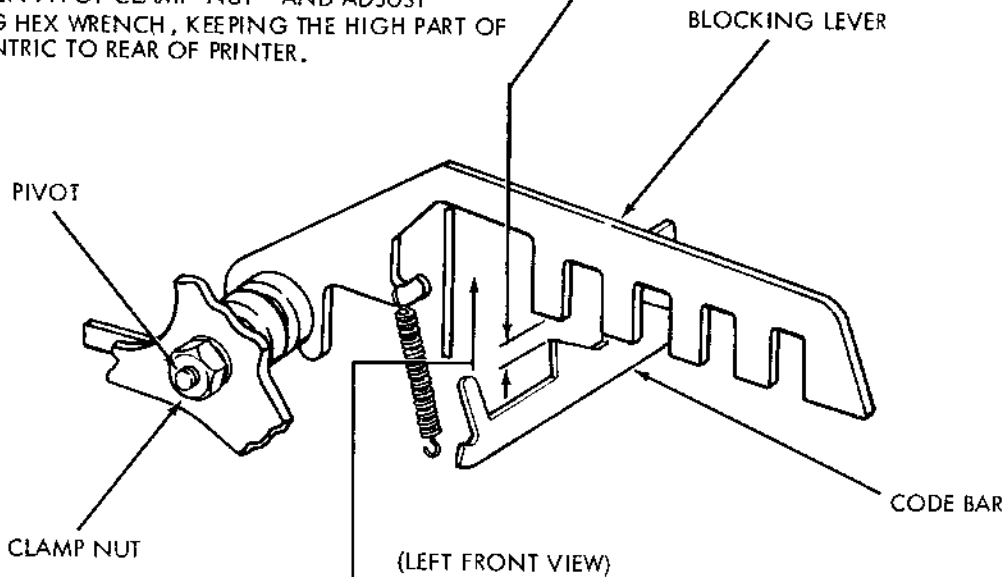
MIN. 0.006 INCH --- MAX. 0.060 INCH BETWEEN THE BLOCKING LEVERS AND THE CODE BARS.

TO CHECK

(ON 8 LEVEL UNITS ONLY SET THE RANGE SCALE INDICATOR BETWEEN 70 AND 80) ENERGIZE THE SELECTOR MAGNET AND SET UP "RUB-OUT" CODE COMBINATION IN SELECTOR, WITH SELECTOR CLUTCH LATCHED IN ITS "STOP" POSITION, MANUALLY TRIP CODE BAR CLUTCH AND ROTATE MAINSHAFT, ALLOWING CODE BARS TO RISE UNTIL THEIR ENDS ARE APPROXIMATELY FLUSH WITH LEFT (OUTER) EDGE OF BLOCKING LEVERS.

TO ADJUST

LOOSEN PIVOT CLAMP NUT AND ADJUST USING HEX WRENCH, KEEPING THE HIGH PART OF ECCENTRIC TO REAR OF PRINTER.

BLOCKING LEVER SPRINGS (SELECTOR)TO CHECK

SET UP BLANK (ALL SPACING) CODE COMBINATION IN SELECTOR. ROTATE MAIN SHAFT UNTIL PRINTER IS IN STOP CONDITION.

REQUIREMENT

MIN. 1/2 OZ. ---MAX. 1-1/4 OZS. TO START LEVER MOVING.

NOTE

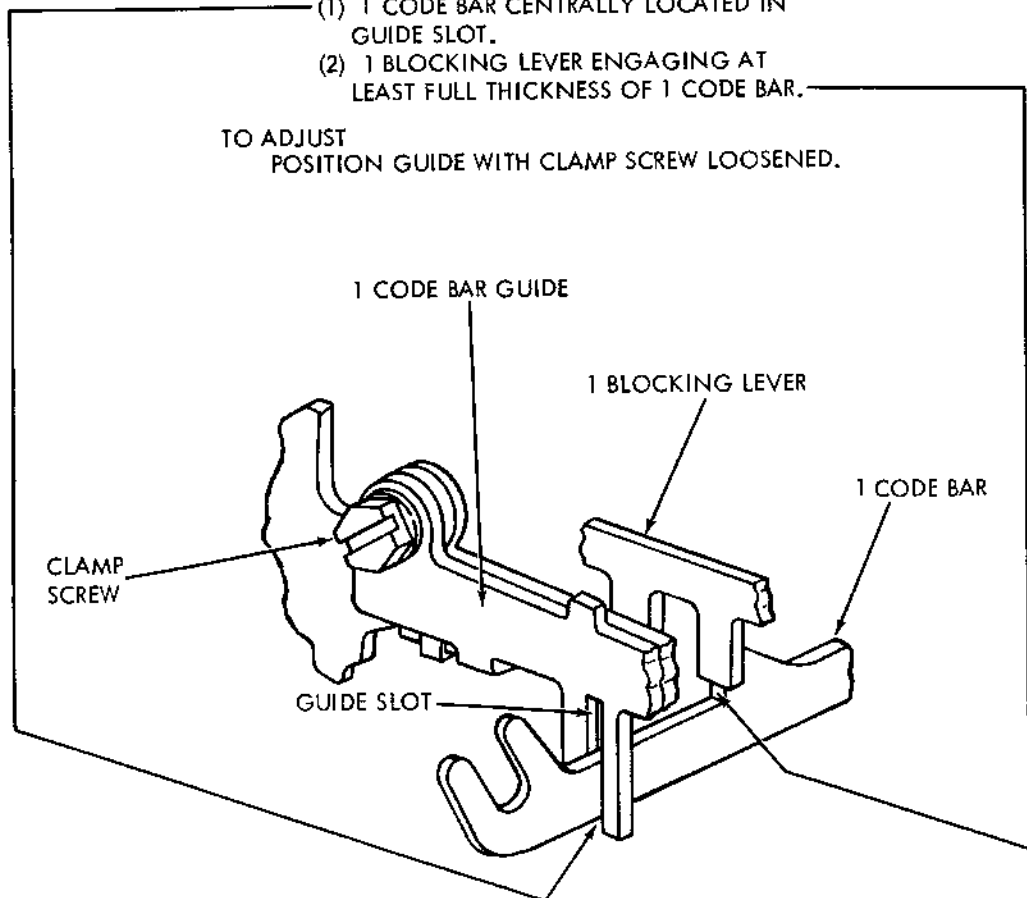
CHECK FOR EACH BLOCKING LEVER SPRING.

NO. 1 CODE BAR GUIDE (FUNCTION) - MODEL 33 ONLY

REQUIREMENT
WITH PRINTER IN STOP CONDITION

- (1) 1 CODE BAR CENTRALLY LOCATED IN GUIDE SLOT.
- (2) 1 BLOCKING LEVER ENGAGING AT LEAST FULL THICKNESS OF 1 CODE BAR.

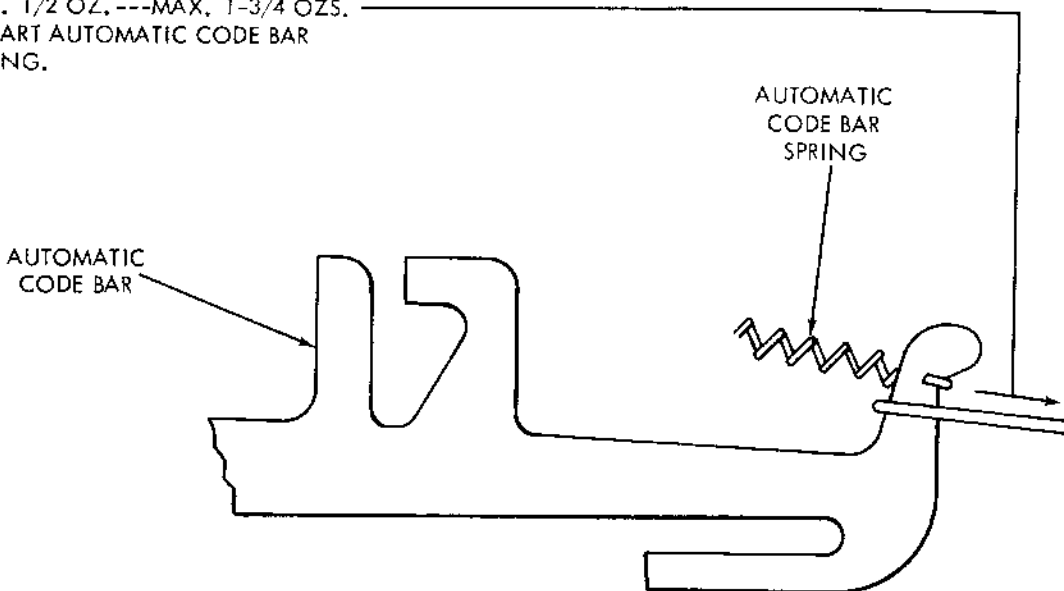
TO ADJUST
POSITION GUIDE WITH CLAMP SCREW LOOSENED.



AUTOMATIC CODE BAR SPRING (FUNCTION)

REQUIREMENT

WITH CARRIAGE AT LEFT MARGIN
 MIN. 1/2 OZ. ---MAX. 1-3/4 OZS.
 TO START AUTOMATIC CODE BAR
 MOVING.



NO. 3 CODE BAR SPRING (FUNCTION)*

REQUIREMENT

WITH PRINTER IN STOP CONDITION
 AND NO. 3 CODE BAR'S FOLLOWER *
 ON CARRIAGE LIFTED
 MIN. 12 OZS. ---MAX. 14 OZS.
 TO START CODE BAR MOVING.

NOTE

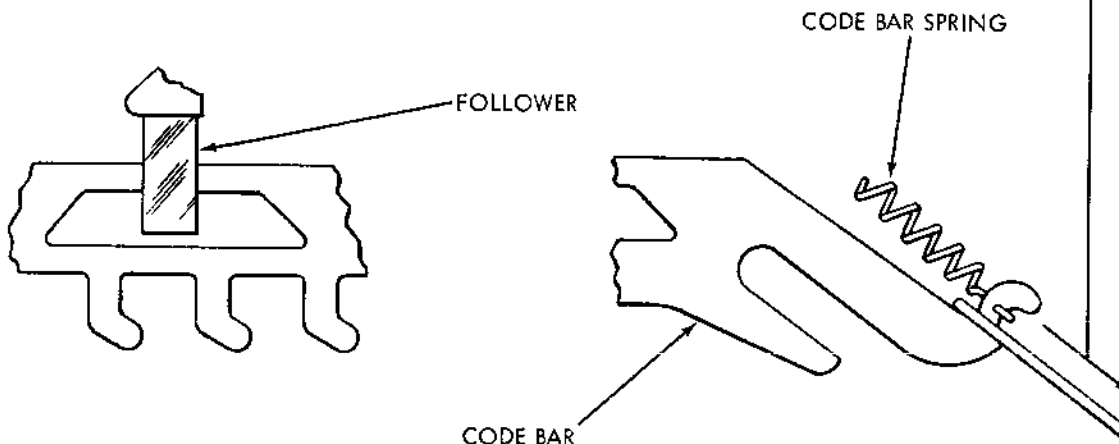
CHECK FOR EACH CODE BAR SPRING
 OTHER THAN AUTOMATIC AND NO. 3.*

CODE BAR SPRINGS (FUNCTION)

(OTHER THAN NO.3 AND AUTOMATIC)*

REQUIREMENT

WITH PRINTER IN STOP CONDITION
 AND CODE BAR'S FOLLOWER LIFTED
 MIN. 5-1/2 OZS. ---MAX. 7-1/2 OZS.
 TO START BAR MOVING.



* NO. 4 ON MODEL 33 PRINTERS

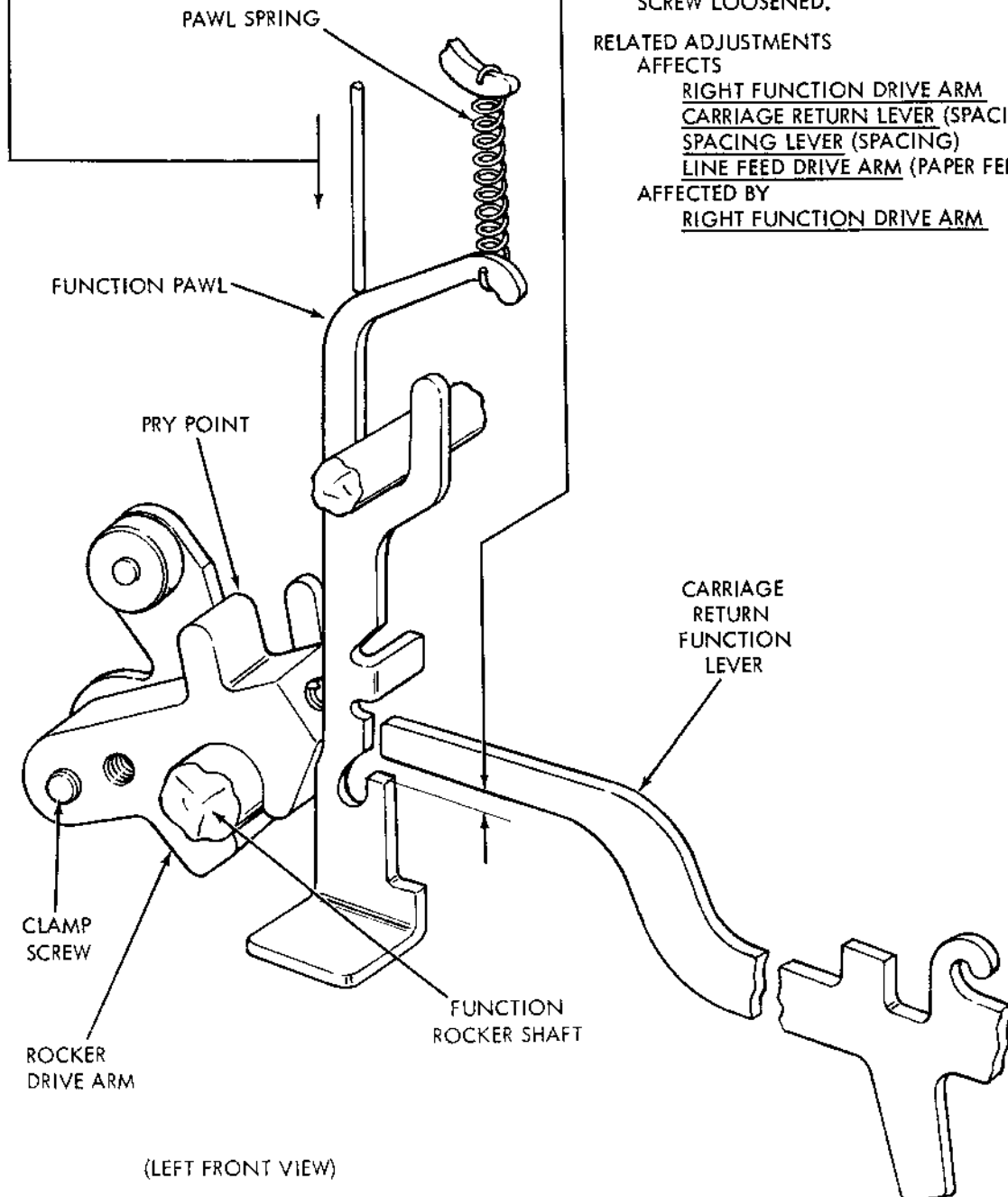
FUNCTION PAWL SPRING (FUNCTION)
REQUIREMENT

WITH PRINTER IN STOP POSITION, AND ALL EXTERNAL LOADS WHICH WOULD INFLUENCE THE REQUIREMENT REMOVED

MIN. 1-1/4 OZS. --- MAX. 2-1/2 OZS.
TO START PAWL MOVING

MIN. 9 OZS. --- MAX. 13 OZS.
ON PAWLS FOR "BELL" AND WHERE
FUNCTION CONTACTS ARE USED.

MIN. 6 OZS. --- MAX. 8-1/2 OZS.
FOR ANSWER-BACK FUNCTION PAWL.



(LEFT FRONT VIEW)

LEFT ROCKER DRIVE ARM (FUNCTION)

TO CHECK

SET UP CARRIAGE RETURN CODE COMBINATION (---4-) or (1-34---8) IN SELECTOR. ROTATE MAIN SHAFT UNTIL FUNCTION BAIL IS AT HIGHEST POINT OF TRAVEL.

REQUIREMENT

MIN. 0.020 INCH---MAX. 0.040 INCH
BETWEEN CARRIAGE-RETURN FUNCTION LEVER
AND ITS FUNCTION PAWL.

TO ADJUST

USING PRY POINT, ADJUST ROCKER DRIVE ARM (ON FUNCTION ROCKER SHAFT) WITH CLAMP SCREW LOOSENED.

RELATED ADJUSTMENTS

AFFECTS

RIGHT FUNCTION DRIVE ARM
CARRIAGE RETURN LEVER (SPACING)
SPACING LEVER (SPACING)
LINE FEED DRIVE ARM (PAPER FEED)

AFFECTED BY

RIGHT FUNCTION DRIVE ARM

RIGHT FUNCTION DRIVE ARM (FUNCTION)

TO CHECK

SET UP ANSWER-BACK CHARACTER (WRU) IN SELECTOR. ROTATE MAIN SHAFT UNTIL FUNCTION BAIL IS AT ITS HIGHEST POINT. MAKE SURE THAT DISTRIBUTOR CLUTCH HAS NOT BEEN TRIPPED.

REQUIREMENT

MIN. 0.020 INCH---MAX. 0.040 INCH
BETWEEN ANSWER-BACK FUNCTION LEVER AND ITS FUNCTION PAWL. RECHECK ROCKER DRIVE ARM.

TO ADJUST

USING PRY POINT, ADJUST RIGHT FUNCTION DRIVE ARM (ON FUNCTION ROCKER SHAFT) WITH CLAMP SCREW LOOSENED.

RELATED ADJUSTMENTS

AFFECTS

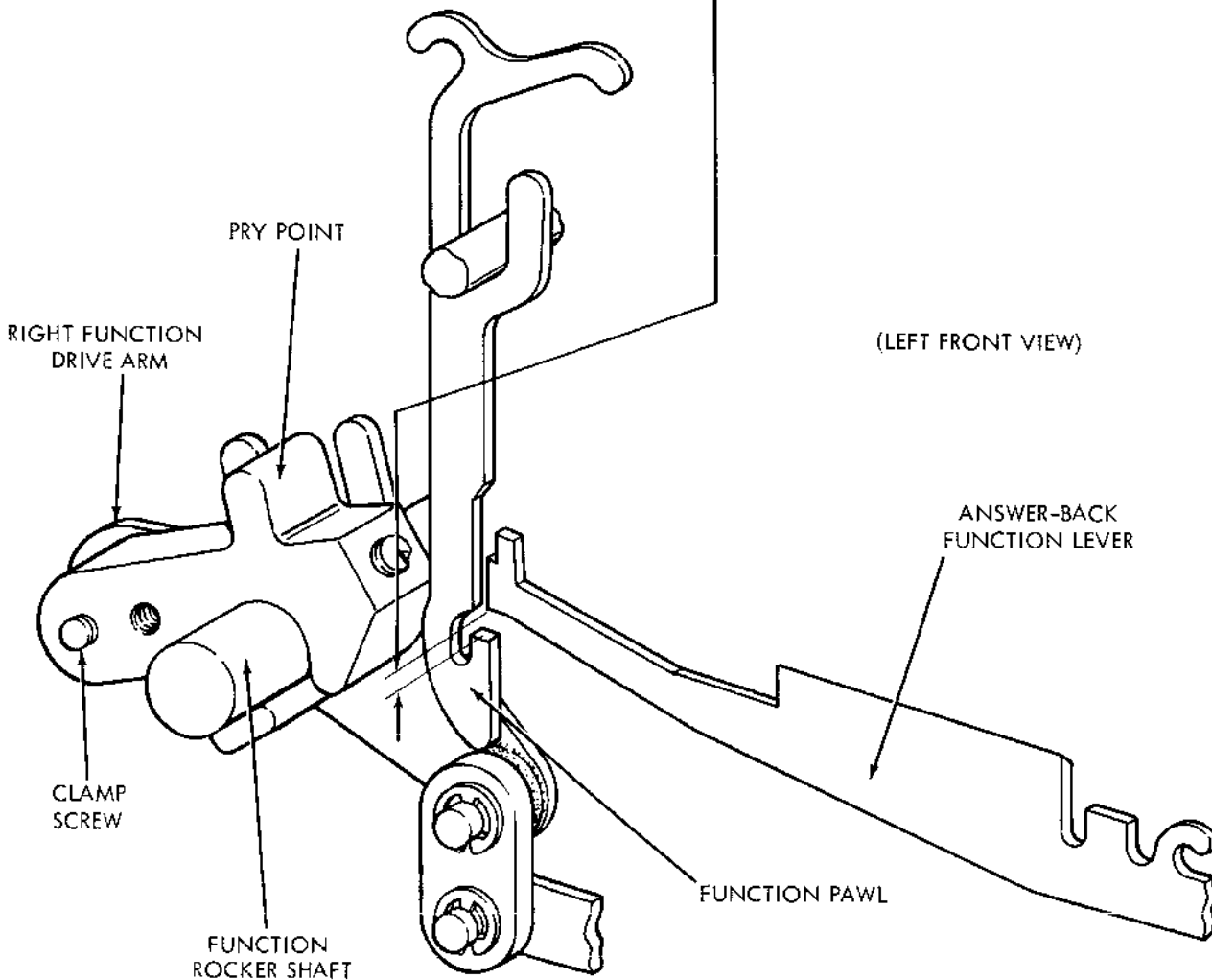
CARRIAGE RETURN LEVER (SPACING)

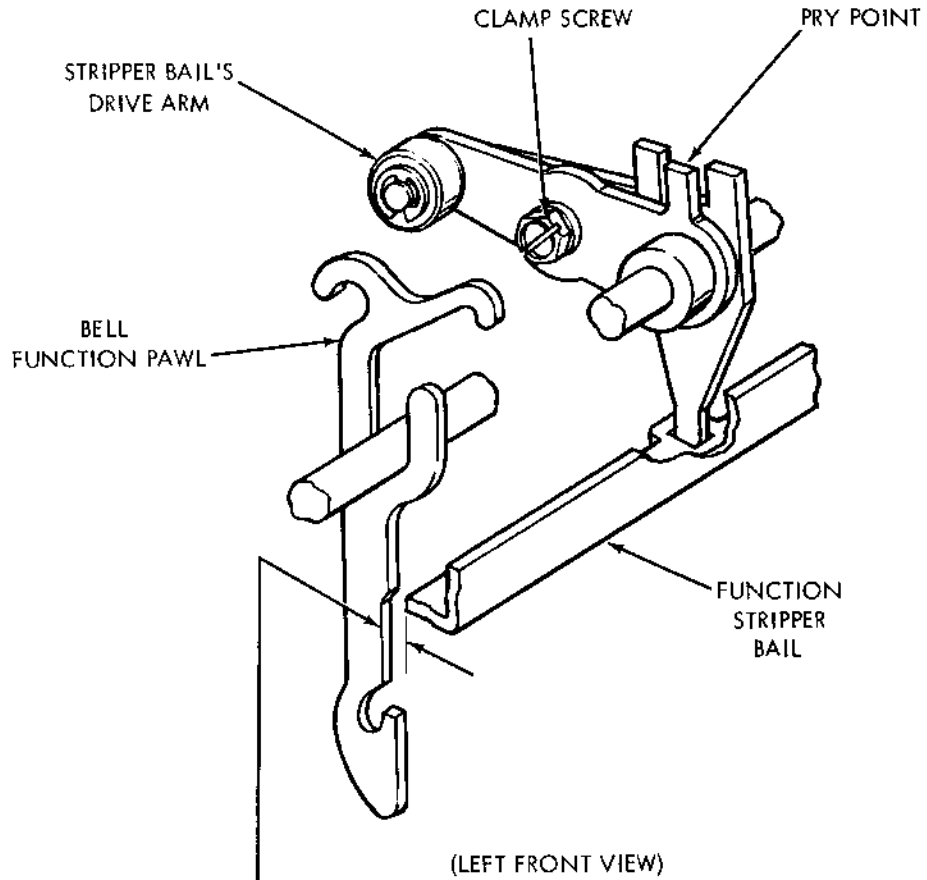
SPACING LEVER (SPACING)

LINE FEED DRIVE ARM (PAPER FEED)

AFFECTED BY

ROCKER DRIVE ARM





STRIPPER BAIL (FUNCTION)

REQUIREMENT

WITH PRINTER IN STOP CONDITION
 MIN. 0.015 INCH---MAX. 0.025 INCH
 BETWEEN FUNCTION STRIPPER BAIL AND
 EDGE OF STRIPPED FUNCTION PAWL.

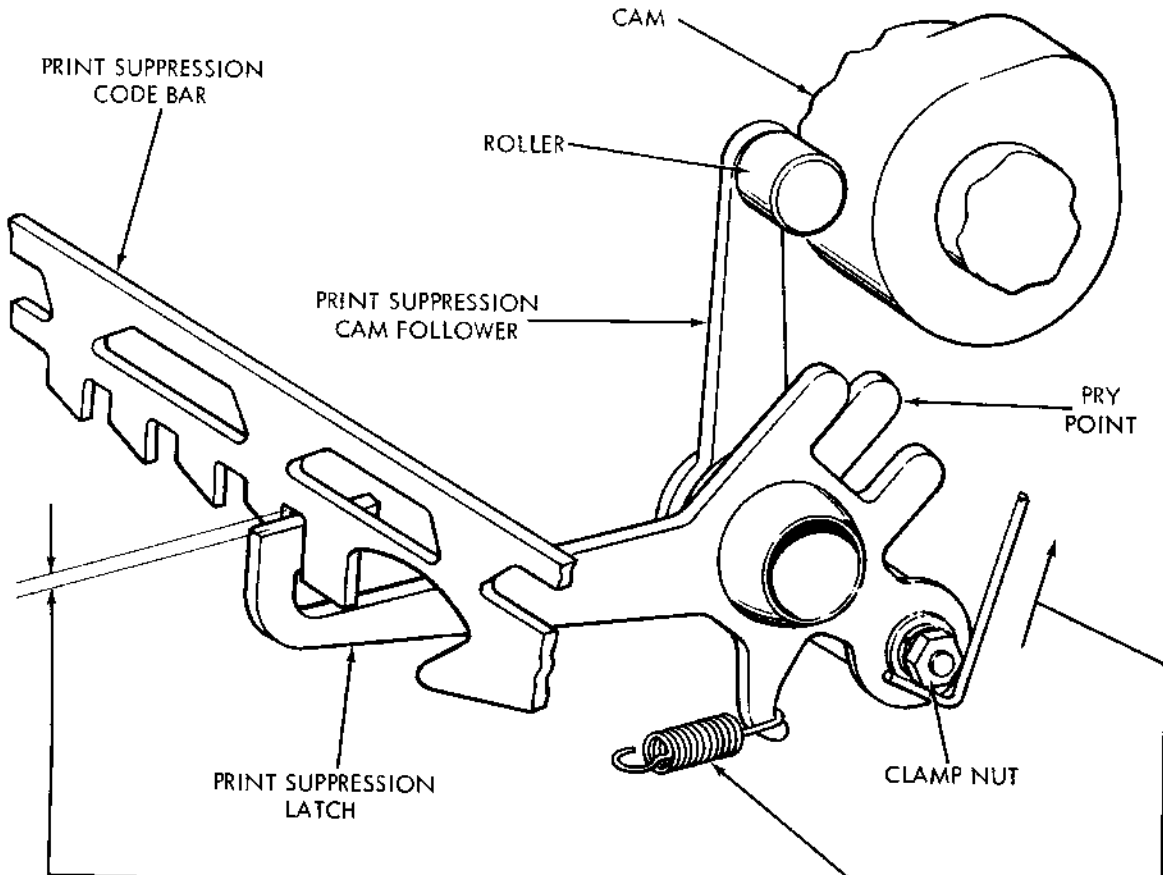
TO ADJUST

USING PRY POINT, ADJUST STRIPPER
 BAIL'S DRIVE ARM WITH CLAMP SCREW
 LOOSENED. CHECK AT MARGIN BELL PAWL.

RELATED ADJUSTMENT

AFFECTS

LINE FEED STRIPPER PLATE (PAPER FEED)



PRINT SUPPRESSION CAM FOLLOWER
(FUNCTION)

REQUIREMENT

WITH PRINTER IN STOP CONDITION AND CAM FOLLOWER ROLLER RESTING ON ITS CAM

MIN. 0.005 INCH---MAX. 0.030 INCH BETWEEN PRINT SUPPRESSION LATCH AND PRINT SUPPRESSION CODE BAR.

PRINT SUPPRESSION CAM FOLLOWER SPRING

(RIGHT SIDE VIEW)

PRINT SUPPRESSION CAM FOLLOWER SPRING
(FUNCTION)

REQUIREMENT

WITH PRINTER IN STOP CONDITION
MIN. 5-3/4 OZS. ---MAX. 7-1/4 OZS. TO START CAM FOLLOWER MOVING.

TO ADJUST

USING PRY POINT, POSITION CAM FOLLOWER WITH CLAMP NUT LOOSENED.

RELATED ADJUSTMENTS

AFFECTED BY

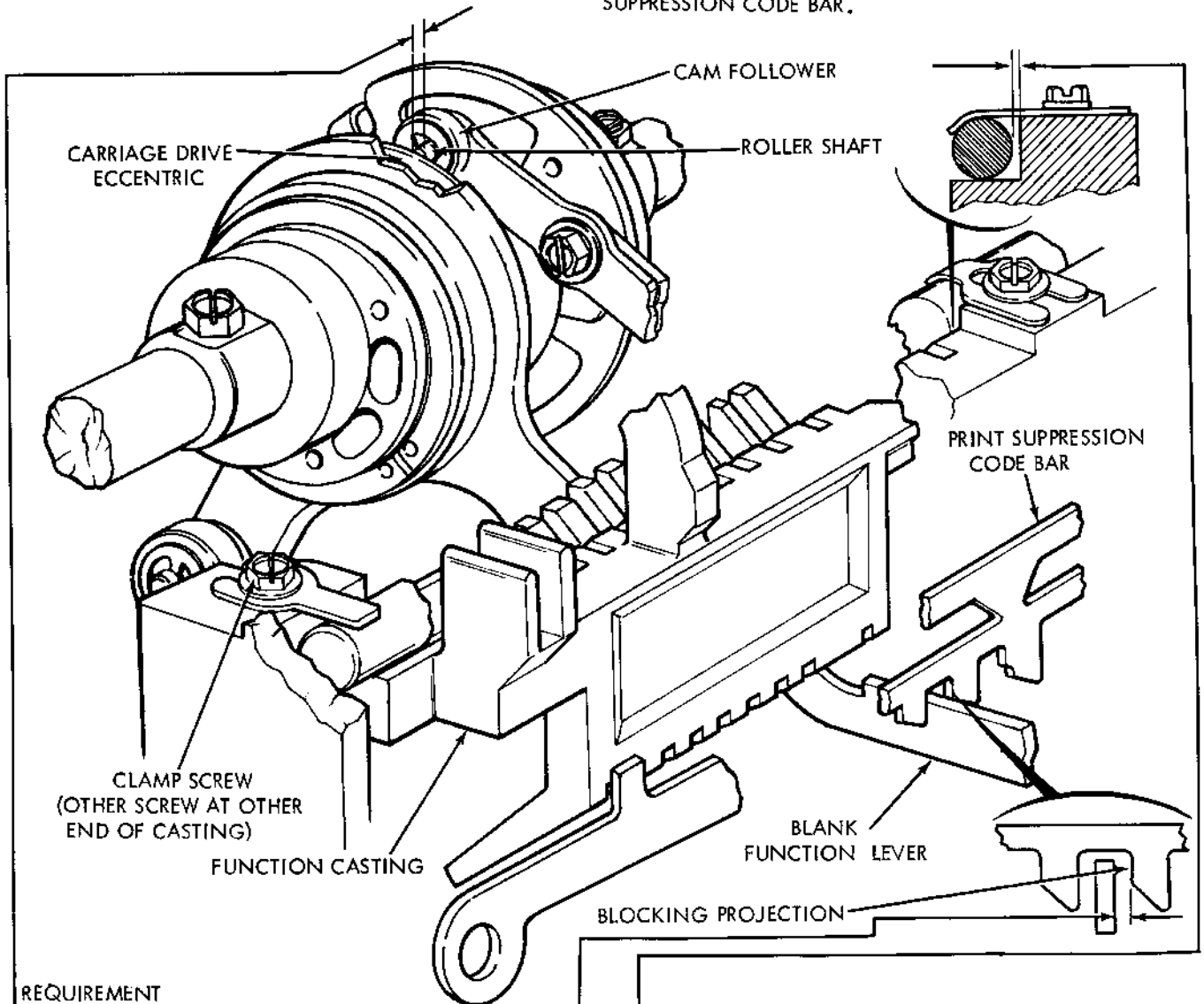
CODE BAR RESET LEVER

**CASTING (FUNCTION)
TO CHECK**

SET UP BLANK (ALL SPACING) CODE COMBINATION IN SELECTOR. ROTATE MAIN SHAFT UNTIL FUNCTION BAIL APPROACHES HIGH PART OF TRAVEL, BUT PRINT SUPPRESSION CAM FOLLOWER HAS NOT REACHED HIGH PART OF ITS CAM.

NOTE

- (1) MODEL 32 PRINTER HAS BLANK FUNCTION LEVER IN THE NO. 6 SLOT.
- (2) MODEL 33 DOES NOT HAVE A BLANK FUNCTION LEVER. WHENEVER THE NO. 6 AND 7 CODE ELEMENTS ARE SPACING THE FUNCTION LEVER IN THE NO. 6 SLOT IS ACTIVATED TO BLOCK THE PRINT SUPPRESSION CODE BAR.



REQUIREMENT

- (1) AS GAGED BY EYE
MIN. 0.030 INCH---MAX. 0.050 INCH
BETWEEN BLOCKING PROJECTION ON PRINT SUPPRESSION CODE BAR AND BLANK FUNCTION LEVER.
- (2) MIN. 0.005 INCH
BETWEEN CARRIAGE DRIVE ECCENTRIC AND ROLLER'S SHAFT ON STRIPPER BAIL'S CAM FOLLOWER.

TO ADJUST

- POSITION FUNCTION CASTING WITH CLAMP SCREWS LOOSENED.
- (3) THE FUNCTION SHAFT SHALL BE IN CONTACT WITH, OR NOT MORE THAN
MAX. 0.003 INCH
AWAY FROM THE VERTICAL SURFACE AT THE CENTER OF THE CASTING.

TO ADJUST

LOOSEN CENTER CLAMP MOUNTING SCREW, POSITION SHAFT AND CLAMP.

RELATED ADJUSTMENTS

AFFECTS

FUNCTION CAM CLUTCH (MAIN SHAFT)

AFFECTED BY

PRINT SUPPRESSION LATCH

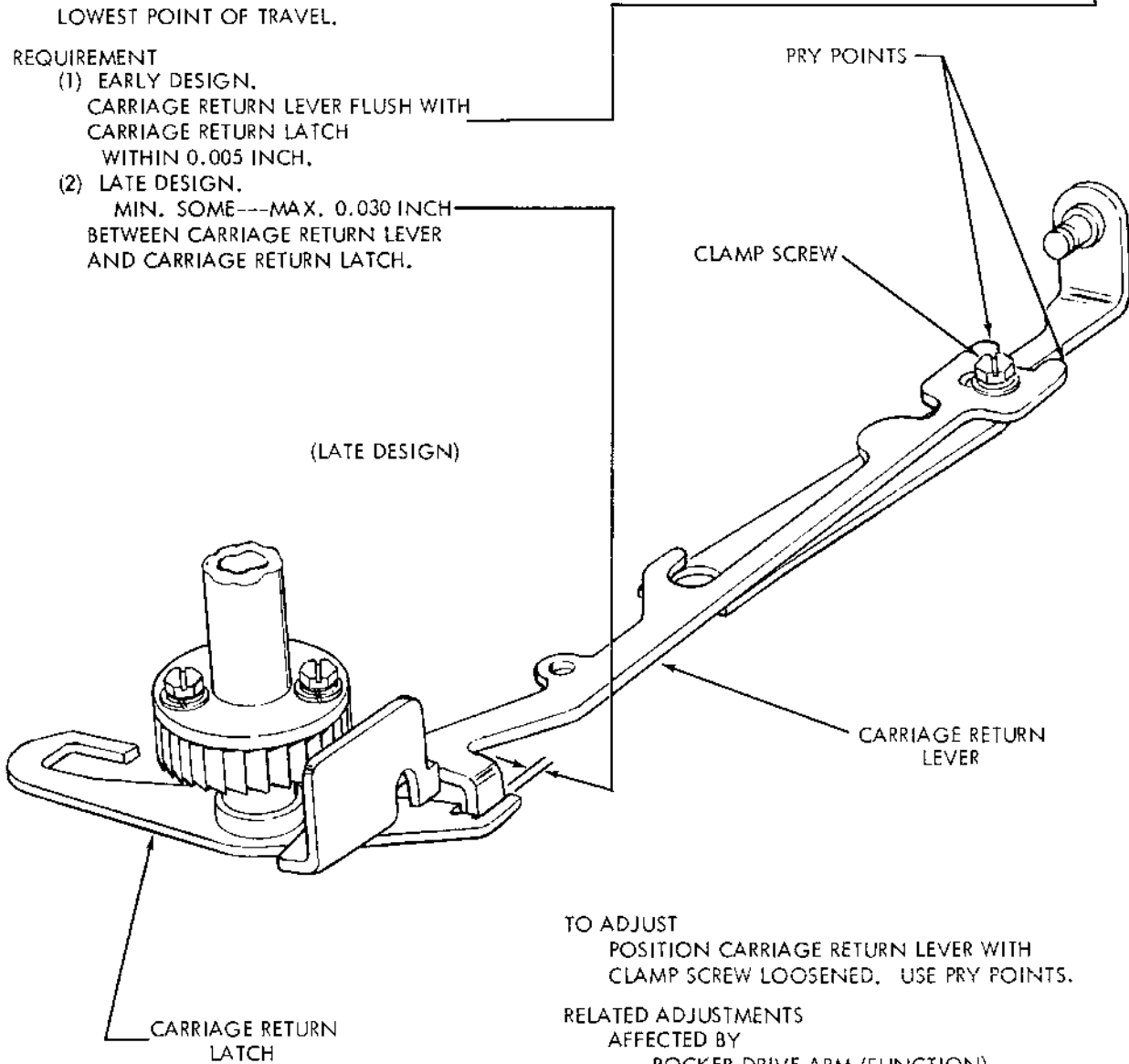
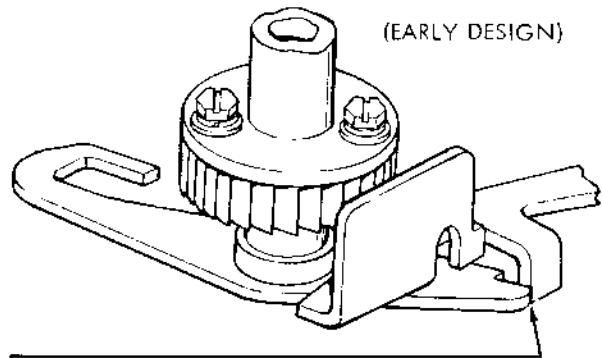
CARRIAGE RETURN LEVER (SPACING)

TO CHECK

SET UP CARRIAGE RETURN COMBINATION
(---4-) or (1-34---8) IN SELECTOR. ROTATE
MAIN SHAFT UNTIL FUNCTION BAIL REACHES
LOWEST POINT OF TRAVEL.

REQUIREMENT

- (1) EARLY DESIGN,
CARRIAGE RETURN LEVER FLUSH WITH
CARRIAGE RETURN LATCH
WITHIN 0.005 INCH.
- (2) LATE DESIGN,
MIN. SOME---MAX. 0.030 INCH
BETWEEN CARRIAGE RETURN LEVER
AND CARRIAGE RETURN LATCH.



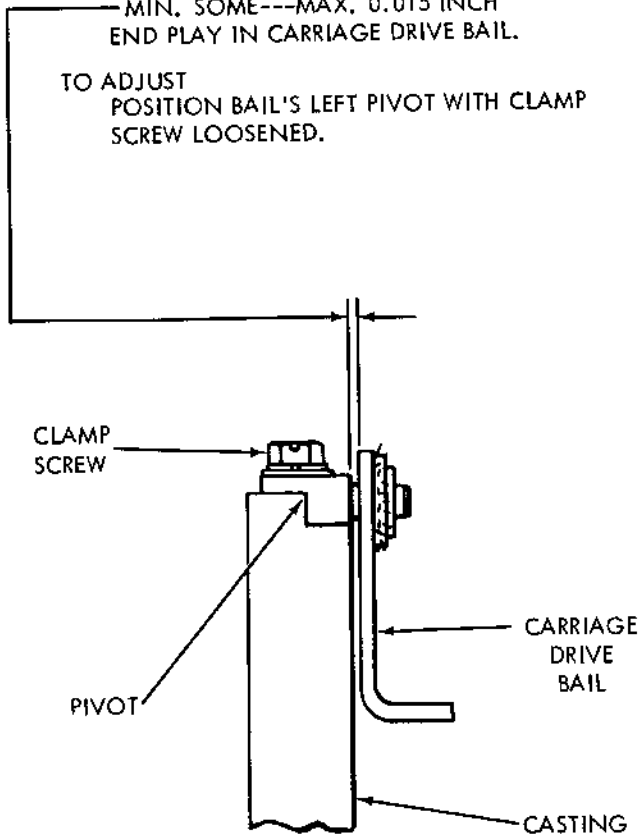
TO ADJUST
POSITION CARRIAGE RETURN LEVER WITH
CLAMP SCREW LOOSENED. USE PRY POINTS.

RELATED ADJUSTMENTS
AFFECTED BY
ROCKER DRIVE ARM (FUNCTION)
RIGHT FUNCTION DRIVE ARM (FUNCTION)

CARRIAGE DRIVE BAIL (FUNCTION)

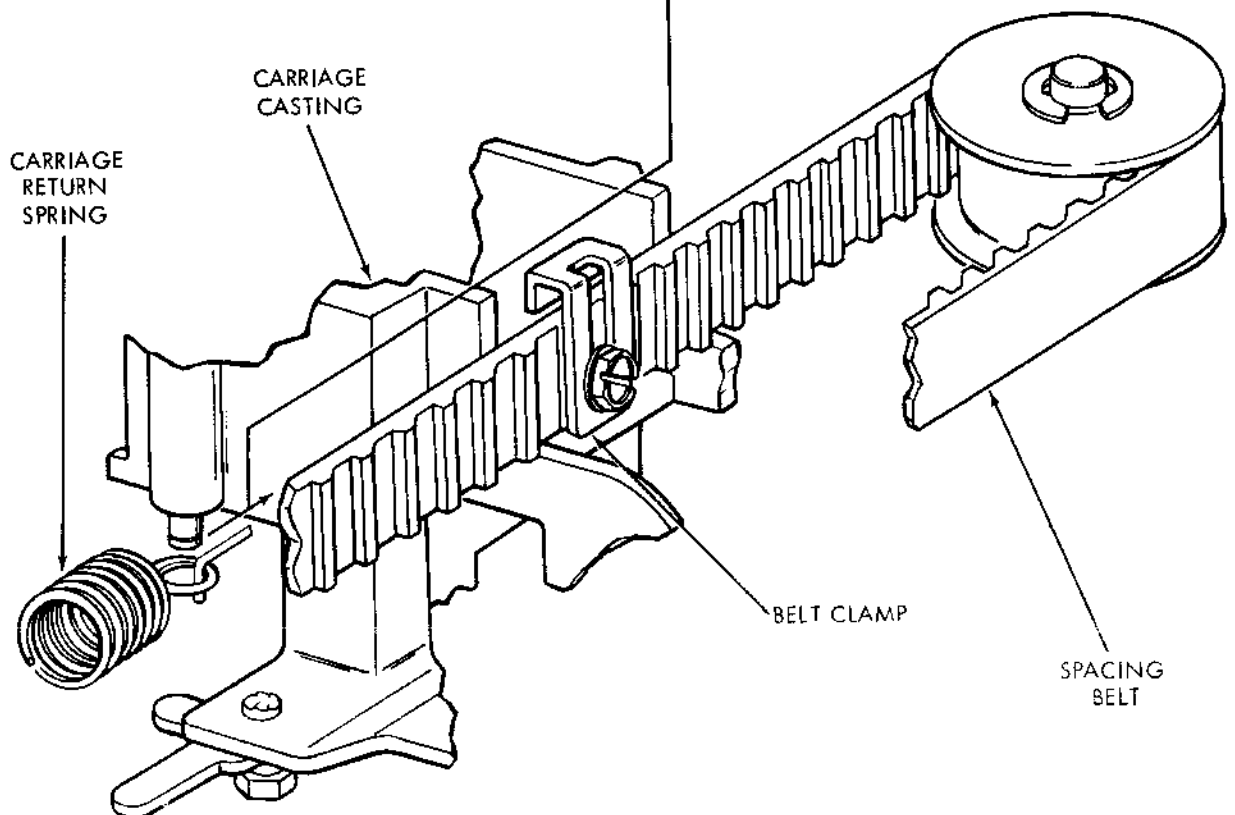
REQUIREMENT
AS GAGED BY EYE
MIN. SOME---MAX. 0.015 INCH
END PLAY IN CARRIAGE DRIVE BAIL.

TO ADJUST
POSITION BAIL'S LEFT PIVOT WITH CLAMP
SCREW LOOSENED.



CARRIAGE RETURN SPRING (SPACING)

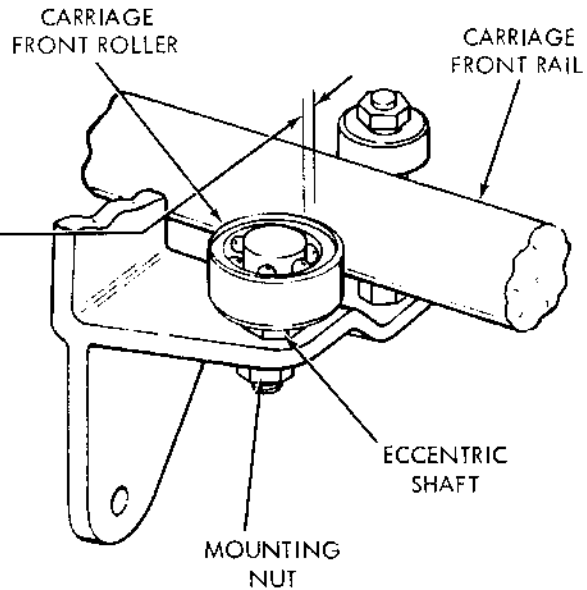
REQUIREMENT
WITH PRINTER IN STOP CONDITION AND
CARRIAGE AT RIGHT MARGIN,
MIN. 48 OZS. ---MAX. 52 OZS.
TO PULL SPRING TO INSTALLED LENGTH.



FRONT ROLLERS (CARRIAGE)

REQUIREMENT
WITH PRINTER IN STOP CONDITION,
CARRIAGE FRONT ROLLERS (2) SHALL
SPIN FREELY WITH
MAX. CLEARANCE OF 0.004 INCH.

TO ADJUST
BY MEANS OF ECCENTRIC SHAFT,
POSITION EACH ROLLER TIGHT AGAINST
RAIL WITH MOUNTING NUT LOOSENED,
SLOWLY BACK OFF ECCENTRIC TO MEET
REQUIREMENT.

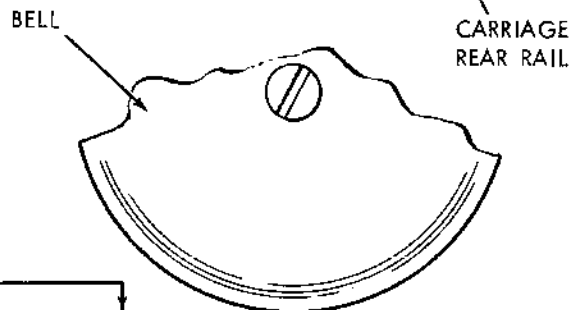
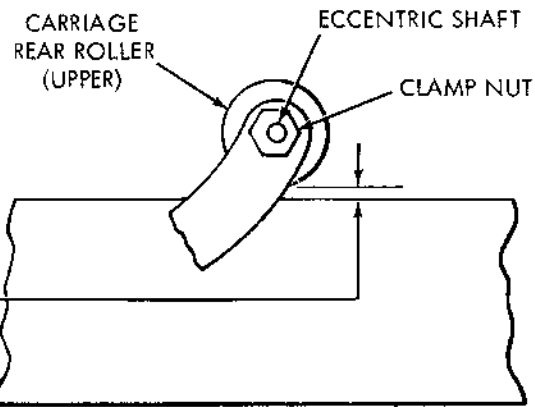


REAR ROLLER (CARRIAGE)

TO CHECK
POSITION CARRIAGE NEAR RIGHT MARGIN,
TRIP SELECTOR CLUTCH. ROTATE MAIN
SHAFT UNTIL CARRIAGE DRIVE BAIL IS IN
REAR MOST POSITION.

REQUIREMENT
MIN. ---MAX. 0.005 INCH
BETWEEN CARRIAGE REAR RAIL AND
UPPER CARRIAGE REAR ROLLER.

TO ADJUST
USING HEXAGON WRENCH, POSITION ROLLER'S
ECCENTRIC SHAFT WITH CLAMP NUT
LOOSENED.

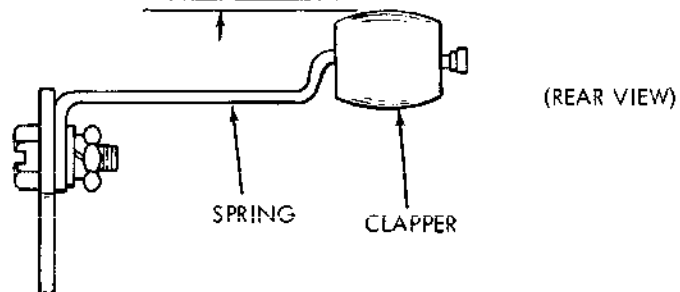


BELL CLAPPER (FUNCTION)

REQUIREMENT
WITH PRINTER IN STOP CONDITION
MIN. 0.030 INCH --- MAX. 0.070 INCH
BETWEEN CLAPPER AND BELL.

TO ADJUST
USING PLIERS, BEND CLAPPER SPRING.

REQUIREMENT (FINAL)
THE BELL MUST BE AUDIBLE
WHEN THE APPROPRIATE
SELECTION IS MADE.



NOTE

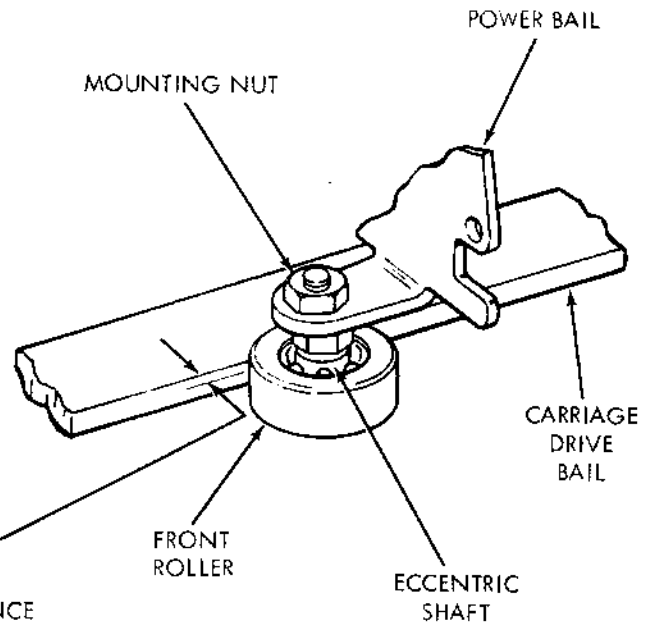
REMOVE RIBBON MECHANISMS AT THIS POINT IN COMPLETE READ-ADJUSTMENT PROCEDURE. FOR INSTRUCTIONS, SEE DISASSEMBLY AND REASSEMBLY

POWER BAIL ROLLER (CARRIAGE)

TO CHECK
TRIP FUNCTION CLUTCH AND ROTATE MAIN SHAFT UNTIL CARRIAGE DRIVE BAIL REACHES APPROXIMATE VERTICAL POSITION.

REQUIREMENT
FRONT ROLLER SHALL SPIN FREELY WITH MIN. SOME --- MAX. 0.005 INCH CLEARANCE

TO ADJUST
WITH MOUNTING NUT LOOSENED, POSITION ROLLER AGAINST DRIVE BAIL BY MEANS OF ECCENTRIC SHAFT. BACK OFF SHAFT TO MEET REQUIREMENT.



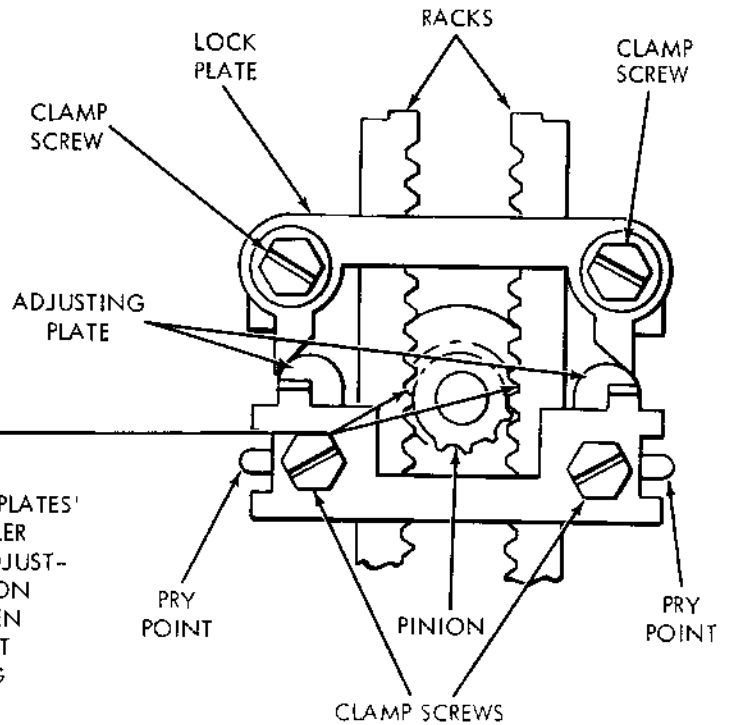
(LEFT FRONT VIEW)

ROTARY RACKS (CARRIAGE)

REQUIREMENT
0.004 INCH BACKLASH BETWEEN PINION AND EACH RACK.

TO ADJUST
LOOSEN ADJUSTING AND MOUNTING PLATES' CLAMP SCREWS. PLACE 0.004 INCH FEELER GAGE BETWEEN ONE OF RACKS AND ADJUSTING PLATE. USING PRY POINT, POSITION ADJUSTING PLATE FOR NO PLAY BETWEEN RACK AND PINION. MAKE ADJUSTMENT FOR OTHER RACK. TIGHTEN ADJUSTING PLATE CLAMP SCREWS. REMOVE FEELER GAGE. POSITION LOCK PLATE TIGHT AGAINST ADJUSTING PLATE AND TIGHTEN ITS CLAMP SCREWS.

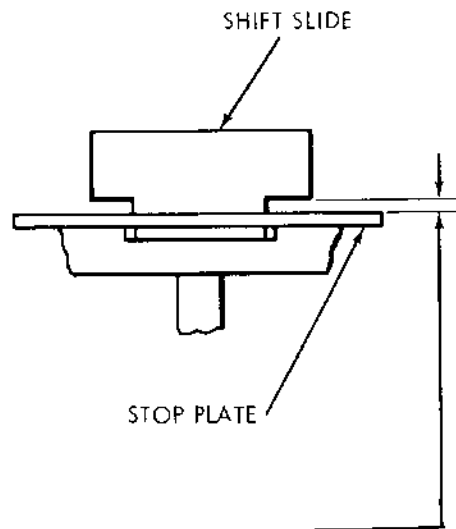
RELATED ADJUSTMENT AFFECTS
STOP PLATE



(TOP VIEW)

REAR RAIL - LEFT END (CARRIAGE)REQUIREMENT

PLACE PRINTER IN FIGURES POSITION ("0" SELECTED) (*).
 ROTATE MAIN SHAFT UNTIL CODE BARS HAVE RISEN FULLY,
 POSITION CARRIAGE SO CENTER LINE OF TYPEWHEEL IS
 APPROXIMATELY 2-7/8 INCHES FROM LEFT END OF PLATEN
 (DASHPOT PLUNGER ALMOST COMPLETELY WITHDRAWN
 FROM DASHPOT). CLEARANCE BETWEEN BOTTOM EDGE
 OF NUMBER "0" SHIFT SLIDE (*) AND TOP EDGE OF STOP PLATE
 MIN. 0.030 INCH --- MAX. 0.040 INCH



(REAR VIEW)

TO ADJUST

BY MEANS OF PRY POINT, POSITION LEFT END
 OF CARRIAGE REAR RAIL WITH MOUNTING
 SCREWS FRICTION TIGHT.

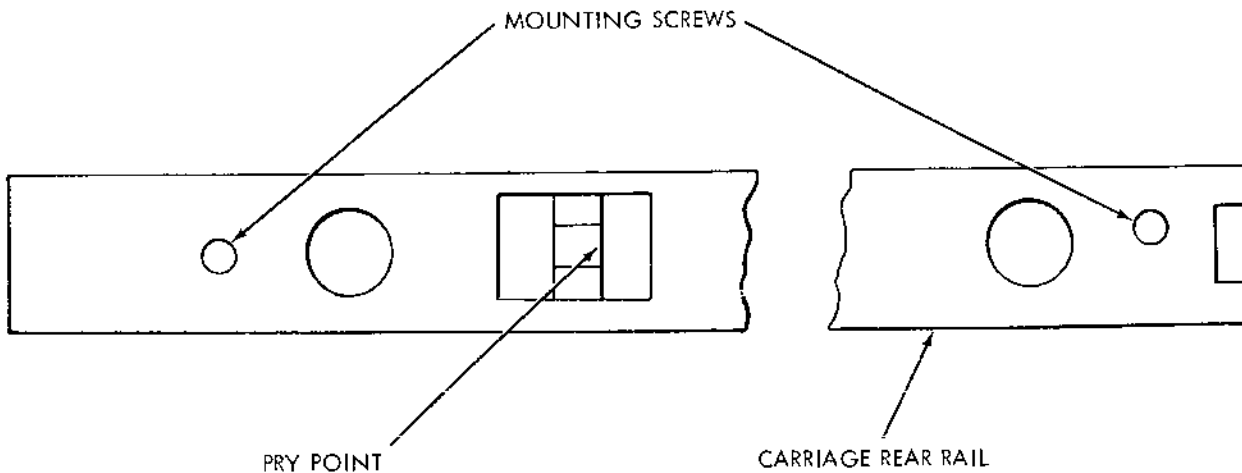
* NO. 1 ON MODEL 33 PRINTER

RELATED ADJUSTMENTSAFFECTS

REAR ROLLER
ROTARY RESET LEVER
THIRD PULSE LINK
REAR RAIL - RIGHT END
DRIVE BAIL
PRINT RESET ARM
PRINT DRIVE LEVER
PLATEN - VERTICAL (PAPER FEED)

AFFECTED BY

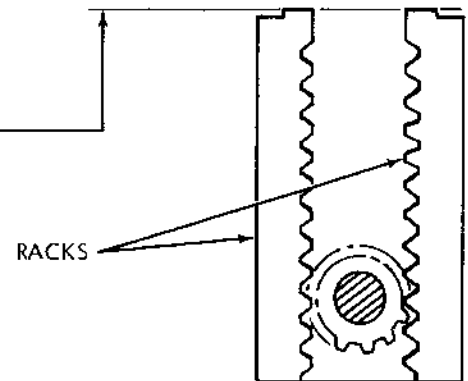
REAR RAIL - RIGHT END



ROTARY RESET LEVER (CARRIAGE)

REQUIREMENT

WHEN PRINTER RETURNS TO STOP
CONDITION, RACKS SHALL BE COM-
PLETELY RESET.



(TOP VIEW)

TO ADJUST

PLACE CARRIAGE AT LEFT MARGIN.
USING FINGER PRESSURE ON POWER
BAIL AND RESET LEVER, POSITION
RESET LEVER WITH CLAMP SCREW
LOOSENED. WIGGLE TYPEWHEEL.
ONLY SMALL AMOUNT OF ROTATIONAL
PLAY SHOULD BE PRESENT.

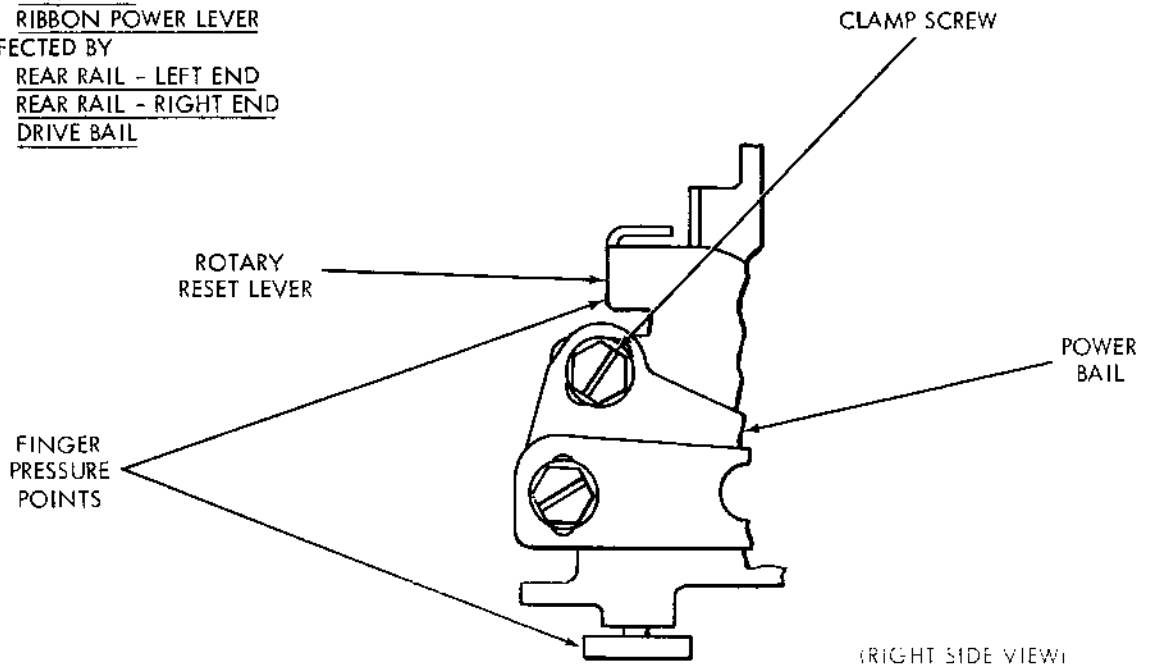
RELATED ADJUSTMENTS

AFFECTS

DRIVE BAIL
RIBBON POWER LEVER

AFFECTED BY

REAR RAIL - LEFT END
REAR RAIL - RIGHT END
DRIVE BAIL



THIRD PULSE LEVER (CARRIAGE)

TO CHECK

PLACE CARRIAGE AT LEFT MARGIN. SET UP ALL MARKING CODE COMBINATION IN SELECTOR. ROTATE MAIN SHAFT UNTIL FUNCTION CLUTCH JUST TRIPS.

REQUIREMENT

AS GAGED BY EYE

MIN. 0.010 INCH --- MAX. 0.030 INCH BETWEEN ROTARY DRIVE ARM AND LEFT RACK WHEN PLAY IN RACK IS TAKEN UP IN DOWNWARD DIRECTION.

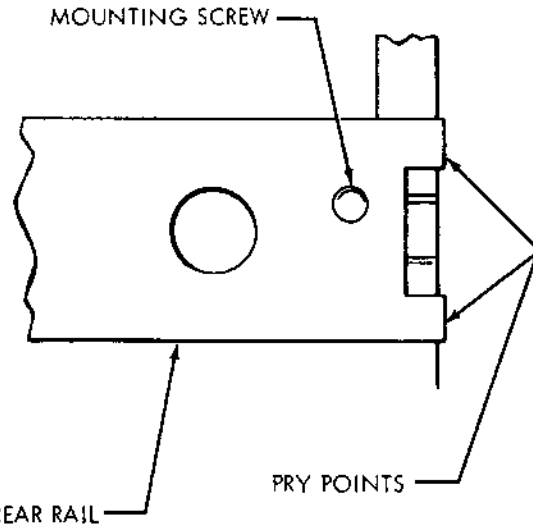
TO ADJUST

USING PRY POINTS, BEND THIRD PULSE LEVER.

RELATED ADJUSTMENTS

AFFECTED BY

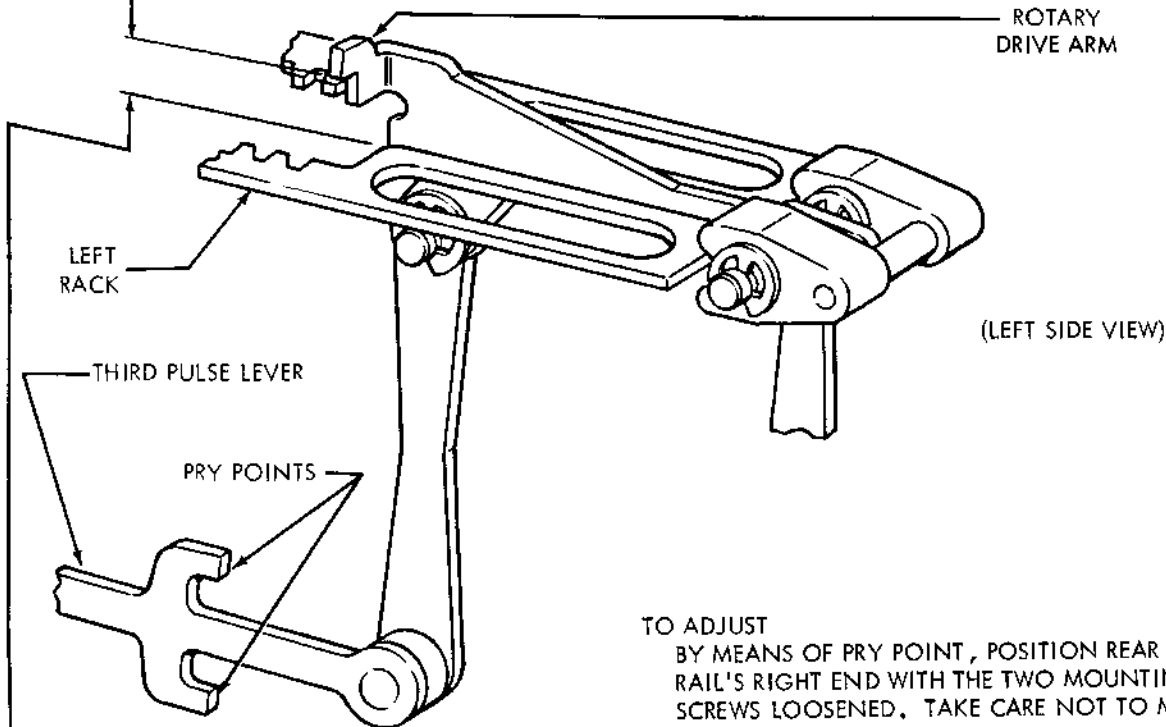
REAR RAIL - LEFT END
REAR RAIL - RIGHT END



REAR RAIL

PRY POINTS

ROTARY
DRIVE ARM



LEFT
RACK

(LEFT SIDE VIEW)

THIRD PULSE LEVER

PRY POINTS

TO ADJUST

BY MEANS OF PRY POINT, POSITION REAR RAIL'S RIGHT END WITH THE TWO MOUNTING SCREWS LOOSENED. TAKE CARE NOT TO MOVE RAIL'S LEFT END.

REAR RAIL - RIGHT END (CARRIAGE)

(1) REQUIREMENT - PRELIMINARY

PLACE CARRIAGE AT RIGHT HAND MARGIN. ROTATE MAIN SHAFT UNTIL FUNCTION CLUTCH JUST TRIPS.

MIN. 0.010 INCH --- MAX. 0.030 INCH CLEARANCE BETWEEN LEFT RACK AND UNDER SIDE OF DOWN STOP ON THIRD PULSE LEVER, AS GAGED BY EYE.

(2) REQUIREMENT - FINAL

WHEN UNIT IS OPERATED UNDER POWER, TYPE WHEEL SHOULD SHIFT FROM RIGHT TO LEFT OR LEFT TO RIGHT SIDE AND PRINT PROPER CHARACTER UNIFORMALLY.

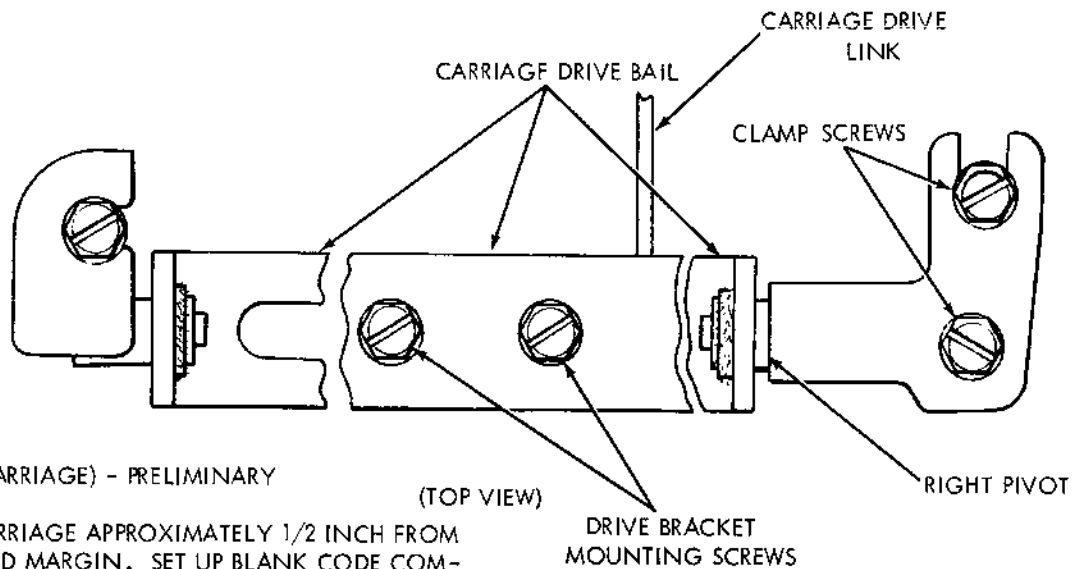
RELATED ADJUSTMENTS

AFFECTS

REAR RAIL - LEFT END
ROTARY RESET LEVER
THIRD PULSE LEVER
DRIVE BAIL
PRINT RESET ARM
PLATEN-VERTICAL (PAPER FEED)

AFFECTED BY

REAR RAIL - LEFT END



DRIVE BAIL (CARRIAGE) - PRELIMINARY REQUIREMENT

- (1) PLACE CARRIAGE APPROXIMATELY 1/2 INCH FROM LEFT-HAND MARGIN. SET UP BLANK CODE COMBINATION IN SELECTOR. ROTATE MAIN SHAFT UNTIL CARRIAGE DRIVE BAIL REACHES ITS REARMOST POSITION. THERE SHALL BE APPROXIMATELY

0.030 INCH

CLEARANCE BETWEEN PRINT HAMMER BAIL AND PRINT HAMMER TRIP LEVER.

- (2) THIS CLEARANCE SHALL BE EQUAL WITHIN 0.020 INCH APPROXIMATELY 1/2 INCH OF THE RIGHT-HAND MARGIN.

TO ADJUST

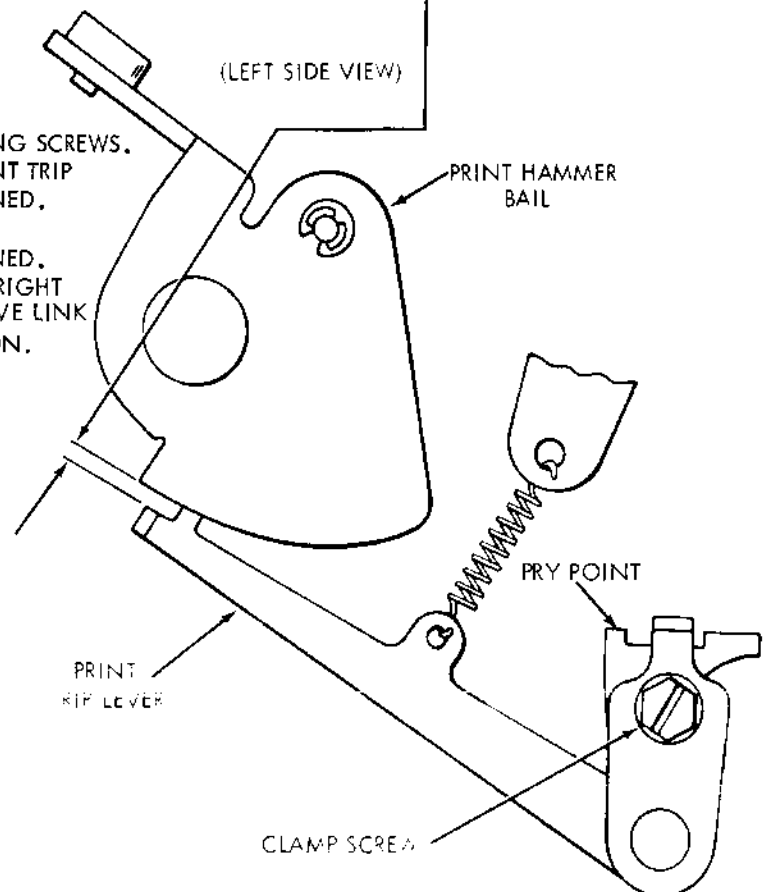
- (1) REQUIREMENT
LOOSEN DRIVE BRACKET MOUNTING SCREWS. USING PRY POINT, POSITION PRINT TRIP LEVER WITH CLAMP SCREW LOOSENED.
- (2) REQUIREMENT
WITH MOUNTING SCREWS LOOSENED, POSITION CARRIAGE DRIVE BAIL'S RIGHT PIVOT. MAKE SURE CARRIAGE DRIVE LINK IS NOT BIASED IN EITHER DIRECTION.

RELATED ADJUSTMENTS AFFECTS

PRINT TRIP LEVER
PRINT RESET ARM
PRINT DRIVE LEVER
ROTARY RESET LEVER

AFFECTED BY

REAR RAIL - LEFT END
REAR RAIL - RIGHT END
ROTARY RESET LEVER



PRINT DRIVE LEVER (CARRIAGE)

REQUIREMENT

WITH PRINTER IN STOP CONDITION,
TELETYPE TOOL NO. 180588 SHALL FIT
BETWEEN VERTICAL DRIVE BAIL AND
COMMON VERTICAL STOP ARM
WITHIN 0.005 INCH
(CLEARANCE IS NOMINAL 0.234 INCH.)

TO ADJUST

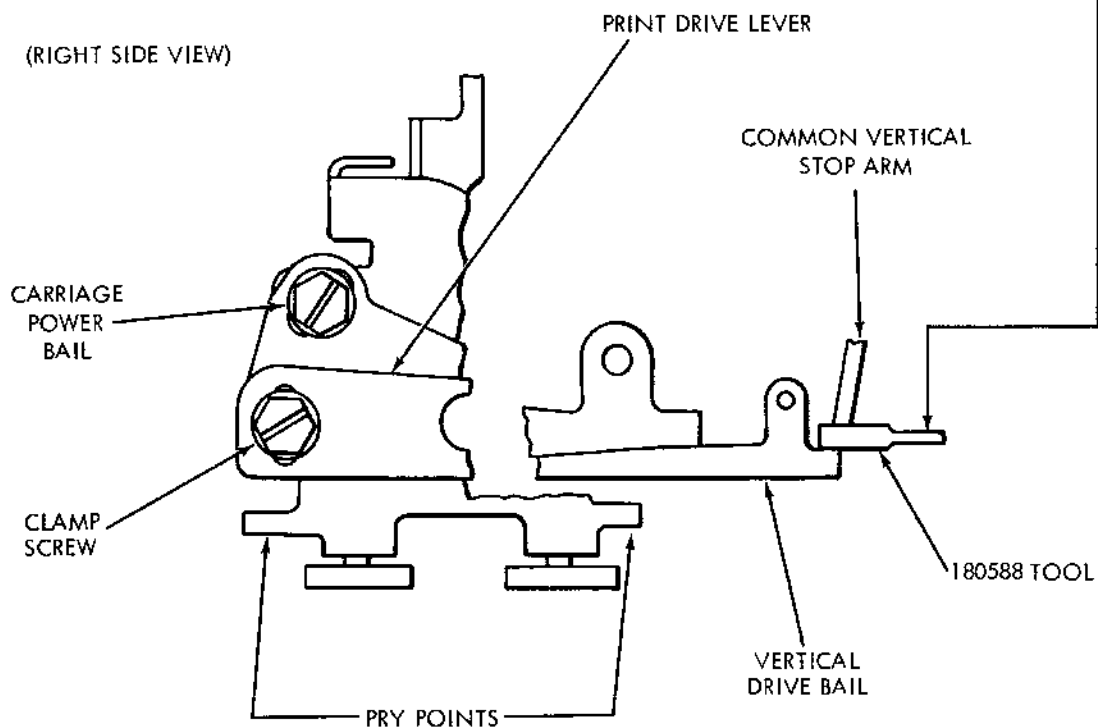
USING PRY POINTS, POSITION PRINT DRIVE
LEVER ON POWER BAIL WITH CLAMP SCREW
LOOSENED.

RELATED ADJUSTMENTS

AFFECTS

PRINT TRIP LEVERPLATEN - VERTICAL (PAPER FEED)PRINT RESET ARM

AFFECTED BY

REAR RAIL - LEFT ENDREAR RAIL - RIGHT ENDDRIVE BAIL

PRINT RESET ARM (CARRIAGE)

REQUIREMENT

WITH PRINTER IN STOP CONDITION
MIN. 0.009 INCH---MAX. 0.030 INCH
BETWEEN PRINT HAMMER BAIL AND
PRINT TRIP LEVER.

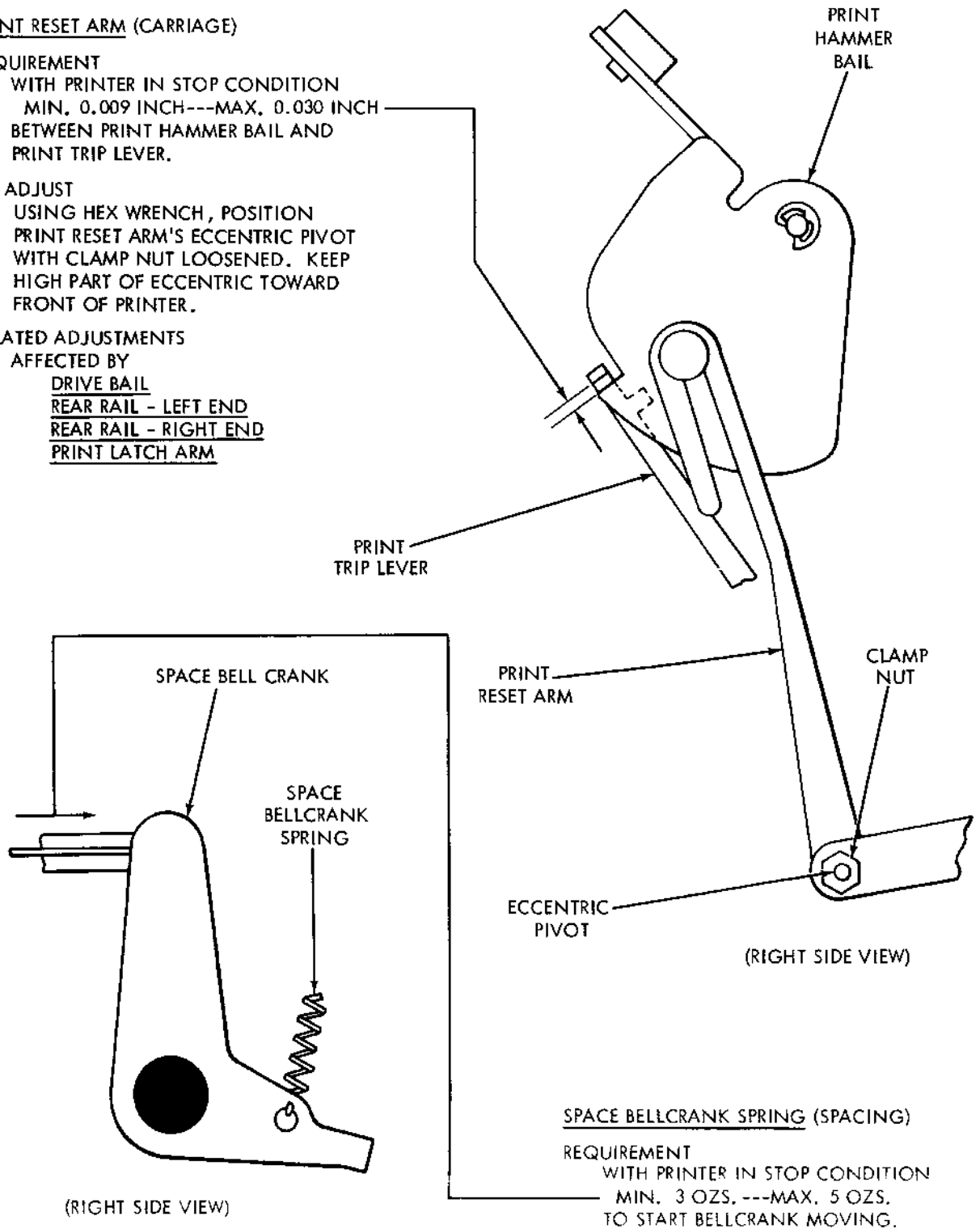
TO ADJUST

USING HEX WRENCH, POSITION
PRINT RESET ARM'S ECCENTRIC PIVOT
WITH CLAMP NUT LOOSENED. KEEP
HIGH PART OF ECCENTRIC TOWARD
FRONT OF PRINTER.

RELATED ADJUSTMENTS

AFFECTED BY

- DRIVE BAIL
- REAR RAIL - LEFT END
- REAR RAIL - RIGHT END
- PRINT LATCH ARM

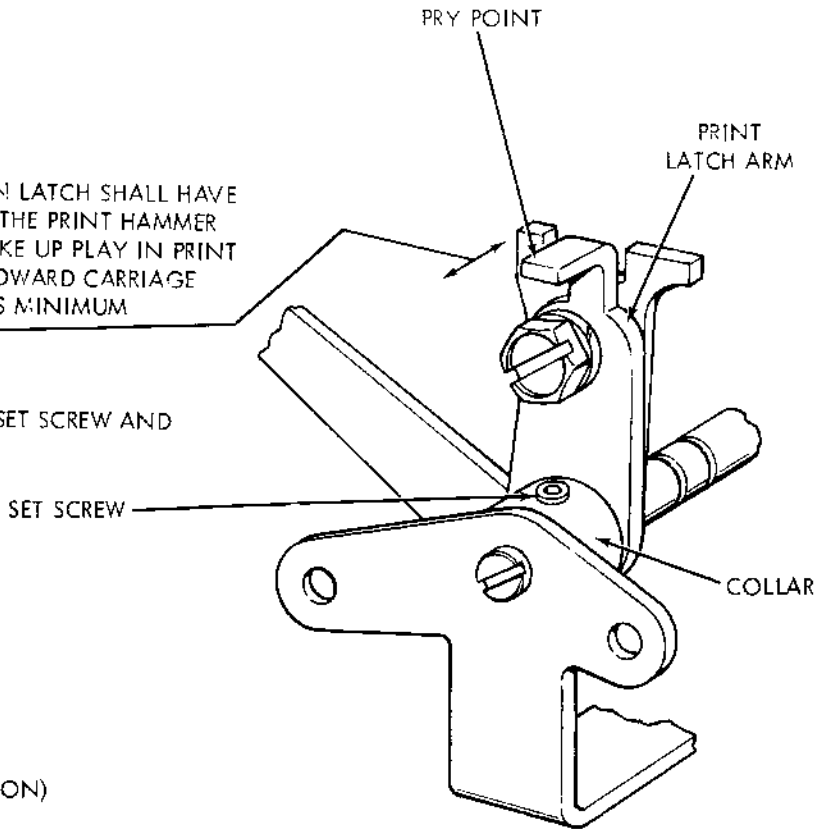


PRINT LATCH ARM (CARRIAGE)

REQUIREMENT

THE PRINT HAMMER SUPPRESSION LATCH SHALL HAVE A MINIMUM OF FULL BITE WITH THE PRINT HAMMER RESET BAIL WITH NO BINDS. TAKE UP PLAY IN PRINT HAMMER SUPPRESSION LATCH TOWARD CARRIAGE CASTING WHEN CHECKING THIS MINIMUM REQUIREMENT.

TO ADJUST USING HEX WRENCH, LOOSEN SET SCREW AND POSITION COLLAR.



(RIGHT REAR VIEW)

FUNCTION LEVER SPRINGS (FUNCTION)

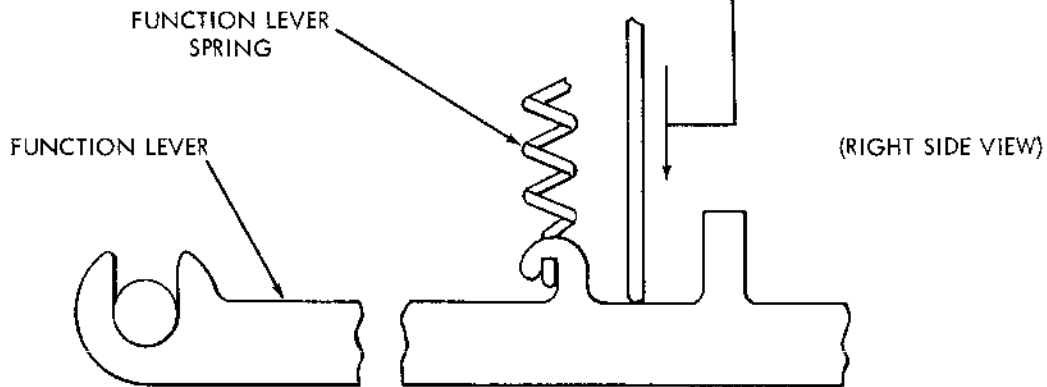
REQUIREMENT

WITH PRINTER IN STOP CONDITION
MIN. 19 OZS. --- MAX. 24 OZS.

FOR LINE-FEED AND AUTOMATIC
LINE FEED FUNCTION LEVERS WHEN
LINE FEED BLOCKING LEVER IS HELD UP.

MIN. 3-1/2 OZS. --- MAX. 5-1/2 OZS.
FOR CARRIAGE RETURN FUNCTION LEVER
WHEN CARRIAGE RETURN LEVER IS HELD
IN FRONTWARD POSITION.

MIN. 3-1/2 OZS. --- MAX. 5-1/2 OZS.
FOR ALL OTHER FUNCTION LEVERS.



(RIGHT SIDE VIEW)

SLIDE GUIDE PLATE SPRINGS (CARRIAGE)

NOTE

TO CHECK THIS SPRING TENSION REQUIRES REMOVING CARRIAGE FROM PRINTER. THEREFORE, DO NOT CHECK IT UNLESS THERE IS REASON TO BELIEVE THAT IT WILL NOT MEET REQUIREMENT.

REQUIREMENT

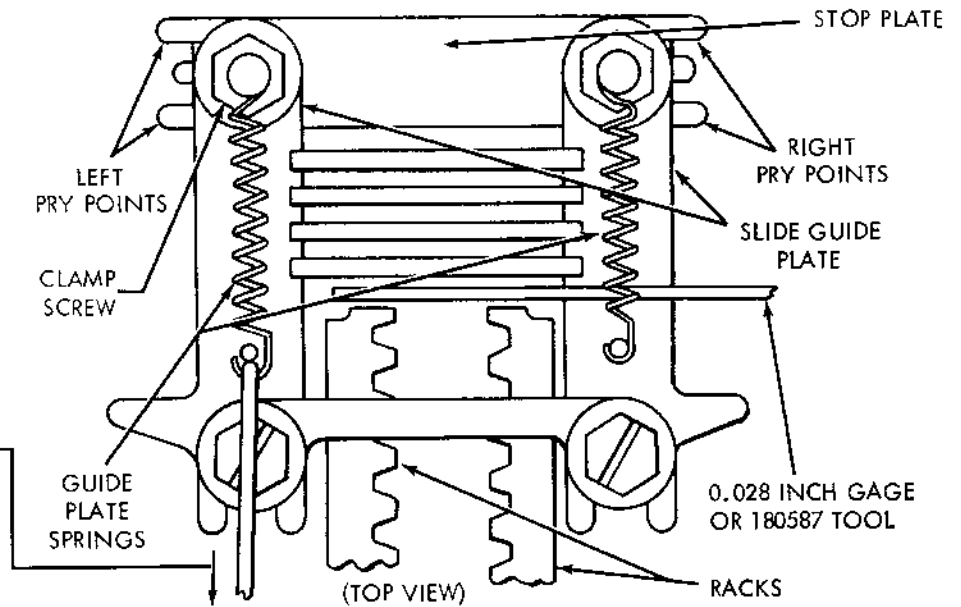
MIN. 1 OZ. ---

MAX. 3 OZS.

TO PULL SPRING TO INSTALLED LENGTH.

NOTE

CHECK RIGHT AND LEFT SPRING.



STOP PLATE (CARRIAGE) - PRELIMINARY

TO CHECK

SET UP CODE COMBINATION OF A CHARACTER IN COUNTERCLOCKWISE FIELD OF TYPEWHEEL. ROTATE MAIN SHAFT UNTIL CARRIAGE DRIVE BAIL IS IN REAR MOST POSITION. CHECK TO SEE IF VERTICAL ROW CONTAINING CHARACTER IS PROPERLY SELECTED. REPEAT FOR CHARACTER IN CLOCKWISE FIELD.

REQUIREMENT

TYPEWHEEL POSITIONING CORRECT IN BOTH CLOCKWISE AND COUNTERCLOCKWISE DIRECTIONS.

TO ADJUST

PLACE PRINTER IN STOP CONDITION. BACK OFF LEFT AND RIGHT SLIDE GUIDE PLATE ADJUSTMENTS. (SEE BELOW.) MAKE TWO CLAMP SCREWS FRICTION TIGHT. PLACE 0.028 INCH GAGE OR ADJUSTING TOOL NO. 180587 ACROSS END OF RACKS. HOLD ROTARY POSITIONING BAIL SO THAT IT DOES NOT YIELD, AND POSITION STOP PLATE SO THAT ENTIRE SLIDE ASSEMBLY IS TIGHT AGAINST RACK AND TOOL.

RELATED ADJUSTMENTS

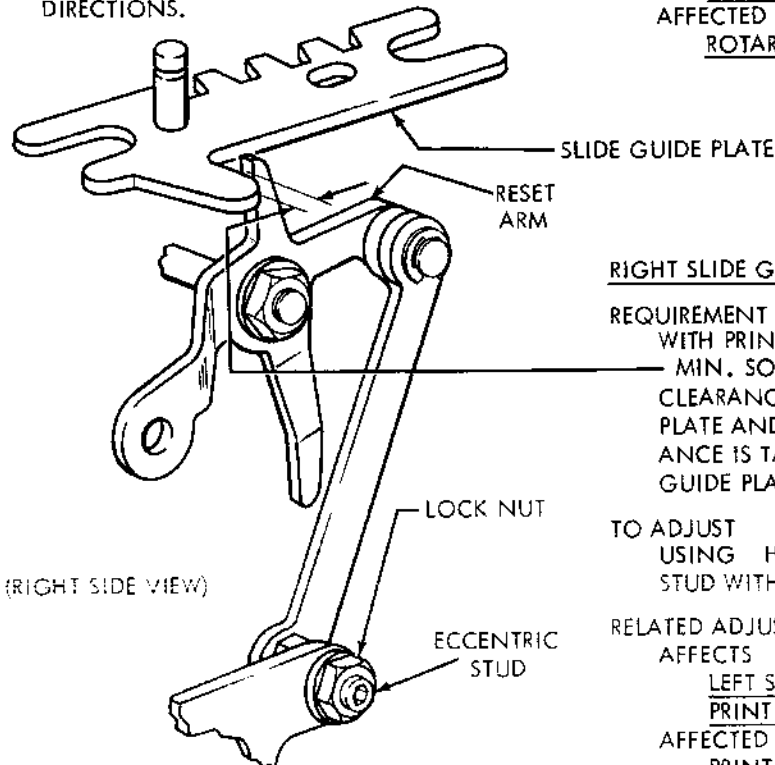
AFFECTS

RIGHT SLIDE GUIDE PLATE

LEFT SLIDE GUIDE PLATE

AFFECTED BY

ROTARY RACKS



RIGHT SLIDE GUIDE PLATE (CARRIAGE)

REQUIREMENT

WITH PRINTER IN STOP POSITION
MIN. SOME --- MAX. 0.015 INCH
CLEARANCE BETWEEN RIGHT SLIDE GUIDE PLATE AND THE RESET ARM WHEN CLEARANCE IS TAKEN UP FOR MAXIMUM (BOTH GUIDE PLATES HELD TOWARD FRONT).

TO ADJUST

USING HEX WRENCH, ROTATE ECCENTRIC STUD WITH ITS LOCK NUT LOOSENED.

RELATED ADJUSTMENTS

AFFECTS

LEFT SLIDE GUIDE PLATE

PRINT TRIP LEVER

AFFECTED BY

PRINT DRIVE LEVER

STOP PLATE

LEFT SLIDE GUIDE PLATE (CARRIAGE)

REQUIREMENT

WITH PRINTER IN STOP CONDITION
 MIN. SOME---MAX. 0.015 INCH
 CLEARANCE BETWEEN LEFT SLIDE GUIDE
 PLATE AND LEFT RIBBON LIFTER ARM
 WHEN CLEARANCE IS TAKEN UP FOR
 MAXIMUM (BOTH GUIDE PLATES HELD
 TOWARD FRONT).

TO ADJUST

USING PRY POINTS, POSITION LEFT RIBBON
 LIFTER ARM WITH CLAMP NUT LOOSENED.

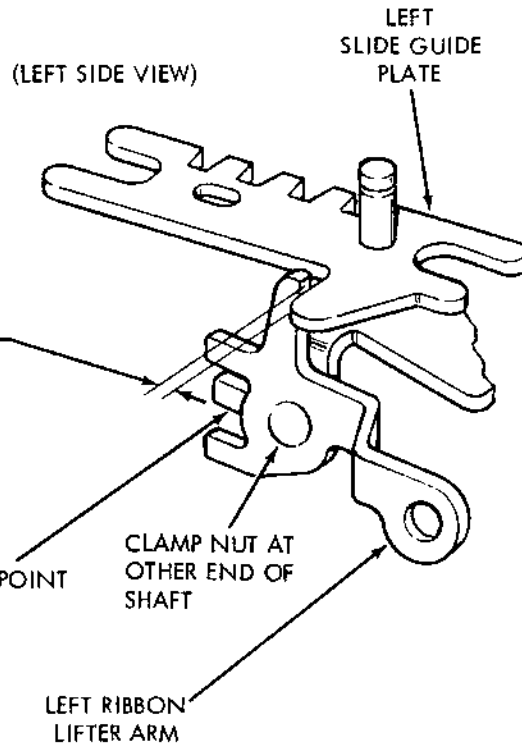
RELATED ADJUSTMENTS

AFFECTS

RIBBON GUIDE

AFFECTED BY

RIGHT SLIDE GUIDE PLATE



RIBBON GUIDE (CARRIAGE)

TO CHECK

TRIP SELECTOR CLUTCH AND ROTATE
 MAIN SHAFT UNTIL RIGHT RIBBON LINK
 SEPARATES FROM RIBBON GUIDE
 MIN. 0.010 INCH---MAX. 0.015 INCH

REQUIREMENT

CLEARANCE AT LEFT LINK
 MAX. 0.010 INCH
 GREATER AND NOT LESS THAN AT RIGHT LINK.

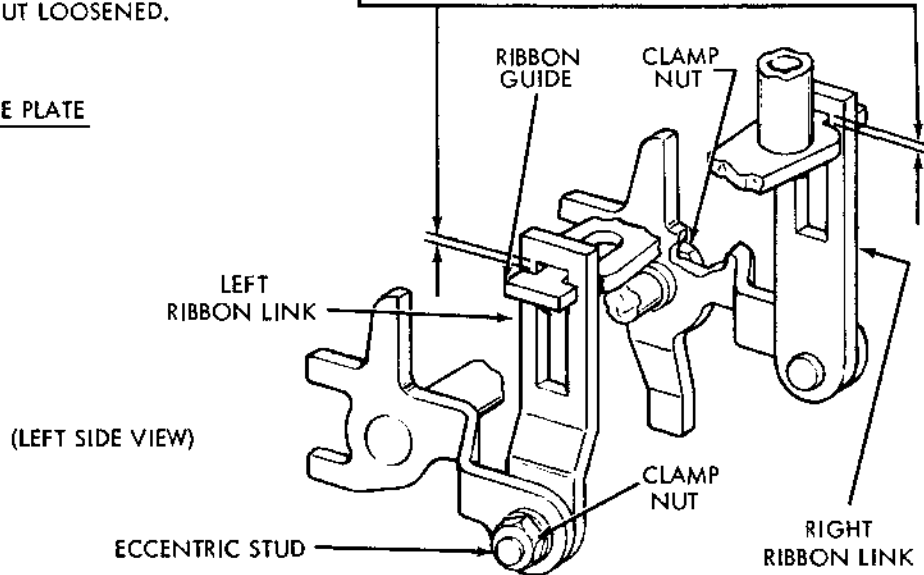
TO ADJUST

USING HEXAGON WRENCH, POSITION ECCENTRIC
 STUD WITH CLAMP NUT LOOSENED.

RELATED ADJUSTMENT

AFFECTED BY

LEFT SLIDE GUIDE PLATE



PRINT TRIP LEVER (CARRIAGE)

REQUIREMENT

(1) PLACE CARRIAGE APPROXIMATELY 1/2 INCH FROM LEFT-HAND MARGIN. SET UP BLANK COMBINATION IN SELECTOR. ROTATE MAIN-SHAFT UNTIL THE CARRIAGE DRIVE BAIL REACHES ITS REARMOST POSITION. CLEARANCE BETWEEN PRINT HAMMER BAIL AND PRINT HAMMER TRIP LEVER

MIN. 0.040 INCH --- MAX. 0.100 INCH

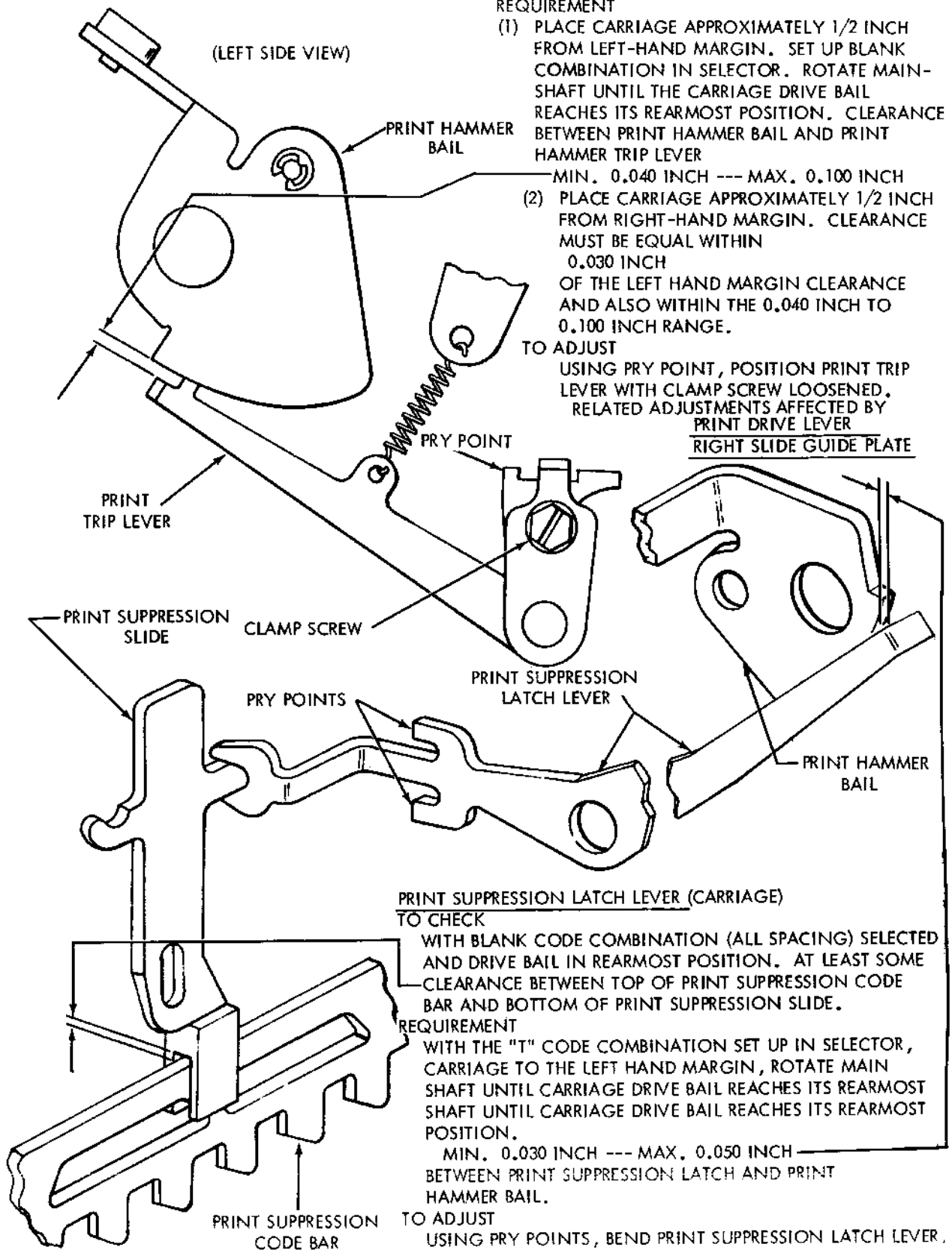
(2) PLACE CARRIAGE APPROXIMATELY 1/2 INCH FROM RIGHT-HAND MARGIN. CLEARANCE MUST BE EQUAL WITHIN 0.030 INCH

OF THE LEFT HAND MARGIN CLEARANCE AND ALSO WITHIN THE 0.040 INCH TO 0.100 INCH RANGE.

TO ADJUST

USING PRY POINT, POSITION PRINT TRIP LEVER WITH CLAMP SCREW LOOSENED. RELATED ADJUSTMENTS AFFECTED BY PRINT DRIVE LEVER

RIGHT SLIDE GUIDE PLATE



PRINT SUPPRESSION LATCH LEVER (CARRIAGE)

TO CHECK

WITH BLANK CODE COMBINATION (ALL SPACING) SELECTED AND DRIVE BAIL IN REARMOST POSITION. AT LEAST SOME CLEARANCE BETWEEN TOP OF PRINT SUPPRESSION CODE BAR AND BOTTOM OF PRINT SUPPRESSION SLIDE.

REQUIREMENT

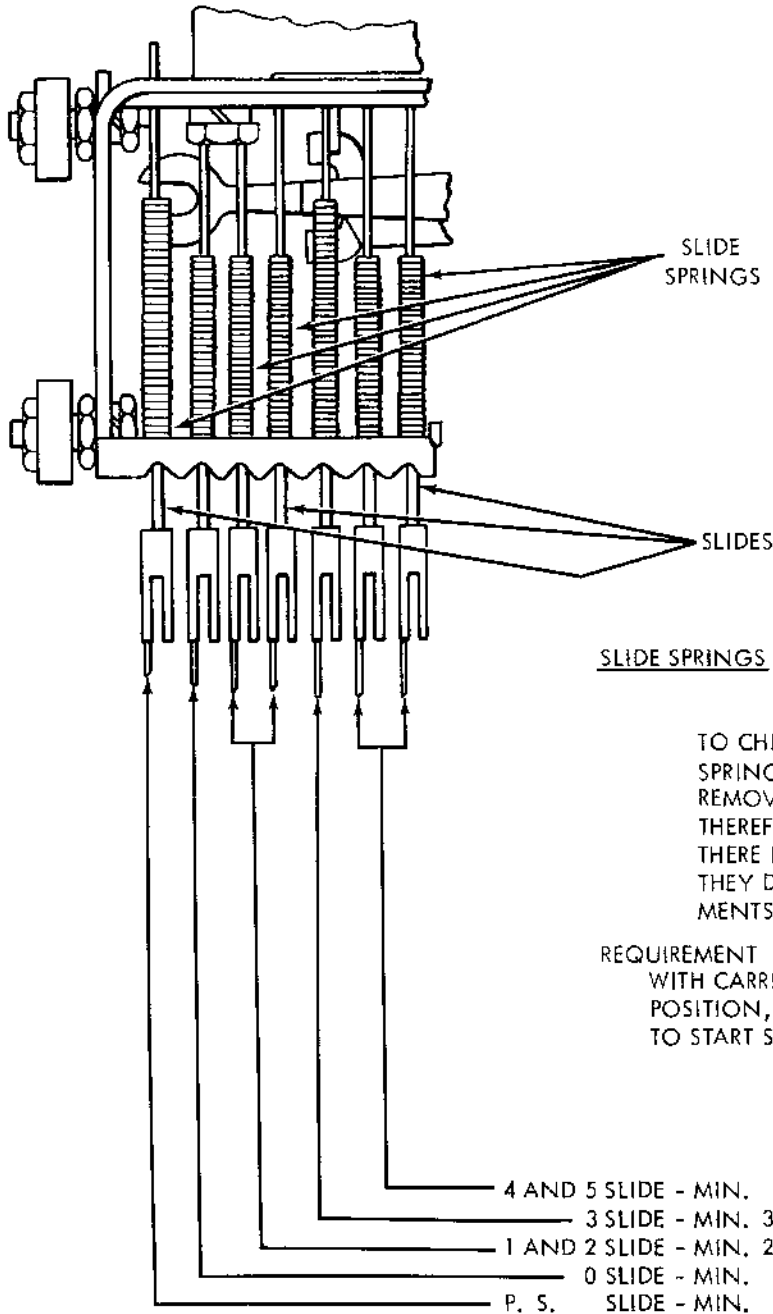
WITH THE "T" CODE COMBINATION SET UP IN SELECTOR, CARRIAGE TO THE LEFT HAND MARGIN, ROTATE MAIN SHAFT UNTIL CARRIAGE DRIVE BAIL REACHES ITS REARMOST POSITION.

MIN. 0.030 INCH --- MAX. 0.050 INCH

BETWEEN PRINT SUPPRESSION LATCH AND PRINT HAMMER BAIL.

TO ADJUST

USING PRY POINTS, BEND PRINT SUPPRESSION LATCH LEVER. USE FINGER PRESSURE TO HOLD LATCH LEVER AGAINST BAIL WHILE MAKING ADJUSTMENT. IF GAP IS TOO SMALL, USE TOP PRY POINT. IF IT IS TOO LARGE, USE BOTTOM PRY POINT.



SLIDE SPRINGS (CARRIAGE)

NOTE

TO CHECK TENSIONS OF THESE SPRINGS, IT IS NECESSARY TO REMOVE CARRIAGE FROM PRINTER. THEREFORE, DO NOT CHECK UNLESS THERE IS REASON TO BELIEVE THAT THEY DO NOT MEET THEIR REQUIREMENTS.

REQUIREMENT

WITH CARRIAGE POWER BAIL IN THE STOP POSITION, IT SHALL REQUIRE FOLLOWING TO START SLIDES MOVING.

- 4 AND 5 SLIDE - MIN. 1/4 OZ. ---MAX. 1-1/4 OZS.
- 3 SLIDE - MIN. 3-3/4 OZS. ---MAX. 4-1/2 OZS.
- 1 AND 2 SLIDE - MIN. 2 OZS. ---MAX. 3 OZS.
- 0 SLIDE - MIN. 1/4 OZ. ---MAX. 1 OZ.
- P. S. SLIDE - MIN. 1/2 OZ. ---MAX. 1-1/4 OZS.

NOTE

THE ADJUSTMENTS AND SPECIAL REQUIREMENTS CONTAINED HEREIN WERE WRITTEN FOR 5 LEVEL MACHINES. THE SLIDE NUMBERING IS DIFFERENT ON THE 8 LEVEL MACHINES. TO CONVERT FROM 5 LEVEL TO 8 LEVEL SLIDE NUMBERS IT WILL MERELY BE NECESSARY TO MENTALLY ADD ONE (1) TO THE 5 LEVEL SLIDE NUMBER. EXAMPLE: NUMBER 0 SLIDE FOR 5 LEVEL BECOMES NUMBER 1 SLIDE FOR 8 LEVEL, NUMBER 3 SLIDE FOR 5 LEVEL BECOMES NUMBER 4 SLIDE FOR 8 LEVEL, ETC.

(LEFT SIDE VIEW)

ROTARY DRIVE LEVER SPRING (CARRIAGE)

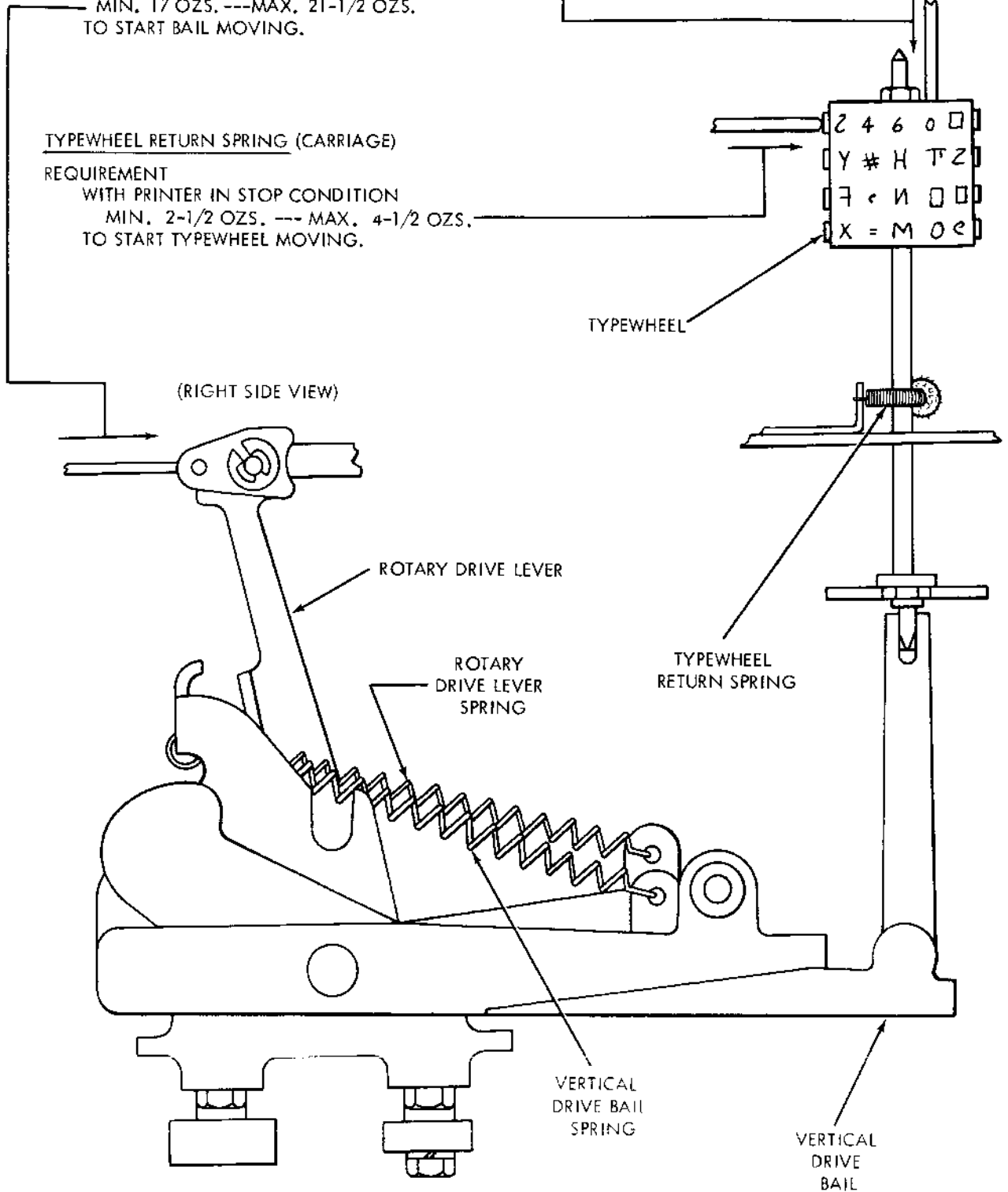
REQUIREMENT
 WITH ALL MARKING CODE COMBINATION
 SELECTED AND MAIN SHAFT ROTATED UNTIL
 CARRIAGE DRIVE BAIL IS IN REAR MOST POSITION
 MIN. 17 OZS. ---MAX. 21-1/2 OZS.
 TO START BAIL MOVING.

VERTICAL DRIVE BAIL SPRING (CARRIAGE)

REQUIREMENT
 WITH PRINTER IN STOP CONDITION
 MIN. 13 OZS. ---MAX. 18 OZS.
 TO START TYPEWHEEL MOVING.

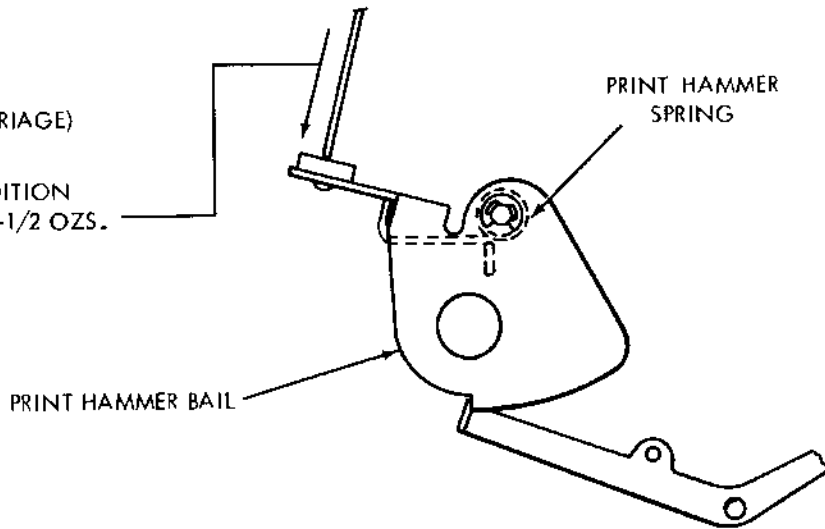
TYPEWHEEL RETURN SPRING (CARRIAGE)

REQUIREMENT
 WITH PRINTER IN STOP CONDITION
 MIN. 2-1/2 OZS. --- MAX. 4-1/2 OZS.
 TO START TYPEWHEEL MOVING.



PRINT HAMMER BAIL SPRING (CARRIAGE)

REQUIREMENT
 WITH PRINTER IN STOP CONDITION
 MIN. 3 OZS. --- MAX. 4-1/2 OZS.
 TO START HAMMER MOVING.

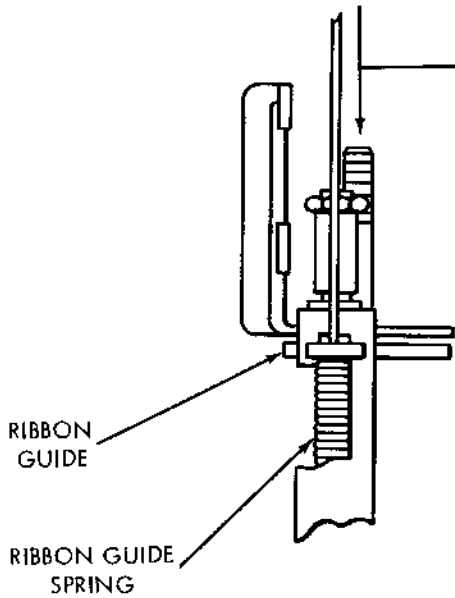


(RIGHT SIDE VIEW)

RIBBON GUIDE SPRING (CARRIAGE)

TO CHECK
 REMOVE RIBBON FROM GUIDE. TRIP
 SELECTOR CLUTCH AND ROTATE MAIN
 SHAFT UNTIL CARRIAGE DRIVE BAIL IS
 IN REARMOST POSITION.

REQUIREMENT
 MIN. 6 OZS. --- MAX. 9 OZS.
 TO START GUIDE MOVING.

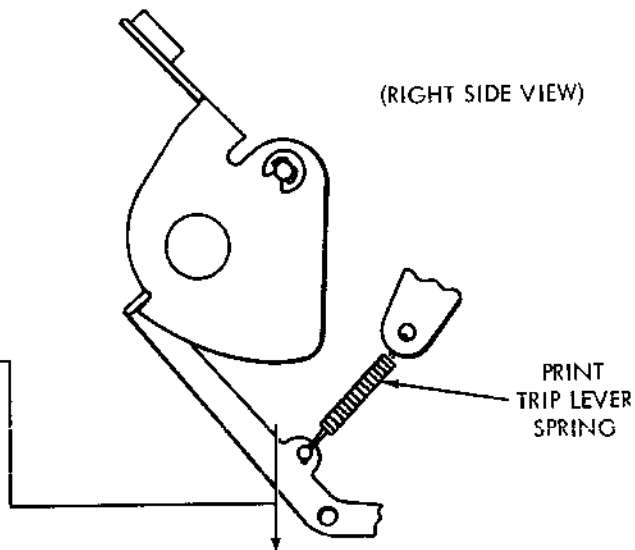


(LEFT SIDE VIEW)

(RIGHT SIDE VIEW)

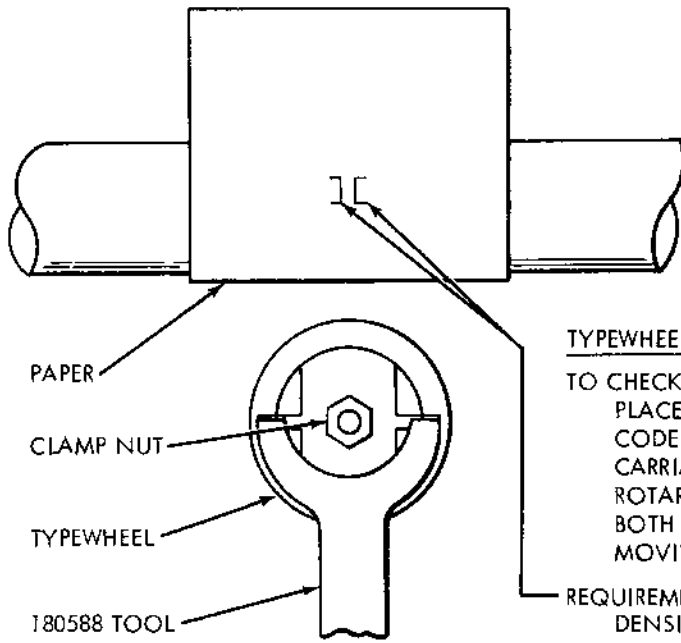
PRINT TRIP LEVER SPRING (CARRIAGE)

REQUIREMENT
 WITH PRINTER IN STOP CONDITION
 MIN. 1 OZ. --- MAX. 2-1/2 OZS.
 TO START LATCH MOVING



NOTE

REPLACE PLATEN AND RIBBON MECHANISM AND DASHPOT CYLINDER. FOR INSTRUCTIONS, SEE "DISASSEMBLY AND REASSEMBLY" (SECTION 5).



TYPEWHEEL (CARRIAGE)

TO CHECK

PLACE PAPER IN PRINTER. SELECT BLANK (ALL SPACING) CODE COMBINATION. ROTATE MAIN SHAFT UNTIL CARRIAGE DRIVE BAIL IS IN REARMOST POSITION. HOLD ROTARY DRIVE LEVER ALL THE WAY REARWARD TO RESET BOTH RACKS. MANUALLY TRIP PRINT HAMMER BY MOVING PRINT SUPPRESSION LATCH LEVER FRONTWARD.

REQUIREMENT

DENSITY OF LEFT AND RIGHT LINE OF PRINTED IMPRESSION APPROXIMATELY EQUAL. (DENSITY AT TOP AND BOTTOM MAY BE UNEQUAL BECAUSE OF MISADJUSTMENT OF PLATEN-VERTICAL (PAPER FEED)).

RIBBON POWER LEVER (CARRIAGE)

(1) REQUIREMENT

WITH CARRIAGE DRIVE BAIL IN REARMOST POSITION AND RIBBON RATCHET SEATED AGAINST FEED PAWL, CLEARANCE BETWEEN FACE OF A RATCHET TOOTH AND THE CORNER TIP OF CHECK PAWL ON BOTH RIGHT AND LEFT RIBBON RATCHETS AS GAGED BY EYE

MIN. SOME --- MAX. 0.045 INCH

(2) REQUIREMENT

WITH UNIT OPERATING UNDER POWER THE FEED PAWL SHALL ADVANCE RIBBON RATCHET ONE TOOTH ON EACH OPERATION FOR BOTH LEFT AND RIGHT RIBBON RATCHETS

TO ADJUST

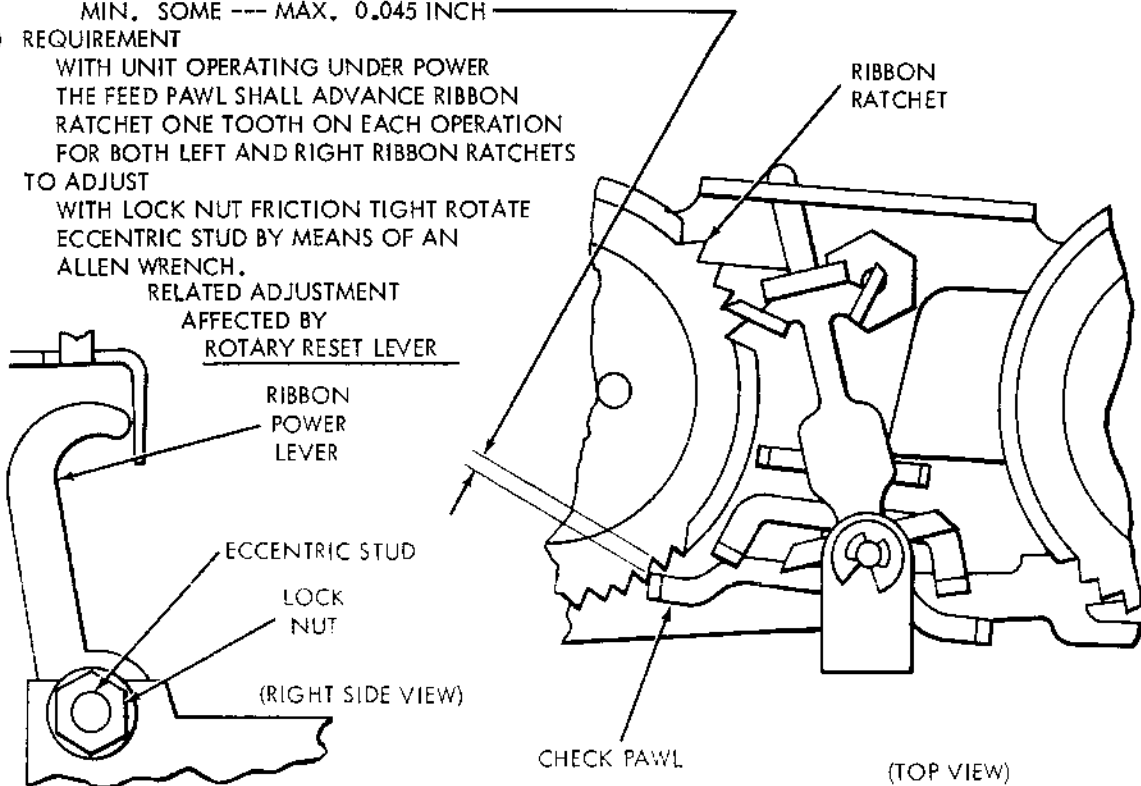
WITH LOCK NUT FRICTION TIGHT ROTATE ECCENTRIC STUD BY MEANS OF AN ALLEN WRENCH.

RELATED ADJUSTMENT

AFFECTED BY ROTARY RESET LEVER

TO ADJUST

POSITION TYPEWHEEL WITH CLAMP NUT LOOSENED. HOLD TYPEWHEEL WITH 180588 TOOL WHEN TIGHTENING NUT.



RIBBON RATCHET SPRING (CARRIAGE)

REQUIREMENT

WITH FEED AND CHECK PAWLS DISENGAGED FROM RATCHET

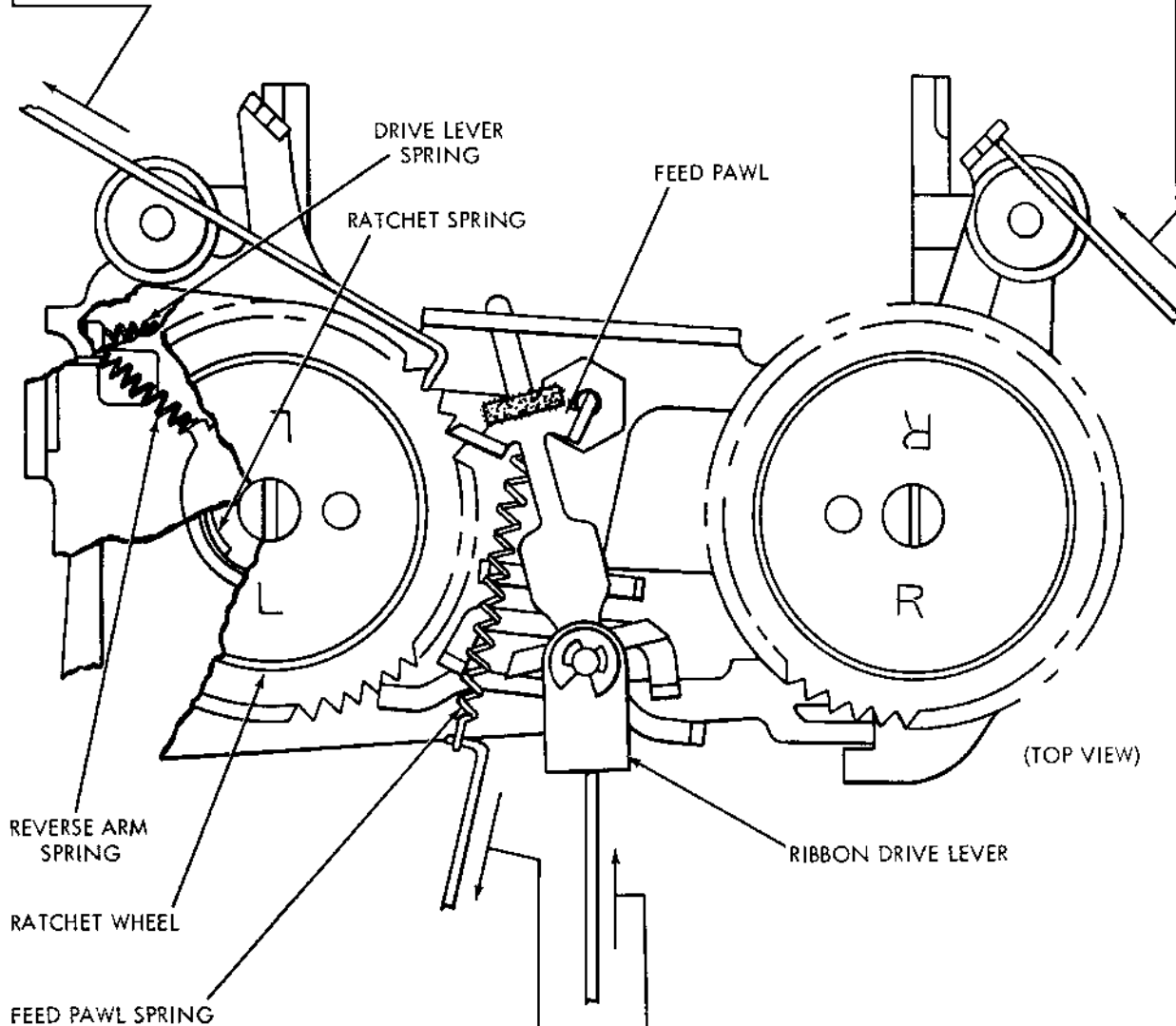
MIN. 1-1/2 OZS. ---MAX. 3-1/2 OZS. TO START RATCHET MOVING.

RIBBON REVERSE ARM SPRING (CARRIAGE)

REQUIREMENT

WITH PRINTER IN STOP CONDITION AND RIBBON REMOVED

MIN. 1-1/2 OZS. ---MAX. 3 OZS. TO START ARM MOVING.



REVERSE ARM SPRING

RATCHET WHEEL

FEED PAWL SPRING

DRIVE LEVER SPRING

RATCHET SPRING

FEED PAWL

(TOP VIEW)

RIBBON DRIVE LEVER

RIBBON FEED PAWL SPRING (CARRIAGE)

REQUIREMENT

WITH PRINTER IN STOP CONDITION
MIN. 2-1/2 OZS. ---MAX. 4 OZS.

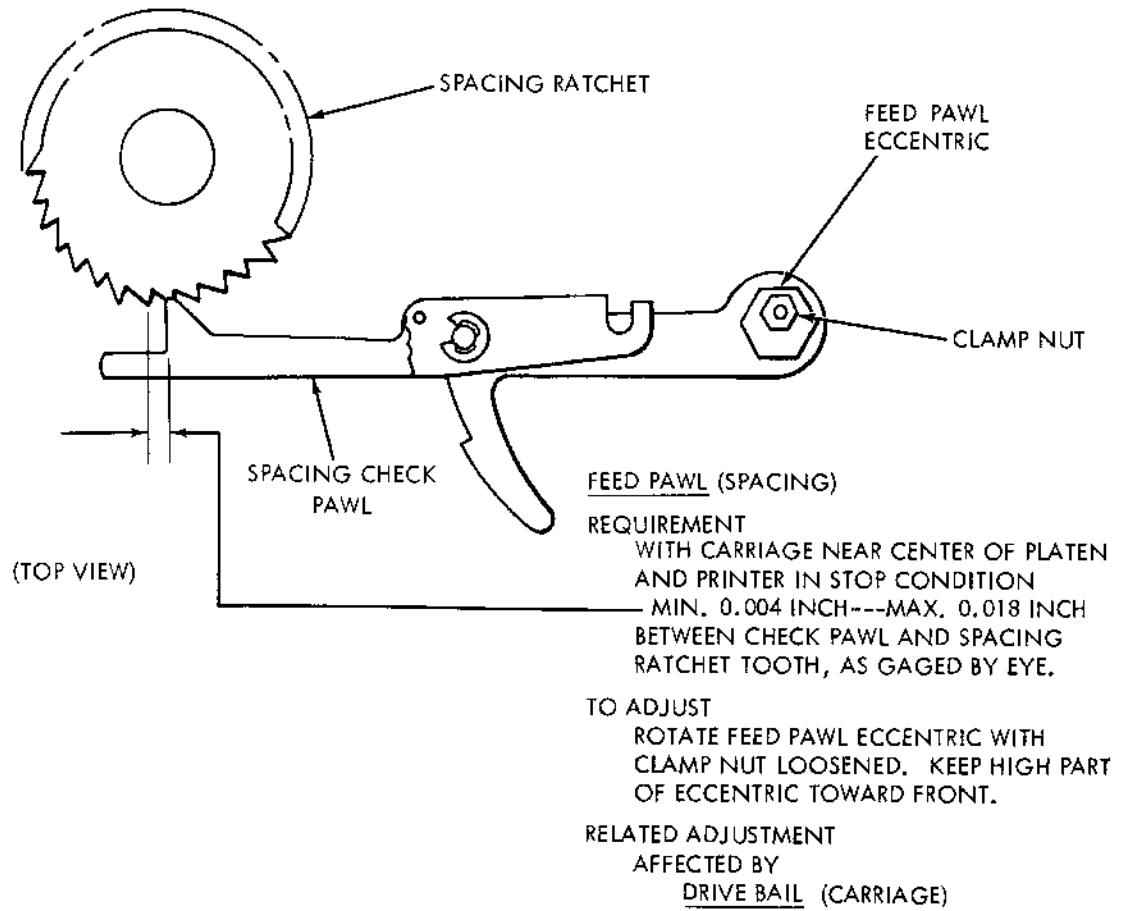
TO PULL SPRING TO INSTALLED LENGTH.

RIBBON DRIVE LEVER SPRING (CARRIAGE)

REQUIREMENT

WITH PRINTER IN STOP CONDITION
MIN. 5-1/2 OZS. ---MAX. 9 OZS.

TO START LEVER MOVING.



**SPACE SUPPRESSION LEVER
REQUIREMENT**

- (1) CLEARANCE BETWEEN RIGHT END OF SPACING FEED PAWL AND TIP OF NOTCH ON SPACE SUPPRESSION LEVER

MIN. 0.005 INCH --- MAX. 0.040 INCH

- (2) SOME CLEARANCE BETWEEN LEFT END OF "0" CODE BAR AND REAR EXTENSION OF SPACE SUPPRESSION LEVER.
(3) THE HIGH PART OF ECCENTRIC SHALL BE POSITIONED TOWARD REAR OF UNIT.

NOTE

IF SPACING FEED PAWL IS MOVED TOO FAR TO THE REAR, IT WILL BE NECESSARY TO DISENGAGE SPACING FEED PAWL FROM SPACING RATCHET.

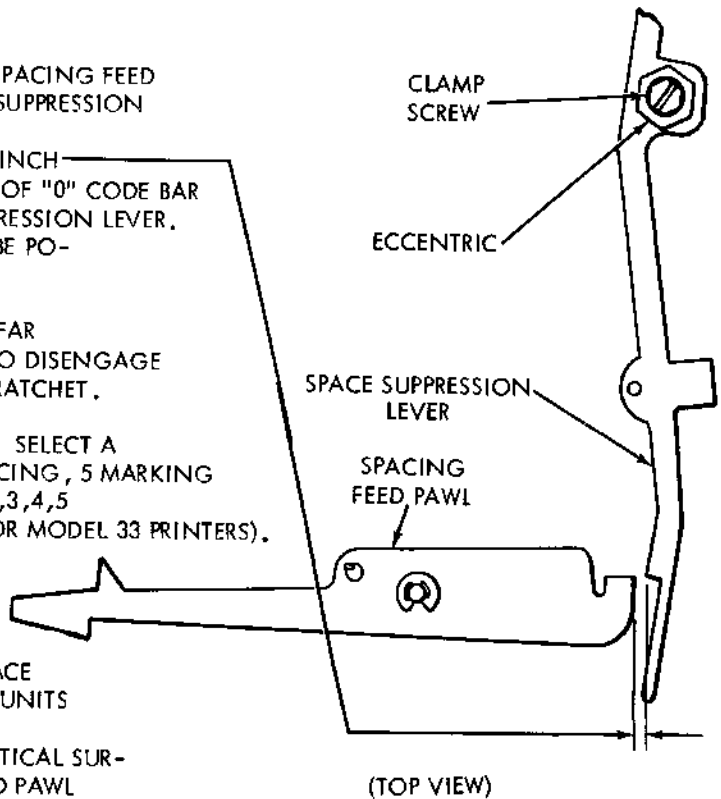
TO ADJUST

- (1) PLACE CARRIAGE IN CENTER OF UNIT. SELECT A TYPING CHARACTER ("T" 1,2,3,4, SPACING, 5 MARKING FOR MODEL 32 PRINTERS AND "@" 1,2,3,4,5 SPACING, 6 MARKING, 7 SPACING FOR MODEL 33 PRINTERS).

NOTE

IT MAY BE NECESSARY TO TRIP THE SPACE SUPPRESSION LEVER WHEN REPAIRING UNITS WHICH HAVE BEEN MALADJUSTED.

- (2) ROTATE MAINSHAFT UNTIL FRONT VERTICAL SURFACE OF RIGHT END OF SPACING FEED PAWL IS ALIGNED, AS GAGED BY EYE, WITH NOTCH ON SPACE SUPPRESSION LEVER.
(3) WITH SPACE SUPPRESSION LEVER ECCENTRIC CLAMP SCREW FRICTION TIGHT. POSITION ECCENTRIC SO THAT WHEN THE FOLLOWING CHECKS ARE PERFORMED, REQUIREMENTS NOS. (1), (2), AND (3) ARE MET.



TO CHECK

- (1) MOVE AND HOLD SPACE SUPPRESSION LEVER AGAINST RIGHT END OF SPACING FEED PAWL. TO DO THIS, PUSH AND HOLD PRINT SUPPRESSION CODE BAR TOWARD RIGHT SIDE OF UNIT. ROTATE SHAFT VERY SLOWLY (FORWARD OR BACKWARD AS NECESSARY) UNTIL FRONT VERTICAL SURFACE OF SPACING FEED PAWL AND FRONT SURFACE OF NOTCH IN SPACE SUPPRESSION LEVER ARE ALIGNED FLUSH WITH EACH OTHER.

NOTE

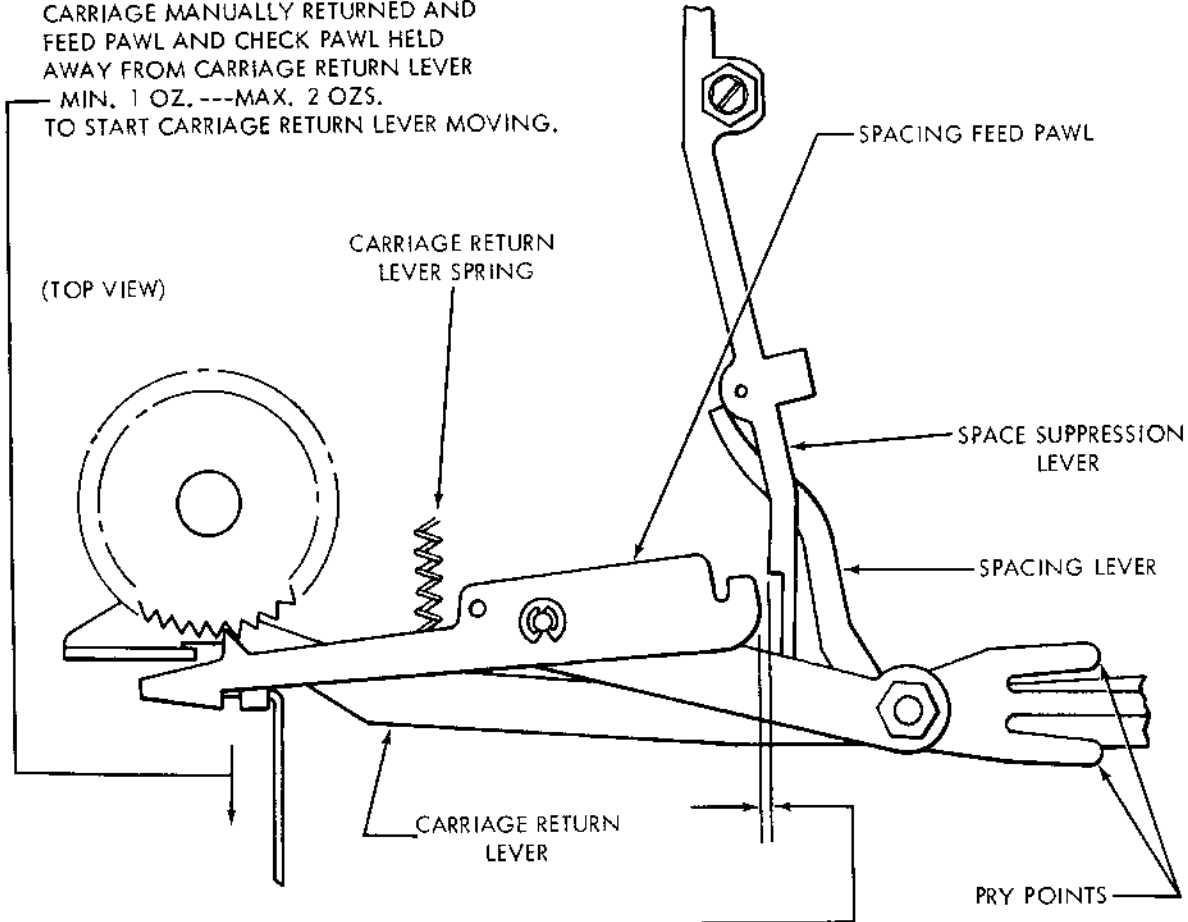
IF THE SPACING FEED PAWL IS MOVED TOO FAR TO THE REAR WHILE ATTEMPTING TO OBTAIN THE DESIRED ALIGNMENT, (THIS APPLIES TO THE CHECKING PROCEDURE ONLY) IT WILL BE NECESSARY TO REPEAT ADJUSTMENTS NOS. 2,3, AND TO CHECK NO. 1.

- (2) RELEASE PRINT SUPPRESSION CODE BAR SO THAT THE SPACE SUPPRESSION LEVER MOVES TO RIGHT WITH A SNAP.
(3) TIGHTEN ECCENTRIC CLAMP SCREW. PERFORM TO CHECK NOS. 1 AND 2 AND RECHECK ALL THREE REQUIREMENTS. READJUST IF NECESSARY.

CARRIAGE RETURN LEVER SPRING (SPACING)

REQUIREMENT

WITH PRINTER IN STOP CONDITION,
CARRIAGE MANUALLY RETURNED AND
FEED PAWL AND CHECK PAWL HELD
AWAY FROM CARRIAGE RETURN LEVER
MIN. 1 OZ. ---MAX. 2 OZS.
TO START CARRIAGE RETURN LEVER MOVING.

SPACING LEVER (SPACING)

REQUIREMENT

- (1) CLEARANCE BETWEEN RIGHT END OF SPACING FEED PAWL AND TIP OF NOTCH ON SPACE SUPPRESSION LEVER AS GAGED BY EYE
MIN. 0.005 INCH --- MAX. 0.040 INCH
- (2) THE SPACE SUPPRESSION TRIP LEVER SHALL FULLY RETURN TO ITS FORWARD POSITION POSITIVELY AND WITHOUT HESITATION.

TO ADJUST

- (1) PLACE CARRIAGE IN CENTER OF UNIT. WITH SPACE CODE COMBINATION (--3--) FOR 5 LEVEL UNITS OR (----6-8) FOR 8 LEVEL UNITS SELECTED.

NOTE

IT MAY BE NECESSARY TO TRIP THE SPACE SUPPRESSION LEVER ON UNITS WHICH HAD NOT BEEN PREVIOUSLY ADJUSTED OR WHEN REPAIRING UNITS WHICH HAD BEEN MALADJUSTED.

- (2) ROTATE THE MAINSHAFT UNTIL FRONT VERTICAL SURFACE OF RIGHT END OF SPACING FEED PAWL IS ALIGNED (AS GAGED BY EYE) WITH THE NOTCH ON THE SPACE SUPPRESSION LEVER.

(CONTINUED ON NEXT PAGE)

(CONTINUED FROM PRECEDING PAGE)

NOTE

IF THE SPACING FEED PAWL IS MOVED TOO FAR TO THE REAR, IT WILL BE NECESSARY TO DISENGAGE THE SPACING FEED PAWL FROM THE SPACING RATCHET.

- (3) POSITION SPACE SUPPRESSION TRIP LEVER BY BENDING MIDDLE PRONG OF ITS PRY POINTS SO THAT WHEN THE FOLLOWING CHECKS ARE PERFORMED, REQUIREMENTS NOS. 1, AND 2 ARE MET.

NOTE

IF SPACE SUPPRESSION TRIP LEVER BINDS AT ITS CONNECTION TO OPERATING LINK, BEND THE FORMED EAR ON RIGHT END OF SPACE SUPPRESSION TRIP LEVER TO MAKE IT PARALLEL TO OPERATING LINK AND TO RELIEVE THE "BIND". TO ADJUST FOR REQUIREMENT NO. 1, USE THE FRONT PRY POINT TO INCREASE THE GAP AND USE THE REAR PRY POINT TO DECREASE THE GAP.

TO CHECK

- (1) MOVE AND HOLD SPACE SUPPRESSION LEVER AGAINST RIGHT END OF SPACING FEED PAWL. TO DO THIS, PUSH TOWARD THE REAR OF UNIT, ON RIGHT END OF SPACE SUPPRESSION TRIP LEVER, AT POINT WHERE IT IS CONNECTED TO ITS OPERATING LINK. ROTATE SHAFT VERY SLOWLY (FORWARD AND/OR BACKWARD WHEN NECESSARY) UNTIL FRONT VERTICAL SURFACE OF SPACING FEED PAWL AND FRONT SURFACE OF NOTCH IN SPACE SUPPRESSION LEVER ARE ALIGNED FLUSH WITH EACH OTHER.

NOTE

IF SPACING FEED PAWL IS MOVED TOO FAR TO REAR WHILE ATTEMPTING TO OBTAIN DESIRED ALIGNMENT (THIS APPLIES TO THE CHECKING PROCEDURE ONLY), IT WILL BE NECESSARY TO REPEAT ADJUSTMENTS NOS. 1, AND 2, AND CHECK (1) ABOVE.

- (2) RELEASE SPACE SUPPRESSION LEVER SO THAT IT MOVES TO RIGHT WITH A "SNAP".
 (3) TAKE UP PLAY OF SPACING FEED PAWL AT ITS LEFT END IN AN UPWARD DIRECTION.

READJUST, IF NECESSARY.

NOTE

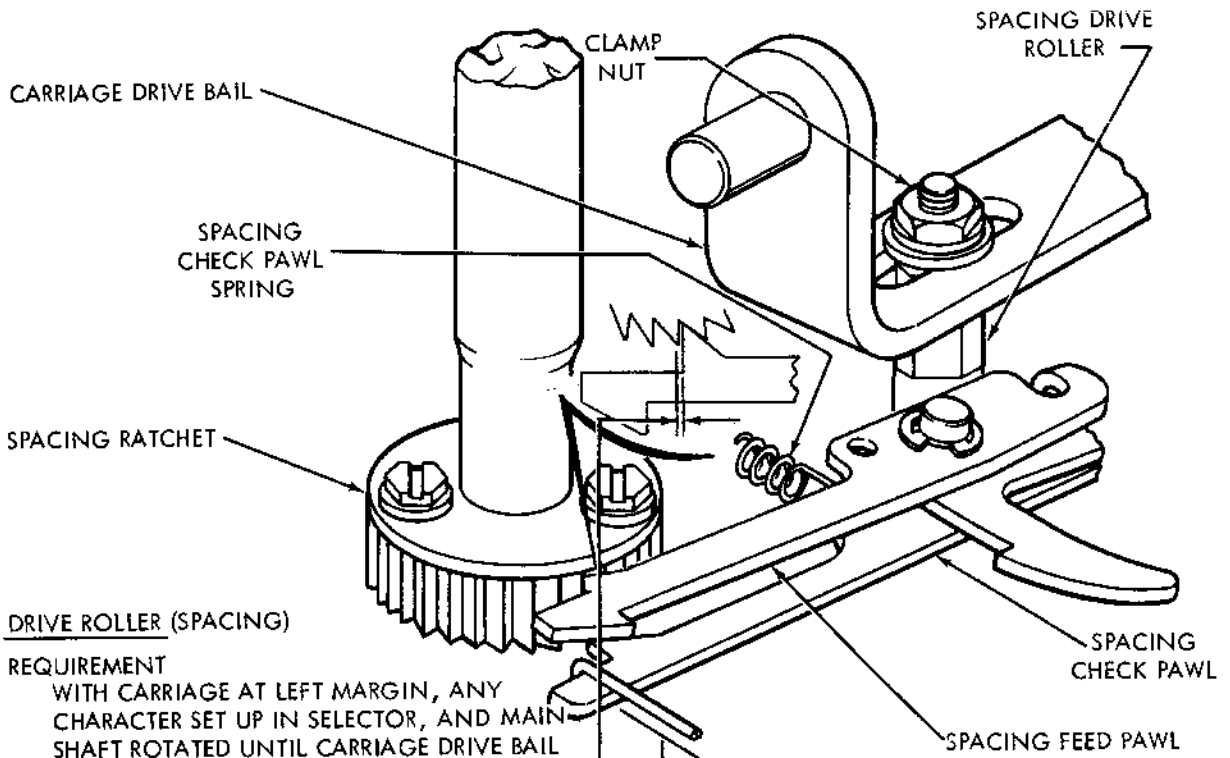
SELECT "BLANK" FUNCTION (ALL SPACING), ROTATE MAIN-SHAFT, AND CHECK FOR MINIMUM .015 INCH ENGAGEMENT (GAGE BY EYE) BETWEEN RIGHT END OF SPACING FEED PAWL AND TIP OF NOTCH ON SPACE SUPPRESSION LEVER. REFINE SPACE SUPPRESSION LEVER, AND SPACE LEVER ADJUSTMENTS WITHIN THEIR REQUIREMENTS, IF NECESSARY.

RELATED ADJUSTMENTS

AFFECTED BY

ROCKER DRIVE ARM (FUNCTION)

RIGHT FUNCTION DRIVE ARM (FUNCTION)



DRIVE ROLLER (SPACING)

REQUIREMENT

WITH CARRIAGE AT LEFT MARGIN, ANY CHARACTER SET UP IN SELECTOR, AND MAIN SHAFT ROTATED UNTIL CARRIAGE DRIVE BAIL IS IN REARMOST POSITION

MIN. 0.005 INCH --- MAX. 0.030 INCH BETWEEN SPACING FEED PAWL AND RATCHET TOOTH.

TO ADJUST

POSITION SPACING DRIVE ROLLER CARRIAGE DRIVE BAIL WITH CLAMP NUT LOOSENED.

REQUIREMENT (FINAL)

THE UNIT SHALL CONSISTENTLY SINGLE SPACE FROM RIGHT TO LEFT HAND MARGIN.

RELATED ADJUSTMENT AFFECTED BY DRIVE BAIL (CARRIAGE)

SPACE SUPPRESSION LEVER SPRING (SPACING)

REQUIREMENT

WITH PRINTER IN STOP CONDITION MIN. 1-1/2 OZS. --- MAX. 3 OZS. TO START LEVER MOVING.

SPACING FEED PAWL SPRING (SPACING)

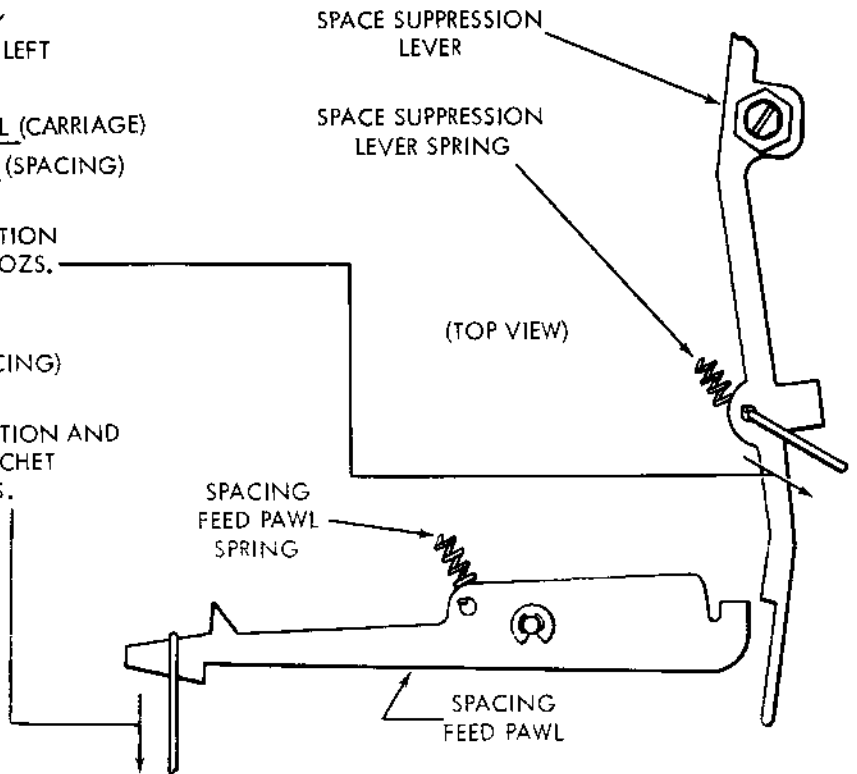
REQUIREMENT

WITH PRINTER IN STOP CONDITION AND PAWL DISENGAGED FROM RATCHET MIN. 2 OZS. --- MAX 4 OZS. TO START PAWL MOVING.

SPACING CHECK PAWL SPRING (SPACING)

REQUIREMENT

WITH PRINTER IN STOP CONDITION MIN. 3/4 OZ. --- MAX. 1-1/2 OZS. TO START PAWL MOVING.



PLATEN-HORIZONTAL (PAPER FEED)

(1) REQUIREMENT

WITH BLANK COMBINATION SELECTED, ROTATE MAIN SHAFT UNTIL DRIVE BAIL IS IN REAR-MOST POSITION. ROTATE PLATEN UNTIL FLAT ON LEFT-HAND SIDE OF PLATEN IS ALIGNED HORIZONTALLY ON TOP OR THE "0" ON KNOB IS IN ITS UPPERMOST POSITION

MIN. 0.042 INCH --- MAX. 0.058 INCH BETWEEN RIBBON GUIDE AND PLATEN AT BOTH MARGINS WHEN PLAY IN RIBBON GUIDE IS TAKEN UP TOWARDS PLATEN WITH A SPRING HOOK APPLIED IN THE WEDGE SHAPED PROJECTION OF RIBBON GUIDE.

(2) REQUIREMENT

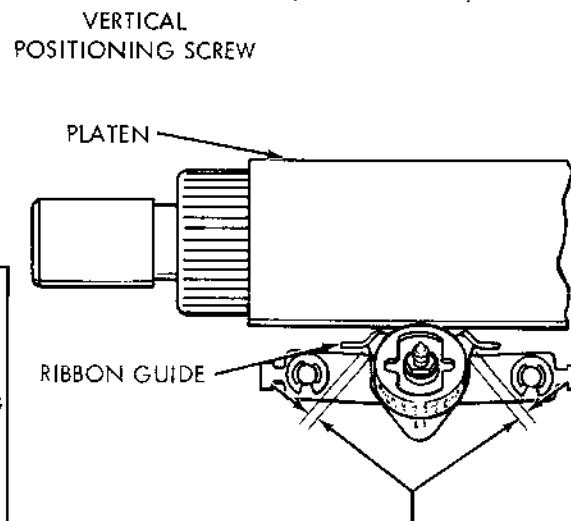
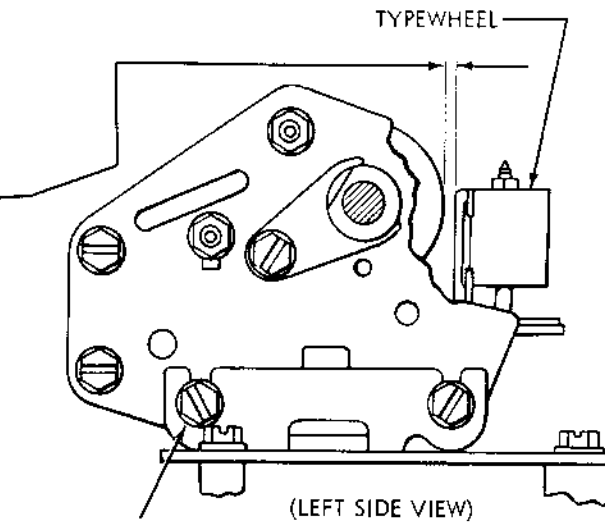
WHEN PRINTED UNDER POWER, THERE SHALL NOT BE ANY RIBBON SMUDGE.

(3) REQUIREMENT

PLACE CARRIAGE AT MIDDLE OF LINE, SELECT "M" FOR THE MODEL 32 AND "X" FOR MODEL 33 PRINTERS. ROTATE MAIN SHAFT UNTIL DRIVE BAIL IS IN ITS REARMOST POSITION AND PRINT HAMMER STRIKES TYPEWHEEL. MANUALLY PUSH TYPEWHEEL REARWARD UNTIL IT JUST TOUCHES PLATEN. THE TYPEWHEEL SHALL NOT TOUCH RIBBON GUIDE OR CAUSE RIBBON GUIDE TO MOVE TOWARDS PLATEN.

NOTE: NO PAPER OR RIBBON IN THE UNIT. TO ADJUST

LOOSEN FOUR VERTICAL POSITIONING SCREWS. PLACE BOTH ENDS OF PLATEN IN LOWEST POSITION. LOOSEN FOUR HORIZONTAL POSITIONING SCREWS. POSITION PLATEN HORIZONTALLY TO MEET REQUIREMENTS. TIGHTEN HORIZONTAL POSITION SCREWS. ADJUST RIBBON GUIDE BY BENDING IF NECESSARY. PROCEED TO PLATEN-VERTICAL ADJUSTMENT.

PLATEN-VERTICAL (PAPER FEED)

REQUIREMENT

AS GAGED BY EYE, APPROXIMATE UNIFORM DENSITY AT TOP AND BOTTOM OF PRINTED CHARACTER ALONG ENTIRE LENGTH OF PRINTED LINE.

TO ADJUST

USING PRY POINTS POSITION PLATEN VERTICALLY WITH VERTICAL POSITIONING SCREWS LOOSENED. BE SURE TO RAISE OR LOWER PLATEN MOUNTING PLATES AND NOT JUST TWIST THEM.

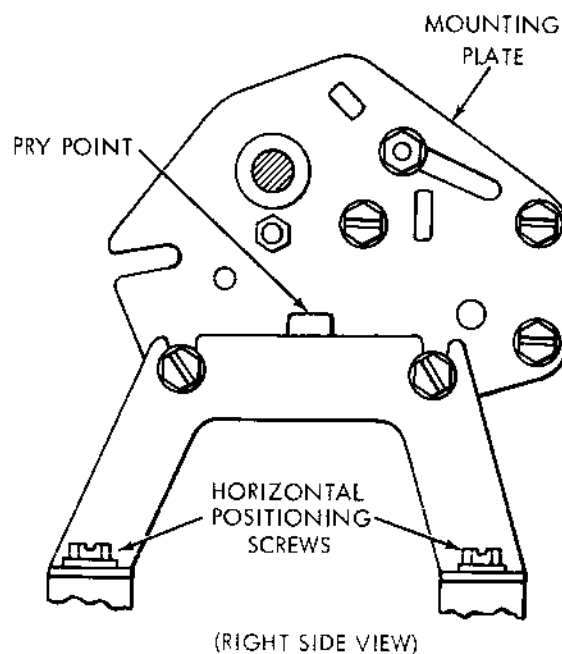
RELATED ADJUSTMENTS

AFFECTS

LINE FEED UPSTOP BRACKET
PRESSURE ROLLER

AFFECTED BY

REAR RAIL - LEFT END (CARRIAGE)
REAR RAIL - RIGHT END (CARRIAGE)
PRINT DRIVE LEVER (CARRIAGE)



SINGLE-DOUBLE LINE FEED (PAPER FEED)

REQUIREMENT
UPSTOP STUD AT LOWER END OF SLOT.

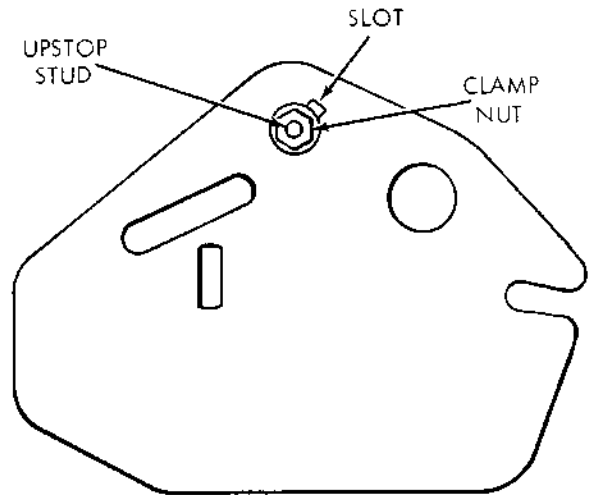
TO ADJUST
POSITION STUD WITH CLAMP NUT LOOSENED.

RELATED ADJUSTMENTS
AFFECTS

PLATEN DETENT

NOTE

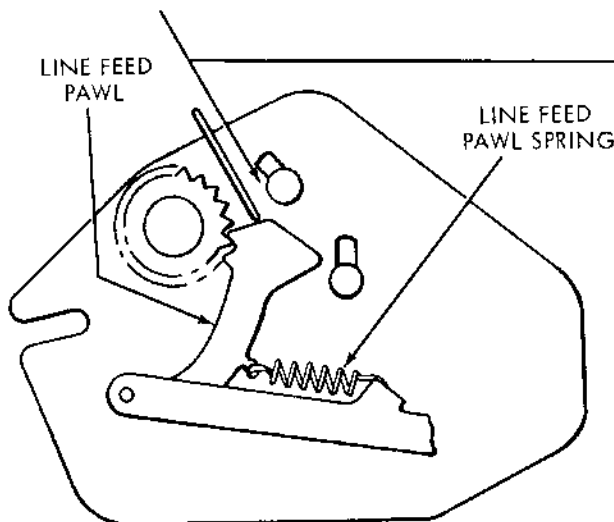
IF DOUBLE LINE FEED IS DESIRED,
POSITION STUD AT UPPER END OF SLOT
AFTER ALL ADJUSTMENTS HAVE BEEN MADE.



(LEFT SIDE VIEW)

LINE FEED PAWL SPRING (PAPER FEED)

REQUIREMENT
WITH PRINTER IN STOP CONDITION
MIN. 3/4 OZ. --- MAX. 1-3/4 OZS.
TO START PAWL MOVING.



(RIGHT SIDE VIEW)

PLATEN DETENT (PAPER FEED)

REQUIREMENT
WHEN OPERATED BY FINGER PRESSURE,
LINE FEED PAWL SHALL FULLY SEAT IN
PLATEN RATCHET WITHOUT INTERFERENCE
FROM TEETH.

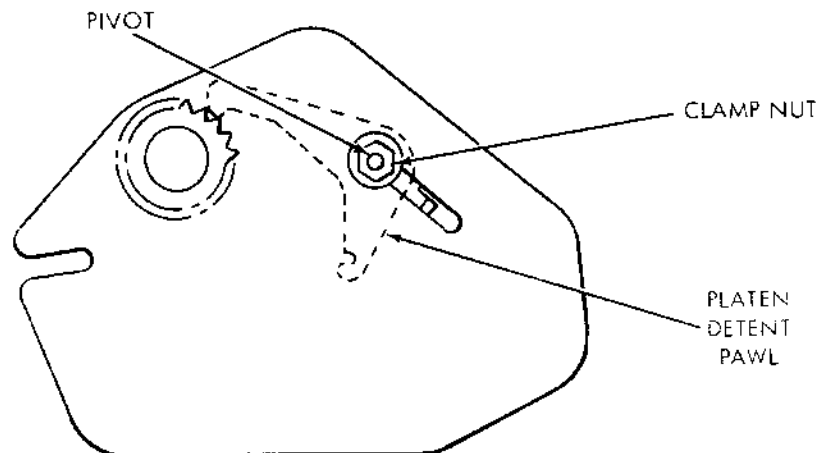
TO ADJUST
POSITION PLATEN DETENT PAWL'S PIVOT
WITH CLAMP NUT LOOSENED.

RELATED ADJUSTMENTS
AFFECTS

LINE FEED PAWL DOWNSTOP

AFFECTED BY

SINGLE-DOUBLE LINE FEED



LINE FEED DRIVE ARM (PAPER FEED)

REQUIREMENT

CARRIAGE IN THE CENTER OF UNIT, WITH LINE FEED CODE COMBINATION (-2---) OR (-2-4---8) SET UP IN SELECTOR AND MAIN SHAFT ROTATED UNTIL FUNCTION BAIL IS AT HIGHEST POINT

MIN. SOME --- MAX. 0.010 INCH

BETWEEN LINE FEED DRIVE ARM AND LINE FEED BLOCKING LEVER, WHEN THE PLAY IN THE DRIVE ARM AND BLOCKING LEVER IS TAKEN UP TO MAKE THIS CLEARANCE A MINIMUM.

TO ADJUST

USING PRY POINTS, POSITION DRIVE ARM WITH CLAMP SCREW LOOSENED UNTIL THERE IS DEFINITE CLEARANCE. THEN CAREFULLY POSITION IT TO MEET REQUIREMENT.

RELATED ADJUSTMENTS

AFFECTS

LINE FEED UPSTOP BRACKET

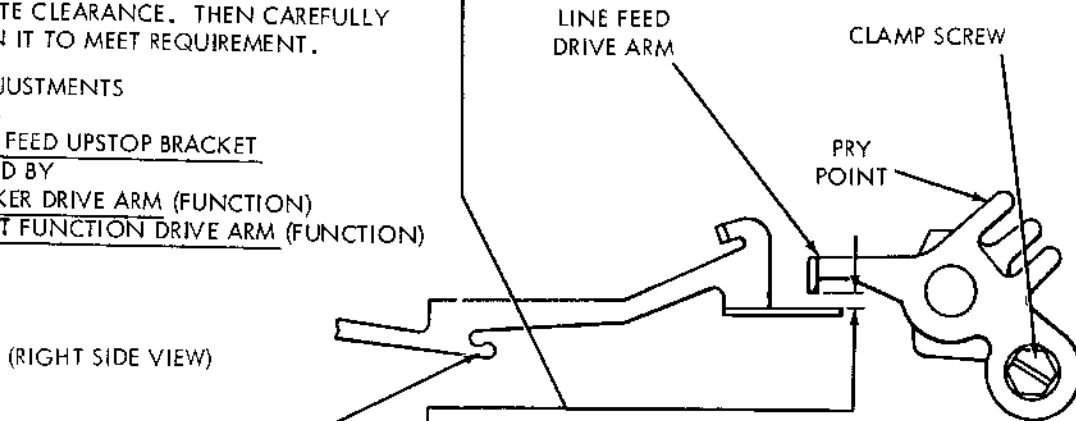
AFFECTED BY

ROCKER DRIVE ARM (FUNCTION)

RIGHT FUNCTION DRIVE ARM (FUNCTION)

NOTE

REPLACE MOTOR ON PRINTER ASSEMBLY AND REPLACE PRINTER ASSEMBLY ON SUB-BASE AT THIS POINT. FOR INSTRUCTIONS SEE "DIS-ASSEMBLY AND REASSEMBLY" (SECTION 5). MAKE GEAR BRACKET (MOTOR) AND BELT TENSION (MOTOR) ADJUSTMENTS.



(RIGHT SIDE VIEW)

LINE FEED UPSTOP BRACKET (PAPER FEED)

REQUIREMENT

CARRIAGE IN THE CENTER OF UNIT, WITH LINE FEED CODE COMBINATION (-2---) OR (-2-4---8) SET UP IN SELECTOR AND MAIN SHAFT ROTATED UNTIL FUNCTION BAIL IS AT HIGHEST POINT, PUSH DOWN ON LINE FEED FUNCTION LEVER TO TRIP THE PRINT SUPPRESSION CODE BAR

MIN. 0.020 INCH --- MAX. 0.040 INCH

TO ADJUST

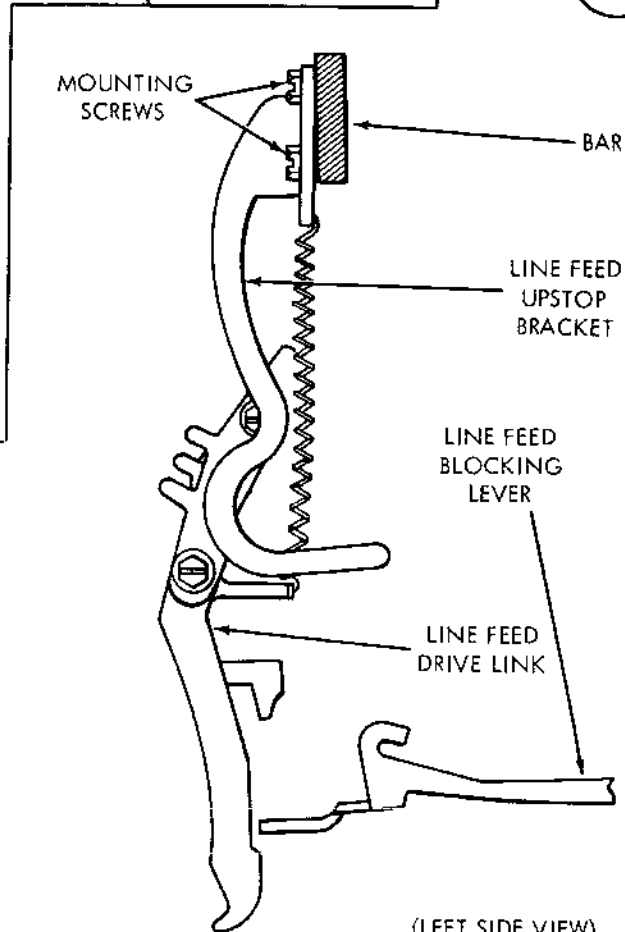
POSITION LINE FEED UPSTOP BRACKET WITH CLAMP SCREWS LOOSENED TO MEET THE REQUIREMENT.

RELATED ADJUSTMENTS

AFFECTED BY

PLATEN-VERTICAL

LINE FEED DRIVE ARM



(LEFT SIDE VIEW)

PLATEN DETENT PAWL SPRING (PAPER FEED)

REQUIREMENT

MIN. 24 OZS. ---MAX. 30 OZS.
TO START PAWL MOVING.

LINE FEED DRIVE LINK (PAPER FEED)

REQUIREMENT

THE MOTION SUPPLIED BY FUNCTION BAIL SHOULD
MATCH MOTION REQUIRED BY LINE FEED PAWL,
TO ADJUST (PRELIMINARY)

BACK OFF LINE FEED STRIPPER PLATE. LOOSEN
BOTH LINE FEED LINK CLAMP SCREWS VERY LOOSE.
PLACE CARRIAGE IN CENTER OF UNIT, ROTATE PLATEN
SO FLAT ON LEFT SIDE OF PLATEN IS ALIGNED
HORIZONTALLY ON TOP. SET UP LINE FEED CODE
COMBINATION (-2---) OR (-2-4---8) IN SELECTOR.
ROTATE MAIN SHAFT UNTIL FUNCTION BAIL REACHES
LOWEST POINT. USING PRY POINT, POSITION DRIVE
LINK SO THAT WHEN LINE FEED LINKAGE HAS RO-
TATED PLATEN ONE TOOTH, DETENT PAWL SEATS
FULLY IN RATCHET. TIGHTEN CLAMP SCREWS.

TO CHECK

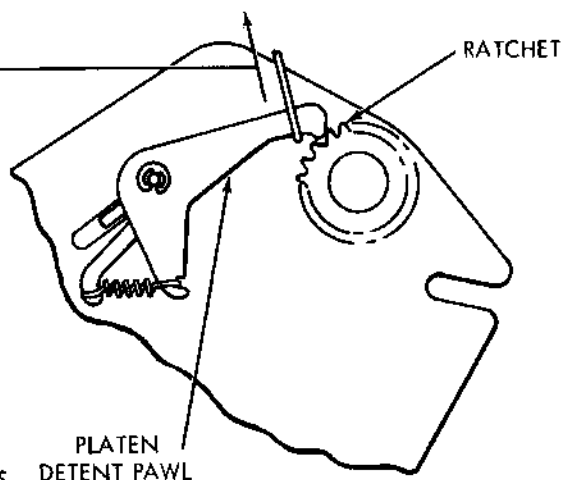
ROTATE FUNCTION MECHANISM TO ITS LOWEST
POINT, WITH LINE FEED DETENT HELD AWAY
FROM PLATEN LOWER DETENT INTO ITS NOTCH.
THE PLATEN SHOULD BARELY MOVE.

FINAL

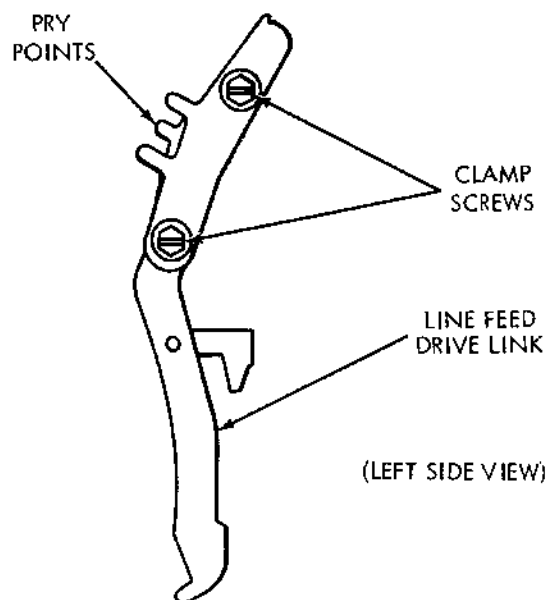
WITH UNIT OPERATING UNDER POWER, THE
SPACING OF THE LINE FEED SHALL BE
UNIFORM AND CONSISTENT WITH NO BACKLASH.

RELATED ADJUSTMENT

AFFECTED BY LINE FEED PAWL DOWNSTOP



(LEFT SIDE VIEW)



(LEFT SIDE VIEW)

LINE FEED PAWL DOWNSTOP (PAPER FEED)

REQUIREMENT

CARRIAGE IN CENTER OF UNIT, ROTATE PLATEN
SO FLAT LOCATED ON LEFT END (VISIBLE AFTER
REMOVAL OF PLATEN KNOB) IS HORIZONTAL
AND ON TOP. SET UP LINE FEED CODE COM-
BINATION (-2---) OR (-2-4---8) AND ROTATE
MAIN SHAFT UNTIL FEED PAWL HAS ROTATED
PLATEN ONE TOOTH AND PLATEN DETENT HAS
FULLY SEATED IN RATCHET.

REQUIREMENT

MIN. SOME---MAX. 0.010 INCH
BETWEEN BACK OF LINE FEED PAWL AND ITS
DOWNSTOP.

TO ADJUST

POSITION DOWNSTOP WITH CLAMP NUT
LOOSENED.

RELATED ADJUSTMENTS

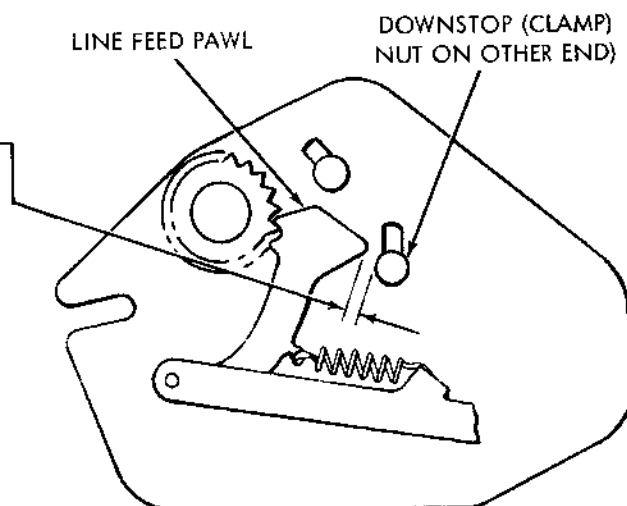
AFFECTS

LINE FEED DRIVE LINK

AFFECTED BY

PLATEN DETENT

LINE FEED DRIVE LINK



(RIGHT SIDE VIEW)

LINE FEED STRIPPER PLATE (PAPER FEED)

REQUIREMENT

CARRIAGE IN CENTER OF UNIT, ROTATE PLATEN SO FLAT ON LEFT END (VISIBLE AFTER REMOVAL OF PLATEN KNOB) IS HORIZONTAL AND ON TOP. WITH LINE FEED CODE COMBINATION (-2---) OR (-2-4---8) SET UP IN SELECTOR AND MAIN SHAFT ROTATED UNTIL FUNCTION BAIL IS AT ITS LOWEST POINT. THE LINE FEED STRIPPER PLATE SHALL BE IN CONTACT WITH OR

MIN. SOME --- MAX. 0.010 INCH FROM THE FUNCTION STRIPPER BAIL.

TO ADJUST

POSITION LINE FEED STRIPPER PLATE WITH CLAMP SCREW LOOSENED.

RELATED ADJUSTMENT

AFFECTED BY
STRIPPER BAIL (FUNCTION)

PRESSURE ROLLER (PAPER FEED)

REQUIREMENT

WITH PRESSURE ROLLER RELEASED (PRESSURE LEVER IN FORWARD POSITION)

MIN. 0.010 INCH GAGED BY EYE, BETWEEN PRESSURE ROLLER AND SLIDE SPRING POSTS ON SLIDE GUIDE ON CARRIAGE. (CLEARANCE SHOULD NOT BE SO LARGE THAT ROLLER IS NOT DETENTED IN RELEASED POSITION.)

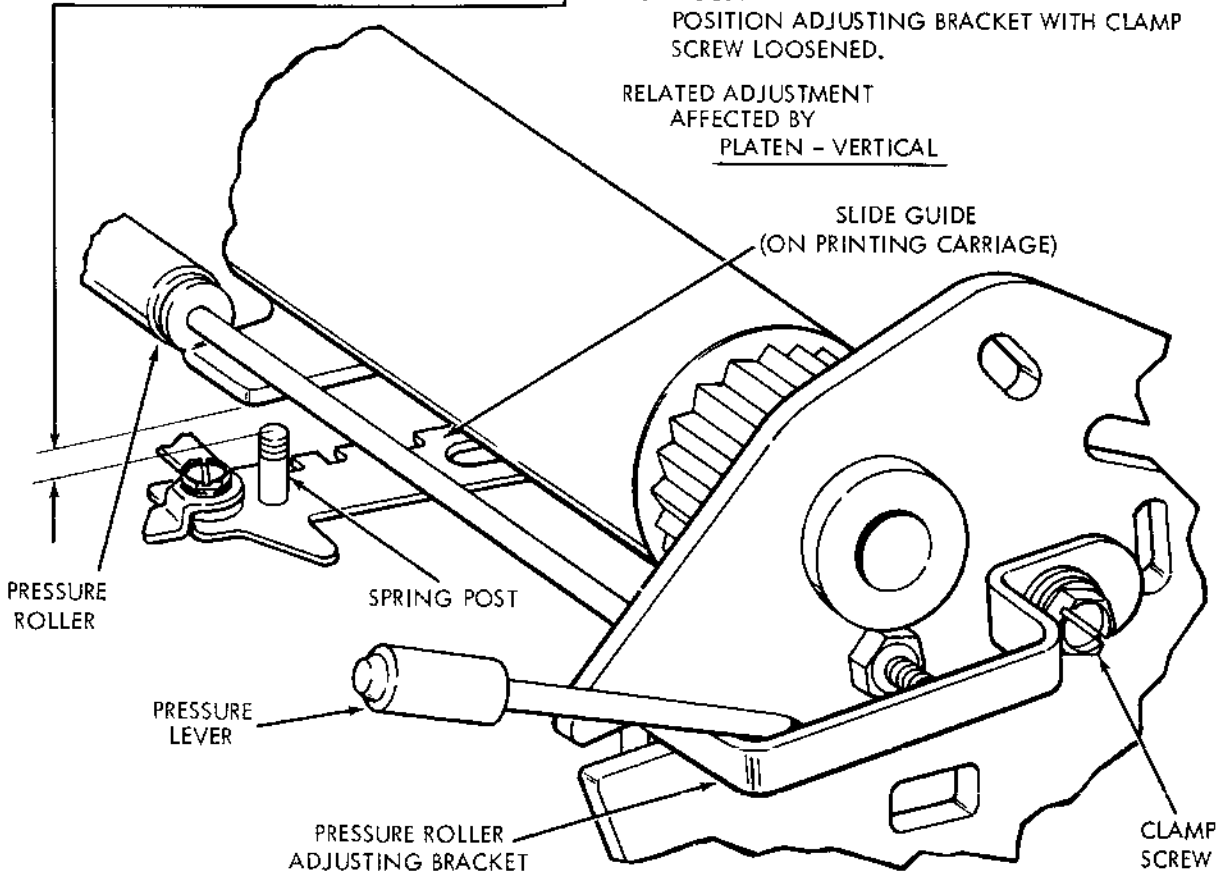
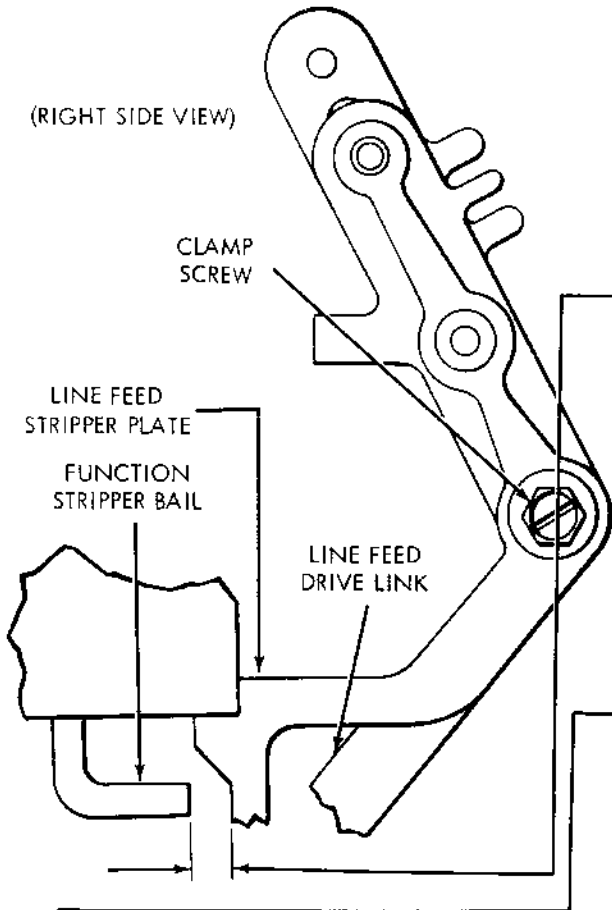
TO ADJUST

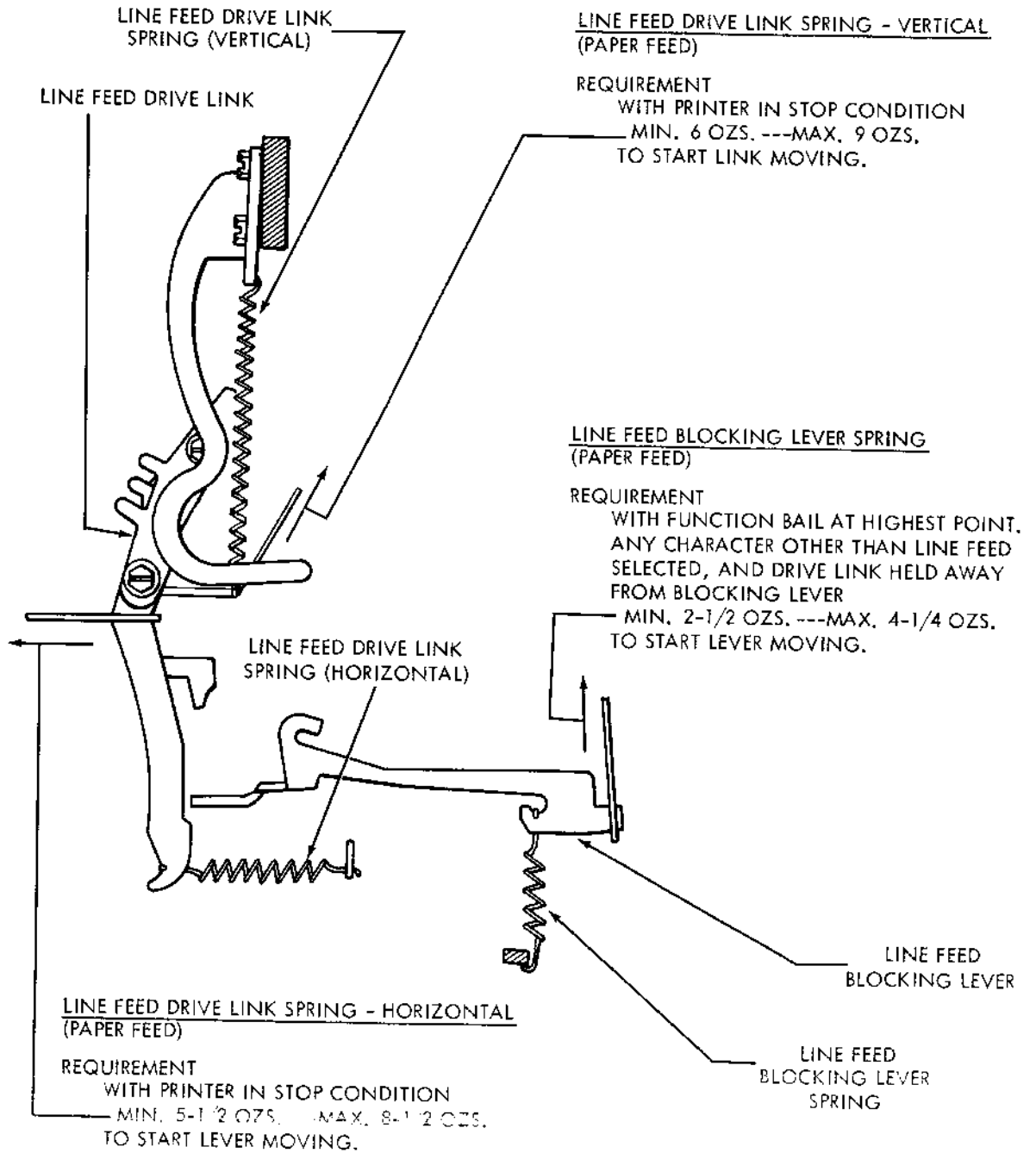
POSITION ADJUSTING BRACKET WITH CLAMP SCREW LOOSENED.

RELATED ADJUSTMENT

AFFECTED BY
PLATEN - VERTICAL

(RIGHT SIDE VIEW)





PAPER GUIDE SPRINGS (PAPER FEED)

REQUIREMENT
 WITH SCALE AT ONE END OF PAPER GUIDE
 MIN. 1-1/2 OZS. ---MAX. 3-1/2 OZS.
 TO START GUIDE MOVING.

PAPER STRAIGHTENER BAIL SPRING
 (PAPER FEED)

REQUIREMENT
 WITH SCALE AT CENTER OF BAIL
 MIN. 1 OZ. ---MAX. 3 OZS.
 TO START BAIL MOVING.

PAPER GUIDE PLATE SPRINGS (PAPER FEED)

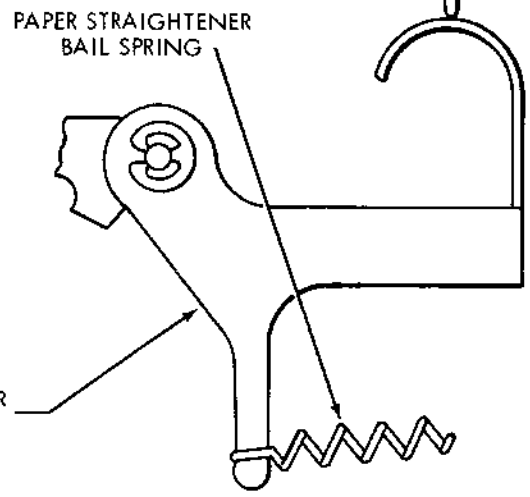
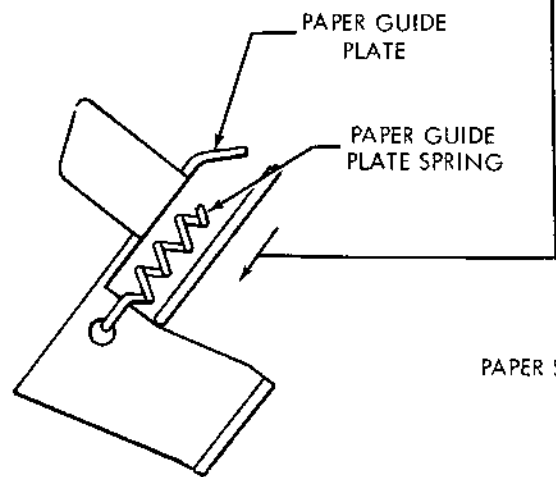
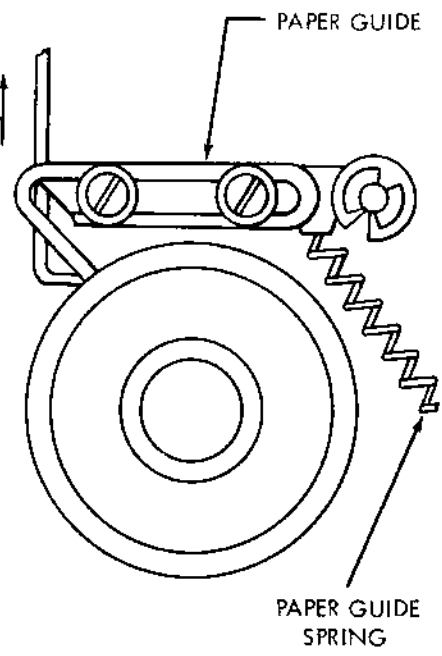
REQUIREMENT
 WITH PRESSURE LEVER RELEASED
 MIN. 3/4 OZ. ---MAX. 1-3/4 OZS.
 TO START PLATE MOVING.

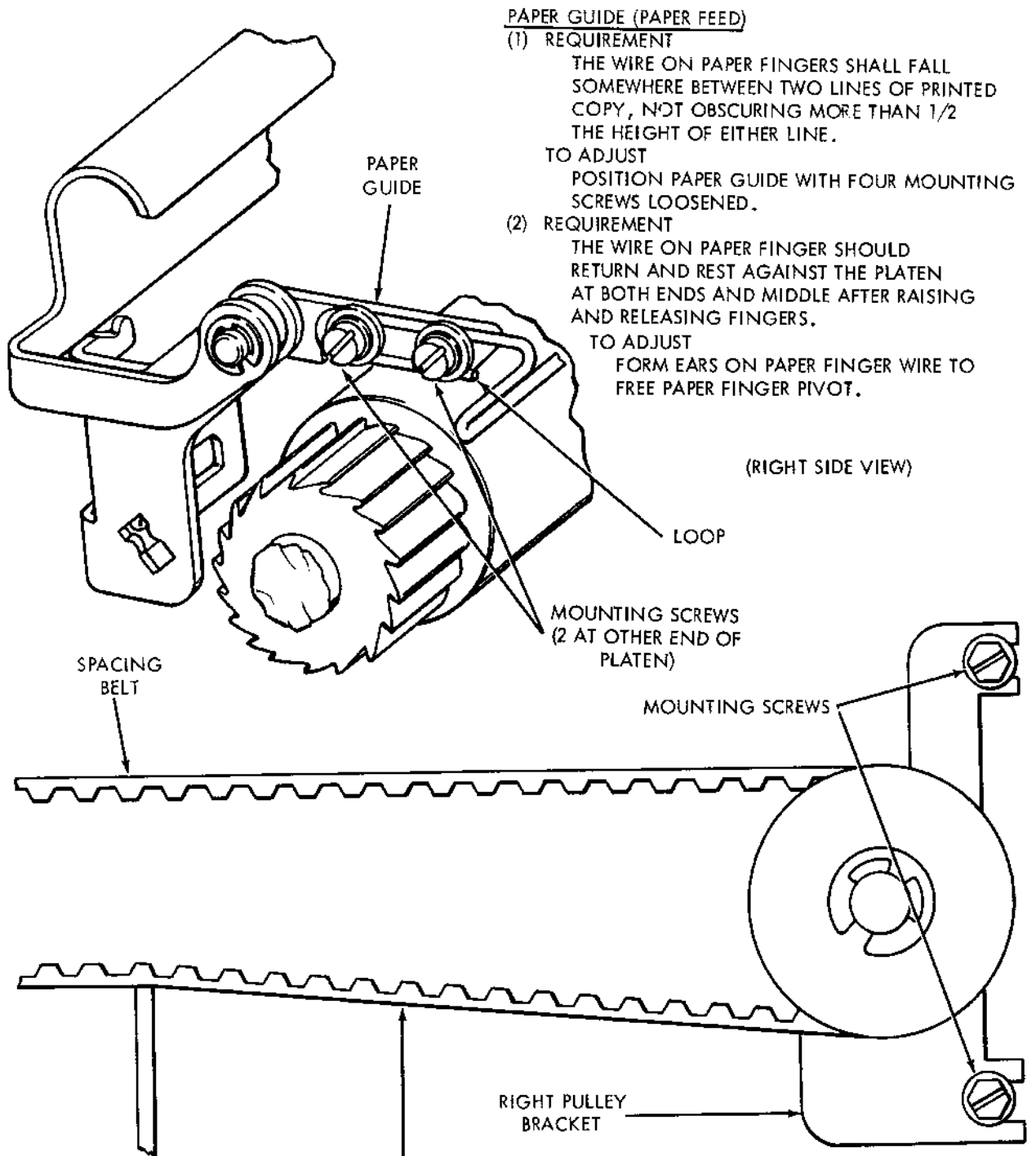
NOTE

CHECK OTHER SPRING BY PLACING
 SCALE AT OTHER END OF GUIDE.

NOTE

CHECK EACH OF TWO SPRINGS.



PAPER GUIDE (PAPER FEED)

(1) REQUIREMENT

THE WIRE ON PAPER FINGERS SHALL FALL SOMEWHERE BETWEEN TWO LINES OF PRINTED COPY, NOT OBSCURING MORE THAN 1/2 THE HEIGHT OF EITHER LINE.

TO ADJUST

POSITION PAPER GUIDE WITH FOUR MOUNTING SCREWS LOOSENED.

(2) REQUIREMENT

THE WIRE ON PAPER FINGER SHOULD RETURN AND REST AGAINST THE PLATEN AT BOTH ENDS AND MIDDLE AFTER RAISING AND RELEASING FINGERS.

TO ADJUST

FORM EARS ON PAPER FINGER WIRE TO FREE PAPER FINGER PIVOT.

(RIGHT SIDE VIEW)

SPACING
BELT

MOUNTING SCREWS

RIGHT PULLEY
BRACKETSPACING BELT TENSION (SPACING)

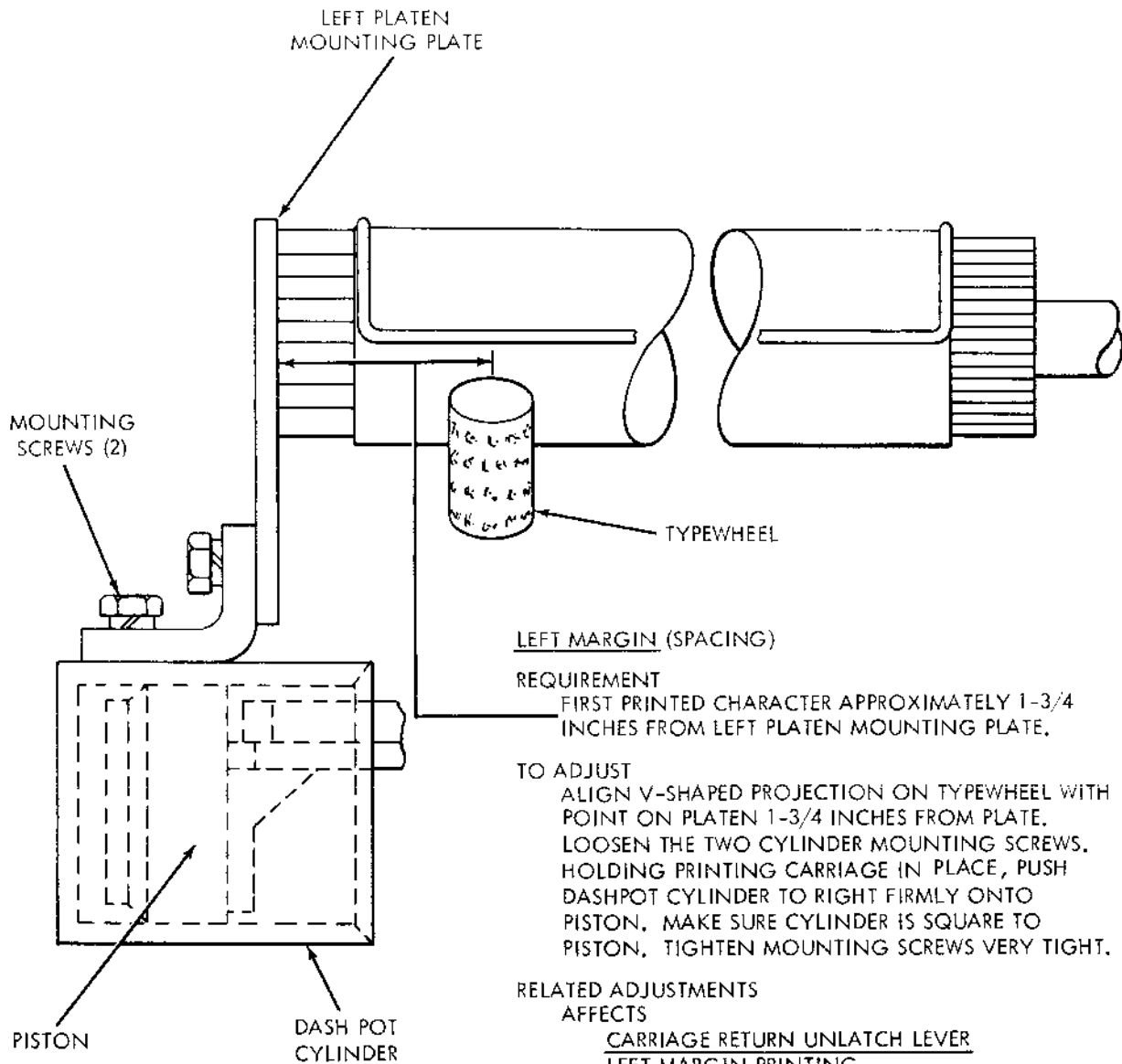
REQUIREMENT

WITH PRINTER IN STOP CONDITION, CARRIAGE AT LEFT MARGIN, AND 8 OZS. OF PRESSURE APPLIED NEAR CENTER OF BELT
MIN. 9/16 INCH---MAX. 11/16 INCH
BETWEEN OUTER SURFACES OF BELT.

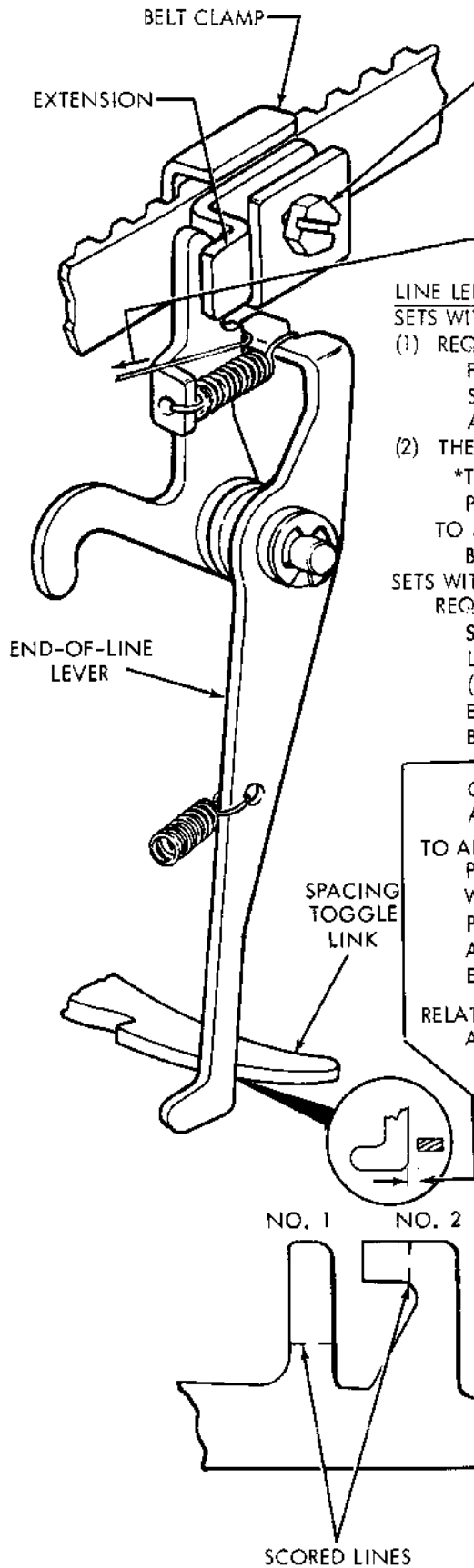
TO ADJUST

POSITION RIGHT PULLEY BRACKET WITH MOUNTING SCREWS LOOSENED.

(TOP VIEW)



(FRONT VIEW)



END OF LINE LATCH SPRING REQUIREMENT

WITH PRINTER IN STOP POSITION, CARRIAGE RETURN LEVER UNLATCHED
 MIN. 1-1/2 OZS. --- MAX. 3 OZS.
 TO START LATCH MOVING.

LINE LENGTH (FUNCTION AND SPACING) SETS WITH AUTOMATIC CR-LF.

(1) REQUIREMENT

FOR 69 CHARACTER LINE, AUTOMATIC CODE BAR AS SHOWN. FOR 72 CHARACTER LINE, PROJECTION NO. 1 AND 2 REMOVED.

(2) THE END OF LINE MARGIN BELL SHALL RING AS FOLLOWS:

*TWO RINGS SHALL BE PERMITTED ON SUCCESSIVE CHARACTERS, PROVIDED THE FIRST RING OCCURS AS SHOWN ABOVE.

TO ADJUST

BREAK OFF PROJECTIONS AT SCORED LINES AS REQUIRED.

SETS WITH END-OF-LINE SPACE SUPPRESSION REQUIREMENT

SELECTION OF PROPER LENGTH OF LINE: WITH CARRIAGE LOCATED ONE CHARACTER BEFORE END OF LINE, (CHARACTER NO. 71 ON A 72 CHARACTER LINE FOR EXAMPLE). ROTATE MAIN SHAFT UNTIL CARRIAGE DRIVE BAIL REACHES ITS REARMOST POSITION.

MIN. 0.025 INCH --- MAX. 0.100 INCH

CLEARANCE BETWEEN END OF LINE SUPPRESSION LATCH AND TOGGLE LINK OF SPACING MECHANISM.

TO ADJUST

POSITION BELT CLAMP (AND EXTENSION) WITH CLAMP SCREW LOOSENED. BREAK OFF PROJECTIONS ON AUTOMATIC CODE BAR AS INSTRUCTED IN PART (1), SO THAT END-OF-LINE BELL WILL RING AT PROPER TIME.

RELATED ADJUSTMENT AFFECTS

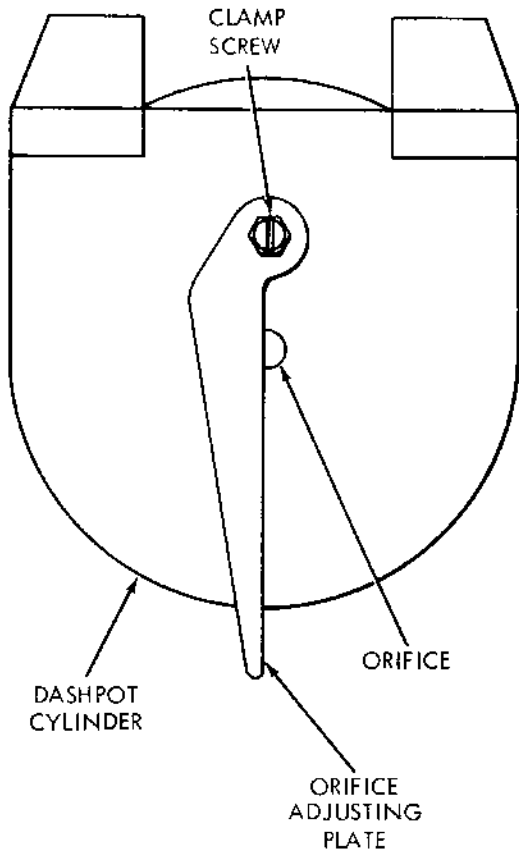
LEFT MARGIN (SPACING)

NO. 1 NO. 2

AUTOMATIC CODE BAR

SCORED LINES

(LEFT SIDE VIEW)



DASHPOT ORIFICE (SPACING)

REQUIREMENT

NO PNEUMATIC OR MECHANICAL BOUNCE OF CARRIAGE UPON ITS RETURN.

TO ADJUST

POSITION ORIFICE ADJUSTING PLATE WITH CLAMP SCREW LOOSENED.

CARRIAGE RETURN UNLATCH LEVER (SPACING)

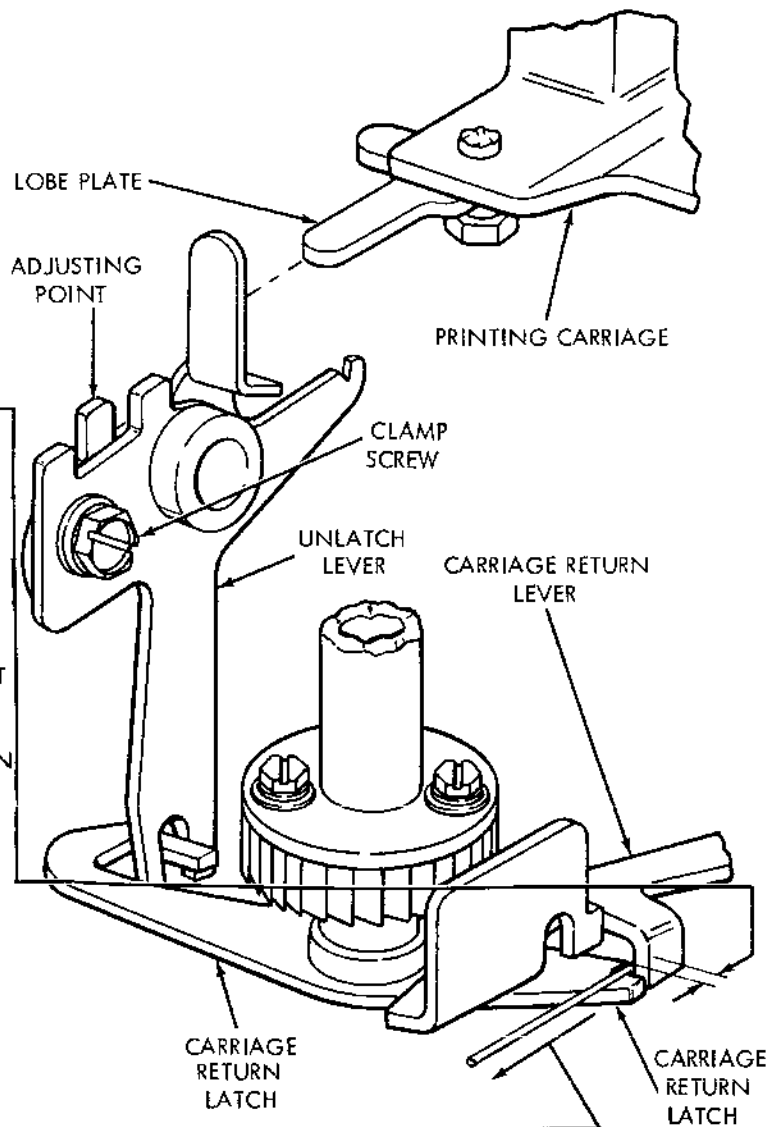
REQUIREMENT

WHEN THE CARRIAGE RETURNS, CARRIAGE RETURN LEVER UNLATCHED AND MIN. SOME --- MAX. 0.050 INCH BETWEEN THE CARRIAGE RETURN LATCH AND THE CARRIAGE RETURN LEVER. WHEN PLAY IN LATCH IS TAKEN UP TO MAKE THE CLEARANCE A MINIMUM.

TO ADJUST

PRELIMINARY: PLACE ADJUSTING POINT AT CENTER OF RANGE WITH MOUNTING SCREWS LOOSENED. POSITION LOBE PLATE SO AS TO SELECT LOBE THAT MOST NEARLY TOUCHES UNLATCH LEVER. CHECK FRONT ROLLERS (CARRIAGE). FINAL: USING ADJUSTING POINT, POSITION UNLATCH LEVER WITH CLAMP SCREW LOOSENED.

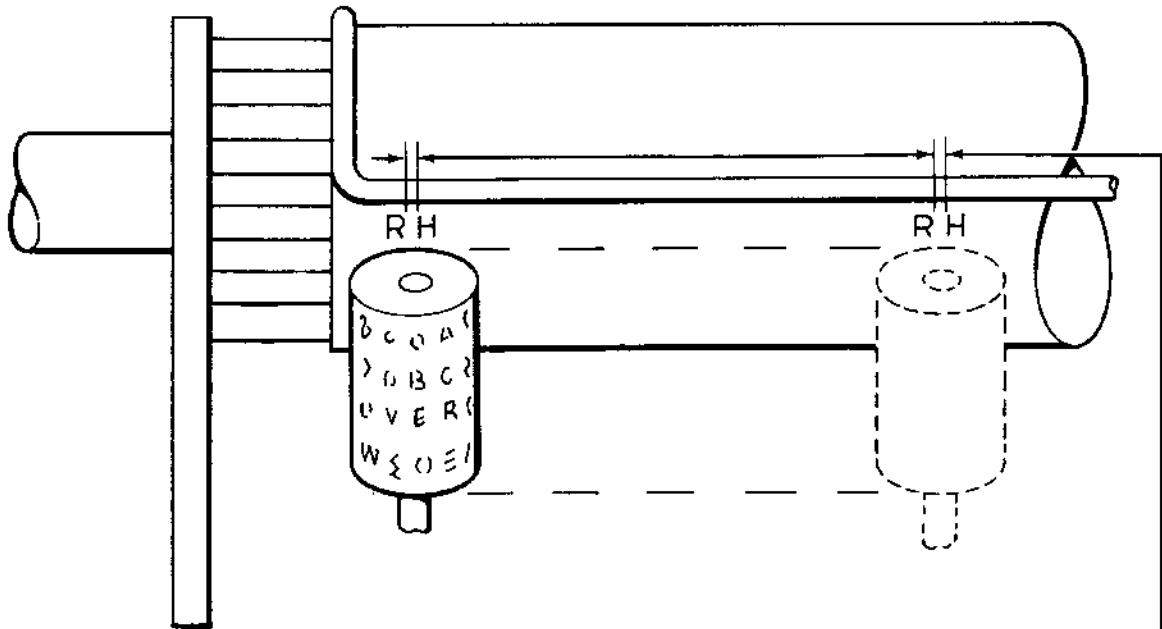
RELATED ADJUSTMENT AFFECTED BY LEFT MARGIN



CARRIAGE RETURN LATCH SPRING (SPACING)

REQUIREMENT

WITH PRINTER IN STOP CONDITION AND CARRIAGE RETURN LEVER UNLATCHED MIN. 1-1/2 OZS. ---MAX. 3 OZS. TO START LATCH MOVING.

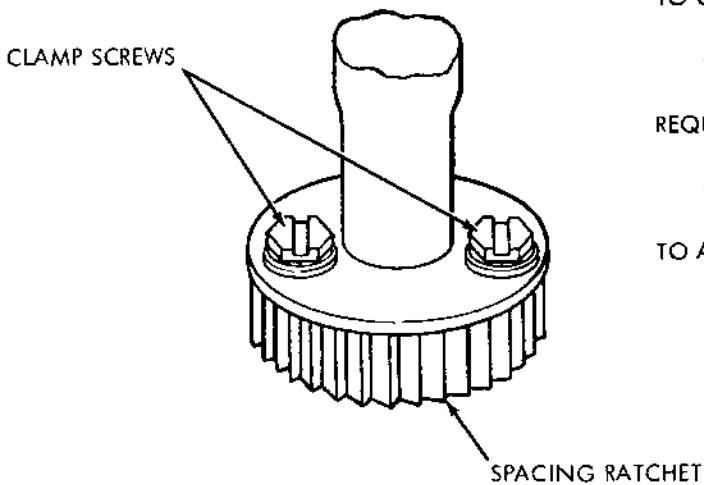


LEFT MARGIN PRINTING (SPACING)

TO CHECK
PRINT TWO OR MORE CHARACTERS SUCH AS RH AT LEFT MARGIN AND AT CENTER OF LINE.

REQUIREMENT
CHARACTER TO CHARACTER SPACING APPROXIMATELY SAME AT CENTER OF LINE AS AT LEFT MARGIN.

TO ADJUST
POSITION SPACING RATCHET WITH CLAMP SCREWS LOOSENED.



NOTE

THIS ADJUSTMENT CAN BE MADE EASIER BY REMOVING KEYBOARD. FOR INSTRUCTIONS, SEE SECTION 5.

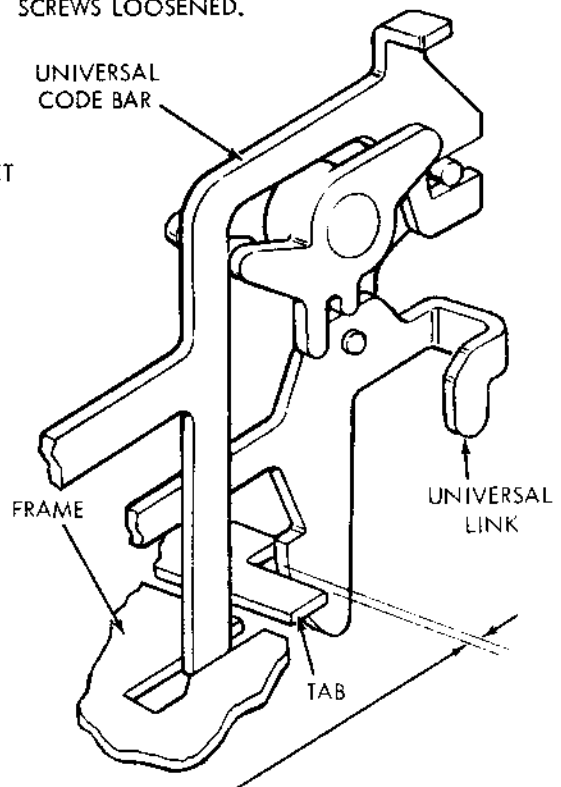
UNIVERSAL LINK (KEYBOARD)

REQUIREMENT
WITH PRINTER IN STOP CONDITION
MIN. 0.089 INCH---MAX. 0.103 INCH
BETWEEN THE UNIVERSAL LINK AND
KEYBOARD FRAME.

TO ADJUST
PLACE SCREWDRIVER THROUGH
OPENING AND BEND TAB ON FRAME.

NOTE

REPLACE KEYBOARD. FOR INSTRUCTIONS, SEE SECTION 5.



NOTE

REPLACE MOTOR ON PRINTER ASSEMBLY AND REPLACE KEYBOARD AND PRINTER ASSEMBLIES ON SUB-BASE AT THIS POINT. FOR INSTRUCTIONS, SEE "DISASSEMBLY AND REASSEMBLY" (SECTION 5).

NOTE

PRIOR TO GAGING THE REQUIRED GAP, PUSH END OF KEYBOARD UNIVERSAL LEVER THAT PROTRUDES THROUGH THE FRONT OF KEYBOARD FRAME TO BOTTOM OF ITS GUIDE SLOT AND ALLOW IT TO SNAP UP.

DISTRIBUTOR TRIP LINKAGE (KEYBOARD)

TO CHECK
WITH PRINTER IN STOP CONDITION, DEPRESS A KEY TO TRIP DISTRIBUTOR CLUTCH. ROTATE MAIN SHAFT UNTIL KEYBOARD TRIP LEVER IS AT HIGHEST POINT OF CAM FOLLOWER'S THROW AND UNIVERSAL LEVER IS IN LOWEST POSITION.

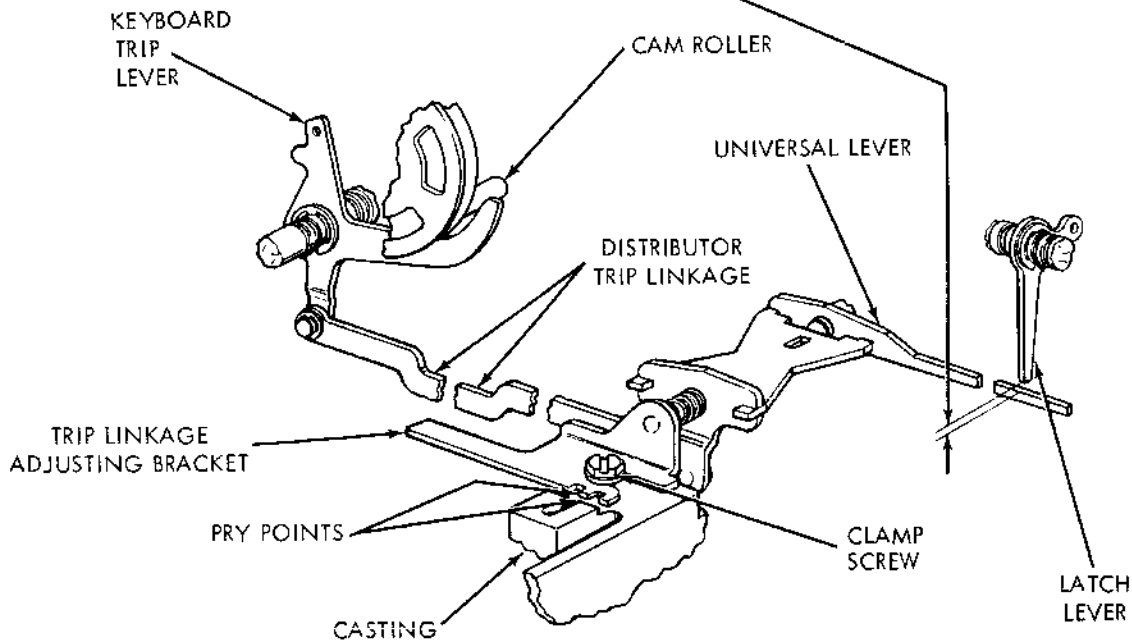
REQUIREMENT

MIN. 0.010 INCH---MAX. 0.035 INCH
BETWEEN LATCH LEVER AND UNIVERSAL LEVER.

TO ADJUST
USING PRY POINTS ON CASTING AND BRACKETS, POSITION TRIP LINKAGE ADJUSTING BRACKET WITH CLAMP SCREWS LOOSENED.

RELATED ADJUSTMENT
AFFECTS

TRIP LEVER ENGAGEMENT (DISTRIBUTOR)



CONTACT WIRES (KEYBOARD)

- (1) REQUIREMENT
 WITH PRINTER IN STOP CONDITION AND T-LEVER
 IN MARKING POSITION
 MIN. 0.010 INCH---MAX. 0.025 INCH
 BETWEEN CONTACT WIRE AND TERMINAL.

TO ADJUST
 BEND WIRE WITH 98055 BENDING TOOL.

- (2) TO CHECK
 WITH PRINTER IN STOP CONDITION, PLACE
 T-LEVERS IN SPACING POSITION. PLACE
 UNIVERSAL LEVER IN UP POSITION BY
 DEPRESSING UNIVERSAL CODE BAR (SEE
 UNIVERSAL LINK ADJUSTMENT).

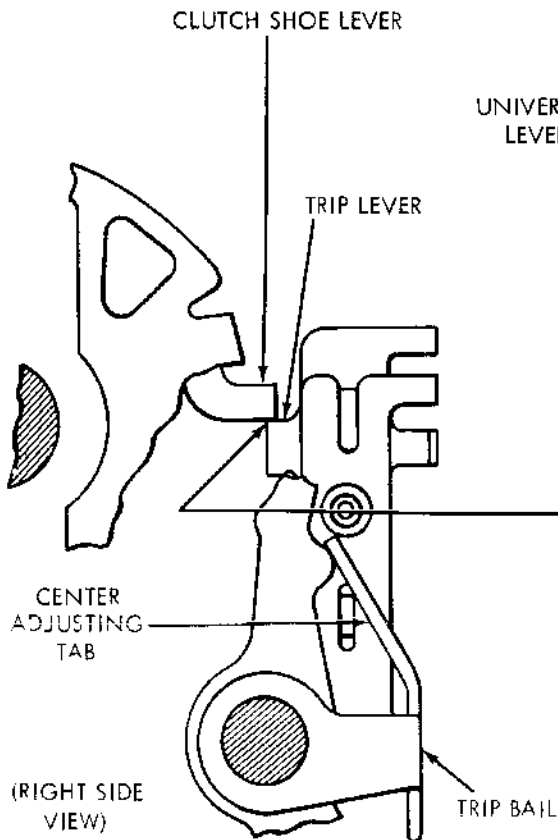
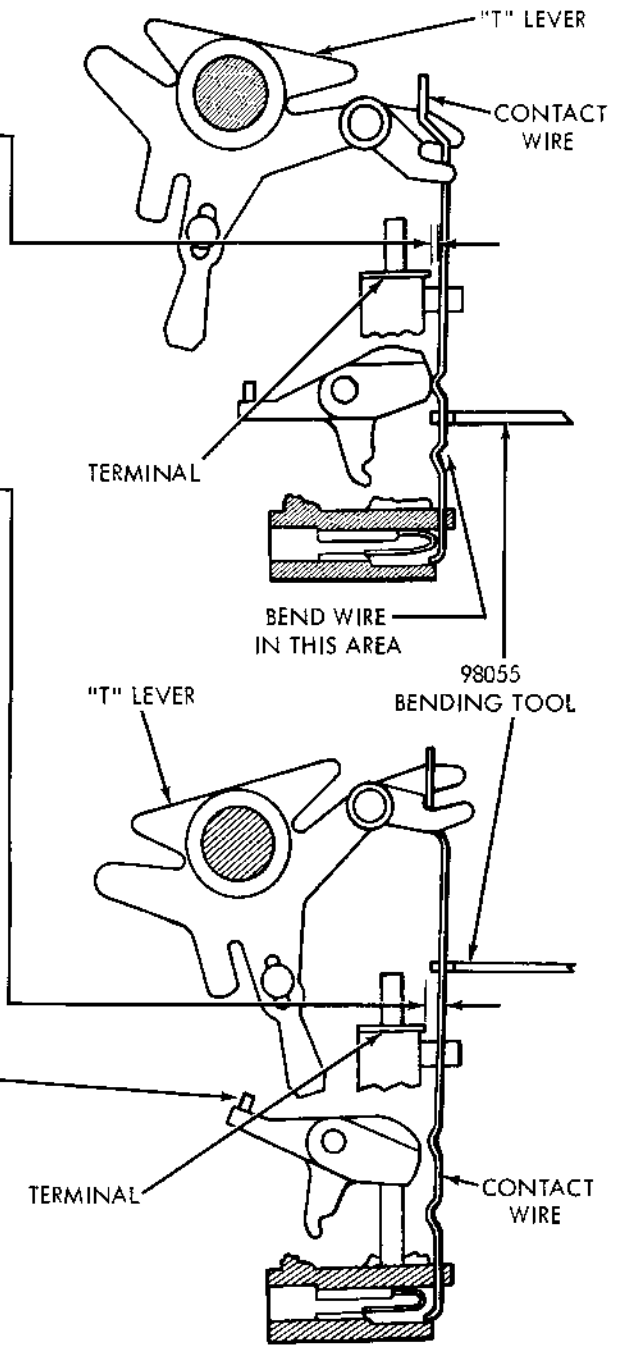
REQUIREMENT
 MIN. 0.020 INCH --- MAX. 0.040 INCH
 BETWEEN CONTACT WIRE AND TERMINAL.

TO ADJUST
 BEND WIRE WITH 98055 BENDING TOOL.

RELATED ADJUSTMENT
 PART (2) OF THIS ADJUSTMENT IS AFFECTED BY
 PART (1).

NOTE

CHECK REQUIREMENTS FOR EACH
 CONTACT WIRE.



TRIP LEVER ENGAGEMENT (DISTRIBUTOR)
 REQUIREMENT

WITH KEYBOARD TRIP ARM IN LATCHED
 POSITION, THE CLUTCH STOP LEVER SHOULD
 ENGAGE CLUTCH SHOE LEVER BY APPROXIMATELY
 FULL THICKNESS OF CLUTCH SHOE LEVER.

TO ADJUST
 REMOVE ANSWER-BACK DRUM. BEND CENTER
 ADJUSTING TAB WITH 180993 BENDING TOOL.
 REPLACE DRUM.

RELATED ADJUSTMENT
 AFFECTED BY
DISTRIBUTOR TRIP LINKAGE (KEYBOARD)

NOTE: FOR INSTRUCTIONS ON CODING ANSWER-BACK DRUM, SEE "INSTALLATION" (SECTION 2).

DRUM (ANSWER-BACK)

TO CHECK

DISENGAGE (LATCH) DISTRIBUTOR CLUTCH. LOOSEN NUT ON ADJUSTING SCREW SO THAT FEED PAWL IS FREE TO MOVE. POSITION DRUM SO THAT DETENT LEVER IS BETWEEN STOP (ST) AND NO. 20 ROW. MAKE SURE CONTROL LEVER IS FULLY SEATED IN INDENT AND DRUM IS FULLY DETENTED.

REQUIREMENT

- (1) BARELY PERCEPTIBLE CLEARANCE BETWEEN DRUM AND CONTROL LEVER.
- (2) THE AXIS OF THE ANSWER-BACK DRUM SHALL BE PARALLEL TO DISTRIBUTOR TRIP PIVOT SHAFT AS GAUGED BY EYE.

TO ADJUST

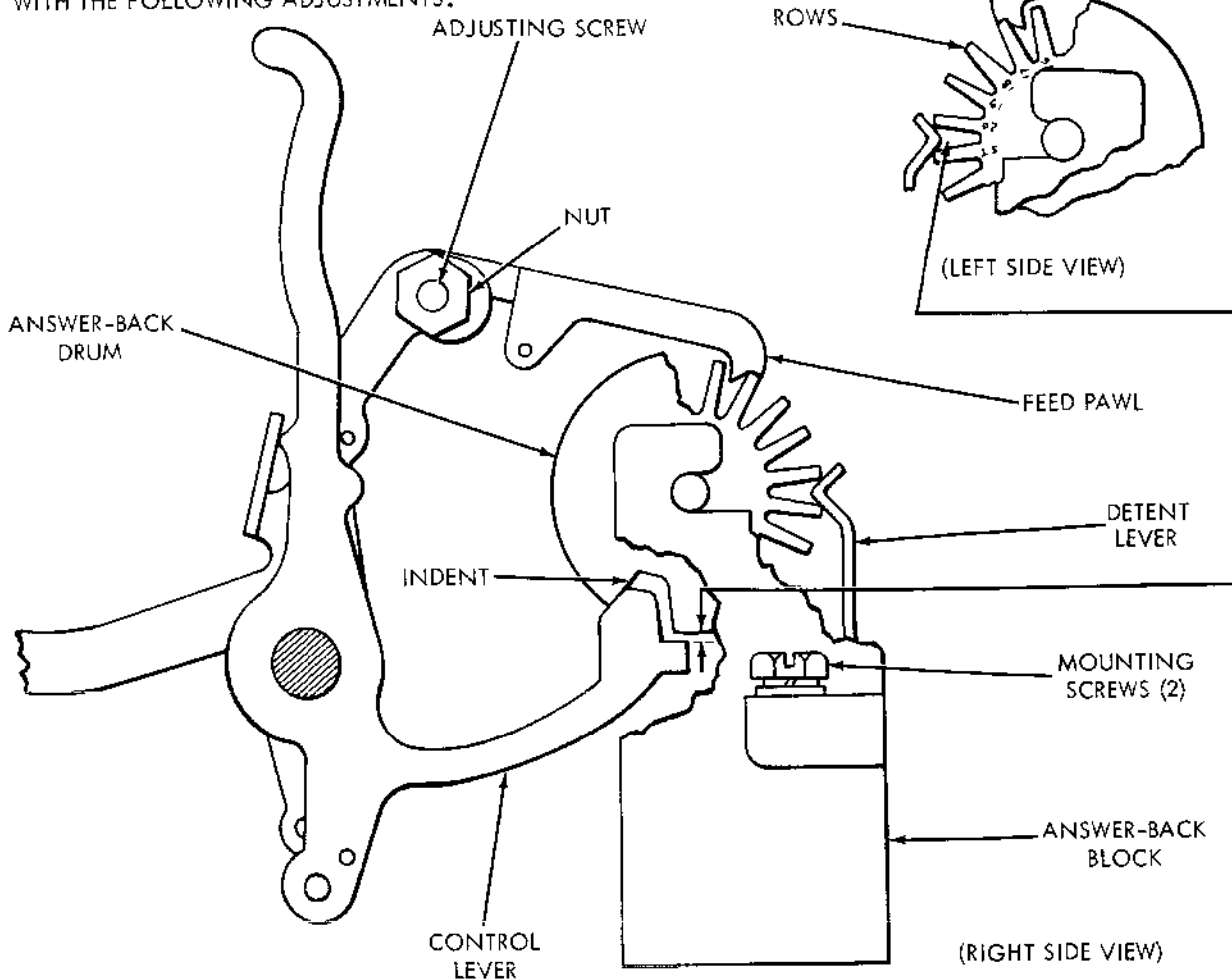
LOOSEN "HERE IS" ADJUSTING BRACKET AND ANSWER-BACK ADJUSTING BRACKET SCREWS SO BOTH BRACKETS ARE FREE TO MOVE. LOOSEN ANSWER-BACK BLOCK SCREWS (2) FRICTION TIGHT. MOVE ANSWER-BACK BLOCK TO MEET REQUIREMENTS.

RELATED ADJUSTMENTS

AFFECTS

CLUTCH TRIP BAIL, FEED PAWL, BLINDING CONTACT WIRE, FEED LEVER

NOTE: IF THE SET IS EQUIPPED WITH THE ANSWER-BACK MAGNET TRIP (VARIABLE FEATURE), THE ANSWER-BACK TRIP LEVER OVERTRAVEL ADJUSTMENT, SHOULD BE MADE AND, IF NECESSARY, THE TRIP LEVER ADJUSTMENT TAB SHOULD BE BENT FORWARD TO CLEAR THE CONTROL LEVER BEFORE PROCEEDING WITH THE FOLLOWING ADJUSTMENTS.



CLUTCH TRIP BAIL (ANSWER BACK)
REQUIREMENT

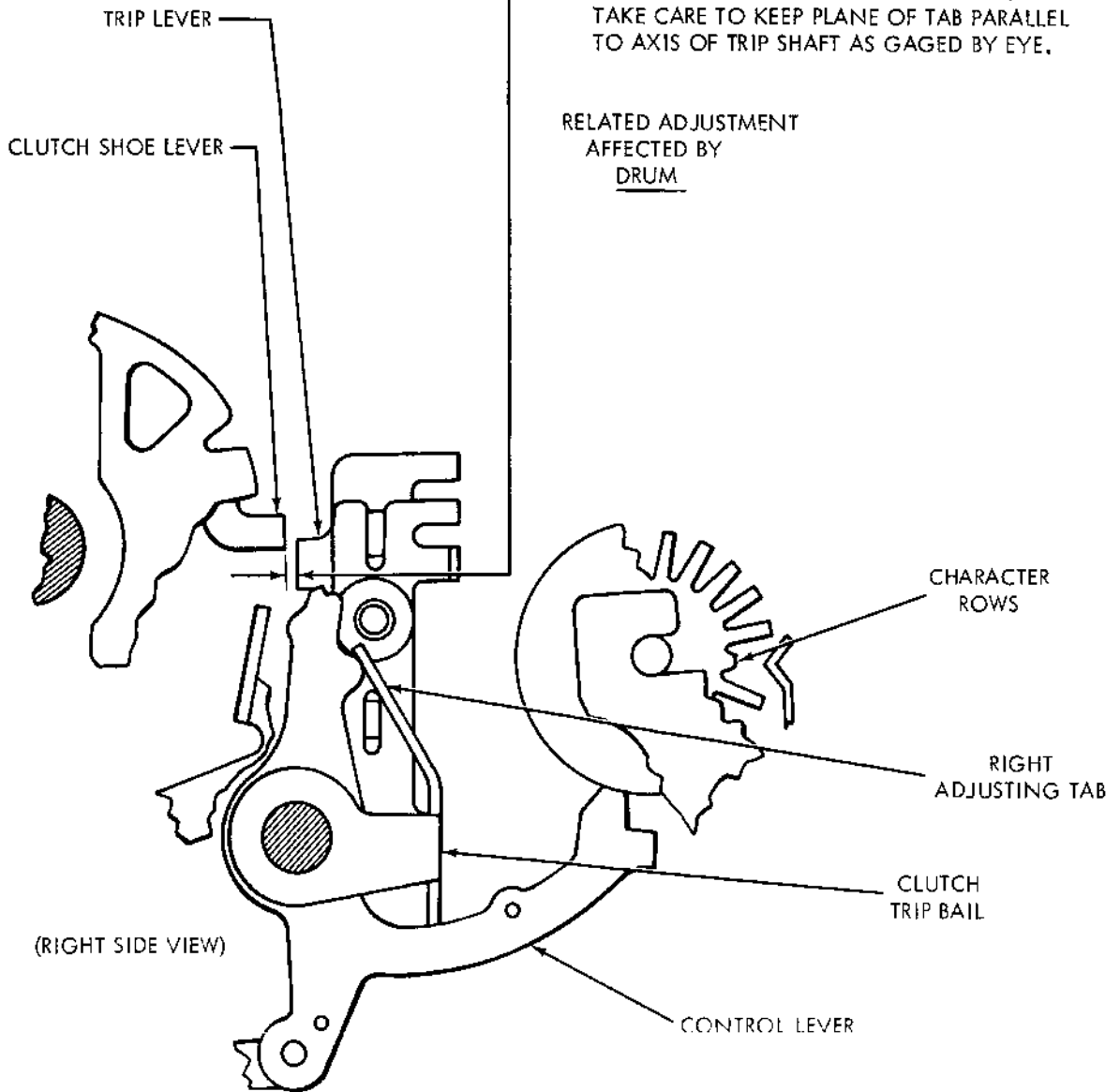
WITH CLUTCH TRIPPED AND UPPER EDGE OF SHOE LEVER IN LINE WITH UPPER EDGE OF CLUTCH STOP ARM AND ANSWER-BACK DRUM ROTATED TWO CHARACTER CYCLES, (DETENT BETWEEN NO. 1 AND NO. 2 LEVELS), CLEARANCE BETWEEN THE CLUTCH SHOE LEVER AND CLUTCH STOP ARM

MIN. 0.020 INCH --- MAX. 0.040 INCH

TO ADJUST

USING 180993 BENDING TOOL, BEND RIGHT ADJUSTING TAB ON CLUTCH TRIP BAIL. TAKE CARE TO KEEP PLANE OF TAB PARALLEL TO AXIS OF TRIP SHAFT AS GAGED BY EYE.

RELATED ADJUSTMENT
AFFECTED BY
DRUM



**FEED PAWL (ANSWERBACK)
REQUIREMENT**

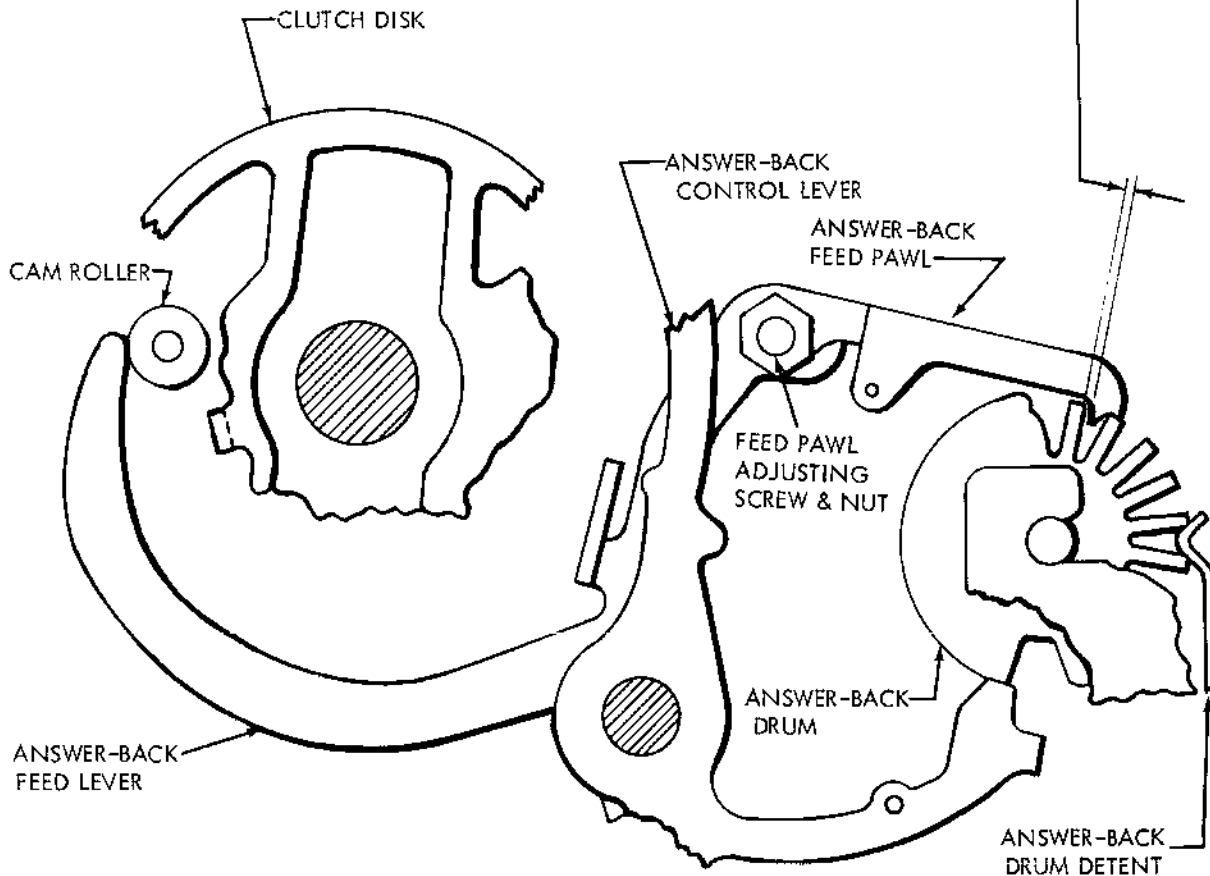
WITH DISTRIBUTOR CLUTCH DISENGAGED (LATCHED)
MANUALLY ROTATE ANSWER-BACK DRUM ONE CHARACTER
CYCLE. MANUALLY ROTATE THE DISTRIBUTOR SHAFT UNTIL
THE DISTRIBUTOR SHAFT CAM ROLLER IS ON HIGH PART
OF ANSWER-BACK FEED LEVER. POSITION FEED LEVER
SIDWAYS SO IT IS PERPENDICULAR TO AXIS OF DRUM
AS GAGED BY EYE AND AS ENTIRE WIDTH OF FEED
PAWL TOOTH RIDES ONLY IN RATCHET SECTION OF
ANSWER-BACK DRUM. TAKE UP PLAY OF FEED PAWL
TOWARDS REAR OF UNIT AND RELEASE. CLEARANCE
BETWEEN FEED PAWL AND NO. 17 DRUM TOOTH
MIN. SOME --- MAX. 0.010 INCH

TO ADJUST

POSITION FEED PAWL WITH NUT ON ADJUSTING
SCREW FRICTION TIGHT.

**RELATED ADJUSTMENTS
AFFECTS**

"HERE IS" ADJUSTING BRACKET TRIP BAIL



FEED LEVER (ANSWERBACK)
REQUIREMENT

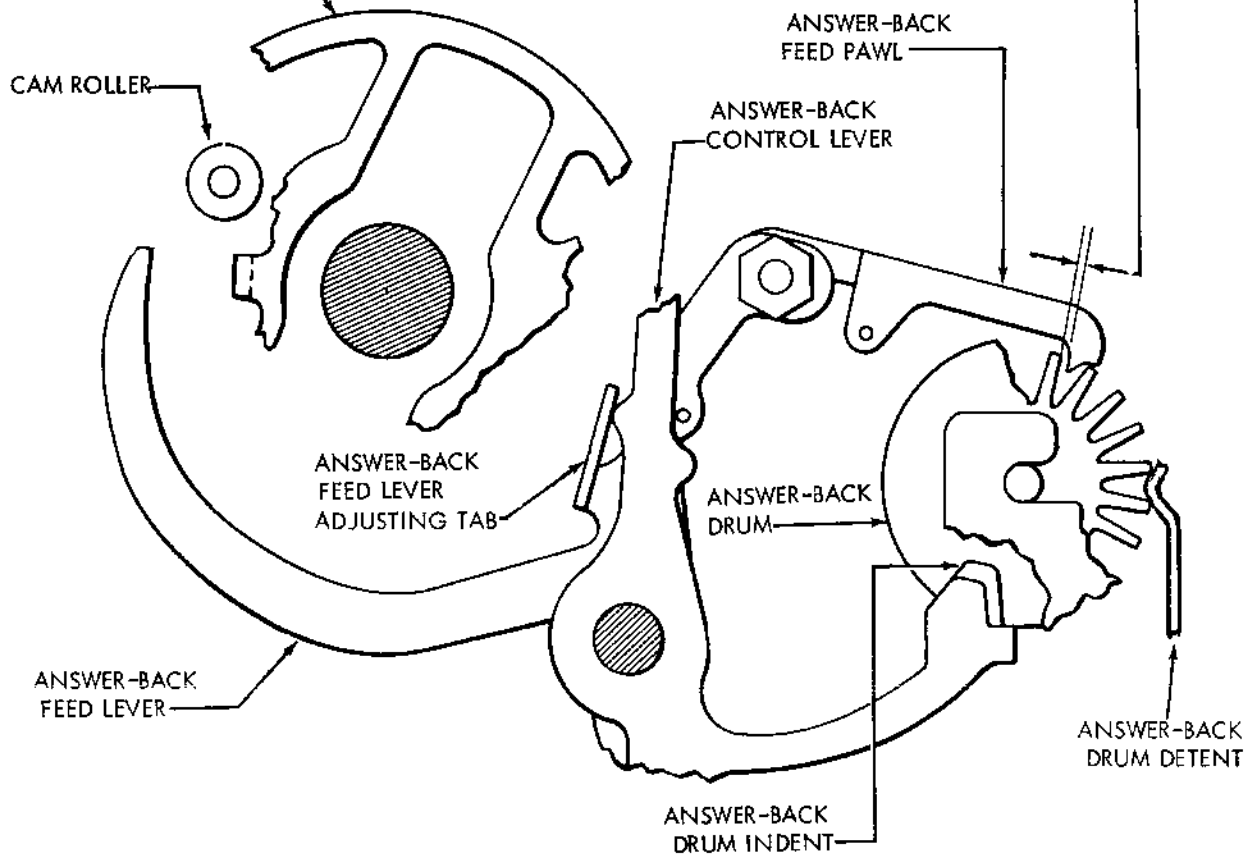
WITH ANSWER-BACK CONTROL LEVER IN INDENT OF ANSWER-BACK DRUM. MANUALLY TRIP THE DISTRIBUTOR CLUTCH, ROTATE DISTRIBUTOR SHAFT UNTIL CAM ROLLER IS NOT IN CONTACT WITH ANSWER-BACK FEED LEVER. POSITION FEED LEVER SIDWAYS SO IT IS PERPENDICULAR TO THE AXIS OF DRUM AS GAGED BY EYE AND SO THAT THE ENTIRE WIDTH OF FEED PAWL TOOTH RIDES ONLY IN RATCHET SECTION OF ANSWER-BACK DRUM. TAKE UP PLAY OF FEED PAWL TOWARDS REAR OF UNIT AND RELEASE. CLEARANCE BETWEEN ANSWER-BACK FEED PAWL AND NO. 16 DRUM TOOTH.

MIN. 0.006 INCH --- MAX. 0.020 INCH

TO ADJUST

USING 180993 BENDING TOOL, BEND FEED LEVER'S ADJUSTING TAB.

RELATED ADJUSTMENTS AFFECTED BY DRUM.



"HERE-IS" ADJUSTING BRACKET (ANSWER-BACK)

REQUIREMENT

WITH ANSWER-BACK CONTROL LEVER IN INDENT OF ANSWER-BACK DRUM, DISTRIBUTOR CLUTCH TRIPPED MANUALLY AND DISTRIBUTOR SHAFT ROTATED CLOCKWISE UNTIL FEED LEVER IS NOT IN CONTACT WITH CAM ROLLER (SEE FEED LEVER)

MIN. 0.015 INCH---MAX. 0.030 INCH

OVERTRAVEL BETWEEN FEED PAWL AND TOOTH ON ANSWER-BACK DRUM WHEN "HERE IS" KEY IS FULLY DEPRESSED.

TO ADJUST

USING PLY SLOTS, POSITION "HERE-IS" ADJUSTING BRACKET WITH CLAMP SCREW LOOSENED.

RELATED ADJUSTMENT

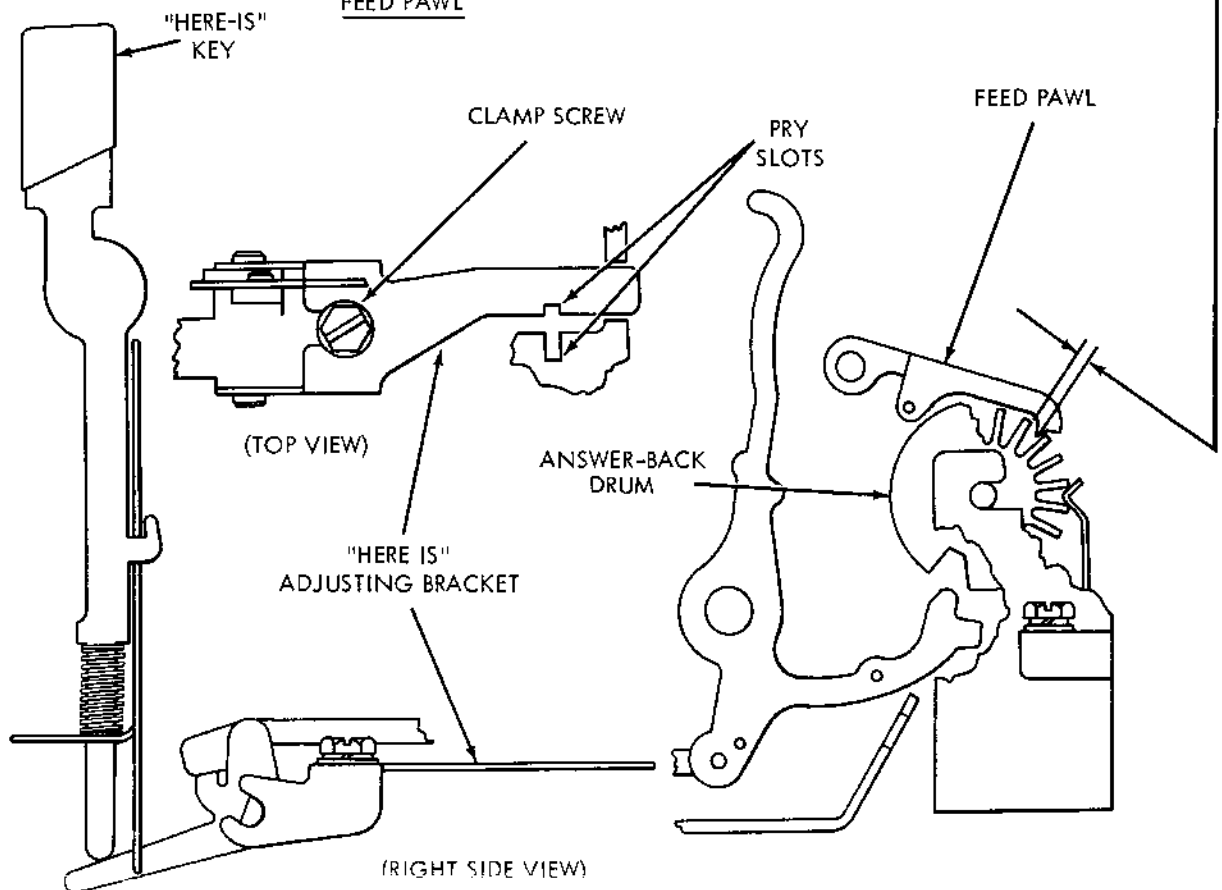
AFFECTS

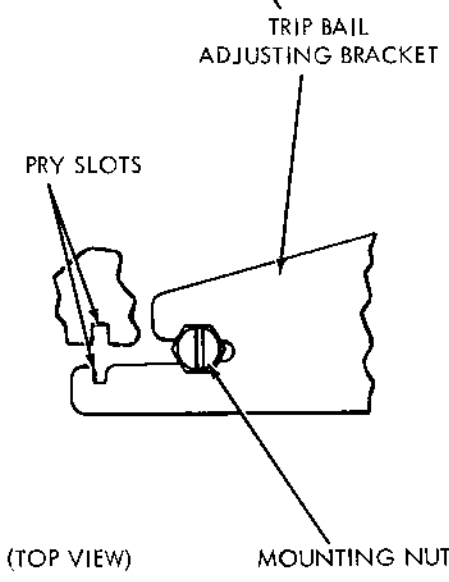
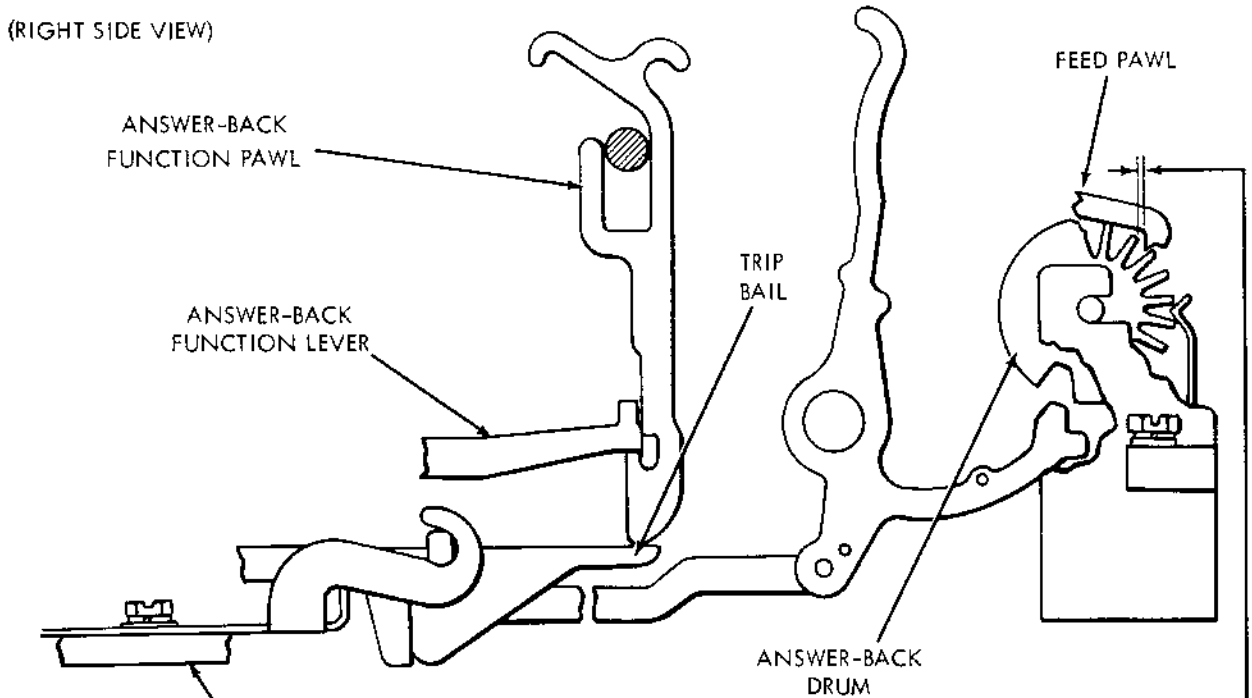
BLINDING CONTACT WIRE

BLOCKING FOLLOWER

AFFECTED BY

FEED PAWL





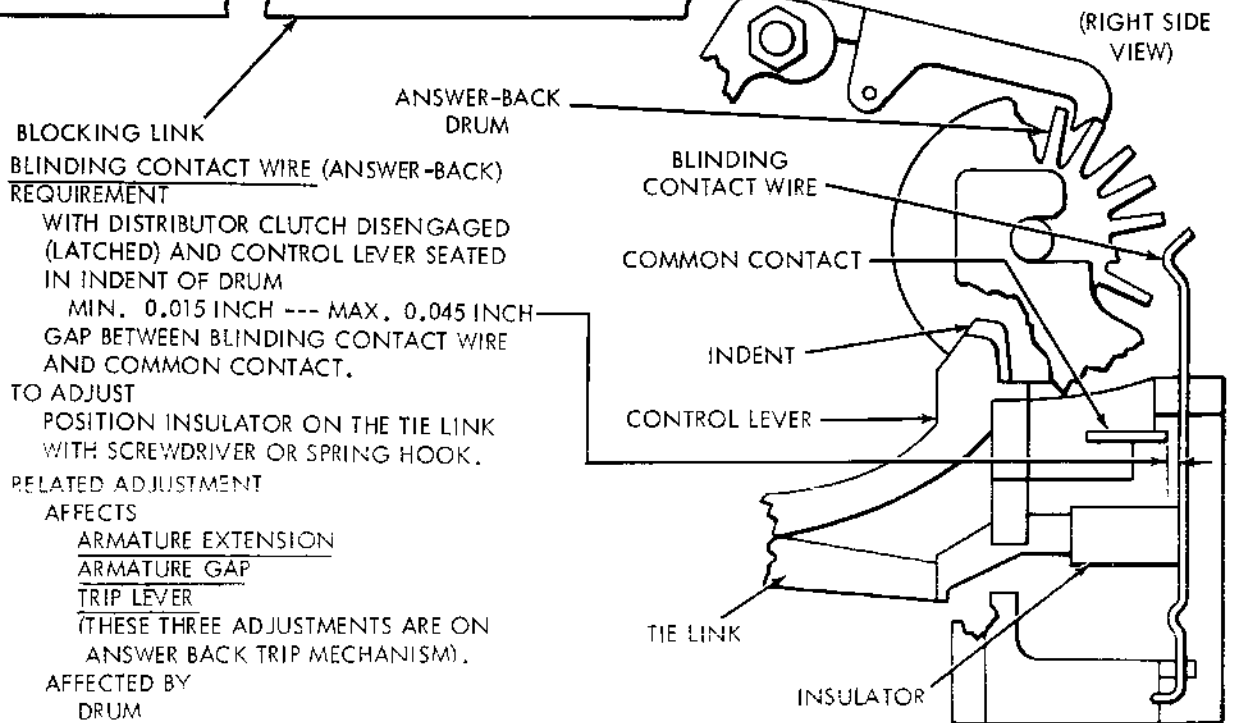
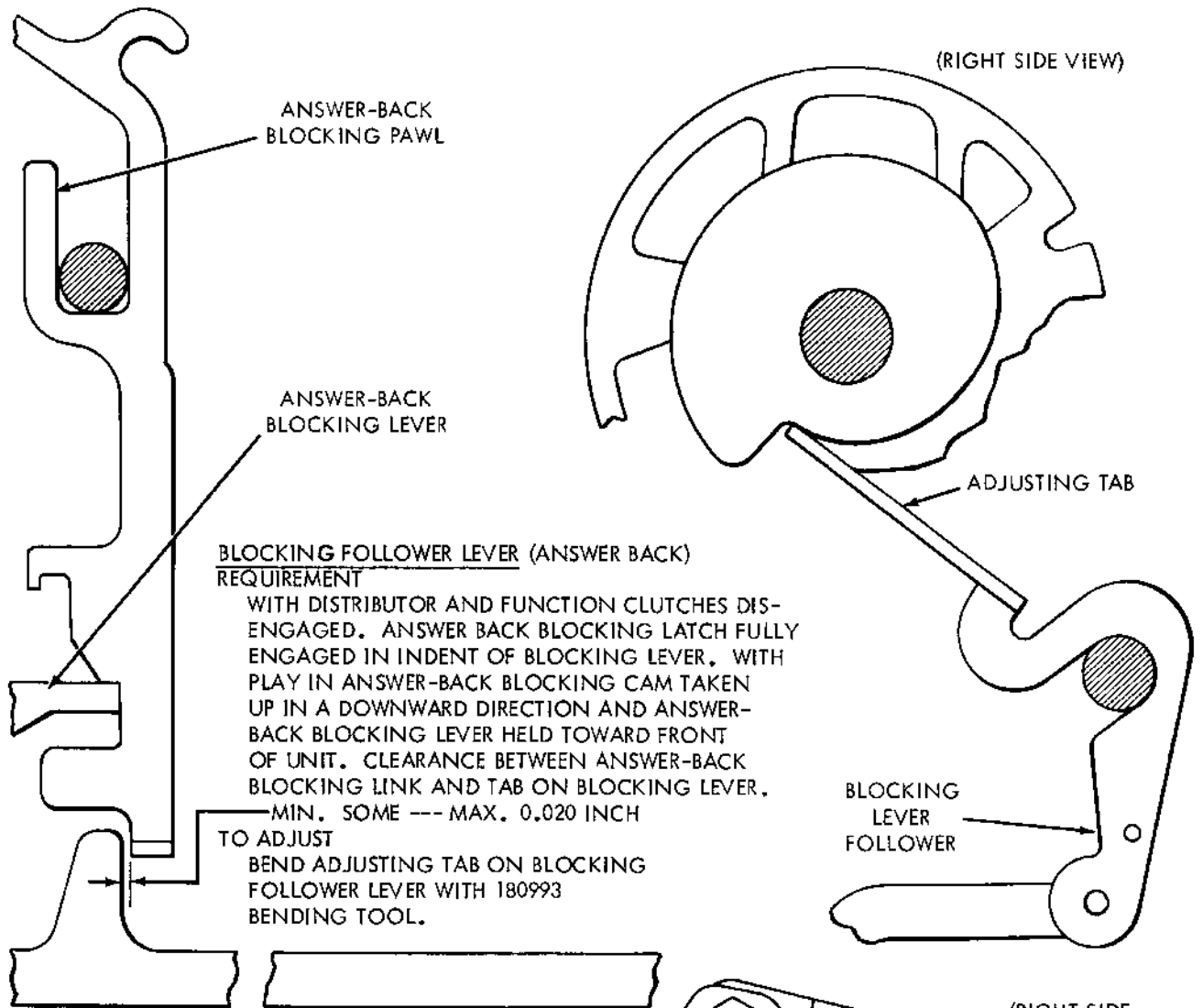
TRIP BAIL (ANSWER-BACK)

TO CHECK
 WITH PRINTER IN STOP CONDITION, MANUALLY TRIP FUNCTION CLUTCH AND ROTATE MAIN SHAFT UNTIL FUNCTION BAIL IS IN HIGHEST POSITION. PUSH ANSWER-BACK FUNCTION PAWL DOWN UNTIL IT IS ENGAGED BY ITS FUNCTION LEVER. MANUALLY TRIP DISTRIBUTOR CLUTCH AND ROTATE MAIN SHAFT UNTIL FEED PAWL REACHES ITS LOWER-MOST POINT OF TRAVEL. THE FEED PAWL SHOULD MOVE BACK TO PICK UP THE NEXT TOOTH ON THE ANSWER-BACK DRUM AND WITH THE PLAY IN THE FEED PAWL TAKEN UP TOWARDS THE REAR AND THE PAWL CENTERED IN THE RATCHET SECTION OF THE DRUM.

REQUIREMENT
 MIN. 0.020 INCH---MAX. 0.035 INCH
 OVERTRAVEL BETWEEN FEED PAWL AND TOOTH ON DRUM

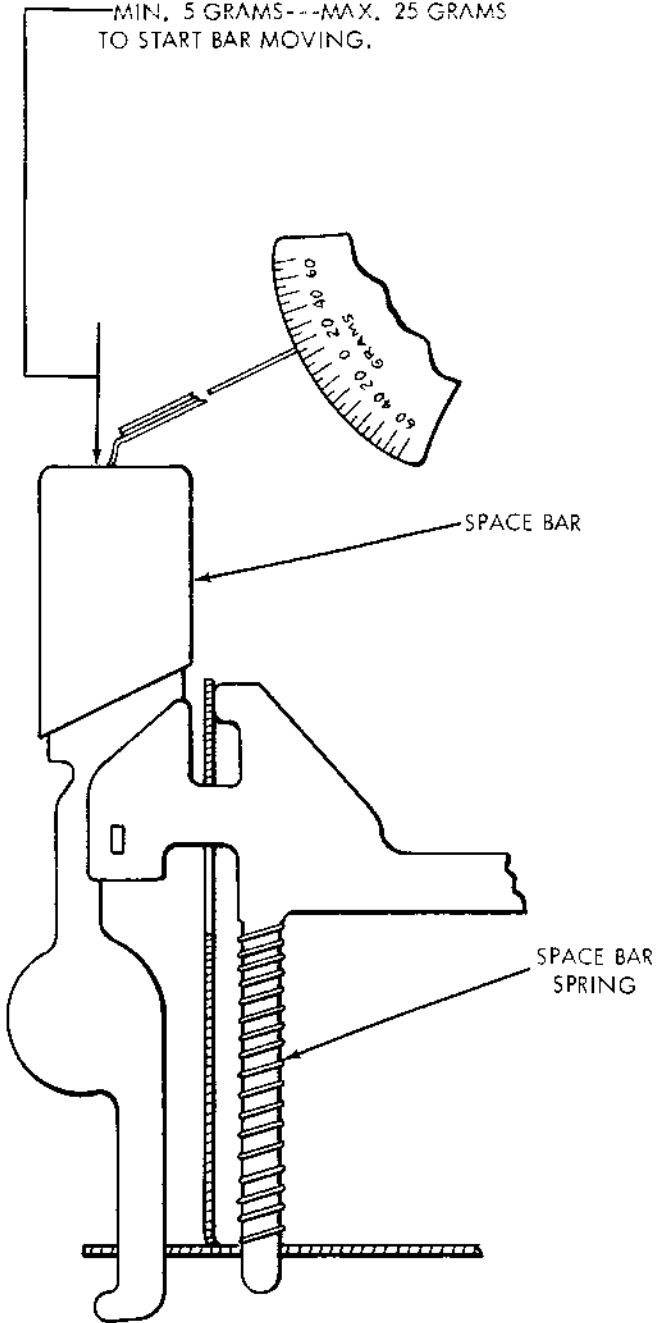
TO ADJUST
 USING PRY SLOTS, POSITION TRIP BAIL ADJUSTING BRACKET WITH MOUNTING NUT LOOSENED.

RELATED ADJUSTMENT
 AFFECTED BY
FEED PAWL



SPACE BAR SPRING (KEYBOARD)

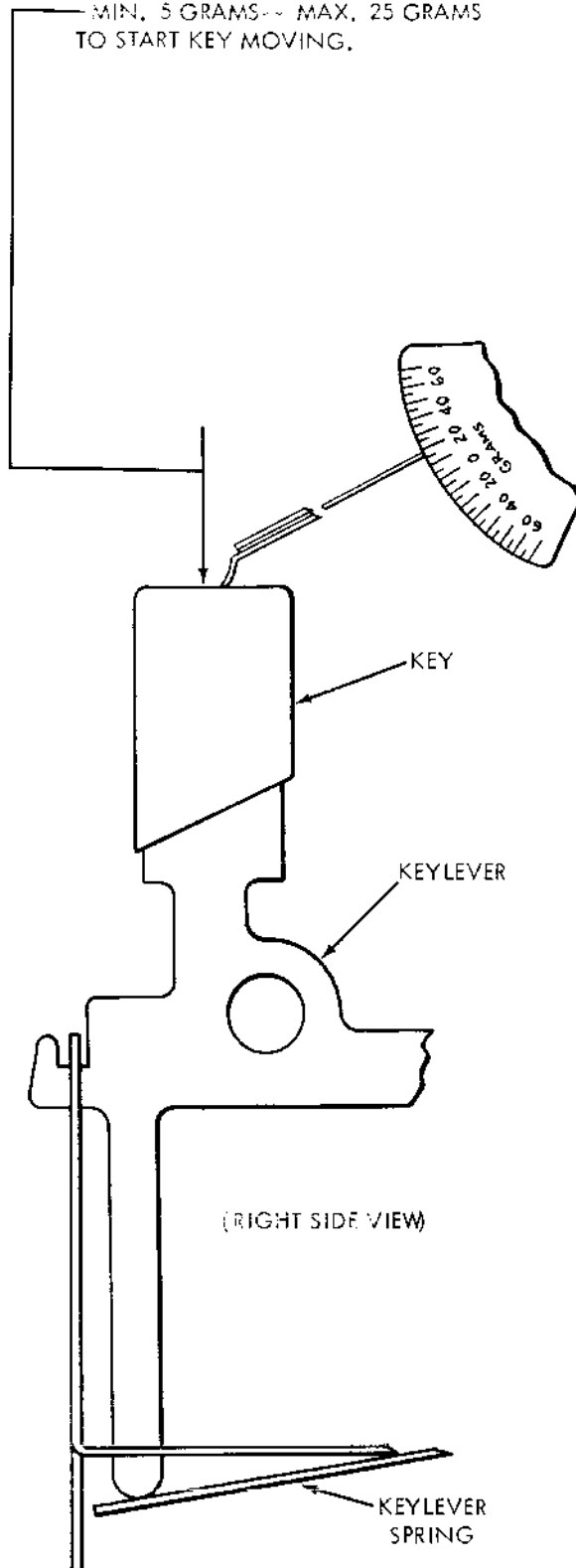
REQUIREMENT
WITH SPACE BAR DEPRESSED AND THEN
RELEASED
MIN. 5 GRAMS--MAX. 25 GRAMS
TO START BAR MOVING.



NOTE
CHECK EACH KEYLEVER SPRING.

KEYLEVER SPRING (KEYBOARD)

REQUIREMENT
WITH KEY DEPRESSED AND THEN
RELEASED
MIN. 5 GRAMS--MAX. 25 GRAMS
TO START KEY MOVING.



NON-REPEAT LEVER SPRING (KEYBOARD)

REQUIREMENT

WITH KEYBOARD COVER REMOVED AND
 PRINTER IN STOP CONDITION
 MIN. 3/4 OZS. ---MAX. 1 1/2 OZS.
 TO START NON-REPEAT LEVER MOVING.

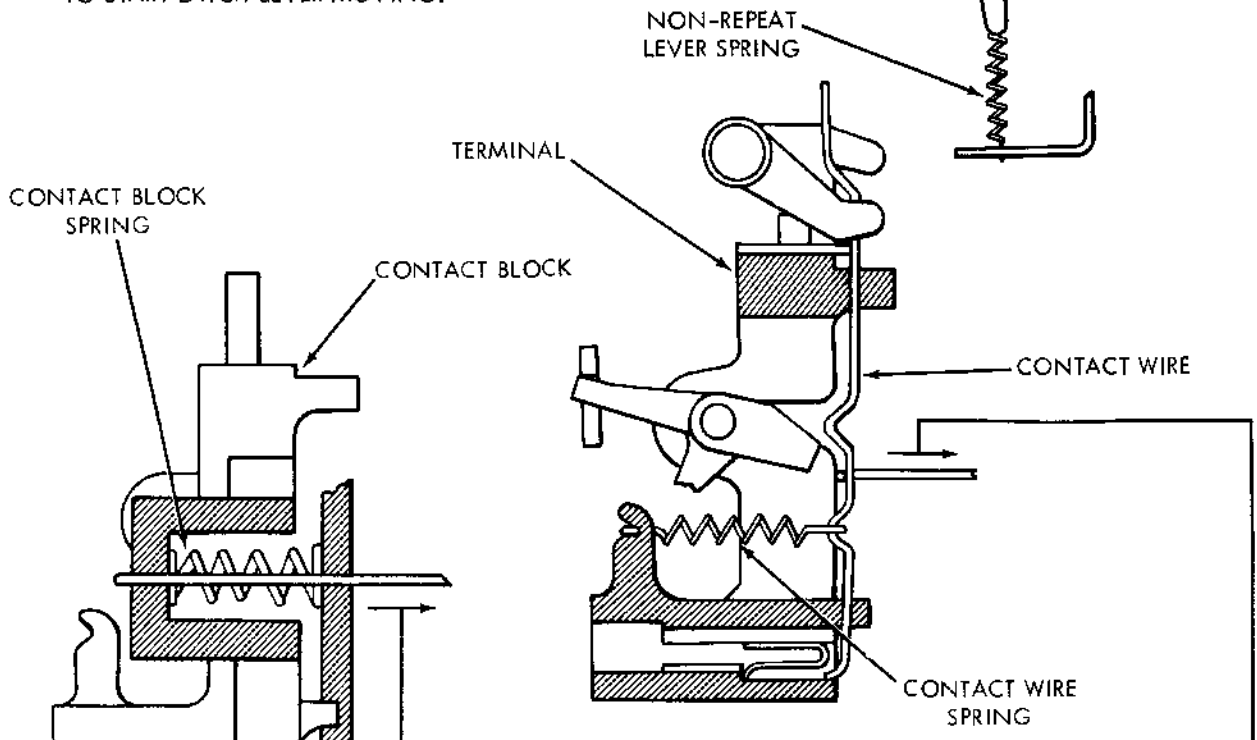
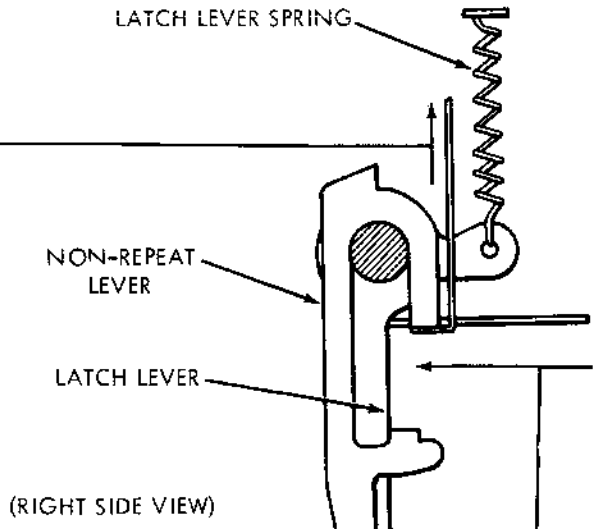
LATCH LEVER SPRING (KEYBOARD)

TO CHECK

REMOVE CALL CONTROL ASSEMBLY,
 TRIP DISTRIBUTOR CLUTCH AND RO-
 TATE MAIN SHAFT UNTIL DISTRIBUTOR
 TRIP CAM FOLLOWER IS AT HIGH POINT
 OF CAM ROLLER'S THROW (SEE
 DISTRIBUTOR TRIP LINKAGE).

REQUIREMENT

MIN. 1/2 OZ. ---MAX. 1 OZ.
 TO START LATCH LEVER MOVING.



CONTACT BLOCK SPRING (KEYBOARD)

REQUIREMENT

WITH CALL CONTROL ASSEMBLY REMOVED
 MIN. 18 OZS. ---MAX. 24 OZS.
 TO START CONTACT BLOCK MOVING.

CONTACT WIRE SPRING (KEYBOARD)

TO CHECK

REMOVE CALL CONTROL ASSEMBLY,
 PLACE T-LEVERS IN MARKING (CLOCK-
 WISE POSITION), TRIP KEYBOARD BY
 DEPRESSING UNIVERSAL CODE BAR
 (SEE UNIVERSAL LINK).

REQUIREMENT

MIN. 3/4 OZ. ---MAX. 1-1/4 OZS.
 TO START CONTACT WIRE MOVING
 AWAY FROM TERMINAL.

"HERE IS" KEYLEVER SPRING (KEYBOARD)

REQUIREMENT
MIN. 18 GRAMS---MAX. 35 GRAMS
TO START KEYLEVER MOVING.

REPEAT KEYLEVER SPRING (KEYBOARD)

REQUIREMENT
MIN. 15 GRAMS---MAX. 30 GRAMS
TO START KEYLEVER MOVING.

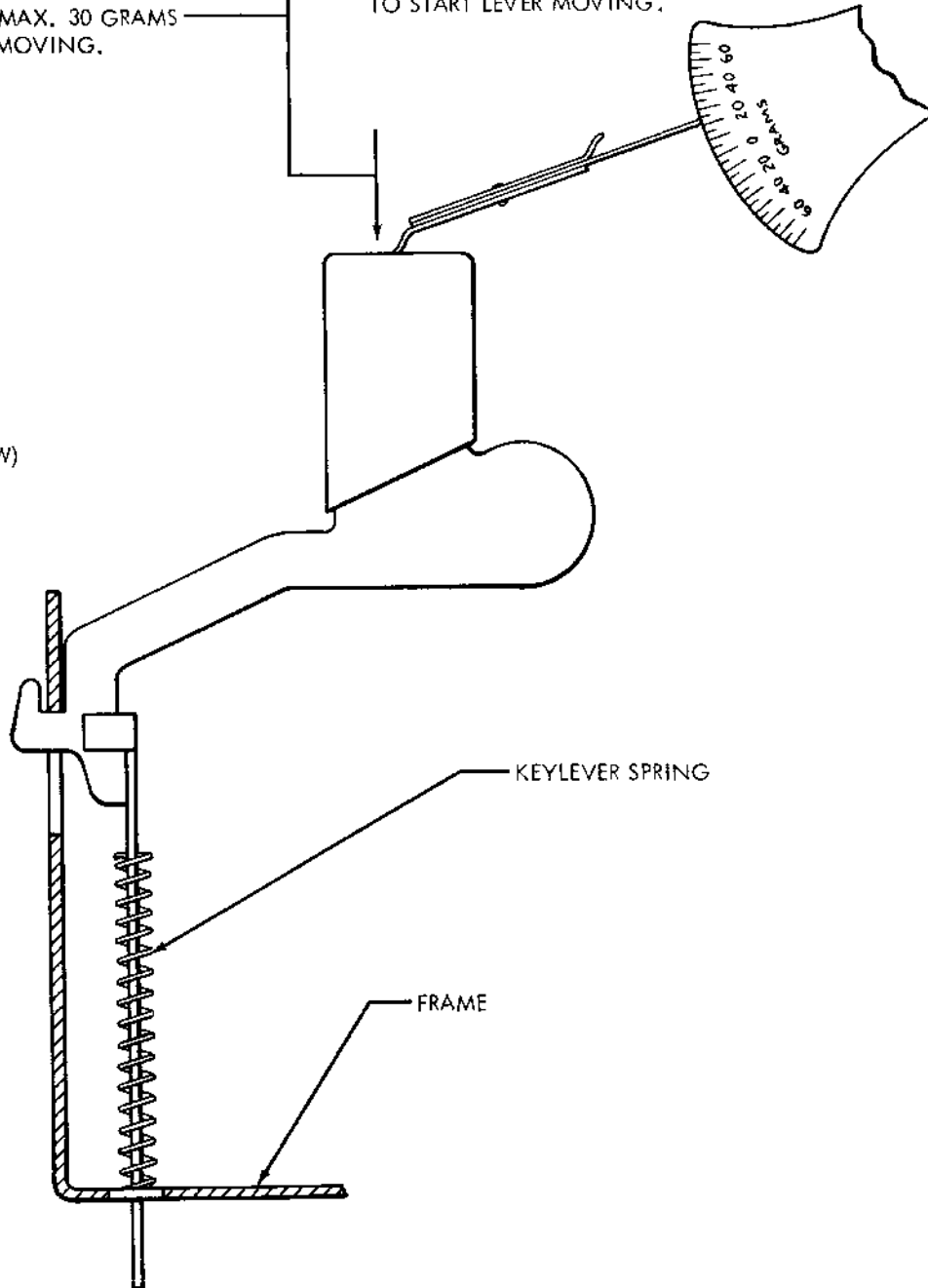
BREAK KEYLEVER SPRING (KEYBOARD)

REQUIREMENT
(5 LEVEL ONLY)
MIN. 12 OZS. --- MAX. 18 OZS.
(8 LEVEL ONLY)
MIN. 4-1/2 OZS. --- MAX. 10 OZS.
TO START LEVER MOVING.

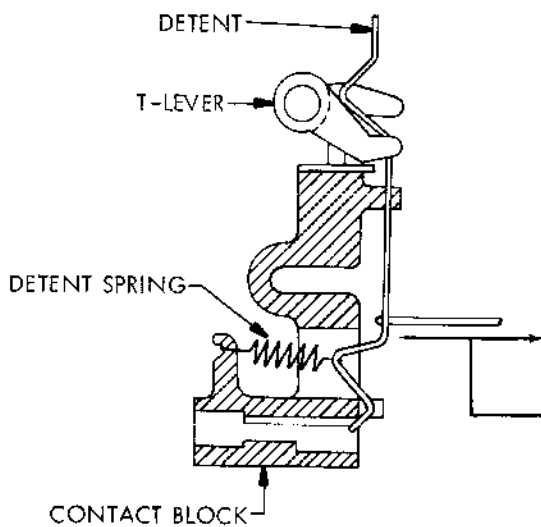
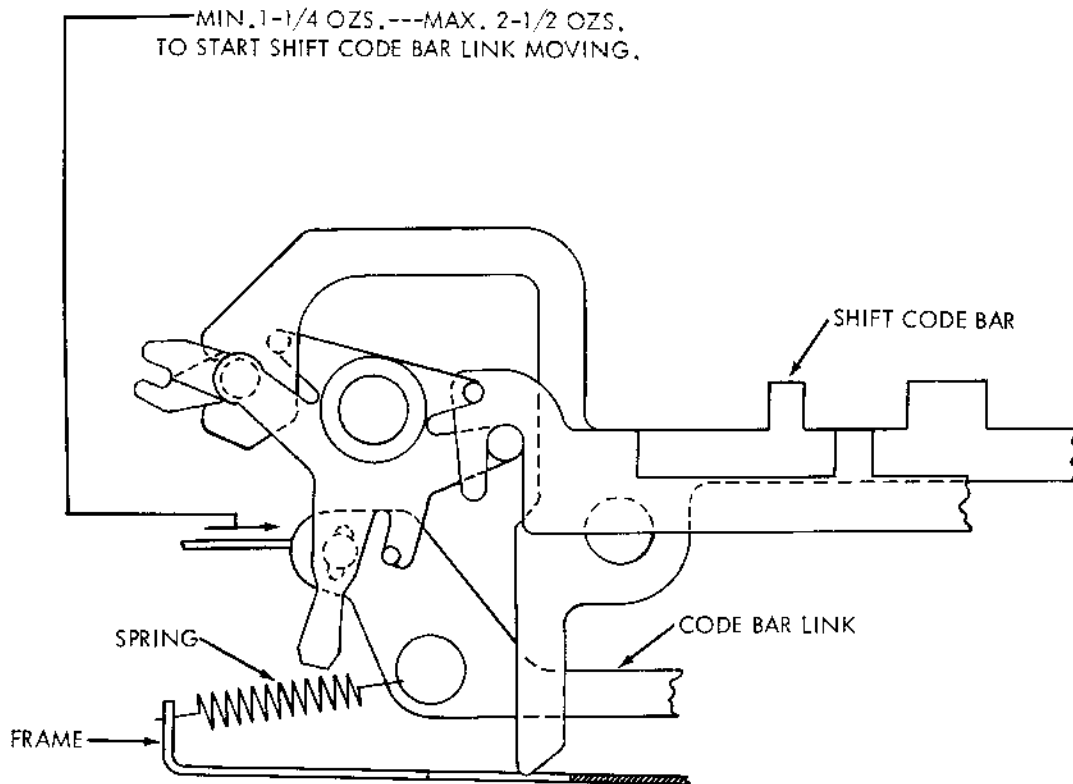
CONTROL KEYLEVER SPRING (KEYBOARD)

REQUIREMENT
(8 LEVEL ONLY)
MIN. 1-1/2 OZS. --- MAX. 3-1/2 OZS.
TO START LEVER MOVING.

(RIGHT SIDE VIEW)



SHIFT CODE BAR SPRING (KEYBOARD)

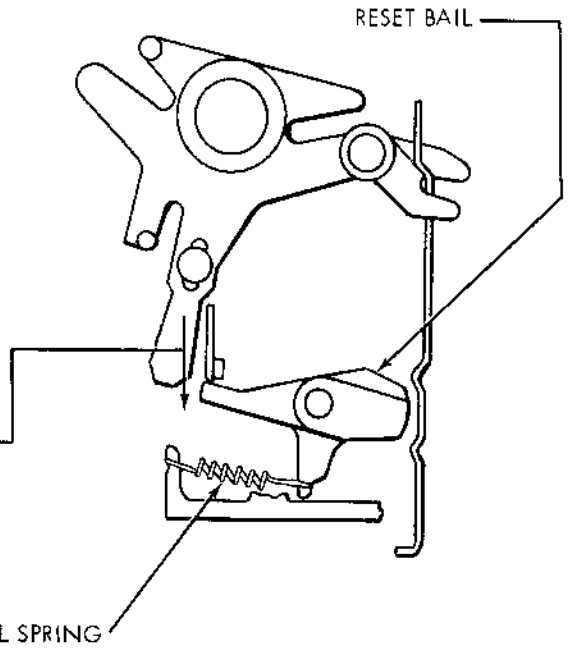


LETTERS - FIGURES DETENT SPRING
(FOUR ROW FIVE LEVEL KEYBOARD ONLY)
REQUIREMENT
WITH KEYBOARD IN "LETTERS" OR "FIGURES"
CONDITION.
MIN. 1-1/2 OZS.
MAX. 3 OZS.
TO START DETENT MOVING AWAY FROM
T-LEVER.

RESET BAIL SPRING (KEYBOARD)

TO CHECK
 REMOVE KEYBOARD COVER. TRIP
 KEYBOARD BY DEPRESSING LETTERS
 OR DELETE KEY.

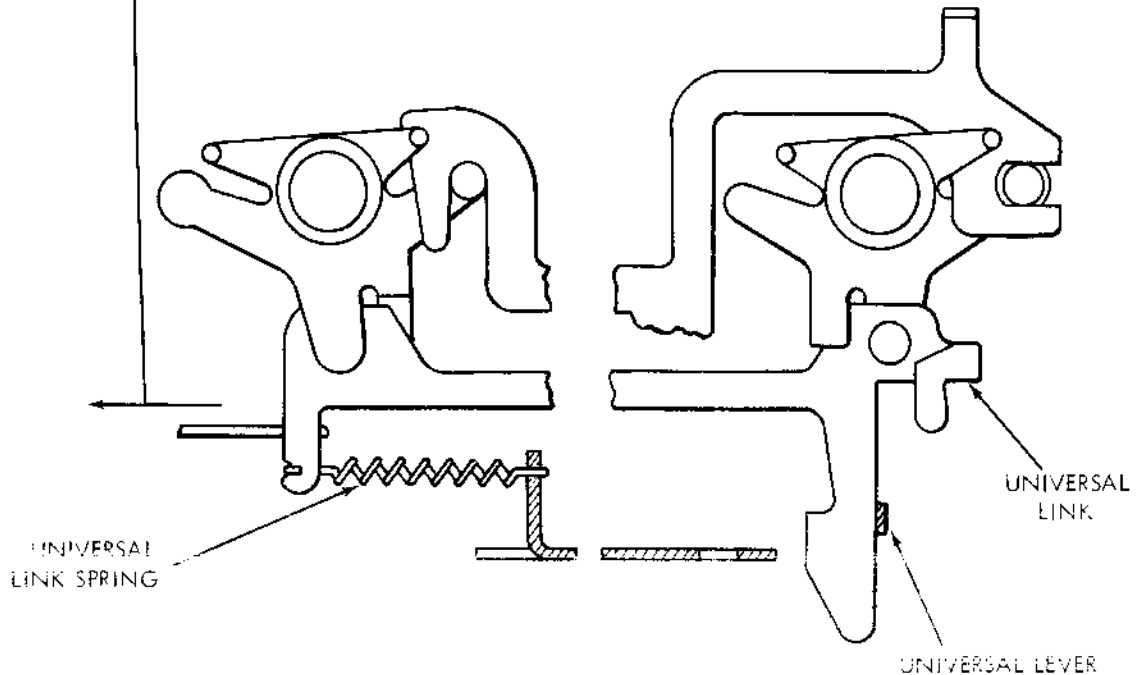
REQUIREMENT
 MIN. 1-1/2 OZS. ---MAX. 2 OZS.
 TO START BAIL MOVING.



(RIGHT SIDE VIEW)

UNIVERSAL LINK SPRING (KEYBOARD)

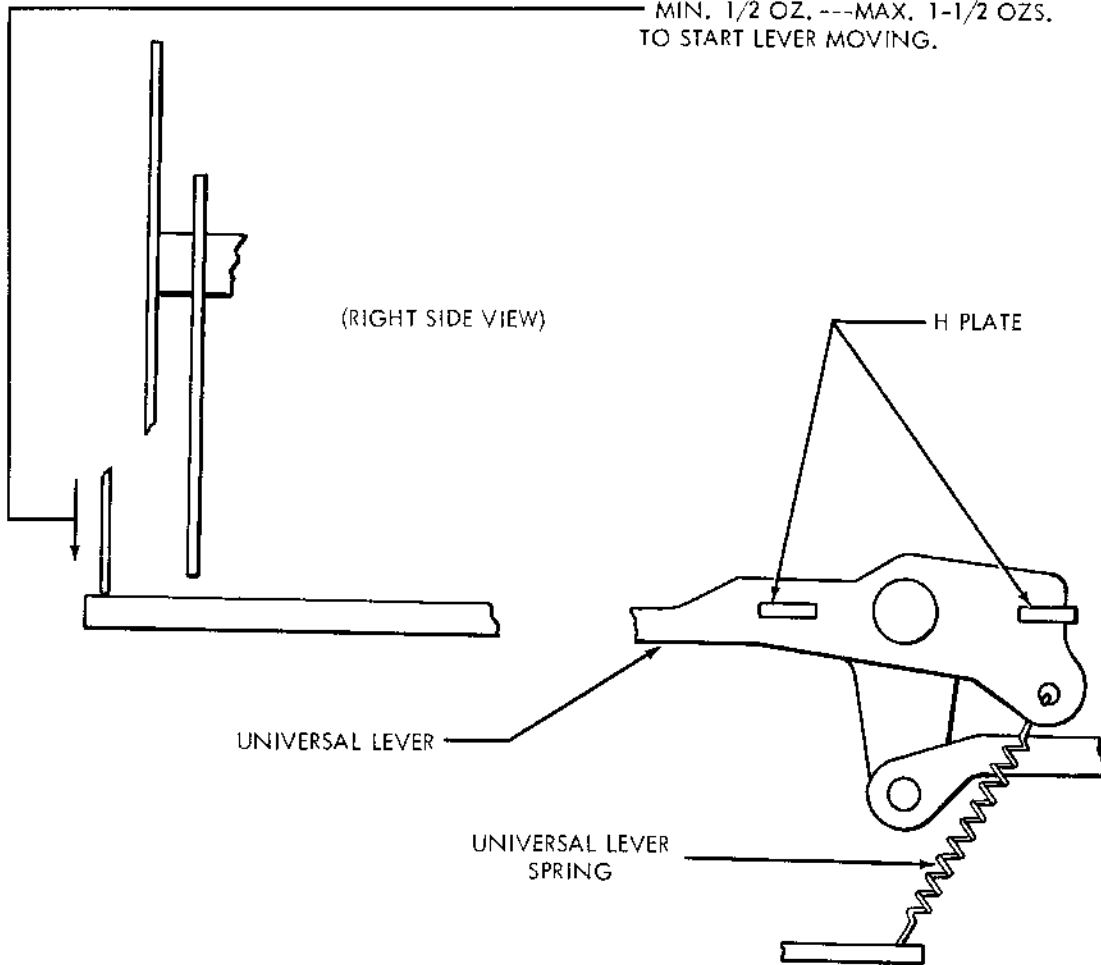
REQUIREMENT
 WITH KEYBOARD TRIPPED (UNIVERSAL
 LEVER IN UP POSITION)
 MIN. 1/2 OZ. ---MAX. 1-1/4 OZS.
 TO START UNIVERSAL LINK MOVING.

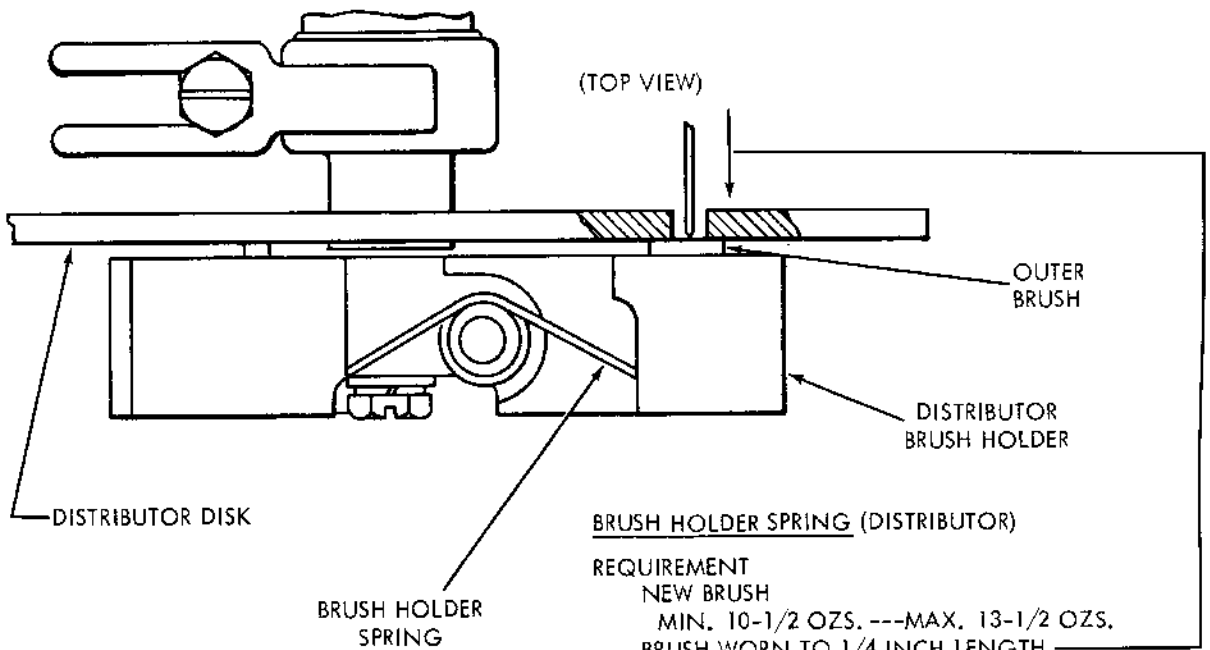


(RIGHT SIDE VIEW)

UNIVERSAL LEVER SPRING (KEYBOARD)

REQUIREMENT
WITH KEYBOARD COVER AND H PLATE
REMOVED, AND PRINTER IN STOP
CONDITION
MIN. 1/2 OZ. ---MAX. 1-1/2 OZS.
TO START LEVER MOVING.





BRUSH HOLDER SPRING (DISTRIBUTOR)

REQUIREMENT

NEW BRUSH

MIN. 10-1/2 OZS. ---MAX. 13-1/2 OZS.

BRUSH WORN TO 1/4 INCH LENGTH

MIN. 7-1/2 OZS. ---MAX. 10-1/2 OZS.

TO START OUTER BRUSH MOVING.

CLUTCH LATCH LEVER SPRING (DISTRIBUTOR)

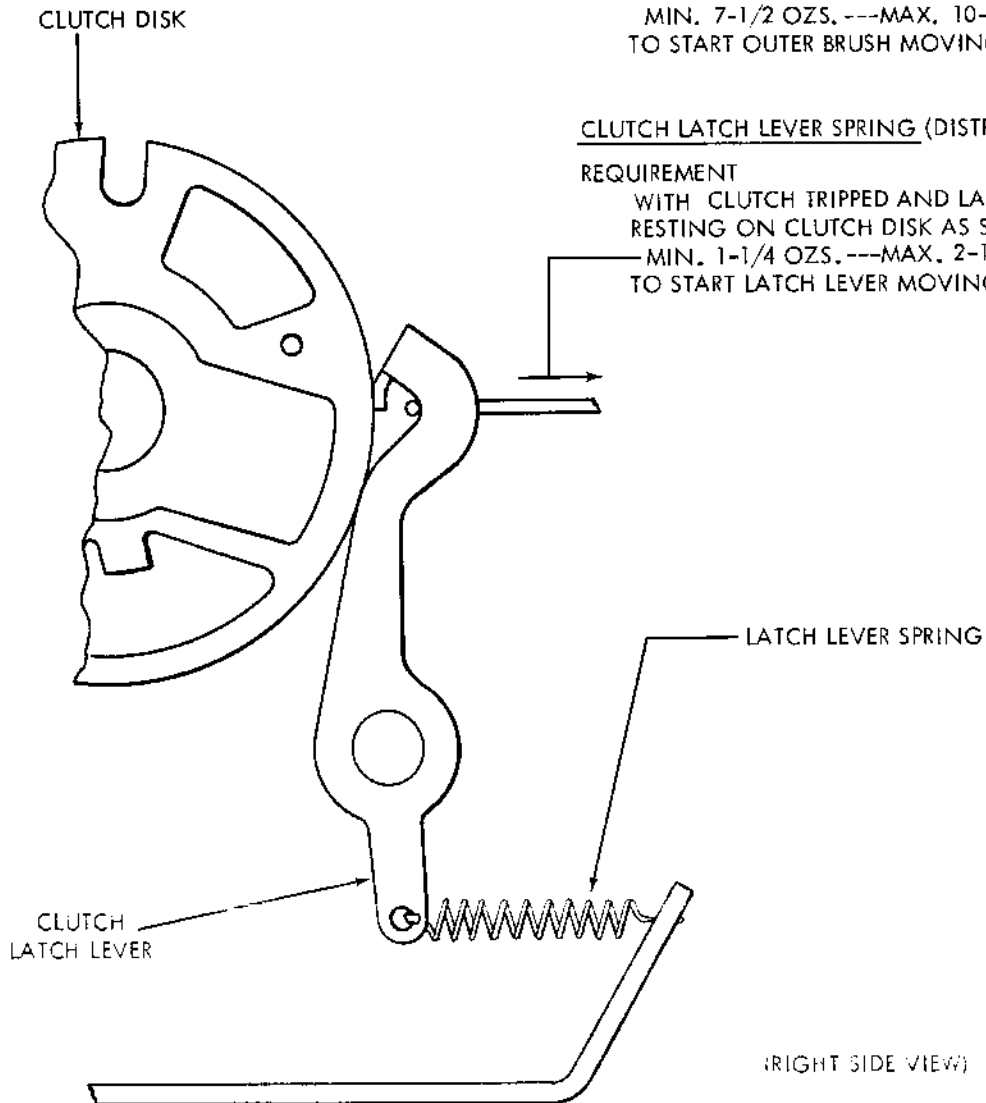
REQUIREMENT

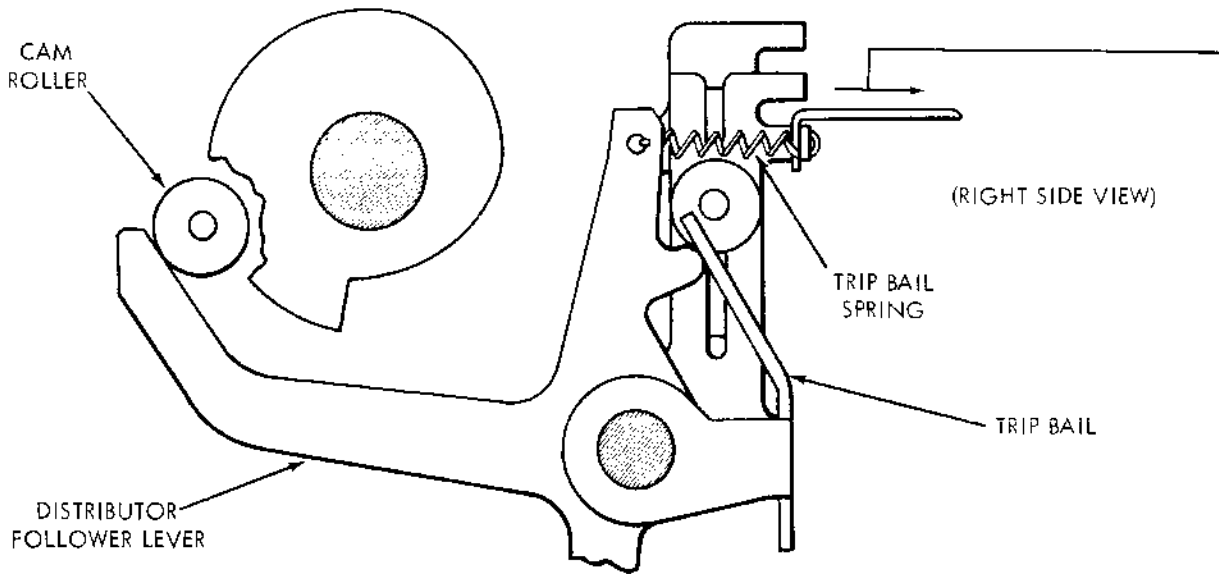
WITH CLUTCH TRIPPED AND LATCH LEVER

RESTING ON CLUTCH DISK AS SHOWN

MIN. 1-1/4 OZS. ---MAX. 2-1/4 OZS.

TO START LATCH LEVER MOVING.





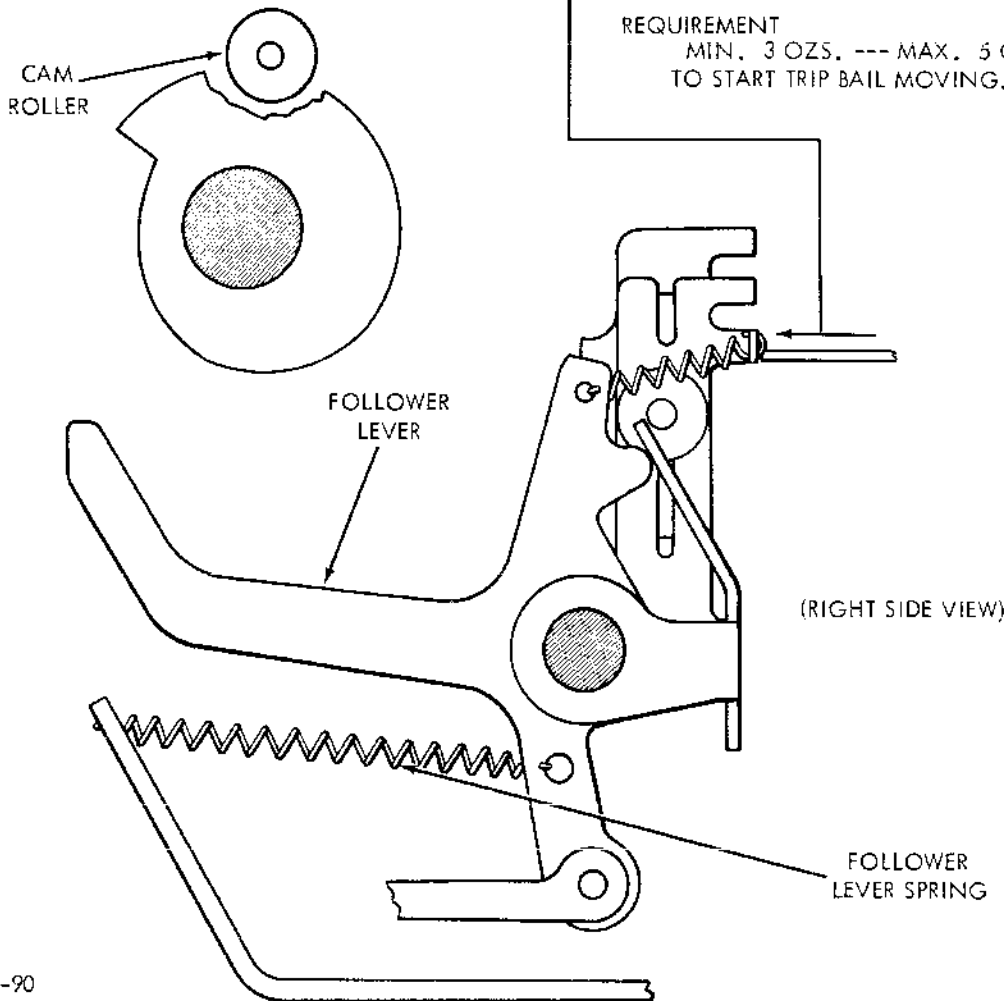
FOLLOWER LEVER (DISTRIBUTOR)

REQUIREMENT
 WITH H PLATE REMOVED AND
 FOLLOWER LEVER NOT IN CONTACT
 WITH ROLLER
 MIN. 2 OZS. --- MAX. 3 OZS.
 TO START LEVER MOVING.

TRIP BAIL SPRING (DISTRIBUTOR)

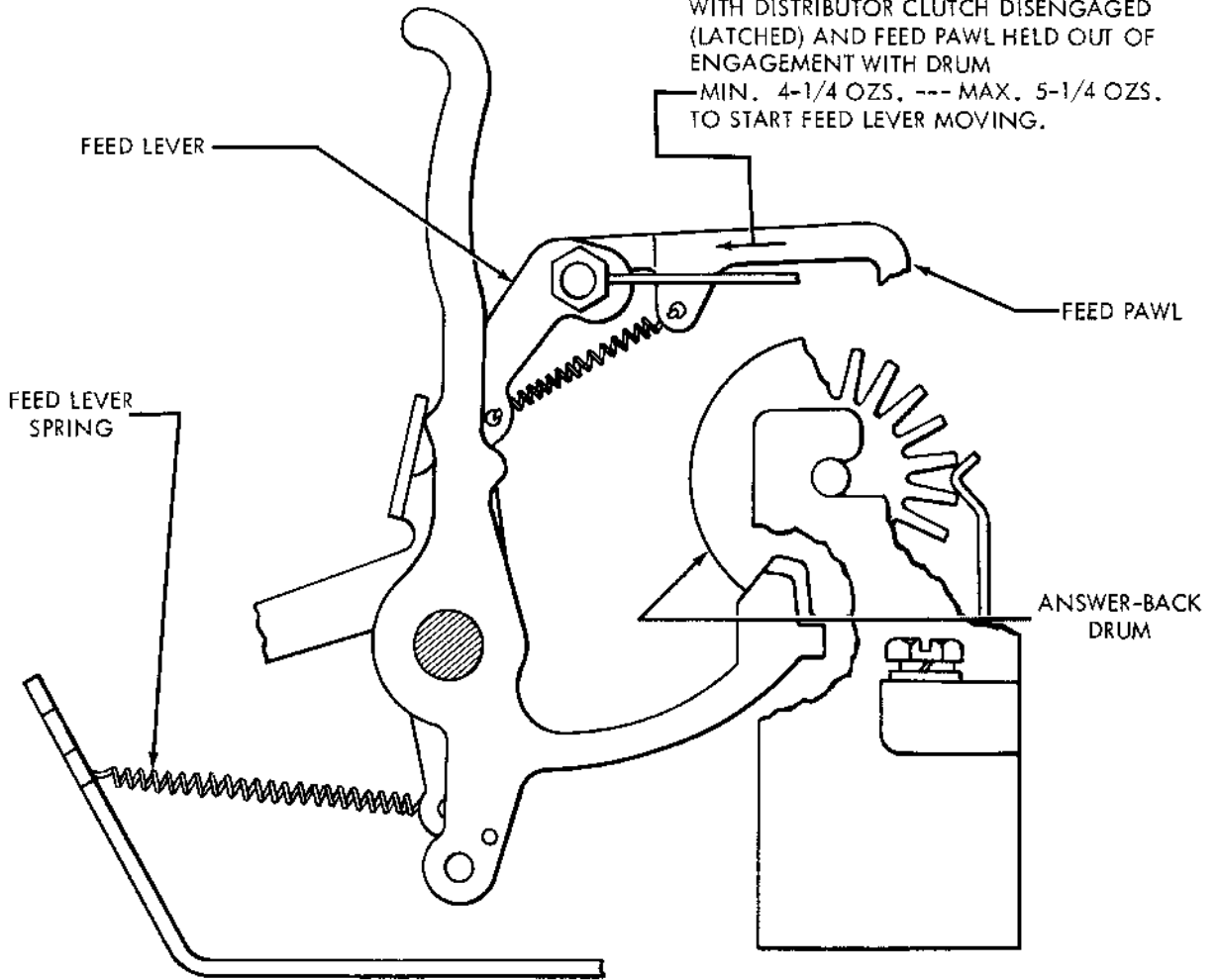
TO CHECK
 PLACE ANSWER-BACK DRUM IN HOME
 POSITION (DETENT LEVER BETWEEN NO. 20
 AND STOP (ST) ROWS). TRIP DISTRIBUTOR
 CLUTCH AND ROTATE MAIN SHAFT UNTIL
 FOLLOWER LEVER IS AT HIGHEST POINT OF
 CAM ROLLER'S THROW.

REQUIREMENT
 MIN. 3 OZS. --- MAX. 5 OZS.
 TO START TRIP BAIL MOVING.

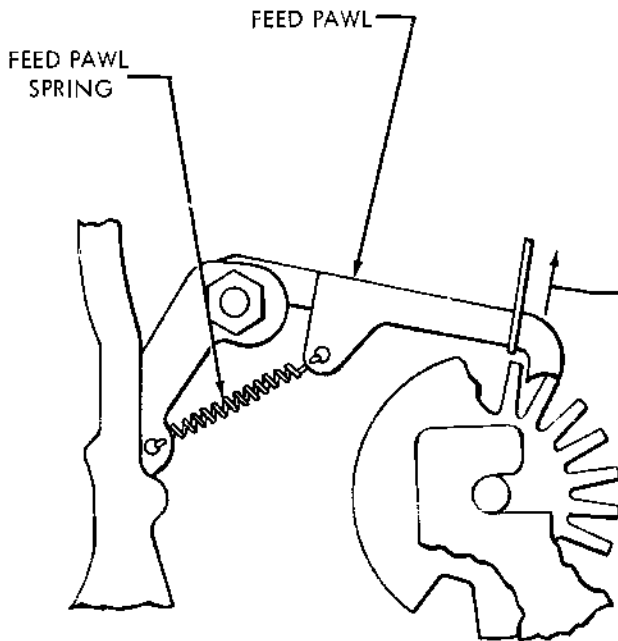


FEED LEVER SPRING (ANSWER-BACK)

REQUIREMENT
WITH DISTRIBUTOR CLUTCH DISENGAGED
(LATCHED) AND FEED PAWL HELD OUT OF
ENGAGEMENT WITH DRUM
--- MIN. 4-1/4 OZS. --- MAX. 5-1/4 OZS.
TO START FEED LEVER MOVING.



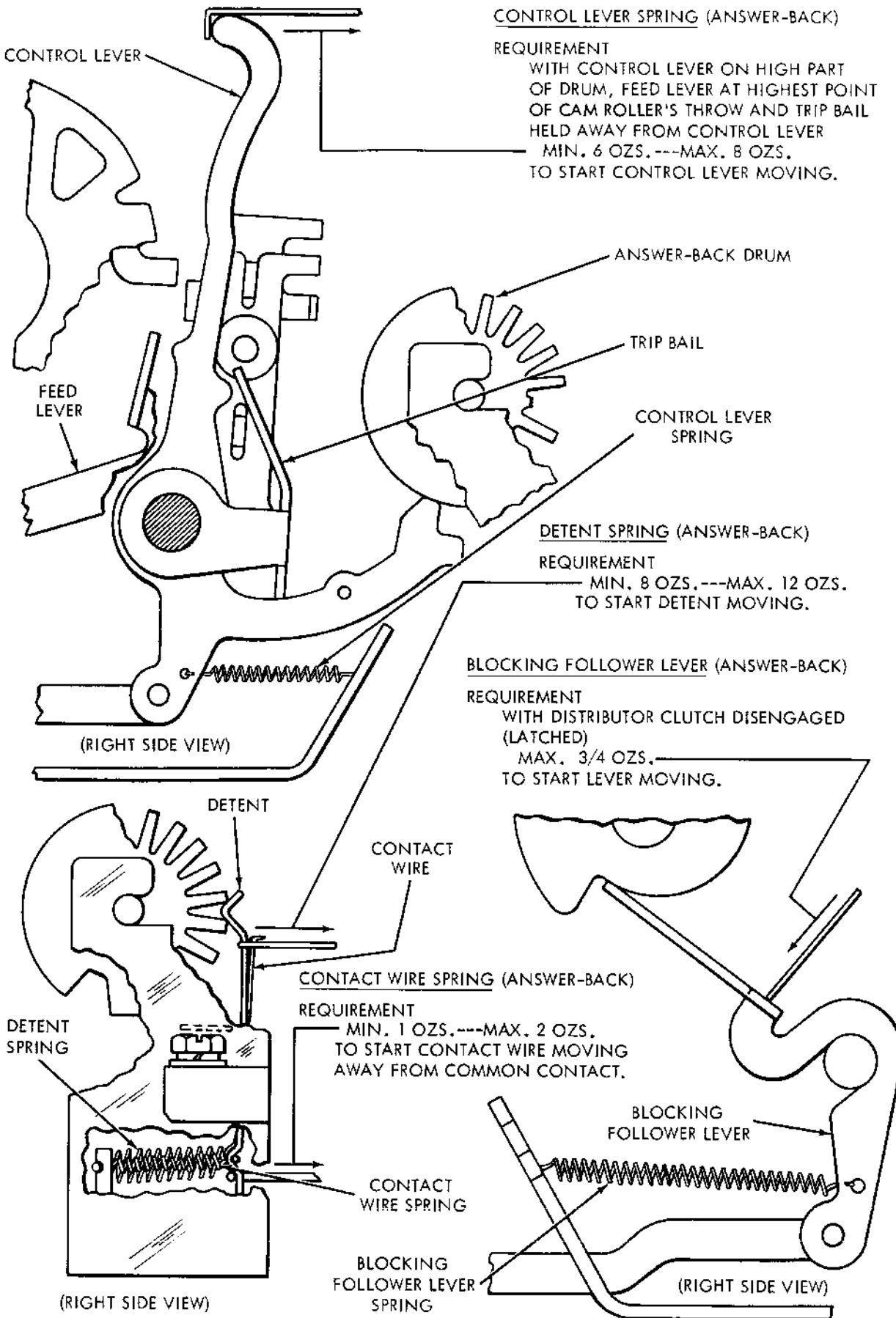
(RIGHT SIDE VIEW)



FEED PAWL SPRING (ANSWER-BACK)

REQUIREMENT
WITH DISTRIBUTOR CLUTCH DISENGAGED
(LATCHED)
--- MIN. 1/2 OZ. --- MAX. 1-1/4 OZS.
TO START FEED PAWL MOVING.

(RIGHT SIDE VIEW)



ARMATURE SPRING (SELECTOR)

(1) REQUIREMENT (PRELIMINARY)
 WITH PRINTER IN STOP CONDITION, CARRIAGE NEAR RIGHT MARGIN, AND START LEVER HELD AWAY FROM ARMATURE
 MIN. 3 OZS. ---MAX. 3-1/2 OZS. _____
 TO START ARMATURE MOVING.

(2) REQUIREMENT (FINAL)
 WHEN CHECKED WITH SIGNAL DISTORTION SET (DXD), MINIMUM SELECTOR RECEIVING MARGINS AS FOLLOWS:

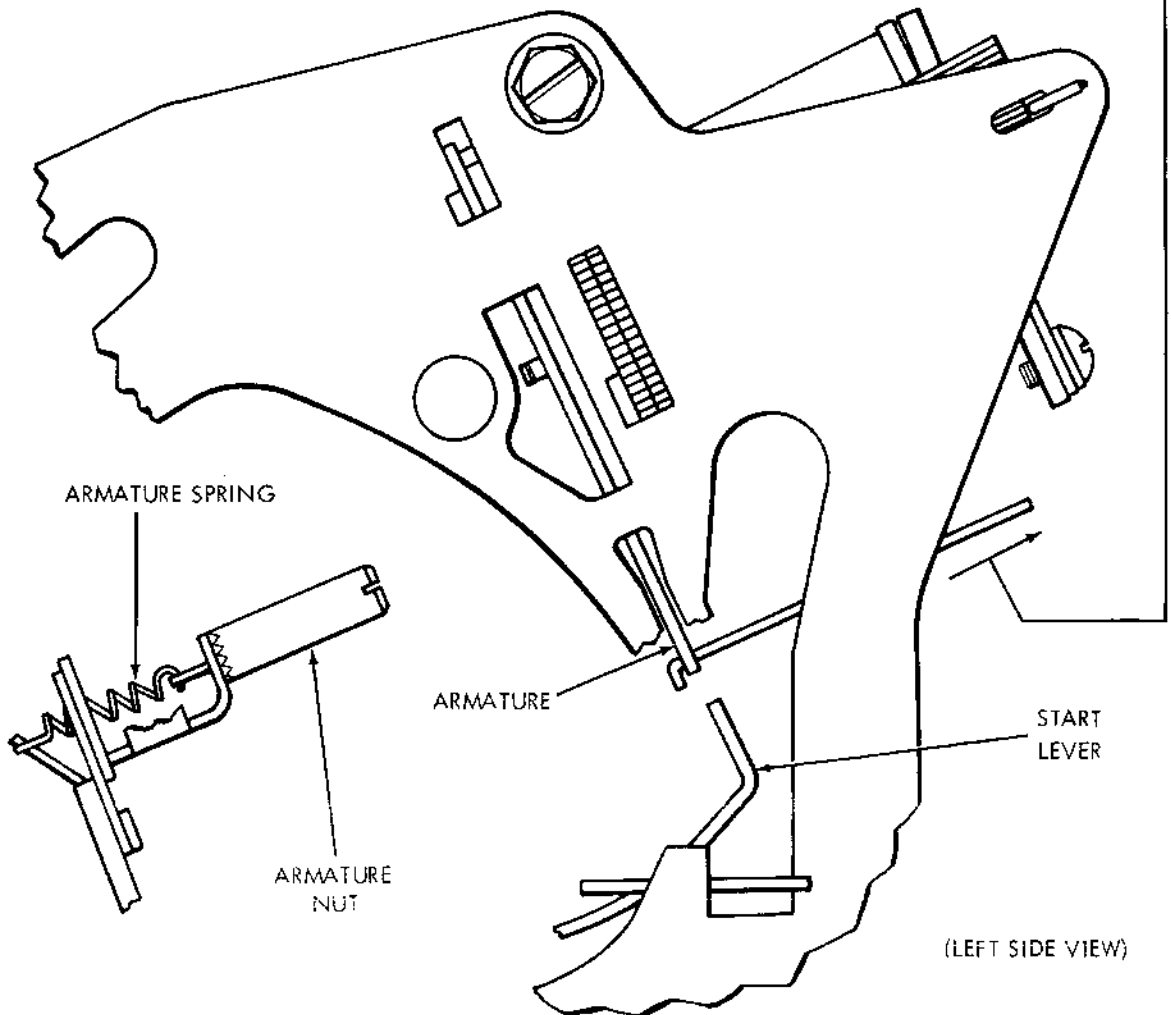
	<u>SPEED</u>	<u>RANGE ZERO DISTORTION</u>	<u>OVERALL BIAS</u>	<u>END DISTORTION AT BIAS OPTIMUM SETTING</u>
5 AND 6 LEVEL TO ADJUST	100 WPM	72 PTS	38 PER CENT	35 PER CENT

ROTATE ADJUSTING NUT CLOCKWISE TO INCREASE ARMATURE SPRING TENSION AND COUNTERCLOCKWISE TO DECREASE IT.

RELATED ADJUSTMENTS
 AFFECTED BY, MAGNET CORE, ARMATURE BRACKET

ARMATURE SPRING TENSION, BRACKET POSITION AND RECEIVING MARGIN (SELECTOR)
 REQUIREMENT

A FINAL CHECK OF ARMATURE BRACKET POSITIONING ADJUSTMENT NEED NOT BE MADE IF RECEIVING MARGIN REQUIREMENTS ARE MET.



FINAL PRINTING ALIGNMENTGENERAL

WHEN PRINTER IS ADJUSTED AS INSTRUCTED ON PREVIOUS PAGES, QUALITY OF PRINTED COPY SHOULD BE GOOD. HOWEVER, MINOR READJUSTMENTS MAY BE NECESSARY.

TO CHECK

PRINT "TH" AT VARIOUS POINTS ALONG LENGTH OF PRINTING LINE.

REQUIREMENT

QUALITY OF PRINTED CHARACTERS GOOD.

TO ADJUST

USE THE FOLLOWING GUIDE IN MAKING READJUSTMENTS:

DENSITY OF TOP AND BOTTOM OF CHARACTERS NOT EQUAL AND/OR UNDERSCORING OR OVERSCORING OF CHARACTERS

---REFINE PLATEN - VERTICAL (PAPER FEED) ADJUSTMENT BY MOVING PLATEN TOWARD PORTION OF LIGHT DENSITY.

LEFT CHARACTER (T) OF POOR QUALITY

---USING LEFT PRY POINTS, REFINE STOP PLATE (CARRIAGE) ADJUSTMENT.

RIGHT CHARACTER (H) OF POOR QUALITY

---USING RIGHT PRY POINTS, REFINE STOP PLATE (CARRIAGE) ADJUSTMENT.

CHARACTERS SPREAD OUT

---REFINE STOP PLATE (CARRIAGE) ADJUSTMENT BY MOVING PLATE FRONTWARD.

CHARACTERS RUN TOGETHER

---REFINE STOP PLATE (CARRIAGE) ADJUSTMENT BY MOVING PLATE REARWARD.

BOTH CHARACTERS LIGHT ON LEFT SIDE

---REFINE TYPEWHEEL (CARRIAGE) ADJUSTMENT BY ROTATING WHEEL CLOCKWISE AS VIEWED FROM TOP.

BOTH CHARACTERS LIGHT ON RIGHT SIDE

---REFINE TYPEWHEEL (CARRIAGE) ADJUSTMENT BY ROTATING WHEEL COUNTERCLOCKWISE AS VIEWED FROM TOP.

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SECTION 4

VARIABLE

FEATURES

ANSWER-BACK TRIP MAGNET MECHANISMTRIP MAGNET (ANSWER-BACK)

REQUIREMENT

MAGNET BRACKET ALL THE WAY TO LEFT ON CASTING POST.

TO ADJUST

POSITION MAGNET BRACKET WITH MOUNTING SCREWS (2) LOOSENED.

TRIP LEVER OVERTRAVEL (ANSWER-BACK)

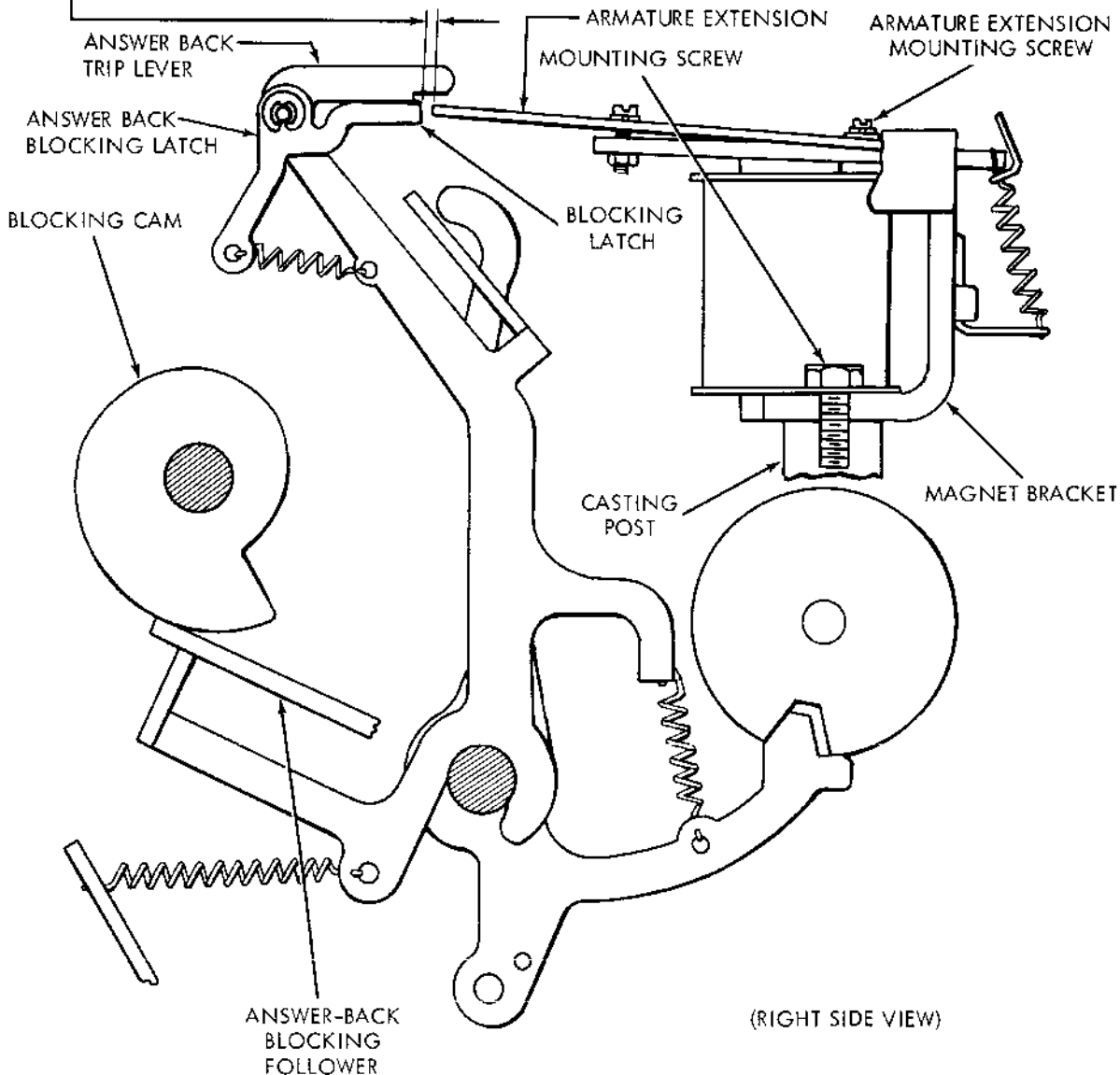
REQUIREMENT

WITH ANSWER-BACK DRUM FULLY DETENTED IN STOP POSITION, ARMATURE IN ATTRACTED POSITION, WITH PLAY TAKEN UP TOWARD THE REAR OF UNIT, ANSWER-BACK BLOCKING FOLLOWER ON HIGH PART OF BLOCKING CAM, TAKE UP AND RELEASE PLAY OF ANSWER-BACK TRIP LEVER TOWARD RIGHT REAR CORNER OF UNIT, TAKE UP AND HOLD PLAY OF BLOCKING CAM IN AN UPWARD DIRECTION, CLEARANCE BETWEEN END OF MAGNET ARMATURE EXTENSION AND END OF BLOCKING LATCH.

MIN. 0.006 INCH --- MAX. 0.015 INCH

TO ADJUST

POSITION ARMATURE EXTENSION WITH MOUNTING SCREW LOOSENED.



ANSWER-BACK TRIP MAGNET MECHANISMARMATURE GAP (ANSWER-BACK)

(1) REQUIREMENT

WITH DISTRIBUTOR CLUTCH IN STOP POSITION, ARMATURE IN ATTRACTED POSITION, ROTATE MAINSHAFT UNTIL SHOULDER ON THE ANSWER-BACK TRIP LEVER OVERLAPS END OF ARMATURE EXTENSION BY APPROXIMATELY

--- MIN. SOME --- MAX. 0.015 INCH

AS GAGED BY EYE.

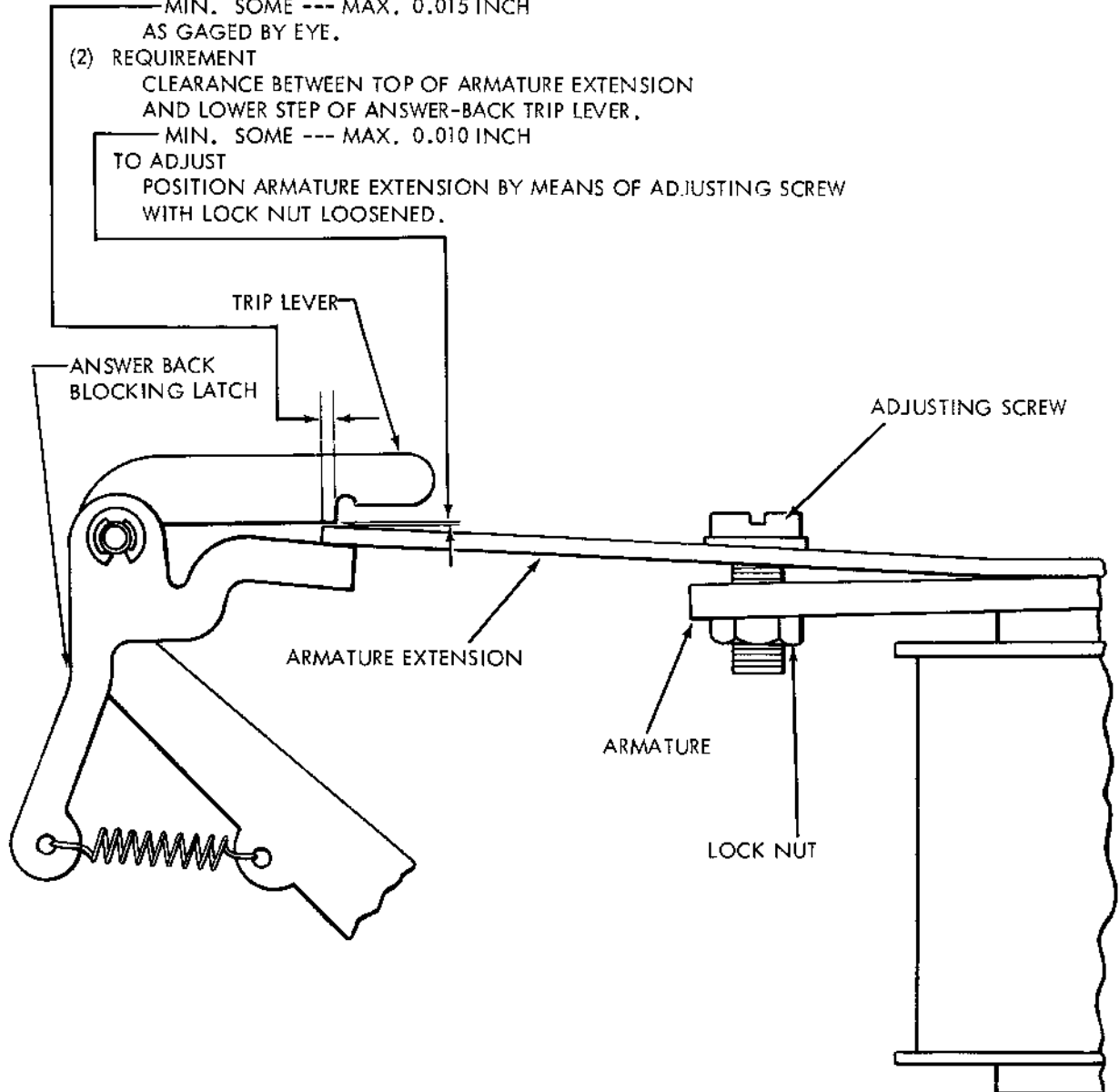
(2) REQUIREMENT

CLEARANCE BETWEEN TOP OF ARMATURE EXTENSION AND LOWER STEP OF ANSWER-BACK TRIP LEVER,

--- MIN. SOME --- MAX. 0.010 INCH

TO ADJUST

POSITION ARMATURE EXTENSION BY MEANS OF ADJUSTING SCREW WITH LOCK NUT LOOSENED.



(RIGHT SIDE VIEW)

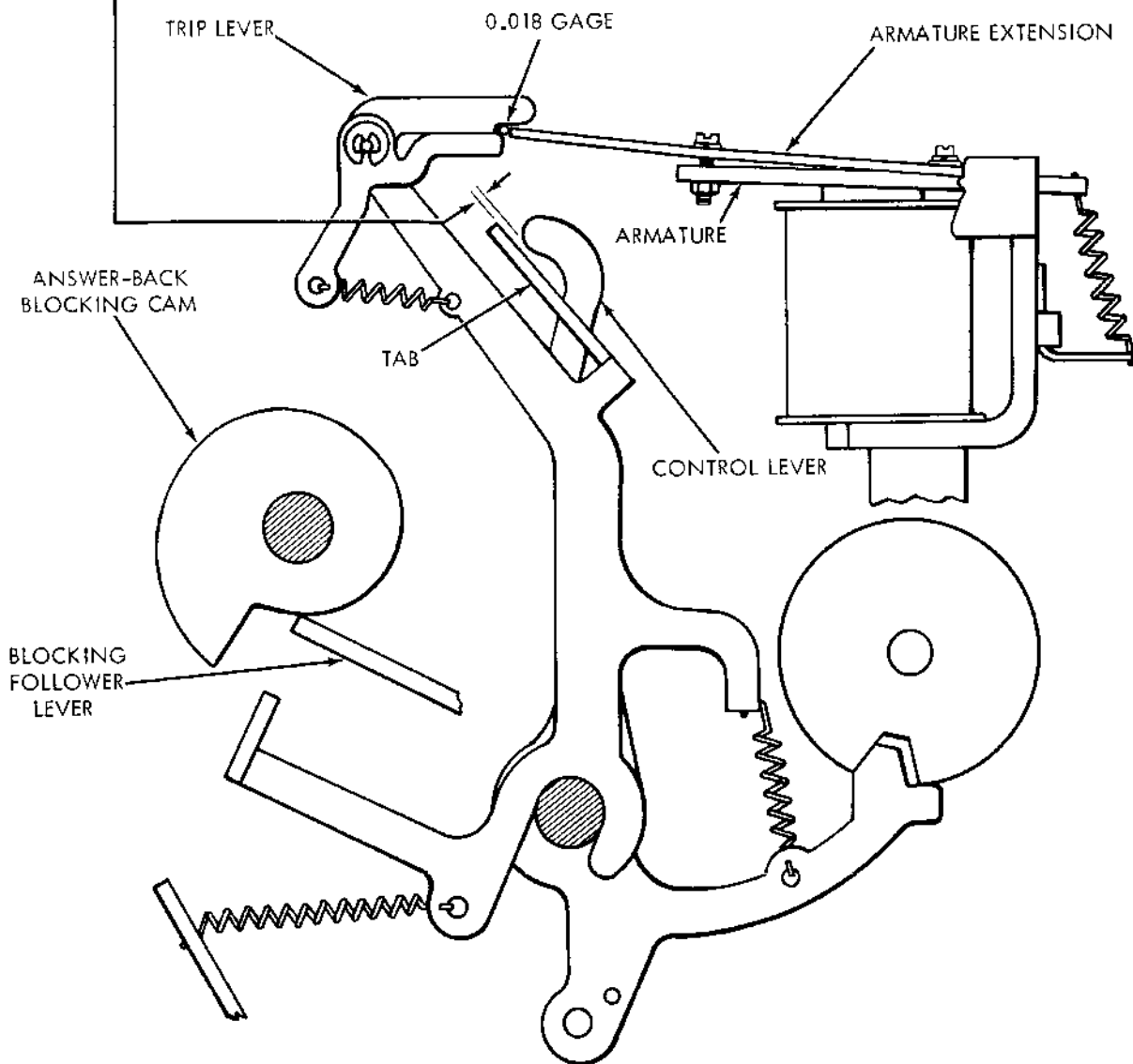
ANSWER-BACK TRIP MAGNET MECHANISMTRIP LEVER - (ANSWER-BACK)REQUIREMENT

WITH DISTRIBUTOR CLUTCH DISENGAGED, ANSWER-BACK DRUM FULLY DETENTED, MAGNET ARMATURE IN UNATTRACTED POSITION, TAKE UP PLAY IN TRIP LEVER TO THE RIGHT OF THE UNIT AND PLAY IN THE CONTROL LEVER TO THE LEFT OF UNIT. WITH AN 0.018 INCH GAGE PLACED BETWEEN THE END OF THE ARMATURE EXTENSION AND THE SHOULDER OF TRIP LEVER

MIN. SOME --- MAX. 0.008 INCH
CLEARANCE BETWEEN THE ADJUSTING TAB ON THE TRIP LEVER AND THE CONTROL LEVER.

TO ADJUST

BEND TAB ON TRIP LEVER WITH 180993 BENDING TOOL.



(RIGHT SIDE VIEW)

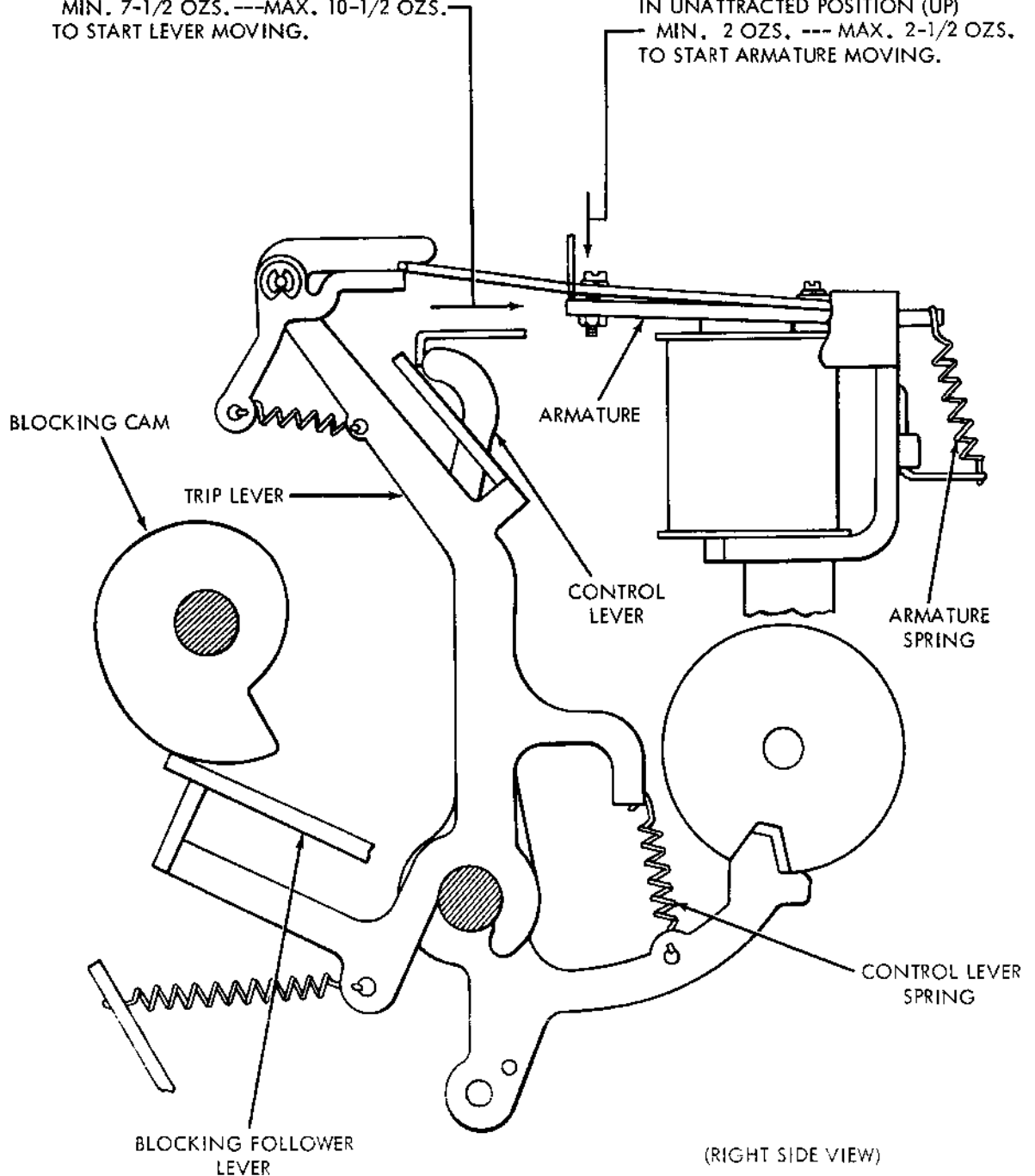
ANSWER-BACK TRIP MAGNET MECHANISM

CONTROL LEVER SPRING (ANSWER-BACK)

REQUIREMENT
 WITH DISTRIBUTOR CLUTCH TRIPPED
 AND BLOCKING FOLLOWER LEVER ON
 HIGH PART OF BLOCKING CAM
 MIN. 7-1/2 OZS. --- MAX. 10-1/2 OZS.
 TO START LEVER MOVING.

ARMATURE SPRING (ANSWER-BACK)

REQUIREMENT
 WITH DISTRIBUTOR CLUTCH TRIPPED
 AND BLOCKING FOLLOWER LEVER ON
 HIGH PART OF CAM, AND ARMATURE
 IN UNATTRACTED POSITION (UP)
 MIN. 2 OZS. --- MAX. 2-1/2 OZS.
 TO START ARMATURE MOVING.



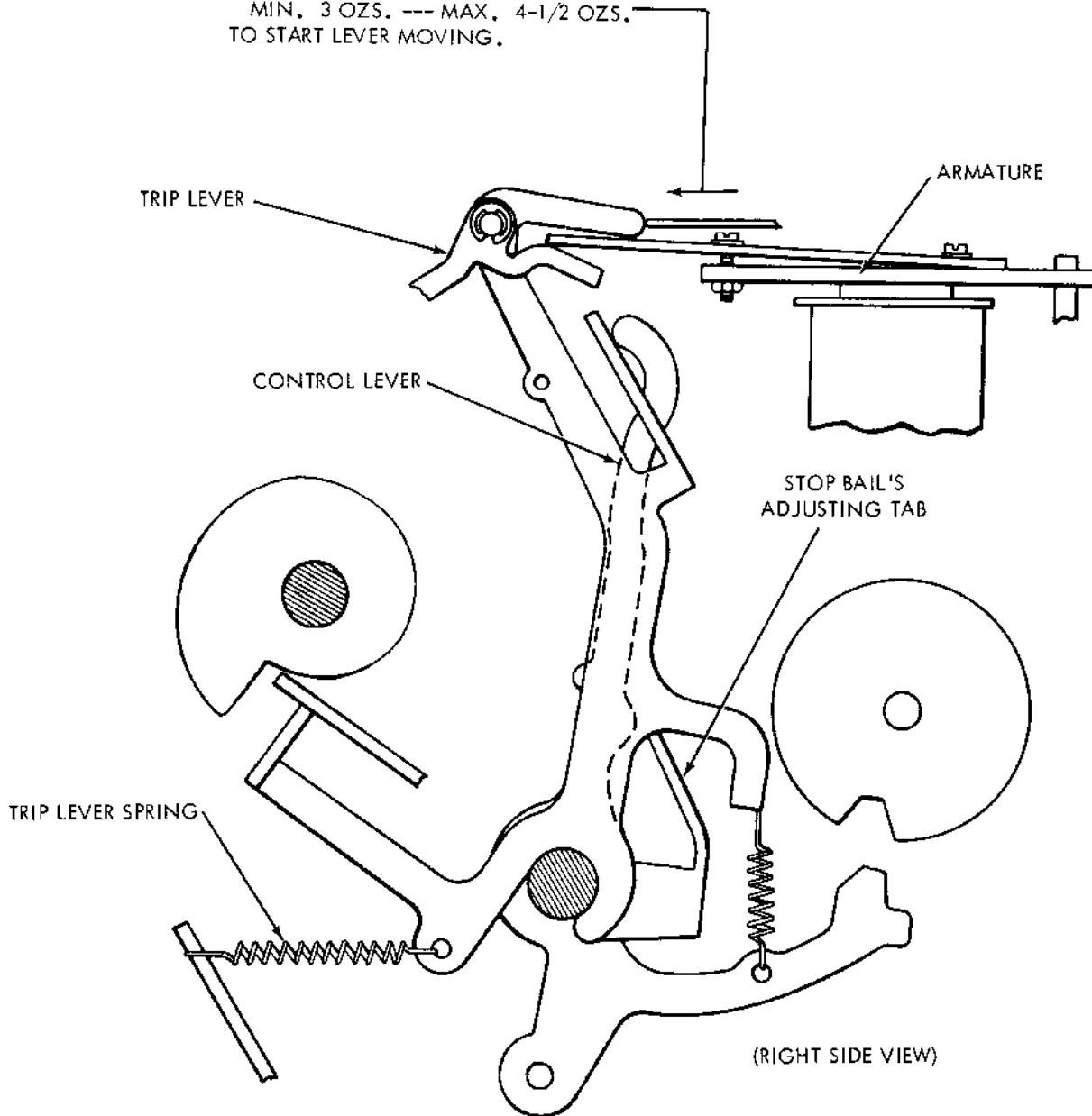
ANSWER-BACK TRIP MAGNET MECHANISMTRIP LEVER SPRING (ANSWER-BACK)

TO CHECK

DISENGAGE (LATCH) DISTRIBUTOR CLUTCH.
MANUALLY TRIP ARMATURE. POSITION STOP
BAIL SO THAT ITS ADJUSTING TAB DOES NOT
INTERFERE WITH CONTROL LEVER. ARMATURE
HELD ENERGIZED.

REQUIREMENT

MIN. 3 OZS. --- MAX. 4-1/2 OZS.
TO START LEVER MOVING.



FUNCTION BOX MECHANISM

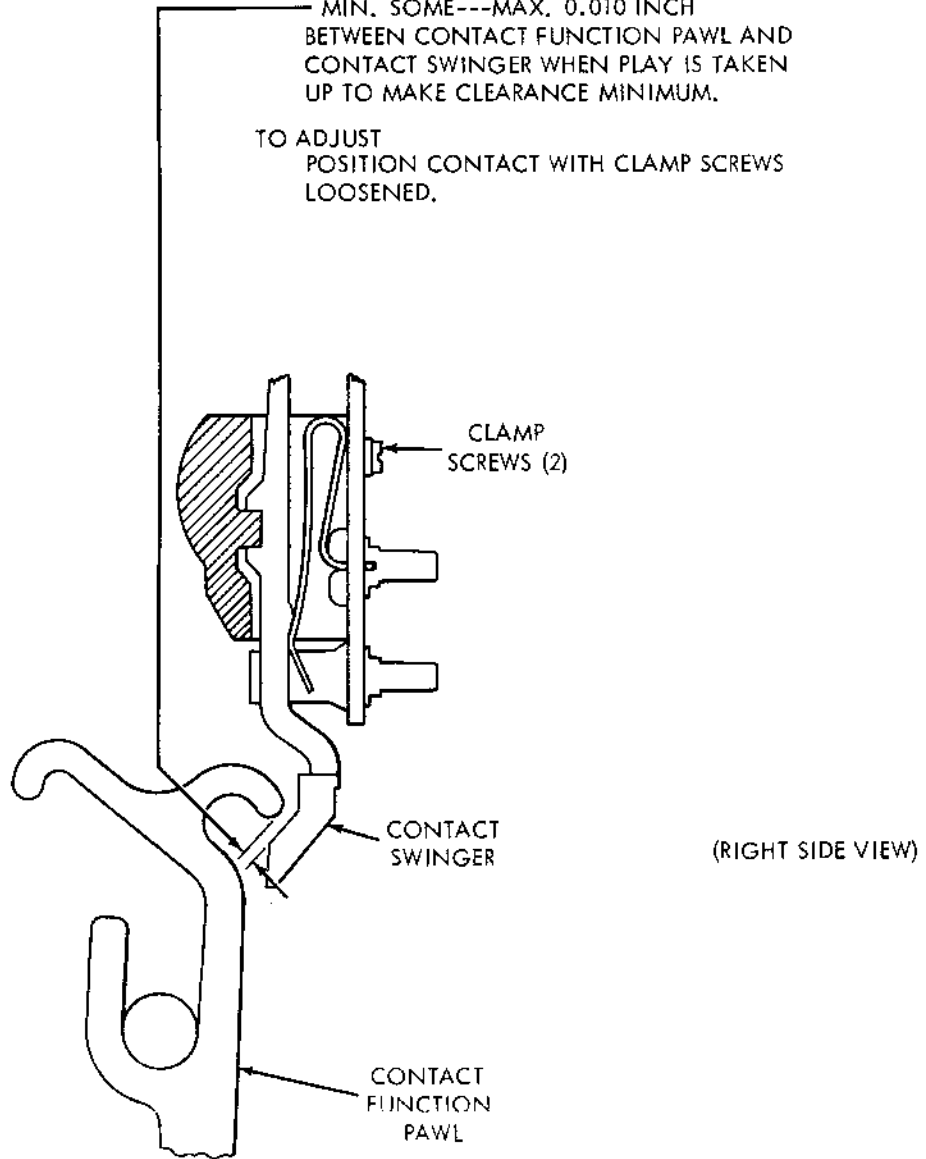
FUNCTION BOX CONTACTS (FUNCTION)

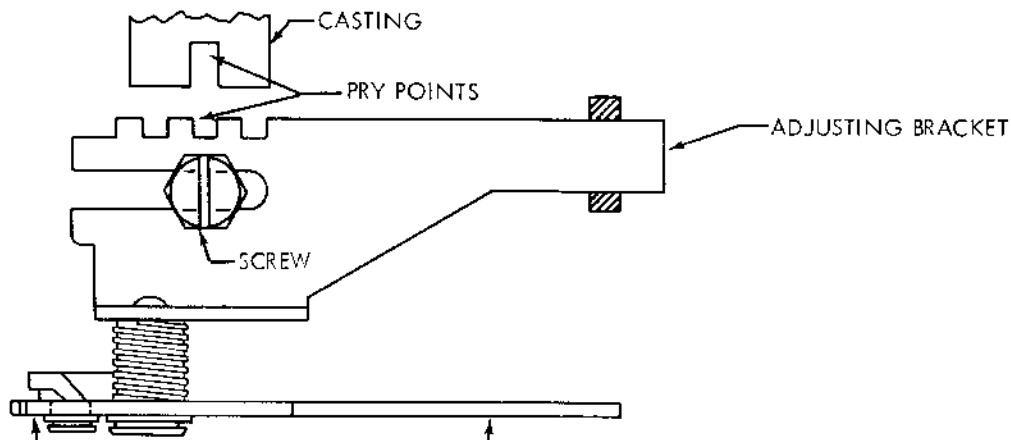
REQUIREMENT

WITH CODE COMBINATION THAT OPERATES CONTACTS SET UP IN SELECTOR AND MAIN SHAFT ROTATED UNTIL FUNCTION BAIL IS IN HIGHEST POSITION

MIN. SOME---MAX. 0.010 INCH BETWEEN CONTACT FUNCTION PAWL AND CONTACT SWINGER WHEN PLAY IS TAKEN UP TO MAKE CLEARANCE MINIMUM.

TO ADJUST POSITION CONTACT WITH CLAMP SCREWS LOOSENED.





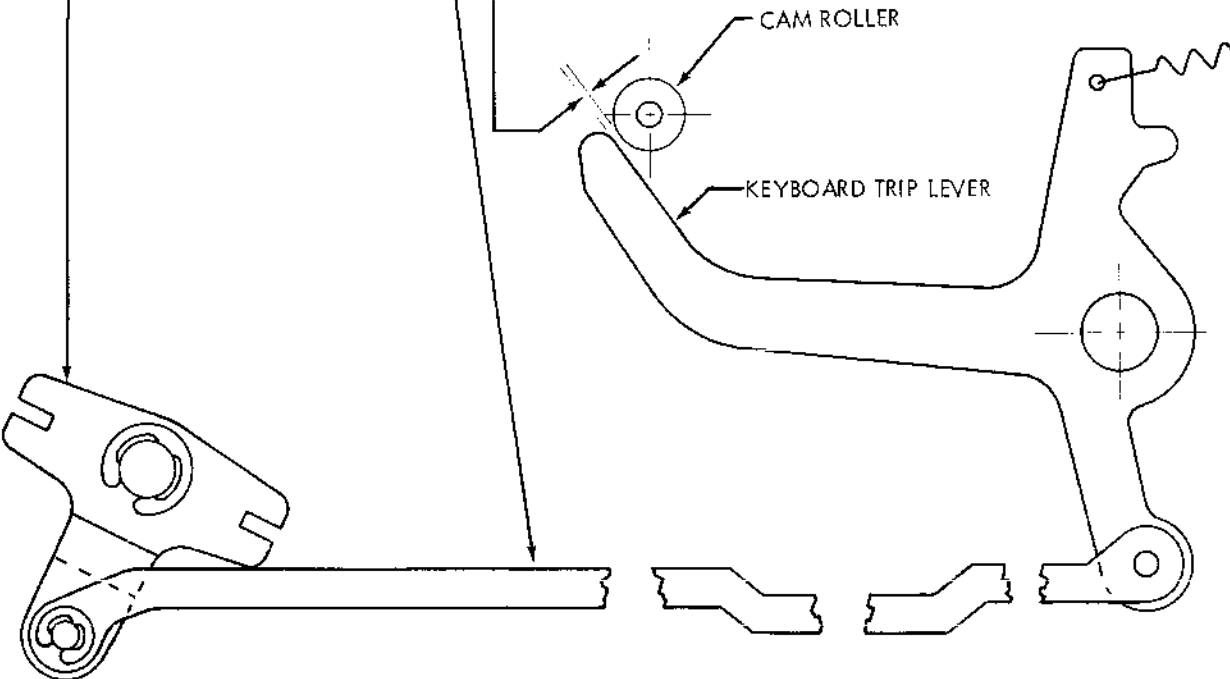
TRIP LEVER (KEYBOARD) (APPLICABLE TO RECEIVE ONLY UNITS)
REQUIREMENT

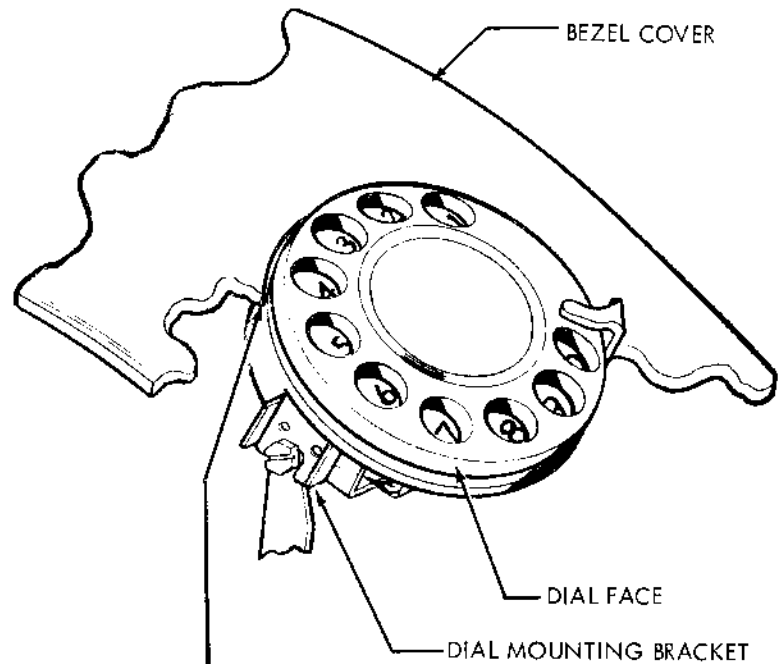
WITH CAM ROLLER ON HIGH PART OF KEYBOARD TRIP LEVER, KEYBOARD TRIP ARM IN ITS LOWER-MOST POSITION. CLEARANCE BETWEEN KEYBOARD TRIP LEVER AND CAM ROLLER.

MIN. SOME --- MAX. 0.015 INCH

TO ADJUST

WITH MOUNTING SCREW FRICTION TIGHT, INSERT SCREWDRIVER IN PRY POINTS, MOVE ADJUSTING BRACKET UNTIL REQUIREMENT IS MET.





DIAL TO COVER
REQUIREMENT

THE NUMBERED FACE OF DIAL SHALL BE FLUSH
TO OUTSIDE SURFACE OF COVER WITHIN
1/16 INCH BELOW TO 3/32 INCH ABOVE
AND PARALLEL TO OUTSIDE SURFACE OF COVER
WITHIN 1/16 INCH AS GAGED BY EYE.

TO ADJUST

WITH DIAL MOUNTING BRACKET SCREWS FRICTION
TIGHT POSITION DIAL.

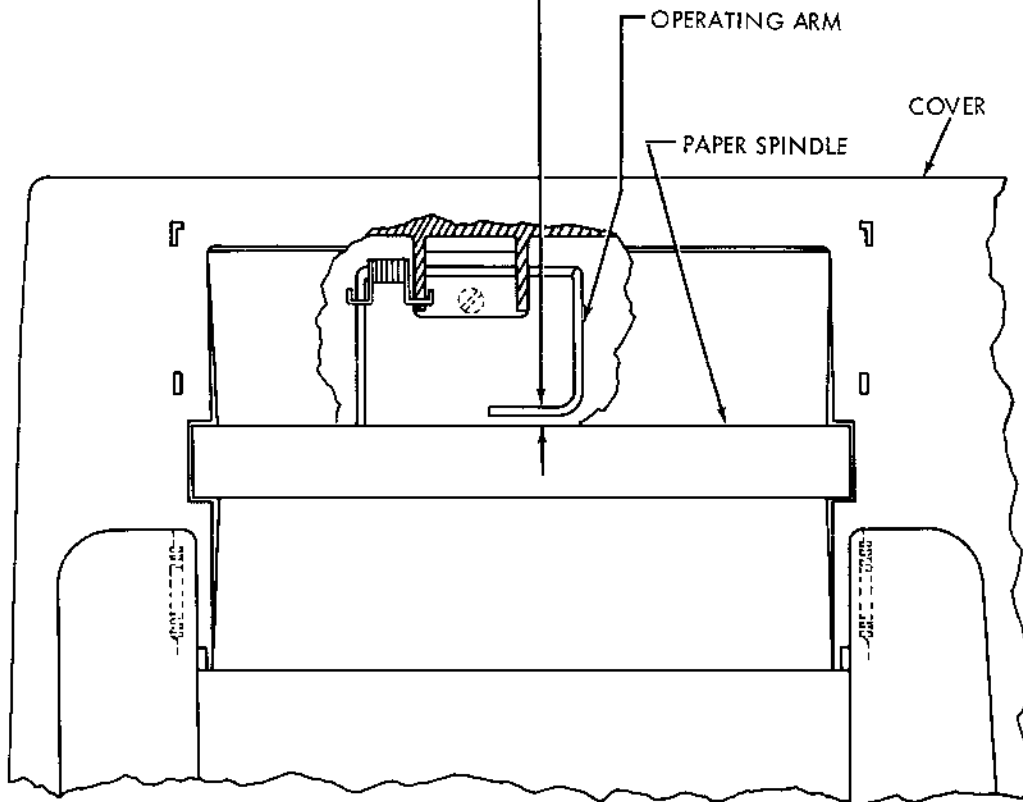
LOW PAPER CONTACTS (WHEN USED)OPERATING ARM

REQUIREMENT

WITH PAPER SPINDLE IN PLACE, CLEARANCE
BETWEEN OPERATING ARM AND SPINDLE
MIN. 0.25 INCH --- MAX. 0.30

TO ADJUST

BEND THE WIRE OPERATING ARM. IF
CONTACT OPERATES WHEN ROLL DIAMETER
IS TOO LARGE, BEND ARM CLOSER TO
ROLL. IF CONTACT OPERATES WHEN
ROLL DIAMETER IS TOO SMALL, BEND
ARM AWAY FROM ROLL.



TAPE READER

READER TRIP LEVER OVERTRAVEL (CLUTCH TRIP) REQUIREMENT

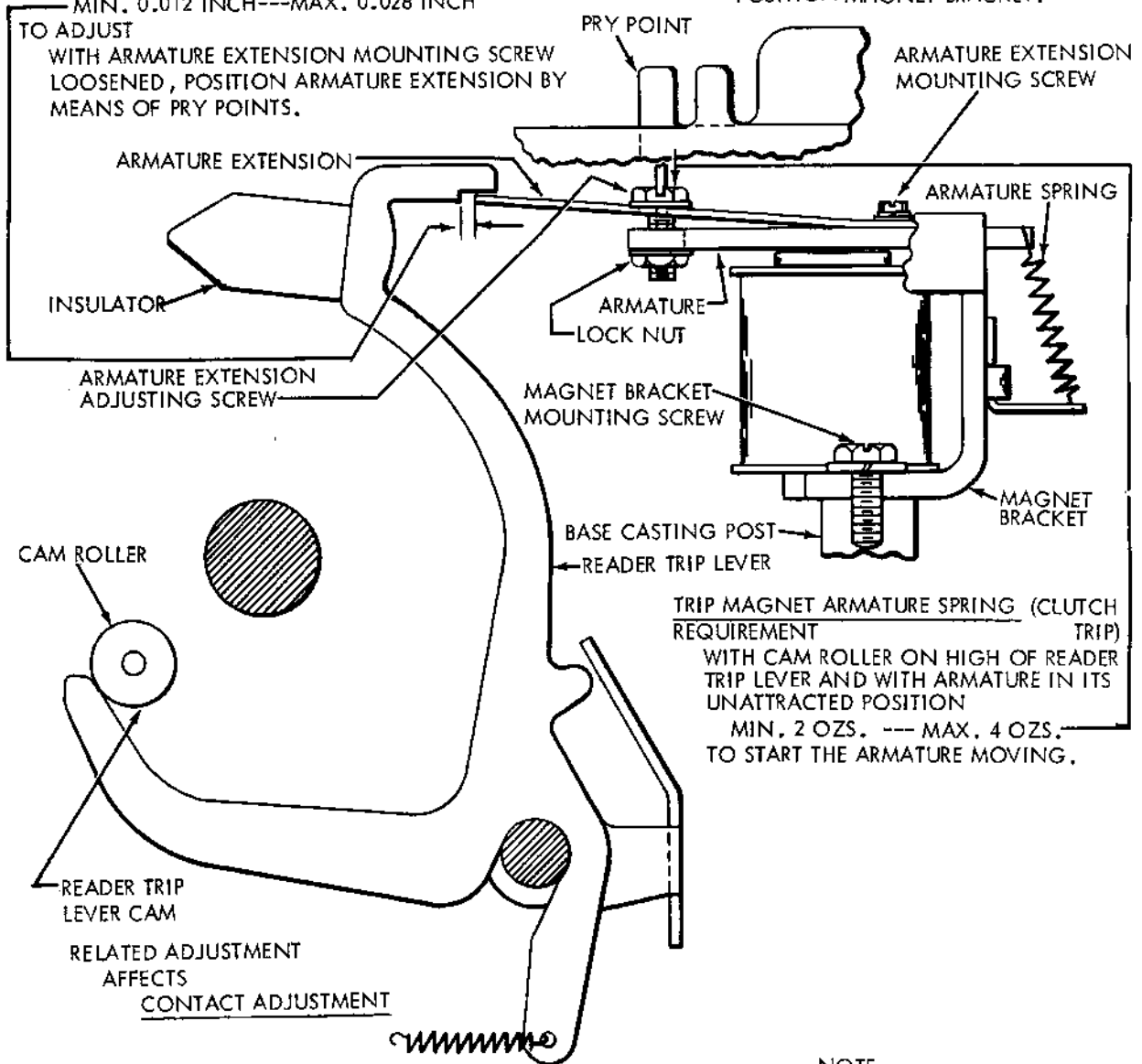
ARMATURE IN UNATTRACTED POSITION. CAM ROLLER ON HIGH PART OF READER TRIP LEVER CAM. TAKE UP AND RELEASE PLAY IN ARMATURE PIVOT TO REAR OF UNIT. POSITION THE READER TRIP LEVER IN THE CENTER OF ARMATURE EXTENSION. CLEARANCE BETWEEN END OF ARMATURE EXTENSION AND LATCHING SURFACE OF READER TRIP LEVER MIN. 0.012 INCH---MAX. 0.028 INCH

TRIP MAGNET (CLUTCH TRIP) REQUIREMENT

POSITION MAGNET BRACKET ON THE BASE CASTING POST AS FAR TO THE FRONT AS THE MAGNET BRACKET MOUNTING SCREW PERMITS.

TO ADJUST

WITH AUXILIARY BRACKET MOUNTING SCREWS AND MAGNET BRACKET MOUNTING SCREW FRICTION TIGHT, POSITION MAGNET BRACKET.



TO ADJUST WITH ARMATURE EXTENSION MOUNTING SCREW LOOSENED, POSITION ARMATURE EXTENSION BY MEANS OF PLY POINTS.

TRIP MAGNET ARMATURE SPRING (CLUTCH TRIP) REQUIREMENT

WITH CAM ROLLER ON HIGH OF READER TRIP LEVER AND WITH ARMATURE IN ITS UNATTRACTED POSITION MIN. 2 OZS. --- MAX. 4 OZS. TO START THE ARMATURE MOVING.

CAUTION

THE READER FEED MAGNET OPERATES UNDER HIGH VOLTAGE. PRECAUTIONARY MEASURES SHOULD BE TAKEN WHENEVER POWER TO THE READER IS TURNED ON. HIGH VOLTAGE WILL PERSIST FROM THE POWER PACK UNTIL APPROXIMATELY 10 SECONDS AFTER DISCONNECT.

NOTE

REQUIREMENTS SPECIFYING THE ARMATURE IN THE ATTRACTED POSITION REFERS TO THE ARMATURE BEING MAGNETICALLY ATTRACTED TO THE MAGNET CORE. THE MAGNET CORE SHOULD BE ASSEMBLED TO THE MAGNET BRACKET SUCH THAT THE MAGNET CORE SLOT IS PERPENDICULAR TO THE MAGNET BRACKET PIVOT SURFACE AS GAGED BY EYE. (SEE CONTACT GAPS ADJUSTMENT).

ARMATURE EXTENSION (CLUTCH TRIP)
REQUIREMENT

(1) WITH DISTRIBUTOR CLUTCH IN STOP POSITION, ARMATURE HELD DOWN MANUALLY IN ATTRACTED POSITION, ROTATE DISTRIBUTOR CLUTCH UNTIL A CLEARANCE OF

MIN. SOME --- MAX. 0.040 INCH EXISTS BETWEEN END OF ARMATURE EXTENSION AND TRIP LEVER.

(2) THERE SHALL BE

MIN. SOME --- MAX. 0.010 INCH CLEARANCE BETWEEN THE ARMATURE EXTENSION AND TRIP LEVER AT ITS CLOSEST POINT.
TO ADJUST

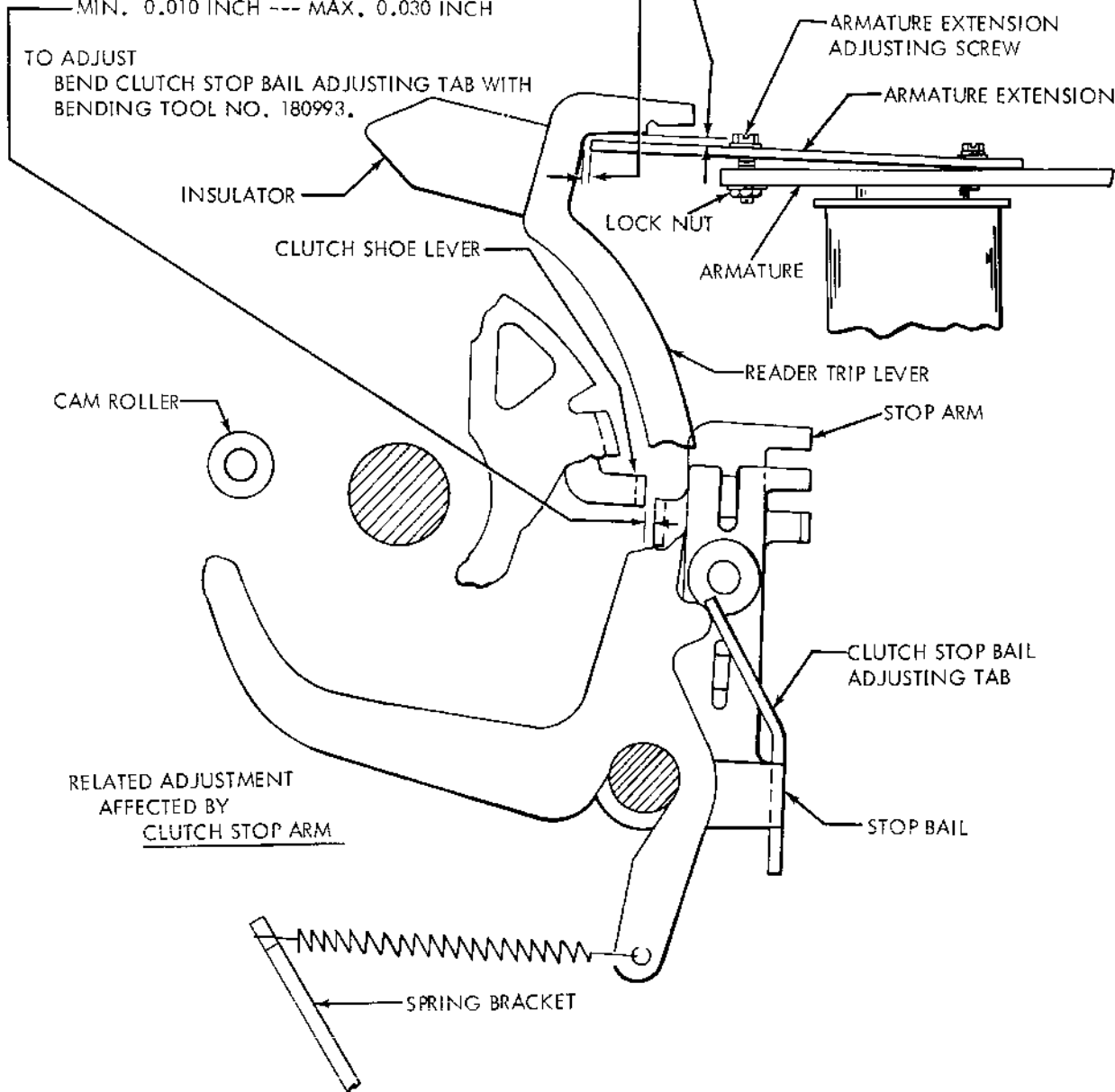
STOP ARM (CLUTCH TRIP)
REQUIREMENT

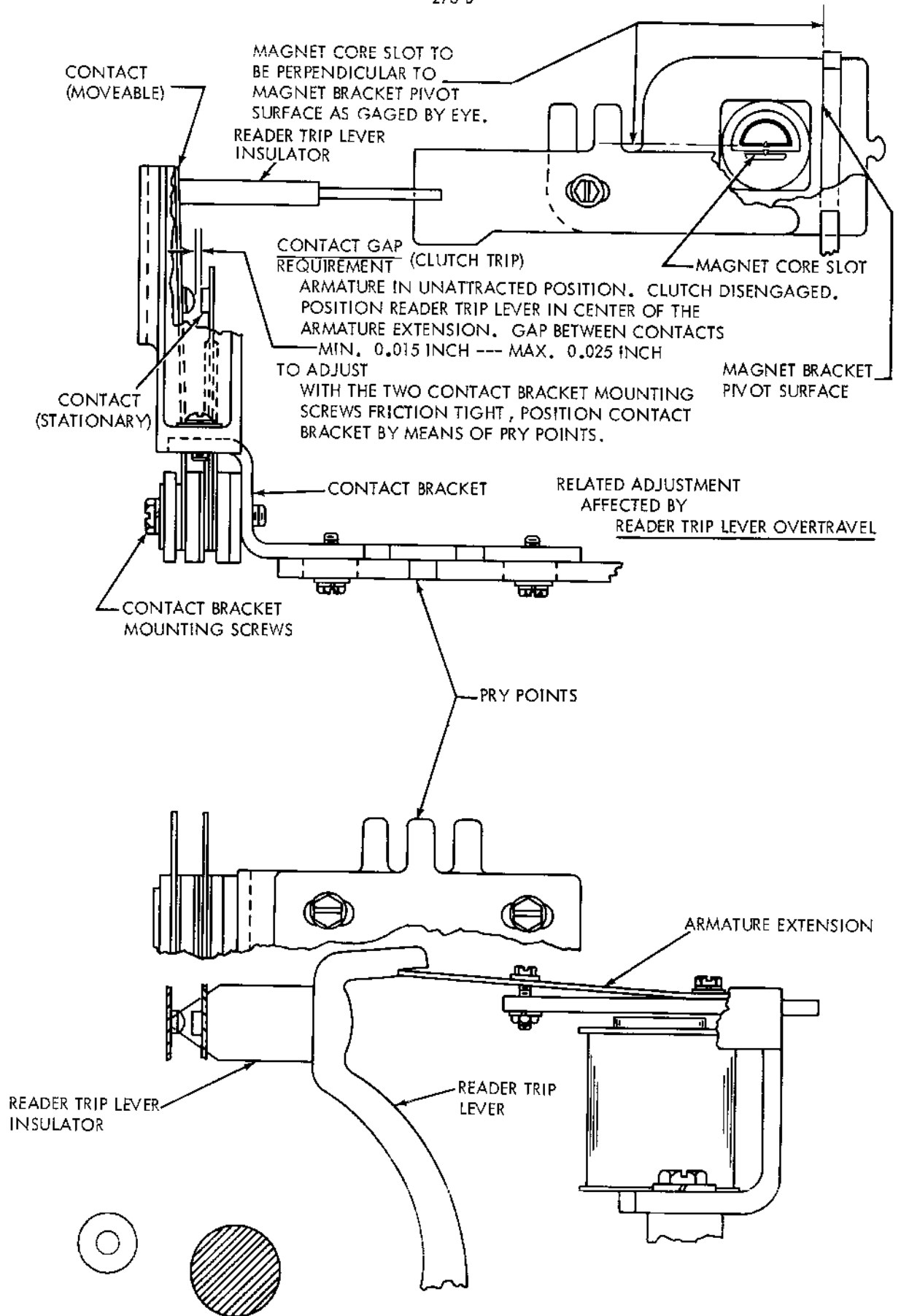
CLUTCH TRIPPED BY MOMENTARILY HOLDING ARMATURE IN ITS ATTRACTED POSITION. CLEARANCE BETWEEN CLUTCH PRY BAR AND STOP ARM

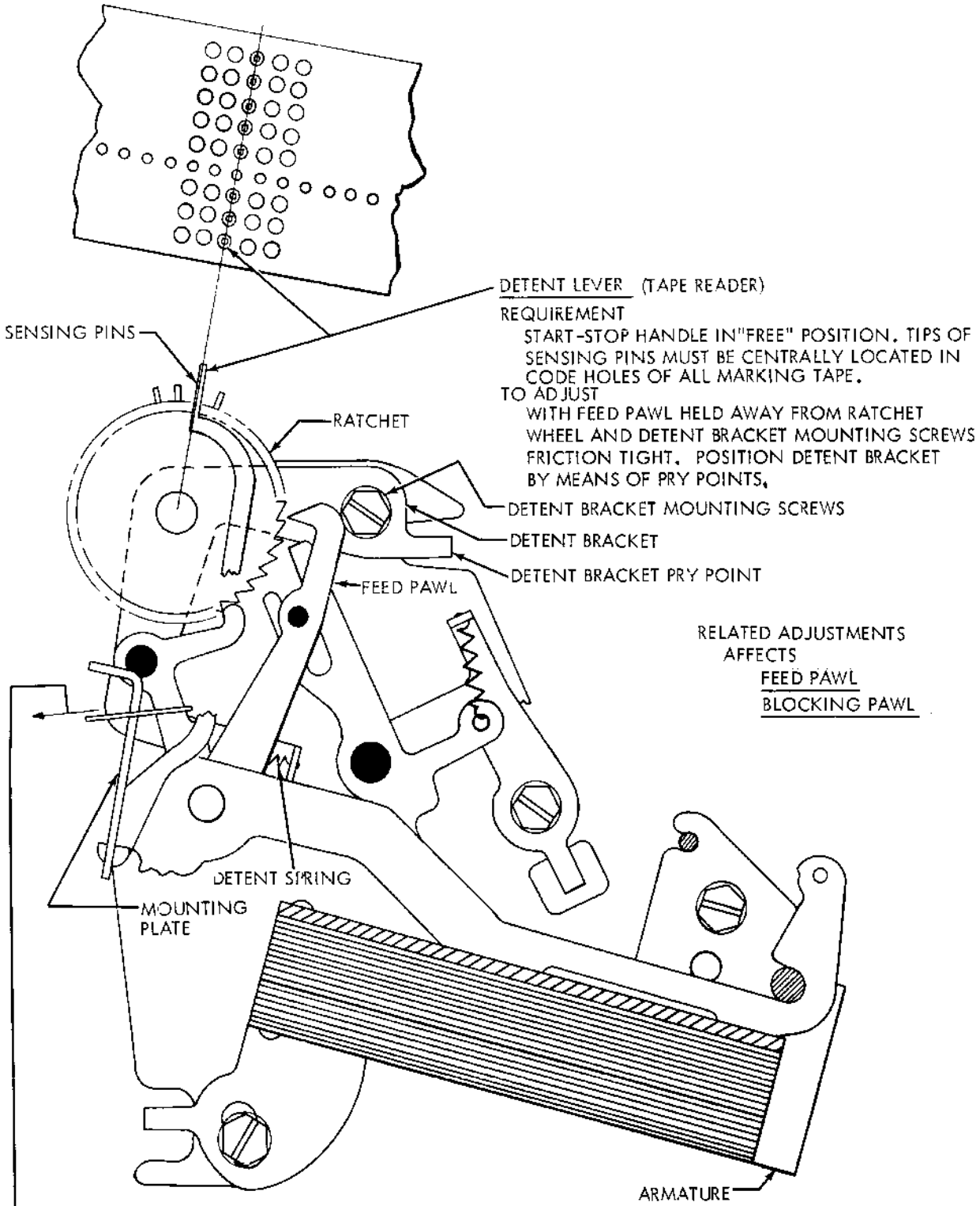
MIN. 0.010 INCH --- MAX. 0.030 INCH

TO ADJUST BEND CLUTCH STOP BAIL ADJUSTING TAB WITH BENDING TOOL NO. 180993.

LOOSEN ARMATURE EXTENSION ADJUSTING SCREW LOCK NUT. POSITION ARMATURE EXTENSION BY MEANS OF THE ARMATURE EXTENSION ADJUSTING SCREW.







DETENT LEVER (TAPE READER)

REQUIREMENT

START-STOP HANDLE IN "FREE" POSITION. TIPS OF SENSING PINS MUST BE CENTRALLY LOCATED IN CODE HOLES OF ALL MARKING TAPE.

TO ADJUST

WITH FEED PAWL HELD AWAY FROM RATCHET WHEEL AND DETENT BRACKET MOUNTING SCREWS FRICTION TIGHT. POSITION DETENT BRACKET BY MEANS OF PRY POINTS,

RELATED ADJUSTMENTS
AFFECTS
FEED PAWL
BLOCKING PAWL

DETENT LEVER SPRING (TAPE READER)

REQUIREMENT

MIN. 3-1/2 OZS. --- MAX. 5-1/2 OZS.
TO START DETENT MOVING.

**FEED PAWL - ADJUSTMENT WITH GAGE NO. 183103 (TAPE READER)
REQUIREMENT**

ARMATURE IN UNATTRACTED POSITION. SOME CLEARANCE MUST EXIST, BETWEEN BLOCKING PAWL AND RATCHET TOOTH. (SEE BLOCKING PAWL ADJUSTMENT FOR PROCEDURE IN OBTAINING CLEARANCE.) THERE SHALL BE:

MIN. SOME --- MAX. 0.008 INCH CLEARANCE BETWEEN FEED PAWL AND RATCHET TOOTH AND A TOTAL OF FIVE RATCHET TEETH BETWEEN DETENT AND FEED PAWL.

**UPSTOP SPRING (TAPE READER)
REQUIREMENT** (CONTINUED ON FOLLOWING PAGE)

WITH ARMATURE SPRING POST REMOVED FROM ITS SLOT IN MAGNET BRACKET

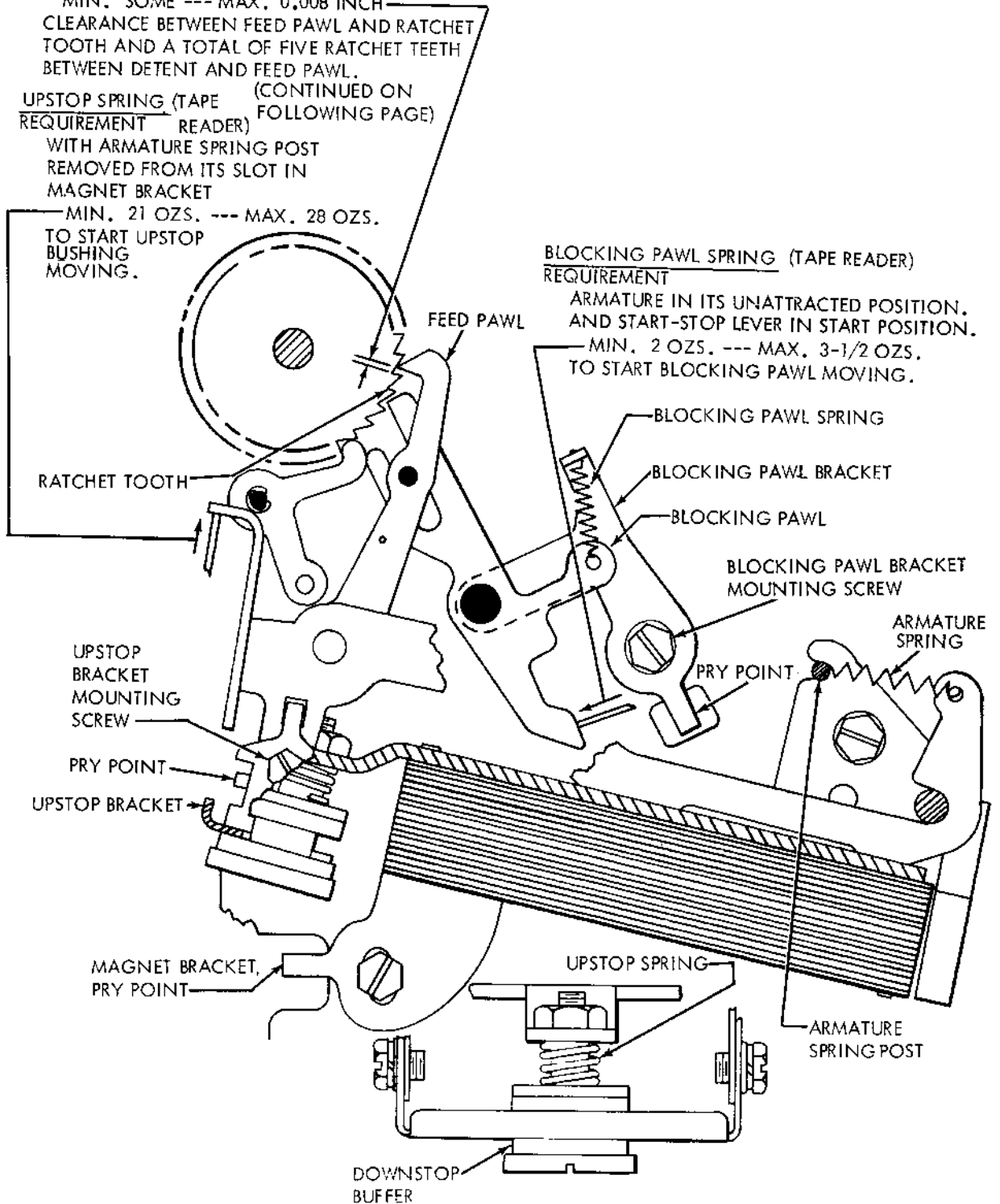
--- MIN. 21 OZS. --- MAX. 28 OZS.

TO START UPSTOP BUSHING MOVING.

**BLOCKING PAWL SPRING (TAPE READER)
REQUIREMENT**

ARMATURE IN ITS UNATTRACTED POSITION, AND START-STOP LEVER IN START POSITION.

--- MIN. 2 OZS. --- MAX. 3-1/2 OZS. TO START BLOCKING PAWL MOVING.



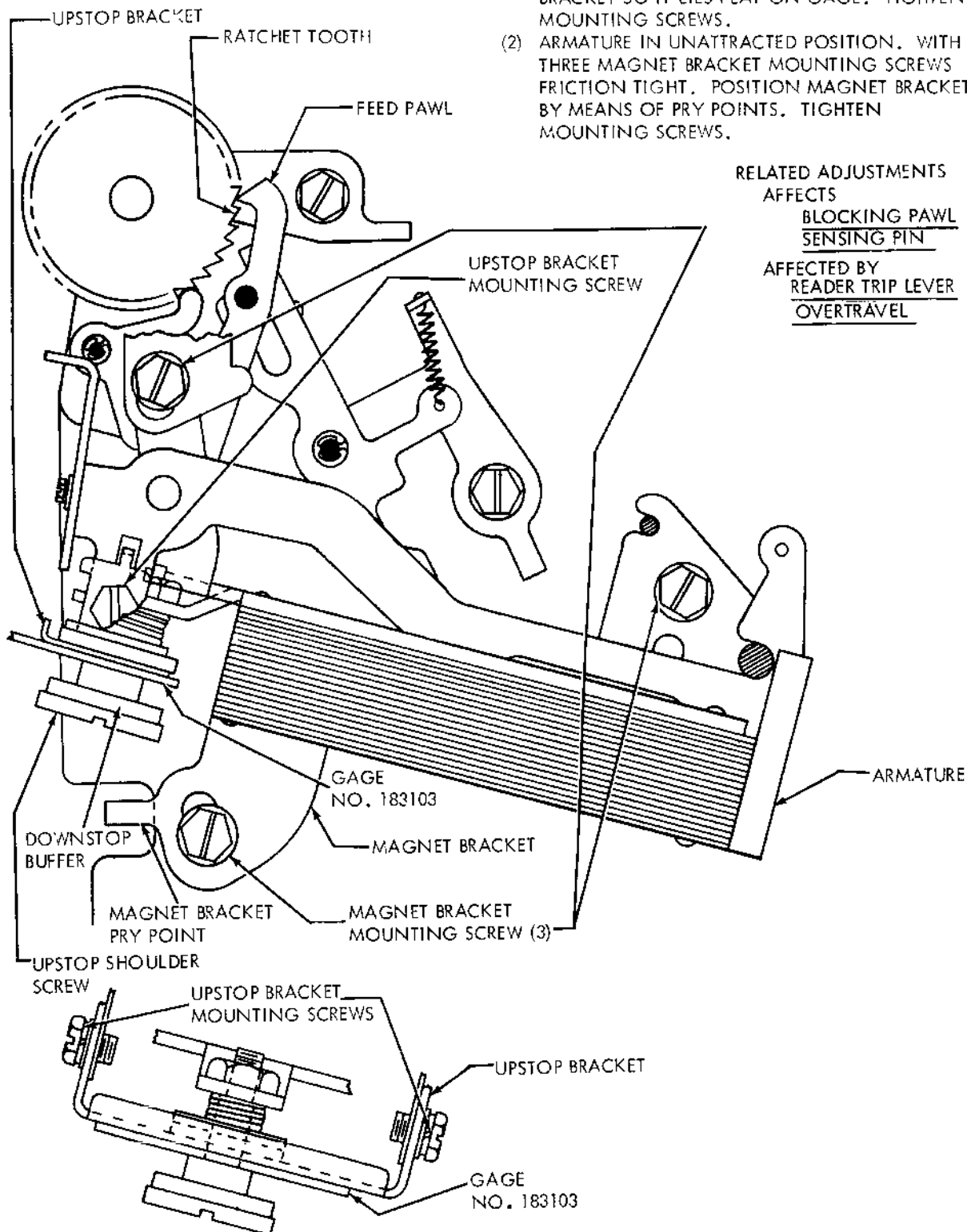
(CONTINUED FROM PRECEDING PAGE)

TO ADJUST

- (1) ARMATURE IN ATTRACTED POSITION, WITH TWO UPSTOP BRACKET MOUNTING SCREWS FRICTION TIGHT. INSERT GAGE NO. 183103 BETWEEN UPSTOP BRACKET AND SHOULDER OF UPSTOP SHOULDER SCREW. POSITION UPSTOP BRACKET SO IT LIES FLAT ON GAGE. TIGHTEN MOUNTING SCREWS.
- (2) ARMATURE IN UNATTRACTED POSITION, WITH THREE MAGNET BRACKET MOUNTING SCREWS FRICTION TIGHT. POSITION MAGNET BRACKET BY MEANS OF PRY POINTS. TIGHTEN MOUNTING SCREWS.

RELATED ADJUSTMENTS
AFFECTS
BLOCKING PAWL
SENSING PIN

AFFECTED BY
READER TRIP LEVER
OVERTRAVEL



FEED PAWL - ADJUSTMENT WITHOUT GAGE NO. 183103 (TAPE READER)

REQUIREMENT (PRELIMINARY)

- (1) ARMATURE IN ATTRACTED POSITION. LOOSEN TWO UPSTOP BRACKET MOUNTING SCREWS SO THE UPSTOP BRACKET DOES NOT LIMIT FEED PAWL MOTION. CLEARANCE BETWEEN FEED PAWL AND RATCHET TOOTH:

MIN. 0.035 INCH --- MAX. 0.045 INCH

A TOTAL OF SIX RATCHET TEETH ARE BETWEEN THE DETENT AND FEED PAWL

TO ADJUST

WITH THREE MAGNET BRACKET MOUNTING SCREWS FRICTION TIGHT. POSITION MAGNET BRACKET BY MEANS OF PRY POINTS.

REQUIREMENT (SEE FEED PAWL ADJUSTMENT WITH GAGE NO. 183103)

- (2) ARMATURE IN UNATTRACTED POSITION. SOME CLEARANCE MUST EXIST BETWEEN BLOCKING PAWL AND RATCHET TOOTH. (SEE BLOCKING PAWL ADJUSTMENT FOR PROCEDURE IN OBTAINING CLEARANCE.) THE UPSTOP BRACKET SHALL LIE FLAT AGAINST THE DOWNSTOP BUFFER. CLEARANCE BETWEEN FEED PAWL AND RATCHET TOOTH.

MIN. SOME --- MAX. 0.008 INCH

TO ADJUST

WITH TWO UPSTOP BRACKET MOUNTING SCREWS FRICTION TIGHT. POSITION UPSTOP BRACKET BY MEANS OF PRY POINTS.

REQUIREMENT (FINAL)

- (3) ARMATURE IN ATTRACTED POSITION. CLEARANCE BETWEEN FEED PAWL AND RATCHET TOOTH.

MIN. 0.025 INCH --- MAX. 0.035 INCH

TO ADJUST

WITH THREE MAGNET BRACKET MOUNTING SCREWS FRICTION TIGHT. POSITION MAGNET BRACKET BY MEANS OF PRY POINTS. RECHECK REQUIREMENT NO. 2 IF NECESSARY.

RELATED ADJUSTMENT

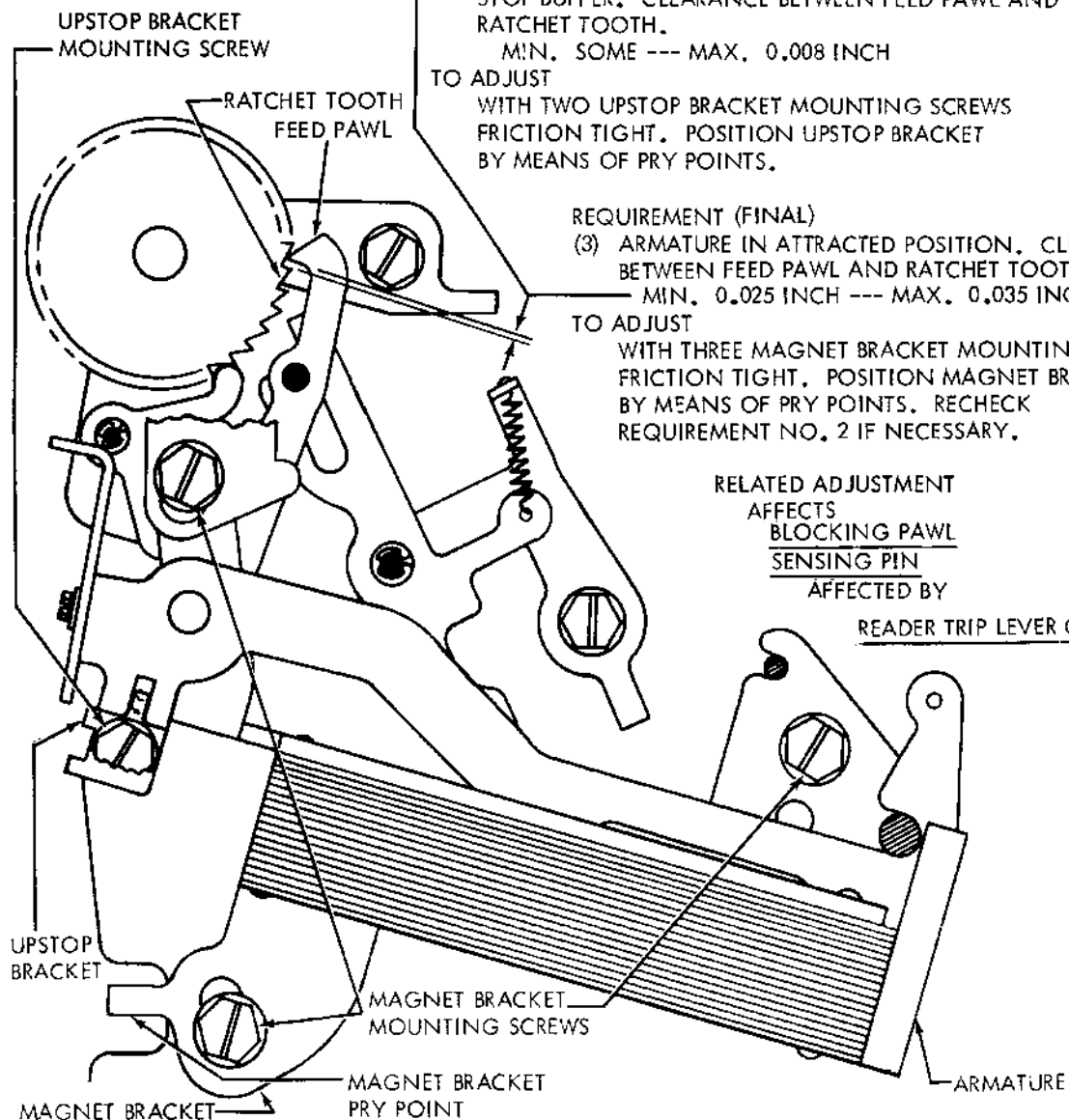
AFFECTS

BLOCKING PAWL

SENSING PIN

AFFECTED BY

READER TRIP LEVER OVERTRAVEL



BLOCKING PAWL (TAPE READER)

REQUIREMENT

ARMATURE IN UNATTRACTED POSITION. SOME CLEARANCE MUST EXIST BETWEEN BOTTOM SURFACE OF FEED PAWL AND RATCHET TOOTH. CLEARANCE BETWEEN END OF BLOCKING PAWL AND RATCHET TOOTH

MIN. SOME --- MAX. 0.010 INCH (THE CLEARANCE SHALL BE SOME TO 0.003 INCH WHEN USING A TELETYPE TAPE-WINDER).

TO ADJUST

WITH BLOCKING PAWL BRACKET MOUNTING SCREW FRICTION TIGHT. POSITION BLOCKING PAWL BRACKET BY MEANS OF PRY POINT.

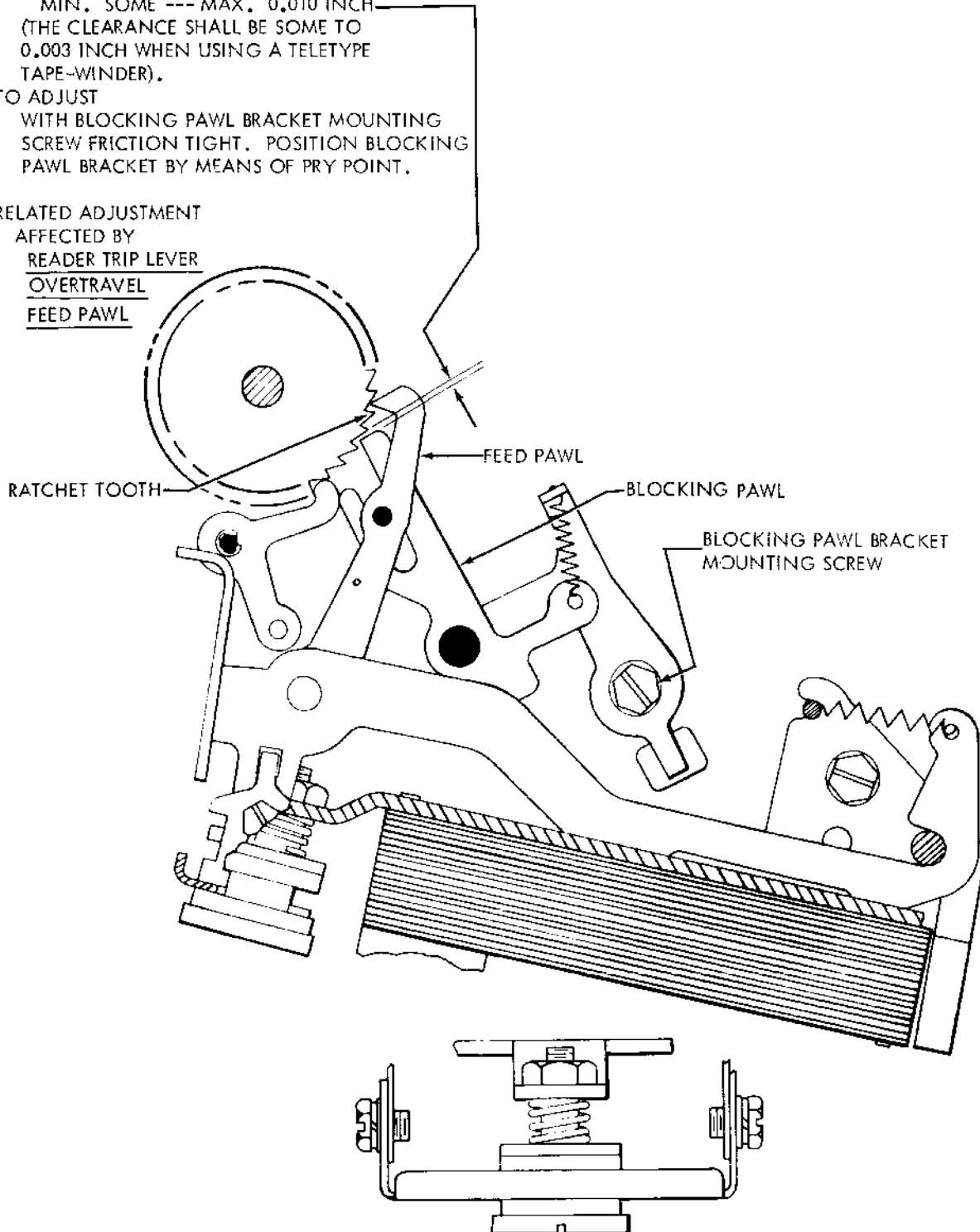
RELATED ADJUSTMENT

AFFECTED BY

READER TRIP LEVER

OVERTRAVEL

FEED PAWL



SENSING PIN SPRING (TAPE READER)

REQUIREMENT

ARMATURE IN ITS ATTRACTED POSITION

MIN. 1-1/2 OZS. --- MAX. 2-3/4 OZS.

TO POSITION SENSING PIN FLUSH WITH TOP PLATE

SENSING PIN (TAPE READER)

REQUIREMENT

ARMATURE IN UNATTRACTED POSITION. TIP OF

ALL SENSING PINS SHALL BE

FLUSH --- MAX. 0.015 INCH

BELOW THE TOP PLATE.

TO ADJUST

WITH TWO SENSING PIN GUIDE MOUNTING

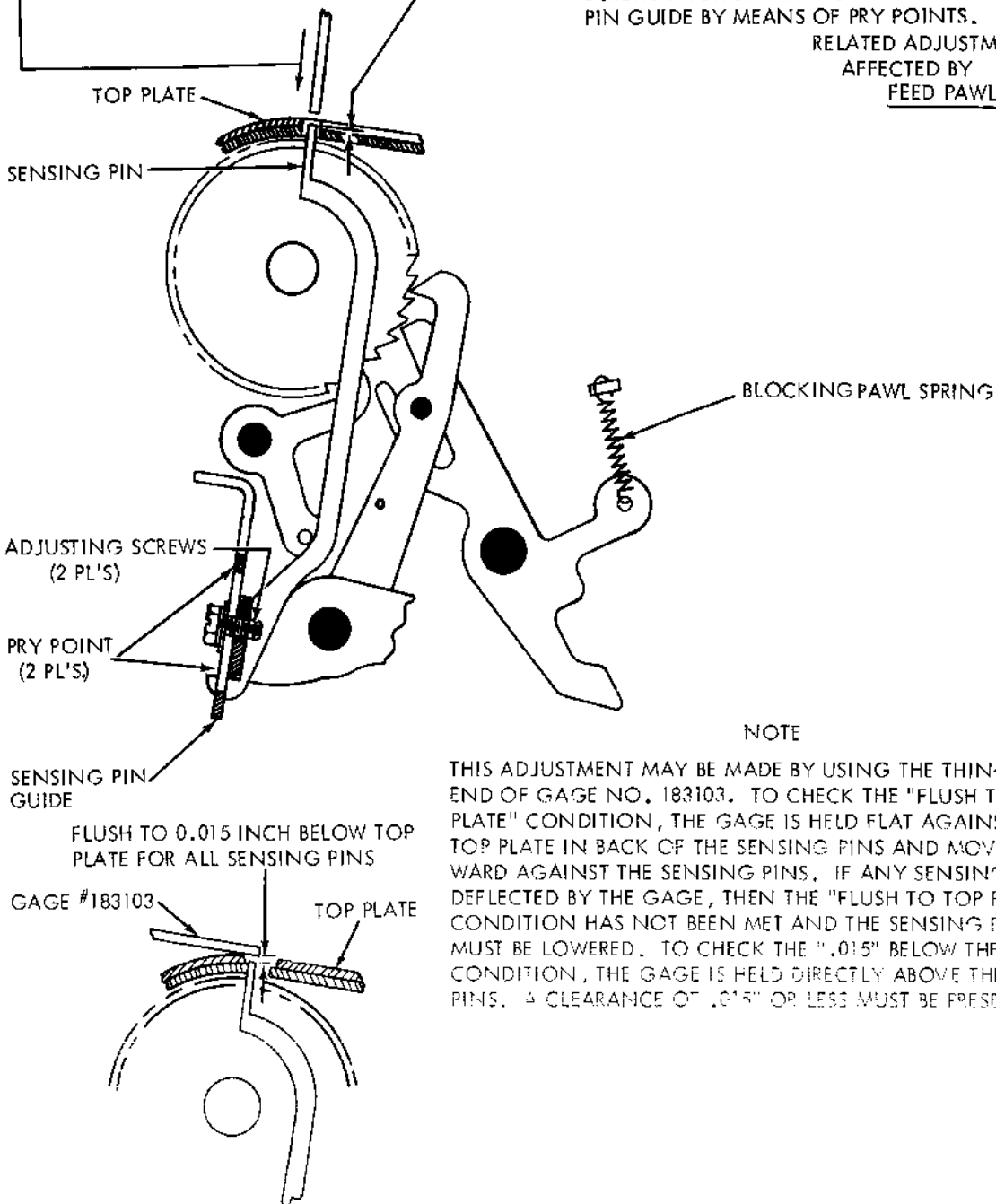
SCREWS FRICTION TIGHT. POSITION SENSING

PIN GUIDE BY MEANS OF PRY POINTS.

RELATED ADJUSTMENT

AFFECTED BY

FEED PAWL



NOTE

THIS ADJUSTMENT MAY BE MADE BY USING THE THIN-SLOTTED END OF GAGE NO. 183103. TO CHECK THE "FLUSH TO TOP PLATE" CONDITION, THE GAGE IS HELD FLAT AGAINST THE TOP PLATE IN BACK OF THE SENSING PINS AND MOVED FORWARD AGAINST THE SENSING PINS. IF ANY SENSING PINS ARE DEFLECTED BY THE GAGE, THEN THE "FLUSH TO TOP PLATE" CONDITION HAS NOT BEEN MET AND THE SENSING PIN GUIDE MUST BE LOWERED. TO CHECK THE ".015" BELOW THE PLATE" CONDITION, THE GAGE IS HELD DIRECTLY ABOVE THE SENSING PINS. A CLEARANCE OF ".015" OR LESS MUST BE PRESENT.

START-STOP CONTACT WIRE SPRING (TAPE READER)

REQUIREMENT

START-STOP LEVER IN START POSITION, WITH TAPE OUT PIN FULLY DEPRESSED

MIN. 1 1/4 OZS. --- MAX. 2 1/4 OZS.

TO START THE START-STOP CONTACT WIRE MOVING.

98055 BENDING TOOL

START-STOP LEVER

TAPE-OUT PIN

TAPE OUT PIN EXTENSION

TERMINAL

START-STOP CONTACT WIRE

START-STOP CONTACT WIRE (TAPE READER)

REQUIREMENT

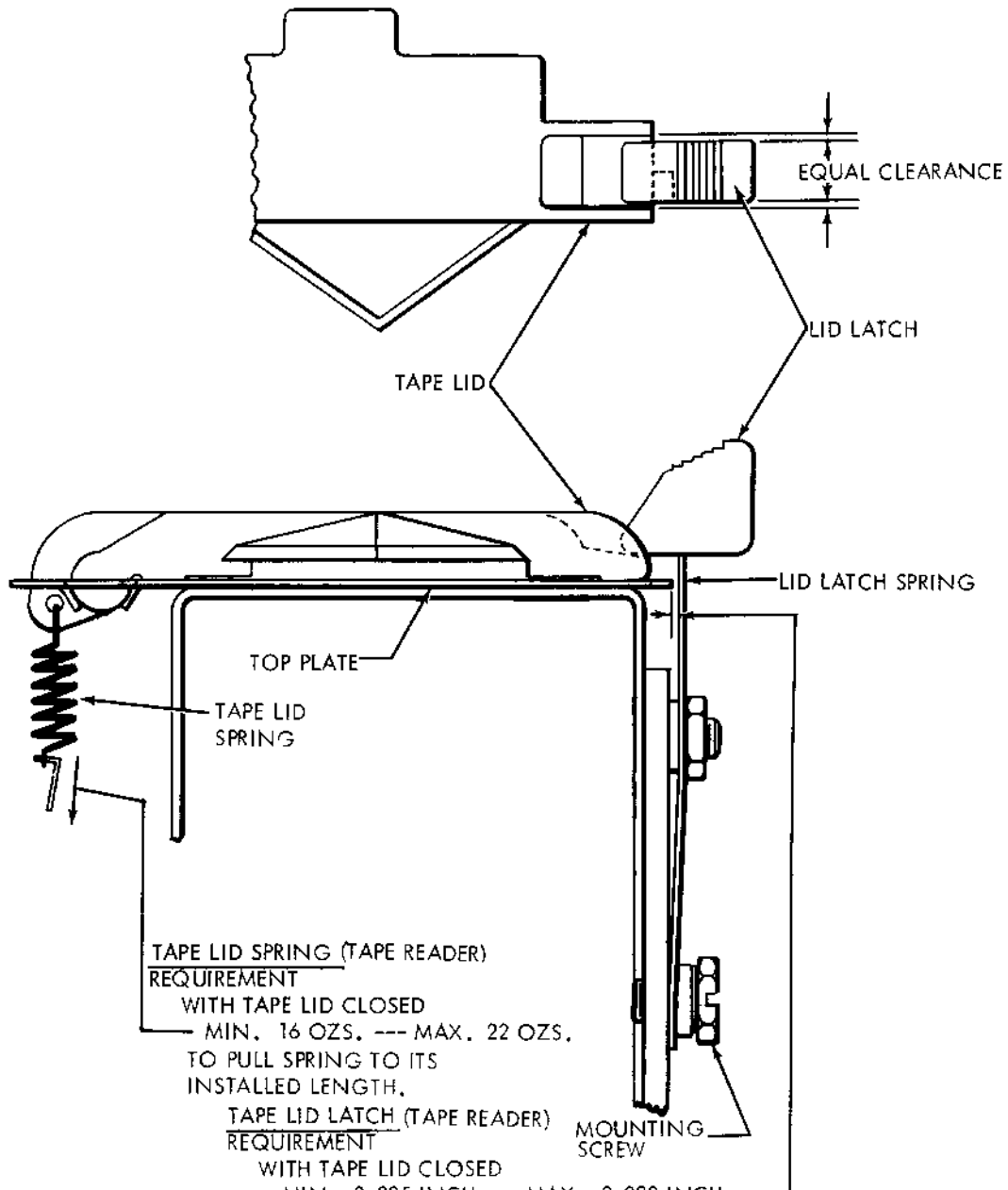
WITH TAPE OUT PIN IN ITS UP POSITION AND START-STOP LEVER IN START POSITION, CLEARANCE BETWEEN START-STOP CONTACT WIRE AND ITS TERMINAL

MIN. 0.015 INCH --- MAX. 0.025 INCH

TO ADJUST

BEND CONTACT WIRE BETWEEN TERMINAL AND TAPE OUT PIN EXTENSION WITH BENDING TOOL NO. 98055.

START-STOP CONTACT WIRE SPRING



TAPE LID SPRING (TAPE READER)
REQUIREMENT
 WITH TAPE LID CLOSED
 MIN. 16 OZS. --- MAX. 22 OZS.
 TO PULL SPRING TO ITS
 INSTALLED LENGTH.

TAPE LID LATCH (TAPE READER)
REQUIREMENT
 WITH TAPE LID CLOSED
 MIN. 0.005 INCH --- MAX. 0.020 INCH
 CLEARANCE BETWEEN TOP PLATE AND LID LATCH
 SPRING AND THERE SHALL BE EQUAL CLEARANCE
 BETWEEN LID LATCH AND TAPE LID.

TO ADJUST
 WITH MOUNTING SCREW FRICTION TIGHT, POSITION
 LID LATCH VERTICALLY.

FEED MAGNET CONTACT SPRING (CLUTCH TRIP)

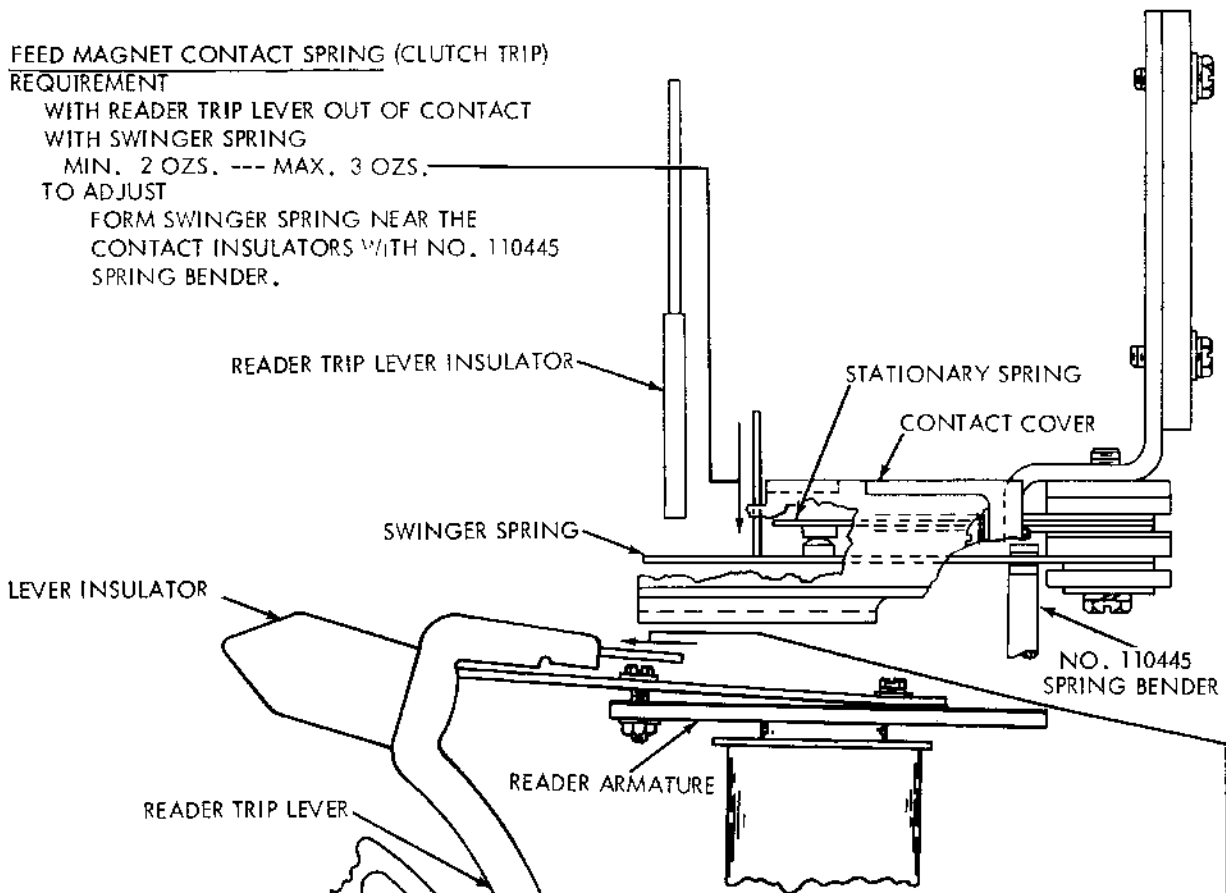
REQUIREMENT

WITH READER TRIP LEVER OUT OF CONTACT
WITH SWINGER SPRING

MIN. 2 OZS. --- MAX. 3 OZS.

TO ADJUST

FORM SWINGER SPRING NEAR THE
CONTACT INSULATORS WITH NO. 110445
SPRING BENDER.

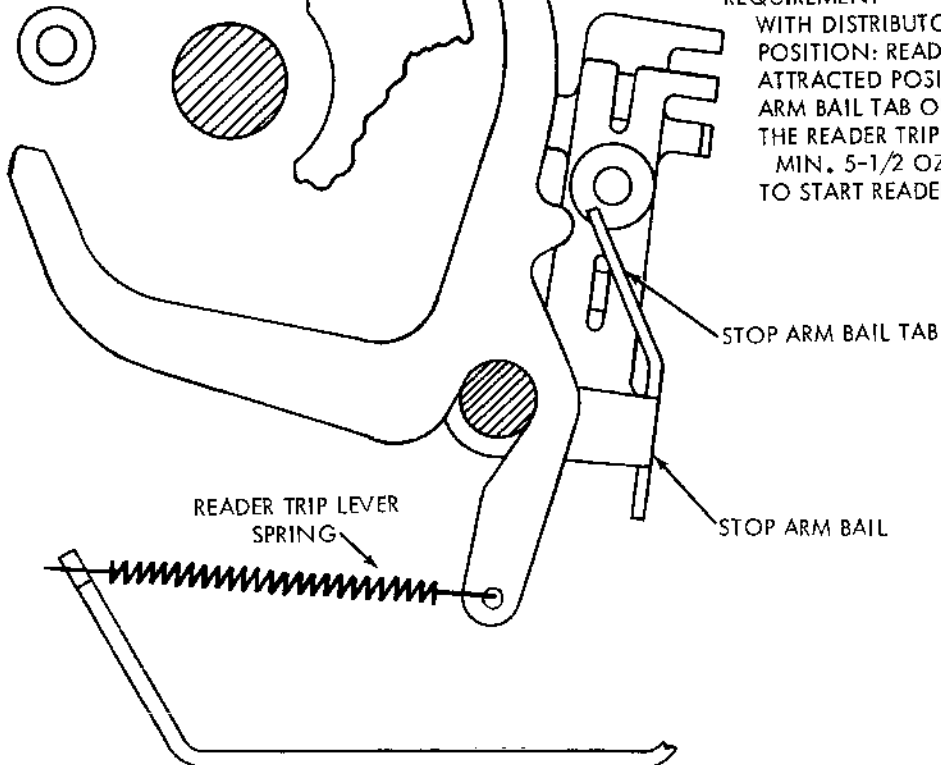


READER TRIP LEVER SPRING (CLUTCH TRIP)

REQUIREMENT

WITH DISTRIBUTOR CLUTCH IN STOP
POSITION: READER ARMATURE IN ITS
ATTRACTED POSITION AND WITH STOP
ARM BAIL TAB OUT OF CONTACT WITH
THE READER TRIP LEVER

MIN. 5-1/2 OZS. --- MAX. 8 OZS.
TO START READER TRIP LEVER MOVING.



TIGHT TAPE LEVER SPRING (TAPE READER)

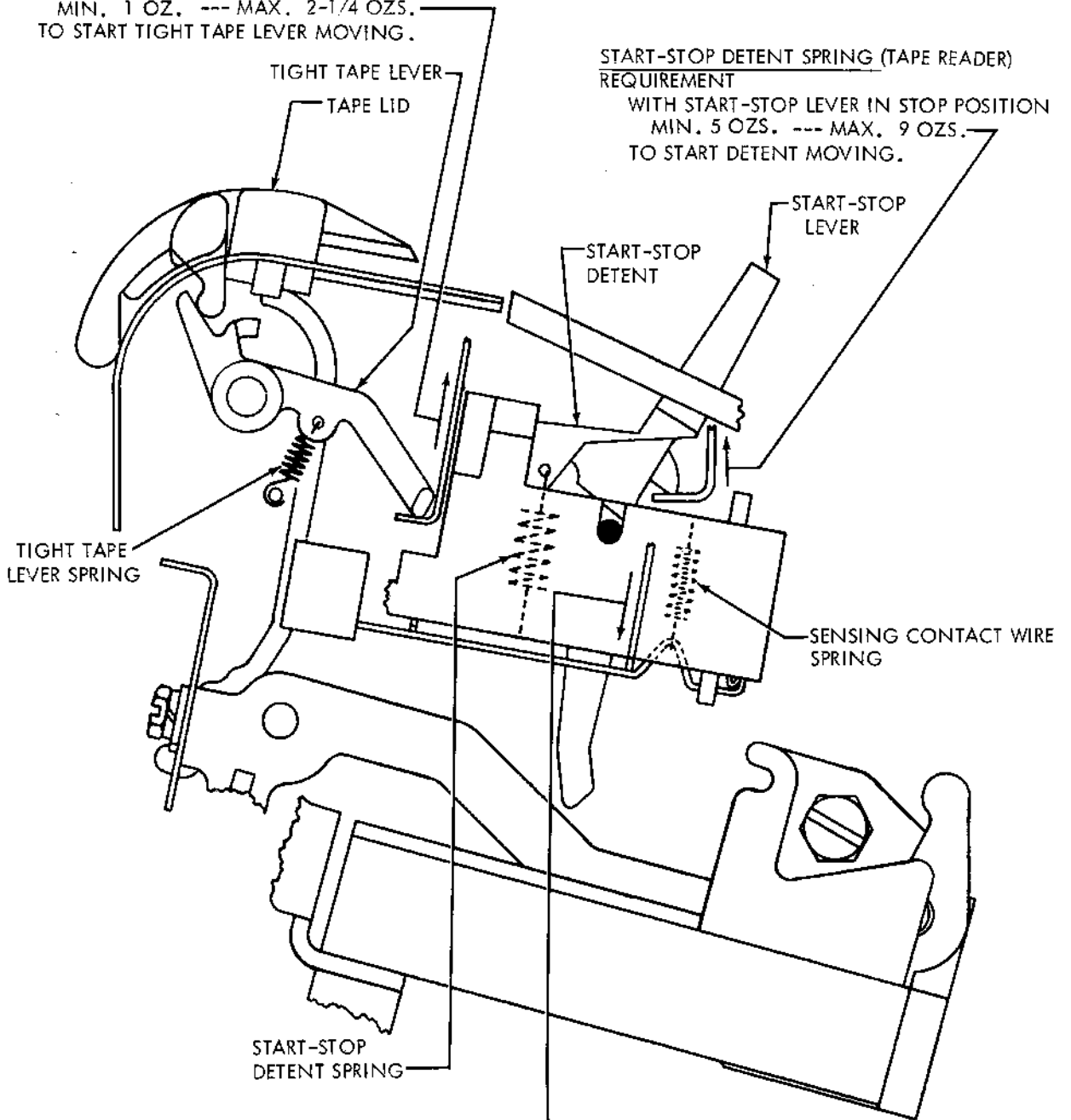
REQUIREMENT

WITH THE TAPE LID CLOSED
 MIN. 1 OZ. --- MAX. 2-1/4 OZS.
 TO START TIGHT TAPE LEVER MOVING.

START-STOP DETENT SPRING (TAPE READER)

REQUIREMENT

WITH START-STOP LEVER IN STOP POSITION
 MIN. 5 OZS. --- MAX. 9 OZS.
 TO START DETENT MOVING.



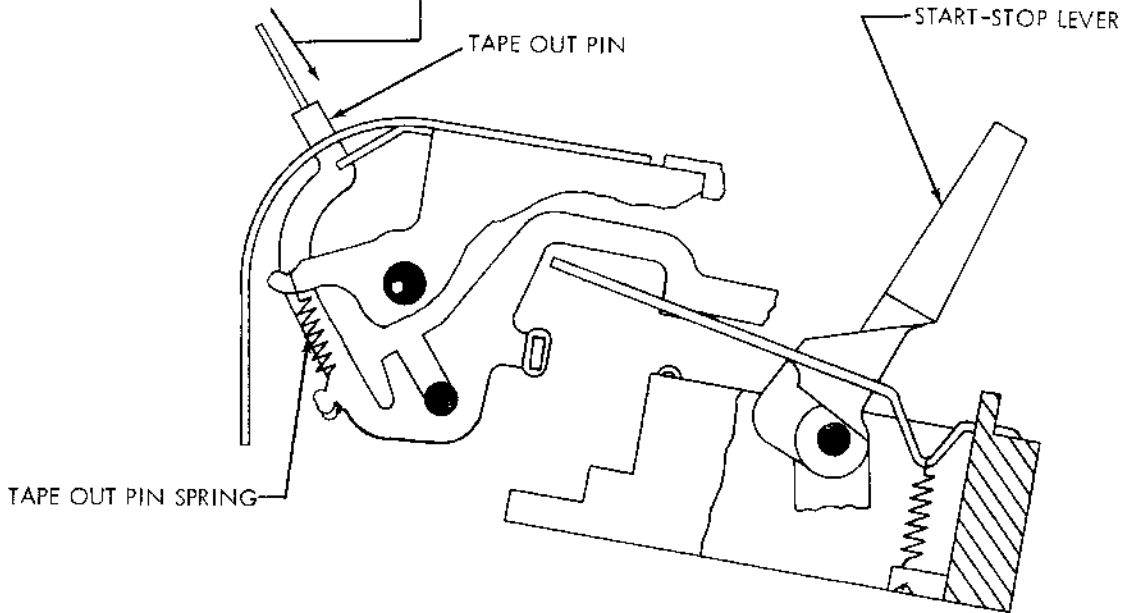
SENSING CONTACT WIRE SPRING (TAPE READER)

REQUIREMENT

WITH ARMATURE IN ITS ATTRACTED POSITION
 MIN. 3/4 OZ. --- MAX. 1-3/4 OZS.
 TO START CONTACT WIRE MOVING.

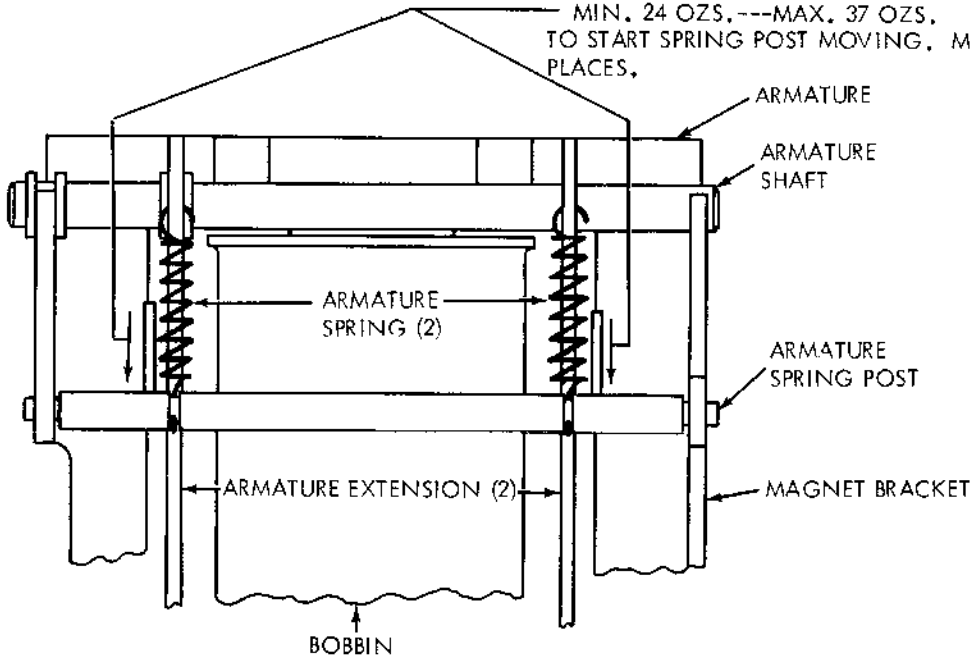
TAPE OUT PIN SPRING (TAPE READER)
REQUIREMENT

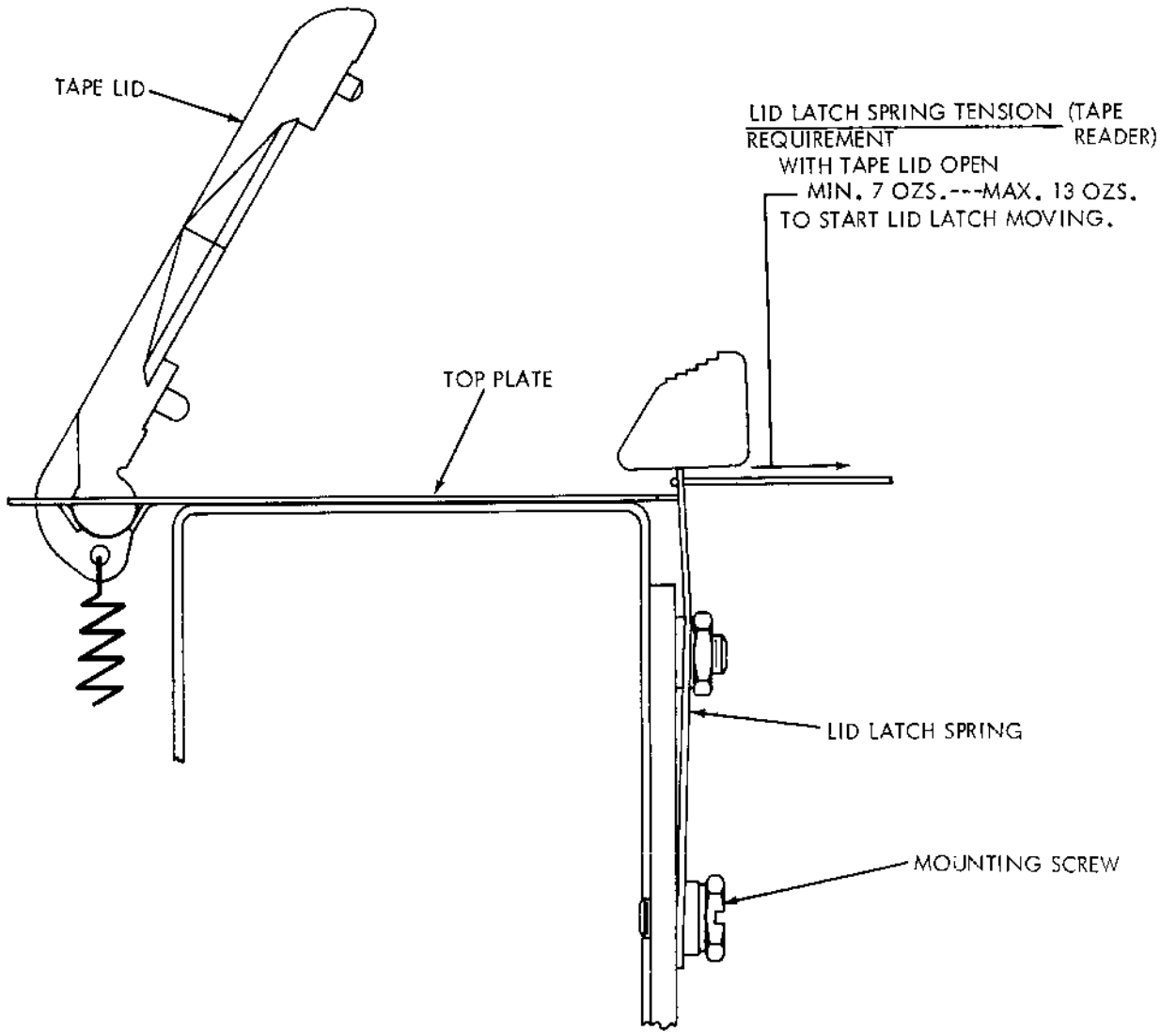
WITH START-STOP LEVER IN STOP POSITION,
 MIN. 1 OZ. --- MAX. 3 OZS.
 TO START TAPE OUT PIN MOVING.



ARMATURE SPRING (TAPE READER)
REQUIREMENT

WITH ARMATURE IN ITS UNATTRACTED POSITION
 MIN. 24 OZS. --- MAX. 37 OZS.
 TO START SPRING POST MOVING. MEASURE AT TWO PLACES.

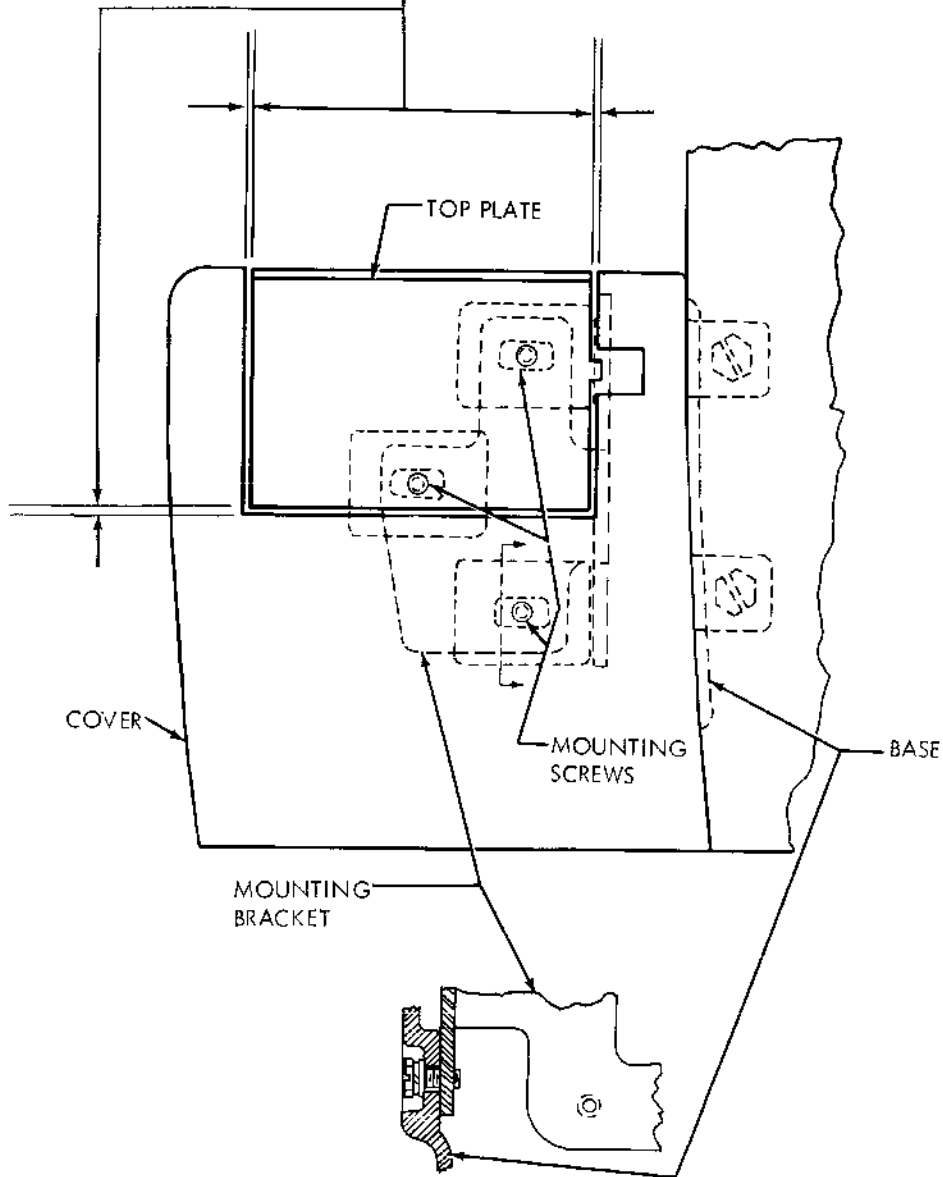




READER MOUNTING BRACKET (TAPE READER)
REQUIREMENT

THERE SHALL BE EQUAL CLEARANCE ON THREE
SIDES BETWEEN TOP PLATE ASSEMBLY AND
READER COVER.

TO ADJUST
WITH THREE MOUNTING SCREWS FRICTION TIGHT,
POSITION READER BASE.



TAPE PUNCH

NOTE

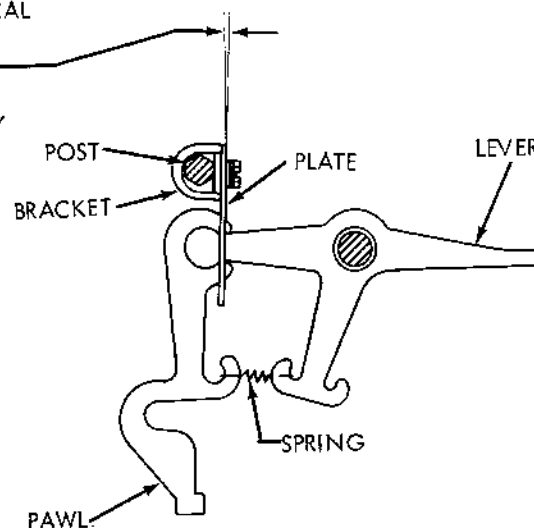
CHAD EXTENSION - PRIOR TO MAKING ADJUSTMENTS
REMOVE THE CHAD EXTENSION. REASSEMBLE
WHEN THE ADJUSTMENTS ARE COMPLETED.

POST, BRACKET AND PLATE
REQUIREMENT (PRELIMINARY)

AT THE TIME OF ASSEMBLY OR REASSEMBLY THE
POST, BRACKET AND PLATE ASSEMBLY SHALL BE
ASSEMBLED SO THAT THE PLATE SHALL BE VERTICAL
OR WITHIN 2 DEGREES FROM VERTICAL IN A
CLOCKWISE DIRECTION (AS GAGED BY EYE).

TO ADJUST

ASSEMBLE POST, BRACKET AND PLATE ASSEMBLY
TO MEET REQUIREMENT.

ARM (TAPE NUDGER) POST

NOTE

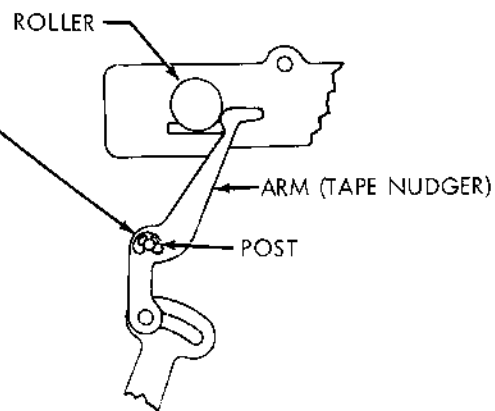
THIS ADJUSTMENT APPLIES ONLY TO UNITS WHICH
HAVE AN ELONGATED HOLE IN THE CASTING.

REQUIREMENT

AT THE TIME OF ASSEMBLY OR REASSEMBLY THE
POST SHALL BE IN ITS MOST REARWARD POSITION.

TO ADJUST

ASSEMBLE POST TO MEET REQUIREMENT.

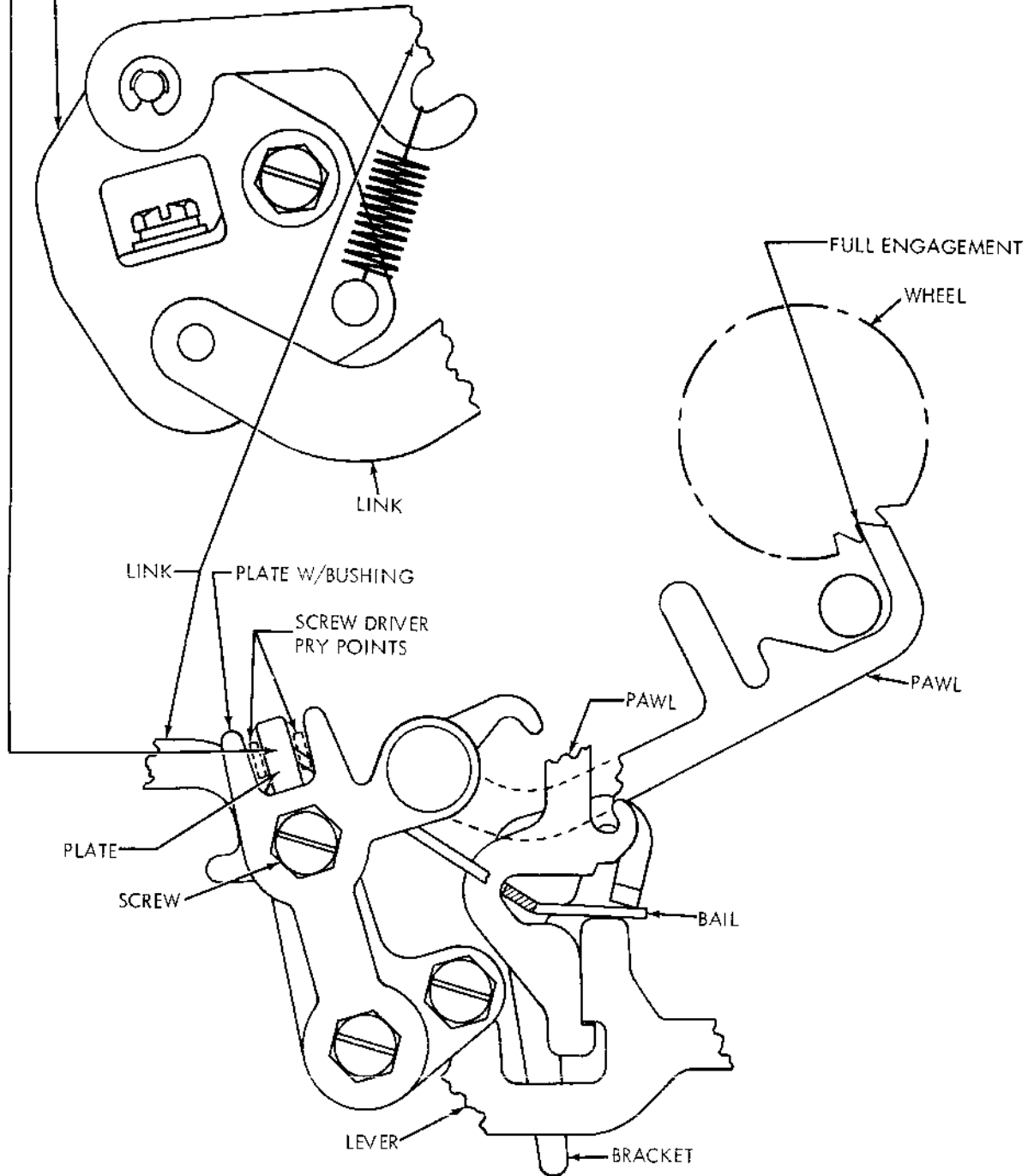


FEEDWHEEL RATCHET AND PAWL (PRELIMINARY)
REQUIREMENT

THE PLATE SHALL BE IN MIDDLE OF
SLOT LOCATED IN PLATE W/BUSHING
(AS GAGED BY EYE).

TO ADJUST
WITH SCREW FRICITION TIGHT ADJUST
PLATE.

PLATE W/BUSHING W/POSTS



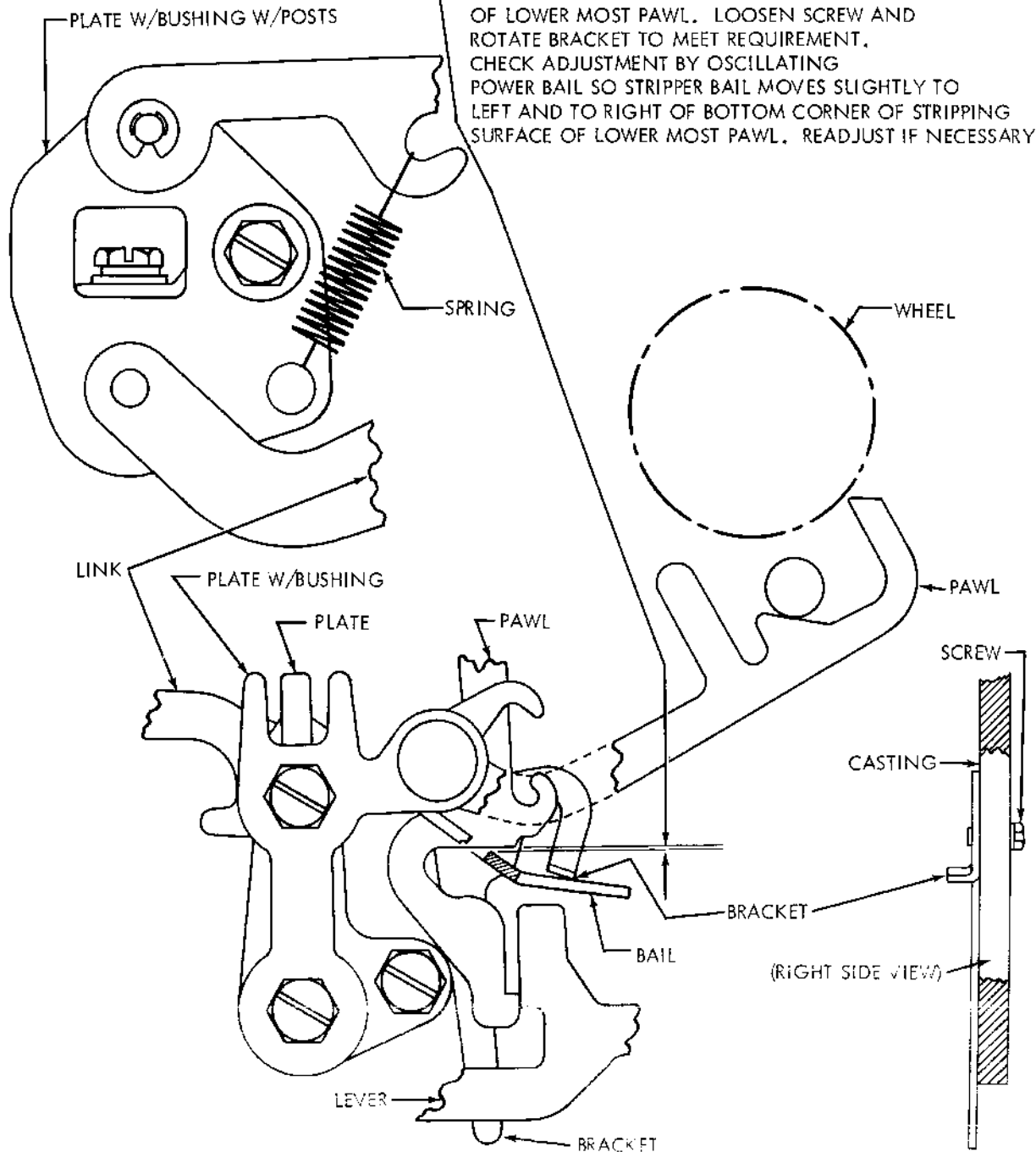
STRIPPER BAIL UPSTOP
REQUIREMENT

WITH PERFORATOR UNIT REMOVED FROM PRINTER AND WITH ALL PAWLS IN THEIR UPPERMOST POSITION THE STRIPPER BAIL SHALL CLEAR THE BOTTOM CORNER OF THE STRIPPING SURFACE OF LOWER MOST PAWL BY

MIN. SOME --- MAX. 0.010 INCH AS GAGED BY EYE.

TO ADJUST

STRIP ALL PAWLS TO THEIR UPPERMOST POSITION. MANUALLY OPERATE POWER BAIL SO THE STRIPPER BAIL LINES UP DIRECTLY UNDER BOTTOM CORNER OF STRIPPING SURFACE OF LOWER MOST PAWL. LOOSEN SCREW AND ROTATE BRACKET TO MEET REQUIREMENT. CHECK ADJUSTMENT BY OSCILLATING POWER BAIL SO STRIPPER BAIL MOVES SLIGHTLY TO LEFT AND TO RIGHT OF BOTTOM CORNER OF STRIPPING SURFACE OF LOWER MOST PAWL. READJUST IF NECESSARY.



SEE NOTE BELOW

TAPE PUNCH DRIVE (PRELIMINARY)
REQUIREMENT

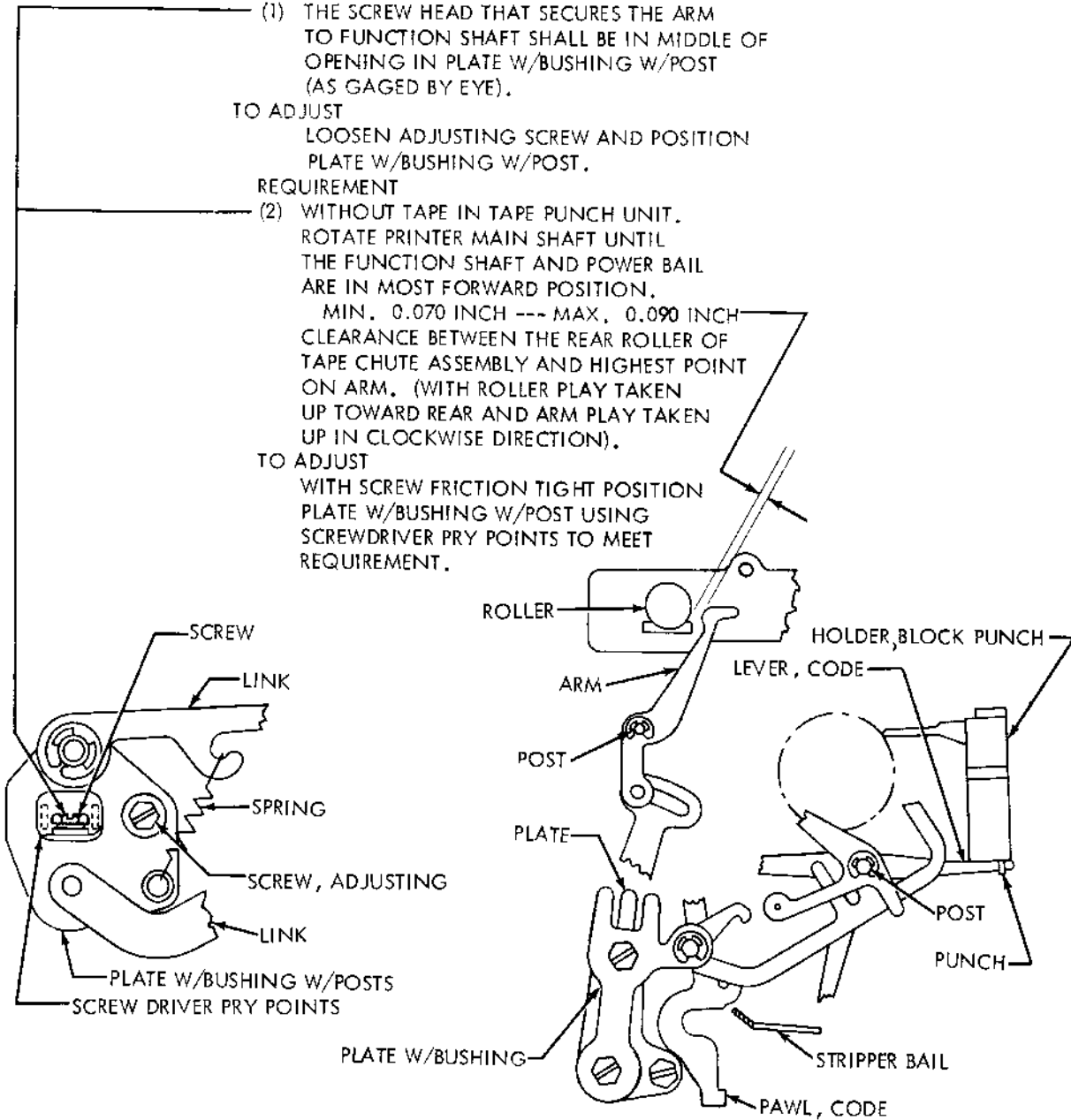
- (1) THE SCREW HEAD THAT SECURES THE ARM TO FUNCTION SHAFT SHALL BE IN MIDDLE OF OPENING IN PLATE W/BUSHING W/POST (AS GAGED BY EYE).

TO ADJUST
LOOSEN ADJUSTING SCREW AND POSITION
PLATE W/BUSHING W/POST.

REQUIREMENT

- (2) WITHOUT TAPE IN TAPE PUNCH UNIT, ROTATE PRINTER MAIN SHAFT UNTIL THE FUNCTION SHAFT AND POWER BAIL ARE IN MOST FORWARD POSITION.
MIN. 0.070 INCH --- MAX. 0.090 INCH
CLEARANCE BETWEEN THE REAR ROLLER OF TAPE CHUTE ASSEMBLY AND HIGHEST POINT ON ARM. (WITH ROLLER PLAY TAKEN UP TOWARD REAR AND ARM PLAY TAKEN UP IN CLOCKWISE DIRECTION).

TO ADJUST
WITH SCREW FRICTION TIGHT POSITION
PLATE W/BUSHING W/POST USING
SCREWDRIVER PRY POINTS TO MEET
REQUIREMENT.



NOTE

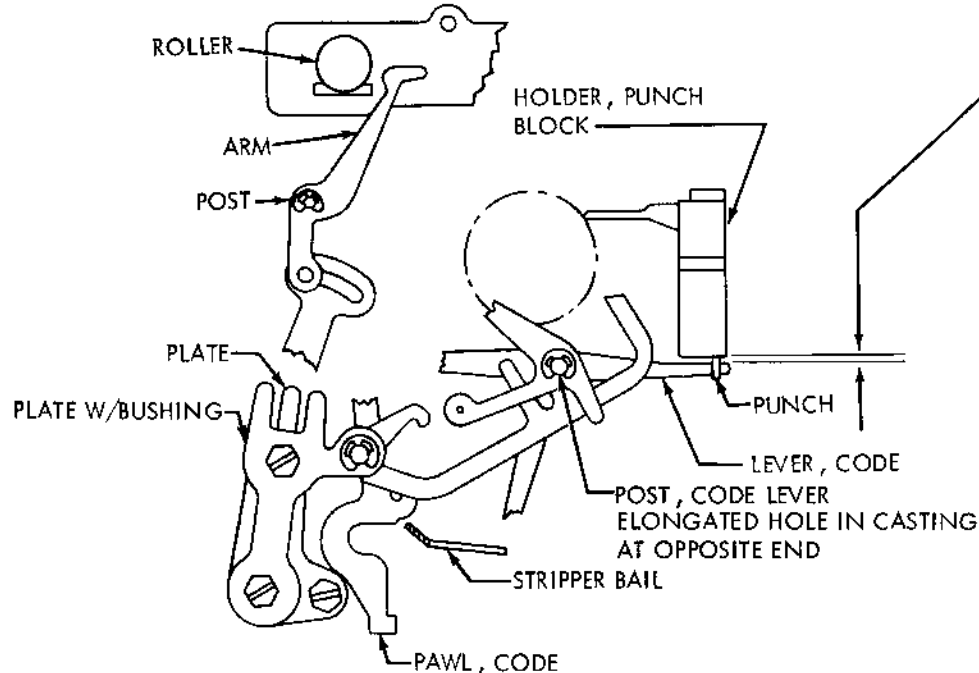
TAPE PUNCH DRIVE, PUNCH PIN PENETRATION, POST BRACKET AND PLATE, AND FEED WHEEL RATCHET AND PAWL ADJUSTMENT MUST BE MADE IN SEQUENCE. PRIOR TO MAKING THESE ADJUSTMENTS CHECK, POST BRACKET AND PLATE, ARM (TAPE NUDGER) POST, FEED WHEEL RATCHET AND PAWL, AND STRIPPER BAIL UPSTOP ADJUSTMENTS.

PUNCH PENETRATION**REQUIREMENT: UNDER THE FOLLOWING CONDITIONS:**

- (1) MOUNTED TAPE PUNCH UNIT (WITHOUT TAPE) IN THE "ON" POSITION.
- (2) 5 LEVEL UNIT - WITH EITHER THE FIGS. "D" OR THE RUB-OUT COMBINATION IN THE TAPE PUNCH UNIT.
8 LEVEL UNIT - WITH THE RUB-OUT COMBINATION IN THE TAPE PUNCH UNIT.
- (3) WITH THE PRINTER FUNCTION SHAFT AND THE POWER BAIL IN THE MOST FORWARD POSITION.

MIN. 0.032 INCH --- MAX. 0.037 INCH

CLEARANCE BETWEEN TOP SURFACE OF FURTHEST LEVER AND BOTTOM SURFACE OF PUNCH BLOCK HOLDER. THERE SHALL BE NO LESS THAN 0.017 INCH CLEARANCE BETWEEN THE CLOSEST LEVER AND THE BOTTOM SURFACE OF THE PUNCH BLOCK HOLDER.

**TO ADJUST**

5 LEVEL UNIT: MOVE CODE LEVER MOUNTING POST TO ITS LOWER MOST POSITION AND TIGHTEN SCREW FRICTION TIGHT. WITH RUB-OUT COMBINATION IN TAPE PUNCH UNIT AND POWER BAIL IN MOST FORWARD POSITION MEASURE THE GAP BETWEEN TOP SURFACE OF FURTHEST LEVER AND BOTTOM SURFACE OF PUNCH BLOCK HOLDER. REPEAT OPERATION WITH FIGS. "D" COMBINATION. WITH COMBINATION THAT MEASURES LARGEST GAP OF THE TWO COMBINATIONS IN TAPE PUNCH UNIT MANUALLY ROTATE PRINTER MAIN SHAFT SO FUNCTION SHAFT AND POWER BAIL ARE IN MOST FORWARD POSITION. WITH A 0.037 INCH GAGE PLACED TO RIGHT OF PUNCH PIN AND BETWEEN FURTHEST CODE LEVER AND IN CONTACT WITH BOTTOM SURFACE OF PUNCH BLOCK HOLDER MOVE POST UPWARD SO THAT TOP SURFACE OF LEVER JUST TOUCHES THE GAGE. RECYCLE AND CHECK THE GAP AT THE FURTHEST LEVER. THE GAP SHALL BE BETWEEN 0.032 INCH TO 0.037 INCH. THE GAP BETWEEN TOP SURFACE OF CLOSEST LEVER AND BOTTOM SURFACE OF PUNCH BLOCK HOLDER SHALL NOT BE LESS THAN 0.017 INCH (WITH GAGE PLACED TO THE RIGHT OF THE PUNCH PIN). REFINE ADJUSTMENT TO MEET REQUIREMENT.

8 LEVEL UNIT: MOVE CODE LEVER MOUNTING POST TO ITS LOWER MOST POSITION AND TIGHTEN SCREW FRICTION TIGHT. WITH RUB-OUT COMBINATION IN TAPE PUNCH UNIT MANUALLY ROTATE PRINTER MAIN SHAFT SO THAT FUNCTION SHAFT AND POWER BAIL ARE IN MOST FORWARD POSITION. WITH A 0.037 INCH GAGE PLACED TO RIGHT OF PUNCH PIN AND BETWEEN FURTHEST CODE LEVER AND IN CONTACT WITH BOTTOM SURFACE OF PUNCH BLOCK HOLDER MOVE POST UPWARD SO THAT TOP SURFACE OF LEVER JUST TOUCHES GAGE. RECYCLE AND CHECK GAP AT FURTHEST LEVER. THE GAP SHALL BE BETWEEN 0.032 INCH TO 0.037 INCH. THE GAP BETWEEN TOP SURFACE OF CLOSEST LEVER AND BOTTOM SURFACE OF PUNCH BLOCK HOLDER SHALL NOT BE LESS THAN 0.017 INCH (WITH GAGE PLACED TO RIGHT OF PUNCH PIN). REFINE ADJUSTMENT TO MEET REQUIREMENT.

POST, BRACKET AND PLATE**REQUIREMENT: (FINAL)**

5 LEVEL UNIT: WITH FIGS. "D" COMBINATION IN TAPE PUNCH UNIT AND WITH PRINTER FUNCTION SHAFT AND POWER BAIL IN REAR MOST POSITION THERE SHALL BE

MIN. 0.005 INCH --- MAX. 0.015 INCH

CLEARANCE BETWEEN THE "A-0" SENSING LEVER AND PAWL. THERE SHALL BE SOME CLEARANCE BETWEEN THE "A-8" SENSING LEVER AND ITS PAWL. WITH RUB-OUT COMBINATION IN TAPE PUNCH UNIT AND WITH PRINTER FUNCTION SHAFT AND POWER BAIL IN REAR MOST POSITION THERE SHALL BE SOME CLEARANCE BETWEEN THE FEED SENSING LEVER AND ITS PAWL AND CODE SENSING LEVERS AND THEIR PAWLS.

8 LEVEL UNIT: WITH RUB-OUT COMBINATION IN TAPE PUNCH UNIT AND WITH FUNCTION SHAFT AND POWER BAIL IN REAR MOST POSITION THERE SHALL BE

MIN. 0.005 INCH --- MAX. 0.015 INCH

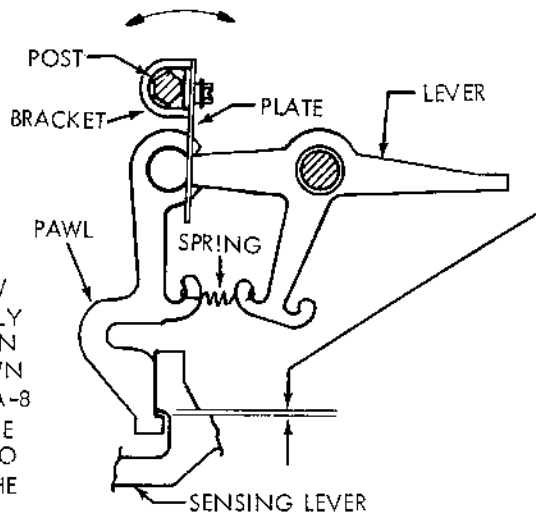
CLEARANCE BETWEEN "0" SENSING LEVER AND PAWL. THERE SHALL BE SOME CLEARANCE BETWEEN THE FEED SENSING LEVER AND ITS PAWL AND CODE SENSING LEVERS AND THEIR PAWLS.

CAUTION: EXERCISE CARE SO THAT THE GUIDE ALWAYS GUIDES THE PAWL AND LEVER SIMULTANEOUSLY. AVOID ROTATING GUIDE IN THE COUNTER-CLOCKWISE DIRECTION FROM ITS MOST VERTICAL POSITION.

TO ADJUST

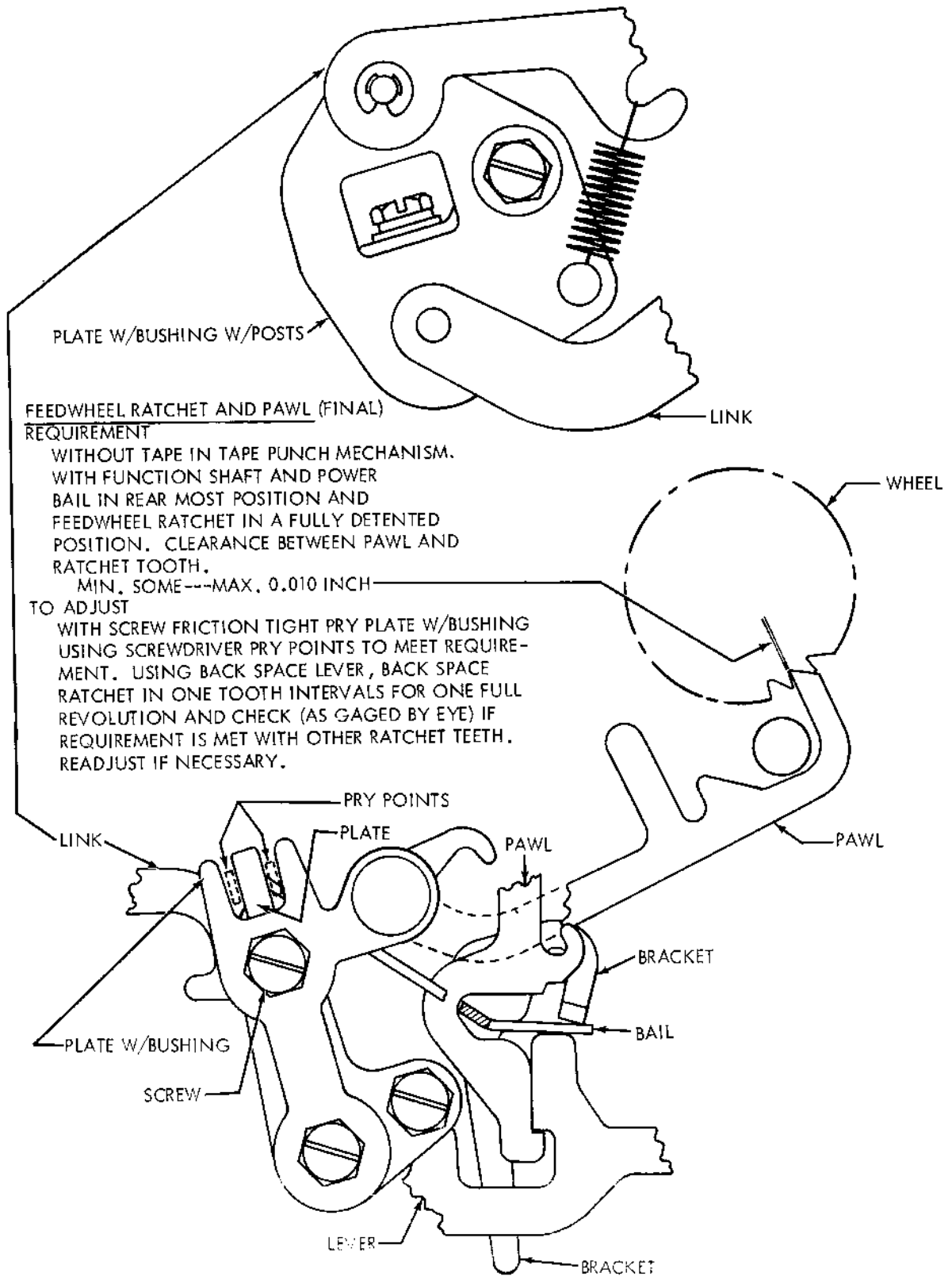
5 LEVEL UNIT: WITH FIGS. "D" COMBINATION IN TAPE PUNCH UNIT AND WITH PRINTER FUNCTION SHAFT AND POWER BAIL IN REAR MOST POSITION CHECK THE GAP BETWEEN THE A-0 SENSING LEVER AND ITS PAWL. LOOSEN SCREW AND ROTATE POST, BRACKET AND PLATE ASSEMBLY ONLY IF THE GAP IS NOT PER REQUIREMENT. (DO NOT POSITION POST, BRACKET AND PLATE ASSEMBLY JUST TO BIAS THE LOW OR HIGH SIDE OF THE CLEARANCE.) WHILE MANUALLY BIASING THE AUXILIARY BAIL (JUST BELOW THE TABS IN NO. 2 AND 5 CODE LEVERS) DOWNWARD, PRESS DOWN LIGHTLY ON THE MOST REARWARD PORTION OF THE A-8 SENSING LEVER. THE A-8 SENSING LEVER SHALL HAVE SOME MOVEMENT BEFORE MOTION IS TRANSFERRED TO ITS PAWL. IF NO MOVEMENT IS PRESENT INCREASE THE GAP SLIGHTLY BETWEEN THE A-0 SENSING LEVER

AND ITS PAWL WITHIN ITS 0.005 INCH TO 0.015 INCH LIMITS UNTIL SOME MOVEMENT IS PRESENT. WITH RUB-OUT COMBINATION IN TAPE PUNCH UNIT AND WITH PRINTER FUNCTION SHAFT AND POWER BAIL IN REAR MOST POSITION MANUALLY BIAS CODE LEVERS IN FRONT OF PUNCH PINS DOWNWARD AND CHECK THE 1,2,F,3,4, AND 5 SENSING LEVERS FOR MOVEMENT BEFORE MOTION IS TRANSFERRED TO THEIR PAWLS. READJUST THE POST, BRACKET AND PLATE ASSEMBLY UNTIL SOME MOVEMENT IS PRESENT BETWEEN EACH SENSING LEVER AND ITS PAWLS. RECHECK THE 0.005 INCH TO 0.015 INCH GAP REQUIREMENT BETWEEN THE A-0 SENSING LEVER AND ITS PAWL.



8 LEVEL UNIT: WITH RUB-OUT COMBINATION IN TAPE PUNCH UNIT AND WITH PRINTER FUNCTION SHAFT AND POWER BAIL IN REAR MOST POSITION CHECK THE GAP BETWEEN THE NO. "0" SENSING LEVER AND ITS PAWL. LOOSEN SCREW AND ROTATE POST, BRACKET AND PLATE ASSEMBLY ONLY IF GAP IS NOT PER REQUIREMENT. (DO NOT POSITION POST, BRACKET AND PLATE ASSEMBLY JUST TO BIAS THE LOW OR HIGH SIDE OF THE CLEARANCE.) WHILE MANUALLY BIASING CODE LEVERS IN FRONT OF THE PUNCH PINS DOWNWARD PRESS DOWN LIGHTLY ON THE MOST REARWARD PORTION OF EACH SENSING LEVER. EACH SENSING LEVER SHALL HAVE SOME MOVEMENT BEFORE MOTION IS TRANSFERRED TO ITS PAWL. READJUST THE POST, BRACKET AND PLATE ASSEMBLY UNTIL THE REQUIREMENT IS MET. RECHECK THE 0.005 INCH --- 0.015 INCH GAP REQUIREMENT.

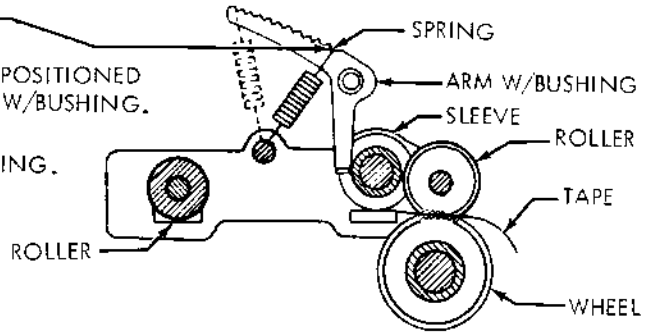
NOTE: REMAKE STRIPPER BAIL UPSTOP ADJUSTMENT ONLY IF POST, BRACKET AND PLATE ASSEMBLY IS ROTATED TO MEET THIS REQUIREMENT.



TEN CHARACTERS PER INCH

(1) REQUIREMENT (PRELIMINARY)

THE OPEN END OF SPRING SHALL BE POSITIONED ON LOWER MOST GROOVE ON ARM W/BUSHING. TO ADJUST WITH A SPRING HOOK POSITION SPRING.

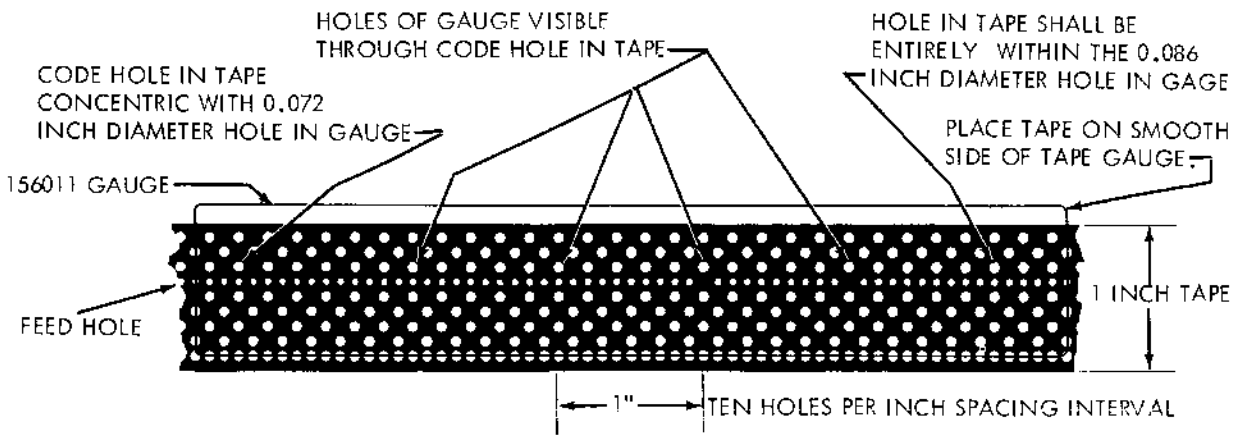
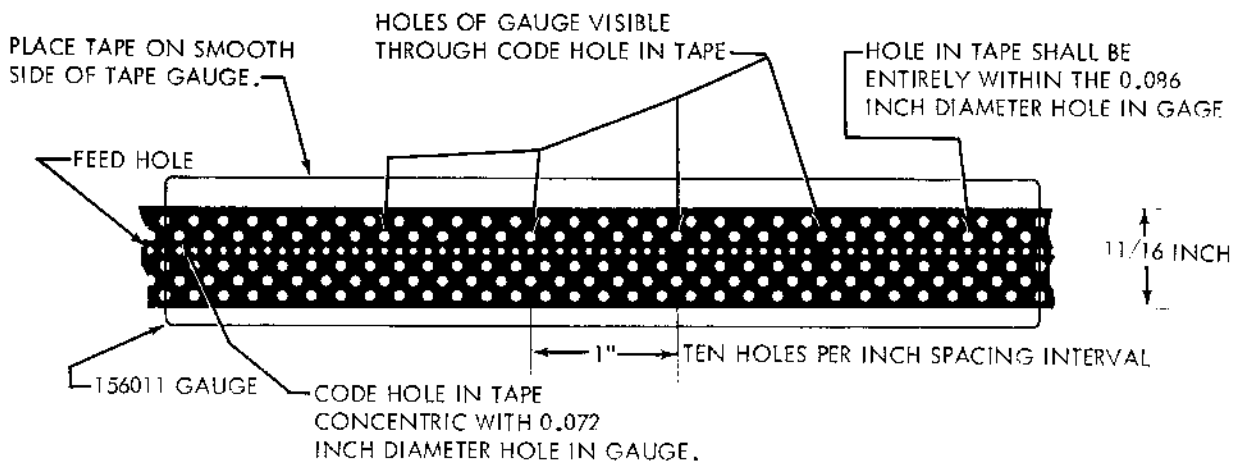


(2) REQUIREMENT

WITH A PIECE OF TAPE PERFORATED WITH A SERIES OF "R AND Y" COMBINATIONS FOR FIVE LEVEL UNITS OR "R AND - HYPHEN" COMBINATIONS FOR EIGHT LEVEL UNITS PLACED OVER THE SMOOTH SIDE OF THE 156011 TAPE GAUGE SO THAT THE CIRCULAR PORTION OF THE FIRST NUMBER 2 CODE HOLE IN THE TAPE IS CONCENTRIC WITH THE FIRST HOLE OF THE TAPE GAUGE, THE NEXT FOUR HOLES IN THE TAPE GAUGE SHOULD BE VISIBLE THROUGH THE NUMBER 2 CODE HOLES IN THE TAPE AND THE CIRCULAR PORTION OF THE LAST (SIXTH) NUMBER 2 CODE HOLE IN THE TAPE SHALL BE ENTIRELY WITHIN THE 0.086 INCH DIAMETER HOLE OF THE TAPE GAUGE. OPERATE THE TAPE PUNCH MECHANISM UNDER POWER AND CHECK PERFORMATIONS TO MEET REQUIREMENT.

TO ADJUST

POSITION SPRING UPWARDS IN GROOVES UNTIL REQUIREMENT IS MET.

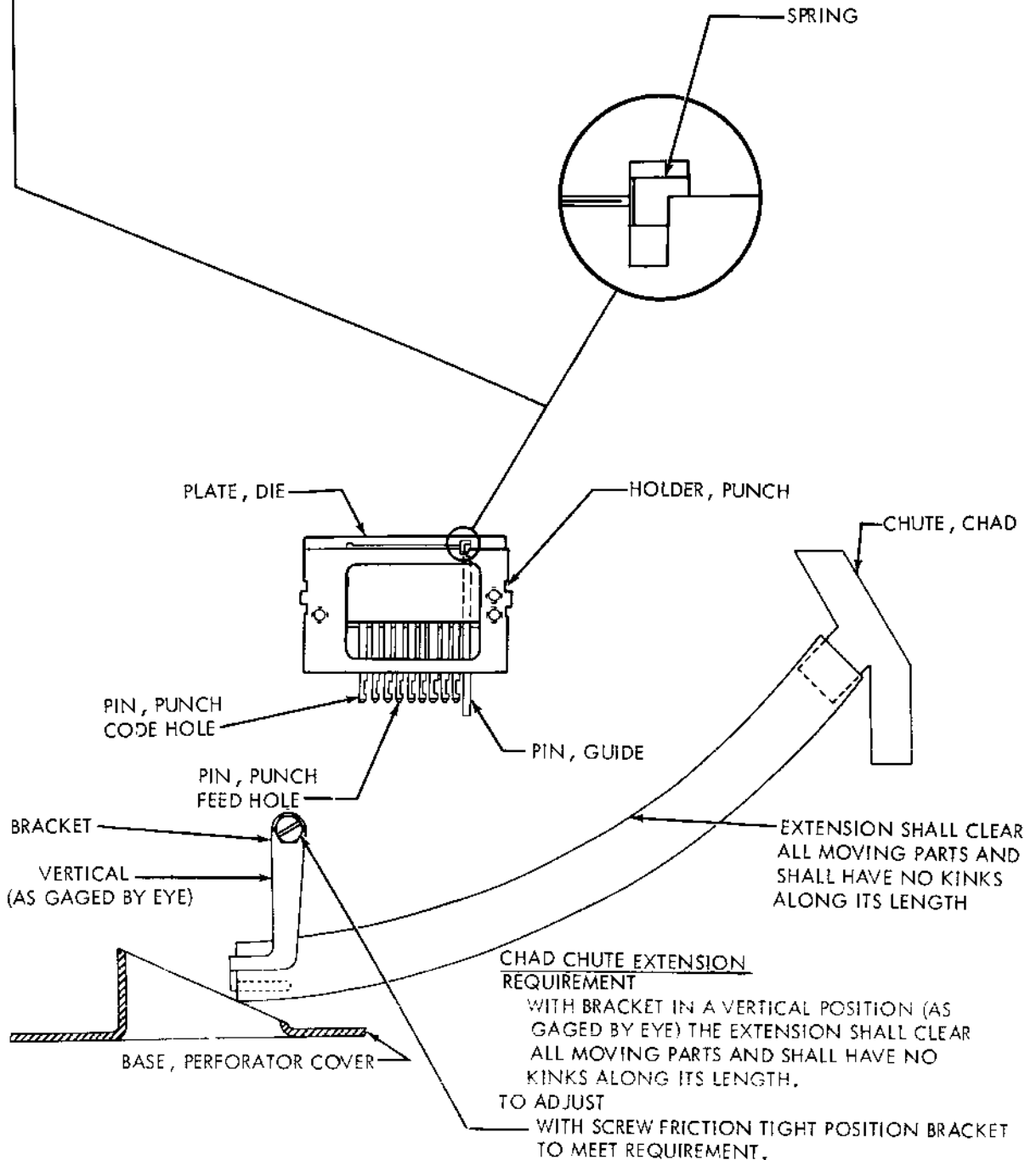


PUNCH BLOCK BIAS SPRING REQUIREMENT

WITH TAPE REMOVED FROM THE MECHANISM THE BIASING SPRING SHALL REST AGAINST SIDE OF THE CLEARANCE SLOT IN BLOCK AND SHALL BE SYMMETRICAL (AS GAGED BY EYE) ABOUT THE TAPE OPENING OF THE BLOCK.

TO ADJUST

WITH SCREW FRICION TIGHT POSITION SPRING SO THAT IT JUST RESTS AGAINST THE SIDE OF CLEARANCE AND IS SYMMETRICAL ABOUT THE TAPE OPENING.



CHAD CHUTE EXTENSION REQUIREMENT

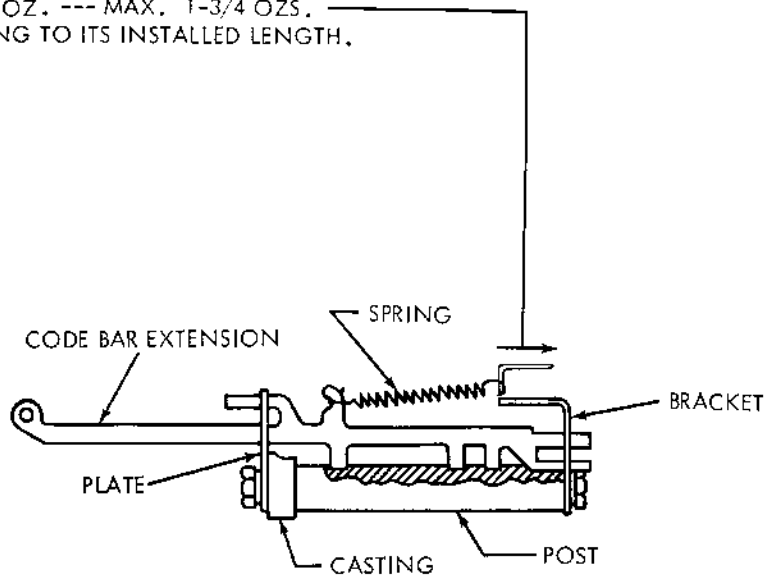
WITH BRACKET IN A VERTICAL POSITION (AS GAGED BY EYE) THE EXTENSION SHALL CLEAR ALL MOVING PARTS AND SHALL HAVE NO KINKS ALONG ITS LENGTH.

TO ADJUST

WITH SCREW FRICION TIGHT POSITION BRACKET TO MEET REQUIREMENT.

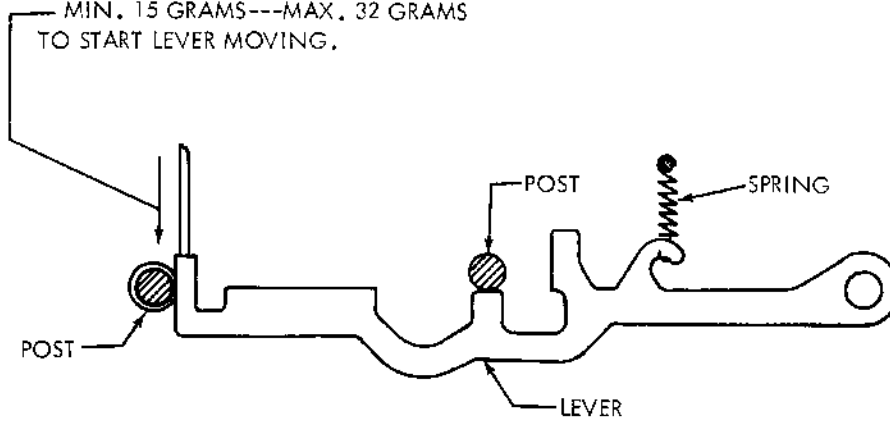
CODE BAR LEVER SPRINGS
REQUIREMENT

WITH THE PRINTER IN STOP POSITION AND
 TAPE PUNCH UNIT MOUNTED TO PRINTER
 MIN. 3/4 OZ. --- MAX. 1-3/4 OZS.
 TO PULL SPRING TO ITS INSTALLED LENGTH.



SENSING LEVERS SPRINGS
REQUIREMENT

WITH TAPE PUNCH IN STOP POSITION
 MIN. 15 GRAMS --- MAX. 32 GRAMS
 TO START LEVER MOVING.



PAWL AND LEVER SPRING

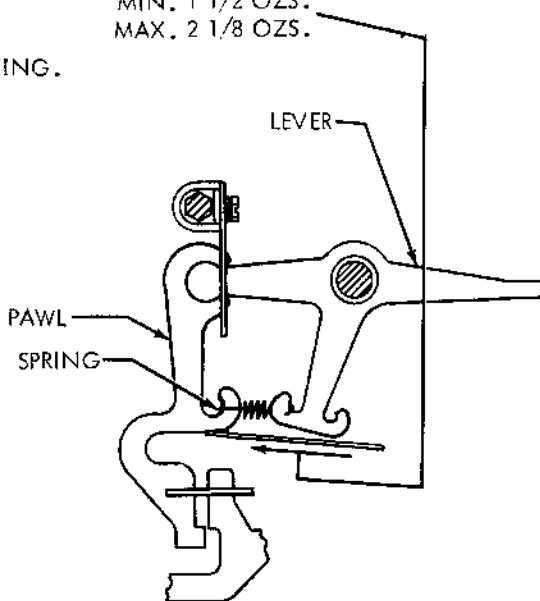
REQUIREMENT

WITH A SPRING SCALE LOCATED ON STEP BELOW
 SPRING HOOK AND WITH SENSING LEVER SPRING
 REMOVED

UPPER SPRING
 MIN. 7/8 OZ.
 MAX. 1 1/2 OZS.

LOWER SPRING
 MIN. 1 1/2 OZS.
 MAX. 2 1/8 OZS.

TO START PAWL MOVING.



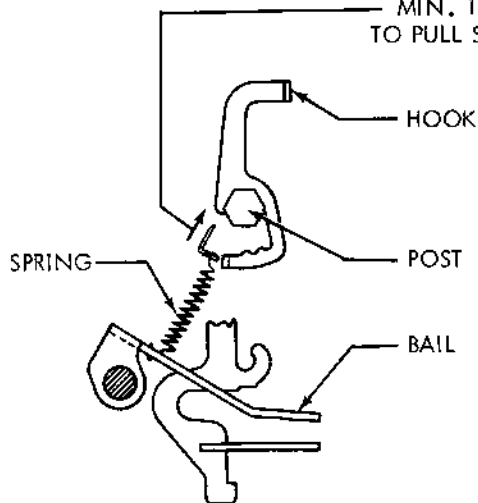
STRIPPER BAIL SPRING

REQUIREMENT

WITH TAPE PUNCH IN STOP POSITION

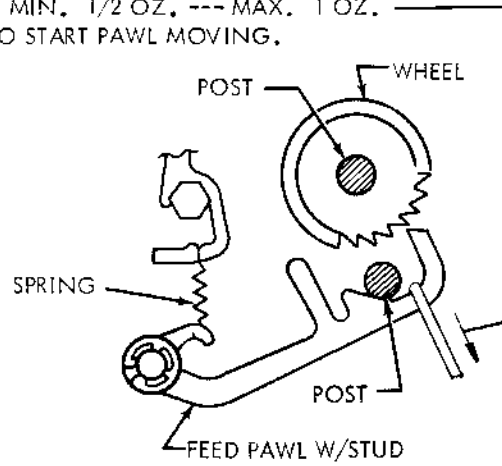
MIN. 12 OZS. ---MAX. 15 OZS.

TO PULL SPRING TO ITS INSTALLED LENGTH.



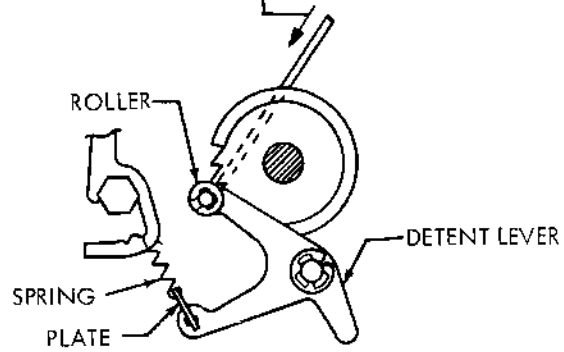
FEED PAWL SPRING
REQUIREMENT

WITH TAPE PUNCH IN STOP POSITION
MIN. 1/2 OZ. --- MAX. 1 OZ.
TO START PAWL MOVING.



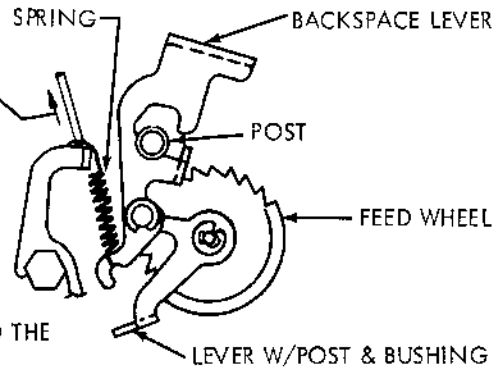
DETENT LEVER SPRING
REQUIREMENT

WITH TAPE PUNCH IN STOP POSITION
MIN. 10 OZS. --- MAX. 13 OZS.
TO START DETENT LEVER MOVING.



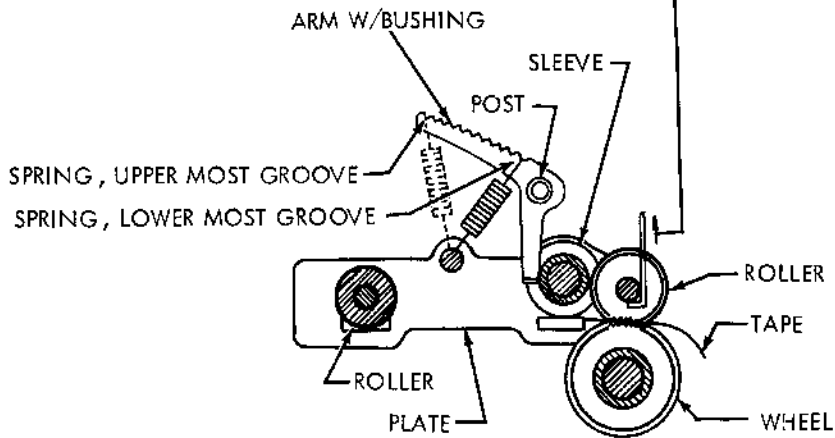
BACK SPACE LEVER SPRING REQUIREMENT

WITH TAPE PUNCH IN STOP POSITION
 MIN. 3/4 OZ. --- MAX. 1 1/2 OZS.
 TO PULL SPRING TO ITS INSTALLED LENGTH.



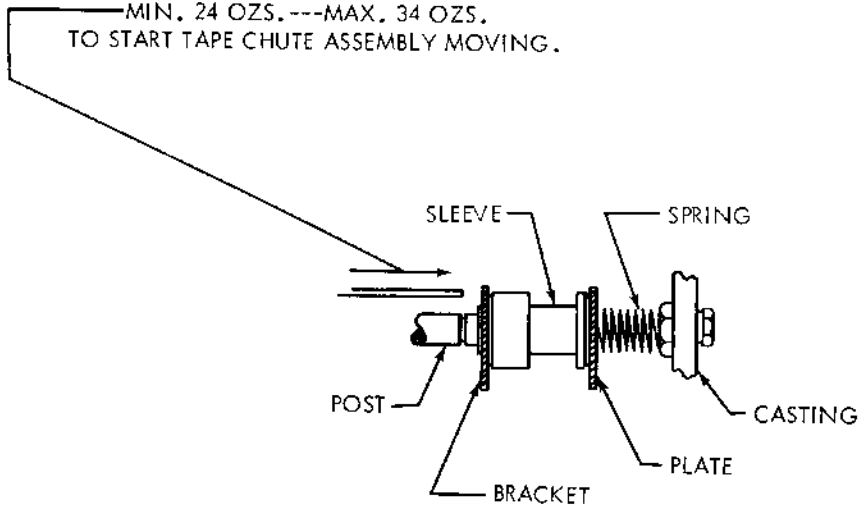
TAPE CHUTE ROLLER SPRING REQUIREMENT

PULL UP ON THE SHAFT JUST TO THE LEFT OF THE ROLLER
 (1) WITH SPRING IN UPPER MOST GROOVE
 MIN. 40 OZS. --- MAX. 48 OZS.
 (2) WITH SPRING IN LOWER MOST GROOVE
 MIN. 22 OZS. --- MAX. 28 OZS.
 TO START LIFTING TAPE CHUTE ROLLER.



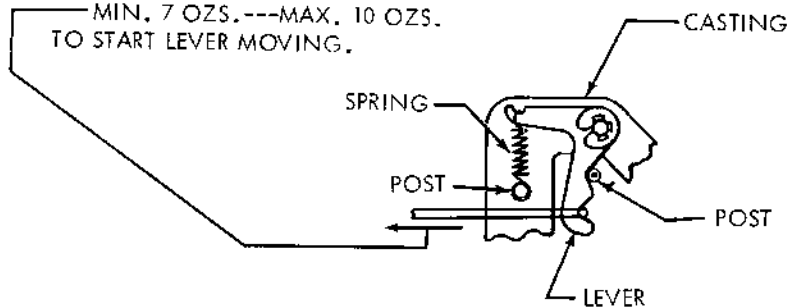
TAPE CHUTE ASSEMBLY COMPRESSION SPRING REQUIREMENT

WITH TENSION SPRING REMOVED AND THE PRESSURE ROLLER SLIGHTLY ABOVE THE FEED WHEEL, PUSH AXIALLY ON THE FRONT PLATE OF TAPE CHUTE ASSEMBLY
 MIN. 24 OZS. ---MAX. 34 OZS.
 TO START TAPE CHUTE ASSEMBLY MOVING.



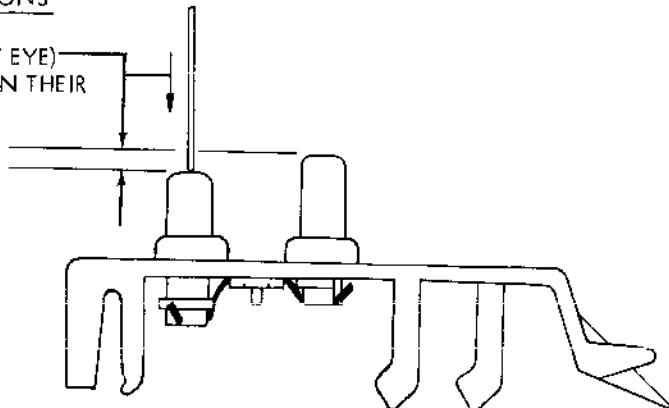
ON-OFF CONTROL LEVER DETENT SPRING REQUIREMENT

WITH THE LEVER WITH BUSHING AND POST HELD IN THE "OFF" POSITION (TAPE PUNCH UNIT OFF) HOOK SCALE IN GROOVE AND PULL
 MIN. 7 OZS. ---MAX. 10 OZS.
 TO START LEVER MOVING.



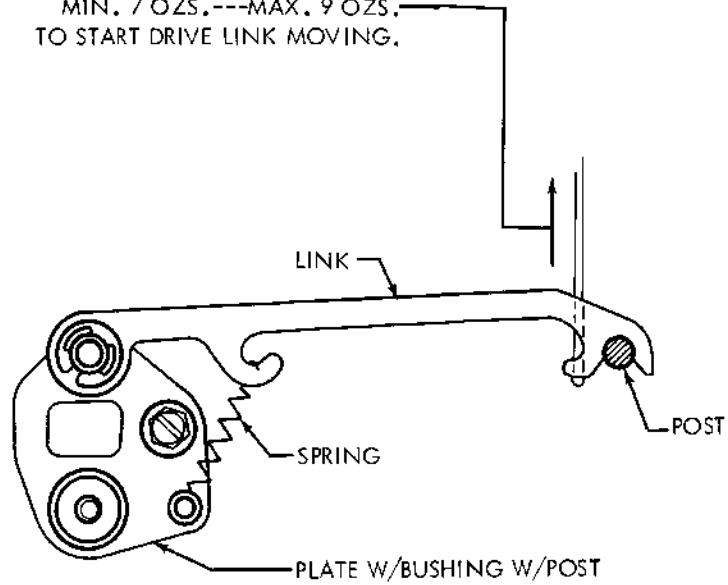
"REL.", "B.S.P.", "ON" OR "OFF" BUTTONS REQUIREMENT

PUSH DOWN 1/8 INCH (AS GAGED BY EYE) WHILE THE OTHER BUTTONS REMAIN IN THEIR NORMAL UPWARD POSITION.
 MIN. 1/2 OZ. ---MAX. 1 1/2 OZS.



DRIVE LINK SPRING
REQUIREMENT

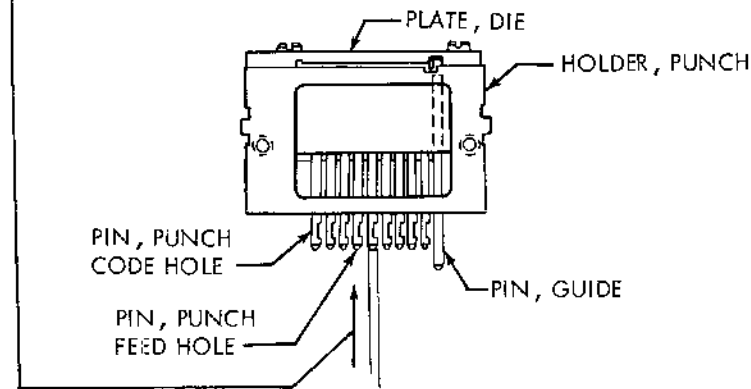
WITH TAPE PUNCH IN STOP POSITION
MIN. 7 OZS. --- MAX. 9 OZS.
TO START DRIVE LINK MOVING.



PUNCH BLOCK ASSEMBLY (5 LEVEL & 8 LEVEL)
REQUIREMENT

REMOVE PUNCH BLOCK ASSEMBLY FROM TAPE PUNCH
UNIT TO PERFORM THIS CHECK.
WITH THE PUNCH PIN SLOTS FACING THE GUIDE PIN
MIN. SOME --- MAX. 4 OZS.

TO START EACH PUNCH MOVING. THIS REQUIREMENT
MUST BE MET ANYWHERE ALONG THE PUNCHES
TRAVEL IN THE TAPE PUNCH UNIT.



SECTION 5

DISASSEMBLY AND REASSEMBLY

5-1. GENERAL.

a. The disassembly procedure given in this section will break the Printer, Tape Reader and Tape Punch, down into its major assemblies and mechanisms. If further disassembly is required, refer to Bulletin 1184B which shows detailed arrangements of parts. Where it will help in determining their location, the numbers of the parts are given in the instructions.

b. NOTE: Most of the mechanisms are mounted on castings by self-tapping screws. Therefore, to remove the mechanisms, do not remove the screws — merely loosen them unless specifically instructed otherwise.

c. Retaining rings are made of spring steel and have a tendency to release suddenly. To avoid loss of these rings when removing them, proceed as follows:

Hold retaining ring to prevent its rotating. Place blade of screwdriver in one of ring's slots. Rotate screwdriver in direction to increase diameter. Ring will come off easily in fingers without flying.

d. Before beginning disassembly, remove connectors from external receptacles (power source, Data Set, etc.).

5-2. COVER (Figure 5-1).

a. Remove paper and spindle. Remove volume

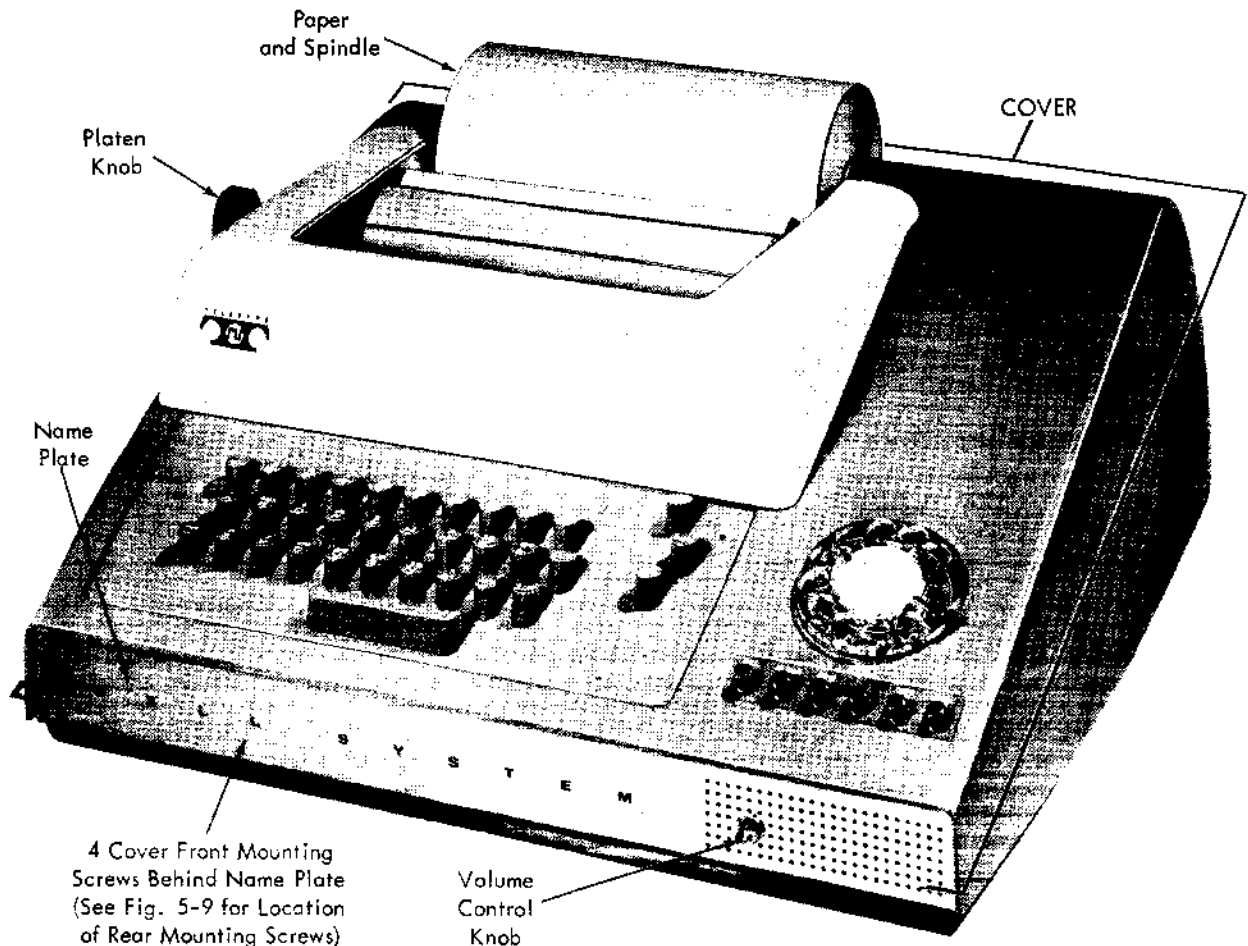


Figure 5-1. Printer Set

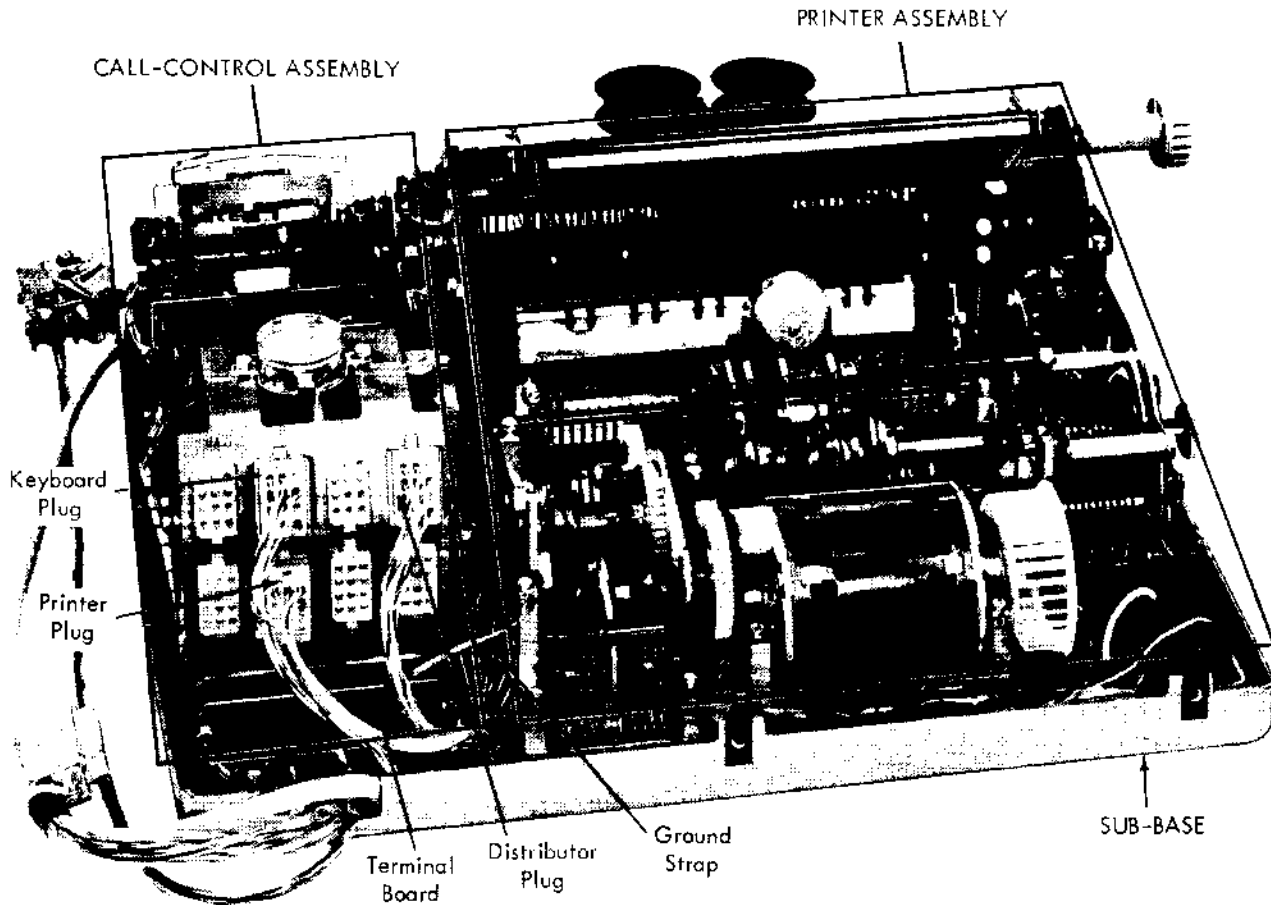


Figure 5-2. Printer Set — Rear View — Cover Removed

control knob (if used) by pulling frontward. Remove name plate by pulling it frontward. Remove platen knob by pulling it to left.

b. Remove seven 125002 mounting screws — four in front, three in rear of cover (see Figure 5-9).

c. Lift cover from base.

d. Remove external connections (signal line, etc.) from terminal board on call control assembly (Figure 5-4).

d. To replace cover, reverse procedure used to remove it. Make sure that keyboard, dial, etc., are properly aligned in holes provided.

5-3. PRINTER ASSEMBLY.

a. TO REMOVE PRINTER ASSEMBLY (Figure 5-2).

(1) Remove printer plug (marked P) and distributor plug (marked D) from their receptacles on call control assembly. Remove ground cable from ground tab on call control assembly.

(2) Insert screwdriver in slot in 180977 H-plate (Figure 5-3) and push to left against pressure of spring until plate is disengaged from universal lever. Remove H-plate.

(3) Lift printer assembly from sub-base.

(4) To replace printer assembly, reverse procedure used to remove it. Make sure that assembly is properly seated on rubber isolators (Figure 5-8) and 180831 answer-back lever (Figure 5-3) is under and aligned with HERE IS key lever. Receptacles on attendant set are marked D and P.

b. TO REMOVE RIBBON MECHANISM. (Figure 5-3).

(1) Remove ribbon by removing two ribbon spools and disengaging ribbon from ribbonguide and 181116 reverse arm.

(2) Loosen two 152893 mounting screws and lift ribbon mechanism from carriage.

(3) To replace ribbon mechanism, reverse procedure used to remove it.

c. TO REMOVE PLATEN MECHANISM (Figure 5-4.)

(1) Remove 119651 retaining ring and 90615 spring from line feed linkage.

(2) Disengage 181176 link from 181168 bell-crank.

(3) Loosen four 181242 mounting screws in two platen side plates.

(4) Lift platen mechanism from Printer assembly.

(5) To replace platen mechanism, reverse procedure used to remove it.

d. TO REMOVE CARRIAGE MECHANISM (Figure 5-3).

(1) Unhook carriage return spring from carriage.

(2) Loosen two 180798 mounting screws in spacing pulley's mounting bracket. Rotate and remove bracket.

(3) Loosen two 180798 mounting screws in spacing drum's mounting bracket. Remove mounting bracket.

(4) Disengage spacing belt from pulley on spacing drum.

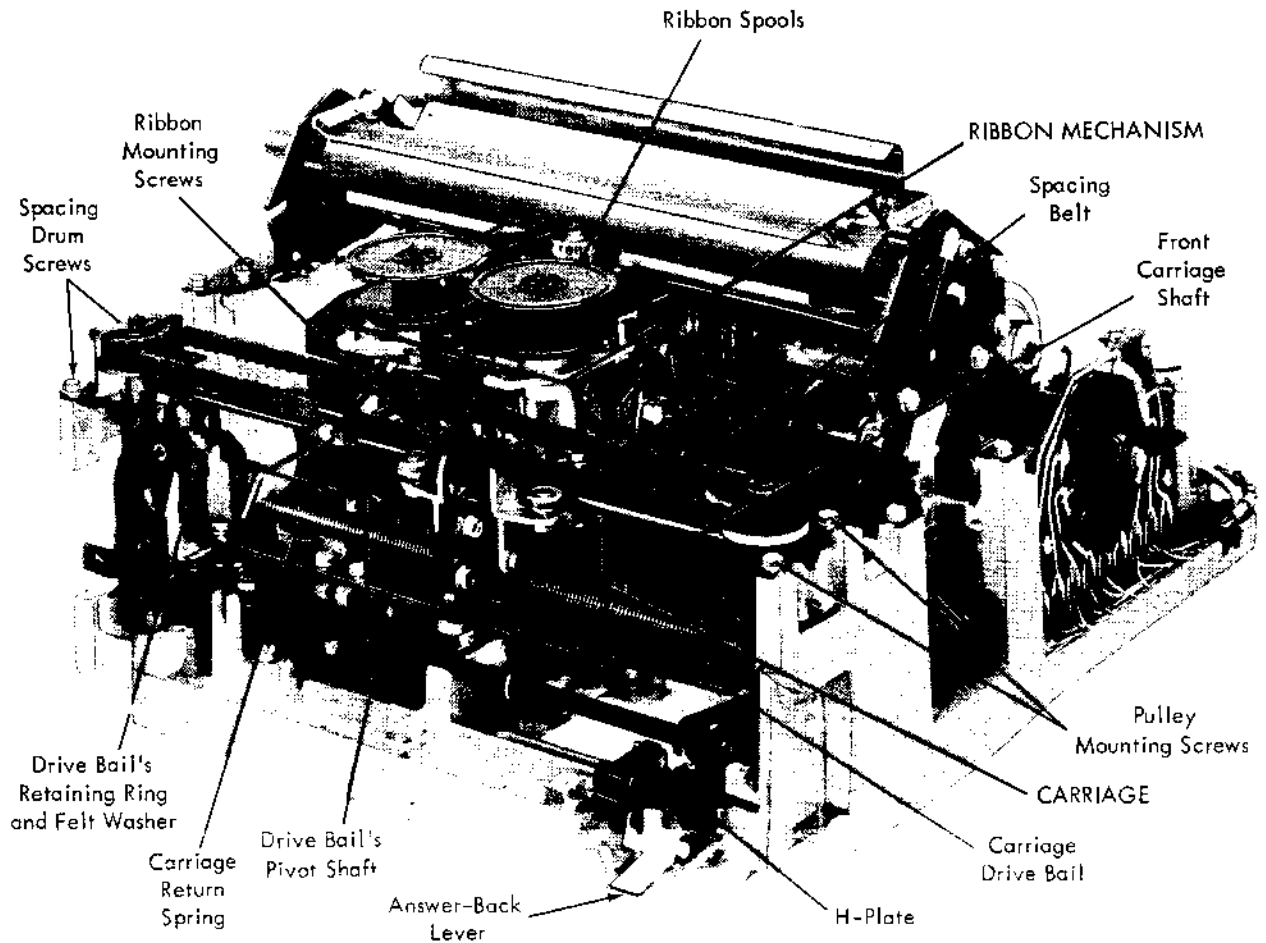


Figure 5-3. Printer Assembly — Front View

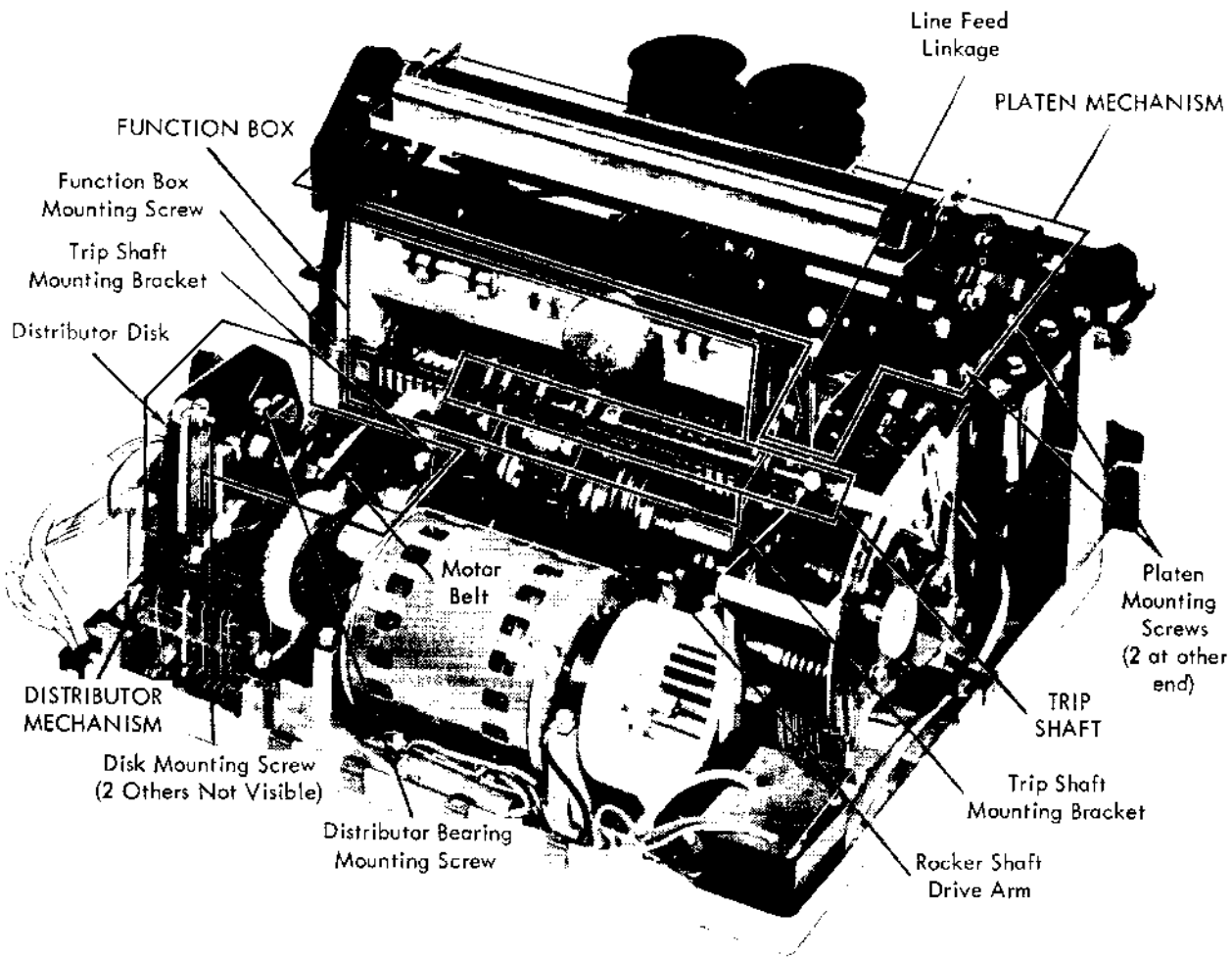


Figure 5-4. Printer Assembly — Rear View

(5) Remove front carriage shaft by sliding to right.

(6) Disengage rollers from rear rail and lift carriage from printer assembly.

(7) To replace carriage, reverse procedure used to remove it and observe following precautions.

(a) Make sure nylon slide guides engage proper associated code bars (Figure 5-6).

(b) Make sure two rear rollers engage carriage rear rail (Figure 5-6).

e. TO REMOVE SELECTOR MECHANISM (Figure 5-5).

(1) Lock armature in spacing position to pre-

vent it from pulling selector levers from their guide.

(2) Remove 150040 mounting screw with lock washer from selector cam-clutch.

(3) Holding levers away, remove selector cam-clutch from main shaft by pulling to left and rotating back and forth.

(4) From under side of base, remove 180798 mounting screw from bottom of left platen support post. Loosen 180798 screw in top of post and remove it and dashpot cylinder.

(5) Loosen 181246 mounting screw in 180648 follower arm. Slide arm off trip shaft.

(6) Loosen 180798 mounting screw and remove 180682 upstop bracket. Tighten screw to secure 181230 retaining plate.

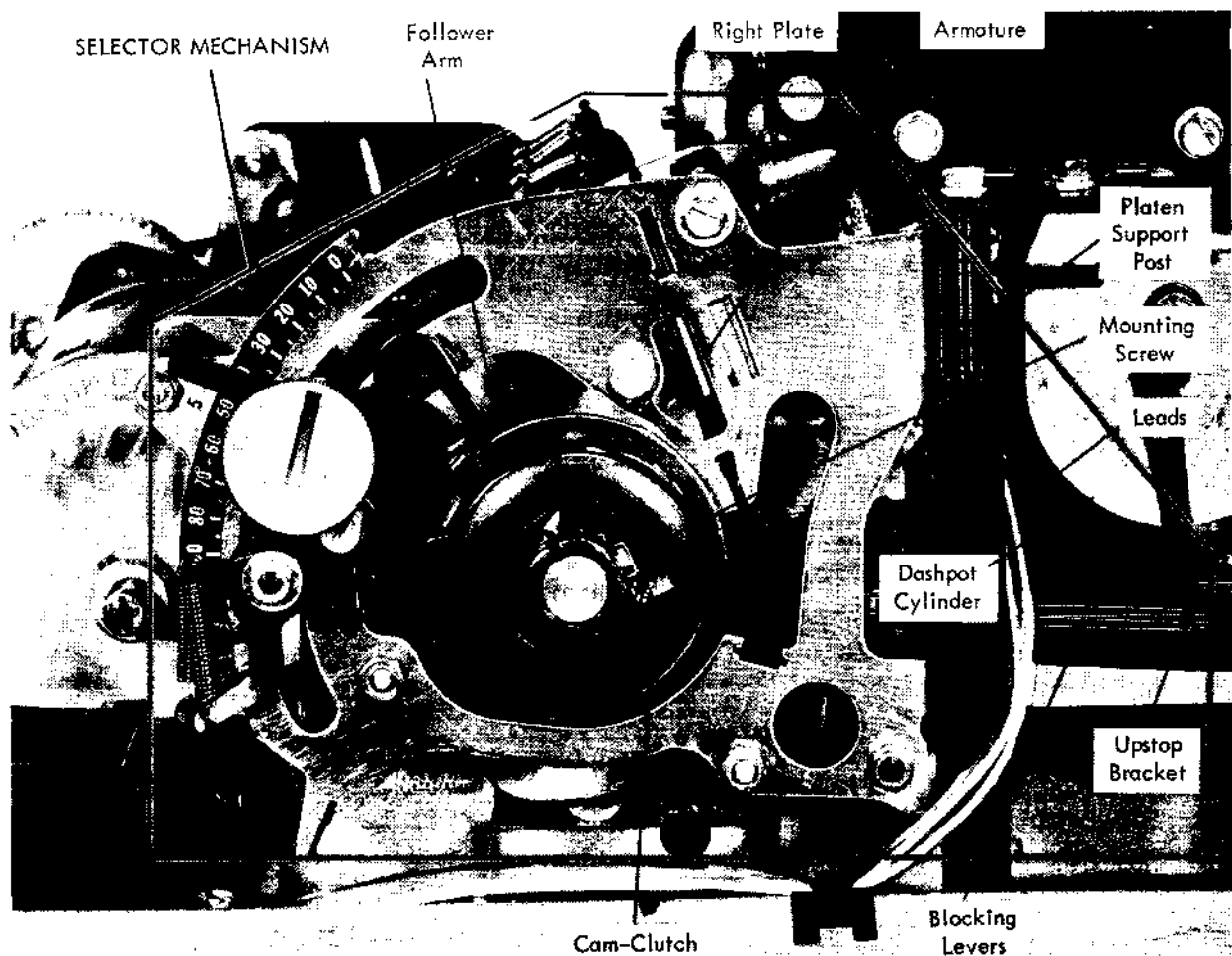


Figure 5-5. Selector Mechanism

(7) Remove three 180675 mounting screws with 180676 speed nuts from selector right plate.

(8) Loosen screws and remove two leads from selector magnet.

(9) Remove selector mechanism.

(10) To replace selector mechanism reverse the procedure used to remove it with following precautions:

Make sure blocking levers are properly seated in guide slots in front 180950 code bar tie bracket (see Figure 5-7).

To prevent bending right plate, make sure it is properly fitted around 181006 bearing on main shaft.

f. TO REMOVE CODE BAR MECHANISM (Figure 5-6).

(1) Loosen four 180798 mounting screws, remove four 180925 clamps and lift code bar mechanism from frame.

(2) To replace code bar mechanism, reverse procedure used to remove it and observe the following precautions:

(a) Make sure function levers are in proper slots in code bars.

(b) Make sure code bars' reset extensions are to right of 180928 code bar reset bail and in proper slots of guide.

(c) Make sure both right and left 180920 guide shafts are fully seated in their mountings.

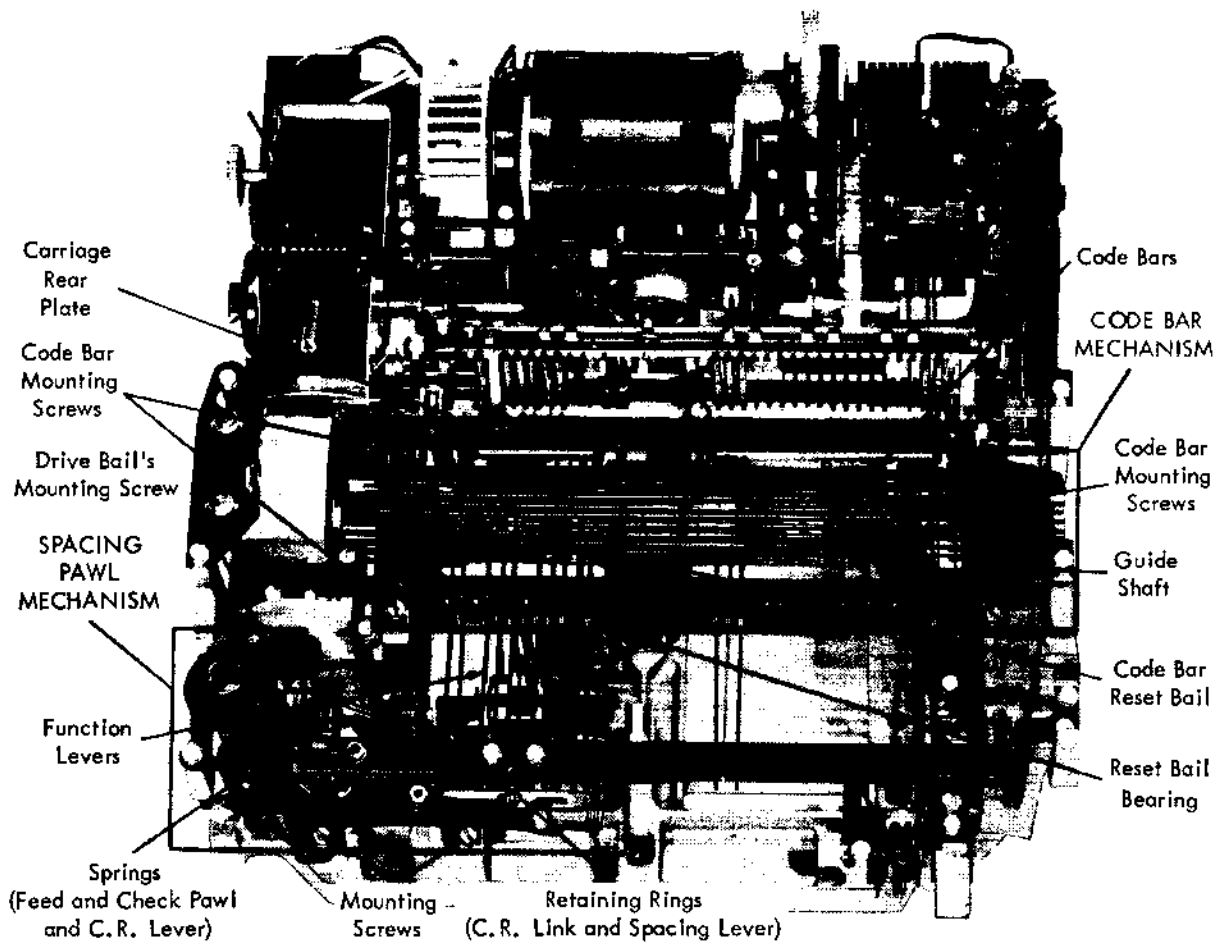


Figure 5-6. Printer Assembly — Front View —
Carriage and Platen Removed

(d) Make sure 181070 space suppression lever is to left of 180947 print suppression code bar.

(e) Make sure 180752 print suppression latch lever fits into slot of 180923 bracket mounted on the rear tie bracket.

g. TO REMOVE TRIP SHAFT MECHANISM (Figure 5-4).

(1) Loosen four 180798 mounting screws in left and right mounting brackets. Push inwards on brackets and lift mechanism from casting.

(2) To replace trip shaft mechanism, reverse procedure used to remove it.

h. TO REMOVE FUNCTION BOX MECHANISM (Figure 5-4).

(1) Unhook 74702 spring (connects to 180928 code bar reset bail) from 180773 plate (see Figure 5-7).

(2) Loosen two 180798 mounting screws and remove two 180796 clamp plates (see Figure 5-8).

(3) Lift function box mechanism from base.

(4) To replace function box mechanism, reverse procedure used to remove it with following precaution:

Function levers should be in proper slots and aligned with their respective pawls.

i. TO REMOVE MAIN SHAFT MECHANISM (Figure 5-8).

(1) Remove 3598 nut and flat washer from 180546 pivot shaft on carriage drive bail (see Figure 5-3). Disengage front end of 181005 drive link from pivot shaft.

(2) Remove 119649 retaining ring from function rocker shaft's 180774 drive arm. Disengage 180746 arm on rocker shaft from drive arm.

(3) Position main shaft mechanism to right and lift from base.

(4) To replace main shaft mechanism, reverse procedure used to remove it. Make sure distributor shaft is properly positioned to left against pressure of brush spring.

j. TO REMOVE DISTRIBUTOR MECHANISM (Figure 5-4).

(1) Loosen 180798 mounting screw and remove 180797 retaining plate from bearing near right end of distributor shaft.

(2) Loosen 151721 and two 180989 mounting screws in distributor disk.

(3) Slide wire leads out of connections on distributor disk.

(4) Remove motor belt.

(5) Lift distributor mechanism from base.

(6) To replace distributor mechanism, reverse procedure used to remove it with following precaution:

Make sure leads are inserted into proper

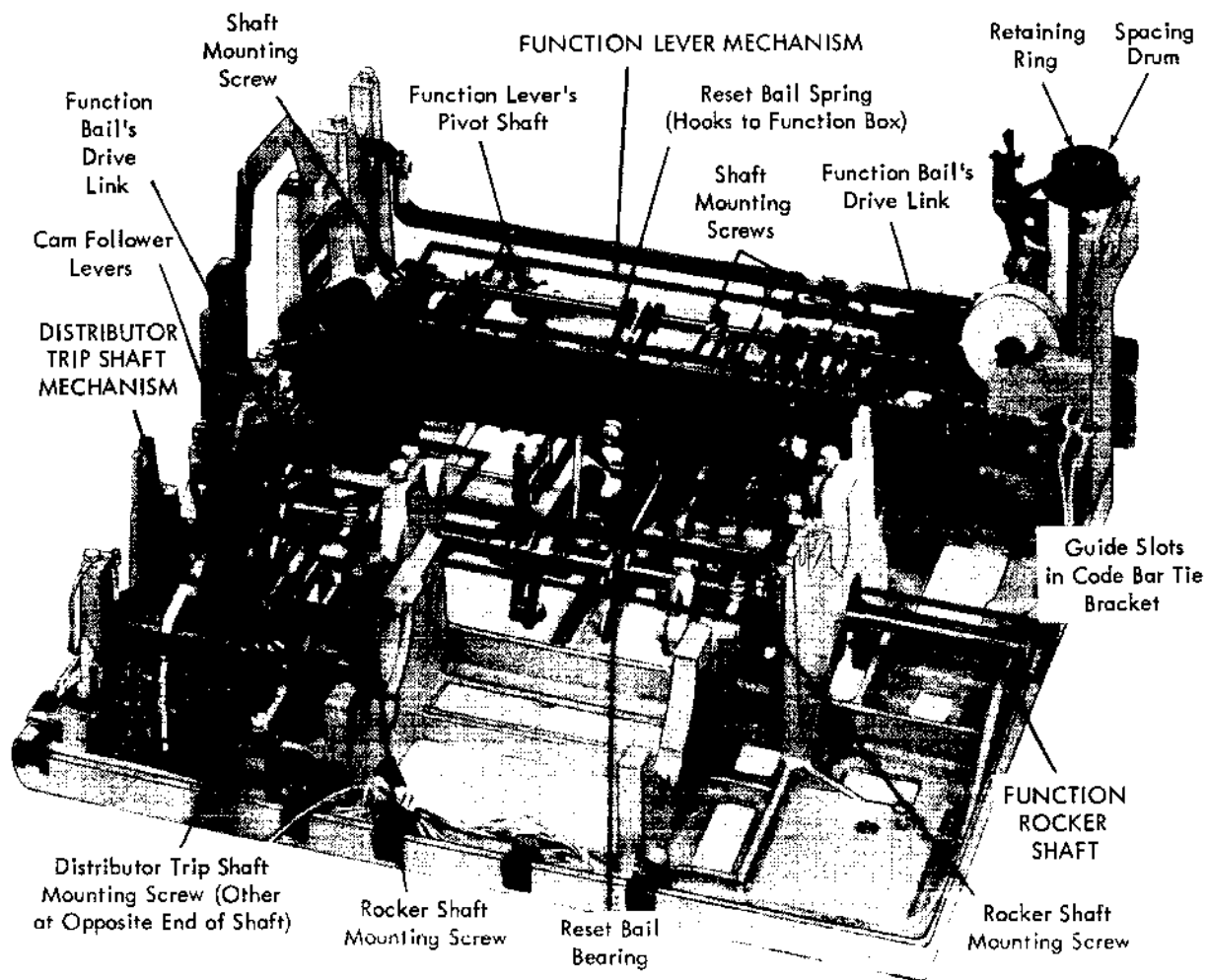


Figure 5-7. Printer Assembly — Rear View —
A Number of Mechanisms Removed

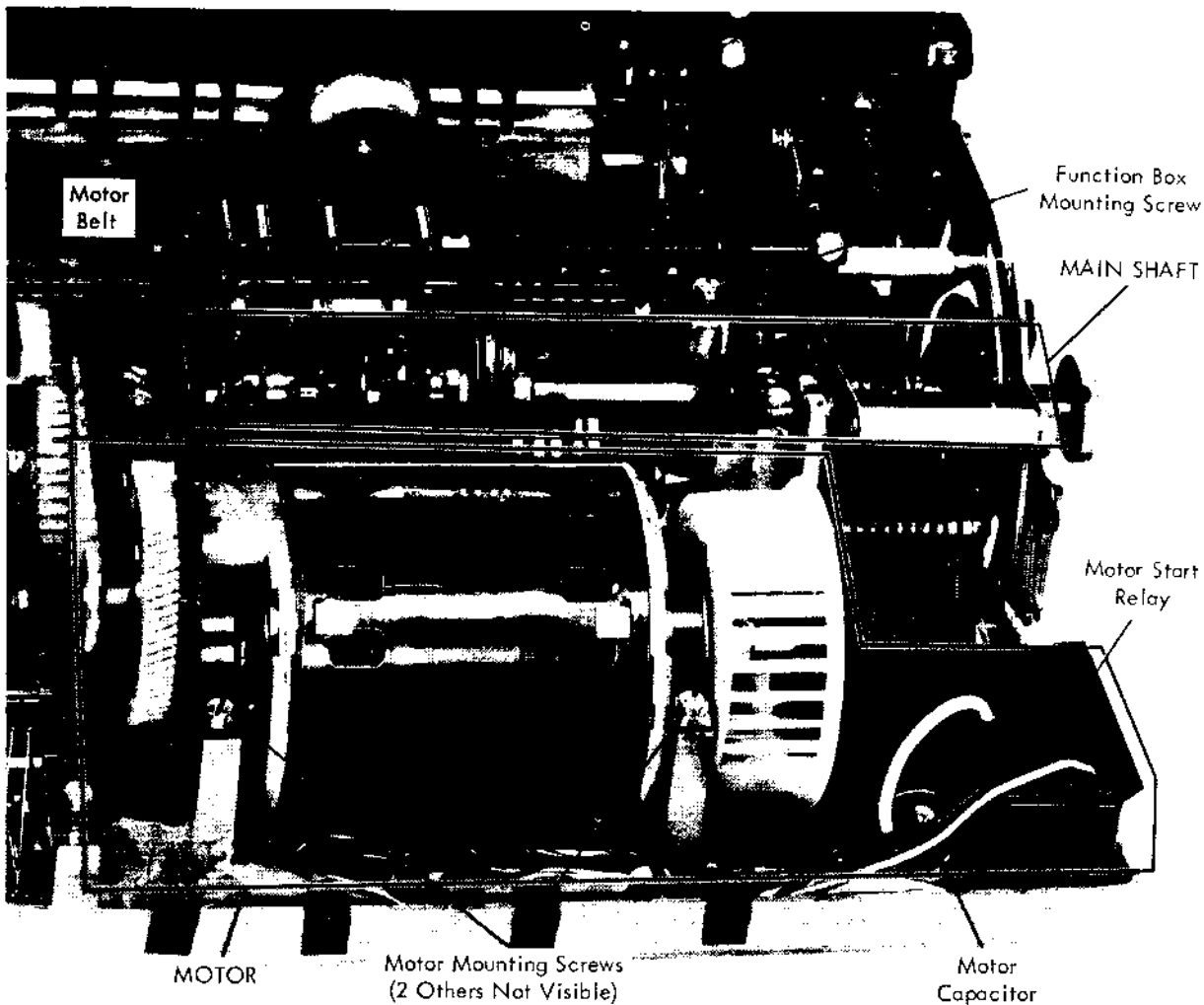


Figure 5-8. Printer Assembly — Rear View

connections on disk. (See appropriate wiring diagram.)

k. TO REMOVE DISTRIBUTOR TRIP SHAFT MECHANISM (Figure 5-7).

(1) Remove 119649 retaining ring from post connecting links to each of following cam follower levers: 180985, 180820, and 180821.

(2) Unhook five springs from 180988 spring bracket.

(3) Loosen two 180798 mounting screws and remove two 180972 buffer clamps.

(4) Remove distributor trip shaft mechanism from base.

(5) To replace distributor trip shaft mechanism, reverse procedure used to remove it.

l. TO REMOVE MOTOR (Figure 5-8).

(1) Remove four 180798 mounting screws and two motor clamps.

(2) Disengage motor belt from gear-pulley mounted on motor housing.

(3) Loosen 180798 screw in motor-start relay.

(4) Remove motor, motor capacitor, start relay and associated wiring.

(5) To replace motor, reverse procedure used to remove it.

m. TO REMOVE FUNCTION ROCKERSHAFT MECHANISM (Figure 5-7).

(1) Remove 119651 retaining rings from

posts at rear of 180769 left and 180770 right function bail's drive links.

(2) Loosen two 180798 mounting screws and remove two 180797 plates on left and right rocker shaft bearings.

(3) Lift rocker shaft mechanism from base.

(4) To replace rocker shaft mechanism, reverse procedure used to remove it.

n. TO REMOVE CODE BAR RESET BAIL (Figure 5-6).

(1) From under side of base, remove 153841 screw with lock washer and 181247 screw from two 180930 bearings (see Figure 5-7).

(2) Lift 180928 code bar reset bail from casting.

(3) To replace code bar reset bail, reverse procedure used to remove it. In replacing 153841 screw, make sure it passes through 180776 spring bracket before entering bearing.

o. TO REMOVE SPACING DRUM MECHANISM (Figure 5-7).

(1) Remove 119653 retaining ring from top of spacing drum and remove drum.

(2) From under side of base, remove the 112626 nut and lock washer from lower end of spacing drum shaft.

(3) Lift spacing drum shaft from base.

(4) To replace spacing drum mechanism, reverse procedure used to remove it.

p. TO REMOVE CARRIAGE DRIVE BAIL (Figure 5-3).

(1) Loosen 180798 mounting screw and remove 181230 clamp plate at left end of carriage drive bail (see Figure 5-6).

(2) Remove 119651 retaining ring and felt washer at right end of bail.

(3) Remove drive bail by sliding it to left.

(4) To replace drive bail assembly, reverse procedure used to remove it.

q. TO REMOVE SPACING PAWL MECHANISM (Figure 5-6).

(1) Unhook 76397 spring from 181067 feed pawl, 70466 spring from 181065 check pawl, and 70388 spring from 181319 carriage return lever.

(2) Remove 119649 retaining rings from 181314 carriage return link and 181068 spacing lever.

(3) Loosen two 180798 mounting screws.

(4) Lift spacing pawl mechanism from casting.

(5) To replace spacing pawl mechanism, reverse the procedure used to remove it.

r. TO REMOVE FUNCTION LEVER MECHANISM (Figure 5-7).

(1) Loosen three 180798 mounting screws and rotate levers' pivot shaft so flat side is vertical.

(2) To remove any function lever unhook its spring and disengage lever from pivot shaft.

(3) To remove lever's pivot shaft, remove two 180797 clamp plates and 180795 spring bracket. Lift out shaft with two drive links attached.

(4) To replace function lever mechanism, reverse the procedure used to remove it.

5-4. KEYBOARD AND CALL CONTROL ASSEMBLY.

a. TO REMOVE KEYBOARD AND CALL CONTROL ASSEMBLY (Figure 5-9).

(1) Remove keyboard plug (marked K) from receptacle on call control assembly (Figure 5-2).

(2) Remove four 121551 mounting screws and remove call control assembly.

(3) Disengage keyboard cable from 182531 cable clips on sub-base.

(4) Loosen two 180798 keyboard mounting screws. Slide keyboard assembly to rear and lift it from sub-base.

(5) To replace keyboard assembly, reverse procedure used to remove it.

CAUTION

Make sure that plug is mated with similarly designated receptacle.

b. TO REMOVE KEYBOARD COVER (Figure 5-9).

(1) Remove 119652 retaining ring from each side of keyboard cover.

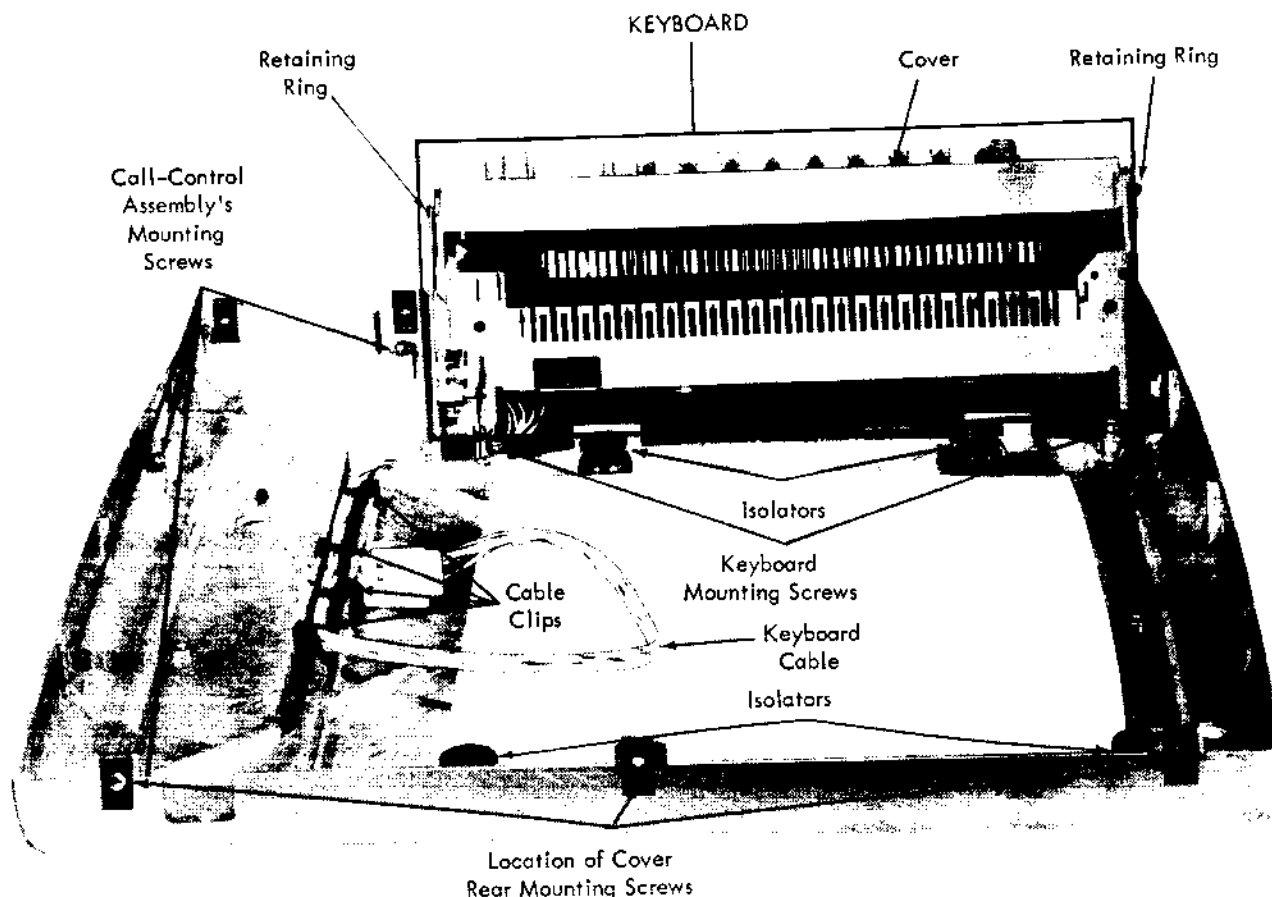


Figure 5-9. Sub-Base with Keyboard — Rear View

(2) Disengage cover from right and left side brackets.

(3) Lift cover off keys.

(4) To replace keyboard cover, reverse procedure used to remove it.

c. TO REMOVE MISCELLANEOUS PARTS (Figure 5-10).

(1) To remove any keylever, depress front end of 180086 universal lever. Depress keylever, disengage it from front or rear guide slot, and lift it out of keyboard frame. Note that certain levers have compression springs on their lower stems so that the springs may be properly replaced during reassembly.

(2) To remove space bar mechanism, remove space bar with attached keylever. Bow 180056 space lever and disengage it from two 180055 space keylevers. Disengage space key-

levers from guide slots and remove them from frame. Note position of compression springs on keylever's lower stems so that they can be properly replaced during reassembly.

(3) Code bars may be removed after all keylevers are removed. Disengage bars from T-levers and lift out of keyboard frame.

(4) To remove keyboard contact mechanism, remove right side bracket by snapping it off frame. Remove contact mechanism. Note positions of 180031 compression springs so that they may be properly replaced during reassembly. Remove contact mechanism.

(5) To remove two T-lever shafts, spread frame and lift out. To remove T-levers, remove 119653 retaining rings and slide levers off their shafts.

(6) To replace miscellaneous parts, reverse procedure used to remove them.

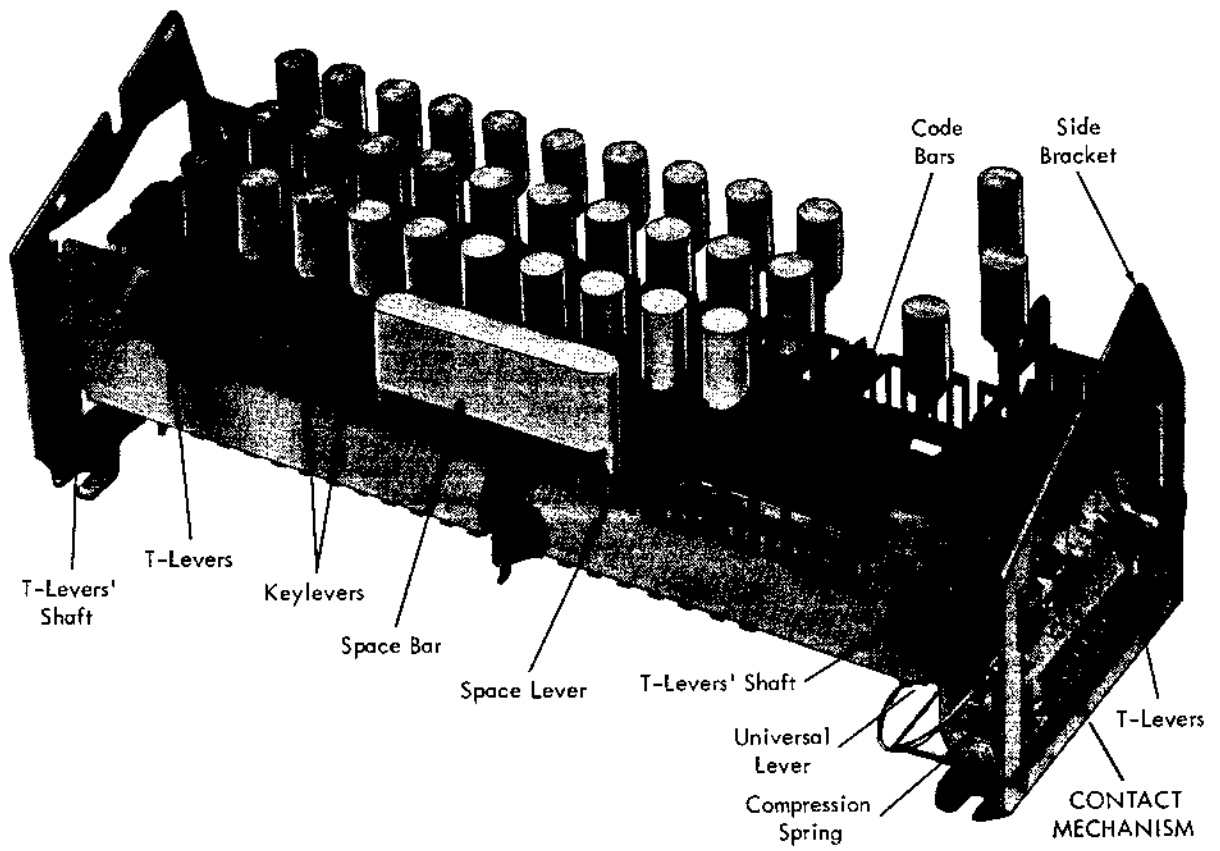


Figure 5-10. Keyboard — Front View — Cover Removed

5-5. TAPE READER.

CAUTION

The tape reader feed magnet and trip magnet operate under high voltage. Precautionary measures should be taken whenever power to the reader is turned on. High voltage will persist from the power pack until approximately 10 seconds after disconnect.

a. The disassembly procedure given in this section will break the Tape Reader down into its major assemblies and mechanisms. If further disassembly is required, refer to Bulletin 1184B which shows detailed arrangements of parts. Where it will help in determining their location, the numbers of the parts are given in the instructions.

b. The Tape Reader and Cover are assembled at the factory.

c. The 183046 Tape Reader Cover is fastened to the printer cover with two sets of 181244 Screws, 7002 Washers, 124177 Lock Washers, and 3598 Nuts.

(1) The two covers are assembled with the bottom surface of the covers flush with each other.

(2) There shall be equal clearance on three sides between the top plate assembly and the 183046 Tape Reader Cover. Position the 183047 Tape Reader Base with its three mounting screws friction tight.

d. Assembly of Reader Base to Printer Base (Figure 5-11).

(1) The 183047 Reader Base is fastened to the printer base with two 181244 Mounting Screws "A" and 153538 Mounting Screw, 7002 Washer, 124177 Lock Washer, and 3598 Nut "B". For assembly, the following procedure must be adhered to:

(2) Insert and tighten mounting screws "A" with the 183047 Reader base held firmly against side of printer base.

(3) Assemble and tighten mounting screw "B".

(4) To disassemble above items reverse the assembly procedure.

e. To Remove Reader Cable Assembly

(1) On Model 32 ASR, remove tape reader (marked R 1); on Model 33 ASR, remove tape reader plug (marked 6).

(2) Remove plug from power pack.

(3) Remove two 182726 Push-On Terminals from the tabs of the reader contact assembly.

(4) Remove any cable clamps necessary.

(5) Remove five 121551 Call Control Bracket Mounting Screws.

(6) Lift call control unit and remove reader cable which is located under the call control unit.

(7) Replace call control unit.

(8) Remove three 181244 Mounting Screws, 7002 Washers, and 124177 Lock Washers, from reader mounting bracket.

(9) Lift reader cable and assembly out.

(10) To replace Reader Cable Assembly, reverse procedure used to remove it.

f. To Remove Contact Block Cable Assembly.

(1) On Model 32 ASR, remove tape reader plug (marked R 1); on Model 33, remove tape reader plug (marked 6).

(2) Remove plug from power pack.

(3) Remove two push-on terminals from tabs of the reader contact assembly.

(4) Remove any cable clamps necessary.

(5) Remove five 121551 Call Control Bracket Mounting Screws.

(6) Lift call control unit and remove reader cable which is located under the call control unit.

(7) Replace call control unit.

(8) Remove two push-on terminals from tabs of the feed magnet coil.

(9) Remove the 3598 Nut on the 183026 Contact Block Shaft and slide shaft until it is out of the body hole of the 183036 Mounting Plate.

(10) Pull the 183049 Contact Block towards the front of the unit until the contact block mounting slots are disengaged from the 183048 Top Plate Bracket Mounting slots.

(11) Remove the 183049 Contact Block and the cable assembly.

(12) To replace contact block cable assembly, reverse procedure used to remove it.

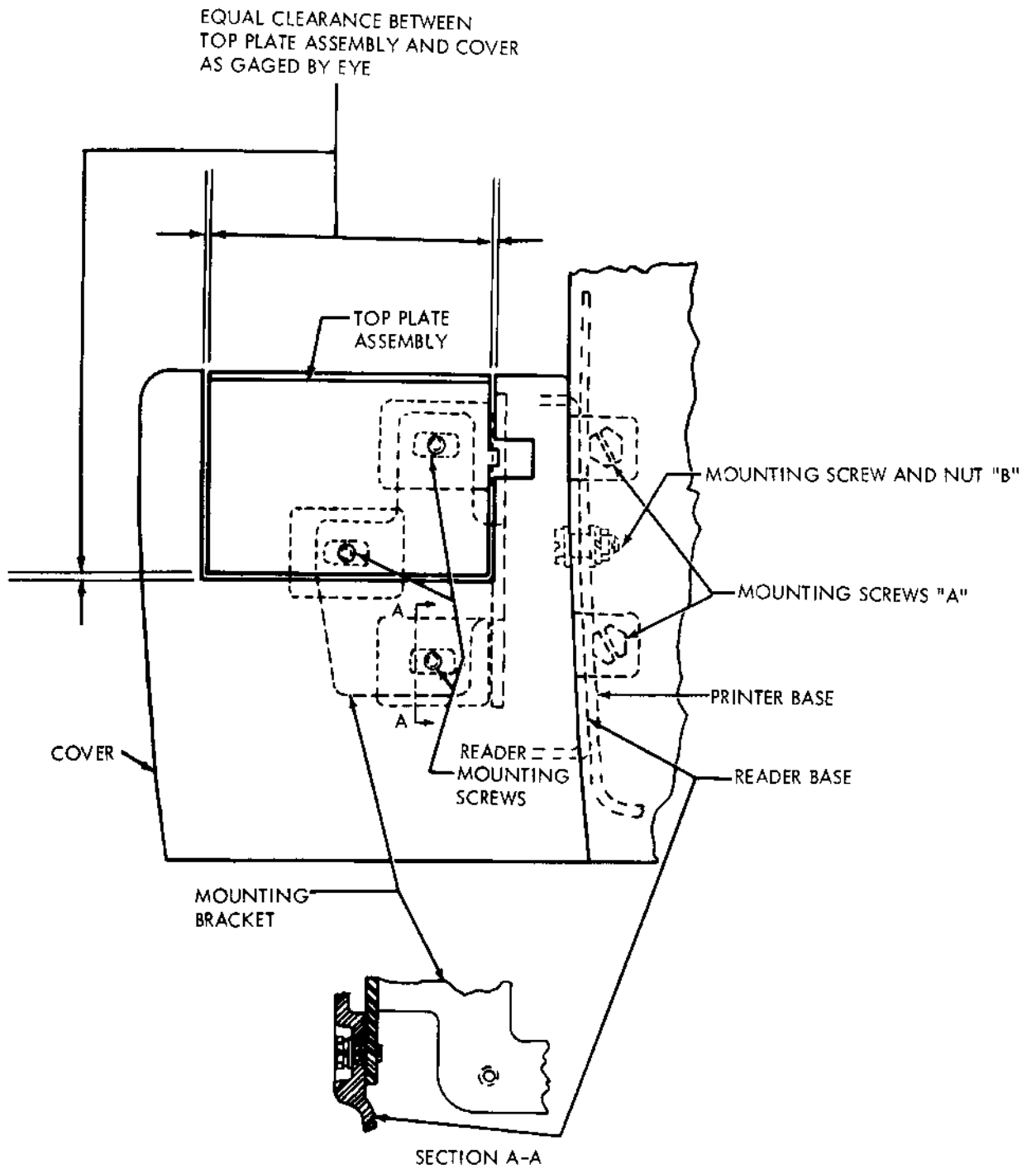


Figure 5-11. Tape Reader and Cover

g. To Remove Reader Cable Assembly.

- (1) Remove contact block cable assembly.
- (2) Remove the 182726 Push-On Terminal tab of 183050 Common Bar.
- (3) Remove all other terminals with Extraction Tool No. 182697.
- (4) To replace reader cable assembly, reverse procedure used to remove it.

h. To Remove Sensing Pin Assembly.

- (1) Remove two 151152 Mounting Screws, 110743 Lock Washers, and 104807 Flat Washers, which mount the 183035 Sensing Pin Guide.
- (2) Remove sensing pin assembly.
- (3) To replace sensing pin assembly, reverse procedure used to remove it.

i. To Remove the 182139 Feed Magnet Assembly.

- (1) Remove contact block assembly.
- (2) Remove sensing pin assembly.
- (3) Unhook the 90517 Detent Lever Spring from the 183023 Detent Bracket.
- (4) Unhook the 114107 Blocking Pawl Spring from the 183020 Blocking Pawl Bracket.
- (5) Remove three magnet bracket mounting screws. (One 151152 Screw, 110743 Lock Washer, and two 181241 Screws.)
- (6) Slide the 183011 Feed Pawl Stud out of engagement with the 183016 Blocking Pawl.
- (7) Remove feed magnet assembly.
- (8) To replace feed magnet assembly, reverse procedure used to remove it.

j. To Remove Feed Wheel Top Plate Assembly.

- (1) Remove contact block and cable assembly.
- (2) Remove sensing pin assembly.
- (3) Remove the 182139 Feed Magnet Assembly.
- (4) Unlatch the 183032 Tape Lid.

(5) Remove detent bracket 181241 Mounting Screw and feed wheel shaft 3598 Nut, and 124177 Lock Washer.

(6) Remove feed wheel top plate assembly.

(7) To replace feed wheel top plate assembly, reverse procedure used to remove it.

k. To Remove Reader Feed Contact Assembly.

- (1) Remove two push-on 182726 Terminals of the reader cable.
- (2) Remove two 152893 Reader Feed Contact Mounting Screws, 104752 Flat Washer, and 110743 Lock Washers.
- (3) Remove reader feed contact assembly.
- (4) To replace reader feed contact assembly, reverse procedure used to remove it.

l. To Remove Reader Trip Magnet Assembly.

- (1) Remove reader feed contact assembly.
- (2) On Model 32 ASR Units, remove plug P and with Extractor Tool No. 182697 remove terminals 4 and 5 (also terminals 1 and 6 on units with answer back).
- (3) On Model 33 ASR Units, remove plug 4 and with Extractor Tool No. 182697 remove terminals 11 and 12 (also terminals 4 and 5 on units with answer back).
- (4) To replace reader trip magnet assembly, reverse procedure used to remove it.

m. The Power Pack Assembly (Figure 2-11.) is snapped on (with two clips assembled to the power pack), to the front panel of the printer stand. Position power pack so it shall be spaced approximately 1/2 inch from the right panel of the printer stand.

5-6. TAPE PUNCH

a. The disassembly procedure given in this section will break the Tape Punch down into its major assemblies and mechanisms. If further disassembly is required, refer to Bulletin 1184B which shows detailed arrangements of parts. Where it will help in determining their location, the numbers of the parts are given in the instructions.

b. Base, Cover Assembly (Figure 5-12). The 182913 Tape Punch Base mounts to the left

rear side of the Model 32 or Model 33 Printer Base with three 153538 Screws, six 7002 Flat Washers, three 124177 Lock Washers and three 3598 Nuts, placed in the three slots located in both bases. Line up the back end of the tape punch base with the back end of the printer base, engage the locating tabs on the tape punch base with the printer base and tighten screws. To disassemble base from printer base, reverse procedure used to assemble it to printer base.

c. To Remove Punch Block Assembly

(1) Loosen and remove the two 153817 Mounting Screws, and 110743 Lock Washers.

(2) Slide the punch block assembly forward until the tongue in the punch block holder and the punches disengage the groove in the 182903 Tape Punch casting and 182813 Code Levers respectively.

d. To Assemble Punch Block Assembly

(1) Position the slots in the punches so that they face the guide pin. The bottom of the punches should be in line and in a position that approximates their position when on the tape punch.

(2) Line up the punch slots with their levers and reverse the procedure in paragraph c.

e. To Remove Tape Chute Assembly

(1) Mark the groove where the tension spring end is positioned (pencil or other suitable mark).

(2) Unhook the 72468 Tension Spring, remove the 182936 Arm with bushing and then loosen and remove 182845 Mounting Screw.

(3) Remove the 181244 Mounting Screw from the tape chute assembly.

(4) To replace tape chute assembly reverse the above procedure making sure the spring is positioned in the marked groove of the arm with bracket.

f. Punch Pawl and Lever Assembly

(1) To provide easy disassembly and reassembly of the punch pawl and lever on to its 182824 Mounting Post always assemble the ball of the lever into the socket of the pawl and keep the two joined together by its 42661 spring. The tension of the spring will keep the two together in one plane, thereby permitting easy handling.

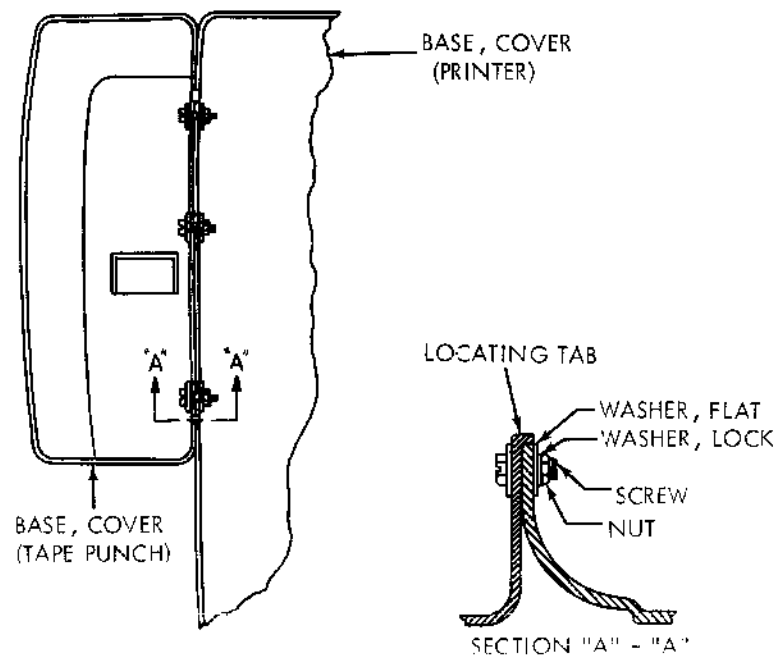


Figure 5-12. Tape Punch Base and Cover

(2) Where the spring does not supply a force to keep the two together apply finger pressure on the ends of the levers in the same direction as the spring. This procedure simulates the spring and also provides for easy handling.

(3) Following either of these procedures will allow the pawl, lever and spring to be easily disassembled or assembled.

(4) Once assembled to the unit the slotted plate of the post, bracket and plate assembly keeps the pawl, lever combination in a plane.

g. To Remove Post, Bracket and Plate Assembly.

(1) Never disassemble the post, bracket and plate assembly prior to removing the pawl, lever and spring combinations. The slotted plate keeps the ball and socket of the lever and pawl in full engagement.

(2) Prior to removing the 182821 Post, 182893 Bracket and 182822 Plate, always remove the pawl, lever and spring combinations. To remove, loosen and remove the 181244 Screw. To assemble, always mount the post bracket and

plate assembly before assembling the pawl, lever and spring combination. To position refer to adjustment section.

h. To Remove Pawl and Sensing Lever Guide Plate

(1) Unhook sensing lever 182909 Spring and rotate sensing levers out of way. Loosen and remove the 181242 Screw and 3598 Nut.

(2) Remove the 182815 Sensing Lever Guide Plate.

(3) To assemble reverse the procedure used to remove it. However before tightening the screw, push the plate downward to take up all the play. Viewing the tape punch from the left side, position the plate in a horizontal to a slight counterclockwise direction from a horizontal plane as gaged by eye. Tighten screw and nut.

i. To Remove Chad Chute Assembly

(1) Remove the 182915 Extension. To remove the 182908 Chad Chute Assembly, loosen and remove the 151152 Screws and 110743 Lock Washer.

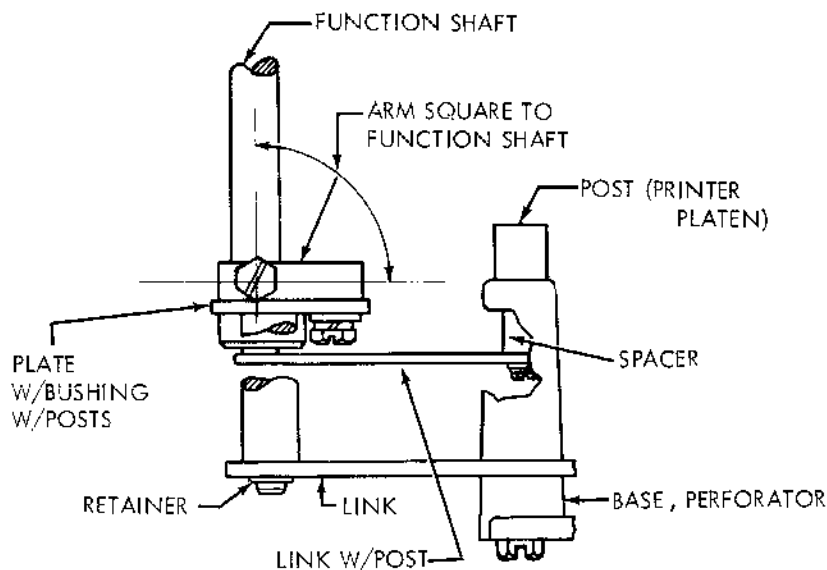


Figure 5-13. Perforator Drive Parts Assembly

(2) To assemble place the 0.010 inch lips on the top surface of die plate and 0.040 inch lip on the front face of the die plate. Line up the oblong holes of the plate with the holes in the punch block holder. Apply finger pressure on top of the chad chute assembly towards punch block assembly, assemble and tighten the 151152 Screws and 110743 Lock Washers. Reassemble the 182915 Extension.

NOTE

The assembly procedure is described for the following items. To disassemble these items reverse the assembly procedure.

j. Tape Punch Drive Parts Assembly (Figure 5-13).

(1) With the printer function shaft in the most forward position assemble the 182898 Arm on the function shaft. Line up the hole in the arm with the threads in the function shaft. Push down on the arm in line with the threads, assemble the 181231 Screw and tighten.

(2) Assemble the 182895 Plate w/bushing w/post and the 181245 Screw and 76461 Flat Washer.

(3) Center the screw head that secures the arm to the function shaft in the opening located in the plate w/bushing w/post and tighten screw.

(4) Assemble the 182902 Spacer, the 182900 Link w/post and 181249 Screw. With finger pressure applied to the link w/post in line with the function shaft, place the link into the bushing. After releasing finger pressure, the link w/post should spring back to its initial position. After releasing finger pressure, the link w/post should spring back to its initial position. If it does not spring back, loosen the link w/post screw, and the 180798 Screw on top of the 181045 Platen Mounting Post. Position post to satisfy this condition.

k. Tape Punch Assembly (Figure 5-14).

(1) The tape punch unit mounts on the left side of the Model 32 or Model 33 printer base casting with three screws and a nut plate.

(2) To assemble, manually set up the printer so that the 0, 1, 2, 3, 4, and 5 (in a five level printer) and the 0, 1, 2, 3, 4, 5, 6, and 7 (in eight level printer) code bars are in the marking

position. Place the code extensions in their respective code bar slots and the tape punch casting on the carriage rail. (The left end of the carriage rail protrudes 0.0189 inches nominally beyond the outside surface of the printer base casting's left front wall. If this condition is not present on the printer, loosen the carriage rail clamps and collars and move the carriage rail to the left so that the right end of the rail is flush as gaged by eye with the right vertical surface of the "V" groove. The rail on the left end will protrude 0.189 inches beyond the left surface on the left front mounting wall. This provides the tape punch casting with a nominal 0.094 inch rail to engage and locate from.) Place the nut plate on the inside surface and in line with the slots of the front wall of the printer's base casting. Assemble the middle screw first, then the rear screw and the most forward screw last. Tighten the screws in the same sequence. Assemble the drive link, retainer and the tension spring.

l. Lid Assembly (Figure 5-15).

(1) A 182912 Lid, four 182919 Buttons, a 182917 Spring and a 182932 Self Locking Nut form the lid assembly.

(2) To assemble, place the buttons into the lid holes.

(3) Engage each spring leaf with the button slot. Place the spring on the base and captivate with the self locking nut.

m. Cover Assembly (Figure 5-16).

(1) The tape punch unit cover consists of a 182922 Left Cover and 182921 Right Cover Assembly and the lid assembly.

(2) To assemble, secure the right cover to the left cover with three screws (two 182916 Screws and one 180798 Screw) thereby forming the left cover and right cover assembly. Secure this assembly to the printer cover with six screws, twelve flat washers, six lock washers, and six nuts. (Place the screw heads on the inside wall of the right cover.)

(3) Snap the lid assembly into place through the bosses located in both halves of the cover.

(4) This assembly plus the printer lid forms the cover for the five level and eight level automatic send-receive sets.

(5) Assemble the cover to the printer base in the same manner as in the send and receive sets.

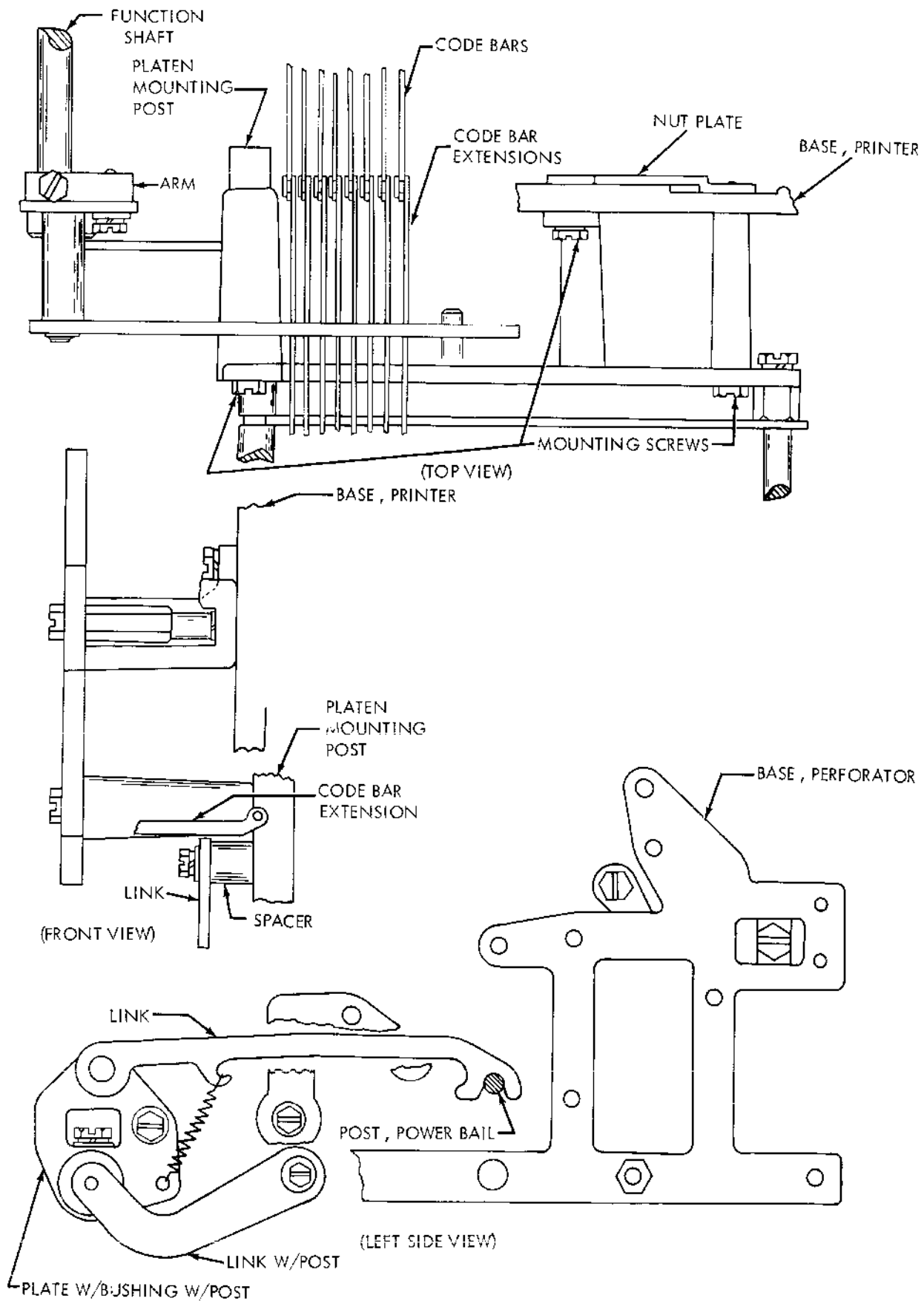
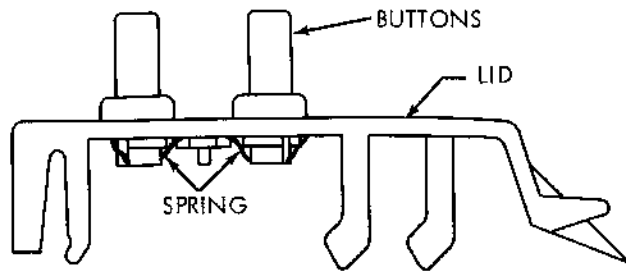
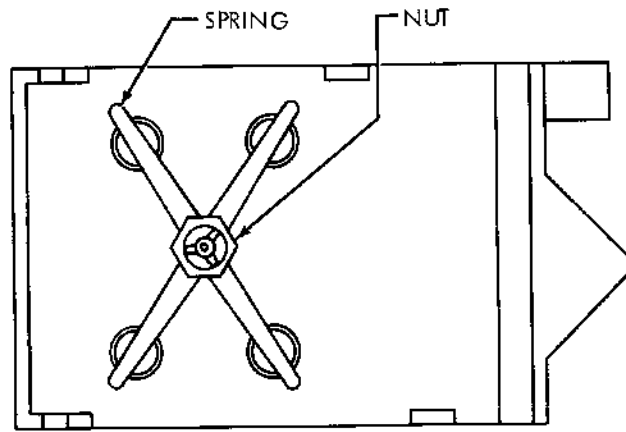


Figure 5-14. Tape Punch Assembly



(LEFT SIDE VIEW)



(BOTTOM VIEW)

Figure 5-15. Tape Punch Lid Assembly

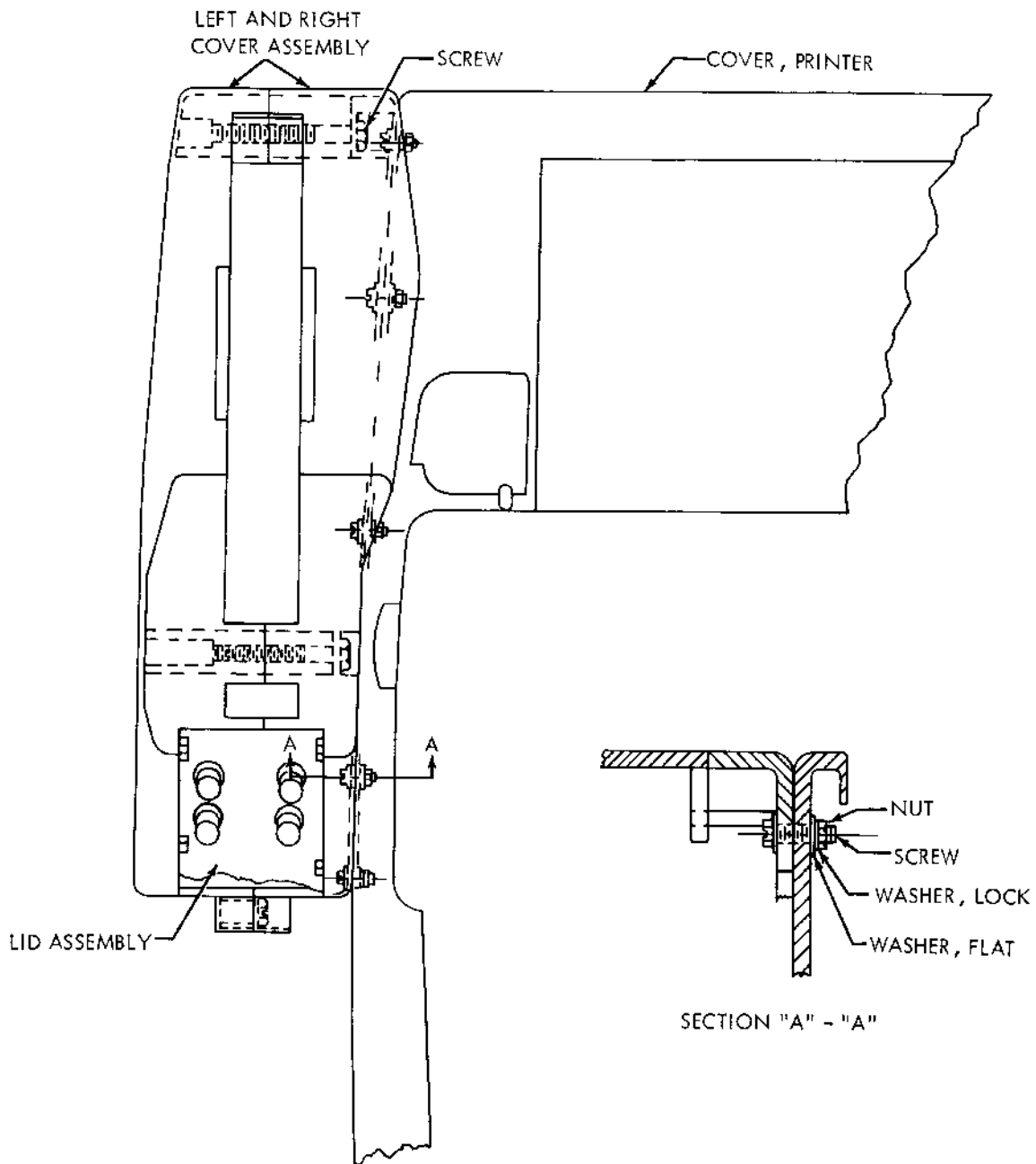


Figure 5-16. Tape Punch Cover Assembly

SECTION 6
LUBRICATION

6-1. GENERAL.

a. This section provides instructions for lubricating the Printer, Tape Reader and Tape Punch. The general lubrication areas are illustrated by photographs. The specific points to receive lubricant are indicated by line drawings with text, which follow the photographs. The drawings are keyed to the photographs by paragraph numbers.

6-2. GENERAL INSTRUCTIONS.

a. Thoroughly lubricate the Printer, Tape Reader or Tape Punch, but avoid over-lubrication that might permit the lubricant to drip or be thrown on adjacent parts.

b. Saturate all felt washers and oilers with oil, and apply oil to each end of all bearings.

6-3. LUBRICANTS.

Use the following lubricants:

- Oil - Teletype KS7470 Oil
- Grease - Teletype KS7471 Grease
- Grease - (Lubriplate 105)
- Teletype 108805 Grease

6-4. LUBRICATING INTERVALS.

Lubricate the Printer, Tape Reader or Tape Punch, before putting it in service or prior to storage. After a short period of service, re-lubricate it to make sure no areas have been missed. Thereafter, lubricate it at regular intervals as indicated below:

<u>Operating Speed</u> <u>(Words per Minute)</u>	<u>Lubrication</u> <u>Interval</u>
PRINTER	
60	1000 hours or 1 year*
100	500 hours or 6 months*

<u>Operating Speed</u> <u>(Words per Minute)</u>	<u>Lubrication</u> <u>Interval</u>
TAPE READER	
60	500 hours or 6 months*
100	250 hours or 3 months*
TAPE PUNCH	
60 or 66	1000 hours or 1 year*
100	500 hours or 6 months*

*Whichever comes first.

6-5. KEY TO TEXT.

a. The instructions that accompany the line drawings consists of an abbreviated direction (explained below), the specific lubrication point (e.g., pivot), and the part (e.g., carriage drive bail).

b. The points are divided into nine categories according to the type of lubrication they receive. These are indicated by the abbreviated directions on the line drawings as follows:

- G Apply thin coat of Grease.
- D Keep Dry - no lubricant permitted.
- OS Oil Sparingly (1 or 2 drops only).
- OSD Oil Sparingly or leave Dry#.
- OL Oil Liberally (3 or more drops).
- OSL Oil Sparingly or Liberally.
- OSAT Saturate with Oil (felt washers and oilers).
- L Apply a thin coat of Lubriplate.
- GOL Brush on well a mixture containing 50% KS7471 Grease and 50% KS7470 oil.

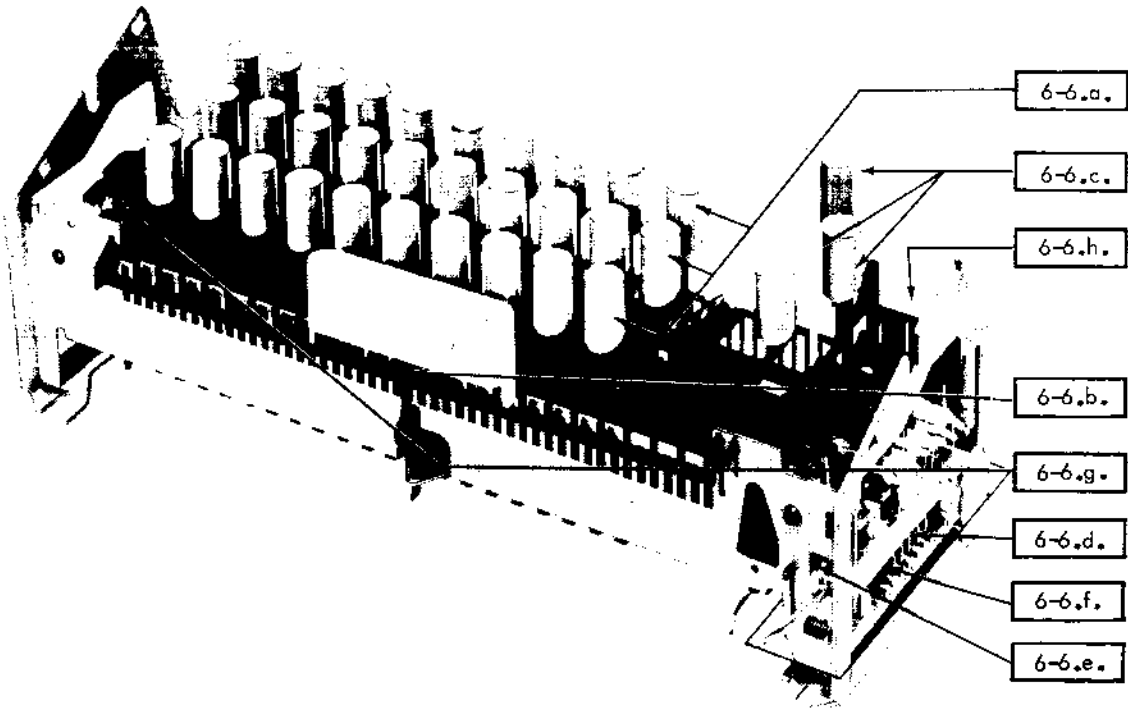
#Applies to all areas not contacted by other parts.

CAUTION

Do not clean the following with solvents:

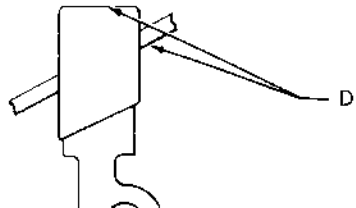
- Keyboard Contact Block
- Answer-Back Contact Block
- Platen Cover
- Cover and Window

6-6. KEYBOARD



(KEYBOARD - KEYTOP GUIDE REMOVED)

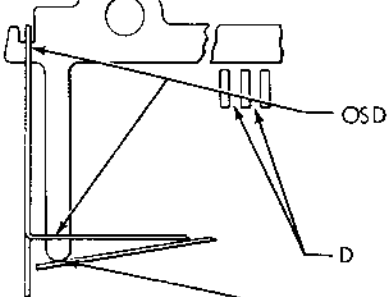
6-6.a. KEYLEVERS



TOP SURFACE

KEYTOPS AND GUIDE

6-6.b. SPACE BAR



GUIDE SLOTS

FRAME

AREAS BETWEEN BARS

CODE BARS

CONTACT SURFACE

KEYLEVER SPRINGS

CONTACT SURFACES (5)

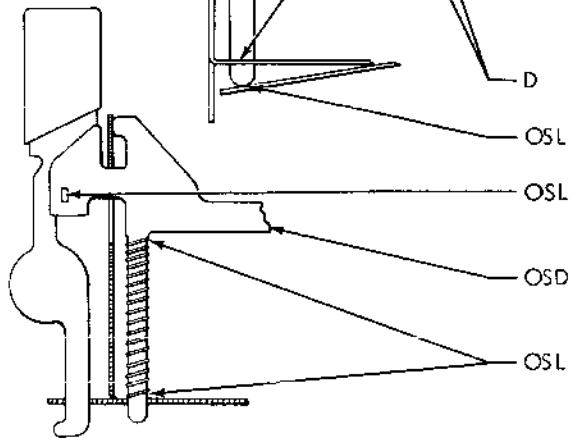
SPACE LEVER

SURFACES ENGAGING CODE BARS

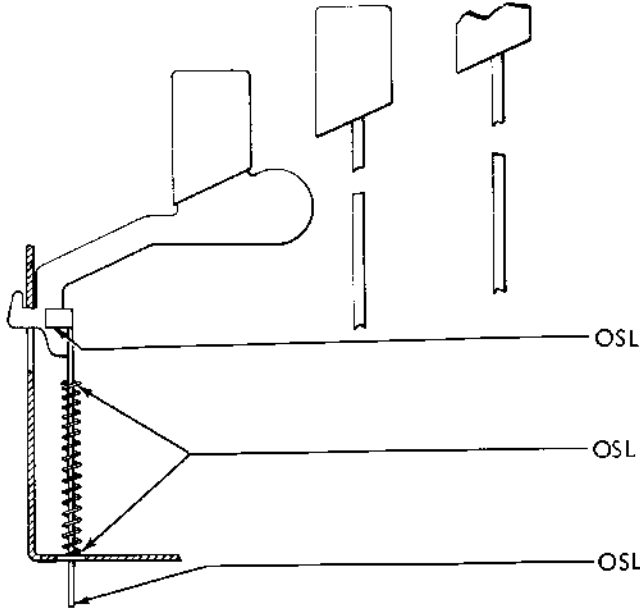
KEYLEVERS

SEAT (EACH END)

SPRINGS (2)



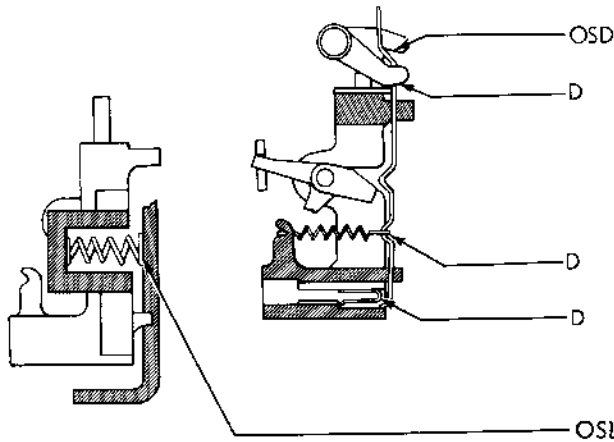
6-6.c. "HERE-IS," "BREAK" AND "REPEAT" KEYLEVERS



CAUTION
DO NOT CLEAN KEYBOARD CONTACT BLOCK WITH SOLVENTS.

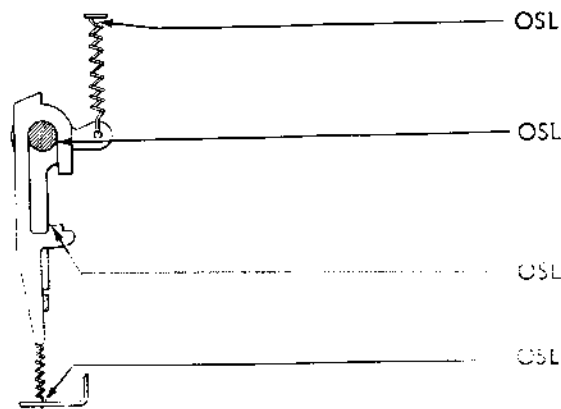
- OSL CONTACT SURFACES KEYLEVERS
- OSL SEAT (EACH END) SPRINGS (3)
- OSL CONTACT POINT "BREAK" KEYLEVER

6-6.d. CONTACT BLOCK



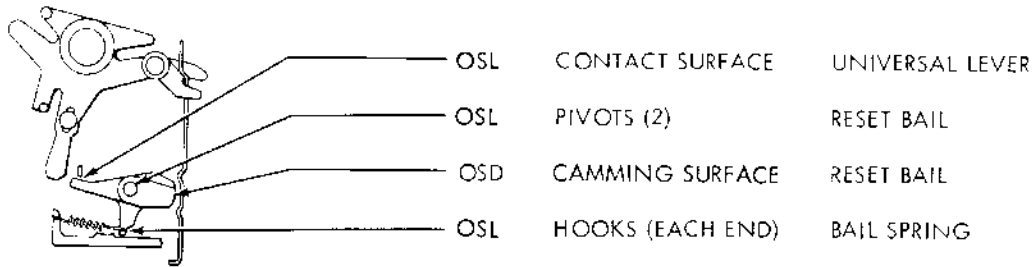
- OSD ENGAGING SURFACES T-LEVERS (6)
- D CONTACT SURFACE CONTACT WIRES (6)
- D SPRINGS (6) CONTACT WIRES
- D CONTACT SURFACE CONTACT WIRES (6)
- OSL SEAT (EACH END) SPRINGS (2)

6-6.e. LATCH LEVER HOOKS

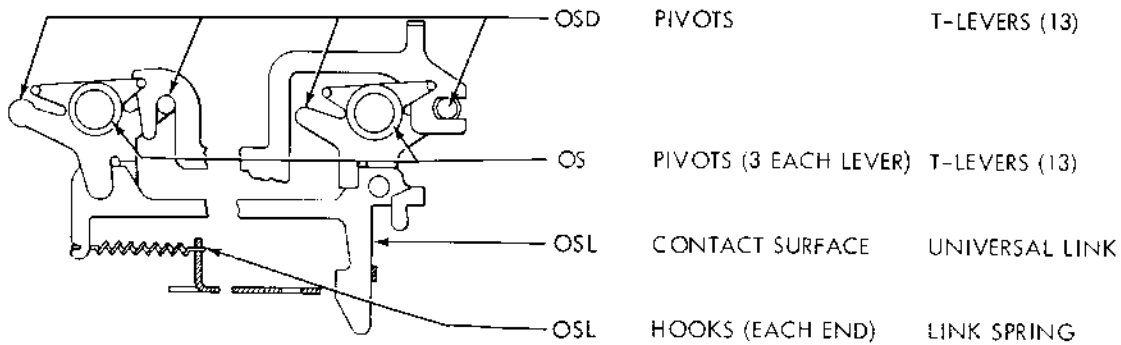


- OSL HOOKS (EACH END) LATCH LEVER SPRING
- OSL PIVOT LATCH LEVER AND NON-REPEAT LEVER
- OSL CONTACT SURFACE LATCH LEVER
- OSL HOOKS (EACH END) NON-REPEAT SPRING

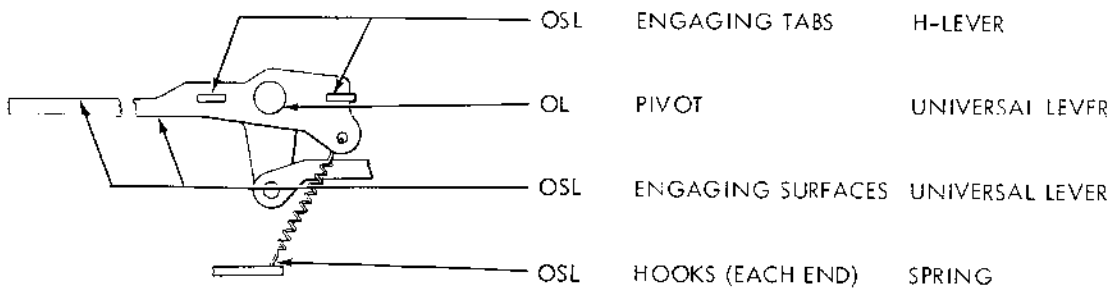
6-6.f. RESET BAIL

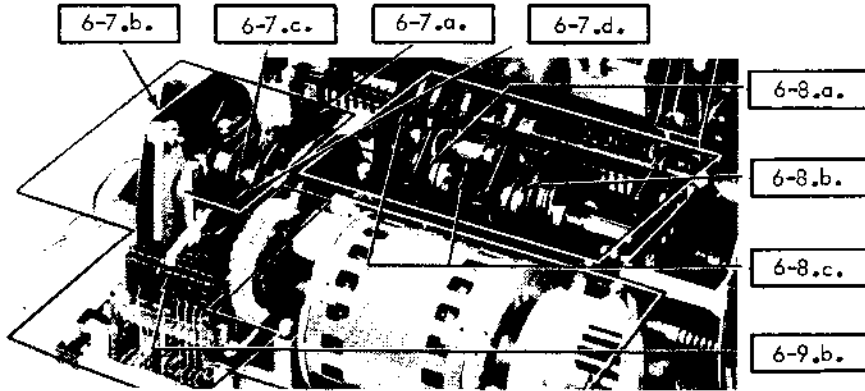


6-6.g. CODE BAR MECHANISM



6-6.h. UNIVERSAL LEVER

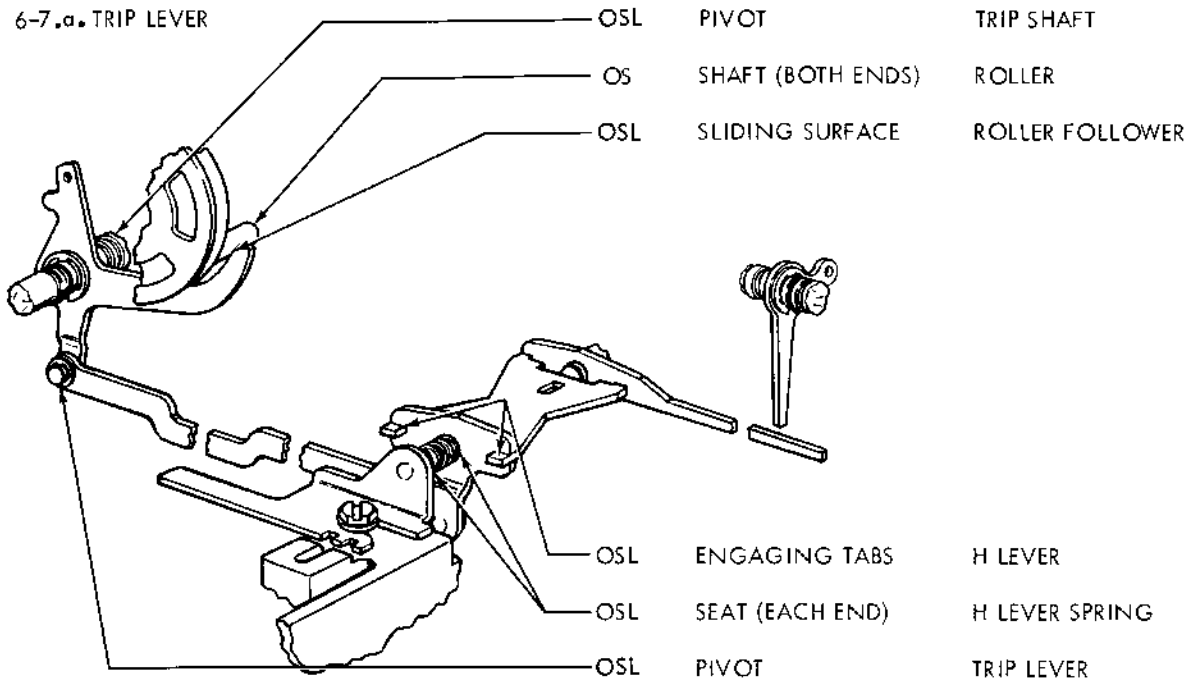




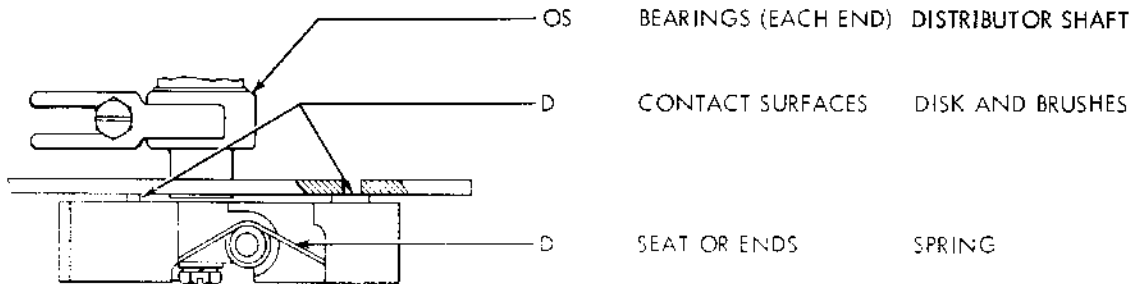
(REAR VIEW)

6-7. PRINTER - DISTRIBUTOR AREA

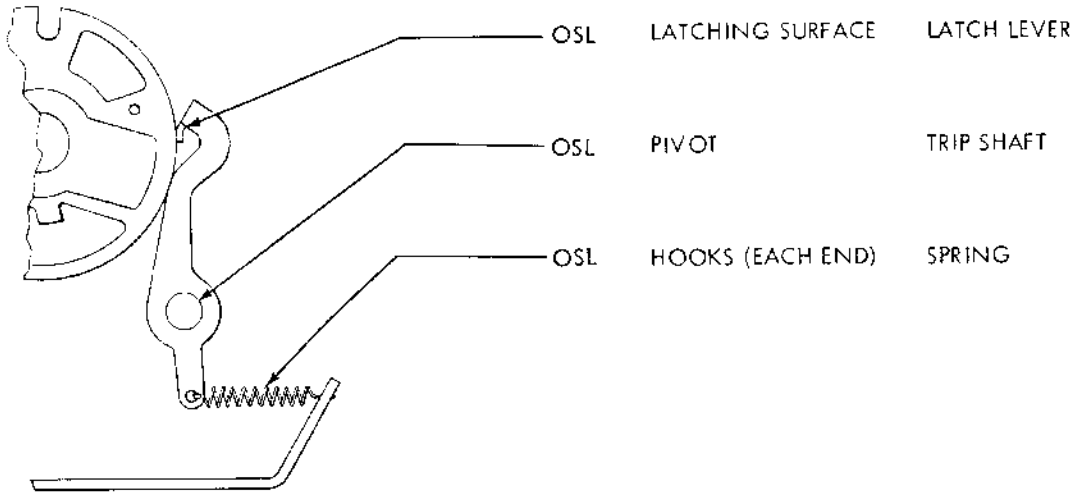
6-7.a. TRIP LEVER



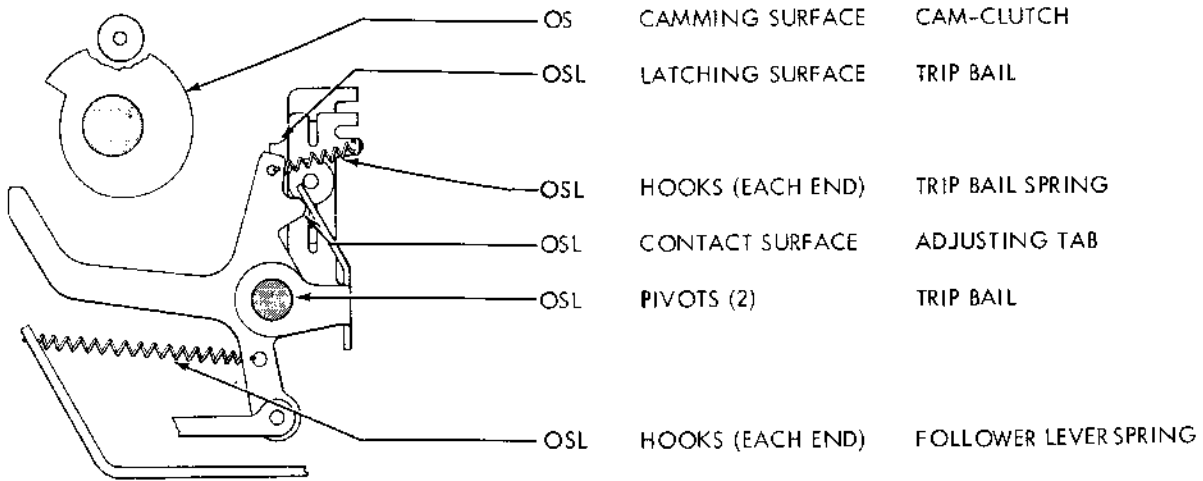
6-7.b. DISK AND BRUSHES



6-7.c. LATCH LEVER

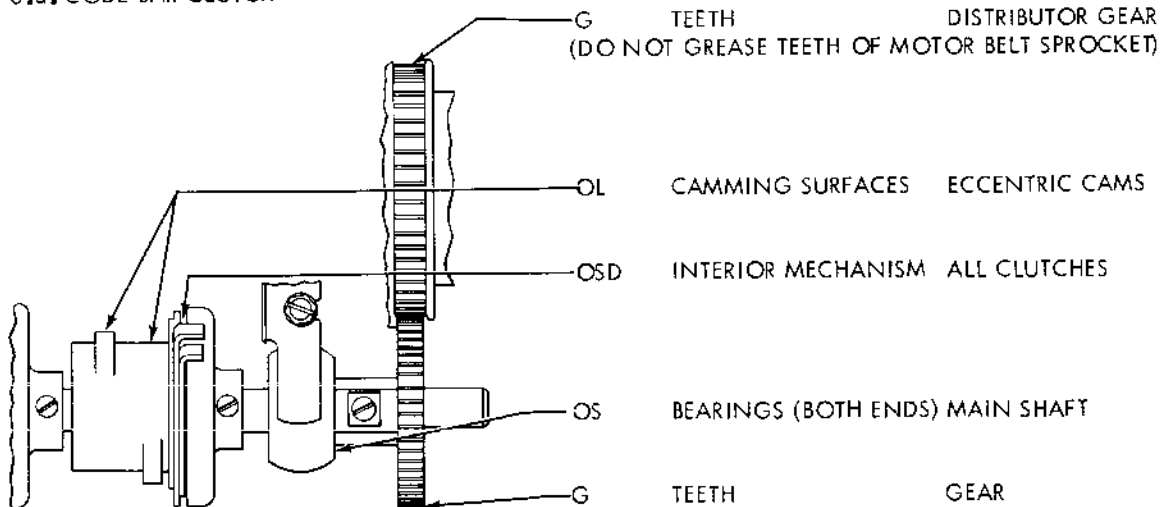


6-7.d. TRIP BAIL

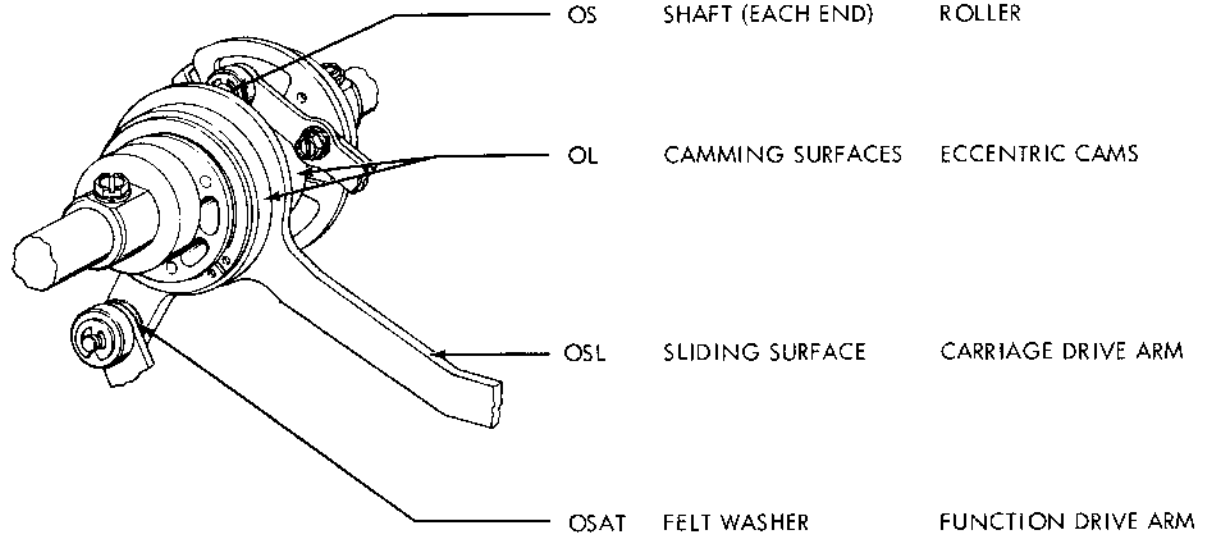


6-8. PRINTER - MAIN SHAFT

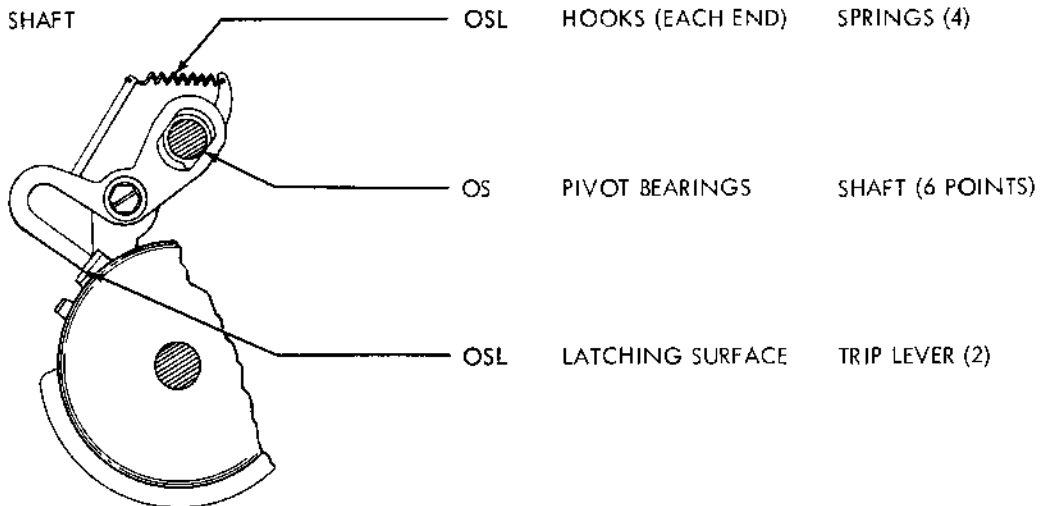
6-8.a. CODE BAR CLUTCH



6-8.b.FUNCTION CLUTCH

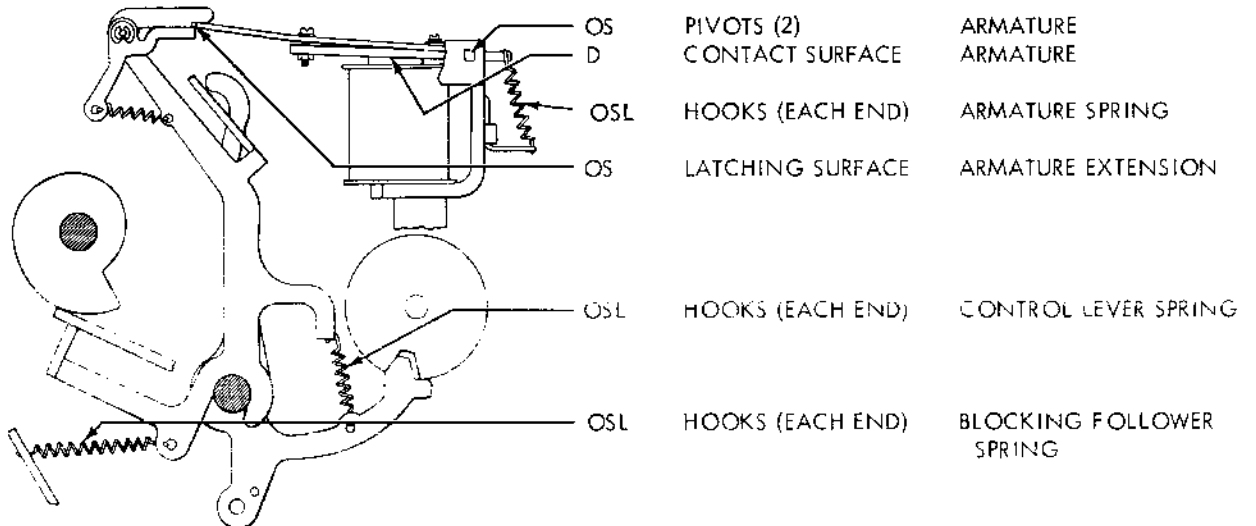


6-8.c. TRIP SHAFT

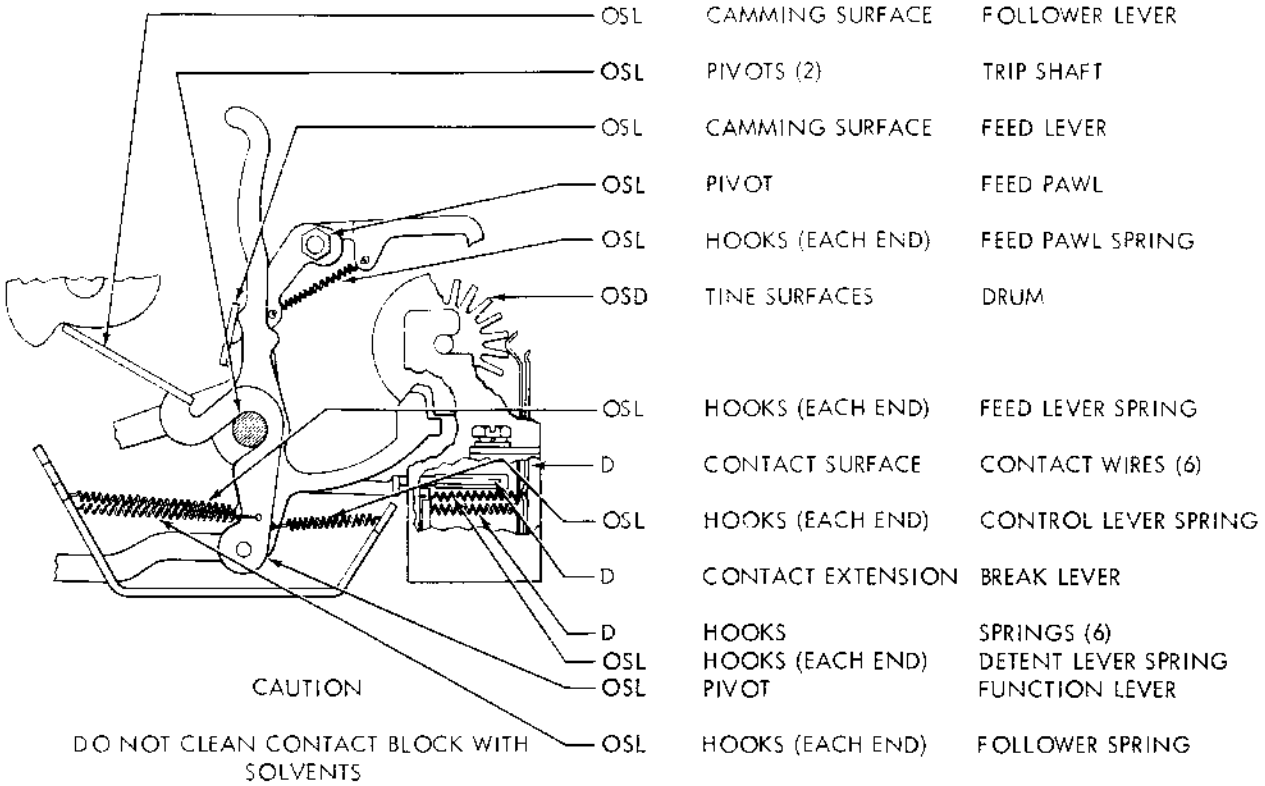


6-9. PRINTER - ANSWER BACK AREA

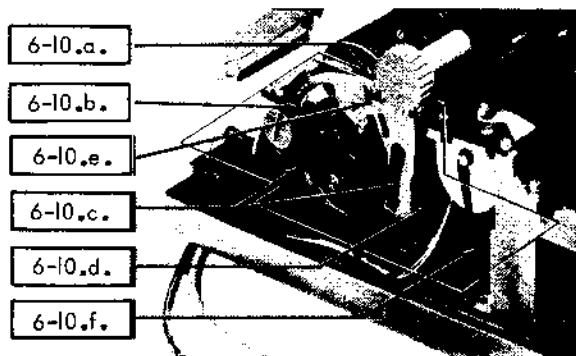
6-9.a. TRIP MAGNET - LOCATED ABOVE DRUM (NOT ILLUSTRATED PHOTOGRAPHICALLY)



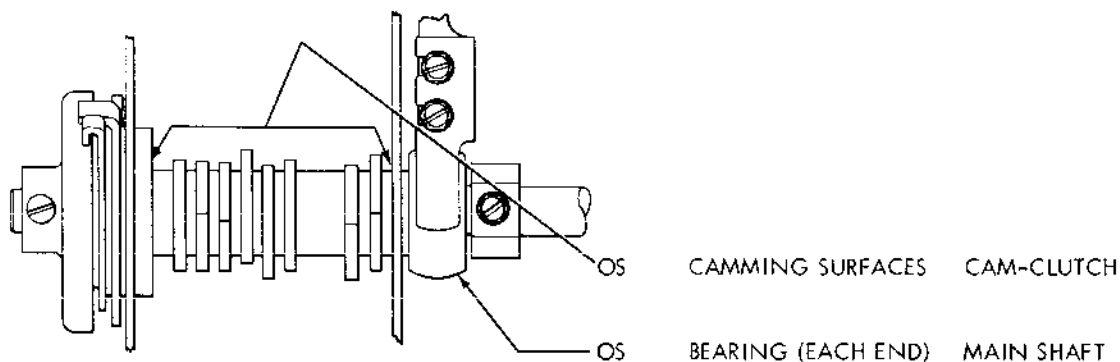
6-9.b. ANSWER-BACK MECHANISM



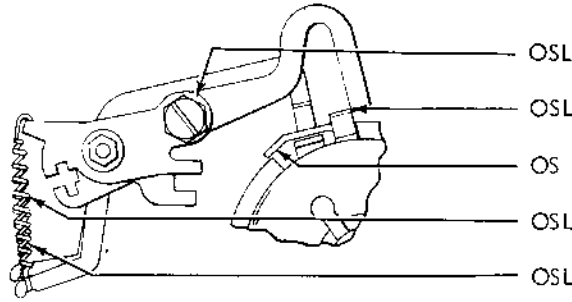
6-10. PRINTER - SELECTOR AREA



6-10.a. CAM-CLUTCH

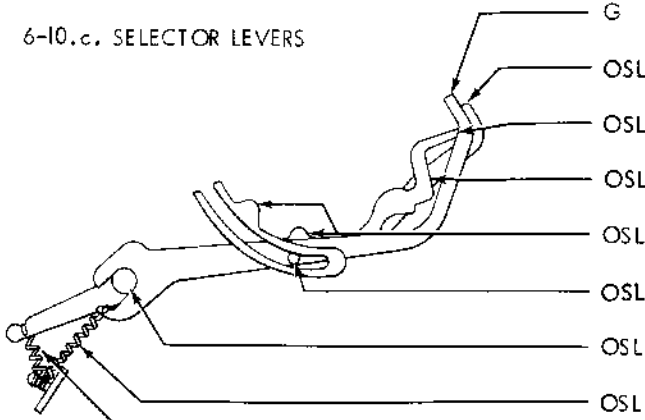


6-10.b. LATCH LEVER AND TRIP LEVER



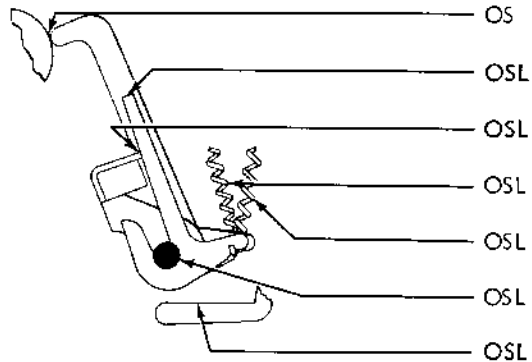
- OSL PIVOTS (2) LEVERS
- OSL ENGAGING SURFACE TRIP LEVER
- OS LATCHING SURFACE LATCH LEVER
- OSL HOOKS (EACH END) TRIP LEVER SPRING
- OSL HOOKS (EACH END) LATCH LEVER SPRING

6-10.c. SELECTOR LEVERS



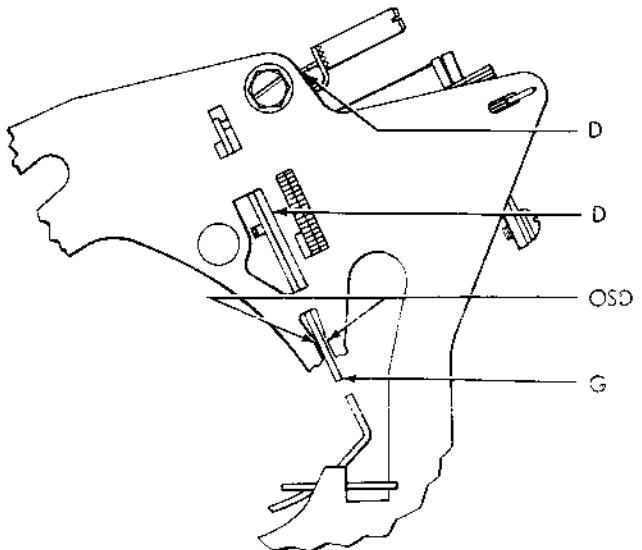
- G (AFTER OILING) TIP START LEVER
- OSL CONTACT SURFACE LOCK LEVER
- OSL CONTACT SURFACE SELECTOR LEVERS (6)
- OSL ENGAGING SURFACE SELECTOR LEVERS (6)
- OSL CAMMING SURFACE SELECTOR LEVERS (6)
- OSL SLIDING CONTACT START LEVER
- OSL PIVOTS (8) LEVERS
- OSL HOOKS (EACH END) START LEVER SPRING

6-10.d. PUSH LEVERS AND STRIPPER BAIL



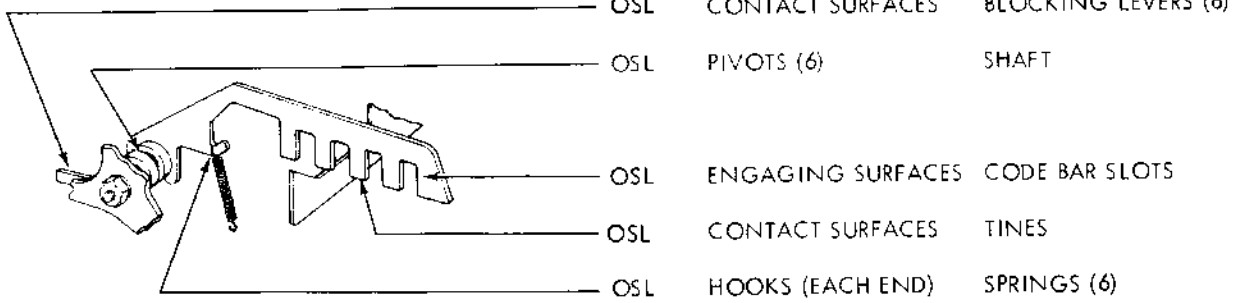
- OSL HOOKS (EACH END) SPRINGS (6)
- OS CAMMING SURFACE CAM FOLLOWER
- OSL LATCHING SURFACE PUSH LEVERS (6)
- OSL CONTACT SURFACE STRIPPER BAIL
- OSL HOOKS (EACH END) BAIL SPRING
- OSL HOOKS (EACH END) PUSH LEVER SPRINGS (6)
- OSL PIVOTS (6) PUSH LEVERS
- OSL CONTACT SURFACES BLOCKING LEVERS (6)

6-10.e. ARMATURE

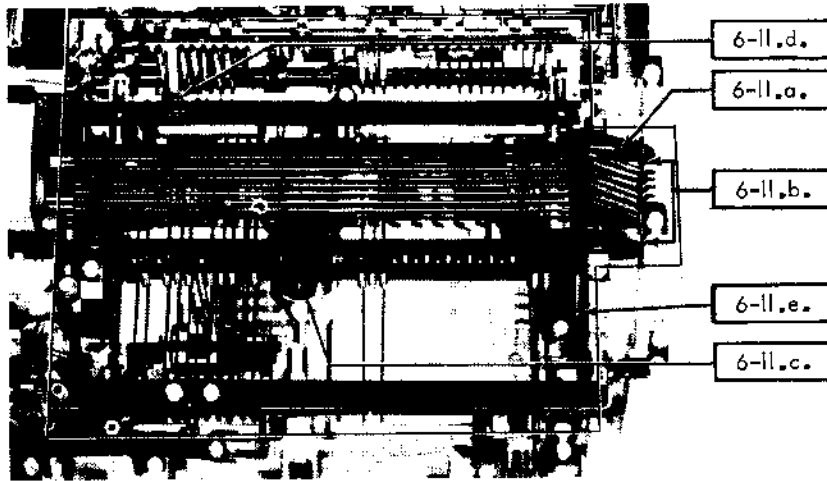


- D HOOKS ARMATURE SPRING
- D ENGAGING SURFACES ARMATURE
- OSD ENGAGING SURFACES SIDE PLATES
- G ENGAGING SURFACE ARMATURE

6-10.f. BLOCKING LEVERS

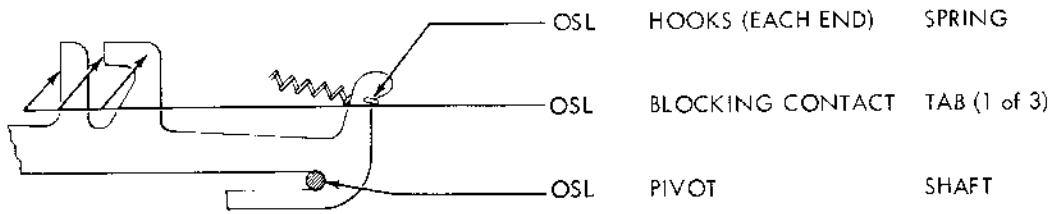


6-11. PRINTER - FUNCTION AREA

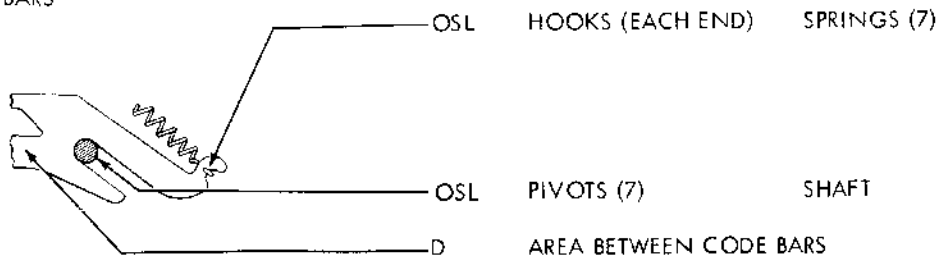


(PLATEN AND CARRIAGE REMOVED FOR ILLUSTRATION PURPOSES - REMOVAL FOR LUBRICATION IS NOT REQUIRED.)

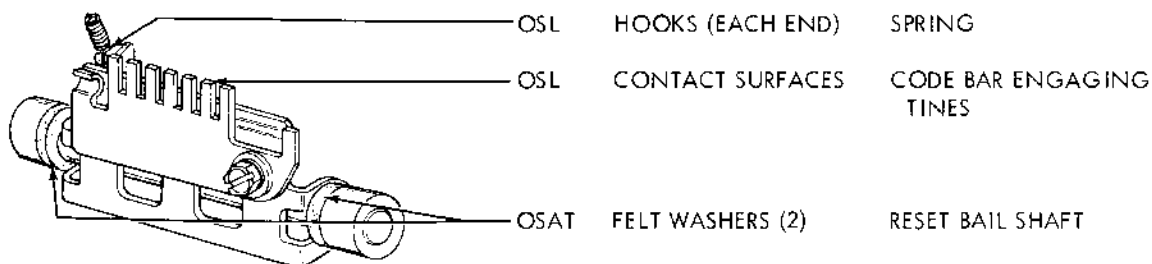
6-11.a. AUTOMATIC CODE BAR



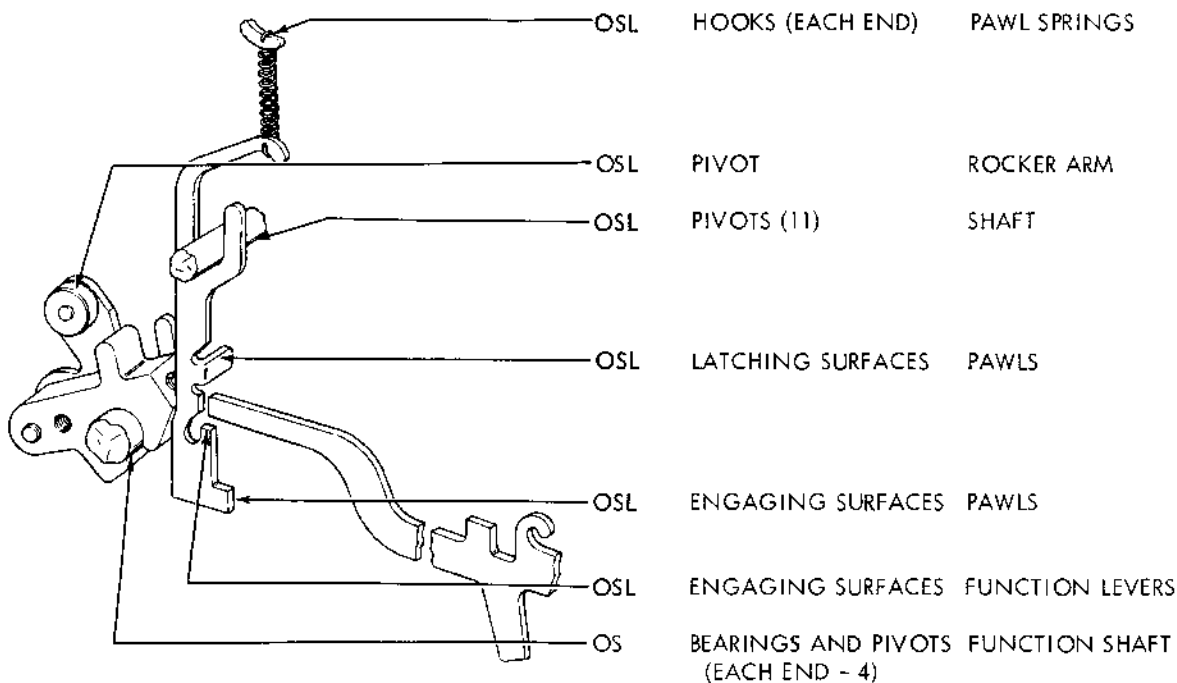
6-11.b. CODE BARS



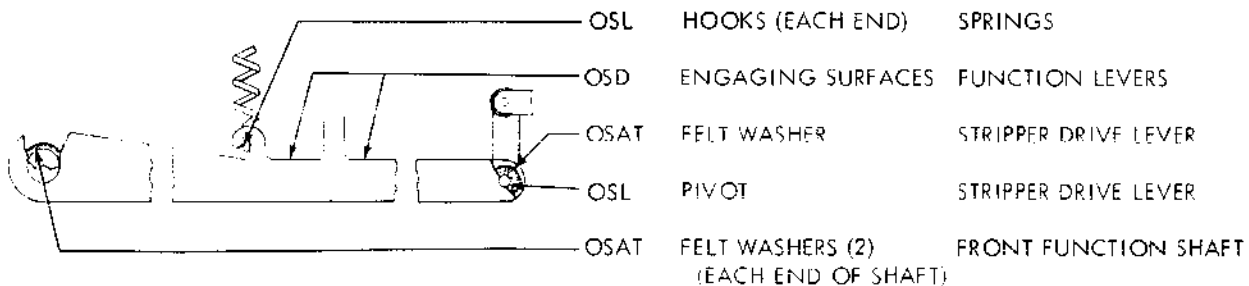
6-11.c. RESET BAIL



6-11.d. ROCKER AND PAWLS



6-11.e. FUNCTION LEVERS

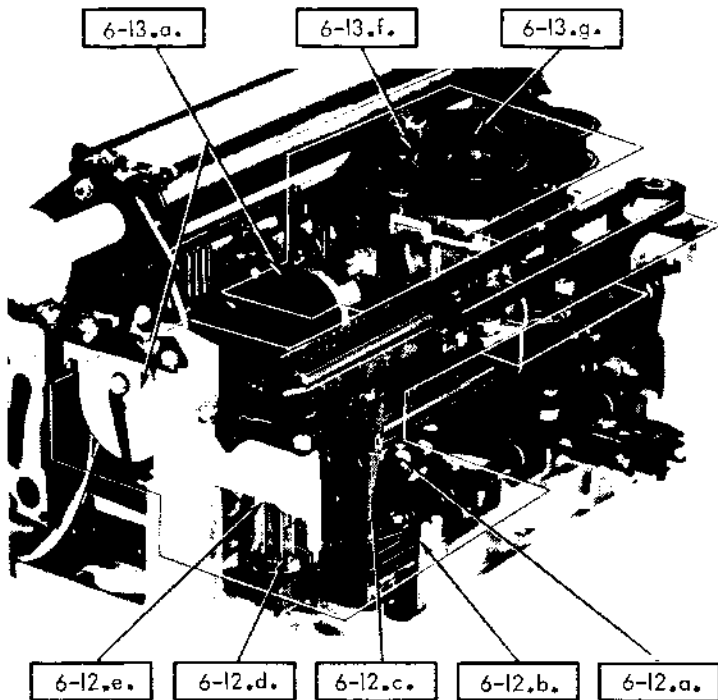


6-12. PRINTER - SPACING AREA

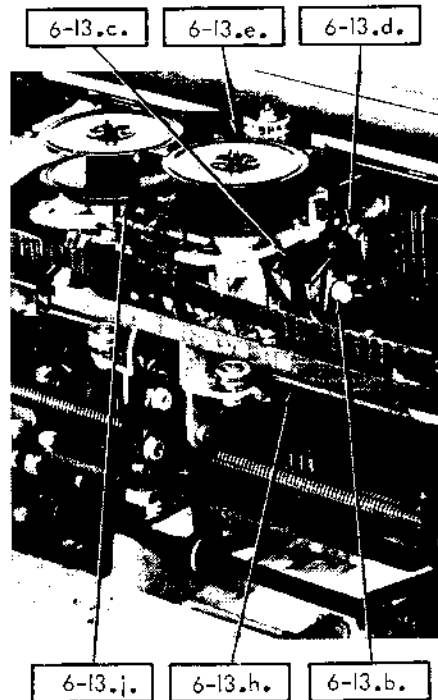
6-13. PRINTER - CARRIAGE AREA

NOTE

REMOVE RIBBON MECHANISM BEFORE LUBRICATING. SEE SECTION 5 FOR INSTRUCTIONS.

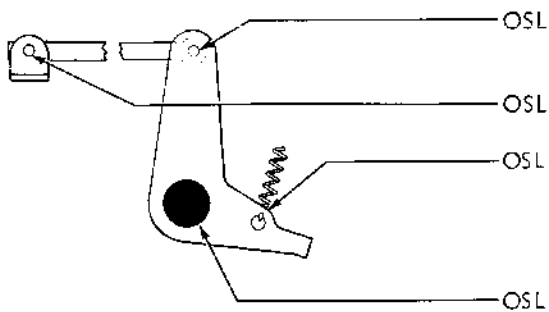


(LEFT FRONT)



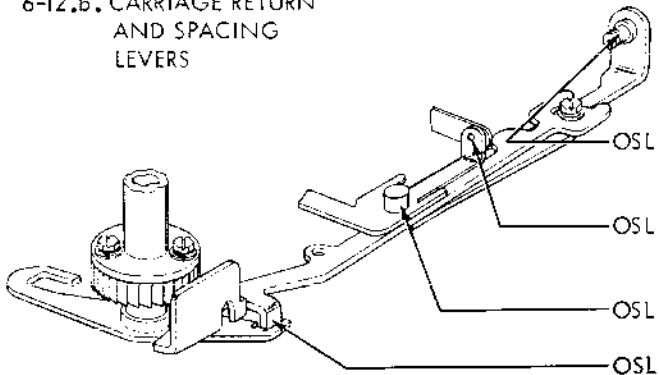
(RIGHT FRONT)

6-12.a. SPACE BELL CRANK



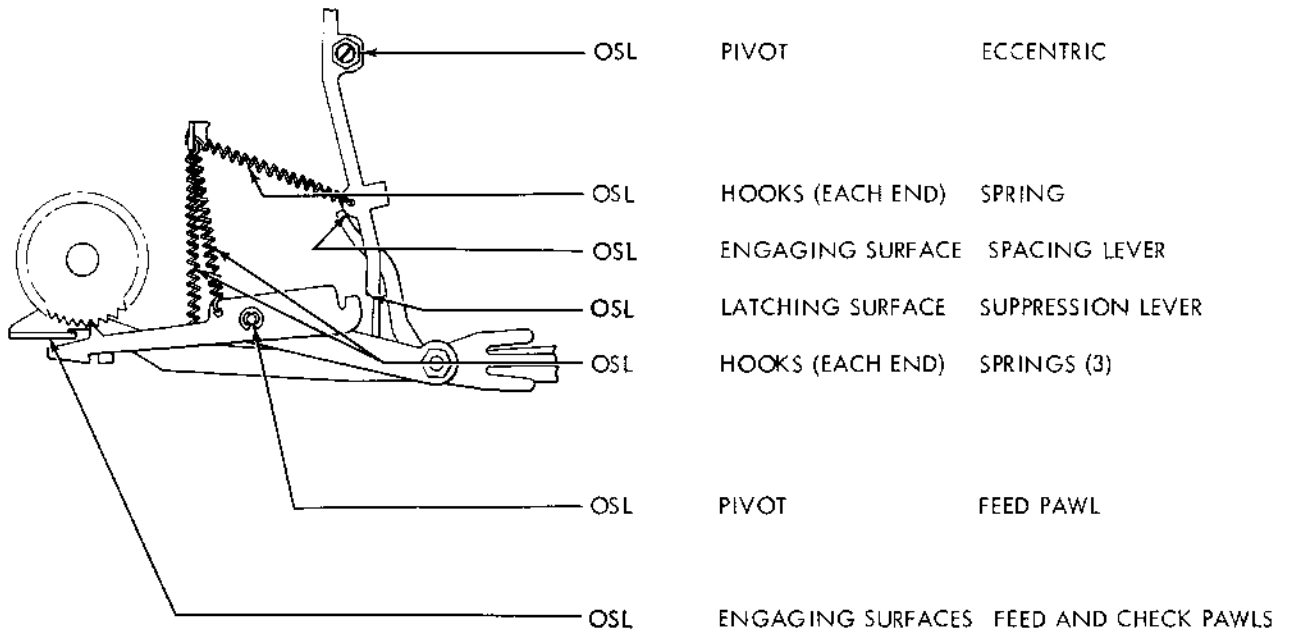
- OSL PIVOT BELL CRANK
- OSL PIVOT SPACING LEVER
- OSL HOOKS (EACH END) SPRING

6-12.b. CARRIAGE RETURN AND SPACING LEVERS

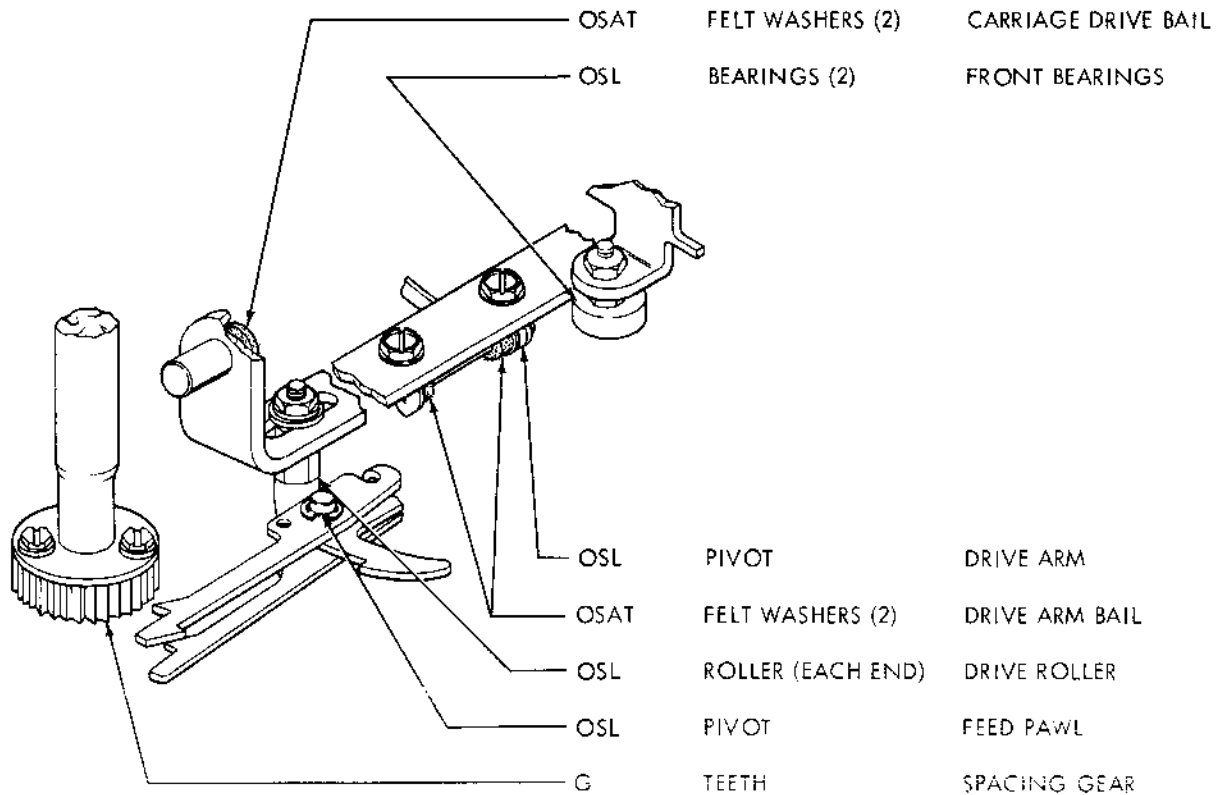


- OSL PIVOT BELL CRANK
- OSL PIVOT CARRIAGE RETURN LEVER
- OSL PIVOT SPACING LEVER
- OSL PIVOT SPACING MECHANISM
- OSL ENGAGING SURFACE LATCH

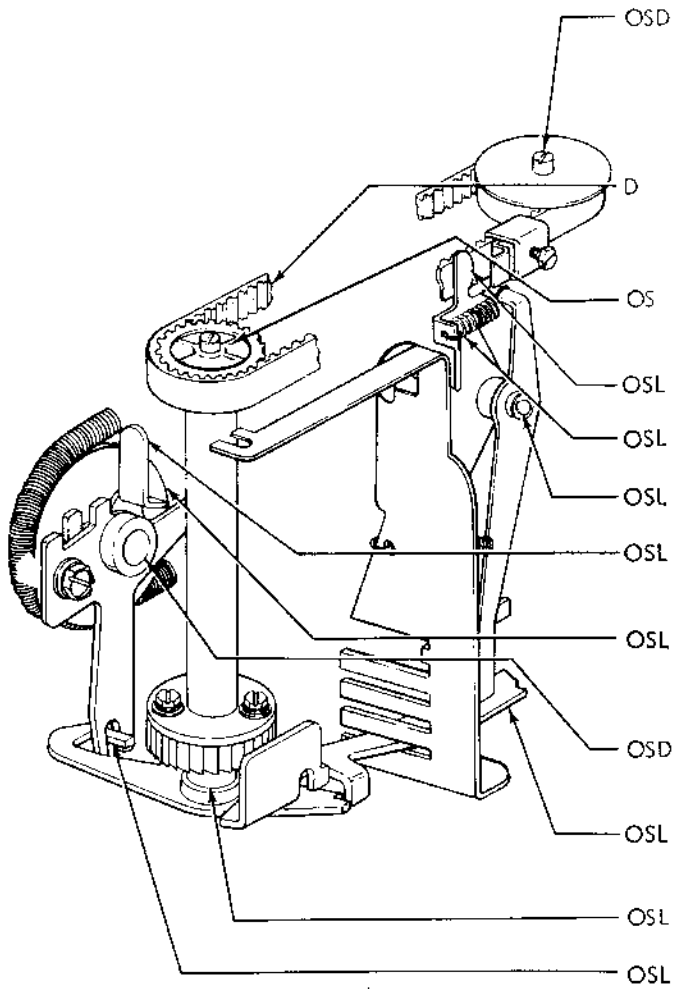
6-12.c. SPACING MECHANISM



6-12.d. DRIVE MECHANISM

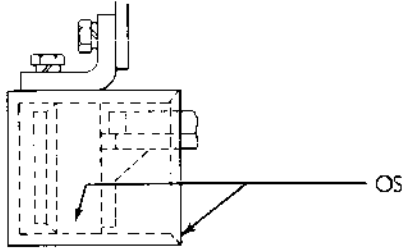


6-12.e. SPACING MECHANISM



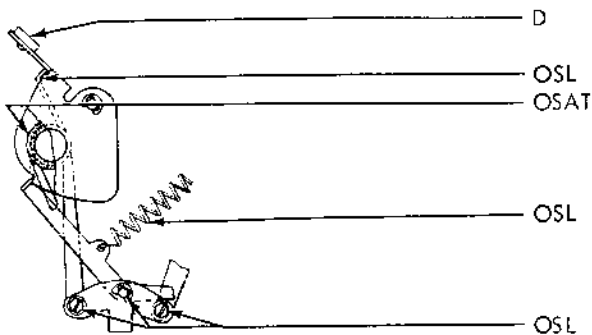
- PIVOT
- BELT PULLEY
- BELT, AND PULLEY
- SPACING BELT
- SHAFT (REMOVE BRACKET AND RETAINING RING)
- SPROCKET
- ENGAGING SURFACE
- SUPPRESSION ARM
- HOOKS (EACH END)
- SPRING
- PIVOT
- SUPPRESSION ARM
- ENGAGING SURFACE
- LATCH ARM
- CONTACT SURFACE
- SPRING PULLEY
- PIVOT
- SPRING PULLEY
- ENGAGING SURFACE
- SUPPRESSION LATCH
- PIVOT
- LATCH
- ENGAGING SURFACES
- LATCH

6-13.a. DASHPOT



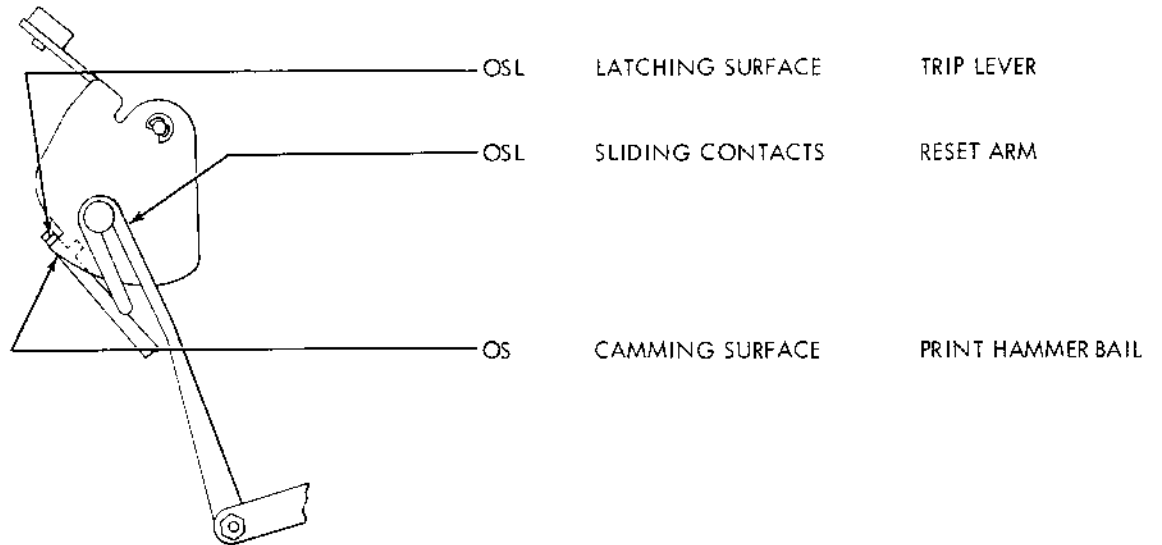
- SLIDING SURFACES
- DASHPOT AND CYLINDER
(APPLY WITH OIL DAMPENED CLOTH. TOO MUCH LUBRICANT WILL CAUSE MALFUNCTION.)

6-13.b. PRINT HAMMER

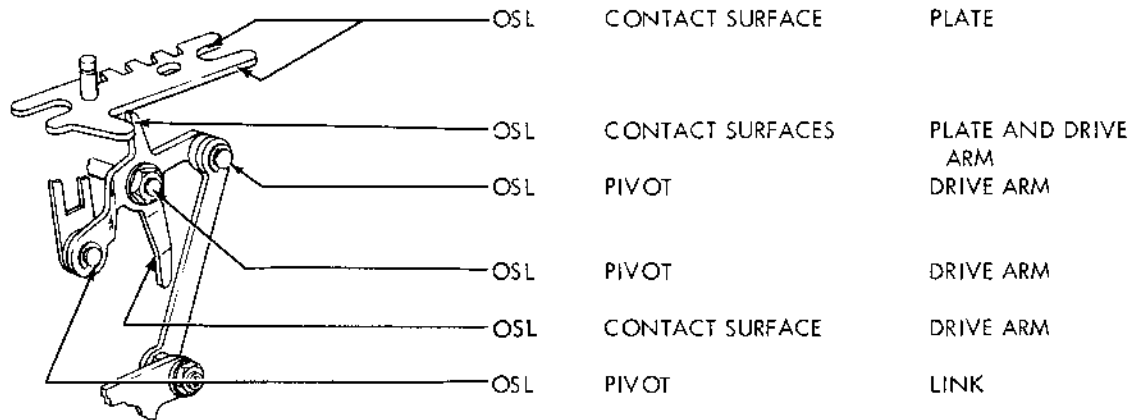


- SURFACE
- PRINT HAMMER
- ENDS (2)
- FELT WASHERS (2)
- TORSION SPRING
- SPRING SHAFT
- HOOKS (EACH END)
- SPRING
- BEARINGS (3)
- DRIVE BAIL

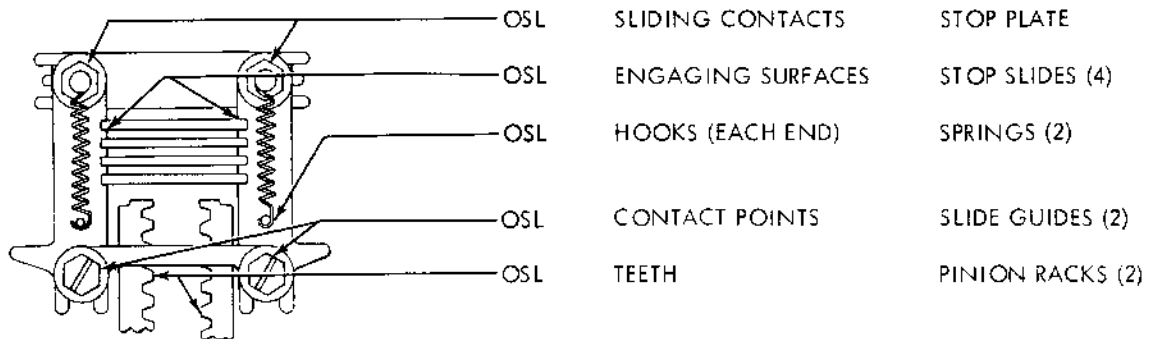
6-13.c. RESET ARM



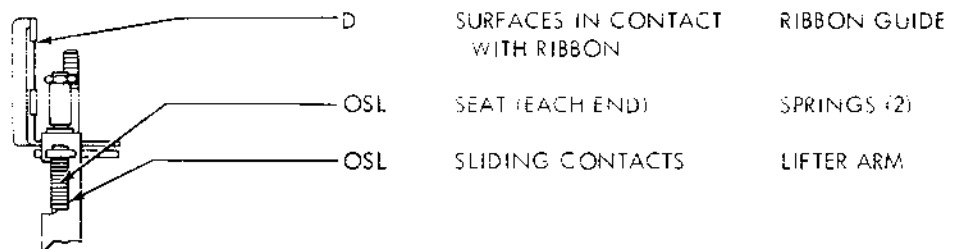
6-13.d. SLIDE GUIDE PLATES



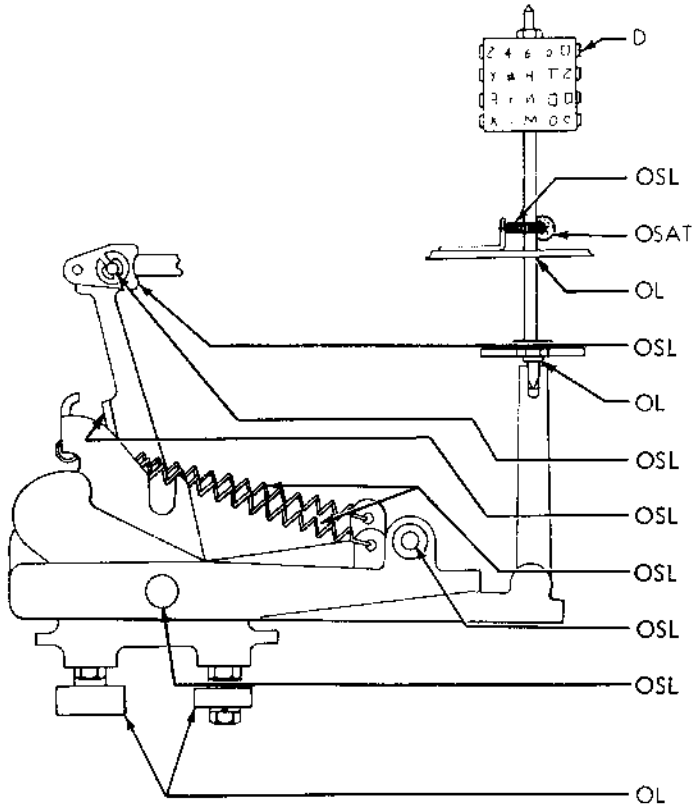
6-13.e. SLIDE GUIDE PLATES



6-13.f. RIBBON GUIDE SPRING

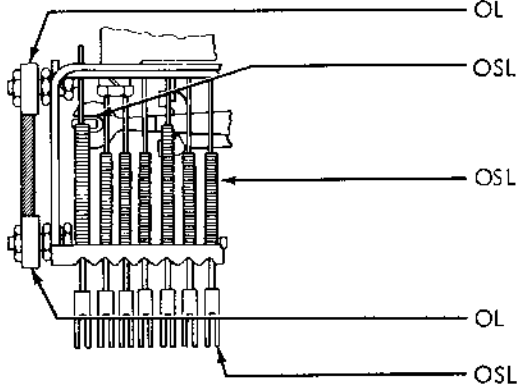


6-13.g. TYPEWHEEL MECHANISM



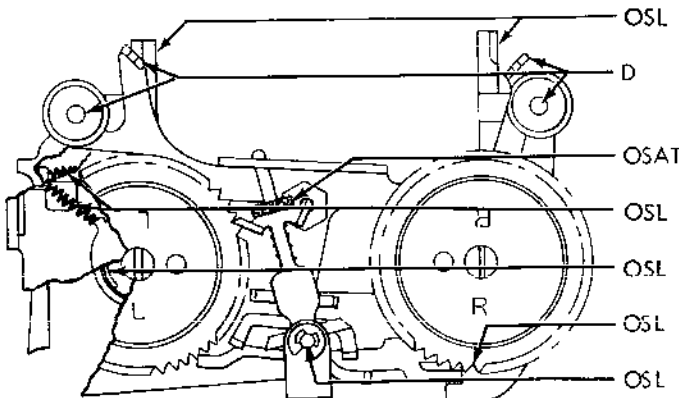
- | | |
|-----------------------|-----------------------------------|
| PRINTING SURFACE | TYPEWHEEL |
| HOOKS (EACH END) | RETURN SPRING |
| FELT WICK | TYPEWHEEL SHAFT |
| UPPER BEARING | POSITIONING CAGE |
| ENGAGING SURFACES (2) | ROTARY DRIVE LEVER |
| LOWER BEARING | POSITIONING CAGE |
| PIVOT | THIRD PULSE LINK |
| CONTACT SURFACE | POWER BAIL |
| HOOKS (EACH END) | SPRINGS (2) |
| PIVOT | DRIVE ARM |
| PIVOT | POWER BAIL |
| BEARINGS | ROLLERS (FRONT AND REAR - 2 EACH) |

6-13.h. SLIDES



- | | |
|-------------------|------------------------|
| BEARING | REAR ROLLER (TOP) |
| ENGAGING SURFACE | SUPPRESSION LATCH FORK |
| SEATS (EACH END) | SLIDE GUIDE SPRINGS |
| BEARING | REAR ROLLER (BOTTOM) |
| CODE BAR CONTACTS | SLIDES |

6-13.j. RIBBON MECHANISM



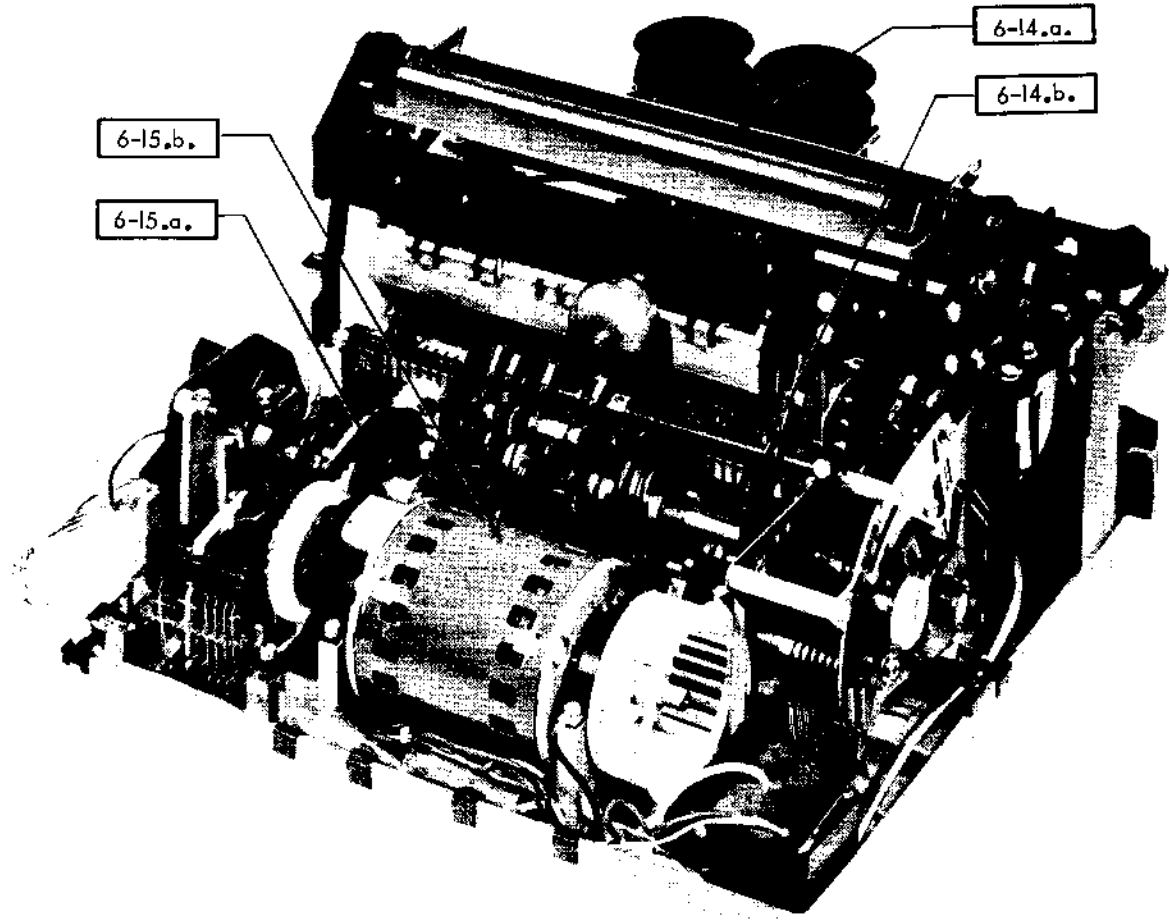
- | | |
|-------------------|---------------------|
| PIVOT POINTS (2) | MOUNTING SHAFT |
| SLOTS AND ROLLERS | RIBBON PATH |
| FELT WICK | FEED PAWL |
| HOOKS (EACH END) | SPRINGS (3) |
| SEAT (EACH END) | TORSION SPRINGS (2) |
| TEETH | RATCHETS (2) |
| PIVOT | FEED PAWL |

6-14. PRINTER - PAPER FEED AREA

6-15. MOTOR

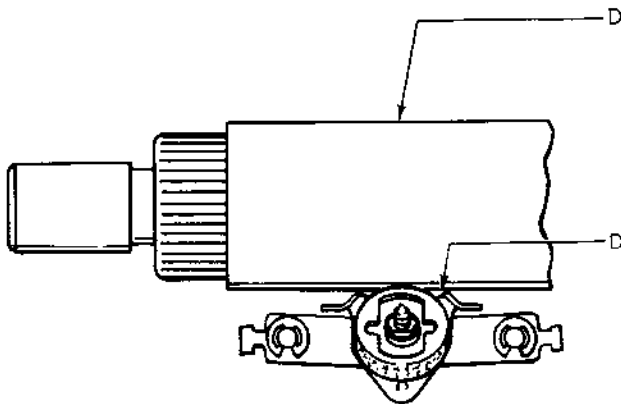
NOTE

REINSTALL RIBBON MECHANISM. FOR INSTRUCTIONS, SEE SECTION 5.



(REAR VIEW)

6-14.a. PAPER FEED



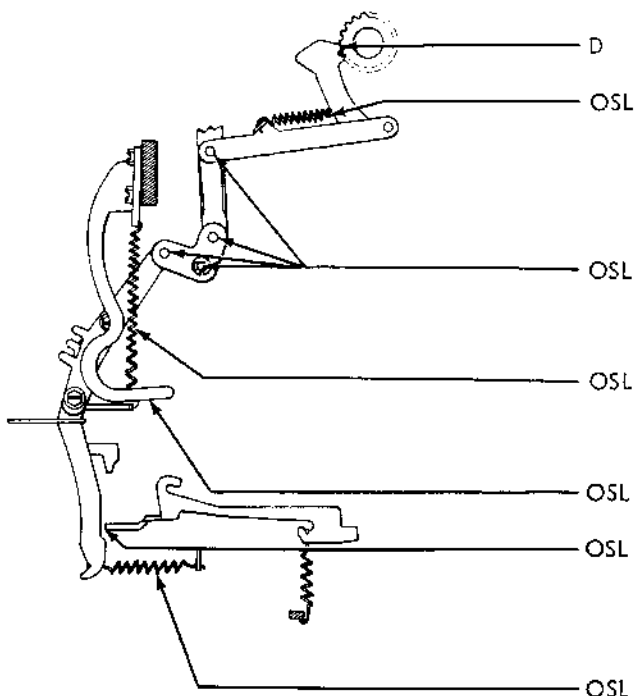
ALL SURFACES CONTACTING PAPER

ALL SURFACES CONTACTING RIBBON

CAUTION

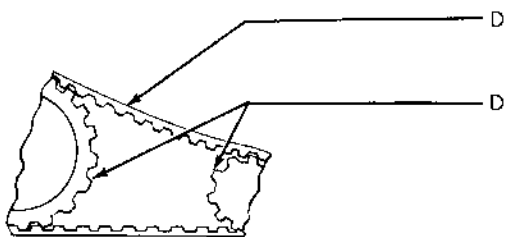
DO NOT CLEAN PLATEN WITH SOLVENTS

6-14.b. LINE FEED MECHANISM



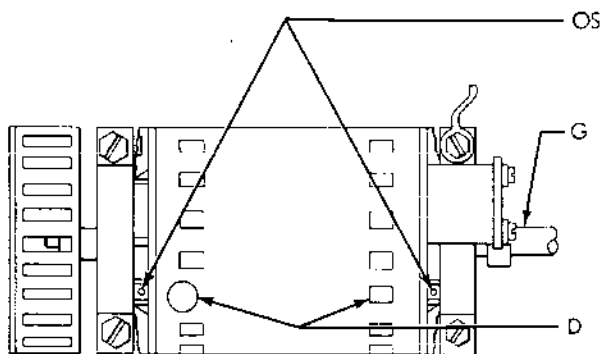
- D TEETH PLATEN SPROCKET
- OSL HOOKS (EACH END) SPRING
- OSL PIVOTS (4) LINE FEED LINKAGE
- OSL HOOKS (EACH END) DRIVE LINK SPRING
- OSL ENGAGING SURFACE UPSTOP BRACKET
- OSL ENGAGING SURFACE BLOCKING LEVER
- OSL HOOKS (EACH END) BLOCKING LEVER SPRING

6-15.a. INTERMEDIATE GEARS



- D MOTOR BELT
- D TEETH SPROCKETS (2)

6-15.b. MOTOR



- OS BEARINGS (EACH END) MOTOR SHAFT
- G PACK GREASE IN SPACE BETWEEN TWO OIL-LITE BEARINGS. GEAR MUST BE REMOVED. INTERMEDIATE GEAR
- D INTERIOR AREAS MOTOR

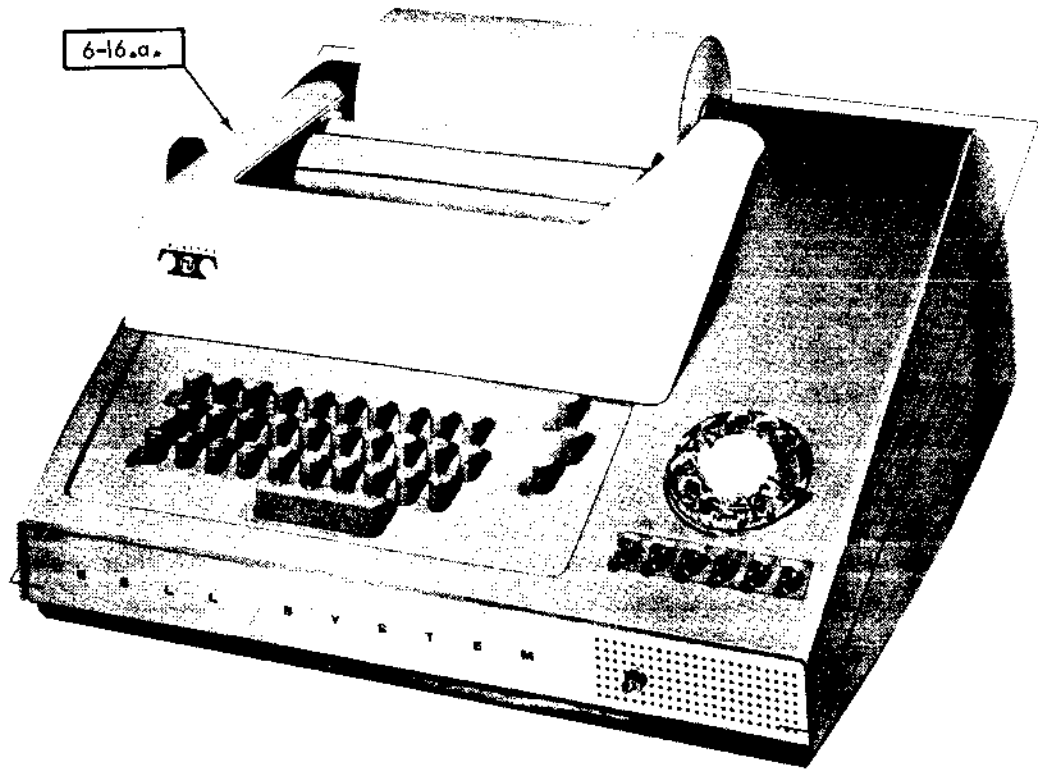
CAUTION

MOTOR START RELAY AND CAPACITOR MUST BE KEPT FREE OF LUBRICANTS.

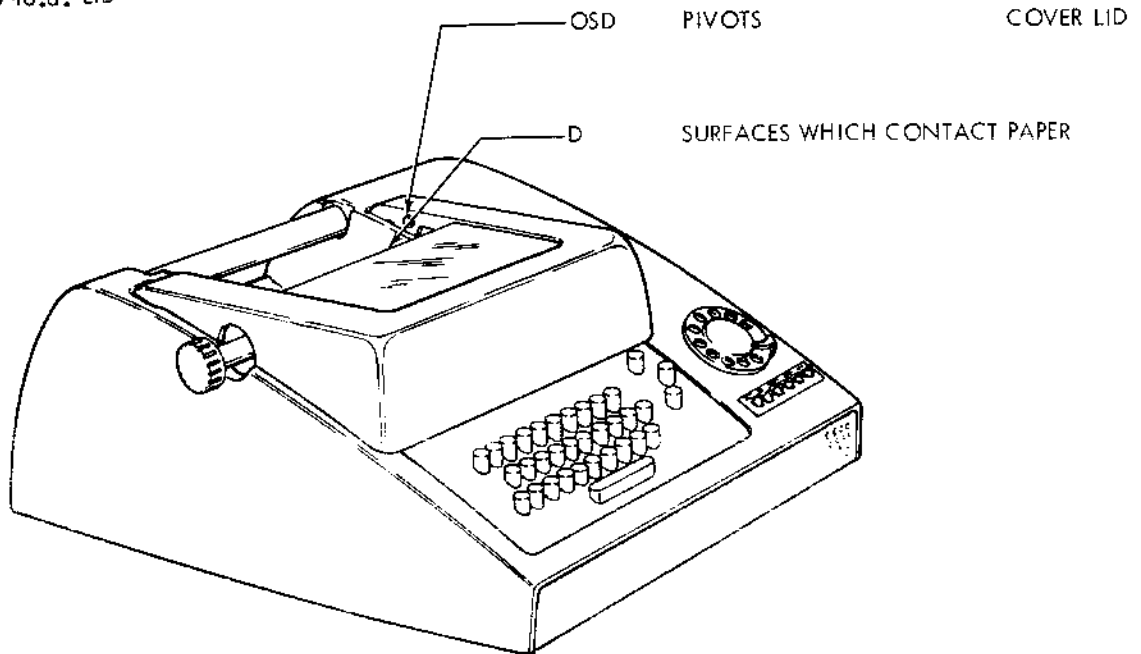
6-16. COVER

CAUTION

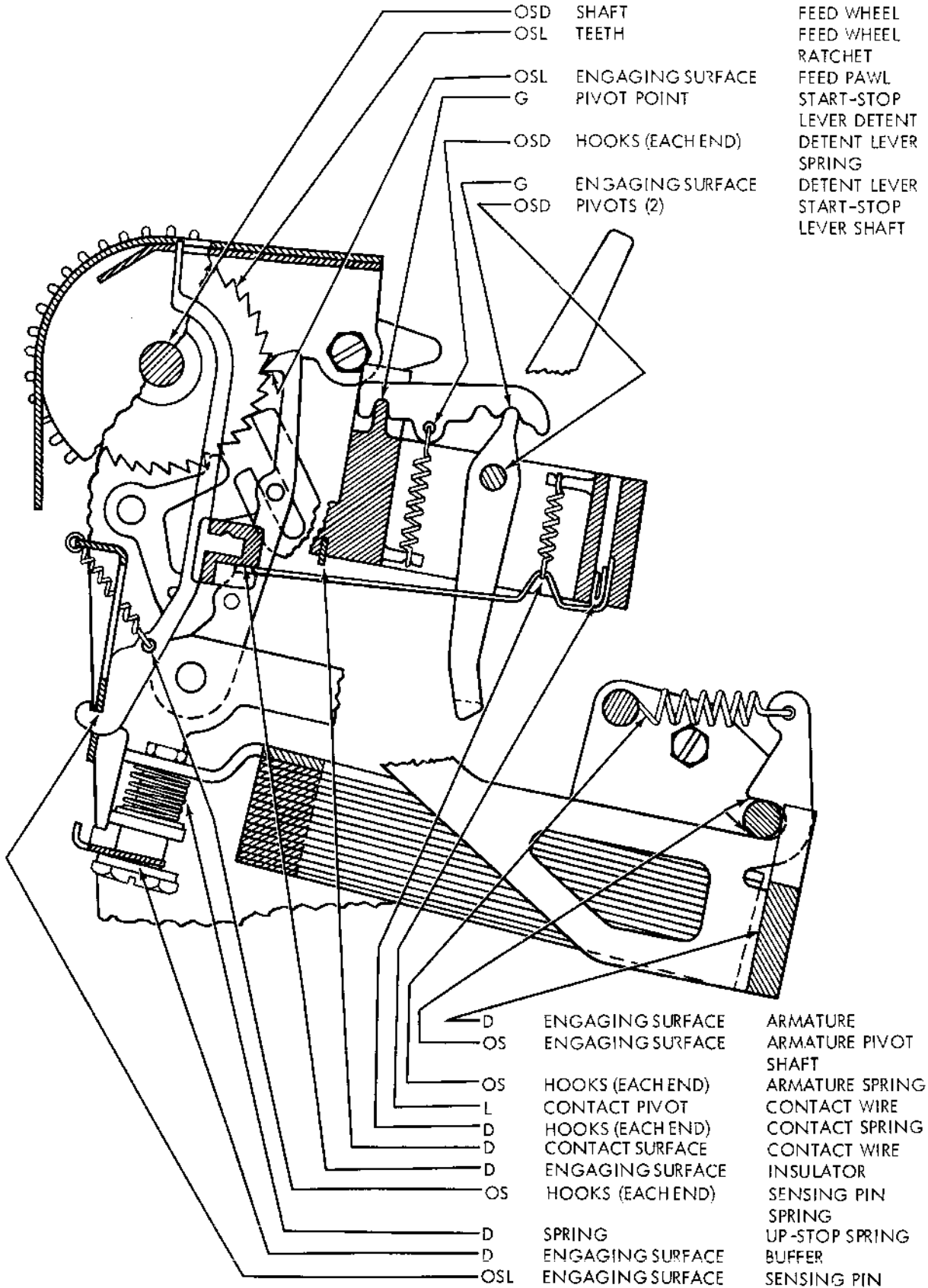
DO NOT CLEAN COVER OR WINDOW IN COVER LID WITH SOLVENTS.



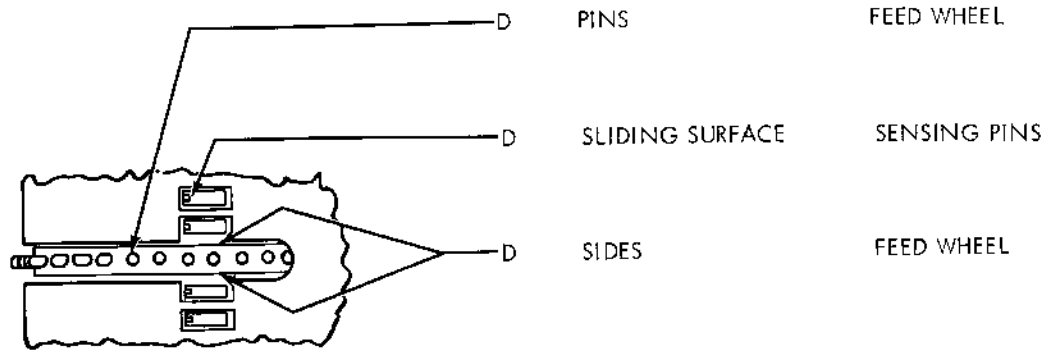
6-16.a. LID



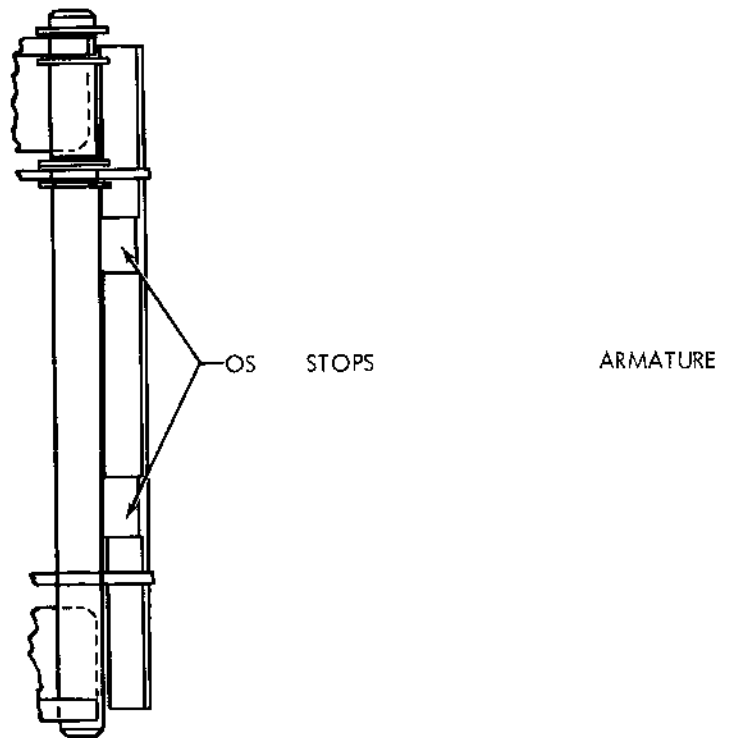
6-17. TAPE READER MECHANISM



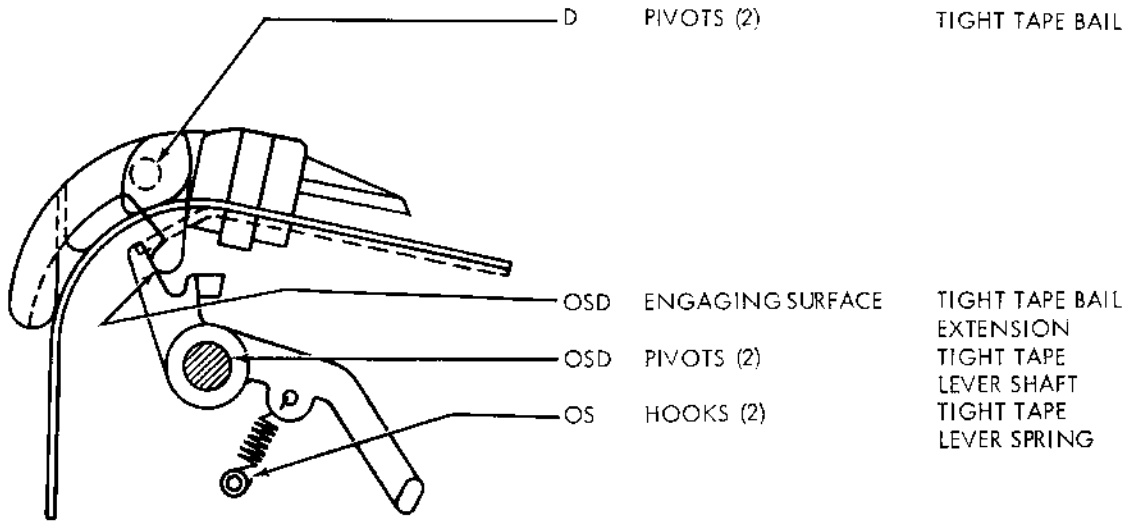
6-17.a. FEED WHEEL (TAPE READER)



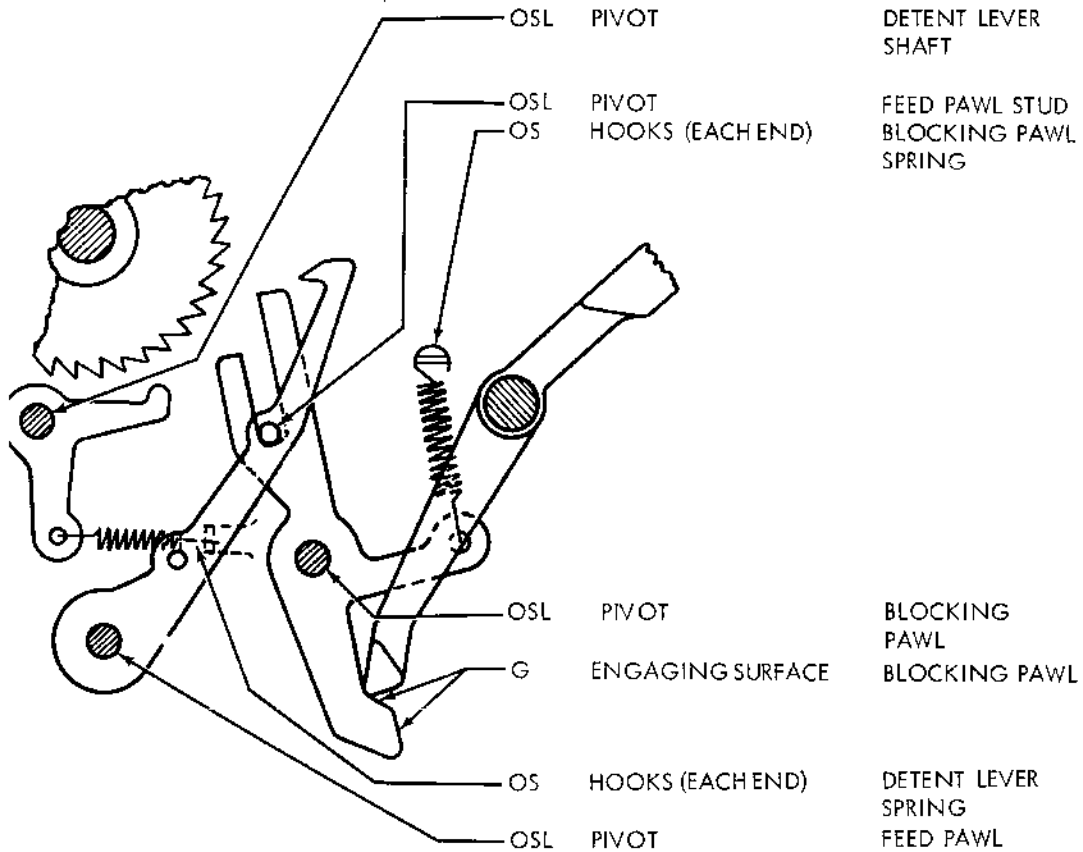
6-17.b. ARMATURE SHAFT (TAPE READER)



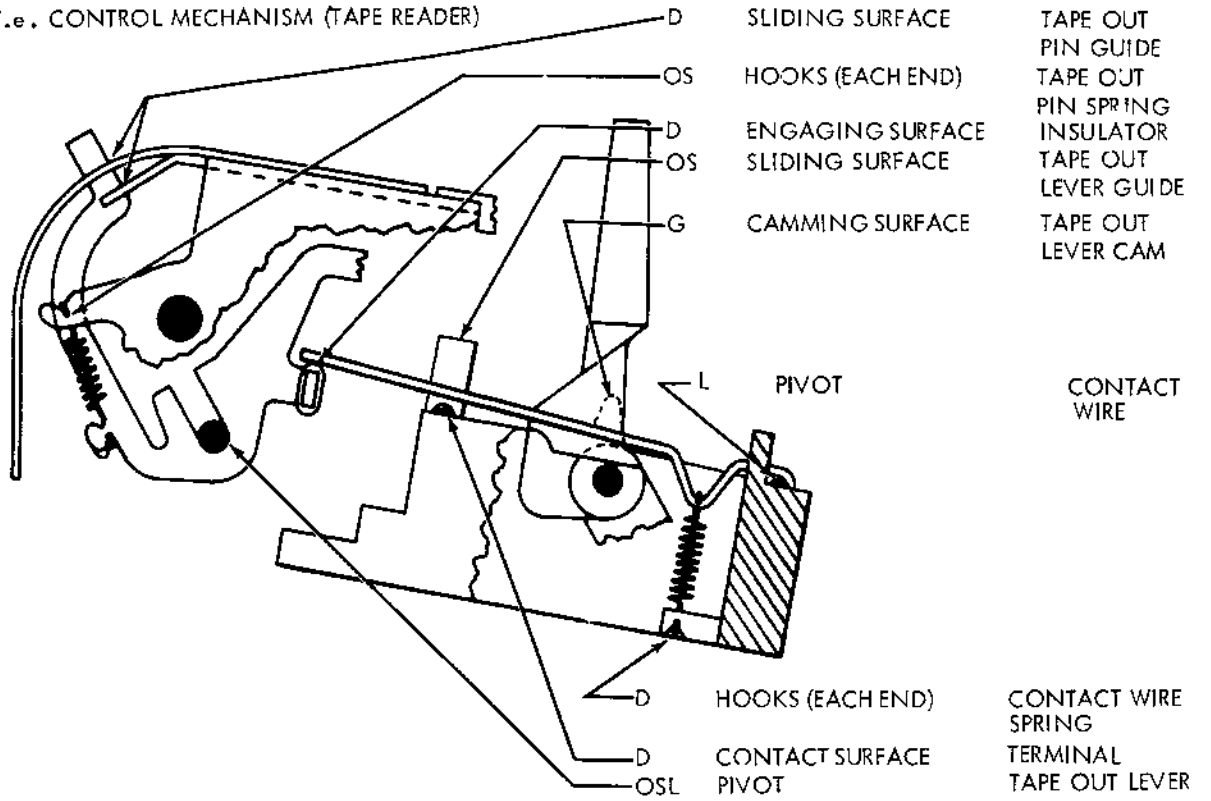
6-17.c. TIGHT TAPE MECHANISM (TAPE READER)



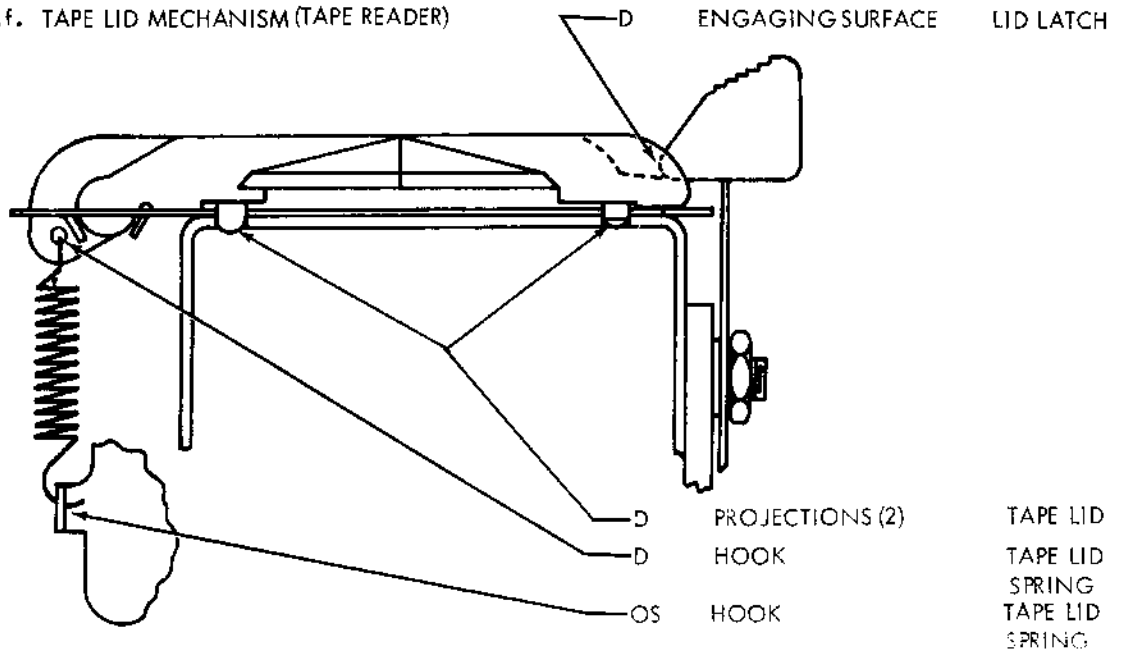
6-17.d. FEED PAWL MECHANISM (TAPE READER)



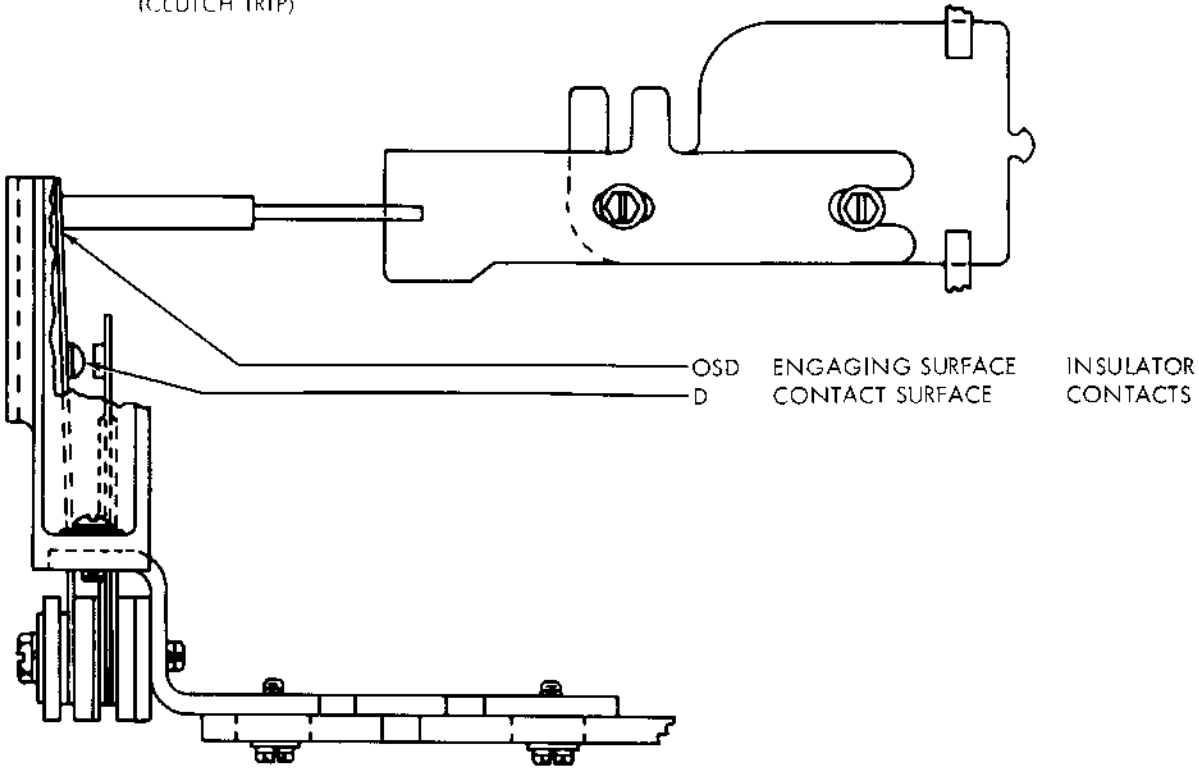
6-17.e. CONTROL MECHANISM (TAPE READER)



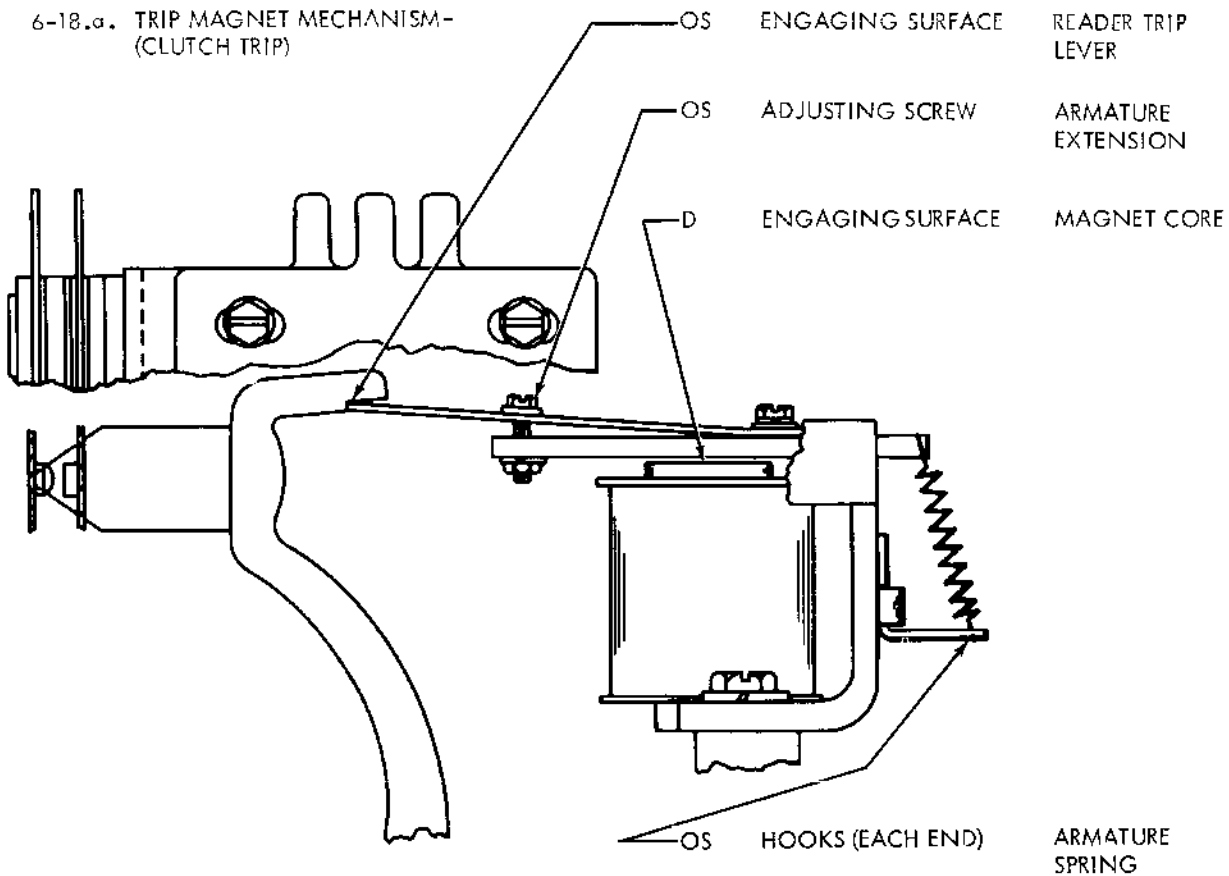
6-17.f. TAPE LID MECHANISM (TAPE READER)



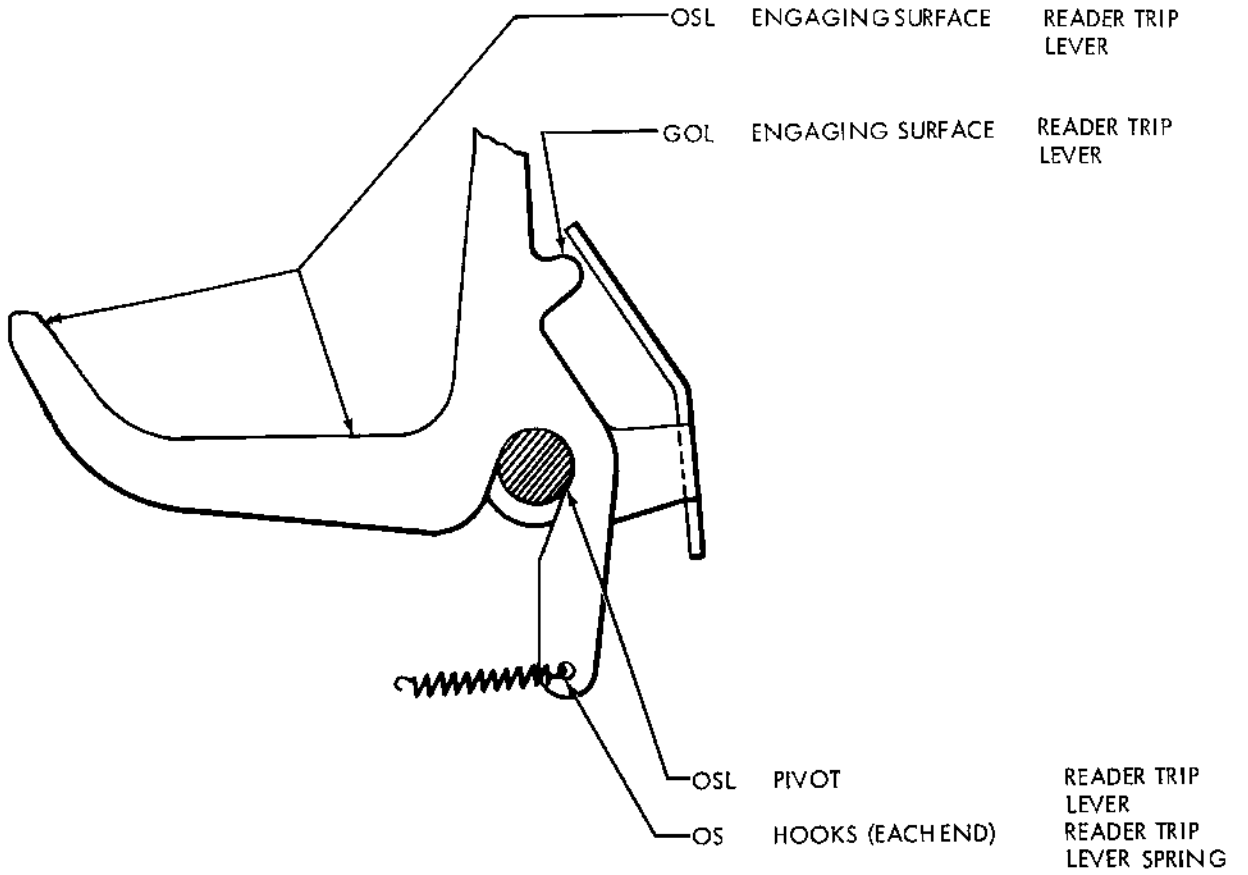
6-18. TRIP MAGNET MECHANISM-
(CLUTCH TRIP)



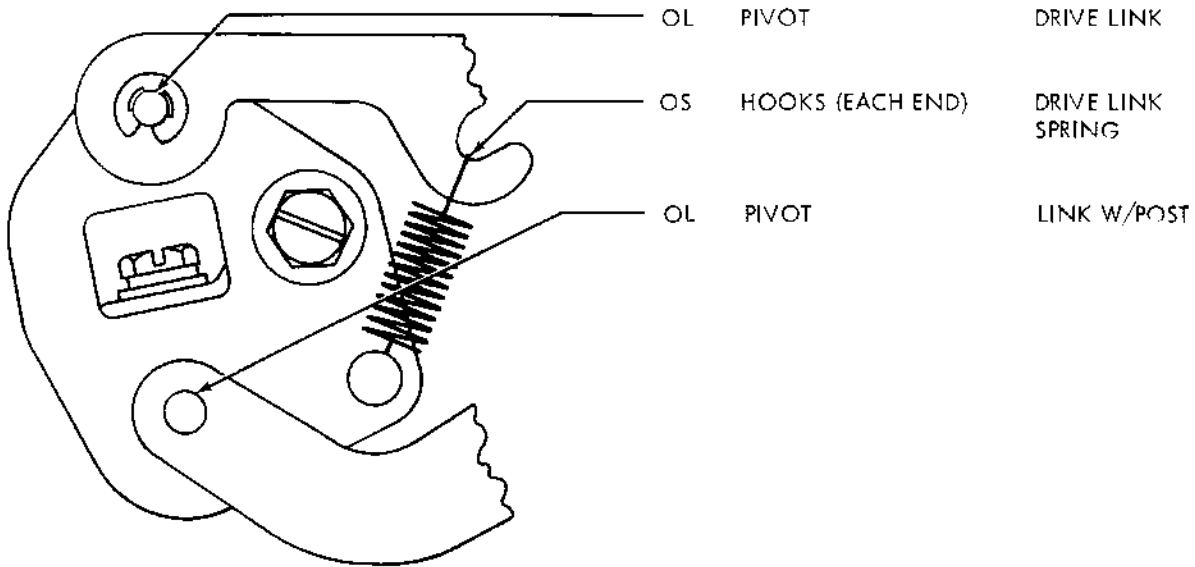
6-18.a. TRIP MAGNET MECHANISM-
(CLUTCH TRIP)



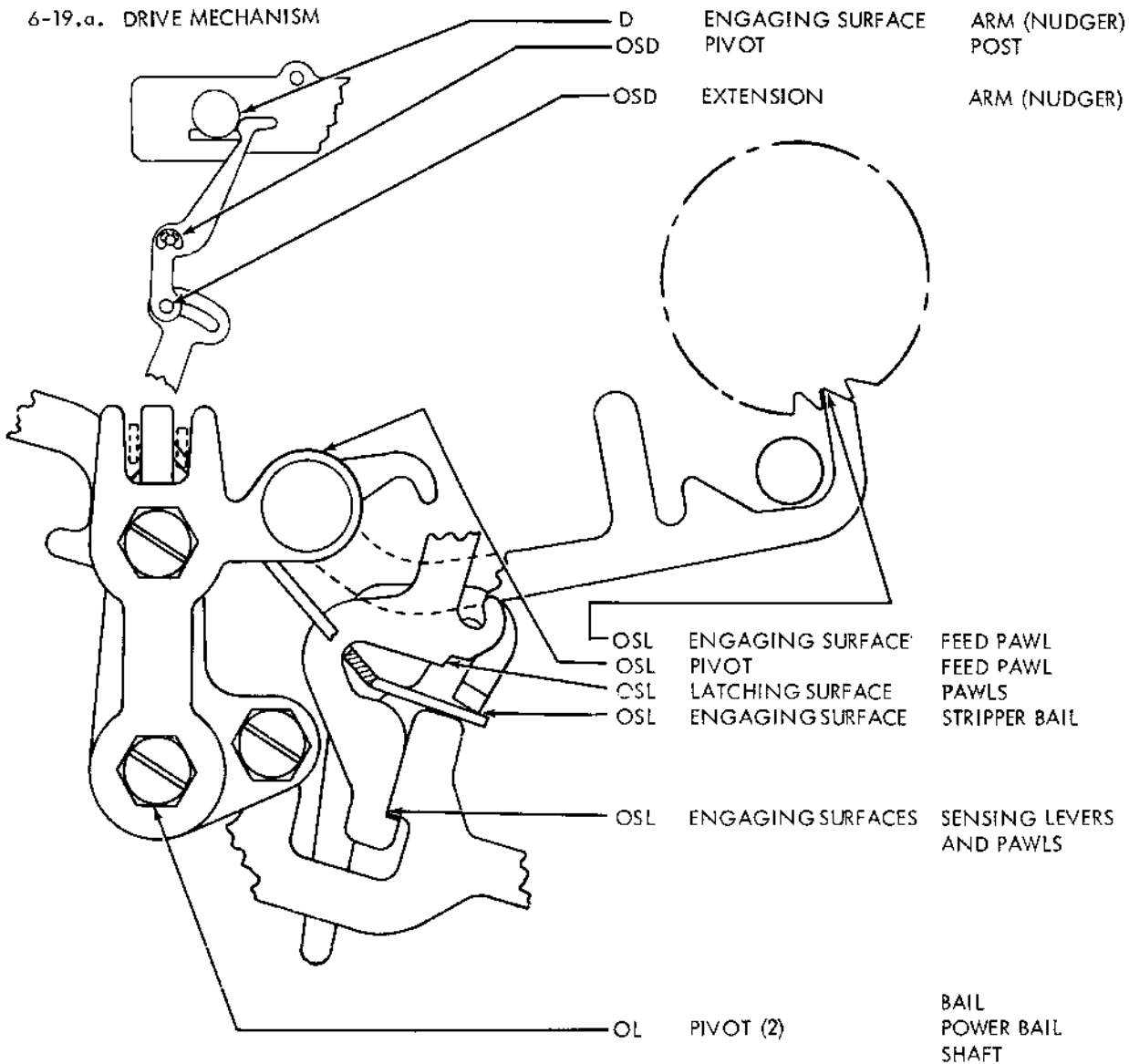
6-18.b. TRIP MAGNET MECHANISM-
(CLUTCH TRIP)



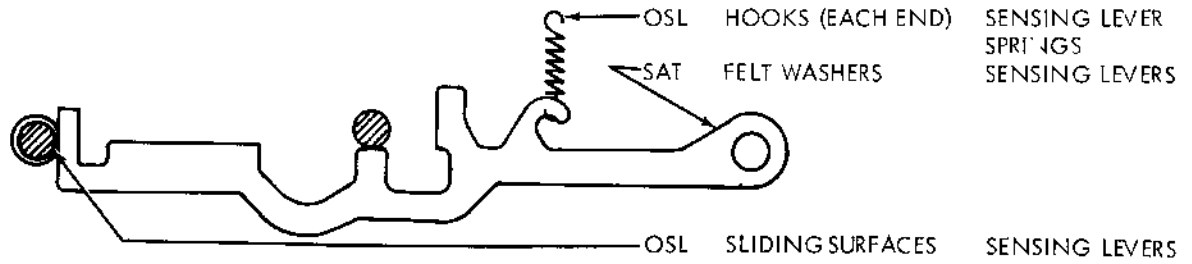
6-19. DRIVE LINK - TAPE PUNCH



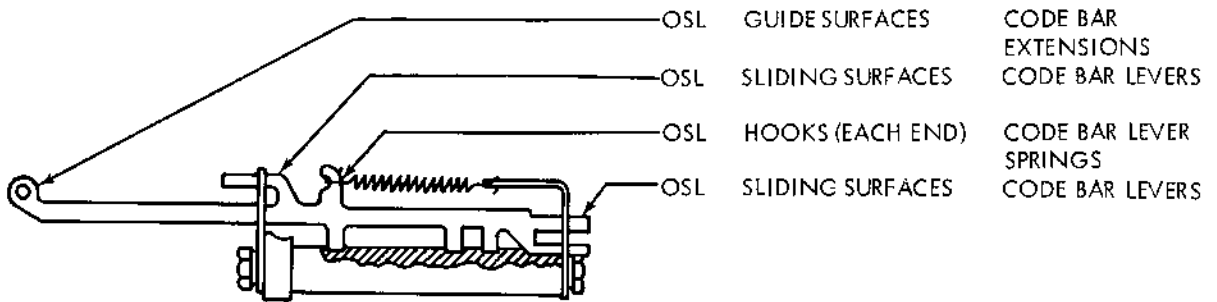
6-19.a. DRIVE MECHANISM



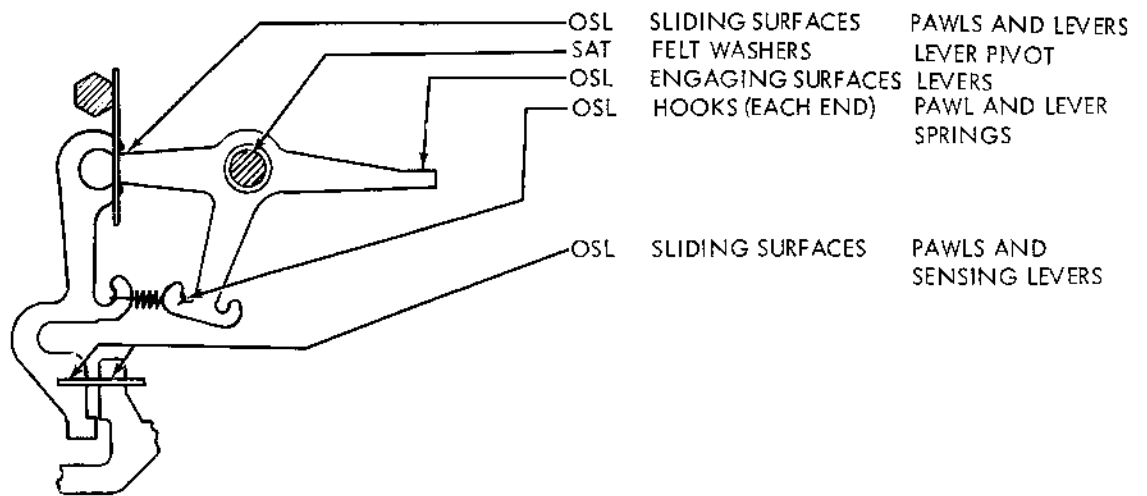
6-19.b. SENSING LEVERS



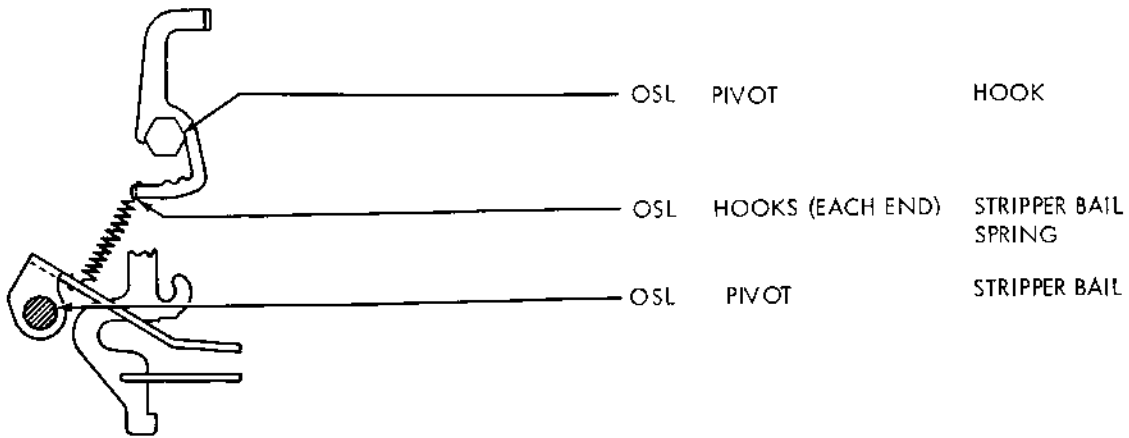
6-19.c. CODE BAR LEVERS



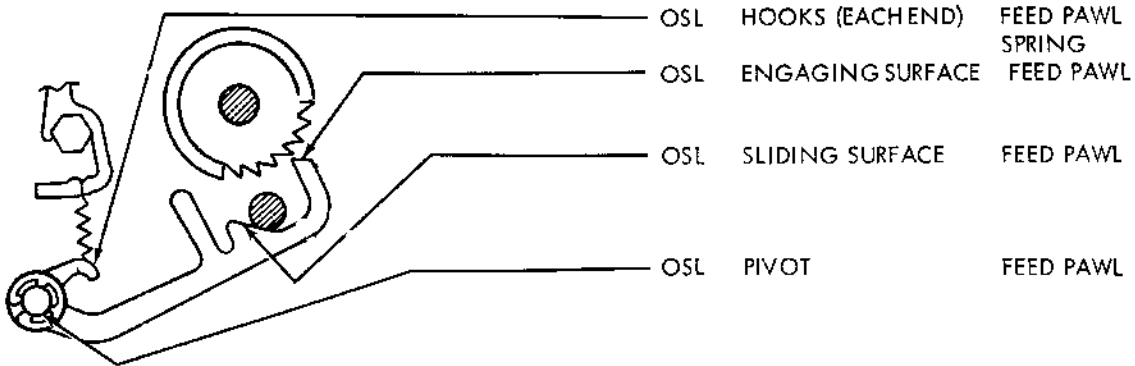
6-19.d. PAWLS AND LEVERS



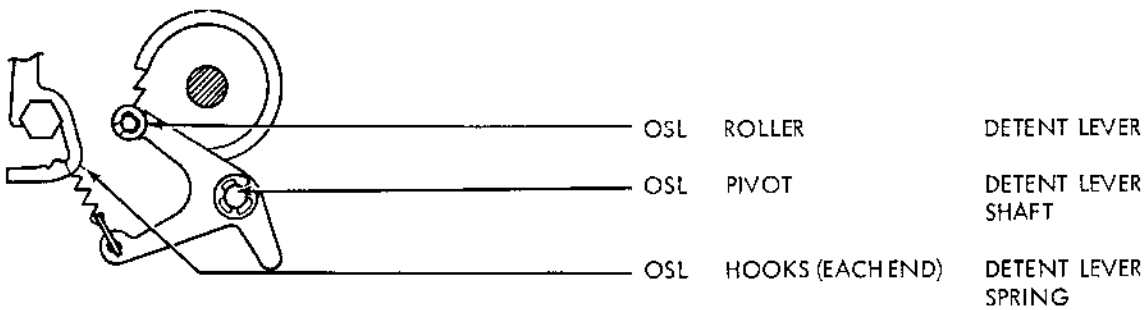
6-19.e. STRIPPER BAIL



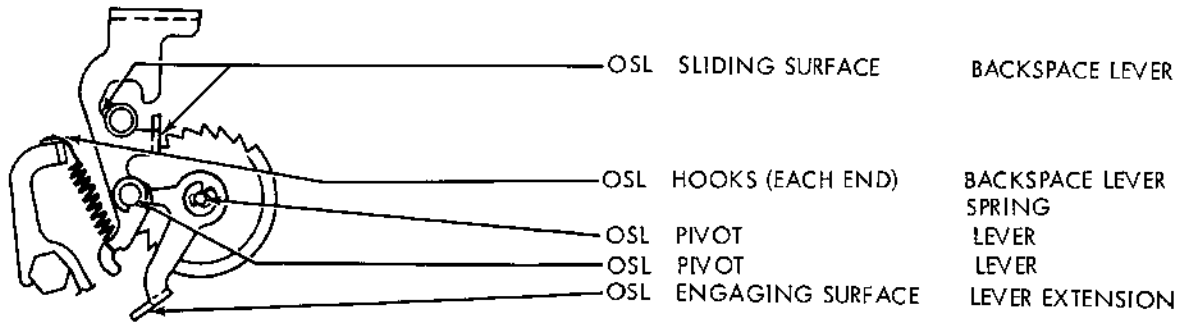
6-19.f. FEED PAWL



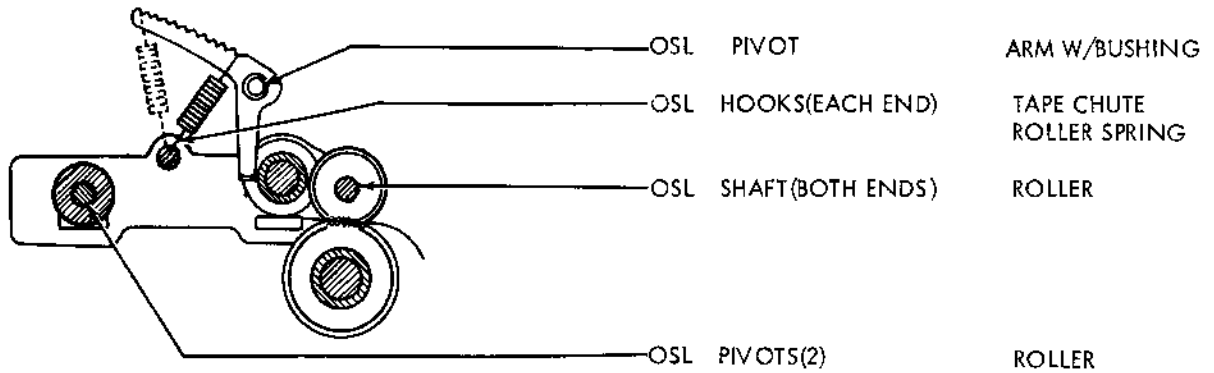
6-19.g. DETENT LEVER



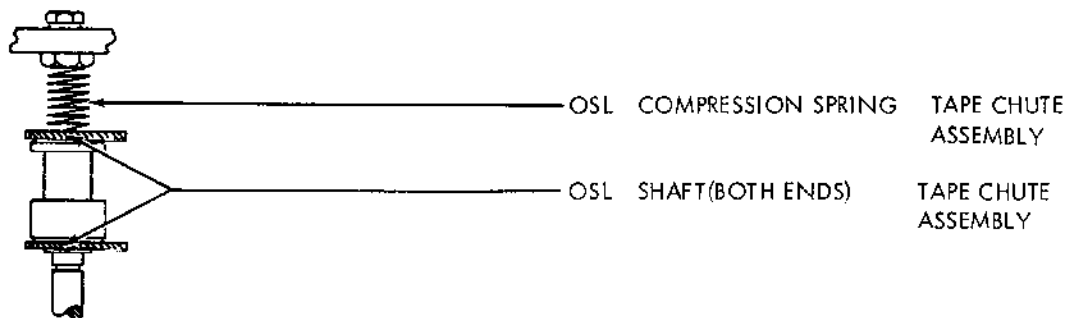
6-19.h. BACKSPACE LEVER



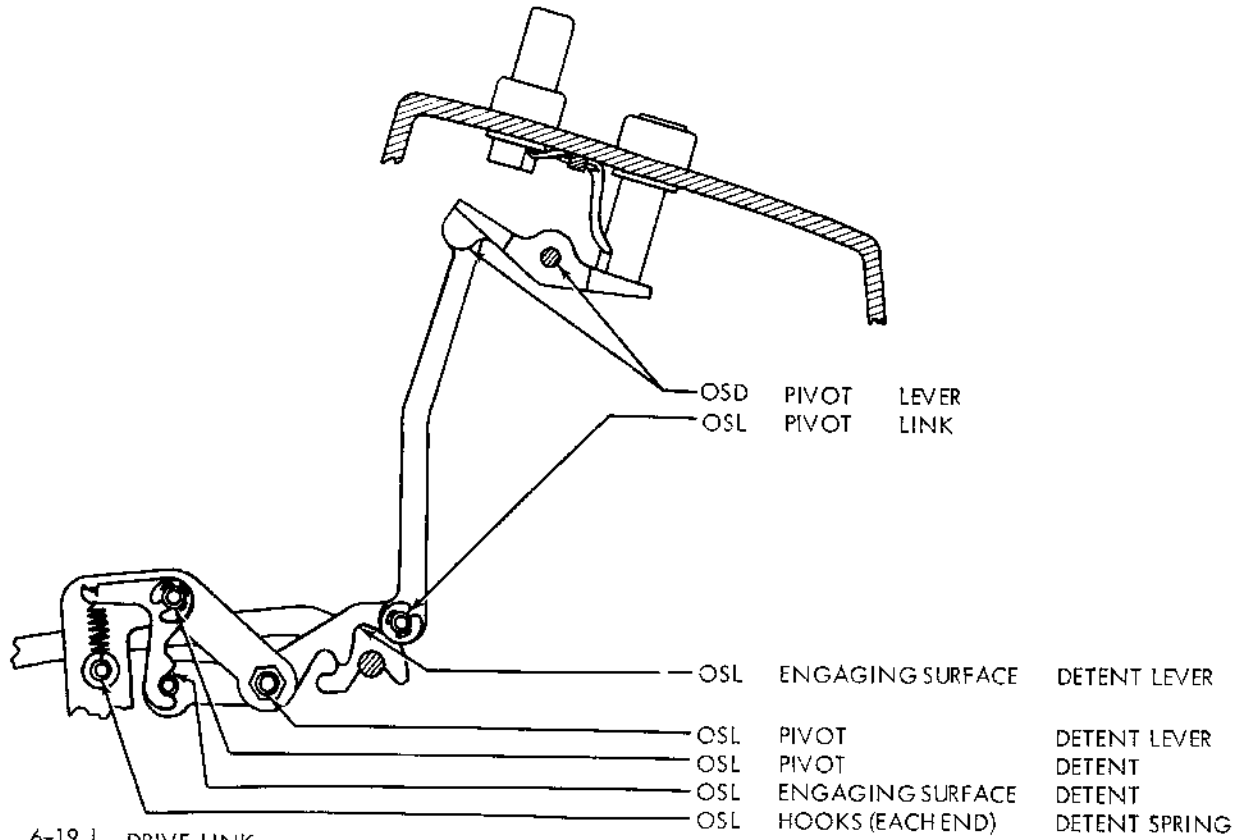
6-19.i. TAPE CHUTE ASSEMBLY



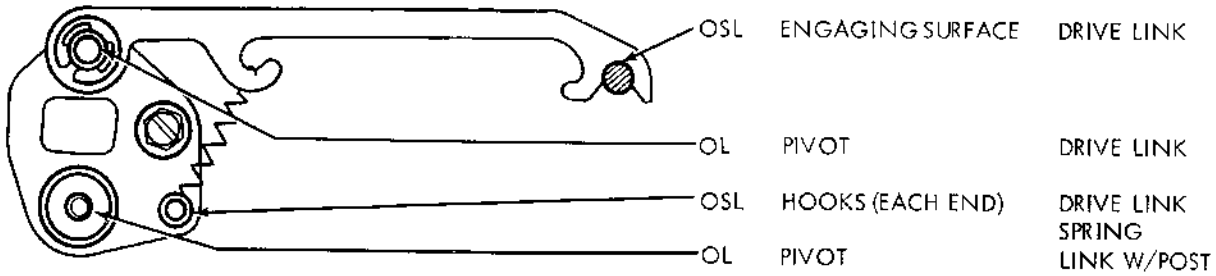
6-19.i. TAPE CHUTE ROLLER



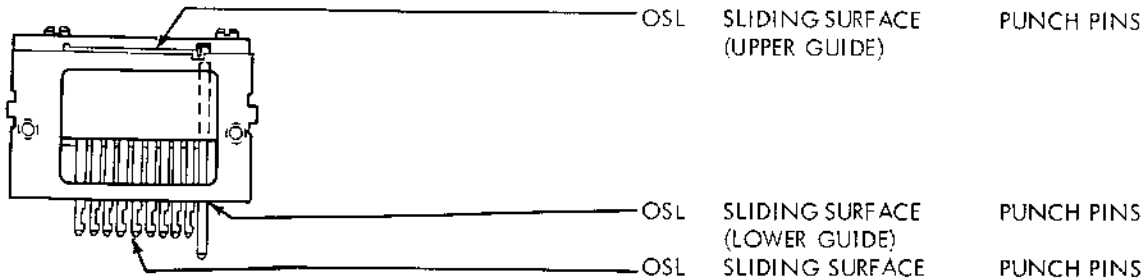
6-19.k. ON-OFF MECHANISM

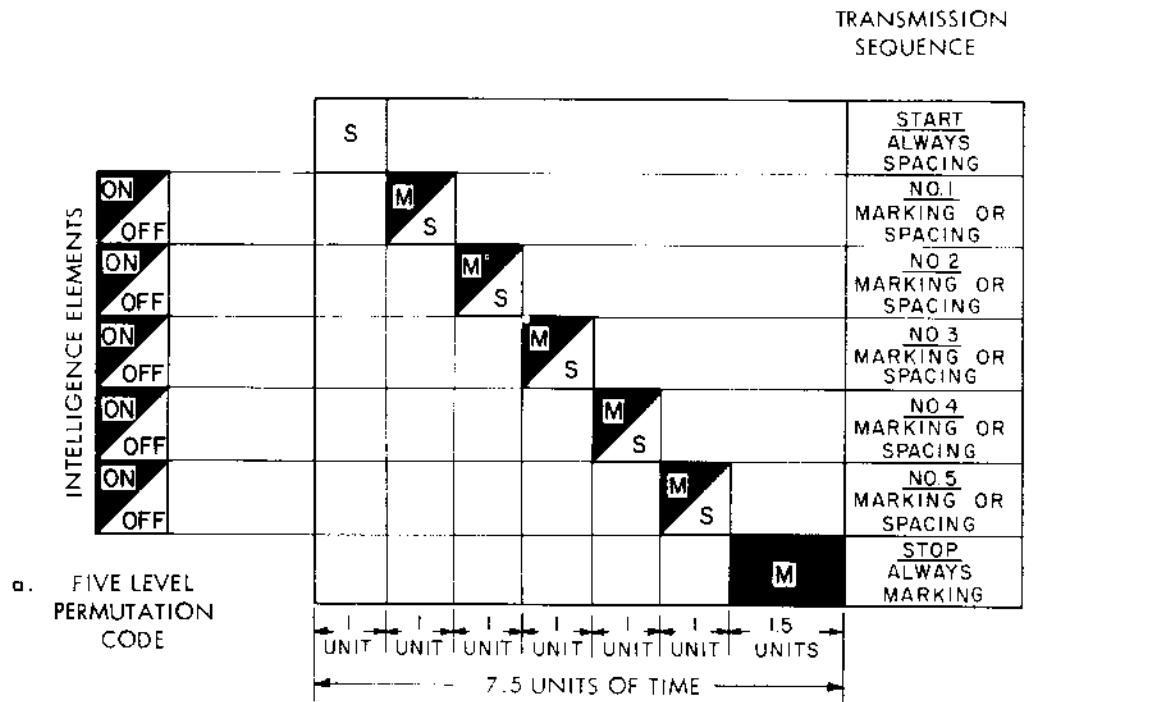


6-19.l. DRIVE LINK



6-19.m. PUNCH BLOCK ASSEMBLY





b. FIVE LEVEL START-STOP SIGNALING CODE

FIGURES	5/8	3/4	B	8	1/2	3/4	7/8	9	0	1	4	BELL	5	7	3/8	2	/	6	"	BLANK	LETTERS	FIGURES	SPACE	CARRIAGE RETURN	LINE FEED	
LETTERS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	●	●	●	●	●																					
2	●		●																							●
3			●																							
4	●	●	●	●	●																					●
5	●																									

c. TYPICAL FIVE-LEVEL CHARACTER ARRANGEMENTS

Figure 7-1. Code.

SECTION 7

PRINCIPLES OF OPERATION

7-1. GENERAL.

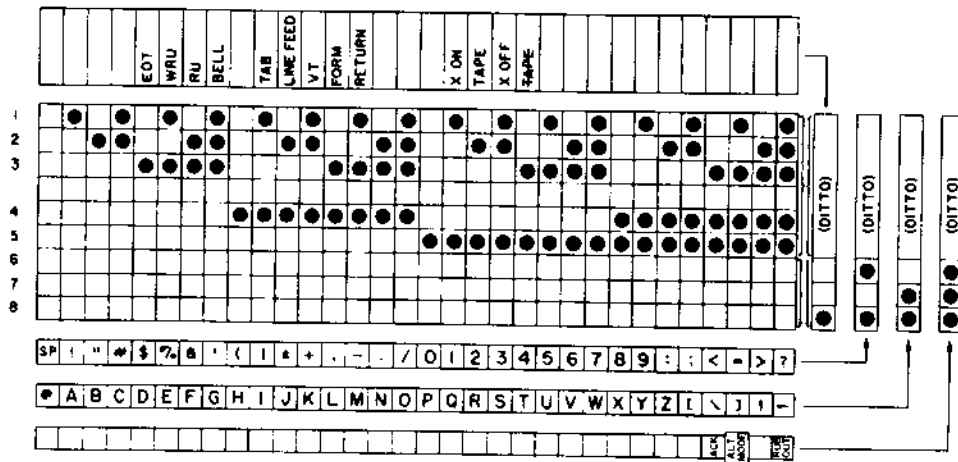
a. This section explains the operation of the Model 32 and 33 Printers. Paragraph 7-2 describes the code used by the Printers to transmit and receive messages. Paragraph 7-3 outlines in general terms the overall operation. Paragraph 7-4 and up explains in detail the operation of the components that make up the Set.

b. In the illustrations, fixed pivots are solid black, and floating pivots—i.e., those mounted on parts that move—are cross-hatched.

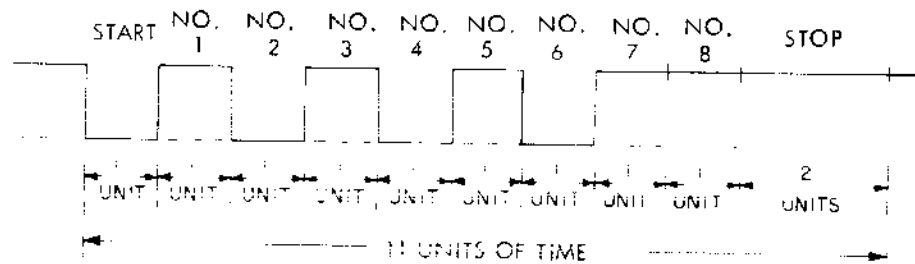
7-2. CODE (Figures 7-1 and 7-2).

a. GENERAL.

(1) The Teletypewriters transmit and receive messages by means of a binary permutation code (Figure 7-1.a.). The characters



a. CHARACTER ARRANGEMENT



b. CURRENT WAVEFORM FOR LETTER "U"

Figure 7-2. Eight-Level Data Interchange Code.

making up the messages—letters, numerals, symbols, functions, etc.—are represented by prearranged combinations of binary intelligence elements (also referred to as levels or bits), each of which may be in one of two states (on or off, etc.). Depending on whether a five-, six-, seven-, or eight-level code is employed, each combination consists of five, six, seven, or eight intelligence elements. The total number of permutations available in a given code is equal to two to the n power where n is the number of intelligence elements. For example, in a six-level code, there are two to the sixth power, or 64, permutations.

(2) In the various stages of a communication system using teletypewriter equipment, the above code may occur in a number of different forms, including parallel or sequential electrical pulses, mechanical positions of parts, code holes in paper tape, and tone frequencies. For transmission purposes, it is placed in an electrical form referred to as a start-stop signaling code or simply a teletypewriter code (Figure 7-1.b.). The intelligence elements are applied sequentially to a signal line as current or no-current time intervals. Intervals during which current flows in the signal line are referred to as marking elements and during which no current flows as spacing elements. To insure synchronization between the transmitting and receiving equipment, a start element which is always spacing is added at the beginning of each combination of intelligence elements, and a stop element which is always marking is added at the end.

(3) In different signaling codes the length of the stop element may vary. For example, in the code illustrated in Figure 7-1.b., the length of the stop element is 1.5 times the other elements. Thus, the transmission of a character requires 7.5 units of time. It is therefore said to have a 7.5 unit transmission pattern.

b. FIVE-LEVEL CODE—MODEL 32.

(1) The code accommodated by the Model 32 Printers is illustrated in Figure 7-1.b. Since it has five intelligence elements and its stop element is 1.5 units of time, it is a five-level code with a 7.5 unit transmission pattern. It has two to the fifth power, or 32, available permutations.

(2) To accommodate more than 32 characters, a letters-figures shift is designed into the Printers. This is similar to the lower and upper case of a typewriter and permits each code combination, excluding the two used to shift the equipment, to represent two characters.

(3) A typical character arrangement is shown on the chart in Figure 7-1.c. The black circles represent marking elements, the blank squares spacing elements. When the letters code combination (12345) is transmitted, it conditions all Printers connected to the circuit to print, at the receipt of all following code combinations, the characters in the letters (lower case) line on the chart. Similarly, when the figures code combination (12-45) is transmitted, it conditions the Printers to print the characters or perform functions in the figure (upper case) line on the chart.

c. EIGHT-LEVEL CODE—MODEL 33 (Figure 7-2).

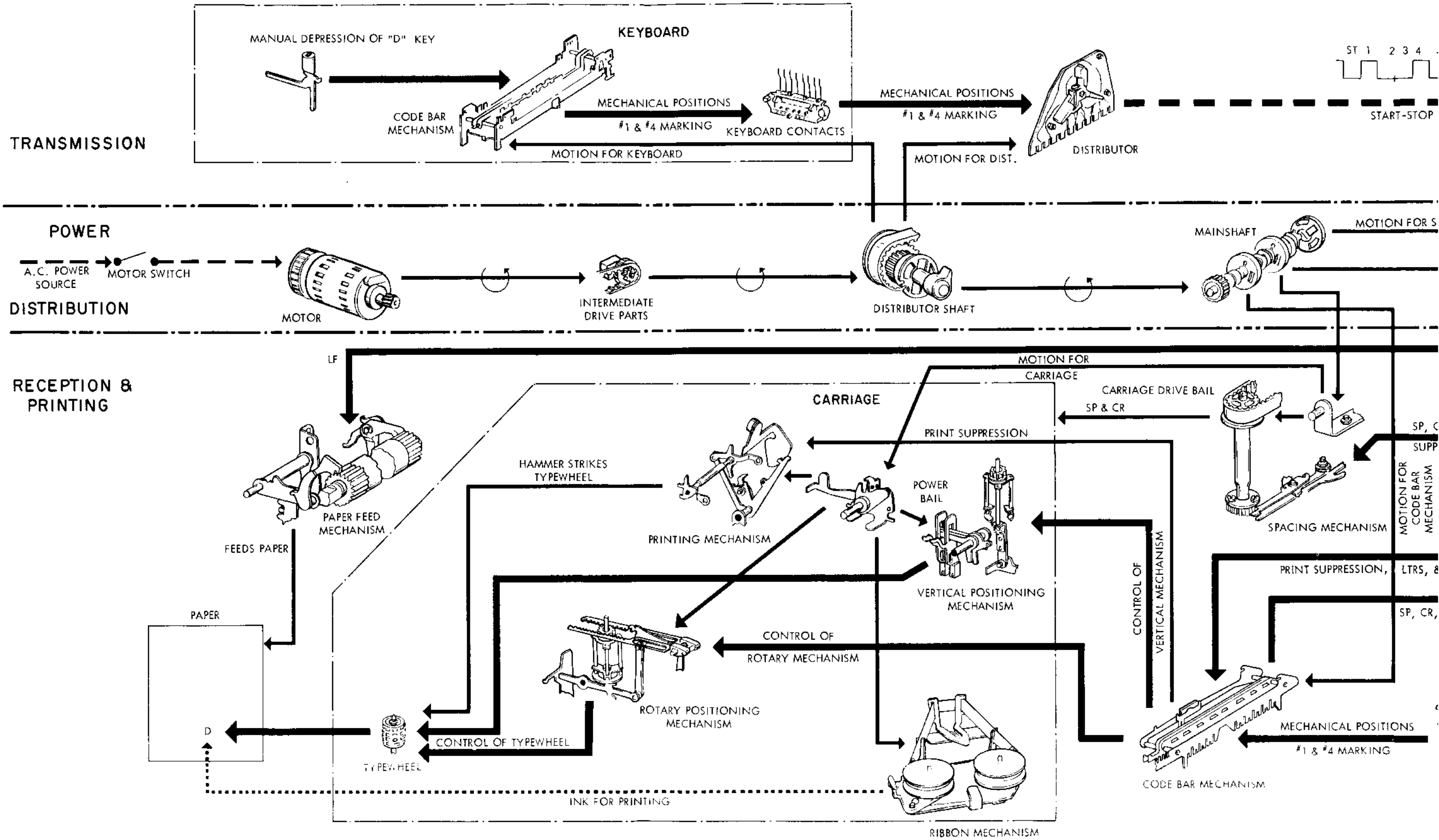
(1) The data interchange code accommodated by the Model 33 Printer is illustrated in Figure 7-2. Since it has eight intelligence elements and its stop element is 2 units of time, it is an eight-level code with an eleven-unit transmission pattern. However, at the present it utilizes only the first seven intelligence elements, the eighth always being transmitted as marking. Thus, it has two to the seventh power, or 128, available permutations. Of these combinations, 64 are assigned to printing characters. The rest are devoted to control (non-printing) characters or are unassigned.

(2) The character arrangement for the data interchange code is shown on the chart in Figure 7-2. The black circles represent marking elements, the blank squares spacing elements. The main block gives the arrangements of elements No. 1 through No. 5. The four smaller blocks at the right give the arrangements of elements No. 6 and No. 7 for the three rows of characters as indicated by the arrows. For keyboard transmission, two shift keys labeled CONTROL and SHIFT are used as covered in paragraph 7-5.d.

7-3. GENERAL OPERATION (Figures 7-3 and 7-4).

a. Figure 7-3 is a pictorial schematic of the basic Printer's operation. Figure 7-4 shows the sequence of events involved in receiving a character.

b. The middle portion of the Figure 7-3 illustrates power distribution. A.C. electrical power is applied to a motor through a motor switch which may be manually or automatically controlled. The motor converts the electrical power to rotary motion which is transferred by intermediate drive parts to a distributor shaft. The latter drives a main shaft and, through a cam-clutch, provides motion to a distributor mechanism. The main shaft, through three cam-clutches, distributes motion to a



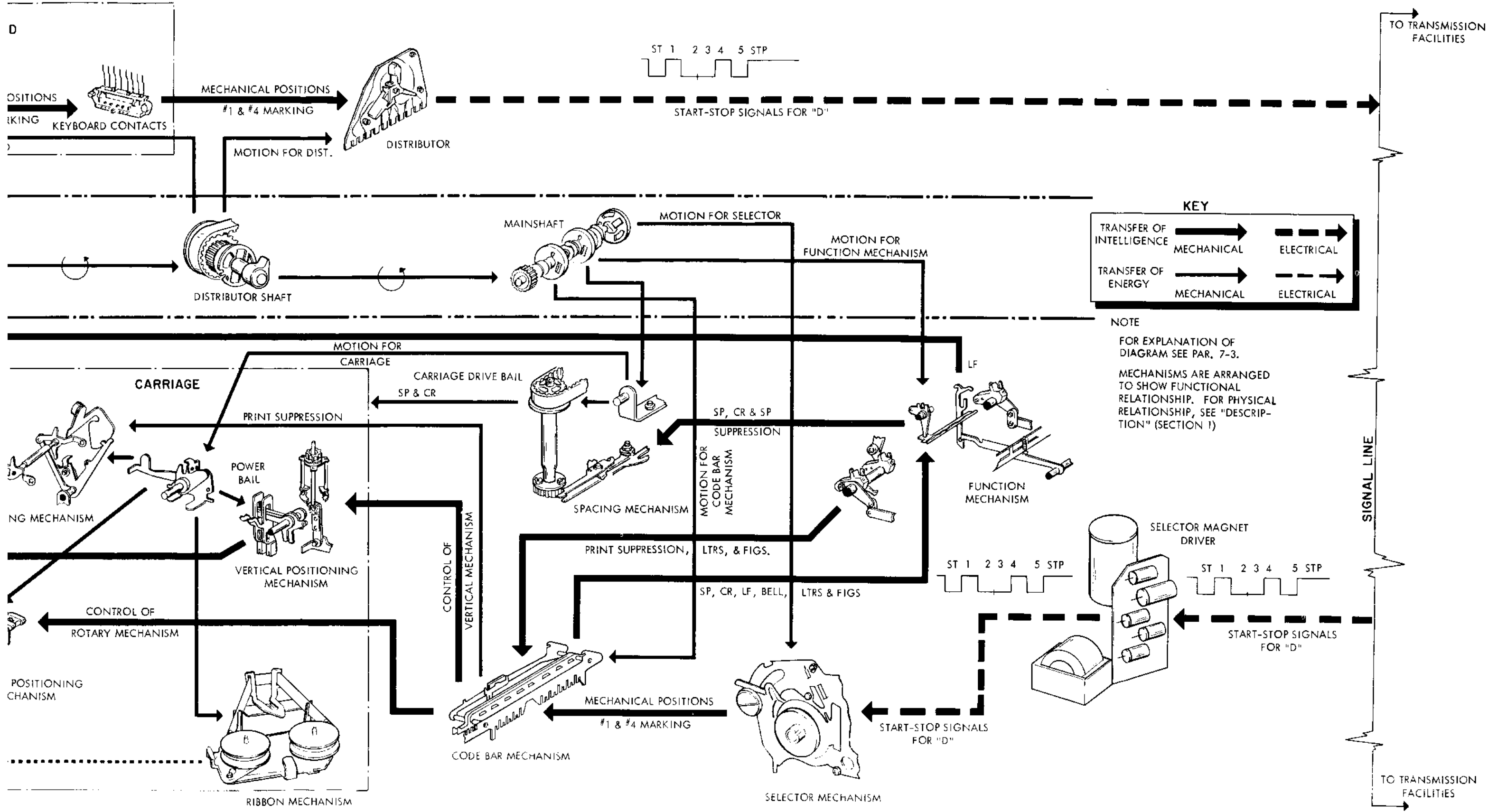


Figure 7-3. Schematic Diagram - Printer Operation.

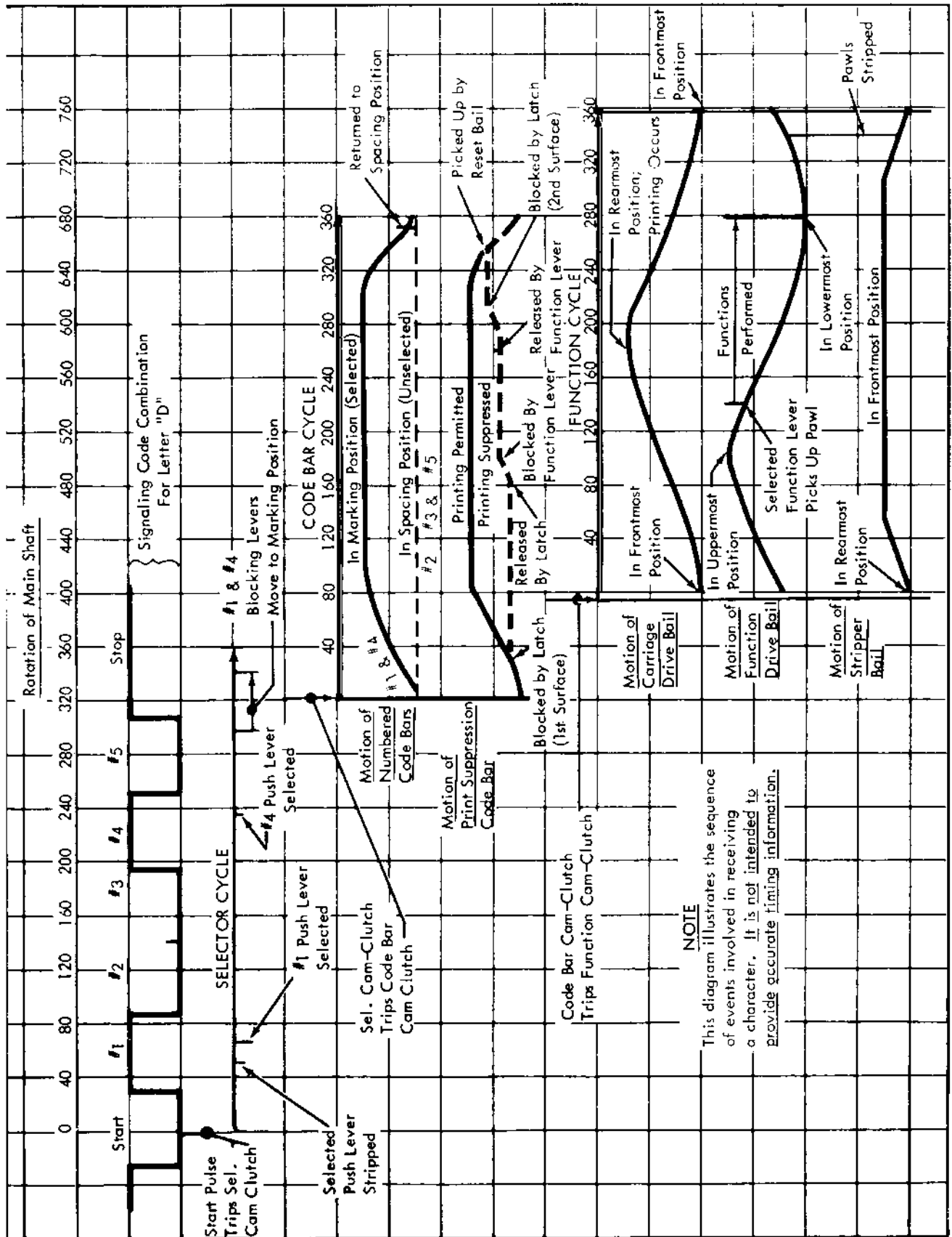


Figure 7-4. Sequence Diagram - Printer Operation.

selector mechanism, a code bar mechanism, a function mechanism, a spacing mechanism, and a printing carriage.

c. The upper portion of the diagram illustrates transmission which is effected by an operator depressing the keys of a keyboard. Assume that the "D" key is manually depressed. A code bar mechanism converts this selective action to mechanical positions corresponding to the code combinations representing the letter "D" (1--4-). These positions, in turn, set up the code combination in a set of keyboard contacts. The distributor then translates the position of the contacts to a corresponding signaling code combination and applies it to the transmission facilities which carry it to distant stations. Since a local selector magnet drive is connected to the transmission facilities, it also receives the signals.

d. The lower portion of the diagram illustrates reception and printing. Assume that the signaling code combination representing the letter "D" (1--4-), which may have been originated either remotely or by the local keyboard, is received from the transmission facilities by the selector magnet driver. The driver converts it to a form suitable to operate the selector mechanism. The selector then translates it to mechanical positions which are transferred to the code bar mechanism.

e. Under the control of the code bar mechanism, rotary and vertical positioning mechanisms on the carriage position a typewheel so as to select the letter "D" embossed on its surface. A printing mechanism, by means of a print hammer, drives the typewheel against an inked ribbon and the paper to print the character. A ribbon mechanism feeds the ribbon and reverses its direction of feed when a spool is depleted.

f. Controlled by the code bar mechanism, a function mechanism enables the Printer to perform functions supplementary to printing. The standard functions consist of space (SP), carriage return (CR), line feed (LF), blank (BL), bell, and, in the case of Model 32 Printers, letters (LTRS) and figures (FIGS). In response to the reception of LTRS or FIGS, the function mechanism conditions the code bar mechanism to cause printing in the lower or upper case, respectively. It also causes the code bar mechanism to suppress printing on receipt of all functions.

g. A spacing mechanism positions the carriage so that the characters are properly located horizontally on the paper. It spaces the carriage each time printing occurs and when

the SP code combination is received. The function mechanism suppresses spacing on the receipt of all functions except SP. At the receipt of the CR code combination, the function mechanism causes the spacing mechanism to return the carriage to the left margin so that a new printing line can be started.

h. A paper feed mechanism positions the paper vertically so that the characters are properly located in lines on the paper. At the receipt of the LF code combination, the function mechanism causes the line feed mechanism to raise the paper to the next printing line.

7-4. POWER DISTRIBUTION (Figure 7-5).

a. MOTOR.

(1) Rotary mechanical motion for the Printers is generated by synchronous motors. The motors are described and illustrated in "Description" (Section 4).

(2) The motor ordinarily used on Model 33 Printers has a run winding and a start winding connected in parallel (see appropriate schematic wiring diagram). The start winding is in series with an electrolytic capacitor and the contacts of a current-sensitive start relay.

(3) When the motor circuit is closed, the initial surge of current energizes the relay coil which closes the relay contacts. The magnetic flux produced by the operating and start windings starts the rotor turning. As the rotor accelerates, the current through the windings, capacitor and relay decreases. When it drops to a predetermined level, the relay coil opens the contacts and removes the start coil from the circuit. Using the operating coil alone, the motor continues to accelerate until it reaches synchronous speed.

(4) The motor ordinarily used on Model 32 Printers is similar, but has a run capacitor.

b. DISTRIBUTION (Figure 7-5).

(1) The rotary motion produced by the motor is transferred through a motor pinion, an intermediate gear-pulley and a motor belt to a distributor gear-pulley. The latter drives a main shaft gear and also a distributor cam-clutch which provides motion for the keyboard and distributor mechanism.

(2) The main shaft, through three cam-clutches, distributes motion to the various mechanisms on the printer assembly (excluding the distributor). A selector cam-clutch provides motion for the selector. A code bar cam-clutch

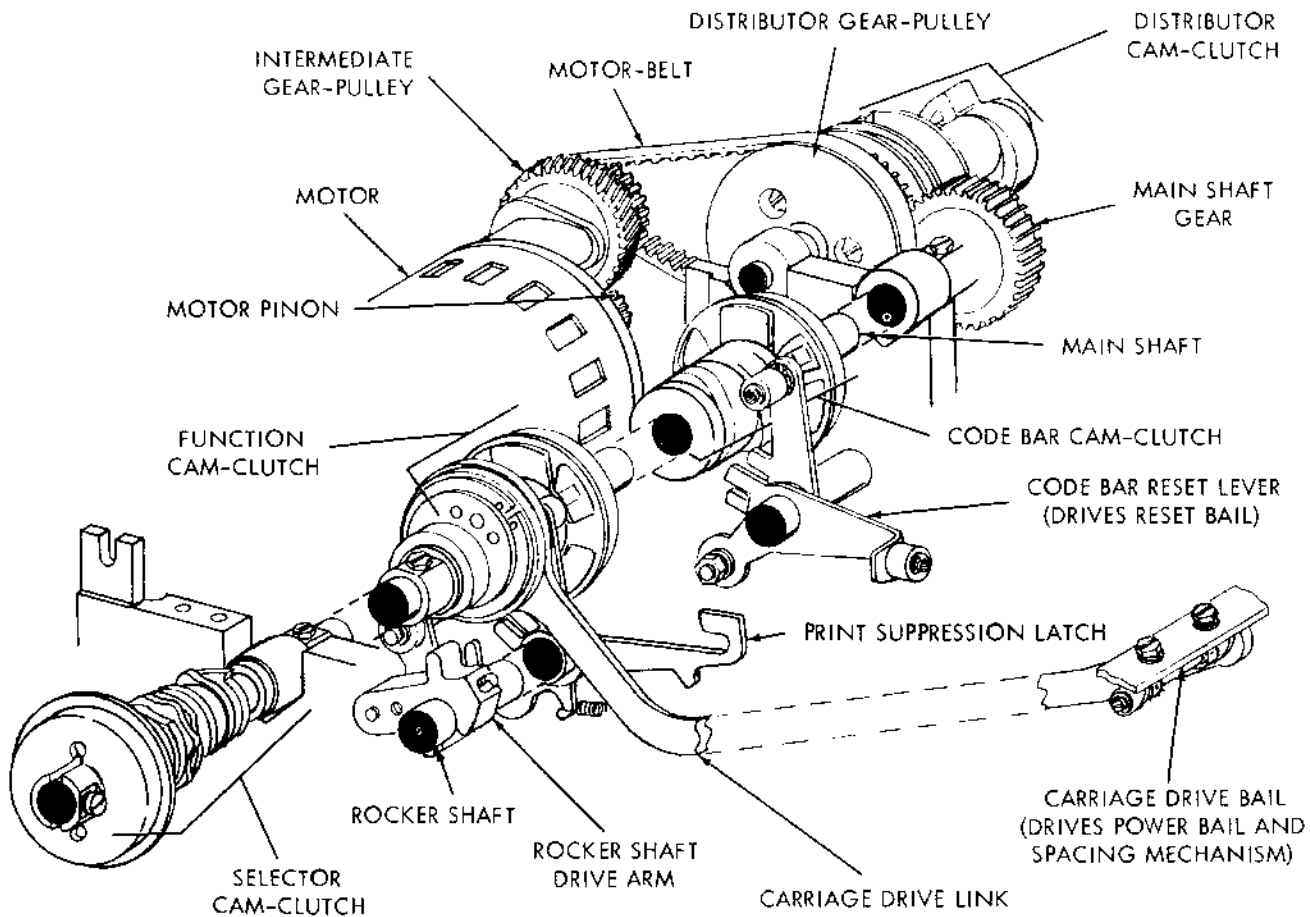


Figure 7-5. Power Distribution.

drives the code bar mechanism, and a function cam-clutch furnishes motion to a function rocker shaft, a function stripper bail, a carriage drive bail, and a print-suppression latch.

c. CAM-CLUTCHES (Figure 7-6).

(1) The operation of all four cam-clutches are basically the same. A typical cam-clutch is shown in Figure 7-6.

(2) A clutch drum is attached to and rotates in unison with a shaft. In their stop position, a trip lever and a latch lever hold a shoe lever, two shoes, a cam disk and cam sleeve stationary.

(3) When the trip lever moves away from the shoe lever, the latter under spring pressure moves away from a stop lug on the cam disk. Through two lugs, the shoe lever expands the shoes until they contact the notched inner surface of the drum. The drum causes the shoes to start to rotate, and the shoes,

in turn, through a lug on the cam disk, rotate the disk and the attached cam sleeve. The clutch is now engaged as shown in Figure 7-6, and the cam sleeve rotates in unison with the shaft.

(4) When the trip lever moves to its stop position, it is struck by the shoe lever. The cam disk continues to rotate until the latch lever seats in its notch, and the shoe lever and stop lug are pinched together by the trip lever and latch lever. A spring holds the shoes together so they no longer contact the drum. Thus, the cam-clutch is again disengaged as described in paragraph 7-4.c.(2).

7-5. TRANSMISSION.

a. GENERAL—Transmission of messages is accomplished by an operator selectively depressing the keys and space bar of the keyboard in same manner as in typing. The downward movement of each key or the space bar is translated by a code bar mechanism into mechanical arrangement corresponding to the

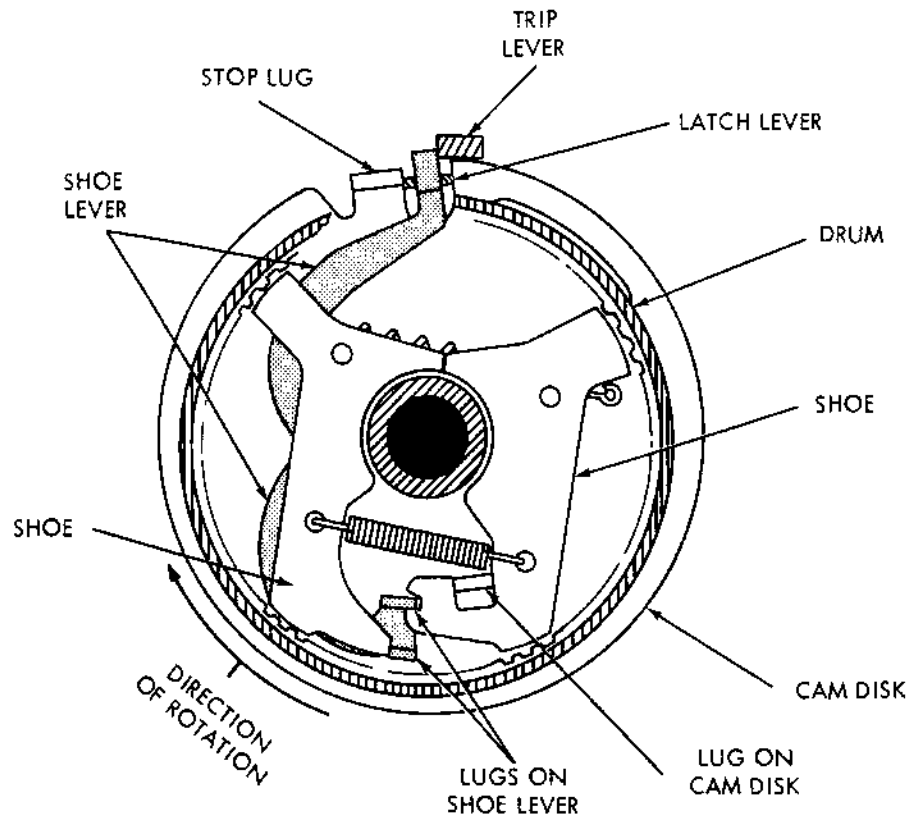


Figure 7-6. Cam Clutch.

code combination representing the character on the keytop. The mechanical arrangements set up the code combinations in a set of keyboard contacts. A universal mechanism trips a distributor cam-clutch, and a distributor mechanism then translates these positions to a corresponding start-stop signal for application to the transmission facilities, Par. 7-5.b. and c. cover transmission on Model 32 Printers. Par. 7-5.d. explains how it differs on the Model 33.

b. KEYBOARD.

(1) In conjunction with a distributor mechanism, the keyboard provides facilities for transmitting messages by the manual operation of a group of keys. The Model 32 and 33 keyboards are described and illustrated in "Description" (Section 1).

(2) Code Bar Mechanism (Figure 7-7).

(a) For each intelligence element of the code, there is a code bar sub-mechanism which consists of a front bar, a rear bar, a tie link and two T-levers (Figure 7-7). The mechanisms are numbered 1 through 5 from

rear to front according to the corresponding code elements. In addition, there is a universal mechanism consisting of one bar, a tie link and two T-levers (Figure 7-8).

(b) The bars have slots in their top edges which codes them so they are selectively depressed by the keys' keylevers. Each mechanism has a marking and a spacing position. In the marking position, the front bar is down, the rear bar is up, and the right T-lever is in the clockwise position. The spacing position is the opposite: front bar up, rear bar down, and right T-lever in counterclockwise position.

(c) The two bars in each mechanism are complementary coded so that, at any keylever position, where one has a slot, the other is solid. When a key is depressed, it is returned to its up position by a leaf spring. However, the code combination representing the key's character remains in the code bar mechanisms. When a new key is depressed, only the mechanisms whose code elements differ from those of the preceding combination are operated as illustrated in the following example:

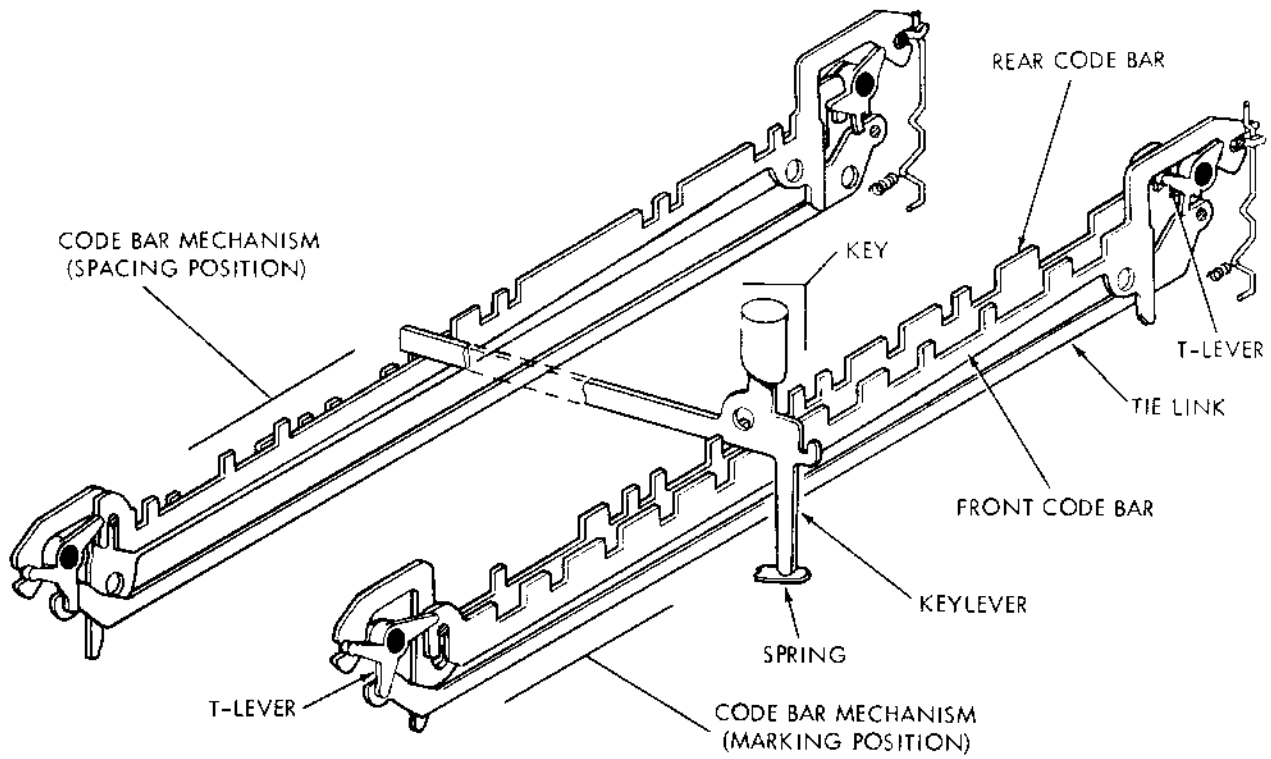


Figure 7-7. Code Bar Mechanism.

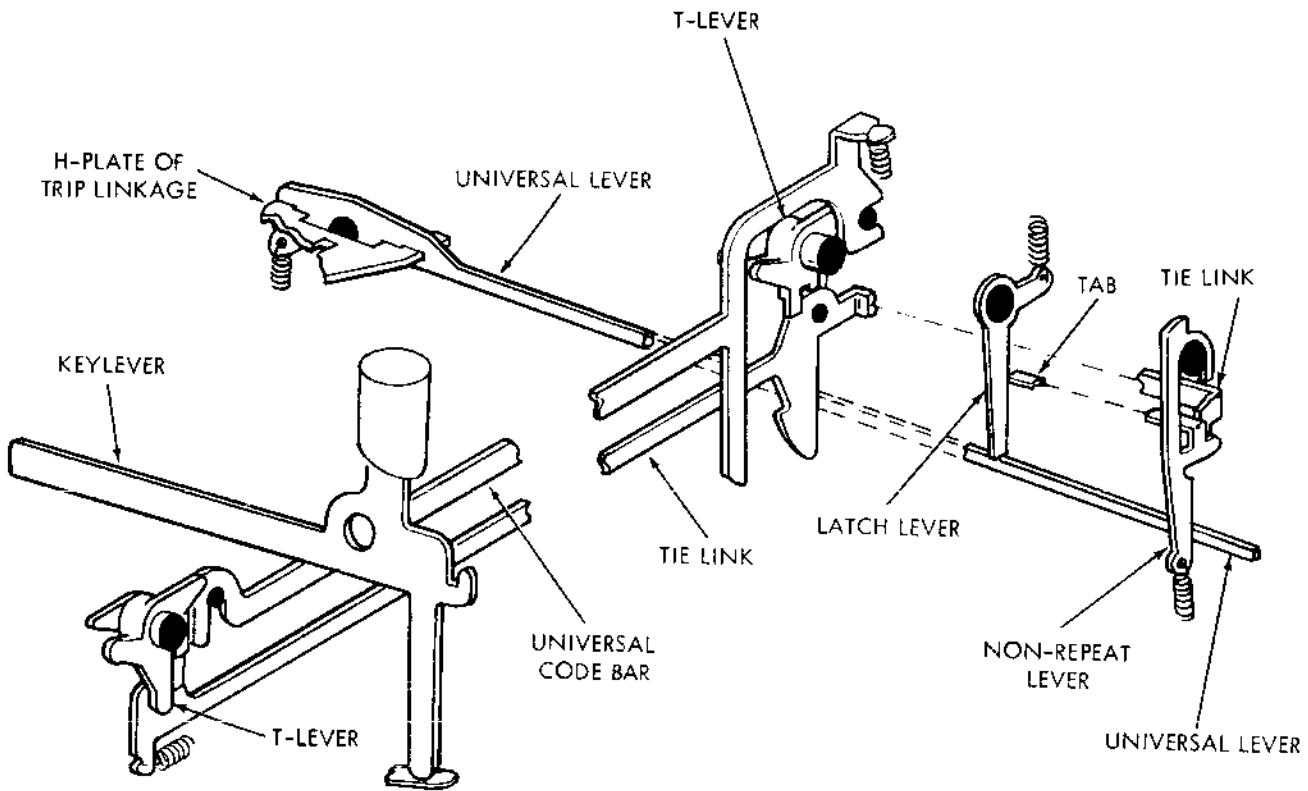


Figure 7-8. Universal Code Bar Mechanism.

(d) Assume that the letter "S" has just been transmitted. The "S" code combination, 1-3--, remains in the code bar mechanisms. Now assume that the "D" key whose combination is 1--4- is depressed. In the case of the No. 1 code bar mechanism, the keylever encounters a slot in the rear bar, and the mechanism remains marking. In the case of No. 2 and 5 mechanism, the lever encounters a slot in the front bar and they remain spacing. In the case of the No. 3 mechanism, the lever encounters a solid portion of the rear bar and shifts it to its spacing position. In a similar manner, the lever encounters the solid portion of the front bar of the No. 4 mechanism and shifts it to the marking position.

(e) Since each code combination is different and is locked in the code bar mechanisms (see par. 7-5. b. (3) (b)), the complimentary coding of the bars serves as an interlock for the keylevers. When one keylever is depressed, another cannot be depressed because it will be blocked by the solid portion of one or more bars.

(3) Universal Mechanism (Figure 7-8).

(a) As a keylever nears the bottom of its travel, it depresses a code bar which is part of a universal code bar mechanism. The code bar, in turn, causes associated T-levers to pivot and a tie link to move to the left. After some free movement, the tie link encounters a tab on a non-repeat lever and pivots the latter to the left. The tab, in turn, pivots a latch lever which releases a universal lever. Under spring pressure, the universal lever moves up and lifts the non-repeat lever so that its tab is moved from between the universal tie link and the latch lever. Under spring pressure, the latch lever and non-repeat lever move back to the right to their unoperated position.

(b) In its up position, the universal lever locks the right intelligence T-levers in the positions set up by the keylever, permits a contact bail to pivot to its down position (see paragraph 7-5. b. (4)), and through a trip linkage trips the distributor clutch (see paragraph 7-5. c.). Near the end of the distributor cycle, the trip linkage moves the universal lever back to its down position where it is latched by the latch lever.

(c) Should the keylever remain depressed beyond the end of the distributor cycle, when the universal lever moves to its down position, the non-repeat lever under spring tension moves down until it hangs up on the top of the universal tie link which is still in its left position. When the key-lever is finally released, the tie link moves back to the right and permits

the non-repeat lever to move all the way down so that its tab is again between the tie link and the latch lever. The trip mechanism operates in this way to prevent the distributor clutch from being retripped when a keylever is held down.

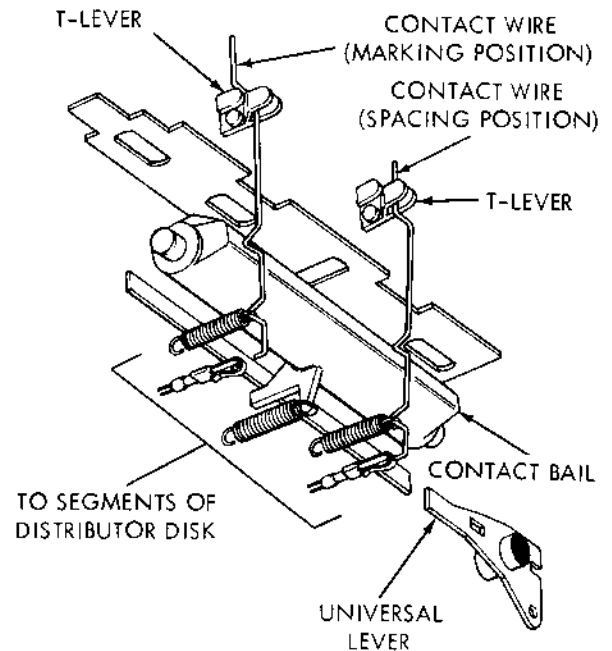


Figure 7-9. Keyboard Contact Mechanism.

(4) Keyboard Contact Mechanism (Figure 7-9).

(a) The code bar mechanisms set up the code combinations in a set of keyboard contacts. A contact wire is associated with each right T-lever excluding the universal. In the stop condition of the keyboard, a contact bail is held in its up position by the universal lever, and, in turn, holds the contact wires to the right away from the T-levers.

(b) When a keylever is depressed, a code combination is set up in the code bar mechanisms. The universal lever moves to its up position and permits the contact bail to pivot under spring pressure to its down position. The contact wires associated with the T-levers that are in the marking (clockwise) position are permitted under spring pressure to move to the left against a common terminal. Those associated with the T-levers that are in the spacing (counterclockwise) position are held to the right away from the terminal. For example, if the "D" code combination (1--4-) is in the code bar mechanisms as described

in paragraph 7-5.b.(2)(d), the No. 1 and No. 4 contact wires are against the terminal, and the No. 2, 3 and 5 are away from the terminal (see Figure 7-11).

(c) As covered in paragraph 7-5.c., the distributor mechanism converts these positions to start-stop signals. Near the end of the distributor cycle, the universal lever moves back to its down position and pivots the bail to its up position. The bail, in turn, cams the contact wires back to the right and holds them there in the stop position.

(5) Line Break - When a line break (BREAK) key is depressed, it pivots a T-lever which opens the break contact (see Figure 7-11). This action opens the signal line until the key is released.

(6) Repeat - To repeat the transmission of a character, its keylever is held down along with the repeat (RPT) keylever. The latter holds the non-repeat lever down where its tab remains between the tie link and the latch lever

(see paragraph 7-5.b.(3) and Figure 7-8). The latch lever is held in its left position and does not latch the universal lever at the end of the cycle. The universal lever thus moves up and trips the distributor clutch causing the character to be retransmitted as long as the RPT key is depressed.

c. DISTRIBUTOR MECHANISM (Figures 7-10 and 7-11).

(i) The distributor mechanism converts the positions of the keyboard contacts to start-stop signals and applies them to the signal line. The mechanism receives rotary motion from a distributor gear-pulley attached to the drum of a distributor clutch. The clutch disk is connected to a distributor shaft. A brush holder mounted on the shaft carries two carbon brushes which are electrically connected by a spring and ride on an inner and outer disk, respectively. The disks are part of a printed circuit card that provides facilities for inter-connecting the distributor with other apparatus. The outer disk is divided into segments—

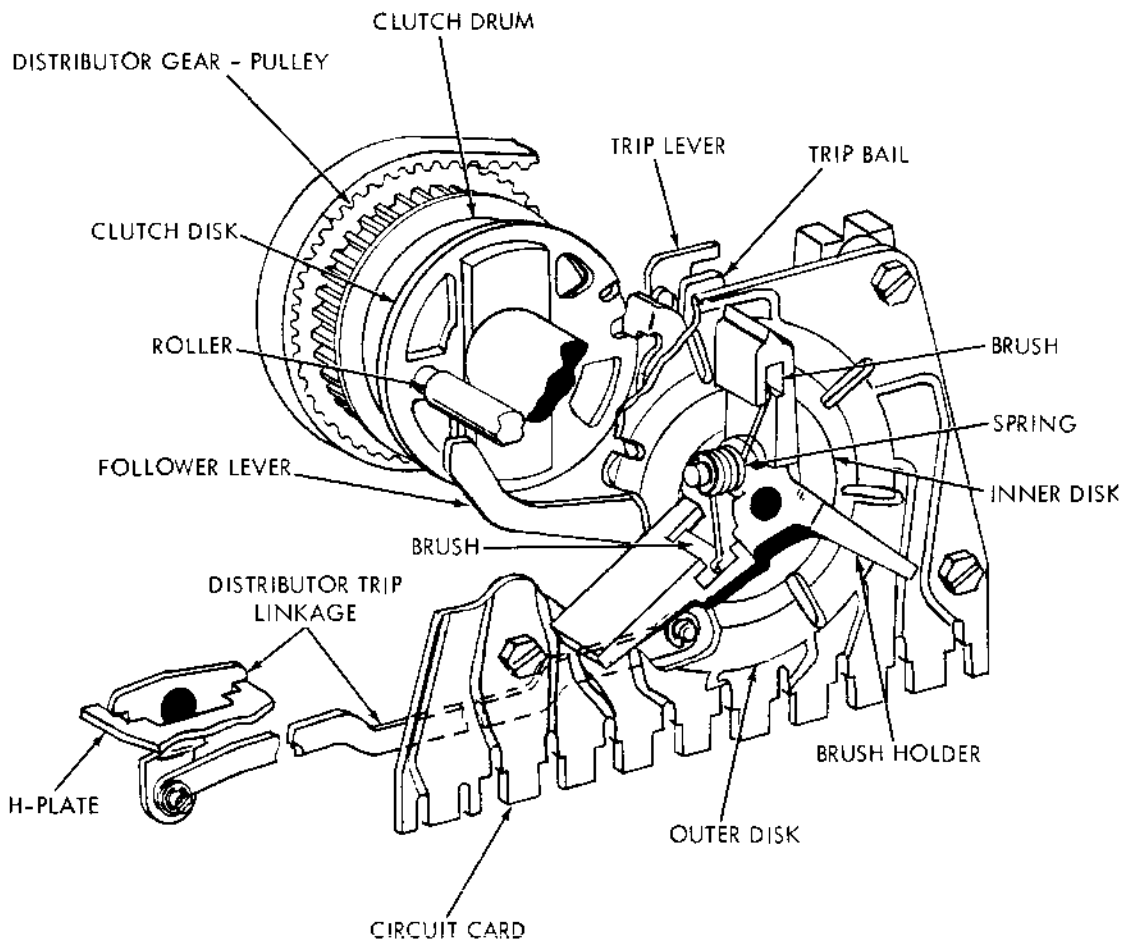


Figure 7-10. Distributor Mechanism.

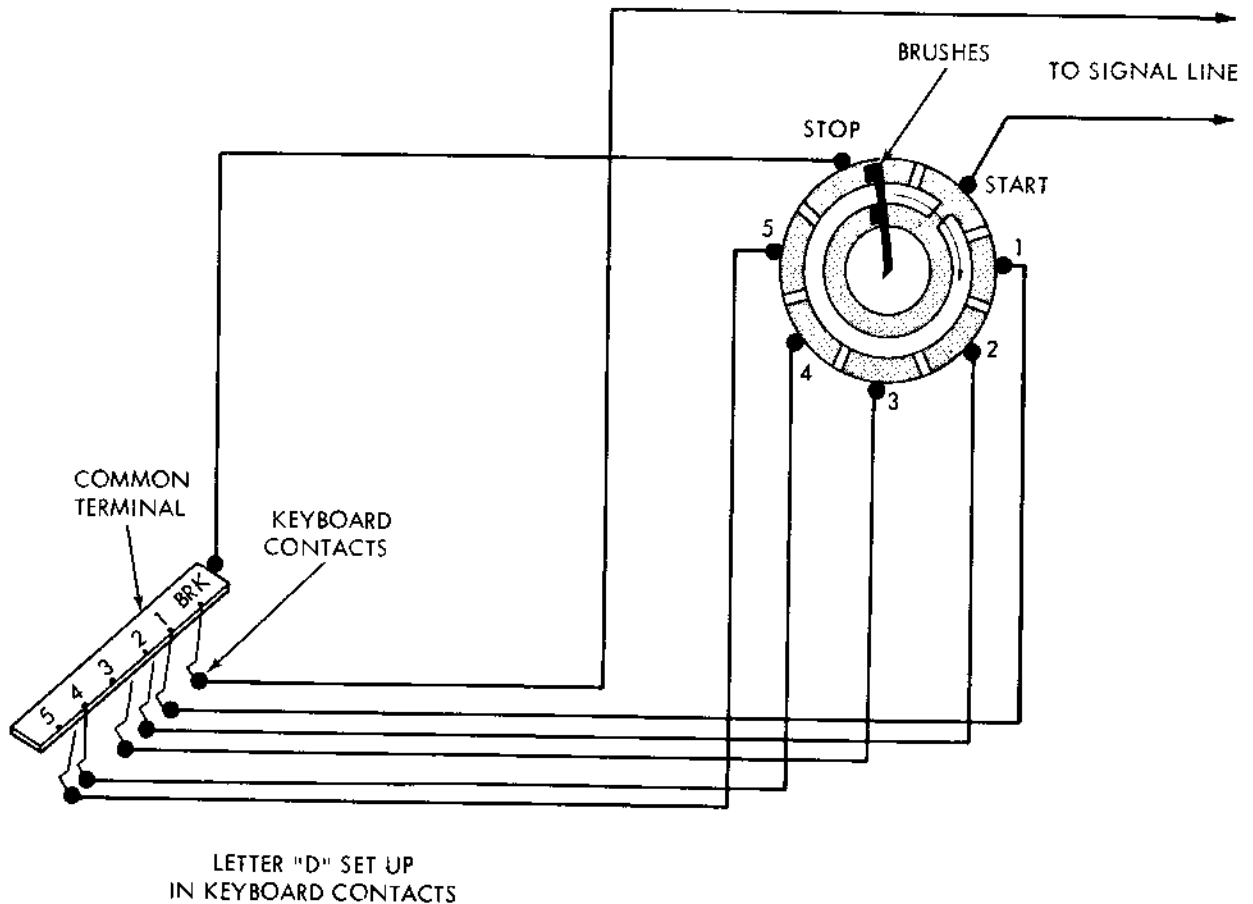


Figure 7-11. Signal Wiring - Model 32 Distributor and Keyboard Contacts.

ten for Model 33 Printers, 7 for Model 32. The segments correspond to the elements of the code described in paragraph 7-2.

(2) In the stop position, the distributor clutch is disengaged, and the outer brush rests on the stop segment. When a keylever is depressed, the proper code combination is set up in the keyboard contacts and the universal lever moves to its up position. The motion of the transfer lever is conveyed by an H-plate to a distributor trip linkage on the printer assembly. The trip linkage pivots a trip bail which carries a trip lever rearward out of the way of the distributor clutch's shoe lever. The clutch engages and rotates the shaft and brush holder. The outer brush passes over the segments on the outer disk in the following order: (1) start, No. 1 through No. 5 and stop for Model 32 Printers and (2) start, No. 1 through No. 8 and stop for Model 33. Near the end of the shaft's revolution, a roller on the clutch disk pivots a follower lever which moves the trip bail and lever frontwards. This motion is transferred

through the trip linkage and H-plate to the universal lever which is moved to its down position where it is latched. When the clutch completes its revolution, the shoe lever strikes the trip lever, and the clutch disengages.

(3) The effect of the above operation is to apply a start-stop code combination to the signal line corresponding to the combination set up in the keyboard contacts. This can best be shown by an example. Figure 7-11 is a simplified schematic of a Model 32 distributor and keyboard contacts.

(4) In the stop position, the outer brush rests on the stop segment, and current flows in the signal circuit which is closed (the path being from one side of the line through the start segment, the inner disk, the brushes, the stop segment, the common terminal and the break contact to the other side of the line). Thus a marking condition exists. Assume again that the "D" key is depressed. The 1--4-code combination is set up in the keyboard contacts.

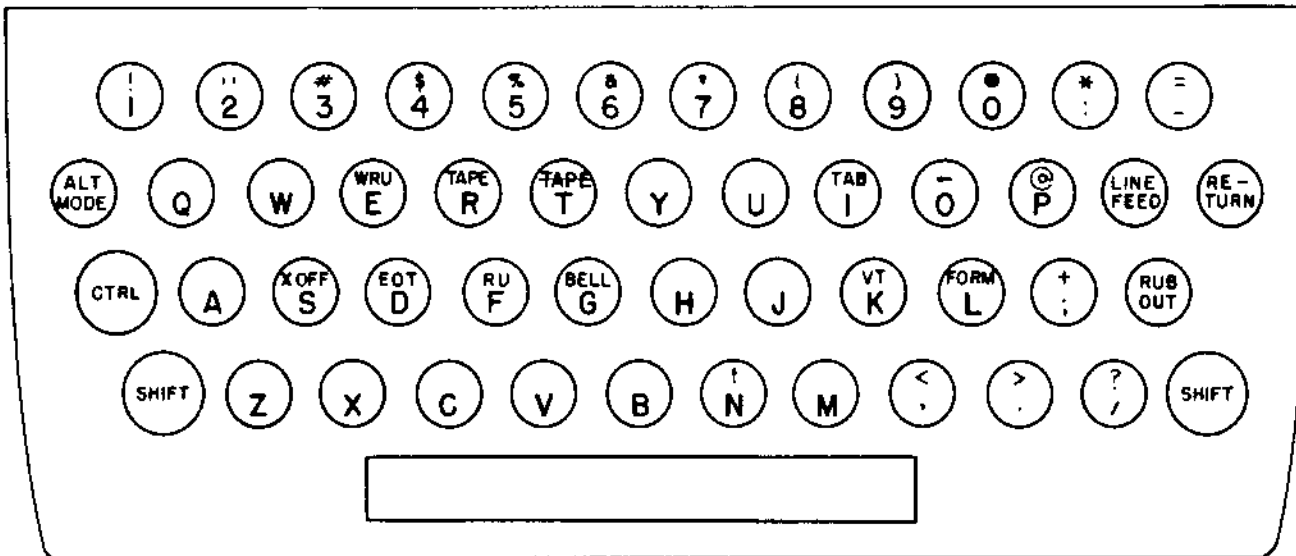


Figure 7-12. Keyboard Arrangement - Model 33.

(5) The distributor clutch is tripped, and the brush holder begins its revolution. While the brush is on the start segment, the circuit is open, no current flows, and a spacing element is transmitted. While it is on the No. 1 segment, the circuit is closed (the signal path being through the start segment, the inner disk, the brushes, the No. 1 segment, the closed No. 1 contact, the common terminal and the break contact); thus current flows, and a marking element is transmitted. While the brush is on the No. 2 and No. 3 segments, since the No. 2 and No. 3 contacts are open, the circuit is broken, no current flows, and spacing elements are transmitted. In a similar manner, a No. 4 marking element and a No. 5 spacing element transmitted. When the brush reaches the stop segment, the cam-clutch is disengaged and the line again becomes marking.

d. MODEL 33 (Figures 7-12 and 7-13).

(1) Transmission on Model 33 Printers is similar to that on Model 32 except that facilities are provided on the keyboard and distributor to generate the eight-level data interchange code (see paragraph 7-2.c.) and the keyboard utilizes two shift keys. The key labeled "SHIFT" is used to generate the code combinations for the printing characters appearing on the upper keytops (e.g., "\$" that appears above "4" on the keytop in Figure 7-12). The control (CTRL) key is used to generate the codes for the control characters appearing on the upper keytops (e.g., "WRU" that appears above "E" on the keytop in Figure 7-12). In the case of both shift and control, the shift key must be held down while the appropriate character key is struck.

(2) The SHIFT key inverts the No. 5 code element. If the element is normally marking

it makes it spacing; if the element is normally spacing it makes it marking. It does this by two "two-headed" T-levers, one at the shift position and one at the No. 5 position, each of which operates two contact wires, alternately opening one and closing the other. As shown in Figure 7-13, in the spacing condition the c. contact associated with the No. 5 T-lever is open and the d. contact is closed. In its unoperated position the a. contact associated with the SHIFT T-lever is closed and the b. contact is open. For example, if the "4" key alone is pressed, the code combination for "4" (--3-56-8, see Figure 7-2) is set up in the keyboard contacts and subsequently transmitted. In this case, the two-headed No. 5 T-lever holds the c. contact closed and the d. contact open, resulting in a marking No. 5 element (the signal path being through the stop segment, the common terminal, the closed c. contact, the closed a. contact, the No. 5 segment, the brushes, the inner disk and the start segment as shown in Figure 7-13).

(3) If the "4" key is depressed with the SHIFT key, the same condition is set up in the contacts except that the two-headed shift T-lever holds the a. contact open and the b. contact closed and thus opens the signal circuit. This results in the No. 5 element being spacing rather than marking, and the code combination for "\$" (--3--6-8) being transmitted.

(4) If the "N" keylever alone is depressed, the code combination for "N" (-234--78) is set by the code bars and subsequently transmitted to the line. In this case the two-headed No. 5 T-lever holds the c. contact open and the d. contact closed. On the other hand, if the "N" key is depressed with the SHIFT

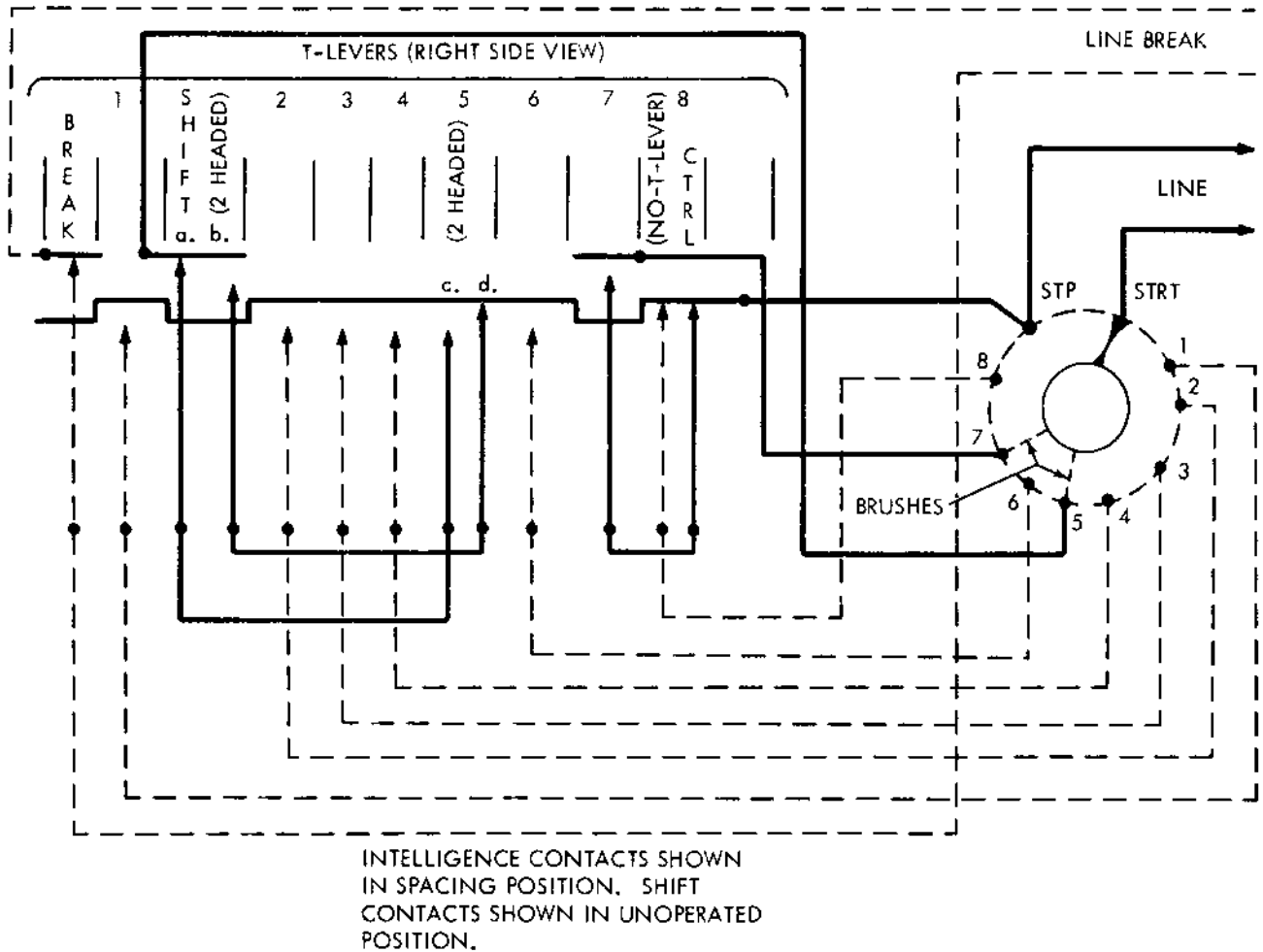


Figure 7-13. Signal Wiring - Model 33 Keyboard and Distributor.

key, the same condition is set up in the keyboard contacts as before except that the SHIFT key opens the a. contact and closes the b. contact and thus closes the signal circuit. This results in the No. 5 element being marking rather than spacing and the code combination for (-2345-78) being transmitted.

(5) The CTRL key converts the No. 7 element from marking to spacing. For example, if the "E" keylever alone is depressed, the "E" code combination (1-3---78) is set up in keyboard contacts and subsequently transmitted (the path of the current for the marking No. 7 element being through the stop segment, the common terminal, the closed control contact, the closed No. 7 contact, the No. 7 segment, the brushes, the inner disk, and the start segment). If the "E" key is held down with the CTRL key, the same condition as before is set up in the contacts except that the control T-lever opens the control contact and thus breaks the signal circuit. This results in the No. 7 element

being spacing and the code combination for "WRU" (1-3---8) being transmitted.

7-6. RECEPTION AND CONVERSION.

a. SELECTOR MECHANISM (Figures 7-14 and 7-15).

(1) The selector mechanism receives the signaling code combinations from the selector magnet driver and converts them to corresponding mechanical arrangements that control the code bar mechanism. The selector mechanism is described and illustrated in "Description" (Section 1).

(2) A magnet coil is wired by two leads to the output of the driver. In the stop condition, the output of the driver is marking, and the coil is energized and holds the armature against a magnet core. When a code combination is received, the start pulse (spacing) de-energizes the coil and the armature

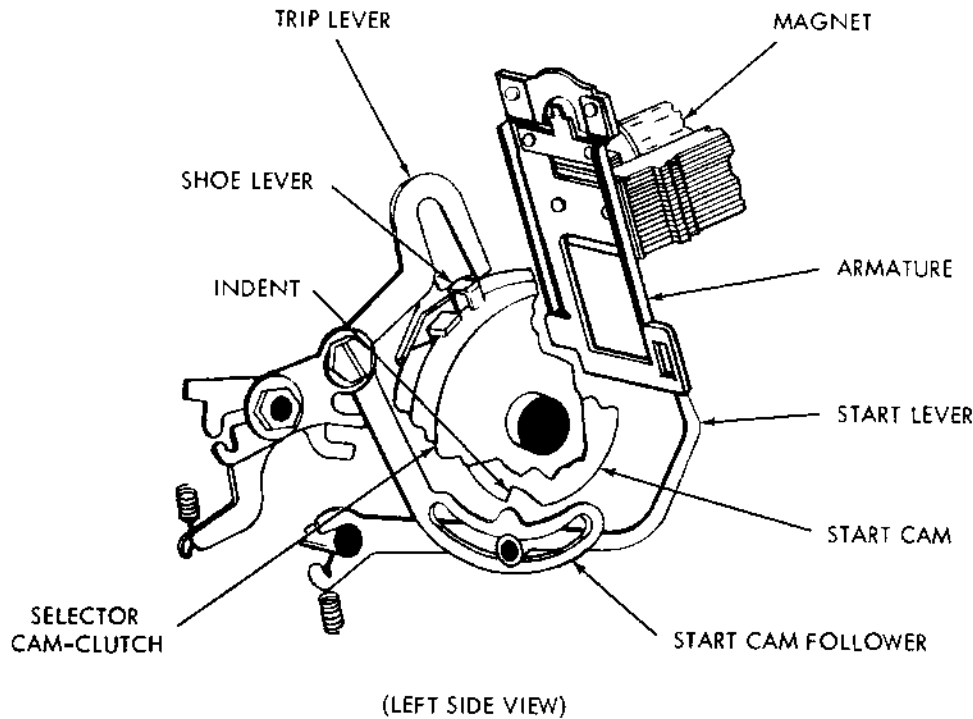


Figure 7-14. Selector Trip Mechanism.

moves rearward to its spacing position out of the way of a start lever (Figure 7-14). The latter moves up and carries an associated start cam follower into the indent in its cam. The follower, in turn, moves an attached trip lever up out of engagement with a clutch shoe lever. A selector cam-clutch engages and makes one complete revolution (cycles) during which the start cam holds the start lever out of the way of the armature.

(3) As the cam-clutch cycles, a spacing lock lever, a stripper bail, a code bar cam-clutch's trip follower arm, and selector levers (eight for Model 33, five for Model 32) ride on individual cams under spring pressure.

(4) Near the beginning of the cycle, the stripper cam pivots the stripper bail which strips any push levers selected during the previous cycle from their respective selector levers and leaves them in their unselected position in front of the selector levers. The design of the cam-clutch is such that, as each element of the code combination is received following the start element, an indent in the corresponding selector lever cam and the spacing lock lever cam are presented to their respective levers. Since the operation of each selector linkage is the same, only that of one of them will be described.

(5) If the intelligence element is spacing, it de-energizes the magnet coil, and the armature moves to its spacing (rear) position. The spacing lock lever is permitted to move up and it holds the armature in this position during the sampling interval (Figure 7-15). The selector lever is prevented from moving up into the indent of its cam by the armature, and the push lever remains in its unselected (spacing) position in front of the lever.

(6) On the other hand, if the element is marking, the armature moves forward to its marking position out of the way of the selector lever and blocks the spacing lock lever. The selector lever moves up into the indent in its cam, locking the armature in its marking position during the sampling interval and permitting its spring-biased push lever to move rearward under the selector lever.

(7) As the code combination is received, each intelligence element is sampled in turn, and the corresponding selector levers and push levers are positioned accordingly (see Figure 7-4). The contours of the selector cams are such that, near the end of the cycle, they drive the selector levers and selected push levers downward and thus pivot corresponding blocking levers counterclockwise (as viewed from left) to their marking position

in which their slotted portion is up (Figure 7-15). The blocking levers associated with the unselected push levers remain in the spacing position in which their slotted portion is down.

(8) Near the end of the cycle, the trip follower arm is moved rearward by its cam and trips the code bar clutch (see paragraph 7-6.c.).

(9) When the stop element (marking) is received at the end of the code combination, the armature moves to its marking position above the start lever where it prevents the start cam follower from falling into the indent in its cam (Figure 7-14). In this position, the follower holds the trip lever down so that, when the cam-clutch completes its cycle, its shoe lever strikes the trip lever, and the clutch is disengaged.

(10) As an example, assume that the letter "D", whose code combination is 1--4-, is re-

ceived by a Model 32 Printer (see Figure 7-4). The start pulse (spacing) trips the cam-clutch which begins its cycle. The stripper bail strips the selected push levers from the selector levers. The intelligence pulses are sampled in order, and the No. 1 and No. 4 push levers are selected. Near the end of the cycle, the cam-clutch cams the No. 1 and No. 4 push levers down and they pivot the No. 1 and No. 4 blocking levers to their marking position. The No. 2, No. 3 and No. 5 remain in their spacing position. The trip cam causes the trip follower arm to trip the code bar cam-clutch. The stop pulse (marking) disengages the selector cam-clutch, and the selector is returned to its stop position.

b. RANGE FINDER (See Figure 1-6).

(1) For optimum operation of the Printer, the selector must sample the code elements at the most favorable time. The range finder

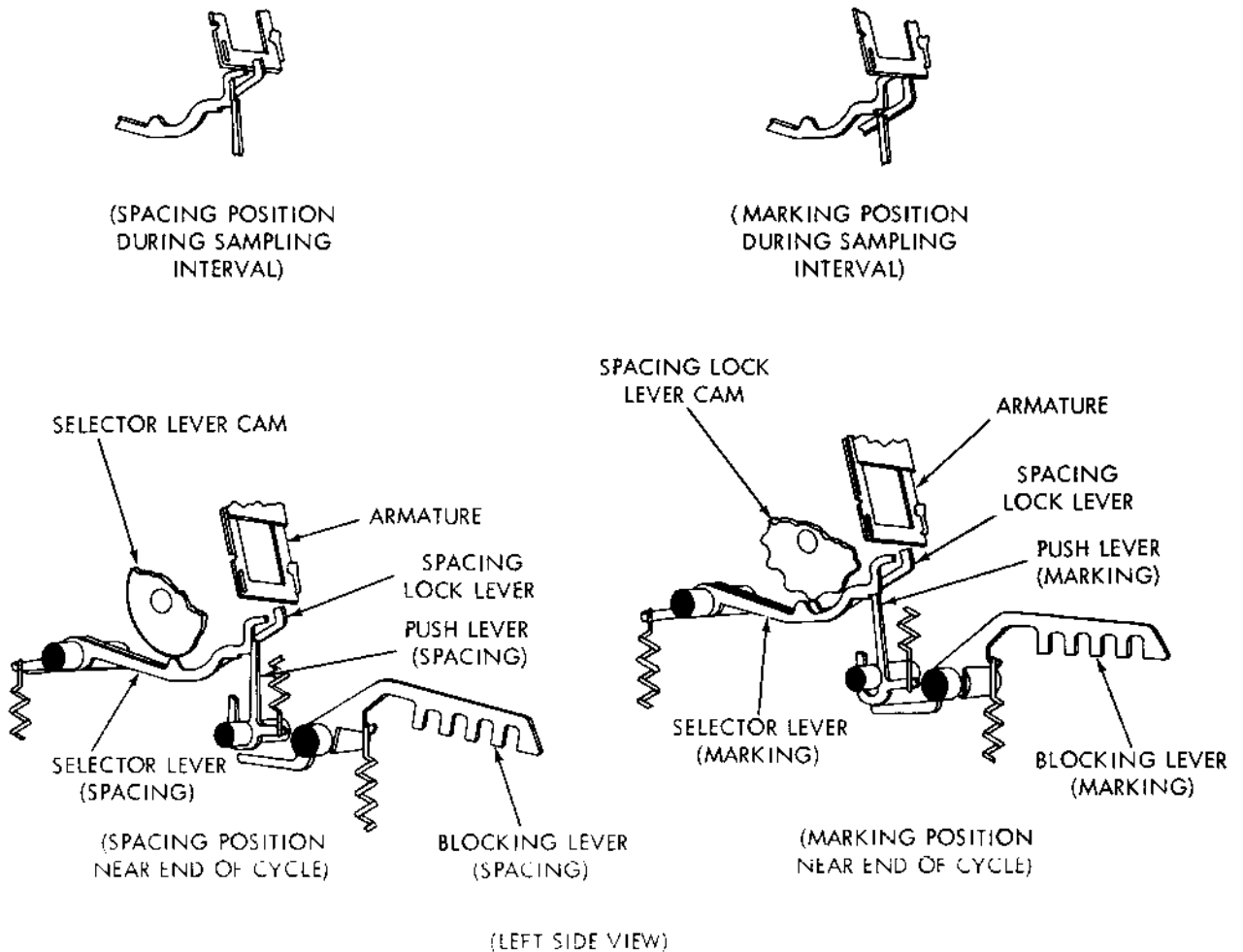


Figure 7-15. Selector Mechanism.

provides a means of determining this time by establishing a range of operating margins.

(2) When a range finder knob is loosened, a pointer may be moved along a range scale by a handle. This changes the angular position of the trip and latch levers with respect to the main shaft, and thus changes the position where the cam-clutch begins and ends its cycle. The effect of this operation is to change the time in the cycle when the selector samples each code pulse.

(3) Rotating the pointer counterclockwise from 60, the center of the scale, causes the selector to sample the trailing portion of the pulse. Rotating the pointer clockwise causes the selector to sample the leading edge. To establish the margins of the operating range, the pointer is moved first in one direction,

then in the other, until errors in printing occur. The pointer is then set at the center of the range and the knob tightened.

c. CODE BAR MECHANISM (Figure 7-16).

(1) The code bar mechanism controls printing and the function mechanism. It is described in "Description" (Section 1).

(2) As mentioned in paragraph 7-6.a.(8) above, near the end of the selector cycle, the selector cam-clutch pivots the code bar cam-clutch's trip follower arm. The arm through a trip shaft pivots a trip lever out of the way of the shoe lever. The cam-clutch engages and makes one revolution (cycles). See Figure 7-4.

(3) As the code bar cam-clutch cycles, a code bar reset lever follows its camming

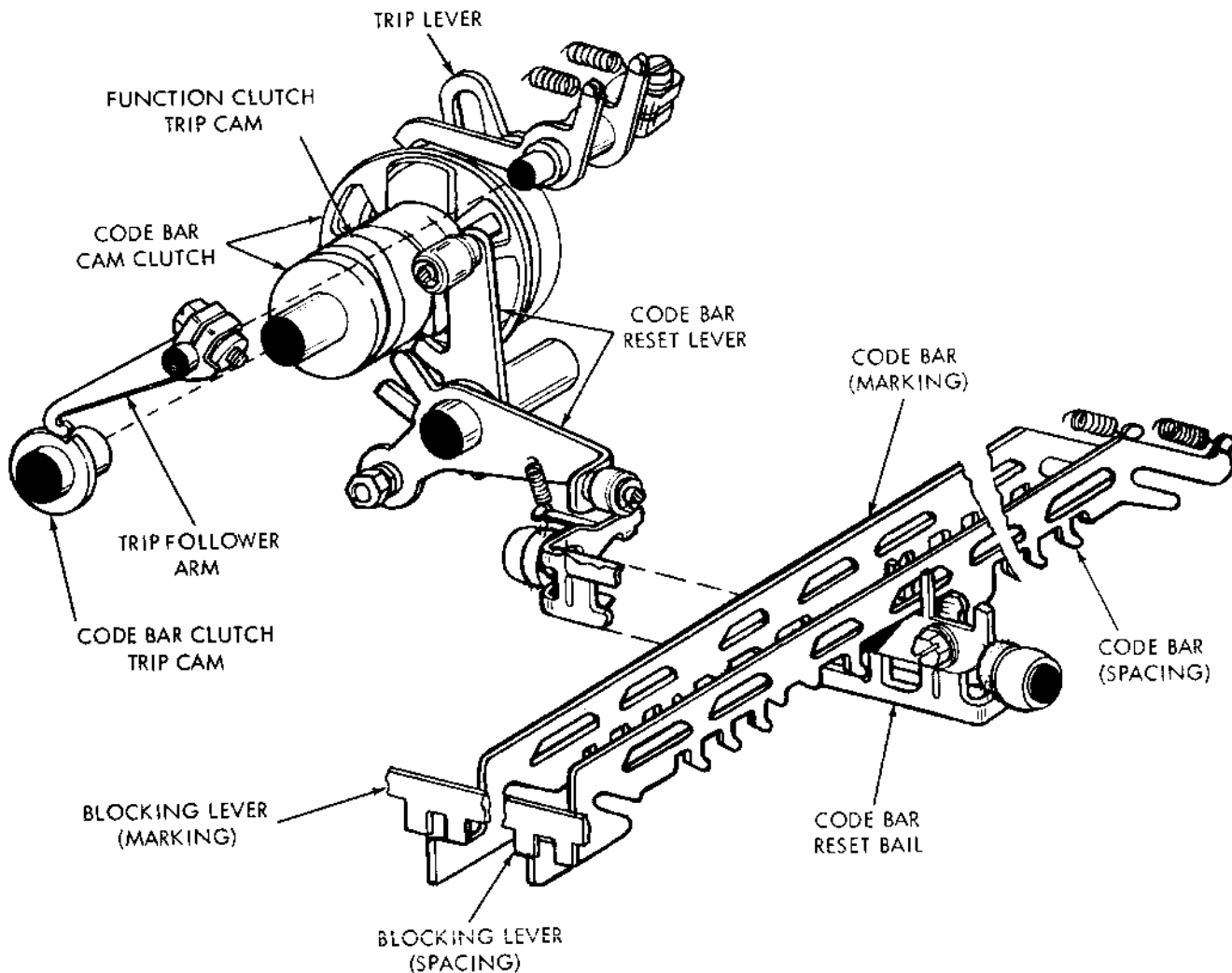


Figure 7-16. Code Bar Mechanism.

surface under the pressure of a code bar reset bail's spring. Early in the cycle, the cam through the reset lever permits the reset bail to pivot counterclockwise.

(4) There are ten bars in the Model 33 Printer and eight bars in the Model 32. As the reset bail pivots, the numbered bars (excluding the No. 0 bar in Model 32 Printers) are permitted under spring pressure to move up and to the left and sense the position of the corresponding selector blocking levers. If a blocking lever is in its marking position (up), it permits its code bar to move all the way up and to the left to its marking position (see Figure 7-4). But if the blocking lever is in its spacing position (down), a projection on the lever holds the bar down in its spacing position. The operation of the print suppression code bar is described in paragraph 7-8.f.(2). The operation of the No. 0 bar on Model 32 Printers is described in paragraph 7-8.d.(3). The operation of the automatic carriage return-line feed bar is described in paragraph 7-12. Function levers under the code bars and carriage slides that ride on top of the bars sense their positions and use them to control various operations as will be described in succeeding paragraphs.

(5) Early in the cycle, a trip cam pivots a follower arm which trips the function cam-clutch (see paragraph 7-7.b. and Figure 7-4).

(6) Near the end of the code bar cycle, the cam through the reset lever pivots the reset bail clockwise. The latter thus returns the bars to their stop (down and right) position.

(7) As an example, take the reception of the letter "D" (1--4-) treated in paragraph 7-6.a.(10), above. The No. 1 and No. 4 blocking levers move to their marking position and the trip cam trips the code bar cam-clutch which begins its cycle. The reset bail permits the code bars to sense the position of the blocking levers. The No. 1 and No. 4 code bars are permitted by their blocking levers to move up and to the left to their marking position. The remaining bars are held down in their spacing position. The cam-clutch trips the function cam-clutch. Near the end of the cycle the reset bail returns the bars to their stop position.

7-7. FUNCTION MECHANISM (Figure 7-17).

a. The function mechanism enables the Printer to perform functions at the receipt of the proper code combinations. Functions are operations supplementary to printing the message, such as moving the carriage back to the left margin

(carriage return) and moving the paper up (line feed) so that a new line can be printed.

b. As mentioned in paragraph 7-4.c.(3), early in the code bar cycle, a cam pivots the function trip follower arm which moves the function trip lever out of engagement with its shoe lever. The function cam-clutch engages and makes one complete revolution (cycles). A function drive cam, through a follower arm and drive arm, causes the function rocker shaft to rock. The rocker shaft, in turn, through two drive linkages, moves a function drive bail up during the first part of the cycle and down during the middle portion (see Figure 7-4).

c. The under side of the code bars are coded by a series of notches and projections. Under the code bars are a number of function levers which pivot on the same shaft as the function drive bail and are connected to the bail by springs. As the bail moves up, the springs pull the levers up so that they sense the code bars. If a lever encounters one or more projections, it is retained in its down position against the tension of its spring. On the other hand, if the slots line up such that an opening is provided for a lever, it moves all the way up to its selected position.

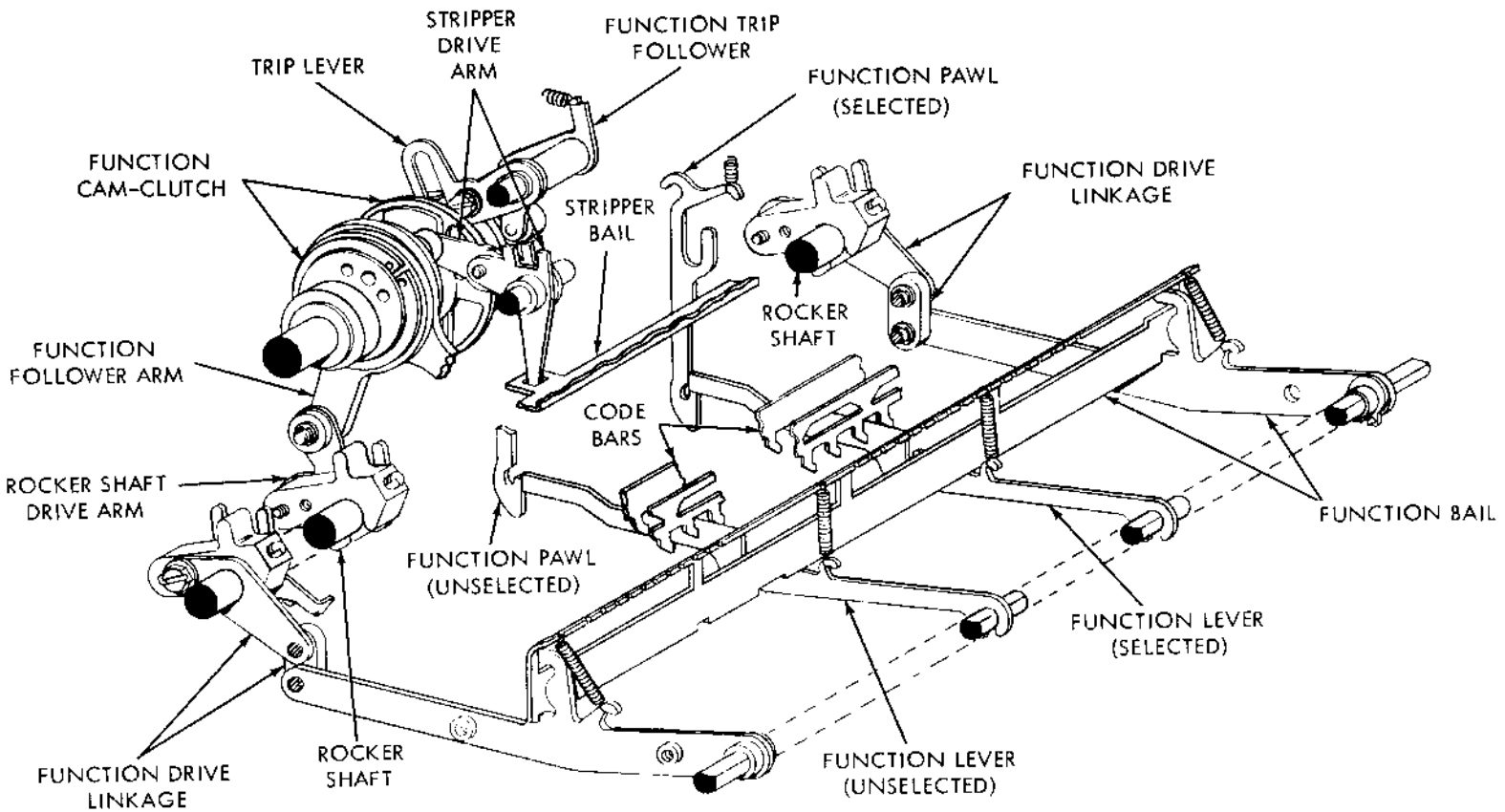
d. In most cases, when a function lever moves up to a certain level, it is latched by an associated function pawl. Then when the drive bail pulls the lever and latched pawl down during the middle portion of the cycle, the pawl provides the motion to effect the function.

e. Near the beginning of the function cycle, a cam pivots a drive arm which moves the function stripper bail frontward (see Figure 7-4). Near the end of the cycle, the cam permits the drive arm under spring pressure to move the stripper bail rearward and strip any latched function pawls from their selected function levers.

f. The operation of the individual function levers and pawls are covered under the individual functions.

7-8. PRINTING.

a. GENERAL — A printing carriage prints the messages on the paper. The carriage is described and illustrated in "Description" (Section 1). Printing is controlled by the code elements described in paragraph 7-2. Although the Model 32 and 33 carriages are the same, the numbers of the code elements controlling the specific operations are different.



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Figure 7-17. Function Mechanism.

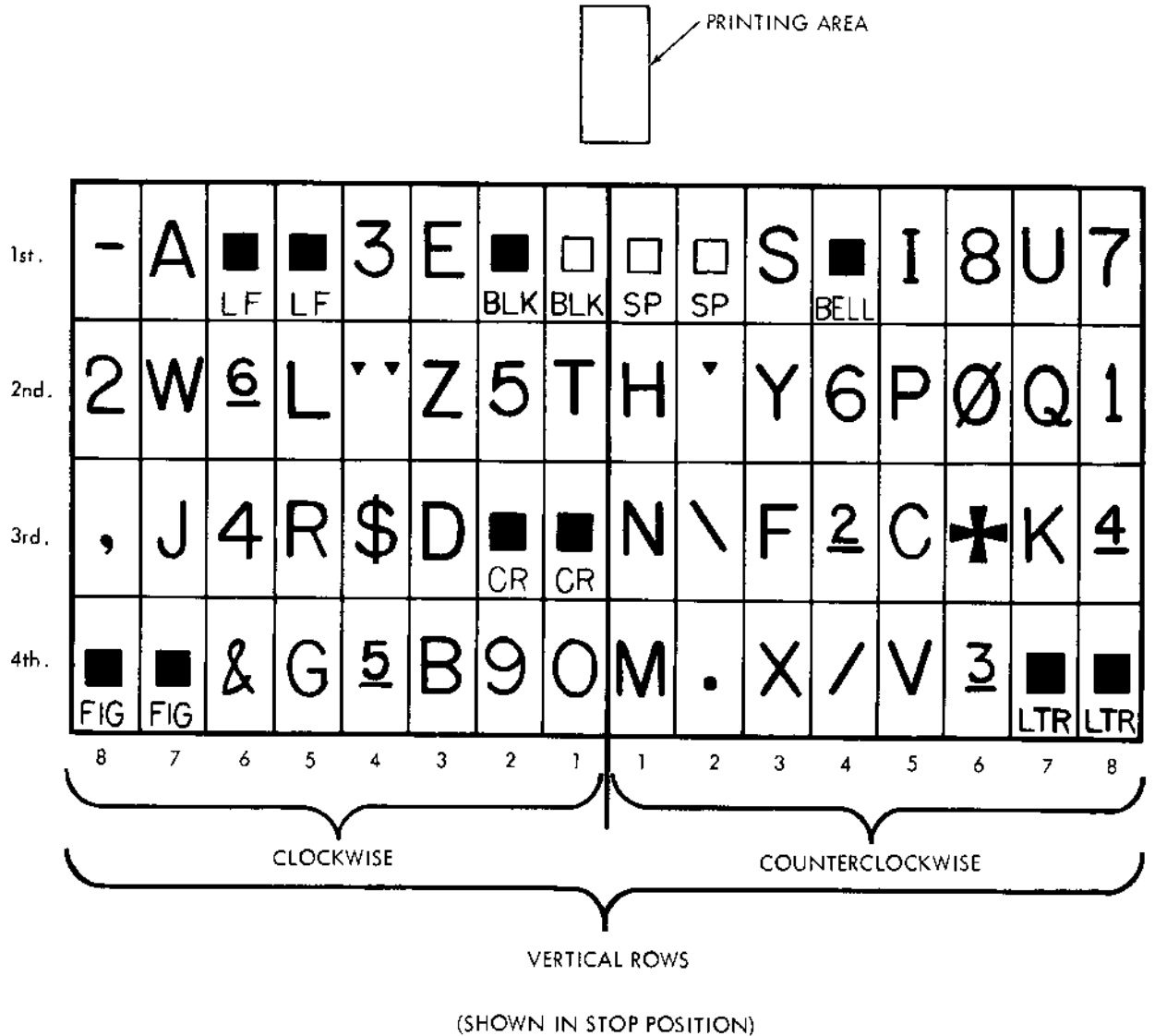


Figure 7-18. Typical Typewheel Character Arrangement - Model 32.

b. TYPEWHEEL (Figure 7-18).

(1) The characters used in printing are embossed on the cylindrical surface of a typewheel. A typewheel character arrangement is shown in Figure 7-18 in which the cylindrical surface is rolled out flat. The characters are arranged in 16 vertical rows of four characters each. For the sake of explanation, the wheel is divided into clockwise and counterclockwise fields to indicate in which direction the wheel is rotated to select the rows. The rows are then numbered 1 through 8 in each direction from the border-line between the fields. The characters in each row are designated the 1st through the 4th from top to bottom.

(2) Again for the sake of explanation, a printing area is indicated in the figure. This is the area the selected character must be in if it is to be printed when the print hammer strikes the typewheel. As shown in the figure, the border line between the fields is under the printing area when the Printer is in the stop condition. During the first part of each function cycle vertical and rotary positioning mechanisms impart separate, but simultaneous, motions to the wheel to select the proper character. The rotary mechanism rotates it either clockwise or counterclockwise to align the proper row with the printing area. The vertical mechanism raises it to place the

proper character in the printing area. During the latter part of the function cycle the type-wheel is returned to its stop position.

(3) For example, assume that the code combination representing the letter "D" is received by the Printer. The rotary mechanism rotates the wheel three and one half rows clockwise and the vertical mechanism raises it three characters plus the distance below the printing area. The print hammer drives it forward and imprints the letter "D" on the paper. The positioning mechanisms then return it to its stop position.

c. POWER — As the function cam-clutch cycles (paragraph 7-7.b.), an eccentric cam imparts oscillating motion through a carriage drive link to a carriage drive bail (see Figure 7-5). The bail pivots rearward during the first part of the cycle and forward to its stop position during the latter part. (See Figure 7-4.) In doing so it causes a power bail on the carriage to pivot first clockwise (as viewed from left), then counterclockwise (see Figure

7-19). The power bail has two rollers that move along the drive bail and permit it to receive the motion regardless of the carriage's position along the printing line.

d. ROTARY POSITIONING.

(1) Direction of Rotation (Figure 7-19).

(a) Which way the typewheel rotates from the stop position is determined by the No. 3 code element on Model 32 Printers and the No. 4 element on Model 33. If this element is marking, the wheel is rotated counter-clockwise; if it is spacing, the wheel is rotated clockwise. In paragraphs (b) and (c) directly below, the numbers apply to the Model 32 are given.

(b) When a code combination is received in which the No. 3 element is marking, the No. 3 code bar moves up and to the left early in the code bar cycle. A following slide, through a linkage, moves a rotary drive arm down so that it engages a left rotary rack, but not a right one. If the No. 3 element is spacing, the alternate condition exists in which the No. 3 code bar is down and the drive arm is up where it engages the right rack but not the left.

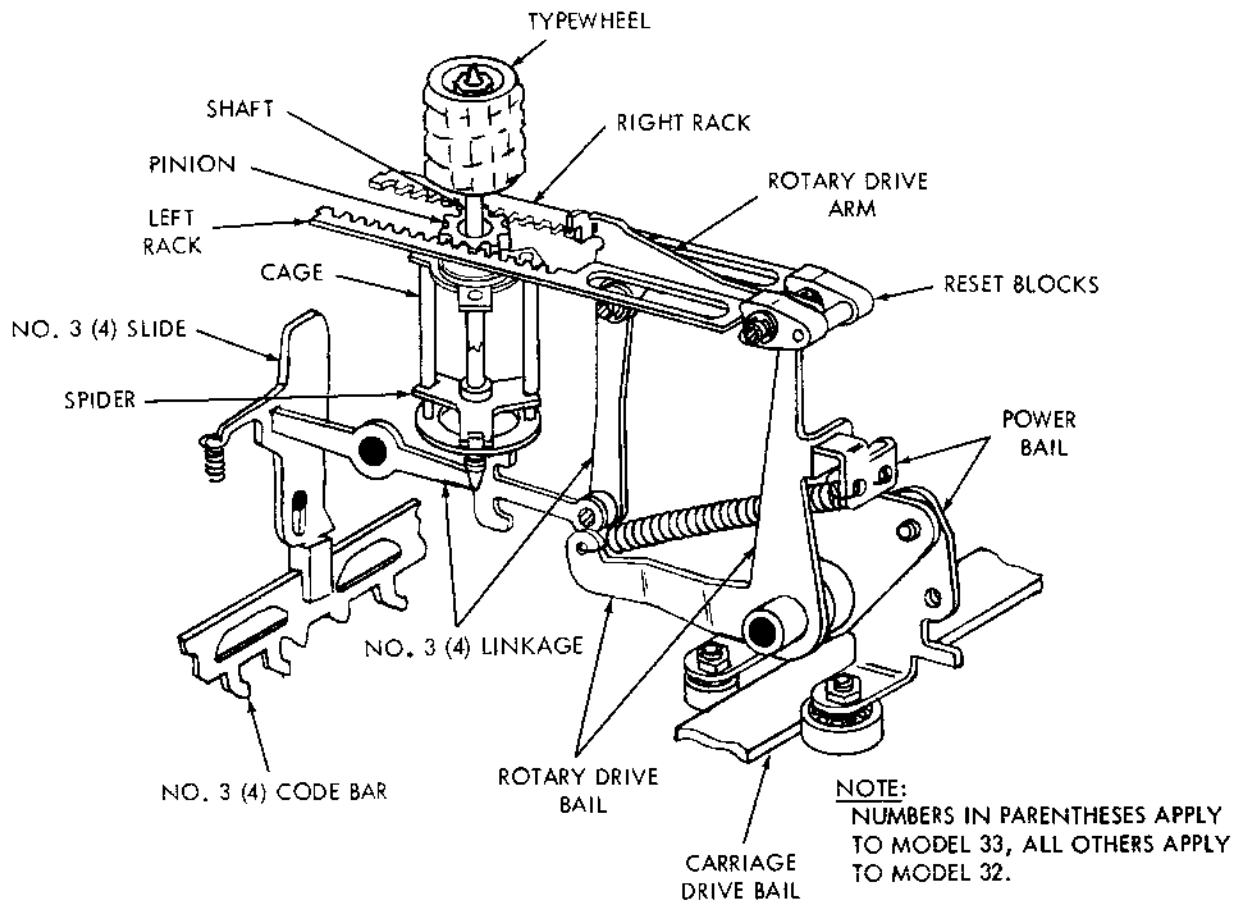


Figure 7-19. Rotary Positioning Mechanism (1).

(c) A rotary drive bail is held against the power bail by a spring. As these bails rock clockwise (as viewed from left) during the first part of the function cycle, the drive arm, which is attached to the rotary positioning bail, moves toward the front. If the arm is down (No. 3 pulse marking), it pulls the left rack with it, and the rack rotates a rotary pinion, a cage, a spider, a shaft and the attached typewheel counterclockwise (as viewed from the top). On the other hand, if the arm is up (No. 3 pulse spacing), it pulls the right rack toward the front, and rotates the typewheel clockwise. As the power bail and rotary drive bail rock back to their stop position during the latter part of the function cycle, two reset blocks on the drive bail return the racks and the typewheel to their stop position.

(2) Degree of Rotation (Figure 7-20).

(a) How far the typewheel rotates in either direction is determined by the No. 1 and No. 2 code elements and the No. 0 code bar on the Model 32 and the No. 1, 2 and 3 code elements on the Model 33. In paragraphs (b) through (e) directly below the numbers applying to the Model 32 are given.

(b) When the No. 1 and No. 2 code pulses are both spacing, the corresponding code bars

and their following rotary stop slides remain down. A common stop slide, which is moved by the other two, also remains down. As one of the racks is pulled forward, the opposite rack is driven rearward by the pinion and strikes the common stop (the one nearest the front). This permits the pinion to rotate the typewheel enough for the No. 1 or No. 2 vertical row (depending on the position of the No. 0 code bar as covered in paragraph 7-8. d. (3) below) of either the clockwise or counterclockwise field to be aligned with the printing area at the time of printing. When a rack is stopped, the rotary bail stops, and its spring extends as the power bail continues its travel.

(c) When the No. 1 element is marking and the No. 2 is spacing, the No. 1 code bar and slide move up, and the No. 1 slide lifts the common slide. In this position, holes in the common slide permit whichever rack is moving toward the rear to pass through and strike the No. 2 slide (second from the front) which is down. Thus the No. 3 or No. 4 row is aligned with the printing area.

(d) When the No. 2 code pulse is marking and the No. 1 is spacing, the No. 2 slide is moved up and lifts the common stop. The rack that's moving rearward passes through holes in

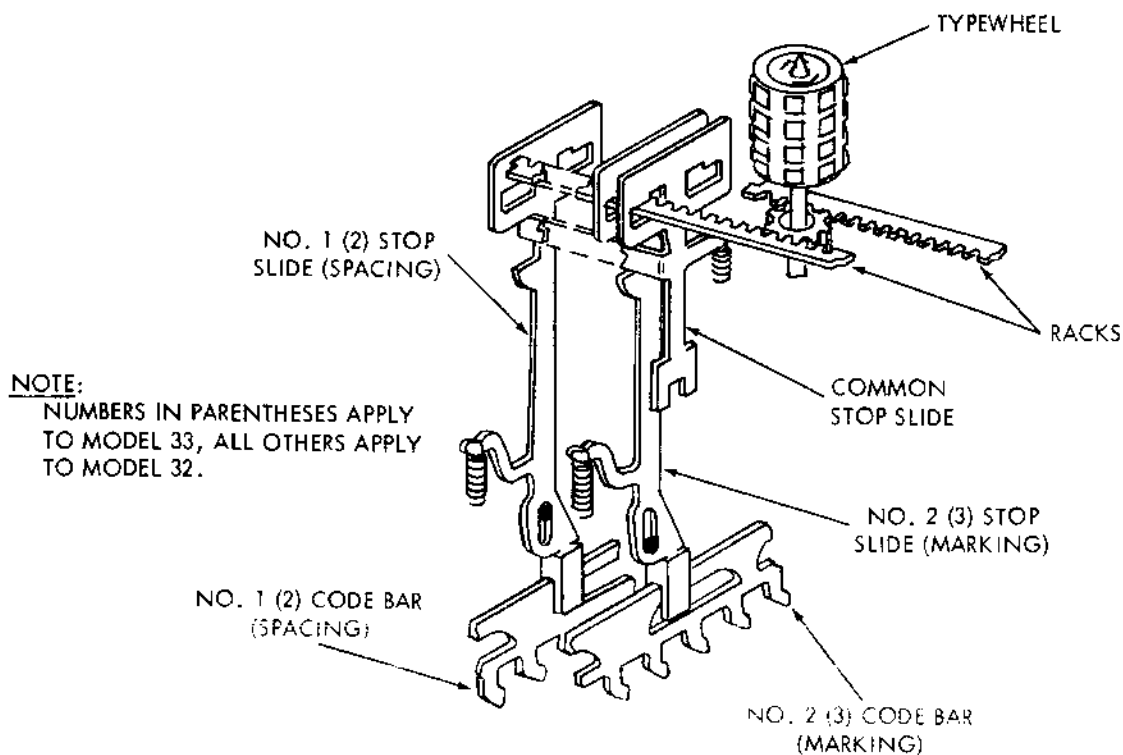


Figure 7-20. Rotary Positioning Mechanism (2).

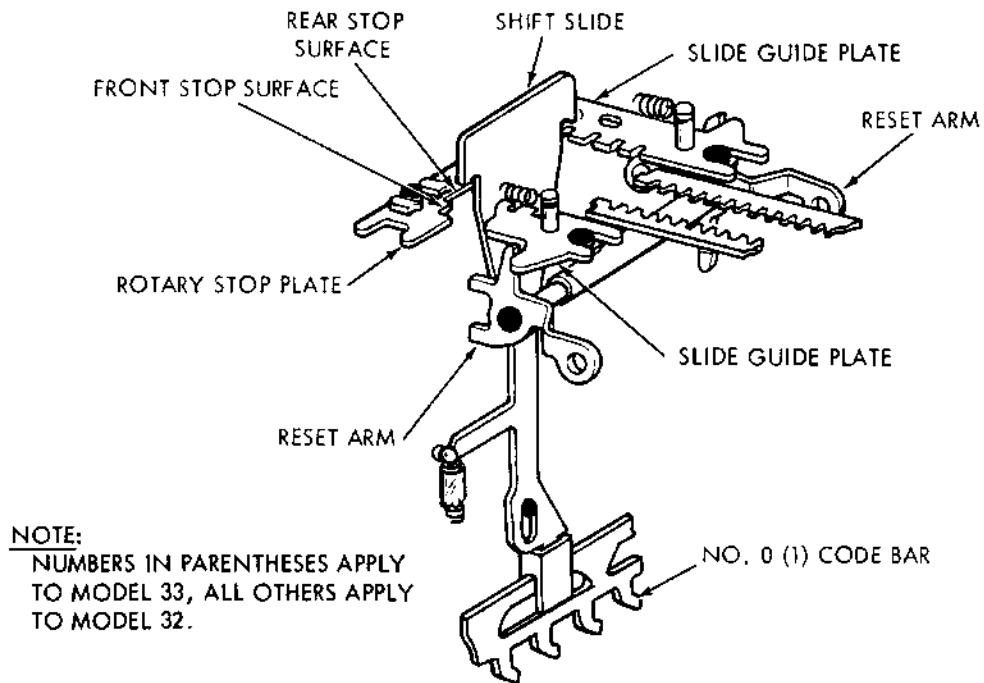


Figure 7-21. Rotary Positioning Mechanism (3).

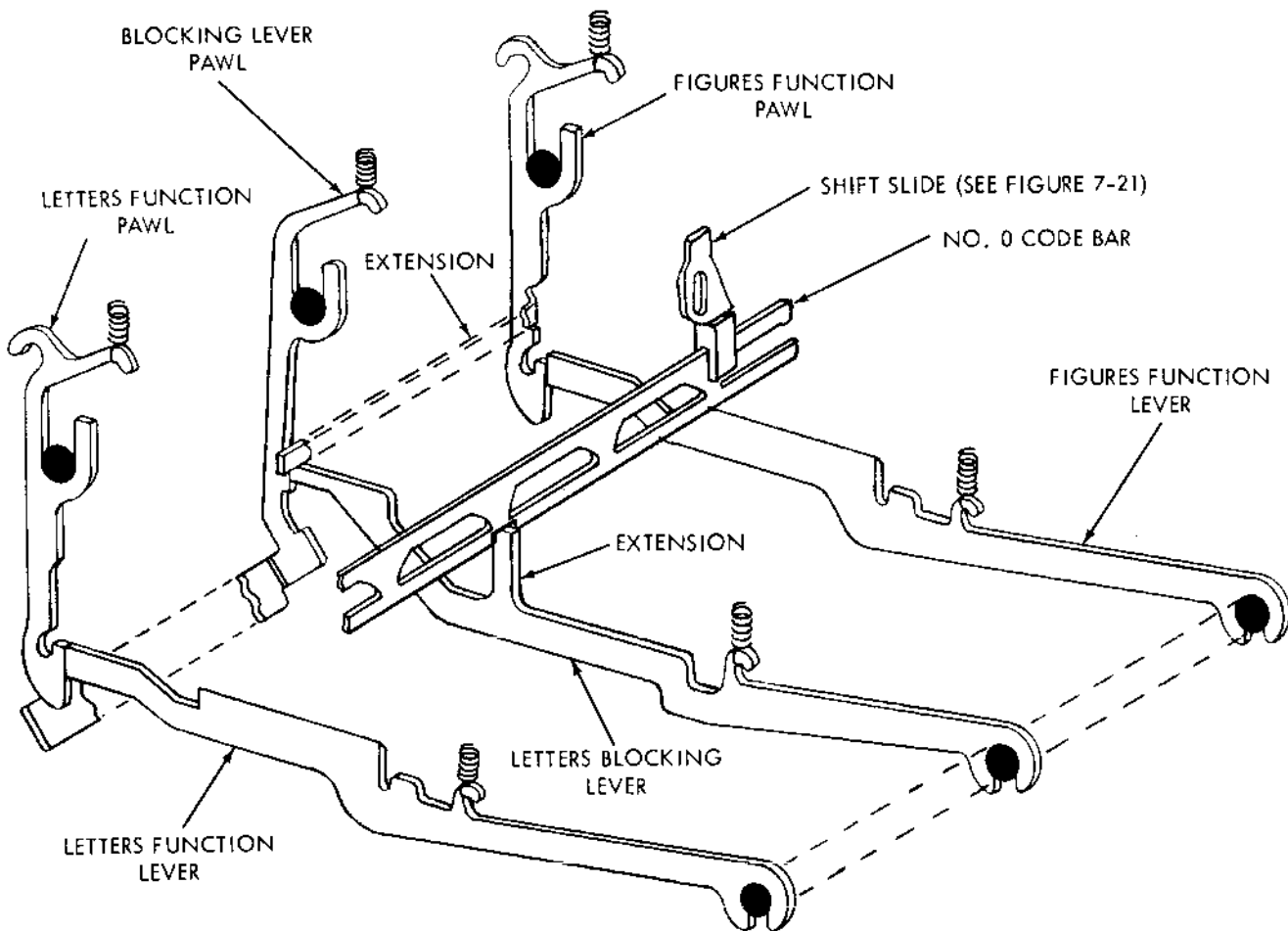


Figure 7-22. Letters-Figures Shift Mechanism.

these slides and strikes the No. 1 slide (third from the front) which is down. Thus, the No. 5 or No. 6 row is aligned with the printing area.

(e) When both the No. 1 and No. 2 code elements are marking, the No. 1 and No. 2 and common slides are moved up and permit the rack to pass through their holes and strike the shift slide (farthest from front). Thus the No. 7 or No. 8 row is aligned with the printing area.

(3) Odd or Even Rows.

(a) Whether the odd or even rows are selected depends on the position of the No. 0 code bar on Model 32 Printers and the No. 1 code bar on Model 33. When this bar is up, the even rows are selected; when it is down the odd rows are selected. In Model 33 Printers, the No. 1 code element controls the position of this bar. In Model 32 Printers, it is controlled by a letters - figures shift mechanism which responds to the LETTERS and FIGURES code combinations.

(b) Model 33 (Figure 7-21).

1. The upper portion of the stop slides move up and down in slots in two guide plates. When one of the racks moves toward the rear and strikes one of the slides, the slides and guide plates are pushed toward the rear until the shift slide strikes rotary stop plate. During the latter part of the function cycle, the guides and slides are returned to their stop position by reset arms which are part of the printing mechanism (see paragraph 7-8.f.).

2. When the No. 1 code element is spacing, the No. 1 code bar and its following slide remain down, and the shift slide strikes front stop surfaces on the stop plate. This results in the No. 1, No. 3, No. 5 or No. 7 vertical row being aligned with the printing area at the time of printing.

3. On the other hand, when the No. 1 code element is marking, the No. 1 code bar and the shift slide are up where the latter presents a narrower outline to the stop plate. Thus when the slide moves toward the rear, it fits into a cut-out in the plate and strikes rear stop surfaces. The difference results in one more row rotation of the typewheel, and the No. 2, No. 4, No. 6, No. 8 row is aligned with the printing area.

(c) Model 32 - Letters-Figures Shift (Figure 7-22).

1. When the Model 32 Printer is in the letters condition, the 0 code bar is blocked by

a letters blocking lever whose extension engages one of bar's slots. When the code bar bail rocks to the left early in each code bar cycle, the 0 code bar is held in its down position. Thus the odd rows will be selected as covered in paragraph 7-8.d.(3)(b) above.

2. On receipt of the figures code combination, the code bars permit a figures function lever to rise to its up position where it is latched by its function pawl. Then as the lever and pawl are pulled down by the function bail during the middle portion of the function cycle, an extension on the pawl moves the letters blocking lever to its down position where it is latched by its pawl and no longer blocks the No. 0 code bar. The Printer is now in the figures condition, and the 0 code bar will move to its up position each code bar cycle until the letters code combination is received. This results in the selection of the even rows as covered in paragraph 7-8.d.(3)(b) above.

3. On receipt of the letters combination, the code bars permit a letters function lever to move to its up position where it is latched by its function pawl. As the lever and pawl are pulled down by the function bail during the middle portion of the cycle, the pawl contacts a slanting extension of the blocking lever's pawl and moves it rearward until it unlatches the blocking lever. The latter is then permitted to move up and block the 0 code. Thus the Printer is returned to the letters condition.

e. VERTICAL POSITIONING (Figure 7-23).

(1) The vertical positioning mechanism positions the typewheel so that the proper character in the selected row is in the printing area at the time of printing. It is controlled by the No. 4 and No. 5 code elements on the Model 32 Printer and by the No. 5 and No. 7 elements on the Model 33. In paragraphs (2) through (6) directly below, the numbers applying to the Model 32 are given.

(2) A vertical drive ball is held against the power bail by a spring. When these balls rock clockwise (as viewed from left) during the first part of the function cycle, the vertical drive ball, through a drive arm, lifts the spider, typewheel shaft, and typewheel. How far the typewheel is raised is determined by three stop arms that are positioned in response to the No. 4 and No. 5 code elements. When the drive ball encounters an arm, it is stopped and its spring extends as the power bail continues to pivot. The spider moves up and down the bars of the cage and thus permits rotary motion to be transferred to the typewheel regardless of its vertical position.

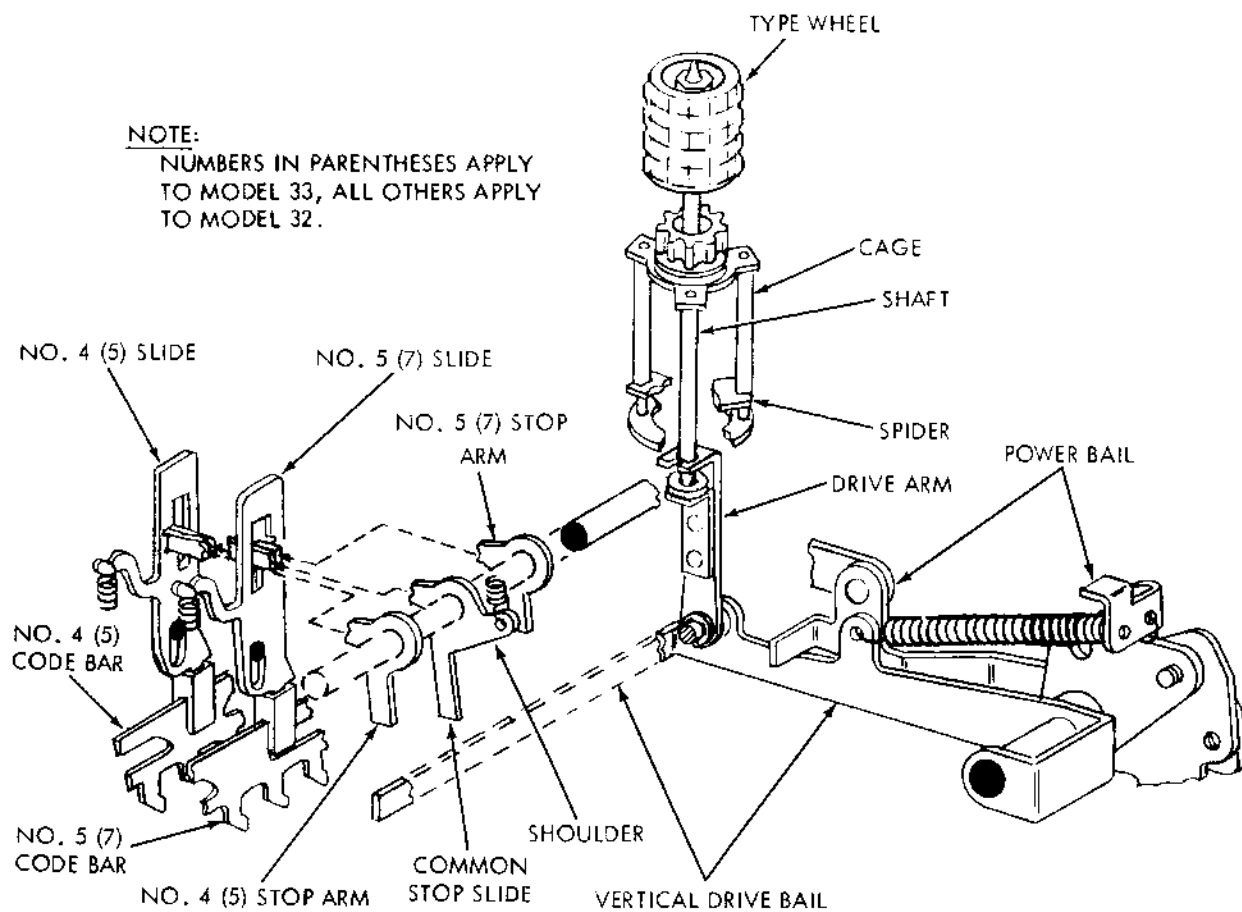


Figure 7-23. Vertical Positioning Mechanism.

During the last half of the function cycle, the parts are returned to their stop position.

(3) When a code combination is received in which the No. 4 and No. 5 code elements are spacing, the No. 4 and No. 5 code bars and their following vertical slides remain in their spacing (down) position, and no motion is transferred to the stop arms. As the rear extension of the drive bail rises, it strikes the common stop arm which is the longest. This permits the typewheel to be raised to the point where the No. 1 character in the selected row is in the printing area at the time of printing.

(4) When the No. 4 element is spacing and the No. 5 is marking, the No. 5 code bar moves its following slide up early in the code bar cycle. The slide pivots the common and No. 5 stop arm rearward out of the way of the drive bail. The bail thus strikes the No. 4 arm (the second longest), and the second character in the selected row is placed in the printing area.

(5) When the No. 4 element is marking and the No. 5 is spacing, the No. 4 slide pivots the No. 4 and common stop arm out of the way. The bail strikes the No. 5 stop arm (the shortest), and the third character is placed in the printing area.

(6) When both the No. 4 and No. 5 elements are marking, all three stop arms are pivoted out of the way. The bail moves up until it strikes a shoulder on the common stop arm, and the fourth character is placed in the printing area.

f. PRINTING MECHANISM.

(1) Printing (Figure 7-24).

(a) After the typewheel has been positioned during the first half of the function cycle, the printing mechanism supplies the impact which drives the selected character against the ribbon and paper. Provisions are included whereby printing is suppressed during functions.

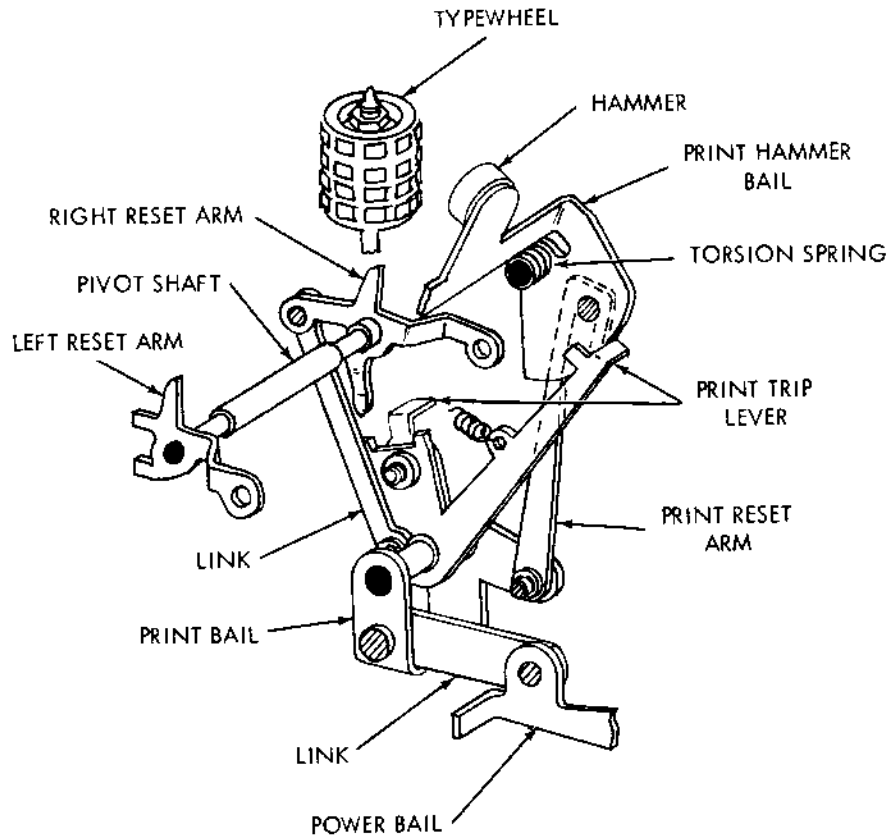


Figure 7-24. Printing Mechanism.

(b) As the power bail rocks during the first part of the function cycle, it imparts through a link counterclockwise motion (as viewed from left) to a print bail. This bail through a link and pivot shaft pivots two reset arms. Midway in the cycle, the right arm moves a print trip lever out of engagement with a shoulder on the print hammer bail. A torsion spring snaps the hammer bail rearward, and the hammer drives the typewheel and ribbon against the paper. Thus the imprint of the selected character is transferred to the paper. The lower end of the typewheel's shaft pivots on the vertical drive arm (see Figure 7-23) and permits the wheel to be driven rearward. The hammer bail has a soft head which strikes the typewheel without damage.

(c) During the last half of the cycle, the power bail returns the printing parts to their stop position, and a print reset arm attached to the print bail returns the print hammer bail to its stop position where it is latched by the print trip lever.

(2) Printing Suppressed (Figure 7-25).

(a) Whenever a function code combination is received, printing is suppressed. As the other

code bars rise early in the code bar cycle (paragraph 7-6.c.), a print-suppression code bar is held down by a print suppression latch (see Figure 7-4). Early in the function cycle, after any of the function levers has been selected, the latch is pivoted away from the code bar by a print-suppression cam on the function cam-clutch.

(b) If no function lever has been selected, the print-suppression code bar moves up and to the left to its selected position. A print-suppression slide follows the motion of this bar and pivots a print-suppression latch lever out of the way of the shoulder on the print hammer bail. Thus when the print trip lever releases the bail, its hammer is permitted to strike the typewheel, and printing occurs as covered in paragraph 7-8.f.(1).

(c) On the other hand, if any function lever moves up to its selected position, it engages one of a series of notches in the print-suppression code bar. When the latch releases the code bar, the selected function lever prevents it from moving all the way to its selected position. Thus the print-suppression latch lever is not pivoted and catches the shoulder when the hammer bail

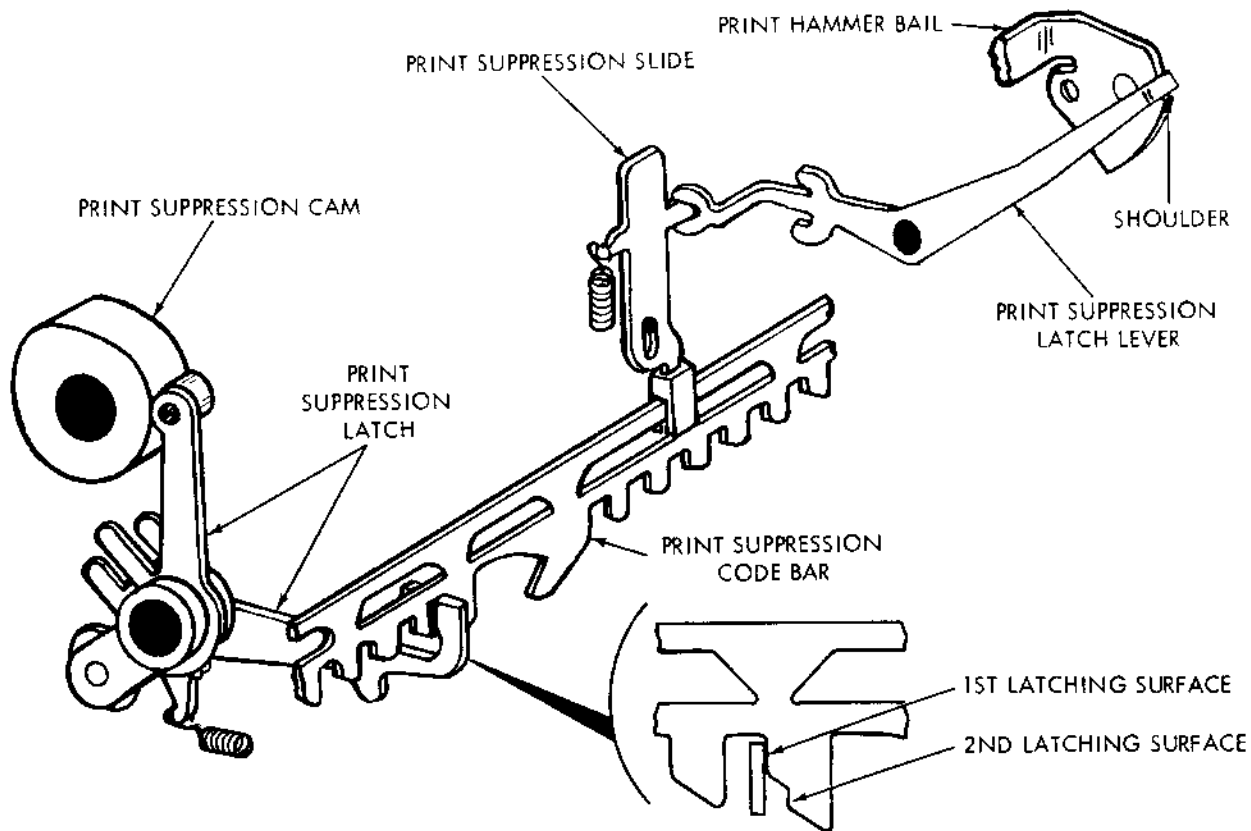


Figure 7-25. Print Suppression Mechanism.

is released by the trip lever. The hammer does not reach the typewheel and printing is suppressed.

(d) As the selected function lever moves down and withdraws from the notch in the print-suppression code bar, the latch, which has been returned to its stop position, engages a second latching surface on the bar. This prevents the bar from rising when the function lever is withdrawn, thus causing printing to occur before the print hammer is completely reset in its stop position. The print-suppression code bar is completely reset with the rest of the code bars at the end of the code bar cycle and at that time the latch engages the first latching surface (see Figure 7-4).

g. RIBBON MECHANISM (Figure 7-26).

(1) The ribbon mechanism supplies the ink for printing. As the Printer operates, the mechanism feeds the ribbon from one spool to the other, and reverses the direction of feed when the spool is nearly depleted. It is described and illustrated in "Description" (Section 1).

(2) As the power bail rocks during the first part of the function cycle, it pivots a ribbon power lever which moves a ribbon drive lever rearward. A feed pawl which rides on the drive lever acts on a ratchet to rotate a ribbon spool. A check pawl drops into the succeeding tooth and detents the ratchet until it is again rotated during the next operation.

(3) The mechanism continues to rotate one spool until the other is nearly depleted. An eyelet in the ribbon then engages a ribbon reversing arm. As the eyelet is pulled against the arm, the latter moves to a point where a detent spring shifts it to its alternate position where one of its reversing extensions falls ahead of an extension on the feed pawl. As the pawl moves forward during the last half of the cycle, it strikes the arm's extension and is pivoted to its alternate position against the other ratchet. In doing this, it strikes an extension on the check pawl and pivots it to its alternate position against the other ratchet. The depleted spool is now rotated to take up the ribbon until the other spool is nearly depleted when reversal again takes place.

(4) The ribbon guide, which is spring biased upward, is mounted so that it will slide up and

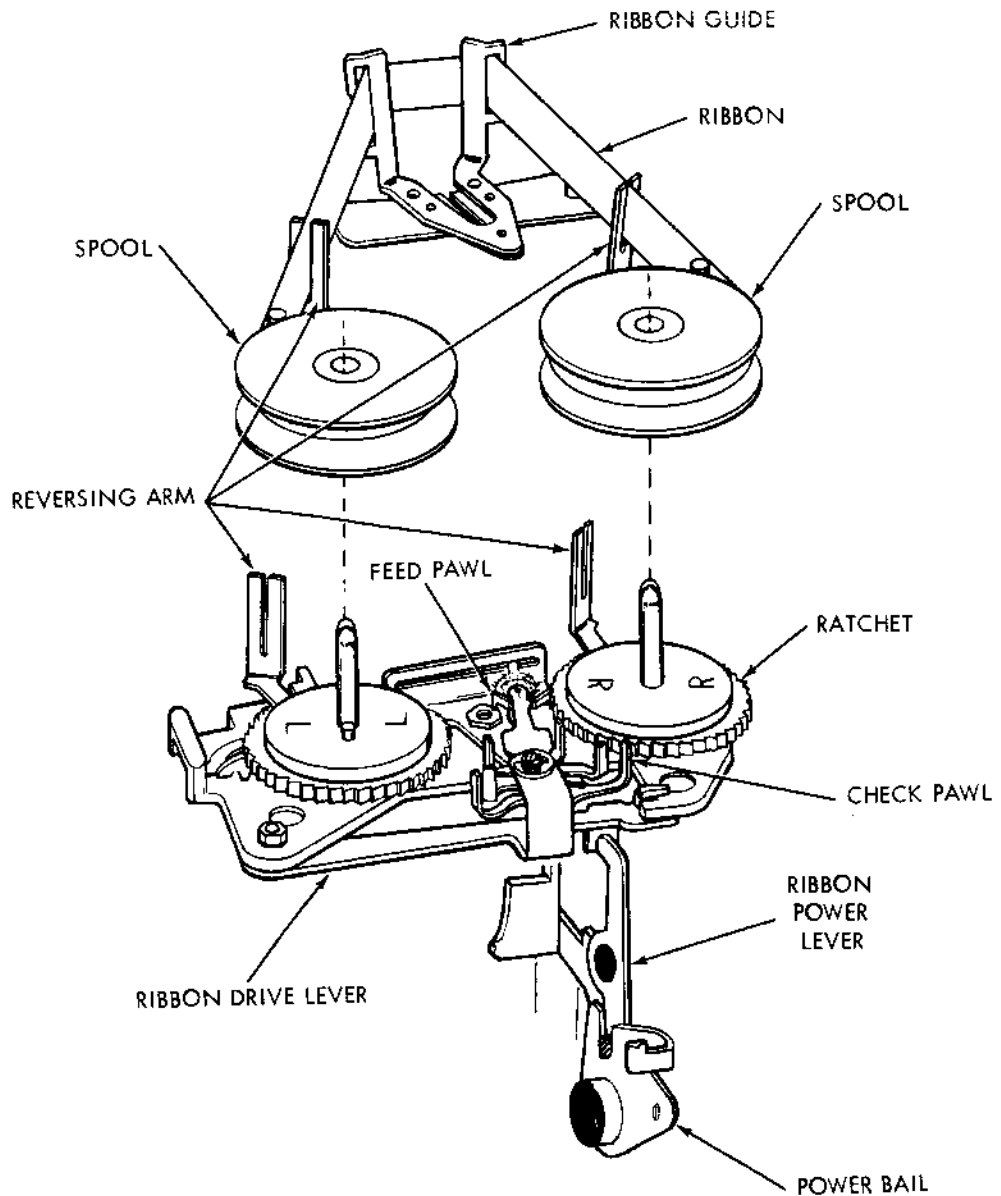


Figure 7-26. Ribbon Mechanism.

down on posts. As the print pivot shaft turns during the first half of the cycle (see paragraph 7-8.i.(1)(b) above), the two pivot arms permit the guide to rise so that it is between the selected character and the paper midway in the cycle. At this time the print hammer drives the type-wheel and the ribbon against the paper. During the last half of the cycle the pivot arms retract the guide and ribbon to their stop position so that the printed characters are visible.

h. EXAMPLE.

(1) Assume that the Model 32 Printer is in the letters condition and that the letter "D", whose

code combination is 1--4-, is received. The No. 1 and No. 4 code bars move up and to the left to their marking position early in the code bar cycle. Since the No. 3 bar is down, the rotary drive arm moves up and engages the right rack. Since the No. 1 bar is up and the No. 2 is down, the No. 1 and common stop slides are moved up. Since the Printer is in the letters condition, the 0 code bar keeps the shift slide down. Since the No. 4 code bar is up and the No. 5 is down, the No. 4 and common stop arms are pivoted out of the way of the vertical drive bail.

(2) As the power bail rocks clockwise (as viewed from left) during the first part of the

function cycle, the following occurs: The rotary drive arm pulls the right rack forward and rotates the typewheel clockwise. The left rack, driven by the typewheel's pinion, moves rearward, passes through a hole in the common slide, and strikes the No. 2 stop slide. The stop slides and their guides are moved rearward, and the wider outline of the shift slide strikes the front stop surfaces of the stop plate. Thus, the No. 3 vertical row is aligned with printing area (see Figure 7-18).

(3) Concurrent with the rotary positioning, the vertical drive bail moves up until it strikes the No. 5 stop arm, and the third character in the No. 3 row is placed in the printing area (see Figure 7-18).

(4) Since no function lever has been selected, the print-suppression code bar moves up and to the left early in the cycle and moves the print-suppression latch lever away from the print hammer bail. Midway in the cycle, the right reset arm moves the print trip lever out of engagement with the shoulder on the hammer bail, and the bail snaps rearward and drives the letter "D" and the ribbon against the paper.

(5) During the last half of the cycle the parts are returned to their stop position.

7-9. SPACING.

a. GENERAL — The spacing mechanism positions the carriage so that the printed characters

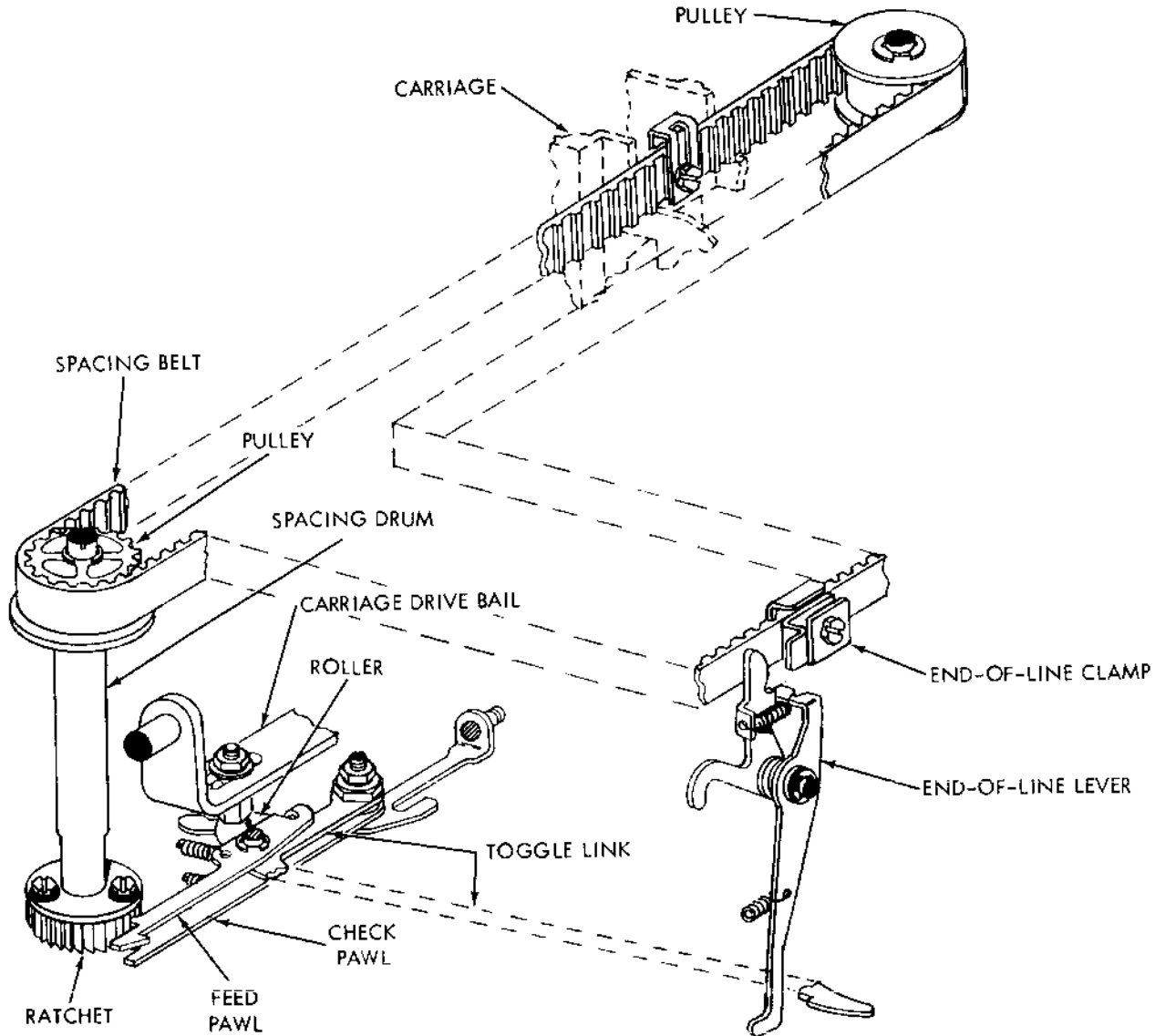


Figure 7-27. Spacing Mechanism.

are properly located horizontally on the paper. Each time a character is printed, the carriage is positioned one character to the right. Spacing is suppressed on all functions except space (SP) when spacing occurs and printing is suppressed. At the end of the printing line, spacing is suppressed and the Printer overprints. When the carriage return (CR) function is received, the carriage is returned to the left margin. The spacing mechanism is described and illustrated in "Description" (Section 1).

b. WITH PRINTING (Figure 7-27) — As the carriage drive bail moves rearward during the first half of the function cycle, a small roller mounted near its left pivot permits a toggle linkage, consisting of a spacing feed pawl and toggle link, to buckle under spring pressure. The pawl moves to the right and engages the next tooth on a ratchet which is part of a spacing drum. When the roller is moved forward during the last half of the function cycle, it unbuckles the toggle linkage, and the pawl is moved to the left and rotates the drum one tooth. This motion is imparted by a pulley at the top of the drum to a timing belt which is looped around a pulley on the right side of the Printer. The belt, in turn, moves the carriage to the right one space against the tension of a large carriage return spring. The carriage is held in this position by a check pawl which engages the drum's ratchet.

c. SPACE SUPPRESSION.

(1) On Functions (Figure 7-28).

(a) On every function except space (SP), spacing as well as printing must be suppressed. When a character to be printed is received, the print-suppression code bar moves up and to the left as covered in paragraph 7-8.f.(2). In doing so, it pivots a space suppression latch so that it is moved to the right out of the way of the toggle linkage. This permits the linkage to buckle and effect spacing as described in paragraph 7-9.b. above.

(b) On the other hand, when a function is received, the print-suppression code bar remains down and to the right, as covered in paragraph 7-8.f.(2), and thus does not pivot the space suppression latch. In this position, the latch engages the toggle linkage and prevents it from buckling all the way, and the feed pawl does not move far enough to the right to engage the next tooth. Thus, the drum is not rotated and the carriage is not spaced.

(2) At End of Line (Figure 7-27). — When the carriage reaches the right margin, a clamp on the spacing belt pivots an end-of-line lever counterclockwise. In this position, a latching surface on the spacing toggle link engages the lever and prevents the linkage from buckling

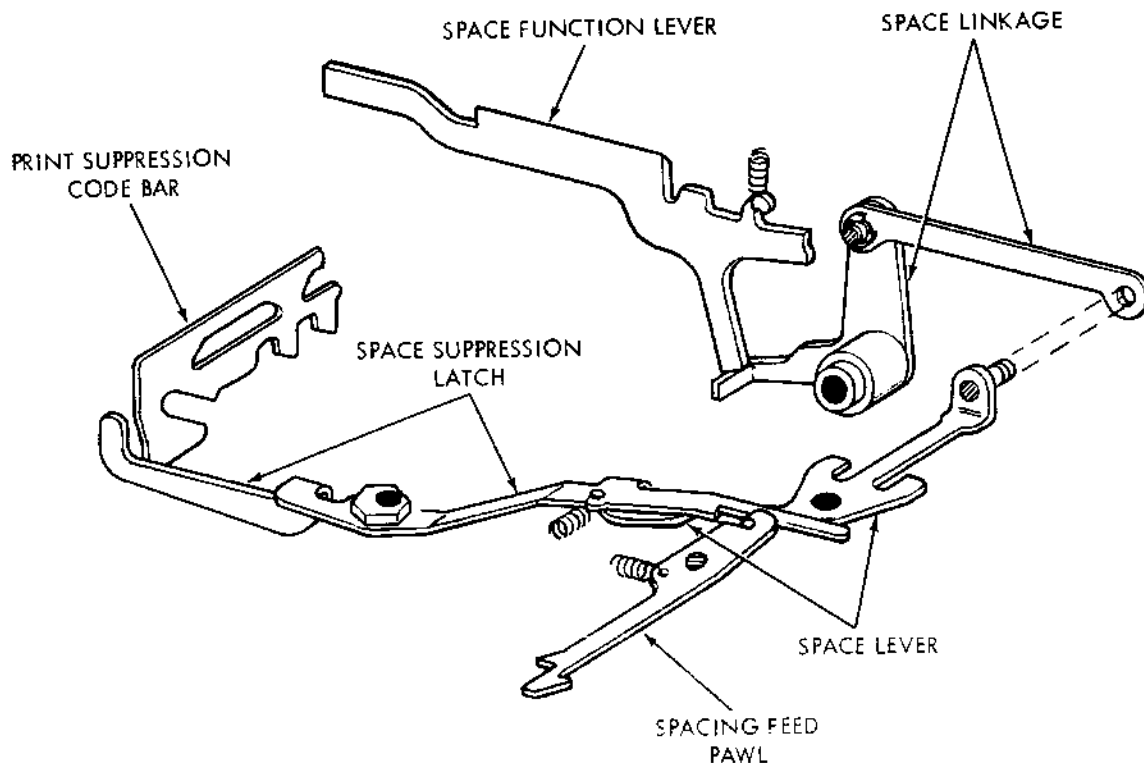


Figure 7-28. Space Function and Suppression Mechanism.

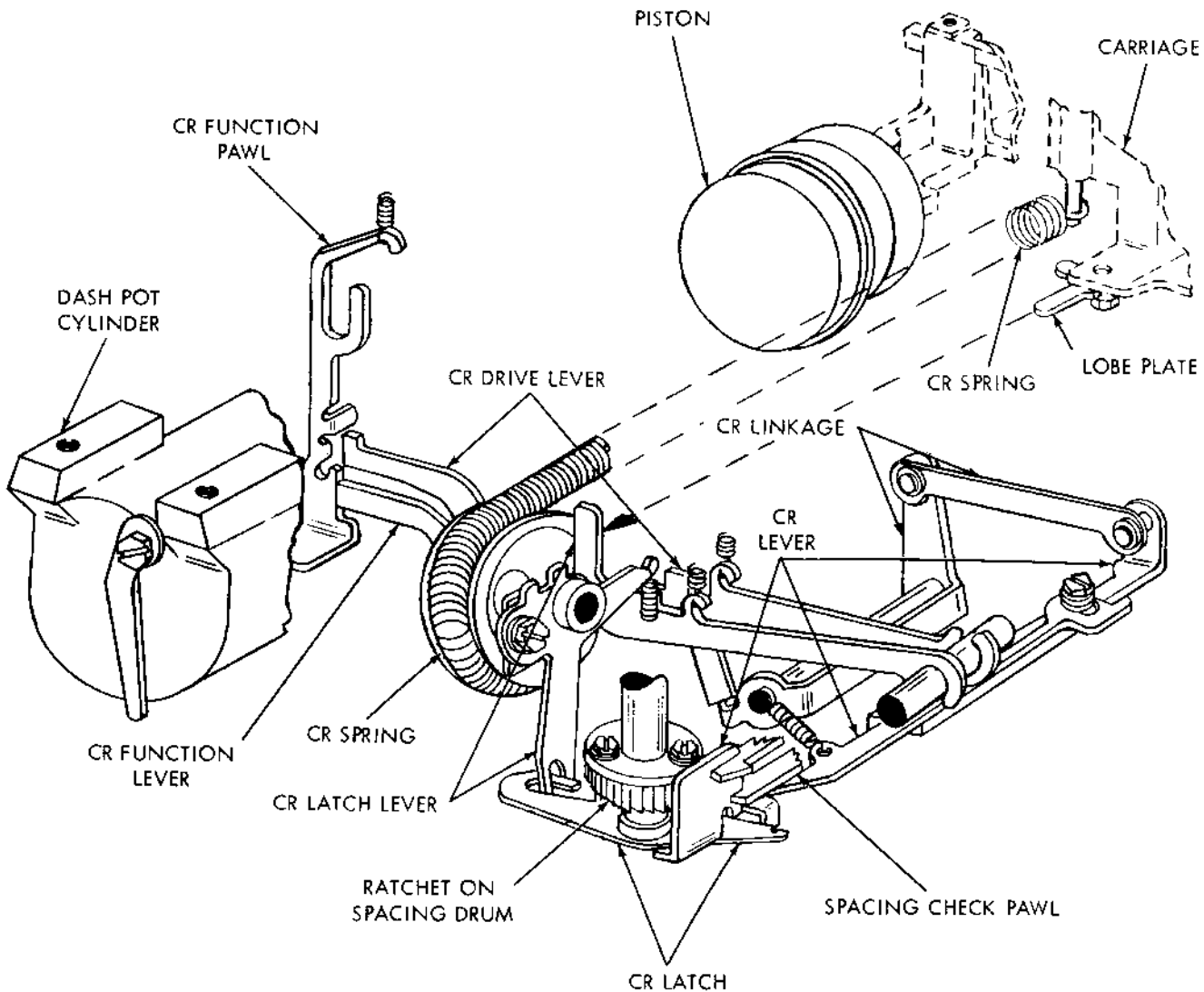


Figure 7-29. Carriage Return Mechanism.

and effecting spacing. Thus, spacing is suppressed, and the Printer overprints at the right margin until the CR code combination is received.

d. **SPACE FUNCTION** (Figure 7-28) — When the space (SP) code combination is received, the code bars permit a space function lever to move up to its selected position early in the function cycle. This motion is transferred through a space linkage to a space lever which moves the print-suppression latch out of the way of spacing toggle linkage. Thus, the spacing linkage is permitted to buckle completely and effect spacing as covered in paragraph 7-9.b. Printing is suppressed as covered in paragraph 7-8.f.(2).

e. **CARRIAGE RETURN (CR)** (Figure 7-29).

(1) When the CR code combination is received, the code bars permit the CR function lever to move up to its selected position during the first part of the function cycle. In this position, the lever is latched by its function pawl. As the function bail moves the lever and the pawl downward during the middle portion of the cycle, an extension on the pawl pivots a CR drive lever. This motion is transferred through a CR linkage to a CR lever which is moved frontward where it is latched by a carriage return latch.

(2) In moving frontward, the carriage return lever carries the spacing feed and check pawls out of engagement with the ratchet on the spacing

drum. The carriage return spring then pulls the carriage back to the left margin. As the carriage nears the left margin, a lobe plate on the carriage strikes a latch lever which causes the latch to release the CR lever. The latter moves rearward under spring pressure and permits the feed and check pawls to again engage the spacing ratchet. Late in the function cycle, the CR function pawl is stripped from its function lever by the stripper bail.

(3) As the carriage approaches the left margin at relatively high speed, a piston on the carriage enters a dash pot cylinder and compresses the air ahead of it. The air forms a cushion which slows the carriage and then, as it escapes through a small, variable hole at the left end

of the cylinder, permits the carriage to be stopped at the left margin without excessive shock.

7-10. PAPER FEEDING (Figure 7-30).

a. The paper feed mechanism positions the paper vertically so that the printed characters are properly located in lines on the paper. It feeds the paper on receipt of the line feed (LF) code combination. It may be adjusted for either single or double line feed.

b. The paper feeds off a roll and is led around a platen that positions it vertically in front of the typewheel. A paper guide plate leads it down around the platen. A pressure

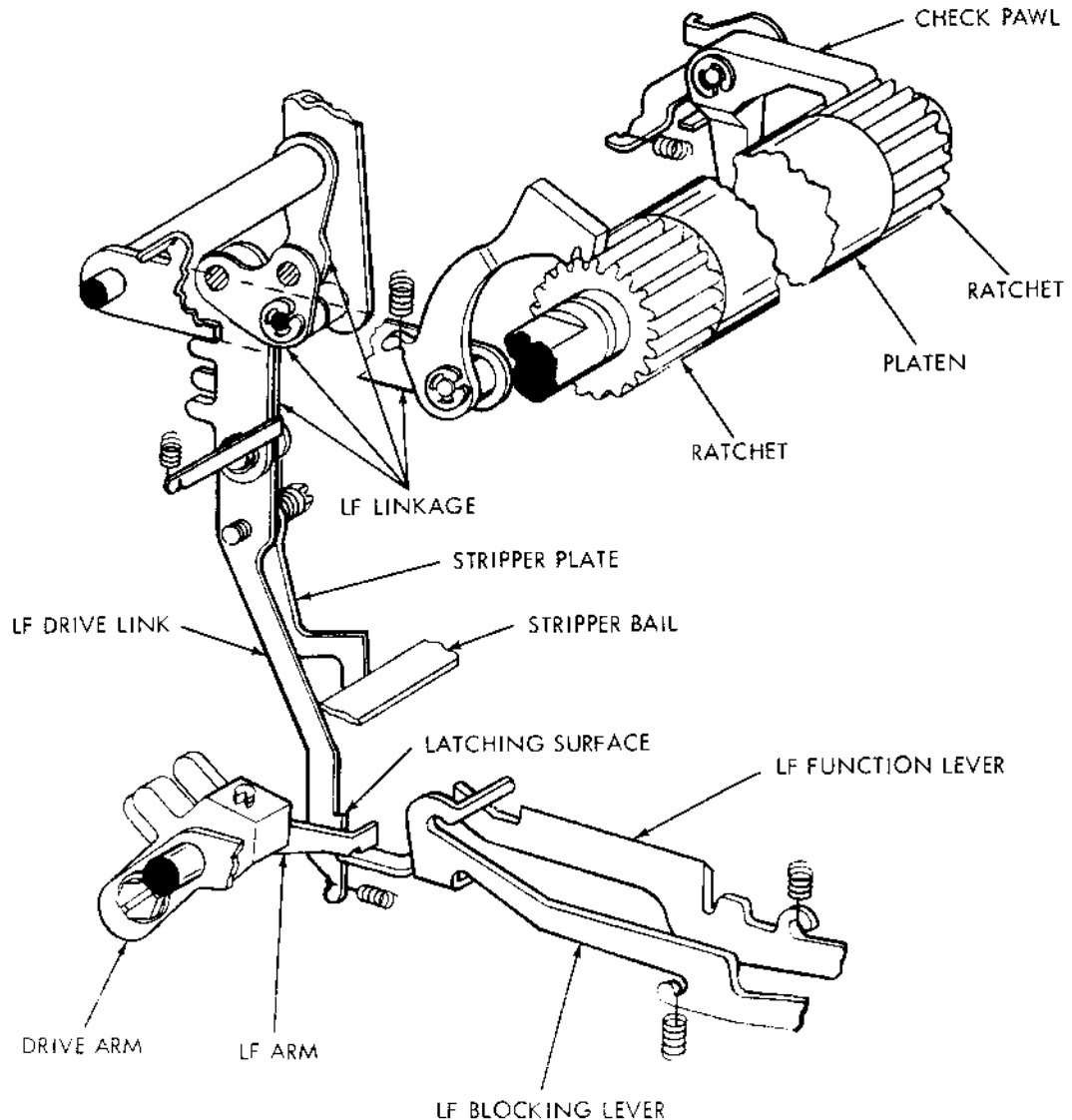


Figure 7-30. Paper Feed Mechanism.

roller, which sits in a cut-out in the guide, holds the paper against the platen so that it is fed when the platen rotates. A curved wire shaft biases the pressure roller and the guide plate against the paper. The pressure is released by a lever on the right end of the shaft. The paper is held around the front of the platen by a wire guide and is led up out of the Printer by a deflector guide. It can be manually fed by a knob on the left end of the platen.

c. When the LF code combination is received, the code bars permit the LF function lever to move up to its selected position early in the function cycle. The function lever, in turn, moves up a LF blocking lever which is engaged by the latching surface of a LF drive link. As the left drive arm on the function rocker shaft moves down during the middle portion of the cycle, a LF arm engages the blocking lever and moves it down. This motion is transferred through a LF linkage to a pawl which engages a ratchet on the left end of the platen. The pawl rotates the platen and thus feeds the paper up one or two lines of printing depending on what the mechanism is adjusted for.

d. The pawl is guided into the teeth by two guide posts. A check pawl riding on a ratchet at the right end of the platen holds the paper in position until the platen is again rotated. At the end of the cycle, the function stripper bail contacts a stripper plate and strips the drive link from the blocking lever which is returned to its unoperated position.

7-11. END OF LINE BELL.

As the carriage moves to the right during printing, a projection picks up an automatic carriage return-line feed (Auto CR-LF) code bar at a predetermined point. The carriage moves the bar to the right a short distance farther at which time a notch in the bar permits a bell function lever to move up to its selected position where it is latched by its function pawl. During the middle portion of the function cycle, the lever moves the pawl down against the pressure of the latter's spring. When the stripper bail strips the pawl late in the function cycle, the pawl moves up and causes a clapper mounted on a wire spring to snap up and ring a gong.

7-12. AUTOMATIC CR-LF.

a. As described in the preceding paragraph, the carriage picks up the Auto CR-LF code bar at a predetermined point and moves it to the right. When the carriage reaches the right margin, a notch in the code bar permits an Auto CR-LF function lever to move up to its selected position where it is latched by its pawl.

b. The Auto CR-LF function lever, in turn, moves the LF blocking lever up to where it is latched by the LF link. Line feed then occurs as described in paragraph 7-10.

c. When the Auto CR-LF lever and its pawl are pulled down during the middle portion of the cycle, the pawl encounters an extension on the CR pawl and moves it down. CR then occurs as described in paragraph 7-9.e.

7-13. ANSWER-BACK MECHANISM (Figure 7-28).

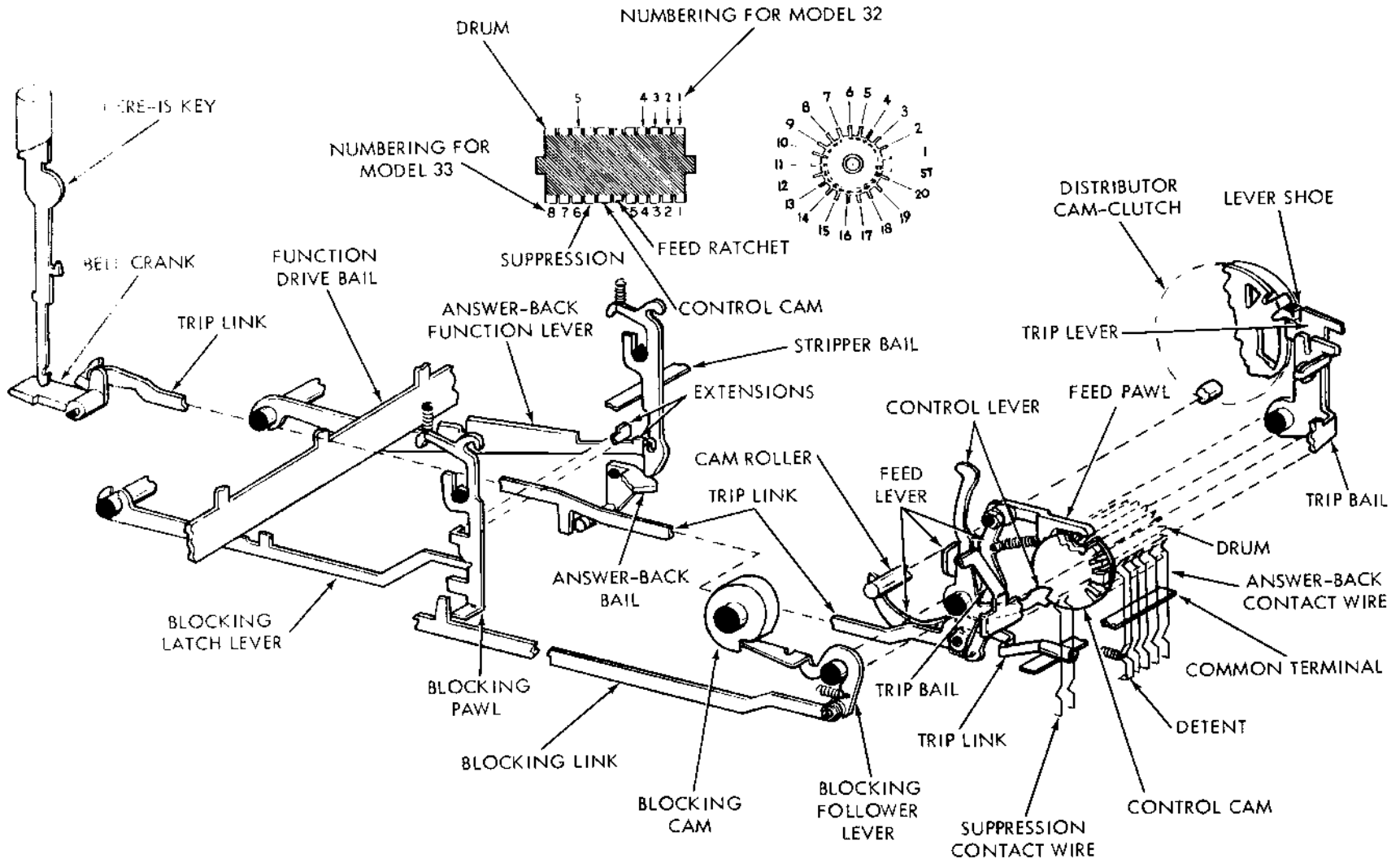
a. GENERAL.

(1) An answer-back mechanism automatically transmits a predetermined sequence of characters for identification purposes. The basic mechanism may be actuated in two ways: (1) remotely by the reception of a predetermined call character, and (2) locally by the depression of the HERE IS key. In addition, as an optional feature, it may be actuated by a trip-magnet mechanism at the receipt of a signal generated by external equipment such as a Data Set. The mechanism is described and illustrated in "Description" (Section 1).

(2) A drum is coded with the characters making up the answer-back sequence. Sequences of up to 20 characters may be encoded. When the mechanism is actuated, it rotates the drum which sets up the code combinations in a set of answer-back contacts. The distributor converts the positions of the contacts to start-stop signals for transmission. After the answer-back sequence has been sent, the mechanism returns itself to its unoperated condition. For operational considerations that will be described below, provisions are made for suppressing the first character sensed by the contacts, and for preventing the mechanism from being actuated by the local generation of the call character.

b. DRUM (Figure 7-28) — Viewing it from the rear, the drum has 11 "levels" as follows from right to left: five numbered levels, feed ratchet, control cam, suppression, and three more numbered levels. The numbering for Model 32 and Model 33 are illustrated in Figure 7-28. Viewing it from the numbered end, it has 21 rows, 1 through 20 and start (ST). The ratchet is used to rotate the drum as described in paragraph 7-13.c. The control cam, which has four removable tines, controls the length of answer-back as described in paragraph 7-13.g. The suppression level is used to suppress the first character and delete errors as described in paragraph 7-13.f. By breaking off tines in the various rows at the numbered intelligence levels, the drum may be coded to generate the proper answer-back characters. For example, if the

Figure 7-31 Answer-Back Mechanism.



first character is the letter "D" (1--4-), tines at the No. 1 and 4 levels should be broken off in the No. 3 row (the first two rows are usually used for CR and LF). The fourth row would be coded to represent the second character and so on. Instructions for coding the drum appear in "Installation" (Section 2).

c. REMOTE ACTUATION — FUNCTION MECHANISM.

(1) The function mechanism must be arranged to actuate the mechanism at the receipt of the proper call character.

(2) When the answer-back call character is received by the Printer, the code bars permit the answer-back function lever to move up to its selected position where it is latched by its pawl. As the function lever and pawl are moved down by the function drive bail during the middle portion of the function cycle, the pawl pivots an answer-back bail which moves a trip link frontward. The trip link pivots a control lever out of an indentation in the control cam. The control lever, through the trip bail, moves the trip lever rearward out of engagement with the shoe lever and trips the distributor cam-clutch.

(3) When the distributor cam-clutch begins its cycle, a cam roller moves up and permits a feed lever to pivot rearward against the control lever. A feed pawl pivoted on the feed lever is moved rearward where it picks up the next tooth on the drum's ratchet. Near the end of the function cycle, the answer-back function pawl is stripped from its function lever by the stripper blade. The control lever under spring pressure tends to return to its unoperated position in the indentation in the control cam. This would terminate the answer-back operation by disengaging the distributor cam-clutch. However, since the feed pawl is now engaged with the next ratchet tooth, the spring pressure on the control lever is not strong enough to overcome the combined pressure of the feed lever spring and the drum's detent, and the mechanism remains in its operated condition through the first distributor cycle.

(4) Near the end of the distributor cycle, the cam roller on the distributor cam-clutch moves the feed lever and feed pawl frontward, and the pawl acts on the ratchet to rotate the drum one tooth. The control cam on the drum now prevents the control lever and trip lever from returning to their stop position. The cam-clutch thus continues to cycle and rotate the answer-back drum.

(5) The answer-back contacts are wired in parallel with the keyboard contacts to the

segments of the distributor disks. As the drum is rotated during the answer-back operation, the contact wires under spring pressure sense each row of tines in turn. If a tine has been broken off at a given level in a row, the associated wire moves frontward to its marking position against a common terminal. On the other hand, if a tine is present, it holds the spring away from the terminal in its spacing position. As the distributor cam-clutch cycles, the distributor converts the position of the contacts to sequential start-stop signals for transmission in same manner as it does with the keyboard contacts (see paragraph 7-5.c.).

(6) The drum continues to rotate until the next indentation in the control cam is presented to the control lever. The latter then moves into the indentation and returns the associated parts to their unoperated position. The shoe lever then strikes the trip lever and disengages the cam-clutch. The mechanism is thus returned to its unoperated condition.

d. LOCAL ACTUATION - HERE IS KEY —

When the HERE IS key is manually depressed, it pivots a bell crank which moves the trip link frontward. The trip link pivots the control lever to its operated position, and the answer-back operation is the same as that described in paragraph 7-13.c. above.

e. FIRST CHARACTER SUPPRESSION.

(1) Since they are wired in parallel with the keyboard contacts, the answer-back contacts must all be in their spacing position when the mechanism is unoperated so that they do not interfere with keyboard transmission. Therefore, inasmuch as the mechanism does not feed the drum until near the end of the first cycle, the first character sensed must be all spacing. However, such a character is undesirable in some systems. Therefore, a feature is provided for shunting the signal line during the sensing of the first character.

(2) As described in paragraph 7-13.c.(2) above, the trip link moves frontward when answer-back is initiated and remains there until it is terminated. In this position, it permits a suppression contact wire to sense the drum's suppression level. The suppression contact is wired so that it shunts the outgoing signal line when it is closed. The tine at the suppression level of the first character must always be broken off. Thus, the suppression contact wire is selected and keeps the line marking until the second character is sensed. The tines are left at the suppression level in all the other rows, and thus hold the wire unselected throughout the rest of the answer-back operation. At the end of the operation, the trip link again

moves rearward and holds the wire unselected while the mechanism is unoperated.

f. ANSWER-BACK SUPPRESSION ON TRANSMISSION.

(1) Since the Printer receives every code combination that it transmits, the sending of the call character would actuate the local answer-back mechanism as well as the one at the distant station. To prevent this, a blocking mechanism is provided which prevents the function mechanism from operating in the answer-back area during transmission.

(2) As the distributor cam-clutch cycles, a blocking cam pivots a blocking follower lever which pulls a blocking link rearward. The link pivots a blocking pawl rearward until it releases a blocking latch lever which, under spring pressure, moves up against the function drive bail. When the function drive bail and the latch lever move up during the first part of the function cycle, the latch lever cams the blocking pawl further rearward where an extension on the pawl is over an extension on the answer-back function lever. The function lever is thus prevented from moving up far enough to be latched by its pawl and initiate answer-back.

(3) During the latter part of the distributor cycle, the blocking arm allows the blocking link to move frontward to its unoperated position. As the function drive bail moves down during the middle portion of the function cycle, it drives the blocking latch lever downward to the point where the blocking pawl is permitted to pivot frontward to its unoperated position. Thus every time a character is initiated locally, the cam-clutch cycles and operates the blocking mechanism which prevents the answer-back function lever from sensing the code bars and initiating answer-back regardless of what character is processed by the Printer assembly. On the other hand, when remotely initiated characters are received, the distributor cam-clutch does not cycle, the blocking mechanism is not operated, and the function lever is permitted to sense the code bars and initiate answer-back on the call control character.

g. LENGTH OF ANSWER-BACK.

(1) The length of the answer-back sequence can be varied either by the control cam or the suppression contact. Using the control cam, the mechanism can be coded for either one-, two- or three-cycle operation. The control cam has removable tines at four positions. For one cycle operation, one of these tines is broken off so that the drum stops at the start character. This arrangement yields 21 characters, 20 of

which may be used in the answer-back sequence since the start character must be suppressed.

(2) For two-cycle operation, two of the control cam's tines are broken off so that the drum stops at the start and 11th row respectively. This arrangement yields 10 and 11 characters alternately, 9 and 10 respectively, which may be used in the answer-back sequence. For three-cycle operation, three of the control cam's tines are broken off so that the drum stops at the start, 14th and 17th row. This arrangement yields seven characters per cycle, six of which may be used for the answer-back sequence. When multiple-cycle operation is employed, the answer-back sequence must be coded in each segment of the drum so that it will be transmitted every time answer-back is initiated.

(3) When the suppression contact is used to control the length of the sequence, the drum is stepped through one complete revolution each time answer-back is initiated, regardless of the length of the sequence. Unneeded rows are eliminated from the sequence by breaking out their suppression level. For example, if 12 character sequence is required, the suppression level of rows 13 through 20 would be broken off. When the drum presents these rows to the contacts, the characters will be shunted out. The suppression level can be broken off to delete a character when an error has been made in coding.

7-14. CALL CONTROL ASSEMBLY — DIAL TWX (4409 WD).

a. GENERAL.

(1) The call control assembly covered in this paragraph couples the Model 32 Printer through a Data Set to telephone networks for use in Bell System Dial TWX Service.

In conjunction with the Data Set, it provides facilities for initiating, accepting, controlling and completing calls. It is described and illustrated in "Description" (Section 1), Paragraph 7-14.b. outlines in general terms its overall operation. Paragraph 7-14.c. covers the signal requirements for its operation with the Data Set. Paragraph 7-14.d. through 7-14.f. explains its step-by-step operation. 4407WD, 4408WD, and 4409WD are applicable schematic wiring diagrams.

(2) The call control assembly, when used with the 101A Data Set, is connected with conventional telephone central offices having the required routing and message accounting equipment. These are generally the same offices and equipment serving telephone customers in the area. Direct current signals are used for both originating and terminating traffic, providing the

same conditions as for conventional local telephone set operation. The dial on the set is a d.c. pulsing device that initiates connections. Also included in the Set are ringing or tone sounding apparatus for alerting the called party. Optionally available is an automatic answer back mechanism.

b. GENERAL OPERATION.

(1) The call control assembly provides for signaling speeds up to 100 wpm from d.c. marking and spacing intelligence pulses originating from the distributor in the associated Printer. These pulses are directed to the input of the selector magnet drive in the call control assembly where they are amplified and returned to the Printer as 0.500 ampere d.c. pulses to operate the selector magnet.

(2) If the originate (ORIG) key on the call control assembly has been depressed and connection with a called station satisfactorily completed, the intelligence pulses originated by the distributor are also connected with the Data Set. The Data Set converts the d.c. pulses to tone signals for transmission over telephone lines. Another Data Set, located at the called station, converts the tone signals back to d.c. pulses, which are directed to the input of the selector magnet driver, there to operate the selector on the Printer of the called station. The Printer at a given station normally copies both the transmitted and received d.c. signals, operating on a half duplex basis.

(3) Although the Data Set is not a part of this equipment, a brief discussion of its function is necessary to understand the operation of the system. Start-stop d.c. signal pulses form essentially a square wave which cannot readily be transmitted over telephone lines. The 101A Data Set is basically a converter which changes the d.c. signals from the sending or calling station into frequency-shifted tones for transmission over the telephone network. A marking pulse from a sending station is converted to a 1270 cycle marking signal (F_1 mark) and a spacing pulse becomes a 1070 cycle spacing signal (F_1 space). The Data Set at the receiving or called station sends a 2225 cycle marking signal (F_2 mark) and a 2025 cycle spacing signal (F_2 space). During transmission of a message the calling station sends mark and space tones (F_1 mark and space) while the called station sends a continuous mark tone (F_2 mark). In this way the telephone facilities are operated on a full duplex basis. If the signal received at either station (F_1 mark and space at the called station and F_2 mark at the calling station) shifts to a space tone for more than one second, or if the received signal is lost for one second, the Data Set will cause the station to be disconnected. This provides assurance that the connection is

maintained for the entire period of message transmission.

(4) The call control assembly, used with the Data Set, operates with conventional telephone central offices that have the necessary routing and accounting facilities. In operation, a call is initiated by depressing the ORIG key. A lamp illuminates the pushbutton and the dial tone will be heard through a loud speaker. If the line is busy, a busy-signal will be heard and the CLEAR key should be depressed. If the line is open, the operator dials the number of the desired station. This causes the called station to go into connect condition. If the Set is manually operated, the called station operator presses the answer (ANS) button. Following a short interval, about 1-1/4 seconds, in which telephone facilities are connected, the called station transmits a mark tone (F_2) and receives a mark tone (F_1) from the calling station. Receiving the continuous F_2 mark tone from the called station for one second causes the calling station to go into traffic condition, and its motor is turned on. Likewise, the continuous F_1 mark tone from the calling station for one second causes the called station to go into traffic condition, and its motor is turned on. Either station can now transmit, manually or automatically.

(5) At the end of the message, either station may originate a disconnect by depressing the CLEAR pushbutton, at which time each station goes back to its idle condition, ready to receive or originate other calls. For keyboard practice, maintenance purposes, or preparation of copy, the LOCAL pushbutton is depressed. This turns on the motor and disables automatic answering facilities if present. In event of an incoming call during local operation, the set responds to ringing signals and the ANS pushbutton must be operated manually. Operation of the TEST pushbutton causes received signals to be re-transmitted to the distant station for maintenance purposes. A lamp, associated with each key, illuminates the pushbutton whenever that button has been operated and the operating condition exists. The ANS lamp is pulsed in response to ringing signals of an incoming call, and lights continuously when the call is answered. The CLEAR lamp is automatically extinguished 1.5 seconds after the button has been depressed and disconnect is completed.

(6) A steady mark signal blinds the associated Printer during all intervals, except when in the traffic condition. This prevents spurious characters from being printed except due to loss of signals, circuit noise, or deliberate break or "space-disconnect" signals.

(7) Power Requirements — Power input to the Printer is 115 v. $\pm 10\%$, 60 cps $\pm 2\%$. Average

power consumption is 35 watts (not including Printer's motor) with peaks up to 50 watts permitted.

c. SIGNALING LEVELS.

(1) As measured at the telephone loop terminals, transmission should not exceed 0 dbm at any time. Signal level loss over the subscriber's loop, between the call control assembly with its associated Data Set and the serving central office, should not exceed 14 dbm over a range of 1,000 to 2,300 cycles (see requirements of F_1 and F_2 signals in paragraph 7-14, b. (3) above). Transmission of F_1 and F_2 signals is adjustable in the Data Set. The transmitted frequencies or tones generated are held to within ± 5 cycles of the nominal for any combination of electrical and environmental conditions within the normal operating range of the set.

(2) Normal signaling margins should be maintained at signal levels down to -45 dbm, with decreasing margins to -50 dbm. At -53 dbm, with noise level at least 3 dbm lower, the unit will go into "space hold" condition, and at all lower levels, or when no signals are being received, spacing output is provided. Maximum signal distortion, or loss of margin, as a result of tone modulation or demodulation in the Data Set, should not exceed 5% to 8% (loss of 5 to 8 points of range by the recording Printer). When two stations send their respective F_1 and F_2 tones simultaneously at an output level of 0 dbm, the tone as received at each station should be -45 dbm.

d. PROGRESS OF A CALL.

(1) To initiate a call the ORIG pushbutton is depressed and the call control assembly leaves the idle condition at the calling station. During the period of time in which connection is being made, the telephone central office makes no time measurements. When the ORIG pushbutton is closed, the call control assembly is connected to the telephone line through the Data Set, and "off-hook" is set up. The amplifier is connected into the circuit so that the dial tone from the central office is heard. The called station is dialed while the amplifier monitors the progress.

(2) At the called station audible and visible signaling devices are operated. The called station goes "off-hook" and into the connect condition upon operation of the ANS pushbutton circuit, by manual or automatic means, at the distant point. At this time, there is a non-signaling interval of 1.225 seconds during which accounting and toll recording facilities at the telephone exchange will be cleared. Following the non-signaling interval, the called station transmits its F_2 mark tone and sets its monitoring timer

to respond to the F_1 mark tone from the calling station. When the continuous F_2 mark tone is received at the calling station for a period of one second, indicating that a Dial TWX station has answered, it will go into the "traffic" condition and turn on its motor. When the continuous F_1 mark tone is received at the called station for an interval of one second, it will indicate that a Dial TWX station originated the received call and this Set also will go into the "traffic" condition. The station may now acknowledge the call either by operator keyboarding, or by automatic answer-back message transmission (optional equipment). The monitoring timers at both stations are set to respond to reception of a space tone from the distant station. Traffic can now be exchanged from either station on a half-duplex basis.

(3) During the time the two stations are connected (traffic interval), either station can initiate a disconnect. Operation of the CLEAR pushbutton at either station will cause transmission of a spacing signal of 1.5 seconds duration, after which the station originating the disconnect will discontinue its tone transmission and go back "on-hook" (idle). The other station, after receiving the spacing signal for one second, will automatically transmit its 1.5 second spacing signal and then go into idle or "on-hook" condition. Both stations will then be back in their original idle condition in which calls can be either originated or accepted.

(4) Call control assemblies equipped with automatic answering facilities will respond to received ringing signals, turning the Set on at the end of the ringing interval and proceeding through the connect to the traffic condition. Automatic message answer-back is a part of this feature. The presence of an operator is required in order to complete disconnect and return the set to idle condition. For unattended service, an automatic disconnect timing device (optional) actuated when a call is answered, will cause the Set to go through the traffic condition, send the 1.5 second spacing tone, and go back "on-hook" if the F_1 mark tone is not received within eight seconds after the called station answered. This is designed to prevent the unattended station from being "busied" by (telephone) calls that fail to cause a full traffic connection to be set up. This feature does not affect normal automatic disconnect upon receiving the one second spacing tone or loss of tones due to a "drop off."

(5) Errors in dialing, as well as telephone plant troubles that cause improper connections to data-phone service, are evidenced by audible signals at the calling station. Such conditions are manually cancelled by the operator at either station by means of the CLEAR pushbutton.

This returns both stations to the "on-hook" idle condition. (Since no mark tones were received, the Printer may run "open" briefly until the Sets go through the traffic condition on their way to idle.) When there is a loss of signals due to "drop-off," disconnect will automatically occur by means of "space hold" facilities (see paragraph 7-14. c. (2) above). Break signals generated from a printer keyboard are limited to 0.450 second, followed automatically by a mark condition, even when the break key continues to be depressed. In this way, two successive blank signals can be received by the receiving selector, without causing an automatic disconnect (see paragraph (4) above).

(6) When the LOCAL pushbutton is depressed, automatic answering facilities are disabled and the motor is energized so that the Printer can be used for preparing copy without transmitting to another station. In this condition the Set can also be used for operator practice or for maintenance purposes. If an incoming signal is received during this time, it is manifested by ringing signals, and manual operation of the ANS pushbutton is required in order to receive the message. Means are also provided by operating the TEST pushbutton, for connecting the d.c. output of the Data Set demodulator back to the modulator, so that received signals can be re-transmitted to the sending, or distant, station (central office test position) for maintenance purposes. The monitoring timer is disabled during this time so that sustained intervals of mark or space signals may be repeated through the Set. In the TEST connection, the operator can reverse F₁ and F₂ tones upon request from test position.

e. SELECTOR MAGNET DRIVER (Figure 7-32).

(1) The selector magnet driver consists of a printed circuit card, a power transformer, a filter capacitor, and an external power resistor. The components of the driver set are mounted on the printed circuit card, except for the larger components, and the card inserted into a 15-point edge connector for interconnection with other components. The power transformer and filter capacitor, mounted to the rear of the circuit card, are part of the integral d.c. source of the call control assembly. Use of a transformer permits isolation of the entire selector circuit from other grounds. The selector magnet driver operates on 0.020 or 0.060 ampere neutral signals or 0.030 ampere polar signals, depending upon the system. The Dial TWX System generally employs 0.020 ampere neutral operation. If it should become necessary to change the mode of operation, the card should be removed from the connector before attempting to change the strapping. Input signals of 0.060 ampere are connected to terminals 12 and 1, leaving resistors R1 and R2 in parallel with each other. For input signals of 0.020 ampere, strap "W" is removed and the input is connected at terminal 12. If it is necessary to match the impedance of a 0.060 ampere magnet driver, strap "W" is cut and the input connected at terminal 10. For polar operation, R1 and R2 are omitted from the circuit and connected to the input at terminals 12 and 1. The output of the selector magnet driver is 0.500 amperes provided on marking signals for operation of the selector magnet on the Printer.

(2) The transistor bias voltages and low voltage references that set the input switching level

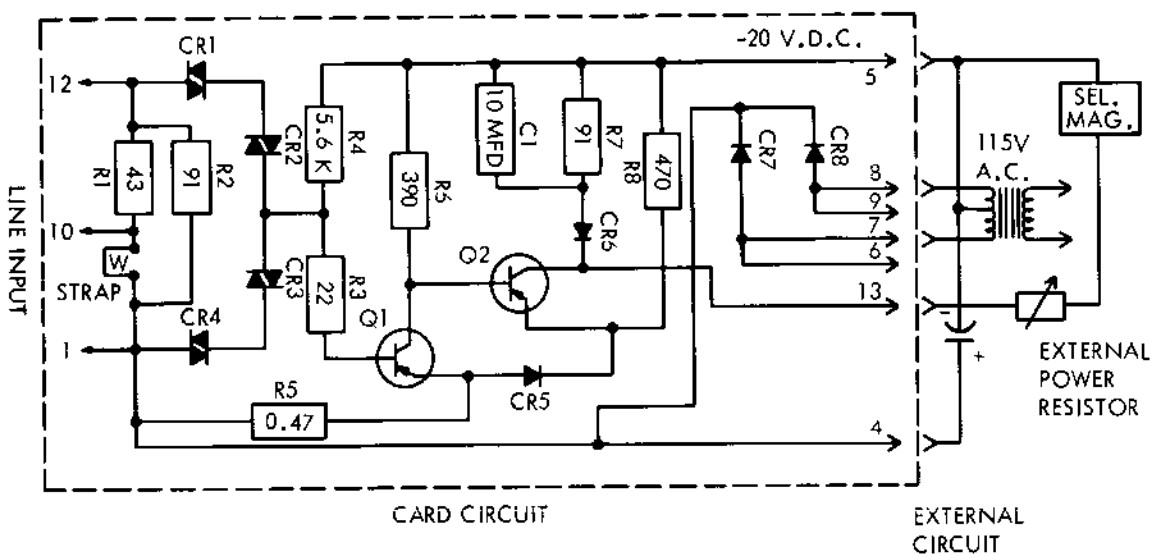


Figure 7-32. Selector Magnet Driver Circuit - Dial TWX.

of the selector magnet driver are developed by the four varistors or "click reducers" identified as CR1, CR2, CR3, and CR4 in the schematic, Figure 7-32. These varistors are two diffused junction silicon diodes mounted in opposite directions. The device has a forward diode characteristic in either direction so that its voltage drop will vary slightly with current. At 100 milliamperes, there is a voltage drop of about 0.8 volt across each.

(3) The schematic in Figure 7-32 is a switching circuit, made up of transistors Q1 and Q2. These transistors form a "snap action" trigger circuit that changes from one state to the other at a mid-point value of the input current, and is instantaneous regardless of slope, on time rate of change of input current. When the input signal is marking, Q1 is non-conductive and Q2 is conductive, and, conversely, when the input signal is spacing, Q1 is conductive and Q2 is non-conductive. For neutral operation, no line current flows during the spacing condition. Thus, the drop across the CR1, CR2, CR3, and CR4 decreases and Q1 is turned on at the half line current point by a negative current through R4 and R3. The collector of Q1 rises toward 0, applying the reverse current to Q2, turning Q2 off and de-energizing the selector magnet. At this time the magnet opposes the change in current and applies a transient to the collector of Q2 which is more negative than the battery potential at terminal 5. CR6 now conducts, passing the transient through C1 and R7 which limits the transient to a value well under the breakdown voltage of Q2, while the magnet energy is being dissipated. For marking input, positive current is applied to terminal 12 or 10 producing a total voltage drop of about 3 volts

across CR1, 2, 3, and 4. R3 connects half of this voltage to the base of Q1, turning Q1 off as the current reaches 1/2 of its final value. The collector of Q1 goes negative, and a drop across R6 is applied to the base of Q2, turning Q2 on. R5 provides emitter bias to Q1, and supplies a regenerative action to the transition.

(4) Input Protection — Resistor R1 and R2 samples the current flowing into the base of Q1. If the current exceeds a predetermined safe value of around 100 milliamperes, the voltage developed across R1 and the base to emitter junction of Q1 exceeds the forward drop of CR1 and CR2, and the majority of any excess current is shunted through them and around Q1. This protects the transistor from high current surges. Since the varistors are bi-directional, the input is protected for excess currents of either polarity.

(5) Output Circuit — Transistor Q2 controls the current fully through the selector magnet coil. The selector magnet, in series with an external 35 ohm 25 watt resistor is connected between the collector of Q2 at terminal 13 and negative battery at terminal 5, and supplies the load for Q2. On marks the current through Q2 quickly rises to 0.500 amperes, energizing the selector magnet. The supply current for marking and spacing conditions can be adjusted for customer requirements by varying the tap on the external 35 ohm resistor. However, this is not normally required.

f. SPEAKER AMPLIFIER (Figure 7-33).

(1) The function of the speaker amplifier is to provide an amplified audio signal in the 300

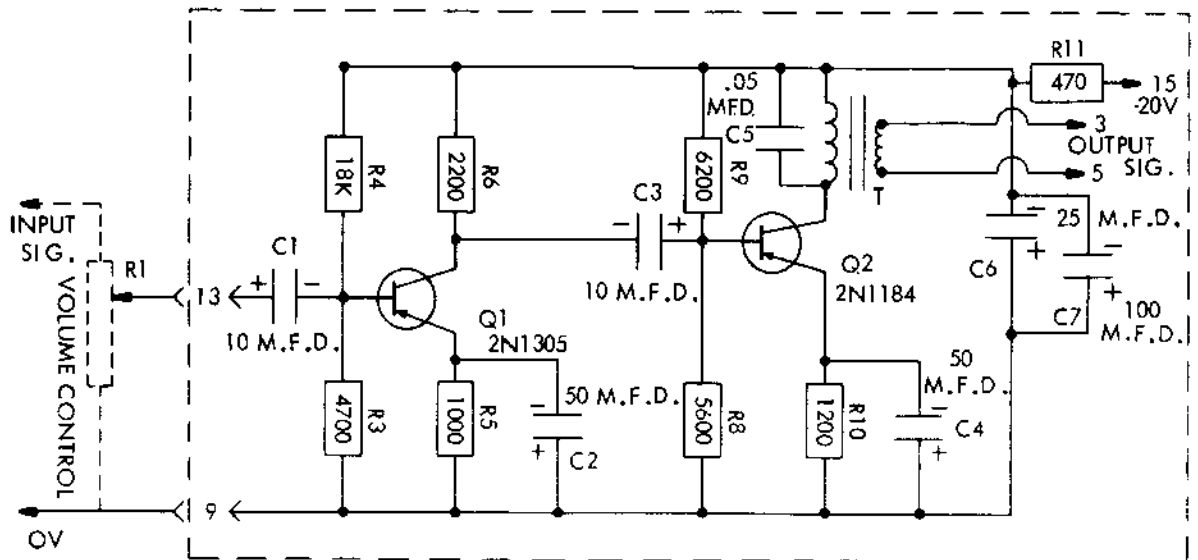


Figure 7-33. Speaker Amplifier Circuit.

to 3,000 cycle range. Its input signal consists of dial tones or busy signals of approximately -50 dbm received from the telephone line by way of the Data Set. The input impedance of the amplifier is about 1300 ohms, and the output impedance 125 ohms with a signal amplification of 60 dbm. It operates from a -20 v. -10% applied to terminal 15, and its output, connected to terminals 3 and 5, drives the speaker.

(2) The circuit (Figure 7-33) is that of a two stage transistorized resistance-capacitance coupled audio amplifier. Positively biased input signals are connected at terminal 13 and return to ground at terminal 9 through potentiometer R1 and resistor R2. The setting of R1 determines the signal level applied to the base of Q1 through the coupling capacitor C1 and is, therefore, the volume control for the set. Q1 amplifies the base input signals approximately 30 db. The output of transistor Q1 is coupled to the base of transistor Q2, through capacitance C3, where the signal is again amplified about 30 db. The output of Q2 is coupled to the speaker through the impedance matching transformer T.

(3) The other components of the amplifier and their function in the circuit are as follows: C2 and C4 are emitter by-pass capacitors for Q1 and Q2 respectively, paralleling the emitter limiting resistors R5 and R10; C5 acts as a high frequency filter across the primary of impedance matching transformer T; C6 and C7 are used as decoupling filters in the power supply; R3, R4, R8 and R9 are base biasing resistors for Q1 and Q2; R6 is the collector load resistor for Q1 and the primary of T is the collector load for Q2; R11 is the voltage dropping resistor in the -20 v. supply line.

7-15. CALL CONTROL ASSEMBLY - TELEX (4779WD).

a. GENERAL.

(1) The call control assembly covered in this paragraph couples the Printer to telegraph networks for use in the Western Union TELEX Service and provides facilities for initiating, accepting, controlling and completing calls. It is described in "Description" (Section 1), Paragraph 7-15.b. outlines in general terms its overall operation. Paragraphs 7-15.c. through 7-15.f. explain its detailed operation. Applicable schematic wiring diagram is 4779WD.

(2) The assembly operates over short and intermediate length telegraph loops using neutral signaling, or over longer loops with polar signaling when modified with proper polar-to-neutral converting circuitry. It includes a power supply, local-remote control circuits, a selector

magnet driver circuit, and a motor delay timer circuit.

b. GENERAL OPERATION.

(1) A selector magnet driver circuit delivers marking signals of 0.500 ampere and spacing signals of essentially 0 ampere to the associated Printer selector magnet. The signals trigger the driver circuit at about half the current level for normal (0.060 ampere mark) neutral input signals. In Sets modified for polar operation the signal is applied to polar-to-neutral converting circuits and then to the driver.

(2) The operator's controls, used for originating calls, consists of a set of pushbutton keys and a telephone type dial:

(a) There are four translucent, nonlocking keys. An illuminating lamp associated with each key is energized under the operating conditions described in the following paragraphs, except that the START lamp is a spare and does not light.

(b) The dial, a conventional telephone type, operates normally closed bifurcated pulsing contacts that open and close to send dialing pulses during the dial run-down interval. The pulses are produced at a rate of ten per second, with the contacts open for 0.061 ± 0.003 second during each pulse interval. A pair of normally open "off-normal" contacts close when the dial wheel is rotated from its idle position. These contacts provide a steady mark current to "blind" the printer selector when dialing is undertaken. This prevents the printing of spurious characters if dialing is necessary when in the connected condition as in multi-address calling.

(3) Neutral Signaling Conditions.

(a) In the idle condition, with the motor and Printer stopped and visual indicators de-energized, there is a positive current of 0.005 ampere in the telegraph loop. When the calling station operator depresses the START pushbutton, it causes the shunting of a major portion of the loop resistance and the loop current increases to 0.060 ampere. The start button must be held in the depressed position while switching apparatus in the telegraph exchange is made available. When the circuit is ready, the telegraph exchange interrupts the 0.060 ampere loop current for about 0.025 seconds. This "Proceed to Dial" signal causes the DIAL lamp to be illuminated at the calling station, and locks in the shunt to the loop resistance so that the operator may now release the start pushbutton and proceed to dial the number of the called station. Rotation of the dial transmits signals consisting of no current for 0.060 second followed by full

current (0.060 ampere) for 0.040 second during each dial pulse interval. When dialing is completed, the exchange furnishes the connection and signifies this by reversing the telegraph loop current from positive to negative, which causes the printer motor to start and the CONN lamp to light. Message transmission can now be exchanged between the connected Printers. The line signals are 0.060 ampere marking and zero current spacing.

(b) If the distant called station is busy or disabled at the time of a call, the local telegraph exchange reverses the local loop current from positive to negative for about 0.200 second, then causes it to revert to positive current again. This causes the local motor to start and the CONN lamp to light momentarily, but then both turn off and the Set returns to the idle condition as the positive current is detected.

(c) Incoming Calls — The local telegraph exchange responds to an incoming call by reversing the idle signal loop from positive to negative current. At the local station, the CONN lamp is illuminated and the Printer motor is turned on as the shunt to the loop resistance is applied in response to the current change. Message transmission can now take place with unattended service at the receiving station.

(d) Disconnect — Following completion of traffic, a disconnect can be originated from either the calling or the called station. Holding the STOP pushbutton depressed causes the line to go open (zero current). In approximately three seconds, the local exchange causes the connection to the distant station to be broken, and reverses the current in the local loop so that positive current flows, limited by the local station loop resistance. This turns off the motor and extinguishes the CONN lamp. The STOP pushbutton is released after the CONN lamp goes out. The original idle condition is now restored. When a disconnect is initiated from a remote station, the local exchange recognizes the open line interval and breaks the connection. The loop current is reversed back to positive and the local station returned to the idle condition as stated above.

(e) Local operation is provided by depressing the LOCAL pushbutton until the LOCAL lamp is turned on. This places the Printer Set in an "off-line" operating condition, for preparation of copy, practice or maintenance purposes. To return to the idle condition, the regular disconnecting key (STOP) is held operated until the lamp is extinguished, or a call can be initiated by operating the START pushbutton directly. If a call is received while the Set is in the LOCAL condition, the buzzer will sound for an interval of 2.6 seconds and the

Set will automatically shift over to the call-connected condition with the CONN lamp illuminated.

(4) Polar Signaling Condition.

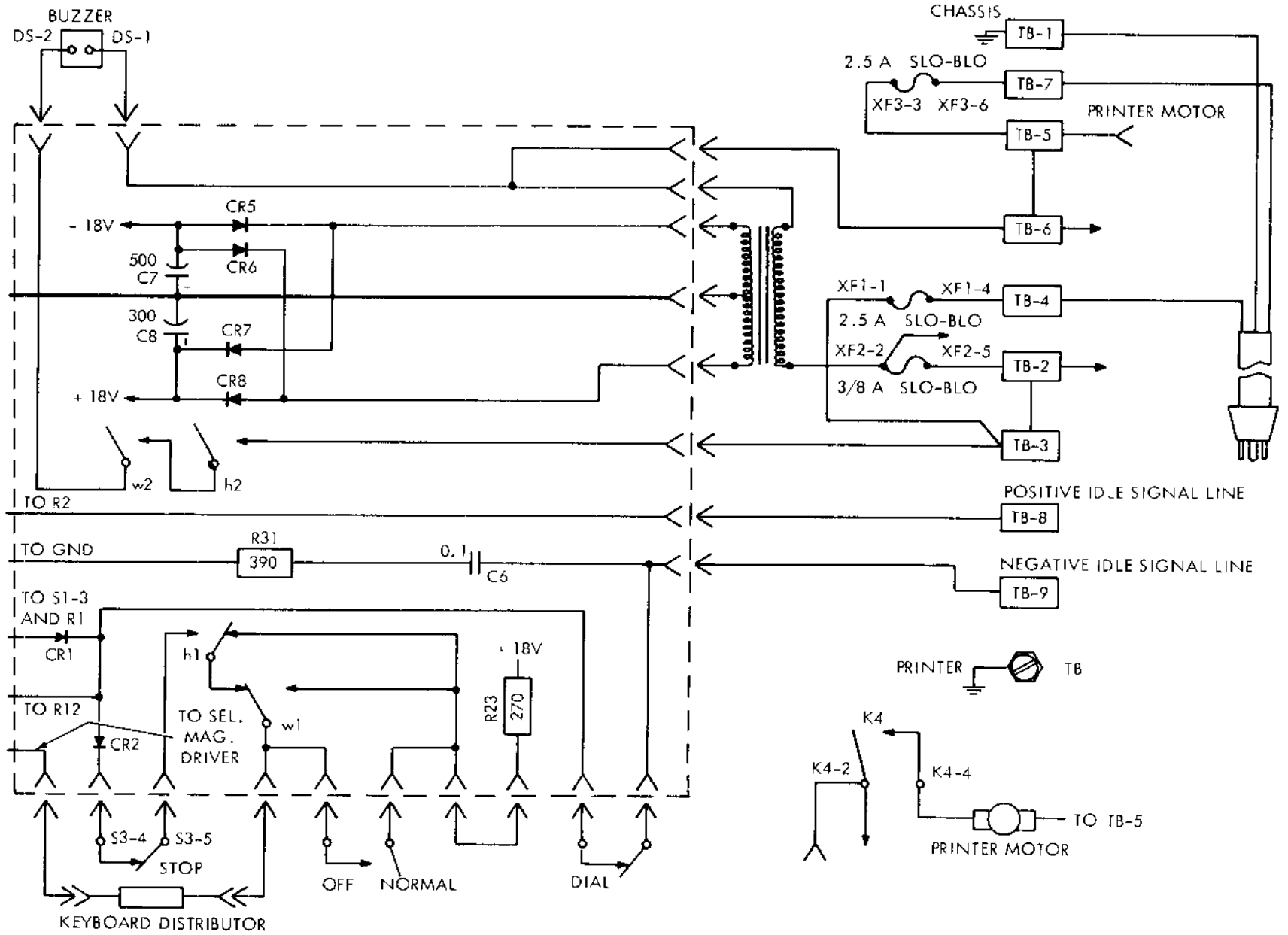
(a) Call control assemblies that are modified for polar operation respond to and transmit polar telegraph signals on separate receiving and sending "legs" extending to the telegraph exchange facilities. The operating conditions and sequence are similar to that for neutral signaling (paragraph (3) above.).

(b) In the idle condition, the sending and receiving legs each have from 0.015 to 0.040 ampere positive current flowing. The sending leg current is supplied by the call control assembly and the receiving leg current by the central exchange. At the local station, the polar adapter interconnects the legs with the neutral signaling control and printer circuitry. Operation of the START pushbutton causes the current in the sending leg to reverse to a negative polarity with a value equal to the positive current formerly applied (0.015 to 0.040 ampere). The telegraph exchange responds by reversing the current to negative on the receiving leg for 0.025 second. This causes illumination of the proceed to DIAL lamp, at which time the START pushbutton should be released. The dialing signals go out over the sending leg in polar form, each pulse interval consisting of 0.060 second of positive current followed by 0.040 second of negative current. When connection is completed, the exchange reverses the polarity of the receiving leg from positive to negative current. After 0.080 second of this reversal, the call control causes the motor to turn on and the CONN lamp to be illuminated. Traffic can now be exchanged. Each station is arranged to record its transmitted copy. Transmitted and received signals consist of positive current for space and negative current for mark on both signal legs.

(c) When receiving an incoming call, the local exchange reverses the receiving leg current from positive to negative. The local call control, after 0.080 second of negative current, turns on the motor and the CONN light and causes the sending leg current to be reversed from positive to negative.

(d) If the distant station that is called is busy, it will result in the momentary application of negative current to the local receiving leg, followed by a return to a continuous positive current. The motor may run briefly, but the Set will be quickly placed back into the idle condition.

Figure 7-34. Power Input Circuit.



(e) In effecting a disconnect, operation of the STOP pushbutton causes the transmission of positive current on the sending leg. The exchange will then reverse the current on the receiving leg to positive as it breaks connection to the distant station. The call control detects the positive current and, after 1.300 seconds, turns the motor and CONN lamp off as it applies a steady positive current to the sending leg, restoring the Set to the idle condition. If the disconnect is initiated at the distant Set, the positive current disconnect signal, when applied to the local receiving leg, causes the local Set to go into the idle condition after 1.300 seconds and the sending loop becomes positive again.

(f) For local operation, the internal conditions are the same as for neutral signaling. Externally, the signal legs remain on positive current unless a call is received. When a call is received, a negative current on the receiving leg for 0.080 second causes the buzzer to sound for 2.6 seconds, following which the Set shifts to the call-connected condition.

c. **POWER SUPPLY** (Figure 7-34) — A fused power supply operates on 115 volts a.c. $\pm 10\%$ at 60 cps and a power input of 12 watts. It floats with respect to the input line; that is, it is not at earth ground. Therefore, the center tap of the transformer is ± 120 volts to earth ground in neutral signaling. The polar adapter, on Sets equipped for polar operation, also contains a power supply. When operating on a polar line, this power supply, as well as that of the call control assembly, is operated with ground to earth.

d. LOCAL-REMOTE CONTROL CIRCUITS.

(1) **General** — The local-remote control is a printed card assembly consisting of three circuits that accomplish the switching called for by the input line or operation of the push-button key set. These circuits are the "Proceed to Dial," "Connect," and "Local" circuits (see Schematic Wiring Diagram 4779WD). They are essentially binaries (flip-flops) that have been modified to perform their function. All the circuits are protected with a diode arc suppressor against transients and voltage pulses generated by their associated relays. A negative voltage, generated at the collector of a transistor, will be shorted through the diode to resistor R27. The transient will be developed across R27 and the lamp associated with the relay. The diodes performing this function are CR10, CR12, and CR19. The circuits are also protected from transient noise induced into them from leads in the cable to the dial and key and lamp assembly. A low pass filter or delay network of the RC type is placed in

a feedback loop in each binary. The delay network slows the response time of the associated binary, reducing its susceptibility to noise. These delay networks are made up of R10 and C3, R21 and C4, and R39 and C11. The signal line inputs are filtered against spurious noise occurring on the line. There are two of these filters, both of the RC type. In the "Proceed to Dial" circuit, the delay network (R5 and C1) provides 0.001 second delay. In the "Connect" circuit, the delay network (R12 and C2) provides a 0.020 second delay. The RC network, consisting of R31 and C6, in the 240 volt signal line, acts as an arc suppressor to protect associated contacts.

(2) **Proceed to Dial Circuit** (Figure 7-35) — This circuit consists of a binary with a line input amplifier. The amplifier consists of transistor Q1 and associated components and the binary consists of transistors Q2 and Q3 and associated components. The amplifier is connected to the binary through a low pass filter or delay network (R5 and C1) which suppresses line noise. Input to the binary from the filter through R6 will turn on the proceed to dial circuit. Two other control inputs turn off the proceed to dial circuit. One of these is through resistor R15 and the other is through push-button contact S3-1. Operation of the transistors in the proceed to dial circuit is as follows:

(a) When transistor Q2 is in conduction, its collector is near neutral potential. Current will flow through Q2, R11, S3-1, S3-2, and R27. Current will also flow from +18 volts through R8 and CR9 to the collector of Q2. The base of Q3 will be held 0.8 volt positive with respect to the collector of Q2 due to the current flow through CR9. The base of Q3 will, therefore, be slightly positive with respect to neutral and Q3 will be turned off. With Q3 turned off, its collector will be negative and base current to Q2 will be supplied through the low pass filter consisting of R9, R10, and C3 which holds Q2 in conduction.

(b) When transistor Q3 is in conduction, the proceed to dial circuit is on and the collector is near neutral. Current flows through Q3, K1, XDS-2 and R27. Since the collector Q3 is near neutral, current flow through R7, R9 and R10 produces a positive potential at the base of Q2 which holds Q2 off. With Q2 off, base current for Q3 will flow through CR9, R11, S3-1, S3-2 and R27, holding Q3 in conduction.

(c) If an input current in excess of 0.002 ampere flows from TB-8 across CR4 to neutral, a positive potential of 0.8 volt is developed across CR4. This positive potential holds Q1 in

conduction and its collector near neutral potential. Neutral potential at this collector has no effect on the base of Q2 because of isolation provided by R5 and R6. If the input current falls below 0.002 ampere, a negative 0.8 volt is developed across CR4 due to the flow of current through R3, R2 and CR4. This potential turns off Q1 and its collector becomes positive. Current flows through R4 and R5 to charge C1 toward a positive 18 volts. When sufficient voltage is developed across C1, the base of Q2 will be back biased through R6. Transistor Q2 turns off and Q3 turns on. The proceed to dial circuit is now on. Back bias to the base of Q2 is supplied by the voltage divider R7, R9 and R10 so that the positive potential applied across R6 is no longer required to hold Q2 off. If more than 0.002 ampere begins to flow across CR4 again, Q1 will turn on, and its collector will go to neutral, but this will have no effect on the base of Q2.

(d) If negative signal is applied to the side of R15 opposite the base of Q2, enough current will flow to forward bias the base of Q2 and cause it to conduct. Q3 will turn off and supply sufficient base current through R9 and R10 to hold Q2 in conduction. The negative signal on R15 can now be removed and Q2 will remain in conduction.

(e) With the proceed to dial circuit on, Q3 in conduction, base current for Q3 flows through R11 and CR9. By operating the STOP pushbutton, the current path through S3-1 is broken. Q3 will then turn off and Q2 will turn on. Collector current will not flow in Q2, but will be near neutral, holding Q3 off. When the STOP button is released, collector current will flow in Q2. Proceed to dial is now off.

(3) Connect Circuit (Figure 7-36) — This circuit consists of a binary (Q4 and Q6), one side of which is driven by emitter follower Q5. The only control input to this circuit is by the signal line through R12 and R13. C2 and R12 form a low pass filter or delay network. Signal delay in the network is approximately 0.02 second. A single passive control, consisting of R28 and CR3, is used for low paper conditions:

(a) Transistor Q5 controls the base of Q4. If Q4 is in conduction, its collector is near neutral. Voltage divider R17 and R18 hold the base of Q6 positive so that Q6 is off. The collector of Q6 will then be negative and the base of Q5 will be held slightly negative through R20 and R21. Since Q5 is an emitter follower, its emitter will be held at the same potential as its base. With its emitter at a negative potential, Q4 will be held on.

(b) When the connect circuit is on, Q6 is in conduction and its collector is near neutral. The voltage divider R19, R20 and R21 holds the base of Q4 and therefore the emitter positive. With the emitter of Q5 positive, the base of Q5 will be back biased and Q4 will be off. The collector of Q4 will then be negative. Base current for Q6 will flow through R16 and R17 holding the connect circuit on.

(c) To control the connect circuit a high voltage must be developed at the junction of CR1 and CR2. This voltage will be approximately ± 200 volts. If a +200-volt signal is applied at this point, the base of Q5 will be biased positive and Q4 will turn off, turning on Q6. If a -200 volt signal is applied, the base of Q5 will be biased negative and Q4 will turn on, turning Q6 off. An input signal at or near neutral will have no effect upon the connect circuit and it will remain in its prior state.

(d) The base of Q5 is protected against excessively high voltages by transistor operation or by CR11. If a negative 200 volt signal is present, the voltage on the base of Q5 will fall, forcing its emitter to follow. When the emitter of Q5 becomes negative with respect to ground, Q4 will turn on. With Q4 in conduction, its base potential is held close to the emitter potential. Therefore, the base cannot go more negative than approximately -0.4 volt. This action also holds the base voltage of Q4 within -0.4 volt of its emitter. The base voltage of Q5, then, cannot become more negative than approximately -0.8 volt. If a positive 200 volt signal is present at the input, the base of Q5 will start to become positive. The diode CR11 is forward biased to positive base voltages. It will limit the voltage on the base of Q5 to approximately +0.8 volt. Therefore, under the severest input conditions, a voltage swing of more than ± 0.8 volt is not expected.

(e) Resistors R24, R25 and R26 and capacitor C5 are used where a polar converter is employed. As they are shown connected in 4779WD, they have no effect on the operation of this circuit.

(4) Local Circuit (Figure 7-37) — A binary and a uni-junction transistor timer make up the local circuit. Binary operation of Q8 and Q9 is the same as that of the proceed to dial circuit. There are four input controls available.

(a) Operation of the LOCAL pushbutton turns on the local circuit (Q9 on). When contact S2-1 is closed, base current is supplied to Q9 through R37 and R38 and Q9 will turn on, turning off Q8. If the anode of either CR13 or CR14 is neutral, current flowing through R38 will flow through one of the diodes and not

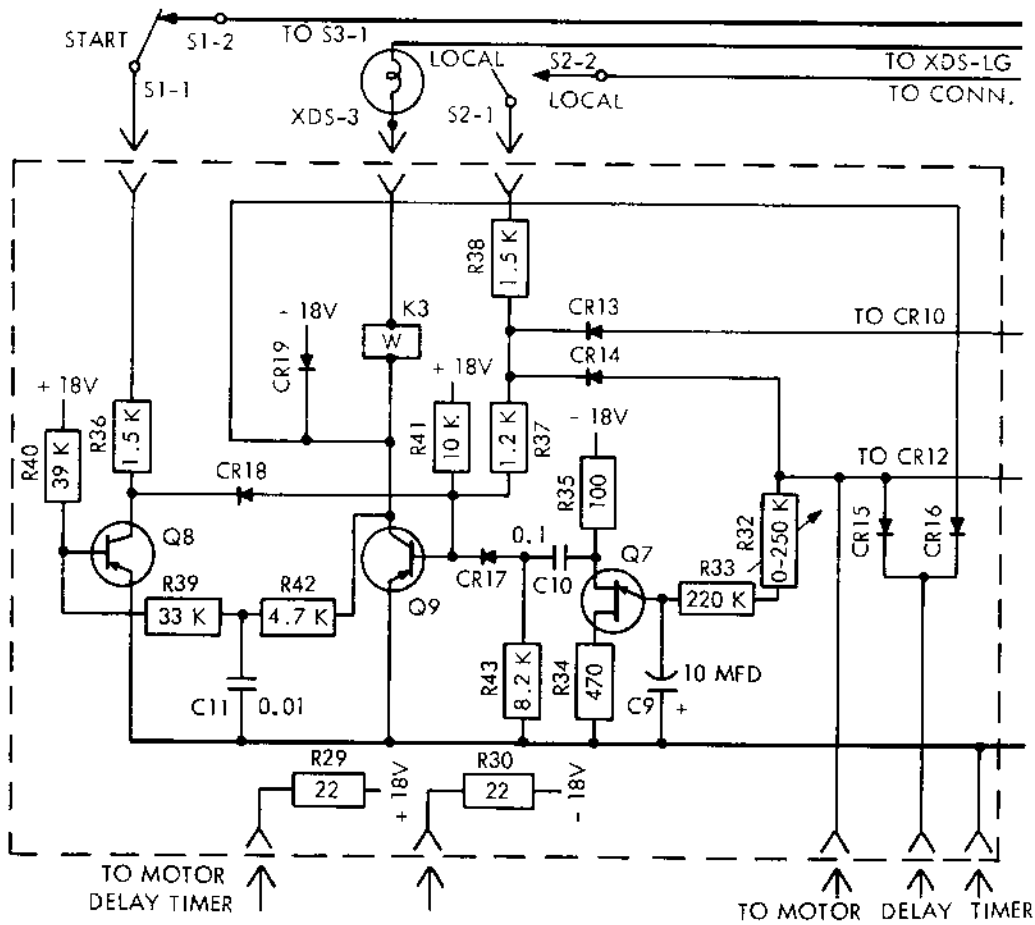


Figure 7-37. Local Circuit.

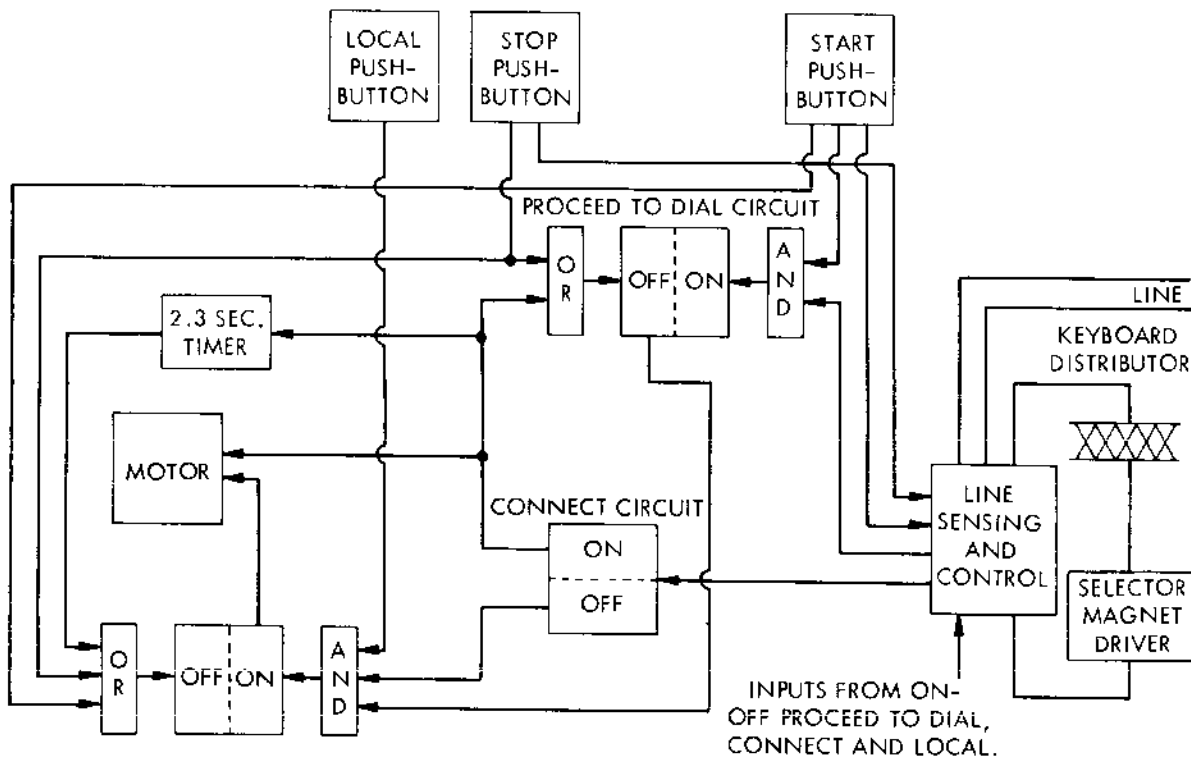


Figure 7-38. Block Diagram - Local-Remote Control Circuits.

reach the base of Q9. These two diodes allow the local circuit to be turned on only when the proceed to dial and connect circuits are off.

(b) The local circuit can be turned off by operation of either the START or the STOP pushbutton. When the local circuit is on, the base current for Q9 flows through contacts S1-1 of the START pushbutton and contact S3-1 of the STOP pushbutton. Since the contacts of the two pushbuttons are in series, operating either of them will turn Q9 off.

(c) The uni-junction transistor output will also turn off the local circuit. This transistor (Q7) is a breakdown device. If the voltage on C9 is more negative than approximately -8 volts, the resistance of the junction between the lead connected to C9 and the lead connected to R35 is high. When the voltage on C9 becomes more positive than approximately -8 volts, the resistance of this junction will become very low and C9 will recharge through R35. The increase in current flowing through R35, while recharging C9, will cause an increase in the voltage drop across R35. The positive pulse is coupled through C10 and CR17 to the base of Q9, causing it to turn off and Q8 to turn on. The local circuit is then off. As capacitor C9 is recharged, the resistance of the junction again becomes high.

(d) Capacitor C9 is discharged toward neutral or held at about -18 volts through R32 and R33. If the input to R32 is negative (connect circuit off), the capacitor will be held at -18 volts. If the input to R32 is near neutral (connect circuit on), capacitor C9 will discharge through R32 and R33 toward neutral. At the end of 2.3 seconds interval, the voltage on C9 will be approximately -8 volts and the uni-junction will break down and turn the local circuit off as described above.

(5) Circuit Interconnections.

(a) Proceed to dial (see Figure 7-38).

1. In order to turn on the proceed to dial circuit, two conditions must be satisfied. The START pushbutton must be operated and the proper line signal must be received from the exchange. The START pushbutton presents the proper signal to the exchange so that the request to dial is recognized. It also protects the proceed to dial circuit from an open line and long line breaks such as those generated when the dial is operated.

2. The proceed to dial circuit can be turned off in two ways. If the STOP button is operated or the connect circuit operates, the proceed to dial circuit will turn off. Local

control is provided by operation of the STOP button, while the connect circuit provides automatic control initiated by the exchange.

(b) The connect circuit is controlled only by the line and therefore has only one input. This input is from line sensing and control as shown in Figure 7-38.

(c) Local Circuit.

1. To turn the local circuit on, three conditions must be satisfied. The proceed to dial and connect circuits must be off and the LOCAL pushbutton must be operated. The input of both the proceed to dial and the connect circuit protect against accidental operation of the local circuit which would otherwise cause an automatic disconnect.

2. The local circuit is turned off by operating the STOP button or the START button or the 2.3 second timer. The START and STOP pushbuttons provide local control of the circuit while the timer provides automatic control. The timer is controlled by the connect circuit which is, in turn, controlled by the line. The timer continues to oscillate as long as the connect circuit is on, but only the first timing pulse is required to turn off the local circuit.

(d) Each of the above three circuits has an input to the line sensing and control. The inputs are in the form of relay contacts which switch the line through the proper internal path in the local and remote control assembly. When either the connect or local circuit is on, a motor control relay is operated. The contacts of the relay are used to turn on the motor of the associated Printer.

(6) Idle Line Condition—In this state all relays and lamps are off. This requires that transistors Q3, Q6 and Q9 be off and that Q2, Q4 and Q8 be in conduction. The output transistor of the motor delay timer is off and the selector magnet driver is marking.

(a) The signal loop is a 240 volt source with 4000 ohms in series. In the idle condition the local-remote control offers 43,800 ohms of local resistance to the signal loop. The flow of loop current in this condition is shown in Figure 7-39. Current flows from TB8, the positive idle terminal, across CR4, through R1 and CR1 in parallel with the base-emitter junction of Q4 and Q5. R13 and R12. From this point, current flows through the dial pulse contacts to terminal TB9.

(b) Loop current develops a positive potential at A in Figure 7-39 holding transistor Q1 on. The collector of Q1 is shorted to ground

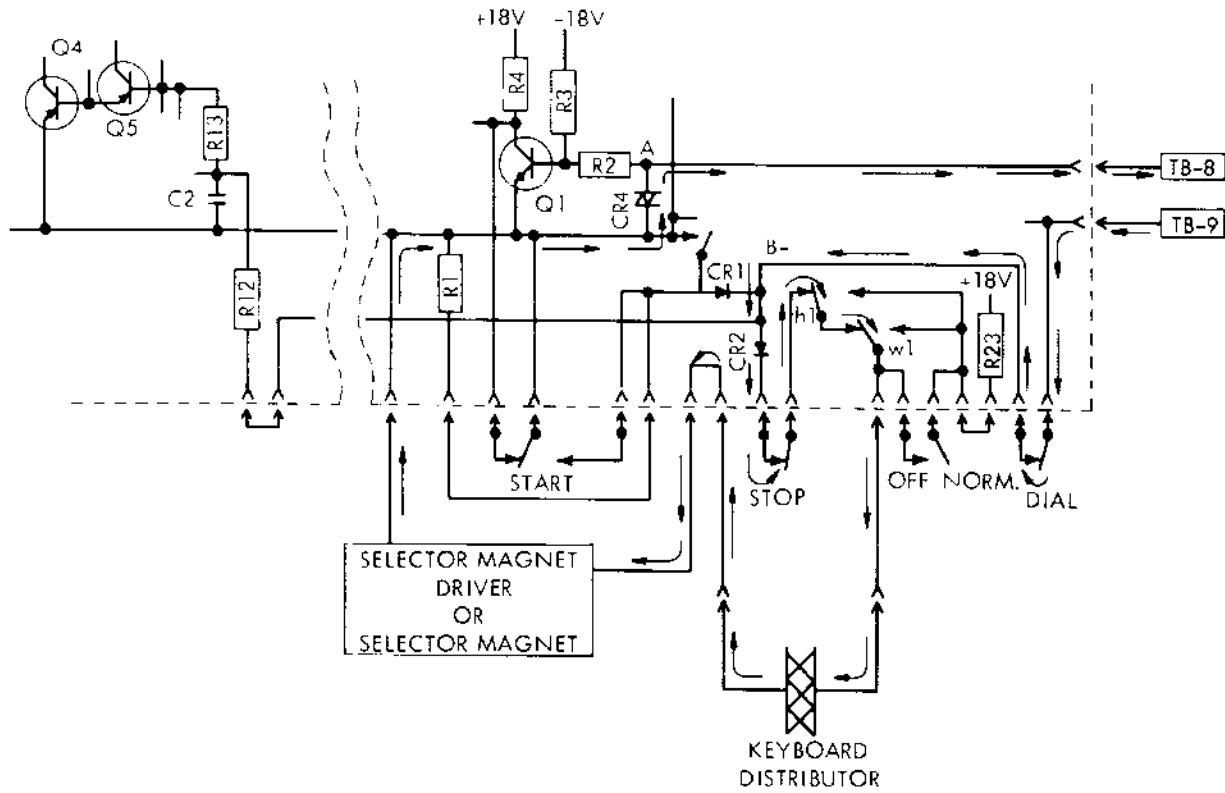


Figure 7-39. Local-Remote Control Circuit - Current Flow (Local Connection).

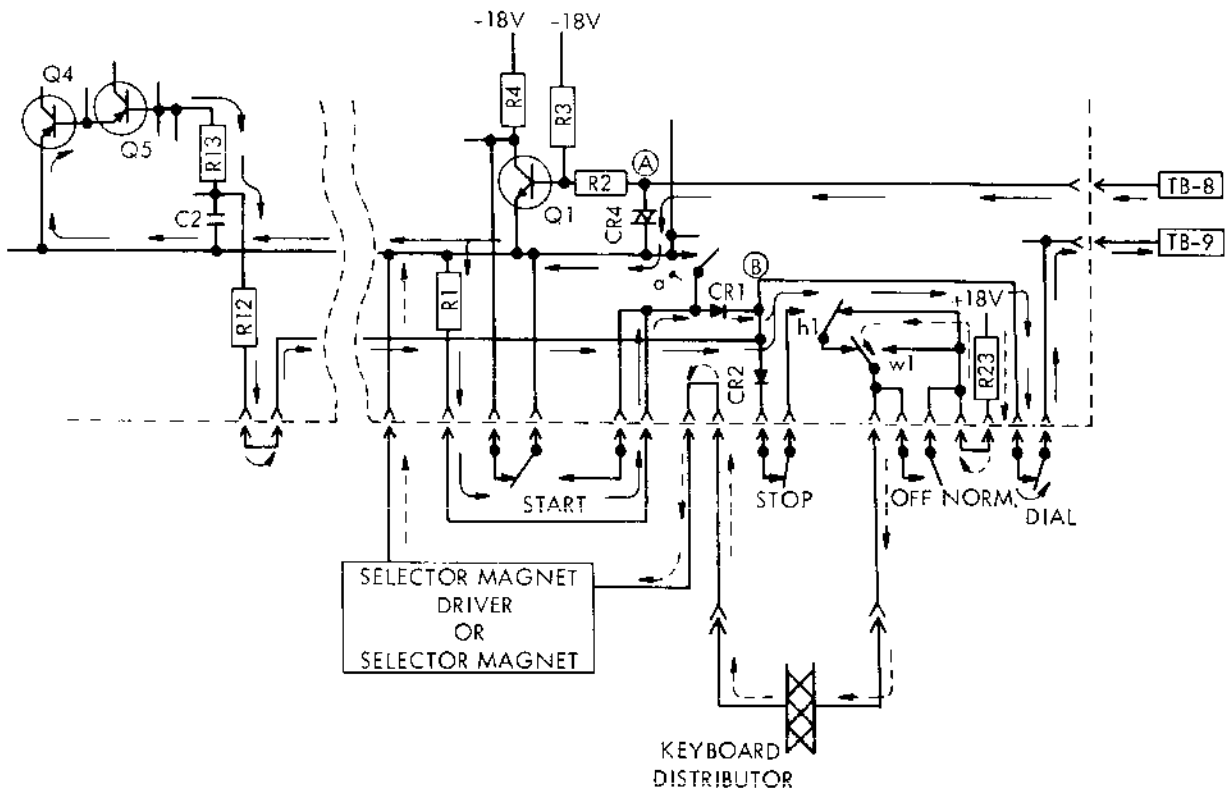


Figure 7-40. Local-Remote Control Circuit - Current Flow (Idle).

through contacts S1-4 and S1-5 on the START button. Therefore, no signal is developed at the collector unless the START button is depressed. Loop current develops about -200 volts with respect to neutral at point B. This potential holds Q4 in conduction and the connect circuit off (Q6 off).

(c) The selector magnet driver is supplied 0.060 ampere locally to hold the selector magnet. This current is supplied through R23 and flows through contacts h1 and w1, the keyboard distributor, and the selector magnet driver to neutral.

(7) Initiating a Call — A call can be initiated with the Set in either idle or local condition by depressing the START pushbutton. This performs three functions. Contacts S1-1 and S1-2 open and turn off the local circuit. Contacts S1-4 and S1-5 open and remove the short from the collector of Q1. The collector will remain at ground since more than 0.002 ampere is flowing through CR4. Contacts S1-3 and S1-5 close shorting the local loop resistance which allows the loop current to rise to 0.060 ampere. The loop current now flows from TB8, through CR4, contact S1-5, contact S1-3, CR1 and the dial impulse contacts to TB9. Shorting out the local loop resistance causes the voltage at point A to rise neutral. This has no effect on the state of the connect circuit.

(a) Proceed to dial — When the START button is depressed, a proceed to dial pulse will cause the collector of Q1 to go positive and in turn operate the proceed to dial circuit (turn on Q3). With Q3 in conduction, current will flow through the A(K1) relay and the Dial lamp, causing both of them to be operated. The normally open contact "a" of the A relay will operate the short contacts S1-3 and S1-5 of the START button. Loop current now flows from TB8, through CR4, contact "a," CR1, and the dial pulse contacts to terminal TB9.

1. With Q3 in conduction, its collector will be near neutral. This holds the junction of R37 and R38 in the Local circuit near neutral through CR13 as the LOCAL button is operated. The local circuit cannot now be turned on. The proceed to dial circuit may be turned off by operating the STOP button. Contacts S3-1 and S3-2 will open and cause Q3 to turn off as described earlier. With Q3 turned off the Set will revert to the idle line condition and the current loop will be as shown in Figure 7-40.

2. In initiating a call, if the START button is released at any time before the proceed to dial pulse is given by the exchange, the Set will revert to the idle line condition. The exchange requires a short time to reset after the

START button is released early and should not be reoperated for a few seconds.

(b) Dialing — The dial is in the signal loop at all times, but may be used to transmit information to the exchange only during the proceed to dial and the connect conditions. Since the dial impulse contacts are in series with the loop, operation of the dial will completely break loop current. In order to prevent damage to the dial contacts, an arc suppressor, R31 and C6, is placed across the contacts.

(8) Connection.

(a) Local Connection — If a call is initiated locally, current in the loop will be 0.060 ampere from TB8 to TB9 through the path described in paragraph 7-15.d. (6) before connection. When the loop polarity is reversed by the exchange, current flow is from TB9 to TB8. Diode CR1 becomes reverse biased, stopping current flow except through R12 and R13. This current flow turns off Q4 and turns on the connect circuit (turns on Q6). With Q6 in conduction, the H(K2) relay will operate and the CONN lamp will light. The transfer contacts h1 of the H relay will switch and allow loop current of 0.060 ampere to flow through the distributor and selector magnet driver as shown in Figure 7-39. Loop current now flows from TB9, through the dial pulse contacts, CR2, the contacts of h1 and w1, the keyboard distributor, the selector magnet driver and CR4 to TB8. Current will also flow through CR15 to operate the motor delay timer and, in turn, the motor control relay (K4) when Q6 is in conduction. Contacts K1 will close and start the motor. Q4 is cut off and its collector is negative. Feedback from the collector of Q4 to the base of Q2 through R15 will turn off the proceed to dial circuit. The A relay will release and the DIAL lamp will go out. The "a" contact will open, but does not have any effect upon the loop current flow, since it is not now in the current loop. The junction of R37 and R38 is held near neutral from the collector of Q6 through CR14. This prevents operation of the local circuit.

(b) Remote Connection — On an incoming call, the set may be connected remotely while in the idle line or local conditions. The loop path is shown in Figure 7-40 for both of these conditions. The incoming call causes the exchange to reverse the loop polarity. This causes the potential at the junction of CR1 and CR2 to change from -200 volts to approximately +200 volts. The potential causes the connect circuit to operate as described in the paragraph above.

(c) Low Paper Circuit — If the paper in a Printer has become low and the low paper

contacts operate, the junction of R12 and R13 will not be allowed to become positive. Q4 cannot be turned off and a connection cannot be made. If low paper occurs during a call, the Set will remain in the connected state since zero potential at the junction of R12 and R13 will not effect the connect circuit. A disconnect will occur in the normal manner, since CR3 will be back biased to a negative potential at the junction of R12 and R13. If a call is initiated locally with a low paper condition, the normal sequence of events will occur, until a connection is attempted. When the exchange cannot connect, it will reverse the loop polarity and the Set will return to the idle state.

(9) Disconnect.

(a) Local Disconnect — Operation of the STOP pushbutton while in the connect condition opens contacts S3-4 and S3-5, which are in series with the loop, and breaks the loop. When the exchange recognizes the break, it reverses the loop polarity. The reverse polarity is blocked by CR2 and current flows through CR1 along the path shown in Figure 7-40. At point A, -200 volts is developed due to current flow as described in 7-15.d.(6). This potential causes the connect circuit to turn off. The CONN lamp goes out and the H relay releases. The h1 contacts return to the blinded condition and the Printer stops running open. The input to the motor delay timer becomes negative and the timer will time out. After 0.550 second the motor control relay releases and the motor will turn off. This delay allows the Printer clutches to latch.

(b) Remote Disconnect — The operation of the circuits and the loop paths are the same as those described in 7-15.d(8)(b). The STOP button is not operated locally, but the signal conditions appear identical to the local-remote control.

(10) Local Off-Line Operation — When the Set is in the idle line condition, operation of the LOCAL pushbutton will cause the local circuit to operate (Q9 turns on). If the control is in the proceed to dial or connect conditions, CR13 or CR14 will prevent operation of the local circuit. When the local circuit operates, the W relay operates and the LOCAL lamp will light. Contact w1 of the W relay will short out contacts h1 in the keyboard-selector magnet driver loop. Current to this loop will then flow through R23, w1, the keyboard and the selector magnet driver to neutral. Current will also flow through CR16 to turn on the output transistor of the motor delay timer. The motor control relay will operate and the motor will start. The Printer is now ready for off line operation. To return to the idle line condition, the STOP button may be depressed. Contacts S3-1

and S3-2 open and turn off the local circuit. A call may be initiated in the local condition in the usual manner. When the START button is depressed contacts S1-1 and S1-2 open and turn off the local circuit in the same way as the STOP button.

(a) If an incoming call is received while the Set is in the local condition, the action of the circuit is the same as that described in 7-15.d. (6) (a) and (b). The H relay operates to shunt the line through the keyboard distributor and selector magnet driver, but this operation cannot be accomplished, since the w1 contacts have shorted the h1 contacts out of the circuit. Operation of the h2 contacts will complete the 117 v.a.c. circuit to the buzzer causing it to sound.

(b) When the connect circuit is turned on, the collector of Q6 approaches neutral. This causes the timer to start. At the end of a 2.3 second period, a positive pulse from the timer is coupled to the base of Q9 through C10 and CR17. The pulse causes the local circuit to turn off, the LOCAL lamp to be extinguished and the W relay to be released. The w1 contacts short the signal loop through the keyboard distributor and selector magnet driver. The w2 contacts open and the buzzer will turn off. The Set is now in the connect condition.

e. SELECTOR MAGNET DRIVER (Figure 7-41).

(1) The selector magnet driver, combined with an external power transformer, a resistor and a filter capacitor, provides 0.500 ampere for driving a selector magnet from a telegraph signal source of appropriate input line current. The input signals are applied through terminals 7 and 13, with R1 determining the switching level. The operation of the circuit, in general, is the same as that described for TWX application in paragraph 7-14.e.

(2) For mark input, positive current is applied to terminal 7, providing a positive bias to the base of transistor Q1 that overcomes the normal negative bias supplied through R1 and stabilized by Zener diode ZD1. Q1 turns off as the increasing positive current reaches one-half of its final value. The collector of Q1 goes negative, and the drop across the collector load resistor R3 is applied to the base of Q2, turning Q2 on. R4 provides emitter bias to Q1, and supplies a regenerative action to the transistor.

(3) The selector magnet, in series with the external resistor, is connected between the collector of Q2 at terminal 6 and negative battery at terminal 15, and supplies the load for

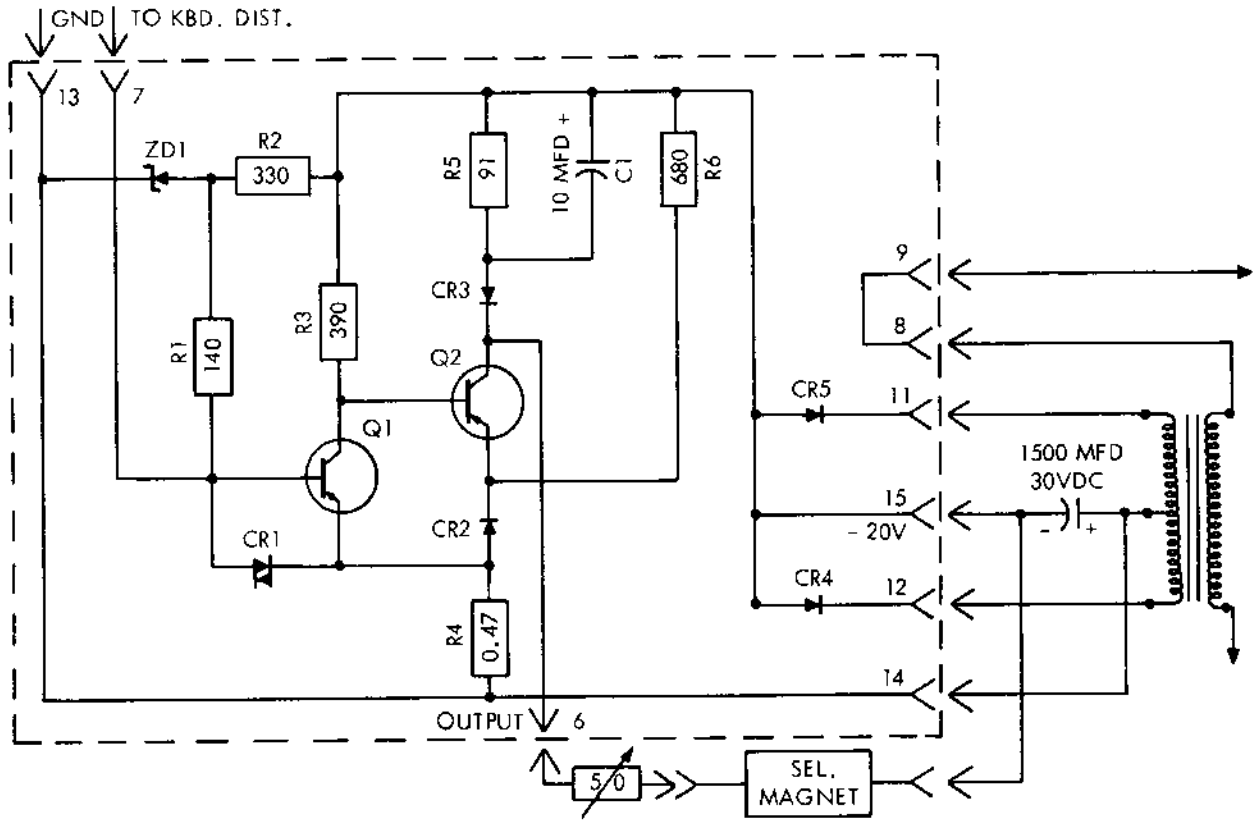


Figure 7-41. Selector Magnetic Driver Circuit - TELEX.

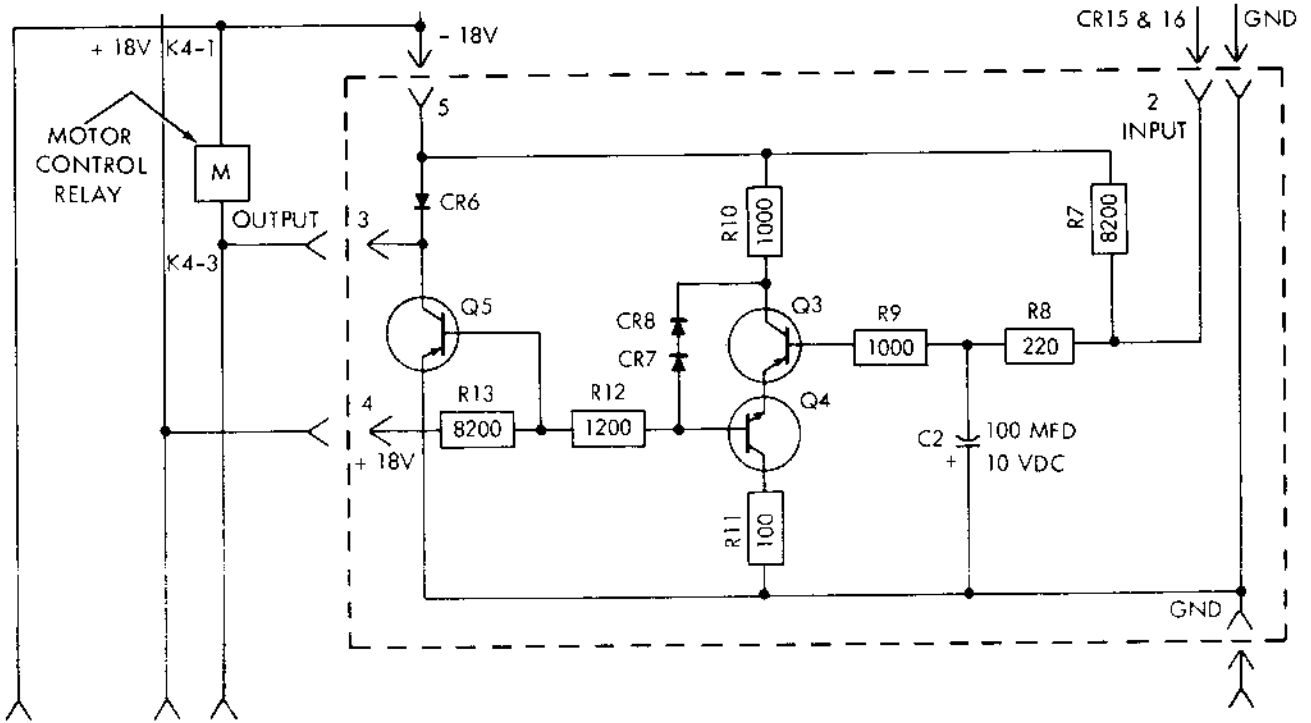


Figure 7-42. Motor Delay Timer Circuit.

Q2. On marks, the current through Q2 quickly rises to 0.500 ampere, as set by the external resistor, and energizes the selector magnet.

(4) On space input, the positive input bias decreases and Q1 is turned on at the half line current point by negative bias through R1. The collector of Q1 rises toward zero, applying reverse bias to Q2, turning off Q2, and de-energizing the selector magnet. The magnet opposes the change in current and applies a transient to the collector of Q2 which is more negative than the battery potential at terminal 15. CR3 now conducts, passing the transient to C1 and R5 which limit the transient to a value well under the breakdown voltage of Q2, while the magnet energy is being dissipated.

f. MOTOR DELAY TIMER (Figure 7-42).

(1) The motor delay timer provides a means to delay motor turn-off in the Printer, allowing the Printer to complete its printing cycle and come to rest before the motor begins to stop. This circuit is mounted on the same circuit card assembly with the selector magnet driver but is electrically independent of it. It is designed to drive a motor control relay connected between points 3 and 5 and is operated when either the connect or local circuit is on.

(2) The motor delay timer consists of a regenerative switch (Q3 and Q4) and an output driver (Q5). The input to the timer is from the collector of Q9 through diode CR16 or from the collector of Q6 through diode CR15 in the local and connect circuits of the local-remote control assembly. The diodes provide insulation between the input of the timer and the transistors of the local-remote control for negative signals. When the input of the timer at point 2 is grounded, the output driver will turn on immediately. When the input signal is removed, the output driver will remain in conduction for approximately 0.550 second, holding the motor control relay operated long enough to allow the Printer to complete its printing cycle before turning off the motor.

(3) When a negative input signal is applied to point 2, base current to Q3 will flow through R7, R8 and R9. Q4 will be held in conduction by base current flowing through R12 and R13. The collector of Q3 will be at approximately -1.6 volts. The voltage divider, R12 and R13, will hold the base of Q5 positive and Q5 will be cut off.

(4) If ground is now applied to the input, the base of Q3 will approach ground and become reverse biased, turning it off. The collector of

Q3 will become -10.0 volts. This voltage will cause the voltage at the base and the emitter of the emitter follower Q4 to be -8.5 volts. The emitter of Q3 will be held at -8.5 volts by the emitter of Q4, holding Q3 off. The -10.0 volts at the collector of Q3 will cause base current to flow to Q5 through CR7, CR8 and R12. Q5 will then go into conduction, operating the external motor control relay.

(5) If the ground input is now removed, current will flow through R7 and R8, charging C2 toward -18 volts. After about 0.550 second, the voltage on C2 reaches -8.5 volts, the voltage on the emitter, and Q3 goes into conduction with its collector going less negative. This causes the base of Q4 and therefore the emitter of Q3 and Q4 to become less negative. The process continues until both Q3 and Q4 are saturated. C2 will then discharge through R9 and the base of Q3 to ground. Base current to hold Q3 in conduction is supplied through R7, R8 and R9.

(6) At 25 degrees C. with 390 ohm output load, the delay of the timer is from 0.475 second to 0.675 second when the supply voltages are within 3% of their nominal values.

g. POLAR ADAPTER-TELEX (Figure 7-43).

(1) The following description is based upon Schematic Wiring Diagram 5923WD.

(2) The Polar Adapter converts the types of signals received from the receiving leg and the printer into those usable by the circuitry and the sending leg. Some of the functions of the relay contacts are modified by the Polar Adapter, but they serve the same general purpose. The outward operations of the Control Unit, with the Polar Adapter attached, are identical to those of the Control Unit alone.

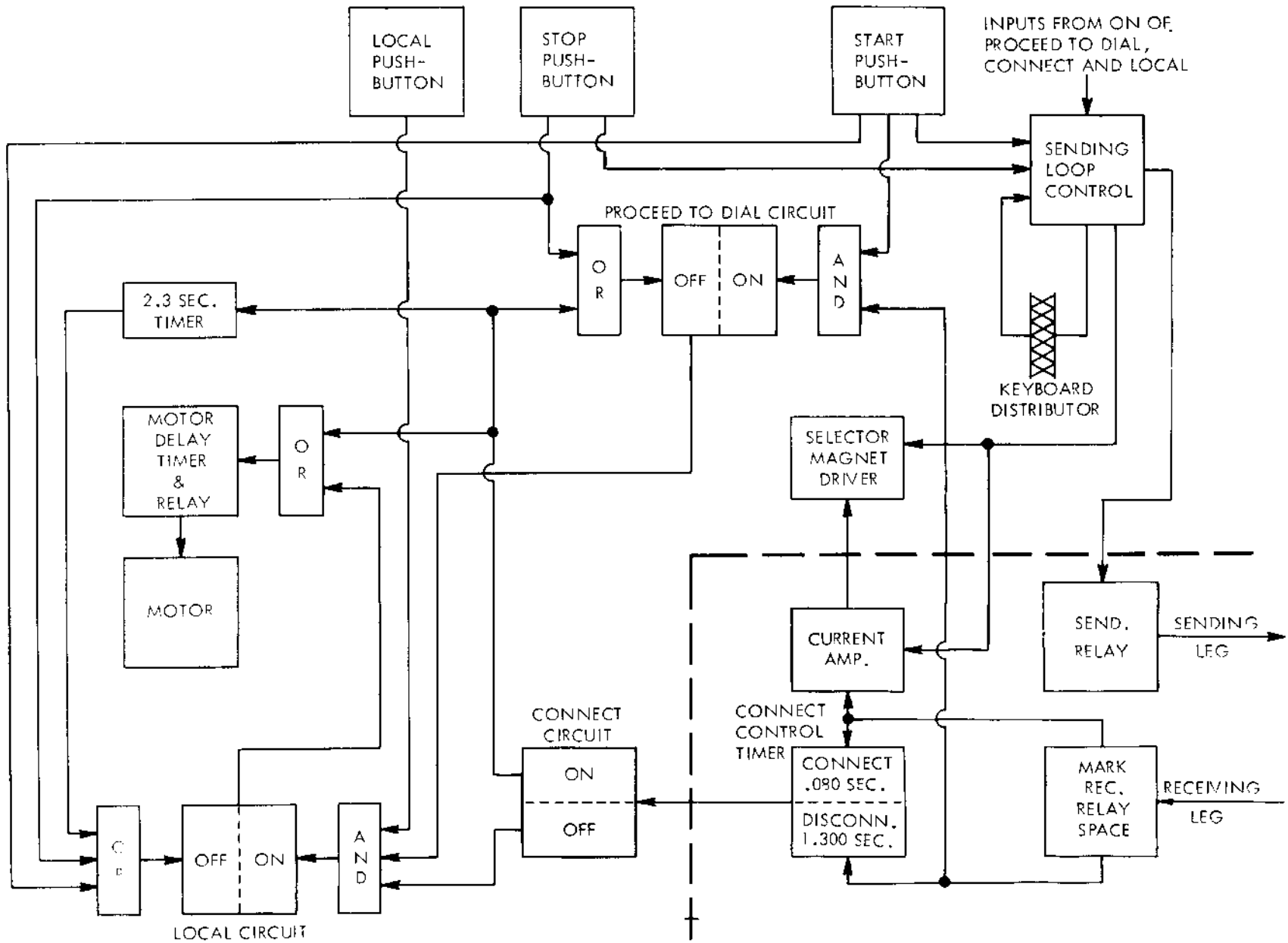
(3) The Polar Adapter consists electrically of four basic parts. These parts are:

(a) The Receiving Polar Relay - This relay converts the received signals into those usable by the circuitry of the Adapter and the Control Unit.

(b) The Sending Polar Relay - This relay converts the make-break signals generated by the keyboard distributor into transmitted line signals.

(c) The Connect Control Timer - This circuit is made up of four basic parts and differentiates between control and information signals.

Figure 7-43. Block Diagram Polar Adapter Circuit (TELEX)



(d) The Current Amplifier - This circuit amplifies the signals of the Receiving Polar Relay to control the Selector Magnet Driver.

(4) The Adapter operates on a three wire basis. Two of these wires are the sending and receiving legs. The third wire is an earth return for these two legs. The Adapter will, therefore, not operate unless earthground is supplied. The chassis of the Adapter is grounded to the power supply. When installed in the Control Unit, electrical connection is made through the chassis contact to the third wire in the power plug. This third wire in the power cord must be connected to a suitable earth ground.

(5) The Sending and Receiving Polar Relays are of the non-bridging mercury wetted contact type. They are housed in metal cylinders with an 11 pin tube socket at their base. Because of the mercury in the relay capsule, they must be operated within 30° of vertical, to prevent shorting of the contacts.

The coils of the relay are as follows:

- Pins 2 and 11 - Drive coil
- Pins 3 and 10 - Drive coil
- Pins 5 and 9 - Bias coil
- Pins 6 and 8 - Bias coil
- Pins 1 and 7 - Contacts
- Pin 4 - Tongue

In the Adapter, contact 7 has been chosen as the SPACING contact and contact 1 as the MARKING contact. To close contact 1 and the tongue, current must flow from either pins 2 to 11, 3 to 10, 9 to 5, or 8 to 6.

(6) All relay contacts are protected by arc suppressors. These arc suppressors slow the rate of change of voltage across the mercury wetted contacts of the relays. On the Receiving Polar Relay, the arc suppressors are made up of R32, R33, C5 and C6. On the Sending Polar Relay, they are made up of R43, R44, C7 and C8.

(7) All voltage sources are isolated by at least 120 ohms. In the event of a momentary short, current through the relay contacts or the connectors is limited to one ampere or less. If a short is of long duration, the resistor will act like a fuse and open the shorted circuit. These resistors are R34, R36, R38, R41 and R42.

(8) When polar signals are being transmitted by the Sending Polar Relay, a noise suppressor is used in the sending leg. This suppressor consists of a "pi" filter and is made up of C11A, C11B and R45. The filter rejects all high frequency components of the transmitted signal. It is not used when neutral signals are transmitted.

(9) The Receiving Polar Relay

This relay and its associated components convert incoming signals into those usable by the circuitry of the Adapter and the Control Units.

Several types of input signals to this relay are possible. These modes of operation may be selected by appropriate strapping of the binding posts on the 181607 printed card assembly. The various modes of operation are:

(a) Polar signals, battery supplied remotely. This is the normal mode of operation and all Adapters are supplied with strapping for this type of operation. Refer to Wiring Diagram 5923WD.

(b) Neutral signals, battery supplied by the Adapter. In this condition, posts 3 and 4, 5 and 7, and 12 and 13 are strapped together.

(c) Neutral signals, battery supplied remotely (battery negative). In this condition, posts 5 and 12, 6 and 13, and 3 and 4 are strapped together.

(d) Neutral signals, battery supplied remotely (battery positive). In this condition, posts 3 and 4, 12 and 13, and 5 and 6 are strapped together.

With the wiring as described above, a SPACING signal will cause the tongue (4) of the relay to rest on the SPACE contact (7). With a MARKING signal, the tongue will rest on the MARK contact (1). The tongue (4) of the relay is supplied with +120 volts through R34. It supplies this voltage to the selected contact, while the other contact has no potential applied. Both contacts have two outputs. One of these is a voltage or direct output, while the other is a current output. The current output is through a diode and a resistor and will supply approximately .010A to ground. The diode prevents reversed currents from flowing, when the contact is not supplied with +120 volts from the tongue. The output diodes and resistors are CR11, CR12, R30 and R31.

The bias for this relay, when used in neutral operation, is .030 A. and is supplied through R37 and strapped terminals 3 and 4. Operating current for neutral operation, when supplied locally, is supplied from -120 volts and is limited to .060 A. by R46 and the signal line resistance.

(10) Sending Polar Relay

This relay converts the neutral make-break signal generated by the keyboard distributor and the dial into those required on the send-

ing leg. There are a variety of possible signal types that can be transmitted. These are:

(a) Polar signals, battery supplied by the Adapter. This is the normal mode of operation and all Adapters are supplied with strapping for this type of operation. Refer to Wiring Diagram 5923WD.

(b) Neutral signals, battery supplied by the Adapter. In this condition, posts 10 and 11 are strapped together and the straps between 8 and 9, 14 and 15, and 16 and 17 are cut.

(c) Neutral signals, battery supplied remotely. In this condition posts 6 and 10 are strapped together and straps between 8 and 9, 10 and 11, 14 and 15, and 16 and 17 are cut.

Since both the drive and bias windings are wired in series, both windings are supplied with the same amount of current. The input current of .021A to the drive windings is supplied through R40 from +120 volts. The .021A to the bias is supplied through R39 from +120 volts.

(11) Connect Control Timer

This circuit consists of four basic parts on the 181606 assembly. These are: a strobe pulse generator, two timing transmission gates, and binary.

The strobe pulse generator generates a 120 cps square wave. This square wave and the outputs from the Receiving Polar Relay are used as inputs to the two timing transmission gates. The outputs of these two gates are used to control the binary. The output of the binary, in turn, is used to control the "Connect" circuit in the Control Unit.

The strobe pulse generator is made up of Q1 and Q2 and associated components. It is controlled and caused to oscillate by AC from the power transformer of the Control Unit. This 12.5 VAC (18 volt peak) sine wave is rectified by CR1 and CR2 to form a negative 120 cps wave. The base of Q1 is biased by R2 and R3, such that -3.9 volts is necessary at the junction of CR1 and CR2 to turn on Q1. When base current does flow to Q1, it will turn on and its collector will become nearly ground. R4 and R5 form a voltage divider, which back biases the base of Q2, holding it off. The voltage at the collector of Q2 will be set by a voltage divider made up of R8 and R9. This voltage is -9.1 volts. Feedback, through R6 from the collector of Q2 to the base of Q1, will help provide "snap-action".

When the 120 cps wave becomes more positive than -3.9 volts, base current to Q1 will

cease to flow. The collector of Q1 will become -5.7 volts. Base current to Q2 will flow through R5, causing it to turn on, and its collector will become very nearly ground. This circuit will continue to oscillate as described as long as power is applied to the Control Unit transformer.

Two one-percent tolerance resistors (R8 and R9) in the collector of Q2 set the voltage at that point at -9.1 volts. This voltage level is important in controlling the binary and setting the proper time delay intervals in the timing gates. The square wave generated at the collector of Q2 will be ground for approximately .0013 seconds and -9.1 volts for approximately .007 seconds.

When a SPACING signal is present on the receiving leg, +120 volts is applied to contact 7 and no voltage is applied to contact 1 of the Receiving Polar Relay. No voltage will appear across R28 and the voltage at the junction of R28 and R26 is set by current flow through CR10 and R26. This voltage will be approximately -60 volts. CR8 will conduct and the voltage across C3 and at the anode of CR5 will be held at -60 volts. If Q4 is in conduction, its base will be nearly ground and CR5 will be back biased by 60 volts.

The 9.1 volt strobe pulse introduced at C1 will cause the voltage at the anode of CR5 to rise to -50.9 volts. The negative pulse, that follows in .0013 seconds, will lower it to -60 volts. The net result of these strobe pulses upon the voltage on C3 is, therefore, zero and CR5 is not forward biased at this time.

When a MARKING signal appears on the receiving leg, +120 volts is applied to one side of R28 through the MARKING contact of the Receiving Polar Relay. The voltage divider consisting of R26 and R28 sets the voltage at their junction at +22 volts and back biases CR8. This isolates C3 from R26 and R28. C3 will now begin to discharge through R20 from -60 volts toward ground. The voltage at the anode of CR5 will follow, thus reducing the back bias on CR5. After approximately .080 seconds the voltage on C3, and therefore at the anode of CR5, will have risen to -9.1 volts. The next strobe pulse to appear at C1 will cause CR5 to become slightly forward biased and part of the pulse will appear at the base of Q4.

The gate just described is the connect timing gate and produces a signal delay of approximately .080 seconds. The disconnect timing gate operates in a similar manner. The input to R27 is from the SPACING contact. When MARK appears on the receiving leg, R25 and CR9 hold the voltage on C4 at -60 volts. When a SPACING signal appears, CR7 will be back biased and C4

will discharge through R19 from -60 volts toward ground. In approximately 1.300 seconds, the voltage across C4, and therefore at the anode of CR4, will become more positive than -9.1 volts. The next strobe pulse introduced across C2 will cause CR4 to be forward biased and part of the strobe pulse will appear at the base of Q3.

C3 will recharge to -60 volts from -9.1 volts in .004 seconds. C4 will recharge in .010 seconds. Both of these recharge times are less than one code element length and can be considered instantaneous.

The outputs of the transmission gates control the binary, which is made up of Q3 and Q4 and associated components. The operation of this binary is similar to that of the binaries in the Control Unit. The control of the binary by the transmission gates is the same as that of the 2.3 second timer controlling the "Local" circuit in the Control Unit. A positive pulse at the base of Q4, through CR5, will turn off Q4 and turn on Q3. The collector of Q3 will then be near ground. Current will flow through R35 and through ZD1 to the collector of Q3. The cathode of ZD1 will be 9.1 volts positive with respect to its anode, so that the voltage at the cathode will be +9.1 volts. This point is the output to the "Connect" circuit of the Control Unit.

A positive pulse at the base of Q3 through CR4 will turn off Q3 and turn on Q4. The collector of Q3 will go negative. Current flow through CR6 and R23 will hold this voltage to -18 volts. Current flow through R35 and ZD1 will hold the voltage at the cathode of ZD1 9.1 volts positive of -18 volts. The output will then be -8.9 volts. A negative output (Q3 off) will hold the "Connect" circuit of the Control Unit off and a positive output (Q3 on) will hold the "Connect" circuit on.

(12) Current Amplifier

This circuit is made up of Q5 and associated components on the 181606 assembly. Base current to this amplifier is supplied through CR12 and R31 from the MARKING contact of the Receiving Polar Relay.

If ground is applied to the emitter of Q5 through CR3 or by strapping binding posts 1 and 2, the base is back biased by the voltage divider made up of R13 and R14. If base current is now supplied, the transistor will turn on. With the collector load as shown in 5923WD and Figure 7-45, .060A of collector current will flow.

If the ground to the emitter of Q5 through CR3 is switched to +120 volts, CR3 will become back biased. The emitter is biased to near +18 volts through R12. Since both the emitter and

collector are biased to +18 volts, no current will flow between them. Base current supplied to the transistor will flow into both the collector and emitter. The current in the collector will flow from the base, through the collector, the Selector Magnet Driver and R23 to +18 volts. This current flow is in the reverse direction of the normal control current for the Selector Magnet Driver and it will be held SPACING.

The amplifier will supply MARKING current only when ground is applied to the emitter and base current is supplied. If either of these conditions is not fulfilled, the Selector Magnet Driver will not be supplied input current and its output will be SPACING.

Strapping post 1 and 2 will permanently apply ground to the emitter and allow duplex operation of the printer.

(13) Circuit Interconnections

Figure 7-43 is a block diagram showing the Polar Adapter connected to the Control Unit. The Control Unit portion of the diagram is the same as that shown in Figure 7-39, with one exception. The Line Sensing and Control block of the Control Unit is rewired through the connectors (J4, J5 and J6) and is now called the Sending Loop Control. All of the components are identical in these two blocks, but rewiring allows the block to control the sending leg rather than the signal loop. This block also has outputs to the Current Amplifier and the Selector Magnet Driver. The input to the Current Amplifier allows the printer to read its own copy. The input directly to the Selector Magnet Driver is for printer blinding.

The Receiving Polar Relay MARKING contact supplies inputs to both the Connect Control Timer and the Current Amplifier. The input to the Current Amplifier allows the printer to read incoming copy. The input to the Connect Control Timer allows the Adapter to recognize a connect signal. The SPACING contact supplies inputs to both the Connect Control Timer and the "Proceed to Dial" circuit of the Control Unit. The input to the Connect Control Timer allows the Adapter to recognize a disconnect signal. The input to the "Proceed to Dial" circuit supplies current for SPACING signals and no current for MARK. This allows this circuit to operate in the normal manner.

(14) IDLE Line Condition

In this condition both the sending and receiving legs are SPACING. All the circuits in the Control Unit are off. The SPACING contact of the Receiving Polar Relay is +120 volts, allowing C4 to be discharged. CR4 will then

allow strobe pulses to pass to the base of Q3, holding it off. The output of the Connect Control Timer is then negative, holding the "Connect" circuit in the Control Unit off.

Figure 7-44 is a schematic wiring diagram of the Sending Loop Control, along with the Current Amplifier and the Sending Polar Relay. Blinding current to the Selector Magnet Driver flows from +18 volts through R23, J5-2, the Selector Magnet Driver, J4-1, the hl contact, the wl contact, J4-7, and the keyboard to ground. No current flows in the drive coils of the Sending Polar Relay, since neither the Start contact, the a contact nor the hl contact are operated to supply ground.

The MARKING contact of the Receiving Polar Relay has no voltage applied. No base current will then flow from this contact to Q5. The emitter of Q5 is biased to +18 volts through R12. The cathode of CR3 is at +120 volts, supplied through R39 and the sending relay coils, and CR3 is back biased.

(15) Initiating a Call

A call may be initiated when the Control Unit is in either the IDLE line or LOCAL conditions as described earlier. Depressing the START button will allow current to flow through the drive coils of the Sending Polar Relay. This relay will then transmit a MARKING signal on the sending leg. The current path through the coils is shown dotted in Figure 7-44.

Operating the START button will also remove ground from the collector of Q1 in the Control Unit. Current to the input of the "Proceed-to-Dial" circuit (base of Q1) is supplied from the SPACING contact of the Receiving Polar Relay. (Not shown in Figure 7-44). The "Proceed-to-Dial" circuit will not operate until this current is interrupted.

(16) Proceed-to-Dial

The exchange will recognize the MARKING signal transmitted as a request-to-dial. When the exchange has selected the proper equipment, it will transmit a .025 second MARKING signal on the receiving leg. The Receiving Polar Relay will respond to this signal, interrupting the current flow to the input of the "Proceed-to-Dial" circuit. This circuit will then turn on, energizing the A relay and the Proceed-to-Dial lamp. The a contact will operate, shunting out the Start button contact. The Start button may now be released.

When the Receiving Polar Relay responds to the .025 second pulse, C3 in the Connect Control Timer will start to discharge. After .025

seconds the receiving leg returns to SPACING, causing C3 to be recharged to -60 volts. In the .025 interval, the voltage across C3 will not rise to -9.1 volts and no strobe pulses will be passed by CR5. The Connect Control Timer, therefore, will not respond to a Proceed-to-Dial pulse.

(17) Dialing

The dial signaling contacts are in series with the drive coils of the Sending Polar Relay as shown in Figure 7-44. The dial contacts will thus energize and de-energize this relay, whenever current is flowing through them. The make-break signal generated by the dial contacts will be transmitted as MARK-SPACE signals by the Sending Polar Relay. These MARK-SPACE signals are used by the exchange to make the necessary connection.

(18) Call Connection

With the Control Unit in the Proceed-to-Dial condition, the sending leg is MARKING and the receiving leg is SPACING. When dialing is completed, the exchange will switch the receiving leg to MARKING. This signal causes the tongue of the Receiving Polar Relay to transfer and apply +120 volts to R28. CR8 will become back biased and C3 will begin to discharge toward ground. After .080 seconds, the voltage across C3 will be approximately -9.1 volts. The next strobe pulse to appear will pass through CR5 to the base of Q4. The output of the Connect Control Timer will then become positive and cause the "Connect" circuit to turn on. As described earlier, the "Proceed-to-Dial" circuit will turn off. As the "Connect" circuit turns on, the H relay will operate, the hl contacts will transfer, the CONN lamp will light and the motor will turn ON.

Current flow to the drive coils of the Sending Polar Relay is now through R40, the drive coils, the Dial contacts, CR2, the Stop contacts, hl, wl and the keyboard contacts to ground as shown in Figure 7-45. Base current to Q5 is now supplied from the marking contact of the Receiving Polar Relay through CR12 and R31. Input current to the Selector Magnet Driver will flow from +18 volts through R23, the Selector Magnet Driver, Q5, CR3, J4-3, CR2, the Stop contacts. hl, wl and the keyboard contacts to ground.

Both the current paths, for the drive coils of the Sending Polar Relay and the Selector Magnet Driver, are through the keyboard contacts. If the keyboard is operated, the signal will be transmitted on the sending leg and cause the selector magnet of the printer to operate.

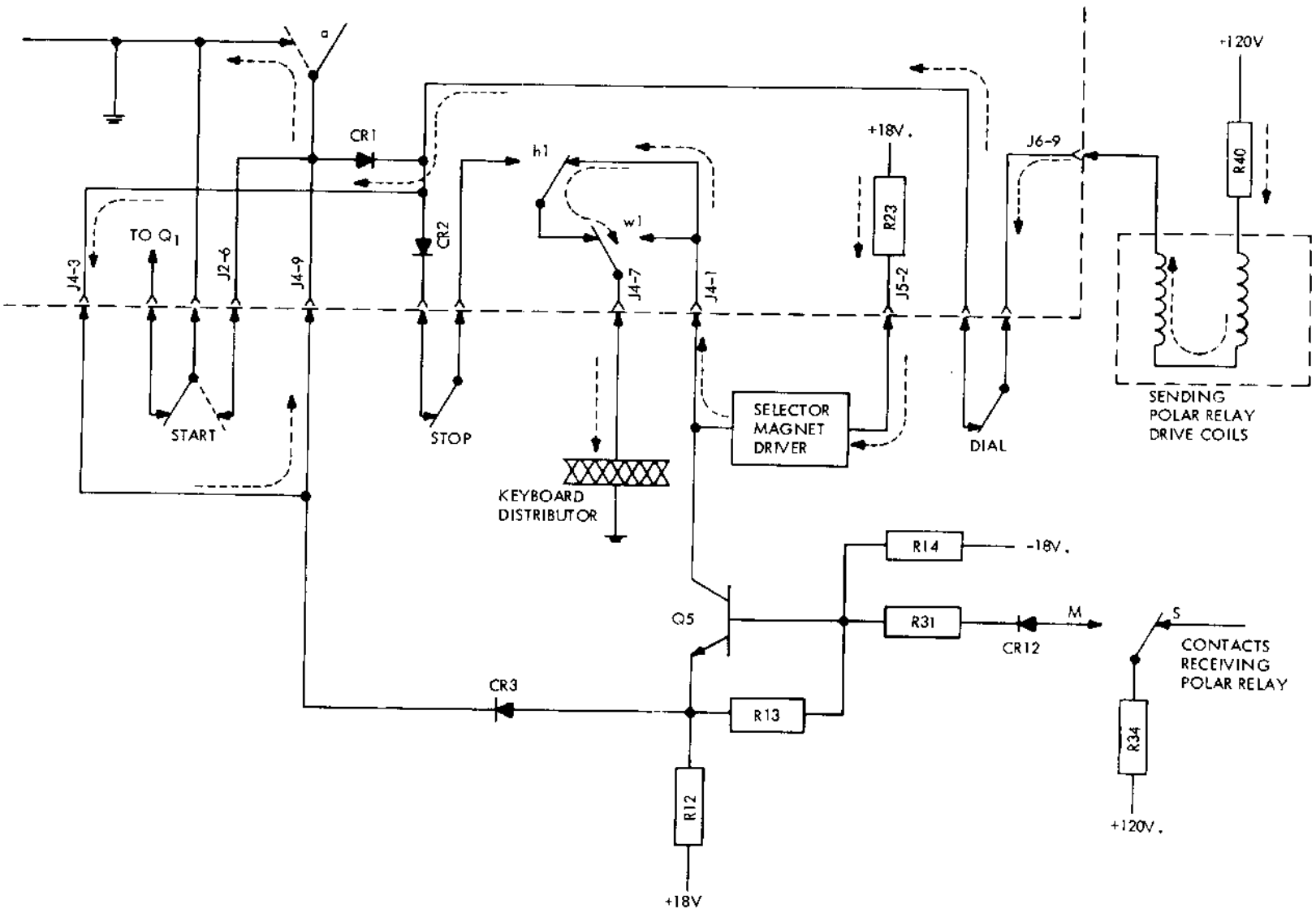


Figure 7-44. Sending Loop Control Circuit with Sending Polar Relay (TELEX)

When information is received from the distant station, the Receiving Polar Relay will operate, making and breaking base current to Q5. This will cause Q5 to make and break current flow to the Selector Magnet Driver without affecting the sending circuit.

The longest possible normal spacing signal generated by the distant printer will be less than 1.300 seconds. This is the length of spacing signal required to cause the Connect Control Timer to disconnect. Therefore, under normal signaling, the Connect Control Timer will not be affected by information signals.

(19) Remote Connection

The Control Unit may be connected remotely from either the IDLE Line or LOCAL condition. An incoming call is indicated by the exchange by its transmission of a MARKING signal on the receiving leg. The Connect Control Timer, after .080 seconds, will turn on the "Connect" circuit in the Control Unit. When the hl contacts transfer, a current path to ground is set up through the drive coils of the Sending Polar Relay. It will then transmit a MARKING signal on the sending leg, to signify that the unit has connected. The remainder of the operations are the same as those described in paragraph g.(18).

If the paper in the machine has become low and the low paper contacts operate, the voltage across C3 will be held at -60 volts through R29. This will stop any connections from occurring. If the Control Unit is already in the Connect condition, when the low paper contacts close, the call may be completed, but subsequent connections will be blocked.

If a call is originated locally with a low paper condition, the normal sequence of events will occur, until the connection is attempted. When the exchange does not receive a MARKING signal on the sending leg, it will return the receiving leg to SPACING (Idle Line condition).

(20) Call Disconnect

If the Stop button is depressed, while the unit is in the Connect condition, the Stop contacts in series with the drive coils of the Sending Polar Relay will open. The relay output will then be SPACING. The exchange will recognize this long SPACING signal as a request to disconnect and will send a SPACING signal on the receiving leg. The Receiving Polar Relay contacts will transfer and allow C4 to discharge toward ground. After 1.300 seconds, the voltage across C4 will be -9.1 volts and the next strobe

pulse will pass through CR4 to the base of Q3. The output of the timer will become negative, turning off the "Connect" circuit in the Control Unit. When the hl contacts transfer, current to the drive coils of the Sending Polar Relay will be held off, so that the Stop button may be released. The hl contacts will now also supply blinding current to the Selector Magnet Driver. The Control Unit is now in the IDLE Line condition.

(21) Remote Disconnect

When the remote unit generates the spacing signal to disconnect, the Receiving Polar Relay will allow C4 to discharge and after 1.300 seconds the timer will turn off the "Connect" circuit. The hl contacts will transfer, stopping current flow to the drive coils of the Sending Polar Relay and blinding the Selector Magnet Driver. The Control Unit is now in the IDLE Line condition.

(22) Local Off Line Operation

This operation is identical to that of the Control Unit without Adapter, except for the current path to the Selector Magnet Driver. This path is shown in Figure 7-44.

7-16. CALL CONTROL ASSEMBLY - WADS (5918WD)

a. GENERAL

(1) The call control assembly covered in this paragraph couples the Model 33 Printer through a Data Set to telephone networks for use in Bell System Wide Area Data Service (WADS) and Four Row Dial TWX service. In conjunction with the Data Set, it provides facilities for initiating, accepting, controlling, and completing calls. This paragraph is based on wiring diagram 5918WD. Other associated wiring diagrams are 4404WD, 4405WD, 4406WD, 4412WD, 4413WD, 4470WD, 4973WD, and 4979WD.

(2) The call control assembly, when used with the 101C or 105A Data Set, is connected with conventional telephone central offices having the required routing and message accounting equipment. These are generally the same offices and equipment serving telephone customers in the area. Direct current signals are used for both originating and terminating traffic, providing the same conditions as for conventional local telephone set operation. The dial on the set, for initiation of call connections, may be either a d.c. pulsing or multi-frequency tone device. Also included in the set are ringing or tone sounding apparatus for alerting the called party.

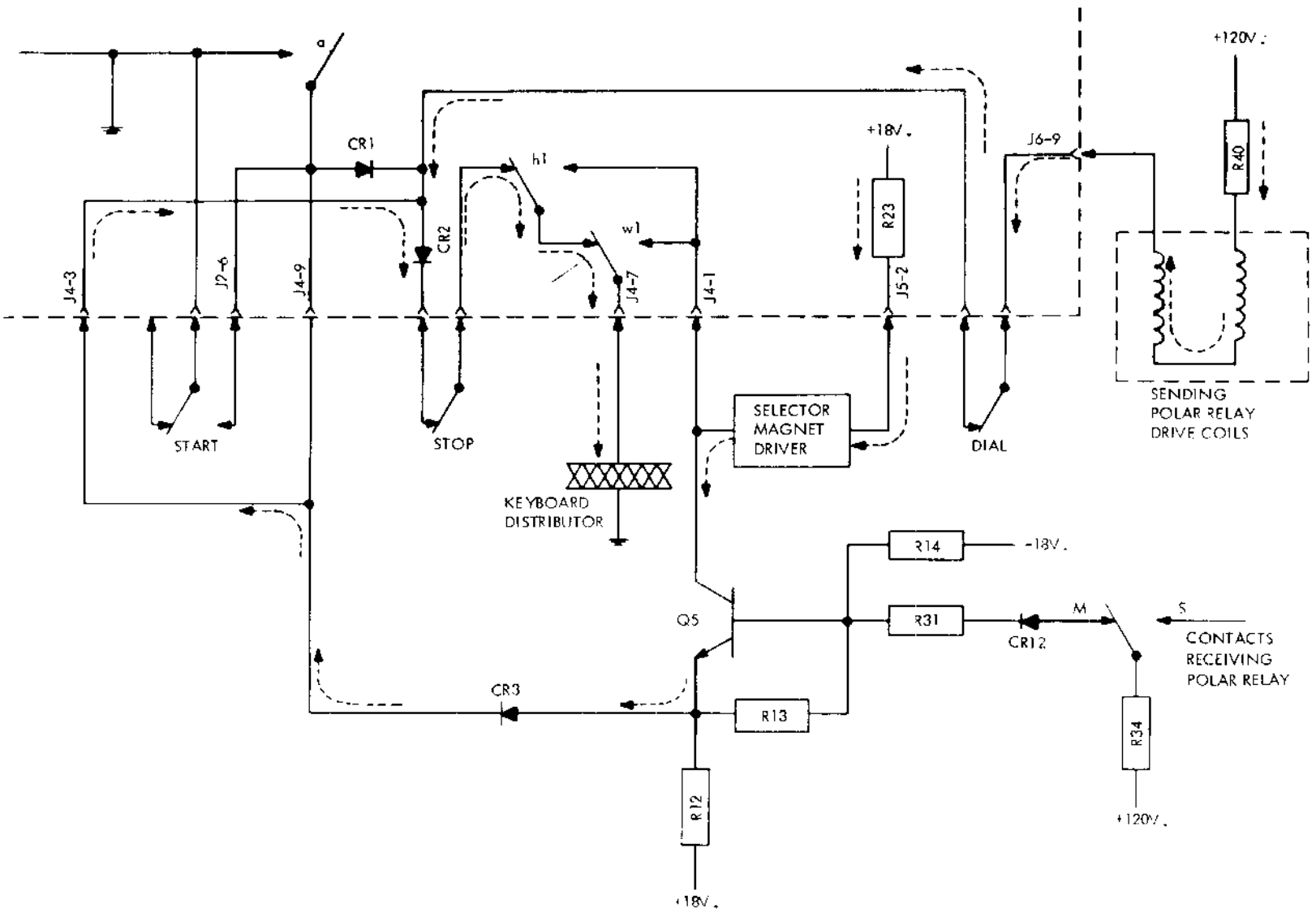


Figure 7-45. Receiving Loop Control Circuit with Receiving Polar Relay (TELEX)

b. GENERAL OPERATION

(1) The call control assembly provides for signaling speeds of 100 WPM from d.c. marking and spacing intelligence pulses originating from the distributor in the associated Printer. These pulses are directed to the input of the selector magnet driver in the call control assembly where they are amplified and returned to the printer as 0.500 ampere d.c. pulses to operate the selector magnet.

(2) If the originate (ORIG) key on the call control assembly has been depressed and connection with a "called" station satisfactorily completed, the intelligence pulses originated by the distributor are also connected with the Data Set. The Data Set converts the d.c. pulses to tone signals for transmission over telephone lines. Another Data Set, located at the "called" station, converts the tone signals back to d.c. pulses, which are directed to the input of the selector magnet driver there, to operate the selector on the Printer of the "called" station. The Printer at a given station normally copies both the transmitted and received d.c. signals, operating on a half duplex basis.

c. ORIGINATING A CALL - To originate a call, the ORIG nonlocking key is momentarily operated. This connects the station to the line and lights the ORIG lamp. The lamp remains lit until the originate mode is terminated. If the line is busy, or a wrong number or no connection signal is received, depressing the CLR pushbutton will disconnect the set from the line so the call can be re-made.

d. SPEAKER AMPLIFIER SYSTEM.

(1) The loudspeaker amplifier is powered only after the ORIG key is operated, and is quieted when the station connects. It has two inputs, one from the line via the buffer amplifier in the Data Set limiter and the other from the touch-tone dial (TTD). Three outputs are provided: (1) into the loudspeaker or optional hand held receiver, (2) into the line through the sending amplifier in the Data Set, and (3) an auxiliary output into the Data Set. The line to loud-speaker connection permits monitoring of supervisory signals when originating a call. The touch-tone dial-to-line and touch-tone dial-to-loudspeaker connection provides for amplification of the outgoing multifrequency dialing signals and for monitoring them during outpulsing. The line-to-second output connection is provided for the dial tone detector (when furnished). The various connections mentioned are established by switching in the data set, and by the common switch in the touch tone dial.

(2) The speaker amplifier is a conventional direct coupled 2-transistor audio amplifier. The input signals from the line are fed through the receiving buffer amplifier in the Data Set into the primary winding of the input transformer. The primary winding continuously carries approximately 4 ma quiescent current from the receiving buffer amplifier. The other input, from the TTD, is fed directly into Q1 through C5A. Both inputs are d.c. isolated from the amplifier stages.

(3) Two outputs are taken from transistor Q2A, one from the collector circuit and the other from the emitter.

(a) The collector output is fed through a step down output transformer (T2) into the loud-speaker (or receiver). Potentiometer RS is used to set proper volume for varying loop loss and ambient noise level. The TTD signals are independent of loop loss.

(b) The emitter output splits into two signal lines: one for injecting the multifrequency (MF) dial tones into the Data Set sending amplifier, and the other for feeding the dial tone detection circuit (when provided). The signal level from the emitter output is essentially independent from the setting of potentiometer RS.

(4) By-passed R6A is a supply voltage dropping resistor. Diode CR1A is provided to block a sneak path (in the answer mode) from ground through the ANS and ORIG lamps. Without the CR1A, the ORIG lamp would be dimly lit and the amplifier would not be silent, when the station is in the answer mode. The amplifier operates only in the originate mode until the station connects. In any mode other than originate, the ground is disconnected. When the station connects, the amplifier input is short circuited in the Data Set.

e. DIAL MECHANISMS

(1) Rotary Pulsing Dial - For pulse dialing application, a pulsing contact of the rotary dial is inserted in the telephone line. The manual rotary dial is equipped with a normally closed pulsing contact and a normally opened off-normal contact. The pulsing contact is inserted into the telephone line when the station originates a call. When answering, a short circuit is applied across the pulsing contact. The off-normal contact is placed across the output of the amplifier, and silences the loudspeaker whenever the dialing disk is moved.

(2) Pulsing Card Dial

(a) To use the card dialer, the ORIG key is operated. After dial tone has been received, a card with the telephone number punched in it

is inserted in the slot and entirely pushed in. This operation winds a spring motor, which later pushes the card out of the slot as the dialing proceeds.

(b) The dialer is started by momentarily depressing the START bar. This operates the dial START contact, and establishes a path from the ring side of the telephone line through point 5 on the dialer, the released pulsing relay contacts K (P), released HOME and dial START contacts, operated dial START contacts, and point 2 on the dialer to the tip side of the telephone line. The current from the central office battery operates the pulsing relay K (P), which transfers the ring to tip path to the Matrix. This path is closed or opened according to the code punched in the card. The dial pulse is transmitted as the sensing springs sense the holes in the card.

(c) Sending of the dial pulse means interruption of the current in the telephone line. This releases the K (P) relay. Movement of the K (P) relay armature rotates the scanning drum by 1/16 revolution so that the next digit pulse can be sensed and transmitted as the K (P) relay reoperates. After two pulses have been transmitted, the HOME contacts operate and remain operated until the end of the scanning drum revolution. This establishes a direct operating path for the K (P) relay so that, when the station is returned on-hook in the middle of the digit, the digit pulsing can be completed and the drum will be returned to its normal (HOME) position.

(d) In this manner, the drum completes the revolution in 16 steps. 10 of the steps are required to send the digit, and 6 to provide the interdigital time. At the completion of revolutions, an escapement is tripped which permits the next row of holes on the card to be placed in position for sensing.

(e) This sequence is repeated at each row as the card advances out of the dial. If no STOP code is punched in the card, the dialer will keep advancing the card (even if no number code is punched) until the card is released. If the STOP code is sensed, the dial STOP contacts operate. With the HOME contacts released, a transmission path is established from the telephone line to the Data Set input as follows: RING - point 5, dial STOP contacts operated, HOME contacts released, point 1, hybrid coil in the Data Set, TIP. The Data Set can then complete the connection.

(f) When the station is connected, the card can be released by operating the RELEASE bar. No attempt should be made to release the card by reoperating the START bar, as this

will trigger the dialing mechanism and the following short circuit will be placed across the output of the Data Set: point 1, HOME and dial START contacts released, dial START contacts operated, point 2. And, after the two first pulses on each revolution: point 1, HOME contacts operated, point 6. This shunt will prevent the station from receiving or sending until the card is disengaged. If this condition persists, the Data Set will disconnect.

(3) Touch-Tone Dial

(a) For multifrequency dialing (MF) application, the dialing frequencies generated by the touch-tone dial are fed through the loud-speaker amplifier and into the telephone line via the sending amplifier in the Data Set. The touch-tone dial can be equipped with the card dialer. To use it, the ORIG key is operated, creating the off-hook condition. When dial tone is received, the card is inserted and the START bar operated. The spring motor wound by insertion of the card pushes the card of the dialer past sensing contacts. The contacts determine dialing frequencies generated by the associated touch-tone dial. If the STOP code is punched in the card following the address, the dialing stops when the STOP code is read. The card should then be released by reoperating the START bar. Dialing proceeds much faster than with the pulsing card dialer. As the station connects, the output of the touch-tone dial is disconnected from the data set so that there is no hazard connected with improper operation of touch-tone dial or card dialer at that time.

(b) The touch-tone multifrequency (MF) signal generator is a one transistor oscillator generating two frequencies any time a single push-button is operated. Seven frequencies are provided with each dial digit corresponding to two frequencies according to the table below:

Touch-Tone Frequencies		1209	1336	1477	
CPS	→				
697		1	2	3] DIAL DIGITS
770		4	5	6	
851		7	8	9	
941			10		

(c) When the station is idle, a current of about 25 ma flows from ground through RT resistance of point 1 of the touch-tone dial; then through varistors RV3 and RV4, resistor R1, and out of point 6 to -20V in the Data Set. The transistor Q1 is energized, so that there will be no click when the circuit starts to generate the MF signal. The oscillations are

suppressed by DC current through the tank coils T1 and T2 maintained by the potential difference across RV4. By interrupting this initial coil current the oscillation's build up time is minimized.

(d) To dial a digit, a pushbutton on the dialing plate is operated. This closes two frequency determining contacts, one for the T1-C1 tank circuit, and the other for the T2-C2 tank circuit. The Common Switch (CS) operates in following sequence:

1. y-z contacts open, making the loudspeaker amplifier input available to MF signal only.

2. s-t contacts close, and establish a path from the loudspeaker amplifier, through the sending amplifier in the Data Set, and into the line. The feedback through the receiving buffer amplifier in the Data Set back into the loudspeaker amplifier is disabled by previously opened y-z contacts.

3. w_2 -v contacts open, disabling the receiving buffer amplifier in the Data Set. This eliminates a possibility of false connect due to MF signals.

4. q-p contacts open, together with w_2 -v contacts, resetting the dial tone detecting circuit when furnished.

5. w_1 -u contacts open, interrupting the dc current through the tank coils. Since the tanks T1-C1 and T2-C2 are coupled to the coils in Q1 circuit, the unit starts oscillating with a very short build-up time.

The same functions could be assured with w_2 -v contacts operating first and y-z contacts eliminated. However, the interruption of current in the primary coil of the input transformer in the loudspeaker amplifier would cause a loud click to be heard every time a digit is dialed.

(e) The frequencies above 1000 cycles per second are generated at a somewhat higher level to compensate for greater line loss at those frequencies. Also, there is a variation of amplitude for various digits. The PT resistor is set at the time of assembly of the Attendant Circuit with the Data Set for an output of 0 dbm on the line for the digit with highest output level.

(4) Touch-Tone and Card Dialer

(a) To use the automatic card dialer, the ORIG key is operated. After the dial tone has been received, a punched card is inserted into

the slot and pushed down. The START bar is then momentarily operated. The card dialer proceeds with dialing under power of a spring motor wound by insertion of the card when a STOP code is read, the dialing stops. The card should then be released by reoperating the START bar.

(b) As seen in the wiring diagram, the sensing contacts in the card dialer are in parallel with the frequency determining contacts in the associated touch-tone dial. As the card advances out of the slot, the sensing contacts sense the holes punched in the card determine the proper frequencies to be transmitted. This occurs for every row on the card.

The normally opened E contacts in the card dialer are placed across the excitation w_1 -u contacts in the TTD. When dialing manually, the E contacts are opened and there is no interference from the card dialer. With the card down in the slot, the operation of the START bar closes the E contacts and operates the common switch, through mechanical linkage, for the duration of dialing. The common switch connects the input and output circuits of the loudspeaker amplifier as described in paragraph (3)(d) above. Opening of the w_1 -u contacts transfers the excitation function to the E contacts in the card dialer. As the card advances out of the slot, the E contacts open for each row exciting the TTD into generating the MF dial signals.

(c) During dialing, there are short intervals of time when all the sensing contacts are opened and the E contacts are open. Therefore, the TTD will break into spurious oscillations somewhere between 7 KC-14 KC. Although this frequency band is suppressed by the telephone line, these frequencies would be noticeable on the loudspeaker. The action of capacitors CT and C4A in the loudspeaker amplifier combine to suppress this spurious signal from reaching the loudspeaker.

(d) Since the card advances out of the slot very rapidly, there is no need for a separate release bar. When station connects, relay contacts in the Data Set (CON 8 in 101C) disconnect the MF signal input and remove any hazard connected with false operation of the MF dials.

i. ANSWERING A CALL - MANUAL AND AUTOMATIC

(1) Manual Answering - To answer a Call manually, momentarily depress the ANS pushbutton. This connects the station to the line, and lights the ANS lamp. The lamp remains lit until the answer mode is terminated. Manual

answering is necessary only when the automatic answer-back circuit is disabled. The automatic answer-back circuit is disabled by the tabulating contacts, form feed contacts, low paper contacts, Data Set relay contacts (when in local mode), and the out of service switch.

(2) Automatic Answer-Back - The answer-back drum is allowed to rotate by pulsing the armature coil from either the Data Set, WRU contacts in the Printer Set stunt box, or the Here Is key. When the Data Set at an answering station makes a complete connection to the sending station, it puts ground on the answer-back coil circuit, and allows the coil to energize and trip the answer-back. Since ground is maintained on this circuit throughout a call, a non-repeat mechanism is added to the answer-back package which allows the answer-back mechanism to operate only once.

g. SIGNAL GENERATION - The Printer Set can send by operating the keyboard, answer-back mechanism, or break key. The keyboard signal generator contacts and answer-back contacts are in parallel with the signal generator (distributor), which is, in turn, connected to the Data Set. The break key connects to the Data Set via separate leads.

h. SELECTOR MAGNET DRIVER

(1) General - The Data Set supplies a 20 milliamperes DC signal to the selector magnet driver associated with the page printer. The selector magnet driver amplifies the signal to 500 milliamperes to operate the selector on the page printer. The selector magnet driver is a two stage transistorized amplifier capable of switching high output currents (0.500 ampere) at very closely controlled input current levels. The output of the driver is automatically regulated and is essentially independent of normal variations in power supply voltage and of selector magnet and current limiting resistance values.

(2) Circuit Description

(a) Open Line: When the line circuit is open (SPACING), transistor Q1 will be turned on by the regulated current flowing through R1 into its base. This current, which is controlled by R1, will be set near the desired switching level. With Q1 conducting, Q2 will be cut off, since the potential at the base of Q2 will be more positive than at the emitter. In this condition, only small leakage currents will flow in the collector circuit.

(b) Space-To-Mark Transition: As the SPACE-to-MARK transition begins, the negative bias current flowing in the base of Q1 is diverted to the line circuit. As the line current rises toward the MARKING current value, it extracts base current from Q1. When the line current approaches the total current supplied to the base of Q1 to within 0.001 ampere, which is about one half the nominal mark current value, Q1 begins to turn OFF. Q2 will then begin to receive forward bias current from R8 and begin to turn ON. The base current will then be amplified by Q2, and a current which is a multiple of the base current will appear in the emitter circuit. This increase in emitter current results in an increase in the negative potential measured across R3. The increase in the negative potential at the emitter of Q1 causes it to go further into cut-off. The feedback process continues until the current in the selector magnet reaches a value which is determined by the zener reference voltage, clamp diode CR4, and the emitter resistance of Q2 (the emitter resistance of Q2 is adjusted by R4 to compensate for component variations). As the line current completes the transition to the final marking current value, the base of Q1 becomes positively biased. The positive bias current will be approximately one-half the total marking line current. The positive potential to the base of Q1 is clamped to approximately 0.6 volts by the input protecting varistor, CR5.

(c) Mark-to-Space Transition - The line current, in changing from MARK-to-SPACE, will finally reach the point where R1 will begin to supply some forward current to the base of Q1. The line current level at which this occurs will be a little more negative than the point at which the circuit switched from space to mark, due to the common emitter resistor voltage feedback. As Q1 begins to turn ON, the current through R8 will be diverted from the base of Q2 causing it to begin to turn OFF. As Q2 turns OFF, the voltage across R4 will begin to go positive, causing Q1 to be further turned ON. This effect gives regeneration to the MARK-to-SPACE transition.

(d) Mark-to-Space Switching Transient - When Q2 is turned off during the MARK-to-SPACE transition, a negative voltage transient is developed at its collector. This transient is due to dissipation of the energy stored in the magnetic field of the driven magnet when energized by 0.500 ampere. If the high voltage developed at the collector of Q2 is not limited, it would continue to rise until the collector-to-emitter reach through breakdown voltage is exceeded. It has been found that repeated breakdown of this kind causes deterioration of the transistor, and finally a collector-to-emitter

short circuit. Therefore, it is necessary to provide a transient suppressing network at the collector of Q2. The transient suppression network presently in use is a compromise which affords a minimum peak voltage combined with a magnet release time to provide for adequate printer margins. The network consists of C1 in parallel with R9. CR3 isolates the network from voltages more positive than negative battery potential.

i. DISCONNECTING A CALL

(1) A call is normally terminated by the EOT code combination which provides fast disconnect without introducing hit characters. This is accomplished by the Data Set, in response to EOT contact closures in the stunt boxes of both the sending and receiving sets.

(2) A call connection can also be cleared manually by momentarily depressing the CLR pushbutton. This triggers the clearing sequence in the Data Set, and lights the CLR lamp. The CLR lamp will remain lit for the duration of the call. During the first 100 milliseconds of the clearing sequence, the BK lamp will also light.

j. LOCAL MODE - The local mode provides off-line operation of the set. The operator selects the local mode by depressing the LCL locking key. The LCL key lights the LCL lamp and operates the motor control relay (MCR) to energize the motor. The Data Set connects the sending circuit to the receiving circuit, and enables the keyboard and answer back to transmit to the page printer. If the set is in a terminal hunting group, the operator must turn the out-of-service switch to the RESTORE position until a dial tone is received after finishing operation in the local mode.

k. OUT-OF-SERVICE SWITCH

(1) The out-of-service switch prevents the automatic answering of incoming calls. In its NORMAL position, it has no effect or function. (Arrow upright); in the OUT-OF-SERVICE position (rotated counterclockwise and detented) it sets the following conditions:

(a) A contact is closed that applies power to the out-of-service light.

(b) A contact is closed that shorts the ringer coils. This makes the ringer inoperative. As an option the contact can be located to shunt both the ringer and series capacitor (i.e., the telephone line). This makes the station appear off hook or busy to the central office.

(c) A contact is opened that breaks the automatic answer circuit to the answer relay. This prevents the relay from operating in response to the ring up relay and thus the set will not answer.

(2) For stations that are not in terminal hunting groups, the operator may return the set to service by turning the out-of-service switch to its NORMAL position. For terminal hunting stations, however, the operator must turn the switch to the RESTORE position and hold it until a dial tone is heard. In this position:

(a) A contact is closed that shorts the tip to ring (off-hook condition). This condition is detected by the central office which then releases the set from lock-out and applies the dial tone.

(b) A contact is closed that completes a path from the speaker amplifier to ground. This permits the amplifier to pass the line signals (dial tone).

1. LOW PAPER ALARM

(1) A low paper alarm is provided in the Printer Set. When a low paper condition occurs, make contacts in the low paper switch provide ground to the low paper buzzer permitting it to operate. Depressing the BUZ RLS key (locking) in the call control unit silences the buzzer and provides an operate path to the BUZ RLS lamp. Attempting to release the key without replenishing the paper supply will result in the buzzer operating. When the paper has been replenished, the set is returned to normal by releasing the BUZ RLS key. When used with more complex circuits, the key can be made non-locking.

(2) Break contacts on the low paper switch disable the automatic answer-back circuit placing the set in a "don't answer" condition. The operator can override the "don't answer" condition by manually answering. If the low paper alarm occurs during a call the operator has the option of completing the call before changing the paper or interrupting the call. To interrupt the call, the operator stops transmission by depressing the Break key followed by depressing the BK RLS key to notify the distant station of the problem. The connection is cleared by simultaneously operating the CONTROL and EOT keys. Turning the out-of-service switch to the detent position insures that the set will not automatically answer a call while paper is being replenished.

(3) To restore the set to service, after paper has been inserted, depress the CLR button. This enables the low paper buzzer and the answerback mechanism to return the OUT-OF-SERVICE switch to its normal position. (For sets in terminal hunting groups, turn the switch to its RESTORE position and hold it there. When a dial tone is heard, release the switch.) The set is now in a normal idle operating position.

m. TEST MODE - If the TST key is operated while the set is connected to a test center, the message sent by the test center will be recorded on the page printer and turned around and sent back for analysis. This is accomplished by connecting the teletypewriter to the Data Set through a set of transfer contacts and a break contact to ground. This type of operation can be terminated by momentarily operating any of the non-locking keys which will then release the TST locking key.

7-17. TAPE READER

a. General - The Tape Reader assembly attaches to the left side of the printer keyboard. The clutch trip mechanism is assembled into the printer distributor. The power pack is attached inside the printer stand. The tape reader is designed to sense code combinations perforated in a tape.

(1) To initiate operation the lid latch handle is moved to the right releasing the lid, and allowing the lid to swing open. The tape is placed on the feed pins in its proper position and lid is closed.

(2) There are three basic positions for the start-stop handle: on, off and free wheeling. In the basic reader only an on-off contact is used in conjunction with the start-stop handle. When the reader is moved to the start position the contact is closed. In the basic unit, this contact is wired in series with the clutch trip coil which is located in the distributor area of the printer.

(3) The clutch trip coil when energized releases the reader trip lever. The lever when released performs two functions. First, the reader feed magnet contact, which is held open by an insulator on the back side of the trip lever, closes. In its continued travel, a projection on the lever rotates the clutch stop ball releasing the clutch and initiating a distributor cycle.

(4) The feed contact, having closed, causes the reader feed magnet in the reader package to be energized. The magnet, upon energization, attracts, the armature assembly.

(5) The armature in rotating about its pivot, raises the armature extensions. Fastened to the ends of the armature extensions is a sensing pin guide.

(6) The sensing pins are guided, spring biased, and raised into the sensing pin position by means of this guide. Where a hole exists in the tape (marking condition) the pin moves with the guide and the spring is not stretched. Where no hole exists in the tape (spacing condition) the pin is blocked and the spring is stretched.

(7) A contact block is arranged in such a way that insulators on the sensing pins hold the contacts open in the down position of the pins. These contacts are connected as a parallel output to the individual segments of the printer distributor.

(8) Also, as the armature extensions are raised, a feed pawl which is attached to the inner extension raises, causing it to engage a new tooth on the feed ratchet.

(9) The reader trip lever remains in its tripped position throughout the distributor cycle. Toward the end of the cycle, near the beginning of the stop pulse, a camming roller on the distributor shaft assembly engages a camming surface on the trip lever moving it into its reset position.

(10) If the trip magnet remains energized, as it would where continuous reader operation is desired, the lever will again fall to the tripped position in the sufficient time so the clutch will not stop.

(11) The lever while being reset, opens the reader feeding contact causing the feed magnet to be de-energized until the lever again falls into the tripped position.

(12) The magnet, upon de-energization, releases the armature, lowering the extensions and with drawing the pins from the tape. At the same time, the feed pawl advances the feed ratchet one step.

(13) The feeding and withdrawing of pins is accomplished simultaneously, therefore, the sensing pin guides in the top plate are slotted to permit the pins to travel with the tape for a distance.

(14) Associated with the ratchet are also a detent and a blocking pawl. The detent, with its circular surface engaging the ratchet teeth, serves to hold the ratchet and feed wheel in its correct position during sensing.

(15) The blocking pawl, which rides a pin on the feed pawl, is lowered into engagement with a ratchet tooth during the feed stroke. This is

to prevent excessive overthrow of the feed wheel during feeding, without the use of a heavy detent spring. It also prevents the pulling ahead of the tape, during sensing, by a tape winder, without the use of a heavy detent spring. During the up-stroke of the armature extensions, the blocking pawl is rotated out of engagement with the tooth by the pin on the feed pawl.

(16) The armature is provided with a spring loaded upstop which serves two purposes: One, a portion of the energy during the end of the stroke is stored in a spring and returned to the armature on the down-stroke to give a rapid release and acceleration; Two, a portion of the energy is dissipated through a resilient buffer to minimize noise and metallic clatter.

(17) The reader is provided with a free wheeling feature. The start-stop lever is pushed beyond its normal detented position. An extension on the handle near the mounting plate of the reader engages and detents itself on a countour on the lower end of the blocking pawl. This causes the blocking pawl to rotate and detent itself in the free wheeling position. A hook, on the bottom side of the blocking pawl, engages the pin on the feed pawl which normally drives the blocking pawl, rotating the feed pawl away from the feed wheel. This same post, moved into this extreme position engages a surface on the detent, pulling and holding it into a position where it clears a feed wheel.

(18) A tight tape feature is also provided. A plastic bail, which snaps onto the tape lid, has on it an extension which projects through the top plate. This extension engages a surface on the tight tape lever. The tight tape lever, which is pivoted on the feed wheel shaft, has an extension which extends below the start-stop contacts in the contact block. When the tape is taut, the tight ball rotates, causing the tight tape lever to also rotate, opening the start-stop contacts and stopping the reader.

(19) A dragging type tape-out pin is also provided. This pin has an insulating extension on it which moves the start-stop contacts open, in a similar fashion, when tape is absent from above the pin.

(20) The tape lid, when closed, is located front to rear and right to left entirely by a pair of locating pins, integrally molded, which project into a pair of locating holes in the top bracket which are closely related dimensionally to both sensing pin guides and feed wheel guide. The hinge, under these conditions, is not functional as no contact is made between the hinge and the top plate in this position.

(21) The lid is held down by a spring biased

latch at one end and by the return spring at the other end. This insures positive contact between the lid and the top plate at both ends under all conditions and insures a more reliable tape lid top plate clearance for the tape, without adjustment of a hinge.

(22) When the latch is moved to release the lid, the return spring exerts a torque about one end of the lid surface contacting the top plate, causing the lid to rotate about that edge until the floating hinge pivot (which is semi-cylindrical portion at the end of the lid) moves down far enough to engage a pair of shear-formed tabs, which form a pivoting edge leaves the top plate and the cylinder forms the hinge for the remainder of its travel to the open position. When open, this floating hinge requires only sufficient accuracy to insure that the locating pin closest to it will engage, or at least partially engage, the locating hole closest to it and be guided into the hole when the lid is closed. There are, therefore, no hinge adjustments required.

7-18. TAPE PERFORATOR

a. GENERAL - The Tape Perforator assembly attaches to the left side of the printers base casting. The individual mechanisms and sub-assemblies that form the perforator unit, mount on the perforator base casting which serves as the main structural member.

(1) Rotation of the printer's function shaft provides a pre-determined controlled motion for the power bail assembly. The power bail oscillates from a post mounted to the base and receives its motion from the printer's function shaft through the drive link. This motion is transferred to the nudger, tape feed mechanism and into the punch mechanism to perform the tape feed functions.

(2) The individual members that compose the power bail assembly perform the following functions:

(a) Drive Post - The drive link imparts motion to the power bail through the drive-post.

(b) Nudger Arm - There is a cam profile perforated in the nudger arm which transfers motion to the nudger.

(c) Feed Pawl Arm - The feed pawl derives its motion from the feed pawl arm.

(d) Stripper Bail - The stripper bail pivots from a post that is supported by the nudger and feed pawl arms.

(e) Sensing Lever Bail - Motion is transferred to the sensing levers through a post supported by the nudger and feed pawl arms.

(3) There is a code bar extension for each printer code bar. Motion is imparted to the code bar extensions by the code bars thru the printer's code bar reset bail. A bracket and a plate mounted to the perforator base provide the support and the guiding for the code bar extensions.

(a) The perforator receives its intelligence from the printer's selector.

(b) The selector's blocking levers control the mark or space position of the code bar which in turn transfer this position to the code bar extensions. A blocked code bar represents a space and an unblocked code bar represents a mark.

(c) Each code bar extension contains a tab located on its underside which is oriented to line up with its respective sensing lever, pawl, lever and code punch combination.

(4) The tape feed and tape perforation sequence of operation is as follows:

(a) The perforator basically has the same timing as the printer's function mechanism.

(b) The selector trips the code bar clutch at the end of its cycle. The character combination stored in the selector's blocking levers is transferred to the code bar extensions as explained above.

(c) The function clutch is tripped when the code bar reset bail reaches its most counterclockwise position.

(d) As the power bail rotates counterclockwise from its stop position the feed pawl engages a tooth on the feed wheel ratchet. When the bail reaches its most counterclockwise position the ratchet has been indexed one full tooth space and the tape has advanced 0.100 inches by the feed wheel.

(e) There is a sensing lever, pawl, lever and code punch combination for each code level.

(f) The feed punch has its own sensing lever, pawl and lever.

(g) During the power bails counterclockwise travel each sensing lever is permitted to pivot clockwise and sense the code bar extensions. Each sensing lever, except the feed punch sensing lever, contains a tab on its top side which lines up with its respective code bar extension.

(h) When a code bar extension is spacing the tab located on its underside lines up with the tab on the sensing lever. The tabs engage each other and the sensing lever is blocked from pivoting to its most counterclockwise position.

(i) When a code bar extension is in the mark position its tab is not in line with the sensing lever tab. As a result the sensing lever pivots to its most clockwise position.

(j) The feed punch sensing lever always travels to its most clockwise position since it has no tabs. This motion is presented to the pawl, lever and punch combination through a latching surface located on the pawl.

(k) When the perforator unit is in the stop position the pawl is in its most vertical position, the lever is in its most clockwise position and the code punch is in its most downward position or below the surface of the tape.

(l) When a sensing lever is in the space position its latching surface is prevented from engaging with the pawl's latching surface. As a result the pawl is not selected.

(m) When the sensing lever is in the mark position its latching surface engages the latching surface on the pawl. When the two latching surfaces engage, the pawl is in the selected position.

(n) As the power bail rotates clockwise the feed pawl slides along the inclined surface of the adjacent ratchet tooth, drops behind it and is cammed away from the ratchet wheel. Occurring simultaneously, the sensing levers in the mark position rotate counterclockwise and transfer their motion to the selected pawl, lever and code punch combination. A point is reached where the drive bail transfers its motion to the spacing sensing levers. Since their pawl, lever and code combinations are in the non-select position no motion is transferred to them. This results as a blank in the tape since the code punch remains in its most downward position below the tapes surface. As the drive bail continues and reaches its most clockwise position the code punch of a selected pawl, lever and code punch combination travels upwards, perforates a hole in the tape and continues to its most vertical position. The feed hole is always perforated in the tape since its pawl and lever is always selected. Just prior to the end of the drive bails most clockwise position the stripper bail through its bias spring engages a latching surface located under the spring hook of the selected pawl.

(o) During the power bail's clockwise motion the tape nudger performs its function. Motion is transferred from a cam profile located in one

of the arms of the power bail through a post molded as an integral part of the nudger. The nudger rotates counter-clockwise, engages and nudges the tape gently when the selected code punches are engaged with the tape. This enables the tape roll to be indexed a small amount without affecting tape feed spacing since only the weight of the paper between the tape roll is reflected to the tape feed wheel when the tape is being advanced.

(p) As the power bail rotates counter-clockwise to its stop position the stripper bail strips the selected pawls from their sensing lever. The selected pawl, lever and code punch combinations return to their stop position through their bias springs and the retractor mechanism. The sensing lever bail of the power bail also acts as a part of the retractor mechanism. As the stripper strips the pawls a cam surface on the pawl which acts as the other member of the retractor mechanism engages the sensing lever bail post and cams the pawl upwards to the stop position. During this portion of the drive bail's travel the code bar extensions are reset by the printer's code bar reset bail.

(5) The tape guide assembly consists of a bracket, two rollers, three posts, a wheel and a compression spring held together by retainers. A tension spring biases the tape guide assembly in the clockwise direction. The knurled roller settles against the knurled feedwheel with a predetermined force. It is the combination of force and the knurled wheels that provide adequate tape spacing. The tape guide assembly is shaped in the form of a funnel to provide easy tape threading. A push button located in the cover lid when pushed down against a bent tab located on the bracket disengages the tape guide assembly from the feed wheel thereby providing easy tape removal from the perforator unit.

(6) The punch block assembly consists of code punches, a feed punch, a holder, a die plate and a bias spring. The code punches and feed punch are oriented to the die plate through slots which engage levers in their respective code level, pawl, and lever combinations. The bias spring always biases the tape against one edge of block. This results in the code hole and feed hole relation to the tape edge to be held constant.

(7) The back space lever when depressed manually to its most downward position back spaces the ratchet one tooth space. This results in the tape being back spaced one full character. The backspace lever through another lever cams out the feed pawl during the back space operation. This is a safety feature to prevent a jam if the operator accidentally operates the back space mechanism while the perforator unit is running.

CHANGE 2

b. Some applications may require that the answer-back code "upper case D" be converted to a "figures" code to prevent tripping of the answer-back when the tape is read by the transmitter. The perforator unit design includes the provision for adding an auxiliary drive bail for converting Upper Case "D", to the answer-back trip code combination, to "figures" by perforating additional holes in the tape.

(1) The auxiliary drive bail consists of two sensing levers, two pawls, two levers, and a shaft when assembled together, form an auxiliary drive bail that drives preselected code punch levers.

(2) Tabs pre-coded with the Figures "D" combination on the under side of the code bar extensions are sensed by the A-0 and the A-8 sensing levers. All code combinations except the Figures "D" code combination block the A-0 and A-8 sensing levers from reaching their most clockwise position.

(3) On sensing the upper case "D" code combination (0, 1 and 4 code levels marking) the A-0 and the A-8 sensing levers impart motion to the auxiliary drive bail.

(4) To convert Figures "D" to Figures the No. 2 and No. 5 code punch levers have tabs located on their underside which line up with the shaft of the auxiliary drive bail.

(5) When the Figures "D" code combination is received by the perforator unit the No. 0, 1, and 4 sensing lever, pawl lever, and code punch combinations are actuated by the power bail through their sensing levers and the No. 2 and No. 5 code punches are actuated by the auxiliary drive bail through the tabs located on the underside of the No. 2 and No. 5 code punch levers. The resulting perforations in the tape is a "Figs" code combination.

(6) The auxiliary drive bail design to convert one code combination to another is based on adding perforations to the first code combination to get the desired code combination. The auxiliary drive bail can only add perforations in the tape, it cannot delete them.

c. The drive mechanism consists of a separate set of parts which when assembled together on the printer forms the perforator unit drive. The perforator unit drive bail receives its motion from the printer's function shaft through an arm, plate, and drive link.

(1) The plate is fastened to the arm which in turn is fastened to the function shaft.

(2) The drive link pivots from a post mounted in the plate and is biased in the clockwise direction by a tension spring.

(3) Located on the drive link's underside and at the end opposite the pivot is a "V" groove that engages the post located in the perforator unit power bail.

(4) There is a link with a post that is included in the set of drive parts. One end mounts through a spacer to the printer's platen mounting post and the post at the other end fits into a bushing located in the plate. Its purpose is to add rigidity to the printer's function shaft.

d. The on and off push-buttons are located in the perforator cover lid. A spider leaf spring held captive to the underside of the lid biases the push-buttons upwards. The underside of the push-buttons line up with the flat surfaces on a plastic lever that pivots from a post mounted to the perforator unit frame.

(1) Motion is transferred to an on-off control lever through a link, the plastic lever and the on-off push-buttons.

(2) When the "on" button is depressed the on-off control lever rotates to its most counter-clockwise position, the link to its most vertical position and the plastic lever to its most clockwise position.

(3) The "V" groove located in the on-off control lever profile disengages the perforator

unit drive bail post. A roller located on the lever cams the drive link in the clockwise direction. The "V" groove on the drive link engages the power bail drive post while the "V" groove on the on-off control lever is partially disengaged. The interaction of the "V" grooves is designed so that either "V" groove controls the drive bail before the other becomes totally disengaged. The "V" groove on the on-off control lever is in its most counter-clockwise position completely clears the path of the power bail drive post while the roller is completely disengaged from the drive link.

(4) A detent lever biased in the counter-clockwise direction by a tension spring holds the mechanism in its off position.

(5) The opposite action occurs when the "off" button is depressed. The on-off control lever is detented in its most clockwise direction, the link in its lowest vertical position and the plastic lever in its counter-clockwise position. The drive link is completely cammed out of the path of the power bail drive post by the roller on the on-off control lever. The on-off control lever always locks the drive bail in the stop position.

e. The ASA code has assigned R₁ on, R₁ off code combinations to automatically start and stop the perforator unit on receipt of the code combinations. Provision has been made in the perforator unit to accept an additional mechanism to perform this function.

f. Provision has been made to automatically turn off the perforator unit when it receives an end of message (EOM) code combination.