NAVSHIPS 0967-173-7010
VOLUME 1
(of 2 Volumes)

TECHNICAL MANUAL
28 KEYBOARD SEND-RECEIVE (KSR)
AND RECEIVE-ONLY (RO)
TELETYPETRITER SETS
INTRODUCTION

This manual contains two (2) volumes of literature for the 28 Keyboard Send-Receive and the Receive-Only Teletypewriter Sets as follows:

Volume 1, NAVSHIPS 0967-173-7010, provides cross reference material, description and principles of operation, installation, adjustments, lubrication, disassembly and reassembly, and component wiring diagrams.

Volume 2, NAVSHIPS 0967-173-7020, provides parts ordering information.

Each volume is made up of a group of appropriate independent sections. The sections are complete within themselves; they are separately identified by title and section number and the pages of each section are numbered consecutively, independent of other sections.

The identifying number of a section, a 9-digit number, appears at the top of each page of the section, in the left corner of left-hand pages and the right corner of right-hand pages.

To locate specific information, refer to the table of contents. The name of the involved component, the title of the section, and the 9-digit section number may then be found. The sections are arranged in the order shown in the table of contents. Turn to page one of the section indicated where the contents of the section will be found (except where a section is small and does not require a listing of contents).
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28 KEYBOARD SEND-RECEIVE (KSR) AND
RECEIVE-ONLY (RO) TELETYPETRITER SETS
FOR U. S. NAVY
GENERAL CROSS REFERENCE INFORMATION

1. GENERAL

1.01 This section provides a listing of Keyboard Send-Receive and Receive-Only Teletypewriter Sets being used by the U. S. Navy.

1.02 The component units included in the various sets are cross referenced with respect to Navy codes and Teletype codes in the following chart.

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# 28 KEYBOARD SEND-RECEIVE (KSR) AND RECEIVE-ONLY (RO)

TELETYPEWRITER SETS

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## 1. GENERAL

1.01 The 28 Keyboard Send-Receive (KSR) Teletypewriter Sets are electromechanical apparatus that provide terminal facilities for exchanging page-printed messages over appropriate transmission facilities including telegraph lines, telephone networks, and radio channels. An operator sends the messages by typing them on a keyboard, and the originating set and those at distant stations print them on page-width copy paper or continuous business forms. The sets translate the messages to a serial start-stop (teletypewriter) code for transmission and convert the code to printed characters at the point of reception. They will operate at various speeds up to 100 words per minute.

1.02 The 28 Receive-Only (RO) Sets are similar to the KSR Sets, but have no keyboard sending facilities. They are used in applications that require only the reception of page-printed messages.

1.03 The KSR and RO Sets can be used for recorded communication either cross office or cross country. With the proper modifications, they will function in dial or other switched-line networks. Utilizing the capabilities of a built-in switching device, the stunt box, the Sets will operate in selective calling systems (par. 5.01), and provide local or remote control of external equipment or operations.

## 2. VARIATIONS

2.01 The sets are available in several configurations to meet varying installation and operational requirements:

(a) Floor Model Set - A floor-standing set with additional space for accessory equipment (Fig. 1).

(b) Table Model Set - Identical to the Floor Model Set except that it contains no additional space and it rests on a table (Fig. 2).

(c) Rack Mounted Set - Equipped with a close-fitting enclosure, is compact and rests on an equipment rack or on a table (Fig. 3).

(d) Wall Mounted Set - May be mounted on a wall surface to conserve floor space (Fig. 4).

(e) Multiple KSR and RO Set - Provides two RO and one KSR, or three RO sets in a single enclosure (Fig. 5).
Figure 1 - Floor Model Keyboard Send-Receive (KSR) Teletypewriter Set
3. COMPONENTS

3.01 The component complement of a KSR Set may vary from one installation to another, depending upon the operational requirements. In general, a KSR Set consists of a typing unit, a keyboard base, motor unit, electrical service unit, and enclosure. A complete description of these components will be found in the appropriate section for a particular component.

3.02 The motor unit and typing unit are mounted on the base portion of the keyboard. The motor unit supplies rotary motion through a gear set to the typing unit which, in turn, supplies it to the keyboard. Gear sets may be interchanged to obtain various operating speeds up to 100 WPM. The keyboard and electrical service unit are mounted in a cabinet or enclosed by covers. The receive-only base replaces the keyboard in the Receive-Only Set.

Figure 2 - Table Model Receive-Only (RO) Teletypewriter Set
Figure 3 - Rack Mounted Send-Receive (KSR) Teletypewriter Set

**TYPING UNIT** (Fig. 6)

3.03 The typing unit contains the mechanism necessary for translating electrical input signals into printed, alpha-numeric characters or functional control operations. The unit may be equipped to accommodate either friction or sprocket feed paper, in single or multi-copy form, either rolled or fan folded. It includes a stunt box that provides, non-printing functions such as case shifting, carriage return and line feed and, in addition, switching facilities for remote controls, station selection, and other applications.

**SEND-RECEIVE KEYBOARD AND RECEIVE-ONLY BASE** (Figs. 2 and 6)

3.04 Both the send-receive keyboard and the receive-only base provide mounting facilities for the typing unit, motor, driving gears, and various mechanisms required for control of
Figure 4 - Wall Mounted Send-Receive (KSR) Teletypewriter Set
Figure 5 - Typical Multiple KSR and RO Set
Figure 6 - Floor Model Keyboard Send-Receive (KSR) Teletypewriter Set (Interior View)
the set. Unlike the receive-only base, the send-receive keyboard is equipped with mechanisms for generating and transmitting a teletypewriter signal.

MOTOR UNITS (Fig. 6)

3.05 The motor units that provide mechanical motion for KSR and RO sets are of two basic types: ac synchronous and ac/dc series governed. The ac synchronous motor is used when the power source is regulated; the ac/dc series governed motor operates from either regulated or unregulated power. The latter is required where only unregulated power is available. The units operate at the same speed, and to accommodate varying load requirements they are available in standard and heavy-duty horsepower ratings.

ELECTRICAL SERVICE UNIT (Fig. 6)

3.06 The electrical service unit serves as the area of concentration for the wiring of KSR and RO sets, and provides mounting facilities for various electrical assemblies and components. It may include such optional assemblies as a line (polar) relay, line shunt relay, rectifier, motor control mechanism, and selector magnet driver. The set's main power switch, convenience outlet and fuse, terminal blocks, and interconnecting cables may also be included.

ENCLOSURES (Figs. 1 through 5)

3.07 The components of KSR and RO sets may be housed in the following enclosures: the floor model, the table model, the rack mounted cover, the wall mounted enclosure, and the multiple KSR and RO enclosure. The enclosures are of sheet metal construction and are finished internally and externally in baked enamel.

4. VARIABLE FEATURES

4.01 A wide variety of optional features are available with the equipment. These features, which provide special, non-printing operations or control facilities, or serve as an aid in operation, are in most cases readily installed in the field. Some of the features are described briefly below.

(a) Horizontal Tabulator - Permits rapid movement of the typebox to predetermined positions on the copy paper.

(b) Vertical Tabulator - Advances a form to any predetermined position within the form.

(c) Form Feed-Out - Advances a form to the first printing line on the succeeding form from any point on the previous form.

(d) Automatic Carriage Return - Line Feed - These functions occur simultaneously should the sending station fail to initiate them, when the typebox reaches the right margin.

(e) Motor Control - Starts or stops the set's motor during active or idle transmission periods, or in response to other, predetermined signal-line or separate-line conditions.

(f) Answer-Back - With this feature, KSR sets can automatically transmit their station identification character sequence, upon request of another station, or by local control.

(g) Accessories - A number of accessories are available to facilitate paper and form handling, including low-supply indicator alarms, special trays and shelves, and paper winders.

5. SELECTIVE CALLING

5.01 Selective calling operation is a method of message transmission control, in which traffic is selectively directed only to those sets actually concerned with the information being transmitted. Each set in the circuit, which may be standard line or radio, is assigned an identification code. The code may be made up of any character or sequence of characters. Recognition of this code, and other selective calling codes, is made by the stunt box in the typing unit of each set. The typing unit, upon recognition of the proper code, will be placed in the select-non-print condition. When this occurs, direct printing is suppressed while the selector mechanism and the stunt box remain active. In this way, the typing unit monitors signal line conditions, but does not respond, either to print or to perform a function, until it receives instructions in the form of selective calling code sequences.
6. TECHNICAL DATA

SIGNAL REQUIREMENTS

A. Sequential - Five intelligence levels, with start-stop pulses.

(1) Neutral - Selector magnets directly connected to signal line.

(2) Polar - Line relay or selector magnet driver required.

B. Parallel (Neutral) - An accessory multi-wire distributor unit is necessary to convert parallel input to required sequential form.

POWER REQUIREMENTS (TYPICAL)

A. Sets with Synchronous Motor Units - 115 vac, ±10%, 60 ± .75% cycles, single phase.

B. Sets with Governed Motor Units

(1) 115 vac ±10%, 50-60 cycles, single phase.

(2) 115 vdc with external resistance.

OPERATING SPEEDS

<table>
<thead>
<tr>
<th>Characters Per-Minute</th>
<th>600</th>
<th>460</th>
<th>428</th>
<th>404</th>
<th>400</th>
<th>390</th>
<th>368</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations Per-Second</td>
<td>10.0</td>
<td>7.7</td>
<td>7.1</td>
<td>6.7</td>
<td>6.7</td>
<td>6.5</td>
<td>6.1</td>
</tr>
<tr>
<td>Unit Code</td>
<td>7.42</td>
<td>7.42</td>
<td>7.00</td>
<td>7.42</td>
<td>7.50</td>
<td>7.00</td>
<td>7.42</td>
</tr>
<tr>
<td>Bauds (Bits-per-second)</td>
<td>74.2</td>
<td>56.9</td>
<td>50.0</td>
<td>45.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency (Cycles/Second)</td>
<td>37.1</td>
<td>28.4</td>
<td>25.0</td>
<td>22.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length in Milliseconds</th>
<th>One Character</th>
<th>100</th>
<th>130</th>
<th>140</th>
<th>149</th>
<th>150</th>
<th>154</th>
<th>163</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unit Pulse</td>
<td>13.5</td>
<td>17.6</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td>22.0</td>
<td>22.0</td>
</tr>
<tr>
<td></td>
<td>Stop Pulse</td>
<td>19.1</td>
<td>24.9</td>
<td>20.0</td>
<td>28.5</td>
<td>30.0</td>
<td>22.0</td>
<td>31.2</td>
</tr>
</tbody>
</table>

APPROXIMATE DIMENSIONS (INCHES)

<table>
<thead>
<tr>
<th>Set</th>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KSR</td>
<td>39</td>
<td>20-1/2</td>
<td>24</td>
</tr>
<tr>
<td>RO</td>
<td>39</td>
<td>20-1/2</td>
<td>21</td>
</tr>
<tr>
<td>Table Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KSR</td>
<td>16</td>
<td>20-1/2</td>
<td>24</td>
</tr>
<tr>
<td>RO</td>
<td>16</td>
<td>20-1/2</td>
<td>21</td>
</tr>
<tr>
<td>Rack Mounted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KSR</td>
<td>12</td>
<td>17</td>
<td>24</td>
</tr>
<tr>
<td>RO</td>
<td>12</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>Wall Mounted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KSR</td>
<td>30-3/4</td>
<td>16-1/2</td>
<td>14-1/2</td>
</tr>
<tr>
<td>RO</td>
<td>30-3/4</td>
<td>16-1/2</td>
<td>11-1/2</td>
</tr>
<tr>
<td>Typical Multiple KSR and RO</td>
<td>72</td>
<td>21-1/2</td>
<td>28</td>
</tr>
</tbody>
</table>
SECTION 573-100-100

PRINTED CHARACTERS

A. Type Pallet Arrangements - Standard, upper case arrangements include:

1. Communications (Punctuation symbols)
2. Fractions
3. Weather symbols

Individual pallets for upper and lower case characters are available separately for field installation.

B. Type Styles and Spacing (Typical)

<table>
<thead>
<tr>
<th>Style</th>
<th>Character Height</th>
<th>Horizontal Characters Per Inch</th>
<th>Vertical Lines Per Inch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Caps</td>
<td>Fraction</td>
<td>Single - SPACE - Double</td>
</tr>
<tr>
<td>Murray</td>
<td>.103&quot;</td>
<td>.162&quot;</td>
<td>10</td>
</tr>
<tr>
<td>Gothic</td>
<td>.103&quot;</td>
<td>none</td>
<td>10</td>
</tr>
<tr>
<td>Gothic</td>
<td>.103&quot;</td>
<td>.162&quot;</td>
<td>12</td>
</tr>
<tr>
<td>Long Gothic</td>
<td>.120&quot;</td>
<td>.170&quot;</td>
<td>10</td>
</tr>
<tr>
<td>Large Gothic</td>
<td>.180&quot;</td>
<td>.180&quot;</td>
<td>10</td>
</tr>
</tbody>
</table>

PLATENS

<table>
<thead>
<tr>
<th></th>
<th>Friction Feed</th>
<th>Sprocket Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Rubber covered cylinder, fixed to platen shaft.</td>
<td>Rubber covered cylinder, free on platen shaft.</td>
</tr>
<tr>
<td>Length</td>
<td>8-3/4&quot;</td>
<td>Selected for desired form width.</td>
</tr>
<tr>
<td>Paper Width</td>
<td>Any width up to 8-1/2&quot;</td>
<td>Minimum: 3-5/8&quot;</td>
</tr>
<tr>
<td>Characters per line</td>
<td>Margin is adjustable from 1 to 85 characters</td>
<td>Margin is adjustable from 1 to maximum number indicated in chart.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Form Width in Inches</th>
<th>Maximum Characters* Per Line</th>
<th>Form Width in Inches</th>
<th>Maximum Characters* Per Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>77</td>
<td>5-3/4</td>
<td>44</td>
</tr>
<tr>
<td>8-1/2</td>
<td>72</td>
<td>5-1/2</td>
<td>42</td>
</tr>
<tr>
<td>8</td>
<td>67</td>
<td>5</td>
<td>37</td>
</tr>
<tr>
<td>7-1/2</td>
<td>62</td>
<td>4-1/2</td>
<td>32</td>
</tr>
<tr>
<td>7</td>
<td>57</td>
<td>4-5/16</td>
<td>30</td>
</tr>
<tr>
<td>6-1/2</td>
<td>52</td>
<td>4-1/4</td>
<td>29</td>
</tr>
<tr>
<td>6-3/8</td>
<td>51</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>6-1/4</td>
<td>50</td>
<td>3-5/8</td>
<td>23</td>
</tr>
<tr>
<td>6</td>
<td>47</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Based on ten characters per inch with allowance of three characters for platen end play.
Figure 7 - Typical Keyboard Send-Receive (KSR) Teletypewriter Set (Schematic Diagram)
SECTION 573-100-100

**Typing Unit Ribbon**

- **Style**: Black record ribbon
- **Length**: 33 feet
- **Width**: 1/2 inch
- **Thickness**: 0.0055 inch

**Typing Unit Paper (Friction Feed)**

- **Type**: Standard yellow paper roll
- **Outside diameter**: 4-1/2 inch
- **Width**: 8.45 inch
- **Length**: 325 feet
- **Core diameter**: 1 inch
- **Core thickness**: 0.125 inch

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Reissued, March 1967
28 KEYBOARD SEND-RECEIVE (KSR) AND RECEIVE-ONLY (RO) TELETYPEWRITER SETS

INSTALLATION

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1. GENERAL

1.01 This section outlines the installation procedure for the KSR and RO Teletypewriter Sets in their various enclosures. It also indicates requirements and adjusting procedures needed for proper operation of the set.

1.02 References made to left or right, top or bottom, and front or rear apply to the set in its normal position as viewed from the front or operator's position.

1.03 Each 28 Page Printer Set (KSR or RO) consists of a cabinet, an electrical service unit (LESU), motor unit, set of gears, keyboard or base, and a page typing unit. These are basic units, some of which may be provided with various accessories for different service requirements. The set of gears must be ordered separately for the desired speed of operation.
SECTION 573-100-200TC

Note: Refer to the appropriate sections for location of parts, adjustments, and lubrication.

2. INSTALLATION

CONSOLE AND TABLE MODEL SETS (Figure 1)

A. Installation of Cabinet

Note: Unpack all components with care. Observe all caution labels and instructions. All bags and small loose parts should be kept with their associated apparatus until used in the installation. Space requirement dimensions are given in Figure 2.

2.01 Lay carton on its side, then cut open the bottom sealed edges. Hold carton flaps back and stand the carton upright (two men should handle this phase). Grasp carton and pull up and off the cabinet. Remove top and side packing frame. Move cabinet carefully off base and remove paper cover.

2.02 A tapped bushing is provided at each corner of the bottom of the cabinet for securing cabinet directly to the mounting surface. In selecting the mounting bolts to be used, be certain each bolt will engage all the threads in the tapped bushing. The proper bolt thread and spacing between bolts are shown in Figure 3 for both the table and floor models.

Note: Install signal line and power cables before securing the table model to a mounting surface.

2.03 On the console model, four adjustable feet permit a maximum variation of one inch in height at each corner for the purpose of leveling the cabinet. Use a 3/4 inch open-end wrench on the feet to make adjustments.

2.04 Instructions for installing separately packed accessories are included with each modification kit.

B. Electrical Connections

2.05 Two holes, containing filler plugs, are provided in the rear corners of the shelf of the printer compartment. Two additional holes, containing knockouts, are provided in the rear corners of the floor of the lower compartment. Make electrical connections by opening these holes and feeding cables up from the bottom through the holes. Signal line and power cable may be routed through either the left or right hole. Wires or cables (used in the table cabinet), which are routed through these holes, should be taped. The taped cables and/or wires will use the excess space in the hole and provide for noise reduction as well as strain relief for the cables. See Figure 4.

Note: In units where RF noise suppressors are used, power line and signal line connections are made directly to the appropriate suppressor through strain relief clamps located centrally underneath the bottom of the printer compartment. See Figure 4.

2.06 Cable clamps are provided for securing cables at the input point to the floor model cabinet, thus providing strain relief. Electrical tape may be wound around the wires at the clamping point, if additional thickness is required. The clamps are supplied in a bag tied inside the lower compartment.

Note: Paragraph 2.06 does not apply to floor model cabinets that have a 4-1/4 inch wide and 6 inch high cable duct opening in the lower right side. Covers are provided to conceal the cable duct opening.

2.07 A horizontal wiring channel with two terminal blocks extends across the upper rear position of the printer compartment of the cabinet. These terminals are protected with insulating covers which are secured to posts in the channel by means of screws. Remove the cover to expose the terminals so that set connections may be made.

2.08 Make power and signal line connections to the cabinet and attach the wiring from various units comprising the printer set, in accordance with the appropriate printer set wiring diagrams. An actual wiring diagram of each unit is packed with the unit, while a schematic wiring diagram of the complete printer set is packed with the electrical service unit.

Note: Reference to these diagrams is emphasized in order to avoid the many difficulties that may arise from incorrect wiring and connecting.

2.09 A cabinet ground stud is provided above the right terminal block on the lid hinge mounting flange. A wire connected to the common station ground should be attached to the ground stud in each cabinet at the time of installation.
BOTH MODELS

23-1/2" FOR KEYBOARD, 20-1/2" FOR BASE

(Front View)

Table Model

38-3/8"

52-1/4"

(Front View)

Floor Model

29-1/4"

52-1/4"

(Side View - Dome Open)

Figure 2 - Space Requirement Dimensions
C. Installation of Components

Electrical Service Unit

2.10 With the cabinet dome raised, place the electrical service unit (LESU) in the rear of the cabinet, with the legs extending upward, the serial number plate facing the front of the cabinet, and the fuse holder and power receptacle on the right side of the unit. Secure it in position with two studs furnished with the unit.

2.11 Route the loose end cables (extending from either side of the unit) behind their respective cable guides and connect them to the lower row of terminals on the cabinet terminal blocks. Make connections as shown on the applicable wiring diagram allowing sufficient slack near terminals.

2.12 Route the typing unit and keyboard cables behind their respective cable guides, and forward through cable guides mounted on the side cradle rails. These cables are to be connected to their respective units later.

2.13 Connect the cabinet lighting, margin indicator, signal bell, signal line, and power line cables to the terminals as shown on the appropriate wiring diagram.

2.14 Make the necessary strap connections at the cabinet terminal blocks as shown in the wiring diagram of the electrical service unit.

2.15 Remove the rear crossbar of the cradle assembly in the cabinet by removing its two mounting screws, lockwashers and flat washers.

2.16 Manual Switch

(a) Unfasten the power switch shaft from the hinge bar and bracket.

(b) From the inside of the cabinet, position the short bent portion of the shaft through the hole in the right front side on the upper shelf of the cabinet so that it points to the right. Locate the shaft so that the bracket on the end of the shaft engages the power switch lever on the electrical service unit and the groove at the end of the shaft engages the edge of the pivot hole in the front right corner of the LESU chassis.

(c) Place one end of the power switch shaft spring on the power switch shaft and hook the other end in the hole on the side cradle.
rail of the cradle assembly. If the shaft is properly seated in the pivot hole in the LESU, the shaft will not pull out.

Motor Unit

2.17 Remove the gear guard tied to the keyboard or base. Remove four of the 1/4-32 hex head screws with captive lockwashers from the bag tied to the gear guard. Secure the motor unit to the keyboard or base with the four screws and lockwashers. Connect the ground strap (on motor units so equipped) to the right rear motor mounting screw.

2.18 Remove the insulating cover from the terminal block on the keyboard or base just to the left of the motor. Connect the motor
leads to terminals 1 and 2 of this terminal block. Reinstall the insulating cover.

Set of Gears

2.19 Remove the motor pinion and the intermediate driven gear from the small box stamped TP151060 or TP161293 (60 wpm), TP151075 or TP161294 (75 wpm), TP151100 or TP161295 (100 wpm), or TP152766 (67 wpm). Numbers TP161293, TP161294, and TP161295 are sets of nylon gears.

2.20 Remove the screw and lockwasher in the left end of the motor shaft. Place the motor pinion on the motor shaft with the geared end toward the motor. Secure the gear with the screw and lockwasher just removed. Where the nylon pinion is used, position the isolator over the hub of the nylon gear while pressing the extensions of the isolator downward into the holes of the bearing hub. Slide the assembled gear and isolator over the motor shaft with the teeth toward the motor. Insert the two posts into the holes in the isolator aligning them with the tapped hole in the motor shaft. Screw the posts down tight.

Note: In sets on which the LD multiple wire distributor unit is to be used, intermediate gear assembly changes should be made at this point. Remove the intermediate gear driving shaft and replace it with the shaft supplied with the LD unit. Complete the LD installation by following instructions enclosed with the LD modification kit of LD unit.

2.21 Remove the two screws and lockwashers from the hub on the right end of the intermediate gear shaft. Mount the intermediate driven gear on the shaft with the flat side of the gear to the right. Secure the gear with the two screws and lockwashers removed and make certain that the motor pinion and intermediate driven gear mesh together properly.

2.22 To install the gear guard, mount it in position over the motor pinion and intermediate gear mechanism and secure it with the rear left motor unit screw.

Keyboard or Base

2.23 Remove the cabinet crossbar from the front of the cabinet by loosening the two thumb screws that secure it.

2.24 Remove the two studs from the rear crossbar previously removed from the cradle assembly. See Paragraph 2.15. Turn the rear crossbar so that its channel is down and the two tapped mounting holes are nearest the rear edge of the bar. Place the bar underneath the rear mounting holes of the keyboard or base with motor unit, and secure it with the two studs just removed.

2.25 Remove the two studs from the front crossbar hinge. Place the keyboard or base on the cradle assembly in the cabinet. Loosen the two front crossbar mounting screws and position the bar in its elongated mounting holes so that the holes in the base and the tapped holes in the hinge are in alignment. Secure the base to the front crossbar hinge by means of the two studs just removed.

2.26 Replace the front cabinet crossbar in its mounting slots in the cabinet with the wider side of the bar downward. Be careful not to jam the bar against the keyboard contact box. Tighten the two thumb screws.

2.27 To seal the keyboard or base rubber sealing plate against the cabinet, push the keyboard or receive-only base toward the rear of the cabinet as far as possible. Hold it in this position and tighten the two front cabinet crossbar mounting screws. The rubber seal should fit snugly against the cabinet all the way around.

2.28 Secure the rear crossbar to the cradle assembly by means of the two screws, lockwashers, and flat washers previously removed.

2.29 Plug the connector on the cable from the right end of the electrical service unit into the receptacle on the right side of the typing unit and latch it in position.

2.30 Plug the connector on the cable from the left end of the electrical service unit into the receptacle on the left rear corner of the keyboard or base and latch it in position.

2.31 Mount the RY30 relay in LESU units if so equipped. Observe polarized pins and insert relay into socket.

Typing Unit

2.32 Install the typebox on the typing unit if not previously installed.

CAUTION: THE TYPEBOX SHOULD BE FIRMLY SEATED ON THE BEARING STUDS. THE POINT OF THE LATCH TOGGLE
SHOULD BE PLACED IN THE NOTCH OF THE TYPEBOX PLATE BEFORE MOVING THE TOGGLE TO ITS LATCHED POSITION TO AVOID SPRINGING THE LATCH.

2.33 Place the page typing unit on the keyboard or base. The front feet of the typing unit must be placed over the locating studs provided on the keyboard or base. Rotate the motor by hand until the gears mesh properly. Secure the typing unit with the four remaining screws with captive lockwashers from the bag.

2.34 The following adjustments should be made during initial installation of the printer set prior to placing the keyboard or base and typing unit into the cabinet. They should also be checked if a different unit is substituted at a later date.

   (a) MOUNTING TYPING UNIT ON KEYBOARD OR BASE (Interrelated Features) - Section 573-116-700TC

   (b) INTERMEDIATE GEAR BRACKET (Interrelated Features) - Section 573-116-700TC

   (c) TIME DELAY DISABLING DEVICE (Time Delay Mechanism) - Section 573-116-700TC

   (d) MOTOR SPEED (Series Governed Motor Units) - Section 573-220-700TC

   (e) PAPER FINGER OR GUIDE BRACKET (Line Feed and Platen Mechanism) - Section 573-115-700TC

   (f) PAPER GUIDE (Line Feed and Platen Mechanism) - Section 573-115-700TC

   (g) COPY WINDOW (LAC) - Section 573-134-700TC

Final Checking

2.35 A visual check of all fuses, plugs, screw terminal connections, and lamps for looseness or breakage should be made before putting the equipment into operation.

2.36 Make certain that the power control shaft is downward to its OFF position before closing the main power to the equipment.

   Note: Insert a piece of bond paper between the selector magnet pole faces and the armature to soak up any lubrication which may have accumulated. When removing the paper, made sure no lint or bits of paper remain.

Lighting Facilities

2.37 For cabinet with two copylight switches, the switches are to be checked as follows:

   (1) The copylight switch (ON, OFF, MAIN ON), located on the electrical service unit, should be in the ON position.

   (2) The copylight switch, located to the left of the window in the cabinet dome, should be in the ON position.

   Note: Make sure the copylight shield does not interfere with the print hammer. If necessary, loosen the crossbar mounting screws on the cradle and push keyboard or base toward the rear for clearance.

2.38 For cabinet with one copylight switch, the location of the switch depends upon the respective copylight modification kit installed.

   (a) When using either the TP154744 or TP159357 kit (6 volt system for ac application), the switch is located on a bracket attached to the right dome hinge and should be in the NORMAL ON position.

   (b) When using the TP152309 kit (60 volt lamps for dc application), the switch is located to the left of the window in the cabinet dome and should be in the NORMAL ON position.

Installing Paper and Ribbon

2.39 To install paper, remove paper spindle by sliding one of the spindle retainers toward the rear. Insert spindle in a roll of paper and remount it so that the paper unwinds from underneath. With the paper release lever toward the rear, route the paper up over the paper straightener shaft, down, and under the platen as shown in Figure 5.

2.40 To install ribbon, remove both spools from the ribbon spool shafts. Engage the hook on the end of the new ribbon in the hub of the empty spool. Wind a few turns of the ribbon onto the empty spool in the same direction that it comes off the full spool. Make sure that the reversing eyelet has been wound up on the empty spool. Place the spools on the ribbon spool shafts so that the ribbon on the right spool comes off the right side and the ribbon on the left spool comes off the left side without twisting. Thread the ribbon around the rollers and through the reverse lever slots as shown in Figure 6.
Figure 5 - Path of Paper

Figure 6 - Path of Ribbon
Sprocket Feed Paper

2.41 The sprocket feed typing unit will handle up to 12 copies of stapled continuous form paper or up to 6 copies of unstapled paper. When this paper is used, the paper admission slot in the back of cabinet behind the electrical service unit must be opened. Loosen the two nuts under the flange inside the cabinet and move the plate so that the slot is open.

2.42 The stapled form paper may be fed from a form supply box on the floor behind the cabinet or from the shelf provided in the TP152349 paper supply box and form accumulating shelf.

2.43 The unstapled form paper should be fed from the form supply box on a platform not more than 18 inches below the paper admis-
SECTION 573-100-200TC

sion slot or on the shelf provided in the TP152349 paper supply box and form accumulating shelf.

WALL MOUNTED SETS (Figure 7)

A. Mounting Backplate Assembly

2.44 The fully assembled wall mounted page printer set weighs approximately 110 pounds. It has seven mounting holes for attaching it to the wall. The supporting wall must be capable of withstanding a 60-pound shear force and a 90-pound tensile (or compressive) force at each mounting hole.

2.45 The locations of the mounting holes on the backplate assembly are shown in Figure 8. Since the horizontal distance between holes is 14-5/8 inches, the backplate cannot be mounted on standard 16 inch center-to-center wall studs. When attaching the backplate assembly to wall structures where the existing mounting holes are unsatisfactory, alternate holes may be added along the side and bottom edges. No mounting hardware can be located along the upper central edge because it would interfere with the paper supply.

2.46 The following list contains suggested mounting hardware to be used with various wall materials.

(a) Masonry Wall - Use Ackerman-Johnson retainers or tabular expansion shield (made by the Rawplug Company) with 3/16 inch diameter or #12 bolts.

(b) Hollow Wood or Tile Wall - Use 3/16 inch diameter toggle bolts.

(c) Solid Wood Wall - Use #12 round head wood screws.

(d) Lath and Plaster, or Plasterboard Walls - Use 3/16 inch diameter toggle bolts. Auxiliary support may be required for these types of walls. Caution must be taken to insure that the supporting wall meets the loading requirements set forth in Paragraph 2.44.

2.47 As indicated in Figure 8, the recommended height from the floor to the top mounting holes is 54 inches. This distance has been found satisfactory to accommodate an average height operator. If desired, the height may be varied to meet the customer's requirements.

2.48 If the backplate is used for locating the mounting holes on the wall, it may be more convenient to separate the framework from the backplate. This can be accomplished by loosening the four screws shown in Figure 9 and sliding the framework from the backplate assembly.

B. Intermediate Gear and Keyboard

2.49 The following installation and adjusting procedure for the keyboard (or base) and the typing unit are to be performed before the units are installed on the backplate assembly.

2.50 Remove the retainer ring, which is adjacent to the left bearing side, and the 3/8 inch hex nut and associated lockwasher from the right end of the shaft. Slide the shaft to the left and remove the pulley, the two belt retainers, and the belt. Place the rubber isolator over the small end of the intermediate gear. Slide the gear with isolator onto the shaft so that the isolator side is on the left. Replace the two belt retainers, the belt, and the pulley. Slide the shaft to the right, back to its original position, and replace the retainer ring, the 3/8 inch hex nut, and associated lockwasher. Locate the intermediate gear in its correct position and fasten it with the two set screws supplied. See Figure 10.

C. Mounting Typing Unit on Keyboard

CAUTION: LOOSEN MOUNTING SCREWS ON THE INTERMEDIATE GEAR ASSEMBLY. MOVE ASSEMBLY TO ITS REAR-MOST POSITION.

2.51 Remove and retain the four mounting screws supplied with the base unit. See Figure 10. Place the typing unit on the keyboard (or base) unit and make certain that the front feet of the typing unit are placed over the locating studs provided on the base unit. Rotate the intermediate shaft by hand in order to mesh the gear teeth. Secure the typing unit to the base unit with the four mounting screws.

(1) Adjust the intermediate gear assembly and the timing belt as indicated in Figures 11 and 12.

(2) Remove the typing unit from the keyboard (or base) in preparation for installing the keyboard (or base) on the backplate assembly.

2.52 Place the motor unit on the bottom of the base unit in the proper location. See Figure 7. Place timing belt over the pinion.
Note: Recommended distance from top mounting holes to floor is 54 inches for average height operators.

Figure 8 - Location of Mounting Holes for Backplate
Figure 9 - Backplate Framework
Push motor to rearmost position and secure it to the base with four screws, four lockwashers, two nuts, and two nut plates.

2.53 Insert the keyboard ground strap between its ground screw on the keyboard base and the mounting frame at the front right corner of the backplate assembly.

2.54 With the motor unit in its properly adjusted position, secure the keyboard (or base) to the backplate assembly with the mounting studs which are supplied as part of the keyboard (or base) assembly.

2.55 Mount typing unit to keyboard (or base) following instructions in Paragraph 2.51.

2.56 With the keyboard (or base) and typing unit in place, adjust the two support hinges near the base of the backplate assembly as outlined under HINGE MOUNTS in Section 573-134-700TC.

D. Electrical Service Unit

2.57 The lower part of the mounting frame has four projecting tabs upon which the electrical service unit rests (Figure 9). Place the unit into the frame. On early models, the hinged front plate is held in place by a magnetic latch on the mounting frame. Later models have positive latches. The plate and latch should be perpendicular to each other as gauged by eye. If necessary, loosen the screws and position the latch to meet the requirement.

2.58 Route the keyboard connecting cable from the electrical service unit up along the left side of the mounting frame. Route the cable behind all spring clips supplied with the mounting frame for this purpose. Clamp the keyboard cable to the keyboard with the spring clip supplied on the keyboard. See Figures 7 and 10. Route the typing unit connector up along the right side of the mounting frame and fasten with the spring clips supplied with the frame.
(1) Requirement
Clearance between driven gear on printer and intermediate should be
Min 0.004 inch—Max 0.008 inch.

To Adjust
Loosen three mounting screws and make them friction tight. Position the assembly
toward front or rear.

(2) Requirement
There should be some clearance between right belt retainer on intermediate gear
assembly and spacing cutout lever on printer.

To Adjust
Position the assembly toward the left. Tighten screws.

Figure 11 - Intermediate Gear Assembly
I. Requirement

Force of $2 \pm 1/2$ ozs to deflect belt $1/8$ inch when measured midway between pulleys.

To Adjust

With motor plate mounting screws loosened, slide motor toward front of base to increase tension or toward rear of base to decrease tension. Tighten screws.

---

TIMING BELT

Figure 12 - Timing Belt Adjustment

2.59 Securely connect the two ground straps at the left end of the service unit to the cabinet mounting frame and the page printer mounting frame. See Figure 13. Friction fit ground tabs are supplied.

Note: Ground connections must be made properly to eliminate shock hazard!

E. Cover Installation and Adjustments

Note: The requirements for the following adjustments are covered in Section 573-134-700TC.

2.60 With the cover removed from the backplate assembly, check the WINDOW DOOR HINGE MOUNTS, LOWER DOOR LATCHES, and COPYHOLDER adjustments.

2.61 Before placing the cover on the backplate assembly, loosen the nut securing the large central mount and make it friction tight. For Receive-Only (RO) Sets, remove the three keylever assemblies from the cover by removing six nuts, lockwashers, and flat washers.

Note: The following adjustments in Section 573-134-700TC are to be performed with the cover in place but not secured, ie, the two screws at the bottom of the backplate assembly are not tightened:

- KEYTOP GUIDEPLATE COVER (Send-Receive Set)
- KEYTOP COVER (Receive-Only Set)
- KEYTOP GUIDE AND COVER (Send-Receive Set)
- POWER SWITCH

General Cover Adjustments

2.62 Check the WINDOW AND PAPER GUIDE adjustment in Section 573-134-700TC.

(a) Upon completion of the above adjustment, secure the cover in position with the two screws located near the bottom of the backplate assembly.
CAUTION: TO INSURE PROPER GROUNDING, PILE HARDWARE IN THE INDICATED ORDER.

Figure 13 - Ground Strap Installation

(b) Clip the lamp shields on the two copyright lampholders. The clearance between the lamp shields and the cover should be a minimum of 1/16 inch, if as indicated under COPY LAMPS in Section 573-134-700TC.

F. Miscellaneous

Power and Telegraph Connections

2.63 The power cord to be used with the apparatus must be of the three-wire type. A receptacle supplied with the electrical service unit is to be connected to the mate provided on the bottom plate of the service unit.

Note: Attach the ground lead to the center post of the receptacle.

2.64 Power and telegraph leads may be brought through the rear of the backplate assembly or through the hole located in the bottom of the cover.

Paper and Ribbon Installation

2.65 The paper spindle for the friction feed page printer is supplied with the typing unit. Insert the spindle in a roll of paper and mount it in the lower part of the cabinet so that the paper unwinds from underneath. Route the paper up through the paper channel in the rear and down under the platen (as indicated in Section 573-134-700TC). Check power lead and, if necessary, route it in such a manner as not to interfere with the paper.

2.66 If a sprocket feed page printer is installed, the plastic spindle retainers may be removed to provide additional storage space for sprocket feed forms. These retainers are attached to the lower part of the backplate assembly.

Figure 14 - Multiple Mounted KSR and RO Set
2.67 Remove both spools from the ribbon spool shafts. Engage the hook on the end of the new ribbon in the hub of the empty spool. Wind a few turns of the ribbon onto the empty spool in the same direction that it comes off the full spool. Make sure that the reversing eyelet has been wound up on the empty spool. Place the spools on the spool shaft so that the ribbon on the left spool comes off the left side without twisting. Thread the ribbon around the rollers and through the reverse lever slots (Figure 6).

MULTIPLE MOUNTED SETS (Figures 14, 15, 16, and 17)

A. General

2.68 Some multiple mounted sets consist of three or four receive-only (RO) printers; others consist of two RO printers and one key-
board send-receive (KSR) printer. Installation instructions are given for one printer of each type. For additional printer units, the same procedure applies.

2.69 Unpack each component of the set with care to avoid scratching or damaging the equipment. Carefully cut along the sealed edges.

B. Installation of Cabinet (Figures 18, 19, and 20)

2.70 The cabinet must be fastened to a level floor. One-quarter inch mounting holes are provided. Mounting hardware is not furnished.

(a) Remove the electrical service unit mounting panel through the front lower compartment door.

(b) Remove the plate floor to gain access to the base of the cabinet.

(c) Bolt the cabinet to the floor through the four holes provided.

(d) Replace the plate floor and the electrical service unit mounting panel.

(e) Remove the shipping bolts which tie the inner frame to the outer shell.

(f) Remove the small, slotted L-shaped brackets (two at top of each sliding rail — both sides) which prevent the base plates from moving upward during shipment. Loosen mounting screw and slide slotted L-shaped bracket out. Tighten mounting screw.

(g) Connect power and signal line according to the wiring diagram furnished with the set.

(h) Check cover adjustments as outlined in Section 573-134-700TC.

C. Installation of Components

2.71 Install the motor unit (LMU21, LMU28 or LMU52 whichever is used with the set) on each of the base plate assemblies for the receiving-only levels with four TP104124 screws and four TP2449 lockwashers. This hardware should be found in the muslin bag that is tied to the base plate.

Figure 17 - KSR Unit Pulled Out of Multiple Mounted Set
2.72 Mount the box containing the filtering element to the base directly behind the left rear typing unit side frame. Secure it with three TP121575 screws and three TP2669 lockwashers which should also be in the muslin bag.

2.73 Select the proper gear set for the desired operating speed as listed below:

<table>
<thead>
<tr>
<th>SPEED</th>
<th>7.42 UNIT CODE</th>
<th>7.00 UNIT CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 wpm</td>
<td>TP161293 TP307850</td>
<td>TP173795</td>
</tr>
<tr>
<td>67 wpm</td>
<td>- TP307851</td>
<td>-</td>
</tr>
<tr>
<td>75 wpm</td>
<td>TP161294</td>
<td>TP163504</td>
</tr>
<tr>
<td>100 wpm</td>
<td>TP161295 TP307852</td>
<td>TP163505</td>
</tr>
</tbody>
</table>

Install the TP159287 isolator on the motor pinion. Place the isolator and pinion on the motor shaft so that the pinion is between the motor and the isolator. Secure the pinion and isolator to the motor shaft with two TP161301 posts.

2.74 Remove screws and lockwashers from the intermediate gear hub. Mount the driven gear with the two screws and lockwashers just removed from the hub.

2.75 Loosen the four intermediate gear assembly mounting screws and position the assembly to provide...
SECTION 573-100-200TC

LOCATIONS OF FLOOR ANCHORS FOR 1/4" BOLTS (SUPPLIED BY CUSTOMER)

CABLE OPENINGS

BASE

DOOR OPENED 180°

(Front)

(Right Side)

Figure 19 - Multiple Mounted Cabinet Dimensions

Min 0.004 inch—Max 0.008 inch

backlash between the motor pinion and the driven gear. Tighten the four assembly mounting screws.

2.76 Connect the motor power leads of the motor to terminals No. 1 and No. 2 of the terminal block as indicated in the wiring diagram of the set.

2.77 Unfasten the display from the front plate of the typing unit. Loosen the display rack clampscrews. Rotate the rack to approximately a vertical position. Tighten the clampscrews.

2.78 Mount the typing unit on the base over its locating studs. Rotate the motor fan by hand to insure meshing of the gears. Secure the typing unit to the base with four TP25123

Page 20
KEYBOARD TRANSMITTER
EXTENDS 6-1/4" BEYOND FRONT
OF CABINET WHEN INSTALLED
AND IN OPERATING POSITION

ALL CABLES ENTERING BASE
OF CABINET MUST BE
DIRECTED UP THROUGH
THIS CUTOUT

BOTTOM PLATE

(REAR)

(Left Side)

Figure 20 - Multiple Mounted Cabinet Dimensions (continued)

screws, four TP2449 lockwashers, and four
TP2846 flat washers.

2.79 Adjust the typing unit gear and the in-
termediate gear to provide a barely per-
ceptible amount of backlash. To adjust, loosen
clampscrew at the front of the intermediate gear
assembly. Raise or lower the intermediate
gear assembly by means of the adjusting screw
until the proper backlash is obtained. Tighten
the clampscrew. Recheck the motor pinion to
driven gear backlash. (For further information,
refer to Section 573-116-700TC.)

2.80 Loosen the five screws which mount the
paper winder assembly. Center the paper
winder with the paper supply roll on the typing
unit. Tighten the mounting screws.

2.81 It may be necessary to reposition the
copy display rack on the upper typing
unit to provide adequate clearance between it
and the edge of the top cover. If so, proceed as
follows:

(a) With the top pair of slides in their closed
position, loosen the eight slide mounting
screws and pull the slides to their most for-
ward position.

(b) Loosen the two screws and two nuts which
mount the copy display rack to the typing
unit side frame. Position the rack up or down
to provide approximately 1/16 inch between
the roller of the top display rack and the
bottom edge of the top fixed cover when the
closed slides are pushed toward the rear to
bring the rack and cover in line. Make sure
there is at least 0.030 inch clearance between
the leading edge of the paper fingers of the
copy display assembly and the ribbon guides
of the typebox on the typing unit when the type-
box is in its uppermost position. Tighten all
mounting screws and nuts.

Keyboard

2.82 Install the TP179294 bracket on the
TP179293 keyboard panel with four
TP151631 screws, four TP7002 flat washers,
four TP2191 lockwashers, and two TP179304
nut plates. Leave the screws friction tight.
See Figure 21.

2.83 Remove the two upper screws which
mount the rubber keyboard seal. Mount
the panel and brackets on the base with two
shoulder screws and two TP84579 flat washers.
Leave screws friction tight.
2.84 Mount the TP179298 mounting bracket on the left side of the base with the oil drip pan between the base and bracket so that the leading edge of the bracket is inside the returns of the keyboard panel. Mount with two TP179303 screws, two TP2449 lockwashers, two TP2846 flat washers, and two TP3595 nuts. Leave screws friction tight.

2.85 Mount the TP179297 bracket on the right side of the keyboard in the same manner as the left bracket was mounted.

2.86 Solder the TP171158 ground strap to pin No. 19 of the base connector. Place the other end of the strap under a connector mounting screw.

2.87 Mount the paper winder (if it is not already mounted) on the mounting brackets behind the keyboard with four TP153442 screws, six TP111516 flat washers, four TP45815 lockwashers, and four TP125231 nuts.

2.88 Mount the keyboard and paper winder (if not already mounted) on the lower set of slides. Position the left mounting bracket so that the slide does not bind when pulled out or pushed in. Tighten the mounting screws on the left side.

2.89 Check keyboard panel adjustment Paragraph 2.94.

2.90 Install the motor on the keyboard with the four screws and lockwashers furnished. Connect motor leads to terminals No. 1 and No. 2 on the terminal block as indicated on the wiring diagram.

2.91 Mount the typing unit as outlined in 2.85 and 2.86, but use the four TP151678 screws and four TP2449 lockwashers furnished.

2.92 Check slide adjustment as outlined in Section 573-134-700TC.
2.93 Make sure all power switches are in the OFF position and connect all cables with their mating connectors.

D. Adjustments

Keyboard Panel Adjustment (Figure 22)

2.94 Check the following adjustments found in Section 573-134-700TC:

PRINTER COVERS
TOP AND MIDDLE PRINTER COVER DEPTH
PRINTER COVER LATCHES
SLIDE STOPS
CARRIAGE RETURNS AND LINE FEED LEVERS

Requirement
The bottom return of the keyboard panel should be in the line with the formed edge of the TP179300 top front brace assembly. The panel should be centered within the opening of the bottom cover.

To Adjust
Loosen the keyboard panel mounting screws and make them friction tight. Position the keyboard panel to meet the above requirement. Tighten the top mounting screws being sure to draw the panel tight against the rubber gasket on the keyboard or base.

Figure 22 - Keyboard Panel Adjustments
1. GENERAL

1.01 This section describes the tests made to determine if the Keyboard Send­Receive (KSR) Set will operate properly. The KSR Set provides means for receiving page printed messages and for manually originating messages between two or more stations which are similarly equipped.

1.02 The Receive-Only (RO) Sets are similar to the KSR Set, but are not equipped with keyboard sending facilities. Tests involving the keyboard are not adaptable to the Receive-Only (RO) Sets.

2. KEYBOARD OPERATING TESTS

2.01 Turn the main power switch, located on the lower right side of keyboard, to its upper position, ON. This conditions the KSR Set for service depending on the capabilities of a built-in switching device, the stunt box.

2.02 Manually depress each character key and determine that the proper character is printed.

(a) Depressing the LOC LF (local line feed) key causes the paper to feed from the typing unit at approximately three times the speed obtained when the LINE FEED and REPT (repeat) keys are held depressed.

(b) Depressing the REC (keyboard lock) key causes the signal generator to be shunted, thereby preventing signal generation. This key will remain depressed until released by depressing the SEND key.

(c) Depressing the SEND key (keyboard unlock) removes the shunt from the signal generator.

(d) Depressing the BREAK key for about two seconds operates the electrical keyboard lock as in (b) making it necessary to depress the SEND key to resume keyboard transmission.

(e) Hold the REPT (repeat) key depressed together with any other key except local function keys. This causes repeated transmission of the associated code combination.

(f) Depressing the LOC CR (local carriage return) key causes the carriage to return to the left-hand margin.

(g) Depressing the upper case S key causes the bell to ring once each time the key is depressed.

(h) Depressing the blank key alternately with any other key, except the local function keys, will not lock the keyboard. Depressing the blank key twice in succession operates the keyboard lock, and makes it necessary to depress the SEND key to resume keyboard transmission.

(i) Depressing the spacebar, located below the bottom row of keys, initiates an electrical signal, as well as a mechanical allowance, for a space (as between words) in the page printed message.

(j) Depressing the FIGS (figures) key conditions the equipment on the line for printing symbols indicated on the upper part of the keys, such as, figures, punctuation marks, or other upper case symbols.
(k) Depressing the LTRS (letters) key conditions the equipment on the line for printing characters indicated on the lower part of the keys.

CABINET LIGHTS

2.03 The margin indicator lamp, located to the right on the cabinet dome, is illuminated six characters before the end of a page printed line, or six characters before the counted end-of-line position. Care should be taken to avoid overtyping the last character.

2.04 The cabinet lights are controlled by a three-position switch located inside the top cover to the left of the top door. With the set connected to power, the power switch in the ON position, and the light switch in the OFF position, all lights will be off. With the light switch in the NORMAL ON position, all lights will be on except the end-of-line indicator lamp. With the light switch in the MAINT.ON position, all lights will be on continuously except for the end-of-line indicator lamp.

2.05 With the set connected to power, the power switch in the OFF position, and the light switch in the MAINT.ON position, all lights will be on except the end-of-line indicator lamp.

Note: The left and right margins of the teletypewriter set are adjusted at time of installation. The operator should not attempt to make these adjustments.
28 KEYBOARD SEND-RECEIVE (KSR) AND RECEIVE-ONLY (RO) TELETYPETRITER SETS
DISASSEMBLY AND REASSEMBLY

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2. DISASSEMBLY AND REASSEMBLY ... 1

SINGLE UNIT CONSOLE OR TABLE MODEL SETS .................................. 1
SKINTIGHT OR RACK MOUNTED SETS ........................................... 2
WALL MOUNTED SETS .......... 2
MULTIPLE MOUNTED KSR AND RO SETS ...................... 2

1. GENERAL

1.01 This section provides the information for the disassembly and reassembly of component units from a 28 Keyboard Send-Receive (KSR) or a Receive-Only (RO) Teletypewriter Set.

1.02 The sequence of procedures outlined herein should be followed when disassembly of a complete set is undertaken. Refer to Section 570-005-800TC for list of tools.

CAUTION: REMOVE ELECTRICAL POWER FROM SET BEFORE STARTING DISASSEMBLY.

2. DISASSEMBLY AND REASSEMBLY

2.01 When removing a unit from the set, the procedure followed and the location from which mounting screws are removed should be carefully noted so that reassembly can be done correctly. Where no specific instructions are given for reassembly, reverse the procedure used in removal of the unit.

2.02 Unlatch and raise the cabinet dome. Reach inside the cabinet and loosen the knurled thumb screw at each end of crossbar. Slide the crossbar toward either end and lift out.

Note: The KSR or RO set may be tilted in the LAC cabinet for better access to the rear of the typing unit or to the electrical service unit. In order to tilt the units, remove the two screws with lockwashers and flat washers that secure the rear cradle rail to the right and left cradle rails. Raise the typing unit and base up at the rear until the rear cradle rail is latched by a latch provided on the right side of the cabinet.

2.03 Remove the four screws that secure the typing unit to its base. Disconnect the cable connector from the right side frame. Lift the typing unit up and out of the cabinet.

2.04 Remove the four hexagonal studs (one at each corner) that secure the keyboard or base to the cradle of the cabinet. Unplug the cable connector at left rear portion of the keyboard or base. Lift keyboard or base up and out.

2.05 Remove the mounting stud from each end of the electrical service unit. Disengage the switch rod from the right end of the electrical service unit box by pressing against the tension of its retaining spring, and sliding the rod several inches forward. In replacing the rod make sure the forward end points to the right.

Note: The electrical service unit may be turned upside down in cabinet for servicing.

2.06 To completely remove the electrical service unit from the cabinet, disconnect the remaining cables and wires from the terminal board at the rear of the cabinet. Lift unit out.
2.07 The lower compartment door on floor models (if equipped) may be completely removed and used as a maintenance tray. Loosen the two fasteners that hold the top of the door closed and lower the door. Remove the rod at the bottom of the door by compressing the spring on the rod. Place the two rubber bumpers found in the enclosed bag onto the two front upright projections of the electrical service unit, if they are not already installed. With the typing unit removed, and the crossbar reinstalled, place the bottom part of the door inside upward on the rubber bumpers, which are on the front legs of the electrical service unit, and rest the handles of the door on the crossbar assembly.

SKINTIGHT OR RACK MOUNTED SETS

2.08 To remove the cover from the set, unlatch lock lever at the front of keyboard on some models, other models are fastened with three screws, and lift cover upward and off the base.

2.09 Remove the four screws that secure the typing unit to the base; unplug the cable and lift the typing unit upward off the base.

2.10 Remove four screws that secure the keyboard to the cradle or subbase. Disconnect the electrical cables and lift keyboard out.

2.11 Remove the mounting stud at each end of the electrical service unit in the rack mounted set and turn the unit upside down for servicing. On skintight sets, remove the electrical service unit cover. Remove the stud at each end of the electrical service unit and lift the unit off.

WALL MOUNTED SETS

2.12 To remove the cabinet from the set, unlatch and lower the bottom compartment door. Remove two screws inside the back bottom edge of the cabinet that fasten the cabinet to the wall plate. Pull bottom of cabinet away from wall, lift upward and off.

2.13 Remove the four screws that secure the typing unit to the base. Unplug the cable connector from the right side frame. Lift typing unit off the base.

2.14 Remove the four hexagonal studs (one at each corner) that secure the keyboard or base to its mounting. Unplug the cable connector from the back of the keyboard. Lift the keyboard or base out.

2.15 To remove the electrical service unit, lower the magnetically latched front plate on which the terminal boards are mounted. Lift the electrical service unit out from its mounting pads.

MULTIPLE MOUNTED KSR AND RO SETS

2.16 Unlatch and lower the covers at the front of the cabinet. Pull a drawer with its typing unit and base forward.

2.17 To remove a typing unit, remove the four screws which fasten it to its base. Unplug the cable from the typing unit. Lift the unit up and off the base.

2.18 To remove the keyboard or receive-only base, remove the four hexagonal studs (one at each corner) that secure keyboard or base to the brackets on the keyboard panel.

2.19 Remove the paper winder belt from its drive pulley if present.

2.20 Unplug the cable from the back of the keyboard and lift keyboard with motor unit out.

2.21 Pull open bottom compartment door for access to electrical service unit.

2.22 To remove the back panel, unscrew the mounting screws and lift out.

2.23 The base assemblies with the paper winders may be lifted out the front for a short distance without disconnecting any cables. If further removal is desired, the cables must be disconnected.

2.24 The electrical service unit may be brought out the backway for servicing by removing its mounting screws.
1. GENERAL

1.01 The components of 28 Send-Receive (KSR) and Receive-Only (RO) Teletypewriter Sets may be installed in the following enclosures: the floor model, the table model, the rack mounted cover, the wall mounted cabinet, and the multiple KSR and RO enclosures.

1.02 The enclosures are of sheet metal construction and are finished internally and externally in baked enamel. Physical dimensions of each enclosure type are listed in Table 1.

<table>
<thead>
<tr>
<th>Enclosure Type</th>
<th>Height (Inches)</th>
<th>Width (Inches)</th>
<th>Depth (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor Model</td>
<td>39</td>
<td>20-1/2</td>
<td>18-1/2</td>
</tr>
<tr>
<td>Table Model</td>
<td>16</td>
<td>20-1/2</td>
<td>18-1/2</td>
</tr>
<tr>
<td>Rack Mounted Cover</td>
<td>12</td>
<td>17</td>
<td>24</td>
</tr>
<tr>
<td>Wall Mounted Enclosure</td>
<td>30-3/4</td>
<td>16-1/2</td>
<td>14-1/2</td>
</tr>
<tr>
<td>Multiple KSR and RO Enclosures</td>
<td>72</td>
<td>21-1/2</td>
<td>28</td>
</tr>
</tbody>
</table>

2. DESCRIPTION

2.01 FLOOR MODEL ENCLOSURE (Figures 1 and 2)

The floor model enclosure contains an upper compartment for housing of the keyboard or receive-only base, the typing unit, and the electrical service unit, and a lower panel for storage or accessory equipment installation.

2.02 The upper compartment has a dome shaped lid, which is hinged at the rear. The dome is unlatched by a pushbutton and is counter-balanced by a stop arm mechanism that aids in raising and supporting it in the open position. The dome contains a window through which the printed copy may be viewed and which also serves as a copy tearing edge. Access to the copy is made through a hinged copy door that is unlatched by a pushbutton mechanism. Incandescent lamps located under the dome illuminate the copy. A three-position switch controls the copy lamps. Accessible when the dome is raised, the copy-lamp switch provides the following operating modes: NORMAL ON, OFF, and MAINT (maintenance) ON.

2.03 The cradle assembly, which forms the floor of the upper compartment, will accommodate either a keyboard or receive-only base. The cradle permits the mounted units to be tilted forward for inspection and maintenance.

2.04 Terminal boards for power and signal line connections are located on the inner rear wall. The electrical service unit is placed to the rear of the keyboard or receive-only base. Its power switch is controlled through a lever at the front of the enclosure.

2.05 Rubber sealing strips are applied to the edges of both the dome and the door of the lower panel for silencing purposes.

2.06 The floor model enclosures may be equipped with the following accessories:

(a) A signal bell, to make audible those signals that are transmitted for supervisory purposes.
Figure 1 - Floor Model Enclosure
Figure 2 - Floor Model Enclosure (with Electrical Service Unit)
(b) Electrical noise suppressors, to minimize electromagnetic radiation from the signal and power lines.

(c) A margin indicator lamp, which may be equipped with a line balancing resistor.

(d) A copy tray, with a movable copy holder and line guide.

(e) An offset copy holder.

(f) An apparatus mounting rack, which installs in the lower panel, for mounting accessory equipment.

(g) A sprocket-feed paper guide.

(h) A directory holder.
(i) A form-out alarm mechanism.
(j) A busy line indicator lamp.
(k) A paper supply and accumulating shelf.
(l) A paper winder.

TABLE MODEL ENCLOSURE (Figure 3)

2.07 The table model enclosure differs from the floor model enclosure (2.01 to 2.06) in that it contains no storage area (lower level).

RACK MOUNTED COVER (Figure 4)

2.08 The rack mounted cover provides housing for a send-receive keyboard or receive-only base, motor, and typing unit; the electrical service unit is contained in a separate enclosure. The unit enclosure and the electrical service unit enclosure are installed on a common base plate, with the cover occupying the forward section. The close-fitting design of the cover provides a reduction in weight and noise, and better sealing against dust.

2.09 Access to the interior of the enclosure is made through dual, hinged lids. The rear lid is held in the open position by a stop arm mechanism. The front lid is released by a pushbutton latch mechanism. It contains a transparent panel through which the printed copy may be viewed. The cover is secured to the base plate by a latching mechanism, which is operated by a lock lever from the front of the enclosure.

2.10 A copy lamp switch controls lamps that illuminate the printed copy. A margin indicator lamp and a copy tray, equipped with a movable copy holder and line guide, are also provided.

Figure 4 - Rack Mounted Cover
2.11 All external signal and power connections are made through terminal boards in the electrical service unit. A receptacle is provided in the cover for connection with the electrical service unit.

WALL MOUNTED ENCLOSURE (Figure 5)

2.12 The wall mounted enclosure provides housing for a KSR or RO Set. The enclosure is intended for installation directly to the wall surface in areas where it is desired to conserve floor space. Mounting may be made to a variety of wall materials, including: masonry, hollow or solid wood, lath and plaster, plasterboard and tile walls.

2.13 The principal parts of the enclosure are the cover, back plate assembly, and the frame assembly. The cover contains a lid which may be opened for access to the typing unit ribbon mechanism, typebox and copy paper thread-
ing area, and a window for viewing the printed copy and for use as a copy paper tearing edge. A copy lamp, controlled by the motor-power switch, is provided for illumination of the printed copy. The front surface of the cover contains a copyholder tray with an adjustable, combination line guide and retainer. The lower level of the cover has a magnetically-latched door, which provides access to the electrical service unit and paper supply.

2.14 The backplate assembly is used to mount the enclosure to the wall surface. It contains a paper chute and provides support for the frame assembly, to which the cover is secured. One large, centrally positioned isolation mount, and two stabilizing mounts isolate the frame assembly from the back plate assembly.

MULTIPLE KSR AND RO ENCLOSURES
(Figure 6)

2.15 The multiple KSR and RO enclosures provide housing facilities for either two RO sets and one KSR Set, or three RO Sets. In general, the enclosures accommodate the following methods of copy handling:

(a) Single copy paper, fed out and torn off.

(b) Single copy paper, displayed on a copy display rack and wound on a paper winder.

(c) Two-ply paper, the first copy torn off, the second copy displayed and wound on a paper winder.

2.16 Typically, the enclosures are of double-frame construction, consisting of an inner and an outer frame. The inner frame contains three sets of slides, installed in a step-like arrangement for mounting the teletypewriter sets. They permit partial withdrawal of the sets for maintenance purposes. The lower level of the enclosure contains the electrical service assembly, installed on a mounting panel. In some enclosures, electrical service units are used. Access to the lower part of the enclosure is made through a hinged door. Access to the rear of the units may be made by removing the rear panel.

2.17 Each of the two upper sets of slides (and also the lowest set of slides if three RO sets are to be installed) contain a base plate with an intermediate gear assembly, paper winder assembly and wiring for installing and connecting a typing unit and a motor unit. The lower set of slides mount a send-receive keyboard or receive-only base, equipped with a typing unit, motor unit and paper winder assembly.

2.18 In some enclosures, a hinged cover equipped with a copy window and push buttons for local control is installed at each teletypewriter position. In other enclosures, a single window is used. It may be raised for access to the equipment. Copy illumination systems may be provided for each position.

2.19 The enclosure may be equipped with a low-paper alarm system for each teletypewriter position. The alarm system includes a warning lamp and audible alarm, a reset switch, control relays, and a power supply. The alarm indicators and reset switch are generally installed on a control panel above the upper teletypewriter position.

2.20 When a KSR Set is installed, a panel that contains pushbutton switches for connecting the output of the keyboard to either of the three typing units, or to a separate line circuit may be provided (Fig. 6). The panel may also contain switches for the control of ac power and open line alarm lamps for each level.

2.21 The electrical service assembly may provide the following features:

(a) Copy lamp transformers for the copy lamp systems.

(b) Fuses for the ac circuits.

(c) One main power switch for the ac power to the enclosure.

(d) Control relays for switching the output of the keyboard to any of the typing unit circuits or to a separate line circuit. Power for operating the relays is supplied externally.

(e) Adjustable resistors, one for each incoming signal line, for making line current adjustments.

(f) Three selector magnet drivers (one for each typing unit) equipped with an open line sensing device which actuates an associated open line relay.
Figure 6 - Multiple KSR and RO Enclosure
(g) Terminal blocks and terminal boards for connections between the electrical service assembly and wiring of the enclosure.

2.22 External connections may enter the enclosure through several cable duct openings provided. Cabling to and from the electrical service assembly is of sufficient length to allow the assembly to be pulled forward through the access door and set on the floor for maintenance purposes.

2.23 Accessories for the enclosure include a static eliminator for the copy paper in each teletypewriter position, direct-drive paper winders for the upper two positions, and copy display racks.
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functions of the unit may be found in sections discussing specific components and complete sets. Only independent features of the electrical service unit are discussed in this section, under Principles of Operation.

### 2. DESCRIPTION

2.01 The electrical service unit (Figure 1) consists, basically, of a metal frame, or chassis, and a number of mounting plate assemblies. The chassis has four legs that permit the unit to be turned upside down for maintenance purposes. Cutouts for routing cables or mounting switches and controls, as required, are provided. The mounting plate assemblies are installed on the blank top of the chassis. Unused positions are occupied by blank mounting plates. Terminal boards and cables, required for interconnection of the assemblies with other components, are provided by the installed assemblies.

2.02 Some of the features that may be mounted on the unit are listed below:

(a) Line shunt relay assembly.
(b) Line (polar) relay assembly.
(c) Rectifier assembly.
(d) Line test key assembly.
(e) Capacitor-resistor assembly.
(f) Motor control assembly.
(g) Signal line limiting resistance.
(h) Convenience outlets (115 ac).
(i) Convenience outlet fuses.
(j) Power switch (may be installed directly on chassis).
(k) Selector magnet driver.

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Figure 1 - Typical 28 Electrical Service Unit
3. PRINCIPLES OF OPERATION

LINE SHUNT RELAY (Figures 1 and 2)

3.01 The signal line is connected through the line shunt relay contacts, either to the line relay or directly to the selector magnets of a receiving unit; e.g., a typing unit is shown in Figure 2. The solenoid of this relay is controlled by the main power switch and, if present, the motor control mechanism. If power is removed from the set, through opening of the main power switch or by action of the motor control mechanism (3.09), the relay releases and maintains signal line continuity while bypassing the local unit.

LINE RELAY (Figures 1 and 2)

3.02 The line relay is used to reduce the effects of line distortion or to convert a polar signal to the neutral form required by the selector magnets. The relay has two windings: one, the line winding, is operated by the signal line and the other, the bias winding, is operated by a local dc source, such as the rectifier assembly (3.05). Operation of the relay is as follows:

3.03 Signal Line Spacing: During a spacing (no current) pulse, current from the local dc source energizes the bias winding, causing the armature to be attracted to the space contact. In this position, no current is supplied to the selector magnets.

3.04 Signal Line Marking: During a marking (current) pulse, the signal line current applied to the line winding is of sufficient magnitude to create a magnetic flux that overcomes the attraction of the bias winding. The relay armature is attracted to the mark contact, which connects the local dc source to the selector magnets.

RECTIFIER ASSEMBLY (Figure 1)

3.05 The rectifier assembly (Figure 1) consists of a power transformer, two semiconductor type rectifiers arranged for full-wave

--- Figure 2 - Line Relay Circuit ---
rectification, and a filter capacitor. Rectifier assemblies are available providing outputs of 120, 300, and 500 mA, respectively. Each provides 120 VDC from an input of 115 VAC (±5 V), 50 to 60 cps, single phase. The output of the rectifier is normally used in local circuits, such as the receiving unit selector magnets (3.01), the line relay bias winding (3.02), and the line test key assembly (3.07). The rectifier supplying 120 mA is generally adequate for applications such as the KSR, ROTR etc. The 300 mA and the 500 mA rectifier assemblies are necessary when additional external equipment are used.

**SIGNAL LINE LIMITING RESISTANCE**

3.06 Used in place of the line relay (3.02), an assembly containing a fixed or variable resistor (rheostat) may be installed to limit the signal line current to either 0.020 or 0.060 amperes.

**LINE TEST KEY ASSEMBLY**

3.07 The line test key assembly permits manual shunting of the signal line for independent operation of the set. The assembly may be wired to draw 0.020 or 0.060 amperes from the local DC supply. It contains an additional set of contacts that may be used to provide audible or visual indications.

**CAPACITOR-RESISTOR ASSEMBLY**

3.08 An assembly composed of a capacitor and resistor may be used to permit the operation of such local components as the AC/DC series governed motor unit or the line test key assembly from a direct DC source.

**MOTOR CONTROL MECHANISMS**

**A. Relay Motor Control Mechanism**

3.09 The relay motor control mechanism provides control of motors under two different operating conditions. Connected to control a separate loop, the relay motor control mechanism will stop all motors in the loop each time loop battery is applied or removed. Connected in the signal line circuit, the mechanism will stop all motors in the circuit whenever the signal line current is reversed.

3.10 The relay motor control mechanism consists of a solenoid operator, a single-pole, double-throw enclosed switch, a terminal block, and a cable for interconnection with the motor control and power terminal block of the electrical service unit. A rectifier assembly which mounts on the terminal block is required for reversed signal line operation.

3.11 In separate motor control loop operation, the contacts of the switch are placed in the motor power circuit. Control power, which is externally supplied, energizes the switch contacts to change position. The switch contacts may be connected for motor start when the solenoid is energized and motor stop when the solenoid is de-energized, or motor start when the solenoid is de-energized and motor stop when the solenoid is energized. Resistors may be required to limit the control line current.

3.12 In reversed signal line current operation, the solenoid is inserted in the signal line circuit. The rectifier assembly is bridged across the solenoid coil with polarization that permits current flow when signals are being received. The rectifier exhibits a very low resistance in the forward direction, resulting in a negligible current flow through the solenoid coil, and minimum distortion of the signal. The switch contacts are connected in the motor power circuit to provide a closed circuit when the solenoid is de-energized. Reversing the polarity of the signal line current causes the solenoid to operate and the switch contacts to change position and open the motor power circuit.

**B. Electrical Motor Control Mechanism**  
(Figures 1 and 3)

3.13 The electrical motor control mechanism is controlled by signals generated by an external source such as a typing unit stunt box contact or by a keyboard or base unit time delay mechanism that responds to an idle signal line condition. When the mechanism is installed, the set's wiring is such that the circuit through the line shunt relay is under the control of the motor power switch in the motor control mechanism. The contacts of the line shunt relay shunt the selector magnets rather than the signal line. When the motor is de-energized by the electrical motor control mechanism, the line shunt relay is de-energized and its contacts shunt the selector magnets. This automatically sets up the double blank function in the typing unit stunt box and results in the locking up of the keyboard. The following description covers the
operation of the electrical motor control mechanism through a complete cycle.

Stop Position

3.14 In this position the motor is shut down, the line shunt relay is de-energized, the selector magnets are shunted, and the constant signal line current holds the start magnets energized. The start magnet armature is positioned toward the right, where it is held by the latch lever. The motor power switch, operated by the stop magnet armature, is open and the original line switch completes the start magnet circuit.
Open Line Position

3.15 In this position, the signal line is open, the start magnets are de-energized, and the start magnet armature is released. With the release of the start magnet armature, the latch lever is also released, permitting the stop magnet armature to swing toward the left. The movement of the stop magnet armature is blocked, however, by the start magnet armature and is not sufficient to change the positions of the motor power and signal line switches.

Start Position

3.16 In this position, the signal line is closed, and the start magnets have been energized, the start magnet armature moved downward and the stop magnet armature released. The release of the stop magnet armature enabled the motor power and signal line switches to operate. The operated signal line switch shunted the start magnets from the signal line circuit. The operated motor power switch completed the circuit through the line shunt relay, removed the shunt from the selector magnets, and completed the circuit to the motor unit.

Stop Position

3.17 The electrical motor control mechanism will return to the stop position and stop the motor unit when a pulse is received from the control circuit (3.13). The pulse momentarily energizes the stop magnet, causing the stop magnet armature to swing to the right and operate the motor power and signal line switches. The signal line switch places the start magnet coils into the signal line circuit. The start magnet coils are then energized and the start magnet armature is pulled downward. This permits the latch lever to engage the stop magnet and hold it in the stop position. The operated motor power switch opens the circuit through the line shunt relay, shunting the selector magnets and opening the circuit to the motor unit.

SELECTOR MAGNET DRIVER ASSEMBLY

3.18 The selector magnet driver assembly is a solid-state device which repeats the line signals in a form that will effectively operate a selector mechanism. The assembly is normally used in place of the line relay for this equipment. For a detailed description of the selector magnet driver operation, refer to the applicable publications.
# 28 Teletypewriter Keyboard and Base

## Description and Principles of Operation

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### 1. GENERAL

1.01 The 28 keyboard provides mounting and transmission facilities for the 28 Keyboard Send-Receive (KSR) Teletypewriter Set. The 28 receive-only base provides mounting facilities for the 28 Receive-Only (RO) Teletypewriter Set.

### 2. DESCRIPTION

#### KEYBOARD (Figs. 1, 2 and 3)

A. General

2.01 The 28 keyboard is a device for converting the mechanical action resulting from the manual depression of a key into electrical pulses that are transmitted over a signal line. In addition, the keyboard provides mounting facilities for the typing and motor units of a Keyboard Send-Receive (KSR) Teletypewriter Set, as well as for a variety of accessories.

2.02 The keyboard is installed on a cradle assembly in the floor and table model enclosures, on a base plate assembly in the wall and rack mounted enclosures, and on slide-type mountings in the multiple KSR and RO cabinet. The front of the keyboard protrudes beyond the enclosure and is fitted with a rubber pad that seals the edges of the aperture from dust and for a silencing effect.

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2.03 Motive force for activating the keyboard is derived from the motor unit by way of the typing unit. The electrical wiring to and from the keyboard is terminated in a connector mounted at the left rear of the unit. Fuses for the power circuits are located in the electrical service unit.

2.04 The keyboard is operable on line at the following speeds; 60, 75 and 100 words-per-minute; or 360, 460, and 600 operations-per-minute. Operating speeds are varied by interchanging sets of gears that are supplied as optional components. The signal generator contact box may be adapted to provide either polar or neutral signals.

2.05 The major sections of the keyboard are the base assembly, keyboard mechanism, and the signal generator mechanism.

B. Base Assembly

2.06 The base assembly provides mounting facilities for the keyboard and signal generator mechanisms, the intermediate gear assembly, cable and switch assembly, margin indicator switch, power terminal block, and optional accessories, such as the time delay and paper feed-out mechanisms.

2.07 The intermediate gear assembly consists of two helical gears, a shaft, and a mounting bracket. The assembly transfers motive
Figure 2 - 28 Teletypewriter Keyboard in Wall Mounted Set (Cover Removed)
power from the motor to the associated typing unit. Changes in operating speed are made by changing the motor pinion and the intermediate gear assembly driving gear.

C. Keyboard Mechanism

2.08 The keyboard mechanism contains the keytops, keylevers, code bars and levers and other code selecting parts that transform the intelligence contained in the manual selection of a keytop into a teletypewriter code combination, represented by code bar positions. The code combination for the selected character is transferred from the code bars through transfer levers to the signal generator mechanism.

2.09 The keytops are positioned in the conventional three-bank arrangement, with numerals, punctuation marks, and special symbols available in upper case positions. The space bar is located centrally below these keys. Keytops for local carriage return and local line feed are provided above the standard keytops for facility of operation. This row has provisions for 9 additional keys for optional, special operations. A wedge lock assembly prevents the simultaneous depression of more than one keytop.

D. Signal Generator Mechanism

2.10 The signal generator mechanism generates the start-stop teletypewriter signal. It consists of, basically, an enclosed contact box containing a set of fulcrum-type transmitting contacts, a transfer bail that controls the opening and closing of the contacts, selector levers that engage the transfer bail in a sequence determined by the position of the code bars, and a multi-lobe cam which determines the pulse duration of the signal code elements. A shaft, which mounts a gear and clutch, receives motive power to drive the mechanism from a gear on the associated typing unit.

2.11 The contact box will generate either neutral or polar signals, and may be equipped with an rf or arc suppression network.

E. Wall Mounted Keyboard (Fig. 2)

2.12 The keyboard used in wall mounted KSR sets differs from the standard keyboard in that its intermediate gear assembly contains one helical gear and one pulley. The motor unit mounts below the keyboard, on the left rear side, and its pinion engages with and drives the belt. The belt in turn engages with and drives the belt pulley and the attached intermediate shaft as-

Figure 3 - 28 Teletypewriter Keyboard (Top View)
assembly. A gear on the intermediate shaft assembly transfers the motive power to the typing unit.

F. Variable Features

2.13 The keyboard has provisions for accommodating a variety of accessories, including the following:

(a) Motor start for page feed out.
(b) Time delay motor stop.
(c) Local reverse line feed.
(d) Local back space.
(e) Signal line break.
(f) Keyboard lock and unlock.
(g) Repetition of characters.
(h) Repeat on space.
(i) RF and arc suppression.
(j) Answer-back (automatic station identification).
(k) Synchronous pulsed transmission.
2.14 The receive-only base is an aluminum, sheet metal structure used in place of the send-receive keyboard when receiving facilities only are required. It supports the motor unit and the typing unit and provides for carriage return and line feed operation of the local typing unit. It does not incorporate code selecting and signal generating mechanisms. The receive-only base may include the following accessories:

(a) Signal line break.
(b) Motor start for page feed out.
(c) Time delay motor stop.
(d) Margin indicator lamp contact.
(e) Print/non-print switch.
(f) Local transmitter control.

2.15 The wall mounted receive-only base used in wall mounted RO sets differs from the standard base in that its intermediate gear assembly contains only one helical gear, and a belt drive system is used.

3. PRINCIPLES OF OPERATION

KEYBOARD

A. Depression of Keys (Figs. 5 through 9)

3.01 As a code selecting keytop is depressed, the corresponding code lever rotates about its pivot point. The rear end of the code lever comes up and rotates the universal bail. The extension arm on the top of the universal bail moves out of engagement with the step at the rear end of the universal bail latch. This
occurs when the key and corresponding code lever are about two-thirds of the way toward full stroke. The universal ball latch then moves downward under spring force developed by the universal ball latch spring. As this latch comes down, it strikes the code bar reset ball latch lever and carries it downward. When the corner of the reset ball latch descends beyond the center line of the needle bearing (mounted on the reset ball), the various spring forces acting on the reset ball cause it to swing to the right. This in turn allows the various code bars to move to the right (in the direction of the spring forces acting on each code bar). During this time, the code lever is moved up to its full position. Therefore, the code lever may stop some of the code bars from moving to their extreme right hand position. The code bars have vertical extensions that engage a curved part of the signal generator transfer levers. Those code bars that are permitted to move to the extreme right also move the corresponding transfer lever to the right. However, those code bars that are stopped, because their teeth engage the actuated code lever, do not quite touch or move their corresponding transfer levers. Therefore, these transfer levers remain in their normal left hand position (Fig. 8).

3.02 A locking wedge is mounted on the projection of the lower position of all code levers and function levers. When the lever is operated, its locking wedge moves downward between the lock balls in the lock ball channel preventing the simultaneous operation of more than one key lever (Fig. 6).

3.03 Simultaneously with the trip-off of the reset bail and the movement of the code bars to the right, the clutch trip bar (located in the rear slots of the code bar guides) moves to the right. This clutch trip bar engages the clutch stop lever and moves it out of latch with the clutch stop lug. Up to this point, all of the action has been caused by manual operation of the keytop and its associated code lever (Fig. 5).

3.04 The motor unit (mounted on the rear right corner of the keyboard base) supplies the mechanical power to drive the associated typing unit and the signal generator shaft that is geared to the typing unit main shaft. Re-

Figure 6 - Wedgelock Mechanism
fer to the appropriate section for description and principles of operation for the motor unit.

B. Positioning of Code Bars (Figs. 5, 7 and 8)

3.05 Once the clutch is tripped, it rotates continuously as long as the keyboard is turned on. Since the clutch shoes are mounted on a plate that is part of the cam assembly, the cam begins to rotate (clockwise when viewed from the front of the keyboard).

3.06 The arrangement of the cam assembly is such that the third cam from the rear begins to push downward on its corresponding transfer lever. At almost the same time, the eighth cam from the rear begins to move the transfer lever locking ball upward. The blade portion of this locking ball goes up beside a downward projection on each transfer lever. The locking projection is left or right of the locking ball, depending upon the position of the transfer lever (as set up by the permutation action of the code bars). Thus, in the first few degrees of cam rotation, the permuted position of the transfer levers is located into position and the code bars are free to be reset in their normal latched position.

3.07 The cams and their corresponding transfer levers are numbered from rear to front. The number 3 cam engages its transfer lever first; and moves it down. Since the start pulse is always spacing, no code bar is required to engage this lever and it is always held to the left by its spring. Therefore, as the third cam moves the lever down, the hook at the upper right side of the transfer lever engages the right side of the transfer (rocker) ball. This tips the transfer ball to the right and pulls the contact drive link to the right. The resulting action of the contact toggle is such that the left set of contacts acts as a pivot and the right hand contacts begin to open. The right hand contacts control the signal current in single contact type operation. When these contacts are open, the result is no current in the signal circuit. Therefore, the first pulse, the start pulse of any character code is a spacing (no current) pulse.

3.08 The number 1 cam and the transfer lever move downward next. In turn, the upper left hook of the associated transfer lever pulls down on the rocker ball (holding it to the right or tilting it back to the left). This pushes the drive link to the left (or right) resulting in clos-
ing the right (or left) contacts and allowing a marking (or spacing) pulse to be transmitted.

3.09 Similarly, the remaining transfer levers 2, 4, 5 and 6 are pulled downward by their respective cams. The resulting pulse is marking if the transfer lever is to the right or spacing if it is to the left. The number 7 transfer lever is held to the right by a stop pin. Therefore, the last pulse (the stop pulse) is always marking (current on).

3.10 The locking bail is actuated by the number 8 cam lobe. This cam begins to move the locking bail up into its locking position almost as soon as the cam starts to rotate (Fig. 9). Full lock position occurs approximately at the half-way point of the start pulse (48-1/2 degrees of rotation). The dwell on the eighth cam from the front holds the lock ball in its lock position until after the beginning of the number 5 pulse. Then the cam pulls the bail down out of lock, and all transfer levers are free to return to their initial positions at a point about halfway through the stop pulse.

C. Resetting of the Code Bars (Fig. 7)

3.11 Reset of the code bars is accomplished by means of an eccentric on the front of the cam assembly, which drives an eccentric follower arm (Fig. 7). This arm engages a stud on the side of the reset bail and pulls the reset bail to the left as the cam rotates. At the peak position of the reset eccentric, the code bar reset bail latch is clear of the needle bearing stud. This permits the latch spring to pull the latch up into locking position and the code bar reset bail is latched as the eccentric drives the follower arm back to its initial position. As the code bar reset bail is moved to the left (into reset), it engages projections on the permutation code bars, clutch trip bar, and a step on the non-repeat lever. Thus, all of these elements are moved to the left into latched reset position.

3.12 The reset eccentric is positioned in an angular relationship to the remainder of the cam so that pick-up of the code bars and non-repeat lever begins. Just after the number 2 pulse begins, near the end of the start pulse, the

Figure 8 - Code Bar Selection
code bars have been moved to the left a sufficient distance to permit the code lever (that determined the permutation) to drop down out of the universal bail. This permits the universal bail to rotate forward and move the non-repeat lever down and off the reset bail. At the same time, the extension of the universal bail moves in under its latch lever and holds this latch lever up almost in the same position that the pawl on the non-repeat lever had held it in the early reset movement. With the universal bail latch held up, the reset bail continues to move to the left. Full rest occurs at approximately 180 degrees of cam rotation 1/4 through the number 3 pulse). As soon as the universal bail is permitted to move forward, a second keytop can be depressed. However, from that point on, full time of cam rotation must expire before a third and successive keytops can be operated.

FUNCTION KEYS

A. Local Carriage Return Mechanism (Fig. 10)

3.13 Operation of the local carriage return keylever causes its function lever to raise the forward end of the local carriage return ball (Figure 10). The ball rotates about its pivot point until the upper end engages the carriage return lever on the typing unit. Thus, the carriage return mechanism on the local typing unit is made to operate without disturbing the other typing units on the same line circuit.

B. Local Line Feed Mechanism (Fig. 12)

3.14 Operation of the local line feed keylever causes its function lever to raise the forward end of the local line feed ball (Fig. 12). The ball rotates about its pivot point and the upper end pushes the trip link until the link engages the line feed clutch trip lever on the typing unit. The actuated line feed mechanism on the local typing unit operates without disturbing the other typing units on the same line circuit.

C. Signal Line Break Mechanism (Fig. 11)

3.15 Operation of the BREAK keylever opens the signal line circuit until the keylever is released. Depression of the keylever engages the signal break ball, lifting it upward. The upper area of the signal break ball moves downward and actuates the normally closed signal line switch. Upon release of the keylever, a return spring exerts a force that moves the upper end of the signal break ball upward, closing the signal line circuit.
Figure 10 - Local Carriage Return Mechanism

Figure 11 - Signal Line Break Mechanism
Figure 12 - Local Line Feed Mechanism
D. Keyboard Lock Mechanism (Fig. 13)

3.16 The keyboard may be locked manually (local) or electrically (remote). Local locking of the keyboard is achieved by operation of the keyboard lock (KBD LOCK) keylever, which causes its function lever to raise the lock bar pawl. Spring tension on the lock bar moves it to the extreme right position. In this position, the square teeth on the lower part of the lock bar are positioned over each code keylever. This restricts the movement of any selected keylever, preventing trip off of latches and the generation of a signal.

3.17 Remote keyboard locking occurs when two consecutive blank code signals are received by the associated typing unit. Reception of this code results in the keyboard lock lever to move downward. The lock lever engages the keyboard lock plunger and moves it downward. As the plunger operates, it exerts a pressure on a yield spring, which engages the keyboard lock ball. The lock ball rotates about its pivot point, engages the keyboard lock function lever, and raises it. This operation trips off the lock bar pawl. With the tripping of the lock bar pawl, the locking action that results is identical to that described above.

E. Keyboard Unlock Mechanism (Fig. 14)

3.18 Operation of the keyboard unlock keylever (KBD UNLK) causes its function lever to move the lock bar to the left to a position where the lock bar pawl falls into a notch in the top of the lock bar. In this position, the lock bar teeth are between code selection levers and do not restrict their operation.

F. Margin Indicator Mechanism (Fig. 15)

3.19 The margin indicator cam disc on the typing unit spring drum rotates with the drum as printing or spacing occurs. As the end of each line is approached, the cam surface of the disc makes contact with the margin indicator contact lever and rotates it clockwise about its pivot point (Fig. 15). When the contact lever leaves the switch plunger, the margin indicator switch closes the circuit to a margin indicator lamp, mounted in the set's enclosure. A carriage return cycle returns the cam disc to its starting position and opens the switch.

4. RECEIVE-ONLY BASE

4.01 The receive-only base is a structure which supports an intermediate gear assembly and provides mounting facilities for a typing unit and a motor unit. Two keylevers, CR (carriage return) and LF (line feed) are mounted on the front of the unit, and provide off-line operation only. All electrical wiring is brought into the base through a receptacle mounted at the left rear of the base (Fig. 4).

5. VARIABLE FEATURES

5.01 The operation of some of the mechanisms and components available as accessories to the keyboard or base (as indicated) is covered in the following paragraphs.

MOTOR START FOR PAGE FEED OUT

5.02 This accessory device installs on the keyboard or base and provides motor-driven feed out of copy paper when the LOC LF
TIME DELAY MECHANISM (Fig. 16)

5.03 The time delay mechanism operates in conjunction with the motor control mechanism in the electrical service unit to provide automatic motor unit stop after a predetermined interval of idle signal line time has elapsed. The mechanism contains two ratchet wheels—one with 27 teeth, and one with 28 teeth. A reciprocating eccentric follower pawl, powered by the keyboard intermediate shaft, drives the ratchet wheels, one tooth at a time. The latch pawl rides the inside flanges of the ratchet wheels and controls the contact pawl latching lever, which holds the contact pawl away from the flanges. Each ratchet wheel has an indentation in its inside flange. After a maximum of 756 revolutions of the intermediate shaft, these indentations are adjacent for almost one revolution. When the adjacent indentations pass over the latch pawl, it drops into them, briefly, and then disengages the contact pawl latching lever from the contact pawl. This permits the contact pawl to ride the flanges of the ratchet wheels until either one of two events occur.

5.04 If a line signal is received before 756 revolutions of the intermediate shaft, the typing unit main bail drive extension engages the upper end of the contact pawl and causes it to again be latched by the contact pawl latching lever. This begins a new cycle of time measurement.

5.05 If a line signal is not received before 756 revolutions of the intermediate shaft, the indentations in the flanges of the ratchet wheels again become adjacent and permit the contact pawl to drop. This action results in a pulse transmission to the motor control mechanism, which responds by switching off the motor unit.

5.06 The time elapsed between the reception of the last line signal and the stopping of the motor unit varies with the operating speed. For 60 wpm, the range is 86 to 172 seconds; 75 wpm, 60 to 120 seconds; and 100 wpm, 53 to 106 seconds.

5.07 The mechanism may be disabled by adjusting an eccentric that moves the eccentric follower pawl out of engagement with the ratchet wheels. Motor unit operation may be restored by opening the signal line circuit (eg, depressing the BREAK key lever).
Figure 16 - Time Delay Mechanism

Figure 17 - Repeat Mechanism
LOCAL REVERSE LINE FEED

5.08 This mechanism is installed on a keyboard to enable off-line feeding of the copy paper in the downward (reverse) direction. The LOC R LF (local reverse line feed) keylever initiates the operation.

LOCAL BACK SPACE

5.09 This mechanism permits the insertion of a backspace at the local typing unit when the LOC BSP (local back space) keylever is operated. It is installed on the keyboard only. Refer to the sectionalized literature for the 28 typing unit for description of operation.

REPETITION OF CHARACTERS (Fig. 17)

5.10 To repeat a character, the REPT (repeat) keylever is operated simultaneously with one of the keylevers in the three-row bank, or the space bar. Levers associated with the REPT keylever engage the non-repeat lever, preventing the reset bail from engaging the step. Therefore, the universal bail latch lever remains in the down position, preventing the code bar reset bail latch from moving up into the full latch position. This permits the reset bail to follow the eccentric arm movement. As a result, the code bars and their transfer levers are in the permutation position at the start of each repetitive cycle, and the same pulse pattern is transmitted to the signal line.

REPEAT-ON-SPACE MECHANISM (Fig. 17)

5.11 A keyboard equipped with a repeat-on-space mechanism will automatically transmit the space function for as long as the space bar is operated. When the space bar is depressed, the rear portion of the space code lever engages and lifts the lower end of the space repeat lever. As the space repeat lever moves clockwise (viewed from the front), it engages the code bar bail latch lever. The code bar bail latch lever drops downward and is held in this position until the space bar is released.

RADIO FREQUENCY NOISE AND ARC SUPPRESSION

5.12 The keyboard may be equipped with rf noise and arcing suppression circuitry. Installed in the signal generator contact box, the suppression circuit may be for rf or arcing only, or a combination circuit for both types of interference.
ANSWER-BACK MECHANISM (Figs. 18 and 19)

5.13 The answer-back mechanism is an electro-mechanical device which permits the identity of a called station to be transmitted automatically to the originating station, in response to a coded, sequential message from the signal line. The HERE IS keytop is provided for manual operation. Transmissions are generated in the normal manner by the keyboard, which, through its code bar mechanism, reads the code combination contained in a message drum.

5.14 The mechanism is comprised basically, of a coded message drum, control relay, and keyboard contacts. The drum is coded for the desired combination by removing code tines from the 21 code blades provided, as required (Fig. 18). The first character transmitted is always a L'TRS combination to place the called station in the unshift position; the other 20 may be any characters desired. However, the first transmission is usually followed by CR and LF. This sequence is also typically used to end a coded sequence, to insure that the answer-back message will appear at the beginning of a line at the distant station and that over-printing of the message will not occur. Typically, 16 characters are available for the answer-back identification.

5.15 The following explanation of operation uses the combination FIGS - D as an example. The combination used may vary with the application.

A. Called Station

5.16 The answer-back message is initiated at the called station by depressing the FIGS, upper case D combination at the originating station. The operation of the FIGS function box contact at the called station will de-energize the answer-back (non-contention) control relay if this relay is in an energized condition prior to the reception of the FIGS combination. The closing of the D function box contact then completes a circuit to the answer-back trip magnet via normally closed control relay contacts; the D contact also locks the keyboard through a lever extension to the blank-blank sequence locking mechanism, if the set is so equipped.

5.17 The closure of this circuit energizes the answer-back trip magnet and results in the counter-clockwise rotation of the armature and associated stop-lever latch, thereby un-blocking and releasing the stop lever. Under the bias of a spring attached to the code bar latch operating lever, the stop lever rotates counter-clockwise until it comes to rest against the mechanism base plate. Before coming to rest the stop lever moves the blocking lever counter-clockwise, thereby unblocking the drive plate and releasing it to its spring action. The drive plate rotates counter-clockwise to a stop where the attached drive link is in a position to accept the feeding motion from the keyboard code bar bail. As the stop lever continues its counter-clockwise rotation, the code bar ball latch operating lever rotates clockwise, striking the code bar ball latch. The latch rotates clockwise and releases the code bar ball. The code bar ball releases the keyboard code bars and the clutch trip bar, which move to the right under spring action. The clutch trip bar thereby trips the signal generator clutch and initiates an operating cycle.

5.18 While the code combination transmitted during the first cycle must be a letters combination, the code combinations of the succeeding 20 cycles may be any arbitrary character determined by the detachable code blades fastened to the code drum. The code combination on each blade is read by five sensing levers which transfer the code selections to a vertical projection on each of the 5 code bars. Each code combination is thus transmitted in the normal manner by the keyboard signal generator mechanism. A spacing condition occurs whenever a code bar is prevented from moving to the right by its associated sensing lever; unrestricted movement of a code bar results in a marking condition. Since the sensing levers must be held away from the code bars, in order to prevent their interference during normal keyboard operation, a stop code blade having a letters combination is used. This results in a letters combination for the first character.

5.19 Once during each rotation of the signal generator cam assembly, the code bar ball is pulled to the left by a cam eccentric, causing it to rotate clockwise. The ball thereby resets the keyboard code bars and, with the character generator drive link now in its released position, rotates the drive plate clockwise. This action causes the stepping pawl to step the code drum one position clockwise.

5.20 With the stop lever in its released position, the code bar ball latch operating lever also maintains the code bar ball latch in a released position. The signal generator mechanism will cycle continuously until it rotates the code drum one full revolution or 21 characters. The first code blade, which is the
SECTION 573-116-100

115 VOLTS AC

SLOT 34 U.C.D CONTACTS
(IN TYPING UNIT STUNT BOX)

SLOT 33 FIGURES CONTACTS

KEYBOARD PULSING CONTACTS

ANSWER-BACK CONTROL RELAY

HERE-IS KEYBOARD CONTACT

SPARK SUPPRESSOR NETWORK

Figure 19 - Typical Answer-Back Circuit
stop code blade having a letters combination, has an additional projection. When it is being rotated into the sensing position, the projection contacts the stop lever, rotating it clockwise. The left extension of the stop lever rotates the code bar ball latch operating lever counterclockwise, which in turn releases the code bar ball latch to the action of its attached spring. Continued rotation of the stop lever brings it in a position where if released to the action of the spring attached to the code bar ball latch operating lever, it will reverse rotation and become latched on the stop lever attached to the trip magnet armature. Such a position is reached when the stop code blade passes its area of contact with the stop lever which is just prior to the complete movement of the stop code blade into the sensing position.

5.21 When the code bar ball latch is released to its spring action, it rotates counterclockwise in contact with the code bar ball latch roller until it latches the code bar ball. At this point the blocking lever is also released to its spring action and it rotates counterclockwise until it rests against a projection on the stop lever. In this position the blocking lever holds the drive plate in its extreme clockwise position and the attached drive link is once more unable to follow the feeding motion from the code bar ball. Further operation of the signal generator and character generator is thus prevented. At this point the operator must manually unlock the keyboard to restore it to its normal operating condition if the set is equipped with the blank-blank sequence locking mechanism.

B. Originating Station

5.22 The keyboard pulsing (or blinding) contact, mounted on the signal generator assembly, is operated every keyboard cycle by a cam which is mounted on the signal generator shaft. The pulsing contact is timed to close before the beginning of the start pulse and remain closed until after the end of the 5th pulse.

5.23 Each time it operates, the keyboard pulsing contact will energize the answerback control relay; the control relay will remain energized via its own contacts, and the FIGS stunt box contact.

5.24 The FIGS stunt box function pawl in the typing unit is specially designed to engage the FIGS function bar at all times. The pawl is never stripped by the stripper ball. This means that the function pawl holds the function lever away from the FIGS contact. When the FIGS function bar is selected, it will permit the pawl and lever to move forward and operate the FIGS contact (the normal stunt box...
operation is such that the contact does not operate until the selected function bar has first moved forward and then rearward).

5.25 This arrangement converts a normally-open, momentary-operate FIGS contact to a normally-closed, momentary-operate FIGS contact and advances the timing of the FIGS contact operation to insure that either the FIGS contact or the keyboard pulsing contact will keep the control relay energized during every signal generator cycle.

5.26 The local operator depresses the FIGS - D combination to call the remote station. The FIGS contact may or may not de-energize the control relay depending upon how long afterwards the operator depresses the D combination. In any event, the D combination will again energize the control relay, if necessary. The local answer-back will, therefore, be disabled due to the opening of the normally closed control relay contacts, which are in series with answer-back trip magnet.

SYNCHRONOUS PULSED TRANSMISSION (Fig. 3 and 20)

5.27 Upon operation in the appropriate key-lever, the reset bail in the keyboard is moved to the right and releases the selected code bars. The universal code bar (a modified clutch trip bar) is released and moved to the right also, at which time it closes the clutch magnet conditioning contact. This action enables the clutch trip magnet to respond to an externally supplied synchronous pulse (50 or 100 milliamperes of 20 millisecond duration). When energized by the synchronous pulse, the clutch trip magnet releases and moves the clutch trip bar to the right. This movement causes the clutch trip bail extension to trip the signal generator clutch. The signal generator cam shaft then rotates and transmits the selected signal.

5.28 During the single rotation of the signal generator cam shaft, the reset bail is rotated clockwise and latched. The universal code bar, clutch trip bar, and the five code bars are moved and held to the left by the reset bail.
28 TYPING UNIT
DESCRIPTION AND PRINCIPLES OF OPERATION

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### 1. GENERAL

1.01 The 28 typing unit is an electromechanical unit that translates a five-level, electrical, start-stop (teletypewriter) code into mechanical motions that print information on page-width paper. It will operate at various speeds up to 100 words per minute. There are two basic units: The friction feed which prints on single or multiple copy paper fed from a roll, and the sprocket feed which prints on folded, form-feed paper with perforations spaced to fit teeth on the platen. In addition, a number of variable features are available.

1.02 Unless stated to the contrary, references in the text to "left" or "right" indicate the operator's right or left, facing the front of the unit, the selector mechanism at the right, and the type box at the front. In illustrations, unless specifically labeled otherwise, it is assumed that the equipment is being viewed from the front. Pivot points are shown in the drawings by circles or ellipses which are solid black to indicate fixed pivot points and crosshatched to indicate floating points.

1.03 With the main shaft under power (associated equipment main power supply on), the typing unit is described as running closed when a steady current (marking) condition is maintained in the signal line and no signal intelligence is received. It is described as running open when a no current (spacing) condition is maintained through an interruption in signal line current.

### 2. DESCRIPTION

#### GENERAL (Figs. 1 through 5)

2.01 The basic function of the 28 typing unit is to record in page printed form information received from a signal line in the form of a signaling code combination which represents characters or functions. The typing unit translates these electrical code combinations into mechanical motions which imprint the message or initiate the indicated function, such as line feed, carriage return, or signal bell. Printing is accomplished through an inked ribbon upon paper rolled around a horizontally stationary platen while the type and printing mechanism move from left to right across the page. All operations of the typing unit are performed automatically in response to input signal code combinations. A few local off-line functions such as line feed, or carriage return may be initiated.
2.02 Character representations, or graphics, are the alphabetic, numeral or symbol intelligence equivalent of the input code combinations. Function representations are the coded equivalent of non-typing operations auxiliary to reception of the graphics, such as linefeed, carriage return, or signal bell.

2.03 The speed of operation of the equipment is usually given in operations per minute. Speed in words per minute is roughly one-sixth of the operations per minute. The typing unit is designed to operate at 60, 75 or 100 words per minute, depending on the gear ratio used on associated equipment.

2.04 The typing unit is mounted on a receive-only base or a keyboard. Rotary mechanical motion for its operation and information
in the form of the signaling code come from external sources. A front plate and side plates provide mounting facilities for the various assemblies and mechanisms that make up the unit.

MAIN SHAFT

2.05 Motive power for operation of the typing unit is received through the intermediate gear mechanism of the base or keyboard base on which the unit is mounted. Power is applied to the drivengear, centrally located on the main shaft at the rear of the typing unit. The main shaft rotates at a constant speed to operate the equipment at speeds of 60, 75 or 100 words per minute, depending upon external gear ratios.

2.06 Six all-steel internal expansion clutches convert the rotary motion of the main shaft to the linear mechanical requirements for

![Figure 3 - 28 Typing Unit (Sprocket Feed) (Right Front View)](image)
operation of the printer. The clutches rotate with the main shaft when engaged and do not rotate when disengaged (latched). From left to right in their installed position on the main shaft, the clutches control the type box, line feed, spacing, function, code bar and selecting mechanisms, respectively.

**SELECTING MECHANISM**

2.07 A selecting mechanism translates the signaling code combinations into corresponding mechanical arrangements which control the code bars. It includes a two-coil magnet that connects in series with the external signal line. The coils may be wired in either series or parallel to accommodate 0.020 ampere or 0.060 ampere line currents. A range finder is used to refine the mechanical orientation of the selector to the signaling code.

**CODE BAR MECHANISM**

2.08 The code bar mechanism, when positioned by the selecting mechanism to correspond to the input code intelligence, sets up mechanical...
requirements for type box positioning, printing and stunt box operation.

PRINTING MECHANISM

2.09 When mechanically conditioned by the code bar mechanism, the printing mechanism prints the selected character and spaces to the next printing area on the paper, or spaces without printing, or on units so equipped, tabulates horizontally, or returns the type box to the left hand printing margin. The mechanism includes horizontal positioning mechanism operated by the code bars, spacing mechanisms and carriage return, and the print hammer mechanism.
2.10 The type box is capable of vertical and horizontal positioning in response to the permutations set up by the codebar mechanism. When positioned to correspond to the input code intelligence, the type box presents a single type pallet with the embossed graphic equivalent of the selected code for printing. Printing is accomplished when this pallet is struck by the print hammer to press an inked ribbon against the paper, which is supported by the typing unit platen.

SPACING MECHANISM

2.11 The spacing mechanism moves the type box and printing mechanism one character to the right each time a graphic character is received and imprinted. A suppression mechanism prevents spacing on receipt of certain non-typing functions. On sprocket feed typing units, the spacing mechanism may be adapted to the page to predetermined stop positions.

LINE FEED MECHANISM

2.12 The line feed mechanism permits single or double line advance of paper in the platen mechanism when the code combination for this function is received. The function may also be initiated locally through mechanical linkage with the base or keyboard base. On sprocket feed typing units, the line feed mechanism may be adapted to vertical tabulation and to rapid form feed out.

STUNT BOX (Fig. 5)

2.13 The stunt box is a compact, self-contained device with memory storage capabilities that provides the typing unit with the facilities of a built-in sequence selector. In effect, it allows the 32 available letters and figures character combinations to be used again for special, non-typing operations, without the sacrifice of horizontally when each character has been printed and automatically reverses the direction of ribbon feed when one of the two ribbon spools has been emptied.

PAPER FEED MECHANISM

2.15 The platen and paper feed mechanisms are located at the top of the printer, between the two side plates. A manual paper or form feed out knob is located at the top of the left side plate. Paper is fed from a supply at the rear of the printer either by friction feed or on sprockets located on the ends of the platen.

3. TECHNICAL DATA

APPROXIMATE DIMENSIONS

<table>
<thead>
<tr>
<th></th>
<th>Width</th>
<th>Depth</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15-1/4 inches</td>
<td>10 inches</td>
<td>9-3/4 inches</td>
</tr>
</tbody>
</table>

Weight

<table>
<thead>
<tr>
<th>Type</th>
<th>Friction Feed</th>
<th>Sprocket Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19 pounds</td>
<td>22 pounds</td>
</tr>
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SIGNAL REQUIREMENTS

Code ........ Sequential, 7.42 unit, Start-Stop

Current

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selector coils in series</td>
<td>0.020 amperes</td>
</tr>
<tr>
<td>Selector coils in parallel</td>
<td>0.060 amperes</td>
</tr>
</tbody>
</table>

3.01 All electrical requirements for operation of the 28 typing unit are supplied through associated equipment, such as a base, keyboard base or electrical service unit. All electrical connections to the typing unit are made through a cable connector, mounted just above the selecting mechanism on the right side (Fig. 3).
SIGNALLING CODE (Fig. 6)

3.04 Information is received by the typing unit in the form of a 7.42 unit start-stop signaling code in which each character (graphic) or function is represented by a sequential combination of current and no-current time intervals. Intervals during which current flows in the signal circuit are referred to as marking and those in which no current flows are spacing. Every combination includes five pulses (also referred to as levels) that carry the intelligence, each of which may be either marking or spacing. To insure synchronization between the transmitting and receiving equipment, a start pulse which is always spacing is added at the beginning of each combination of intelligence pulses, and a stop pulse which is always marking is added at the end.

3.05 The code representation for the graphics R and Y are illustrated in Figure 7. In these combinations, alternate marking and spacing conditions for the intelligence pulses are required.

3.06 In different signaling codes used with 28 teletypewriter equipment, the length of the stop pulse may vary. For example, in the code illustrated in Figure 6, the length of the stop pulse is 1.42 times the other pulses. Thus, the transmission of a graphic requires 7.42 units of time. It is therefore said to have a 7.42 unit transmission pattern. The stop pulse may be equal in duration to the other pulses in some applications, in which case the transmission code would have a 7.0 unit transmission pattern.

3.07 The total number of permutations of a five level (5 intelligence pulses) code is two to the fifth power, or 32. To accommodate more than 32 graphics, a letters-figures shift is designed into the typing unit. 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.

![Diagram](attachment:Figure_6_Signaling_Code.png)
3.08 A typical character arrangement is shown on the chart of Figure 6. The block circles represent marking pulses, the blank squares spacing pulses. When the letters code combination (12345) is transmitted, it conditions all typing units 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 typing units to print the character or perform functions in the figure (upper case) line on the chart.

4. GENERAL OUTLINE OF OPERATION

4.01 The friction feed typing unit (Fig. 2) and the sprocket feed typing unit (Fig. 3) are essentially identical, except for differences in the paper feeding mechanisms. The following description of operation applies to both units, with the difference covered in par. 12 (friction feed) and par. 14 (sprocket feed).

4.02 The relationship of the operating mechanisms of the 28 typing unit are illustrated in the block diagram (Fig. 8). Rotary motion from the intermediate gear mechanism of an associated base or keyboard base is applied to the main shaft, which turns constantly as long as the associated unit is under power. A signal applied to the selector magnets initiates operating sequences. The application of voltage to the stunt box and to various switches and controls is dependent upon external circuitry and associated equipment.

4.03 The signaling code combinations are applied to the selecting mechanism through a cable connector located just above the selector magnets. The start pulse (spacing) of each code combination permits the start lever to fall to the rear behind the magnet armature and rotate to trip the selector cam clutch. The range finder mechanism permits adjustment of the angular relationship of the trip-off point to the optimum quality incoming line signal.

4.04 The selector cam clutch, driven by the main shaft, as are all clutches, converts the incoming signal into mechanical marking or spacing equivalents of each pulse in the signal code. A cam on the selector cam clutch engages the code bar clutch when a signal code combination has been translated and locked in a mechanical arrangement in the selecting mechanism.

4.05 The code bar clutch initiates mechanical actions which position the code bars in patterns determined by the selecting mechanism (marking-left, spacing-right), and condition the typing unit for type box positioning, function selection and printing. A cam operated by the code bar clutch operates the function clutch and type box clutch trip mechanisms.

4.06 The function clutch controls the function bail and the stripper bail. The function reset ball permits transfer to intelligence from the code bars to the function mechanism and, upon receipt of a function code, operates the function linkage or switch or contact corresponding to the input signal code. The stripper bail resets selected function mechanisms. When the input signal calls for carriage return function, direct mechanical linkage between the stunt box and the spacing mechanism initiates this function. When the input signal calls for line feed, the function mechanism trips the line feed mechanism, engaging the line feed clutch.

4.07 The line feed clutch operates mechanical linkages which advance the paper one or two spaces by rotating the platen. On units so equipped, the page feed out mechanism also operates the line feed clutch trip mechanism.

4.08 The code bar mechanism (4.04) and the code bar clutch operate in combination to trip the type box clutch. When the type box clutch is tripped, it initiates mechanisms involved in vertical positioning of the type box, horizontal type box positioning, ribbon feed and printing. The main rocker bail provides power from the type box clutch (and main shaft), and the code bars determine the specific application of that power required for each input signal code combination representing a graphic. A cam plate on the main rocker bail trips the spacing
clutch stop mechanism to engage the spacing clutch, except when spacing is suppressed.

4.09 The spacing clutch, when tripped by the cam plate on the printing mechanism main rocker ball, advances the type box and printing hammer one character space to the right across the paper. Spacing suppression may be initiated by the function mechanism, to permit execution of a non-typing function without interference with the page printed message by the carriage return mechanism or by the printing mechanism when the type box reaches the end of a printed line.

4.10 The type box, positioned by the printing and spacing mechanisms in accordance with intelligence set up in the code bars, presents a single graphic in printing position for each operating cycle. To prevent printing during a function selection, the type box is positioned to present a vacant type-pallet position. At the proper moment, with the type box locked in printing position, a spring loaded print hammer is released to tap the selected type pallet sharply against the inked ribbon and the paper. A cleanly imprinted graphic character corresponding to the input signal code combination results, and the printing mechanism trips the spacing clutch to move both the type box and the print hammer to the next horizontal printing position to the right.

5. DISTRIBUTION OF MOTION (Fig. 9)

GENERAL

5.01 The main shaft is located in the lower rear portion of the typing unit, supported between the two side frames by ball bearings. It extends the full width of the unit.

5.02 Centrally located on the shaft are two driving gears. The larger gear meshes with the intermediate gear mechanism of the associated base or keyboard base to transmit power from the motor to the typing unit. The smaller gear drives the signal generator mechanism of an associated keyboard base.

5.03 Power take-off from the constantly rotating main shaft is controlled by six clutches, each of which, when tripped (engaged, or unlatched) drives its associated mechanism. From the right end of the shaft, these clutches may be identified as the selector clutch (with cam sleeve), the code bar clutch, the function clutch, the spacing clutch, the line feed clutch and the type box clutch. The sequence in which these clutches are tripped is, selector, code bar, function, type box, spacing and line feed. However, the type box and spacing clutch engagement may be suppressed under certain operating conditions, and the line feed clutch is operative only upon a specific set of input signal code combinations.

5.04 The spacing and line feed clutches are three stop clutches (Fig. 10), each permitting their associated mechanism to operate through one-third of a revolution of the main shaft. All other clutches are one stop clutches (Figs. 11 and 12), operating through an entire revolution of the main shaft.

ONE STOP CLUTCHES (Figs. 11 and 12)

5.05 The clutch drums are attached to and rotate with the main shaft (Fig. 9). In the disengaged position, as shown in Fig. 11, the clutch shoes do not contact the drum, and the shoes and cam disk are held stationary. Engagement is accomplished by moving the stop arm (Fig. 12) toward the rear of the typing unit, away from the clutch, thus releasing stop lug A and the lower end of shoe lever B (Fig. 12). The upper end of lever B pivots about its ear C, which bears against the upper end of the secondary shoe and moves its ear D and the upper end of the primary shoe toward the left until the shoe makes contact with the notched inner surface of the rotating drum at point E. As the drum turns counterclockwise, it drives the primary shoe downward so that it again makes contact with the drum at point F. There, the combined forces acting on the primary shoe cause it to push against the secondary shoe at point G. The lower end of the secondary shoe then bears against the drum at point I. The forces involved are multiplied at each of the preceding steps. The aggregate force is applied through the shoes to the lug J on the clutch cam disk, and the disk and attached cam turn in unison with the drum.

5.06 Disengagement is effected when the lower end of shoe lever B strikes the stop arm. Lug A and the lower end of the shoe lever are brought together (Fig. 11), and the upper end of lever B pivots about its ear C and allows its other ear D to move toward the right. The upper spring then pulls the two shoes together and away from the drum. The latch lever seats in the indent in the cam disk, and the cam is held in its stop position until the clutch is again engaged.
Figure 8 - 28 Typing Unit, Schematic Diagram
THREE STOP CLUTCHES (Fig. 10)

5.07 Two of the clutches, spacing and line feed, have three sets of lugs equally spaced about their periphery. The action is as described in 5.05-5.06, but the clutch is permitted to rotate through only one-third revolution before the stop lever and latch lever halt its motion.

6. SELECTION

GENERAL

6.01 The selecting mechanism consists of two magnet coils, an armature, a selector cam clutch, and the associated levers, arms, bails and slides necessary to convert the electrical pulses of the start-stop code to the mechanical arrangements which govern the character to be printed and the function to be performed.

SELECTOR MECHANISM (Figs. 9, 13 and 14)

6.02 The selector cam clutch comprises, from right to left (Fig. 9) the clutch, the stop arm bail cam, the fifth, fourth, and the third selector lever cams, the cam for spacing and marking lock levers, the second and first selector lever cams, the push lever reset bail cam, and the code bar clutch trip cam.
6.03 During the time in which a closed line circuit (marking) condition exists, the selector magnet coils are energized and hold the selector armature against the selector magnet pole pieces. In this stop position, the selector armature blocks the start lever (Fig. 13). While the signal for any character or function is being received, the start (spacing) pulse releases the selector armature which, under the tension of its spring, moves away from the magnet cores, and thus unlatches the start lever. The start lever rotates clockwise (as viewed from the right) under tension of its spring, moving the stop arm bail into the indent of the first cam. As the stop arm bail rotates about its pivot point, the attached stop arm is moved out of engagement with the clutch shoe lever. The selector cam clutch engages and begins to rotate. The stop arm bail immediately rides to the high part of its cam, where it remains to hold the start lever away from the selector armature during the reception of the signal code combination. When the stop pulse at the end of the signal code combination is received, the selector armature is pulled up to block the start lever. Thus, the stop arm bail is prevented from dropping into the indent of its cam, and the attached stop arm is held so as to stop the clutch shoe lever. The clutch cam disk upon which the latch lever rides has an indent as its stop position. When the clutch shoe lever strikes the stop arm, the inertia of the cam disk assembly causes it to continue to turn until its lug makes contact with the lug on the clutch shoe lever. At this point, the latch lever drops into the indent in the cam disk, and the clutch is held disengaged until the next start bit is received.
6.04 The series of five selecting levers and a marking lock lever ride their respective cams on the selector cam clutch. As the marking or spacing signal pulses are applied to the selector magnets, the selector cam clutch rotates and actuates the selector levers. When a spacing pulse is received, the marking lock lever is blocked by the end of the armature, and the spacing lock lever swings toward the rear, above the armature, and locks it in the spacing position until the next signal pulse is received. Extensions on the marking lock lever prevent the selector levers from following their cams (Fig. 14). When a marking pulse is received, the spacing lock lever is blocked by the end of the armature, and the marking lock lever swings...
to the rear, below the armature, to lock it in the marking position until the next signal pulse is received. During this marking condition, the selector levers are not blocked by the marking lock lever and are permitted to move against their respective cams. The selecting lever that is opposite the indent in its cam while the armature is locked in marking condition swings to the rear, or selected, position momentarily.

6.05 Each selecting lever has an associated push lever which drops into a notch on the top of the selecting lever when the selecting lever falls into the indent in its cam. As the selector cam clutch rotates, each selecting lever is moved forward as it rides to the high part of its cam. Selected (dropped) push bars are also moved forward. Unselected push bars remain in the rear position, on top of the notch of the selecting lever. When all five code pulses have been received, push levers are held in their selected or unselected position until the next start bit is received.

6.06 When the subsequent start pulse is received, the cam clutch is again engaged. The push lever reset bail, following its cam, unlatches the selected push levers. The push
levers then return to their unselected (rear) position under their spring tension.

**ORIENTATION**

6.07 For optimum performance, the selecting mechanism should sample the code elements at the most favorable time. Manual operation of the range finder varies the time of sampling between the operating margins. Adjusting the range finder is called orientation.

6.08 When the range finder knob (Fig. 13) is pushed inward and rotated, its attached range finder gear moves the range finder sector (which mounts the stop arm bail, stop arm and latch lever) either clockwise or counterclockwise about the selector cam clutch. This changes the angular position at which the selector cam clutch stops with respect to the selecting levers. When an optimum setting is obtained, the range finder knob is released. Its inner teeth engage the teeth of the indexing lock stud to lock the rangelinder mechanism in position. The setting may be read on the range finder scale opposite the fixed index mark.

**7. POSITIONING THE CODE BARS**

**CODE BAR MECHANISM (Fig. 15)**

7.01 The character printed or the function performed by the typing unit is basically determined by the code bar mechanism, to which the input signal intelligence, translated into mechanical form, is transmitted from the...
selecting mechanism push bars. The code bars are positioned by code bar shift bars which move to the left for marking and to the right for spacing. The shift bars, positioned to the rear for marking and forward for spacing, are pushed into marking position by selected push bars through a mechanical linkage intermediate arms and transfer levers.

7.02 Power to position the selected code bar levers, and through them the code bars, is supplied by the code bar clutch. The code bar clutch is engaged by its cam on the selector cam clutch (6.02).

CODE BAR OPERATION (Figs. 15, 16 and 17)

7.03 Each selector push lever (6.04) has an associated intermediate arm, transfer lever and code bar shift bar (Fig. 15). In addition, there is a common transfer lever with its code bar shift bar. When a push lever is toward the rear (spacing) its associated intermediate arm and transfer lever are pulled toward each other by a spring. The upper end of the transfer lever is held forward (spacing), holding the code bar shift bar in spacing position. When a push lever is moved forward (marking), it rotates the intermediate arm counterclockwise, positioning the transfer lever to the rear (marking) and holding the code bar shift bar in marking position. The common transfer lever (third from left, operating the common code bar, third from bottom) has an extension which passes behind the number 1 and 2 transfer levers. There is no connection between the common transfer lever and the selecting mechanism, but when either the number 1 or number 2 push bar is selected, the associated transfer levers position the common code bar shift bar to the rear (marking). The right ends of these code bars determine vertical positioning of the type box (Fig. 17).

7.04 As the selector cam clutch completes its revolution, the trip shaft operating lever rides to the peak of the code bar clutch trip cam (Fig. 9). This causes the shaft to turn slightly (counterclockwise, viewed from the right) to move the code bar clutch trip lever away from the clutch stop lug and engage the clutch. Rota-
tion of the clutch operates an eccentric and the
shift lever drive shaft, shift lever drive arm and
shift lever drive link. The drive link moves two
code bar shift levers in a scissors like action,
the front lever moving to the left, the rear lever
moving to the right. Any code bar shift bar in
marking position (left) during the previous oper­
ating cycle is moved to spacing position (right)
by the forward shift lever, unless the transfer
lever is once again holding that bar to the rear
(marking). The rear shift bar, as it moves to
the left (Fig. 16) carries with it any code bar
shift bar held in the marking position, complet­
ing the transfer of intelligence from the select­
ing mechanism to the code bars.

7.05 At the end of one revolution, the code bar
clutch trip lever strikes the clutch shoe
lever. Inertia of the cam disk assembly causes
it to continue to turn to permit the latch lever to
drop into the indent in the cam disk, and the
clutch is held disengaged. The code bars, code
bar shift bars and shift levers are held in the
selected position, but the transfer levers and
intermediate arms are free to position the shift
bars forward or to the rear in response to new
input signal intelligence from the selector.

CODE BAR ARRANGEMENT (Fig. 17)

7.06 A total of nine code bars in marking (left)
or spacing (right) position convey me­
chanically translated signal intelligence to the
typing and function mechanisms. The code bars
are arranged from top to bottom as follows: sup­pression, number 4, number 1, number 5,
number 2, number 3, common, zero (0) and
letters-figures shift (S).

8. POSITIONING THE TYPE BOX

GENERAL

8.01 All of the characters (graphics) that may
be printed by the typing unit are formed
by type pallets which are arranged in a type box.
The type box is mounted in a carriage from which
it may be removed for cleaning or replacement.
In order to print any selected character, the
type box carriage is so positioned that the char­
acter on the pallet is directly over the desired
location on the paper. Since the pallets are
arranged in four horizontal rows and sixteen
vertical rows, it is necessary to position the
type box carriage both horizontally and verti­
cally. See Fig. 18 for arrangement of graphics
which are represented on the type box pallets.
See Fig. 6 for input signal code permutations
equivalent to each graphic representation.

8.02 The type box carriage rides on rollers
over a track which is moved vertically
for positioning in that particular plane. The
carriage is positioned horizontally on its track
by the oscillating rail slide and type box car­
rriage link. The slide rides the oscillating rail
and is clamped to the rear section of the upper
draw wire rope. The link provides a flexible
connection to permit the type box carriage to
follow both the vertical movement of the type
box carriage track and the horizontal movement
of the oscillating rail slide.

8.03 The lower right rear end of the upper
draw wire rope is fastened to the spac­
ing drum. From this point, it passes part way
around the spacing drum, upward and around
the right rail pulley and downward to the spring drum. After passing part way around the spring drum, the upper draw wire rope is doubled backward around it and passes upward to the left printing carriage rail pulley over to the right printing carriage rail pulley, and downward links are used to accomplish the horizontal positioning of the oscillating rail and also connect it with the oscillating rail shift slide. The links are pivoted and are such a length that only one at a time may be fully extended.
8.06 The lower most code bar, designated S, contains a pin near its right end that projects upward to permit engagement with the stunt box. The code bar is positioned to the left (the figures position) or to the right (the letters position). A slotted extension of the S code bar engage a tongue from the right end of the letters-figures shift slide and causes it to follow the S code bar movements. Pins at the end of the shift slide serve as lower guides for the right and left shift link breaker slides. Pins which project from the front plate serve as upper guides and pivot points. The main bail has left and right breaker slide bails mounted on its ends.

8.07 Upon receipt of the signal code for the letters shift operation, the shift slide is moved to the right (Fig. 20). This positions the left shift link vertically with its lower end over the left breaker slide bail. The right breaker slide is positioned such that its lower end is to the right of the right breaker slide bail. As the main ball moves upward, the right breaker slide bail clears the right breaker slide, but the left breaker slide bail engages the left breaker slide and moves it upward. As a result of this action, the left oscillating rail shift links open and the oscillating rail is permitted to be moved to the right. This action presents the letters field in line for printing. In a similar manner, when the signal code for the figures shift is received, the right oscillating rail shift links are opened, the oscillating rail shifts to left, and the figures field of the type box is in line for printing.
VERTICAL POSITIONING (Fig. 21)

8.08 The selection of the various characters from the four horizontal rows and eight vertical rows in either field (figures or letters) and the printing of those characters take place as follows:

8.09 The number 1 and number 2 code bars determine the selection of the horizontal row. The number 3 code bar determines whether the selection is to be made from the left four vertical rows or the right four vertical rows (in either the figures or the letters field). The number 4 and number 5 code bars determine the selection of one row from the four vertical rows predetermined by the number 3 code bar.

8.10 Four code bars (longer than the others) extend through the right code bar bracket and serve as stops for the right vertical positioning levers (Fig. 21). They are (from top to bottom) the suppression, number 1, number 2 and common code bars. Notches are arranged in the left ends of these code bars so that the left side vertical positioning levers are stopped,
in each case, by the same bar that blocks the right side levers. After all code bars have been positioned by the code bar positioning mechanism, the code bar clutch cam follower arm and its roller, in traversing the sloping indent on the code bar clutch cam, rotates the clutch trip lever shaft. As the shaft turns, it first causes the function clutch lever to release the function clutch (Fig. 22) and then causes the type box clutch trip arm to engage its trip lever and release the type box clutch. When the type box clutch completes its revolution, it is disengaged by its trip lever and latch lever in the same manner as the code bar clutch (7.05). During its rotation, the type box clutch operates a drive link and a bracket to cause the main rocker shaft to oscillate. This, in turn, through its left and right brackets and the main side drive links, extends the motion to the vertical positioning levers (Fig. 21). These levers are driven upward until they strike a projecting code bar, which causes them to buckle. The type box carriage track is mounted between the vertical positioning levers, and its vertical motion is controlled by them.

8.11 When the number 1 and number 2 code bars are toward the right (spacing), the common code bar is also toward the right, where it blocks the vertical positioning levers. The top row of pallets in the type box are then in line for printing. When the number 1 code bar is toward the left (marking), the common code bar is toward the left. If the number 2 code bar is toward the right (spacing), it blocks the vertical positioning levers, and the second row of pallets (from the top) are then in line for printing. When the number 1 code bar is toward the right (spacing), and the number 2 code bar is toward the left (marking), the common code bar is toward the left. The number 1 code bar blocks the vertical positioning levers and the third row of pallets is in line for printing. When both the number 1 and number 2 code bars are to the left (marking), the common code bar is also to the left. The suppression code bar blocks the vertical positioning levers, and the fourth (bottom) row of pallets in the type box are then in line for printing. At each of the four levels at which the vertical positioning levers may be stopped, they are locked momentarily by lock levers controlled by the main side lever follower arms.

HORIZONTAL POSITIONING (Figs. 23 and 24)

8.12 A bracket attached to the main rocker shaft applies vertical motion to the main ball by means of two main ball links (Fig. 23). Attached to each end of the oscillating rail shift
slide are pivoted, buckling-type drive links which extend downward to each end of the main bail. As the main bail moves downward under impetus of the type box clutch, the left shift slide links, if not buckled, will try to shift the oscillating rail slide drive links toward the right, while the right slide drive links, if not buckled, will try to shift the oscillating rail shift slide links to the left. When the number 3 code bar is shifted toward the left (marking), the horizontal motion reversing slide is shifted toward the left by the reversing slide shift lever, and is held there by detent levers. A bracket near the right end of the reversing slide will then make contact with the right shift slide drive links and cause them to buckle. As the main bail is driven downward, the unbuckled left shift slide drive links will start to shift the oscillating rail shift slide toward the right. This positions the type box so that the characters to be printed will be located in the left half of the figures or the letters field. In a similar manner, when the number 3 code bar is shifted toward the right (spacing), the horizontal motion reversing slide is also shifted toward the right by the shift lever and is held there by the detent levers. A bracket near the left end of the horizontal motion reversing slide then makes contact with the left shift slide drive links and causes them to buckle. As the main bail is driven downward, the unbuckled right shift slide drive links will start to shift the oscillating rail shift slide toward the left. This positions the type box so that the characters to be printed will be located in the right half of the figures or the letters field.

8.13 After determination of the field (figures or letters) and the group of vertical rows in which the character to be printed is located, the number 4 and number 5 code bars operate...
three horizontal motion stop slides to determine the row in that group in which the character is to be found (Fig. 24). A wedge shaped horizontal positioning lock lever which is pulled downward by the main bail through a yield spring bears against the horizontal positioning lock lever arm. This arm drives the oscillating rail shift slide in the direction in which it was started (by the number 3 code bar selection) until one of two decelerating slides which are mounted on the oscillating rail shift slide strikes an unselected horizontal motion stop slide. A camming surface on the unbuckled shift slide drives the decelerating slide and causes the drive links to buckle. The oscillating rail shift slide finally comes to rest when it strikes the blocked decelerating slide. This, in turn, ends the downward excursion of the lock lever, and the yield spring extends until the main bail reaches the lowest point of its oscillation. As the main bail returns upward, it centers the oscillating rail shift slide. It is during this time that the horizontal motion stop slides are positioned for the selection of the next character. The number 4 and number 5 code bars each operate a code bar bail bell crank. Each, in turn, moves a horizontal motion stop slide toward the front (marking) or toward the rear (spacing) (Fig. 24). A third (common) stop slide (spring tensioned toward the rear) is located between the upper and lower stop slides and has projections which pass across the front edges of these slides (Fig. 23). Each stop slide is of a different length. The common stop slide, which is the longest stop, has an additional stop on its shank, so that it serves as the shortest stop when all the slides are moved forward.
The upper slide (operated from the number 4 code bar) is the second longest stop, and the lower slide (operated from the number 5 code bar) is the third longest stop.

8.14 When both the number 4 and number 5 code bars are moved toward the right (spacing), their respective horizontal motion stop slides are toward the rear. The oscillating rail shift slide is moved to the right or left of its central position (determined by the number 3 code bar) until it is stopped by one end of the common horizontal motion stop slide. This positions the first vertical row (right or left of the center of the figures field or the letters field) in line for printing. When the number 4 code bar is toward the right (spacing), and the number 5 code bar is toward the left (marking), the lower and the common stop slides are toward the front, and the upper stop slide is toward the rear. The oscillating rail shift slide is moved to the right or left of its central position until it is stopped by one end of the upper stop slide. This positions the second vertical row (right or left of the center of the figures field or the letters field) in line for printing. When the number 4 code bar is toward the left (marking) and the number 5 code bar is toward the right (spacing), the upper and the common stop slides are toward the front and the lower stop slide is toward the rear. The oscillating rail shift slide is moved toward the right or left of its central position until it is stopped by one end of the lower stop slide. This positions the third vertical row (right or left of the center of the figures field or the letters field) in line for printing.

8.15 When both the number 4 and the number 5 code bars are toward the left (marking), their respective horizontal motion stop slides and the common stop slide are toward the front. The oscillating rail shift slide is moved toward the right or left of its central position until it is stopped by one side of the shank of the common stop slide. This positions the fourth vertical row (right or left of the center of the figures field or the letters field) in line for printing.

9. PRINTING

9.01 After the type box has been moved so that the selected type pallet is in its proper position, it must be struck by a print hammer in order to print. This is accomplished by the action of the printing carriage located on the printing carriage track at the top of the front plate mechanism.

POSITIONING (Figs. 23 and 25)

9.02 The printing carriage rides on rollers on the printing carriage track, which is rigidly attached to the typing unit front plate. The carriage is clamped to the forward section of the upper draw wire rope. This moves the carriage along its track in such a manner that the hammer advances to the next printing position after each character (graphic) is imprinted.

OPERATION

9.03 The printing track which is located on the front of the typing unit (Fig. 25) is fastened to an extension at each end of the main bail. As the main bail reciprocates vertically, it extends the motion through the printing track, which travels in guides located at each end of the track. The printing arm, which extends downward from the printing carriage, rides the printing track. As the arm follows the reciprocating motion of the track, its upper end moves first toward the left and then toward the right. When the upper end of the arm moves toward the left, it rotates the print hammer operating ball clockwise against its spring tension until it becomes latched by the operating ball latch.

9.04 The print hammer operating ball draws the print hammer away from the type box by means of the print hammer ball spring. When the upper end of the printing arm moves to its extreme right position, it makes contact with the latch and causes it to release the print hammer operating ball. The operating ball is swung in a counterclockwise direction by the operating ball spring until it strikes its stop. The print hammer ball, in being driven by the operating ball, is swung toward the type box. When the operating ball is stopped, momentum causes the print hammer ball to continue its travel against the tension of the print hammer ball spring until the printing hammer strikes the selected type pallet. The force with which the hammer strikes is adjustable to three positions marked on the carriage.

10. SPACING

GENERAL (Figs. 25 and 26)

10.01 To space the printed character properly, the type box and printing carriages must be advanced with each character printed. The spacing must also be accomplished when the input signal code combination represents a letter space. As was shown in 8.02 and Fig. 19, the carriages are connected to a draw wire rope
Figure 26 - Spacing Mechanism
which, in turn, is fastened to the spring drum and the spacing drum. The purpose of the spring drum, which contains a torsion spring, is to tension the draw wire rope and pull the carriages to the left. The spacing drum has ratchet teeth about its perimeter which are engaged by the eccentric driven spacing drum feed pawls (Fig. 26). The spacing shaft which mounts the spacing eccentrics is driven through its helical gear attached to the three stop spacing clutch on the main shaft. The gear ratio of 1-1/2 to 1 causes the spacing shaft to turn one-half a revolution each time the spacing clutch is tripped. This allows the feed pawls to advance the spacing drum by one ratchet tooth.

10.02 The same trip shaft which, through a cam on the code bar clutch (4.05) trips the function clutch, also rotates the type box clutch trip lever counterclockwise (viewed from the left). Unless movement of this lever is blocked by the print suppression mechanism, the type box clutch is engaged, oscillating the main rocker shaft, which drives the printing mechanism (8.10). A cam plate (Fig. 26) fastened to the bottom of the rocker shaft is moved upward by the shaft as it begins its movement. The cam plate operates the spacing trip lever ball. As this ball is rotated, it raises the spacing trip lever until it latches onto the spacing clutch trip lever arm. As the rocker shaft reverses its direction of rotation, the spacing trip lever ball and the trip lever move downward under spring tension, causing the latched up spacing clutch trip lever arm to operate the spacing clutch trip lever and engage the spacing clutch.

10.03 Before the spacing clutch completes one-third of a revolution, its restoring cam moves the spacing trip lever about its pivot point until it releases the spacing clutch trip lever, which returns to its normal position in time to stop the spacing clutch after one-third of a revolution. The spacing clutch three-stop cam disk upon which the latch lever rides has an indent at each stop position. When one of the three lugs on the clutch shoe lever disk strikes the spacing clutch trip lever, the inertia of the cam disk assembly causes it to turn until its lugs make contact with the lugs on the clutch shoe lever disk. The latch lever drops into an indent in the cam disk, and the clutch is held disengaged until the trip lever is again operated.

SPACE FUNCTION

10.04 The non-typing function by which spacing between words or any spacing other than that which accompanies printing is accomplished is initiated when the code bars are set in a combination equivalent to the spacing code combination (all spacing except third pulse marking). The function is executed through the code bar clutch, tripping the printing clutch, and the spacing clutch as described in 10.01-10.03. For this function, the type box is positioned so that a vacant pallet (top horizontal row, first right row in the figures field) is presented beneath the type hammer. No printing occurs when the type hammer is tripped in its normal fashion. The stunt box is not involved in the execution of this function.

SPACE SUPPRESSION (Fig. 26)

10.05 When certain non-typing functions are selected or when the carriages reach their extreme right position, it is necessary to suppress spacing to avoid interference with the page printed message or damage to the equipment. This is accomplished by moving the spacing suppression slide forward to a point at which it will hold the upper end of the spacing trip lever forward and prevent it from engaging the spacing clutch trip lever.

10.06 In the case of spacing suppression on selection of a function code combination, the spacing suppression slide is shifted forward by the spacing suppression bail, mounted beneath the function box. When space suppressing function levers are selected, they engage the bail and, when the function mechanism is operated, move the bail forward. Moved forward with the bail, the suppression slide prevents engagement of the spacing clutch.

10.07 When the carriages are near their extreme right position, a cut-out ring on the spacing drum engages the spacing cut-out transfer bail (Fig. 26), which in turn operates the spacing cut-out ball. The ring and the end of the spacing cut-out transfer bail are shown in Fig. 19. The spacing cut-out bail shifts the spacing suppression slide forward and prevents engagement of the spacing clutch until the carriages are returned. The maximum number of characters which the typing unit may print is eighty-five, including spacing function spaces. In order to prevent spacing beyond this point, and subsequent damage to the equipment, several teeth are omitted from the spacing drum ratchet wheel.

MARGIN INDICATOR (Fig. 19)

10.08 When used in conjunction with a keyboard base, the typing unit actuates a margin indicator switch (base mounted). Before the type
box carriage reaches the end of its travel, an actuator mounted on the face of the spring drum operates the switch contact. The angular position of the cam disk with respect to the spring drum may be altered to change the point at which the indicator contact will be closed.

11. RIBBON FEEDING

DESCRIPTION (Fig. 27)

11.01 The left and right ribbon feed mechanisms oscillate in a vertical plane with each revolution of the type box clutch. They are driven by ribbon drive links attached to the main side levers (Fig. 21). At their uppermost positions, the ribbon mechanisms position the ribbon relative to the horizontal type box row being printed. After each character is printed, the ribbon mechanisms are dropped downward together with and behind the type box, to permit viewing of the last printed character. The ribbon is held in place at the point of printing by a ribbon guide fastened to the rear of the type box carriage.

![Figure 27 - Ribbon Feeding Mechanism](LEFT SIDE VIEW)
11.02 Each of the ribbon mechanisms consists of a bracket which is hinged at its rear end, and upon which is mounted a ribbon spool shaft (Fig. 27). A ribbon tension bracket is keyed to the lower end of the ribbon spool shaft. A ribbon ratchet wheel is mounted freely on the ribbon spool shaft just below the ribbon spool bracket, from which it is separated by a friction washer. This applies a constant drag to the ratchet wheel.

OPERATION

11.03 A ribbon tension plate which is keyed to the hub of the ribbon ratchet wheel has two projecting lugs (A and B, Fig. 27) that straddle the lug on the ribbon tension bracket. A ribbon tension spring tends to maintain the ribbon tension bracket against lug A of the ribbon tension plate. In operation, the ribbon spool bracket, driven by the ribbon drive link, pivots about points D and E respectively and are held against the teeth on the ribbon ratchet wheel by their springs. As the ribbon spool bracket is moved upward, the ratchet wheel feed lever skips over one tooth, while the ratchet detent lever holds the ribbon ratchet wheel from turning backward. When the ribbon spool bracket is moved downward, the ratchet feed lever engages a ratchet tooth and pushes the ratchet wheel. A tooth on the ribbon ratchet wheel then skips over the ratchet detent lever. The teeth on the left and right ribbon ratchet wheels face in opposite directions so that when their feed levers are engaged, the left ribbon ratchet wheel turns counterclockwise (viewed from the top).

11.04 In order for the ribbon to be pulled from one ribbon spool to the other, only one of the ribbon mechanism can have its ratchet feed and ratchet detent levers engaged with its ribbon ratchet wheel at a time. As the ribbon ratchet wheel turns, the ribbon tension plate also turns, and extends the ribbon tension spring. When the lug B of the ribbon tension plate makes contact with the ribbon tension bracket, the ribbon spool shaft is made to turn, and the ribbon is wound on the ribbon spool.

RIBBON REVERSING

11.05 When the ribbon has been completely unwound from one spool, it is necessary to reverse its direction so it can rewind. This is accomplished automatically by disengaging one set of ratchet feed and ratchet detent levers and engaging the other set. While the ribbon is passing from the left spool to the right spool, the right set of levers is engaged. The left set is held disengaged against the tension of the springs by the left ribbon feed reverse lever, which is in its downward position (Fig. 27). The lever is held in this position by means of the ribbon reverse detent lever through the intervening ribbon reverse detent cam, ribbon reverse shaft and ribbon reverse spur gear. As the ribbon unwinds from the ribbon spool, it passes around the ribbon roller and through the slot in the end of the ribbon lever. When the ribbon nears its end of the ribbon spool, an eyelet which is fastened to the ribbon catches in the ribbon lever slot and pulls the lever toward the right.

11.06 The next time the ribbon mechanism is moved upward, the displaced ribbon lever engages the end of the left ribbon reversing lever and causes it to move to the position shown in phantom in Fig. 27. As the lever moves, its teeth rotate the left spur gear which, through the ribbon reverse shaft, turns the detent cam and the right spur gear. As the right spur gear moves the right ribbon reversing lever downward, a pin on the lever drives the right ribbon feed lever downward to disengage the ratchet feed and wheel. At the same time a pin on the left ribbon reversing lever moves the left ribbon feed reversing lever upward to permit the left ratchet feed and detent levers to engage the left ribbon ratchet wheel. Thus, the ribbon mechanisms are positioned to rewind the ribbon on the left ribbon spool. When it nears its end on the right ribbon spool, the ribbon is again reversed in a manner similar to that just described. During the reversing cycle, the ribbon is maintained taut by the previously extended ribbon tension spring.

12. PAPER FEEDING (FRICTION FEED)

12.01 Paper for the page printed message is stored on a roll 8-1/2 inches wide, mounted on a paper spindle suspended between the two side plates at the rear of the typing unit. From the roll, the paper passes over a paper straightener shaft, downward behind the platen (Fig. 28) and between the platen and three pressure rollers. A paper pressure bail at the front of the platen equalizes pressure brought to bear on the paper by the pressure rollers. The pressure bail can be released by rotating the paper release lever at the top of the right side plate to the rear (clockwise, viewed from the right) when it is necessary to straighten the paper or to remove paper from the platen. Two paper fingers operated on a spring tensioned shaft...
across the front of the platen hold copy paper firmly against the plate, in position for printing.

13. STUNT BOX OPERATION

FUNCTIONS (Fig. 29)

13.01 There are two types of operation which can be performed by the typing unit. The first embodies those mechanical actions which are directly necessary to the actual printing of a character (or space function). The second embodies mechanical action which alters the positions of the various mechanisms or activates external devices or circuits through switching contacts. The latter are known as functions.

Note: Spacing may technically be considered a function, but it is mechanically associated with the printing operation, except when suppressed by function mechanisms.

13.02 As in printing, the reception of function codes results in the positioning of the code bars (7.01). The back edges of the code bars are notched (Fig. 30). Positioned directly behind the code bars is a stunt box, which contains the function bars for the various functions (Figs. 29 and 30). Each function bar has a series of tines on its end, offset to one side or the other to correspond with the marking and spacing elements of the particular input signal code combination to which it is to respond. Tines positioned to the right are spacing; those to the left are marking.

13.03 When the function clutch is engaged (Fig. 22), it rotates and extends motion to the function bar reset ball (through the intervening cam and follower arm and function rocker shaft) to cause the function bar reset ball with its attached reset bail blade to release the function bars momentarily (Fig. 31). As the spring tensioned function bars are released, they move forward to bear against the code bars. If
<table>
<thead>
<tr>
<th>SLOT NUMBER</th>
<th>MANDATORY POSITION FOR</th>
<th>SHIFT FORK POSITIONS WITH ASSOCIATED CODE BAR INDICATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UNSHIFT-ON-SPACE</td>
<td>LETTERS-FIGURES SHIFT CODE BAR</td>
</tr>
<tr>
<td>2</td>
<td>FIGURES SHIFT</td>
<td>SUPPRESSOR CODE BAR</td>
</tr>
<tr>
<td>3</td>
<td>LETTERS SHIFT</td>
<td>SUPPRESSOR CODE BAR</td>
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<tr>
<td>4</td>
<td>AUTOMATIC CR</td>
<td>ZERO CODE BAR</td>
</tr>
<tr>
<td>5</td>
<td>CR</td>
<td>SUPPRESSOR CODE BAR</td>
</tr>
<tr>
<td>9</td>
<td>ON-LINE BACKSPACE</td>
<td>SUPPRESSOR CODE BAR</td>
</tr>
<tr>
<td>17</td>
<td>HORIZONTAL TAB</td>
<td>SUPPRESSOR CODE BAR</td>
</tr>
</tbody>
</table>

FUNCTIONS NOT ASSIGNED TO SPECIFIC SLOTS

- SPACE SUPPRESSION FOR SINGLE LF
- SIGNAL BELL CONTACT
- BUSY LIGHT CONTACT
- MOTOR STOP CONTACT

| 35          | KEYBOARD LOCK          | SUPPRESSOR CODE BAR                                 |
| 36          | KEYBOARD LOCK          | SUPPRESSOR CODE BAR                                 |

| 39          | AUTOMATIC LF OR ON-LINE REVERSE LF |
| 40          | LF                       |
| 41          | ON-LINE REVERSE LF       |
| 42          | FORM FEED OUT            |

Figure 29 - Stunt Box (Top View)
the codebars are positioned for a function, each tine on the function bar for that function will be opposite a notch in the code bar. This will permit the selected function bar to continue to move forward into the codebars, while the other function bars are blocked by one or more code bars (Fig. 32).

13.04 Associated with each function bar in the stunt box is a function pawl and a function lever. In the unselected position, the function bar is not latched with its function pawl (Fig. 33). When the function bar reset blade releases the function bars, any selected bar will move sufficiently forward (to the left, in Fig. 33) to permit it to engage its function pawl. Then, as the reset bail blade returns the function bar to its initial position, the function bar carries the function pawl to the rear (to the right, Fig. 34). The function pawl, in turn, moves the function lever clockwise about its pivot point. A projection at the lower end of most function levers operates the spacing suppression bail (10.06), and the selected levers move the bail forward. Either the upper or the lower end operates the indicated function.
Figure 31 - Reset Bail Mechanism

Figure 32 - Function Bar Selection

Figure 33 - Typical Function Linkage (Unselected)
13.05 Near the end of the function cycle, a stripper blade (Fig. 30) operated by a cam on the function clutch assembly rises to engage any selected function pawl and strip it from its function bar. Springs return the released function pawl and the function lever to their original position. The function clutch is disengaged upon completion of one revolution when its latch lever falls into the indent of the clutch cam, in the same manner as described in connection with the code bar clutch (7.05).

CARRIAGE RETURN FUNCTION
(Figs. 35 and 36)

13.06 The carriage return function mechanism is located in the right end of the typing unit. Reception of the input signal code combination for the function causes the function bar, pawl and lever to operate (Fig. 35). The lower end of the function lever engages the carriage return slide arm and pushes it forward. The slide arm, in turn, moves the carriage return ball and its lever about their pivot point. As the front portion of the lever moves downward, it takes with it the lower section of the spacing drum feed pawl release link. This causes the upper portion of the link to turn and disengage the spacing drum feed pawls from the spacing drum (Fig. 36).

13.07 When the carriage return lever reaches the lowest point, the carriage return latch ball locks it there. The disengagement of the spacing drum feed pawls from the spacing drum permits the spring drum to return the printing and type box carriages toward the left side of the typing unit. As the spacing drum nears the end of its counterclockwise rotation, the roller on the stop arm contacts the transfer slide which, in turn, drives the dashpot piston into the dashpot cylinder. A small passageway with an inlet from the inside of the cylinder and three outlets to the outside is incorporated in the end of the cylinder. Two of the openings to the outside are closed by a steel ball, which is held in its seat by means of a compression spring. A set screw which may be locked in place with a nut is used to regulate the spring pressure on the ball. The rate of deceleration provided by the cushioning effect of the trapped air is automatically regulated for various lengths of lines by means of the ball valve. This, together with the direct opening to the outside, determines the rate at which the air may escape from the cylinder. When the spacing drum reaches its extreme counterclockwise position, an extension on the stop arm trips the carriage return latch ball plate, which is fastened to the carriage return latch ball. The latch ball disengages the carriage return lever, and the feed pawls are again permitted to engage the spacing drum.

13.08 Local (off-line) operation of the carriage return mechanism may be obtained from the keyboard base or base on which the typing unit is mounted. A projection beneath the carriage return lever (Fig. 35), when rotated to the rear (counterclockwise, viewed from the right), operates the carriage return mechanism in the same way as when this lever is operated by the stunt box.

LINE FEED FUNCTION (Figs. 37 and 38)

13.09 The line feed function mechanism is located in the left end of the typing unit. The code bar mechanism set to correspond to an input signal code combination for spacing permits two line feed function bars, pawls and levers to operate. The function linkage at the far left of the stunt box (Fig. 37) operates the line feed mechanism. The lower end of the line feed function lever engages the line feed slide arm and pushes it forward. The slide arm, in turn, moves the line feed clutch trip arm and the trip lever above their pivot point until the trip lever releases the three stop line feed clutch. The line feed gearing is such that each
Figure 35 - Carriage Return Function Mechanism
one-third revolution of the clutch will advance
the platen by one line. Therefore, the length of
time that the line feed clutch trip lever is held
away from the clutch will determine the number
of line feeds that occur.

13.10 The timing relationship between the
stripper blade cycle and the main shaft
rotation is such that the function pawl is not
stripped from a function bar until after more
than one-third of a revolution of the clutch has
occurred. Thus, the line feed clutch trip lever
will stop the clutch after two-thirds of a revolu­
tion, or double line feed, has occurred. When
single line feed is desired, it is necessary to
strip the function pawl from the line feed func­
tion bar before the line feed clutch completes
one-third of a revolution. This is accomplished
by the use of an auxiliary function pawl stripper
which is attached to the left end of the stripper
ball. The cam disk on the three-stop line feed
clutch provides the motive force to operate the
stripper ball once each one-third revolution of
the line feed clutch.

13.11 The stripper ball on which the slotted
line feed function pawl stripper rides
may be shifted toward the right (double) or to
the left (single) by action of the single or double
line feed lever (Fig. 37). The upper end of
the pivoted single or double line feed lever protrudes
from the upper left of the left side plate of the
typing unit, where it rides in the two position
side frame detent extension. When the lever is
in position 1; the stripper bail engages line feed
function stripper to raise it into contact with
the function pawl before the stripper blade
would strike it. When the lever is moved to the
rear (position 2), the bail is disengaged from
the blade, and the stripper blade strikes the
function pawl in the normal cycling of the func­
tion box stripper blade.

13.12 When single line feed is being used, the
line feed function lever is released too
soon (by the line feed function pawl stripper)
to prevent spacing. Therefore, an additional
line feed function bar, pawl and lever are in­
stalled in a slot of the stunt box for the pur­
purpose of suppressing spacing on single line feed
Figure 37 - Line Feed Mechanism
Figure 38 - Line Feed Mechanism
function. This mechanism, which always operates on the line feed function code bar arrangement, is released only by the stunt box stripper blade and, therefore, holds the spacing suppression ball operated (forward) until the spacing cycle is completed. After the line feed clutch is stopped by its trip lever, it is disengaged when the latch lever drops into the indent in the clutch cam, in the same manner as described in connection with the code bar clutch (7.05).

13.13 Each one-third revolution of the line feed clutch causes its attached spur gear (Fig. 38) to rotate the line feed eccentric spur gear and its attached eccentrics one-half of a revolution. The eccentrics, which are offset in opposite directions, each carry a line feed bar. These bars are guided by the line feed bar bell crank and alternately engage the line feed spur gear on the platen, advancing the platen one line for each one-half turn of the eccentrics. A platen detent ball engages the line feed spur gear to retain the platen at each setting.

13.14 When it is desired to position the platen manually, this may be accomplished by bearing down on and rotating the platen handwheel at the top of the right side plate. This causes the platen handwheel spur gear to engage the platen idler gear, which in turn is engaged with the platen spur gear on the platen shaft. At the same time, the line feed bar release lever (Fig. 38) bears on the line feed bar bell crank and causes it to disengage the line feed bars from the line feed spur gear.

13.15 Local (off-line) operation of the line feed mechanism may be obtained from the keyboard base or base on which the typing unit is mounted. A projection beneath the line feed clutch trip lever (Fig. 37), when rotated to the rear (counterclockwise, viewed from the right), operates the line feed mechanism in the same way as when this lever is operated by the function box. Since the clutch is manually engaged, line feed is continuous until released at the keyboard or base.

LETTERS-FIGURES SHIFT FUNCTION (Fig. 20)

13.16 Upon reception of the letters or figures signal code, the letters and figures function bars, pawls and levers initiate the letters or figures shift (8.05). The upper ends of the function levers engage the letters and figures function slides (Fig. 20). The front ends of these function slides have camming surfaces which, when a slide is shifted to the rear by its function lever, move the letters-figures code bar fork to the right (letters position) or to the left (figures position). The fork engages a pin on the bracket which is fastened to the letters-figures shift code bar, and positions the code bar to the right or left (Fig. 20). Movement of the letters-figures code bar results in the positioning of the typebox, through related mechanisms, for printing of letters or figures, as described in 8.05.

STUNT BOX CONTACTS (Figs. 39 and 40)

13.17 For external circuit control and switching functions, the function levers may be positioned to operate normally open, normally closed, or SPDT switches mounted on the top of the stunt box. In general, the function contacts are similar except for electrical connections,
which are determined by external requirements. The contact arm configuration is changed as required to either make or break the contact when the associated function lever is in selected (rear) position. All contacts are wired through the cable connector located on the right side plate. A typical contact (NO) is illustrated in unselected (Fig. 39) and selected (Fig. 40) condition.

14. SPROCKET FEED TYPING UNIT

GENERAL (Figs. 3 and 41)

14.01 Except for differences in the platen and associated mechanisms (par. 2), the sprocket feed typing unit includes all features of the friction feed typing unit described in this section. It has a sprocket feed mechanism for insertion of a form-fold paper supply for the page printed message.

DESCRIPTION

14.02 The platen is equipped at each end with an eleven pin sprocket, with pins spaced to accommodate holes along the edges of form fold paper for the page printed message (Fig. 41). The pins are cammed (within the platen) so that the two bottom and two top pins on each side at the front of the platen are extended, while all others are retracted. Extended pins engage the holes in the form fold and pull the paper into page printing position over the front of the platen, where it is held by two paper fingers. At the rear of the platen, the form fold is fed through an aperture at the back of the enclosure housing the typing unit, across a flat paper guide, and under the bottom of the platen. Paper feeding and line feeding are as described in 13.09. Paper fingers are released to a spring loaded upright position by pushing a lever marked PUSH on the top of the right side plate to the rear. The fin-
gers are repositioned by depressing them manually until the end of the paper guide shaft latches an indent on the release lever.

15. VARIABLE FEATURES
HORIZONTAL TABULATION (Figs. 42 and 43)

15.01 The spacing drum for typing units equipped for horizontal tabulation has a slotted tab stop ring mounted over the face of the spacing drum, in place of the carriage return ring on other units. The ring (Fig. 42), when coded for the desired tabulation, will allow the carriage to be moved rapidly, at a speed three times that of normal spacing, to predetermined horizontal positions on the printed page.

15.02 Reception of the input signal code combination representing horizontal tabulation operates the associated stunt box mechanisms to move the function lever forward. The function lever moves the horizontal tabulator slide (Fig. 43) forward. As the slide arm moves forward, it engages the operating lever cam plate, causing the operating lever to pivot about its mounting stud, located at the center of the lever. As the upper end of the operating lever moves forward, the extension link attached to the lower end of the lever moves to the rear. Near the end of its travel, the extension link clears the blocking lever, allowing it to move down into position to block the link from moving forward.

---

Figure 42 - Horizontal Tabulation Mechanism
15.03 Tripping of the spacing clutch is initiated in the same way as for normal printing (10.01–10.02). As the trip lever moves down, however, it hooks over and pulls down the intermediate trip ball (Fig. 43). The intermediate ball in turn pulls down the stop lever arm and trips the clutch stop lever, which is clamped to the lower end of the stop arm. The spacing clutch then starts to rotate. The stop lever arm in its unoperated position rests against the intermediate ball.

15.04 Fastened to and moving as part of the operating lever is the latch ball adjusting plate (Fig. 43). Mounted to the stud on the upper end of the adjusting plate is the stop lever arm latch ball. The latch ball in its rest position is held forward by spring tension against a projection on the adjusting plate. Therefore, when the upper end of the operating lever moves forward, the latch ball moves with it until the upper end of the latch ball strikes the spacing stop lever arm, which would not have been pulled down yet. The operating lever continues moving until it reaches its forward position, but the latch ball resting against the stop lever arm is prevented from going any farther and pivots around its mounting stud. Later, when the stop lever arm is pulled down by the spacing trip lever, the forward end of the stop lever arm comes below the latching surface of the latch ball. The latch ball then moves forward over the stop lever arm, latching it down as long as the operating lever is held in its operated position.

15.05 As the spacing clutch starts to rotate, the cam plate stripper ball (Fig. 43) engages the cam lobe on the spacing clutch restoring cam. This pivots the stripper ball about its shaft, causing the operating lever cam plate to be pivoted downward, out of engagement with the slide arm. The operating lever then drops back slightly until the lever extension link butts up against the blocking lever, which is in the down position. Thus, the operating lever is held operated, the spacing stop lever arm is latched down by the latch ball, and the spacing clutch will rotate until the blocking lever is tripped, unblocking the operating lever extension link.

15.06 As the spacing clutch rotates, the spacing drum will rotate until a tab stop attached to the drum reaches the tabulator pawl mounted on the blocking lever (Fig. 42). As the tab stop moves across the pawl, the pawl is moved down, causing the blocking lever to rotate about its mounting stud and releasing the operating lever extension link. The operating lever returns to its unoperated position. The latch ball releases the stop lever arm, and the clutch stop lever blocks further rotation of the spacing clutch. The tabulator function slide arm returns to its unoperated (rear) position when the function pawl is stripped from the function bar during the normal operation of the function stripper blade.

15.07 When the printing carriage nears the right margin position, the spacing cut-out lever (Fig. 42) on the spacing drum engages the lower surface of the bail extension pawl. The extension pawl and ball rotate together due to the pawl spring until the bail is fully operated. When the transfer ball is in its operated position, the space suppression slide is operated, and further normal spacing is prevented. If the clutch were to continue to rotate, the spacing drum will continue to rotate after the transfer ball reaches its operated position. At this time, the bail reaches a fixed stop, but the extension pawl pivots about the lower pivot point, permitting the cut-out lever on the drum to go by the pawl. The transfer ball and the extension pawl will then return to their unoperated position. When the carriage returns, the space cut-out lever engages the upper surface of the extension pawl, causing the pawl to pivot about the mounting shaft until the cut-out lever is able to go by the pawl. The extension pawl is then returned to its unoperated position.

15.08 A set of contacts, the forward contacts interrupting operation of an associated transmitter distributor set during the tabulation operation, the rear operating a motor hold mechanism external to the typing unit, are operated simultaneously when the operating lever is in operating position.

VERTICAL TABULATION AND FORM OUT (Fig. 44)

15.09 A number of form starter gears and index discs (Fig. 44) are available to adapt sprocket feeds typing units for form out accommodation of forms two to fifteen inches in length with vertical tabulation in 1-inch increments, or of two to ten inches in length with vertical tabulation in 1/2 inch increments. The form starter gear and the index disc are selected for the desired form length. The form out mechanism automatically advances a form to the first printing line on the succeeding form from any point on the previous form. The vertical tabulation mechanism advances a form to any predetermined position within the form.
When the input signal code combination representing form out is received, the associated stunt box mechanism linkage moves the form out slide forward. As a result, the tabulator slide moves forward, moving the line feed slide forward so that it unlatches the line feed clutch. With the line feed clutch engaged, movement of the form out slide is prevented by the form out blocking lever, and the line feed mechanism operates continuously.
Figure 44 - Vertical Tabulation and Form Out Mechanisms
15.11 When the stop plate on the rotating disc engages the pawl, the form out blocking lever is moved upward, permitting the slides to return to their unoperated positions. When this occurs, the line feed clutch is disengaged, and the form out operation is terminated.

15.12 The sequence of operation of vertical tabulation is similar to that of the form out mechanism. When the input signal code combination representing vertical tabulation is received, the associated stunt box mechanism operates a vertical tabulator slide. The slide, moving forward, engages the line feed slide, which in turn engages the line feed clutch. The vertical tabulator blocking lever retains the vertical tabulator slide in the operated position, and the line feed clutch is permitted to rotate continuously.

15.13 The vertical tabulator slide remains in the operated position until the stop plate on the disc engages the bail, which in turn raises the blocking lever and allows the vertical tabulation slide and the line feed slide to return to their unoperated positions. The line feed clutch is disengaged, and the function mechanism is stripped to its unoperated position.

15.14 A set of transmitter control contacts operate on both vertical tabulation and form out cycling. The contacts contain an insulated swinger that rides on an extension of each blocking lever. When either blocking lever is in the operated position, the contacts are opened and, through external wiring, stop transmission from the associated transmitter-distributor.

AUTOMATIC CARRIAGE RETURN-LINE FEED

15.15 The automatic carriage return-line feed feature operates through stunt box mechanism each time the type box carriage advances to within one character of the right margin. Should an operator fail to originate these functions, this feature provides them automatically.

15.16 With the type box carriage advanced to within one character of the right margin, the automatic carriage return bell crank is tripped by an arm attached to the spacing drum (Fig. 26). The bell crank turns clockwise and positions the automatic carriage return-line feed code bar, marked O, to the right. Two identical function bars, each with a single code projection are provided in the stunt box, adjacent to the carriage return and line feed function bars. The code bar normally blocks the function bars. When the automatic carriage return-line feed code bar is positioned to the right, however, the function bars and their associated pawls and levers operate. The carriage return and line feed slide arms are operated, and cause these functions to occur simultaneously.

LOCAL BACKSPACE

15.17 Each time the LOC BSP (local backspace) key lever on the associated keyboard unit is operated, a backspace occurs at the local typing unit. The key lever, through an operating bail and trip link engages the spacing clutch. As the spacing eccentric assembly rotates, the spacing feed pawl that is moving upward is prevented from engaging the teeth on the spacing drum by the action of the eccentric and the pivoting of the feed pawl on the back space camming bail. As a result, the spacing drum rotates backward under spring tension, following the feed pawl that is moving downward. After a single backspace occurs, the spacing clutch is disengaged by action of the trip link stripper, which rides on the clutch cam disc.

UNSHIFT ON SPACE

15.18 Each time the space function signal code is received, the unshift on space feature automatically shifts the type box to the letters position. A function bar and its function lever, located adjacent to the letters-figures function mechanism, operate upon receipt of the space signal code. The function lever engages an extension of the letters function slide. Therefore, when a spacing function occurs, letters shift will also occur, in the manner described in 8.05. This feature may be disabled by the adjustment of a screw which raises the end of the function pawl from the function bar.

SIGNAL BELL

15.19 The circuit to the signal bell magnet is controlled by a set of normally-open electrical contacts operated by the stunt box. The function bar for the signal bell function has six code lugs, five for the signal code combination, such as S or J, and one for the letters-figures shift code bar. To select the signal bell function, the letters-figures shift code bar must be in or shifted to the figures position. Then, each time the signal code combination for the bell function is received, the function lever will pulse the signal bell contact. If the letters-figures code bar is in the letters position at this time, it will block the signal bell function bar.
1. GENERAL 

1.01 This section is reissued to include additional synchronous motor information, and to revise the section number appearing on each page. With the exception of the section number, which changed on every page, all other changes and/or additions are indicated by marginal arrows, or by arrows placed within the illustration or table.

1.02 The motor units that provide electromagnetic rotating motion for operating various teletypewriter apparatus are of two basic types: synchronous and series (governed). Both types are self-contained motor units, with characteristics adaptable for use with standard power sources.

1.03 The synchronous type motor units (Figures 1 and 2) are available in miniature (25 millihorsepower), standard, and heavy duty ratings. These motor units must be operated from a standard, single-phase, regulated power source with specifications as listed in Tables I and II.

1.04 The series (governed) type motor units (Figure 3) are available in standard and heavy duty horsepower ratings and may be operated from regulated or unregulated, standard, single-phase power sources, or dc (direct current). The series (governed) type motor unit is also available for operation with 48 volts dc only. Specifications are given in Table III.

2. DESCRIPTION

2.01 In general, the synchronous motor units consist of a motor and mounting arrangement, and the required starting and protective devices. Variations of this type are described below.

SYNCHRONOUS MOTOR UNITS

A. Miniature Synchronous Motor Units (Figure 1)

2.02 The 25 millihorsepower miniature synchronous motor units consist of a two-pole wound stator and two end shields that support a squirrel cage type rotor. The motor is secured to its bracket-type cradle by means of resilient mounts at each end, which tend to reduce the transmission of vibrations from the motor to the driven apparatus. A starting relay, capacitor and thermostatic cutout switch are mounted under the cradle. The thermostatic cutout switch protects the motor windings from excessive current drawn by the motor. It can be reset manually.

2.03 The variations of the miniature synchronous include 3600 rpm (60-cycle units) and 3000 rpm (50-cycle units) operation; an external fuse instead of the thermostatic cutout switch; single or dual air ducts to improve
ventilation, or an air shield to isolate the incoming cool air from the outgoing heated air; and mounting of control parts on the side of the motor instead of under the cradle.

B. Standard and Heavy Duty Synchronous Motor Units (Figure 2)

2.04 The standard and heavy duty synchronous motor units consist of a two pole wound stator and two end shields that support a ball bearing rotor. A combination hand wheel and fan is mounted on the motor shaft, and two fans are mounted at each end of the rotor within the end shields. The opposite end of the shaft contains a tapped hole for mounting the driving gear. A motor starting relay, starting capacitor, and thermostatic cutout switch are mounted in a compartment of the motor mounting bracket. The thermostatic cutout switch, which is reset manually, protects the motor windings from excessive current drawn by the motor. The motor is supported by resilient mounts which are part of the end shields and which are held in place by straps attached to the mounting bracket. The resilient mounts tend to reduce the transmission of vibration from the motor to the driven associated apparatus.

2.05 Variations of the standard and heavy duty synchronous motor units include: 3600 rpm (60 cycle units) and 3000 rpm (50 cycle units) operation; 1/20 and 1/12 horsepower ratings; replacement of the fan with a gear to reverse the direction of rotation for such applications as the high speed punch unit; inverted mounting for installation in the Wall Mounted Page Printer Set, for example; re-location of control parts to meet varying installation requirements as in the Multiple KSR and RO Set where the control parts are mounted in a compartment at the rear of the fan.
SERIES (GOVERNED) MOTOR UNITS (Fig. 3)

2.06 The series (governed) motor units typically consist of a motor, speed regulator (governor), protective and control devices, and a mounting. Variations of this type are described below.

A. 1/20 Horsepower Motor Units (AC/DC)

2.07 The 1/20 hp series (governed) motor unit consists of a series type motor, speed governor, motor mounting bracket, and a housing for the governor resistors and spark suppression capacitor. The governor is mounted on an extension of the armature shaft and includes a fan that circulates air through the motor. The opposite end of the shaft contains a tapped hole for mounting the driving gear. Targets for speed checking purposes are provided on the governor cover. The motor is mounted by means of resilient mounts at each end shield that are fastened to the mounting bracket by straps.
2.08 A variation of the motor unit described in 2.07 is available with electrostatic shielding and radio frequency noise suppression. The higher horsepower rating accommodates, for example, the requirements of the Automatic Send-Receive Set.

B. 1/15 Horsepower Motor Units (AC/DC)

2.09 These motor units are similar to the units described in 2.07, but are equipped with electrostatic shielding and radio frequency noise suppression.

C. 1/15 Horsepower Motor Units (DC)

2.10 These motor units are designed to operate with 48 volts dc only and are equipped with electrostatic shielding and radio frequency noise suppression.
<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>LMU19, LMU20, LMU24, LMU26, LMU31, LMU45, MU43 (Bell 28F)</th>
<th>LMU35, LMU40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Horsepower</td>
<td>25 Millihorsepower</td>
<td>25 Millihorsepower</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>115 ±10% AC</td>
<td>115 ±10% AC</td>
</tr>
<tr>
<td>Phase</td>
<td>Single</td>
<td>Single</td>
</tr>
<tr>
<td>Frequency</td>
<td>60 Cycles, ±0.75%</td>
<td>50 Cycles, ±1%</td>
</tr>
<tr>
<td>Input Current (Full Load - Amperes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starting</td>
<td>4.0-5.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Running</td>
<td>1.25</td>
<td>0.47</td>
</tr>
<tr>
<td>Power Factor (Full Load)</td>
<td></td>
<td>89%</td>
</tr>
<tr>
<td>Watts Input (Full Load)</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Start Capacitor</td>
<td>88-108UF (130-156UF, MU43 (Bell 28F))</td>
<td>64-77</td>
</tr>
<tr>
<td>Run Capacitor</td>
<td></td>
<td>7.0</td>
</tr>
<tr>
<td>Speed</td>
<td>3600 RPM</td>
<td>3000 RPM</td>
</tr>
<tr>
<td>Rotation</td>
<td>Clockwise viewed from pinion end</td>
<td>Clockwise viewed from pinion end</td>
</tr>
<tr>
<td>Mounting</td>
<td>Upright</td>
<td>Upright</td>
</tr>
<tr>
<td>Other Distinguishing Characteristics</td>
<td></td>
<td>LMU35, LMU40 - Contain no thermostatic cutout device. Fused (0.8A) externally. Relay and capacitors mounted on motor mounting bracket. Equipped with an air shield.</td>
</tr>
<tr>
<td>LMU19</td>
<td>Relay, capacitor, and thermostatic cutout switch mounted on motor bracket.</td>
<td></td>
</tr>
<tr>
<td>LMU20, LMU26</td>
<td>Relay, capacitor, and thermostatic cutout switch mounted on motor bracket.</td>
<td></td>
</tr>
<tr>
<td>LMU20</td>
<td>Relay, capacitor, and thermostatic cutout switch mounted on motor bracket.</td>
<td></td>
</tr>
<tr>
<td>LMU24</td>
<td>Twin exhaust ducts. Relay and capacitor mounted on motor bracket. No thermostatic cutout switch. Fused externally. Latest design have double shaft.</td>
<td></td>
</tr>
<tr>
<td>LMU24</td>
<td>Twin exhaust ducts. Relay and capacitor mounted on motor bracket. No thermostatic cutout switch. Fused externally. Latest design have double shaft.</td>
<td></td>
</tr>
<tr>
<td>LMU24</td>
<td>Twin exhaust ducts. Relay and capacitor mounted on motor bracket. No thermostatic cutout switch. Fused externally. Latest design have double shaft.</td>
<td></td>
</tr>
<tr>
<td>LMU31</td>
<td>Capacitor and thermostatic cutout switch mounted on motor bracket. Relay mounted on bracket assembly.</td>
<td></td>
</tr>
<tr>
<td>LMU45, MU43 (Bell 28F)</td>
<td>Relay, thermostatic cutout switch mounted on motor bracket. Capacitor mounted on motor shield. Wiring for external start switch noise suppressor (LMU45 only).</td>
<td></td>
</tr>
<tr>
<td>CHARACTERISTICS</td>
<td>LMU3 (Bell 28A), LMU15 (Bell 28LA), LMU30, LMU37, LMU42, LMU46</td>
<td>LMU33, LMU36, LMU38, LMU51, LMU52</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Rated Horsepower</td>
<td>1/20</td>
<td>1/20</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>115 ±10%, AC</td>
<td>115 ±10%, AC</td>
</tr>
<tr>
<td>Phase</td>
<td>Single</td>
<td>Single</td>
</tr>
<tr>
<td>Frequency</td>
<td>60 Cycles, ±0.75%</td>
<td>50 Cycles, ±0.75%</td>
</tr>
<tr>
<td>Input Current (Amperes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starting</td>
<td>9.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Running</td>
<td>1.85</td>
<td>2.4</td>
</tr>
<tr>
<td>Power Factor (Full Load)</td>
<td>30%</td>
<td>35%</td>
</tr>
<tr>
<td>Watts Input (Full Load)</td>
<td>65</td>
<td>107</td>
</tr>
<tr>
<td>Heat Dissipation (Watts)</td>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>Start Capacitor Rating</td>
<td>43-48 UF</td>
<td>43-48 UF</td>
</tr>
<tr>
<td>Speed</td>
<td>3600 RPM</td>
<td>3000 RPM</td>
</tr>
<tr>
<td>Rotation</td>
<td>LMU42 CW, others CCW viewed from fan or short shaft end.</td>
<td>CCW viewed from fan or short shaft end.</td>
</tr>
<tr>
<td>Mounting</td>
<td>All upright except LMU27 and LMU30 which are inverted.</td>
<td>All upright except LMU36 which is inverted.</td>
</tr>
<tr>
<td>Other Distinguishing Characteristics</td>
<td>LMU3 (Bell 28A) - Control parts in compartment under motor. Fan cooled. Thermostatic cut-out switch. Latest design have more compact control parts arrangement.</td>
<td>LMU33 - Similar to LMU3 (Bell 28A). No fan.</td>
</tr>
<tr>
<td>CHARACTERISTICS</td>
<td>LMU3 (Bell 28A), LMU15 (Bell 35A), LMU21 (Bell 28LA), LMU30, LMU37, LMU42, LMU46</td>
<td>LMU33, LMU36, LMU38, LMU51, LMU52</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
</tbody>
</table>
| Other Distinguishing Characteristics - Continued | LMU15 (Bell 35A) - Same as LMU3 (Bell 28A) except no fan. Pinion on short shaft end.  
LMU21 (Bell 28LA) - Same as LMU3 (Bell 28A) except control parts at rear of fan.  
LMU30 - Same as LMU3 (Bell 28A) except for inverted mounting with control parts above motor.  
LMU37 - Same as LMU3 (Bell 28A) except for more compact cradle and mounting arrangement. Control parts on side of motor.  
LMU42 - Same as LMU3 (Bell 28A) except cradle and mounting arrangement is more compact and control parts are in a bracket on side of motor.  
LMU46 - Same as LMU3 (Bell 28A) except for wiring for motor start relay arc suppressor.  
LMU49 - Same as LMU3 (Bell 28A) but with speed sensing device. | LMU38 - Differs from LMU3 (Bell 28A) only in power frequency.  
LMU51 - Similar to LMU3 (Bell 28A) except for more compact cradle and mounting arrangement. Fan reversed (solid side adjacent to end bell).  
LMU52 - Similar to LMU3 except control parts mounted at rear of fan. | LMU12 (Bell 28C) - Same as LMU11 but with control parts located in motor mounting cradle and end shields rotated 180° for upright mounting.  
YMU-1 - Control parts are located in a compartment of the motor mounting cradle. |
## TABLE 3. TECHNICAL CHARACTERISTICS OF SERIES (GOVERNED) MOTOR UNITS

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>LMU6 (Bell 28B), LMU28, LMU41</th>
<th>LMU13, LMU32, LMU39</th>
<th>LMU23, LMU29 (Bell 28E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Horsepower</td>
<td>1/20</td>
<td>1/15</td>
<td>1/15</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>115 ±10%, AC/DC</td>
<td>115 ±10%, AC/DC</td>
<td>48 ±10%, DC</td>
</tr>
<tr>
<td>Phase</td>
<td>Single</td>
<td>Single</td>
<td>-</td>
</tr>
<tr>
<td>Frequency</td>
<td>25, 50, or 60 cycles, or DC</td>
<td>25, 50, or 60 cycles, or DC</td>
<td>-</td>
</tr>
<tr>
<td>Input Current (Full Load - Amperes)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starting</td>
<td>2.4 2.7 1.9 1.8</td>
<td>4.5 4.0 2.8 3.4</td>
<td>13.5</td>
</tr>
<tr>
<td>Running</td>
<td>1.18 1.34 1.12 0.93</td>
<td>2.1 2.3 1.8 1.7</td>
<td>2.5</td>
</tr>
<tr>
<td>Power Input (Watts)</td>
<td>123 114 92 1.07</td>
<td>235 200 190 195</td>
<td>120</td>
</tr>
<tr>
<td>Power Factor (Full Load)</td>
<td>90% 74% 71% -</td>
<td>96.8% 87% 79% -</td>
<td>-</td>
</tr>
<tr>
<td>Heat Dissipation (Watts)</td>
<td>86 87 55 70</td>
<td>130 97.2 94.2 111</td>
<td>66</td>
</tr>
<tr>
<td>Series Resistor (Ohms)</td>
<td>25 - - 50</td>
<td>12 - - 20</td>
<td>-</td>
</tr>
<tr>
<td>Target Indicator</td>
<td>4, 6, and 35 Spot</td>
<td>4, 6, and 35 Spot</td>
<td>4, 6, and 35 Spot</td>
</tr>
<tr>
<td>Governed Speed</td>
<td>3600 RPM</td>
<td>3600 RPM</td>
<td>3600 RPM</td>
</tr>
<tr>
<td>Rotation</td>
<td>CCW viewed from commutator end</td>
<td>CCW viewed from commutator end</td>
<td>CCW viewed from governor end</td>
</tr>
<tr>
<td>Mounting</td>
<td>Upright</td>
<td>LMU13, LMU32 - Inverted LMU39 - Upright</td>
<td>LMU23 - Inverted LMU29 - Upright</td>
</tr>
<tr>
<td>RF Shielding</td>
<td>LMU28, LMU41</td>
<td>LMU32, LMU39</td>
<td>LMU29 (Bell 28E)</td>
</tr>
<tr>
<td>RF Suppression</td>
<td>LMU28, LMU41</td>
<td>LMU32, LMU39</td>
<td>LMU29 (Bell 28E)</td>
</tr>
<tr>
<td>Other Distinguishing Characteristics</td>
<td>Control parts compartment rectangular on LMU6 (Bell 28B) and LMU28 and LMU41 governor resistor mounted on heat sink.</td>
<td>LMU39 governor resistor mounted on a heat sink. LMU13, LMU32 cradle compartments are rectangular.</td>
<td>No screened governor cover on LMU29 (Bell 28E)</td>
</tr>
</tbody>
</table>
3. PRINCIPLES OF OPERATION

SYNCHRONOUS MOTOR UNITS (Figs. 1, 2, and 4)

3.01 The following description of operation applies to the miniaturized, standard, and heavy duty synchronous motor units.

3.02 The stator of the synchronous motor has two windings: a starting winding and an operating (or run) winding. The starting winding, starting capacitor and the normally-open contacts of the starting relay are connected in series. The coil of the current-operated starting relay is connected in series with the operating winding. When power is applied, the initial current through the operating winding (and also the starting relay coil) energizes the relay, and its contacts close the circuit to the starting winding. As the speed of the rotor increases, the current in the operating winding decreases and, when the current has decreased to a predetermined magnitude, the starting relay de-energizes. Its contacts open and remove the starting winding from the operating circuit. The rotor continues to accelerate until it reaches the synchronous operating speed. Rotation is in the counterclockwise direction, as viewed from the fan or short-shaft end of the motor.

3.03 The thermostatic cutout switch is connected in series with both stator windings. This temperature operated device opens the circuit to these windings whenever excessive current is drawn, such as may occur if the motor is stalled, thereby preventing overheating and damage to the motor and control parts. The switch may be reset after the unit has cooled by depressing a pushbutton.

Figure 4 - Typical Synchronous Motor Unit Schematic Diagram
3.04 The following description of operation is applicable to all series (governed) motor units.

3.05 The series wound motor utilizes an electro-mechanical governor for speed regulation. The governor regulates the speed at 3600 rpm, ±1 percent, by alternately increasing and decreasing the current in the series connected field windings and armature, which are also in series with a governor contact. A resistor (high-wattage) and capacitor are connected in parallel with the governor contact. The contact is held closed under the tension of a spring which is adjusted to maintain this condition during speeds up to a predetermined rate. With the contact closed, the resistors are shorted out. When the speed of the motor exceeds the predetermined rate, the centrifugal force acting upon the contact momentarily overcomes the spring tension and the contact is opened. This removes the short from the resistors and they then appear in series with the field windings and armature, reducing their current, and consequently reducing the speed of the motor.
3.06 The tension on the contact spring is adjustable to maintain the motor speed at 3600 rpm. To make this adjustment, a target is provided to compare the motor speed with a standard. The outside surface of the governor cover is finished in white with three rows of black spots equally spaced about its periphery. The outer, center, and inner rows contain four, six, and thirty-five spots, respectively. The four spot row is a target which should remain essentially stable at 3600 rpm, when viewed through the moving shutter of a 120 vibrations per-second tuning fork. The six spot and thirty-five spot rows serve as targets when using an 87.6 vibration-per-second tuning fork. The six spot row is used to approach an on-speed setting and the thirty-five spot row is used to arrive at an accurate setting of 3600 rpm.
1. GENERAL

1.01 This section provides description, installation, adjustments, lubrication, principles of operation, and wiring information for the LPW300 (Bell 1A) paper winder.

1.02 The paper winder, in conjunction with a copy display rack, is capable of winding page copy from friction feed 28, 32, 33, or 35 Console Teletypewriter Set (KSR, RO, or ASR), or 28 Table Model Teletypewriter Set using LPC204, LPC205 (Bell 28A), or LPC206 cover.

Note: The paper winder is not to be used with sprocket feed sets.
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Figure 2 shows the winder mounted on the back of a 28 console cabinet.

TECHNICAL DATA

A. Electrical

Power Requirements ------ 115 +10 percent volts ac, 50/60 cycle

Note: The mercury switch controls the motor current.

B. Capacity

Note: At 15 percent (or less) relative humidity.

28 or 35 Set ------ 400 feet, 8-1/2 inch wide (0.0034- to 0.0043-inch thick) KS1920 paper

32 or 33 Set ------ 320 feet, 8-1/2 inch wide (0.0034- to 0.0043-inch thick) KS8483 paper

Note: The winder accommodates paper widths from 4-1/4 to 8-1/2 inches. Since pull-back operation of narrow width paper may require the use of an additional modification kit, it is recommended that copy pull-back be restricted to use with 8-1/2 inch width paper.

3. INSTALLATION

Note: For parts referred to, other than the loose parts furnished with the paper winder, components of the paper winder, or of the TP195259 modification kit, refer to appropriate set parts publication.

LOOSE PARTS

3.01 The following loose parts are furnished (in bag) with the paper winder:

<table>
<thead>
<tr>
<th>Part Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1253</td>
<td>Screw</td>
</tr>
<tr>
<td>TP3646</td>
<td>Lockwasher</td>
</tr>
<tr>
<td>5830WD</td>
<td>Diagram, Wiring</td>
</tr>
<tr>
<td>TP49514</td>
<td>Nut</td>
</tr>
<tr>
<td>TP49612</td>
<td>Screw</td>
</tr>
<tr>
<td>TP78469</td>
<td>Foot, Rubber</td>
</tr>
<tr>
<td>TP82474</td>
<td>Terminal (Spade)</td>
</tr>
<tr>
<td>TP97347</td>
<td>Screw, Set</td>
</tr>
<tr>
<td>TP114466</td>
<td>Connector, Receptacle</td>
</tr>
<tr>
<td>TP165255</td>
<td>Screw, Sheet Metal</td>
</tr>
<tr>
<td>TP192007</td>
<td>Terminal</td>
</tr>
<tr>
<td>TP193951</td>
<td>Guide, Paper</td>
</tr>
</tbody>
</table>

Note: The TP114466 receptacle connector, furnished with the paper winder, mates with the connector on the winder power cord which is approximately 18 inches long. The customer must furnish the wiring between the connector and an ac power source. Three TP82474 terminals (spade) and two TP192007 terminals (one is a spare) are provided for use in making wiring connections.

28 EQUIPMENT

3.02 Install paper winder on 28 console cabinet or 28 LPC204, LPC205 (Bell 28A), or LPC206 cover as follows (Figure 3):

(1) Remove TP152797 plate w/screws and TP151532 cover w/plate from rear of cabinet by removing two TP6345 nuts, TP2191 lockwashers, and TP7002 washers. Discard the parts and mounting hardware.
Note: Hole must be added for LPC covers. Winder is mounted with three screws, lockwashers, and nuts on LPC covers.

Figure 3 - Installing Paper Winder on 28 Console Cabinet (LAC or LAAC) or 28 LPC204, LPC205 (Bell 28A), or LPC206 Cover

(2) Mount the paper winder at the rear of the cabinet, using two holes made available in preceding Paragraph (1), two lower holes present in the cabinet, four TP1253 screws, TP3646 lockwashers, and TP49514 nuts.

(3) Mount the paper winder on 28 LPC204, LPC205 (Bell 28A), or LPC206 cover using two TP1253 screws, TP3646 lockwashers, and TP49514 nuts to secure the upper portion of the paper winder bracket to the rear of the cover. Using the winder bracket as a template, drill a 0.172 inch diameter hole (11/64 inch drill) in the LPC cover coinciding with the lower left mounting hole of the winder bracket. Secure the lower portion of the winder bracket with a TP1253 screw, TP3646 lockwasher, and TP49514 nut.

(4) For 28 console cabinet - The three TP82474 terminals may be used when power is to be obtained from the "C" terminal board of the cabinet.

(5) For 28 LPC cover - The three TP82474 terminals may be used when power is to be obtained from the "T" terminal board of the cover.

(6) Insert appropriate copy display rack into its locating holes on the paper winder frame (Figure 3).

32 AND 33 EQUIPMENT

3.03 Install paper winder on 32 or 33 console cabinet as follows. A TP195259 modification kit (Paragraph (1) below) is required (Figure 4).

(1) The TP195259 modification kit consists of:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TP195253</td>
</tr>
<tr>
<td>2</td>
<td>TP195256**</td>
</tr>
<tr>
<td>4</td>
<td>TP6345</td>
</tr>
<tr>
<td>4</td>
<td>TP195180</td>
</tr>
<tr>
<td>4</td>
<td>TP195259</td>
</tr>
</tbody>
</table>
(2) Loosen the screw securing the TP193953 motor housing to the winder and remove the housing.

(3) Remove the two resistor leads from the terminal block assembly and tape the resistor leads from interference with other wiring and moving parts.

(4) Adjust the winder mercury switch (Figures 7 and 8). Replace the TP193953 motor housing and tighten the retaining screw.

(5) Secure the two TP195256 hangers to the paper winder using four TP195180 rubber bumpers, TP2191 lockwashers, and TP6345 nuts.

(6) Looking at the rear of the cabinet, hook the right hanger over the top ledge of the removable panel. Tilt the lower end of the winder outward slightly and slide the winder to the right until the left hanger engages the ledge of the panel. Position winder for alignment of winder spindle with typing unit platen.

Note: When TP195259 modification kit is installed on 32 or 33 console cabinet equipped with three thumb screws (used to fasten rear of cover), remove and discard the center thumb screw.

(7) The three TP82474 terminals may be used when power is to be obtained from the set at terminals 1 and 2 of the "TS" terminal board and terminal 4 of the motor control relay.

(8) Insert appropriate copy display rack into its locating holes on the paper winder frame (Figure 3).
3.04 Install paper winder on 35 console cabinet as follows (Figure 5):

1. Remove TP152797 plate w/screws and TP192116 cover w/plate from rear of cabinet by removing two TP6345 nuts, TP2191 lockwashers, and TP7002 washers. Discard the parts and mounting hardware.

2. Mount the paper winder at the rear of the cabinet using two holes made available in preceding Paragraph (1), two TP78469 rubber feet, TP49612 screws, TP3646 lockwashers, TP49514 nuts, two lower holes present on later cabinet, two TP78469 rubber feet, and TP165255 sheet metal screws.

Note: If the cabinet does not have the two lower holes they must be added. Use the frame of the paper winder as a template and spot or mark the location of the two lower mounting holes of the winder on the cabinet. Drill two 0.125 inch diameter holes (1/8 inch drill) in the cabinet. Make certain that no metal chips get into the winder and printer set mechanisms.

Figure 5 - Installing Paper Winder on 35 Console Cabinet
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COPY DISPLAY RACK

PAPER

PAPER-SLACK
BAIL

PAPER WOUND
ON SPINDLE

WINDER
FRAME

CABINET

Figure 6 - Path of Paper from Printer Unit to Paper Winder Spindle

3.07 Check alignment of paper with paper winder spindle. If necessary, adjust paper in typing unit. Make certain that the paper fingers on the typing unit are in the proper location.

3.08 For narrow paper, assemble the TP-193951 paper guide to the slack bail for the applicable width of paper and secure the paper guide using the TP97347 set screw.

SPINDLE AND PAPER REMOVAL

3.09 To remove the spindle, shut off the power with the paper winder ON-OFF switch, grasp the spindle (or the roll of paper, if any, on the spindle) at the end which is farthest away from the motor and pull upward (assuming winder is mounted on cabinet).

3.10 To remove the roll of paper from the spindle, pull the spindle flanges outward.

GENERAL INSTRUCTIONS AND CHECKS

Note: The paper winder is factory adjusted for operation with 28 or 35 Set. For 32 or 33 Set application, it will be necessary to remake the Mercury Switch Position Adjustment (Figures 7 and 8).

3.05 The operation of the paper winder ON-OFF switch should be checked to determine whether the slack bail and its associated mercury switch activate the winder spindle. If necessary, check the mercury switch position adjustment (Figures 7 and 8).

3.06 See Figure 6 for path of paper from printer unit to paper winder spindle.

Page 6
MERCURY SWITCH POSITION ADJUSTMENT

(1) Requirement
The two glass-enclosed leads of the switch must be positioned such that the mercury makes contact with the leads simultaneously when the switch is activated (Figure 7).

(2) Requirement
The mercury switch should start the motor when the following clearances are present:

For 28 or 35 Set:
3/4 to 1-1/4 inches (factory adjustment).

For 32 or 33 Set, readjust to:
1/8 to 5/8 inch.

To Adjust
Position the switch with its mounting screw loosened (Figure 7).

Figure 8 - Paper Winder Mercury Switch Position
3.11 To reassemble the spindle, engage the two pins on each of the flanges with the two holes in each opposite flange.

3.12 To replace the spindle, first engage the bearing hole in the spindle with the bearing on the motor shaft (see that the ends of the spindle pins are on either side of the post in the bearing) then press the opposite end of the spindle down (assuming winder is mounted on cabinet) until the spindle bearing post slips past the retaining spring.

4. ADJUSTMENTS

4.01 See Figures 7 and 8 after paper winder is installed. Reposition the mercury switch, if necessary.

5. LUBRICATION

Note: Frequency consistent with set lubrication schedule.

5.01 Paper-Slack Bail - One drop KS7470 oil at each pivot point.

6. PRINCIPLES OF OPERATION

6.01 The paper is guided over the copy display rack, underneath the paper-slack bail, to the paper winder spindle. The paper-slack bail will be in the lowermost position. Consequently the mercury switch mounted on the paper-slack bail will be ON and the motor will be operating. The drive pin on the motor shaft will engage the flange rod, thereby winding the paper. As the paper winds, the slack bail will be raised and the mercury switch will tilt to the OFF position. Current will then be interrupted (32 or 33 application) or will flow through a resistor connected across the mercury switch (28 or 35 application). Further operation of the motor is prevented, thereby minimizing the pull on the printer paper-feeding mechanism. Approximately ten lines (single space) will have to be fed out before the slack bail will again be in position to start the winder motor through the action of the mercury switch.

7. SERVICING

CAUTION: DISCONNECT POWER TO PAPER WINDER BEFORE SERVICING.
# 28 Teletypewriter Cabinets - for KSR and RO Sets

## Adjustments

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## General

1.01 This section provides instructions for adjusting the 28 teletypewriter cabinets designed to house the Keyboard Send-Receive and the Receive-Only teletypewriters.

1.02 In this issue, cabinets for the Automatic Send-Receive Sets have been removed. Wall-mounted cabinets for housing single 28 KSR or RO sets have been added, multiple page printer cabinets for housing three or four printer sets have also been added. Since this is a general

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revisions, marginal arrows ordinarily used to indicate changes and additions have been omitted.

1.03 Most cabinet adjustments are initial adjustments that are made at the factory and do not require routine adjusting unless mounting screws have become loosened or parts have been removed and replaced. Adjustments most likely to need checking or remaking are outlined and illustrated herein. The figures show the adjusting tolerances, positions of moving parts, and spring tensions. Where an illustration shows interrelated parts, the sequence that should be followed in checking the requirements and making the adjustments shown is indicated by the letters (A), (B), (C), etc.
2. ADJUSTMENTS

LAC — 28B through 28E and 28J Teletypewriter Cabinets

2.01 Dome

(A) **DOME**

1. **Requirement**
   - The dome should be centered on the cabinet from right to left and placed
     - Min 3/16 inch — Max 1/4 inch from the front edge of the cabinet.
   
   **To Adjust**
   - Position the dome with the six nuts which secure the dome hinges to the dome loosened. Tighten the nuts.

2. **Requirement**
   - There should be a light-proof seal at the rear of the dome between the rubber gasket and the top edge of the cabinet.
   
   **To Adjust**
   - Position the dome downward with the six nuts, which secure the dome hinges to the cabinet, loosened. Tighten the nuts.

(B) **DOME CATCH**

1. **Requirement**
   - The dome should latch securely with a light-proof seal at the front of the dome between the rubber gasket and the top edge of the cabinet.
   
   **To Adjust**
   - The dome catch should unlatch when the catch button is depressed no deeper than the outer surface of the dome.

2. **Requirement**
   - The dome catch should unlatch when the catch button is depressed no deeper than the outer surface of the dome.
   
   **To Adjust**
   - Bend the two dome catches.

(C) **SMALL DOOR CATCH**

1. **Requirement**
   - The small door should securely latch.

2. **Requirement**
   - When the door is released from its catch it should spring open at least 1/2 inch.
   
   **To Adjust**
   - Bend the small door catch. Recheck rear of door to make certain it is flush with or slightly above the dome.
2.02 Small Door

(A) SMALL DOOR

Requirement
The small door should be centered from right to left. It should be positioned so as to provide a light tight seal between the rubber gasket and the ledge of the dome at all points.

To Adjust
Loosen the two nuts that secure detent bracket to dome bracket. Loosen the two nuts that secure detent arm to hinge extension. Loosen the four nuts that secure door hinges to dome bracket. Push hinges against dome bracket and tighten the four nuts that secure hinges to dome bracket. Loosen the three nuts that secure hinge extension to door. Slide door to its extreme forward position and position centrally from side to side with 1/32 inch minimum clearance on each side. Position the door so that it is flush with or not more than 3/32 inch above the dome. Door is to be parallel to within 3/32 inch. Tighten the three nuts that secure hinge extension to door. If the above requirements cannot be met, loosen the four nuts that fasten the door hinge to hinge extension. Position door flush with or slightly above dome so that the above requirements are met. Tighten the four nuts.

(B) DETENT ARM AND DETENT BRACKET

Requirement
With the dome closed, the small door should spring open at least 1/2 inch when released from its catch. The small door should remain in its detented position when the dome is opened into its fully raised position.

To Adjust
Position the detent arm and the detent bracket by means of their elongated mounting holes. Tighten the four nuts. If necessary reposition the detent arm. Recheck all nuts for tightness.

(C) SMALL DOOR STOP ARM

Requirement
Stop arm should be free of binds when door is opened or closed.

To Adjust
Loosen the stop arm bracket mounting screws. Close the door. Disconnect the torsion spring. Align stop arm for freeness and tighten mounting screws with door closed. Replace torsion spring.

(D) COUNTERBALANCE

Requirement
The dome should remain in its maximum open position and not close unless moved manually.

To Adjust
Turn the spring adjusting screw. (See Par. 2.01.)
2.03 Copyholder, Copy Lamp

(A) COPYHOLDER

Requirement
There should be sufficient tension on the line guide to hold copy in place and to prevent the line guide from slipping down its shaft. Line guide should be parallel to copyholder tray.

To Adjust
Remove the mounting screws or nuts from the line guide shaft and turn the shaft. Remount the shaft and tighten screws or nuts. Bend line guide to make it parallel to copyholder.

(B) WINDOW AND PAPER GUIDE (For cabinets housing friction feed typing units)

(1) Requirement
When the small door is opened or closed, the window should clear paper guide by 1/16 inch.

Note: 0.080 to 0.110 inch on skin tight cabinet. (See Par. 2.16.)

To Adjust
Position window with its retainer screws loosened. Check to see that gasket is between glass and metal surface.

(2) Requirement
With small door closed, the bottom edge of the paper guide should be Min 7/64 inch—Max 9/64 inch below bottom surface of window.

To Adjust
Position the paper guide with its mounting screws loosened.

(C) INDICATOR LAMP

Requirement
Clearance between indicator lamp and lens—approximately 1/16 inch.

To Adjust
Position lamp holder on its bracket with mounting screws loosened.

(D) COPY LAMP

Requirement
Clearance between copy lamp and cover approximately 1/16 inch.

To Adjust
Position lamp holder on its bracket with its mounting nut loosened. (On skin tight cabinets, rotate shield for desired illumination.)
2.04 Form Guide

Note: The following four adjustments are for cabinets housing sprocket feed typing units.

**FRONT FORM GUIDE**

Requirement
With typing unit in cabinet and large and small doors latched, clearance between the lower edge of the front form guide and the platen should be
Min 3/64 inch---Max 5/64 inch

To Adjust
Loosen the form guide mounting screws. Press the paper guide against the platen, then raise the form guide parallel to the platen.

**REAR FORM GUIDE**

Requirement
With a sheet of sprocket feed paper placed in the form guide and pushed to the right (rear view) against the guide gracket, the clearance between the left edge of the paper and the guide post should be
Min 3/64 inch---Max 5/64 inch

To Adjust
Position the guide post with its mounting nut loosened.
Requirement
Small door open and positioned so that clearance between front form guide and window is at minimum clearance.
Min 0.060 inch --- Max. 0.080 inch

To Adjust
Position window with four window retainer mounting screws loosened.

Note: If stapled paper is used, staples should pass freely through slot. If they do not, increase clearance as required.
2.06 Signal Bell and Cradle

(A) ARMATURE SPRING TENSION

Requirement
Min 1/2 oz --- Max 1 oz

to push the armature against the core (vertically).

To Adjust
Bend the armature extension just below the armature spring.

(B) REMOTE SIGNAL BELL

Requirement
Armature held against the magnet core. Clearance between the armature ball and the bell
Min 0.020 inch --- Max 0.035 inch

To Adjust
Bend the armature extension just below the armature spring.

(C) CRADLE

Requirement
Top of hinge bracket parallel to top of hinge bar.

To Adjust
Turn stop screw with locknut loosened.
2.07  End-Of-Form Alarm Mechanism and Low-Paper and Paper-Out Switch Assembly

END-OF-FORM LEVER

Requirement
End-of-form lever should move freely between typing unit and paper guide on the cabinet. Check with dome closed and small door open.

To Adjust
Position end-of-form lever forward or backward with its clamp screws loosened and up or down with end-of-form assembly mounting screws loosened.

LOW-PAPER AND PAPER-OUT SPRING

Requirement
Min 1/4 oz---Max 1-1/2 oz to pull the low-paper and paper-out levers up to point where switches operate.
2.08 Off-Set Copyholder

**MOUNTING SCREWS**

- **BEARING PLATE**
- **TORSION SPRING**
- **BUSHING**
- **LINE GUIDE**
- **PIVOT ARM**

(A) **PIVOT ARM AND LINE GUIDE**

1. **Requirement**
   - There should be sufficient tension on the pivot arm to hold it in the desired position.

   **To Adjust**
   - Tighten the bearing plate mounting screws.
     (Remove shims, if present.)

2. **Requirement**
   - There should be sufficient tension on the line guide to prevent it from slipping down its pivot arm.

   **To Adjust**
   - Remove the lower bearing plate.
   - Remove the screw from the bottom of the pivot arm.
   - Slip the line guide off the pivot arm.
   - Rotate the bushing in the line guide to increase the tension of the torsion spring.
   - Reassemble.

(B) **COPYHOLDER BRACKET AND TOP BRACKET ALIGNMENT ON TABLE MOUNTED CABINET (NOT ILLUSTRATED)**

**Requirement**
- With lower bracket in forward position, the hole in the top bracket should align with the top hole in copyholder bracket.

**To Adjust**
- Position lower bracket along its elongated mounting holes by means of its two nuts.

2.09 Directory Holder (TWX)

**DIRECTORY HOLDER (TABLE CABINET)**

**Requirement**
- The directory holder should fit snugly against the wall of the cabinet.

**To Adjust**
- Loosen the four bottom inner set of nuts which secure the shock mounts and the holder. Push the holder against the wall of the cabinet and tighten the nuts.
Note: Rest cabinet on a level floor when making the following adjustments.

(A) PRINTER COVERS

(1) Requirement
Generally, all gaps around the covers should be equal within ± 1/16 inch.

(2) Requirement
With covers closed, clearance between top edge of covers and bottom edge of adjacent covers should be approximately 1/16 inch. Covers must not touch when being opened.

(3) Requirement
With covers closed, side clearance between covers and adjacent covers should be approximately equal.

To Adjust
Position the covers with their hinge nuts friction tight.

Note: Clearance between lower edge of bottom cover and center cross brace should be Max 1/4 inch.

To Adjust
Refine (2) above with larger gap beginning at top cover.
2.11 Printer Cover continued

(A) TOP AND MIDDLE PRINTER COVER

DEPTH

Requirement
With printer covers in closed position, their left and right outer surfaces should be flush with or no more than 1/16 inch below left and right flanges of cabinet shell.

To Adjust
Position printer covers with their respective four hinge bracket mounting screws friction tight.

---

(B) PAPER GUIDE

Requirement
Bottom edge of paper guide should be flush with bottom surface of window.

To Adjust
Position paper guide with three mounting screws loosened.

(C) WINDOW

Requirement
Clearance between paper and paper guide when closing the paper access door should be Min 1/16 inch

To Adjust
Position window with four window retainer screws loosened. Make sure gasket is between glass window and metal surface.
2.12 Cover Latches

**PRINTER COVER LATCHES**

(1) **Requirement**
With cover in closed position, bolts should touch striker plates.

(2) **Requirement**
Bolts should engage striker plates by a minimum of 1/16 inch.

---

(1) **To Adjust**
With cover open and striker plate mounting screws friction tight, move striker plates toward front of cabinet. Close cover and open paper access door. Position striker plates to meet (1) above. Close paper access door. Carefully move printer cover thumbscrews toward each other and open printer cover. Tighten striker plate mounting screws.

(2) **To Adjust**
Close cover and open paper access door. Remove cover thumbscrews and their lockwashers from extensions. With their locknuts loose, rotate extensions to move bolts right or left as required. Align tapped hole in extension with hole in cover. Replace thumbscrews and lockwashers. Tighten extension locknuts.
2.13 Shelf Slide Stops

(A) SLIDE STOPS

(1) Requirement
With each printer unit in rearmost position, center of typing unit platen should be in line with front edge, plus or minus \( \frac{1}{16} \) inch, of printer cover above it for the upper two typing units.

(2) Requirement
Center of platen of bottom typing unit should be in line with front edge of cover above it within \( \frac{1}{16} \) inch forward - \( \frac{3}{16} \) inch rearward.

To Adjust
(1), (2): Open cover and loosen slide mounting screws friction tight. Position slide, base and typing unit to meet requirement.

Note: This adjustment affects carriage return and line feed lever adjustments. Therefore, if slide stops are readjusted, carriage return and line feed levers should also be re-adjusted.

(B) CARRIAGE RETURN AND LINE FEED LEVERS

Requirement (each printer cover)
With printer cover closed
\[ \text{Min } \frac{3}{32} \text{ inch} - \text{Max } \frac{5}{32} \text{ inch} \]
clearance between head of lever adjusting screw and rear surface of key-lever mounting bracket.

To Adjust
Depress keylever assembly and rotate it 90 degrees. Remove keylever assembly and keylever spring. Close cover and turn lever adjusting screw, accessible through hole in cover, to meet requirement.
2.14 Paper Winder

(C) PAPER SPINDLE CYLINDER REGULATING BUSHING
To control the tension of the cylinder on the right hub, position regulating bushing to the right or left with its set screw loosened.

(PAPER SPINDLE CYLINDER REGULATING BUSHING) (A) PAPER SPINDLE SHAFT ENDPLAY
Requirement
Clearance between shoulder of shaft and friction drive assembly should be 1/32 inch. Left end of shaft should touch wick in friction drive assembly.

To Adjust
Position bearing bracket by means of elongated mounting holes.

(B) FRICTION CLUTCH TORQUE
Requirement
After running paper winder ten minutes with cylinder held stationary it should require
Min 5 ozs---Max 7 ozs

to hold cylinder stationary against rotation by driven pulley.

To Adjust
Position capstan nut with locknut loosened.

(D) WINDER ASSEMBLY
Requirement
Equal clearance between edges of paper and spindle flanges.

To Adjust
Thread paper around platen of typing unit. Grasp edges of paper as it comes around top of platen roller and align them with edges of paper being fed into platen. Pull top free edge of paper so there is no slack and lock paper on platen. Feed paper manually until it can be threaded onto winder cylinder. Move winder assembly with its mounting screws loosened to get equal clearance between both edges of paper and spindle flanges.
2.15 Paper Winder continued

(A) PULLEY ALIGNMENT

Requirement
Projected plane of each pulley should be in line with each other and parallel to side frame.

To Adjust
Loosen driver pulley adjusting screw. Move in or out to meet requirement. Tighten screw.

(B) BEARING BRACKET ADJUSTMENT

Note: The intermediate gear bracket adjustment should be made before making this adjustment. See appropriate section covering adjustments for keyboard and base.

Requirement
Bearing bracket should be position so that center line of intermediate shaft extension will coincide with center line of intermediate shaft in both horizontal and vertical planes.

To Adjust
(1) Horizontal - Loosen mounting bracket screws to friction tight. Loosen set screws in flexible coupling and slide coupling toward pulley end of shaft so opposite end of shaft is visible. Position bracket to align shaft extension with intermediate shaft on keyboard base.

(2) Vertical - Loosen bearing bracket mounting screws to friction tight. Position bearing bracket to align shaft extension with intermediate shaft on keyboard base. Retighten screws. Connect shaft and shaft extension by replacing and fastening flexible coupling in position.
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2.16 Dome

(A) DOME CENTERING

(1) Requirement
The dome should be centered from side to side on the cabinet.

(2) Requirement
Front edge of dome should fit flush to front edge of cabinet.

To Adjust
Position the dome with the six dome hinge nuts loosened.

(B) SMALL DOOR

(1) Requirement
Door should be flush with to 3/32 inch above dome.

(2) Requirement
Door should be parallel to dome within 3/32 inch.

To Adjust
Position door with the four hinge extension nuts loosened.

For the following adjustments see Par. 2.03.

(C) PAPER GUIDE

*(D) WINDOW - Refer to requirement below and Par. 2.03.

(E) INDICATOR AND COPY LAMPS

(F) COPYHOLDER

*(D) WINDOW (Also see Par. 2.03)

Requirement
As small door is opened, it should clear projection on rear lid by
Min 0.005 inch—Max 0.015 inch

To Adjust
Position the window with its mounting screws (4) loosened.
2. 17 Hinge Mount

**WALL MOUNTED PRINTER CABINET**

With keyboard (or receiving-only base), printer and motor unit installed, the hinge shall be perpendicular to side plate - gauge by eye. Check both sides.

**To Adjust**
Position right and/or left hinge upward or downward with its mounting screws loosened.
2.18 Keytop Guide Plate

**KEYTOP GUIDE PLATE COVER (SEND-RECEIVE UNIT)**

**Requirement**
With cover installed, clearance between keytop guide plate and its cover
Min 0.090 inch—Max 0.125 inch

**To Adjust**
With nuts that secure cover mounting bar loosened, lower screws and eccentric clamp screws loosened, position eccentric.

**KEYTOP COVER (RECEIVE-ONLY UNIT)**

**Requirement**
With cover in place, power switch shall be centrally located in its cover opening.

**To Adjust**
With nuts that secure cover mounting bar loosened, lower screws and eccentric clamp screws loosened, position eccentric.
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2.19 Keytop Guide Plate continued

KEYTOP GUIDE AND COVER (SEND-RECEIVE UNITS)

(1) Requirement
With cover in place, clearance between rear edge of keytop guide and lip of cover
Min 0.090 inch---Max 0.0125 inch

(2) Requirement
Clearance should be approximately equal at each end.

(1) To Adjust
With nut which secures large central mount loosened, position upper support bar.

(2) To Adjust
With four bolts that secure lower support bar loosened, position lower support bar.

POWER SWITCH

Requirement
With cover panel in place, surface of switch toggle lever (1) in ON position (2) in OFF position should be flush with top surface of cover (gauge by eye).

To Adjust
With cover removed, position switch with its adjusting screws loosened.

Note: Should additional adjustment be needed, loosen bolts securing large central mounting bracket, and position upper bar.
2.20 Carriage Return, Line Feed, Break Lever and Door Hinge

(A) CARRIAGE RETURN/LINE FEED/ AND BREAK LEVER (RECEIVE-ONLY UNIT)

Requirement
With cover in place, clearance between top surface of respective lever adjusting screw and outer surface of cover
Min 7/8 inch—Max 15/16 inch

To Adjust
Remove each keylever assembly (3) from cover (see Par. 2.18). Then replace cover and position each adjusting screw through hole in cover (slot in screw should be horizontal after adjusting).

(B) WINDOW DOOR HINGE MOUNTS

Requirement
Window door should lie flat on right and left supporting edge of cabinet (gauge by eye).

To Adjust
With hinge mounting nuts (2) loosened, position the door.

(C) LOWER DOOR HINGE MOUNTS

Requirement
Door should lie flat against cover.

To Adjust
With each hinge mounting nut (2) loosened, position the door.

(D) LOWER DOOR LATCHES

Requirement
Door should latch firmly and lie flat against cover.

To Adjust
With magnetic latch mounting screws loosened, position the latch.

SMALL COPYHOLDER (WITH LINE GUIDE)
Requirement — Refer to Par. 2.03.
2.21 Window and Paper Guide

**Requirement**
With typing unit in place, large and small doors latched, clearance between paper guide and platen
Min 3/64 inch—Max 5/64 inch

**To Adjust**
With paper guide mounting screws loosened, position guide parallel to platen.

**COPY LAMPS**

**Requirement**
With cover and light shield in place, clearance between lamp assembly and cover should be at least 1/16 inch.

**To Adjust**
Bend the bracket.

**WINDOW**

**Requirement**
With small door closed, parallel clearance between paper guide and edge of window
Min 0.080 inch—Max 0.110 inch

**To Adjust**
With window clamp mounting screws loosened (4), position the window.

**PATH OF PAPER**
28 ELECTRICAL SERVICE UNITS
ADJUSTMENTS

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1. GENERAL

1.01 This section provides mechanical adjusting information for the 28 electrical service units and most of the various components that may be assembled onto it. It is reissued to include a signal bell assembly and to arrange the material in a standardized format.

Note: Remove power from units, before making adjustments.

1.02 Since this is a general revision, marginal arrows normally used to indicate changes and additions have been omitted.
SECTION 573-133-700

2. REQUIREMENTS AND ADJUSTMENTS

2.01 28G and 28G-1 Electrical Service Unit

SLOW RELEASE RELAY

Requirement
The relay should not de-energize while receiving a series of BLANK code combinations. The
time required to stop an associated transmitter after receipt of line break signal should not
exceed
Max 800 milliseconds.

To Adjust
Insert a 5-foot strip of BLANK tape into the transmitter. Turn the keyboard control knob to the K-T position. Turn the line-test key to the TEST position. Depress the SEND key. Loosen the residual screw locknut on the armature of the slow release relay and turn the screw counterclockwise until no gap exists between the armature and pole piece. Press the slow release relay test button and turn on the transmitter. With the tape running through the transmitter turn the residual screw clockwise until the slow release relay armature begins to vibrate. Then turn the residual screw counterclockwise slowly until the armature stops vibrating. Tighten the locknut. Rerun the entire 5-foot strip of tape through the transmitter, while the slow release relay test key is held depressed; the slow release relay armature must not drop out.

Insert a 5-foot strip of LETTERS tape into the transmitter. Plainly mark a row of perforations approximately three inches back from the sensing pins on the transmitter. Hold the slow release relay test button depressed, and start the transmitter. When the previously marked row of perforations reach the sensing pins, depress the line-break key and hold depressed until the transmitter stops. Mark the row of perforations immediately over the sensing pins, remove the tape from the transmitter and count the number of perforations between the two marked lines. The number of perforations between these lines should be no greater than,

1. Eight for 100 wpm operation.
2. Six for 75 wpm operation.
3. Five for 60 wpm operation.

Should the number of perforations be greater than that specified above, turn the residual screw clockwise approximately 1/8 turn and repeat the above test. The number of perforations may be fewer than that specified above provided the requirement is met.
2.02 Electrical Motor-Control Mechanism (if Equipped)

(A) STOP ARMATURE SPRING

Requirement
Stop armature latched on start armature. Stop armature spring unhhooked.
Min 4-1/2 oz — Max 6 oz to pull spring to installed length.

(B) INTERMEDIATE LEVER SPRING

Requirement
With the stop and start armatures held against their cores, apply a gram scale to the under side of the intermediate lever just to the right of its downward extension and push upward.
Min 10 grams
Max 20 grams to start the lever moving upward.

(C) START ARMATURE SPRING

Requirement
Stop armature in attracted position. Intermediate lever held upward. 8 oz scale applied to start armature at right of intermediate lever lower extension
Min 2-1/2 oz
Max 4 oz to hold start armature against cores.

(D) START MAGNET CORE

Requirement
Stop armature in unattracted position. Clearance between the start magnet core and anti-freeze rivet on the start armature

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To Adjust
Advance or retard the start magnet cores with screwdriver (locknut loosened).
2.03 Relay Motor-Control Mechanism (if Equipped)

**SWITCH POSITIOCN (IF UNIT IS SO EQUIPPED)**

**Requirement**
When the solenoid plunger is depressed slowly, the switch should operate when the plunger is within

\[
\text{Max } 0.005 \text{ inch}
\]
from the end of its travel (gauge by eye). Check by the audible click or by test lamp.

**To Adjust**
Loosen the switch mounting screws.
Hold the plunger downward and move the switch toward the plunger until it operates. Tighten the screws.

**EARLIER DESIGN**
(CONTACT PILE-UP TYPE)

(A) **MIDDLE CONTACT SPRING**

**Requirement**
With solenoid plunger unoperated

\[
\text{Min } 2 \text{ oz} - \text{Max } 3 \text{ oz}
\]
to break contact with inner contact.

**To Adjust**
Form middle contact spring with suitable spring bender.

(B) **OUTER CONTACT SPRING**

**Requirement**
Hold solenoid plunger operated.

\[
\text{Min } 12 \text{ oz} - \text{Max } 16 \text{ oz}
\]
to break contact with the middle contact spring.

**To Adjust**
Form outer contact spring with suitable spring bender.

(C) **INNER CONTACT SPRING GAP**

**Requirement**
Hold solenoid plunger operated.
Clearance between inner and middle contact spring contact surface

\[
\text{Min } 0.025 \text{ inch} - \text{Max } 0.030 \text{ inch}
\]

**To Adjust**
Form inner contact spring with suitable spring bender.
2.04 Signal Bell

(A) ARMATURE SPRING TENSION

Requirement
Min 1/2 oz—Max 1 oz
to push the armature against the core (vertically).

(B) REMOTE SIGNAL BELL

Requirement
Armature held against the magnet core. Clearance between the armature ball and the bell
Min 0.020 inch—Max 0.035 inch

To Adjust
Bend the armature extension just below the armature spring.

2.05 Line Test Key Assembly (if Equipped)

LINE TEST KEY

Note: This key is carefully adjusted at the factory and should not need readjusting unless it has been disassembled or mutilated.

Requirement
When knob is moved to downward position contacts 9-10 should close before contacts 8-10 and 5-6 open.

To Adjust (if necessary)
Form contact leaf springs with a suitable spring bender to meet requirements.
SECTION 573-133-700

2.06 28 LB Electrical Service Unit

(A) Requirement for circuit assurance detector: The circuit assurance detector should accept incoming spacing signals from a receive set without setting off an alarm. If the spacing signals fall within the limits of 32.6 to 73.0 ms in length, and are received at least once each 500 ms, the alarm does not operate. The alarm contacts in the dry-reed relay pack (a part of the circuit assurance detector) close to initiate an alarm if the signal to the send set does not comply.

(B) To adjust: The timers on the circuit assurance card are adjusted with off-line signals by using the TP146439 adapter. The character T or V (32.6 ms marking pulse and 73.0 ms marking pulse respectively) is sent from the 28 LA or 28 LB transmitter distributor to the MLR relay. Using the TP146439 adapter, a 32.6 ms spacing pulse, and a 73.0 ms spacing pulse are taken from the normally closed contacts of the MLR relay and fed into the card. The operating point of the lower limit timer is set by using the 32.6 ms spacing pulse and the operating point of the upper limit timer is set by using the 73.0 ms spacing pulse.

(C) Preliminary preparation:

1. Prepare four test tapes as follows:
   a. Three feet punched with BLANKS only.
   b. Three feet punched with T only.
   c. Three feet punched with M only.
   d. Three feet punched with V only.

2. Lower the message processing panel of the send set.
   a. Block relay CFR operated.
   b. Block relay PBRB operated.
   c. Set the timer disable switch to its NORMAL position.

---

![Diagram of MLR 276H](image-url)
(3) Lower the alarm panel of the send set.
   (a) Block relay TCFR in the unoperated position.

(4) Remove the following from their sockets in the electrical service unit.
   (a) Relay REC.
   (b) Relay LFR.
   (c) Relay MLR.
   (d) Wave shaping assembly (TP-146652).

(5) Plug relay MLR into the socket provided in the adapter.

(6) Plug the adapter, with the MLR relay, into the MLR socket of the electrical service unit.

(7) Plug the adapter test plug into the REC socket of the electrical service unit.

(D) Upper limit timer adjustment (73 ms):

   (1) Set the switch on the adapter to its ADJUST position.
   (2) Place the beginning of the V test tape in the reading head of the TD.
   (3) Set the TD STOP-RUN lever in the STOP position.
   (4) Press the reset key on the key and lamp assembly to clear all alarms.
   (5) Set the TRANSMITTER selector switch on the key and lamp assembly to its NORMAL position.
   (6) Start the test tape through the TD by operating the STOP-RUN lever to the RUN position.
   (7) With the TD reading the V test tape, rotate the adjusting screw of the 200K potentiometer (rear potentiometer) on the card counterclockwise until the CONNECTION LOST alarm operates. Then rotate the screw counterclockwise until the alarm fails to operate.

   Note: Every time the alarm operates, the circuit must be reset by pressing the RESET key with the TD lever in the STOP position.

(8) Very slowly rotate the adjusting screw counterclockwise until the CONNECTION LOST alarm just operates as V test tape is read by TD.

(E) Lower limit timer adjustment (32.6 ms):

   (1) Set the switch on the adapter to ADJUST position.
   (2) Place the beginning of the T test tape in the reading head of the TD.
   (3) Set the TD STOP-RUN lever in the STOP position.
   (4) Press the RESET key on the key and lamp assembly to clear all alarms.
   (5) Set the TRANSMITTER selector switch on the key and lamp assembly to its NORMAL position.
   (6) Start the test tape through the TD by setting the STOP-RUN lever on RUN.
   (7) With the TD reading the T test tape, rotate the adjusting screw of the 100K potentiometer (forward potentiometer) on the card clockwise until the CONNECTION LOST alarm operates. Then rotate the screw counterclockwise until the alarm fails to operate.

   Note: Every time the alarm operates, the circuit must be reset by pressing the RESET key with the TD lever in the STOP position.

(8) Very slowly rotate the adjusting screw clockwise until the CONNECTION LOST alarm just operates as T test tape is read by TD.

(F) Final tests:

   (1) Set the adapter switch in its TEST position. Press the RESET key on the key and lamp assembly with the TD lever in the STOP position to clear any alarms.
   (2) Place the beginning of the BLANK test tape in the reading head of the TD and start the TD reading. CONNECTION LOST alarm should operate. If not, readjust the upper limit timer. To clear an alarm condition depress the RESET key on the key and lamp assembly with the TD lever in the STOP position.
(3) Replace the BLANK test tape with the T test tape and start the TD. The CONNECTION LOST alarm should fail to operate. If the alarm operates, readjust the upper limit timer as described in (D).

(4) Replace the T test tape with the M test tape and start the TD. The CONNECTION LOST alarm should fail to operate. If the alarm operates, readjust the lower limit timer as described in (E).

(5) Replace the M test tape with the V test tape and start the TD. The CONNECTION LOST alarm should operate. If the alarm fails to operate, readjust the lower limit timer as described in (E). Clear the alarm as previously described.

(6) Restore the equipment to normal by reversing the order of (C), Preliminary preparation. The timer disable switch should be in NORMAL position.
# 28 TELETYPEWRITER KEYBOARD AND BASE (KSR AND RO)

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1. GENERAL

1.01 This section has been revised to include recent engineering changes and additions, and to make it a standard publication. It also contains the specific requirements and adjustments for the 28 keyboard and base. Since it is a general revision, marginal arrows ordinarily used to indicate changes and additions are omitted.

1.02 Maintenance procedures which apply only to mechanisms of a particular design, or to certain models of 28 keyboards and bases are so indicated in the titles of the paragraphs which contain these particular adjustment requirements.

Note: Remove power from unit before making adjustments.

1.03 The adjustments of each unit are arranged in a sequence that should be followed if a complete readjustment of the unit were undertaken. The tools and spring scales required to perform these adjustments are listed in the applicable section. After an adjustment is completed, be sure to tighten any nuts or screws that are loosened. The adjusting illustrations indicate tolerances, positions of moving parts, spring tensions and the angles at which scales should be applied when measuring spring tensions. Where an illustration shows interrelated parts, the sequence that should be followed in checking the requirements and making the adjustments shown, is indicated by letters (A), (B), (C), etc.

1.04 References made to left or right, up or down, front or rear, etc apply to the unit in its normal operating position as viewed from the front.

1.05 When a requirement calls for a clutch to be disengaged, the clutch shoe lever must be fully latched between its trip lever and latchlever so that the clutch shoes release their tension on the clutch drum. When engaged, the clutch shoe lever is unlatched and the clutch shoes are wedged firmly against the clutch drum.

1.06 All electrical contact points should meet squarely. Contacts with the same diameter should not be out of alignment more than 25 percent of the contact diameter. Check contacts for pitting and corrosion and clean or burnish them before making specified adjustment or tolerance measurement. Avoid sharp kinks or bends in the contact spring.

CAUTION: KEEP ALL ELECTRICAL CONTACTS FREE OF OIL AND GREASE.

1.07 Units may have signal contacts made of either unplated or gold-plated tungsten. If in doubt as to the type of contacts, remove signal generator cover (Par. 2.04) and inspect contacts for gold plating.

A. Cleaning

1.08 Use twill jean cloth (KS2423) (TP107162) to clean gold-plated contacts.

1.09 Open contacts. Drop strip of twill jean between them. Close contacts. Draw twill jean part way through. Open contacts and withdraw twill jean.

1.10 This procedure prevents small fibers at edges of twill jean strip from becoming lodged between contacts.

1.11 Clean unplated tungsten contacts in accordance with standard procedures.

B. Servicing for Special Low-Voltage Applications.

1.12 For standard applications including those with data sets, observe standard maintenance procedures and intervals. Special low-voltage applications are covered below.

1.13 For optimum reliable operation in special low-voltage applications, clean gold-plated contacts with twill jean, as instructed above, at intervals of approximately 50 hours of
actual contact operation. Since maintenance interval and life expectancy of the contacts are dependent on the signal circuit, maintenance interval may be lengthened for specific applications.

Note 1: Applying operating voltage of standard Distortion Test Set directly to contacts may damage gold-plating and impair special low-voltage operation. When electrically adjusting or testing contacts (Par. 2.21), use an intermediate device, keyed by the contacts to interrupt current to stroboscopic lamp of Test Set. This intermediate device must be capable of being keyed by a 3- to 20-volt change at maximum of 20 milliamperes.

Note 2: Normally for special low-voltage applications, contacts should be used in circuits operating between 3 and 20 volts dc at a current level not to exceed 60 milliamperes. Between 20 and 70 volts dc the current should be adjusted so as not to exceed a 120 milliwatt power level. The contacts are not normally intended for use with voltages above 70 volts dc. Exceeding this level for an appreciable length of time may result in damage to the gold plating and make them unfit for special low-voltage applications.
Figure 2 - 28 Teletypewriter Base (Receiving-Only)
2. BASIC UNIT

2.01 Codebar Assembly

NOTE: REMOVE PERFORATOR TRANSMITTER BASE FROM CABINET BEFORE ADJUSTING CODE BARS.

(B) CODE LEVER UNIVERSAL BAIL SPRING

REQUIREMENT

GENERATOR CLUTCH DISENGAGED, UNIVERSAL BAIL LATCH IS HELD OUT OF CONTACT WITH THE BAIL.

MIN 1 OZ
MAX 2 OZ
TO START BAIL MOVING.

CODE LEVER UNIVERSAL BAIL

UNIVERSAL BAIL SPRING

NOTE: REMOVE PERF ORATOR TRANSMITTER BASE FROM CABINET BEFORE ADJUSTING CODE BARS.

CODE BAR GUIDE CLEARANCE

REQUIREMENT

ALL CODE BARS SHOULD MOVE FREELY WITHOUT BINDS INCLUDING THE CLUTCH TRIP BAR AND KEYBOARD LOCK BAR.

MIN 0.010 INCH
MAX 0.010 INCH
TO ADJUST LOOSEN MOUNTING SCREWS AND POSITION CODE BAR GUIDE.

CODE BAR GUIDE MOUNTING SCREWS

NOTE: THE BAIL SHOULD BE SO ADJUSTED THAT THE SPACE BAR CAN BE OPERATED WITHOUT BINDING IN THE HOLES IN THE GUIDE PLATE AND THE FRAME.

FRAME

SPACE BAR BAIL

NOTE: KEYLEVER COVER MUST BE REMOVED, SEE DISASSEMBLY AND REASSEMBLY.

(C) SPACE BAR BAIL PIVOT

REQUIREMENT

MIN SOME END PLAY.
MAX 0.010 INCH
SPACE BAR FREE FROM BIND.
TO ADJUST POSITION SPACE BAR WITH PILOT SCREWS LOOSENED.

PILOT SCREW

SPACE BAR BRACKET

FRONT BLADE (LEFT VIEW)

REAR BLADE

CODE LEVER UNIVERSAL BAIL

NOTE: REMOVE PERF ORATOR TRANSMITTER BASE FROM CABINET BEFORE ADJUSTING CODE BARS.

CODE BAR GUIDE CLEARANCE

REQUIREMENT

ALL CODE BARS SHOULD MOVE FREELY WITHOUT BINDS INCLUDING THE CLUTCH TRIP BAR AND KEYBOARD LOCK BAR.

MIN 0.010 INCH
MAX 0.010 INCH
TO ADJUST LOOSEN MOUNTING SCREWS AND POSITION CODE BAR GUIDE.

CODE BAR GUIDE MOUNTING SCREWS

NOTE: THE BAIL SHOULD BE SO ADJUSTED THAT THE SPACE BAR CAN BE OPERATED WITHOUT BINDING IN THE HOLES IN THE GUIDE PLATE AND THE FRAME.
2.02 Signal Generator Mechanism

2.02 Signal Generator Mechanism

---

**CLUTCH SHOE LEVER**

- CLUTCH CAM DISC
- ADJUSTING DISC
- ADJUSTING DISC CLAMP SCREWS
- CLUTCH DISC STOP LUG
- GEAR SLEEVE

**CLUTCH Cam DISC**

**CLUTCH DRUM**

---

**CLUTCH SHOE LEVER**

- CLUTCH DRUM
- CLUTCH LATCH LEVER SPRING
- CLUTCH LATCH LEVER

---

**CLUTCH STOP LEVER SPRING**

**CLUTCH LATCH LEVER SPRING**

**REQUIREMENT**

- CLUTCH ENGAGED AND ROTATED 1/4 TURN.
- MIN 2 OZ
- MAX 3 OZ

**REQUIREMENT**

- CLUTCH LATCH LEVER RESTING ON THE HIGHEST POINT OF CLUTCH DISC.
- MIN 2 OZ
- MAX 3 OZ

---

**CLEARANCE WHEN CLUTCH IS DISENGAGED SHOULD BE 0.055 INCH TO 0.085 INCH LESS THAN WHEN CLUTCH IS ENGAGED.**

**TO CHECK**

- LATCH CLUTCH IN DISENGAGED POSITION AND MEASURE CLEARANCE. ROTATE GEAR UNTIL OIL HOLE IS UPWARD. ENGAGE CLUTCH AND MEASURE CLEARANCE.

**TO ADJUST**

- LOOSEN THE TWO ADJUSTING DISC CLAMP SCREWS TO POSITION DISC.

---

**CLUTCH SHOE LEVER**

- CLUTCH DRUM
- CLUTCH STOP LEVER SPRING
- CLUTCH TRIP BAIL EXTENSION

---

**CLUTCH STOP LEVER**

**CLUTCH STOP LEVER SPRING**

- CLUTCH LATCH LEVER SPRING

**REQUIREMENT**

- CLUTCH STOP LEVER SPRING

**REQUIREMENT**

- CLUTCH SHOE LEVER

**REQUIREMENT**

- CLUTCH LATCH LEVER SPRING

---

**CLUTCH STOP LEVER**

**CLUTCH STOP LEVER SPRING**

**REQUIREMENT**

- CLUTCH LATCH LEVER SPRING

**REQUIREMENT**

- CLUTCH SHOE LEVER

**REQUIREMENT**

- CLUTCH LATCH LEVER SPRING

---

**SELECTION 573-116-700**

---

Page 8
2.03 Signal Generator Mechanism continued

(A) CLUTCH SHOE LEVER SPRING

**REQUIREMENT**

- CLUTCH ENGAGED.
- CAM DISC HELD TO PREVENT TURNING.
- MIN 15 OZ
- MAX 20 OZ
- TO MOVE SHOE LEVER IN CONTACT WITH STOP LUG.

![Diagram of clutch system with labels CLUTCH SHOE LEVER, STOP LUG, CAM DISC, CLUTCH DRUM, SECONDARY CLUTCH SHOE, PRIMARY CLUTCH SHOE, CLUTCH SHOE LEVER SPRING, CLUTCH SHOE SPRING.]

(B) CLUTCH SHOE SPRING

**NOTE**

IN ORDER TO CHECK THIS SPRING TENSION, IT IS NECESSARY TO REMOVE THE CLUTCH FROM THE MAIN SIGNAL GENERATOR DRIVE SHAFT. THEREFORE, IT SHOULD NOT BE CHECKED UNLESS THERE IS GOOD REASON TO BELIEVE THAT IT DOES NOT MEET ITS REQUIREMENT.

**REQUIREMENT**

- CLUTCH DRUM REMOVED,
- MIN 3 OZ
- MAX 5 OZ
- TO START PRIMARY SHOE MOVING AWAY FROM SECONDARY SHOE AT POINT OF CONTACT.
2.04 Signal Generator Mechanism continued

(B) TRANSFER BAIL DETENT LATCH SPRING

REQUIREMENT
MIN 2-3/4 OZ
MAX 4-1/4 OZ
TO START LATCH MOVING.
HOLD TRANSFER BAIL TO LEFT.

TRANSFER BAIL DETENT LATCH SPRING
LATCH
TRANSFER BAIL
DETENT LATCH SPRING I
REQUIREMENT
LATCH
MIN 2-3/4 OZ
MAX 4-1/4 OZ,
TO START LATCH MOVING.
HOLD TRANSFER BAIL TO LEFT.

TRANSFER BAIL DETENT PLATES
SCREW DRIVER ADJUSTMENT

(A) TRANSFER BAIL DETENT PLATE

REQUIREMENT
EQUAL L H AND R H CLEARANCE WITHIN
0.002 INCH WHEN TRANSFER BAIL IS AT
EXTREME L H OR R H POSITION AS THESE
OCUR IN A CHARACTER BETWEEN START
AND NO. 1 PULSES ONLY.

SCREW DRIVER ADJUSTMENT
MOUNTING SCREWS

TO ADJUST
ROTATE DETENT PLATE RIGHT OR LEFT BY MEANS OF SCREWDRIVER
WITH DETENT PLATE MOUNTING SCREWS LOOSENED.

(C) SIGNAL CONTACT CLEARANCE

REQUIREMENT
MARKING AND SPACING GAPS SHOULD BE EQUAL WITHIN 0.001 INCH.
TO CHECK
DEPRESS Y KEYLEVER AND ROTATE SIGNAL GENERATOR CAM SLEEVE UNTIL EACH CONTACT
HAS FULLY OPENED.
TO ADJUST
LOOSEN MOUNTING SCREWS AND MOVE CONTACT BOX BY MEANS OF ECCENTRIC.
NOTE: CHECK BY MEANS OF SIGNAL CHECKING DEVICE WHERE POSSIBLE, AND CAREFULLY RE-
FINE THE ADJUSTMENT TO ELIMINATE ALL BIAS FROM THE SIGNALS BY EQUALIZING THE
CURRENT-ON AND CURRENT-OFF INTERVALS

COVER

SPACING CONTACT

MARKING CONTACT

CONTACT BOX SPRING

CONTACT BOX

ELECTRICAL NOISE
SUPPRESSOR

CAUTION: ON UNITS SO EQUIPPED -
CLEAN GOLD CONTACTS BY PULLING
TWILL JEAH HALF WAY THROUGH THE
CLOSED CONTACTS, OPEN CONTACTS
AND REMOVE TWILL JEAH.
USE NO OTHER CLEANING OR
BURNISHING METHODS. AVOID
PITTING OR CHIPPING THE CONTACTS.

(D) SIGNAL CONTACT DRIVE LINK

REQUIREMENT
WITH MAINSHAFT IN STOP POSITION AND TRANSFER BAIL DETENT LATCH SPRING UN HOOKED
(SEE FIG. ABOVE), MOVE LATCHES AWAY FROM TRANSFER BAIL EXTENSION, HOLD
THE TOGGLE FIRMLY AGAINST CONTACTS.
MIN 6 OZ --- MAX 9 OZ
TO START TRANSFER BAIL EXTENSION MOVING.

(E) SIGNAL CONTACT SPRING

REQUIREMENT
REMOVE DRIVE LINK SPRING
TRANSFER BAIL HELD CLEAR OF
DRIVE LINK.
MIN 2 OZ --- MAX 3 OZ
TO START LINK MOVING.
2.05 Codebar Assembly continued

(A) Codebar and Code Lever Clearance Requirement

Carriage return key depressed but not enough to trip off universal bail latch or clutch bar.

MIN 0.006 INCH --- MAX 0.017 INCH

Measure at code bar #3

To adjust position guide by adjusting slot with four mounting screws loosened.

(B) Clutch Trip Bar Spring Requirement

Blank key depressed to allow the clutch trip bar to fall to right.

Spring unhooked from bracket

MIN 8 OZ --- MAX 12 OZ

To pull spring to installed length.

NOTE: See following page for adjustments (C), (D), (E) and (F).
### Codebar Assembly continued

**NOTE:** ADJUSTMENTS CONTINUED FROM PRECEDING PAGE.

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<td>WITH THE CLUTCH DISENGAGED AND LATCHED, POWER OFF AND ARMATURE OF THE MAGNET ASSEMBLY HELD AWAY FROM THE CLUTCH TRIP BAR. PUSH AT THE RIGHT HAND END OF CLUTCH TRIP BAR.</td>
<td>MIN 9 OZ --- MAX 12 OZ TO START CLUTCH TRIP BAR MOVING.</td>
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<td><strong>NOTE:</strong> HOLD THE SWINGER OF THE CONTACT ASSEMBLY AWAY FROM THE UNIVERSAL CODE BAR WHEN MEASURING THE CLUTCH TRIP SPRING TENSION.</td>
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<td><strong>REQUIREMENT</strong></td>
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<tr>
<td>WITH THE CLUTCH DISENGAGED AND LATCHED, DEPRESS THE BLANK KEY TO ALLOW THE UNIVERSAL CODE BAR TO FALL TO THE RIGHT. SPRING UNHOOKED FROM THE BRACKET.</td>
<td>MIN 8 OZ --- MAX 12 OZ TO PULL SPRING TO INSTALLED LENGTH.</td>
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<td>LETTERS KEYLEVER DEPRESSED (POWER OFF) HOLD TRANSFER LEVERS TO THE RIGHT SO THEY DO NOT AFFECT THE CODE BARS.</td>
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<td>MIN 2-1/2 OZ --- MAX 6 OZ TO START LOCK BAR MOVING.</td>
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</table>
2.06 Codebar Assembly continued

(A) FUNCTION BAIL AND CODE LEVER CLEARANCE

REQUIREMENT
MIN 0.015 INCH
BETWEEN ANY FUNCTION BAIL AND ITS
ADJACENT CODE LEVER.

TO ADJUST
POSITION FUNCTION BAIL ASSEMBLY WITH
MOUNTING SCREWS AND TYPING UNIT
LOCATING STUDS LOOSENED.

NOTE: THIS ADJUSTMENT SHOULD NOT BE MADE
UNLESS THE LOCK BALL CHANNEL HAS BEEN
DISASSEMBLED.

2.07 Keyboard Mechanism

(B) LOCK BALL CHANNEL

REQUIREMENT
THERE SHOULD BE SOME TO 0.006
INCH CLEARANCE BETWEEN END OF
LOCK BALL CHANNEL AND ADJUSTING
SCREW WHEN MOST OF THE CODE LEVERS
ARE CENTRALLY LOCATED IN THE LOCK
BALL CHANNEL SLOTS.

TO CHECK:
REMOVE THE LOCK BALL RETAINER.
REMOVE A WEDGE FROM EACH END AND
ONE FROM THE CENTER IN ORDER TO
VIEW THE POSITION OF THE CODE LEVER.

TO ADJUST
LOOSEN THE LOCK BALL CHANNEL MOUNTING SCREWS. BACK OFF LATERAL ADJUSTING
SCREWS AND POSITION CHANNEL. TURN ONE ADJUSTING SCREW IN AGAINST THE END
OF THE CHANNEL AND LOCK IT. TURN THE OTHER ADJUSTING SCREW IN TO THE END
OF THE CHANNEL AND BACK IT OFF 1/4 TURN. LOCK THE SCREW. REPLACE THE WEDGES
AND CHECK THEIR POSITION WITH RESPECT TO THE BALLS. PULL CHANNEL ASSEMBLY
DOWNWARD UNTIL ALL CODE LEVERS STRIKE THEIR UPSTOP WITHOUT WEDGES JUMPING
OUT OF POSITION. REPLACE LOCK BALL RETAINER. BACK OFF BALL ENDPLAY ADJUSTING
SCREW.
SECTION 573-116-700

2.08 Codebar Assembly continued

(2) Codebar Assembly continued

(A) Code Bar Bail Latch Spring
Requirement
- Min 1/2 oz
- Max 1-1/2 oz
To start Code Bar Bail Latch moving.

(B) Code Bar Bail
Requirement
- Cam eccentric and arm which hold the bail in extreme reset position to the left.
  - Min some
  - Max 0.006 inch
- Between Code Bar Bail Roller and Code Bar Bail Latch
To adjust with lock nut loosened, adjust eccentric stud so that high point is in upper half of arc.

(C) Non Repeat Lever Spring
Requirement
- Any key lever depressed
  - Min 2 oz
  - Max 3-1/4 oz
To start Non Repeat Lever moving downward.

(D) Code Bar Bail and Non Repeat Lever Clearance
Requirement
- Mechanism in initial trip-off position, any key depressed, no power.
  - Min 0.010 inch
  - Max 0.020 inch
- Between roller of Code Bar Bail and Non Repeat Lever pick-up step.
To adjust loosen lock nut and shoulder screw and move mechanism left or right.
2.09  Keyboard Mechanism

(A) BALL WEDGELOCK AND BALL TRACK CLEARANCE

REQUIREMENT (PRELIMINARY)

ADJUSTMENT SCREW BACKED OUT TO PERMIT MAXIMUM BALL MOVEMENT WITHOUT THE BALLS ROLLING OUT OF TRACK. (FROM PREVIOUS LATERAL ADJUSTMENT)

APPLY 32 OZ. OF PRESSURE TO THE "Q" OR THE "P" KEYLEVER

MIN  0.005 INCH
MAX  0.015 INCH

EQUAL WITHIN 0.005 INCH BETWEEN THE TIP OF THE WEDGE-LOCK AND THE BALL TRACK.

TO ADJUST

LOosen MOUNTING SCREWS AT EACH END OF THE BALL TRACK AND ADJUST TRACK UP OR DOWN.

NOTE: REMOVE KEYBOARD HOOD IN ORDER TO MAKE THIS ADJUSTMENT. SEE DISASSEMBLY AND REASSEMBLY

NOTE: WHEN GAUGING THESE CLEARANCES MAKE SURE THERE IS NO CLEARANCE BETWEEN THE LOWER EDGE OF CODE LEVER EXTENSIONS AND THE BOTTOM OF THE SLOTS IN THE WEDGES.

A TOTAL OF 43 BALLS ARE REQUIRED IN THE BALL TRACK ASSEMBLY.

(B) LOCK BALL END PLAY

REQUIREMENT (PRELIMINARY)

WITH A 32 OZ. PRESSURE APPLIED TO THE CAR. RET. KEY, THE BALLS SHALL HAVE A MIN. CLEARANCE

TO ADJUST

TURN IN BALL END PLAY ADJUSTMENT SCREW WITH FINGERS UNTIL A RESISTANCE IS FELT, TIGHTEN THE NUT.
2.10 Codebar Assembly continued

**SECTION 573-116-700**

**(B) UNIVERSAL BAIL LATCH SPRING REQUIREMENT**

<table>
<thead>
<tr>
<th>CLUTCH DISENGAGED, UNIVERSAL BAIL HELD AWAY FROM LATCH LEVER. NON REPEAT LEVER BELL CRANK HELD DOWN AGAINST ITS STOP POST.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIN 7-1/2 OZ</td>
</tr>
<tr>
<td>MAX 11 OZ</td>
</tr>
<tr>
<td>TO START LATCH LEVER MOVING.</td>
</tr>
</tbody>
</table>

**(A) UNIVERSAL BAIL LATCH LEVER (PRELIMINARY)**

**NOTE:** ON KEYBOARDS EQUIPPED FOR REPEAT SPACE OPERATION, UNHOOK THE SPRING FROM THE PLATE WITH STUD - SEE PAR. 3.01.

**REQUIREMENT**

CLEARANCE BETWEEN UNIVERSAL BAIL LATCH LEVER AND POST ON UNIVERSAL BAIL EXTENSION.

- MIN 0.015 INCH
- MAX 0.025 INCH

**TO CHECK**

DEPRESS SPACE BAR SLOWLY WITH 32 OZ PRESSURE. MANUALLY ROTATE UNIVERSAL BAIL BACKWARDS AND RELEASE QUICKLY.

**TO ADJUST**

LOosen THE THREE SCREWS THAT FASTEN THE UNIVERSAL BAIL REAR BLADE. ROTATE ECCENTRIC. KEEP HIGH PART OF ECCENTRIC UP.

**(C) UNIVERSAL BAIL EXTENSION REQUIREMENT (POWER OFF)**

UNIVERSAL BAIL EXTENSION POST RESTING AGAINST END OF UNIVERSAL BAIL LATCH LEVER

- MIN 0.050 INCH
- MAX 0.080 INCH

BETWEEN EXTENSION AND NON REPEAT LEVER

**TO CHECK**

DEPRESS LETTERS KEYLEVER AND RELEASE IT. CHECK CLEARANCE.

**TO ADJUST**

POSITION THE EXTENSION WITH ITS TWO CLAMP SCREWS LOOSENED.

**(D) UNIVERSAL BAIL - REAR BLADE REQUIREMENT**

UNIT IN INITIAL TRIP-OFF CONDITION, NO KEY DEPRESSED, NO POWER, EXTENSION POST OF UNIVERSAL BAIL RESTING AGAINST THE END OF LATCH. SOME TO 0.025 INCH BETWEEN UNIVERSAL BAIL REAR BLADE AND ANY CODE LEVER.

**TO ADJUST**

POSITION REAR BLADE WITH MOUNTING SCREWS LOOSENED.
2.11 Keyboard Mechanism continued

BALL WEDGELOCK, BALL END PLAY AND UNIVERSAL BAIL LATCH ADJUSTMENTS - (FINAL)

CHECK UNDER POWER

(1) REQUIREMENT
MIN 2 OZ
MAX 6 OZ
TO TRIP ANY CENTER ROW KEY.

(2) REQUIREMENT
WITH 6-1/2 OZ PRESSURE APPLIED PERPENDICULAR TO THE "A" KEY, DEPRESS EACH KEY IN THE THIRD ROW. THE "A" KEY SHALL TRIP EACH TIME A KEY IS RELEASED. REPEAT THIS CHECK WITH THE 6-1/2 OZ PRESSURE ON THE "CAR. RET." KEY.

(3) REQUIREMENT
THE CLUTCH SHALL NOT TRIP WHEN ANY TWO KEYS ARE DEPRESSED SIMULTANEOUSLY.

(4) REQUIREMENT
WITH 5-1/4 ± 1/4 OZ APPLIED TO THE "SPACE BAR," DEPRESS "CAR. RET." KEY. THE "SPACE BAR" SHALL TRIP EACH TIME THE "CAR. RET." KEY IS RELEASED BY MOVING THE FINGER OFF THE KEY IN A HORIZONTAL DIRECTION.

NOTE
DISREGARD MULTIPLE SPACE OPERATION IF UNIT IS EQUIPPED WITH 163775 MODIFICATION KIT FOR REPEAT-Space OPERATION.

TO ADJUST
IF NECESSARY, REFINE PRELIMINARY BALL WEDGELOCK, PRELIMINARY Lock BALL END PLAY, PRELIMINARY UNIVERSAL BAIL LATCH, AND UNIVERSAL BAIL EXTENSION ADJUSTMENTS.
2.12 Codebar Assembly continued

**CODEBAR BAIL SPRING**

(A) CODEBAR BAIL SPRING

Requirement
- Clutch disengaged. Spring unhooked from arm.
- Min 9 oz
- Max 11 oz
- To pull to installed length.

(b) LINE BREAK LEVER SPRING

Requirement
- (Combined code lever and break lever spring)
- Min 3 oz
- Max 4 oz
- To move switch break lever in contact with switch plunger.
- Min 6 oz
- Max 8 oz
- To actuate sensitive switch
2.13 Keyboard Mechanism continued

(A) CODE LEVER SPRING

(1) REQUIREMENT
MIN 1 OZ
MAX 2 OZ
TO START CODE LEVER MOVING DOWNWARD.

(2) REQUIREMENT
POWER ON,
GENERATOR CLUTCH DISENGAGED.
MIN 3 OZ
MAX 5 OZ
TO OPERATE KEYLEVER OR SPACE BAR.

(B) LOCAL CARRIAGE RETURN FUNCTION BAIL SPRING

(COMBINED CODE LEVER AND BAIL SPRING)

REQUIREMENT
MIN 1 OZ
MAX 3 OZ
TO MOVE KEYLEVER DOWNWARD.
SECTION 573-116-700

2.14 Keyboard Mechanism continued

- LOCAL LINE FEED
- TRIP LINK
- LOCAL LINE FEED
- TRIP LINK SPRING
- PLUNGER LOCK SPRING
  (FLAT SPRING)
- LOCAL LINE FEED TRIP LINK SPRING
  REQUIREMENT
  MIN 4 OZ
  MAX 10 OZ
  TO START LINK MOVING.

- PLUNGER SPRING
  REQUIREMENT
  WITH PLUNGER OPERATING KEYLEVER DEPRESSED.
  MIN 2 OZ
  MAX 5 OZ
  TO START PLUNGER MOVING DOWNWARD.

Plunger spring requirement with plunger operating keylever depressed. Min 2 oz, max 5 oz to start plunger moving downward.
2.15 Codebar Assembly and Signal Generator Mechanism continued

(B) TRANSFER LEVER LOCKING BAIL SPRING
REQUIREMENT
SPRING UNHOOKED FROM POST,
MIN 5 OZ
MAX 6 OZ
TO PULL TO INSTALLED LENGTH.

(A) TRANSFER LEVER SPRING
REQUIREMENT
CLUTCH DISENGAGED,
MIN 1-1/2 OZ
MAX 2-1/2 OZ
TO START EACH OF 7 LEVERS MOVING.

2.16 Interrelated Features
(C) MARGIN INDICATOR SPRING
REQUIREMENT
MIN 7 OZ
MAX 11 OZ
TO START LEVER MOVING.
NOTE
NOT APPLICABLE TO WALL MOUNTED PRINTER
REFER TO PAR. 2.20

(2) REQUIREMENT
THERE SHOULD BE A BARELY PERCEPTIBLE AMOUNT OF BACKLASH BETWEEN THE INTERMEDIATE DRIVING GEAR AND THE INTERMEDIATE DRIVEN GEAR AT THE POINT WHERE THE BACKLASH IS THE LEAST.

TO ADJUST
RAISE OR LOWER THE FRONT END OF THE INTERMEDIATE GEAR BRACKET BY MEANS OF THE FILLISTER HEAD ADJUSTING AND CLAMPING SCREWS LOCATED AT THE FRONT END OF THE BRACKET. REFINE REQUIREMENTS IF NECESSARY.

INTERMEDIATE DRIVEN GEAR
INTERMEDIATE DRIVING GEAR

(1) REQUIREMENT
THERE SHOULD BE A BARELY PERCEPTIBLE AMOUNT OF BACKLASH BETWEEN THE TYPING UNIT DRIVEN GEAR AND THE TYPING UNIT DRIVING GEAR AT THE POINT WHERE BACKLASH IS THE LEAST.

TO ADJUST
POSITION THE COMPLETE INTERMEDIATE GEAR MECHANISM BRACKET BY UTILIZING THE ADJUSTING SLOTS WITH THE THREE HEXAGON HEAD SCREWS LOOSENED. ALIGN THE GEARS AT THIS TIME.

INTERMEDIATE GEAR BRACKET
KEYBOARD DRIVING GEAR

MOTOR CRADLE
MOTOR MOUNTING SCREW
MOUNTING SCREW
NUT PLATE SCREW
ADJUSTING SCREW
CLAMPING SCREW
TYPING UNIT DRIVEN GEAR
TYPING UNIT DRIVING GEAR
2.18 Interrelated Features continued

(A) Mounting Typing Unit on Keyboard or Base

Requirement
When placing the typing unit on the base hold it tilted slightly to the right and lower the right end into engagement with the right locating stud. While easing the left end downward rotate the motor by hand to properly mesh the gears, secure by four mounting screws. Rotate the motor by hand to insure proper meshing of gears.

(B) Signal Generator Frame

Requirement
With typing unit mounted in position, there should be a perceptible amount of backlash between the signal generator driven gear and the signal generator driving gear at the point where backlash is the least. To adjust remove the signal generator frame rear mounting screw and loosen the shim screw. Add or subtract shims as required.
SECTION 573-116-700

2.19 Wall Mounted Keyboard

WALL MOUNTED PRINTER (28K, 28N TELETYPETRITER BASES)

KEYTOP MECHANISM

REQUIREMENT --- WITH KEYBOARD IN UNOPERATED POSITION. (1) CLEARANCE BETWEEN TOP OF RIGHT END OF LATCH AND BOTTOM OF ASSOCIATED KEYLEVER MIN 0.025 INCH --- MAX 0.045 INCH

(2) BOTTOM OF LATCH MOUNTING BRACKET SHALL BE PARALLEL TO BOTTOM EDGE OF BALL LOCK CHANNEL (GAUGE BY EYE). SEE PAR. 2.09

TO ADJUST --- POSITION THE MECHANISM WITH ITS MOUNTING SCREWS LOOSENED.

KEYLOCK LATCH SPRING

REQUIREMENT --- WITH SPRING SCALE APPLIED TO TOP OF FUNCTION PERIOD KEYTOP, PUSH DOWNWARD UNTIL KEYTOP IS FULLY DEPRESSED (PAR. 2.09). MIN 2-1/2 OZ --- MAX 5-1/2 OZ TO OPERATE KEYLEVER
2.20 Wall Mounted Keyboard continued

**INTERMEDIATE GEAR ASSEMBLY REQUIREMENTS**

1. **CLEARANCE BETWEEN DRIVEN GEAR ON PRINTER AND INTERMEDIATE GEAR SHOULD BE**
   - MIN 0.004 INCH --- MAX 0.008 INCH

2. **THERE SHOULD BE SOME CLEARANCE BETWEEN RIGHT BELT RETAINER ON INTERMEDIATE GEAR ASSEMBLY AND SPACING CUTOUT LEVER ON PRINTER.**

**TO ADJUST**

1. **LOOSEN THREE MOUNTING SCREWS AND MAKE THEM FRICTION TIGHT. POSITION THE ASSEMBLY TOWARD FRONT OR REAR TO MEET REQUIREMENT (1).**

2. **POSITION THE ASSEMBLY TOWARD THE LEFT TO MEET REQUIREMENT (2). TIGHTEN SCREWS.**

**TIMING BELT REQUIREMENT**

FORCE OF 2 ± 1/2 OZ TO DEFLECT BELT 1/8 INCH WHEN MEASURED MIDWAY BETWEEN PULLEYS.

**TO ADJUST**

WITH MOTOR PLATE MOUNTING SCREWS LOOSENED, SLIDE MOTOR TOWARD FRONT OF BASE TO INCREASE TENSION OR TOWARD REAR OF BASE TO DECREASE TENSIONS. TIGHTEN SCREWS.
2.21 Signal Generator Mechanism continued

SIGNAL CONTACT CLEARANCE (USING SIGNAL TEST SET --- SUCH AS 1A OR 28-TYPE TELETYPewriter TEST SETS) PRELIMINARY --- WITH ELECTRICAL NOISE SUPPRESSOR DISCONNECTED FROM CIRCUIT, CONNECT SIGNAL CONTACTS SO AS TO INTERRUPT (KEY) CURRENT TO "STROBE" LAMP OF 1A OR 28-TYPE TELETYPewriter TEST SETS. TEST SET AND KEYBOARD MUST OPERATE AT SAME SPEED. (SEE TABLE 1-1).

REQUIREMENTS

(1) WITH BLANKS COMBINATION SELECTED, ORIENT SCALE OF TEST SET TO ALIGN ZERO MARK OF STOP SEGMENT WITH BEGINNING OF STOP PULSE IMAGE. LENGTH OF TRACE SHALL BE FROM THE ZERO MARK TO MIN 141-1/2 DIVISIONS -- MAX 142-1/2 DIVISIONS. (7.42 UNIT CODE ONLY) TO ADJUST - IF VARIATIONS OCCUR, POSITION SCALE SO THAT VARIATIONS EXTEND EQUALLY ON RIGHT & LEFT OF 142 MARK.

(2) NOMINAL LENGTH OF PULSES NO. 1, 2, 3, 4, & 5 IS 100 DIVISIONS. TO ADJUST - RECHECK CONTACT CLEARANCE REQUIREMENT PAR. 2.04. REFINE CLEARANCE, WHERE NECESSARY, TO FAVOR PULSES 1 THRU 5 BY ORIENTING BEGINNING OF STOP PULSE TRACE UP TO ± 5 DIVS. FROM ZERO MARK OF SEGMENT (REFER TO REQUIREMENTS "A" AND "B" BELOW)

(3) EACH PULSE TRACE (SEE "C" BELOW) TO BE FREE OF UNDERSIRABLE BREAKS. TO ADJUST - RECHECK TRANSFER BAIL DETENT PLATE REQUIREMENT. (PAR. 2.04) AND WHERE NECESSARY, REFINE ADJUSTMENT. NOTE --- DETENT PLATE MAY BE ROTATED EITHER LEFT OR RIGHT AS LONG AS DETENT TOGGLE LATCH CONTINUES TO CAM OFF PROJECTION OF TRANSFER BAIL.

A. BEGINNING OF EACH TRACE SHOULD FALL BETWEEN
   1. ZERO MARK AND 95TH DIV. OF SCALE SEGMENT
   2. 95TH DIV. (PREVIOUS SEGMENT) AND ZERO MARK.

B. END OF EACH TRACE (EXCEPT STOP PULSE)
   1. 95TH DIV. (PREVIOUS SEGMENT) & ZERO MARK
   2. ZERO MARK AND 95TH DIV. OF SCALE SEGMENT.

C. EACH TRACE OF THE MARKING CODE PULSES MAY HAVE A BREAK WITHIN TOLERANCE LIMITS - THE BREAK SHOULD NOT OCCUR PRIOR TO 95TH DIVISION OF OBSERVED PULSE (1 THROUGH 5) OR 137TH DIVISION OF STOP PULSE. SEE TABLE 1-1 FOR PERMISSIBLE WIDTH OF BREAK AT SPEED OF OPERATION.

--- SEE "R" & "Y" COMBINATION PAR. 2.22

---

<table>
<thead>
<tr>
<th>SPEED</th>
<th>OPERATIONS PER MINUTE</th>
<th>WIDTH OF BREAK NOT TO EXCEED</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 WPM</td>
<td>388.182</td>
<td>1 DIVISION</td>
<td>MARKING PULSES (1 THROUGH 5 &amp; STOP)</td>
</tr>
<tr>
<td>75 WPM</td>
<td>460.00</td>
<td>1-1/2 DIVISIONS</td>
<td>MARKING PULSES (1 THROUGH 5 &amp; STOP)</td>
</tr>
<tr>
<td>100 WPM</td>
<td>600.00</td>
<td>2 DIVISIONS</td>
<td>MARKING PULSES (1 THROUGH 5 &amp; STOP)</td>
</tr>
</tbody>
</table>
2.22 Signal Generator Mechanism continued

"R" AND "Y" COMBINATION

FOR UNITS WITH SPACING CONTACTS OF SIGNAL GENERATOR WIRED FOR POLAR OPERATION

REQUIREMENTS —

1. SPACING PULSES SHALL START NO EARLIER THAN 94TH DIV. OF PREVIOUS SEGMENT AND NO LATER THAN 6TH DIV. OF PULSE UNDER OBSERVATION.

2. TRACE OF SPACING PULSE SHALL END NO EARLIER THAN 94TH DIV. OF PULSE UNDER OBSERVATION AND NO LATER THAN 6TH DIV. OF FOLLOWING PULSE.

3. TRACE OF START PULSE SHALL BEGIN NO EARLIER THAN 136TH DIV. OF STOP SEGMENT AND NO LATER THAN 6TH DIV. OF START SEGMENT. START PULSE SHALL END NO EARLIER THAN 94TH DIV. OF START SEGMENT AND NO LATER THAN 6TH DIV. OF NO. 1. SEGMENT.

4. SPACING PULSE MAY HAVE A BREAK PROVIDED THE BREAK IS NOT OVER ONE DIVISION WIDE AND IT DOES NOT OCCUR PRIOR TO 95TH DIV. OF PULSE UNDER OBSERVATION.
2.23  Signal Generator Mechanism continued

NOTE 1: FOR UNITS EQUIPPED WITH SIGNAL REGENERATORS, REMOVE REGENERATOR CIRCUIT CARD BEFORE APPLYING TEST SET PROBES TO SIGNAL CONTACTS.

NOTE 2: APPLYING OPERATING VOLTAGE OF SIGNAL DISTORTION TEST SET DIRECTLY TO GOLD-PLATED SIGNAL CONTACTS MAY MAKE THEM UNSUITABLE FOR SPECIAL LOW-VOLTAGE APPLICATIONS. SEE (PAR. REFERENCE 1:B 1.13) FOR SERVICING INSTRUCTIONS.

2.24 Keyboard Mechanism continued

PLASTIC WINDOW

MOUNTING SCREW

PLASTIC WINDOW REQUIREMENT

PLASTIC WINDOW SHOULD BE FULLY SEATED IN POSITION BEFORE TIGHTENING MOUNTING SCREW.

TO ADJUST POSITION WINDOW WITH MOUNTING SCREW LOOSENED.
3. VARIABLE FEATURES

3.01 Repeat-On-Space Mechanism

(C) SPACE - REPEAT LEVER SPRING
REQUIREMENT
WITH SPRING UNHOOKED
MIN 13-1/2 OZ --- MAX
16-1/2 OZ TO STRETCH
SPRING TO INSTALLED
LENGTH.

STOP LOCK NUT

RESET BAIL ROLLER

TRAVEL SCREW

STOP

SPACE - REPEAT LEVER

(A) TRAVEL SCREW
REQUIREMENT
WITH SPACE KEY FULLY DEPRESSED:
MIN 0.035 INCH --- MAX 0.080 INCH
BETWEEN RESET BAIL ROLLER AND
NON REPEAT LEVER.

TO ADJUST
WITH SPACE KEY FULLY DEPRESSED,
ADJUST TRAVEL SCREW BY LOOSENING
TRAVEL SCREW LOCK NUT, RECHECK
AFTER ADJUSTMENT.

NOTE
SPACE BAR TOUCH TO OBTAIN A
REPEAT IS AFFECTED BY THIS ADJUST-
MENT. TO GET A LIGHTER TOUCH
ADJUST TO UPPER LIMIT. TO OBTAIN
A HEAVIER TOUCH ADJUST TO THE
LOWER LIMIT.

NON REPEAT LEVER

SPACE-REPEAT LEVER TRAVEL
SCREW AND NON REPEAT LEVER.

REQUIREMENT
MIN 0.002 INCH --- MAX 0.020 INCH
BETWEEN SPACE-REPEAT LEVER TRAVEL
SCREW AND NON REPEAT LEVER.

TO ADJUST
DEPRESS "G" KEY LEVER TO TRIP KEY-
BOARD CLUTCH, POSITION STOP BY
LOOSENING STOP LOCK NUT, RECHECK
AFTER ADJUSTMENT.

(B) STOP

TRAVEL SCREW LOCK NUT

(D) SPACE BAR

(1) REQUIREMENT (SINGLE SPACE)
NORMAL KEY TOP PRESSURE
TO TRANSMIT SINGLE SPACE.

(2) REQUIREMENT (REPEAT SPACE)
SPACE BAR FULLY DEPRESSED AND
HELD DOWN TO EFFECT CON-
TINUOUS SPACE TRANSMISSION.
3.02 Time Delay Mechanism

TIME DELAY RATCHET WHEEL TENSION

REQUIREMENT

HOLD OFF ALL PAWLS.
MIN 2 OZ --- MAX 8 OZ
TO MOVE RATCHET WHEEL
TO ADJUST
REMOVE AND BEND THE FRICION SPRINGS.

TIME DELAY SWITCH POSITION

REQUIREMENT

CONTACT PAWL NOT BLOCKED BY LATCH LEVER AND ON HIGH PART
OF THE RATCHET WHEEL.  SOME CLEARANCE BETWEEN CONTACT PAWL
AND SWITCH PLUNGER WHEN PLAY IN RATCHET WHEELS IS TAKEN
UP IN DOWNWARD DIRECTION MAX 0.010 INCH
TO ADJUST
POSITION THE SWITCH WITH THE TWO SWITCH MOUNTING SCREWS
LOOSENEED.

3.03 Time Delay Mechanism continued

CONTACT LATCH PAWL SPRING

REQUIREMENT

LATCH PAWL SPRING UNHOOKED AT ANCHOR.
MIN 12 OZ --- MAX 15 OZ
TO STRETCH SPRING TO INSTALLED LENGTH AS SHOWN.
3.04 Time Delay Mechanism continued

To adjust:

1. Remove the typing unit from the base.
2. Loosen the time delay mounting screws.
3. Rotate the ratchet wheels until the latch pawl drops into the indents in the two ratchet wheels.
4. Lift the eccentric follower pawl upward.
5. Take up the play by pressing the ratchet wheels backward.
6. With the eccentric follower pawl at the end of its extreme forward travel, position the mechanism so that the point of the lower beveled edge of the follower pawl rests on the peak of the first ratchet-wheel tooth forward of a vertical centerline through the ratchet wheel or over travels the peak by not more than 0.010 inch.
7. Recheck minimum clearance of 0.020 inch with typing unit on keyboard base.
8. If necessary, refine adjustment.

TIME DELAY MECHANISM POSITION REQUIREMENT

WITH TYPING UNIT ON BASE. DRIVE BRACKET EXTENSION IN REAR POSITION.
CLEARANCE BETWEEN CONTACT PAWL AND LATCHING LEVER SHOULD BE
MIN 0.020 INCH
3.05 Time Delay Mechanism continued

**ECCENTRIC FOLLOWER PAWL SPRING**

**REQUIREMENT**

ECCENTRIC FOLLOWER PAWL IN EXTREME FORWARD POSITION. 8 OZ SCALE APPLIED TO PAWL NEAR RATCHET WHEEL AND PULLED UPWARD

MIN 1-1/2 OZ

MAX 4 OZ

TO START PAWL MOVING.

**TIME DELAY ECCENTRIC FOLLOWER PAWL**

**ADJUSTING LEVER**

**MOUNTING SCREW**

**ECCENTRIC FOLLOWER PAWL SPRING**

**RATCHET WHEEL**

**TIME DELAY DISABLING DEVICE**

**REQUIREMENT**

DISABLE THE TIME DELAY MECHANISM WHEN NOT REQUIRED.

TO ADJUST

LOosen the ADJUSTING LEVER MOUNTING SCREW AND PRESS DOWNWARD ON THE LEVER TO RAISE ECCENTRIC FOLLOWER PAWL OUT OF ENGAGEMENT WITH ITS RATCHET WHEEL.

**NOTE:** FOR ADJUSTMENT OF EARLIER DESIGN MECHANISMS SEE PAR. 5.24
3.06 Local Paper Feed-Out Mechanism

(A) SWITCH LEVER SPRING REQUIREMENT
MIN 11 OZ
MAX 14 OZ
TO PULL SWITCH LEVER FREE OF SWITCH ACTUATING PIN.

NOTE: FOR EARLIER DESIGN SEE PAR. 5.23
3.07 Local Backspace Mechanism

NOTE: FOR EARLIER DESIGN SEE PAR. 5.27

BACK SPACE TRIP LINK HORIZONTAL SPRING

REQUIREMENT
TYING UNIT REMOVED
MIN 1-3/4 OZ
MAX 3 OZ
TO PULL SPRING TO INSTALLED LENGTH.

TRANSFER BAIL SPRING
TRANSFER BAIL ADJUSTING LEVER
BACK SPACE OPERATING BAIL

BACK SPACE TRIP LINK VERTICAL SPRING

REQUIREMENT
TYING UNIT REMOVED
MIN 1-1/2 OZ
MAX 3 OZ
TO PULL SPRING TO INSTALLED LENGTH.

BACK SPACE TRANSFER BAIL SPRING

REQUIREMENT
MIN 1/2 OZ
MAX 1 OZ
TO PULL SPRING TO INSTALLED LENGTH.
3.08 Local Backspace Mechanism continued

TRANSFER BAIL ADJUSTING LEVER

(1) REQUIREMENT
DOWNWARD PRESSURE OF
MIN 16 OZ
MAX 28 OZ
TO OPERATE THE BACKSPACE KEYLEVER

(2) REQUIREMENT
AFTER THE KEYLEVER IS DEPRESSED AND
RELEASED THE CAMMING BAIL SHOULD
RETURN TO ITS UNOPERATED POSITION.

TO ADJUST
POSITION THE TRANSFER BAIL ADJUSTING
LEVER WITH ITS MOUNTING SCREW LOOSENED.
IF THE UNIT IS FORWARD-SPACING, THE
ADJUSTING LEVER MUST BE RAISED UNTIL
PROPER BACKSPACING IS ACCOMPLISHED.

NOTE: THIS ADJUSTMENT IS INTERRELATED
WITH THE TYPING UNIT AND MAY HAVE
TO BE REMADE WHEN A DIFFERENT
TYPING UNIT IS USED ON THE BASE.

NOTE: FOR EARLIER DESIGN SEE PAR. 5.28
3.09 Reverse Line Feed Mechanism

REVERSE LINE FEED TRIP LINK VERTICAL SPRING
REQUIREMENT
TYPING UNIT REMOVED.
MIN 1-1/2 OZ
MAX 3-1/2 OZ
TO PULL SPRING TO INSTALLED LENGTH.

REVERSE LINE FEED TRIP LINK HORIZONTAL SPRING
REQUIREMENT
TYPING UNIT REMOVED.
MIN 1-1/2 OZ
MAX 3-1/2 OZ
TO PULL SPRING TO INSTALLED LENGTH.
3.10 Offline Contact

(A) CONTACT BRACKET

(1) REQUIREMENT
WITH THE GENERATOR CLUTCH LATCHED IN STOP POSITION EACH CONTACT GAP SHOULD BE
MIN 0.025 INCH
MAX 0.035 INCH

(2) REQUIREMENT
WITH THE CODE BAR RESET BAIL IN ITS EXTREME LEFT POSITION THE CLEARANCE BETWEEN THE BAKELITE INSULATOR AND CONTACT BRACKET SHOULD BE
MIN 0.015 INCH

(3) REQUIREMENT
CLEARANCE BETWEEN THE BAKELITE INSULATORS OF THE CONTACT ASSEMBLIES SHOULD BE
MIN 0.050 INCH

(4) REQUIREMENT
EACH BAKELITE INSULATOR SHOULD BE APPROXIMATELY CENTERED ON ITS RESPECTIVE CODE BAR EXTENSION

TO ADJUST
POSITION THE CONTACT BRACKETS WITH THEIR MOUNTING SCREWS LOOSENED.
IF NECESSARY, LOOSEN CONTACT PILE-UP SCREWS OR BEND CONTACT SPRINGS.

(C) SOLENOID BAIL SPRING

REQUIREMENT
BACKSPACE LINK HELD AWAY
MIN 2 OZ MAX 3 OZ
TO MOVE SOLENOID ARMATURE AWAY FROM SWITCH PLUNGER.

Solenoid operated bail
Solenoid mounting bracket
Solenoid mounting bracket position

Requirement
WITH THE SOLENOID ATTRACTED AND WITH 12 OZ OF PRESSURE APPLIED TO THE TRIP LINK IN A REARWARD DIRECTION THE CLEARANCE BETWEEN THE TRIP LINK AND THE SOLENOID OPERATED BAIL SHOULD BE
MIN SOME --- MAX 0.010 INCH
TO ADJUST
POSITION THE SOLENOID MOUNTING BRACKET WITH ITS MOUNTING SCREWS LOOSENED.
SECTION 573-116-700

3.11 Offline Contact continued

MOUNTING SCREWS

(A) SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SOLENOID OPERATED SWITCH PLATE POSITION

REQUIREMENT

WITH THE SOLENOID DE-ENERGIZED, THE CLEARANCE
BETWEEN ARMATURE AND THE SWITCH
(NOT THE PLUNGER) SHOULD BE

MIN 0.025 INCH
MAX 0.035 INCH

TO ADJUST
POSITION THE SWITCH PLATE WITH ITS
MOUNTING SCREWS LOOSENED.

SWITCH BRACKET

(B) BACKSPACE KEYLEVER OPERATED SWITCH POSITION

REQUIREMENT

WITH THE BACKSPACE KEYLEVER IN ITS
NORMAL UNOPERATED POSITION, THE CLEARANCE
BETWEEN THE BACKSPACE KEYLEVER OPERATED
SWITCH AND THE SWITCH OPERATING LEVER
SHOULD BE

MAX 0.055 INCH

TO ADJUST
POSITION THE SWITCH BRACKET WITH ITS
MOUNTING SCREWS LOOSENED.

SWITCH BRACKET

(C) SWITCH OPERATING LEVER SPRING

REQUIREMENT

MIN 7-1/2 OZ MAX 10-1/2 OZ

TO MOVE LEVER AWAY FROM PLUNGER.

SWITCH BRACKET

D) CONTACT SPRING

REQUIREMENT

WITH CR KEYLEVER DEPRESSED CHECK FRONT CONTACT
WITH SPACE BAR DEPRESSED CHECK CENTER AND REAR CONTACTS
MIN 1 OZ MAX 2 OZ

TO OPEN CONTACTS

TO ADJUST
BEND CONTACT SPRING. IF NECESSARY REMOVE CONTACT ASSEMBLY.

SWITCH BRACKET

(E) CODE BAR SPRING

REQUIREMENT

SPACE BAR DEPRESSED
MIN 3 OZ MAX 4 OZ

TO START EACH CODE BAR MOVING

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3.12 Universal Keyboard Switch

(A) KEYBOARD UNIVERSAL SWITCH
PRELIMINARY
REQUIREMENT
CENTERLINE OF INSULATED
PORTION OF UNIVERSAL SWITCH
ASSEMBLY SHOULD ALIGN WITH
CENTERLINE OF CODE BAR LEVER.
TO ADJUST
POSITION UNIVERSAL SWITCH
ASSEMBLY LATERALLY ON RE­
TAINER BAR WITH ITS MOUNT­
ing SCREW LOOSENED.

(B) KEYBOARD UNIVERSAL SWITCH - HORIZONTAL
REQUIREMENT
CENTERLINE OF INSULATED PORTION OF UNIVERSAL SWITCH ASSEMBLY SHOULD ALIGN WITH
CENTERLINE OF LOWERMOST PORTION OF CODE BAR LEVER.
TO ADJUST
POSITION RETAINER BAR FORWARD OR REARWARD ON ITS BRACKETS WITH ITS MOUNTING
SCREWS LOOSENED.

(C) KEYBOARD UNIVERSAL SWITCH - VERTICAL
REQUIREMENT
1. CLEARANCE BETWEEN CENTER AND LOWER
CONTACT POINTS SHOULD BE
MIN 0.015 INCH --- MAX 0.025 INCH
TO CHECK
FULL CONTACT FUNCTION LEVER DOWN
AGAINST CODE BAR BASKET AT REAR OF
BASKET AND FRONT OF CONTACT LEVER
TOUCHING CENTER OF CONTACT INSULATOR
TO ADJUST
BEND UPPER CONTACT SPRING

2. CLEARANCE BETWEEN CENTER AND LOWER
CONTACT POINTS SHOULD BE
AT LEAST 0.010 INCH
TO CHECK
DEPRESS CONTACT OPERATING KEY WITH
16 OZ PRESSURE.

3. CENTER AND LOWER CONTACTS SHOULD
CLOSE WITH SOME OVER-TRAVEL
TO CHECK
FULLY DEPRESS CONTACT OPERATING KEY
TO ADJUST
POSITION COMPLETE ASSEMBLY WITH RIGHT
AND LEFT BRACKET MOUNTING SCREWS
LOOSENED.
3.13 Blinding Contact (Pulsing Contact) Mechanism

NOTE: CHECK ADJUSTMENTS (A), (B), (C) BEFORE INSTALLING CONTACT ASSEMBLY ON SIGNAL GENERATOR

(A) CONTACT ALIGNMENT

REQUIREMENT
CONTACT SURFACES SHOULD BE REASONABLY PARALLEL TO EACH OTHER.
TO ADJUST
BEND LARGE CONTACT SPRING

(B) CAM FOLLOWER ARM (UPPER EXTENSION)

REQUIREMENT
CLEARANCE BETWEEN UPPER EXTENSION OF CAM FOLLOWER ARM AND CONTACT SPRING INSULATOR SHOULD BE
MIN 0.015 INCH --- MAX 0.025 INCH
TO CHECK
CAM FOLLOWER ARM RESTING AGAINST ITS STOP SCREW
TO ADJUST
POSITION STOP SCREW WITH ITS LOCKNUT LOOSENED.

(C) CONTACT SPRING

REQUIREMENT
MIN 3-1/2 OZ --- MAX 4-1/2 OZ
TO JUST SEPARATE THE CONTACTS
TO ADJUST
BEND LARGE CONTACT SPRING, RE-CHECK (A).

(D) CONTACT GUARD

SEE PAR. 3.14

(E) CONTACT GAP (SEE NOTE 1 ON PAR. 3.14)

REQUIREMENT
CLEARANCE BETWEEN CONTACT POINTS SHOULD BE
MIN 0.015 INCH --- MAX 0.025 INCH
TO CHECK
ROTATE MAIN SHAFT TO LATCHED POSITION (CAM FOLLOWER ARM EXTENSION ON HIGH PART OF CAM).
TO ADJUST
POSITION CONTACT ASSEMBLY MOUNTING BRACKET WITH ITS MOUNTING SCREWS LOOSENED.
3.14 Blinding Contact (Pulsing Contact) Mechanism continued

NOTE: 1. CHECK ADJUSTMENTS (D), (E), (F) WITH CONTACT ASSEMBLY INSTALLED ON SIGNAL GENERATOR AND BEFORE INSTALLATION OF SIGNAL GENERATOR ON KEYBOARD.
2. THE BLINDING CONTACT IS NOT ADJUSTABLE TO OTHER THAN THE TIMING OF THE STOP PULSE OF THE SIGNAL GENERATOR.

(D) CONTACT GUARD
REQUIREMENT
CLEARANCE BETWEEN CONTACT GUARD AND ROCKER BAIL ASSEMBLY SHOULD BE MIN 0.010 INCH
TO ADJUST POSITION CONTACT ASSEMBLY WITH TWO MOUNTING SCREWS LOOSENED. MAINTAIN EQUAL CLEARANCE BETWEEN CONTACT SPRINGS AND CONTACT GUARD.

(E) CONTACT GAP
SEE PAR. 3.13

(F) CAM FOLLOWER ARM (LOWER EXTENSION)
REQUIREMENT
CLEARANCE BETWEEN LOWER EXTENSION EDGE OF CAM FOLLOWER ARM AND INSIDE SURFACE OF CLUTCH DISC SHOULD BE MIN 0.015 INCH
TO ADJUST POSITION CAM FOLLOWER HINGE WITH ITS TWO MOUNTING SCREWS LOOSENED.
NOTE --- ROTATE MAIN SHAFT SEVERAL TIMES AND CHECK THE ENTIRE CYCLE. MAKE SURE LOWER EXTENSION OF FOLLOWER ARM DOES NOT COME IN CONTACT WITH ADJUSTING DISC MOUNTING SCREWS.
3.15 Blinding Contact (Pulsing Contact) Mechanism continued

(G) SPECIAL REQUIREMENTS (FOLLOWING INSTALLATION OF SIGNAL GENERATOR) PROCEED TO (H) IF A DISTORTION TEST SET IS AVAILABLE
1. CONNECT INDICATOR LAMP ACROSS PULSING CONTACTS. ROTATE MAIN SHAFT UNTIL CLUTCH BECOMES LATCHED.
2. SET UP LETTERS COMBINATION AND ROTATE MAIN SHAFT SLOWLY. THE LAMP SHOULD LIGHT WHEN THE THIRD TRANSFER LEVER BEGINS TO MOVE DOWN ON THE TRANSFER BAIL (START PULSE) AND REMAIN LIT UNTIL JUST BEFORE THE SIXTH TRANSFER LEVER LATCHES UP ON THE TRANSFER BAIL (FIFTH PULSE).
3. REFINE THE ADJUSTMENTS, IF NECESSARY. CHECK THE BLINDING CYCLE WITH THE ASSOCIATED UNIT IN THE CIRCUIT WHILE OPERATING UNDER MOTOR POWER.

(H) STROBE REQUIREMENTS (FOLLOWING INSTALLATION OF SIGNAL GENERATOR) IF A DISTORTION TEST SET IS AVAILABLE.

Set up "LETTERS" CODE COMBINATION AND ORIENT SCALE OF TEST SET WITH SIGNAL. INTRODUCE THE BLINDING CONTACT INTO THE CIRCUIT (CONTINUE TO TRANSMIT "LETTERS" CODE COMBINATION) AND ADJUST BLINDING CONTACT TO OBTAIN THE FOLLOWING RESULTS:

a. BLINDING CONTACT SHOULD CLOSE BEFORE BEGINNING OF START PULSE AND REMAIN CLOSED TILL AFTER END OF 5TH PULSE.

b. SLIGHT BREAKS (1 OR 2 DIVISIONS) ARE PERMISSIBLE AT EACH END OF BLINDING PULSE. NONE ARE PERMISSIBLE IN THE GENERAL BLINDING SCALE RANGE.

3.16 Lockbar Contacts (Electrical Send-Receive Break Mechanism)

[B) LOCK BAR CONTACT TENSION REQUIREMENT
MIN 10 OZ --- MAX 15 OZ
TO START CONTACT SWINGER MOVING
TO CHECK ---
LATCH THE LOCK BAR ("SEND" KEY DEPRESSED AND RELEASED)
TO ADJUST
BEND CONTACT SPRINGS. RECHECK ADJUSTMENT (A)

(A) LOCK BAR CONTACTS REQUIREMENT
1. GAP BETWEEN NORMALLY OPEN CONTACTS SHOULD BE
MIN 0.008 INCH --- MAX 0.012 INCH
TO CHECK --- DEPRESS "REC" KEY
2. GAP BETWEEN NORMALLY CLOSED CONTACTS SHOULD BE
MIN 0.008 INCH --- MAX 0.012 INCH
TO CHECK --- DEPRESS "SEND" KEY AND RELEASE
3. ALL CONTACTS SHOULD CLOSE WITH A SMALL AMOUNT OF OVERTRAVEL
TO ADJUST
BEND CONTACT SPRINGS USING CONTACT BENDING TOOL. AVOID DISTORTING THE CONTACT SPRINGS
3.17 Answer-Back Mechanism (Switched Circuit Network)
Keyboards LK6 and Up (Bell 28D and Up) "FIGS" "C"

**NOTE:** ADJUSTMENTS ON THIS PAGE SHOULD BE MADE WITH THE ANSWER-BACK MECHANISM REMOVED FROM THE KEYBOARD.

**A)** **Magnet Yoke**

- **Requirement:**
  - Clearance between latching surfaces of stop lever extension and stop lever latch should be
  - Min: 0.005 inch
  - Max: 0.015 inch

  **To Check:**
  - Hold tip of stop lever against stop blade.

  **To Adjust:**
  - Position magnet yoke with its two mounting screws loosened.

**B)** **Stop Lever Latch**

1. **Requirement:**
   - Clearance between stop lever and stop lever latch should be
   - Min: 0.002 inch
   - Max: 0.007 inch

   **To Check:**
   - Hold armature against the magnet core and the stop lever in its maximum counter-clockwise position.

2. **Requirement:**
   - Clearance between stop lever and stop lever latch throughout a complete travel of the stop lever—Min: 0.002 inch

   **To Check:**
   - Hold armature against magnet core.

   **To Adjust:**
   - Position stop lever latch with its two mounting screws loosened.
3.18 Answer-Back Mechanism (Switched Circuit Network)
Keyboards LK6 and Up (Bell 28D and Up) "FIGS" "C" continued

NOTE: TO FACILITATE MAKING THIS ADJUSTMENT, REMOVE MESSAGE DRUM AND DRIVE
PLATE ASSEMBLY FROM MECHANISM.

(B) SENSING LEVER SPRINGS
REQUIREMENT
WITH THE SIGNAL GENERATOR CLUTCH IN STOP POSITION AND
THE MESSAGE DRUM REMOVED IT
SHOULD REQUIRE
MIN 1/4 OUNCE
MAX 1-1/4 OUNCES
TO START EACH SENSING LEVER MOVING.

(C) DETENT LEVER SPRING
REQUIREMENT
WITH THE SIGNAL GENERATOR CLUTCH IN STOP POSITION AND
THE MESSAGE DRUM REMOVED IT
SHOULD REQUIRE
MIN 22 OUNCES
MAX 26 OUNCES
TO START THE DETENT LEVER MOVING.

(A) CHARACTER GENERATOR MOUNTING PLATE
(1) REQUIREMENT
SENSING LEVERS SHOULD BE CENTERED ON
THE FULL WIDTH OF THEIR ASSOCIATED CODE
BAR.

(2) REQUIREMENT
CLEARANCE BETWEEN SHOULDERS OF CODE
BARS #1 AND #5 AND THEIR ASSOCIATED
SENSING LEVERS SHOULD BE
MIN 0.002 INCH
MAX 0.012 INCH
TO ADJUST
POSITION THE MOUNTING PLATE WITH THE
THREE MOUNTING SCREWS LOOSENED.
3.19 Answer-Back Mechanism (Switched Circuit Network)
Keyboards LK6 and Up (Bell 28D and Up) "FIGS" "C" continued

PERFORM THIS ADJUSTMENT BEFORE FINAL INSTALLATION OF MESSAGE DRUM AND DRIVE PLATE ASSEMBLY.

**DRIVE LINK SPRING REQUIREMENT**

WITH THE SIGNAL GENERATOR CLUTCH IN STOP POSITION, IT SHOULD REQUIRE

MIN 10 OUNCES
MAX 15 OUNCES
TO PULL SPRING TO INSTALLED LENGTH

**DRIVE LINK REQUIREMENT**

CLEARANCE BETWEEN DRIVE PLATE EXTENSION AND BLOCKING LEVER SHOULD BE

MIN 0.002 INCH
MAX 0.007 INCH
TO CHECK SIGNAL GENERATOR CAM ECCENTRIC AND ARM HOLDING CODE BAR BAIL IN EXTREME RESET POSITION TO THE LEFT.

TO ADJUST LOOSEN THE TWO ADJUSTING SCREWS AND POSITION THE TWO DRIVE LINKS BY MEANS OF THE ADJUSTING SLOTS.

**NOTE**

THE STANDARD KEYBOARD ADJUSTMENTS LISTED BELOW SHOULD BE CHECKED DURING INSTALLATION OF THE ANSWER-BACK MECHANISM.

A. CODE BAR AND CODE LEVER CLEARANCE, PAR. 2.05.
B. CODE BAR BAIL - PAR. 2.08. REFINE THIS ADJUSTMENT TO 0.004 TO 0.006 INCH.
C. CODE BAR BAIL AND NON REPEAT LEVER CLEARANCE, PAR. 2.08.
D. UNIVERSAL BAIL LATCH LEVER, PAR. 2.10.
E. UNIVERSAL BAIL EXTENSION, PAR. 2.10.
3.20 Answer-Back Mechanism (Switched Circuit Network)
Keyboards LK6 and Up (Bell 28D and Up) "FIGS" "C" continued

THE FOLLOWING FINAL ADJUSTMENTS FOR ANSWER-BACK MECHANISM SHOULD BE MADE
AFTER INSTALLATION OF THE MECHANISM ON THE KEYBOARD.

**Stepping Pawl**

**Requirement**
- Clearance between stepping pawl and any code blade should be
  - MIN 0.018 INCH
  - MAX 0.030 INCH

**To Check**
- Message drum in fully detented position,
- Signal generator cam and arm holding code bar bail in extreme reset position to the left.

**To Adjust**
- Loosen lock nut and position eccentric stud so that its high point is toward the top.

**Stepping Pawl Spring**

**Requirement**
- With signal generator clutch in stop position
  - MIN 2-1/2 OUNCES
  - MAX 3-1/2 OUNCES

**To Start Pawl Moving.**

**Latch Operating Lever Spring**

**Requirement**
- With signal generator clutch in stop position
  - MIN 5 OUNCES
  - MAX 6 OUNCES

**To Start Lever Moving.**

**Latch Operating Lever Adjusting Screw**

**Requirement**
- Clearance between extension on latch operating lever and code bar bail latch should be
  - MIN 0.005 INCH — MAX 0.015 INCH

**To Check**
- Signal generator clutch fully disengaged, stop lever latched on magnet armature latch.

**To Adjust**
- With lock nut loosened, position latch operating adjusting screw.
3.21 Answer-Back Mechanism (Switched Circuit Network)
Keyboards LK6 and Up (Bell 28D and Up) "FIGS" "C" continued

**A** BLOCKING LEVER SPRING

Requirement:
With Signal Generator Clutch in Stop Position, unhook Blocking Lever Spring from Stop Lever.
Min 1 Ounce
Max 2 Ounces
To pull Spring to Installed Length.

**B** ARMATURE LATCH SPRING

Requirement:
With Signal Generator Clutch in Stop Position, unhook Armature Latch Spring from spring post on Magnet Yoke.
Min 2 Ounces
Max 4 Ounces
To pull Spring to Installed Length.

**C** MOTOR CONTROL RELAY SWITCH

Requirement:
The switch should be in its operated position when the armature is held against the magnet core.
To adjust position switch with its mounting screws loosened.
1. REMOVE MESSAGE DRUM FROM ANSWER-BACK ASSEMBLY AND TAKE OUT CODE BLADES AS FOLLOWS: REMOVE DRIVE LINK SPRING ALLOWING DRIVE LINK TO DROP OUT OF ENGAGEMENT WITH STUD ON DRIVE PLATE. LIFT MESSAGE DRUM FROM NOTCHES. DEPRESS STEPPING PAWL EXTENSION AND PULL DRUM OFF SHAFT. REMOVE "O" RING FROM ONE END OF DRUM AND TAKE OUT TWENTY CODE BLADES. IT IS NOT NECESSARY TO TAKE OUT STOP BLADE. (REFER TO PARTS BULLETIN 1149B).

2. CODE A BLADE BY BREAKING OFF UNWANTED TINES AT SCORED LINE AT BASE OF EACH TINE. THE FIGURE BELOW INDICATES TINES TO BE REMOVED FOR A PARTICULAR CHARACTER. HOLD EACH BLADE SECURELY NEAR SCORE MARK OF TINE TO BE REMOVED. IN STANDARD 5 LEVEL OPERATION, THE O CODE LEVEL TINE IS DISREGARDED.

3. CODE THE DRUM IN A COUNTER-CLOCKWISE DIRECTION STARTING WITH NO. 2 CODE BLADE (ADJACENT TO STOP BLADE). BEGIN MESSAGE WITH "LETTERS" (STOP BLADE) FOLLOWED BY "CARRIAGE RETURN" AND "LINE FEED". END MESSAGE WITH "CARRIAGE RETURN" AND "LINE FEED". THIS LEAVES 16 CHARACTERS AVAILABLE FOR MESSAGE PROPER. CODE ANY UNUSED CHARACTERS WITH "LETTERS" OR "BLANKS", SINCE EACH SLOT POSITION IN DRUM MUST BE OCCUPIED BY A CODE BLADE.

4. INSTALL CODED BLADES IN PROPER SLOTS IN DRUM - INSERT END OF BLADE UNDER REMAINING "O" RING AND ROTATE THE BLADE TOWARD CENTER OF DRUM UNTIL IT IS FULLY SEATED. WHEN ALL THE SLOTS ARE FILLED REPLACE "O" RING REMOVED IN 1. ABOVE.

5. APPLY GREASE TO SHAFT OF MESSAGE DRUM. REASSEMBLE MECHANISM REVERSING PROCEDURE OF STEP 1. BE SURE PARTS ARE PROPERLY SEATED. LUBRICA TE PER INSTRUCTION IN APPROPRIATE SECTION.
3.23  Answer-Back Mechanism Keyboards LK6 and Up (Bell 28D and Up) "FIGS" "D"

NOTE: ADJUSTMENT REQUIREMENTS FOR "FIGS" "D" ANSWER-BACK OPERATION ARE IDENTICAL TO REQUIREMENTS FOR "FIG" "C" OPERATION (SEE PAR. 3.17 THROUGH 3.23) EXCEPT FOR THE ADDITIONAL ADJUSTMENT GIVEN BELOW.

![Diagram of Answer-Back Mechanism](image)

**KEYBOARD LOCK BAIL ECCENTRIC REQUIREMENT**

- CLEARANCE BETWEEN KEYBOARD LOCK LEVER W/HUB AND KEYBOARD LOCK FUNCTION LEVER SHOULD BE MIN SOME --- MAX 0.006 INCH

TO CHECK

- FULLY DEPRESS BOTH "KYBD LOCK" AND "HERE IS" KEYS (HOLD LIGHTLY).

TO ADJUST

- LOOSEN LOCK NUT AND POSITION ECCENTRIC WITH ITS HIGH POINT TOWARD FRONT OF KEYBOARD.
3.24 Variable Speed Drive Mechanism

(C) GEAR BRACKET

1. REQUIREMENT
   BACKLASH BETWEEN TYPING UNIT DRIVEN GEAR AND TYPING UNIT DRIVING
   GEAR SHOULD BE MIN 0.002 INCH --- MAX 0.006 INCH
   AT POINT WHERE BACKLASH IS LEAST.

TO CHECK
   VARIABLE SPEED DRIVE MECHANISM AND TYPING UNIT MOUNTED IN PLACE AND
   GEAR GUARD REMOVED.

TO ADJUST
   LOOSEN LEFT FRONT MOTOR BRACKET MOUNTING SCREW TO FRICTION TIGHT.
   POSITION GEAR BRACKET ASSEMBLY BY MEANS OF ADJUSTING SLOT LOCATED
   AT REAR OF ASSEMBLY. ALIGN GEARS BEFORE TIGHTENING MOUNTING SCREWS.

2. REQUIREMENT --- BACKLASH BETWEEN MOTOR PINION AND IDLER GEAR
   SHOULD BE MIN 0.002 INCH --- MAX 0.006 INCH AT POINT WHERE BACKLASH IS
   LEAST. TO ADJUST --- RAISE OR LOWER FRONT END OF GEAR BRACKET BY
   MEANS OF ADJUSTING AND CLAMP SCREWS. SEE FIGURE BELOW

NOTE: RECHECK REQUIREMENT 1 AND REFINE BOTH 1 AND 2 IF
   NECESSARY.

SELECTOR LINK

SELECTOR LEVER

REQUIREMENT
   THERE SHOULD BE FULL MESH OF MATING GEARS.

TO CHECK
   PLACE SPEED SELECTOR LEVER IN DETENTED POSITION AT 100 WPM.

TO ADJUST
   LOOSEN NUT ON SELECTOR LEVER ECCENTRIC SHOULDER SCREW TO FRICTION TIGHT.
   TURN SHOULDER SCREW TO ADJUST. TIGHTEN NUT AND RE-CHECK ALIGNMENT.
   NOTE - KEEP ECCENTRIC PART OF SCREW BELOW HORIZONTAL CENTER LINE.

PERFORM ADJUSTMENT (A) AND (B) BEFORE INSTALLATION OF DRIVE ASSEMBLY.

SECTION THROUGH SPEED SELECTING LEVER
(LEFT VIEW)

SPEED SELECTING LEVER
Pivot Screw

ROLLERS

ADJUSTING SCREW

CLAMP SCREW

SHOULDER SCREW

REQUIREMENT
   BARELY PERCEPTIBLE CLEARANCE BETWEEN GEAR ASSEMBLY BRACKET AND SELECTING
   LEVER AT SHOULDER SCREW PIVOT.

TO ADJUST
   TIGHTEN SHOULDER SCREW TO FRICTION TIGHT AND THEN LOOSEN 1/8 TURN.
   TIGHTEN THE LOCK NUT.
3.25 Variable Speed Drive Mechanism continued

(B) HUB POSITION

REQUIREMENT

CLEARANCE BETWEEN HUB ECCENTRIC AND PLATE SHOULD BE MIN 0.005 INCH

TO ADJUST

POSITION HUB ON SHAFT WITH ITS MOUNTING SCREW LOOSENED.

---

(A) SPREADER POST

REQUIREMENT

THE SPREADER POST SHOULD NOT SPREAD OR COMPRESS SIDES OF VARIABLE SPEED DRIVE ASSEMBLY.

TO ADJUST

LOOSEN BOTH SPREADER POST HEX NUTS. TIGHTEN POST MOUNTING SCREW. TURN INNER HEX NUT UNTIL IT TOUCHES INNER SIDE OF BRACKET. TIGHTEN OUTER HEX NUT TO LOCK POST IN POSITION.

CAUTION: IMPROPER ASSEMBLY MAY CAUSE MISALIGNMENT RESULTING IN SHORTENED BEARING LIFE.
3. 26 Remote Control Gear Shift Mechanism

**GEAR SHIFT MECHANISM**

**REQUIREMENT**

The backlash between the motor pinion and its driven gear and between the typing unit driven gear and its driving gear should be MIN 0.004 INCH — MAX 0.008 INCH at point of minimum backlash.

To adjust, loosen the four screws which mount the assembly bracket to base. Loosen the nut-plate mounting screw at front of assembly bracket. Loosen lock nuts on adjusting bushings. Position gear shift bracket assembly front to rear. Raise or lower rear of assembly by rotating adjusting bushes nearest the motor. Position other bushes against base plate and tighten all screws and lock nut.

**GEAR SHIFT MAGNET ARMATURE SPRING**

**REQUIREMENT**

Magnet de-energized

- MIN 2-1/2 OZ
- MAX 7 OZ

To start armature moving.

---

**Diagram**

- Typing unit driving gear
- Typing unit driven gear
- Armature spring
- Motor pinion
- Driven gear
- Mounting screw
- Adjusting bushing
- Lock nut
- Base
- Nut plate mounting screw

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3.27 Remote Control Gear Shift Mechanism continued

GEAR SHIFT MAGNET

REQUIREMENT

THE POLE FACE OF THE ARMATURE SHOULD MEET
THE POLE FACE OF THE MAGNET SQUARELY

TO ADJUST

POSITION ARMATURE WITH GEAR SHIFT LEVER
CLAMP SCREW LOOSENED AND POSITION
MAGNET BRACKET WITH ITS MOUNTING
SCREWS LOOSENED.

CLUTCH STOP LEVER

REQUIREMENT

ARMATURE RESTING AGAINST MAGNET POLE
FACE, CLEARANCE BETWEEN GEAR SHIFT LEVER
AND THE SLEEVE

MIN 0.002 INCH
MAX 0.010 INCH

TO ADJUST

POSITION GEAR SHIFT LEVER WITH ITS CLAMP
SCREW LOOSENED.

ARMATURE STOP

REQUIREMENT

WITH ARMATURE IN ITS OPEN POSITION AND THE
ARMATURE STOP AGAINST THE CASTING, CLEARANCE
BETWEEN GEAR SHIFT LEVER AND STUD
ON SLEEVE

MIN 0.010 INCH
MAX 0.020 INCH

TO ADJUST

HOLD GEAR SHIFT LEVER IN POSITION AND
POSITION ARMATURE STOP WITH ITS CLAMP
SCREW LOOSENED UNTIL REQUIREMENT IS MET.
### 3.28 Form Feed-Out Mechanism

**SECTION 573-116-700**

- **SWITCH OPERATING ARM**
- **FORM FEED-OUT SOLENOID**
- **FORM FEED-OUT LINK SPRING**
- **SOLENOID SPRING**

**FORM FEED-OUT SOLENOID REQUIREMENT**

- **MIN** 0.005 INCH
- **MAX** 0.035 INCH

**OVERTRAVEL OF FORM START SLIDE ON PAGE PRINTER AFTER BLOCKING LEVER FALLS IN PLACE.**

**TO CHECK**

- OPERATE FORM FEED-OUT SOLENOID.

**TO ADJUST**

- POSITION FORM FEED-OUT SOLENOID ASSEMBLY WITH ITS MOUNTING SCREWS LOOSENED.

*SEE FIGURE BELOW*

**SOLENOID SPRING REQUIREMENT**

- **MIN** 1/2 OZ
- **MAX** 2 OZ

**TO PUSH SOLENOID PLUNGER ALL THE WAY INTO THE SOLENOID.**

**FORM FEED-OUT LINK SPRING REQUIREMENT**

- **MIN** 3-1/2 OZ
- **MAX** 6-1/2 OZ

**TO START FORM FEED-OUT LINK MOVING.**

---

*LEFT VIEW*
### Synchronous Pulse Mechanism

**Mounting Bracket**

**To Check**

With magnet not attracted and clutch trip bar in furthest left position.

**Requirement**

Min 0.005 inch --- Max 0.015 inch between clutch trip bar and armature lever.

**To Adjust**

Position mounting bracket with three mounting screws loose by means of pry point.

**NOTE**

Tighten rear left mounting screw and make mounting bracket adjustment.

---

**Magnet Armature**

**To Check**

Clutch trip bar in extreme left position. Hook 32 oz. scale to armature lever as shown. Measure at right angle to armature lever as indicated.

**Requirement**

Min 3 oz --- Max 5 oz to pull armature lever from clutch trip bar.

---

**Armature Hinge**

**Requirement**

With armature in attracted position armature flush with pole face and magnet bracket extension.

**To Adjust**

Position armature with hinge bracket mounting screw and spring post loose.

---

**Mounting Bracket**

**To Check**

With armature lever held against magnet pole face and clutch trip bar in furthest right position.

**Requirement**

Min 0.005 inch --- Max 0.015 inch between clutch trip bar and armature lever.

**To Adjust**

With right rear and left front mounting bracket screws loose position mounting bracket by means of pry point.
3.30 Synchronous Pulse Mechanism continued

**ARMATURE CLAMP**

N8M S 7N8F 8G Q1

V 7Q>12 1 O5N8\ V 8N2 Q87 \ 5 E82 N2 G 5 N 4BQV 88G 12 N2 2 O5 N8\ 5 E2 F L12 G 712 2 O5 N8\ 2 LNI X 3/8 QG 5 >

OQ (12 7 BS 0O)

L1 O5@7I G 5 E2 F L1V @Q>12 0O)  
F 5 G Q7G <1 O5 N8V 1E1 J O8G 870\  

**REQUIREMENT**

WITH A RMATURE OPERATED,

CLEARANCE BETWEEN ARMATURE CLAMP AND ARMATURE APPROX. 3/8 INCH TO ADJUST POSITION CLAMP WITH ITS MOUNTING SCREW LOOSENED.

**CONTACT MOUNTING SCREWS**

**ARMATURE CONTACT GAP**

WITH UNIVERSAL CODE BAR IN STOP POSITION (TO RIGHT AS VIEWED FROM REAR) CONTACT GAP SHOULD BE MIN 0.020 INCH MAX 0.035 INCH TO ADJUST POSITION CONTACT MOUNTING BRACKET WITH MOUNTING SCREWS LOOSEN.

**CONTACT BRACKET**

**UNIVERSAL CODE BAR**

51 H Q2 5 Q(GAP)

N8M S 8N8F 8G Q1

V 7Q>15 G 7U 8NO2 E1S1 7 8\42 N1(H1 \ OQ1 L1L1 01Q7I H \ Q1 1N7>Q1201  
U 5B V 87\ 11F 5W82 N 51 G Q2 5 Q1 \ 2 L1Q>1 S 6E74\81  
F 7G \0.020 Q5 >1  
F 2 X 0.035 Q5 >1  
OQ (12 7 BS 0O)

LJ O5@7 G 5 J G Q2 5 Q(F J 5 G QZ \ YG <1 4N2 5 C Q80V @Q>1 F 5 G Q85 <1  
O5 N8V 1E1 J O81)}
3.31 Synchronous Pulse Mechanism continued

UNIVERSAL CODE BAR CONTACT REQUIREMENT
WITH UNIVERSAL CODE BAR IN OPERATED POSITION (TO THE LEFT AS VIEWED FROM REAR)
MIN 3-1/2 OZ
MAX 4-1/2 OZ
TO OPEN CONTACTS,
TO ADJUST BEND CONTACT SWINGER.
4. BASE (RECEIVE-ONLY)

4.01 Signal Line Break Mechanism

- BREAK KEY LEVER SPRING
  - REQUIREMENT
    - MIN 25 OZ
    - MAX 30 OZ
    - TO OPERATE SWITCH

- BREAK KEY LEVER

- BRACKET

- KEY LEVER SPRING

- SWITCH

- MOUNTING SCREW

- LEVER EXTENSION

- PLUNGER

- LEVER EXTENSION REQUIREMENT
  - WHEN KEY LEVER IS DEPRESSED, EXTENSION SHOULD OPERATE SWITCH PLUNGER BEFORE BEING STOPPED BY BRACKET.
  - TO ADJUST
  - POSITION EXTENSION ON LEVER WITH MOUNTING SCREW LOOSENED.

4.02 The following requirement should be met:

(a) INTERMEDIATE GEAR BRACKET (PAR. 2.17)
(b) MOUNTING TYPING UNIT ON KEYBOARD OR BASE (PAR. 2.18)
(c) LOCAL LINE FEED TRIP LINK SPRING (PAR. 2.14)
(d) LOCAL CARRIAGE RETURN BAIL SPRING (PAR. 2.13)
(e) MARGIN INDICATOR SPRING (PAR. 2.15)
5. EARLIER DESIGN

5.01 Signal Generator Mechanism

NOTE: IN ORDER TO PERFORM ALL SIGNAL GENERATOR ADJUSTMENTS, IT WILL BE NECESSARY TO REMOVE GENERATOR FROM THE KEYBOARD. SEE APPROPRIATE SECTION.

**SELECTOR LEVER SPRING**

**REQUIREMENT**
- SELECTOR LEVER ON LOW PART OF CAM.
  - MIN 1 OZ
  - MAX 2-1/2 OZ
  - TO START LEVER MOVING.
  - CHECK EACH SELECTOR LEVER SPRING.

**LOCKING BAIL SPRING**

**REQUIREMENT**
- GENERATOR CLUTCH DISENGAGED.
  - MIN 2 OZ
  - MAX 4 OZ
  - TO START LOCKING BAIL MOVING.

**SELECTOR LEVER GUIDE**

**REQUIREMENT**
- WITH SIGNAL GENERATOR CLUTCH DISENGAGED, THE CLEARANCE BETWEEN FRONT SELECTOR LEVER AND THE LOW PART OF ITS CAM SHOULD BE
  - MIN 0.004 INCH
  - MAX 0.010 INCH

TO ADJUST
- POSITION THE SELECTOR LEVER GUIDE WITH ITS MOUNTING SCREWS LOOSENED.
SECTION 573-116-700

5.02 Signal Generator Mechanism continued

TRANSFER LEVER SPRING

REQUIREMENT

TRANSFER LEVERS IN MARKING POSITION. CODE BAR BAIL LATCH SPRING REMOVED START TRANSFER LEVER (5TH FROM FRONT) MANUALLY MOVED TO MARKING POSITION.

TRANSFER LEVERS

MIN 5-1/2 OZ
MAX 8 OZ

MARKING PROJECTION

ROCKER BAIL

SPACING PROJECTION

LOCKING BAIL

TRANSFER LEVER

LOCK NUT

START LEVER

7-1/2 OZ
10 OZ TO START LEVER MOVING.

MARKING PROJECTION

ROCKER BAIL DETENT

REQUIREMENT

CLEARANCE BETWEEN THE ROCKER BAIL ARM AND BOTH THE MARKING AND THE SPACING PROJECTIONS OF THE SELECTOR LEVERS SHOULD BE EQUAL WITHIN 0.005 INCH

TO CHECK


TO ADJUST

EQUALIZE CLEARANCES BY ROTATING THE ECCENTRIC PIVOT STUD OF THE DETENT WITH ITS LOCK NUT LOOSENED. KEEP THE HIGH PART OF THE ECCENTRIC TOWARD THE GENERATOR SHAFT.
5.03 Signal Generator Mechanism continued

NOTE: REMOVE MECHANICAL BREAK LEVER AND SPRING OR ELECTRICAL BREAK LEVER, SPRING AND SWITCH, IF EQUIPPED. SEE PAR. 5.26.

ROCKER EXTENSION MOUNTING SCREWS

ROCKER EXTENSION

INTERMEDIATE LEVER SPRING

SPACING INTERMEDIATE LEVER

MARKING INTERMEDIATE LEVER

FLUTTER LEVER

FLUTTER CAM

INTERMEDIATE LEVER SPRING

REQUIREMENT

CLUTCH DISENGAGED. PULL HORIZONTALLY, PARALLEL TO INTERMEDIATE LEVER'S PATH

MIN  2 OZ

MAX  4 OZ

TO START LEVER MOVING. CHECK SPACING AND MARKING LEVERS.

ROCKER EXTENSION

REQUIREMENT

EQUAL CLEARANCE (WITHIN 0.005 INCH) BETWEEN THE ROCKER EXTENSION AND BOTH THE MARKING AND THE SPACING INTERMEDIATE LEVERS WHEN SELECTED INDIVIDUALLY.

TO CHECK

ROTATE THE SHAFT UNTIL THE MARKING INTERMEDIATE LEVER IS SELECTED AND THE FLUTTER LEVER IS ON LOW PART OF CAM. GAUGE CLEARANCE IN LEFT FIGURE REPEAT PROCEDURE FOR SPACING INTERMEDIATE LEVER. GAUGE CLEARANCE IN RIGHT FIGURE.

TO ADJUST

EQUALIZE CLEARANCES BY POSITIONING THE ROCKER EXTENSION WITH ITS MOUNTING SCREWS LOOSENED.
5.04 Signal Generator Mechanism continued

**SECTION 573-116-700**

DETENT TOGGLE STOP BRACKET

**REQUIREMENT**

CLEARANCE BETWEEN ENGAGING SURFACES OF SPACING AND MARKING INTERMEDIATE LEVERS AND ASSOCIATED SURFACES OF OSCILLATING LEVER SHOULD BE EQUAL WITHIN 0.004 INCH.

TO CHECK:

FRONT SELECTOR LEVER IN MARKING POSITION, GENERATOR SHAFT ROTATED UNTIL FRONT SELECTOR LEVER IS ON PEAK OF ITS CAM, MOVE OSCILLATING LEVER TOWARD MARKING INTERMEDIATE LEVER AND GAUGE THE GAP. THEN WITH FRONT SELECTOR LEVER IN SPACING POSITION AND ON PEAK OF ITS CAM, MOVE OSCILLATING LEVER TOWARD SPACING INTERMEDIATE LEVER AND CHECK GAP.

TO ADJUST:

EQUALIZE THE CLEARANCES BY POSITIONING THE STOP BRACKET WITH ITS MOUNTING SCREWS LOOSENED.
5.05 Signal Generator Mechanism continued

**Detent Lever Spring**

**Requirement**

MIN 8-1/2 OZ  
MAX 10-1/2 OZ  
TO START DETENT LEVER MOVING.

**Intermediate Lever Stop Plate**

**Spacing**

**Marking**

**Spacing Intermediate Lever**

**Marking Intermediate Lever**

**Intermediate Lever**

**Stop Plate**

**Clearance**

**Between Engaging Surfaces**

**Middle MIN**

**Middle MAX**

**Some Clearance**

**Max 0.006 Inch**

**To Check**

WITH THE FRONT SELECTOR LEVER IN ITS MARKING POSITION, ROTATE THE GENERATOR SHAFT UNTIL FRONT SELECTOR LEVER IS ON PEAK OF ITS CAM, MOVE OSCILLATING LEVER TOWARD MARKING INTERMEDIATE LEVER AND GAUGE GAP. WITH FRONT SELECTOR LEVER IN ITS SPACING POSITION AND ON PEAK OF ITS CAM, MOVE OSCILLATING LEVER TOWARD SPACING INTERMEDIATE LEVER AND GAUGE GAP.

**To Adjust**

POSITION INTERMEDIATE LEVER STOP PLATE WITH MOUNTING POST AND MOUNTING SCREW LOOSENED.

**NOTE:** REPLACE THE BREAK LEVER AND ASSOCIATED PARTS.
 SECTION 573-116-700

5.06 Signal Generator Mechanism continued

(A) FLUTTER LEVER SPRING

REQUIREMENT

WITH SIGNAL GENERATOR CLUTCH DISENGAGED AND SPACING INTERMEDIATE LEVER HELD AWAY FROM FLUTTER LEVER, INSERT SCALE BETWEEN CASTING AND BREAK ROD.
MIN 1 OZ
MAX 2-1/4 OZ
TO START FLUTTER LEVER MOVING.

(B) FLUTTER LEVER

(1) REQUIREMENT

WITH THE FLUTTER LEVER ON EACH LOW PORTION OF ITS CAM AND THE MARKING AND SPACING INTERMEDIATE LEVERS ALTERNATELY SELECTED, THE CLEARANCE BETWEEN THE FLUTTER LEVER AND LATCHING SURFACE OF SELECTED INTERMEDIATE LEVER SHOULD BE
MIN 0.005 INCH
MAX 0.018 INCH
WITH THE CLUTCH ENGAGED AND THE SELECTOR LEVERS TO MARKING (LEFT), ROTATE THE GENERATOR SHAFT TO CHECK CLEARANCE ON MARKING INTERMEDIATE LEVERS. HOLD SELECTOR LEVERS TO SPACING (RIGHT) AND ROTATE SHAFT TO CHECK SPACING INTERMEDIATE LEVERS.
TO ADJUST
POSITION THE FLUTTER LEVER MOUNTING STUD IN THE ELONGATED MOUNTING HOLE WITH THE LOCK NUT LOOSENED.

(2) REQUIREMENT

AFTER REQUIREMENT (1) HAS BEEN MET, SELECT THE MARKING AND SPACING INTERMEDIATE LEVERS ALTERNATELY AND ROTATE THE GENERATOR SHAFT UNTIL THE FLUTTER LEVER IS ON SUCCESSIVE HIGH PORTIONS OF ITS CAM. UNDER THESE CONDITIONS THERE SHOULD BE SOME CLEARANCE BETWEEN THE OSCILLATOR AND THE SELECTED INTERMEDIATE LEVER.
TO ADJUST
REFINE THE FLUTTER LEVER ADJUSTMENT AND RECHECK REQUIREMENT (1).
Signal Generator Mechanism continued

**CLUTCH STOP LEVER SPRING**

**REQUIREMENT**

OPERATE CLUTCH STOP LEVER, CLUTCH ENGAGED, ROTATE SHAFT 1/4 TURN.

MIN. 1-3/4 OZ
MAX. 3 OZ

TO START THE LEVER MOVING

**CLUTCH SHOE LEVER SPRING**

**CLUTCH LATCH LEVER**

**CLUTCH SHOE LEVER**

**CLUTCH DRUM**

**CLUTCH STOP LEVER**

**REQUIREMENT**

CLUTCH STOP LEVER SHOULD FULLY ENGAGE THE CLUTCH SHOE LEVER VERTICALLY.

TO ADJUST

POSITION THE STOP LEVER WITH ITS CLAMP SCREW LOOSENED.
5.08 Signal Generator Mechanism continued

CLUTCH LATCH LEVER SPRING

REQUIREMENT

LATCH LEVER RESTING ON HIGH PART OF CLUTCH DISC.

MIN 1-1/2 OZ
MAX 2-1/2 OZ

TO MOVE LATCH LEVER AWAY FROM DISC.

NOTE

REPLACE SIGNAL GENERATOR ON THE KEYBOARD. MAKE CERTAIN THAT THE CODE BAR BAIL LATCH LEVER (PAR. 5.10) IS UNDER CODE LEVER BAIL LATCH LEVER (PAR. 5.12) THAT (IF EQUIPPED) BREAK KEY ROD, ATTACHED TO BREAK LEVER (PAR. 5.26) IS IN ITS GUIDE HOLE IN CODE LEVER GUIDE, AND THAT THE CLUTCH TRIP BAIL EXTENSION (PAR. 5.07) IS IN THE NOTCH PROVIDED IN THE CLUTCH TRIP BAR (REAR) AND THAT THE CODE BAR BAIL (PAR. 5.10) IS RESTING IN THE NOTCHES OF THE FIVE CODE BARS, THE CLUTCH TRIP BAR AND THE KEYLEVER UPSTOP BAR. SEE APPROPRIATE SECTION.
5.09 Signal Generator Mechanism continued

**CONTACT BOX**

**MARKING CONTACT**

**SPACING CONTACT**

**LOCK NUT**

**ADJUSTING SCREW**

**MOUNTING SCREW**

**(TOP VIEW)**

**CONTACT BOX MOUNTING SCREW**

**(A) GENERATOR CONTACT REQUIREMENT**

THE MARKING AND SPACING CONTACT GAPS SHOULD BE EQUAL.

TO CHECK

REMOVE THE COVER FROM THE CONTACT BOX. FIRST, MOVE THE DETENT TOGGLE AGAINST ITS SPACING STOP AND GAUGE THE MARKING CONTACT GAP. THEN MOVE THE DETENT TOGGLE AGAINST ITS MARKING STOP AND GAUGE SPACING CONTACT GAP.

TO ADJUST

ROTATE THE CONTACT BOX ADJUSTING SCREW WITH ITS LOCK NUT LOOSENED AND WITH THE CONTACT BOX MOUNTING SCREWS FRICTION TIGHT. REPLACE CONTACT BOX COVER.

**NOTE**

CHECK BY MEANS OF A SIGNAL CHECKING DEVICE WHERE POSSIBLE AND CAREFULLY REFINE THE ADJUSTMENT TO ELIMINATE ALL BIAS FROM THE SIGNALS BY EQUALIZING THE CURRENT-ON AND CURRENT-OFF INTERVALS.

**(B) CONTACT BOX SPRING REQUIREMENT**

CONTACT BOX COVER REMOVED. DETENT LEVER SPRING DISCONNECTED.

MIN 2 OZ
MAX 4 OZ
TO BREAK CONTACT
5.10 Codebar Assembly

**Reset Lever Spring**

**Requirement**

- **Clutch Disengaged.**
  - **Min:** 2 oz
  - **Max:** 4 oz
  - To start the reset lever moving.

**Requirement**

- **Clutch Engaged. Ltrs. Combination Selected**
- **Clutch Rotated 1/2 Turn Until Reset Lever is in Extreme Left Hand Position**
- **Clearance Between the Code Bar Bail Latch Lever and Code Bar Bail Roller.**
  - **Min:** 0.004 inch
  - **Max:** 0.008 inch
- **To Adjust**
  - Position the code bar bail adjusting screw with its lock nut loosened.
5.11 Codebar Assembly continued

**CODE BAR BAIL SPRING**

**REQUIREMENT**
GENERATOR CLUTCH DISENGAGED
SPRING UNHOOKED.
MIN 6 OZ
MAX 8 OZ
TO PULL SPRING TO INSTALLED POSITION

**CODE BAR BAIL LATCH SPRING**

**CODE BAR BAIL SPRING**

**CODE BAR BAIL LATCH SPRING**

**RESET LEVER SPRING**

**CODE BAR BAIL LATCH**

**CODE BAR BAIL ROLLER**

**CODE BAR BAIL LATCH SPRING**

**REQUIREMENT**
HOLD CODE BAR BAIL TO LEFT TO PROVIDE SOME CLEARANCE BETWEEN CODE BAR BAIL ROLLER AND LATCHING SURFACE OF THE CODE BAR BAIL LATCH
MIN 1/2 OZ
MAX 1-1/2 OZ
TO START THE LATCH MOVING.
SECTION 573-116-700

5. 12 Codebar Assembly continued

CODE LEVER BAIL LATCH LEVER SPRING

REQUIREMENT

SIGNAL GENERATOR CLUTCH DISENGAGED CODE BAR BAIL LATCH TRIPPED.
CODE LEVER BAIL EXTENSION HELD AWAY FROM LATCHING SURFACE OF CODE LEVER BAIL LATCH LEVER.
MIN 3 OZ --- MAX 5 OZ
TO START CODE LEVER BAIL LATCH LEVER MOVING.

MIN 3 OZ --- MAX 5 OZ
TO START CODE LEVER BAIL LATCH LEVER MOVING.

(LEFT SIDE VIEW)

NON REPEAT LEVER

REQUIREMENT

ANY KEYLEVER DEPRESSED, SIGNAL GENERATOR SHAFT ROTATED UNTIL CLUTCH IS DISENGAGED. CLEARANCE BETWEEN CODE LEVER BAIL EXTENSION AND CODE LEVER BAIL LATCH LEVER
MIN 0.020 INCH
MAX 0.030 INCH
LET UP ON KEYLEVER UNTIL SURFACES TO BE MEASURED ARE IN LINE.

TO ADJUST

POSITION NON REPEAT BELL CRANK SHOULDER PIVOT SCREW IN ITS ELONGATED HOLE WITH LOCK NUT LOOSENED.

NON REPEAT SPRING

REQUIREMENT

GENERATOR CLUTCH DISENGAGED. ANY KEYLEVER DEPRESSED.
MIN 1/2 OZ --- MAX 1-1/2 OZ
TO START NON REPEAT LEVER MOVING DOWNWARD.

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5.13 Codebar Assembly continued

(A) **CODE BAR BAIL LATCH SPRING**

**REQUIREMENT**

- **MIN** 1/2 OZ
- **MAX** 1-1/2 OZ

TO START CODE BAR BAIL LATCH MOVING

(B) **CODE BAR BAIL**

**REQUIREMENT**

CAM ECCENTRIC AND ARM WHICH HOLD THE BAIL IN EXTREME RESET POSITION TO THE LEFT.

- **MIN** 0.004 INCH
- **MAX** 0.012 INCH

BETWEEN CODE BAR BAIL ROLLER AND CODE BAR BAIL LATCH

TO ADJUST

ADJUST ECCENTRIC STUD WITH LOCK NUT LOOSENED.
5. 14 Nonrepeat Lever Mechanism

(A) Non Repeat Lever Spring

Requirement:
Any key lever depressed
Min 2 oz
Max 3-1/4 oz
To start non repeat lever moving downward.

(B) Code Bar Bail and Non Repeat Lever Clearance

Requirement:
Mechanism in initial trip-off position, any key depressed, no power.
Min 0.010 inch
Max 0.020 inch
Between lip of code bar bail and non repeat lever pick-up step

To adjust:
Loosen lock nut and shoulder screw and move mechanism left or right.
5.15 Keyboard Mechanism

**KEYLEVER LOCK BALL CHANNEL AND LOCK BALL END PLAY REQUIREMENT**

- Generator shaft rotating, clutch should trip consistently when two keylevers are depressed alternately. Clutch should not trip when two keylevers are depressed simultaneously. When either Q or P keylever is fully depressed, clearance should be:
  - Min: Same clearance
  - Max: 0.020 inch
- Between tip of wedge lock and bottom of channel.

**TO ADJUST**

- Position channel with mounting screws loosened, position lock ball adjusting screw approximately 0.060 inch above bottom of ball channel.
SECTION 573-116-700

5.16 Codebar Assembly continued.

CODE LEVER BAIL LATCH LEVER ECCENTRIC

(1) REQUIREMENT

KEY LEVER WITH SHORTEST DOWNWARD STROKE FULLY DEPRESSED. CLEARANCE BETWEEN FRONT VERTICAL SURFACE OF THE CODE LEVER BAIL EXTENSION AND THE STOP ON THE REAR END OF THE CODE LEVER BAIL LATCH LEVER.

MIN 0.025 INCH
MAX 0.040 INCH

(2) REQUIREMENT

GENERATOR CLUTCH DISENGAGED. CLEARANCE BETWEEN CODE LEVER BAIL LATCH LEVER AND THE CODE BAR BAIL LATCH MIN 0.005 INCH
MAX 0.035 INCH

TO ADJUST

ROTATE THE CODE LEVER BAIL LATCH LEVER ECCENTRIC.

---

CODE LEVER BAIL EXTENSION
CODE LEVER BAIL SPRING

CODE LEVER BAIL LATCH LEVER ECCENTRIC

---

CODE BAR GUIDES

REQUIREMENT

CLEARANCE BETWEEN CODE BARS AND CODE BAR GUIDES MIN SOME CLEARANCE
MAX 0.010 INCH

TO ADJUST

POSITION THE TWO CODE BAR GUIDES WITH THEIR MOUNTING SCREWS LOOSE NED.
5.17 Codebar Assembly continued

**CODE LEVER BAIL NON REPEAT EXTENSION REQUIREMENT**

Generator clutch disengaged. Code lever bail rotated until code lever bail latch lever just trips. With bail latching extension resting against vertical surface of latch lever and shaft rotated until non repeat lever is fully latched on code bar bail extension. Min. some clearance—Max. 0.015 inch between adjustable extension and non repeat lever.

To adjust position adjustable extension with clamp screw loosened.

**Code Lever Assembly continued**

- **Code Lever Bail Non Repeat Extension**
  - Generator clutch disengaged.
  - Code lever bail rotated until code lever bail latch lever just trips.
  - With bail latching extension resting against vertical surface of latch lever and shaft rotated until non repeat lever is fully latched on code bar bail extension.
  - Min. some clearance—Max. 0.015 inch between adjustable extension and non repeat lever.
  - To adjust position adjustable extension with clamp screw loosened.

- **Code Lever Spring Requirement**
  - (Operating under power)
  - With the generator clutch disengaged
  - Min. 3-1/2 oz
  - Max. 8 oz
  - To operate a key.

**Diagram**

- Code lever bail latch lever
- Bail latching extension
- Adjustable extension
- Clamp screw
- Code bar bail extension
- Code lever bail latch lever
- Non repeat lever
- Code lever spring
- Spring plate

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LOCK BAR SPRING

REQUIREMENT

GENERATOR CLUTCH DISENGAGED.
KEYBOARD LOCK KEY HELD DEPRESSED.
MIN  5 OZ
MAX  9 OZ
TO START LOCK BAR MOVING.

CODE BAR SPRING

REQUIREMENT

LETTERS KEYLEVER DEPRESSED.
GENERATOR CLUTCH ENGAGED.
MIN  3 OZ
MAX  4 OZ
TO START A CODE BAR MOVING.

CLUTCH TRIP BAR SPRING

REQUIREMENT

LETTERS KEYLEVER DEPRESSED.
GENERATOR CLUTCH ENGAGED
CLUTCH TRIP BAIL EXTENSION HELD AWAY FROM CLUTCH TRIP BAR
MIN  5 OZ
MAX  9 OZ
TO START CLUTCH TRIP BAR (REAR) MOVING.

BUMPER MOUNTING SCREW

KEYBOARD BASE

CODE BAR BAIL BUMPER

REQUIREMENT

LETTERS SELECTION APPLIED TO CODE BAR.
CLEARANCE BETWEEN SHOULDER ON CLOSEST CODE BAR AND ENGAGING FACE OF CODE BAR BAIL.
MIN  0.010 INCH
MAX  0.020 INCH
TO ADJUST POSITION BUMPER WITH MOUNTING SCREWS.
LOOSENED.
5.19 Codebar Assembly continued

CODE LEVER GUIDE

**Requirement**
- CR KEYLEVER HELD DEPRESSED WHILE DISENGAGING CLUTCH.
- CLEARANCE BETWEEN CR FUNCTION LEVER AND STOPPING EDGE OF NUMBER 5 CODEBAR
  - MIN: 0.005 INCH
  - MAX: 0.015 INCH
- TO ADJUST
  - POSITION THE CODE LEVER GUIDE WITH ITS FOUR MOUNTING SCREWS LOOSENED.

CODE BAR LATCH SPRING

**Requirement**
- GENERATOR CLUTCH COMPLETELY DISENGAGED
  - MIN: 1/4 OZ
  - MAX: 1-1/4 OZ
- TO START LATCH MOVING.

CODE BAR LATCH

**Requirement**
- LETTERS SELECTION APPLIED TO THE CODE BARS AND THE CODE BARS AGAINST THEIR STOP.
- CLEARANCE BETWEEN CODE BAR AND LATCH
  - MIN: 0.010 INCH
  - MAX: 0.025 INCH

CODE BAR BOUNCE SUPPRESSOR BRACKET SUPPORT SCREW

**Requirement**
- GENERATOR CLUTCH DISENGAGED, LETTERS SELECTION APPLIED TO CODE BARS, BOUNCE SUPPRESSOR BAIL HELD AGAINST RESET LEVER WITH PRESSURE OF 3 OUNCES APPLIED VERTICALLY TO BAIL BETWEEN NO. 2 AND NO. 3 CODE BAR LATCH, CLEARANCE BETWEEN BOUNCE SUPPRESSOR BAIL AND NO. 5 CODE BAR LATCH SHOULD BE
  - MIN: SOME CLEARANCE
  - MAX: 0.015 INCH
- TO ADJUST
  - POSITION SUPPORT SCREW WITH ITS LOCK NUT LOOSENED.

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5.20 Keyboard Assembly

**CODE LEVER BAIL EXTENSION**

**CODE LEVER BAIL LATCH LEVER**

**CODE LEVER BAIL**

**FRAME**

**SPACE BAR BAIL**

**PILOT SCREWS**

ALIGNMENT OF THE CODE LEVER BAIL EXTENSION AND THE CODE LEVER BAIL LATCH LEVER SHOULD BRING THE EDGES FLUSH WITHIN 0.010 INCH. CODE LEVER BAIL SHOULD HAVE SOME END PLAY MAX 0.010 INCH TO ADJUST POSITION THE CODE LEVER BAIL BY MEANS OF THE PILOT SCREWS.

THE SPACE BAR SHOULD BE FREE ON ITS PIVOTS AND HAVE SOME END PLAY MAX 0.010 INCH TO ADJUST POSITION THE SPACE BAR BAIL PILOT SCREWS.
21 Interrelated Features

2. REQUIREMENT
   THERE SHOULD BE A BARELY PERCEPTIBLE AMOUNT OF BACKLASH BETWEEN THE INTERMEDIATE DRIVING GEAR AND THE INTERMEDIATE DRIVEN GEAR AT THE POINT WHERE THE BACKLASH IS THE LEAST.
   TO ADJUST
   RAISE OR LOWER THE FRONT END OF THE INTERMEDIATE GEAR BRACKET BY MEANS OF THE FILISTER HEAD ADJUSTING AND CLAMPING SCREWS LOCATED AT THE FRONT END OF THE BRACKET. REFINE REQUIREMENTS IF NECESSARY.

INTERMEDIATE DRIVING GEAR

INTERMEDIATE DRIVEN GEAR

NOTE: OVERLOAD MECHANISM SPRING ADJUSTMENT APPLIES ONLY TO UNITS SO EQUIPPED

(b) OVERLOAD MECHANISM SPRING REQUIREMENT
   OVERLOAD CLUTCH LEVER IN ITS NOTCH
   MIN 40 OZ
   MAX 64 OZ
   TO START LEVER MOVING
   LEVER MUST NOT JUMP FROM NOTCH WITH LESS THAN 64 OUNCES.
SECTION 573-116-700

5.22 Keyboard Assembly continued

LOCAL LINE FEED TRIP LINK SPRING

REQUIREMENT
MIN 5 OZ
MAX 10 OZ
TO START THE LINK MOVING.

LOCK BAIL SPRING

REQUIREMENT
KEYBOARD LOCK KEY DEPRESSED
MIN SOME TENSION
MAX 3 OZ
TO START PLUNGER LEVER MOVING

LOCAL LINE FEED TRIP BAIL

PLUNGER LEVER

LOCAL CARRIAGE RETURN BAIL SPRING

REQUIREMENT
SPRING UNHOOKED FROM BRACKET.
MIN 10 OZ
MAX 15 OZ
TO PULL SPRING TO INSTALLED LENGTH.

CARRIAGE RETURN BAIL

* APPLIES TO KEYBOARD ONLY
5.23 Keyboard Assembly continued

MARGIN INDICATOR SPRING

REQUIREMENT
MIN 9 OZ
MAX 14 OZ
TO MOVE THE CONTACT LEVER FROM THE CONTACT PLUNGER.

CONTACT LEVER

MARGIN INDICATOR SPRING

CONTACT PLUNGER

SENSITIVE SWITCH

FRONT VIEW

PAPER-FEED-OUT MOTOR START MECHANISM SPRING (KEYBOARD)
REQUIREMENT
MIN 6 OZ
MAX 10 OZ
TO START THE LEVER MOVING

SWITCH LEVER

SPRING

LOCAL LINE FEED TRIP LINK

SWITCH

BRACKET
5.24 Variable Features

**SECTION 573-116-700**

**Variable Features**

1. **REPEAT-ON-SPACE LEVER**
   - **Requirement (Motor Running)**
     - MIN 3-1/2 OZ MAX 8 OZ TO TRANSMIT SINGLE SPACE.
     - To check gradually apply pressure to space bar.

2. **Requirement (Motor Running)**
   - MAX 10 OZ TO EFFECT CONTINUOUS SPACE TRANSMISSION.
     - To check abruptly apply pressure to space bar and hold it down.
     - Note: Abrupt operation is necessary to disable code bar bail latch within the 10 OZ MAX. REQUIREMENT.

**To Adjust**
- Fully depress space bar.
- Position eccentric bushing with mounting nut friction tight, generator shaft rotating under power.

3. **REPEAT-ON-SPACE LEVER SPRING**
   - **Requirement**
     - GENERATOR CLUTCH DISENGAGED SPRING UNHOOKED FROM POST
     - MIN 1/2 OZ
     - MAX 1-1/2 OZ
     - To pull spring to position length.
5.25 Variable Features continued

(REPEAT SPACE LEVER SPRING)

(1) REQUIREMENT
MIN 1 OZ --- MAX 1-1/2 OZ
TO PULL REPEAT SPACE LEVER IN ENGAGEMENT WITH RESET BAIL LATCH.

(2) REQUIREMENT
WITH POWER APPLIED AND THE SPACE BAR FULLY DEPRESSED, THE SPACE CHARACTER
SHOULD BE REPEATED AS LONG AS THE SPACE BAR IS HELD DEPRESSED.

ECCENTRIC FOLLOWER PAWL SPRING

REQUIREMENT
ECCENTRIC FOLLOWER PAWL IN EXTREME FORWARD POSITION. 8 OZ SCALE APPLIED
TO PAWL NEAR RATCHET WHEEL AND PULLED UPWARD
MIN 1-1/2 OZ
MAX 4 OZ
TO START PAWL MOVING.

TIME DELAY ECCENTRIC FOLLOWER PAWL

TIME DELAY DISABLING DEVICE

REQUIREMENT
DISABLE THE TIME DELAY MECHANISM WHEN NOT REQUIRED
TO ADJUST
RAISE THE PILOT SCREW (LOCK NUT LOOSENED) AND ECCENTRIC FOLLOWER
PAWL UNTIL THE PAWL CLEAR THE RATCHET WHEEL.
5.26 Variable Features continued

**BREAK LEVER SPRING**

**REQUIREMENT**

WITH SPRING UNHOOKED

MIN 5 OZ

MAX 7 OZ

TO STRETCH SPRING TO INSTALLED LENGTH.

**BREAK KEYLEVER SPRING**

**REQUIREMENT**

MIN 12 OZ

MAX 20 OZ

TO OPERATE SWITCH
5.27 Variable Features continued

**BACK SPACE TRIP LINK VERTICAL SPRING**

**REQUIREMENT**

- **TYPING UNIT REMOVED**
- **MIN** 1-1/2 OZ
- **MAX** 3 OZ
- TO PULL SPRING TO INSTALLED LENGTH.

**BACK SPACE TRIP LINK HORIZONTAL SPRING**

**REQUIREMENT**

- **TYPING UNIT REMOVED**
- **MIN** 1-3/4 OZ
- **MAX** 3 OZ
- TO PULL SPRING TO INSTALLED LENGTH

---

**BACK SPACE TRANSFER BAIL SPRING**

**REQUIREMENT**

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

**NOTE**

IN ORDER TO PUSH VERTICALLY DOWNWARD ON THE BAIL, THE ADJUSTING LEVER MAY HAVE TO BE MOVED TOWARD FRONT OF UNIT. REMAKE TRANSFER BAIL ADJUSTING LEVER HORIZONTAL ADJUSTMENT.

---

**BACK SPACE TRANSFER BAIL ADJUSTING LEVER**

**REQUIREMENT (VERTICAL ADJUSTMENT)**

WITH THE TYPING UNIT REMOVED, THERE SHOULD BE SOME CLEARANCE BETWEEN THE TRANSFER BAIL AND THE STUD ON THE BACK SPACE OPERATING BAIL.

- **MAX** 0.006 INCH

**TO ADJUST**

POSITION THE ADJUSTING LEVER BRACKET NEAR THE CENTER OF ITS ADJUSTING RANGE. POSITION THE ADJUSTING LEVER UP OR DOWN WITH ITS ADJUSTING LEVER SCREW FRICITION TIGHT TO MEET THE REQUIREMENT.
5.28 Variable Features continued

BACK SPACE TRANSFER BAIL ADJUSTING LEVER HORIZONTAL
REQUIREMENT

Typing unit installed, spacing clutch disengaged, front feed pawl in lower position. Back space
key lever held depressed, main shaft rotated until
front feed pawl is opposite the peak of the first
ratchet wheel tooth that moves downward past
the pawl tooth. Clearance should be:

MIN 0.020
MAX 0.035

To adjust

Loosen the mounting screw on the transfer bail
adjusting lever bracket. Depress the back space
key lever and push the adjusting lever and bracket
firmly to rear. Tighten the bracket mounting screw.

Note

After this adjustment the camming bail should
return to its unoperated position when the
key lever is released. If it does not return refine the
adjustment. Recheck the transfer bail vertical adjustment

NOTE: IF A NEW TYPING UNIT IS INSTALLED ON THE
BASE, THIS ADJUSTMENT SHOULD BE CHECKED.
5.29  Answer-Back Mechanism (Switched Circuit Network)
For Keyboards LK3, LK4 and LK5 (Bell 28A and 28C) "FIGS" "C"

"HERE-IS" KEYLEVER ADJUSTMENTS

(A) KEYBOARD UNIVERSAL SWITCH - (PRELIMINARY)
SEE PAR. 3.12 (A)

(B) KEYBOARD UNIVERSAL SWITCH - (HORIZONTAL)
SEE PAR. 3.12 (B)

(C) KEYBOARD UNIVERSAL SWITCH - VERTICAL
REQUIREMENT
CENTER AND LOWER CONTACTS SHOULD CLOSE WITH
MIN SOME
MAX 0.005 INCH
OF OVER-TRAVEL
TO ADJUST
POSITION RETAINER BAR ASSEMBLY WITH BRACKET MOUNTING SCREWS LOOSENED.

NOTE: KEEP CONTACTS FREE OF OIL AND GREASE
SECTION 573-116-700

5.30 Answer-Back Mechanism (Switched Circuit Network)
For Keyboards LK3, LK4 and LK5 (Bell 28A and 28C) "FIGS" "C" continued
PERFORM ADJUSTMENTS ON THIS PAGE DURING INSTALLATION OF PULSING CONTACT ASSEMBLY.

NOTE: KEEP CONTACTS FREE OF GREASE AND OIL.

(C) STOP SCREW
REQUIREMENT
CLEARANCE BETWEEN FINGER AND SWINGER INSULATOR SHOULD BE
MIN 0.010 INCH --- MAX 0.020 INCH
TO CHECK
TRIP CLUTCH AND ROTATE MAIN SHAFT UNTIL FINGER EXTENSION DROPS OFF OF CAM.
TO ADJUST
POSITION STOP SCREW WITH LOCK NUT LOOSENED.

(B) SWINGER CONTACT LEAF
REQUIREMENT
WITH CONTACTS CLOSED
MIN 3-1/2 OZ
MAX 4-1/2 OZ
TO JUST SEPARATE THE CONTACTS
TO ADJUST
BEND SWINGER CONTACT LEAF. RECHECK (A).

(A) CONTACT ASSEMBLY
REQUIREMENT
1. CLEARANCE BETWEEN CONTACT SWINGER-INSULATOR AND SIDES OF CONTACT COVER SHOULD BE EQUAL WITHIN 0.015 INCH. GAUGE BY EYE.
2. SWINGER AND SWINGER OPERATING FINGER SHOULD ALIGN WITHIN 0.015 INCH GAUGE BY EYE.
3. CONTACTS ON CONTACT ASSEMBLY SHOULD ALIGN WITHIN 0.015 INCH
TO ADJUST
POSITION THE CONTACT ASSEMBLY PILE-UP WITH TWO MOUNTING SCREWS LOOSENED.

(D) CONTACT ASSEMBLY BRACKET MOUNTING SCREWS
REQUIREMENT
BRACKET MOUNTING SCREWS SHOULD NOT PROTRUDE MORE THAN 0.031 INCH BEYOND REAR SURFACE OF MOUNTING PLATE.
TO ADJUST
ADD FLAT WASHERS AS NECESSARY.
For Keyboards LK3, LK4 and LK5 (Bell 28A and 28C) "FIGS" "C" continued

(A) PULSING CONTACTS

REQUIREMENT

(PERFORM THIS ADJUSTMENT DURING INSTALLATION OF CONTACTS)

CLEARANCE BETWEEN CONTACT POINTS SHOULD BE
MIN 0.015 INCH
MAX 0.025 INCH

TO CHECK

TRIP CLUTCH AND ROTATE MAIN SHAFT UNTIL FINGER EXTENSION IS ON PEAK OF CAM.

TO ADJUST

POSITION THE CONTACT ASSEMBLY BRACKET WITH BRACKET MOUNTING SCREWS LOOSENED.

MAKE THE FOLLOWING ADJUSTMENTS BEFORE INSTALLING CHARACTER GENERATOR MECHANISM ON KEYBOARD.

(B) MAGNET YOKE

SEE PAR. 3.17 (A)

(C) STOP LEVER LATCH

SEE PAR. 3.17 (B)

MAKE THE FOLLOWING ADJUSTMENTS DURING INSTALLATION OF ANSWER-BACK MECHANISM.

(D) SENSING LEVER SPRINGS

SEE PAR. 3.18 (B)

(E) DETENT LEVER SPRING

SEE PAR. 3.18 (C)

(F) CHARACTER GENERATOR MOUNTING PLATE

REQUIREMENT

1. CLEARANCE BETWEEN SHOULDERS OF CODE BARS #1 AND #5 AND THEIR ASSOCIATED SENSING LEVERS SHOULD BE
MIN 0.008 INCH --- MAX 0.018 INCH
2. SENSING LEVERS SHOULD BE ALIGNED WITH THEIR ASSOCIATED CODE BARS.

TO CHECK

WITH THE CLUTCH ENGAGED AND LETTERS COMBINATION SELECTED ROTATE MAIN SHAFT UNTIL RESET LEVER IS IN EXTREME LEFT POSITION.

TO ADJUST

POSITION MOUNTING PLATE WITH THE THREE MOUNTING SCREWS LOOSENED.
SECTION 573-116-700
5.32 Answer-Back Mechanism (Switched Circuit Network)
For Keyboards LK3, LK4 and LK5 (Bell 28A and 28C) "FIGS" "C" continued

(A) DRIVE LINK SPRING

REQUIREMENT
WITH SIGNAL GENERATOR CLUTCH IN STOP POSITION
MIN 12 OZ
MAX 18 OZ
TO PULL SPRING TO INSTALLED LENGTH.

(B) DRIVE LINK

PERFORM THIS ADJUSTMENT BEFORE INSTALLATION OF MESSAGE DRUM AND DRIVE PLATE ASSEMBLY.

REQUIREMENT
CLEARANCE BETWEEN DRIVE PLATE EXTENSION AND BLOCKING LEVER SHOULD BE
MIN 0.002 INCH
MAX 0.007 INCH
TO CHECK CODE BAR BAIL RESET LEVER IN EXTREME LEFT POSITION.
TO ADJUST POSITION ADJUSTING FINGER AT ADJUSTING SLOTS WITH ADJUSTING FINGER LOCK-SCREW LOOSENED.

NOTE
THE STANDARD KEYBOARD ADJUSTMENTS LISTED BELOW SHOULD BE CHECKED DURING INSTALLATION OF THE ANSWER-BACK MECHANISM:
CODE BAR AND CODE LEVER CLEARANCE, PAR. 2.05 (D)
CODE BAR BAIL, PAR. 2.08 (B)
CODE BAR BAIL AND NON REPEAT LEVER CLEARANCE, PAR. 2.08 (D)
UNIVERSAL BAIL LATCH LEVER, PAR. 2.10
UNIVERSAL BAIL EXTENSION, PAR. 2.10
(A) STEPPING PAWL
MAKE THIS ADJUSTMENT AFTER INSTALLATION OF THE MECHANISM ON KEYBOARD.
REQUIREMENT
CLEARANCE BETWEEN STEPPING PAWL AND ADJACENT CODE BLADE SHOULD BE
MIN 0.018 INCH
MAX 0.030 INCH
TO CHECK MESSAGE DRUM IN FULLY DETENTED POSITION. CODE BARS BAIL RESET LEVER IN EXTREME LEFT POSITION.
TO ADJUST LOOSEN LOCK NUT AND POSITION ECCENTRIC STUD WITH ITS HIGH POINT TOWARD THE TOP.

(B) STEPPING PAWL SPRING
REQUIREMENT
MECHANISM IN STOP POSITION
MIN 2-1/2 OZ --- MAX 3-1/2 OZ
TO START PAWL MOVING.

(C) STOP LEVER SPRING
REQUIREMENT
STOP LEVER LATCHED. LATCH SPRING REMOVED. BLOCKING LEVER SPRING REMOVED
MIN 6 OZ --- MAX 8 OZ
TO START STOP LEVER MOVING

BLOCKING LEVER SPRING
SEE PAR. 3.21 (A)

ARMATURE LATCH SPRING
SEE PAR. 3.21 (B)

CODE BARS BAIL LATCH LEVER
CODING THE MESSAGE DRUM
SEE PAR. 3.22
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## 1. GENERAL

1.01 This section is reissued: to incorporate adjusting information for the Selector Armature Downstop, and the Selector Armature Vertical Adjustment; to rearrange the text matter and assembly grouping to conform to the new

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SECTION 573-115-700

standard format. Since this is a general revision, marginal arrows are omitted.

1.02 The adjustments in this section are divided into basic units, variable features, and earlier design mechanisms. The basic units consist of the friction feed and sprocket feed typing units; the adjustments are sub-divided into major mechanisms most of which are common to both units. All other mechanisms which are of an optional nature to create variations of the 28 typing unit, appear under variable features. When applicable, earlier design mechanisms for the basic units and variable features are cross referenced in their adjustment text.

Note: Remove power from unit before making adjustments.

1.03 The adjustments for the basic units are arranged in a sequence that would be followed if a complete readjustment were undertaken. After an adjustment has been completed, be sure to tighten any nuts or screws that may have been loosened to facilitate the adjustment. If a part that is mounted on shims is to be removed, the number of shims used at each mounting screw should be noted so that the same shim pile up can be replaced when the part is remounted.

1.04 The spring tensions given in this section are indicated values and should be checked with proper spring scales in the position indicated. The adjusting illustrations, in addition to indicating the adjusting tolerances, positions of moving parts, and spring tensions, also show the angle at which the scale should be applied when measuring spring tensions.

1.05 Tools and spring scales required to perform the adjustments are not supplied as part of the equipment but are listed separately in Teletype Bulletin 1124B.

1.06 References made to left or right, up or down, and front or rear apply to the typing unit in its normal operating position as viewed by the operator facing the unit.

1.07 Where instructions call for the removal of parts or subassemblies, refer to appropriate section, covering Disassembly and Re-assembly.

UNMOUNTED POSITIONS OF TYPING UNIT

1.08 The typing unit may be safely placed in any one of three positions for servicing:

(1) In an upright position, and resting on all four feet.

(2) Tilted backward, and resting on the two rear feet and rear points of side frames.

(3) Bottom upwards, and resting on two upper points on each side frame.

In addition, the typing unit may be placed on either end by using the TP159358 modification kit (not supplied with the unit).

OPERATING CONDITIONS OF CLUTCHES

1.09 When a requirement calls for a clutch to be disengaged, the clutch shoe lever must be fully latched so that the clutch shoes are disengaged from the clutch drum. To become fully latched the trip lever must engage the clutch shoe lever, and the clutch disc must rotate far enough to permit the latch lever to fall into the notch on the clutch disc. The disengaged condition is illustrated in the upper figure of Par. 2.21. When engaged, the clutch shoe lever is unlatched and the clutch shoes are wedged against the clutch drum.

Note: When rotating the main shaft of the typing unit by hand, the clutches do not fully disengage upon reaching their stop positions. In order to relieve the drag on the clutches and permit the main shaft to rotate freely, apply pressure to the stop lug on each clutch disc with a screwdriver until each latch lever falls into its notch on its clutch disc. Thus each internal expansion clutch becomes fully disengaged. This procedure should be followed before placing the typing unit on the base and switching on the power.

MANUAL SELECTION OF CHARACTERS OR FUNCTIONS

1.10 To manually operate the typing unit while removed from the keyboard or base, hold the selector magnet armature (Par. 2.01) against the pole pieces with an armature clip. Rotate the main shaft in a counterclockwise direction (handwheel listed in Bulletin 1124B) to bring all clutches to their disengaged position.

Note: The armature clip is attached to the armature by carefully inserting the flat formed end of the clip over the top of the armature and between the pole pieces, and hooking the extruded projection under the edge of the armature. The top end of the clip
should then be hooked over the top of the selector coil terminal (bakelite) guard. The spring tension of the clip will hold the armature in the marking (attracted) position.

1.11 Fully disengage all clutches as described in the note following Par. 1.09. Release the armature momentarily to permit the selector clutch to engage. Turn the main shaft slowly until the no. 5 selector lever has just moved to the peak of its cam. Strip from the selector levers all push levers which are spacing in the code combination that is being selected. It should be noted that selector levers (Par. 2.12) move in succession, starting with the inner (no. 1). Continue to rotate the main shaft until all operations initiated by the selector mechanism clear the typing unit.

VARIABLE FEATURES

1.12 In addition to the basic unit adjustments, covered in Part 2, adjustments for a number of variable features appear in Part 3. Where adjustments of these variable features affect the adjustment sequence, cross reference information has been included in Part 2. Variable feature adjustments which do not affect the adjusting sequence, may be done at any time during the adjusting procedure.

EARLIER DESIGN MECHANISMS

1.13 Parts 2 and 3 contain illustrations and adjusting procedures for mechanisms currently being manufactured. Illustrations and adjusting procedures for mechanisms of earlier design are located in Part 4. Where a new mechanism has replaced a mechanism of earlier design, reference has been made in Parts 2 and 3 to the corresponding mechanism in Part 4.

COMPLETE ADJUSTMENT OF TYPING UNIT

1.14 When making a complete adjustment of the typing unit, the following conditioning operations should be performed to prevent damage:

(a) Loosen the clamp screw on the code bar shift lever drive arm (Par. 2.15).

(b) Move the right and left vertical positioning lever eccentric studs (Par. 2.28 and 2.29) in the rocker shaft studs to their lowest position.

(c) Loosen the two bearing stud mounting screws and two connecting strip clamp screws in the horizontal positioning drive linkage (Par. 2.35).

(d) Loosen the clamp screws and move the reversing slide brackets to their uppermost position (Par. 2.34).

(e) Loosen the function reset bail blade mounting screws (Par. 2.32).

(f) For units equipped with two-stop function clutches: Loosen the shoulder bushings on each function stripper blade arm and move stripper blade and arms to their lowest positions (Par. 4.18).

(g) Loosen the carriage return lever clamp screw (Par. 2.40).

(h) Loosen the clamp screws in the oscillating rail slide (Par. 2.30).

(i) Loosen the reversing slide adjusting stud (Par. 2.34).

(j) Loosen the clamp nuts on the shift code bar guide plates (Par. 2.33).
2. BASIC UNITS

2.01 Selector Mechanism

NOTE
TO FACILITATE MAKING THE FOLLOWING ADJUSTMENTS, REMOVE THE RANGE FINDER AND SELECTOR MAGNET ASSEMBLIES. TO INSURE BETTER OPERATION, PULL A PIECE OF KS BOND PAPER BETWEEN THE ARMATURE AND THE POLE PIECES TO REMOVE ANY OIL OR FOREIGN MATTER THAT MAY BE PRESENT. MAKE certain THAT NO LINT OR PIECES OF PAPER REMAIN BETWEEN THE POLE PIECES AND ARMATURE.

CASTING

ADJUSTING NUT

PIVOT EDGE

SELECTOR ARMATURE

NOTE
THIS REQUIREMENT NEED NOT BE MADE OR CHECKED IF THE SELECTOR MAGNET BRACKET AND RECEIVING MARGIN REQUIREMENTS ARE MET.

(1) REQUIREMENT (ARMATURE CLAMP STRIP)
CLEARANCE BETWEEN ARMATURE CLAMP STRIP AND CASTING.
MIN. 0.025 INCH
MAX. 0.045 INCH

MAGNET CORE

POLE PIECE

(2) REQUIREMENT (ARMATURE ALIGNMENT)
OUTER EDGE OF ARMATURE SHOULD BE FLUSH WITHIN 0.015 INCH WITH OUTER EDGE OF POLE PIECES.
NOTE
THE APPROPRIATE PRELIMINARY SELECTOR ARMA TURE SPRING TENSION ADJUSTMENT MUST BE MADE PRIOR TO THE SELECTOR MAGNET BRACKET ADJUSTMENT.

SELECTOR MAGNET BRACKET (MAGNETS ENERGIZED)
(1) REQUIREMENT --- SPACING LOCK LEVER ON EACH HIGH PART OF CAM. ARMA TURE IN CONTACT WITH POLE PIECE. CLEARANCE BETWEEN END OF ARMA TURE EXTENSION AND SHOULDER ON SPACING LOCK LEVER.
MIN. 0.020 INCH ----------------------- MAX. 0.035 INCH
TO ADJUST --- LOOSEN TWO MAGNET BRACKET MOUNTING SCREWS AND ADJUSTING LINK CLAMP SCREW. POSITION MAGNET BRACKET BY MEANS OF ADJUSTING LINK AND TIGHTEN LINK CLAMP SCREW ONLY.

(2) REQUIREMENT --- SPACING LOCK LEVER ON EACH HIGH PART OF CAM. ARMA TURE IN CONTACT WITH POLE PIECE. SOME CLEARANCE BETWEEN UPPER SURFACE OF ARMATURE EXTENSION AND LOWER SURFACE OF SPACING LOCK LEVER WHEN LOCK LEVER IS HELD DOWNWARD.
MAX. 0.003 INCH
TO ADJUST --- POSITION UPPER END OF MAGNET BRACKET. TIGHTEN TWO MAGNET BRACKET MOUNTING SCREWS. RECHECK REQUIREMENT (1).
CAUTION

BEFORE PROCEEDING WITH THE SELECTOR ARMATURE SPRING ADJUSTMENT, THE TYPE OF ARMATURE (ONE ANTIFREEZE BUTTON OR TWO ANTIFREEZE BUTTONS) MUST BE KNOWN. EXCESSIVE TENSION ON, OR THE MISHANDLING OF A TWO BUTTON ARMATURE CAN DAMAGE THE THIN LEAF SPRING ATTACHED TO THE PIVOT END. IF REMOVAL FOR EXAMINATION IS NECESSARY, DISASSEMBLE AS FOLLOWS:

1. DISCONNECT ARMATURE SPRING.
2. REMOVE ARMATURE MOUNTING SCREWS.
3. WITHDRAW ARMATURE FROM SELECTOR.

REASSEMBLE AND RECHECK THE FOLLOWING ADJUSTMENTS:
- SELECTOR ARMATURE
- SELECTOR ARMATURE DOWNSTOP BRACKET
- SELECTOR MAGNET BRACKET

SELECTOR MAGNET BRACKET - VERTICAL ADJUSTMENT

(3) REQUIREMENT
- MARKING LOCK LEVER ON LOW PART OF CAM. ARMATURE IN CONTACT WITH FRONT POLE PIECE (MAGNET ENERGIZED). THERE SHOULD BE SOME CLEARANCE BETWEEN LOWER SURFACE OF ARMATURE EXTENSION AND UPPER SURFACE OF MARKING LOCK LEVER. GAUGE BY EYE.

TO ADJUST WITH MOUNTING SCREW LOOSENED POSITION UPPER END OF MAGNET BRACKET BY MEANS OF PRY POINT, RECHECK REQUIREMENTS (1) AND (2).
2.04 Selector Mechanism (Cont.)

SELECTOR ARMATURE SPRING (500 MA SELECTOR COILS)
REFER TO PAR. 2.05 USING THE FOLLOWING:

SINGLE BUTTON ARMATURE
500 MA; MIN 4-1/2 OZS --- MAX 5-1/2 OZS

DOUBLE BUTTON ARMATURE
500 MA; APPROXIMATELY --- 1-1/8 OZ
TO PULL REAR BUTTON AGAINST ITS POLE PIECE
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2.05 Selector Mechanism (Cont.)

SELECTOR ARMATURE SPRING (FOR UNITS WITH SINGLE ANTI-FREEZE BUTTON ON SELECTOR ARMATURE)

REQUIREMENT --- (PRELIMINARY) WITH START LEVER, MARKING AND SPACING LOCK LEVERS ON HIGH PART OF THEIR CAMS, HOOK SCALE UNDER END OF ARMATURE EXTENSION (HOLD AS NEARLY VERTICAL AS POSSIBLE). IT SHOULD REQUIRE

(a) MIN. 1-1/2 OZS. ----------------------------- MAX. 2 OZS. FOR 20 MA OPERATION.
(b) MIN. 2-1/2 OZS. ----------------------------- MAX. 3 OZS. FOR 60 MA OPERATION.

TO PULL ARMATURE TO MARKING POSITION.

TO ADJUST --- POSITION ADJUSTING NUT.

REQUIREMENT --- (FINAL) REFER TO SELECTOR RECEIVING MARGIN PAR. 2.11

NOTE

SPRING TENSIONS SHOWN ON THIS PAGE PERMIT OPERATION OF PRINTER PRIOR TO MEASUREMENT OF RECEIVING MARGINS. REFINISH SPRING TENSION FOR MAXIMUM SELECTOR PERFORMANCE WITH UNIT CONNECTED TO SPECIFIC CIRCUIT IN WHICH IT IS TO FUNCTION (OPERATING AT DESIRED SPEED AND LINE CURRENT). SEE PAR. 2.11.

SELECTOR ARMATURE SPRING (FOR UNITS WITH TWO ANTI-FREEZE BUTTONS ON SELECTOR ARMATURE)

REQUIREMENT --- (PRELIMINARY) WITH START LEVER, MARKING AND SPACING LOCK LEVERS ON HIGH PART OF THEIR CAMS, HOOK SCALE UNDER END OF ARMATURE EXTENSION (HOLD AS NEARLY VERTICAL AS POSSIBLE). IT SHOULD REQUIRE

0.020 AMPERES 0.030 AMPERES 0.060 AMPERES
14 GRAMS 18 GRAMS 21 GRAMS

TO PULL REAR BUTTON AGAINST ITS POLE PIECE

TO ADJUST --- POSITION ADJUSTING NUT.

REQUIREMENT --- (FINAL) WHEN A DISTORTION TEST SET IS AVAILABLE, REFINISH SELECTOR ARMATURE SPRING ADJUSTMENT TO MEET SELECTOR RECEIVING MARGIN PAR. 2.11. NOTE --- WITH SELECTOR MAGNETS ENERGIZED, FRONT ANTI-FREEZE BUTTON MUST BE IN CONTACT WITH ITS MAGNET CORE.

Page 12
2.06 Selector Mechanism (Cont.)

NOTE
TO FACILITATE MAKING THE FOLLOWING ADJUSTMENTS, REMOVE THE RANGE FINDER ASSEMBLY
AND SELECTOR MAGNET ASSEMBLY. TO INSURE BETTER OPERATION, PULL A PIECE OF BOND PAPER
BETWEEN THE ARMATURE AND THE POLE PIECES TO REMOVE ANY OIL OR FOREIGN MATTER THAT MAY
BE PRESENT. MAKE CERTAIN THAT NO LINT OR PIECES OF PAPER REMAIN BETWEEN THE POLE PIECES
AND THE ARMATURE.

NOTE
THESE REQUIREMENTS NEED NOT BE MADE NOR CHECKED
IF THE SELECTOR MAGNET BRACKET AND RECEIVING MAR-
GINTHESE REQUIREMENTS NEED NOT BE MADE NOR CHECKED
GIN REQUIREMENTS ARE MET.

(1) REQUIREMENT
CLEARANCE
MIN. 0.025 INCH
MAX. 0.045 INCH
BETWEEN ARMATURE CLAMP STRIP AND
MAGNET BRACKET CASTING.

(2) REQUIREMENT
OUTER EDGE OF ARMATURE SHOULD BE FLUSH WITHIN 0.015 INCH
WITH OUTER EDGE OF POLE PIECES.

(3) REQUIREMENT
START LEVER SHALL DROP FREELY INTO ARMATURE EXTENSION SLOT.
TO ADJUST
POSITION ARMATURE SPRING ADJUSTING NUT TO HOLD ARMATURE FIRMLY AGAINST PIVOT
EDGE OF CASTING. POSITION ARMATURE WITH MOUNTING SCREWS LOOSENED.

REQUIRED
REMOVE OIL SHIELD. WITH MAGNET DE-ENERGIZED, LOCK LEVERS ON HIGH PART OF
THEIR CAM, AND ARMATURE RESTING AGAINST ITS DOWNSTOP, CLEARANCE BETWEEN
END OF ARMATURE AND LEFT EDGE OF LEFT POLE PIECE
MIN. 0.025 INCH MAX. 0.030 INCH.

TO ADJUST
POSITION DOWNSTOP BRACKET WITH MOUNTING SCREW LOOSENED, REPLACE
OIL SHIELD AND CHECK OIL SHIELD ADJUSTMENT.
SECTION 573-115-700

2.07 Selector Mechanism (Cont.)

MARKING LOCK LEVER SPRING
REQUIREMENT --- LETTERS COMBINATION SELECTED, ROTATE MAIN SHAFT UNTIL SELECTOR CLUTCH IS DISENGAGED.
SCALE APPLIED TO LOWER EXTENSION OF LOCK LEVER
MIN. 1-1/2 OZS. ---------- MAX. 3 OZS.
TO START MARKING LOCK LEVER MOVING.

NOTE FOR BELL SERVICE ONLY
WHEN CHECKING UNITS WITH SINGLE BUTTON ARMATURE, SIGNAL LINE SHALL BE SHUNTED BY A TWX SWITCHBOARD SIMULATOR. SIMULATOR SHALL NOT BE USED WITH UNITS EMPLOYING THE TWO BUTTON ARMATURE.

START LEVER SPRING
REQUIREMENT --- WITH LATCH LEVER SPRING UNHOOKEO, STOP ARM BAIL IN THE INDENT OF ITS CAM AND RANGE SCALE SET AT 60, IT SHOULD REQUIRE MIN. 2-1/2 OZS. --------- MAX. 4-1/2 OZS.
TO START STOP ARM MOVING.

NOTE FOR EARLIER DESIGN
SEE PAR. 4.01.
2.08 Selector Mechanism (Cont.)

**Selector Push Lever Spring Requirement**

- Push lever in spacing position
  - Min. 3/4 oz.
  - Max. 1-1/2 ozs.
- To move push lever from selector lever. Check five springs.

**Selector Lever Spring Requirement**

- Place unit upside down.
- Reset bail on peak of its cam.
  - Min. 1-1/4 ozs.
  - Max. 2-1/2 ozs.
- To start each lever moving. Check five springs. If necessary, unhook start lever spring to check No. 4 selector lever spring.

**Selector Clutch Drum Requirement**

- Clutch latched in stop position. Cam-clutch assembly should have some end play max. 0.010 inch
- To adjust position clutch drum with mounting screw loosened.
2.09 Selector Mechanism (Cont.)

(A) PUSH LEVER RESET BAIL SPRING

**REQUIREMENT**

PUSH LEVER RESET BAIL ON LOW PART OF CAM AND 32 OZ. SCALE APPLIED TO RESET BAIL.

**MIN. 4 OZS. --- MAX. 8 OZS.**

TO MOVE BAIL FROM CAM.

(B) SELECTOR CLUTCH LATCH LEVER SPRING

**REQUIREMENT**

LATCH RESTING ON LOW Part Of ITS CAM DISK.

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

TO START LATCH MOVING.

(C) SPACING LOCK LEVER SPRING

**REQUIREMENT**

SELECTOR ARMATURE RELEASED AND SPACING LOCK LEVER ON LOW PART OF ITS CAM. SPRING SCALE APPLIED TO LOWER END OF SPACING LOCK LEVER.

**MIN. 3 OZS. --- MAX. 6 OZS.**

TO MOVE SPACING LOCK LEVER FROM ITS PIVOT SHAFT
2.10 Selector Mechanism (Cont.)

NOTE: REPLACE RANGE FINDER AND SELECTOR MAGNET ASSEMBLY

(A) RANGE FINDER KNOB PHASING
REQUIREMENT
WITH RANGE FINDER KNOB TURNED TO EITHER END OF RACK, ZERO MARK ON SCALE SHOULD BE WITHIN 3 POINTS OF SCRIBED LINE ON RANGE FINDER PLATE.
TO ADJUST
REMOVE MOUNTING NUT, DISENGAGE KNOB FROM RACK AND POSITION KNOB. RE-ENGAGE KNOB WITH RACK AND REPLACE MOUNTING NUT.

(B) SELECTOR CLUTCH STOP ARM
REQUIREMENT
RANGE SCALE SET AT 60. SELECTOR CLUTCH DISENGAGED. ARMATURE IN MARKING POSITION. CLUTCH STOP ARM SHOULD ENGAGE CLUTCH SHOE LEVER BY APPROXIMATELY FULL THICKNESS OF SHOE LEVER.
TO ADJUST
POSITION STOP ARM ON STOP ARM BAIL WITH CLAMP SCREW LOOSENED.
SECTION 573-115-700

2.11 Selector Mechanism (Cont.)

NOTE
ARMATURE WITH TWO ANTI-FREEZE BUTTONS, FRONT BUTTON MUST CONTACT ITS CORE WHEN MAGNETS ARE ENERGIZED

SELECTOR RECEIVING MARGIN

REQUIREMENT (FOR UNITS EMPLOYING ARMATURE WITH ONE ANTI-FREEZE BUTTON) WHEN A SIGNAL DISTORTION TEST SET IS USED FOR DETERMINING THE RECEIVING MARGINS OF THE SELECTOR, AND WHERE THE CONDITION OF THE COMPONENTS IS EQUIVALENT TO THAT OF NEW EQUIPMENT, THE RANGE AND DISTORTION TOLERANCES BELOW SHOULD BE MET.

REQUIREMENT (FOR UNITS EMPLOYING ARMATURE WITH TWO ANTI-FREEZE BUTTONS) WHEN A DISTORTION TEST SET IS AVAILABLE, THE SELECTOR ARMATURE SPRING TENSION SHOULD BE REFINED, IF NECESSARY, TO MEET THE SELECTOR RECEIVING MARGINS. THE FRONT ANTI-FREEZE BUTTON MUST CONTACT THE MAGNET CORE WHEN THE MAGNET COILS ARE ENERGIZED.

SELECTOR RECEIVING MARGIN MINIMUM REQUIREMENTS

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>SPEED WPM</th>
<th>POINTS RANGE (ZERO DISTORTION)</th>
<th>PERCENT MARKING AND SPACING BIAS TOLERATED</th>
<th>END DISTORTION TOLERATED (SCALE SET AT BIAS OPTIMUM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.060 AMP.</td>
<td>60</td>
<td>72</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>(WINDINGS PARALLEL)</td>
<td>75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.02C AMP.</td>
<td>60</td>
<td>72</td>
<td>40</td>
<td>35</td>
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<tr>
<td>(WINDINGS SERIES)</td>
<td>75</td>
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</table>

TO ADJUST: REFINE THE SELECTOR ARMATURE SPRING (SEE PAR. 2.04 and 2.05).

RECEIVING MARGIN FOR DUAL SPEED OPERATION (60 AND 100 WPM)

REQUIREMENT

WITH RANGE SCALE SET AT COMMON OPTIMUM SETTING FOR DUAL SPEED OPERATION, THE PAGE PRINTER SHOULD ACCEPT SIGNALS WITH 35% BIAS AND END DISTORTION WHEN OPERATED AT 60 OR 100 WPM.

TO ADJUST

1. BIAS SELECTOR BETWEEN LIMITS OF 0% TO -7% INTERNAL BIAS AT 100 WPM. (DO NOT READJUST FOR 60 WPM).
2. OBTAIN RECEIVING MARGINS AT 60 AND 100 WPM.
3. CALCULATE COMMON OPTIMUM BIAS SETTING AS FOLLOWS: \( O_c = \frac{UMB_{100} + LSB_{60}}{2} \) WHERE

\( O_c = \) COMMON OPTIMUM BIAS SETTING
\( UMB_{100} = \) UPPER ORIENT LIMIT MARKING BIAS AT 100 WPM
\( LSB_{60} = \) LOWER ORIENT LIMIT SPACING BIAS AT 60 WPM
2.12 Codebar Mechanism

REAR CODE BAR SHIFT LEVER

COMMON TRANSFER LEVER SPRING

REQUIREMENT

TRANSFER LEVER IN SPACING POSITION
SCALE APPLIED NEAR UPPER END OF
COMMON TRANSFER LEVER.

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

TO START LEVER MOVING

TOP VIEW

TRANSFER LEVER ECCENTRIC

REQUIREMENT

PUSH LEVERS POSITION FOR E OR
LF OR LETTERS. SELECTOR CLUTCH
DIENGAGED, CODE BAR SHIFT LEVER
LINK IN UPPERMOST POSITION,
CLEARANCE BETWEEN REAR CODE BAR
SHIFT LEVER AND CODE BAR SHIFT
BAR FARHEST FROM REAR CODE BAR
SHIFT LEVER

MIN. 0.010 INCH
MAX. 0.025 INCH

WHEN PLAY OF SHIFT BAR IS
TAKEN UP FOR MAXIMUM CLEARANCE.

TO ADJUST

ROTATE ECCENTRIC BUSHING WITH
CLAMP SCREW LOOSENED.
HIGH PART OF ECCENTRIC SHOULD
BE ABOVE HORIZONTAL CENTER LINE

NOTE

ONE OR MORE CODEBAR SHIFT
BARS CAN TOUCH CODE BAR
SHIFT LEVERS.

INTERMEDIATE ARM

TRANSFER LEVER

TRANSFER LEVER ECCENTRIC BUSHING

BUSHING CLAMP SCREW

COMMON TRANSFER LEVER SPRING

SELECTOR LEVER

PUSH LEVER (SELECTED)

(RIGHT SIDE VIEW)

TRANSFER LEVER SPRING

REQUIREMENT

TRANSFER LEVER HELD IN SPACING POSITION

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

TO START INTERMEDIATE ARM MOVING.
2.13 Codebar Mechanism (Cont.)

(A) INTERMEDIATE ARM BACKSTOP BRACKET

REQUIREMENT
PUSH LEVERS NOT SELECTED. ALL CODE BAR SHIFT BARS TO THE RIGHT.
SELECTOR CLUTCH DISENGAGED. CODE BAR SHIFT LEVER LINK IN LOWERMOST POSITION. CLEARANCE BETWEEN FRONT CODE BAR SHIFT LEVER AND INNER STEP OF CODE BAR SHIFT BAR FARthest FROM FRONT CODE BAR SHIFT LEVER
MIN. 0.010 INCH
MAX. 0.025 INCH
WHEN PLAY IN PARTS IS TAKEN UP FOR MAXIMUM CLEARANCE.

TO ADJUST
POSITION BACKSTOP BRACKET WITH ITS TWO CLAMP SCREWS LOOSENED.

2.14 Selector Mechanism (Cont.)

(B) SELECTOR CAM LUBRICATOR

REQUIREMENT
THE LUBRICATOR TUBE SHOULD CLEAR THE HIGH PART OF THE LOCK LEVER CAM
MIN. 0.020 INCH
THE HIGH PART OF THE SELECTOR LEVER CAMS SHOULD TOUCH THE LUBRICATOR Wick, BUT SHOULD NOT RAISE IT MORE THAN 1/32 INCH.
NOTE: THERE SHOULD BE SOME CLEARANCE BETWEEN THE MARKING LOCK LEVER SPRING AND THE RESERVOIR.

TO ADJUST
POSITION THE LUBRICATOR BRACKET WITH ITS MOUNTING SCREWS LOOSENED.
2.15 Codebar Mechanism (Cont.)

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TRANSFER LEVERS

CODE BAR SHIFT LEVER

ROLLER

CODE BAR SHIFT LEVER DRIVE ARM

REQUIREMENT
CODE BAR SHIFT LEVER LINK IN THE UPPERMOST POSITION. THERE SHOULD BE SOME CLEARANCE BETWEEN THE TOP OF THE ROLLERS AND THE TOP OF THE CAM SLOTS IN THE CODE BAR SHIFT LEVERS MAX. 0.025 INCH ON THE CLOSEST LEVER.

TO ADJUST
LOOSEN THE CLAMP SCREW. POSITION THE CODE BAR SHIFT LEVER DRIVE ARM ON ITS SHAFT TO MEET THE REQUIREMENT AND TO PROVIDE SOME END PLAY, NOT MORE THAN 0.006 INCH.

NOTE: FOR EARLIER DESIGN SEE PAR. 4.03

CODE BAR SHIFT LEVER LINK BRACKET

CODE BAR SHIFT LEVER LINK

CODE BAR SHIFT LEVER DRIVE ARM

CLAMP SCREW

(FRONT VIEW)

(RIGHT SIDE VIEW)

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SECTION 573-115-700

2.16 Codebar Mechanism (Cont.)

**CODE BAR SHIFT LEVER LINK BRACKET**

**REQUIREMENT**

MOTION OF FRONT AND REAR CODE BAR SHIFT LEVERS SHOULD BE EQUALIZED WITH RESPECT TO CODE BAR TRAVEL.

**TO CHECK (FRONT)**

SELECT BLANK COMBINATION AND ROTATE MAINSHAFT UNTIL CODE BAR SHIFT LEVER LINK REACHES HIGHEST TRAVEL. TAKE UP PLAY FOR MAXIMUM CLEARANCE. CLEARANCE BETWEEN FRONT CODE BAR SHIFT LEVER AND SHOULDER ON NEAREST CODE BAR SHIFT BAR MIN. 0.002 INCH MAX. 0.025 INCH

**TO CHECK (REAR)**

SELECT LETTERS COMBINATION. CHECK CLEARANCE BETWEEN REAR CODE BAR SHIFT LEVER AND SHOULDER ON NEAREST CODE BAR SHIFT BAR IN SAME WAY.

MIN. 0.002 INCH MAX. 0.025 INCH

**TO ADJUST**

POSITION ADJUSTING PLATES (FRONT AND REAR) WITH CLAMP SCREWS LOOSENED.

---

**NOTE:** FOR EARLIER DESIGN SEE PAR. 4.04
2.17 Main Shaft and Trip Shaft Mechanisms

Requirement
CLUTCH TURNED TO STOP POSITION BUT WITH LATCH LEVER NOT LATCHED.
MIN. 5 OZS.
MAX. 7-1/4 OZS.
TO MOVE LATCH LEVER FROM LUG. THIS
REQUIREMENT APPLIES TO CODE BAR
CLUTCH, FUNCTION CLUTCH, SPACING
CLUTCH, LINE FEED CLUTCH, AND TYPE
BOX CLUTCH.

Requirement
SELECTOR CLUTCH AND CODE
BAR CLUTCH DISENGAGED.
CODE BAR CLUTCH TRIP LEVER
SHOULD ENGAGE CLUTCH SHOE
LEVER BY FULL THICKNESS OF
SHOE LEVER AND HAVE SOME
END PLAY
MAX. 0.006 INCH
TO ADJUST
POSITION TRIP LEVER ON ITS SHAFT WITH CLAMP
SCREW LOOSENED.

Requirement
TRIP SHAFT LEVER ON LOW PART OF
CAM, CODE BAR CLUTCH ENGAGED.
ROTATE 1/4 TURN,
MIN. 1 OZ.
MAX. 2 OZS.
TO START LEVER MOVING.
2.18 Main Shaft and Trip Shaft Mechanisms (Cont.)

Requirement
- Cam follower roller on the low part of cam.
- The spring unhooked from spring bracket.

Min. 20 ozs.
Max. 24 ozs.

To pull spring to installed length.

Requirement
- Function clutch and function clutch disengaged. Function clutch trip lever should engage clutch shoe lever by full thickness of shoe lever. (Check at lug with least bite on two stop clutches)

To adjust position trip lever on its shaft with clamp screw loosened, letting shaft have end play.

Min. some
Max. 0.006 inch
2.19 Main Shaft and Trip Shaft Mechanisms (Cont.)

(A) CLUTCH TRIP SHAFT SET COLLARS

(1) REQUIREMENT
SPACING CUT-OUT LEVER SHOULD HAVE SIDE PLAY
MIN. 0.008 INCH
MAX. SOME TO ADJUST

POSITION SPACING CUT-OUT LEVER SET COLLAR

NOTE: FOR EARLIER DESIGN SEE PAR. 4.05.

TRIP LEVER

SPACING CUT-OUT LEVER SET COLLAR

(2) REQUIREMENT
APPROXIMATE ALIGNMENT OF RIGHT END OF STOP EXTENSIONS ON TRIP LEVER AND SHOE LEVER.

TO ADJUST
POSITION LINE FEED CLUTCH TRIP LEVER SET COLLAR.

(3) REQUIREMENT
LINE FEED CLUTCH LATCH LEVER SHOULD HAVE SIDE PLAY.

MIN. 0.008 INCH
MAX. SOME TO ADJUST

POSITION LINE FEED CLUTCH LATCH LEVER SET COLLAR.
SECTION 573-115-700

2. 20  Main Shaft and Trip Shaft Mechanisms (Cont.)

SPACING CLUTCH TRIP LEVER

REQUIREMENT

CLEARANCE BETWEEN TRIP LEVER AND CLUTCH DRUM SHOULD BE 0.018 TO 0.035 INCH LESS THAN CLEARANCE BETWEEN SHOE LEVER AND DRUM AT STOP SHOWING GREATEST CLEARANCE. THERE SHOULD BE SOME OVERBITE ON ALL STOP LUGS. GAUGE BY EYE.

TO CHECK

DISENGAGE THE CLUTCH. TRIP CLUTCH TRIP LEVER AND ROTATE MAIN SHAFT UNTIL TRIP LEVER IS OVER THE SHOE LEVER. TAKE UP PLAY OF SHOE LEVER INWARD BY SNAPING THE TRIP LEVER OVER THE SHOE LEVER. CHECK CLEARANCE BETWEEN SHOE LEVER AND DRUM AT EACH STOP POSITION. WITH THE TRIP LEVER AT THE STOP POSITION WHICH YIELDS GREATEST CLEARANCE, ROTATE MAIN SHAFT SLOWLY UNTIL THE TRIP LEVER JUST FALLS OFF THE STOP LUG. CHECK CLEARANCE BETWEEN TRIP LEVER AND DRUM.

TO ADJUST

POSITION THE TRIP LEVER BY MEANS OF ITS CLAMP SCREW

NOTE: FOR EARLIER DESIGN SEE PAR. 4.06.

CLUTCH TRIP LEVER SPRING

REQUIREMENT

CLUTCH ENGAGED AND ROTATED UNTIL TRIP LEVER RESTS ON STOP LUG

<table>
<thead>
<tr>
<th>CLUTCH</th>
<th>MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPACING</td>
<td>11 OZS.</td>
<td>16 OZS.</td>
</tr>
<tr>
<td>LINE FEED</td>
<td>9 OZS.</td>
<td>12 OZS.</td>
</tr>
<tr>
<td>TYPE BOX</td>
<td>5 OZS.</td>
<td>7-1/4 OZS.</td>
</tr>
</tbody>
</table>

TO MOVE LEVER AWAY FROM STOP LUG.
2.21 Main Shaft and Trip Shaft Mechanisms (Cont.)

(A) **TYPE BOX CLUTCH TRIP LEVER ECCENTRIC POST**

**REQUIREMENT**

TYPE BOX CLUTCH DISENGAGED. TRIP LEVER SHOULD ENGAGE THE CLUTCH SHOE LEVER BY THE FULL THICKNESS OF THE SHOE LEVER.

TO ADJUST

POSITION THE TRIP LEVER ECCENTRIC POST.

(C) **LINE FEED CLUTCH TRIP LEVER ADJUSTING SCREW**

**REQUIREMENT**

LINE FEED FUNCTION SLIDE ARM IN REAR POSITION.

CLUTCH TRIP LEVER AGAINST ITS ECCENTRIC POST.

TRIP ARM HELD AGAINST ITS FUNCTION SLIDE ARM.

SOME CLEARANCE BETWEEN THE END OF THE TRIP LEVER ADJUSTING SCREW AND THE TRIP ARM.

MAX. 0.006 INCH

TO ADJUST

POSITION THE ADJUSTING SCREW.

(B) **LINE FEED CLUTCH TRIP LEVER ECCENTRIC POST**

**REQUIREMENT**

CLEARANCE BETWEEN TRIP LEVER AND CLUTCH DRUM SHOULD BE 0.018 TO 0.035 INCH LESS THAN CLEARANCE BETWEEN SHOE LEVER AND DRUM AT STOP WHICH SHOWS GREATEST CLEARANCE. THERE SHOULD BE SOME OVERBITE ON ALL THREE STOP LUGS AS GAUGED BY EYE.

TO CHECK

DISENGAGE THE CLUTCH. TRIP CLUTCH TRIP LEVER AND ROTATE MAIN SHAFT UNTIL TRIP LEVER IS OVER THE SHOE LEVER. TAKE UP PLAY OF SHOE LEVER INWARD BY SNAPPING THE TRIP LEVER OVER THE SHOE LEVER. CHECK CLEARANCE BETWEEN SHOE LEVER AND DRUM AT EACH STOP POSITION.

WITH TRIP LEVER AT THE STOP POSITION WHICH YIELDS GREATEST CLEARANCE, ROTATE MAIN SHAFT SLOWLY UNTIL THE TRIP LEVER JUST FALLS OFF THE STOP LUG. CHECK CLEARANCE BETWEEN TRIP LEVER AND DRUM.

TO ADJUST

BACK OFF TRIP LEVER ADJUSTING SCREW AND POSITION TRIP LEVER ECCENTRIC STOP POST.
SECTION 573-115-700

2.22 Main Shaft and Trip Shaft Mechanisms (Cont.)

CLUTCH TRIP ARM

TRIP LEVER ECCENTRIC POST

CLUTCH DRUM

DRUM MOUNTING SCREW

CLUTCH SHOE LEVER

CLUTCH DISK STOP LUG

ADJUSTING DISK

CLAMP SCREWS

TYPE BOX CLUTCH TRIP LEVER

(1) REQUIREMENT

CLUTCH TRIP SHAFT CAM FOLLOWER ROLLER
(SEE PAR. 2.18) ON LOWEST SURFACE OF CAM (LOCATED ON CODE BAR CLUTCH).
CLEARANCE BETWEEN INNER FACE OF TYPE BOX CLUTCH TRIP LEVER AND THE CLUTCH DISK STOP LUG.
MIN. 0.025
MAX. 0.045

TO ADJUST
LOosen CLAMP SCREW AND POSITION STOP.

(2) REQUIREMENT

WHEN POSITIONING THE TRIP ARM
DETERMINE THAT THE LATCH LEVER
HAS SOME SIDE PLAY
MAX. 0.008 INCH

TO ADJUST
POSITION THE CLUTCH TRIP ARM ON ITS SHAFT WITH THE CLAMP SCREW LOOSENED.

CLUTCH SHOE LEVER

REQUIREMENT

GAP BETWEEN CLUTCH SHOE LEVER AND ITS STOP LUG SHOULD BE 0.055 INCH TO 0.085 INCH GREATER WHEN CLUTCH IS ENGAGED THAN WHEN THE CLUTCH IS DISENGAGED.

TO CHECK
DISENGAGE THE CLUTCH AND MEASURE THE GAP.
TRIP THE CLUTCH AND ROTATE IT UNTIL THE CLUTCH SHOE LEVER IS TOWARD THE BOTTOM OF THE UNIT.
AGAIN MEASURE THE GAP WITH THE CLUTCH THUS ENGAGED.

NOTE
ON MULTIPLE STOP CLUTCHES CHECK THE CLEARANCE AT THE STOP LUG THAT IS ADJACENT TO THE FORM IN THE CLUTCH ADJUSTING DISK.

TO ADJUST
LOosen THE TWO CLAMP SCREWS ON THE CLUTCH DISK. ENGAGE A WRENCH OR SCREWDRIVER ON THE LUG OF THE ADJUSTING DISK AND ROTATE THE DISK.
2.23 Main Shaft and Trip Shaft Mechanisms (Cont.)

**CLUTCH SHOE LEVER SPRING REQUIREMENT**
CLUTCH ENGAGED. HOLD CAM DISK TO PREVENT TURNING. SPRING SCALE PULLED AT TANGENT TO CLUTCH.

- MIN. 15 OZS.
- MAX. 20 OZS. **ONE-STOP CLUTCHES**

- MIN. 16 OZS.
- MAX. 22 OZS. **MULTIPLE-STOP CLUTCHES**

TO MOVE THE SHOE LEVER IN CONTACT WITH THE STOP LUG.

**CLUTCH DRUM POSITION (EXCEPT SELECTOR) REQUIREMENT**
CLUTCH SHOE LEVER HELD DISENGAGED. CLUTCH SHOULD HAVE SOME END PLAY

- MAX. 0.015 INCH

TO ADJUST
POSITION EACH DRUM AND SPACING CLUTCH SET COLLAR WITH MOUNTING SCREWS LOOSENED.

**CLUTCH SHOE LEVER SPRING**

**NOTE**
IN ORDER TO CHECK THIS SPRING TENSION, IT IS NECESSARY TO REMOVE THE CLUTCH FROM THE MAIN SHAFT. THEREFORE, IT SHOULD NOT BE CHECKED UNLESS THERE IS GOOD REASON TO BELIEVE THAT IT DOES NOT MEET ITS REQUIREMENT.

**REQUIREMENT**
CLUTCH DRUM REMOVED. SPRING SCALE APPLIED TO PRIMARY SHOE AT A TANGENT TO THE FRICTION SURFACE.

- MIN. 3 OZS.
- MAX. 5 OZS.

TO START THE PRIMARY SHOE MOVING AWAY FROM SECONDARY SHOE AT POINT OF CONTACT.
2.24 Spacing Mechanism

(B) SPACING GEAR PHASING REQUIREMENT
Spacing clutch disengaged. Index line on the spacing pawl should be as near as possible to the center of the two lines on the pawl retaining washer.

To adjust
Remove the mounting screw from the spacing shaft gear. Hold the pawls in alignment and engage the spacing shaft gear with the clutch gear at a point where the spacing shaft gear mounting screw hole is in line with the tapped hole in the spacing shaft and insert the mounting screw.

(A) SPACING GEAR CLEARANCE REQUIREMENT
Carriage fully returned. Minimum backlash of spacing gears without bind.

To adjust
Insert shims between the spacing shaft bearing and front plate at upper mounting screw to increase clearance and at lower mounting screw to decrease backlash.
2.25 Line Feed and Platen Mechanism

LINE FEED CLUTCH PHASING REQUIREMENT
LINE FEED CLUTCH DISENGAGED. BOTH LINE-FEED BARS SHOULD ENGAGE TEETH OF LINE FEED SPUR GEAR.
TO ADJUST LOOSEN ASSEMBLY BEARING POST. RE-MESH LINE FEED ECCENTRIC SPUR GEAR WITH CLUTCH GEAR.

2.26 Positioning Mechanism

INNER BEARING RACE
MOUNTING SCREWS

ROCKER SHAFT LEFT BRACKET REQUIREMENT
ROCKER SHAFT LEFT BRACKET FIRMLY SEATED AGAINST INNER BEARING RACE.
TO ADJUST HOLD ROCKER SHAFT IN EXTREME LEFT POSITION AND POSITION THE BRACKET AGAINST THE INNER BEARING RACE WITH MOUNTING SCREWS LOOSENED.
SECTION 573-115-700
2.27 Positioning Mechanism (Cont.)

ROCKER SHAFT BRACKET ECCENTRIC STUD

(1) REQUIREMENT --- WITH TYPE BOX CLUTCH DISENGAGED AND PLAY IN LOCKING ARM TAKEN UP TOWARD FRONT, GAP BETWEEN LOWER SIDE OF LOCK LEVER ROLLER AND TOP EDGE OF SHOULDER ON HORIZONTAL POSITIONING LOCK LEVER SHOULD BE:
   MIN. 0.055 INCH ----------------------------------------------- MAX. 0.090 INCH

(2) REQUIREMENT --- MAKE SURE THAT ROCKER SHAFT DRIVE LINK IS FREE IN ITS BEARINGS (NOT UNDER LOAD) WHEN CLUTCH IS IN (a) ITS STOP POSITION; (b) WHEN IT IS ROTATED 180 DEGREES FROM STOP POSITION.

TO ADJUST --- (1) POSITION ECCENTRIC STUD IN LOWER END OF ROCKER-SHAFT LEFT BRACKET. KEEP HIGH PART OF ECCENTRIC (MARKED WITH DOT) BELOW CENTER LINE OF DRIVE LINK. (2) MAKE SURE THAT STUD IS FREE IN TYPE BOX CLUTCH BEARING AT POSITIONS (a) AND (b) ABOVE (NO PUSHING OR PULLING FORCE ON DRIVE LINK). CHECK MANUALLY BY MOVING LINK TOWARD LEFT SIDE FRAME AND THEN IN REVERSE DIRECTION.

NOTE --- ANY CHANGE IN THIS ADJUSTMENT WILL REQUIRE THAT THE FOLLOWING RELATED ADJUSTMENTS BE RECHECKED: HORIZONTAL POSITIONING DRIVE LINKAGE (PAR. 2.35), RIGHT VERTICAL POSITIONING LEVER ECCENTRIC STUD (PAR. 2.28), LEFT VERTICAL POSITIONING LEVER ECCENTRIC STUD (PAR. 2.29), RIBBON FEED LEVER BRACKET (PAR. 2.50), FUNCTION STRIPPER BLADE ARMS (PAR. 2.31), SPACING TRIP LEVER BAIL CAM PLATE (PAR. 2.33), REVERSING SLIDE BRACKETS (PAR. 2.34) AND RIBBON REVERSE SPUR GEAR (PAR. 2.52), PRINTING TRACK (PAR. 2.49) AND PRINTING ARM (PAR. 2.50).

![Diagram of ROCKER SHAFT BRACKET ECCENTRIC STUD](image-url)
2.28 Positioning Mechanism (Cont.)

(A) RIGHT VERTICAL POSITIONING LEVER

ECCENTRIC STUD

REQUIREMENT

TYPE BOX CLUTCH DISENGAGED, COMMON CODE BAR IN SPACING POSITION. PLAY TAKEN UP BY PRESSING DOWNWARD ON COMMON CODE BAR AT GUIDE BLOCK.

MIN. 0.030 INCH
MAX. 0.050 INCH


(B) VERTICAL POSITIONING LEVER SPRING

REQUIREMENT

VERTICAL POSITIONING LEVER TOES (RIGHT AND LEFT) IN CONTACT WITH THE SUPPRESSION CODE BAR, LEVERS NOT BUCKLED.

MIN. 4 OZS.
MAX. 12 OZS.

TO MOVE THE LINK EXTENSION AWAY FROM THE VERTICAL POSITIONING LEVER.
CHECK BOTH RIGHT AND LEFT SPRINGS.
2.29 Positioning Mechanism (Cont.)

VERTICAL POSITIONING LOCK LEVER
SPRING
REQUIREMENT
TYPE BOX CLUTCH DISENGAGED
MIN. 5 OZS.
MAX. 8 OZS.
TO START LOCK LEVER MOVING,
CHECK RIGHT AND LEFT SPRINGS.

LEFT VERTICAL POSITIONING LOCK LEVER

LEFT VERTICAL POSITIONING LEVER

VERTICAL POSITIONING LOCK LEVER TOE

RIGHT AND LEFT VERTICAL POSITIONING LEVERS SHOULD
BUCKLE EQUALLY WITHIN
0.006 INCH

TO CHECK
COMMON CODE BAR IN SPACING
POSITION, TRIP TYPE BOX
CLUTCH, ROTATE MAIN
SHAFT UNTIL RIGHT VERTI-
CAL POSITIONING LEVER TOE
TOUCHES COMMON CODE BAR,
BUCKLING ITS LOWER LINK
0.008 INCH (MAXIMUM)
LEFT VERTICAL POSITIONING
LEVER TOE SHOULD TOUCH
COMMON CODE BAR, BUCKLING
ITS LOWER LINK EQUALLY
WITHIN 0.006 INCH

TO ADJUST
POSITION ECCENTRIC STUD
ON ROCKER SHAFT LEFT
BRACKET INNER ARM, POSI-
TION HIGH PART OF CAM
(MARKED WITH DOT) TOWARD
REAR.
2.30 Spacing Mechanism (Cont.)

NOTE: CHECK RELATED ADJUSTMENTS, PARs. 2.43, 2.44, AND 2.47, IF THE FOLLOWING ADJUSTMENTS ARE REMADE.

OSCILLATING RAIL SLIDE POSITION

REQUIREMENT

CARRIAGE RETURN RING AND AUTOMATIC CARRIAGE RETURN-LINE FEED RING FREE TO ROTATE ON SPACING DRUM (FIVE MOUNTING SCREWS LOOSENED). SPACING CLUTCH DISENGAGED. FEED PAWL, WHICH IS FARthest ADVANCED, ENGAGING TOOTH IMMEDIATELY ABOVE CUT-AWAY SECTION OF RATCHET. CLEARANCE BETWEEN SLIDE AND PULLEY MIN. 0.025 INCH—MAX. 0.050 INCH TO ADJUST POSITION SLIDE ON WIRE ROPE WITH CLAMP SCREWS LOOSENED.

NOTE: FOR EARLIER DESIGN SEE PAR. 4.07.

RATCHET

MOUNTING SCREWS

CARRIAGE RETURN RING

SPACING DRUM

AUTOMATIC CARRIAGE RETURN-LINE FEED RING (AND SPACE SUPPRESSION RING)

SPACING FEED PAWL SPRING

REQUIREMENT

EACH SPACING PAWL IN LEAST ADVANCED POSITION RESTING AGAINST RATCHET WHEEL. EACH SPRING UNHOOKED FROM BRACKET MIN. 2-1/2 OZS., MAX. 4 OZS., TO PULL SPRINGS TO INSTALLED LENGTH.

NOTE: ON UNITS EQUIPPED FOR 6 SPACES PER INCH THIS TENSION SHOULD BE MIN. 8 OZS., MAX. 10 OZS., TO PULL SPRINGS TO INSTALLED LENGTH.
2.31 Spacing Mechanism (Cont.)

(A) SPACING TRIP LEVER BAIL CAM PLATE
REQUIREMENT
SPACING TRIP LEVER ARM IN UPWARD POSITION. TYPE BOX CLUTCH
ROTATED THROUGH APPROXIMATELY ONE-HALF OF ITS CYCLE, ALL
FUNCTION PAWLS DISENGAGED FROM FUNCTION BAR. CLEARANCE
BETWEEN TOP SURFACE OF TRIP LEVER ARM EXTENSION AND
SPACING TRIP LEVER SHOULDER.
MIN. 0.010 INCH
MAX. 0.040 INCH
TO ADJUST
POSITION CAM PLATE ON ROCKER SHAFT WITH MOUNTING SCREWS
LOOSENED, POSITION FORWARD EDGE OF CAM PLATE PARALLEL TO
SHAFT.

(B) SPACING TRIP LEVER SPRING
REQUIREMENT
TYPE BOX CLUTCH DISENGAGED.
MIN. 2-1/2 OZS.
MAX. 5 OZS.
TO START LEVER MOVING.

(C) SPACING TRIP LEVER BAIL SPRING
REQUIREMENT
SPACING TRIP LEVER BAIL AGAINST STOP,
SPACING TRIP LEVER BAIL SPRING UNHOOKED.
MIN. 8 OZS.
MAX. 12 OZS.
TO PULL SPRING TO INSTALLED LENGTH.
2.32 Function Mechanism

(B) Function Reset Bail Spring --- With typing unit inverted, hold #1 code bar in its marking position so that no function bar is selected. Rotate main shaft until function reset bail springs are in their minimum length position. Hook a 32 oz. scale (between clutch trip shaft and space suppressor bail) on front edge of reset bail (at middle of bail) and pull rearward.

MIN. 10 OZS. ------------------------------- MAX. 22 OZS. (TO START BAIL MOVING).

(A) Function Reset Bail Blade (for units with 2-stop function clutch see Par. 4.09)

(1) Requirement --- With all clutches disengaged, trip code bar clutch and turn main shaft until code-bar clutch shoe-release lever just touches its stop lever. Un-latch all function pawls from their function bars. Hold respective function bar in its extreme rearward position with spring hook; clearance between function bar and reset bail blade should be

MIN. 0.018 INCH ------------------------------- MAX. 0.035 INCH

To check --- Measure clearance at bars in stunt box slots, No's 1, 4, 11, 18, 23, 33, 38 and 41. If a designated slot is vacant, use nearest bar or select bar with highest numbered slot when a bar is located on both sides of vacant slot. (View slots from rear, numbering from left to right).

To adjust --- Position blade on reset bail with its mounting screws friction tight.

(2) Requirement --- Each function pawl should over travel its function bar by at least 0.002 inch with indicated tensions applied. Check pawls one at-a-time at slot No's. used above.

To check --- If carriage return lever adjustment has not been made, loosen its clamp screw. Latch function pawls by lowering stripper blade; trip code bar clutch and position its release lever as in (1) above. Strip off any functions which may have been selected.

To adjust --- Refine requirement (1) above, holding the readjustment within limits

MIN. 0.018 INCH ------------------------------- MAX. 0.035 INCH

Note: If the function reset bail blade is repositioned, check the adjustment of the Figs-Ltrs shift code bar operating mechanism following.
NOTE 1. FOR UNITS WITH ADJUSTABLE GUIDE PLATES AND ONE-STOP FUNCTION CLUTCHES, PROCEED AS SPECIFIED.

NOTE 2. FOR UNITS WITH ADJUSTABLE GUIDE PLATES AND TWO-STOP FUNCTION CLUTCHES, CHANGE FIRST SENTENCE IN REQUIREMENT (1) TO "DISENGAGE FUNCTION CLUTCH AT STOP GIVING LEAST CLEARANCE." THEN PROCEED AS SPECIFIED.

FIGS - LTRS SHIFT CODE BAR OPERATING MECHANISM

(1) REQUIREMENT
- WITH FUNCTION CLUTCH ROTATED UNTIL CLUTCH DISK STOP LUG IS TOWARD BOTTOM OF UNIT, HOOK FIGURES FUNCTION PAWL OVER THE END OF THE FUNCTION BAR. CLEARANCE BETWEEN UPPER GUIDE PLATE EXTENSION AND SHIFT SLIDE. MAX. 0.020 WHEN PLAY IS TAKEN UP FOR MAXIMUM.

(2) REQUIREMENT
- WITH 32 OZ. PULL APPLIED TO FUNCTION PAWL THERE SHOULD BE MIN. 0.002 INCH BETWEEN SHOULDER OF FIGURES FUNCTION PAWL AND FACE OF FUNCTION BAR.

(3) REQUIREMENT
- REPEAT REQUIREMENT (1) & (2) FOR THE LETTERS FUNCTION PAWL. CHECK MAX. CLEARANCE BETWEEN LOWER GUIDE PLATE EXTENSION AND SHIFT SLIDE. CHECK MIN. CLEARANCE BETWEEN SHOULDER OF LETTER FUNCTION PAWL AND FACE OF FUNCTION BAR.

NOTE: THERE SHOULD BE SOME CLEARANCE BETWEEN THE UNOPERATED SHIFT SLIDE AND ITS GUIDE PLATE, WHEN THE SHIFT SLIDE HAS REACHED ITS POSITION OF MAXIMUM TRAVEL.

TO ADJUST
- POSITION UPPER AND/OR LOWER GUIDE PLATE BY THE ADJUSTING SLOT WITH THE CLAMP NUTS LOOSENED.

NOTE: FOR EARLIER DESIGN SEE PAR. 4.08
2.34 Positioning Mechanism (Cont.)

(A) REVERSING SLIDE DETENT SPRING

REQUIREMENT
SLIDE IN LEFT HAND POSITION, SCALE HOOKED IN UPPER RIGHT HAND DETENT NOTCH
MIN. 2 OZS.
MAX. 4-1/2 OZS.
TO START DETENT MOVING

(B) REVERSING SLIDE ADJUSTING STUD

REQUIREMENT
TYPE BOX CLUTCH DISENGAGED.
WITH NO. 3 CODE BAR IN SPACING POSITION (RIGHT), THE REVERSING SLIDE DETENT ROLLERS SHOULD BE FULLY SEATED IN THE RIGHT-HAND NOTCHES OF THE DETENT LEVER.
WITH NO. 3 CODE BAR IN MARKING POSITION (LEFT), THE REVERSING SLIDE DETENT ROLLERS SHOULD BE FULLY SEATED IN THE LEFT-HAND NOTCHES OF THE DETENT LEVER.
TO ADJUST POSITION THE REVERSING SLIDE STUD IN ITS ELONGATED HOLE WITH ITS MOUNTING NUT LOOSENED.

(C) REVERSING SLIDE BRACKETS

REQUIREMENT
TYPE BOX CLUTCH, CODE BAR CLUTCH, AND FUNCTION CLUTCH DISENGAGED.
REVERSING SLIDE MOVED TO RIGHT AND LEFT THROUGH ITS FULL TRAVEL RIGHT MOTION SHOULD BUCKLE LEFT HORIZONTAL POSITIONING DRIVE LINKAGE AND LEFT MOTION SHOULD BUCKLE RIGHT HORIZONTAL POSITIONING DRIVE LINKAGE. THE AMOUNT OF BUCKLING IN EACH CASE SHOULD BE MIN. 0.030 INCH MAX. 0.050 INCH MEASURED AT POINT OF MAXIMUM CLEARANCE.

LEFT HORIZONTAL POSITIONING DRIVE LINK

TO ADJUST POSITION EACH REVERSING SLIDE BRACKET WITH THEIR CLAMP SCREWS LOOSENED.

RIGHT HORIZONTAL POSITIONING DRIVE LINKAGE
NOTE: THESE ADJUSTMENTS APPLY ONLY TO HORIZONTAL POSITIONING DRIVE MECHANISMS EQUIPPED WITH TORSION SPRINGS.

HORIZONTAL POSITIONING DRIVE LINKAGE REQUIREMENT

TYPE BOX CLUTCH DISENGAGED.
CODE BARS 4 AND 5 TO SPACING (RIGHT).
CLEARANCE BETWEEN EACH SIDE OF CENTER HORIZONTAL STOP SLIDE AND DECELERATING SLIDES, ON SIDE WHERE KNEE LINK IS STRAIGHT SHOULD BE EQUAL (WITHIN 0.008 INCH)
MIN. 0.090 INCH
MAX. 0.110 INCH

TO ADJUST

LOSEN BEARING STUD MOUNTING SCREWS AND CONNECTING STRIP MOUNTING SCREWS FRICTION TIGHT. POSITION ONE OR BOTH BEARING STUDS ON THE CONNECTING STRIP TO PROVIDE 0.095 INCH TO 0.105 INCH BETWEEN THE CENTER HORIZONTAL SLIDE AND THE DECELERATING SLIDE ON THE SIDE WHERE THE LINKAGE IS NOT BUCKLED. TIGHTEN THE TWO INNER MOUNTING SCREWS, CHANGE POSITION OF REVERSING SLIDE AND CHECK OPPOSITE CLEARANCE, EQUALIZE BY SHIFTING BOTH STUDS AND CONNECTING STRIP AS A UNIT. HOLD THE DRIVE LINKAGE HUB AGAINST THE LOWER VERTICAL LINK OF THE DRIVE LINKAGE. TIGHTEN THE TWO OUTER BEARING STUD MOUNTING SCREWS. CHECK THE LINKAGE FOR FREENESS THROUGHOUT A COMPLETE CYCLE. THE TYPE BOX CLUTCH DISK SHOULD HAVE SOME MOVEMENT IN THE NORMAL DIRECTION OF ROTATION IN THE STOP POSITION.

NOTE: FOR EARLIER DESIGN SEE PAR. 4.10
2.36 Positioning Mechanism (Cont.)

**VERTICAL POSITIONING LOCK LEVER**

(1) REQUIREMENT

LETTERS COMBINATION SET UP ON CODE BARS, MAIN SIDE OPERATING LEVERS AT UPPER END OF TRAVEL. UPPER NOTCH OF VERTICAL POSITIONING LOCK LEVER FULLY ENGAGED (MANUALLY IF NECESSARY) WITH VERTICAL SLIDE PROJECTION. UPPER SURFACE OF FOLLOWER ARM REAR EXTENSION SHOULD BE MIN. IN CONTACT WITH MAX. 0.004 INCH AWAY FROM INNER EXTENSION OF MAIN SIDE LEVER.

(2) REQUIREMENT

WITH PLAY TAKEN UP BY PULLING UPWARD WITH 8 OZS. TENSION ON TYPE BOX CARRIAGE TRACK, VERTICAL SURFACES MIN. IN CONTACT WITH MAX. 0.012 INCH AWAY FROM EACH OTHER TO ADJUST POSITION RIGHT AND LEFT VERTICAL POSITIONING LOCK LEVERS WITH CLAMP SCREWS LOOSENED.
2.37 Spacing Mechanism (cont.)

**Lower Draw-Wire Rope Pulley Bail Spring Requirement**

- Spring unhooked from pulley bail, bail extension resting on opening in front plate.
- Min. 18 ozs.
- Max. 22 ozs.
- To pull spring to position length.

**Carriage Draw-Wire Rope Requirement**

- Clearance between lower draw-wire rope and carriage return latch bail post should be at least 0.006 inch.
- With the horizontal positioning mechanism in its lowest position, clearance between the lower draw-wire rope and the left horizontal positioning drive linkage should be min. 0.030 inch.

**To Adjust**

- Advance printing carriage to extreme right hand position.
- Rotate type box clutch 1/2 revolution.
- Loosen rope clamp screw one turn only.
- Position pulley bearing studs, with their mounting screws loosened, to meet requirement.
- Check that cable has moved around its equalizing clamp so that rear cable has slightly greater tension than front cable, gauged by feel.
- Tighten the clamp screw.
2.38 Spacing Mechanism (Cont.)

**CARRIAGE RETURN SPRING REQUIREMENT**
Pull required to start spring drum moving
- MIN. 3-1/2 LBS.
- MAX. 4 LBS.

To check:
Spacing drum in its returned position, printing track in lower position. Remove lower cable roller spring. Hold spacing pawl, buffer slide and carriage return latch to prevent interference with spacing drum.

To adjust:
Spring drum nut loosened. Rotate spring drum ratchet wheel to increase tension. Operate escapement lever to decrease tension.

**SPACING FEED PAWL RELEASE LINK SPRING REQUIREMENT**
- MIN. 1/2 OZ.
- MAX. 2-1/2 OZS.
To start spring stretching.
2.39 Spacing Mechanism (Cont.)

(A) CARRIAGE RETURN LATCH BAIL

REQUIREMENT
- CARRIAGE FULLY RETURNED (SEE PAR. 2.43)
- PLAY IN CARRIAGE RETURN BAIL TAKEN UP TO RIGHT BY HOLDING RIGHT SIDE OF BAIL AGAINST ITS RETAINER. CLEARANCE BETWEEN CARRIAGE RETURN LATCH BAIL AND CARRIAGE RETURN LEVER.
- MIN. 0.004 INCH
- MAX. 0.040 INCH

TO ADJUST POSITION LATCH BAIL PLATE WITH CLAMP SCREW LOOSENED.

(B) CARRIAGE RETURN LATCH BAIL SPRING

REQUIREMENT
- SPACING DRUM FULLY RETURNED
- MIN. 3 OZS.
- MAX. 4-1/2 OZS.
- TO START LATCH BAIL MOVING
2.40 Spacing Mechanism (Cont.)

FUNCTION PAWL

CARRIAGE RETURN FUNCTION BAR

UNSHIFT ON SPACE

LTRS.

FIGS.

RIGHT SIDE FRAME

(LEFT SIDE VIEW)

(REAR VIEW)

CARRIAGE RETURN LEVER

REQUIREMENT (UNITS EQUIPPED WITH ONE-STOP FUNCTION CLUTCH)

CARRIAGE RETURN FUNCTION SET UP ON SELECTOR. MAIN SHAFT ROTATED UNTIL FUNCTION CLUTCH STOP LUG IS TOWARD BOTTOM OF UNIT. CARRIAGE RETURN FUNCTION PAWL HOOKED OVER ITS FUNCTION BAR. SPACING DRUM HELD SO THAT CARRIAGE RETURN LATCH BAIL IS LATCHED. CLEARANCE BETWEEN LATCH BAIL AND CARRIAGE RETURN LEVER, MIN. 0.006 INCH — MAX. 0.035 INCH

REQUIREMENT (UNITS EQUIPPED WITH TWO-STOP FUNCTION CLUTCH)

SAME EXCEPT MAIN SHAFT SHOULD BE ROTATED UNTIL FUNCTION CLUTCH IS DISENGAGED IN STOP POSITION THAT RESULTS IN LEAST CLEARANCE. TO ADJUST POSITION CARRIAGE RETURN LEVER ON CARRIAGE RETURN BAIL WITH CLAMP SCREW LOOSENED.
2.41 Spacing Mechanism (Cont.)

**DASH POT VENT SCREW**

**Requires**
Type box carriage should return from any length of line without bouncing.

**To check**
Printer operated at any speed from automatic transmission with one CR and one LF signal between lines, first character of each line should be printed in same location as if unit was manually operated slowly.

**To adjust**
Turn down vent screw until slight pneumatic bounce is perceptible, back off screw until effect disappears. For dashpots with one vent hole: then back screw off one full turn, tighten nut. For dashpots with two vent holes: then back screw off 1/4 turn, tighten nut.

**TRANSFER SLIDE SPRING**

**Requirement**
Transfer slide in extreme left position, spring unhooked.

- **Min.** 3-1/2 OZS.
- **Max.** 4-1/2 OZS.

To pull spring to installed length.

2.42 Function Mechanism (Cont.)

**KEYBOARD LOCK LEVER SPRING**

*(If unit is equipped)*

**Requirement (Unit upside down)**
Scale applied to bell crank

- **Min.** 1/2 OZ.
- **Max.** 1-1/2 OZS.

To start keyboard lock lever moving.
2.43 Spacing Mechanism (Cont.)

**NOTES**

1. WHEN ADJUSTMENTS ON THIS PAGE ARE MADE CHECK RELATED REQUIREMENTS IN PARS. 2.30, 2.44, AND 2.47.

2. FOR SPROCKET FEED PRINTER REQUIREMENTS REFER TO ADJUSTMENTS IN PARS. 2.71 THROUGH 2.75.

3. LEFT MARGIN MAY BE VARIED AS REQUIRED FROM ZERO TO ONE INCH. MAXIMUM RANGE OF ADJUSTMENT FOR MECHANISMS WITH STANDARD (10 CHARACTERS-PER-INCH) SPACING IS AS FOLLOWS:
   (a) FRICTION FEED PLATEN - 85 CHARACTERS
   (b) SPROCKET FEED PLATEN - 74 CHARACTERS

4. PRINTING CARRIAGE POSITION REQUIREMENT REFER TO STANDARD ADJUSTMENT --- PAR. 2.47

5. FOR EARLY DESIGN REFER TO PAR. 4.12.

**AUTOMATIC CR/LF BELL CRANK SPRING REQUIREMENT --- (FOR UNITS SO EQUIPPED)**

WITH FUNCTION CLUTCH DISENGAGED, MIN. 2-1/2 OZS. --- MAX. 7 OZS. TO MOVE THE BELL CRANK.

**LEFT MARGIN REQUIREMENTS --- (72 CHARACTER TYPICAL LINE).**

1. WITH TYPE BOX CLUTCH DISENGAGED, SPACING DRUM IN ITS RETURN POSITION AND TYPE BOX SHIFTED TO LETTERS POSITION; CLEARANCE BETWEEN LEFT EDGE OF PLATEN AND LETTERS PRINT INDICATOR. (SEE NOTE 3).
   MIN. 15/16 INCH --- MAX. 1-1/16 INCH.
   TO ADJUST --- POSITION STOP ARM OF SPACING DRUM* WITH ITS CLAMP SCREWS LOOSENED.

2. WITH SPACING CLUTCH DISENGAGED, FRONT SPACING FEED PAWL FARthest ADVANCED, SPACING DRUM FULLY RETURNED (DASH POT PLUNGER DEPRESSED FULLY) PLAY IN SPACING SHAFT GEAR (PAR. 2.24) TAKEN UP IN CLOCKWISE DIRECTION; CLEARANCE BETWEEN PAWL AND SHOULDER OF RATCHET WHEEL TOOTH IMMEDIATELY AHEAD.
   MIN. SOME --- MAX. 0.008 INCH.

3. THE REAR PAWL, WHEN FARTHEST ADVANCED, SHOULD DROP INTO INDENTATION BETWEEN RATCHET WHEEL TEETH AND SHOULD BOTTOM FIRMLY IN NOTCH.
   TO ADJUST --- REFINE REQUIREMENT (1) ABOVE.

*SHIFT TYPE BOX TO LTRS. POSITION, RETURN PRINT CARRIAGE TO ITS LEFT POSITION AND LOOSENCARRIAGE RETURN RING MOUNTING SCREWS (4). HOLD CARRIAGE RETURN RING IN ITS COUNTER-CLOCKWISE POSITION, AND POSITION TYPE BOX SO THAT ITS LTRS. INDICATOR ALIGNS WITH REQUIRED MARGIN. TIGHTEN MOUNTING SCREWS.
NOTE: CHECK RELATED ADJUSTMENTS, PARs. 2.30, 2.43 AND 2.47 IF THE FOLLOWING ADJUSTMENTS ARE REMADE.

SPACING CUT-OUT TRANSFER BAIL

RIGHT MARGIN
REQUIREMENT
TYPE BOX CLUTCH DISENGAGED, CARRIAGE IN POSITION TO PRINT CHARACTER ON WHICH SPACING CUTOUT IS TO OCCUR. FRONT FEED PAWL FARthest ADVANCED. SPACING CUTOUT TRANSFER BAIL HELD IN ITS UPPERMOST POSITION. ON UNITS HAVING TWO PIECE SPACING CUTOUT BAIL PUSH THE CUTOUT BAIL TOWARDS REAR OF UNIT THROUGH HOLE IN FRONT PLATE. CLEARANCE BETWEEN EXTENSION ON SPACE SUPPRESSION RING AND TRANSFER BAIL MIN. 0.006 INCH — MAX. 0.025 INCH

TO ADJUST
POSITION SPACE SUPPRESSION RING WITH FOUR INDICATED MOUNTING SCREWS LOOSEned.

NOTE
(1) RANGE OF ADJUSTMENT IS FROM 0 TO 85 CHARACTERS.
(2) ON UNITS EQUIPPED WITH AUTOMATIC CARRIAGE RETURN - LINE FEED RING, THIS ADJUSTMENT IS NOT APPLICABLE. (SEE PAR. 2.62)

SPACING CUTOUT TRANSFER BAIL SPRING
REQUIREMENT
MIN. 1 OZ.
MAX. 3-1/2 OZ.
TO START BAIL MOVING.

NOTE: FOR EARLIER DESIGN SEE PAR. 4.13
2.45 Positioning Mechanism (Cont.)

DECELERATING SLIDE SPRING

REQUIREMENT

PRINTING BAIL IN DOWNWARD POSITION. PRINTING CARRIAGE AND DECELERATING SLIDE ASSEMBLY IN RIGHT HAND POSITION.

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

TO START THE SLIDE MOVING WITH THE PRINTING CARRIAGE AND DECELERATING SLIDE IN THEIR LEFT HAND POSITION CHECK THE LEFT HAND DECELERATING SLIDE SPRING

DECELERATING SLIDE

DECELERATING SLIDE SPRING

NOTE: FOR EARLIER DESIGN SEE PAR. 4.13
2.46 Printing Mechanism

**Printing Carriage Lower Roller Requirement**
- Carriage wire rope clamp screws loosened.
- Play of carriage on track—min. without bind, throughout track's full length.
- To adjust (eccentric bushing) position lower roller with screw nut loosened. Keep high part of eccentric (chamfered corner) toward the right.
- To adjust (sliding screw) position lower roller with mounting screw loosened.

**Type Box Carriage Roller Arm Spring Requirement**
- Min. 28 ozs.
- Max. 36 ozs.
- To start upper roller, nearest type box latch, moving away from carriage track.

*Note: For earlier design see par. 4.14*
2.47 Printing Mechanism (Cont.)


![Diagram of printing mechanism]

- **Printing Hammer**
- **Period Type Pallet**
- **Type Box**
- **Clamp Screws**
- **Printing Carriage Position Requirement**
  - Type box in letters position. M type pallet selected. Carriage at approximate midpoint of platen. Type box in printing position. M type pallet should be approximately in center of printing hammer when hammer is just touching M type pallet. Take up play in type box carriage in each direction and set hammer in center of play.
  - To adjust position printing carriage on wire rope with clamp screws loosened.

![Diagram of printing mechanism](right side view)

- **Printing Hammer Bearing Stud Requirement**
  - Type box at midpoint of platen and in position to print period. Printing hammer in contact with type pallet and pressed downward at bearing post. Face of hammer should be fully on end of type pallet.
  - To adjust add or remove shims between shoulder on bearing post and stop bracket.
2.48 Positioning Mechanism (Cont.)

(A) SHIFT LINKAGE REQUIREMENT
CARRIAGE NEAR MIDPOINT OF PLATEN. TYPE BOX IN POSITION TO PRINT LETTER "O". MANUALLY BUCKLE RIGHT SHIFT LINKAGE. SHIFT TYPE BOX TO LEFT. FIGURE "9" TYPE PALLET SHOULD BE APPROXIMATELY IN CENTER OF PRINT HAMMER WHEN HAMMER IS JUST TOUCHING "9" TYPE PALLET.

TO ADJUST
POSITION LEFT SHIFT LINKAGE ON OSCILLATOR RAIL WITH TWO CLAMP SCREWS LOOSENED.
TO RECHECK
SHIFT ALTERNATELY FROM "W" TO "2". TAKE UP PLAY IN EACH DIRECTION. REFINE ADJUSTMENT IF NECESSARY.

(B) SHIFT LINKAGE SPRING REQUIREMENT
LINK IN STRAIGHT POSITION
MIN. 6 OZS.
MAX. 14 OZS.
TO START EACH LINK MOVING.

NOTE: FOR SHIFT MECHANISMS WITH TORSION SPRINGS SEE PAR. 4.15
2.49 Printing Mechanism (Cont.)

(A) PRINTING TRACK

REQUIREMENT
PRINTING TRACK IN ITS EXTREME DOWNWARD POSITION. BLANK SELECTION IN FIGURES.
PRINTING HAMMER OPERATING BAIL LATCHING EXTENSION HELD WITH LEFT FACE IN LINE
WITH THE LATCH SHOULDER. PRINTING ARM SLIDE POSITIONED ALTERNATELY OVER EACH
TRACK MOUNTING SCREW. PRINTING BAIL RESET EACH TIME. CLEARANCE BETWEEN LATCHING
EXTENSION AND OPERATING BAIL LATCH SHOULD BE
MIN. 0.015 INCH
MAX. 0.040 INCH

TO ADJUST
POSITION THE PRINTING TRACK UP OR DOWN WITH ITS MOUNTING SCREWS
LOOSENED. HOLD CLEARANCE TO MAXIMUM.

(B) PRINTING HAMMER PLUNGER SPRING

REQUIREMENT
MIN. 3 OZS.
MAX. 5-3/4 OZS.
TO START PLUNGER MOVING.

(C) PRINTING HAMMER OPERATING BAIL

SPRING (NOT AS ILLUSTRATED)
REQUIREMENT
OPERATING BAIL LATCHED,
SPRING ADJUSTING BRACKET IN LEFT-
HAND NOTCH. HAMMER YIELD SPRING
UNHOOKED.
MIN. 10 OZS.
MAX. 13 OZS.
TO START BAIL MOVING.

(D) PRINTING HAMMER YIELD SPRING

REQUIREMENT
PRINTING HAMMER OPERATING BAIL
AGAINST ITS STOP.
MIN. 1 OZ.
MAX. 2-1/2 OZS.
TO START HAMMER BAIL MOVING
(HORIZONTAL POSITION).

(E) PRINTING HAMMER OPERATING BAIL LATCH

SPRING (NOT AS ILLUSTRATED)
REQUIREMENT
PRINTING TRACK IN ITS EXTREME UPWARD
POSITION.
MIN. 3 OZS.
MAX. 4-1/2 OZS.
TO START LATCH MOVING.
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2. 50 Printing Mechanism (Cont.)

PRINTING HAMMER STOP BRACKET

REQUIREMENT --- WITH TYPE BOX IN POSITION TO PRINT CHARACTER "M", PRINTING TRACK IN ITS MAXIMUM DOWNWARD POSITION, AND PRINTING HAMMER STOP BRACKET HELD TOWARD THE PLATEN WITH PRESSURE OF 8 OZS; CLEARANCE BETWEEN PRINTING HAMMER AND "M" TYPE PALLET.

MIN. 0.005 INCH
MAX. 0.035 INCH

AT ANY POINT ALONG THE ENTIRE LENGTH OF THE PLATEN.

TO ADJUST --- POSITION STOP BRACKET BY MEANS OF ITS TWO MOUNTING SCREWS.

PRINTING HAMMER BAIL

PRINTING HAMMER OPERATING BAIL

LATCHING EXTENSION

OPERATING BAIL LATCH

HAMMER OPERATING BAIL STOP

PRINTING ARM

(1) REQUIREMENT
PRINTING TRACK IN MAXIMUM DOWNWARD POSITION,
PRINTING HAMMER OPERATING BAIL AGAINST ITS STOP.
SOME CLEARANCE BETWEEN SECONDARY PRINTING ARM AND FORWARD EXTENSION OF HAMMER OPERATING BAIL.
MAX. 0.015 INCH
WHEN PRINTING ARM SLIDE IS HELD DOWNWARD OVER EACH PRINTING TRACK MOUNTING SCREW FOR MAXIMUM CLEARANCE.

(2) REQUIREMENT
PRINTING TRACK IN UPPERMOST POSITION, LATCHING EXTENSION OF PRINTING HAMMER OPERATING BAIL SHOULD OVERTRAVEL LATCHING SURFACE OF OPERATING BAIL LATCH BY MIN. 0.006 INCH
CHECK RIGHT AND LEFT POSITIONS TO ADJUST
POSITION SECONDARY PRINTING ARM WITH CLAMP SCREWS LOOSENED.

NOTE 1
THE PRINTING ARM ADJUSTMENT SHOULD ALWAYS BE MADE WITH THE PRINTING HAMMER OPERATING BAIL SPRING BRACKET IN THE NO. 1 POSITION. POSITIONS NO. 2 AND 3 ARE TO BE USED ONLY FOR MAKING MULTIPLE COPIES.

NOTE 2
FOR EARLIER DESIGN SEE PAR. 4.16
2.51 Printing Mechanism (Cont.)

NOTE: THIS ADJUSTMENT APPLIES ONLY TO UNITS SO EQUIPPED AND SHOULD BE MADE WITH THE TYPEBOX IN ITS UPPER POSITION.

NOTE: RECHECK PRINTING STOP BRACKET ADJUSTMENT PAR. 2.50, AND READJUST IF NECESSARY.

TYPE BOX ALIGNMENT
REQUIREMENT
PRINTED IMPRESSION OF CHARACTERS AT TOP AND AT BOTTOM SHOULD BE EQUAL. (GAUGE VISUALLY)
TO ADJUST
LOOSE NUT. OPERATE PRINTER UNDER POWER. REPEAT CHARACTERS E AND Z. TURN ADJUSTING SCREW IN OR OUT (IN STEPS OF 1/4 TURN) TO MEET REQUIREMENT. TIGHTEN NUT.

ADJUSTING SCREW

TYPE BOX

TYPE BOX ADJUSTING PLATE

TYPE BOX CARRIAGE

(FRONT VIEW)

TYPE BOX

RETAINING CLIP

ADJUSTING SCREW

NUT

TYPE BOX ADJUSTING PLATE

TYPE BOX CARRIAGE

(LEFT SIDE VIEW)

NOTE: SOME TYPING UNITS ARE EQUIPPED WITH A RIBBON GUIDE WHICH HAS A TYPE BOX RETAINING CLIP WITH A LIMITED YIELD. IN CASES WHERE IT IS NECESSARY TO BACK THE ADJUSTING SCREW OUT TO PROVIDE HEAVIER PRINTING AT THE TOP OF A CHARACTER, IT MAY BE NECESSARY TO BEND THE SPRING CLIP ON THE RIBBON GUIDE TOWARD THE FRONT SO THAT THE TAB AT THE BOTTOM OF THE TYPE BOX IS HELD AGAINST THE HEAD OF THE ADJUSTING SCREW.
CHECK THE TWO COLOR RIBBON REQUIREMENTS PARs. 3.44 AND 3.45 ON UNITS SO EQUIPPED.

2.52 Printing Mechanism (Cont.)

RIBBON REVERSING LEVER - RIGHT

(A) RIBBON REVERSE SPUR GEAR

REQUIREMENT

WHEN RIGHT REVERSING LEVER IS IN MAXIMUM DOWNWARD POSITION, THE LEFT REVERSING LEVER SHOULD BE IN ITS MAXIMUM UPWARD POSITION.

TO ADJUST

LOOSEN THE SET SCREWS IN THE DETENT CAM. LOOSEN THE LEFT SPUR GEAR NUT. SECURELY TIGHTEN THE RIGHT SPUR GEAR NUT. MOVE THE RIGHT REVERSING LEVER TO ITS MAXIMUM DOWNWARD POSITION AND HOLD LEFT REVERSING LEVER IN ITS MAXIMUM UPWARD POSITION. THEN TIGHTEN THE LEFT SPUR GEAR NUT.

NOTE: ROTATE TYPE BOX CLUTCH 1/2 TURN AND MOVE RIGHT REVERSING LEVER UNDER THE SEGMENT. THERE SHOULD BE SOME CLEARANCE BETWEEN SEGMENT AND THE LEVER. REFINE ADJUSTMENT IF NECESSARY.

(b) RIBBON REVERSE DETENT

REQUIREMENT

RIBBON REVERSE DETENT LINK BUCKLED IN ITS DOWNWARD POSITION, CLEARANCE BETWEEN DETENT LINK AND DETENT LEVER.

MIN. SOME---MAX. 0.055 INCH

WHEN PLAY IN THE LEVER IS TAKEN UP LIGHTLY TOWARD THE RIGHT SIDE OF THE PRINTER.

TO ADJUST

HOLD LEFT RIBBON REVERSING LEVER IN ITS DOWNWARD POSITION, POSITION DETENT LINK, AND TIGHTEN THE UPPER SET SCREW IN THE HUB OF THE DETENT LINK. BUCKLE THE DETENT LINK UPWARD AND TIGHTEN LOWER SET SCREW.

NOTE: FOR EARLIER DESIGN SEE PAR. 4.17

(c) RIBBON REVERSE DETENT LEVER SPRING

(If unit is equipped)

REQUIREMENT

DETENT LINK BUCKLED IN UPWARD POSITION
MIN. 10 OZS.
MAX. 18 OZS.

TO START DETENT LEVER MOVING TOWARD REAR.
2.53 Printing Mechanism (Cont.)

RIBBON FEED LEVER BRACKET

(1) REQUIREMENT (LEFT-HAND MECHANISM)
   LEFT REVERSING LEVER IN UPWARD POSITION.
   RIBBON MECHANISM IN UPPER POSITION.
   RATCHET WHEEL HELD AGAINST THE DETENT LEVER.
   CLEARANCE BETWEEN THE FRONT FACE OF THE
   FEED LEVER AND THE SHOULDER OF A TOOTH
   ON THE RATCHET WHEEL.
   MIN. 0.015 INCH
   MAX. 0.035 INCH

TO ADJUST
POSITION THE FEED LEVER BRACKET WITH ITS
MOUNTING SCREWS LOOSENED.

RIBBON REVERSING LEVER-LEFT

FEED LEVER BRACKET

LONG FEED LEVER SPRING

MOUNTING SCREWS

RIBBON FEED LEVER SPRING

REQUIREMENT
RIBBON FEED LEVERS IN UPPERMOST POSITION.
FOR LONG LEVER: PUSH DOWNWARD NEAR
ITS SPRING.
FOR SHORT LEVER: PUSH DOWNWARD AT POINT
NEAR LONG LEVER SPRING.
MIN. 3/4 OZ.
MAX. 2 OZS.
TO START FEED LEVERS MOVING.
MEASURE ALL FOUR PAWLS.

NOTE: IF MINIMUM REQUIREMENT OF SHORT LEVER IS
NOT MET, PULL LOWER END OF TORSION
SPRING TO REAR.

(2) REQUIREMENT (RIGHT-HAND MECHANISM)
RIGHT REVERSING LEVER AND RIBBON
MECHANISM IN UPWARD POSITION.
ADJUST FEED LEVER BRACKET IN THE
SAME MANNER

NOTE
ROTATE THE MAIN SHAFT, THE
RATCHET WHEEL SHOULD STEP ONE
TOOTH ONLY WITH EACH OPERATION.

REFER TO PARS. 3.44 AND 3.45
FOR TWO COLOR RIBBON MECHANISM

RIBBON RATCHET WHEEL FRICION
SPRING
REQUIREMENT
FEED LEVERS DISENGAGED,
MIN. 3 OZS.
MAX. 7-1/2 OZS.
TO START THE RATCHET WHEEL MOVING.

*TWO COLOR RIBBON REQUIREMENT
MIN. 3 OZS.---MAX. 4 OZS.
TO START RATCHET WHEEL MOVING.
RIBBON LEVER SPRING
REQUIREMENT
MIN. 1-1/2 OZS.
MAX. 3 OZS.
TO START THE LEVER MOVING. CHECK BOTH RIGHT AND LEFT SPRINGS

RIBBON RATCHET WHEEL POSITIONED SO THAT EACH DRIVING PIN IS TOWARD THE OUTSIDE OF THE SPOOL SHAFT.
MIN. 3 OZS.
MAX. 5-1/2 OZS.
TO START SPOOL SHAFT MOVING.
2.55 Function Mechanism (Cont.)

NOTE: REFER TO BULLETIN 1149B FOR INSTRUCTIONS ON CODING THE UNCODED FUNCTION BAR.

(A) FUNCTION LEVER SPRING

NOTE: IF A FUNCTION LEVER OPERATES A CONTACT OR A SLIDE, HOLD OFF THE CONTACT OR SLIDE WHEN CHECKING THE SPRING TENSION.

REQUIREMENT
FUNCTION LEVER IN UNOPERATED POSITION.
SUPPRESSION BAIL HELD FORWARD.

STANDARD
MIN. 1-1/2 OZS.
MAX. 2-3/4 OZS.
TO START FUNCTION LEVER MOVING, CHECK EACH SPRING.

FUNCTION PAWL SPRING

FUNCTION PAWL

FUNCTION BAR SPRING

FUNCTION BAR

FUNCTION LEVER

FUNCTION LEVER SPRING

SUPPRESSION BAIL

(B) FUNCTION PAWL SPRING

REQUIREMENT
REAR END OF FUNCTION PAWL RESTING ON FUNCTION BAR
ONE STOP FUNCTION CLUTCH UNITS:
MIN. 3 OZS.
MAX. 5 OZS.
TWO STOP FUNCTION CLUTCH UNITS:
MIN. 7 OZS.
MAX. 10-1/2 OZS.
TO START PAWL MOVING.
CHECK EACH SPRING.

(C) FUNCTION BAR SPRING

REQUIREMENT
FUNCTION CLUTCH DISENGAGED.
FUNCTION PAWL HELD AWAY.
MIN. 2-1/2 OZS.
MAX. 3-1/2 OZS.
TO START FUNCTION BAR MOVING.

CAUTION: SEVERE WEAR TO THE POINT OF OPERATIONAL FAILURE WILL RESULT IF THE TELETYPEWRITER IS OPERATED WITHOUT EACH FUNCTION PAWL HAVING EITHER A RELATED FUNCTION BAR OR, WHERE A FUNCTION BAR IS MISSING, A RELATED FUNCTION PAWL CLIP TO HOLD THE FUNCTION PAWL AWAY FROM THE STRIPPER BLADE.
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2.56 Function Mechanism (Cont.)

<table>
<thead>
<tr>
<th>REQUIREMENT (RIGHT-HAND POSITION)</th>
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<tbody>
<tr>
<td>The clip should not prevent the associated function pawl from engaging its function bar.</td>
</tr>
<tr>
<td>To adjust</td>
</tr>
<tr>
<td>Position the clip to its extreme right-hand position</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REQUIREMENT (CENTER POSITION)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The clip should hold the function pawl out of engagement with its function bar but should not interfere with the function lever.</td>
</tr>
<tr>
<td>To adjust</td>
</tr>
<tr>
<td>Position the clip with its mounting screw loosened.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REQUIREMENT (LEFT-HAND POSITION)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The clip should hold the function pawl upward out of engagement with its function bar. It should also hold the top end of the function lever in its rear position.</td>
</tr>
<tr>
<td>To adjust</td>
</tr>
<tr>
<td>Position the clip to its extreme left-hand position.</td>
</tr>
</tbody>
</table>
(B) **PLATEN DETENT BAIL SPRING**

**REQUIREMENT**

- DETENT SEATED BETWEEN TWO TEETH ON LINE FEED SPUR GEAR.
- **MIN.** 16 OZS.
- **MAX.** 32 OZS.
- TO START DETENT BAIL MOVING

(D) **LINE FEED BAR BELL CRANK SPRING**

**REQUIREMENT**

- LEFT-HAND LINE FEED BAR IN REAR POSITION.
- **FRICION FEED**
  - **MIN.** 19 OZS.
  - **MAX.** 28 OZS.
- **SPROCKET FEED**
  - **MIN.** 24 OZS.
  - **MAX.** 38 OZS.
- TO START BAR MOVING.

(C) **LINE FEED BAR RELEASE LEVER SPRING**

**REQUIREMENT**

- **MIN.** 3 OZS.
- **MAX.** 8 OZS.
- TO START LEVER MOVING.

ON LP68

- **MIN.** 8 OZS.
- **MAX.** 12 OZS.

**LINE FEED BAR RELEASE LEVER**

**HAND WHEEL**

(A) **LINE FEED SPUR GEAR DETENT ECCENTRIC**

**REQUIREMENT**

LINE FEED CLUTCH DISENGAGED, PLATEN ROTATED UNTIL DETENT STUD IS SEATED BETWEEN TWO TEETH ON LINE FEED SPUR GEAR. WHEN HAND WHEEL IS RELEASED, MANUALLY SET THE TEETH ON THE FEED BARS INTO ENGAGEMENT WITH THE TEETH ON THE LINE FEED SPUR GEAR. THE DETENT STUD SHOULD CONTACT ONE GEAR TOOTH AND BE NOT MORE THAN 0.010 INCH FROM OTHER TOOTH TO ADJUST.

ROTATE THE DETENT ECCENTRIC WITH ITS MOUNTING SCREW LOOSENED. KEEP HIGH PART OF ECCENTRIC UPWARD.

**LINE FEED BAR RELEASE LEVER SPRING**

**REQUIREMENT**

- **DETENT SEATED BETWEEN TWO TEETH ON LINE FEED SPUR GEAR**
- **MIN.** 16 OZS.
- **MAX.** 32 OZS.
- TO START DETENT BAL MOVING

**LINE FEED BAR**

**LINE FEED BAR BELL CRANK**

**LINE FEED BAR RELEASE LEVER**

**HAND WHEEL**

**LINE FEED BAR BELL CRANK SPRING**

**REQUIREMENT**

- LEFT-HAND LINE FEED BAR IN REAR POSITION.
- **FRICION FEED**
  - **MIN.** 19 OZS.
  - **MAX.** 28 OZS.
- **SPROCKET FEED**
  - **MIN.** 24 OZS.
  - **MAX.** 38 OZS.
- TO START BAR MOVING.
SECTION 573-115-700

2.58 Function Mechanism (Cont.)

STRIPPER BLADE DRIVE CAM POSITION

REQUIREMENT

STRIPPER BLADE DRIVE CAM SHOULD MOVE EACH STRIPPER BLADE CAM ARM AN EQUAL DISTANCE ABOVE AND BELOW CENTER LINE OF ITS PIVOT (GAUGE BY EYE)

A. UPWARD DIRECTION
B. DOWNWARD DIRECTION

TO CHECK

WITH FUNCTION CLUTCH DISENGAGED OBSERVE ENGAGEMENT OF STRIPPER BLADE DRIVE CAM (UPPER PEAK) WITH STRIPPER BLADE CAM ARM. THEN ROTATE CLUTCH TO TURN CAM TO ITS EXTREME DOWNWARD POSITION AND OBSERVE ENGAGEMENT OF LOWER CAM PEAK.

TO ADJUST

WITH STRIPPER BLADE DRIVE ARM MOUNTING SCREWS LOOSENED, EQUALIZE THE OVERTRAVEL OF EACH CAM PEAK.

NOTE: FOR EARLIER DESIGN SEE PAR. 4.18
2.59 Spacing Mechanism (Cont.)

**SPACING SUPPRESSION BAIL SPRING**

REQUIREMENT

SPACING SUPPRESSION BAIL IN REAR POSITION. SCALE APPLIED NEAR CENTER OF HORIZONTAL PORTION OF BAIL.

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

2.60 Line Feed and Platen Mechanism (Cont.)

**LINE FEED STRIPPER BAIL SPRING**

REQUIREMENT

LINE FEED CLUTCH DISENGAGED. SCALE HOOKED UNDER LINE FEED STRIPPER BAIL.

MIN. 1/2 OZ.
MAX. 2 OZS.
TO START STRIPPER BAIL MOVING UPWARD.

EARLY DESIGN
REFER TO PAR. 2.61 FOR LATER DESIGN
2.61 Line Feed and Platen Mechanism (Cont.)

SINGLE-DOUBLE LINE FEED LEVER

FUNCTION BAR

STRIPPER BLADE

SINGLE - DOUBLE LINE FEED STRIPPER BAIL ASSEMBLY SPRINGS

(1) REQUIREMENT
LINE FEED CLUTCH DISENGAGED AND SINGLE - DOUBLE LINE FEED LEVER IN SINGLE LINE FEED POSITION,
MIN. 1/2 OZ.
MAX. 2 OZS.
TO START STRIPPER BAIL ARM MOVING UPWARD.

(2) REQUIREMENT
LINE FEED CLUTCH DISENGAGED AND SINGLE - DOUBLE LINE FEED LEVER IN SINGLE LINE FEED POSITION
MIN. 1/2 OZ.
MAX. 2 OZS.
TO START STRIPPER BAIL ARM MOVING TO LEFT AS SHOWN

NOTE: FOR EARLIER DESIGN SEE PAR. 4.20
2.62 Spacing Mechanism (Cont.)

RIGHT MARGIN WITH
AUTOMATIC CARRIAGE RETURN - LINE FEED RING
REQUIREMENT (ON UNITS SO EQUIPPED)
TYPE BOX CLUTCH DISENGAGED, CARRIAGE
POSITIONED TWO SPACES BEFORE CHARACTER
ON WHICH AUTOMATIC CARRIAGE RETURN-LINE
FEED IS TO OCCUR. FRONT FEED PAWL FARTHEST
ADVANCED,
CLEARANCE BETWEEN EXTENSION ON RING
AND AUTOMATIC CARRIAGE RETURN-LINE FEED
BELL CRANK.
MIN. 0.040 INCH --- MAX. 0.055 INCH
TO ADJUST
POSITION RING WITH FOUR INDICATED
MOUNTING SCREWS LOOSENED.

SPACING CUT-OUT TRANSFER BAIL SPRING
SEE PAR. 2.44.

NOTE: FOR ADJUSTMENT ON EARLIER MODELS SEE PAR. 4.19
2.63 Positioning Mechanism (Cont.)

HORIZONTAL STOP SLIDE SPRING

(FRONT TOP VIEW)

HORIZONTAL STOP SLIDE SPRING

REQUIREMENT
CODE BARS IN MARKING POSITION (LEFT)
TYPE BOX CLUTCH ROTATED 1/4 TURN FROM ITS STOP POSITION
HORIZONTAL MOTION DECELERATING SLIDES (PAR. 2.35) HELD
AWAY FROM HORIZONTAL STOP SLIDES
MIN. 1/2 OZ. MAX. 1-1/2 OZS. FOR UPPER AND LOWER SLIDES
MIN. 1-3/4 OZS. MAX. 3 OZS. FOR MIDDLE SLIDE
TO START SLIDE MOVING.
NOTE: WHEN CHECKING UPPER AND LOWER SLIDES, HOLD MIDDLE
SLIDE 1/32 INCH FORWARD.

2.64 Line Feed and Platen Mechanism (Cont.)

PAPER STRAIGHTENER COLLAR - LEFT

PAPER STRAIGHTENER COLLAR - RIGHT

PAPER STRAIGHTENER LEVER SPRING

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

PAPER STRAIGHTENER COLLAR

REQUIREMENT
LEFT COLLAR SPACE
MIN. 9/32 INCH
MAX. 21/64 INCH
FROM THE LEFT SHOULDER ON THE
PAPER STRAIGHTENER SHAFT.
RIGHT COLLAR SPACED.
MIN. 1/16 INCH
MAX. 5/64 INCH
FROM THE RIGHT SHOULD
TO ADJUST
POSITION COLLARS ON SHAFT WITH
SET SCREWS LOOSENED.

NOTE: FOR SPROCKET FEED MECHANISM SEE PAR. 2.75
2.65 Line Feed and Platen Mechanism (Cont.)

**PAPER FINGER SHAFT**

**PAPER FINGER**

**PAPER**

**PAPER FINGER**

**PAPER FINGER - RIGHT**

**PAPER FINGER SPRING**

**PLATEN**

**PRESSURE ROLLER**

**PRESSURE ROLLER LEVER**

**COMPRESSION SPRING**

**PRESSURE ROLLER LEVER SPRING**

**PAPER PRESSURE BAIL SPRING**

**NOTE:** FOR SPROCKET FEED MECHANISM SEE PAR. 2.73

---

**THE PRESSURE END OF THE PAPER FINGERS SHOULD OVERLAP THE PAPER FROM 3/8 INCH TO 1/2 INCH.**

**TO ADJUST**

**POSITION THE PAPER FINGERS BY SLIDING THEM ON THEIR SHAFT.**

**PULL UPWARD ON RIGHT PAPER FINGER TO START LEFT PAPER FINGER MOVING FROM PLATEN.**

**MIN.** 3 OZS.

**MAX.** 6 OZS.

**SCALE HOOKED OVER PRESSURE BAIL AT EACH END OF PLATEN.**

**MIN.** 7 OZS.

**MAX.** 20 OZS.

**TO MOVE PRESSURE BAIL FROM PLATEN.**
2.66 Function Mechanism (Cont.)

**Diagram:**
- Wire Spring Type Lug
- Standard Lug
- Function Lever (Unoperated)

**NOTE:** For earlier design see Par. 4.21 and 4.22

**FUNCTION CONTACT SPRING REQUIREMENT**
- Contact Closed
  - Min. 1 oz.
  - Max. 2 ozs.
  - To open switch contact

- Function Lever (Operated)

**CONTACT PLATE**

**NOTE:** If the switches are removed from the stunt box, the following requirements apply:

1. Provide at least 0.006 inch clearance between the contact arm and the vertical portion of the contact clip. If the switch has contacts front and rear, this clearance applies to both front and rear. To obtain this clearance, position the contact plate before tightening the contact plate screws. The contact must be made before the function lever touches the top plate.

2. On switches with contacts front and rear, check to see that there is a gap of 0.008 to 0.028 inch between the formed-over end of the front contact clip and the bottom of the contact arm when the rear contact is closed.
2.67 Function Mechanism (Cont.)

(1) REQUIREMENT

TO PREVENT UNSHIFT-ON-SPACE FUNCTION, PROVIDE CLEARANCE BETWEEN THE LOWER EDGE OF THE UNSHIFT-ON-SPACE FUNCTION PAWL AND ITS FUNCTION BAR.

MIN. 0.015 INCH

MAX. 0.060 INCH

TO ADJUST

LOosen THE LOCK NUT AND TURN THE DISABLING SCREW IN.

(2) REQUIREMENT

TO RESTORE THE UNSHIFT-ON-SPACE FUNCTION, BACK OFF THE SCREW SO THAT PAWL FULLY ENGAGES THE FUNCTION BAR. THEN CONTINUE TO TURN THE SCREW OUT ONE TO THREE TURNS.
SECTION 573-115-700

2.68 Codebar Mechanism (Cont.)

**CODE BAR DETENT**

**REQUIREMENT**

- FRONT PLATE REMOVED. ALL CLUTCHES DISENGAGED.
- SUPPRESSION AND SHIFT CODE BARS SHOULD DETENT EQUALLY (GAUGED BY EYE)
- TO ADJUST
  - EQUALIZE THE DETENTING OF THE CODE BARS BY ADDING OR REMOVING SHIMS BETWEEN THE CASTING AND THE CODE BAR BRACKET.

**CODE BAR DETENT BRACKET**

**SHIMS**

- SUP
- 4
- 1
- 5
- 2
- 3
- COM.
- 0
- S

**CODE BAR GUIDE BRACKET**

- SHIMS

**CODE BAR**

- (LEFT SIDE VIEW)

- (FRONT VIEW)

- DETENT BALL

- (TOP CROSS SECTION)

**CODE BAR DETENT SPRING**

**NOTE**

UNLESS THERE IS REASON TO BELIEVE THAT THESE SPRINGS ARE CAUSING OPERATING FAILURE DO NOT CHECK THIS REQUIREMENT.

**REQUIREMENT**

- CODE BAR DETENT BRACKET CAREFULLY REMOVED AND CODE BARS REMOVED FROM DETENT BRACKET. SCALE APPLIED TO DETENT BALL AND PULLED IN DIRECTION OF BALL TRAVEL
- MIN. 1-1/2 OZS.
- MAX. 3-1/2 OZS.
- TO START BALL MOVING AGAINST COMPRESSION OF SPRING. CHECK EACH BALL

**CODE BAR YIELD SPRING (IF SO EQUIPPED)**

**REQUIREMENT**

- SELECTOR CLUTCH, CODE BAR CLUTCH, AND TYPE BOX CLUTCH DISENGAGED. NO. 1 CODE BAR IN SPACING POSITION
- MIN. 14 OZS.
- MAX. 23 OZS.
- TO START CODE BAR SHIFT BAR PIVOT MOVING AWAY FROM CODE BAR. CHECK NO. 2 AND COMMON CODE BAR SHIFT BAR IN THE SAME MANNER.
2.69 Spacing Mechanism (Cont.)

MARGIN INDICATOR LAMP

REQUIREMENT
OPERATING UNDER POWER, THE LAMP SHOULD LIGHT ON THE DESIRED CHARACTER.

TO ADJUST
SET THE TYPE BOX CARRIAGE TO PRINT THE DESIRED CHARACTER AND POSITION THE CAM DISK COUNTERCLOCKWISE ON THE SPRING DRUM WITH ITS THREE MOUNTING SCREWS LOOSENED SO THAT THE SWITCH JUST OPENS. IF A LINE SHORTER THAN 72 CHARACTERS IS REQUIRED, IT MAY BE NECESSARY TO REMOVE THE CAM DISK SCREWS AND INSERT THEM IN ADJACENT SLOTS IN THE DISK, IF THE RANGE OF ROTATION IN ONE SLOT IS NOT ENOUGH.
SECTION 573-115-700

2.70 Positioning Mechanism (Cont.)

TYPE BOX POSITION

REQUIREMENT

TYPE BOX AND SPACING CLUTCHES DISENGAGED. TYPE BOX SHIFTED TO LETTERS POSITION. FOUR MOUNTING SCREWS LOOSENED SO THAT SPACE SUPPRESSION RING, OR AUTOMATIC CARRIAGE RETURN LINE FEED RING, IS FREE TO ROTATE ON DRUM. (UNITS EQUIPPED WITH LIMITED ADJUSTMENT SPACING DRUM: SPACING CUT OUT AND AUTOMATIC CARRIAGE RETURN LINE FEED ARMS IN MAXIMUM COUNTER-CLOCKWISE POSITION. SEE PAR. 4.07) CLEARANCE BETWEEN LETTERS PRINT INDICATOR AND CENTER LINE OF SPROCKET PINS IN RIGHT HUB:

MIN. 5/16 INCH
MAX. 7/16 INCH

TO ADJUST
LOOSEN TWO TYPE BOX CLAMP SCREWS AND TWO PRINTING CARRIAGE CLAMP SCREWS. POSITION TYPE BOX. TIGHTEN TYPE BOX CLAMP SCREWS. DO NOT TIGHTEN PRINTING CARRIAGE CLAMP SCREWS UNTIL PRINTING CARRIAGE POSITION ADJUSTMENT IS MADE.
2.71 Line Feed and Platen Mechanism (Con't)

(A) **LEFT MARGIN REQUIREMENT**

1. Type box clutch disengaged, spacing drum fully returned, and type box shifted to letters position: Clearance between center of letters print indicator on type box and center line of sprocket pins at left hub should be:
   - Min. 5/16 inch --- Max. 7/16 inch
   
   TO ADJUST --- position carriage return ring with its mounting screws loosened.

2. Spacing clutch disengaged, front spacing feed pawl in its farthest advanced position, spacing drum fully returned, and play in spacing gear (Par. 2.24) taken up clockwise: Clearance between pawl and shoulder of ratchet wheel tooth immediately ahead:
   - Min. some --- Max. 0.008 inch

3. The rear pawl when farthest advanced should drop into the indentation between ratchet wheel teeth and should bottom firmly in notch.

   TO ADJUST --- refine requirement (1) above

---

(B) **PRINTING HAMMER STOP BRACKET**

1. For units with thick typebox and dummy type pallets use corresponding standard adjustment except clearance between printing hammer and dummy type pallet should be
   - Min. some --- Max. 0.020 inch

2. For units with thin typebox - no dummy type pallets, use corresponding standard adjustment.

3. Certain multiple form units will require a refinement of standard adjustment for the stop bracket to
   - Min. 0.005 inch --- Max. 0.015 inch

---

(C) **RIGHT MARGIN**

1. For units with limited adjustment spacing drum, use corresponding standard adjustment.

2. For units with universal spacing drum, use corresponding standard adjustment.

---

(D) **PRINTING CARRIAGE POSITION**

**USE PAR. 2.4**

(E) **TYPE BOX ALIGNMENT**

**USE PAR. 2.51**

Following this adjustment, all screws should be tightened.
2.72 Line Feed and Platen Mechanism (Con't)

(A) **LINE FEED SPUR GEAR DETENT ECCENTRIC**

Use PAR. 2.57

(B) PRINTED LINE

**REQUIREMENT**

The bottom of the printed line should be 1/32 inch ± 1/64 inch (plus a multiple of 1/6 inch if required) above a horizontal line drawn even with the bottom edge of any sprocket hole.

To adjust:

Loosen screws and position left sprocket. If other than standard paper is used, it may be necessary to make a variation in this adjustment.

Note: spur gear and left platen retainer must be removed to make printed line adjustment.

(C) PLATEN END PLAY

**REQUIREMENT**

Line feed pawls disengaged.

Platen shaft should have some end play

Max. 0.010 inch

To adjust:

Position platen spur gear with clamp screw loosened.

(D) SPROCKET PIN SEPARATION

**REQUIREMENT**

(1) With single sheet of sprocket feed paper placed on the platen the sprocket pins should be centrally located in the feed holes of the paper.

(2) Printed line should be parallel to a line drawn perpendicular to edge of paper within plus or minus 1/32 inch.

To adjust:

Position right sprocket with clamp screw loosened.
2.73 Line Feed and Platen Mechanism (Con't)

**Requirement**

1. **SPROCKET PIN** should be centrally located in the paper finger or guide bracket slot.

2. **REQUIREMENT**
   - **THE GAP BETWEEN THE PLATEN AND THE PAPER FINGER OR GUIDE BRACKET** should be
     - **STAPLED**
       - MIN. 0.050 INCH
       - MAX. 0.105 INCH
     - **SINGLE COPY OR UNSTAPLED MULTIPLE COPY**
       - 0.020 INCH
       - 0.060 INCH

To adjust with paper finger or guide bracket assembly in latched position, loosen both clamp screws, position assembly horizontally to meet requirement (1), rotate assembly to meet requirement (2).

3. **REQUIREMENT (NOT ILLUSTRATED)**
   - MIN. 0.035 INCH
   - BETWEEN LEADING EDGE OF PAPER FINGER OR GUIDE BRACKET AND RIBBON GUIDE. BOTH RIGHT AND LEFT PAPER FINGERS MUST BE PARALLEL TO THE SAME PRINTED LINE AS GAUGED BY EYE.

To adjust:
   - Select letters combination and rotate type box clutch 1/2 revolution.
   - Position paper fingers by means of elongated mounting holes. After tightening the screws recheck these requirements.

**NOTE** --- A minimum clearance that will pass stationery freely is desired. This minimum value is dependent upon type of paper, number of copies, stapling etc.
2.74 Line Feed and Platen Mechanism (Cont.)

SPROCKET PIN SPRING

REQUIREMENT
MIN. 6 OZS.
MAX. 8 OZS.
TO START DEPRESSING THE PIN.

(A) PAPER GUIDE
REQUIREMENT
THE CLEARANCE BETWEEN THE PLATEN AND THE FRONT EDGE OF THE PAPER GUIDE SHOULD BE
STAPLED SINGLE COPY OR UNSTAPLED
MULTIPLE COPY MULTIPLE COPY
MIN. 0.050 INCH 0.020 INCH
MAX. 0.105 INCH 0.060 INCH
TO ADJUST POSITION THE GUIDE WITH ITS REAR MOUNTING SCREWS LOOSENED.

*NOTE --- A MINIMUM CLEARANCE THAT WILL PASS STATIONERY FREELY IS DESIRED. THIS MINIMUM VALUE IS DEPENDENT UPON TYPE OF PAPER, NUMBER OF COPIES, STAPLING ETC.

(C) RIBBON REVERSE SPUR GEAR
USE PAR. 2.52

(D) RIBBON REVERSE DETENT
USE PAR. 2.52

(E) LINE FEED BAR BELL CRANK SPRING
USE PAR. 2.57 EXCEPT
MIN. 28 OZS.
MAX. 38 OZS.
TO START BAR MOVING.
2.75 Line Feed and Platen Mechanism (Con't)

(A) PAPER FINGER OR GUIDE BRACKET SHAFT SPRING
REQUIREMENT
MIN. 6 OZS.
MAX. 10 OZS.
TO MOVE PAPER FINGER OR GUIDE
BRACKET AGAINST THE PLATEN.

(B) PAPER FINGER OR GUIDE BRACKET LATCH SPRING
REQUIREMENT
PAPER FINGER OR GUIDE BRACKET AGAINST PLATEN
MIN. 8 OZS.
MAX. 12 OZS.
TO START LATCH MOVING.

NOTE
SPROCKET FEED MECHANISM WITH RETRACTABLE PINS

PAPER FINGER LOCKING ARM SPRING
REQUIREMENT --- IT SHALL REQUIRE
MIN 1 OZ --- MAX 1-1/2 OZS
TO MOVE ARM AWAY FROM PLATEN

PLATEN DETENT BAIL SPRING
USE PAR. 2.57
SECTION 573-115-700

3. VARIABLE FEATURES
3.01 Horizontal Tabulator Mechanism

NOTE: FOR EARLIER DESIGN SEE PARs. 4.24 THROUGH 4.29.

SPACING CLUTCH TRIP LEVER

REQUIREMENT
SPACING CLUTCH DISENGAGED. TRIP LEVER ARM AND INTERMEDIATE BAIL IN THEIR UPWARD POSITION. THE OUTER SURFACE OF THE TRIP LEVER SHOULD BE FLUSH WITH THE OUTER SURFACE OF THE SHOE LEVER OR UNDER FLUSH TO .010 INCH. CHECK AT STOP LUG WITH LEAST BITE.

TO ADJUST
USE ADJUSTING SCREW TO POSITION SPACING CLUTCH TRIP LEVER.

NOTE
IF THIS ADJUSTMENT IS CHANGED, CHECK THE LATCH BAIL ADJUSTING PLATE - PAR. 3.03

SPACING CLUTCH TRIP LEVER SPRING

REQUIREMENT
SPACING CLUTCH ENGAGED. ROTATE CLUTCH UNTIL TRIP LEVER RESTS ON STOP LUG.
MIN. 11 OZS.
MAX. 16 OZS.
TO MOVE TRIP LEVER AWAY FROM STOP LUG.
3.02 Horizontal Tabulator Mechanism (Con't)

OPERATING LEVER SLIDE ARM

NOTE
PRIOR TO THIS ADJUSTMENT CHECK THE FUNCTION RESET BAIL BLADE ADJUSTMENT.

REQUIREMENT
ON UNITS WITH TWO-STOP FUNCTION CLUTCHES, FUNCTION CLUTCH DISENGAGED.
TYPE BOX CLUTCH ROTATED 1/2 REVOLUTION PAST STOP POSITION. ON UNITS WITH
ONE-STOP FUNCTION CLUTCH, ROTATE FUNCTION CLUTCH UNTIL FUNCTION PAWL
STRIPPER BLADE IS IN ITS LOWER POSITION AND THE FUNCTION RESET BAIL ROLLER IS
ON THE HIGH PART OF ITS CAM. HORIZONTAL TABULATOR FUNCTION PAWL PULLED
TO REAR UNTIL LATCHED ON ITS FUNCTION BAR. CLEARANCE BETWEEN FRONT END
OF OPERATING LEVER SLIDE ARM AND BLOCKING SURFACE OF BLOCKING LEVER
MIN. 0.015 INCH—MAX. 0.035 INCH

TO ADJUST
POSITION SLIDE ARM ON OPERATING LEVER WITH MOUNTING STUD FRICTION TIGHT.
NOTE
WHEN PULLING FUNCTION PAWL TO THE REAR, IF THE OPERATING LEVER CAM ARM
SHOULD BE STRIPPED OFF THE TABULATOR SLIDE ARM BEFORE THE FUNCTION PAWL IS
LATCHED ON THE FUNCTION BAR, TEMPORARILY DISABLE THE STRIPPER BAIL ARM BY
LOOSENING ITS ADJUSTING SCREW.

(LEFT VIEW)

OPERATING LEVER SLIDE ARM SPRING

REQUIREMENT
TRIP LEVER ARM LATCH BAIL SPRING UNHOOKED. OPERATING LEVER IN
OPERATED POSITION WITH SLIDE ARM AGAINST BLOCKING LEVER.
MIN. 8-3/4 OZS. — MAX. 10-3/4 OZS.
TO START LINK MOVING.
NOTE
ON UNITS EQUIPPED WITH TRANSMITTER CONTROL CONTACT, HOLD CONTACT SPRING AWAY FROM STUD
WHEN MEASURING TENSION.

OPERATING LEVER ADJUSTING PLATE

REQUIREMENT
OPERATING LEVER IN UNOPERATED
POSITION. TAKE UP PLAY IN SLIDE ARM AND BLOCKING LEVER TO
MINIMIZE CLEARANCE. CLEARANCE BETWEEN FRONT END OF SLIDE ARM
AND LOWER PROJECTION OF BLOCKING LEVER
MIN. 0.020 INCH—MAX. 0.045 INCH
TO ADJUST
POSITION ADJUSTING PLATE ON BRACKET
WITH MOUNTING SCREWS LOOSENED.

NOTE
IF OPERATING LEVER SLIDE ARM OR OPERATING LEVER ADJUSTING PLATE ADJUSTMENT IS CHANGED ON UNITS
EQUIPPED WITH TRANSMITTER CONTROL CONTACT, CHECK
CONTROL CONTACT GAP AND REMAKE IF NECESSARY.
SECTION 573-115-700

3.03 Horizontal Tabulator Mechanism (Con't)

TRIP LEVER ARM LATCH BAIL

**REQUIREMENT**
- OPERATING LEVER UNOPERATED,
- TRIP LEVER ARM UP. CLEARANCE BETWEEN THE TRIP LEVER ARM AND THE TRIP LEVER ARM LATCH BAIL MIN. 0.020 INCH --- MAX. 0.040 INCH
- TO ADJUST POSITION LATCH BAIL ADJUSTING SCREW WITH ITS LOCK NUT LOOSENED

TRIP LEVER ARM LATCH BAIL SPRING

**REQUIREMENT**
- OPERATING LEVER UNOPERATED,
- TRIP LEVER ARM UP.
- MIN. 2-1/2 OZS. --- MAX. 4-1/2 OZS.
- TO START LATCH BAIL MOVING.

INTERMEDIATE BAIL SPRING

**REQUIREMENT**
- TRIP LEVER ARM AND INTERMEDIATE BAIL IN UNOPERATED POSITION.
- MIN. 1-1/2 OZS. --- MAX. 3-1/2 OZS.
- TO PULL SPRING TO INSTALLED LENGTH.

SPACE SUPPRESSION BAIL

INTERMEDIATE BAIL

(LEFT VIEW)

CLUTCH SHOE LEVER

CLUTCH TRIP LEVER

LATCH BAIL ADJUSTING PLATE

**REQUIREMENT**
- OPERATING LEVER SLIDE ARM POSITIONED TO REAR AND LATCHED ON BLOCKING LEVER. TRIP LEVER ARM LATCH BAIL IN FULLY LATCHED POSITION. SPACING TRIP LEVER DISENGAGED FROM INTERMEDIATE BAIL BY PUSHING FORWARD ON SPACE SUPPRESSION BAIL. CLEARANCE BETWEEN CLUTCH TRIP LEVER AND CLUTCH SHOE LEVER MIN. SOME --- MAX. 0.008 INCH
- TO ADJUST POSITION LATCH BAIL ADJUSTING PLATE WITH MOUNTING SCREWS LOOSENED.
- CHECK AT THE CLUTCH SHOE LEVER WITH THE LEAST CLEARANCE.
3.04 Horizontal Tabulator Mechanism (Cont.)

**HORIZONTAL TABULATOR SLIDE ARM SPRING**

**REQUIREMENT**
- OPERATING LEVER IN UNOPERATED POSITION.
- SLIDE ARM IN UNOPERATED POSITION.
- MIN. 1 OZ.
- MAX. 4 OZS.
- TO START SLIDE ARM MOVING.

**OPERATING LEVER CAM ARM SPRING**

**REQUIREMENT**
- OPERATING LEVER IN UNOPERATED POSITION, HORIZONTAL TABULATOR FUNCTION PAWL UNLATCHED.
- MIN. 4 OZS.
- MAX. 9 OZS.
- TO START STRIPPER BAIL MOVING.

**CAM ARM STRIPPER BAIL**

**REQUIREMENT**
- OPERATING LEVER AND TABULATOR SLIDE ARM IN UNOPERATED POSITIONS.
- SPACING CLUTCH ROTATED UNTIL HIGH PART OF SPACING CAM IS OPPOSITE STRIPPER BAIL.
- CLEARANCE BETWEEN SPACING CAM AND STRIPPER BAIL
- MIN. 0.010 INCH
- MAX. 0.025 INCH
- TO ADJUST POSITION STRIPPER BAIL ARM ON STRIPPER BAIL WITH STRIPPER BAIL ARM SCREW FRICITION TIGHT.

**SPACING CUT-OUT TRANSFER BAIL**

**REQUIREMENT**
- TRANSFER BAIL SHOULD HAVE SOME END PLAY,
- MAX. 0.008 INCH
- TO ADJUST POSITION SET COLLAR WITH ADJUSTING SCREW LOOSENED.
Section 573-115-700

3.05 Horizontal Tabulator Mechanism (Cont.)

**Requirement**

Clearance between spacing cut-out lever on spacing drum and bail extension arm

- **Min.**: 0.006 inch
- **Max.**: 0.025 inch

**To Check**

Place type box in position to print character on which spacing cut-out is desired. Pull forward on part of transfer bail extending below mounting shaft until bail is in fully operated position. Gage clearance.

**To Adjust**

Position cut-out lever with clamp screw loosened.

**Note**

Four screws must be loosened to adjust circular cut-out levers. Do not loosen hex. head screw that clamps front ring.

**Space Suppression**

**By-Pass Spring**

**Requirement**

- **Min.**: 20 ozs.
- **Max.**: 26 ozs.

To start bail extension moving.
3.06 Horizontal Tabulator Mechanism (Con't)

**SPACING DRUM**

**GARTER SPRING**

**SPACING PAWLS**

**TABULATOR STOP**

**TABULATOR RING**

**ROLLER**

**TABULATOR PAWL**

**OPERATING LEVER**

**SLIDE ARM**

**MOUNTING SCREWS**

**PAWL ADJUSTING PLATE**

**BLOCKING LEVER**

**NOTE:**

BEFORE MAKING THIS ADJUSTMENT, CHECK LEFT MARGIN AND SPACING GEAR PHASING ADJUSTMENTS.

PURPOSE

TO SELECT TABULATOR STOP TO BE USED AS REFERENCE IN MAKING FINAL TABULATOR PAWL HORIZONTAL AND VERTICAL ADJUSTMENTS.

PROCEDURE

(1) BEGINNING WITH 15TH SLOT COUNTERCLOCKWISE FROM ROLLER ON TABULATOR RING, PLACE TABULATOR STOPS APPROXIMATELY AN EQUAL NUMBER OF SLOTS APART AROUND REMAINING SLOTTED PERIPHERY OF RING CORRESPONDING TO LENGTH OF PRINTED LINE.

(2) TO MOVE STOPS, HOOK SMALL SPRING HOOK IN HOLE AND PULL OUT RADIA LLY FROM DRUM. HOLDING STOP AWAY FROM DRUM, SLIDE IT ON GARTER SPRING TO DESIRED LOCATION AND INSERT IN SLOT. SPACING DRUM MAY HAVE TO BE ROTATED TO MAKE SOME SLOTS ACCESSIBLE. CAUTION: MAKE SURE ALL STOPS ARE FIRMLY SEATED AND NOT TURNED SIDEWAYS. DO NOT USE PLIERS TO MOVE STOPS.

(3) DISENGAGE ALL CLUTCHES SO FRONT SPACING FEED PAWL IS IN LOWER POSITION. PLACE PAWL ADJUSTING PLATE AT CENTER OF HORIZONTAL AND VERTICAL ADJUSTMENT: TO ADJUST VERTICALLY, LOOSEN BOTH MOUNTING SCREWS: TO ADJUST HORIZONTALLY, LOOSEN ONLY LEFT SCREW. HORIZONTAL ADJUSTMENT SHOULD BE MADE AFTER VERTICAL. DISENGAGE SPACING FEED PAWLS AND ALLOW DRUM TO ROTATE TO EXTREME COUNTERCLOCKWISE POSITION. KEEPING SPACING CLUTCH DISENGAGED, MANUALLY ADVANCE DRUM UNTIL FIRST STOP IS IMMEDIATELY TO LEFT OF PAWL. POSITION ADJUSTING PLATE HORIZONTALLY SO THAT STOP IS ALIGNED WITH LEFT EDGE OF PAWL SHOULDER.

(4) PLACE BLOCKING LEVER AND OPERATING LEVER SLIDE ARM IN UNBLOCKED POSITION, DISENGAGE FEED PAWLS AND LET DRUM ROTATE TWO SPACES COUNTERCLOCKWISE. BOTH FEED PAWLS SHOULD BE FULLY ENGAGED. BLOCK SLIDE ARM WITH BLOCKING LEVER. GAGE AND NOTE CLEARANCE BETWEEN STOP AND SLOPE ON PAWL.

(5) ROTATE DRUM CLOCKWISE UNTIL NEXT STOP IS JUST TO LEFT OF PAWL. REPEAT PROCEDURE DESCRIBED IN PARAGRAPH (4) FOR THIS STOP. REPEAT PROCEDURE FOR REMAINING STOPS, NOTING EACH CLEARANCE.

(6) STOP WITH MAXIMUM CLEARANCE SHOULD BE USED AS REFERENCE IN MAKING FINAL HORIZONTAL AND VERTICAL PAWL ADJUSTMENTS.

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3.07 Horizontal Tabulator Mechanism (Cont.)

**TABULATOR PAWL - VERTICAL (FINAL)**

**TO CHECK:**
- Position spacing drum such that reference tabulator stop, as determined by preliminary tabulator pawl adjustment (Par. 3.06), is opposite shoulder on pawl. Block operating lever slide arm with blocking lever.

**REQUIREMENT:**
- Clearance between pawl and stop: 
  - Min. 0.055 inch
  - Max. 0.075 inch

**TO ADJUST:**
- Position pawl adjusting plate with both mounting screws loosened. Tighten right screw only, using wrench to prevent bushing from turning.

**PAWL ADJUSTING PLATE**

**REFERENCE TABULATOR STOP**

**BLOCKING LEVER SPRING**

**TO CHECK:**
- Hold operating lever slide arm to the rear.

**REQUIREMENT:**
- Min. 2-1/2 ozs. 
  - Max. 4-1/2 ozs.

**TABULATOR PAWL SPRING**

**TO START PAWL MOVING:**
- Min. 3 ozs. 
  - Max. 5 ozs.

**BLOCKING LEVER**

**OPERATING LEVER SLIDE ARM**

**MOUNTING SCREWS**

**TABULATOR PAWL SPRING**

**BLOCKING LEVER SPRING**

**FREE HAND**

**OPERATING LEVER SLIDE ARM**

**BLOCKING LEVER SPRING**

**TABULATOR PAWL SPRING**

**TO CHECK:**
- Hold operating lever slide arm to the rear.

**REQUIREMENT:**
- Min. 2-1/2 ozs. 
  - Max. 4-1/2 ozs.

**TO START BLOCKING LEVER MOVING:**
- Min. 2-1/2 ozs. 
  - Max. 4-1/2 ozs.

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3.08 Horizontal Tabulator Mechanism (Cont.)

**Reference Tabulator Stop**

**Operating Lever Slide Arm**

**Blocking Lever**

**Mounting Screws**

**Tabulator Pawl - Horizontal (Final)**

**To Check**

1. Disengage all clutches so that front spacing feed pawl is in lower position (as shown in Par. 3.06). Position spacing drum so that reference tabulator stop, as determined in preliminary tabulator pawl adjustment (Par. 3.06), is immediately to left of pawl. Operating lever slide arm should be forward in unblocked position. Disengage feed pawls and allow drum to rotate one space counterclockwise. Both feed pawls should be fully engaged. Move slide arm to rear to blocked position.

2. Trip spacing clutch stop lever and slowly rotate main shaft until blocking lever is just tripped. Take up play in spacing shaft toward rear.

**Requirement**

Some portion of clutch disk stop lug should be aligned with rear surface of spacing shaft gear.

**To Adjust**

Repeat procedure set forth in paragraph (1) above. Trip spacing clutch and rotate shaft until middle of stop lug is in line with rear surface of gear. If blocking lever tripped too soon, with left mounting screw loosened, position pawl adjusting plate to left until slide arm can be blocked. Slowly move plate to right until blocking lever just trips. When adjusting trip-off point, care should be taken that blocking lever is cammed down by stop and not manually moved out of blocked position by accident. Recheck requirement.

**Note:**

After obtaining trip-off point, continue rotating main shaft until spacing clutch is disengaged. Pawl should be to right of stop. When slide arm is moved to rear, blocking lever should move to blocked position. If tip of pawl should rest on end of stop, readjust plate to right so that clearance between pawl and stop is:

- Min. 0.003
- Max. 0.008
3.09 Horizontal Tabulator Mechanism (Cont.)

NOTE: FOR INSTRUCTIONS ON HOW TO MOVE TABULATOR STOPS, SEE TABULATOR PAWL PRELIMINARY ADJUSTMENT. PAR. 3.06 (2)

(1) COLUMNAR TABULATOR STOPS

PLACE CARRIAGE IN POSITION TO PRINT FIRST CHARACTER IN COLUMN. PLACE STOP IN SLOT IMMEDIATELY TO LEFT OF PAWL. TO FACILITATE INSERTING STOPS, MARK DESIRED SLOT AND ROTATE DRUM TO MORE ACCESSIBLE POSITION. FOR SETTINGS NEAR LEFT MARGIN, COUNT NUMBER OF SPACING OPERATIONS FROM LEFT MARGIN AND PLACE STOP CORRESPONDING NUMBER OF SLOTS COUNTERCLOCKWISE FROM ROLLER.

NOTE: WHEN PRINTING FORMS, CHECK STOP SETTINGS IN RELATION TO COLUMNS. CORRESPONDING STOPS ON ALL MACHINES ON A CIRCUIT MUST BE THE SAME NUMBER OF SLOTS FROM LEFT MARGIN.

(2) RIGHT MARGIN TABULATOR STOP (WITH WIDE SHELF)

NOTE: BEFORE MAKING THIS ADJUSTMENT, CHECK RIGHT MARGIN AND TABULATOR PAWL ADJUSTMENTS

POSITION PRINTING CARRIAGE AT RIGHT MARGIN (SPACING CUTOUT OPERATED). INSERT STOP WITH WIDE SHELF IN SLOT IMMEDIATELY TO LEFT OF PAWL. SHELF SHOULD EXTEND TO RIGHT SO THAT PAWL RESTS ON IT.
3.10 Horizontal Tabulator Mechanism (Cont.)

NOTE

THE FOLLOWING TWO HORIZONTAL TABULATOR MECHANISM ADJUSTMENTS SHOULD BE CHECKED BEFORE MAKING THE TRANSMITTER CONTROL ADJUSTMENTS SHOWN BELOW.

1. OPERATING LEVER SLIDE ARM (PAR. 3.02)
2. OPERATING LEVER ADJUSTING PLATE (PAR. 3.02)

IF EITHER OF THE ABOVE ADJUSTMENTS ARE CHANGED, THE TRANSMITTER CONTROL ADJUSTMENTS SHOULD BE RECHECKED.

TRANSMITTER CONTROL CONTACT SPRING

REQUIREMENT

OPERATING LEVER IN UNOPERATED POSITION.

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

TO JUST OPEN CONTACTS.

TO ADJUST
BEND THE LONG CONTACT SPRING

PIVOT
LONG CONTACT SPRING
CONTACT ASSEMBLY BRACKET
BRACKET MOUNTING SCREW
TRANSMITTER CONTROL CONTACT GAP

REQUIREMENT

OPERATING LEVER SLIDE ARM PULLED TO REAR UNTIL BLOCKED BY BLOCKING LEVER. CLEARANCE BETWEEN CONTACTS
MIN. 0.010 INCH
MAX. 0.020 INCH

TO ADJUST
POSITION THE CONTACT ASSEMBLY BRACKET WITH THE MOUNTING SCREW LOOSENED. THE BRACKET PIVOTS ABOUT A PIN AT THE UPPER END OF THE BRACKET.
3. 11 Page Feed-Out Mechanism

(A) **PAGE FEED-OUT GEAR PLAY**

**REQUIREMENT**
BARELY PERCEPTIBLE BACKLASH.

**TO ADJUST**
POSITION GEAR PIVOT POST WITH NUT LOOSENED.

(B) **MOUNTING BRACKET**

**REQUIREMENT**
CLEARANCE BETWEEN BLOCKING ARM AND PAGE FEED-OUT SLIDE.
MIN. 0.002 INCH
MAX. 0.015 INCH

**TO CHECK**
SELECT FEED-OUT SEQUENCE CODE BAR CLUTCH DISENGAGED. TAKE UP PLAY IN BLOCKING ARM AND FEED-OUT SLIDE TO MAKE CLEARANCE MINIMUM.

**TO ADJUST**
POSITION LOWER PORTION OF MOUNTING BRACKET WITH MOUNTING SCREWS LOOSENED.

(C) **BLOCKING ARM**

SEE PAR. 3.12
SWITCH OPERATING ARM

(D) **INDEXING DISK**

**REQUIREMENT**
CLEARANCE BETWEEN HIGHEST NUMBERED INDEX PLATE AND BAIL
MIN. 0.020 INCH
MAX. 0.040 INCH

**TO CHECK**
LINE FEED CLUTCH DISENGAGED. INDEX PLATE ADJACENT TO BAIL. TAKE UP PLAY BETWEEN GEARS TO MAKE CLEARANCE MINIMUM.

**TO ADJUST**
DISENGAGE GEAR FROM IDLER. TURN HANDWHEEL CLOCKWISE UNTIL INDEX PLATE JUST OPERATES BAIL. ENGAGE FIRST TOOTH ON IDLER. POSITION INDEXING DISK WITH THREE MOUNTING SCREWS LOOSENED.

**NOTE:** IF PAGE FEED-OUT GEAR HAS UNEVEN NUMBER OF TEETH, ROTATE PLATEN UNTIL HEAD OF SCREW IN PLATEN SPUR GEAR IS UP AND PLATEN IS DETENTED, THEN PROCEED WITH ADJUSTMENT.

(E) **SWITCH OPERATING ARM (USED ONLY WITH TRANSMITTER CONTROL)**

**REQUIREMENT**
BLOCKING ARM IN POSITION TO BLOCK SLIDE. CLEARANCE MIN. SOME MAX. 0.005 INCH

**TO ADJUST**
POSITION SWITCH WITH TWO MOUNTING SCREWS LOOSENED.
(F) **POINTER**

**REQUIREMENT**

- Line feed clutch disengaged.
- Index plate adjacent to bail as shown in Par. 3.11. Pointer should line up with notch in indexing disk and clear disk by approximately 1/16 inch.

To adjust position pointer with mounting screws loosened.

---

(C) **BLOCKING ARM**

**REQUIREMENT**

Bail on peak of index plate. Clearance

- Min. 0.005 inch
- Max. 0.045 inch

To adjust position adjustable arm with mounting screws loosened.

**NOTE**

If requirement cannot be met for each plate, reposition plate with mounting screw loosened.

---

(H) **BLOCKING ARM SPRING**

**REQUIREMENT**

- Blocking arm in unblocked position.
- Min. 3 ozs.
- Max. 5 ozs.

To pull spring to operating length.
3.13 Selective Calling Mechanism

TYPE BOX CLUTCH TRIP LEVER
(SELECTIVE-CALLING UNITS WITH OR WITHOUT OFF-LINE SHIFT SOLENOID)
CLEARANCE BETWEEN TYPE BOX CLUTCH TRIP LEVER AND CLUTCH DISK STOP LUG SHOULD BE MIN. 0.040 INCH---MAX. 0.055 INCH
SEE PAR. 2.22.

PRINT SUPPRESSOR CODE BAR SPRING
SUPPRESSOR CODE BAR TO LEFT,
MIN. 4-1/2 OZS.---MAX. 7-1/2 OZS.
TO START CODE BAR MOVING, CODE BAR SHOULD BE FREE OF BOUNDS.

OFF LINE SHIFT SOLENOID

NOTE: TO CHECK REQUIREMENTS (A, B, AND D), SET FUNCTION CLUTCH IN STOP POSITION AND ALL CODE BARS TO THE RIGHT.

(A) CODE BAR SHIFT MECHANISM
REQUIREMENTS
1. WITH FUNCTION CLUTCH IN STOP POSITION, LATCH FUNCTION LEVER (SHIFT MECH.) ON ITS LOWER RELEASING LATCH. NOTCH IN SUPP. CODE BAR SHOULD ALIGN WITH NOTCHES IN OTHER CODE BARS WHEN ALL CODE BARS ARE SHIFTED TO THE RIGHT.
TO ADJUST
POSITION UPPER OR LOWER GUIDE PLATE (PAR. 2.33) WITH ITS CLAMP NUTS LOOSENED.
2. REPEAT FOR EACH STUNT CASE CODE BAR SHIFT MECHANISM.
NOTE --- POSITION THE ASSOCIATED GUIDE PLATE SO THAT THE MOVEMENT OF THE FORK IS NOT RESTRICTED WITHIN THE RANGE OF ADJUSTMENT.

(D) OFF LINE SHIFT SOLENOID BRACKET ASSEMBLY (OFF LINE ONLY)
REQUIREMENT
NOTCH IN SUPPRESSION CODE BAR SHOULD ALIGN WITH NOTCHES IN OTHER CODE BARS WHEN ALL CODE BARS ARE SHIFTED TO THE RIGHT.
TO ADJUST
POSITION THE SOLENOID BRACKET ASSEMBLY WITH ITS MOUNTING SCREWS LOOSENED.

(C) TYPE BOX CLUTCH SUPPRESSION ARM
SEE PAR. 3.14

(B) CONDITION CODE (ZERO) CODE BAR SHIFT MECHANISM
REQUIREMENT
WITH FUNCTION CLUTCH IN STOP POSITION, LATCH FUNCTION LEVER (SHIFT MECH.). THE NOTCH IN CONDITION CODE (ZERO) CODE BAR SHOULD ALIGN WITH NOTCHES IN OTHER CODE BARS WHEN ALL CODE BARS ARE SHIFTED TO THE RIGHT.
TO ADJUST
POSITION THE UPPER OR LOWER GUIDE PLATE (PAR. 2.33) WITH ITS CLAMP NUTS LOOSENED.
NOTE --- POSITION THE ASSOCIATED GUIDE PLATE SO THAT THE MOVEMENT OF THE FORK IS NOT RESTRICTED.
3.14 Selective Calling Mechanism (Con't)

(C) TYPE BOX CLUTCH SUPPRESSION ARM (WITH OR WITHOUT SOLENOID SHIFT)

REQUIREMENT

SUPPRESSION ARM IN BLOCKING POSITION. SHAFT ROTATED UNTIL THE FUNCTION CLUTCH SHOE LEVER IS OPPOSITE THE FUNCTION CLUTCH TRIP LEVER.

1. AT LEAST 0.003 INCH CLEARANCE BETWEEN TRIP ARM EXTENSION AND CLUTCH TRIP LEVER.

2. AT LEAST 0.006 INCH CLEARANCE BETWEEN THE FUNCTION CLUTCH SHOE LEVER AND FUNCTION CLUTCH TRIP LEVER.

TO ADJUST POSITION SUPPRESSION ARM WITH ITS MOUNTING SCREWS LOOSENED.

OFF LINE STUNT SHIFT SOLENOID SPRING

REQUIREMENT

WITH SOLENOID UNOPERATED, MIN. 2 OZS., MAX. 4 1/2 OZS. TO PULL SPRING TO ITS INSTALLED LENGTH.

1. LATCH FUNCTION LEVER OF ANY STUNT CASE CODE BAR SHIFT MECHANISM AND ROTATE MAIN SHAFT UNTIL LOWER SURFACE OF THE SUPPRESSION ARM IS ALIGNED (APPROX) WITH BOTTOM SURFACE OF BLOCKING BAIL EXTENSION. CLEARANCE BETWEEN SUPPRESSION ARM AND BLOCKING BAIL EXTENSION, WITH PLAY TAKEN UP TO PRODUCE MINIMUM CLEARANCE.

MIN. 0.008 INCH ——— MAX. 0.055 INCH

TO ADJUST POSITION EXTENSION WITH ITS MOUNTING SCREW LOOSENED, REFINE THE ADJUSTMENT IF NECESSARY, AND RECHECK EACH SHIFT MECHANISM.

2. REFINE THE STUNT CASE CODE BAR SHIFT MECHANISM ADJUSTMENT OF ANY SHIFT MECHANISM THAT DOES NOT MEET THE ABOVE REQUIREMENT.
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3.15 Selective Calling Mechanism (Cont.)

- **LINE FEED (Stunt Case) FUNCTION BAR**
- **AUTOMATIC CARRIAGE RETURN - LINE FEED BLOCKING SLIDE**

**CONDITION CODE SHIFT FORK SPRING REQUIREMENT**
WITH CONDITION CODE SHIFT IN ITS UNOPERATED POSITION.
MIN. 1 OZ.
MAX. 3 OZS.
TO PULL SPRING TO ITS INSTALLED POSITION.

**BLOCKING SLIDE SPRING**

**GUIDE PLATE**

**LOWER GUIDE PLATE**

**CONDITION CODE SHIFT FORK**

**AUTOMATIC CARRIAGE RETURN - LINE FEED BLOCKING SLIDE SPRING REQUIREMENT**
WITH CONDITION CODE SHIFT FORK IN ITS UNOPERATED POSITION.
MIN. 1 OZ.
MAX. 3 OZS.
TO PULL SPRING TO ITS INSTALLED POSITION.
3.16 Local Back Space Mechanism

**CAMMING BAIL STOP ARM**

**REQUIREMENT**

SPACING CLUTCH DISENGAGED, FRONT FEED PAWL IN LOWER POSITION, BACK SPACE BAIL HELD OPERATED, CLUTCH TRIPPED AND MAIN SHAFT ROTATED UNTIL THE FRONT FEED PAWL TOOTH IS OPPOSITE THE PEAK OF THE FIRST SPACING DRUM TOOTH THAT MOVES DOWN PAST THE PAWL TOOTH. CLEARANCE BETWEEN PAWL TOOTH AND THE TOOTH ON THE SPACING DRUM RATCHET WHEEL.

MIN. 0.020 INCH
MAX. 0.035 INCH

**TO ADJUST**

POSITION THE ADJUSTING PLATE ON THE INTERMEDIATE ARM IN THE CENTER OF ITS ADJUSTING RANGE. THEN POSITION THE CAMMING BAIL STOP ARM WITH ITS MOUNTING SCREW FRICITION TIGHT TO MEET THE REQUIREMENT.

**CAMMING BAIL SPRING**

**REQUIREMENT**

MIN. 1 OZ.
MAX. 2-1/4 OZS.
TO START BAIL MOVING.
3.17 Reverse Line Feed Mechanism

**Requirement**

- Slide link resting on its stop bracket, line feed clutch disengaged.
- Min. 1-1/2 ozs,
- Max. 3-1/2 ozs,
- To pull spring to installed length.

**Requirement**

- When the line feed bar is nearest the slide link stop bracket during a forward line feed operation, there should be a minimum of 0.045 inch clearance between top surface of slide link and lower edge of closest line feed bar.

**To adjust**

- Position the slide link stop bracket with its mounting screws loosened.
3.18 Reverse Line Feed Mechanism (Cont.)

**LINE FEED CLUTCH SPUR GEAR**

**REQUIREMENT**
- LINE FEED CLUTCH DISENGAGED. SLIDE LINK RAISED UPWARD SO AS TO FULLY ENGAGE THE END OF THE LOWER LINE FEED BAR, SLIDE HELD FORWARD BY ITS SPRING CLEARANCE BETWEEN SLIDE LINK AND LOWER LINE FEED BAR.
- MIN. 0.005 INCH
- MAX. 0.040 INCH

**TO ADJUST**
- SET LINE FEED CLUTCH SPUR GEAR AT CENTER OF ADJUSTING RANGE.
- DISENGAGE LINE FEED CLUTCH, LOOSEN ECCENTRIC ASSEMBLY BEARING POST. MESH THE TWO GEARs SO THAT THE FOWARD EDGES OF THE LOWER ENDS OF THE LINE FEED BARS ARE IN LINE WITH EACH OTHER WITHIN 0.040 INCH. ROTATE THE LINE FEED CLUTCH SPUR GEAR RELATIVE TO ITS MOUNTING PLATE WITH THE GEAR MOUNTING SCREWS LOOSENEd.
- CHECK BOTH BARS FOR THE REQUIRED CLEARANCE AT EACH STOP POSITION OF THE CLUTCH.
3.19 Reverse Line Feed Mechanism (Cont.)

**(B) PLATEN DETENT BAIL SPRING REQUIREMENT**
- DETENT SEATED BETWEEN TWO TEETH ON LINE FEED SPUR GEAR.
- MIN. 16 OZS.
- MAX. 32 OZS.
- TO START DETENT BAIL MOVING.

**(C) LINE FEED BAR RELEASE LEVER SPRING REQUIREMENT**
- MIN. 3 OZS.
- MAX. 8 OZS.
- TO START LEVER MOVING.

**(A) LINE FEED SPUR GEAR DETENT ECCENTRIC REQUIREMENT**
- LINE FEED CLUTCH DISENGAGED. PLATEN ROTATED UNTIL DETENT STUD IS SEATED BETWEEN TWO TEETH ON LINE FEED SPUR GEAR. WHEN HAND WHEEL IS RELEASED, MANUALLY SET THE TEETH ON THE FEED BARS INTO ENGAGEMENT WITH THE TEETH ON THE LINE FEED SPUR GEAR. THE DETENT STUD SHOULD CONTACT ONE GEAR TOOTH AND BE NOT MORE THAN 0.006 INCH FROM THE OTHER TOOTH TO ADJUST.
- ROTATE THE DETENT ECCENTRIC WITH ITS MOUNTING SCREWS LOOSENED. KEEP HIGH PART OF ECCENTRIC UPWARD.
3.20 Reverse Line Feed Mechanism (Cont.)

LINE FEED BAR SPRINGS
REQUIREMENT
LINE FEED BAR ENGAGED
WITH PLATEN GEAR.
MIN. 2-1/2 OZS.
MAX. 5 OZS.
TO PULL EACH SPRING
TO INSTALLED LENGTH.

PLATEN GEAR
LINE FEED BARS
LINE FEED BAR SPRINGS
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3.21 Reverse Line Feed Mechanism (Cont.)

LINE FEED BAR BELL CRANK SPRING

REQUIREMENT
LINE FEED BAR IN REAR POSITION
SLIDE LINK UNOPERATED. LINE FEED
BAR SPRINGS IN PLACE.
MIN. 19 OZS.
MAX. 24 OZS.
TO START LINE FEED BAR MOVING.

BAR BELL CRANK SPRING

LINE FEED BAR SPRING

BAR BELL CRANK

LINE FEED BAR

3.22 Answer-Back Mechanism (Switched Circuit Network)

"FIGURES" STUNT BOX CONTACT
(STUNT BOX SLOT 32)

REQUIREMENT
CLEARANCE BETWEEN CONTACT INSULATOR
AND FUNCTION LEVER SHOULD BE
MIN. SOME --- MAX. 0.010 INCH
TO CHECK
STUNT BOX MOUNTED ON TYPING UNIT AND
"LETTERS" COMBINATION MANUALLY SET UP
ON TYPING UNIT SELECTOR. ROTATE TYPING
UNIT MAIN SHAFT UNTIL FUNCTION LEVER IS
IN EXTREME FORWARD POSITION TOWARD
CONTACT INSULATOR.
TO ADJUST
WITH CONTACT MOUNTING SCREWS LOOSENED, ADD OR REMOVE SHIMS AS REQUIRED.
3.23 Print Suppression Mechanism

**Zero Code Bar Shift Mechanism**

1. **Requirement**
   - Function clutch rotated until function bars are in extreme rear position. Line feed function pawl hooked over its function bar and then stripped. The notch in the zero code bar should line up vertically with the notches in the 4, 1, 5, 2, 3 code bars but may be out of alignment.
   - Max. 0.010 inch in the marking direction.

2. **Requirement**
   - Max. 0.002 inch clearance between guide plate extension and slide.

To adjust:
- Position the guide plate by its lower adjusting slot with its clamp nuts loosened.

**Suppression Code Bar Mechanism**

1. **Requirement**
   - Function bars in rear position. Call directing function pawl hooked over its function bar and stripped. Notch in suppression code bar should line up vertically with notches in 4, 1, 5, 2, 3 code bars but may be out of alignment.
   - Max. 0.010 inch in the marking direction.

2. **Requirement**
   - Max. 0.002 inch clearance between guide plate extension and slide.

To adjust:
- Position the guide plate by its lower adjusting slot with its clamp nuts loosened.

3. **Requirement**
   - There should be some clearance between the rear end of the function bar and the face of the notch on the function pawl when the line feed function pawl and call directing function pawl are alternately hooked over their respective function bar.

Refine the two adjustments above if necessary.
3.24 Continuous Spacing Mechanism

**SOLENOID PLUNGER SPRING REQUIREMENT**

SOLENOID DE-ENERGIZED, SPRING UNHOOKED
- MIN. 1-1/2 OZS.
- MAX. 3 OZS.
TO PULL SPRING TO POSITION LENGTH.

**FUNCTION CLUTCH TRIP LEVER REQUIREMENT**


TO ADJUST
POSITION THE SOLENOID MOUNTING PLATE WITH ITS MOUNTING SCREWS LOOSENED.
IN POSITIONING THE PLATE MOVE EACH END EQUALLY TO AVOID BINDS IN THE SOLENOID PLUNGER AND FUNCTION CLUTCH TRIP LEVER.
3.25 Continuous Spacing Mechanism (Cont.)

**SUPPRESSION BAIL ADJUSTING BRACKET REQUIREMENT**

- FUNCTION CLUTCH ROTATED UNTIL SUPPRESSION BAIL IS IN EXTREME FORWARD POSITION. CR AND LF FUNCTION SLIDE ARMS MANUALLY PUSHED FORWARD UNTIL THE CR AND LF LEVERS ARE TRIPPED. SLIDE ARMS RESTING BACK AGAINST THEIR SLIDE ARM BRACKETS. CLEARANCE BETWEEN PROJECTION ON CR SLIDE ARM AND GUIDE BAR
  - MIN. 0.070 INCH --- MAX. 0.095 INCH

**TO ADJUST**

- POSITION THE CONNECTING LINK ON THE ADJUSTING BRACKET WITH ITS CLAMP SCREW LOOSENED.
- RECHECK AFTER TIGHTENING SCREW. ON TWO-STOP CLUTCHES, CHECK WITH CLUTCH IN EACH POSITION.

**NOTE**

BEFORE MAKING THE FOLLOWING ADJUSTMENT CHECK THE CARRIAGE RETURN LEVER ADJUSTMENT. WITH THE STUNT BOX REMOVED, THE STANDARD ADJUSTING PROCEDURE CANNOT BE FOLLOWED. REFER TO PAR. 2.40 AND USE THE FOLLOWING PROCEDURE.

**CARRIAGE RETURN LEVER REQUIREMENT**

- CLEARANCE BETWEEN CARRIAGE RETURN LATCH BAIL AND CARRIAGE RETURN LEVER (PAR. 2.40) SHOULD BE
  - MIN. 0.006 INCH --- MAX. 0.040 INCH

**TO CHECK**

- PRINTING CARRIAGE IN RETURNED POSITION. TRIP FUNCTION CLUTCH AND ROTATE MAIN SHAFT UNTIL SUPPRESSION BAIL IS IN EXTREME FORWARD POSITION. LOCATE SPACING DRUM SO THAT CARRIAGE RETURN LATCH BAIL RESETS AGAINST CARRIAGE RETURN LEVER EXTENSION.

**TO ADJUST**

- POSITION CR LEVER ON CR LATCH BAIL WITH CLAMP SCREW LOOSENED.
3. 26 Paper-Out Alarm Mechanism

(A) SWITCH POSITION

REQUIREMENT --- HORIZONTAL AXIS OF SWITCH SHALL LIE IN A PLANE PARALLEL TO THE SWITCH BRACKET WHEN THE SWITCH IS MOVED TOWARD UPPER LIMIT OF ITS TRAVEL IN THE MOUNTING HOLES.

TO ADJUST --- WITH ITS MOUNTING SCREWS (2) LOOSENED, POSITION AND ALIGN THE SWITCH.

(B) SWITCH OPERATING LEVER

REQUIREMENT --- WITH PAPER ROLL REMOVED, UPPER SURFACE OF SWITCH BRACKET OPERATING LEVER SHALL LIE IN A PLANE THAT IS PARALLEL WITH UNDER SIDE OF HEXAGONAL PAPER SPINDLE AND REST APPROXIMATELY 1/4 INCH FROM THE SPINDLE.

TO ADJUST --- LOOSEN SCREW THAT SECURE THE SWITCH ASSEMBLY MOUNTING BRACKET AND POSITION THE ASSEMBLY UPWARD OR DOWNWARD.

(C) SWITCH BRACKET SPRING

REQUIREMENT --- WITH SPRING SCALE APPLIED AT THE TOP SWITCH BRACKET OPERATING LEVER NEAR SPRING HOOK, IT SHALL REQUIRE MIN. 11 OZS. --- MAX. 18 OZS.

TO MOVE SWITCH BRACKET CLEAR OF SWITCH PLUNGER (GAUGE BY EYE)
3.27 Vertical Tabulation and Transmitter Distributor Control Mechanism

(C) PAGE FEED-OUT GEAR PLAY

REQUIREMENT
BARELY PERCEPTIBLE BACKLASH BETWEEN IDLER GEAR AND FEED-OUT GEAR

TO ADJUST
POSITION GEAR PIVOT POST WITH NUT LOOSENED.

NOTE: GEARS SHOULD MESH ACCURATELY WHEN CHECKED AT 3 EQUAL DISTANCES AROUND CIRCUMFERENCE OF GEAR.

(PAGE FEED-OUT GEAR) INDEXING DISK
PIVOT POST

IDLER GEAR

MOUNTING BRACKET
MOUNTING SCREW

(A) VERTICAL TABULATOR SLIDE RETAINER
ON UNITS SO EquIPPED

REQUIREMENT
CLEARANCE BETWEEN VERTICAL TAB SLIDE AND RETAINING EDGE OF RETAINER SHOULD BE
MIN. 0.015 INCH --- MAX. 0.040 INCH

TO ADJUST
POSITION RETAINER FORWARD AND LOCATE IT UP OR DOWN WITH MOUNTING SCREWS LOOSENED.

(INNER LEVER) PAGE FEED-OUT BLOCKING LEVER

(B) MOUNTING BRACKET

REQUIREMENT
1. CLEARANCE BETWEEN FEED-OUT BLOCKING LEVER (INNER LEVER) AND FEED-OUT SLIDE --- MIN. S... MAX. 0.020 INCH

TO CHECK
SELECT UPPER CASE "Z" AND ROTATE MAIN SHAFT UNTIL PAGE FEED-OUT SLIDE IS IN ITS MOST FORWARD POSITION. TAKE UP PLAY IN PAGE FEED-OUT BLOCKING LEVER TO MAKE CLEARANCE A MINIMUM.

2. CLEARANCE BETWEEN VERTICAL TAB SLIDE AND VERTICAL TAB BLOCKING LEVER (OUTER LEVER) --- MIN. 0.002 INCH

TO CHECK
SELECT UPPER CASE "J" AND ROTATE MAIN SHAFT UNTIL VERTICAL TAB SLIDE IS IN ITS MOST FORWARD POSITION. TAKE UP PLAY IN VERTICAL TAB BLOCKING LEVER TO MAKE CLEARANCE A MINIMUM.

TO ADJUST
POSITION LOWER PORTION OF MOUNTING BRACKET WITH MOUNTING SCREWS LOOSENED.

(D) BLOCKING LEVER

SEE PAR. 3.28

(E) INDEXING DISK

REQUIREMENT
CLEARANCE BETWEEN INDEX PLATE AND PAWL SHOULD BE
MIN. SOME --- MAX. 0.040 INCH

TO CHECK
LINE FEED CLUTCH DISENGAGED. INDEX PLATE ADJACENT TO PAWL. SLACK IN GEAR TAKEN UP TO MAKE GAP A MINIMUM.

TO ADJUST
PULL FEED-OUT GEAR OUT OF ENGAGEMENT WITH IDLER GEAR. TURN FEED-OUT GEAR HAND WHEEL CLOCKWISE UNTIL INDEX PLATE JUST OPERATES THE PAWL, THEN ENGAGE FIRST TOOTH ON IDLER. POSITION INDEXING DISK WITH THREE MOUNTING SCREWS LOOSENED.

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3.28 Vertical Tabulation and Transmitter Distributor Control Mechanism (Cont.)

(H) POINTER
REQUIREMENT
LINE FEED CLUTCH DISENGAGED, INDEX PLATE ADJACENT TO PAWL, POINTER SHOULD LINE UP WITH NOTCH IN INDEXING DISK AND CLEAR ANY INDEX PLATE BY APPROXIMATELY 1/16 INCH.
TO ADJUST
POSITION POINTER ON SIDE FRAME WITH ITS MOUNTING SCREW LOOSENED.

(I) PAGE FEED-OUT
INDEX PLATE POSITION
SEE PAR. 3.31

(J) TABULATION
INDEX PLATE POSITION
SEE PAR. 3.30

(F) SWITCH CONTACT PRESSURE
(TRANSMITTER CONTROL ONLY)
REQUIREMENT
CONTACTS CLOSED
MIN. 2 OZS. --- MAX. 3 OZS.
TO MOVE CONTACT SWINGER AWAY FROM ITS MATING CONTACT.
TO ADJUST --- BEND SWINGER

*TRANSFER TYPE CONTACTS SEE PARS. 3.29 AND 3.30

(D) BLOCKING LEVER
REQUIREMENT
CLEARANCE BETWEEN BOTTOM OF BLOCKING LEVER AND TOP OF SLIDE WHEN PAWL IS ON PEAK OF INDEX PLATE SHOULD BE
MIN. 0.005 INCH --- MAX. 0.045 INCH
TO ADJUST
TRIP LINE FEED CLUTCH. ROTATE MAIN SHAFT UNTIL PAWL IS ON PEAK OF INDEX PLATE.
POSITION ADJUSTABLE ARM WITH MOUNTING SCREWS LOOSENED. MAKE ADJUSTMENT FOR EACH BLOCKING LEVER.
3.29 Vertical Tabulation and Transmitter Distributor Control Mechanism (Cont.)

VERTICAL TAB BLOCKING LEVER
(OUTER)

PAGE FEED-OUT BLOCKING LEVER (INNER)

PAGE FEED-OUT SLIDE

FUNCTION ARM GUIDE BAR

VERTICAL TAB SLIDE

RETAINER

TRANSMITTER CONTROL SWITCH
(TRANSFER TYPE)

SWITCH ASSEMBLY MOUNTING SCREWS

BLOCKING LEVERS

TRANSMITTER CONTROL SWITCH (TRANSMITTER CONTROL ONLY)

REQUIREMENTS --- FOR TRANSFER TYPE CONTACTS

1. WITH NORMALLY CLOSED (LOWER) CONTACTS CLOSED, CLEARANCE BETWEEN INSULATED EXTENSION OF SWINGER AND LOBES OF FEED-OUT AND VERTICAL TABULATOR BLOCKING LEVER SHALL BE

MIN. SOME CLEARANCE

MAX 0.005 INCH

TO CHECK --- ROTATE MAINSHAFT UNTIL FEED-OUT AND VERTICAL TABULATOR BLOCKING LEVERS ARE UNOPERATED (BLOCKING LEVERS RESTING ON SLIDES).

TO ADJUST --- WITH TRANSMITTER CONTROL SWITCH MOUNTING SCREWS LOOSENED, POSITION THE CONTACT ASSEMBLY.

2. WITH THE NORMALLY OPEN (UPPER) CONTACTS CLOSED

(a). LOBE OF FEED-OUT BLOCKING LEVER (INNER LEVER) SHALL FULLY ENGAGE INSULATED EXTENSION OF CONTACT SWINGER.

(b). THE FEED-OUT BLOCKING LEVER SHALL REST FIRMLY ON THE FUNCTION ARM GUIDE BAR (INTERNAL --- CHECK BY LIFTING LEVER LIGHTLY AT CONTACT END) AND ALSO SEPARATE THE NORMALLY OPEN CONTACT SPRING FROM ITS STIFFENER AS THE UPPER CONTACT CLOSES.

TO CHECK --- SELECT FEED-OUT CODE COMBINATION, ROTATE MAIN SHAFT UNTIL FEED-OUT SLIDE IS IN ITS EXTREME FORWARD POSITION AND FEED-OUT BLOCKING LEVER DROPS BEHIND ITS SLIDE TO CLOSE NORMALLY OPENED CONTACTS.

TO ADJUST --- WITH CONTACT PILE-UP MOUNTING SCREWS LOOSENED, POSITION THE ASSEMBLY.

3. WITH THE NORMALLY OPEN (UPPER) CONTACTS CLOSED

(a). LOBE OF VERTICAL TABULATOR BLOCKING LEVER (OUTER) SHALL FULLY ENGAGE THE INSULATED EXTENSION OF THE SWINGER.

(b). THE VERTICAL TABULATOR BLOCKING LEVER SHALL REST FIRMLY ON THE FUNCTION ARM GUIDE BAR (INTERNAL --- CHECK BY LIFTING LEVER LIGHTLY AT CONTACT END,) AND ALSO SEPARATE NORMALLY OPEN CONTACT SPRING FROM ITS STIFFENER AS UPPER CONTACT CLOSES.

TO CHECK --- SELECT VERTICAL TABULATOR COMBINATION AND PROCEED AS IN ITEM TO CHECK OF REQUIREMENT 2 ABOVE.
3. 30 Vertical Tabulation and Transmitter Distributor Control Mechanism (Cont.)

(J) TABULATION INDEX PLATE POSITION REQUIREMENT --- WITH REQUIREMENT (I)
MET, LINE FEED PLATEN TO DESIRED FIRST LINE OF PRINTING IN THAT FORM.
TO POSITION --- PLACE TABULATION INDEX PLATE TO ALIGN WITH POINTER ON SIDE OF PRINTER. INSTALL ADDITIONAL TAB INDEX PLATES AT SUCCEEDING DESIRED PRINTING LINES WITHIN THE FORM. WHEN TABULATION AT A GIVEN POINT IS NOT NEEDED, ROTATE TAB INDEX PLATES (1/4 TURN) ON THEIR SIDES.

(K) BLOCKING LEVER SPRING *
REQUIREMENT --- WITH SPRING UNHOOKED AND BLOCKING LEVER ON TOP OF SLIDE.
MIN. 9 OZS. --- MAX. 11 OZS.
TO PULL RESPECTIVE SPRING TO POSITION LENGTH.

* BLOCKING LEVER SPRINGS USED WITH TRANSFER TYPE SWITCH (PAR. 3.31)
MIN 12 OZS --- MAX 13-1/2 OZS

(G) TRANSMITTER CONTROL SWITCH (TRANSMITTER CONTROL ONLY)
REQUIREMENTS --- FOR SINGLE-CONTACT TYPE CONTROL
1. WITH TRANSMITTER CONTROL CONTACTS CLOSED, THERE SHOULD BE SOME CLEARANCE BETWEEN INSULATED EXTENSION OF SWINGER AND LOBE OF FEED-OUT AND VERTICAL TABULATOR BLOCKING LEVERS.
TO CHECK - ROTATE MAIN SHAFT UNTIL FEED-OUT AND VERTICAL TABULATOR BLOCKING LEVERS ARE UNOPERATED (RESTING ON TOP OF SLIDES).
TO ADJUST - POSITION THE CONTACT ASSEMBLY WITH ITS MOUNTING SCREWS LOOSENED.
2. WITH TRANSMITTER CONTROL CONTACTS OPENED BY FEED-OUT BLOCKING LEVER, CLEARANCE BETWEEN SWITCH CONTACTS SHALL BE
MIN 0.010 INCH -------------------------------- MAX 0.020 INCH
TO CHECK - SELECT FEED-OUT CODE COMBINATION. ROTATE MAIN SHAFT UNTIL FEED-OUT SLIDE IS IN ITS EXTREME FORWARD POSITION AND FEED-OUT BLOCKING LEVER DROPS BEHIND ITS SLIDE TO OPEN CONTACTS
TO ADJUST - REFINE REQUIREMENT NO. 1 ABOVE.
3. WITH CONTROL CONTACTS OPENED BY VERTICAL TABULATOR BLOCKING LEVER, CLEARANCE BETWEEN SWITCH CONTACTS SHOULD BE
MIN 0.010 INCH -------------------------------- MAX 0.020 INCH
TO CHECK - SELECT VERTICAL TABULATOR CODE COMBINATION. ROTATE MAIN SHAFT UNTIL VERTICAL TAB SLIDE IS IN ITS EXTREME FORWARD POSITION AND VERTICAL TABULATOR BLOCKING LEVER DROPS BEHIND ITS SLIDE
TO ADJUST - REFINE REQUIREMENT NO. 1 ABOVE.
3.31 Vertical Tabulation and Transmitter Distributor Control Mechanism (Cont.)

1. PAGE FEED-OUT INDEX PLATE POSITION
   REQUIREMENT --- PLACE AN INDEX PLATE IN THE NUMBERED SLOTS ON DISK CORRESPONDING TO LENGTH OF PAGE FORM TO BE USED. SYNCHRONIZE PAGE FEED-OUT WITH A FORM BY POSITIONING FORM SO THAT TYPING UNIT WILL PRINT IN FIRST TYPING LINE OF THE FORM. WHEN TYPING UNIT IS IN STOP POSITION, TOP OF RIBBON GUIDE SHOULD ALIGN WITH BOTTOM OF PRINTING LINE.
   TO POSITION --- WITH PAGE FORM IN DESIRED POSITION, DISENGAGE PAGE FEED-OUT GEAR FROM ITS IDLER GEAR. ROTATE FEED-OUT GEAR UNTIL NOTCH IN INDEXING DISK ALIGNS WITH POINTER ON SIDE OF PRINTER, RE-ENGAGE GEARS.

SWITCH CONTACTS (TRANSMITTER CONTROL ONLY)
REQUIREMENTS --- FOR TRANSFER TYPE CONTROL SWITCH

1. WITH NORMALLY CLOSED (LOWER) CONTACTS CLOSED, LIFT SWINGER FREE OF MATING CONTACT. IT SHALL REQUIRE A MINIMUM OF 30 GRAMS TO MOVE LOWER CONTACT SPRING AWAY FROM ITS STIFFENER.
   TO ADJUST - FORM THE LOWER CONTACT SPRING BY BENDING.

2. WITH LOWER CONTACT CLOSED
   MIN 30 GRAMS ----------------------------------------------- MAX 45 GRAMS.
   TO MOVE SWINGER FROM ITS MATING CONTACTS.
   TO ADJUST - FORM THE SWINGER BY BENDING.

3. WITH LOWER CONTACT CLOSED
   (a) GAP BETWEEN UPPER CONTACT AND MATING CONTACT OF SWINGER
       MIN 0.008 INCH --------------------------------------------- MAX 0.015 INCH
       TO ADJUST - POSITION STIFFENER OF NORMALLY CLOSED CONTACT.
   (b) WITH A GAP OF 0.008 TO 0.015 INCH, IT SHALL REQUIRE
       MIN 25 GRAMS ----------------------------------------------- MAX 35 GRAMS
       TO PULL UPPER CONTACT AWAY FROM ITS STIFFENER
       TO ADJUST - FORM THE UPPER CONTACT SPRING BY BENDING.
       RECHECK REQUIREMENT (a).
3.32 Vertical Tabulation and Transmitter Distributor Control Mechanism (Cont.)

(L) LINE FEED CLUTCH TRIP LEVER SPRING
SEE PAR. 2.20

(M) TABULATOR BAIL SPRING
REQUIREMENT
MIN. 3 OZS.
MAX. 8 OZS.
TO PULL BAIL AWAY FROM ITS BACKSTOP LEVER.

(O) STUNT BOX SWITCH SPRING
SEE PAR. 2.66

(N) FORM-OUT PAWL SPRING
REQUIREMENT
MIN. 3 OZS.
MAX. 8 OZS.
TO PULL THE PAWL AWAY FROM ITS BACKSTOP LEVER.
3.33 Universal Contact (Selector) Mechanism

(A) CONTACT MOUNTING BRACKET

REQUIREMENT
THE DRIVE ARM LINKAGE SHOULD BE VERTICALLY ALIGNED TO PREVENT BINDS.
TO ADJUST POSITION THE CONTACT MOUNTING BRACKET WITH ITS MOUNTING SCREWS LOOSENED.

(B) CONTACT BLOCK

REQUIREMENT
THE CONTACT FACES SHOULD BE IN A VERTICAL STRAIGHT LINE
TO ADJUST LOOSEN THE TWO CONTACT MOUNTING SCREWS, PRESS THE CONTACT BLOCK TOWARD THE REAR OF THE TYPING UNIT FIRMLY AGAINST THE SCREWS AND TIGHTEN THE SCREWS.

(C) CONTACT DRIVE ARM POSITION

REQUIREMENT
THE CONTACTS SHOULD OPEN EQUALLY WITHIN 0.010 INCH
TO CHECK ROTATE CODE BAR CLUTCH UNTIL IT IS DISENGAGED AND LATCHED IN STOP POSITION, MEASURE GAP BETWEEN UPPER CONTACTS. TRIP CODE BAR CLUTCH AND ROTATE 180 DEGREES OR UNTIL LOWER CONTACT GAP REACHES ITS MAXIMUM OPENING. MEASURE THE GAP.
TO ADJUST POSITION CONTACT DRIVE ARM WITH ITS CLAMP SCREW LOOSENED.

(D) CONTACT ARM SPRING

REQUIREMENT
WITH SHOULDER SCREW WHICH CONNECTS CONTACT ARM TO DRIVE LINK REMOVED AND SPRING SCALE APPLIED VERTICALLY UPWARD OR DOWNWARD MIN. 2 OZS., MAX. 5 OZS. TO OPEN EITHER CONTACT.
3. 34 Universal Contact (Stunt Box) Mechanism

NOTE: 1. THESE ADJUSTMENTS SHOULD BE MADE WITH THE CONTACT BRACKET ASSEMBLY REMOVED.

NOTE: 2. IF CONTACT SCREWS ARE DISTURBED TO OBTAIN A REQUIREMENT, THEY MUST BE RETIGHTENED AND ALL PRECEDING REQUIREMENTS RECHECKED.

CAUTION: IF IT IS NECESSARY TO INCREASE THE CONTACT SPRING TENSIONS, IT IS ADVISABLE TO REMOVE THE CONTACT SPRING TO INCREASE ITS CURVATURE. AVOID DAMAGE TO CONTACT SPRINGS WHEN ADJUSTING THE STIFFENERS IN THE ASSEMBLY.

(A) CONTACT

1. REQUIREMENT
   CONTACT SPRINGS AND STIFFENERS MOUNTED VERTICALLY AND CONTACT POINTS IN ALIGNMENT (GAUGE BY EYE).
   TO ADJUST
   POSITION THE CONTACT SPRINGS AND STIFFENERS WITH ASSEMBLY SCREWS LOOSENED.

2. REQUIREMENT
   STIFFENERS SHOULD BE PARALLEL WITH THE CONTACT BRACKETS.
   TO ADJUST
   FORM THE STIFFENER

3. REQUIREMENT
   CONTACT SPRINGS SHOULD REST AGAINST THEIR STIFFENERS THROUGHOUT THEIR WIDTH.
   TO ADJUST
   BEND TOP FORMED SECTION OF STIFFENER. IF NECESSARY, BEND CONTACT SPRINGS.

(B) NORMALLY OPEN CONTACT GAP

REQUIREMENT
WITH THE NORMALLY CLOSED CONTACTS CLOSED,
THE NORMALLY OPEN CONTACT SHOULD BE OPEN
MIN 0.020 INCH
MAX 0.025 INCH
TO ADJUST
BEND STIFFENER

(C) CONTACT SPRING (TWO SPRINGS)

REQUIREMENT
MIN 2 OZ
MAX 3 OZ
TO MOVE EACH CONTACT SPRING AWAY FROM ITS STIFFENER, WITH THE SWINGER HELD AWAY
TO ADJUST
REMOVE AND FORM THE SPRING.

(D) SWINGER SPRING

REQUIREMENT
MIN 4 OZ
MAX 6 OZ
TO MOVE SWINGER FROM NORMALLY CLOSED CONTACT.
TO ADJUST
BEND SWINGER

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3.35 Universal Contact (Stunt Box) Mechanism (continued)

TRIP CAM
REQUIREMENT
WITH STRIPPER BAIL SHAFT DRIVE LINK
AT ITS LOWEST POINT, THE CLEARANCE
BETWEEN THE LATCH LEVER AND THE LATCH
CAM SHOULD BE
MIN 0.003 INCH
TO ADJUST
ROTATE THE TRIP CAM WITH ITS MOUNTING
SCREW LOOSENED.
NOTE: AS A CHECK TO SEE THAT THE TRIP CAM IS
NOT INSTALLED 180° OUT OF PLACE, THE MAIN
SHAFT SHOULD BE ROTATED SO THAT THE STRIPPER
SHAFT DRIVE LINK MOVES DOWNWARD.

LATCH LEVER SPRING
REQUIREMENT
WITH LATCH LEVER RESTING ON HIGH PART
OF TRIP CAM
MIN 1/2 OZ
MAX 2 OZ
TO MOVE LATCH LEVER AWAY FROM TRIP CAM.
NOTE: THE FOLLOWING ADJUSTMENTS ARE TO BE MADE WITH THE CONTACT ASSEMBLY INSTALLED ON THE STUNT BOX.

CONTACT BRACKET AND DRIVE CAM

1. REQUIREMENT
   WITH DRIVE LINK IN ITS UPPERMOST POSITION, CLEARANCE BETWEEN TOP OF LATCH LEVER AND LATCH CAM
   MIN 0.003 INCH
   MAX 0.008 INCH

2. REQUIREMENT
   WITH THE MAIN SHAFT ROTATED ON UNTIL THE CLEARANCE IN REQUIREMENT 1 IS CLOSED AND THE LATCH CAM RESTS FIRMLY ON THE LATCH LEVER.
   CLEARANCE BETWEEN THE NORMALLY OPEN CONTACT SPRING AND THE UPPER END OF ITS STIFFENER
   MIN 0.005 INCH
   MAX 0.010 INCH

TO ADJUST
REPOSITION THE CONTACT BRACKET; AND, IF NECESSARY, THE DRIVE CAM.

0.015 TO 0.025 INCH (100 WPM)
3.37 Universal Contact (Stunt Box) Mechanism (continued)

GENERAL APPLICATION TIMING - FINAL (USING DXD OR SIMILAR EQUIPMENT)

CONTACT BRACKET AND DRIVE CAM POSITION

REQUIREMENT

THE NORMALLY OPEN UNIVERSAL CONTACTS SHOULD CLOSE WITHIN \( \pm 0.5 \) MILLISECONDS OF THE CLOSURE OF THE NORMALLY OPEN STUNT BOX CONTACT.

TO ADJUST

REFINE THE DRIVE CAM (AND, IF NECESSARY, THE BRACKET) ADJUSTMENT BY ROTATING THE DRIVE CAM WITHIN THE SPECIFIED LIMITS.

TRIP CAM

REQUIREMENT

THE NORMALLY OPEN UNIVERSAL CONTACTS SHOULD OPEN WITHIN \(-0.5 +0\) MILLISECONDS OF THE OPENING OF THE NORMALLY OPEN STUNT BOX CONTACT.

TO ADJUST

REFINE THE TRIP CAM ADJUSTMENT BY ROTATING THE TRIP CAM ON ITS SHAFT WITHIN THE SPECIFIED LIMITS.

SPECIAL ADJUSTMENTS (FOR 100 WPM)

NOTE: TO PREVENT EXCESSIVE FLEXING OF THE SWINGER, THE NORMALLY OPEN CONTACT SPRING STIFFENER MUST BE BENT TO HOLD THE SPRING AWAY FROM THE SWINGER WITH THE DRIVE LINK IN ITS UPPERMOST POSITION.

NORMALLY OPEN CONTACT GAP (100 WPM)

REQUIREMENT

WITH THE SWINGER RESTING AGAINST THE NORMALLY CLOSED CONTACT THE GAP SHOULD BE

MIN \( 0.075 \) INCH
MAX \( 0.085 \) INCH

TO ADJUST

BEND THE CONTACT SPRING STIFFENER.

CONTACT BRACKET AND DRIVE CAM POSITION (100 WPM)

REQUIREMENT

WITH THE LATCH CAM IN ITS FULLY LATCHED POSITION

MIN \( 0.015 \) INCH
MAX \( 0.025 \) INCH

BETWEEN THE NORMALLY OPEN CONTACT SPRING AND ITS STIFFENER.

TO ADJUST

POSITION THE DRIVE CAM AND/OR, IF NECESSARY, THE CONTACT BRACKET.

SPECIAL APPLICATION TIMING (USING DXD OR SIMILAR EQUIPMENT)

A. NORMALLY CLOSED CONTACTS (100 WPM FOR 83B2 SWITCHING SYSTEM)

1. THE NORMALLY CLOSED CONTACTS SHOULD CLOSE WITHIN 50 TO 80 DIVISIONS AFTER THE START OF THE STOP PULSE.
2. THE NORMALLY OPEN CONTACT SHOULD CLOSE PRIOR TO THE END OF NO. 3 PULSE.
3. THE NORMALLY OPEN CONTACTS SHOULD REMAIN CLOSED FOR AT LEAST 238 DIVISIONS (100 WPM DXD WITH 742 SCALE DIVISIONS).

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3. 38 Universal Contact (Stunt Box) Mechanism (continued)

8. NORMALLY CLOSED CONTACTS (100 WPM USED IN DELTA AND UNITED AIRLINES SYSTEM)

WHEN THE NORMALLY OPEN CONTACTS ARE NOT USED, THE NORMALLY CLOSED CONTACTS SHOULD REMAIN OPEN FOR 53.88 MILLISECONDS OR 400 \( \pm \) 15 DXD DIVISIONS.

TO ADJUST

REFINE THE DRIVE CAM, TRIP CAM AND, IF NECESSARY, THE BRACKET POSITIONS TO MEET THE TIMING REQUIREMENTS.

NOTE 1:

THE NORMAL 0.003 TO 0.008 INCH OVERTRAVEL OF THE LATCH CAM OVER THE LATCH LEVER WITH THE DRIVE LINK IN ITS UPPERMOST POSITION MUST BE INCREASED IN ORDER TO DECREASE NORMALLY CLOSED CONTACT GAP IN THE LATCHED POSITION OF THE LATCH CAM. THIS PREVENTS THE CONTACT FROM BOUNCING WHEN THE LATCH LEVER IS RELEASED.

NOTE 2:

WITH THE LATCH CAM IN ITS LATCHED POSITION, THERE SHOULD BE 0.015 INCH MINIMUM CONTACT GAP BETWEEN THE NORMALLY CLOSED CONTACTS.

GENERAL REQUIREMENTS AFTER TIMING ADJUSTMENTS

NOTE: IT IS VERY IMPORTANT THAT THE FOLLOWING REQUIREMENTS BE MET

A. WITH THE DRIVE LINK IN ITS UPPERMOST POSITION:

1. THE LATCH CAM SHALL NOT OVERTRAVEL OR HANG UP ON THE SWINGER INSULATOR.

2. THERE SHALL BE AT LEAST 0.003 INCH CLEARANCE BETWEEN THE LATCHING SURFACE OF THE LATCH CAM AND THE LATCHING SURFACE OF THE LATCH LEVER.

3. THE CLEARANCE BETWEEN THE NORMALLY OPEN CONTACT SPRING AND ITS STIFFENER SHALL NOT EXCEED 0.025 INCH.

B. WITH THE DRIVE LINK IN ITS LOWERMOST POSITION:

1. THE TOP OF THE SWINGER INSULATOR MUST CLEAR THE CUT-OUT SECTION OF THE LATCH CAM.

2. THERE SHALL BE AT LEAST 0.003 INCH CLEARANCE BETWEEN THE FRONT EDGE OF THE LATCH LEVER LATCHING SURFACE AND THE HIGH PART OF THE LATCH CAM.

C. WITH THE LATCH CAM IN ITS LATCHED POSITION, THERE SHALL BE AT LEAST 0.005 INCH CLEARANCE BETWEEN THE NORMALLY OPEN CONTACT SPRING AND THE UPPER END OF ITS STIFFENER.

D. THE LATCHING SURFACE OF THE LATCH LEVER SHALL COVER THE WIDTH OF THE TRIP CAM AND LATCH CAM.
3.39 Form Alignment Switch Mechanism

(A) FORM FEED-OUT ADJUSTMENT
   SEE PAR. 3.11 AND 3.12

(B) FORM ALIGNMENT SWITCH
   (REMOVE POWER FROM SWITCH)
   REQUIREMENT
   SWITCH SHOULD BE OPERATED WHEN SWITCH LEVER IS WITHIN 0.010 INCH OF BOTTOM OF
   NOTCH IN FORM-OUT DISK AND SHOULD NOT BE OPERATED WHEN LEVER IS ON OUTER EDGE
   OF DISK.
   TO CHECK
   1. ROTATE DISK UNTIL LEVER FALLS INTO NOTCH. PLACE 0.010 INCH FEELER GAGE BENEATH
      LEVER. LIFT LEVER AND ALLOW IT TO COME TO REST ON GAGE. SWITCH SHOULD BE
      OPERATED.
   2. ROTATE DISK UNTIL LEVER RESTS ON OUTER EDGE. SWITCH SHOULD NOT BE OPERATED.
   TO ADJUST
   POSITION SWITCH, AT PRY POINTS, WITH ITS MOUNTING SCREWS LOOSENED.

(C) FORM ALIGNMENT SWITCH SPRING
   REQUIREMENT
   MIN. 6 OZS.
   MAX. 8 OZS.
   TO MOVE THE LEVER FROM OUTER-EDGE OF DISK.
   TO CHECK
   SWITCH OPERATING LEVER ON OUTER EDGE OF DISK
   (NOT IN NOTCH AS SHOWN)
3. 40 DC Magnet Operated Print Suppression Mechanism

(D) ARMATURE EXTENSION OVERTRAVEL

**REQUIREMENT**

1. OVERTRAVEL OF ARMATURE EXTENSION SHOULD BE MIN. 0.010 INCH -- MAX. 0.015 INCH
2. THERE SHOULD BE NO CLEARANCE BETWEEN BLOCKING SURFACE OF ARMATURE EXTENSION AND BOTTOM SURFACE OF SUPPRESSION ARM.
   TO CHECK (REQUIREMENTS 1 AND 2.) SUPPRESSION ARM BLOCKED BY BLOCKING BAIL EXTENSION. HOLD ARMATURE AGAINST POLE FACE OF MAGNET.
3. ROTATE BLOCKING BAIL EXTENSION. IT SHOULD SLIDE UNDER THE SUPPRESSION ARM WITH NO PERCEPTIBLE CLEARANCE.
   TO CHECK (REQUIREMENT 3.) SUPPRESSION ARM BLOCKED BY ARMATURE EXTENSION

TO ADJUST

PIVOT MAGNET BRACKET, UP OR DOWN AND TO THE FRONT OR REAR, WITH ITS MOUNTING SCREWS LOOSENED, USING AN ECCENTRIC ADJUSTING TOOL. PRESS ARMATURE EXTENSION FIRMLY AGAINST BOTTOM OF SUPPRESSION ARM. IF NECESSARY, ADD OR REMOVE SHIMS BETWEEN SUPPRESSION ARM AND TYPE BOX CLUTCH TRIP ARM. RECHECK (B) AND (C).

NOTE: KEEP POLE FACE FREE OF OIL AND GREASE.

(A) TYPE BOX CLUTCH TRIP LEVER SEE PAR. 2.22 AND REFINE REQUIREMENT TO MIN. 0.040 INCH --- MAX. 0.055 INCH

(B) TYPE BOX CLUTCH SUPPRESSION ARM SEE PAR. 3.14

(C) BLOCKING BAIL SEE PAR. 3.14

(F) BLOCKING BAIL EXTENSION CLEARANCE REQUIREMENT
   THERE SHOULD BE NO INTERFERENCE BETWEEN ARMATURE EXTENSION AND BLOCKING BAIL EXTENSION.
   TO ADJUST
   REFINED ABOVE ADJUSTMENTS AS NECESSARY.

(E) ARMATURE EXTENSION CLEARANCE REQUIREMENT
   CLEARANCE BETWEEN END OF ARMATURE EXTENSION AND SUPPRESSION ARM SHOULD BE MIN. 0.012 INCH --- MAX. 0.030 INCH
   TO CHECK
   ARMATURE RELEASED
   TO ADJUST
   POSITION ARMATURE WITH ARMATURE STOP SCREW. RECHECK (D).
3.41 Print Suppression and Offline Stunt Shift Control Mechanism

**SUPPRESSION CODE BAR POSITION**

Notches in Suppression Code Bar should align with notches in other Code Bars. View from rear of unit above stunt box. Gage by eye.

To check:
- Energize the Print Suppression Magnet and place all code bars in spacing position.
- To adjust:
  - Operate magnet armature manually or electrically. Place all code bars in spacing position. Pivot the armature extension in its elongated mounting hole with the mounting screws loosened.

**SUPPRESSION CODE BAR**

- MOUNTING BRACKET
- YOKE
- PRINT SUPPRESSION MAGNET
- ARMATURE
- ARMATURE EXTENSION
- PRINT SUPPRESSION MAGNET ARMATURE RETURN SPRING
- TYPE BOX CLUTCH TRIP LEVER
- TYPE BOX CLUTCH SUPPRESSION ARM
- BLOCKING BAIL

(B) **TYPE BOX CLUTCH TRIP LEVER**
- See Par. 2.22 and refine requirement to
  - MIN. 0.040 INCH
  - MAX. 0.055 INCH

(C) **TYPE BOX CLUTCH SUPPRESSION ARM**
- See Par. 3.14

(D) **BLOCKING BAIL**
- See Par. 3.14

**NOTE:** Keep pole face free of oil and grease.
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3.42 Letters - Figures Codebar Shift Magnet Mechanism

(A) SHIFT MAGNET YOKE
REQUIREMENT
CLEARANCE BETWEEN ARMATURE AND END OF HEELPIECE SHOULD BE
MIN. SOME --- MAX. 0.003 INCH
TO CHECK
MAGNET ARMATURE HELD AGAINST CORE. CHECK CLEARANCE ACROSS END OF HEELPIECE
TO ADJUST
POSITION YOKE WITH ITS CLAMP SCREW LOOSENED.

(B) SHIFT MAGNET ARMATURE
REQUIREMENT
1. CLEARANCE BETWEEN ARMATURE AND
TRANSFER LEVER SHOULD BE
MIN. SOME --- MAX. 0.005 INCH
TO CHECK
MAGNET ARMATURE ATTRACTED. SHIFT
CODE BAR IN FULL MARKING POSITION.
TO ADJUST
POSITION MAGNET FORWARD OR BACKWARD WITH BRACKET MOUNTING SCREWS
LOOSENED.
2. CLEARANCE BETWEEN ARMATURE AND
TRANSFER LEVER SHOULD BE
MIN. SOME --- MAX. 0.010 INCH
TO CHECK
MAGNET ARMATURE UNOPERATED. SHIFT
CODE BAR IN FULL SPACING POSITION.
TO ADJUST
POSITION ARMATURE BACKSTOP SCREW
WITH LOCK NUT LOOSENED.

NOTE: KEEP POLE FACE FREE
OF OIL AND GREASE.

(C) SHIFT MAGNET ARMATURE RETURN SPRING
REQUIREMENT
MIN. 1 OZ. --- MAX. 3 OZS.
TO PULL SPRING TO INSTALLED LENGTH

(D) SHIFT CODE BAR RETURN SPRING
REQUIREMENT
MIN. 3 OZS. --- MAX. 7 OZS.
TO START CODE BAR MOVING
TO CHECK
TRIP TYPE BOX CLUTCH, ROTATE MAIN
SHAFT UNTIL PRINTING TRACK IS IN
LOWEST POSITION

LTRS - FIGS SHIFT CODE
BAR EXTENSION POST

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3.43 Form Feed-Out Mechanism

Form Feed-out Torsion Spring

Requirement:

- MIN. 1/8 OZ.
- MAX. 1-1/4 OZ.

To start bail moving towards rear of unit.
To check:
Disengage line feed clutch trip lever.

*Receive only units
MIN 2 OZS
MAX 6 OZS
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3.44 Two Color Ribbon Mechanism

SEE NOTES 1 THROUGH 5 ON FOLLOWING PAGE

(A) RIBBON MAGNET HINGE BRACKET (LEFT AND RIGHT) (PRELIMINARY)
REQUIREMENT --- MAGNET ENERGIZED OR IN ATTRACTED POSITION, ARMATURE ON POLE PIECE.
CLEARANCE BETWEEN ARMATURE AND POLE PIECE SHOULD BE NOT MORE THAN .005 INCH.
TO ADJUST --- POSITION HINGE BRACKET WITH MOUNTING SCREWS LOOSENED.

(B) RIBBON MAGNET BRACKET (LEFT AND RIGHT) (PRELIMINARY)
REQUIREMENT --- ADJUSTING SCREW IN LOWEST POSITION, ALL CLUTCHES DISENGAGED.
POSITION RIBBON MAGNET BRACKET AS FOLLOWS:
1. HOLD MAGNET ARMATURE STOP LEVER AGAINST MAGNET CORE, LEVER SHOULD BE PARALLEL
   TO OSCILLATING LEVER TOP SURFACE AND ENGAGE THE OSCILLATING LEVER BY AT LEAST
   1/2 OF THE STOP LEVER THICKNESS. GAUGE BY EYE.
2. STOP LEVER HELD AGAINST MAGNET CORE. CLEARANCE BETWEEN STOP LEVER AND
   OSCILLATING LEVER SHOULD BE: MIN. 0.005 INCH --- MAX. 0.020 INCH WITH PLAY
   TAKEN UP TOWARD FRONT OF UNIT.
TO ADJUST --- LOOSEN AND POSITION RIBBON MAGNET BRACKET TO MEET ABOVE REQUIREMENTS.

(C) RIBBON MAGNET HINGE BRACKET (LEFT AND RIGHT) (FINAL)
REQUIREMENT --- MAGNET DE-ENERGIZED OR IN RELEASED POSITION, ROTATE MAIN SHAFT UNTIL
OSCILLATING LEVER IS FULLY UNDER STOP LEVER. CLEARANCE BETWEEN OSCILLATING LEVER
AND STOP LEVER SHOULD BE: MIN. 0.020 INCH --- MAX. 0.040 INCH.
TO ADJUST --- POSITION STOP LEVER ADJUSTING SCREW WITH LOCK NUT LOOSENED.

--- End View ---
3.45 Two Color Ribbon Mechanism

**OPERATIONAL REQUIREMENT - RIBBON MAGNET BRACKET (FINAL) (SEE PRECEDING FIGURE)**

**PRINTS RED WHEN RIBBON MAGNETS ARE ENERGIZED.**

**TO ADJUST**

TURN LEFT AND RIGHT RIBBON BRACKET ROLLER BAIL ADJUSTING SCREWS 1/2 TURN UP. REFINER RIBBON AND RIBBON HINGE BRACKET ADJUSTMENTS. REPEAT ABOVE PROCEDURE IF BLACK IS PRINTED.

**RIBBON ROLLER BAIL SPRING, (LEFT AND RIGHT) (SEE PRECEDING FIGURE)**

**REQUIREMENT**

ALL CLUTCHES DISENGAGED, ADJUSTING SCREW IN LOWEST POSITION MIN. 4 OZS. --- MAX. 6 OZS.

TO START LIFTER BAIL MOVING.

**NOTES**

REFER TO RELATED REQUIREMENTS

1. VERTICAL POSITION LOCK LEVER EXTENSION - PAR. 2.36
2. RIBBON REVERSE SPUR GEAR - PAR. 2.52
3. RIBBON REVERSE DETENT - PAR. 2.52
4. RIBBON FEED LEVER BRACKET - PAR. 2.53
5. RIBBON RATCHET WHEEL FRICTION SPRING - PAR. 2.53 (MIN 3-1/3 OZS --- MAX 4-1/2 OZS).

---

**RIBBON REVERSING LEVER SPRING (LEFT AND RIGHT)**

**REQUIREMENT**

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

TO START LEVER MOVING.

---

**RIBBON GUIDE LEVER SPRING (LEFT AND RIGHT)**

**REQUIREMENT**

MIN. 1 OZ --- MAX. 2 OZS

TO START LEVER MOVING.
4. EARLIER DESIGN MECHANISMS
BASIC UNITS
4.01 SELECTOR MECHANISM

NOTE: BAIL LEVER GUIDE ADJUSTMENT APPLIES ONLY TO UNITS EQUIPPED WITH ADJUSTABLE GUIDES

START LEVER SPRING REQUIREMENT
LATCH LEVER SPRING UNHOOKED. STOP ARM BAIL IN INDENT OF ITS CAM.
RANGE SCALE SET AT 60 MIN. 2-1/2 OZS.
MAX. 4-1/2 OZS.
TO START THE STOP ARM MOVING.

BAIL LEVER GUIDE REQUIREMENT
SOME CLEARANCE BETWEEN EACH SIDE OF GUIDE FORK AND EXTENSION OF START LEVER THROUGHOUT ITS TRAVEL.
TO ADJUST POSITION BAIL LEVER GUIDE WITH MOUNTING NUT LOOSENED.

(RIGHT SIDE VIEW)
4.02 Selector Mechanism

SELECTOR ARMATURE
FOR REQUIREMENTS (1) AND (2) SEE PAR. 2.01 UNDER BASIC UNITS

ARMATURE BACKSTOP

MOUNTING SCREWS

ARMATURE EXTENSION

(BOTTOM VIEW)

(3) REQUIREMENT (ARMATURE BACKSTOP ALIGNMENT)
CLEARANCE BETWEEN SIDES OF BACKSTOP
AND SIDES OF ARMATURE EXTENSION.
MIN. 0.010 INCH

TO ADJUST
1. POSITION ARMATURE SPRING ADJUSTING NUT TO HOLD
   ARMATURE FIRMLY AGAINST PIVOT EDGE OF CASTING.
2. POSITION ARMATURE AND BACKSTOP WITH
   MOUNTING SCREWS LOOSENED.
TRANSFER LEVERS

CODE BAR SHIFT LEVER LINK

CODE BAR SHIFT LEVER DRIVE ARM

REQUIREMENT

CODE BAR SHIFT LEVER LINK IN THE UPPERMOST POSITION.

THERE SHOULD BE SOME CLEARANCE BETWEEN THE TOP OF THE ROLLERS AND THE TOP OF THE CAM SLOTS IN THE CODE BAR SHIFT LEVERS MAX. 0.025 INCH ON THE CLOSEST LEVER.

TO ADJUST

LOOSEN THE CLAMP SCREW. POSITION THE CODE BAR SHIFT LEVER DRIVE ARM ON ITS SHAFT TO MEET THE REQUIREMENT AND TO PROVIDE SOME END PLAY, NOT MORE THAN 0.006 INCH
4.04 Codebar Mechanism (Cont.)

**REAR CODE BAR SHIFT LEVER**

**CODE BAR SHIFT BAR (MARKING)**

**CODE BAR SHIFT BAR (SPACING)**

**CODE BAR SHIFT BAR INNER STEP**

**FRONT CODE BAR SHIFT LEVER**

**TRANSFER LEVERS**

**CODE BAR SHIFT LEVER LINK GUIDE BRACKET**

**MOUNTING SCREWS (3)**

**CODE BAR SHIFT LEVER LINK GUIDE BRACKET**

**REQUIREMENT**

Motion of front and rear code bar shift levers should be equalized with respect to code bar travel.

**TO CHECK (FRONT)**

Select blank combination and rotate main shaft until code bar shift lever link reaches highest travel. Take up play for maximum clearance. Clearance between front code bar shift lever and shoulder on nearest code bar shift bar

Min. 0.002 inch --- Max. 0.025 inch

**TO CHECK (REAR)**

Select letters combination. Check clearance between rear code bar shift lever and shoulder of code bar shift bar in same way.

Min. 0.002 inch --- Max. 0.025 inch

**TO ADJUST**

Position code bar shift lever link guide bracket by means of mounting screws (3).
SECTION 573-115-700
4.05 Main Shaft and Trip Shaft Mechanisms

(A) CLUTCH TRIP SHAFT SET COLLARS

(1) REQUIREMENT
   SPACING CLUTCH LATCH LEVER SHOULD HAVE SIDE PLAY
   MIN. SOME
   MAX. 0.008 INCH
   TO ADJUST
   POSITION SPACING CLUTCH LATCH LEVER SET COLLAR.

SPACING CLUTCH LATCH LEVER SET COLLAR

TRIP SHAFT

TRIP LEVER

MAIN SHAFT

SHOE LEVER

SPACING CLUTCH

NOTE: ANTI-DEFLECTION PLATE ADJUSTMENT APPLIES ONLY TO UNITS SO EQUIPPED.

(B) ANTI-DEFLECTION PLATE

REQUIREMENT

WITH TYPING UNIT UPSIDE DOWN AND FUNCTION, SPACING, LINE FEED, AND TYPE BOX CLUTCHES LATCHED DIENGAGED.

MIN. 1 LB.    MAX. 5 LBS.

TO PULL TRIP SHAFT AWAY FROM ANTIDEFLECTION PLATE.

TO ADJUST
POSITION PLATE WITH MOUNTING SCREWS LOOSENED.
4.06 Main Shaft and Trip Shaft Mechanisms (Cont.)

SPACING CLUTCH TRIP LEVER

Requirement

SPACING AND TYPE BOX CLUTCHES DISENGAGED TRIP LEVER ARM IN UPWARD POSITION.

FOR UNITS WITHOUT U-SHAPED LINE

FEED CLUTCH TRIP LEVER:
- SPACING CLUTCH TRIP LEVER SHOULD BE FLUSH OR UNDERFLUSH BY 1/2 THICKNESS OF SHOE LEVER WITH OUTER SURFACE OF SHOE LEVER.

FOR UNITS WITH U-SHAPED LINE

FEED CLUTCH TRIP LEVER:
- SPACING CLUTCH TRIP LEVER SHOULD ENGAGE SHOE LEVER BY FULL THICKNESS OF SHOE LEVER CHECK AT STOP LUG WITH LEAST BITE.

TO ADJUST

USE ADJUSTING SCREW TO POSITION SPACING CLUTCH TRIP ARM.

SPACING CLUTCH TRIP LEVER SPRING

Requirement

CLUTCH ENGAGED AND ROTATED UNTIL TRIP LEVER RESTS ON STOP LUG.

<table>
<thead>
<tr>
<th>CLUTCH</th>
<th>MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPACING</td>
<td>11 OZS.</td>
<td>16 OZS.</td>
</tr>
<tr>
<td>LINE FEED</td>
<td>9 OZS.</td>
<td>12 OZS.</td>
</tr>
<tr>
<td>TYPE BOX</td>
<td>5 OZS.</td>
<td>7-1/4 OZS.</td>
</tr>
</tbody>
</table>

TO MOVE LEVER AWAY FROM STOP LUG.
4.07 Spacing Mechanism

NOTE: CHECK RELATED ADJUSTMENTS, PARS. 4.12, 4.13, 2.47, IF THE FOLLOWING ADJUSTMENTS ARE REMADE.

OSCILLATING RAIL SLIDE POSITION REQUIREMENT
SPACING CUTOUT LEVER AND AUTOMATIC CR-LF ARM IN MAXIMUM COUNTERCLOCKWISE POSITION ON SPACING DRUM. SPACING CLUTCH DISENGAGED. FARthest advanced spacing pawl engaged with tooth just above cut-away section in ratchet wheel. Right end of oscillating rail slide should clear pulley, MIN. 0.025 INCH --- MAX. 0.050 INCH TO ADJUST POSITION SLIDE ON WIRE ROPE WITH CLAMP SCREWS LOOSENED.

SPACING FEED PAWL SPRING REQUIREMENT
Each spacing pawl in least advanced position, resting against ratchet wheel. Each spring unhooked from bracket MIN. 2-1/2 OZS. --- MAX. 4 OZS. TO PULL SPRINGS TO INSTALLED LENGTH.

NOTE:
ON UNITS EQUIPPED FOR 6 SPACES PER INCH, THIS TENSION SHOULD BE MIN. 8 OZS. --- MAX. 10 OZS. TO PULL SPRINGS TO INSTALLED LENGTH.
4.08 Function Mechanism

NOTE: 1. THIS ADJUSTMENT APPLIES ONLY TO UNITS WITH NON-ADJUSTABLE GUIDE PLATES
2. FOR UNITS WITH ADJUSTABLE GUIDE PLATES SEE PAR. 2.32.

GUIDE PLATE EXTENSION
GUIDE PLATE
MOUNTING NUTS
LETTERS FUNCTION SLIDE

SHIFT FORK
(MOUNTING NUTS)

(TOP VIEW)

SHIFT CODE BAR
FIGURES FUNCTION SLIDE

(MAX. 32 OZS.)

FUNCTION LEVER
FUNCTION PAWL
FUNCTION BAR

(RIGHT SIDE VIEW)

FIGS - LTS SHIFT CODE BAR OPERATING MECHANISM

REQUIREMENT: (FOR TWO STOP FUNCTION CLUTCH)
DISENGAGE FUNCTION CLUTCH AT POSITION GIVING LEAST CLEARANCE, ROTATE TYPE BOX CLUTCH
1/2 REVOLUTION, HOLD FIGURES FUNCTION LEVER IN REARWARD POSITION WITH TENSION OF 32
OZS., CLEARANCE BETWEEN THE FUNCTION PAWL SHOULDER AND FACE OF FUNCTION BAR
MIN. 0.002 INCH
MAX. 0.015 INCH

WHEN PLAY IN PAWL IS TAKEN FOR MAXIMUM CLEARANCE,
DISENGAGE FIGURES FUNCTION PAWL, CHECK LETTERS FUNCTION PAWL IN SAME MANNER.

TO ADJUST
POSITION SHIFT ASSEMBLY WITH CLAMP SCREWS LOOSENED, TAKE UP PLAY IN
MOUNTING HOLES TO REAR,
CAUTION: MANUALLY OPERATE LETTERS AND FIGURES FUNCTION LEVER ALTERNATELY
LEVERS SHOULD BE FREE OF BINDS.
4.09 Function Mechanism (Cont.)

NOTE: 1. THIS ADJUSTMENT APPLIES ONLY TO UNITS WITH A TWO STOP FUNCTION CLUTCH.
     2. FOR UNITS WITH A ONE STOP FUNCTION CLUTCH SEE PAR. 2.33.

FUNCTION RESET BAIL BLADE

(1) REQUIREMENT
FUNCTION CLUTCH DISENGAGED AT STOP POSITION GIVING LEAST CLEARANCE. TYPE
BOX CLUTCH DISENGAGED. ALL FUNCTION PAWLS UNLATCHED FROM THEIR FUNCTION
BARS. FUNCTION BAR HELD IN MAXIMUM REARWARD POSITION. CLEARANCE BETWEEN
FUNCTION BAR AND RESET BAIL BLADE
MIN. 0.018 INCH -- MAX. 0.035 INCH

TO CHECK
MEASURE CLEARANCE AT BARS LOCATED IN STUNT BOX SLOTS. 1, 4, 11, 18, 23, 33, 38,
AND 41. IF THERE IS NO BAR IN A DESIGNATED SLOT, USE NEAREST BAR. IF THERE IS A
BAR ON EACH SIDE OF A DESIGNATED VACANT SLOT, USE BAR IN HIGHEST NUMBERED
SLOT. (NOTE: FACING REAR OF UNIT, SLOTS ARE NUMBERED FROM LEFT TO RIGHT)

TO ADJUST
POSITION BLADE ON RESET BAIL WITH BLADE MOUNTING SCREWS FRICTION TIGHT.

(2) REQUIREMENT
TYPE BOX CLUTCH ROTATED 1/2 REVOLUTION, FUNCTION LEVER HELD IN REARMOST
POSITION WITH 2 LBS. MAXIMUM TENSION. LATCH ASSOCIATED PAWL ONLY ONE AT
A TIME. WITH 32 OZS. TENSION APPLIED TO FUNCTION PAWL, IT SHOULD OVERTRAVEL
ITS BAR
MIN. 0.002 INCH

TO ADJUST
REFINE REQUIREMENT (1).
4.10 Positioning Mechanism

NOTE: THESE ADJUSTMENTS APPLY ONLY TO HORIZONTAL POSITIONING DRIVE MECHANISMS EQUIPPED WITH TENSION SPRINGS.

NOTE: THE LOOPS OF THIS SPRING ARE OFF-SET FROM CENTER IN THE SAME DIRECTION. THE SPRING MUST BE HOOKED ON ITS ANCHORS SO THAT THE SIDE OF THE SPRING ON WHICH THE LOOPS ARE LOCATED, IS TOWARD THE REAR OF THE MACHINE. WHEN REMOVING EITHER SPRING EXERCISE CARE TO AVOID KINKS IN LOOPS.

HORIZONTAL POSITIONING DRIVE LINKAGE SPRING REQUIREMENT

SPRING UNHOOKED FROM ITS POST.
LINKAGE IN ITS UNBUCKLED POSITION.
MIN. 14 OZS. --- MAX. 18 OZS.
TO PULL SPRING TO INSTALLED LENGTH.

HORIZONTAL POSITIONING DRIVE LINKAGE - VERTICAL LINK

REQUIREMENT

TYPE BOX CLUTCH DISENGAGED. CODE BARS 4 AND 5 TO SPACING (RIGHT).
CLEARANCE BETWEEN EACH SIDE OF CENTER HORIZONTAL STOP SLIDE AND DECELERATING SLIDES ON SIDE WHERE KNEE LINK IS STRAIGHT, SHOULD BE EQUAL (WITHIN 0.005 INCH)
MIN. 0.020 INCH --- MAX. 0.040 INCH

TO ADJUST
LOOSEN BEARING STUD MOUNTING SCREWS AND CONNECTING STRIP MOUNTING SCREWS FRICITION TIGHT. POSITION ONE OR BOTH BEARING STUDS ON THE CONNECTING STRIP TO PROVIDE 0.025 INCH TO 0.035 INCH BETWEEN THE CENTER HORIZONTAL SLIDE AND THE DECELERATING SLIDE ON THE SIDE WHERE THE LINKAGE IS NOT BUCKLED. TIGHTEN THE TWO INNER MOUNTING SCREWS, CHANGE POSITION OF REVERSING SLIDE AND CHECK OPPOSITE CLEARANCE. EQUALIZE BY SHIFTING BOTH STUDS AND CONNECTING STRIP AS A UNIT. HOLD THE DRIVE LINKAGE HUB AGAINST THE LOWER VERTICAL LINK OF THE DRIVE LINKAGE. TIGHTEN THE TWO OUTER BEARING STUD MOUNTING SCREWS. CHECK THE LINKAGE FOR FREENESS THROUGHOUT A COMPLETE CYCLE. THE TYPE BOX CLUTCH DISK SHOULD HAVE SOME MOVEMENT IN THE NORMAL DIRECTION OF ROTATION IN THE STOP POSITION.
NOTE: THESE ADJUSTMENTS APPLY ONLY TO HORIZONTAL POSITIONING DRIVE MECHANISMS EQUIPPED WITH TORSION SPRINGS.

HORIZONTAL POSITIONING DRIVE LINKAGE

REQUIREMENT
- TYPE BOX CLUTCH DISENGAGED.
- CODE BARS 4 AND 5 TO SPACING (RIGHT).
- CLEARANCE BETWEEN EACH SIDE OF CENTER HORIZONTAL STOP SLIDE AND DECELERATING SLIDES, ON SIDE WHERE KNEE LINK IS STRAIGHT SHOULD BE EQUAL (WITHIN 0.008 INCH)
  - MIN. 0.015 INCH
  - MAX. 0.040 INCH

TO ADJUST
- LOOSEN BEARING STUD MOUNTING SCREWS AND CONNECTING STRIP MOUNTING SCREWS FRICION TIGHT. POSITION ONE OR BOTH BEARING STUDS ON THE CONNECTING STRIP TO PROVIDE 0.025 INCH TO 0.035 INCH BETWEEN THE CENTER HORIZONTAL SLIDE AND THE DECELERATING SLIDE ON THE SIDE WHERE THE LINKAGE IS NOT BUCKLED. TIGHTEN THE TWO INNER MOUNTING SCREWS.
- CHANGE POSITION OF REVERSING SLIDE AND CHECK OPPOSITE CLEARANCE. EQUALIZE BY SHIFTING BOTH STUDS AND CONNECTING STRIP AS A UNIT. HOLD THE DRIVE LINKAGE HUB AGAINST THE LOWER VERTICAL LINK OF THE DRIVE LINKAGE. TIGHTEN THE TWO OUTER BEARING STUD MOUNTING SCREWS.
- CHECK THE LINKAGE FOR FREENESS THROUGHOUT A COMPLETE CYCLE. THE TYPE BOX CLUTCH DISK SHOULD HAVE SOME MOVEMENT IN THE NORMAL DIRECTION OF ROTATION IN THE STOP POSITION.
4.12 Spacing Mechanism (Cont.)

NOTE: CHECK RELATED ADJUSTMENTS, PARS. 4.07, 4.13 AND 2.47 IF THE FOLLOWING ADJUSTMENTS ARE REMADE.

(B) LEFT MARGIN

(1) REQUIREMENT (FOR 72 CHARACTER LINE)

TYPE BOX CLUTCH DISENGAGED. SPACING DRUM IN RETURNED POSITION.

TYPE BOX SHIFTED TO THE LETTERS POSITION. CENTER OF THE LETTERS PRINT INDICATOR ON THE TYPE BOX SHOULD BE MIN. 15/16 INCH --- MAX. 1-1/16 INCH FROM THE LEFT EDGE OF THE PLATEN.

NOTE: CHECK RELATED ADJUSTMENTS, PARS. 4.07, 4.13 AND 2.47 IF THE FOLLOWING ADJUSTMENTS ARE REMADE.

(2) REQUIREMENT

SPACING CLUTCH DISENGAGED. FRONT SPACING FEED PAWL FARTHEST ADVANCED. SPACING DRUM FULLY RETURNED. PLAY IN SPACING SHAFT GEAR PAR. 2.24 TAKEN UP CLOCKWISE. CLEARANCE BETWEEN PAWL AND SHOULDER OF RATCHET WHEEL TOOTH IMMEDIATELY AHEAD MIN. 0.002 INCH --- MAX. 0.015 INCH

(3) REQUIREMENT

REAR PAWL, WHEN FARTHEST ADVANCED, SHOULD REST AT BOTTOM OF INDENTATION BETWEEN RATCHET WHEEL TEETH.

TO ADJUST

POSITION STOP ARM ON SPACING DRUM WITH MOUNTING SCREWS LOOSENED.

(A) PRINTING CARRIAGE POSITION

(USE STANDARD ADJUSTMENT PAR. 2.47)

NOTE:

FOR OTHER LENGTHS OF LINE, RANGING FROM 65 TO 85 CHARACTERS THE MARGIN CAN BE VARIED AS REQUIRED.

NOTE

THIS VIEW SHOWS THE SPACING DRUM FULLY RETURNED.
NOTE: CHECK RELATED ADJUSTMENTS, PARs. 4.07, 2.38 AND 2.47, IF THE FOLLOWING ADJUSTMENT ARE REMADE.

RIGHT MARGIN REQUIREMENT (OPERATING ON BASE) TYPE BOX CARRIAGE IN POSITION TO PRINT CHARACTER ON WHICH SPACING CUTOUT IS DESIRED. FRONT SPACING PAWL FARDEST ADVANCED. CLEARANCE BETWEEN UPPER EDGE OF SPACING CUTOUT LEVER AND CUTOUT TRANSFER BAIL WHEN SPACING CUTOUT TRANSFER BAIL IS HELD IN ITS EXTREME UPPER POSITION MIN. 0.006 INCH---MAX. 0.025 INCH TO ADJUST POSITION THE CUTOUT LEVER WITH ITS CLAMP SCREW LOOSENED.

SPACING CUTOUT LEVER SPACING CUTOUT TRANSFER BAIL SPRING REQUIREMENT MIN. 1 OZ.---MAX. 3-1/2 OZS. TO START BAIL MOVING.

DECELERATING SLIDE DECELERATING SLIDE BELL CRANK (PART OF DECELERATING SLIDE) DECELERATING SLIDE BELL CRANK SPRING REQUIREMENT MIN. 3/4 OZ.---MAX. 1-3/4 OZS. TO START BELL CRANK MOVING. CHECK RIGHT AND LEFT SPRINGS.
4.14 Printing Mechanism

TYPE BOX CARRIAGE ROLLER
REQUIREMENT
MINIMUM VERTICAL PLAY WITHOUT
BIND IN TYPE BOX CARRIAGE
TO CHECK
MOVE CARRIAGE TO RIGHT END
OF TRACK. PLACE IN UPPER
POSITION. REMOVE DRIVE LINK.
CHECK THROUGHOUT ENTIRE
TRAVEL OF CARRIAGE.
TO ADJUST
POSITION LOWER ROLLER ARM
WITH CLAMP SCREW LOOSENED.

4.15 Positioning Mechanism (Cont.)

NOTE: FOR SHIFT MECHANISMS WITH TORSION SPRINGS

SHIFT LINKAGE SPRING
RIGHT SHIFT LINKAGE

SHIFT LINKAGE SPRING
REQUIREMENT
LINK IN STRAIGHT POSITION.
MIN. 7 OZS.
MAX. 16 OZS.
TO START EACH LINK MOVING.
SECTION 573-115-700
4.16 Printing Mechanism (Cont.)

(A) PRINTING HAMMER STOP BRACKET

(FOR THICK TYPE BOX WITH DUMMY PALLETS)

REQUIREMENT

TYPE BOX IN BLANK OR CR POSITION (WHICHEVER DOES NOT PRINT) AND NEAR CENTER OF PLATEN. PRINTING TRACK IN ITS DOWNWARD POSITION. PRINTING HAMMER HELD AGAINST ITS STOP WITH 8 OZS. OF PRESSURE. CLEARANCE BETWEEN PRINTING HAMMER AND DUMMY TYPE PALLET

FRICITION FEED

MIN. 0.008 INCH
MAX. 0.020 INCH

TO ADJUST

POSITION THE STOP BRACKET WITH ITS MOUNTING SCREW AND THE PRINTING HAMMER BAIL PIVOT STUD LOOSENESED.

(FOR SPROCKET FEED UNITS, SEE PAR. 2.71)

(B) PRINTING ARM

(1) REQUIREMENT

PRINTING TRACK IN MAXIMUM DOWNWARD POSITION. PRINTING HAMMER OPERATING BAIL AGAINST ITS STOP. SOME CLEARANCE BETWEEN SECONDARY PRINTING ARM AND FORWARD EXTENSION OF HAMMER OPERATING BAIL.

MAX. 0.015 INCH

WHEN PRINTING ARM SLIDE IS HELD DOWNWARD OVER EACH PRINTING TRACK MOUNTING SCREW FOR MAXIMUM CLEARANCE.

(2) REQUIREMENT

PRINTING TRACK IN UPPERMOST POSITION. LATCHING EXTENSION OF PRINTING HAMMER OPERATING BAIL SHOULD OVERTRAVEL LATCHING SURFACE OF OPERATING BAIL LATCH BY

MIN. 0.006 INCH

CHECK RIGHT AND LEFT POSITION TO ADJUST POSITION SECONDARY PRINTING ARM WITH CLAMP SCREWS LOOSENESED.

NOTE

THE PRINTING ARM ADJUSTMENT SHOULD ALWAYS BE MADE WITH THE PRINTING HAMMER OPERATING BAIL SPRING BRACKET (PAR. 2.38) IN THE NO. 1 POSITION. POSITIONS NO. 2 AND NO. 3 ARE TO BE USED ONLY FOR MAKING MULTIPLE COPIES.

(C) TYPE PALLET SPRING

REQUIREMENT

TYPE BOX REMOVED FROM THE UNIT. 8 OZ. SCALE APPLIED VERTICALLY TO THE END OF THE PALLET SHANK.

MIN. 1/4 OZ.
MAX. 3/4 OZ.

TO START PALLET MOVING
4.17 Printing Mechanism (Cont.)

(A) RIBBON REVERSE SPUR GEAR

**Requirement**

When the right reversing lever is in its maximum downward position, the left reversing lever should be in its maximum upward position.

To adjust:

1. Loosen the set screws in the detent cam.
2. Loosen the left spur gear nut.
3. Securely tighten the right spur gear nut.
4. Move the right reversing lever to its maximum downward position and hold the left reversing lever in its maximum upward position.
5. Then tighten the left spur gear nut.

---

(B) RIBBON REVERSE DETENT LEVER SPRING

**Requirement**

Detent seated in notch of cam. Right ribbon reversing lever held downward. Min. 6-1/2 OZS. —— Max. 9 OZS. To start the detent lever moving.

---

(C) RIBBON REVERSE DETENT LEVER SPRING

**Requirement**

Detent seated approximately equal in upper and lower positions of detent cam.

To adjust:

Position cam on shaft with set screws loosened. Let left end of detent stud be approximately flush with left face of cam (play in detent taken to right of printer).
4.18 Function Mechanism (Cont.)

**FUNCTION PAWL**

---

**FUNCTION STRIPPER BLADE ARMS**

**REQUIREMENT**

TYPE BOX CLUTCH AND FUNCTION CLUTCH DISENGAGED. LEFT LINE FEED FUNCTION PAWL HELD IN ITS REAR POSITION AND RESTING ON THE UPPER EDGE OF THE STRIPPER BLADE. CLEARANCE BETWEEN UPPER EDGE OF FUNCTION BAR AND LOWER SURFACE OF NOTCHED SECTION OF FUNCTION PAWL.

MIN. 0.055 INCH
MAX. 0.065 INCH

THE LETTERS FUNCTION PAWL NEAR THE OPPOSITE END OF THE STRIPPER BLADE SHOULD HAVE THE SAME CLEARANCE.

TO ADJUST POSITION THE SHOULDER BUSHING AT THE LOWER END OF THE RIGHT AND LEFT STRIPPER BLADE ARM WITH THE LOCK NUT LOOSENED.

NOTE WHEN CHECKING THIS ADJUSTMENT SINGLE–DOUBLE LINE FEED LEVER MUST BE IN DOUBLE LINE FEED POSITION.

4.19 Spacing Mechanism (Cont.)

**AUTOMATIC CARRIAGE RETURN AND LINE FEED ARM**

**REQUIREMENT (OPERATING ON BASE)**

CARRIAGE IN POSITION TO PRINT TWO SPACES BEFORE THE LAST DESIRED CHARACTERS, AND FRONT SPACING PAWL FARthest ADVANCED. CLEARANCE BETWEEN LEADING END OF AUTOMATIC CARRIAGE RETURN ARM AND BELL CRANK.

MIN. 0.040 INCH
MAX. 0.055 INCH

TO ADJUST POSITION AUTOMATIC CARRIAGE RETURN ARM WITH MOUNTING SCREWS LOOSENED.

NOTE RANGE OF ADJUSTMENT IS FROM 65TH TO 85TH CHARACTERS.

**NOTE**

FOR UNITS EQUIPPED WITH UNIVERSAL SPACING DRUM, SEE PAR. 2.62.
4.20 Line Feed Mechanism and Platen Mechanism

NOTE: THIS ADJUSTMENT APPLIES ONLY TO UNITS WITH A TWO-STOP FUNCTION CLUTCH

SINGLE-DOUBLE LINE FEED LEVER

REQUIREMENT

SINGLE-DOUBLE LINE FEED LEVER IN SINGLE LINE FEED POSITION. LINE FEED COMBINATION SET UP. MAIN SHAFT ROTATED UNTIL THE LINE FEED FUNCTION PAWL STRIPPER IS IN CONTACT WITH THE LINE FEED FUNCTION PAWL, THE PAWL SHOULD OVERLAP THE STRIPPER BY MIN. 1/2 THE PAWL THICKNESS WHEN THE PLAY IN THE PAWL IS TAKEN UP IN A DIRECTION TO MAKE THE OVERLAP MINIMUM.

TO ADJUST

POSITION THE LEVER ADJUSTING SCREW
4.21 Function Mechanism (Cont.)

BELL OR MOTOR STOP FUNCTION CONTACT

(1) REQUIREMENT
FUNCTION LEVER AS SHOWN
CONTACT GAP
MIN. 0.010 INCH
MAX. 0.020 INCH
TO ADJUST
BEND THE LOWER ELECTRICAL CONTACT.

(2) REQUIREMENT
FUNCTION LEVER AS SHOWN
MIN. 1-1/4 OZS.
MAX. 1-3/4 OZS.
TO ADJUST
BEND THE UPPER ELECTRICAL CONTACT

(3) REQUIREMENT
RECHECK REQUIREMENT (1)
4.22 Function Mechanism (Cont.)

**Function Mechanism**

**Function Contact SPRING**

**Requirement**
- Contact Closed
  - Min. 1 oz.
  - Max. 2 ozs.
  - To open switch contact

**Contact Assembly**

**Function Lever (Unoperated)**

**Function Lever (Operated)**

**Caution:** Care should be exercised in soldering to contact springs since excessive heat will anneal the springs.

**Function Contact SPRING**

**Requirement**
- Contact Closed
  - Min. 1 oz.
  - Max. 2 ozs.
  - To open switch contact
MARGIN INDICATOR LAMP

REQUIREMENT
OPERATING UNDER POWER, THE LAMP SHOULD LIGHT ON THE DESIRED CHARACTER.

TO ADJUST
SET THE TYPE BOX CARRIAGE TO PRINT THE DESIRED CHARACTER AND POSITION THE CAM DISK COUNTERCLOCKWISE ON THE SPRING DRUM WITH ITS THREE MOUNTING SCREWS LOOSENED SO THAT THE SWITCH JUST OPENS. IF A LINE SHORTER THAN 72 CHARACTERS IS REQUIRED, IT MAY BE NECESSARY TO REMOVE THE CAM DISK SCREWS AND INSERT THEM IN ADJACENT SLOTS OF THE DISK, IF THE RANGE OF ROTATION IN ONE SLOT IS NOT ENOUGH.
VARIABLE FEATURES
4.24 Horizontal Tabulator Mechanism

(A) OPERATING LEVER SLIDE ARM

NOTE
PRIOR TO THIS ADJUSTMENT CHECK FUNCTION
RESET BAIL BLADE ADJUSTMENT (PAR. 4.09)

REQUIREMENT
ON UNITS WITH TWO-STOP FUNCTION CLUTCHES,
FUNCTION CLUTCH DISENGAGED. TYPE BOX CLUTCH
ROTATED 1/2 REVOLUTION PAST STOP POSITION. ON UNITS
WITH ONE-STOP FUNCTION CLUTCH, ROTATE CLUTCH
UNTIL FUNCTION PAWL STRIPPER BLADE IS IN ITS
LOWER POSITION AND THE FUNCTION RESET BAIL ROLLER
IS ON THE HIGH PART OF CAM. HORIZONTAL TABULATOR
FUNCTION PAWL PULLED TO REAR AND LATCHED OVER
FUNCTION BAR. CLEARANCE
MIN. 0.020 INCH
MAX. 0.030 INCH

TO ADJUST
POSITION SLIDE ARM ON OPERATING LEVER WITH
MOUNTING STUD FRICTION TIGHT

(C) OPERATING LEVER EXTENSION
LINK SPRING
REQUIREMENT
TRIP ARM LATCH BAIL SPRING
UNHOOKED. OPERATING LEVER
IN OPERATED POSITION.
SLIDE ARM AGAINST
BLOCKING LINK.
MIN. 8-3/4 OZS.
MAX. 10-3/4 OZS.
TO START LINK MOVING.

(B) OPERATING LEVER ADJUSTING PLATE
REQUIREMENT
OPERATING LEVER IN UNOPERATED
POSITION. CLEARANCE
MIN. 0.070 INCH
MAX. 0.085 INCH
TO ADJUST
POSITION ADJUSTING PLATE ON
BRACKET WITH MOUNTING
SCREWS LOOSE.
SECTION 573-115-700

4.25 Horizontal Tabulator Mechanism (Cont.)

**TRIP ARM LATCH BAIL**

**REQUIREMENT**
OPERATING LEVER UNOPERATED. SPACING TRIP ARM UP. CLEARANCE MIN. 0.025 INCH MAX. 0.035 INCH TO ADJUST POSITION LATCH BAIL ADJUSTING SCREW. TIGHTEN LOCK NUT.

**TRIP ARM LATCH BAIL SPRING**

**REQUIREMENT**
OPERATING LEVER IN UNOPERATED POSITION. MIN. 2-1/2 OZS. MAX. 4-1/2 OZS. TO START LATCH BAIL MOVING.

**TRIP ARM LATCH BAIL ADJUSTING PLATE**

**REQUIREMENT**
SPACING CLUTCH AND TYPE BOX CLUTCH DISENGAGED. OPERATING LEVER SLIDE ARM TO REAR AND LATCHED ON BLOCKING ARM. LATCH BAIL IN FULLY LATCHED POSITION. SPACING TRIP ARM DOWN AND BEARING UP AGAINST LATCHING SURFACE OF LATCH BAIL. CLEARANCE MIN. SOME MAX. 0.008 INCH TO ADJUST POSITION LATCH BAIL ADJUSTING PLATE WITH MOUNTING SCREW FRICITION TIGHT.

**MOUNTING SCREW**

**SPACING TRIP LEVER**

**OPERATING LEVER**

**SPACING TRIP ARM**

**LATCH BAIL ADJUSTING PLATE**

**TRIP ARM LATCH BAIL**

**LOCK NUT**

**LATCH BAIL ADJUSTING SCREW**

**SPACING TRIP ARM OPERATING LEVER**

**LATCH BAIL SPRING**
4.26 Horizontal Tabulator Mechanism (Cont.)

(C) HORIZONTAL TABULATOR SLIDE ARM SPRING

- OPERATING LEVER IN UNOPERATED POSITION, SLIDE ARM IN UNOPERATED POSITION.
  - MIN. 1 OZ.
  - MAX. 4 OZS.
  - TO START SLIDE ARM MOVING.

- STRIPPER BAIL ARM SCREW
- CAM ARM FOLLOWER BAIL

(D) OPERATING LEVER CAM PLATE SPRING

- OPERATING LEVER IN UNOPERATED POSITION, HORIZONTAL TABULATOR FUNCTION PAWL UNLATCHED.
  - MIN. 4 OZS.
  - MAX. 9 OZS.
  - TO START STRIPPER BAIL ARM MOVING.

(A) CAM PLATE STRIPPER BAIL

- OPERATING LEVER AND TABULATOR SLIDE ARM IN UNOPERATED POSITIONS. SPACING CLUTCH ROTATED UNTIL HIGH PART OF SPACING CAM IS OPPOSITE CAM ARM FOLLOWER BAIL. CLEARANCE
  - MIN. 0.010 INCH
  - MAX. 0.025 INCH
  - TO ADJUST POSITION STRIPPER BAIL ARM ON CAM ARM FOLLOWER BAIL WITH STRIPPER BAIL ARM SCREW FRICTION TIGHT.

(B) SPACING CUTOUT TRANSFER BAIL

- SET COLLAR
- ADJUSTING SCREW

- TRANSFER BAIL EXTENSION ARM
- SPACING CUTOUT TRANSFER BAIL

ISS 7, SECTION 573-115-700
4.27 Horizontal Tabulator Mechanism (Cont.)

(A) **RIGHT MARGIN**

**REQUIREMENT**

CLEARANCE

MIN. 0.006 INCH—MAX. 0.025 INCH

TO CHECK

PLACE TYPE BOX IN POSITION TO PRINT CHARACTER ON WHICH SPACING CUTOUT IS DESIRED. PULL FORWARD ON PART OF TRANSFER BAIL EXTENDING BELOW MOUNTING SHAFT UNTIL BAIL IS IN FULLY OPERATED POSITION. GAUGE CLEARANCE.

TO ADJUST

POSITION CUTOUT LEVER WITH CLAMP SCREW LOOSENED. (FOR LOCATION OF CLAMP SCREW SEE PAR. 4.13)

NOTE: FOUR SCREWS MUST BE LOOSENED TO ADJUST CIRCULAR CUTOUT LEVERS.

(B) **SPACE SUPPRESSION BY-PASS SPRING**

**REQUIREMENT**

MIN. 20 OZS.
MAX. 26 OZS.
TO START ARM MOVING.

(C) **TABULATOR SHAFT MOUNTING BRACKETS**

**REQUIREMENT**

LEVER SLIDE ARM TO REAR SO THAT BLOCKING ARM AND TABULATOR STOP ARE IN EXTREME UPPER POSITION. CLEARANCE

MIN. 0.050 INCH—MAX. 0.065 INCH

CLEARANCE MEASURED NEAR LEFT AND RIGHT END OF SHAFT EQUAL WITHIN 0.007 INCH.

TO ADJUST

POSITION MOUNTING BRACKETS WITH MOUNTING SCREWS LOOSENED.

NOTE: MAKE SURE SHAFT IS FREE OF BINDS.

(D) **TABULATOR PAWL SPRING**

**REQUIREMENT**

MIN. 1-3/4 OZS.
MAX. 3 OZS.
TO PULL SPRING TO INSTALLED LENGTH.
4.28 Horizontal Tabulator Mechanism (Cont.)

**Figure 4.28:**

- **ECCENTRIC**
- **LOWER ROLLER MOUNTING SCREW**
- **PAWL MOUNTING ARM**
- **TABULATOR PAWL**
- **FIXED TABULATOR STOP NEAR RIGHT END OF SHAFT**
- **SPACING PAWL**
- **RATCHET**

**Pawl Mounting Arm Operating Range (Preliminary)**

NOTE --- PRIOR TO THIS ADJUSTMENT, CHECK THE FOLLOWING: OSCILLATING RAIL SLIDE (PAR. 2.30), PRINTING CARRIAGE POSITION (PAR. 2.47) AND PRINTING CARRIAGE LOWER ROLLER (PAR. 2.46).

**Requirement (Units with Friction Feed Platen)**

SPACING CLUTCH DISENGAGED. SPACING PAWL, WHICH IS FARTHEST ADVANCED, ENGAGING TOOTH IMMEDIATELY ABOVE CUTAWAY SECTION OF RATCHET. TABULATOR PAWL RIDING UP ON FIXED STOP. HIGH PART OF ECCENTRIC TOWARD FORK OF MOUNTING ARM. CLEARANCE MIN. 0.070 INCH MAX. 0.090 INCH

**Requirement (Units with Sprocket Feed Platen)**

HIGH PART OF ECCENTRIC TOWARD LOWER ROLLER MOUNTING SCREW.

TO ADJUST POSITION ECCENTRIC.
SECTION 573-115-700
4.29 Horizontal Tabulator Mechanism (Cont.)

TO CHECK

TO DETERMINE MAXIMUM LIMIT... (A) SET FIVE TABULATOR STOPS AS SHOWN IN FIGURE. (B) POSITION PAWL IMMEDIATELY TO RIGHT OF STOP NO. 1. (C) POSITION ECCENTRIC TO SET CLEARANCE APPROXIMATELY 0.030 INCH. (NOTE - MEASURE ALL CLEARANCES AT STOP NO. 1 WITH PLAY TAKEN UP IN CARRIAGE TO REDUCE GAP TO MINIMUM) (D) MARK COLUMN LOCATION BY PRINTING A CHARACTER ON PAPER. (E) POSITION PAWL IMMEDIATELY TO RIGHT OF STOP NO. 2 AND MARK COLUMN LOCATION AS IN STEP (D). (F) REPEAT STEP (E) FOR OTHER THREE STOPS. (G) GRADUALLY INCREASE CLEARANCE UNTIL CARRIAGE STOPS ONE SPACE BEFORE ANY COLUMN WHILE RECEIVING FIGURES G LETTERS X FROM TRANSMITTER DISTRIBUTOR. (NOTE - IF UNIT IS NOT EQUIPPED WITH XD CONTROL, PUT FILL-IN CHARACTERS OF LETTERS OR FIGURES IN TAPE TO DELAY PRINTING UNTIL CARRIAGE COMPLETES TRAVEL.) (H) DECREASE CLEARANCE UNTIL TEN LINES OF TABULAR OPERATION CAN BE MADE WITHOUT ERROR. (I) GAUGE AND RECORD VALUES OF CLEARANCE. (2) GAGE ALL CLEARANCES WITH FRONT FEED PAWL FARTHEST ADVANCED.

TO DETERMINE MINIMUM LIMITS... (A) REPEAT STEPS (B) AND (C) ABOVE. (B) GRADUALLY DECREASE CLEARANCE UNTIL CARRIAGE STOPS ONE SPACE AFTER ANY COLUMN. (C) INCREASE CLEARANCE UNTIL TEN LINES OF TABULAR OPERATION CAN BE MADE WITHOUT ERROR. (I) GAUGE AND RECORD VALUE OF CLEARANCE.

TO ADJUST

IF MINIMUM LIMIT IS POSITIVE, ADD IT TO MAXIMUM LIMIT AND DIVIDE THE SUM BY TWO. SET RESULTANT AMOUNT AS MIDPOINT OF RANGE. IF MINIMUM LIMIT IS ZERO OR LESS, DIVIDE MAXIMUM LIMIT BY TWO AND SET THIS AMOUNT AS MIDPOINT OF RANGE. THE DIFFERENCES BETWEEN LIMITS NORMALLY IS NOT LESS THAN 0.045 INCH.

TABULATOR STOP SETTING (NOT ILLUSTRATED)

RIGHT MARGIN TABULATOR STOP (WITH WIDE SHELF)

NOTE: PRIOR TO THIS ADJUSTMENT, CHECK THE FOLLOWING: RIGHT MARGIN (PAR. 4.27) AND PAWL MOUNTING ARM OPERATING RANGE (PAR. 4.28 AND 4.29).

POSITION PRINTING CARRIAGE AT RIGHT MARGIN (SPACING CUTOUT OPERATED). INSERT STOP WITH WIDE SHELF IN SLOT IMMEDIATELY TO LEFT OF TABULATOR PAWL.

COLUMNAR TABULATOR STOPS

PLACE CARRIAGE IN POSITION TO PRINT FIRST CHARACTER IN COLUMN. INSERT STOP IN SLOT IMMEDIATELY TO LEFT OF TABULATOR PAWL. STORE EXTRA STOPS IN SLOTS BEYOND PRINTING LINE AT EITHER END OF SHAFT.

NOTE - WHEN PRINTING FORMS, CHECK STOP SETTINGS WITH RELATION TO COLUMNS. CORRESPONDING STOPS ON ALL MACHINES CONNECTED IN A CIRCUIT MUST BE THE SAME NUMBER OF SPACING OPERATIONS FROM LEFT MARGIN.
4.30  Paper-Out Alarm Mechanism

Bell Crank Follower Spring

Requirement

Spring scale applied to bell crank follower where it makes contact with paper roll

Min. 2 ozs.
Max. 3 ozs.
To start bell crank moving.

Bell Crank Follower

Requirement

The bell crank follower should be approximately 1/4 inch from a flat side of the paper spindle.
To adjust position the switch with its mounting screws loosened.
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## 1. GENERAL

1.01 This section is reissued to include adjustments formerly given in other sections, to include the latest engineering information, and to change the title. Since this revision is of a general nature, marginal arrows which indicate changes have been omitted.

1.02 The adjustment information given in this section and the section covering general teletypewriter requirements and adjustments provide the information necessary for maintenance of the motor unit.

1.03 The illustrations in this section show the adjusting tolerances, positions of moving parts, and spring tensions.
2. MINIATURIZED SYNCHRONOUS MOTOR UNITS

2.01 Motor Positioning

(A) MOTOR POSITIONING

Requirement
Position motor so that leads are approx 30° from center line with oil holes up.

To Adjust
With mounting strap screws loosened, rotate motor.

Note: If necessary, position bracket with bracket screws loosened.

(B) MOTOR GEAR

Requirement
Barely perceptible amount of backlash between the motor driving gear and the main shaft driven gear at the point where backlash is least.

To Adjust
Raise or lower the gear end of the motor by means of the adjusting studs with their lock nuts loosened.

CAUTION: IF THE MOTOR SHOULD BECOME BLOCKED FOR SEVERAL SECONDS, THE THERMOSTATIC CUTOUT SWITCH WILL OPEN THE CIRCUIT. SHOULD THIS HAPPEN, ALLOW MOTOR TO COOL AT LEAST 5 MINUTES BEFORE MANUALLY RESETTING THE SWITCH BY DEPRESSING THE RED BUTTON. AVOID REPEATED RESETTING.
2.02 Motor Shield

(2) Requirement
Clearance between motor shield and motor mounting bracket should be Min 0.062 inch
To Adjust
Position motor shield with its mounting screws loosened.

(1) Requirement
Equal clearance between front and rear ends of motor and motor shield.
2.03 Air Ducts and Capacitor Position

AIR DUCTS (2) (IF SO EQUIPPED)

Requirement
Equally spaced about exhaust ports.
Top edge of ducts to be parallel with motor bracket.

To Adjust
Loosen mounting screws and position ducts.

CAPACITOR POSITION

Requirement
Max 1/2 inch between motor bracket and end of capacitor.

To Adjust
Position relay and capacitor with motor removed from motor bracket and nut plate and clamp screws loosened.
3. STANDARD AND HEAVY DUTY SYNCHRONOUS MOTOR UNITS

3.01 Motor Positioning

MOTOR POSITIONING

(1) Requirement (Upright Mounted Motors)
Oilers should be upward and approximately equidistant from a vertical line through motor shaft.

(2) Requirement (Inverted Mounted Motors)
Oilers should be downward and approximately equidistant from a vertical line through motor shaft.

To Adjust
Position motor with clamp screws (2) loosened.

MOTOR ADJUSTING STUD (IF SO EQUIPPED)

Requirement
Barely perceptible backlash between drive gear and driven gear at point where backlash is least.

To Adjust
With lock nut loosened, position adjusting stud. Tighten nut while holding stud in position.

CAUTION: IF MOTOR BECOMES BLOCKED FOR SEVERAL SECONDS, THERMOSTATIC CUTOUT SWITCH (ON UNITS SO EQUIPPED) WILL BREAK CIRCUIT. SHOULD THIS HAPPEN, ALLOW MOTOR TO COOL AT LEAST 5 MINUTES BEFORE DEPRESSING RED RESET BUTTON. AVOID REPEATED RESETTING.
4. SERIES GOVERNED MOTOR UNITS

4.01 Motor Positioning and Governor

MOTOR POSITIONING (NOT ILLUSTRATED)

Requirement
Motor should be centrally positioned in its rubber mounts so as to provide at least 0.020 clearance between the motor housing and the cradle at the governor end. The cable should also clear the grommet in the screen by at least 0.030 inch.

(A) GOVERNOR CONTACT BACKSTOP

Requirement
Clearance between the movable contact arm and its eccentric backstop.

To Adjust
Rotate the eccentric backstop with clamping screw loosened.

(B) GOVERNOR CONTACT

Requirement
The contacts should meet squarely and not overlap more than 0.010 inch.

To Adjust
Position the stationary contact and contact arm with the clamp screw and post loosened.

CAUTION: EXCESSIVE PRESSURE AGAINST GOVERNOR COVER ASSEMBLY DURING REMOVAL MAY DAMAGE SCREENED WINDOW.
4.02 Motor Governor

Note: Replace governor brushes that have worn to a length of approximately 15/32 inch (2/3 of original length).

**BRUSH COVER**

**BRUSH**

**BRUSH SPRING**

**(A) GOVERNOR BRUSH SPRING REQUIREMENT**

Requirement
Governor fan removed.
Min 4 oz --- Max 6 oz
To move the spring flush with brush cover.

**(B) MOTOR SPEED**

Requirement
With target illuminated and viewed through the vibrating shutters of a 120 vps turning fork the spots on the 4-spot target should appear stationary while rotating. With target illuminated and viewed through the vibrating shutters of an 87.6 vps tuning fork the spots on the 6-spot target should appear stationary while rotating and with speed slightly increased the spots on the 35 spot target should appear stationary.

To Adjust
Stop the motor and turn the adjusting screw as indicated on governor cover. For units with screened governor covers, stop the motor, remove the TP152035 plug from cover. Turn adjusting screw as indicated on periphery of target.

Note: It is possible to adjust the motor at some multiple of the correct speed. To check motor speed when used with a page printer, return typebox carriage to left margin, set up any character in selector and manually trip typebox clutch trip lever. Printing should occur as follows:

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28 TELETYPEWRITER CABINETS - FOR KSR AND RO SETS

LUBRICATION

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1.02 The section is being reissued to remove the lubrication procedures for the Automatic Send-Receive (ASR) cabinets and to add the multiple page printer cabinets, the table model or rack mounted skin tight cabinets and the wall-mounted cabinets. Since this is a general revision, marginal arrows ordinarily used to indicate changes and additions are omitted.

1.03 The figures indicate points to be lubricated and the kind and quantity of lubricant to be used. Lubricate the units just prior to placing them in service. After that lubricate as deemed necessary to provide smooth operation.

1.04 The lubricating symbols in the text of the figures indicate lubricating directions as follows:

O1 Apply one drop of oil.
O2 Apply two drops of oil.
O3 Apply three drops of oil.
G Apply thin coat of grease.
SAT Saturate (felt oilers, washers, wicks) with oil.

1.05 Use TP88970 (KS7470) oil at all locations where the use of oil is indicated. Use TP88973 (KS7471) grease on all surfaces where grease is indicated.
2. LUBRICATION DETAILS

2.01 LAC - 28B to 28E and 28J Teletypewriter Cabinets

- Bearing Surfaces (2 Levers) - Dome Latch Lever
- Hooks - Each End (4 Springs) - Spring
- Bearing Surfaces (2 Rollers) - Dome Latch Roller
- Engaging Surface - Door Latch
- Hooks - Each End (3 Springs) - Spring
- Bearing Surfaces (3 Places) - Door Stop Arm
- Bearing Surfaces (3 Places) - Dome Stop Arm
- Spring Loops (2 Springs) - Spring
- Bearing Surfaces (4 Places) - Dome Counter-Balance Arms
- Sliding Groove - Dome Counter-Balance Arm
- Bearing Surfaces (2 Hinges) - Dome Hinges

2.02 Line Guide

- Line Guide Bushing

Page 2
2.03 End-of-Form Alarm (Variable Feature)

2.04 LPC - 28L and 28M Teletypewriter Cabinets (Wall Mounted)
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2.05 Window Door

2.06 Lower Door
2.07 LBAC - 28LA Teletypewriter Cabinets

2.08 Cabinet, Cover Latches
- Sliding Members
- Springs and Brackets
- Cover Latches (6)
- Cover Latches (6)
- Sliding Members
- Latch Bolt (6)

2.09 Cabinet, Paper Access Door Latches (if present)
- Springs and Brackets
- Access Door Latches (6)

2.10 Cabinet, Carriage Return and Line Feed Keylevers
- Spring
- Keylever (6)
2.11 Paper Winder Clutch Mechanism

- O1 Contacting Point
- SAT Felt Washers
- SAT Wick
- Friction Drive Fork
- Friction Clutch
- Friction Clutch

2.12 Paper Winder Drive Mechanism

- O1 Pivot
- SAT Felt Washers
- O2 Bearing
- Idler Pulley Lever
- Idler Pulley
- Drive Pulley Shaft

2.13 Paper Winder Bracket

- O1 Bearing
- Bearing Bracket
2.14 Low Paper and Paper-Out Switch Mechanism

2.15 LPC - 28A Cabinets
1. GENERAL

1.01 This section provides specific lubrication procedures for the 28 electrical service units. It is being reissued to conform to more of a standard format. Since this is a general revision marginal arrows used to indicate changes and additions, have been omitted.

1.02 The figure indicates points to be lubricated and the kind and quantity of lubricant to be used. Lubricate the units prior to placing them in service. After that, lubricate as deemed necessary to provide smooth operation.

2. LUBRICATION DETAILS

2.01 Stop Magnet

1.03 The lubricating symbol in the text of the figure indicates lubrication directions as follows:

O1 Apply one drop of oil
O2 Apply two drops of oil
O3 Apply three drops of oil
G Apply thin coat of grease
SAT Saturate (felt oilers, washers, wicks) with oil

1.04 Use TP88970 (KS7470) oil at all locations where the use of oil is indicated. Use TP88973 (KS7471) grease on all surfaces where grease is indicated.
# 28 TELETYPEWRITER KEYBOARD AND BASE (KSR AND RO)

## LUBRICATION

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## 1. GENERAL

1.01 This section provides specific lubrication procedures for the 28 teletypewriter keyboard and base (KSR and RO bases) including variable features. It is being reissued to conform to more of a standard format, and to include recent engineering changes and additions. Since this is a general revision, marginal arrows ordinarily used to indicate changes have been omitted.
1.02 The photographs show the paragraph numbers referring to particular line drawings of mechanisms, and where these mechanisms are located on the unit. The line drawings are provided to illustrate the points of lubrication and the quantity of lubricant to be used. Parts in the line drawings are shown in an upright position unless otherwise specified.

1.03 The symbols on the illustrations indicate lubrication as follows:

- O1 Apply 1 drop of oil.
- O2 Apply 2 drops of oil.
- O3 Apply 3 drops of oil.
- G Apply thin film of grease.
- SAT Saturate (felt oilers, washers, wicks) with oil.

1.04 Use TP88970 (KS7470) oil at all locations where the use of oil is indicated. Use TP88973 (KS7471) grease on all surfaces where grease is indicated.

1.05 Lubricate the unit just prior to placing it in service. After a few weeks in service, relubricate to make certain that all points receive lubrication. The following lubrication schedule should be followed thereafter:

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<thead>
<tr>
<th>Operating Speed (WPM)</th>
<th>Lubrication Intervals</th>
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<tr>
<td>60</td>
<td>3000 hours or 1 year*</td>
</tr>
<tr>
<td>75</td>
<td>2400 hours or 9 months*</td>
</tr>
<tr>
<td>100</td>
<td>1500 hours or 6 months*</td>
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*Whichever occurs first.

1.06 All spring eyes, spring wicks and felt oilers should be saturated. The friction surfaces of all moving parts should be thoroughly lubricated. However, over-lubrication, which will permit oil or grease to drip or be thrown on other parts should be avoided.

CAUTION: SPECIAL CARE MUST BE TAKEN TO PREVENT ANY OIL OR GREASE FROM GETTING BETWEEN ELECTRICAL CONTACTS.

1.07 Apply a thick film of grease to all gears. Apply oil to all cams, including the camming surfaces of each clutch disc.
2. LATER DESIGN KEYBOARD

2.01 Keyboard - Bottom View

2.02 Spacebar

2.03 Keylever

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2.04 Breaklever

- Engaging Surface
- Bearing Surface
- Contact Surface

2.05 Codelever

- Contacting Surface (32 Levers)
- Guide Slots (32 Levers)
- Felt Washers (6 Washers)
- Bearing Surface (32 Wedges)
- Hooks - Each End (40 Springs)

2.06 Keyboard Lock

- Guide Slot
- Hooks - Each End
- Bearing Surface
- Engaging Surface

Page 4
2.07 Keyboard - Top View

2.08 Codebar

O1 Hooks - Each End Spring (7 Springs)

Guide Slots (Left and Right - Top and Bottom) Codebar Guides

2.09 Local Carriage Return

O1 Hooks - Each End Spring

Bearing Surface (2 Places) Local Carriage Return Function Bail

Engaging Surface Local Carriage Return Function Lever
2.10 Signal Generator Mechanism - Top Rear View

2.11 Nonrepeat Lever

(Front View)

2.12 Transfer Lever

Page 6
2.13 Contact Box

Note: Contact box cover must be removed prior to lubrication. To remove contact box cover, remove securing nut and lockwasher.

G Engaging Surface Contact Toggle

O1 Hooks - Each End Spring

CAUTION: GREASE SPARINGLY - KEEP CONTACTS FREE OF OIL OR GREASE.

2.14 Transfer Bail

G Engaging Surface Transfer Bail

SAT Felt Washers (2 Washers) Latches

O1 Hooks - Each End Spring (2 Springs)

O2 Bearing Surface Transfer Bail

SAT Oil Wick Transfer Bail

2.15 Function Clutch

O2 Latching Surface Clutch Stop Lever and Clutch Latchlever

O1 Hooks - Each End Spring (2 Springs)

SAT Felt Washers (2 Front & Rear) Clutch Tripbail
2.16 Margin Indicator

Note: Engaging surface of switch and lever shall not be lubricated if switch has a nylon actuator.

2.17 Local Line Feed

2.18 Shaft

2.19 Intermediate Gear

Page 8
2.20 Signal Generator Mechanism - Right Top View

2.21 Locking Bail

- O1 Hooks - Each End
- SAT Felt Washers (2 Front & Rear)
- SAT Felt Wick
- O1 Guide Slots (3 Slots)
- Spring
- Locking Bail Post
- Camming Surfaces
- Locking Bail

2.22 Codebar Bail

- SAT Felt Washers (2 Washers)
- O1 Bearing Surface (2 Places)
- O1 Hooks - Each End (2 Springs)
- SAT Felt Washer
- O4 Bearing
- O2 Bearing Surface
- O2 Engaging Surface
- Codebar Bail
- Codebar Bail
- Spring
- Codebar Bail Latch
- Codebar Bail Latch
- Eccentric Follower

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2.23 Universal Bail Latchlever

- O1: Hooks - Each End
- SAT: Felt Washer
- O2: Guide Slot (Each Side of Slot)
- G: Engaging Surface

2.24 Keyboard - Left Front View

2.25 Electrical Line Break

- O1: Hooks - Each End
- G: Contact Surface
- O1: Bearing Surface

Spring
Universal Bail Latchlever
Universal Bail Latchlever
Reset Bail Latch
Sensitive Switch
Breaklever
2.26 Codelever Universal Bail

![Diagram of Codelever Universal Bail]

2.27 Lockbar Latch

![Diagram of Lockbar Latch]

2.28 Local Paper Feed-Out

![Diagram of Local Paper Feed-Out]

(Later Design)
3. VARIABLE FEATURES (KEYBOARD)

3.01 Local Backspace and Line Feed Mechanisms - Left Top View

3.02 Local Backspace

3.03 Local Reverse Line Feed

Page 12
3.04 Answer-Back Mechanism - Top Rear View

3.05 Answer-Back - Sensing Levers

- O1 Camming Surfaces (5 Places)
- O2 Sensing Levers
- O2 Bearing Surface
- O2 Detent Lever
- O2 Bearing Surface
- O2 Detent Lever and Roller
- O1 Hook - Each End
- O1 Spring
- O1 Bearing Surface
- O1 Detent Lever Roller
- O1 Hooks - Each End (5 Springs)
- O1 Springs
- O1 Hook - Each End
- O1 Spring

3.06 Answer-Back - Armature

- O1 Hook - Each End
- O1 Spring
- O1 Bearing Surfaces (2 Places)
- O1 Armature and Shaft
3.07 Answer-Back Stop Lever

(Front View)

- O1 Contacting Surface
- O1 Latching Surface
- Latch and Stop Lever
- O1 Camming Surface
- Stop Lever
- O2 Bearing Surface
  (2 Places)
- Stop Lever and Lever Pivot
3.08 Answer-Back - Codebars and Sensing Levers

- O1: Engaging Surfaces (5 Places)
  - Sensing Levers and Codebars
- O1: Bearing Surface (Both Sides)
  - Levers Pivot and Side Plate
- O2: Bearing Surfaces (5 Levers)
  - Sensing Levers and Levers Pivot
- O1: Guiding Surfaces (5 Places)
  - Sensing Levers and Mounting Plate

(Top View)
3.09 Answer-Pack Driving Mechanism

- O2 Bearing Surface
- Eccentric Stud and Drive Link

- O1 Hook - Each End
- Spring

- O1 Engaging Surface
- Blocking Lever and Stop Lever

- O2 Bearing Surface (2 Plates)
- Drive Plate

- O1 Engaging Surface
- Drive Link and Stud

- O2 Bearing Surface
- Blocking Lever and Lever Pivot

- O1 Engaging Surface
- Blocking Lever and Extension

3.10 Answer-Back Stepping Pawl

- O2 Bearing Surface
- Stepping Pawl and Eccentric Stud

- O1 Contacting Surfaces
- Stepping Pawl and Codeblades

- O1 Hook - Each End
- Spring

- O1 Contacting Surface
- Adjusting Screw

- O1 Contacting Surface
- Lever and Latch
3.11 Answer-Back Keyboard Lock Bail

(Bottom View)

- Engaging Surfaces: Eccentric and Locklever
- Bearing Surfaces: Function Lever and Bail
- Contacting Surface: "Here Is" Lever and Bail
3.12 Variable Speed Drive Mechanism - Rear View

3.13 Variable Speed Drive - Speed Selecting Mechanism

Gears (11 Including Motor Pinion and Printer Driven Gear) Variable Speed Drive

Shaft Change Gear Slide

Shoulder Screw Selector Eccentric

Pivot Screw Selector Lever

(Top View from Rear)
3.14 Variable Speed Drive - Speed Selecting Mechanism (Continued)

3.15 Blinding (Pulsing) Contact - Left Rear View

3.16 Cam Follower

Note: Avoid getting grease or oil on contact surfaces.
3. 17  Remote Control Gear Shift Mechanism - Top View (Tilted Forward)

3. 18  Remote Control Gear Shift

- O2: Oilite Bearing (2) (Oil Each Side Of Bearings)
- G: Gear Teeth
- Driven Gear Bearings
- Eight Gear Including Motor Pinion
- SAT: Felt Wicks (2)
- Spring Clutches
- SAT: Felt Wick
- Idler Gear
- O1: Loops - Each End
- Armature Spring
- O2: Bearing Points
- Armature Shaft
- O1: Clutch Springs and Hubs (Light Film During Reassembly)
- Idler Gear Bearings
- O2: Oilite Bearing Washers (4)
- Spring Clutches
- O2: Oilite Bearings (2) (Oil Each Side)
- 60 and 100 wpm
- Driver Gear Bearings
3. 19  Form Feed-Out - Left Rear View

3. 20  Form Feed-Out

- O1 Pivots
- O1 Loops - Each End
- Trip Lever
- Sliding Surface
- Solenoid Torsion Spring
- Form Feed-Out Link
- O1 Pivot
- Form Feed-Out Link
- O1 Loops - Each End
- Form Feed-Out Link
- Spring
3.21 Lockbar Contact

(Bottom View)

Note: Avoid getting oil or grease on contact surfaces.

3.22 Repeat on Space Mechanism

(Front View)
3.23 Keyboard - Top View

3.24 Solenoid Bail

- G Fork and Pin
- O1 Hooks - Each End
- G Bearing Surface and Retaining Ring
- G Engaging Surface

3.25 Off-Line Contacts

- G Engaging Surface
- Contact Insulator
3.26 Switch Operating Lever

O1 Hooks - Each End  Spring
O2 Sliding Surface  Operating Lever

G Engaging Surface  Function Lever

3.27 Universal Keyboard Switch (Not Shown on a Locator Photograph)

O1 Bearing Surface  Function Lever and "Here Is" Keylever Assembly
G Bearing Surface  Contact Insulator
4. EARLIER DESIGN KEYBOARD

4.01 Keyboard - Bottom View

4.02 Codelever

- G: Contacting Surface
- O1: Guide Slots (34 Levers)
- SAT: Felt Washers (7 Washers)
- O1: Bearing Surfaces (34 Wedges)
- O1: Hooks - Each End (38 Springs)
- Codelever Bail
- Codelever
- Codelever Shaft
- Lock Ball Track
- Spring
4.03 Local Carriage Return

- O1 Hook - Each End
- O2 Bearing Surface
- G Engaging Surface

4.04 Local Line Feed

- O1 Hooks - Each End
- O2 Guide Slot
- O2 Bearing Surface
- G Engaging Surface
4.05 Keyboard Lock

- O2: Guide Slot
- O1: Hooks - Each End
- O2: Bearing Surface
- G: Engaging Surface
- O2: Bearing Surface

4.06 Codebar Mechanism - Top Front View

- 4.07: Margin Indicator
- 4.08: Margin Indicator Contact Lever
- 4.09, 4.10: Spring
- 4.11: Keyboard Lock Plunger
- 4.12: Keyboard Lock Function Arm
- 4.13: Keyboard Lock Arm Trip Shaft
- 4.14: Contacting Surface
- O2: Bearing Surface
- O1: Hooks - Each End
- O1: Contacting Surface
- O1: Switch Plunger
4.08 Contact Box

Disassembly: Remove nut and lockwasher securing contact box cover and remove cover.

4.09 Codebar

4.10 Codebar (Continued)

4.11 Codelever Bail
4.12 Codebar (Continued)

O1 Hooks - Each End Spring (7 Springs)

O1 Guide Slots - Left, Right and Center (7 Codebars)

4.13 Codebar Bail and Eccentric Follower

O1 Hooks - Each End Spring (4 Springs)

SAT Felt Washers (Front and Rear)

O2 Bearing Surface Codebar Bail Bearing

O1 Engaging Surface Codebar Bail (7 Places)

O2 Engaging Surface Eccentric Follower

O2 Guide Slot Eccentric Follower

SAT Felt Washer Codebar Bail Latch-lever

4.14 Keyboard Selector

O2 Guide Slots Selector Levers (7 Slots)

O2 Bearing Surface Rocker Bail (Front and Rear)

SAT Felt Washers Locking Bail Shaft (2 Washers - Front and Rear)

O2 Guide Slots Selector and Transfer Levers (7 Slots)

O2 Roller Bearings Rocker Bail Detent (2 Rollers)

O2 Bearing Surface Rocker Bail Detent

SAT Felt Washers Transfer Levers Shaft (2 Washers - Front and Rear)

O1 Hooks - Each End Spring (3 Springs)
4.15 Intermediate Gear - Front View

4.16 Signal Generator Mechanism - Left Rear View

4.17 Intermediate Gears

- O6: Each Oilier (Total 4 Oiliers)
- G: Teeth (2 Gears)
- O2: Ball Bearing
- Motor Shaft
- Intermediate Gears
- Intermediate Gear Shaft
4.18 Signal Generator Shaft

![Diagram of Signal Generator Shaft]

- SAT: Felt Washer
- G: Gear Teeth
- O20: Oil Hole
- SAT: Internal Mechanism
- O2: Camming Surface
- G: Each Eye
- SAT: Felt Oiler
- O2: Camming Surface
- Each Cam
- SAT: Felt Washer

4.19 Intermediate Levers

![Diagram of Intermediate Levers]

- O2: Bearing Surface (3 Guides)
- Engaging Surfaces (3 Places)
- O1: Hooks (Each End)
- O2: Bearing Surface
- O2: Bearing Surface
- Intermediate Lever Rollers
- Intermediate Levers
- Spring
- Flutter Lever
4.20 Signal Generator Mechanism

- O2 Bearing Surface
- SAT Felt Washer
- O1 Hooks - Each End (2 Springs)
- O2 Engaging Surface
- O2 Bearing Surface
- O2 Bearing Surface
- O2 Bearing Surface
- O2 Guide Hole

Detent Toggle
Detent Toggle
Spring
Break Bail
Oscillating Lever
Break Rod
Break Lever
Break Rod

4.21 Signal Generator Clutch

- SAT Felt Washers (2 Front & Rear)
- O2 Engaging Surface

Throwout Bail and Tripbail
Clutch Tripbail

4.22 Time Delay Mechanism

- SAT Felt Washer
- G Bearing Surface
- O2 Guide Slot
- G Engaging Surface
- G Teeth (2 Wheels)
- O2 Bearing Surface
- O2 Bearing Surface
- SAT Felt Washer
- SAT Felt Washer
- SAT Felt Washer
- O1 Hooks - Each End (3 Springs)

Eccentric Follower Pawl
Eccentric Follower Pawl
Eccentric Follower Pawl
Eccentric Follower Pawl
Ratchet Wheels
Ratchet Wheel Each End
Ratchet Wheel Shaft
Contact Pawl
Latch Pawl
Latchlever
Spring
4.23 Paper Feed-Out Mechanism - Top View

4.24 Paper Feed-Out

- O2: Bearing Surface
- Switch Lever
- O2: Pivot Point
- Torsion Spring
- G: Engaging Surface
- Thin Film
- Switch Plunger

4.25 Answer-Back Blinding (Pulsing) Contact
(not shown on Locator Photograph)

- O1: Head of Shoulder Screw
- Finger Pivot
  (Do Not Over Lubricate)

  Note: Keep oil and grease off of contacts

- G: Contacting Surface
- Finger and Swinger
- G: Camming Surface
- Finger Extension
- G: Cam
- O2: Contacting Surface

(Rear View)
4.26 Answer-Back Drive Mechanism:

- **O1** Pivot Point
- **O2** Bearing Surfaces (2 Places)
- **O1** Engaging Surface
- **O1** Hook - Each End
- **O1** Engaging Surface
- **O2** Bearing Surfaces
- **O2** Bearing Surface
- **O1** Engaging Surface
- **O1** Engaging Surface
- **O1** Engaging Surface
- **O1** Engaging Surface

- Operating Bail
- Drive Plate Shaft and Side Plates
- Blocking Lever and Stop Lever
- Drive Link Spring
- Blocking Lever and Lever Pivot
- Drive Link and Drive Plate Stud
- Blocking Lever and Drive Plate Extension
- Operating Bail and Drive Link
4.27 Answer-Back Drive Mechanism (Continued)

Note: Lubricate Sensing Lever and Codebar Mechanisms per Paragraphs 3.05, 3.06, 3.07 and 3.08.
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4.28 Repeat Space and Signal Line Break - Left Rear View

4.29 Repeat on Space

4.30 Signal Line Break (Electrical)
5. RECEIVE-ONLY (RO) BASE

5.01 Signal Line Break

5.02 Signal Line Break Mechanism - Left Top View
# 28 Typing Unit

## Lubrication

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Printed in U. S. A.
1. GENERAL

1.01 This section is issued to define the lubrication requirements for the 28 typing unit.

1.02 The specific lubrication instructions are divided into basic units and variable features. The basic units consist of the friction feed and sprocket feed typing units. Mechanisms which are added to a basic unit and are of an optional nature appear under variable features.

1.03 The typing unit should be lubricated as directed in this section. The points to be lubricated and the kind and quantity of lubricant to be used are indicated in the figures. Lubricate the typing unit just before placing it in service. After a few weeks of service, relubricate the unit to make sure that all points have received lubrication. Thereafter, the following schedule should be followed:

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*Whichever occurs first.

1.04 Use KS-7470 oil at all locations where the use of oil is indicated. Use KS-7471 grease on all surfaces where grease is indicated.

1.05 All spring wicks and felt oilers should be saturated. The friction surfaces of all moving parts should be thoroughly lubricated. However, over lubrication, which will permit oil or grease to drip or be thrown on other parts, should be avoided.
CAUTION: SPECIAL CARE MUST BE TAKEN TO PREVENT ANY OIL OR GREASE FROM GETTING BETWEEN THE SELECTOR ARMATURE AND ITS MAGNET POLE FACES. KEEP ALL ELECTRICAL CONTACTS FREE OF OIL AND GREASE.

1.06 Apply a thick film of grease to all gears and the spacing clutch reset cam plate.

1.07 Apply oil to all cams, including the camming surfaces of each clutch disc.

1.08 The photographs show the paragraph numbers referring to particular line drawings of mechanisms and where these mechanisms are located on the unit. Parts in the line drawings are shown in an upright position unless otherwise specified.

Note: References made to left or right, top or bottom, and front or rear apply to the typing unit in its normal operating position as viewed by the operator facing the unit.

1.09 The following list of symbols apply to the specific lubrication instructions given in each paragraph.

- O Apply 1 drop of oil.
- O2 Apply 2 drops of oil.
- O3 Apply 3 drops of oil, etc.
- G Apply thin film of grease.
- SAT Saturate (felt oilers, washers, wicks) with oil.

1.10 During each lubrication period, check the following items. Requirements and adjustments are given in Section 573-115-700.

(1) Printing Carriage Position
(2) Printing Hammer Bearing Stud
(3) Printing Track
(4) Printing Hammer Stop Bracket (Also see Note 2, Par. 2.48, 573-115-700 which refers to Printing Hammer Operating Bail Spring Bracket Position.)
(5) Carriage Draw Wire Rope
(6) Dashpot Vent Screw (Check dashpot transfer slide for freeness.)
2. BASIC UNITS

2.01 Typing Unit - Front View

2.02 Printing Mechanism

SAT FELT WASHERS (2 WASHERS)
PRINTING HAMMER
OPERATING BAIL

G ENGAGING SURFACE
SECONDARY PRINTING ARM
SPRING WICK

SAT FELT WICK

G ENGAGING SURFACE
PRINTING HAMMER STOP

G ENGAGING SURFACE
PRINTING HAMMER

SAT FELT WICK
SPRING WICK

O HOOKS - EACH END (4 SPRINGS)
SPRING

SAT FELT WASHER
OPERATING BAIL LATCH

O2 ENGAGING SURFACES (2 PLACES)
OPERATING BAIL LATCH
2.03 Printing Mechanism (Cont'd)

![Diagram of Printing Mechanism]

**Components**
- SAT: Felt Washers (3 Washers)
- G: Guiding Surface
- O10: Track Surface
- SAT: Felt Washers (2 Washers)
- PRINTING CARRIAGE ROLLERS
- PRINTING ARM EXTENSION
- PRINTING TRACK
- PRINTING ARM

2.04 Type Box Carriage Mechanism

![Diagram of Type Box Carriage Mechanism]

**Components**
- O: Bearing Surface
- BEARINGS (3 Rollers)
- O2: Hook - Each End
- Felt Wick
- SAT: Bearing Surface
- O: Bearing Surface
- BEARINGS (3 Rollers)
- O2: Spring
- TYPE BOX CARRIAGE LATCH
- TYPE BOX CARRIAGE LINK
2.05 Typing Unit - Front View

2.06 Codebar Mechanism

- O2 Guide Slots (Right, Center and Left - 9 Bars)
- Hooks - Each End (3 Places)
- SPRING
2.07 Typing Unit - Left Front View

2.08 Codebar Detents

- BEARING BALLS (9 BALLS)
- CODE BAR DETENT

2.09 Paper Feed Mechanism - Front View

- HOOKS - EACH END SPRING
- BEARING SURFACE PLATEN DETENT BAIL
- BEARING SURFACE PAPER FINGER SHAFT
- BEARING SURFACE (EACH END)
- BEARING SURFACE PLATEN GEARS
- BEARING SURFACE PLATEN SHAFT
- BEARING SURFACES- PAPER PRESSURE ROLLER SHAFTS (WIPE OFF EXCESS OIL)
- BEARING SURFACES EACH END (6 ROLLERS)
- BEARING SURFACES PAPER STRAIGHTENER SHAFT
- BEARING SURFACES PAPER STRAIGHTENER LEVERS
- BEARING SURFACES (RIGHT AND LEFT)
- BEARING SURFACE RIGHT SIDE
- BEARING SURFACE RELEASE LEVER
- BEARING SURFACE RELEASE LEVER LINK
- BEARING SURFACE LINK
SECTION 573-115-701

2.10 Typing Unit - Rear Left End View

2.11 Typing Unit - Right End View

2.12 Ribbon Feed Mechanism - Right Side

(RIGHT SIDE VIEW)

- 02 BEARING SURFACE
- 02 BEARING SURFACE
- SAT FELT WASHER
- 0 HOOKS-EACH END
- 02 ENGAGING SURFACE
- 0 HOOKS-EACH END
- 02 TEETH
- SAT FELT WASHERS (2 WASHERS)
- 02 BEARING SURFACE
- 0 HOOKS-EACH END
- 02 BEARING SURFACES
- 02 BEARING SURFACE (2 PLACES)

(RIGHT SIDE VIEW)

- 02 BEARING SURFACE
- RIBBON ROLLER SHAFT
- RIBBON SPOOL TOGGLE
- RIBBON SPOOL SHAFT
- RIBBON FEED LEVER SPRING
- RIBBON DETENT LEVER
- RIBBON RATCHET WHEEL SPRING
- RIBBON RATCHET WHEEL
- RIBBON FEED LEVER BAIL
- RIBBON LEVER
- SPRING
- RATCHET FEED LEVER SHAFT
- RIBBON DETENT LEVER SHAFT

Page 8
2.13 Ribbon Feed Mechanism - Right Side (Cont’d)

- ENGAGING SURFACE
- BEARING SURFACE
- ENGAGING SURFACE
- TEETH

2.14 Vertical Positioning Mechanism - Right Side

- SAT
- O2
- ENGAGING SURFACE
- BEARING SURFACE
- ENGAGING SURFACE
- BEARING SURFACES (4 PLACES)
- HOOKS - EACH END
- BEARING SURFACES (2 PLACES)
- FELT WASHERS (2 WASHERS)
- GUIDING SURFACE
- BEARING SURFACE
- HOOKS - EACH END
- BEARING SURFACE
- ENGAGING SURFACE
- BEARING SURFACE
- FELT WASHER
- FELT OILER
- HOOKS - EACH END (2 SPRINGS)
- BALL BEARING

- VERTICAL POSITIONING LEVER
- RIBBON DRIVE LINK
- VERTICAL POSITIONING LEVER
- LOCK LEVER
- SPRING
- VERTICAL POSITIONING LEVER
- MAIN SIDE LEVER FOLLOWER ARM
- STRIPPER BLADE
- RIBBON DRIVE LINK
- SPRING
- CODE BAR CLUTCH TRIP SHAFT
- OPERATING LEVER
- MAINSIDE LEVER FOLLOWER ARM
- STRIPPER BLADE ARM
- CODE BAR CLUTCH TRIP SHAFT
- OPERATING LEVER EXTENSION
- VERTICAL POSITIONING LEVER
- SPRING
- SPRING WICK
- ROCKER SHAFT BRACKET
- MAIN ROCKER SHAFT
2.15 Ribbon Feed Mechanism - Left Side

- 0 Hooks - Each End
- 0 Bearing Surface
- 02 Bearing Surface
- SAT Felt Washer
- 0 Hooks - Each End
- 02 Engaging Surface
- Spring
- Ribbon Spool Shaft
- Ribbon Roller Shaft
- Ribbon Spool Shaft
- Ribbon Detent Lever

(RIGHT VIEW)

2.16 Ribbon Feed Mechanism - Left Side (Cont'd)

- 02 Bearing Surface
- Ribbon Reverse Lever
- 02 Engaging Surface
- Ribbon Reversing Lever
- 02 Engaging Surface
- Ribbon Reverse Lever
- G Teeth
- Ribbon Reverse Spur Gear

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2.17 Vertical Positioning Mechanism - Left Side

- GUIDING SURFACE
- BEARING SURFACE
- FELT WASHER
- ENGAGING SURFACES (4 PLACES)
- HOOKS - EACH END
- ENGAGING SURFACE
- BEARING SURFACE
- BEARING SURFACES (2 PLACES)
- FELT WASHERS (2 WASHERS)
- FELT OILER
- CAMMING SURFACE
- FELT WICK
- HOOKS - EACH END
- BALL BEARING
- BEARING SURFACE
- BEARING SURFACE
- STRIPPER BLADE
- RIBBON DRIVE LINK
- VERTICAL POSITIONING LINK
- VERTICAL POSITIONING LOCK LEVER
- SPRING
- VERTICAL POSITIONING LEVER
- RIBBON DRIVE LINK
- VERTICAL POSITIONING LEVER
- MAIN SIDE LEVER
- FOLLOWER ARM
- VERTICAL POSITIONING LEVER
- MAIN SIDE LEVER
- FOLLOWER ARM
- SPRING
- WICK SPRING
- MAIN ROCKER SHAFT
- ROCKER SHAFT BRACKET
- STRIPPER BLADE ARM

2.18 Typing Unit - Right End View
2.19 Codebar Mechanism

- 02 Guide slots
- 02 Engaging surface
- 02 Bearing guide slots (6 slots)
- 02 Roller bearings (4 rollers)
- SAT Felt washers (2 washers)
- 0 Hooks—each end (5 springs)
- 02 Guide slots (5 slots)
- 02 Bearing surfaces (2 places)
- 02 Bearing guide slots (5 slots)
- SAT Felt washer
- 03 Oil hole

2.20 Selector Mechanism

- 02 Bearing guide slots (5 slots)
- SAT Felt wick
- 02 Engaging surfaces (5 levers)
- 02 Guide slot
- 02 Wick
- 02 Guide slots
- 0 Hooks—each end (12 springs)
- Fill cup (avoid air lock)
- 02 Bearing guide slots (6 slots)

- Push lever guide bearing
- Selector wick
- Push levers
- Marking lock lever
- Lubricator wick
- Selector and push levers
- Springs
- Lubricator reservoir
- Selector lever guide bearing
2.21 Selector Mechanism (Cont'd)

G TEETH KNOB
G TEETH RACK
SAT FELT WASHERS (2 WASHERS) CLUTCH TRIP LEVER
O HOOKS - EACH END SPRING

2.22 Typing Unit - Rear View

2.23 Typing Unit - Rear View
2. 24 Stunt Box Mechanism

- O2 GUIDE SLOTS (11 LEVERS)
- O2 GUIDE SLOTS (11 PAWLS)
- EACH FELT WICK
- GUIDE SLOTS (11 LEVERS)
- HOOKS - EACH END (33 SPRINGS)

- SAT

- O2 ENGAGING SURFACES (FRONT & REAR - 11 BARS)
- FUNCTION LEVERS
- FUNCTION PAWLS
- FUNCTION PAWL SPRINGS
- FUNCTION BARS
- SPRING

- O2 GUIDE AND ENGAGING SURFACES
- LINE FEED SLIDE ARM
- SPRING
- KEYBOARD LOCK LEVER
- FUNCTION LEVERS

- O2 BEARING SURFACE
- FUNCTION BARS

- O2 ENGAGING SURFACES (11 LEVERS)
- NEW STYLE

- O2 ENGAGING SURFACE
- LINE FEED STRIPPER SLIDE
- STRIPPER SLIDE

- O2 BEARING SURFACE
- STRIPPER BLADE

- O2 ENGAGING SURFACES (2 PLACES)
- STRIPPER BLADE

- O2 GUIDE SURFACES (EACH END)
- STRIPPER BLADE

- O2 ENGAGING SURFACES
- LINE FEED FUNCTION PAWL STRIPPER
- STRIPPER BLADE

- O2 ENGAGING SURFACES (2 PLACES)
- STRIPPER BLADE

- O2 GUIDING SURFACE
- STRIPPER BAIL

- O2 GUIDING SURFACE

- NEW STYLE

- OLD STYLE

- O2 ENGAGING SURFACES

- OLD STYLE

2. 25 Stripper Blade Mechanism

- O2 ENGAGING SURFACE

- O2 GUIDE SURFACES (2 PLACES)

- O2 GUIDE SURFACES (EACH END)

- O2 ENGAGING SURFACES

- O2 ENGAGING SURFACES (2 PLACES)

- O2 GUIDING SURFACE

- O2 GUIDING SURFACE

- NEW STYLE

- OLD STYLE

2. 26 Ribbon Reverse Mechanism

- O2 ENGAGING SURFACES

- O2 BEARING SURFACE

- G TEETH

- O2 BEARING (RIGHT AND LEFT)

- O HOOKS - EACH END

- O2 BEARING SURFACE

- RIBBON REVERSE DETENT
- PAPER RELEASE LEVER
- RIBBON REVERSE SPUR
- GEAR
- RIBBON REVERSE SHAFT
- SPRING
- RIBBON REVERSE DETENT LEVER
2.27  Shift Mechanism

- Engaging Surfaces
- Engaging Surface
- Guiding Surfaces

0  LETTERS FUNCTION SLIDE
0  FIGURES FUNCTION SLIDE
02  LETTERS AND FIGURES FUNCTION SLIDES

02  ENGAGING SURFACE
LETTERS-FIGURES CODE
BAR FORK

2.28  Function Rocker Shaft Mechanism

- Sat Felt Washers
- Sat Guide Surface
- Sat Felt Washers (2 Washers)
- Sat Felt Washers (2 Washers)
- Sat Felt Washers (2 Washers)

SPACE SUPPRESSION BAIL
CARRIAGE RETURN SLIDE ARM
FUNCTION ROCKER SHAFT
FUNCTION BAIL TOGGLE LINK
FUNCTION BAIL

2.29  Typing Unit - Front Bottom View

- 2.32
- 2.33
- 2.34
- 2.30
- 2.31

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2.30 Spacing Drum Drive Mechanism - Later Design

(Front View)

2.31 Spacing Drum Drive Mechanism - Earlier Design

(Front View)

(See Paragraph 6.08)
2.32 Carriage Return Mechanism

2.33 Spacing Drum Feed Mechanism

2.34 Track Guide Mechanism
2.35 Typing Unit - Front View

2.36 Horizontal Positioning Mechanism

- **SAT** Felt Washer
- **ENGAGING SURFACE**
- **DETENTS (2 DETENTS)**
- **ENGAGING SURFACES (2 PLACES)**
- **BEARING SURFACE**
- **HORIZONTAL REVERSING SLIDE**
- **HORIZONTAL REVERSING SLIDE SHIFT LEVER**
- **DETENT BAILS**
- **OSCILLATING RAIL SHIFT SLIDE**
- **HORIZONTAL REVERSING SLIDE SHIFT LEVER**
- **SAT FELT WASHERS (2 WASHERS)**
- **HORIZONTAL REVERSING SLIDE**
- **HORIZONTAL REVERSING SLIDE**
- **OSCILLATING RAIL SHIFT SLIDE**

(FRONT VIEW)
2.37 Horizontal Positioning Mechanism (Cont’d)

(TOP VIEW)

2.38 Horizontal Positioning Mechanism (Cont’d)

(FRONT VIEW)

2.39 Horizontal Positioning Mechanism (Cont’d)

NOTES
1. WITH SPRINGS LOCATED ON REAR SIDE OF SLIDE
2. WITH SPRINGS LOCATED ABOVE THE SLIDE
2.40 Typing Unit – Front View

2.41 Letters – Figures Shift Mechanism

![Diagram](image-url)
2.42 Letters - Figures Shift Mechanism (Cont'd)

2.43 Oscillating Mechanism

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2.44 Oscillating Mechanism (Cont'd)

2.45 Typing Unit - Bottom View
2.46 Main Shaft - Clutches, Gears, Etc.

2.47 Main Shaft Mechanism

2.48 Selector Cam Clutch Assembly
2.49 Main Shaft - Clutches, Gears, Etc. (Cont'd)

2.50 Turning Unit - Bottom View

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2.51 Spacing Mechanism

- ENGAGING SURFACES
- FELT WASHERS (2 WASHERS)
- FELT WASHER
- SPACING TRIP LEVER
- SPACING SUPPRESSION SLIDE
- SPACING TRIP LEVER

2.52 Spacing Mechanism (Cont'd)

- O2
- SAT
- SAT
- O2
- G
- ENGAGING SURFACE
- FELT WASHER
- ENGAGING SURFACE
- HOOKS - EACH END (2 SPRINGS)
- SPACING TRIP LEVER BAIL SHAFT
- SPACING TRIP LEVER BAIL
- TRIP RESET CAM
- TRIP RESET CAM
- SPRING PLATE
- OIL HOLE
- SPACING SHAFT
- TEETH
- SPACING SHAFT GEAR

2.53 Spacing Mechanism (Cont'd)

- O2
- SAT
- SAT
- O2
- ENGAGING SURFACE
- FELT WASHERS (2 WASHERS)
- FELT WASHER
- SPACING CUT-OUT TRANSFER BAIL
- SPACING CUT-OUT TRANSFER BAIL
- SPACING CUT-OUT BAIL
- SPACING CUT-OUT BAIL
- CARRIAGE RETURN BAIL SHAFT
- SPRING
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2.54 Typing Unit - Rear Left View
2.55 Paper Spindle Latch Mechanism

2.56 Line Feed Mechanism - Friction Feed

- 0 HOOKS—EACH END
- 02 BEARING SURFACE
- 02 BEARING SURFACE
- G TEETH (2 GEARS)
- 02 ENGAGING SURFACE
- 02 GUIDING SURFACE (2 BARS)
- 02 ENGAGING SURFACE
- 0 HOOKS—EACH END
- 02 GUIDING SURFACES (2 BARS)
- 02 BEARING SURFACES (2 BEARINGS)
- G TEETH
- 02 BEARING SURFACE

SPRING
PLATEN HAND WHEEL
PLATEN IDLER SPUR GEAR
PLATEN SPUR GEARS
LINE FEED BARS
LINE FEED BAR RELEASE LEVER
LINE FEED BARS
LINE FEED BAR RELEASE LEVER
SPRING
LINE FEED BAR BELL CRANK
LINE FEED BAR ECCENTRIC BEARING
LINE FEED CLUTCH SPUR GEAR
LINE FEED CLUTCH SPUR GEAR SHAFT
2.57 Typing Unit - Rear Top View

2.58 Line Feed Mechanism - Sprocket Feed

- G TEETH
- 02 BEARING SURFACE
- HANDWHEEL GEAR
- PLATEN DETENT BAIL

- G TEETH
- 02 BEARING SURFACE
- IDLER GEAR
- IDLER GEAR

- G TEETH
- PLATEN GEAR

- 02 BEARING SURFACE
- (2 PLACES)
- PLATEN GEAR

- 0 HOOKS - EACH END
- SPRING

(RIGHT SIDE VIEW)
2. 59 Paper Guide Mechanism - Sprocket Feed

(RIGHT SIDE VIEW)

NOTE: BEFORE ATTEMPTING TO DISASSEMBLY
THE 153700 PLATEN HUB, SEE DISASSEMBLY
AND REASSEMBLY INSTRUCTIONS,
SECTION 573-115-702.
3. VARIABLE FEATURES

HORIZONTAL TABULATOR MECHANISM - EARLIER DESIGN

3.01 Typing Unit - Front View

3.02 Tabulator Shaft Mechanism

3.03 Space Suppression Mechanism
3.04 Typing Unit - Bottom View

3.05 Operating Lever Mechanism

(O2) ENGAGING SURFACES (2 PLACES)
O HOOKS - EACH END
O2 ENGAGING SURFACE
O2 BEARING SURFACE
O2 BEARING SURFACES (2 PLACES)
O2 BEARING SURFACE
O HOOKS - EACH END
O2 GUIDE SURFACE
O2 ENGAGING SURFACES (2 PLACES)
O2 BEARING SURFACE

SPACING TRIP ARM
SPRING
OPERATING LEVER
BLOCKING ARM
TRIP ARM LATCH BAIL
OPERATING LEVER
SPRING
BLOCKING ARM
SLIDE ARM
SLIDE ARM

(LEFT SIDE VIEW)
3.06 Spacing Clutch Mechanism

SELECTIVE CALLING MECHANISM

3.07 Typing Unit - Rear View
3.08 Stripper Bail Mechanism

- **02 BEARING SURFACES (2 BEARINGS)**
- **G ENGAGING SURFACES (EACH ARM)**
- **G ENGAGING SURFACES (2 ARMS)**
- **SAT FELT WASHERS (4 WASHERS)**
- **02 GUIDE SLOTS (EACH END)**
- **G CAMMING SURFACES (2 CAMS)**
- **SAT FELT WASHER**

*APPLY LIGHT FILM OF GREASE AND WIPe OFF SURPLUS WITH CLOTH. LUBRICATION IS REQUIRED ON INITIAL BREAK-IN ONLY.*

3.09 Shift and Stripper Bail Mechanisms

- **02 ENGAGING SURFACES CODE BAR FORKS**
- **02 SLIDING SURFACES (2 SLIDES)**
- **0 HOOKS-EACH END (2 SPRINGS)**
- **02 ROLLERS AND PIVOTS**
- **02 SLIDING SURFACES FUNCTION SLIDES**
- **0 ENGAGING SURFACES FUNCTION SLIDES**
- **0 ENGAGING SURFACE LINE FEED STRIPPER SLIDE**
- **02 GUIDE SURFACES (2 PLACES)**
- **02 GUIDE SURFACES (EACH END)**
- **G ENGAGING SURFACES (2 PLACES)**
- **02 ENGAGING SURFACE STRIPPER BAIL**
3.10 Typing Unit - Rear View - Stunt Box Removed

3.11 Single-Double Line Feed Mechanism

- O2 PIVOT
- O2 ENGAGING SURFACE
- O2 GUIDE SURFACES
- SAT FELT WASHER
- O2 ENGAGING SURFACES (4 SURFACES)
- O2 COILS
- O2 HOOKS - EACH END
- O2 HOOKS - EACH END
- SINGLE-DOUBLE LINE FEED LEVER
- OPERATING ARM
- OPERATING ARM
- OPERATING ARM
- STRIPPER BAIL
- TORSION SPRING
- SPRING
- SPRING
3.12 Function Reset Bail Mechanism

3.13 Typing Unit - Left End View
3.14 Clutch Suppression Mechanism

BEARING SURFACES (2 PLACES)
HOOKS - EACH END
SOLENOID BELL CRANK LEVER SPRING
ENGAGING SURFACES (2 PLACES)
BLOCKING BAIL
FELT WASHERS (2 PLACES)
BLOCKING BAIL

(LEFT SIDE VIEW)

LOCAL BACKSPACE MECHANISM

3.15 Typing Unit - Front View
3.16 Pawl Mechanism

**REVERSE LINE FEED MECHANISM**

3.17 Typing Unit - Bottom View
3.18 Trip Mechanism

LOCAL BACKSPACE MECHANISM (Cont'd)

3.19 Trip Mechanism
3. 21 Line Feed Mechanism

3. 20 Typing Unit - Rear Left View

3. 21 Line Feed Mechanism

- TEETH (2 GEARs)
- GUIDE SURFACE
- GUIDE SURFACES (2 BARS)
- HOOKS - EACH END
- FELT OILER
- BEARING SURFACE
- HOOKS - EACH END
- BEARING SURFACES (2 BEARINGS)
- TEETH
- BEARING SURFACE
- BEARING SURFACE
- TEETH
- BEARING SURFACES
- BEARING SURFACE
- ENGAGING SURFACES (2 PLACES)
- HOOKS - EACH END

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3.22 Typing Unit - Rear Left End View

3.23 Drive Mechanism

G TEETH
O PIVOT
O2 BEARING SURFACE
G TEETH
O PIVOT
O HOOKS - EACH END
O2 ENGAGING SURFACE

IDLER GEAR
ADJUSTABLE ARM
HANDWHEEL
GEAR
BLOCKING ARM
SPRING
SLIDE

(LEFT SIDE)
SECTION 573-115-701

PAPER-OUT ALARM MECHANISM

3.24 Operating Mechanism

![Operating Mechanism Diagram]

CONTINUOUS SPACING MECHANISM

3.25 Trip Mechanism

![Trip Mechanism Diagram]
3.26 Slide Arm Bracket

02 ENGAGING SURFACE (TWO BRACKETS)
SAT FELT WASHERS (EACH END)
02 ENGAGING SURFACE (EACH END)

C.R. SLIDE ARM BRACKET
L.F. SLIDE ARM BRACKET
CONNECTING LINK
COMPRESSION SPRING (LP 6 & 9 ONLY)

3.27 Compression Spring

3.28 Typing Unit - Rear View
SECTION 573-115-701

HORIZONTAL TABULATOR MECHANISM - LATER DESIGN

3. 29 Typing Unit - Front View

3. 30 Typing Unit - Bottom View
3.31 Blocking Lever

- ENGAGING SURFACE TABULATOR STOPS
- BEARING SURFACE TABULATOR PAWL
- HOOKS - EACH END SPRINGS
- BEARING AND GUIDE SURFACE BLOCKING LEVER

3.32 Slide Arm

- ENGAGING SURFACE WITH BLOCKING LEVER AND BRACKET
- HOOKS - EACH END
- BEARING SURFACE

3.33 Operating Lever

- CONTACTING SURFACE WITH ADJUSTING PLATE
- BEARING SURFACE
- BEARING SURFACE
- OPERATING LEVER TRIP LEVER ARM LATCH BAIL
- OPERATING LEVER
3.34 Latch Bail

0 HOOKS - EACH END  LATCH BAIL SPRING

02 GUIDE SURFACES OPERATING LEVER
02 CONTACT WITH SLIDE ARM OPERATING LEVER
0 HOOKS - EACH END SLIDE ARM SPRING
02 BEARING SURFACE OPERATING LEVER

02 SLOT CAMMING SURFACE OPERATING LEVER
02 BRACKET CONTACT SURFACE OPERATING LEVER

SLOT CAMMING SURFACE

FELT WICK SPRING

3.35 Operating Lever

3.36 Intermediate Bail

0 CONTACT SURFACE TRIP LEVER ARM INTERMEDIATE BAIL
02 CONTACTING SURFACE SPACING TRIP LEVER ARM
0 CONTACT SURFACE SPACING TRIP LEVER INTERMEDIATE BAIL

3.37 Spacing Cut-Out Transfer Bail

SAT FELT WASHER TRIP LEVER ARM SHAFT
02 BEARING SURFACE SPACING CUTOUT TRANSFER BAIL
02 BAIL CONTACTING SURFACE SPACING CUTOUT TRANSFER BAIL

3.38 Bail Extension Arm

SAT FELT WASHER TRANSFER BAIL STUD
0 HOOKS - EACH END SPACE SUPPRESSION BY PASS SPRING
02 BEARING SURFACE BAIL EXTENSION ARM
02 CONTACT SURFACE WITH SPACING CUT-OUT LEVER BAIL EXTENSION ARM

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TWO COLOR RIBBON MECHANISM

3.39 Oscillating Lever

3.40 Ribbon Operating Mechanism
SECTION 573-115-701

UNIVERSAL CONTACT (STUNT BOX) MECHANISM

3.41 Stunt Box - Rear View

3.42 Operating Mechanism

- O2 BEARING SURFACE
- G SURFACE
- G LATCHING SURFACE
- G ENGAGING SURFACE
- O HOOKS - EACH END
- O BEARING SURFACE
- LATCH CAM
- CAMS
- LATCH LEVER
- INSULATOR
- SPRING
- LATCH LEVER
3.43 Control Mechanism

(LEFT VIEW)
SEE PAR. 3.22

GEAR
GEAR PAGE FEED-OUT
IDLER
HANDWHEEL
ADJUSTABLE ARM
BEARING SURFACE ADJUSTABLE ARM AND BLOCKING LEVER
SPRING (BOTH ENDS) BLOCKING LEVER
PIVOT BLOCKING LEVER
SLIDES (2) PAGE FEED-OUT AND VERTICAL TAB

ISS 3, SECTION 573-115-701
FORM ALIGNMENT SWITCH MECHANISM

3.44 Operating Mechanism

(LEFT VIEW)
SEE PAR. 3.22

UNIVERSAL CONTACT (SELECTOR) MECHANISM

3.45 Contact Mechanism
DC MAGNET OPERATED PRINT SUPPRESSION MECHANISM

3.46 Suppression Mechanism

LETTERS-FIGURES CODEBAR SHIFT MAGNET MECHANISM

3.47 Shift Magnet Mechanism

NOTE --- KEEP OIL AND GREASE OFF OF POLE FACE

NOTE --- KEEP OIL AND GREASE OFF OF POLE PIECE
PRINT SUPPRESSION AND OFF-LINE STUNT SHIFT CONTROL MECHANISM

3. 48 Shift Mechanism

```
TOP VIEW
LEFT SIDE

O HOOKS (2) SPRING
G BEARING SURFACE ARMATURE EXT. AND BLOCKING LEVER EXT.
SAT FELT WASHERS BLOCKING LEVER
O PIVOT POINT (2) ARMATURE

NOTE --- AVOID GETTING OIL OR GREASE ON MAGNET POLE FACE.
```

FORM FEED-OUT MECHANISM

3. 49 Feed-Out Bail

```
TYPOING UNIT LEFT FRAME VIEWED FROM REAR RIGHT

O PIVOT FORM FEED-OUT BAIL
O LOOP TORSION SPRING
```
1. GENERAL

1.01 This section has been revised to include additional information for lubricating miniature synchronous motors. Since this issue is a general revision, marginal arrows that indicate changes have been omitted.

1.02 For complete lubrication instructions refer also to the section covering teletypewriter apparatus general lubrication.

1.03 The motor should be lubricated initially, before being placed in service, as specified in the section covering the preparation of teletypewriter apparatus for installation. In the case of a new motor, the information supplied with it pertaining to the amount of lubricant should be used as a guide for further lubrication.

1.04 The suggested lubrication interval is indicated in the chart. However, because of varying conditions of application, the motor should be lubricated as often as specified by local instructions.

1.05 Before lubricating the motor, carefully and thoroughly clean the outer surfaces of the ball oilers with a clean cloth (KS2423) dampened with petroleum spirits (KS7860). Avoid depressing the ball oilers so that grit, dirty grease, or contaminated petroleum spirits do not get into the motor bearings (Par. 2.01).

1.06 Whenever the motor is disassembled the bearings should be repacked with Beacon 325 grease or equivalent.

1.07 The exposed motor shaft should be covered with a thin film of grease to prevent rust.

1.08 Use KS7470 oil where oil is specified.

1.09 The miniature synchronous motor does not contain ball oilers, as in the larger type motors, but has only a single oil hole in each end shield as shown in Par. 2.02.

CAUTION: DO NOT USE GREASE GUN ON 28, 32, 33 & 37 MOTOR UNITS.

LUBRICATION INTERVAL

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<td>Standard and heavy duty units</td>
<td>1500 consecutive operating hours or 6 months, whichever occurs first</td>
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2. LUBRICATION

2.01 Motor Bearings - Standard Motors
Lubrication of motor bearings with ball type oilers.

Note: If motor is disassembled at any time, do not replace bearings until they have been re-packed with (Teletype 195298) (Beacon 325 or its equivalent) grease.

2.02 Motor Bearings - Miniature Motors

Oil Hole (2) Oil Hole (One at Each End of Motor)
28 TELETYPewriter CABINETS - FOR KSR AND RO SETS

DISASSEMBLY AND REASSEMBLY

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1. GENERAL

1. 01 This section covers disassembly of four KSR and RO Cabinets and Covers only to the extent necessary to install or remove the components which they house. Further disassembly should be undertaken, refer to exploded illustrations in the appropriate parts section.

1. 02 This section is revised to delete the ASR cabinets and add wall-mounted cabinets, rack-mounted cabinets, and cabinets for multiple-mounted KSR and RO Sets. Since this is a general revision, marginal arrows ordinarily used to indicate changes and additions are omitted.

2. DISASSEMBLY AND REASSEMBLY

A. Single Unit Console Model or Table Model Cabinet

2. 01 Removal of Crossbar

(1) Unlatch and raise the cabinet dome.

(2) Reach inside the cabinet and loosen the knurled thumb screws at each end of the crossbar.

(3) Slide the bar toward either end and lift out.

2. 02 On console model, open the lower compartment by turning the screws one quarter turn and lower the panel.

B. Skintight or Rack-Mounted Cabinet (Cover)

2. 03 To remove cabinet from set.

(1) Unlatch lock lever at front of keyboard and lift cabinet upward and off.

(2) Further disassembly is unnecessary for installation or removal of equipment.

C. Wall-Mounted Cabinet (Cover)

2. 04 To remove the cabinet from set:

(1) Unlatch and lower the bottom compartment door.

(2) Remove two screws inside the back bottom edge of the cabinet that fasten the cabinet to the wall plate.

(3) Pull bottom of cabinet away from wall and lift upward and off.

D. Cabinets for Multiple-Mounted KSR and RO Sets

2. 05 To gain access to the inside front of the cabinet, unlatch the covers and pull the drawer forward. For access to the lower compartment pull open the access door.

2. 06 To remove the back panel, unscrew the mounting screws and lift out.

2. 07 The base assemblies with paper winders may be lifted out the back way a short distance, if desired, without disconnecting any cables. For further removal, the cables must be removed.

2. 08 If necessary the drawer slides may be disassembled from the sides of the cabinet by removing the four screws in each slide.
1. GENERAL

1.01 This section provides disassembly and reassembly instructions for 28 electrical service units used in teletypewriter sets. It is reissued to provide additional information in a standardized format. Since this is a general revision, marginal arrows ordinarily used to indicate changes and additions have been omitted.

1.02 When it is necessary to remove the various components from the electrical service unit, the appropriate wiring diagrams should be used as a reference.

1.03 After the disassembly procedure has been followed, reassembly procedure for most components is obviously a reversal of the disassembly procedure. Where necessary, reassembly information is given.

Note: Remove power from unit before starting disassembly procedure.

2. DISASSEMBLY AND REASSEMBLY

2.01 Removal of 28 Electrical Service Unit from 28 Teletypewriter Cabinet used with 28 Keyboard Send-Receive (28 KSR) or Receive-Only (28 RO) Teletypewriter.

(1) Raise dome of cabinet and disconnect all plugs and receptacles from the typing unit.

(2) Remove the typing unit in accordance with the section entitled "28 Typing Unit, Disassembly and Reassembly."

(3) Disconnect all plugs and receptacles from the keyboard and remove the keyboard.

(4) Remove the mounting studs from each end of the electrical service unit.

Note: The electrical service unit may now be turned upside down for servicing or unwiring components.

(5) The various components may be removed from the unit by removing their mounting screws on the top side of the unit and disconnecting cabling and wires.

(6) If it is desirable to remove the electrical service unit completely from the cabinet, disconnect the remaining wires and cables.

2.02 Removal of Electrical Service Unit from Skin-Tight KSR Sets (Located behind the typing unit cover):

(1) Unlatch electrical service unit cover at each end and lift cover off.

(2) Remove the mounting studs from each end of the electrical service unit and lift unit off base.

(3) Remove various components from the electrical service unit by removing their mounting screws and disconnecting wire or cable connections as necessary.

2.03 Removal of 28 Electrical Service Unit from 28 Automatic Send-Receive Sets (28 ASR):

(a) Without auxiliary equipment

(1) Raise the dome of the cabinet and disconnect all plugs and receptacles from the typing unit.

(2) Remove the typing unit in accordance with the section entitled "28 Typing Unit, Disassembly and Reassembly."

(3) Disconnect all plugs and receptacles from the perforator-transmitter base.

(4) Remove the mounting studs from each end of the electrical service unit.

(5) Remove the power control switch assembly bracket at the right end of the unit and the line-test-key control assembly at the left end.

(6) Remove various components from the electrical service unit by removing their mounting screws and disconnecting wire or cable connections as necessary.
(7) If it is desirable to remove the electrical service unit completely from the cabinet, disconnect the remaining wires and cables.

Note: On some sets it may be necessary to remove the perforator transmitter in order to completely remove the electrical service unit. If necessary, refer to the appropriate section for removing the equipment from the cabinet.

(b) With auxiliary equipment

Note: When Automatic Send-Receive Sets include an auxiliary typing reperforator, an electrical service unit is used in the lower compartment of the ASR cabinet. To disassemble these units, open the bottom compartment.

(1) Disconnect all plugs and receptacle connections between the electrical service unit and other components and from the cabinet terminal boards.

(2) Remove the studs securing it to the relay rack and lift unit out.

(3) Remove various components from the electrical service unit by removing their mounting screws and disconnecting wire and cable connections as necessary.
# 28 TELETYPEWRITER BASE (KSR AND RO)
## DISASSEMBLY AND REASSEMBLY

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### 1. GENERAL

1.01 This section provides instructions for disassembly and reassembly procedure for the 28 keyboard and base units. It is reissued to bring it generally up to date and to provide more of a standard format. Since this is a general revision, marginal arrows ordinarily used to indicate changes have been omitted.

1.02 Disassembly as outlined in this section covers a procedure for removing the main subassemblies. For additional information, refer to the appropriate parts literature for exploded illustrations of mechanisms to be disassembled and for visual identification.

1.03 If possible, disassembly should be confined to subassemblies, many of which can be removed without disturbing adjustments. When reassembling the subassemblies, be sure to check all associated adjustments and spring tensions.

1.04 Many parts are secured by retaining rings which have a tendency to release suddenly when being removed. Loss of these retainers can be minimized by placing a forefinger over the retainer; then place the blade of a suitable screwdriver in one of the slots of the retainer and rotate the screwdriver in a direction to increase the diameter of the retainer for removal.

1.05 The loss of tension springs may also be avoided by placing a forefinger over one end while unhooking the other end with a spring hook. Avoid stretching or mutilating the springs when removing or replacing them.

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2. DISASSEMBLY AND REASSEMBLY

Note: In the absence of reassembly notes, reassemble the mechanisms by reversing the procedure used in removing them.

A. Later Design Keyboard - KSR (This keyboard may be identified by noting that the transfer lever locking bail locks the transfer levers underneath the top portion of the transfer lever. Refer to adjusting sections for figures.) and Receive-Only Base (RO).

2.01 Removal of Signal Generator Assembly:

(1) Remove the typing unit, if present.

(2) Remove the contact box cover and disconnect the signal line leads from the contact terminals.

(3) Remove the two mounting screws at the front of the signal generator frame and the mounting screws at the right rear of the frame.

(4) Lift the signal generator carefully, while holding the universal bail back so that the nonrepeat lever clears and its spring will not be stretched excessively.

CAUTION: IF THE NONREPEAT LEVER IS PULLED DOWN AS MUCH AS 90 DEGREES FROM ITS NORMAL POSITION, THE NONREPEAT LEVER SP1NDLE MAY BE STRETCHED BEYOND ITS ELASTIC LIMITS. THIS MAY CAUSE A MALFUNCTION IN OPERATION OF THE UNIT.

2.02 Removal of Label Set Windows and Label Sets, Keyboard Hood, Keyboard Front Seal, and Keyboard Seal Plates:

(1) Remove the four special screws that secure the label set windows and label sets.

(2) Remove the two screws under the keyboard hood that hold the keyboard hood to the hood mounting bracket; and remove the four screws on top of the keyboard hood which hold it to the left and right frame mounting brackets.

(3) Pull the keyboard hood forward and remove it.

(4) Stretch the keyboard front seal (rubber) off the keyboard upper and lower seal plates.

(5) Remove the four screws that retain the two hood mounting brackets and remove the brackets.

(6) Remove the keyboard upper seal plate by unscrewing the three screws at its rear.

(7) Remove the keyboard lower seal plate by unscrewing the two screws at its front.

2.03 Removal of Keyboard Assembly:

Note: It is easier to disassemble and reassemble the keyboard assembly when it is resting on its rear.

(1) Remove the typing unit in accordance with the section covering disassembly and reassembly of the 28 typing unit.

(2) Remove the signal generator assembly in accordance with 2.01.

(3) Remove the label-set windows and label sets, the keyboard hood, keyboard front seal, and the keyboard seal plates in accordance with 2.02.

(4) Remove the four screws that hold the left and right frame mounting brackets to the front of the keyboard base.

(5) Remove the screws that hold the right and left codelever guide brackets on the top of the keyboard base, and the two screws, at the extreme right and left of the front bracket, which hold the front bracket to the keyboard base.

(6) Remove the four screws in the front of the keyboard base and the four screws on top of the keyboard base.

(7) Tip the front of the keyboard assembly upward and pull it forward, disengaging the function levers.

Reassembly Notes

Note 1: Make sure that all of the function levers except the keyboard lock function lever are under their corresponding function bails.

Note 2: Depress the keyboard lock key lever so that the keyboard lock function lever will go into its position over its bail, in-
stead of under as the other function levers should.

2.04 Removal of Signal Generator Contact Box Assembly:
(1) Remove the signal generator contact box cover and disconnect the signal line leads.
(2) Unhook the toggle drive link spring.
(3) Unscrew the two screws, at the front of the signal generator front plate, that hold the signal generator contact box assembly.
(4) Disengage the drive link from the transfer ball and lift off the signal generator contact box assembly.

Note: If it is necessary to provide new contacts, install an entire contact assembly instead of individual contacts.

2.05 Removal of Transfer Lever Locking Bail:
(1) Remove the signal generator assembly in accordance with 2.01.
(2) Remove the signal generator contact box assembly in accordance with 2.04.
(3) Remove the transfer lever locking ball spring.
(4) Take out the transfer lever locking ball by unlatching the clutch and rotating the shaft to position the cam in such a way that the transfer lever locking ball can be unhooked and dropped down from its guide post. Turn the transfer lever locking ball clockwise until it forms a right angle with its guide, and then remove it through the bottom of the frame.

Reassembly Note: It may be necessary to move the shaft back and forth to position the cam for maximum clearance.

2.06 Removal of Signal Generator Shaft and Cam Assembly:
(1) Remove the transfer lever locking ball in accordance with 2.05.
(2) Remove the two screws that mount the clutch shaft rear mounting plate to the signal generator frame, and remove the nut that locks the shaft to the front of the frame.
(3) Hold the clutch latchlever and the clutch stoplever away and pull back on the clutch shaft rear mounting plate to disengage the shaft from the front plate.

(4) Remove the entire cam, clutch, and shaft assembly by rotating it to clear the various transfer levers. The codebar ball eccentric follower, the felt washer, and the cam spacer will fall free.

(5) To take the cam (with clutch assembly) off the shaft, disengage the clutch by holding the clutch shoe lever against the stop lug, and slide the cam and clutch off.

Reassembly Note: Reposition the codebar-ball eccentric follower, felt washer, and cam spacer before reassembling the signal generator cam and shaft assembly.

2.07 Removal of Keytop Guide Plate:
(1) Remove the label set windows, label sets, and keyboard hood in accordance with 2.02.
(2) Remove the spacebar by unscrewing the two shoulder screws that fasten it to the spacebar bail.
(3) Remove the screw from under the spacebar on the keytop guide plate and remove the two screws, in the upper corners of the keytop guide plate, which hold the keytop guide plate to the frame.

(4) Remove the keytop guide plate by working it off the keytops. (Let the keylevers fall freely.)

Reassembly Note: Position all of the keylevers to the rear. Place the front end of keytop guide plate down on the frame; and push the keylevers into their respective holes, starting with the bottom row and proceeding upward toward the top row.

B. Earlier Design Keyboard - KSR (This keyboard may be identified by noting that the transfer lever locking ball locks the transfer levers at the top of the transfer levers. Refer to adjusting section for figures.) and Receive-Only Base (RO)

2.08 Removal of Keyboard or Base Assembly:
(1) Remove the typing unit, if present, in accordance with the section covering disassembly and reassembly of the 28 typing unit.
(2) Remove the four screws (one at each corner of the keyboard or base) that secure the keyboard or base to the cradle assembly.
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(3) Remove the keyboard plug connector from its keyboard receptacle connector on the left rear corner of the keyboard or base.

(4) Lift the keyboard or base from the cradle assembly.

2.09 Removal of Signal Generator Assembly (Keyboard):

(1) Remove the typing unit in accordance with the section covering disassembly and re-assembly of the 28 typing unit.

(2) Remove the signal generator guard bracket, if present.

(3) Remove the two screws located to the right and left of the contact box and raise the contact box. (Do not unsolder the connections if the contact box is connected to metal tubing.) If the wire connections to the contact box are flexible, unsolder the wires inside the box and do not remove the contact box.

(4) Remove the four screws that mount the signal generator casting (two at the front of the casting and two at the rear). If the keyboard is equipped with an electrical signal line break mechanism, remove the mechanism by removing its two mounting screws.

(5) Lift the signal generator upward from the keyboard.

Reassembly Notes

Note 1: Position the codebar bail latch under the codelever bail latchlever, in the notches of all the codebars, and in the notches of the tripbar and upstop bar.

Note 2: Put the breakrod in its guide hole.

Note 3: Place the clutch tripbail extension in the clutch tripbar notch.

Note 4: Recheck the nonrepeat lever adjustments, the generator contact adjustment, the contact box spring tension, and the codelever guide adjustment as specified for keyboards of this design in the section giving the requirements for the 28 teletype-writer base (KSR or RO).

2.10 Removal of Signal Generator Shaft and Cam Assembly (Keyboard):

(1) Remove the signal generator in accordance with 2.09.

(2) Disconnect the clutch latchlever spring.

(3) Disconnect the clutch stoplever spring.

(4) Disconnect the flutter lever spring.

(5) Remove the front nut of the signal generator shaft.

(6) Remove the two screws that hold the signal generator rear plate to the casting.

(7) Remove the signal generator shaft assembly by lifting it upward and pulling it to the rear simultaneously.

(8) Remove the signal generator cam assembly.

Reassembly Note: Check that the clutch is fully seated and engages the drum.

2.11 Removal of Label Cover and Keyboard Label Set (Keyboard or Base):

(1) Remove the label mounting screw (or screws).

(2) Picking up the label cover at the top edge first, remove the cover and the keyboard label set.

2.12 Removal of Keylever Assembly Cover (Keyboard or Base):

(a) Keyboard

(1) Remove the label cover and the keyboard label set in accordance with 2.11.

(2) Remove the four screws located under the keyboard label set (two at the extreme right side and two at the extreme left).

Note: Support the keylever assembly cover while removing the screws.

(3) Pull the keylever assembly cover forward to remove it.

(b) Base

(1) Remove the two screws located inside the sealing plate (one at the right side and one at the left).
(2) Remove the keylever assembly cover by pulling it forward and downward to disengage it from the two studs near the bottom.

2.13 Removal of Keylever (Keyboard)

(1) Insert the small lug of the TP151383 keylever remover tool in the slot of the keylever and engage the shoulder of the larger lug on the top of the codelever. Pry upward to snap the keylever from the stud on its codelever.

(2) Remove the keylever. (The plastic keytop should not be removed from any keylever to change a character.)

Reassembly Notes:

Note 1: Support the codelever so that it will not be forced down when the keylever is later re-engaged with the stud on its codelever.

Note 2: Make sure that the key lever is re-stored to its proper position in the keytop guide plate.

2.14 Removal of Spacebar (Keyboard):

(1) Remove the keylever assembly cover in accordance with 2.12(a).

(2) Remove the two shoulder screws on the left and right sides of the spacebar.

(3) Remove the spacebar.

2.15 Removal of Keytop Guide Plate (Keyboard):

(1) Remove the keylever assembly cover in accordance with 2.12(a).

(2) Remove the spacebar in accordance with 2.14.

(3) Remove the six mounting screws located on the top of the keytop guide plate.

(4) Remove the keytop guide plate.

2.16 Removal of Lockball Channel (Keyboard):

(1) Remove the keylever assembly cover in accordance with 2.12(a).

(2) Remove the two lockball channel mounting screws at the right and left ends.

(3) Pull the lockball channel forward, being careful not to drop any of the wedges that are located on the codelevens.

Reassembly Note: Reinstall the wedges individually.

2.17 Removal of Sealing Plate (Keyboard or Base):

(1) Remove the keylever assembly cover in accordance with 2.12.

(2) Remove the keylevens (keyboard only) in accordance with 2.13.

(3) Disconnect the space codelever extension (keyboard only) at its snap connection.

(4) Remove all the sealing plate mounting screws.

(5) Remove the sealing plate.

2.18 Removal of Keyboard Lock and Local Line Feed Mechanism (Keyboard and Base):

(1) Remove the signal generator (keyboard only) in accordance with 2.09.

(2) Unhook the codelever bail spring from the codelever bail (keyboard only).

(3) Loosen the two pilot screws and remove the codelever bail (keyboard only).

(4) Remove the retaining ring from the local line feed tripbail.

(5) Remove the two mounting screws and remove the keyboard lock and local line-feed mechanism through the hole in the bottom of the keyboard or base.

2.19 Removal of Codebar Assembly (Keyboard):

(1) Remove the keylever assembly cover in accordance with 2.12(a).

(2) Remove the keylevens in accordance with 2.13.

(3) Disconnect the space codelever extension at its snap connection.

(4) Remove the signal generator in accordance with 2.09.
(5) Remove the four codebar-assembly mounting screws located on top of the codebar frame.

(6) Remove the two screws that mount the carriage-return bracket, and remove the carriage-return bracket.

(7) Remove the keyboard-lock and local line-feed mechanism in accordance with 2.18.

(8) Remove the nut that secures the codelever-bail latchlever, and then remove the latchlever and its spring.

(9) Remove the three screws that mount the nonrepeat-bellcrank mounting plate assembly, and remove the assembly.

(10) Remove the codebar assembly through the opening in the top of the keyboard.

2.20 Removal of Codebar (Keyboard):

(1) Remove the codebar assembly in accordance with 2.19.

(2) Disconnect the codebar springs.

(3) Remove the mounting screw and the lockbar pawl from the codelever guide.

(4) Loosen the mounting screws for the left and right codebar guides until the screws are friction-tight, and lift each guide to its extreme upward position.

(5) Slide the codebar to the left or the right so that one end of the codebar moves out of its codebar guide, and remove the codebar.
1. GENERAL 

1.01 This section is issued to describe the disassembly and reassembly procedures for the 28 typing unit. Disassembly covers a procedure for removing the principal sub-assemblies which make up the unit.

1.02 Reference should be made to the exploded views found in the appropriate parts literature for an illustration of the mechanism to be disassembled, for location and visual identification of parts, and detailed disassembly and reassembly features.

1.03 Disassembly should be confined to sub-assemblies, which can, in some cases, be removed without disturbing adjustments. When reassembling the sub-assemblies, be sure to check all associated adjustments, clearances, and spring tensions.

1.04 If a part that is mounted on shims is removed, the number of shims used at each of its mounting screws should be noted so that the same shim pile-up can be replaced when the part is remounted.

1.05 Retaining rings are made of spring steel and have a tendency to release suddenly when attempting to remove them. Loss of these retainers can be minimized as follows: Hold the retainer with the left hand to prevent it from rotating. Place the blade of a suitable screwdriver in one of the slots of the retainer. Rotate the screwdriver in a direction to increase the diameter of the retainer for removal.

1.06 Avoid loss of springs in disassembly by holding one spring loop with the left hand while gently removing the opposite loop with a spring hook. Do not stretch or distort springs when removing them.

1.07 With cabinet lid raised or enclosure cover removed, loosen and remove the four screws that secure the typing unit to its base. Disconnect the cable plug connector from the side frame. Lift the typing unit off.

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2. DISASSEMBLY AND REASSEMBLY

2.01 When removing a sub-assembly from the unit, the procedure followed and the location from which parts are removed must be carefully noted so that reassembly can be done correctly. Where no specific instructions are given for reassembly, reverse the procedure used in removing it.

TYPE BOX

2.02 To Remove: Trip the type box latch to the right. Lift the right end of the type box upward to an angle of approximately 45 degrees and pull toward the right to disengage it from the left hand bearing stud.

2.03 To disassemble the type box for replacing type pallet or spring, proceed as follows:

(a) Remove both screws and nuts that secure the front plate to the rear plate assembly. Separate the two plates.

(b) Remove the spring from the pallet by compressing it slightly and pulling the formed end out of the slot in the pallet.

Note: This spring should be discarded once it has been removed from its assembly.

(c) When installing the new spring, make certain that the formed end extends through the slot in the pallet.

(d) To reassemble the type box, line up the front plate with the rear plate assembly and draw the two plates together until the head of the pallet leaves the rear plate by approximately 1/16 inch. This may be accomplished by using two 6-40 screws (at least 11/32 inch long) and nuts in place of the two screws and nuts removed when disassembling, and tighten them only enough to hold the pallets as specified above. Do not clamp the plates together until all pallets have been moved into their correct position.

(e) Manipulate the pallets until they fall into their respective openings in the front plate. Press the plates together.

(f) Replace the screws and nuts used in step (d) with screws and nuts removed in step (a).

2.04 To Replace Type Box: Reverse the procedure used in removing it.


PRINTING CARRIAGE

2.05 To Remove: Loosen the two screws in the printing carriage clamp plate and disengage the carriage from the upper draw-wire rope. Move the carriage to the left of its track and tilt the power part forward to disengage the rollers from the track.

2.06 To Replace: Make certain that the printing arm is correctly re-engaged with the printing track. Position the carriage clamp on the upper draw-wire rope for the correct printing carriage position as specified in the adjustment section.

TYPE BOX CARRIAGE

2.07 To Remove: Move the type box carriage to its extreme right hand position.

(a) Select any character in the bottom row of the type box and rotate the main shaft until the type box carriage is in the uppermost position.

(b) Remove the ribbon from the ribbon guide.

(c) Remove the retainer ring from the stud in the right hand end of the type box carriage link. Disengage the link from the carriage.

(d) Hold the ribbon guide forward and the right ribbon reverse lever back. Pull the carriage toward the right to disengage it from the carriage track.

FRONT PLATE

2.08 To Remove: Manually move the type box carriage to the extreme right. Select any character in the bottom row of the type box and rotate the main shaft until the type box carriage is in its uppermost position.
(a) Remove the retainer ring from the type box carriage link right hand stud and disengage the link from the carriage. (See instructions for removing the link retainer in 2.07(c).)

(b) Remove the three screws which secure the main ball drive bracket to the rocker shaft.

(c) Remove the spacing shaft gear.

(d) Remove the four screws which secure the front plate assembly to the typing unit side frames.

(e) Pull the front plate assembly forward to disengage it from its connecting parts in the typing unit.

2.09 To Replace Front Plate: Make certain that the TP150770 and TP150771 code bar bell cranks, the TP152596 letters-figures shift slide, the TP152522 reversing slide shift lever, the TP150438 automatic CR-LF bell crank, if so equipped, and the TP152545 carriage return lever extension are properly engaged with their mating parts before tightening the front plate mounting screws.

2.10 Replace the spacing shaft gear. See Section 573-115-700 for adjustment on phasing the spacing gears.

STUNT BOX

2.11 To Remove: The procedure for removing the stunt box is as follows:

(a) Remove the TP151627 rear tie bar from the typing unit side frames.

(b) Remove the line feed function pawl stripper from the stripper blade.

(c) Remove the single-double line feed lever screw and disengage the lever from the notch in the stripper blade.

(d) The stripper blade is either removed or disengaged from the typing unit, depending upon the design.

1. For earlier design: Hold the stripper blade toward the right side of the typing unit and unhook the stripper blade left hand arm from the blade. Pull the stripper blade toward the left side of the typing unit to disengage the stripper blade from the right hand arm. Remove the stripper blade from the typing unit.

2. For later design: Loosen the screw and remove the retaining ring from the TP153291 camshaft drive arm. Slide the drive arm out of engagement with the stripper blade drive arm.

(e) Remove the screws which secure the stunt box assembly in the typing unit.

(f) Lift the stunt box assembly upward to disengage it from its locating brackets and pull toward the rear to disengage all code bar forks from the code bars. Remove, if present, the contact assembly and cable clamp from the stunt box. Remove the stunt box.

Note: Proceed with 2.12 through 2.16 before replacing stunt box.

STUNT BOX SWITCH

2.12 To replace the contact arm in a stunt box switch, remove the two screws that hold the contact plate to the block.

(a) Carefully unsolder the wire from the TP157889 contact arm spring. (It is not necessary to unsolder the contact arm spring wire from switches having the TP172591 contact spring.)

(b) Remove the contact plate assembly from the contact block.

(c) Remove the contact arm(s) from the contact plate assembly.

1. For earlier design: Slip the TP157889 contact arm spring from the contact plate.

2. For later design: Slip the TP172591 contact arm spring out of engagement with the center lug of the section being replaced.

(d) Place the new spring in position on the contact plate.

(e) Before mounting the contact plate on the block, make sure the end of the spring rests on top of the formed-over portion of the contact clip. There should be some clearance between the low end of the spring (front) and the upper edge of the contact arm to avoid in-
terference with the normal movement of the contact arm.

(f) Replace the contact plate assembly, with the contact arms removed, into the contact block. Mount the contact block in the required location with the two screws friction tight.

(g) Carefully resolder any leads that may have been removed, being careful to avoid overheating.

(h) Insert the pointed end of the contact arm, notch downward, between the bent up end of the spring and the formed-over portion of the contact clip. Push the arm into its operating position in the contact block.

(i) Before tightening the contact plate screws, see Section 573-115-700 for adjusting information.

FUNCTION BAR

2.13 To remove a function bar, first unhook the function bar spring.

(a) Hold the function bar toward the rear of the stunt box and disengage its function pawl from the function bar.

(b) Pull the function bar toward the front to remove it from the stunt box.

FUNCTION PAWL

2.14 To remove a function pawl after the function bar has been removed:

(a) Remove the pawl spring.

(b) Hold associated function lever back.

(c) Remove the pawl from top of stunt box.

FUNCTION LEVER

2.15 To remove a function lever after the function bar and function pawl have been removed:

(a) Remove the TP152889 shaft retainer plate.

(b) Remove the TP150547 shaft nearest the front of the stunt box.

(c) Unhook the spring from the function lever and remove the lever through the top of the stunt box.

FUNCTION LEVER SPRING PLATE

2.16 To remove a function lever spring plate or latch after the function bar, function pawl, and function lever have been removed:

(a) Loosen the screws that fasten the three TP150689 guide blocks to the lower side of the guide bar.

(b) Remove the spring from the TP152660 spring plate or TP154613 latch.

(c) Pull downward on the function lever spring plate or latch to snap it out of engagement with the retainer shaft.

2.17 To replace the stunt box, push it forward in its guide rails to within 1/8 inch of its final position.

2.18 Manually disengage the function pawls from their function bars and push the stunt box assembly forward and downward until it is latched in place on its locating brackets.

2.19 Replace the stunt box mounting screws, receptacle, and selector magnet wires.

CODE BARS

2.20 To unblock the suppression code bar, loosen the TP151152 screw that mounts the TP154650 code bar clip and the retaining plate to the left hand code bar guide bracket, and rotate the code bar clip up out of engagement with the suppression code bar. Tighten the TP151152 screw.

2.21 To Remove the Code Bar Assembly: First, remove the stunt box assembly and the front plate assembly as previously described.

(a) Remove the screws and lock washers which secure the code bar assembly to the side frame.

(b) Remove the TP150301 code bar shift bar retainer plate from the right hand code bar guide bracket.

(c) Unblock the suppression code bar as instructed in 2.20. Remove the TP152546 and TP152255 code bar shift bars and springs.
from the code bars and pull the code bar assembly forward and to the left.

2.22 To Reinstall Code Bar Assembly: Reverse the procedure used in removing it, except do not tighten the mounting screws.

(a) Hook the short extension of the TP152257 spring in the spring hole of the code bar. The short extension of the spring should be hooked from the bottom of the code bar, and the long extension should be hooked over the top of the code bar shift bar.

(b) Loosen the TP151630 code bar assembly tie bar screws and hold the code bar guide brackets back and downward firmly against their locating surfaces on the side frame and tighten the four mounting screws.

(c) Tighten the two tie bar screws.

MAIN SHAFT

2.23 To Remove Main Shaft: The selector cam-clutch assembly must be removed. See 2.35.

(a) Set the typing unit upside down.

(b) Return the carriage to its left hand position.

(c) Remove the screw that secures the spacing shaft in the spacing collar.

(d) Remove the spacing shaft with gear.

(e) Remove the screw that secures the collar and the clamp to the right end of the main shaft.

(f) Remove the TP152573 main shaft right hand bearing retainer plate.

(g) Remove the TP150010 retainer plate at the TP150046 clutch bearing and remove the TP150244 link.

(h) Remove the two screws from the TP152537 main shaft left hand bearing clamp.

(i) Unhook the springs from the trip levers and latch levers associated with all clutches. Position the code bar clutch so that the low part of the clutch cam clears the spring arm on the cam follower. Unhook the code bar clutch cam follower spring.

(j) Remove the TP153300 function clutch arm by removing two screws and retainer ring if present.

(k) Unhook the spring from the TP153573 function bar reset ball.

(l) Move the main shaft assembly toward the left to disengage the code bar clutch and function clutch links from their connecting pins.

(m) Lift the left end of the shaft assembly out of the side frame. Position the shaft so that the function clutch link passes the suppression assembly bracket, then remove the shaft assembly from the typing unit.

Note: Disassembly of the main shaft and clutch assemblies can be accomplished by referring to the exploded views contained in the appropriate parts literature. It should be noted, that when assembling clutches having cams and discs marked "O" for identification, the marked side of the parts should face away from the clutch side of the assembly. Function and code bar clutches should have their driving links assembled so that the longer end of the hub faces away from the clutch side of the assembly.

2.24 To Reinstall Shaft Assembly: Reverse the procedure used in removing it. The line feed clutch spur gear should be positioned with its flat side toward the line feed clutch spacer and with the indentation in the gear toward the special washer between the gear and the main shaft ball bearing.

2.25 To phase the spacing gears, and remake the stripper blade drive cam position adjustment, refer to Section 573-115-700.

UPPER DRAW WIRE ROPE

2.26 To Remove Upper Draw Wire Rope: Return the carriage to the left hand position.

(a) Loosen the nut on the front end of the spring drum stud. Operate the ratchet escapement lever to unwind the carriage return spring.

(b) Remove the upper draw wire rope from the clamp plate on the printing carriage, and the clamp on the oscillator rail slide.
(c) Loosen the clamp screw that secures the upper draw wire rope to the spring drum. Remove the wire rope from the drum.

(d) Remove the screw in the spacing drum that secures the ends of the wire rope. Remove the rope from the drum.

LOWER DRAW WIRE ROPE

2.27 To Remove Lower Draw Wire Rope: Remove the screw that secures the wire rope to the spacing drum. Remove the end of the rope from the drum.

(a) After loosening the screws that secure the TP150796 margin indicator cam disc on the spring drum, position the disc to expose the lower draw wire rope mounting screw.

(b) Remove the lower draw wire rope screw and rope from the spring drum.

(c) Loosen the screws in the pulley bearing studs that mount draw wire rope pulleys and move the studs toward the center of the typing unit.

2.28 To Replace Draw Wire Rope: Make certain that the lower draw wire rope is in front of the upper draw wire rope in the track around the drums.

2.29 Adjust the position of the type box, the printing carriage, and the wire rope tension as specified in Section 573-115-700.

PLATEN (FRICTION FEED)

2.30 To Remove Platen: Remove the line feed spur gear.

(a) Remove the TP150719 and TP150720 platen bearing retainers.

(b) Remove the TP152832 paper straightener shaft.

(c) Hold off the detent and lift the platen out of the side frame.

2.31 When replacing each platen bearing retainer, put its upper screw in first. Leave the screw slightly loose. Press the lower end of the retainer downward and hook it into the elongated hole in the side frame. Replace the lower screw. Tighten both screws.

PLATEN (SPROCKET FEED)

2.32 To Remove Platen: Remove the paper fingers or guide bracket assembly.

(a) Remove the spur gear from the left end.

(b) Remove the TP150719 and TP150720 platen bearing retainers.

(c) Hold off the detent bail and remove the platen.

(d) Remove the sprocket hub assembly from the platen assembly.

(e) Insert the TP153673 shaft tool into the hub and fasten it with the TP151346 screw.

(f) Remove the TP157286 clamp and TP153699 cam from the assembly.

(g) Insert the hub into the TP153797 retaining tool.

Note: These tools must be used when disassembling the TP153700 platen hub in order to hold the spring loaded pins in place when the feed cam is replaced.

2.33 To Replace a Pin: Rotate the hub assembly within the retaining tool, with a tommy wrench inserted in the shaft tool, until the desired pin is opposite the notch in the retaining tool. A pin may then be removed or replaced. Grease pin cylinder liberally before inserting new pin.

CAUTION: WHILE ROTATING THE HUB, THE NOTCH MUST BE COVERED TO PREVENT THE PINS FROM BEING RELEASED. SINCE THE PINS ARE SPRING LOADED, THEY CAN EJECT WITH CONSIDERABLE FORCE.

2.34 To Replace Platen: Reverse the procedure used in removing it. When replacing the TP153686 right sleeve bearing, the chamfer side or side marked "0" must face the end of the shaft and the wide part placed toward the front of the unit. When replacing each platen bearing retainer, put its upper screw in first. Leave the screw slightly loose. Press the lower end of the retainer downward, and hook it into the elongated hole in the side frame. Replace the lower screw. Tighten both screws.
SELECTOR CAM-CLUTCH

2.35 To Remove Selector-Cam Clutch: Facing the right end of the typing unit, lift the TP152410 push lever reset bail from its cam, and move the push lever reset bail to the rear, latching it in the raised position on the push lever guide. Push the marking lock lever (and the blocked selector levers) to the left until the selector magnet armature latches the marking lock lever.

(a) Remove the screw which secures the selector clutch drum to the main shaft. Position the clutch cam disc so that the stop lug is in the uppermost position.

(b) Hold the start lever and spacing lock lever away from the selector cam-clutch assembly; grasp the selector cam-clutch by the clutch cam disc (not by the drum) and pull forward by rotating the cam-clutch slowly.

CAUTION: THE CAM-CLUTCH SHOULD COME OFF THE MAIN SHAFT EASILY. DO NOT FORCE IT.

2.36 To Replace Cam-Clutch Assembly: Reverse the procedure used in removing it except as the cam-clutch approaches its fully installed position, move the trip shaft lever and the clutch latch lever so that they ride on their respective cams. Restore the push lever reset ball and the armature to their operating positions.

SELECTOR MECHANISM

2.37 To Remove Selector Mechanism: The cam-clutch assembly must first be removed from the main shaft. See 2.35.

(a) Remove the TP151658 screw that secures the selector mechanism to the TP152546 intermediate bracket on the code bar positioning mechanism.

(b) Remove from the selector mechanism the spring which connects with the common transfer lever on the code bar positioning mechanism.

(c) Remove the remaining three selector mounting screws and lift the selector from the main shaft bearing housing.

CODE BAR POSITIONING MECHANISM

2.38 To Remove Code Bar Positioning Mechanism: Unhook from the selector the spring attached to the common transfer lever and restore any operating push levers to the spacing position by raising the TP152410 push lever reset bail.

(a) Loosen the clamp screw on the TP150447 shift lever drive arm, and remove the two screws which mount the mechanism -- one to the side frame and one to the selector mounting plate.

(b) Manipulate the transfer levers and TP152548 or TP152255 code bar shift bars while gently twisting the mechanism off the code bar shift bars.

2.39 To Replace Code Bar Positioning Mechanism on the typing unit: Rotate the main shaft to the stop position; push the code bar shift bars to the marking position. Manipulate the code bar shift bars and transfer levers so that the shift bars line up with their respective slots in the TP150525 bracket, and slide the shift bars through the slots, one at a time, leaving the bottom slot vacant.

RANGE FINDER ASSEMBLY

2.40 To Remove Range Finder Assembly: Remove the two screws and the nut that secure the range finder plate to the selector mounting plate. Move the TP152438 stop arm bail forward so that it disengages from the TP161342 start lever and clears the selector clutch disc, while rocking the range finder assembly back and forth as it is removed.

2.41 To Replace Range Finder Assembly: Reverse the disassembly procedure.

Note: For units equipped with the TP152897 bail lever guide, do not tighten the nut until the bail lever guide adjustment has been checked. See earlier design mechanisms in 573-115-700.

SELECTOR MAGNET ASSEMBLY

2.42 To Remove Selector Magnet Assembly: Remove the two screws and nut which mount the range finder to the selector.

(a) Remove the selector magnet cable from the coil terminal screws.

(b) Remove the two magnet assembly mounting screws and lift the assembly out.
28 KEYBOARD SEND-RECEIVE (KSR) AND RECEIVE-ONLY (RO) TELETYPETRITER SETS
FOR U.S. NAVY
COMPONENT WIRING DIAGRAMS

1. GENERAL

1.01 This section contains schematic and/or actual wiring diagrams for the component units of the Keyboard Send-Receive and Receive-Only Teletypewriter Sets listed in Section 573-100-000TC.

1.02 An overall typical schematic wiring diagram of a set is included in the description Section 573-100-100TC.

Note: Wiring diagram numbers are followed with suffix A or S to designate actual or schematic. The numbers are arranged numerically in the section but not in the diagram index.

2. WIRING DIAGRAM INDEX

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