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

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

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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).

VOLUME 1

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28 KEYBOARD SEND-RECEIVE (KSR) AND RECEIVE-ONLY (RO) TELETYPEWRITER 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.

2. ATTACHMENT: KSR AND RO COMPONENT CROSS REFERENCE CHART

KSR COMPONENT CROSS REFERENCE CHART

SUBJECT	NAVY DESIGNATION	DESIGNATION OF MANU-FACTURERS	WIRING DIAGRAM NUMBER	KSR SET NAVY CODE ISSUE
COVER	CW-354/UG	LPC202	5831WD-A	A
PRINTER CABINET	CY-2320/SGA-3	LAC207	3490WD-A	5
	CY-2538/UG	LAC204	3236WD-A, 2876WD-A	10, L
	CY-2539/UG	LAC203	3236WD-A, 2876WD-A	10, L
CABINETS	CY-3689/FGC-74	LBAC241	4947WD-S	B
	CY-4166/FGC-79	LBAC248	4947WD-S	B
	CY-4786/FGC-74A	LBAC261	7531WD-A, 7532WD-S	2, 2
	CY-4787/FGC-100	LBAC264	7808WD-A, 7909WD-S	1-2&2-1 1-2&2-2
ELECTRICAL SERVICE UNIT	SB154A/UG	LESU5/103	2852WD-A, 2853WD-S	D, D
	SB408/UG	LESU6/119	2870WD-A, 2871WD-S	F, 7
	SB964/UG	LESU7/147	2892WD-A, 2893WD-S	5, 10
KEYBOARD	MX-1114B/UG	LK4RN126	Cancelled	
	MX-114C/UG	LK10ARN	2928WD-A	20
	MX-1421A/UG	LK3RE101	Cancelled	
	MX-1677A/UG	LK8ARN	2928WD-A	20
	TT-357/UG	LK30ARN	4718WD-A	6
	TT-385/UG	LK36ARN	4718WD-A	6
	TT-387/UG	LK49ARN	6462WD-A	4
	TT-388/UG	LK35ARN	4718WD-A	6
	TT-389/UG	LK35ARE	4718WD-A	6
	TT-417/FG	LK39ARN	2928WD-A	20
	TT-434/UG	LK48ARN	4718WD-A	6
	TT-435/UG	LK10ARE	2928WD-A	20
	TT-442/UG	LK49ARE	6462WD-A	4
	TT-498/UG	LK48ARE	4718WD-A	6
	TT-500/UG	LK51ARN	4262WD-A	8
RECEIVE-ONLY BASE	MT-1443/UG	LB4/161	2883WD-A	23
	MT-2787/UG	LB29/000	2883WD-A	23
TYPING UNIT	MX-1115B/UG	LP14RN/AY	3214WD-A	44
	MX-1422A/UG	LP14RE/AY	3214WD-A	44
	MX-2984/UG	LP14RN/AGH	3813WD-A	D
	MX-3080/UG	LP65RN/AGB	3214WD-A	44
	TT-358/UG	LP105RN/AGB	3214WD-A	44
	TT-372/UG	LP108RN/AY	3214WD-A	44
	TT-378/UG	LP108RE/ACX	3214WD-A	44
	TT-386/UG	LP109RN/AY	3214WD-A	44
	TT-418/UG	LP113RN/AY	3214WD-A	44
	TT-436/UG	LP14RN/AJE	3813WD-A	D
	TT-437/UG	LP14RN/AJG	3214WD-A	44
	TT-438/UG	LP65RN/AJD	3214WD-A	44
	TT-443/UG	LP14RE/AJF	3214WD-A	44
	TT-499/UG	LP65RE/AGD	3214WD-A	44
MOTOR UNIT	PD-17A/U	LMU3	2900WD-A	42
	PD-18/U	LMU4	2900WD-A	42
	PD-18A/U	LMU41	2900WD-A	42
	PD-96/UG	LMU21	2900WD-A	42
	PD-97/UG	LMU28	2900WD-A	42
	PD-108/U	LMU38	2900WD-A	42
	PD-109/UG	LMU52	2900WD-A	42

NAVY DESIGNATION	AN/FGC-74	AN/FGC-74A	AN/FGC-74X	AN/FGC-79	AN/FGC-79A	AN/FGC-79AX	AN/FGC-79X	AN/FGC-100	AN/FGC-101	AN/UGC-19	AN/UGC-22	AN/UGC-22A	AN/UGC-34
CW-354/UG										X	X	X	X
CY-2320/SGA-3													
CY-2538/UG													
CY-2539/UG													
CY-3689/FGC-74	X		X										
CY-4166/FGC-79				X	X	X	X						
CY-4786/FGC-74A		X											
CY-4787/FGC-100								X	X				
SB154A/UG													
SB408/UG										X	X	X	X
SB964/UG													
MX-1114B/UG													
MX-114C/UG													
MX-1421A/UG													
MX-1677A/UG											X		
TT-357/UG										X			
TT-385/UG	X		X										
TT-387/UG					X	X							
TT-388/UG													
TT-389/UG													
TT-417/FG		X		X			X						
TT-434/UG												X	
TT-435/UG													
TT-442/UG													
TT-498/UG													X
TT-500/UG								X					
MT-1443/UG									X				
MT-2787/UG													
MX-1115B/UG													
MX-1422A/UG													
MX-2984/UG													
MX-3080/UG											X		
TT-358/UG										X			
TT-372/UG													
TT-378/UG													
TT-386/UG	X	X	X					X	X				
TT-418/UG				X	X	X	X						
TT-436/UG													
TT-437/UG													
TT-438/UG												X	
TT-443/UG													
TT-499/UG													X
PD-17A/U	X	X		X	X			X					X
PD-18/U			X				X			X	X		
PD-18A/U													
PD-96/UG	X	X		X	X			X					
PD-97/UG			X				X						
PD-108/U						X						X	
PD-109/UG						X			X				
GEAR SETS	C	C	C	F	C	G	F	C	C	C	F	G	D

NAVY DESIGNATION	TT-47C/UG	TT-47D/UG	TT-47E/UG	TT-47F/UG	TT-47G/UG	TT-47H/UG	TT-47J/UG	TT-47K/UG	TT-48B/UG	TT-48C/UG	TT-48D/UG	TT-48E/UG	TT-48F/UG	TT-48G/UG	TT-48H/UG	TT-48J/UG
CW-354/UG																
CY-2320/SGA-3																
CY-2538/UG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CY-2539/UG																
CY-3689/FGC-74																
CY-4166/FGC-79																
CY-4786/FGC-74A																
CY-4787/FGC-100																
SB154A/UG																
SB408/UG																
SB964/UG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MX-1114B/UG	X								X							
MX-114C/UG		X	X							X		X				
MX-1421A/UG																
MX-1677A/UG																
TT-357/UG																
TT-385/UG																
TT-387/UG				X	X		X	X					X	X	X	X
TT-388/UG						X					X					
TT-389/UG																
TT-417/FG																
TT-434/UG																
TT-435/UG																
TT-442/UG																
TT-498/UG																
TT-500/UG																
MT-1443/UG																
MT-2787/UG																
MX-1115B/UG	X	X		X					X	X						
MX-1422A/UG																
MX-2984/UG			X		X							X				
MX-3080/UG																
TT-358/UG																
TT-372/UG						X					X					
TT-378/UG																
TT-386/UG																
TT-418/UG																
TT-436/UG								X								X
TT-437/UG							X						X	X	X	
TT-438/UG																
TT-443/UG																
TT-499/UG																
PD-17A/U	X	X	X	X	X	X	X	X								
PD-18/U									X	X	X	X	X			
PD-18A/U															X	X
PD-96/UG																
PD-97/UG																
PD-108/U														X		
PD-109/UG																
GEAR SETS	A	B	B	B	B	C	D	E	A	A	C	F	D	G	D	D

NAVY DESIGNATION	TT-69B/UG	TT-69C/UG	TT-69D/UG	TT-69E/UG	TT-69F/UG	TT-70C/UG	TT-70D/UG	TT-70E/UG	TT-70F/UG	TT-128A/UG	TT-128B/UG	TT-128C/UG	TT-129A/UG	TT-130A/UG	TT-130B/UG	TT-130C/UG	TT-131A/UG	TT-171A/UG	TT-171B/UG	TT-171C/UG	TT-176A/UG	TT-176B/UG	TT-176C/UG	TT-234/SGA-3	TT-261/UG	TT-261A/UG	TT-261B/UG	TT-275/UG	TT-283/UG	TT-283A/UG
CW-354/UG																					X	X	X							
CY-2320/SGA-3																								X						
CY-2538/UG										X	X	X	X					X	X	X									X	X
CY-2539/UG	X	X	X	X	X	X	X	X	X					X	X	X	X								X	X	X	X		
CY-3689/FGC-74																														
CY-4166/FGC-79																														
CY-4786/FGC-74A																														
CY-4787/FGC-100																														
SB154A/UG										X			X	X			X													
SB408/UG																					X	X	X							
SB964/UG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X
MX-1114B/UG	X					X																								
MX-114C/UG		X			X		X																	X						
MX-1421A/UG										X			X	X			X													
MX-1677A/UG																					X									
TT-357/UG																						X								
TT-385/UG																														
TT-387/UG				X				X	X																					
TT-388/UG			X																											
TT-389/UG											X																			
TT-417/FG																														
TT-434/UG																							X							
TT-435/UG															X															
TT-442/UG												X				X														
TT-498/UG																														
TT-500/UG																														
MT-1443/UG																		X		X					X		X	X	X	X
MT-2787/UG																			X							X				
MX-1115B/UG	X	X				X	X											X						X	X			X	X	
MX-1422A/UG										X			X	X	X		X													
MX-2984/UG																														
MX-3080/UG																					X									
TT-358/UG																						X								
TT-372/UG			X																X							X				
TT-378/UG											X																			
TT-386/UG																														
TT-418/UG																														
TT-436/UG																														
TT-437/UG				X	X			X	X											X							X			X
TT-438/UG																							X							
TT-443/UG												X				X														
TT-499/UG																														
PD-17A/U	X	X	X	X	X					X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X			
PD-18/U						X	X	X					X				X												X	
PD-18A/U									X																			X		
PD-96/UG																														
PD-97/UG																														
PD-108/U																														X
PD-109/UG																														
GEAR SETS	A	A	C	D	D	A	A	D	D	A	C	D	A	A	F	D	A	H	C	C	A	C	D	H	A	C	D	I	F	G

GEAR SETS

A-151060
B-151060, 152766, 151100
C-163504, 163505, 173795
D-152766, 161293, 161295
E-161293, 161294, 161295
F-161293, 161295
G-159660, 159700
H-151060, 151075, 151100
I - 161293

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

TELETYPEWRITER SETS

DESCRIPTION

CONTENTS PAGE

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).

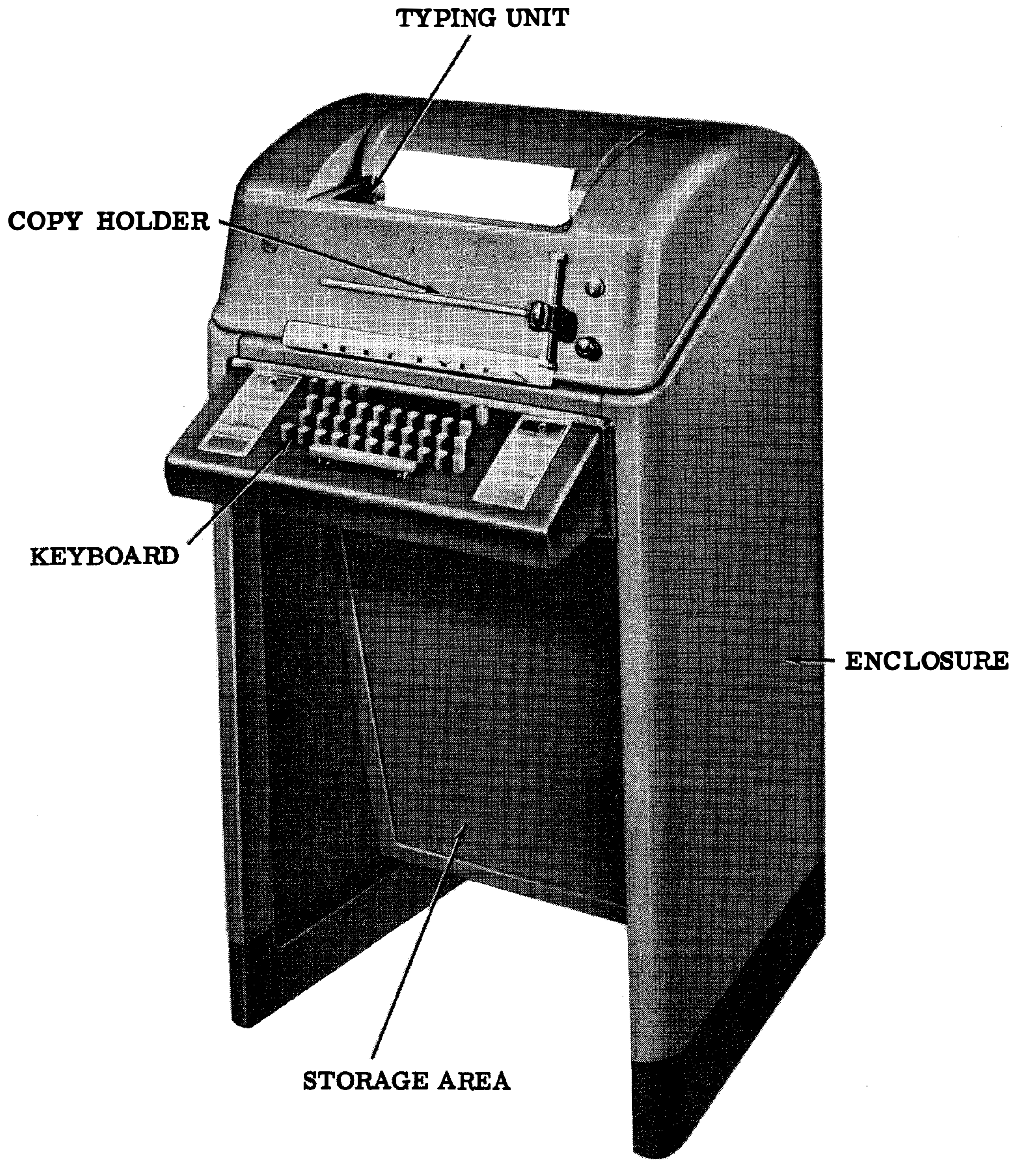


Figure 1 - Floor Model Keyboard Send-Receive (KSR) Teletypewriter Set

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.

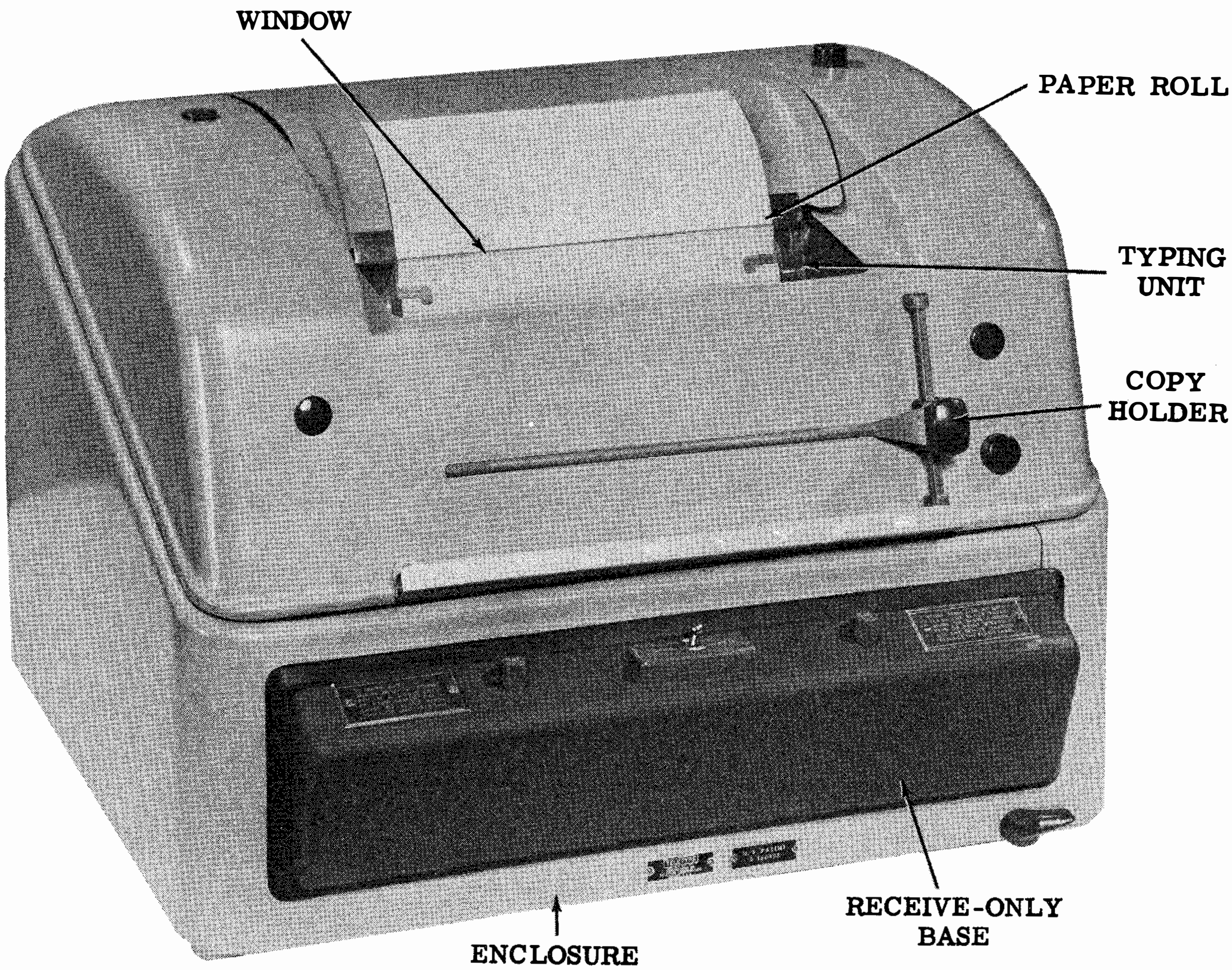


Figure 2 - Table Model Receive-Only (RO) Teletypewriter Set

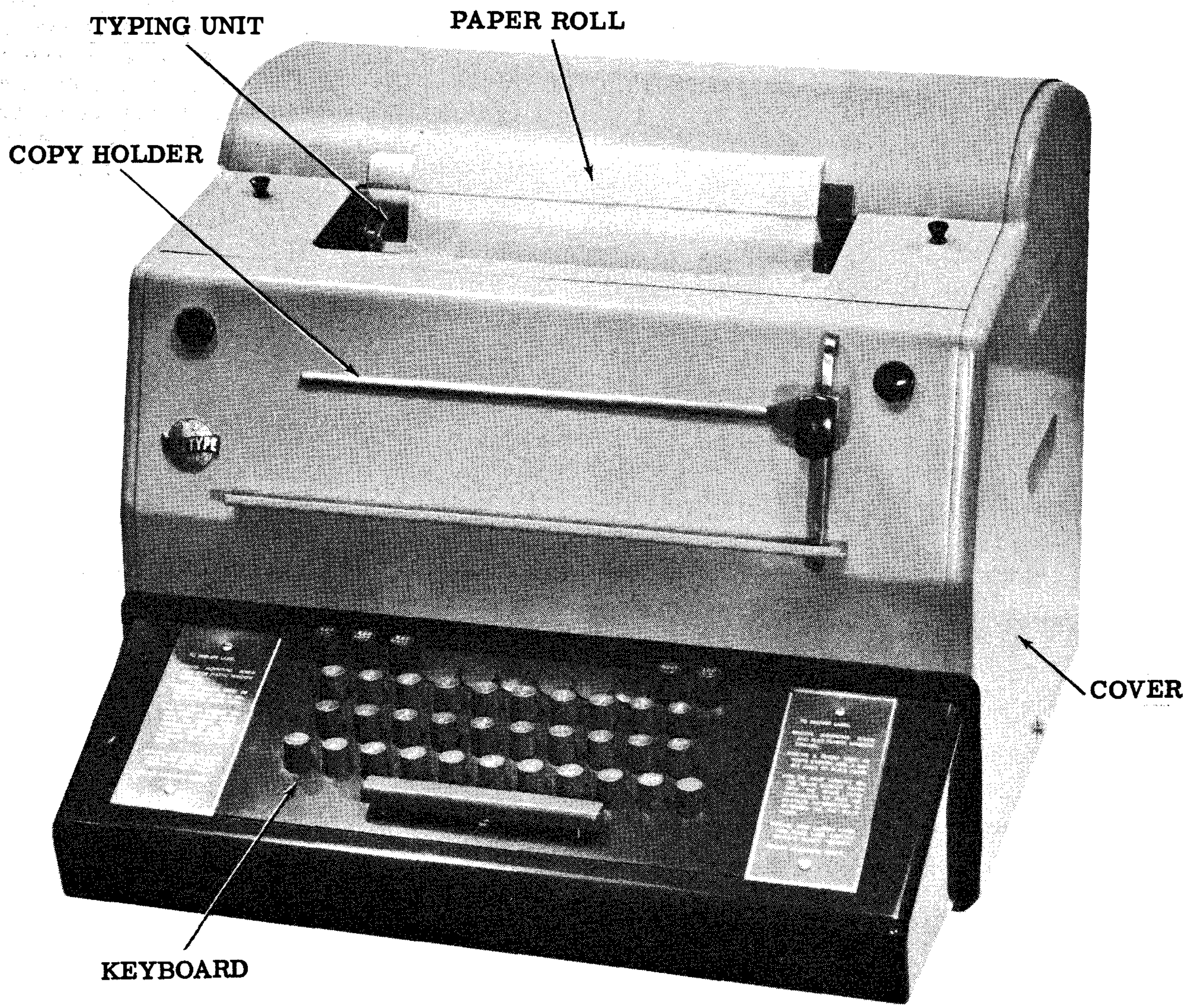


Figure 3 - Rack Mounted Send-Receive (KSR) Teletypewriter Set

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

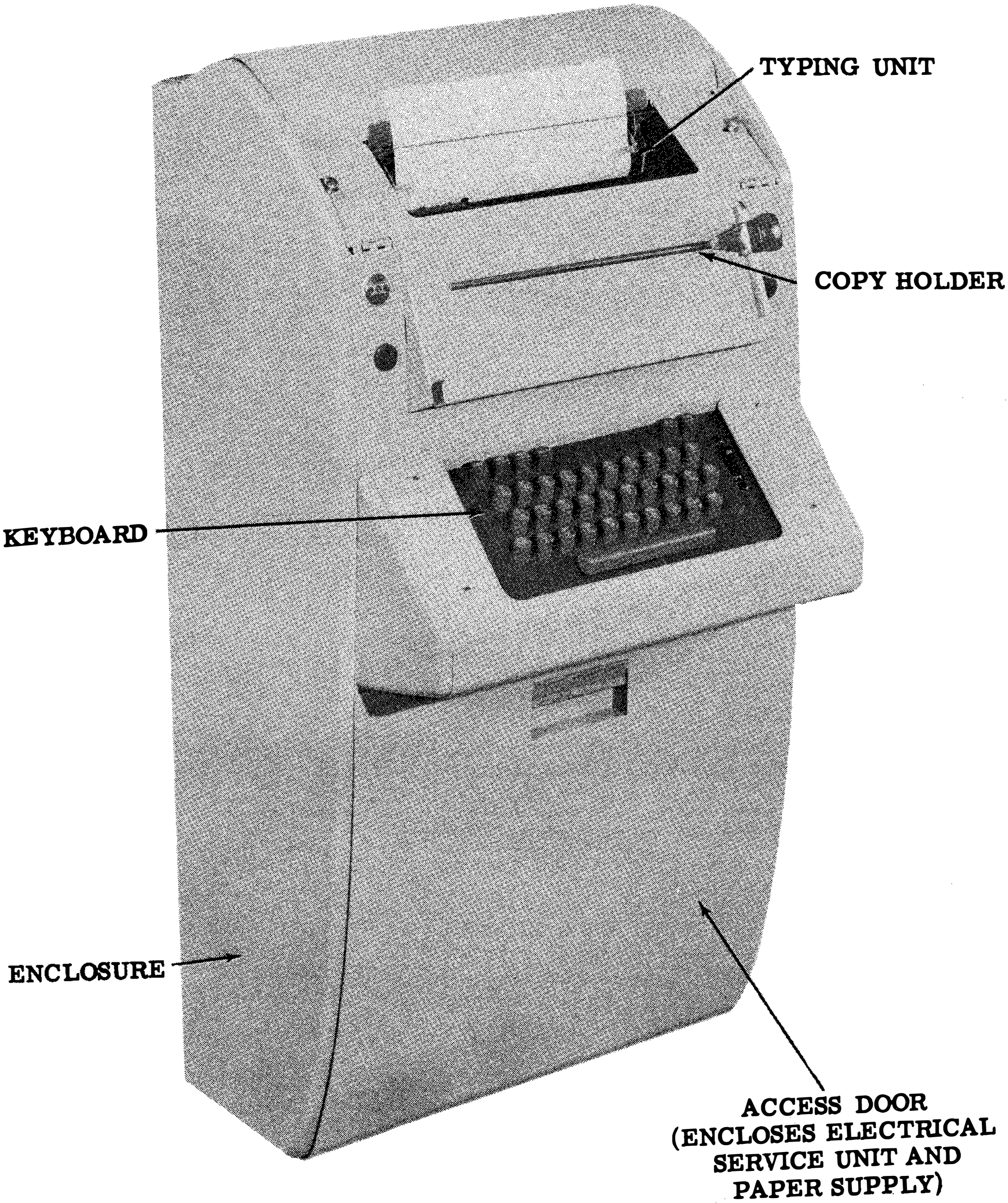


Figure 4 - Wall Mounted Send-Receive (KSR) Teletypewriter Set

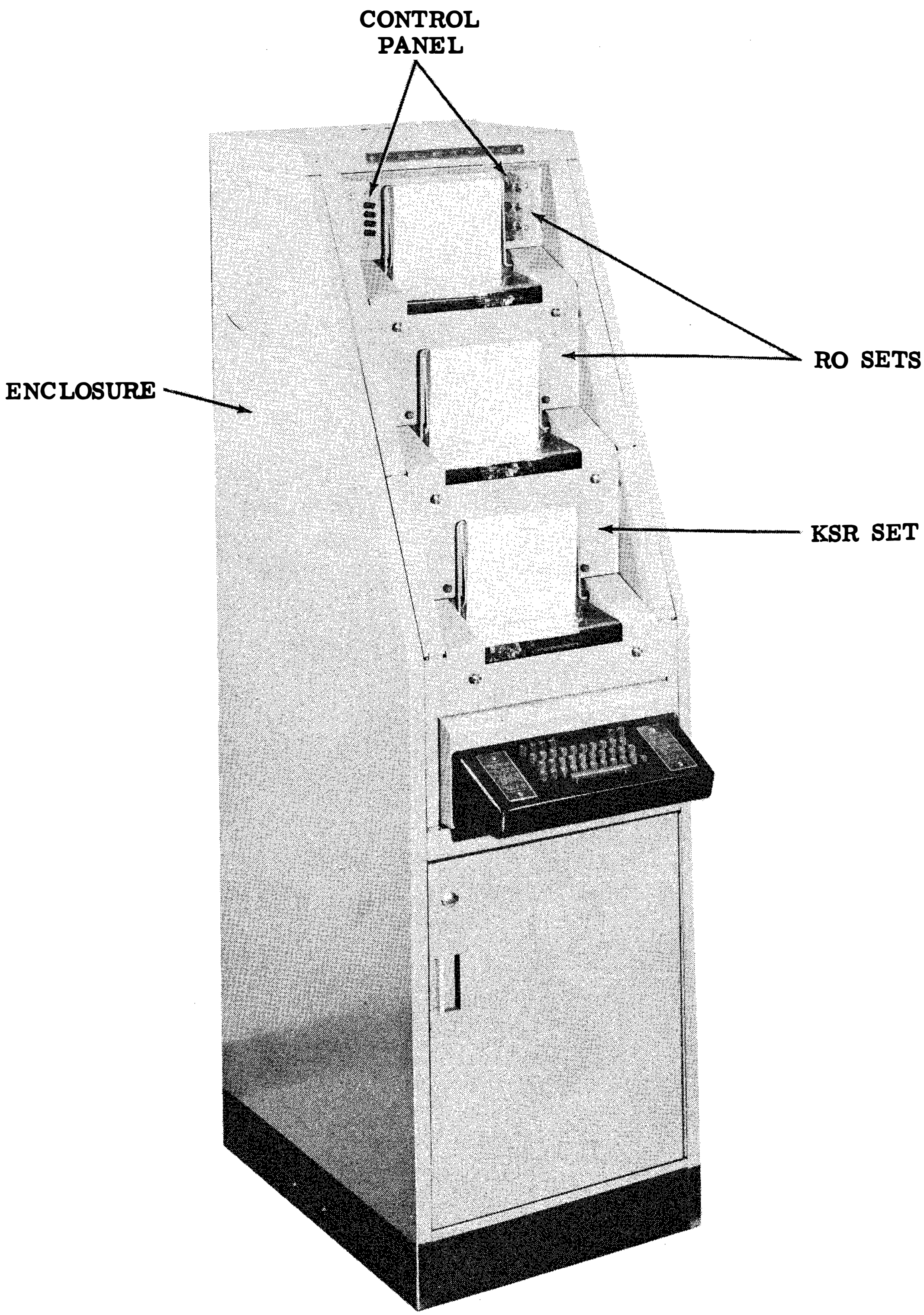


Figure 5 - Typical Multiple KSR and RO Set

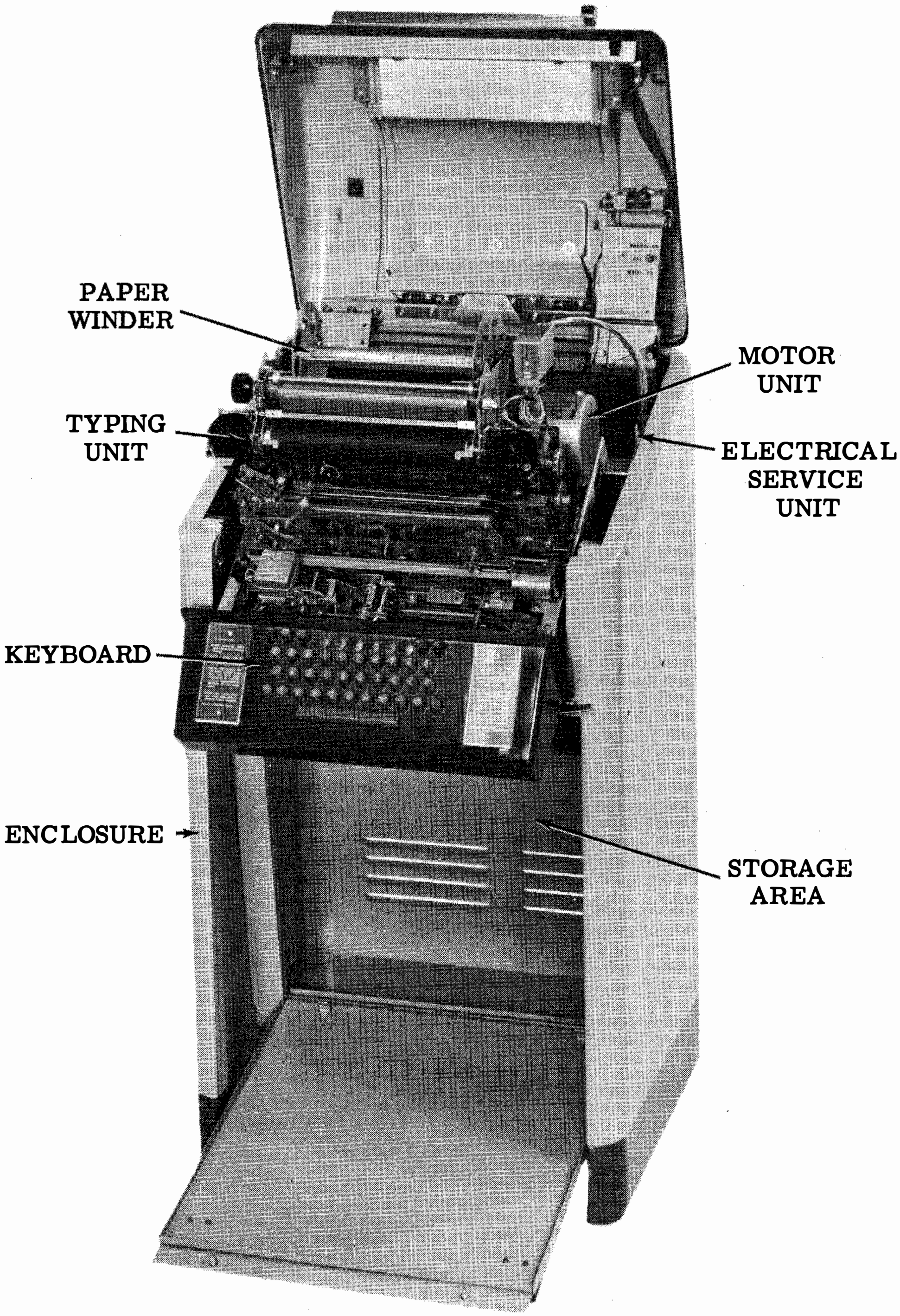


Figure 6 - Floor Model Keyboard Send-Receive (KSR) Teletypewriter Set (Interior View)

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

Characters or Operations	Per-Minute	600	460	428	404	400	390	368
	Per-Second	10.0	7.7	7.1	6.7	6.7	6.5	6.1
Unit Code		7.42	7.42	7.00	7.42	7.50	7.00	7.42
Bauds (Bits-per-second)		74.2	56.9	50.00			45.5	
Frequency (Cycles/Second)		37.1	28.4	25.00			22.8	
Length in Milliseconds	One Character	100	130	140	149	150	154	163
	Unit Pulse	13.5	17.6	20.0	20.0	20.0	22.0	22.0
	Stop Pulse	19.1	24.9	20.0	28.5	30.0	22.0	31.2

APPROXIMATE DIMENSIONS (INCHES)

Set	Height	Width	Depth
Floor Model			
KSR	39	20-1/2	24
RO	39	20-1/2	21
Table Model			
KSR	16	20-1/2	24
RO	16	20-1/2	21
Rack Mounted			
KSR	12	17	24
RO	12	17	21
Wall Mounted			
KSR	30-3/4	16-1/2	14-1/2
RO	30-3/4	16-1/2	11-1/2
Typical Multiple KSR and RO	72	21-1/2	28

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)

Style	Character Height Caps	Character Height Fraction	Horizontal Characters Per Inch Single - SPACE	Horizontal Characters Per Inch Double	Vertical Lines Per Inch Single - FEED	Vertical Lines Per Inch Double
Murray	.103"	.162"	10	5	6	3
Gothic	.103"	none	10	5	6	3
Gothic	.103"	.162"	12	6	6	3
Long Gothic	.120"	.170"	10	5	6	3
Large Gothic	.180"	.180"	10	5	-	3

PLATENS

	Friction Feed	Sprocket Feed
Construction	Rubber covered cylinder, fixed to platen shaft.	Rubber covered cylinder, free on platen shaft.
Length	8-3/4"	Selected for desired form width.
Paper Width	Any width up to 8-1/2"	Minimum: 3-5/8" Maximum: 9"
Characters per line (10 per inch)	Margin is adjustable from 1 to 85 characters	Margin is adjustable from 1 to maximum number indicated in chart.

SPROCKET FEED PLATENS

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

* Based on ten characters per inch with allowance of three characters for platen end play.

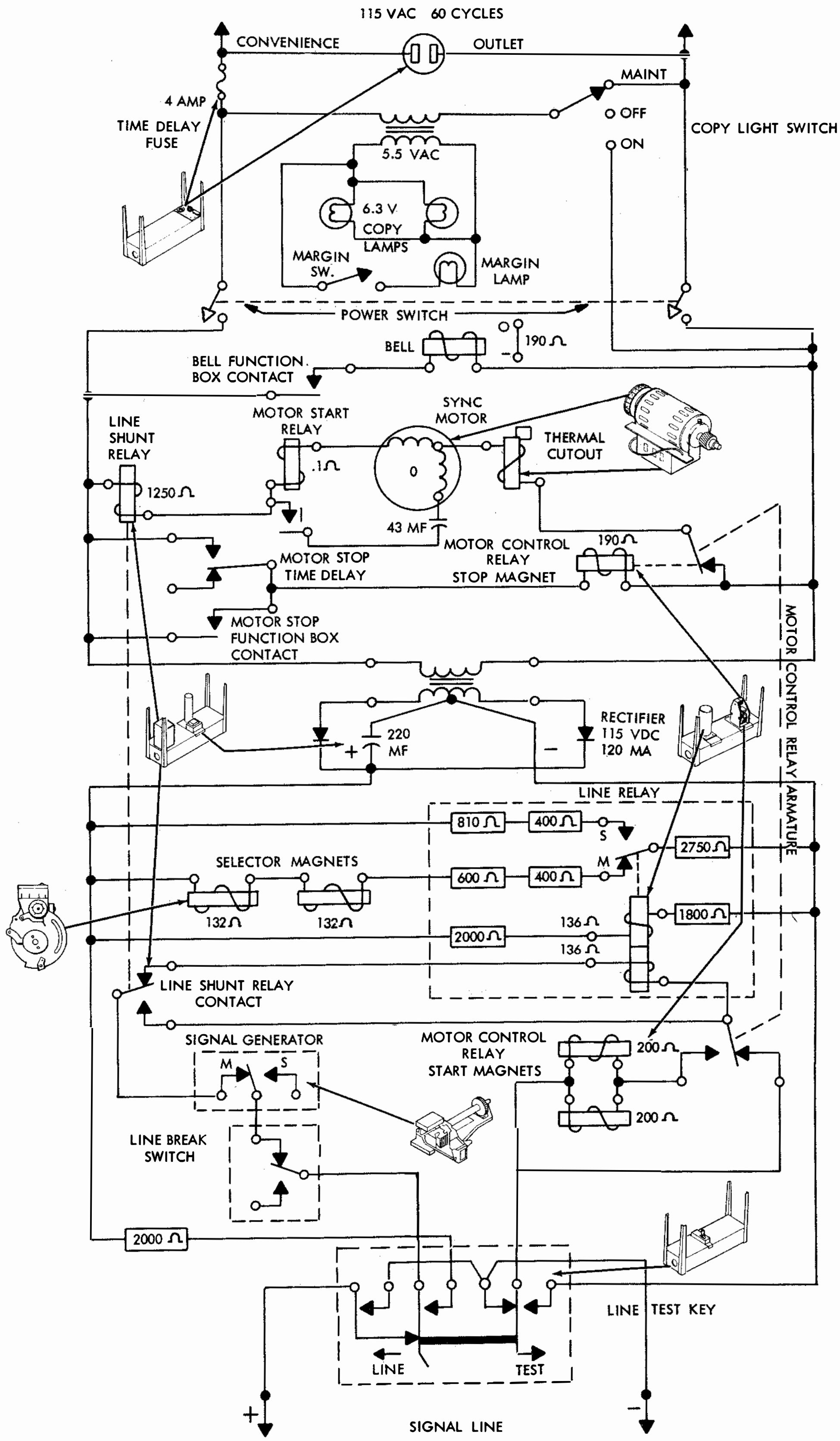


Figure 7 - Typical Keyboard Send-Receive (KSR) Teletypewriter Set (Schematic Diagram)

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

28 KEYBOARD SEND-RECEIVE (KSR) AND RECEIVE-ONLY (RO) TELETYPEWRITER SETS

INSTALLATION

CONTENTS PAGE

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.

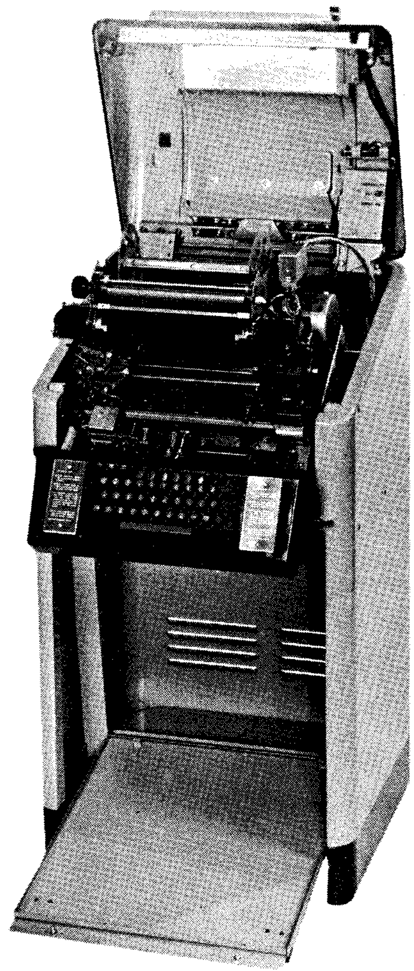


Figure 1 - Typical Console Model, KSR Set

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.

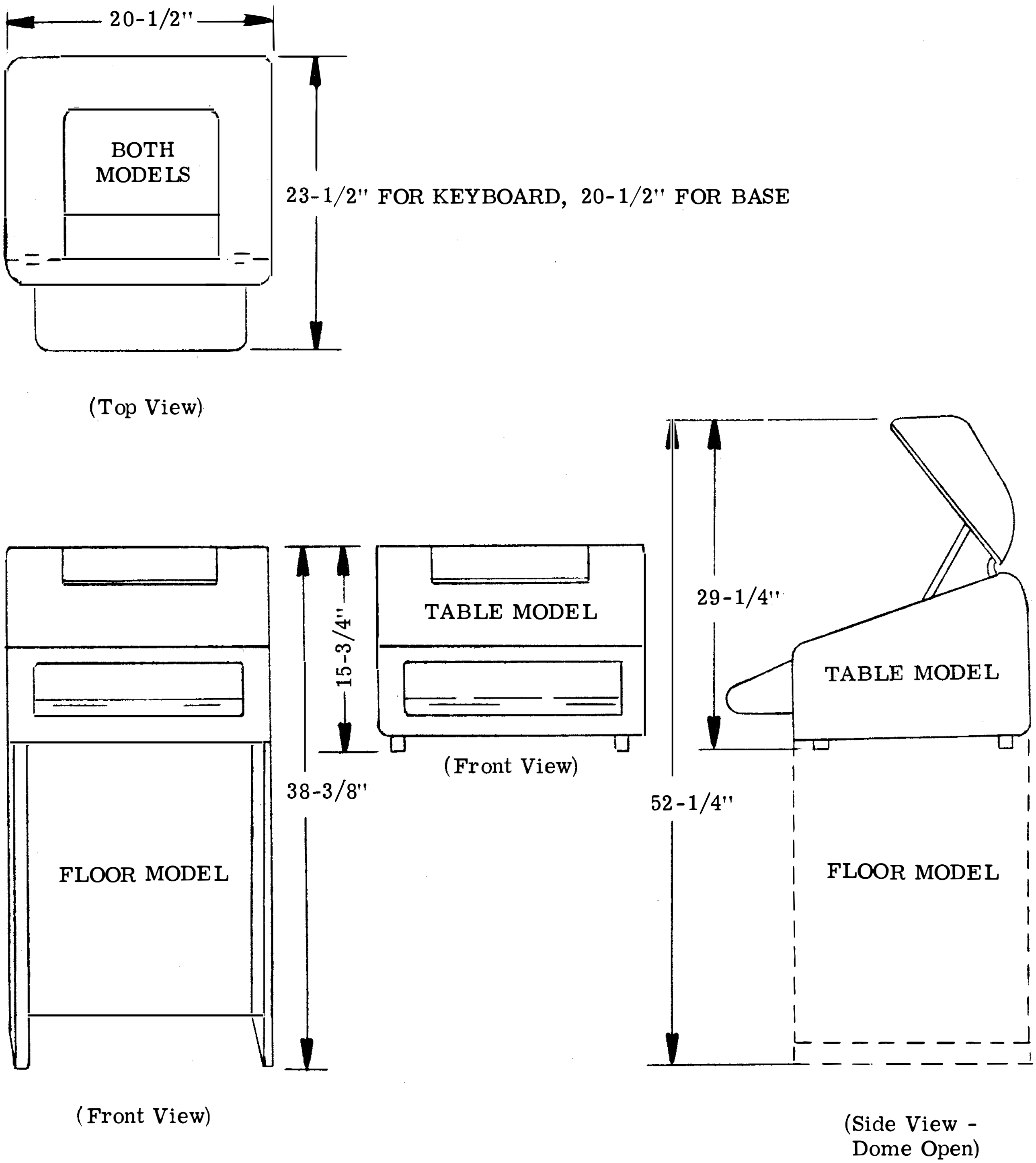


Figure 2 - Space Requirement Dimensions

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.

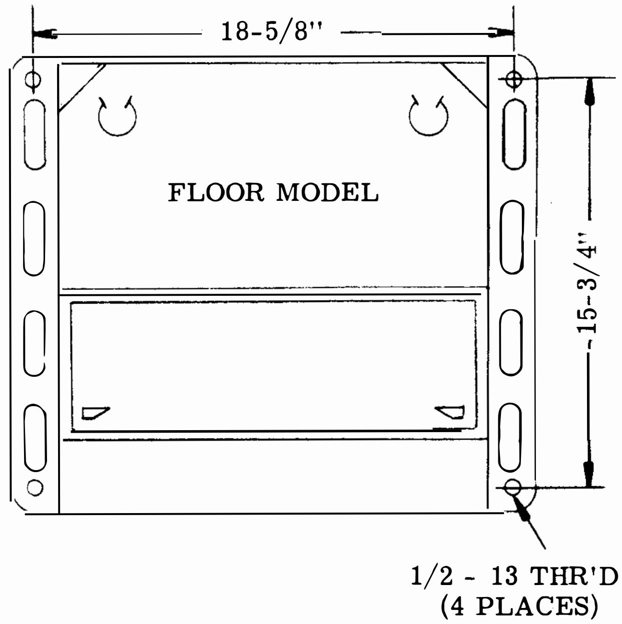
2.15 Remove the rear crossbar of the cradle assembly in the cabinet by removing its two mounting screws, lockwashers and flat washers.

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



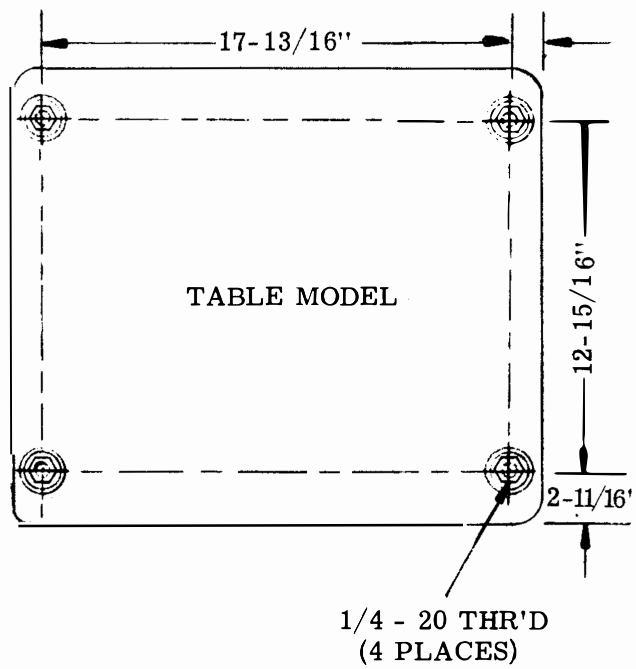


Figure 3 - Bottom Dimensions

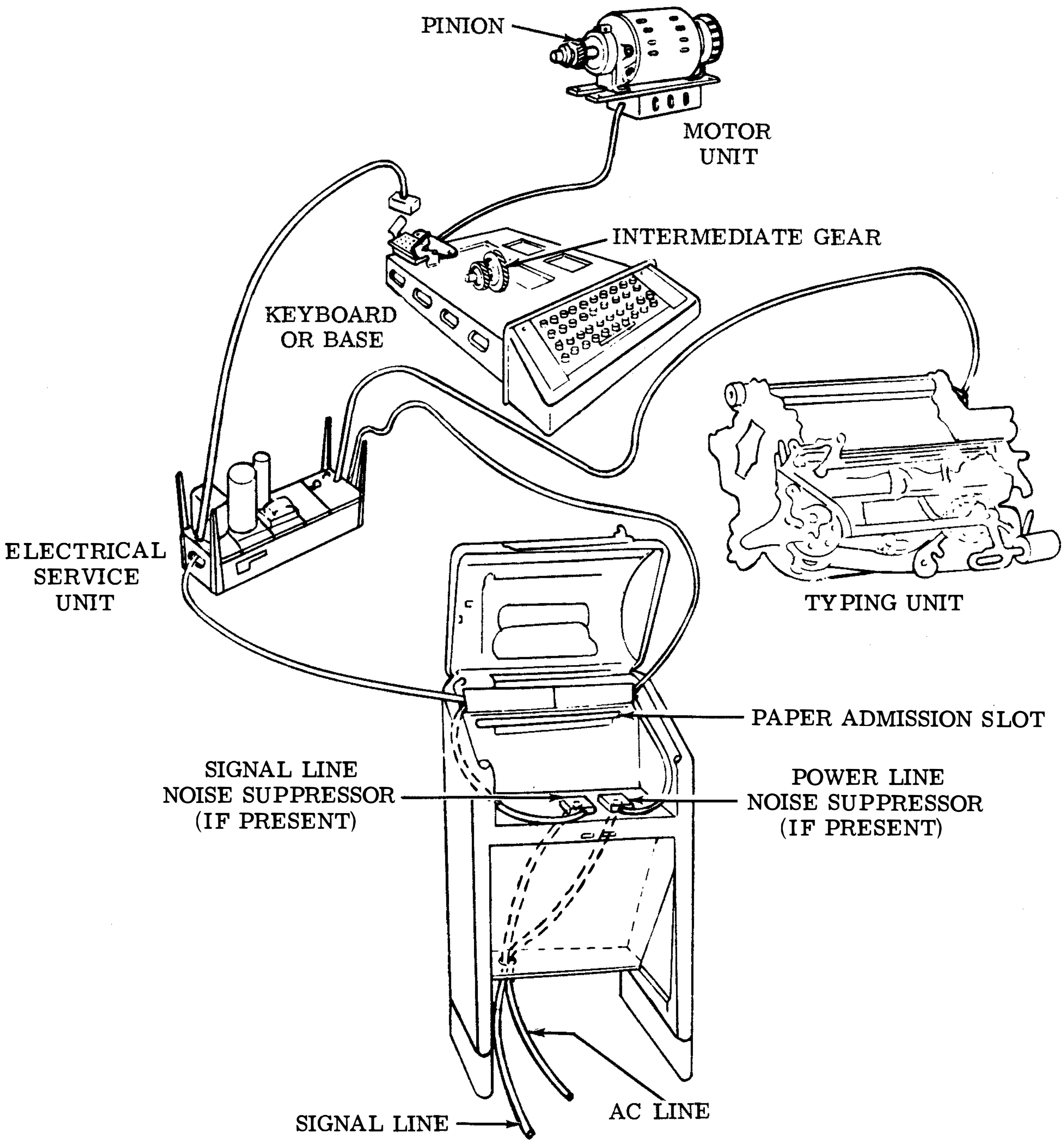


Figure 4 - Basic Units Cable Arrangement

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 bear 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.

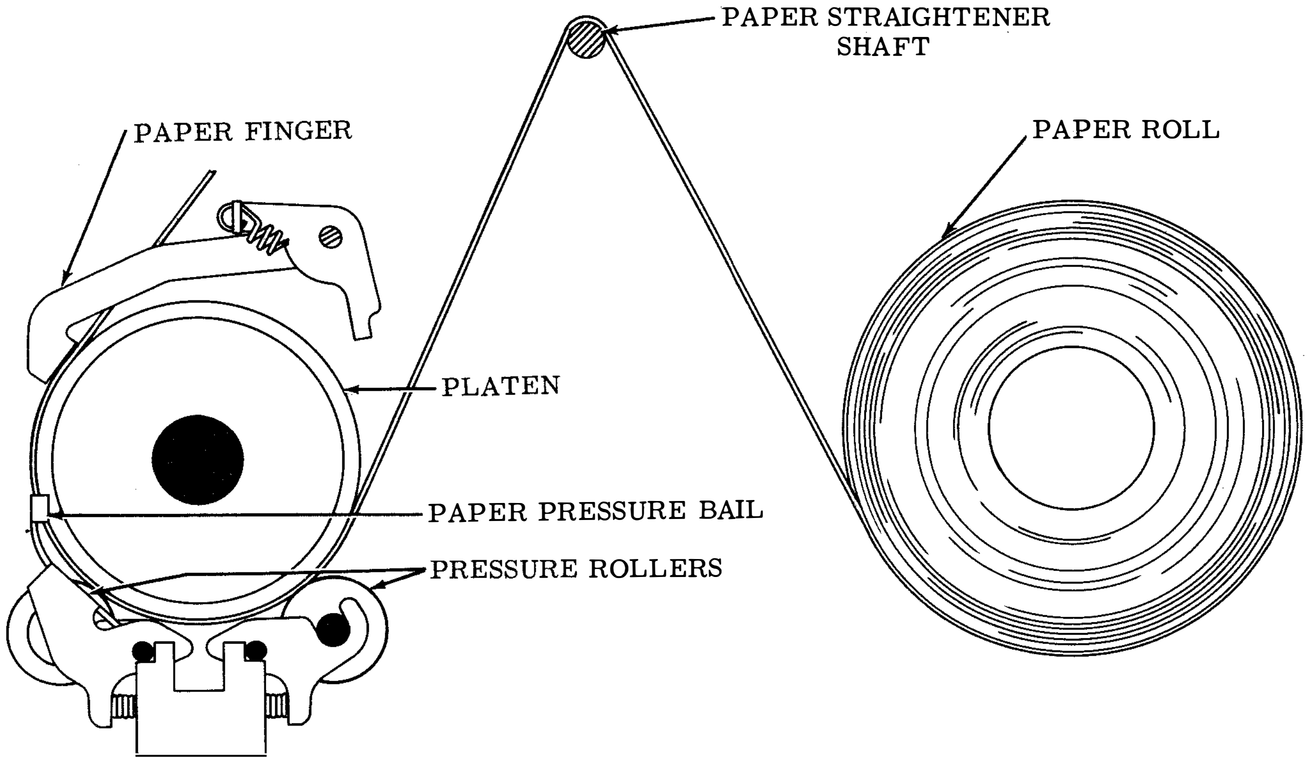


Figure 5 - Path of Paper

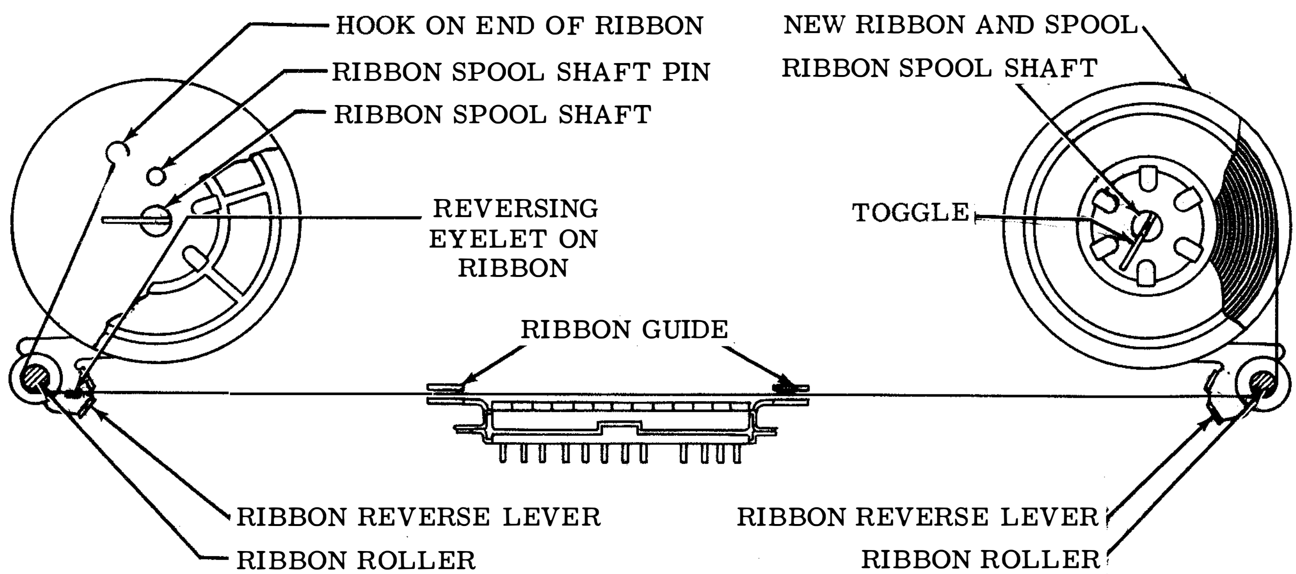


Figure 6 - Path of Ribbon

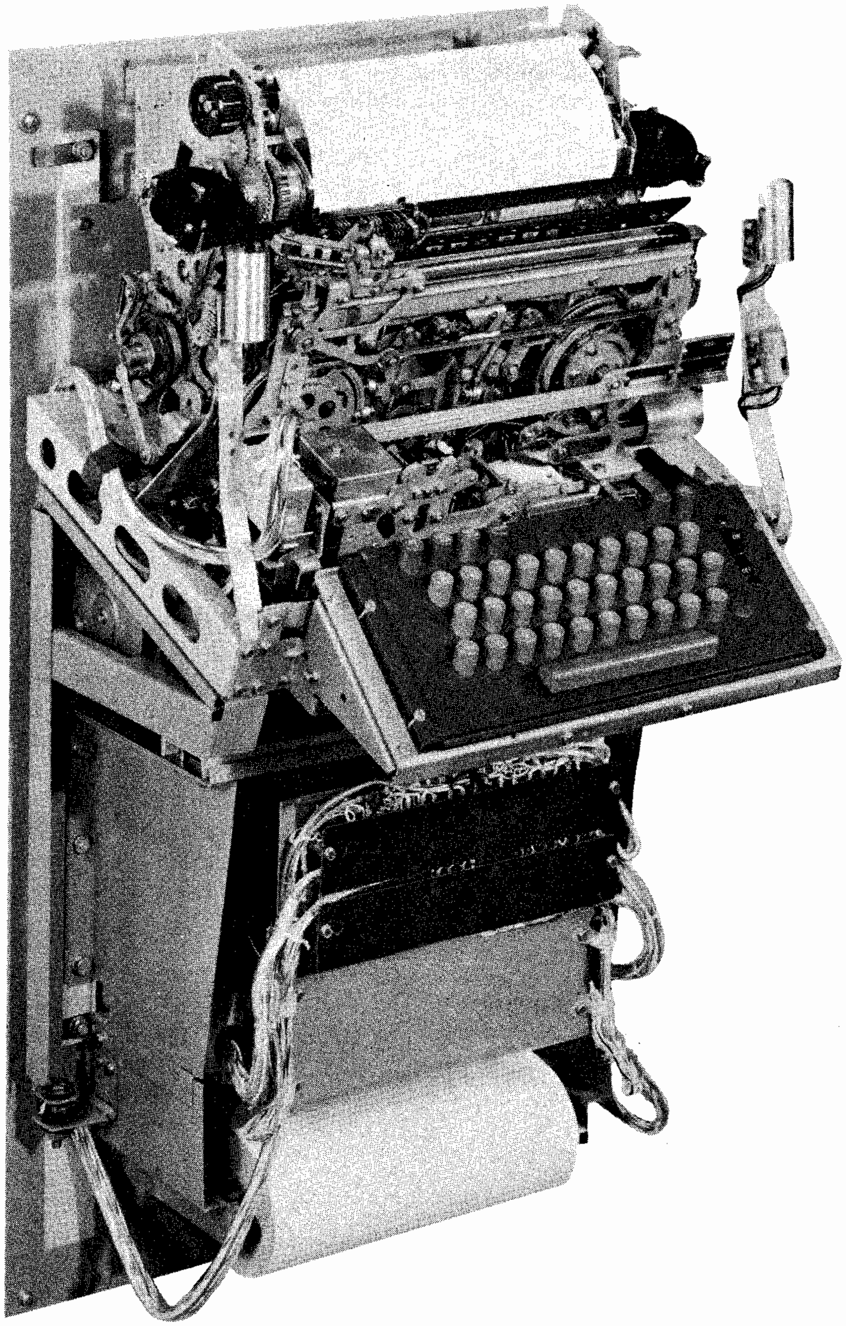


Figure 7 - Wall Mounted Printer Set (Cover Removed)

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 admission 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 REARMOST 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.

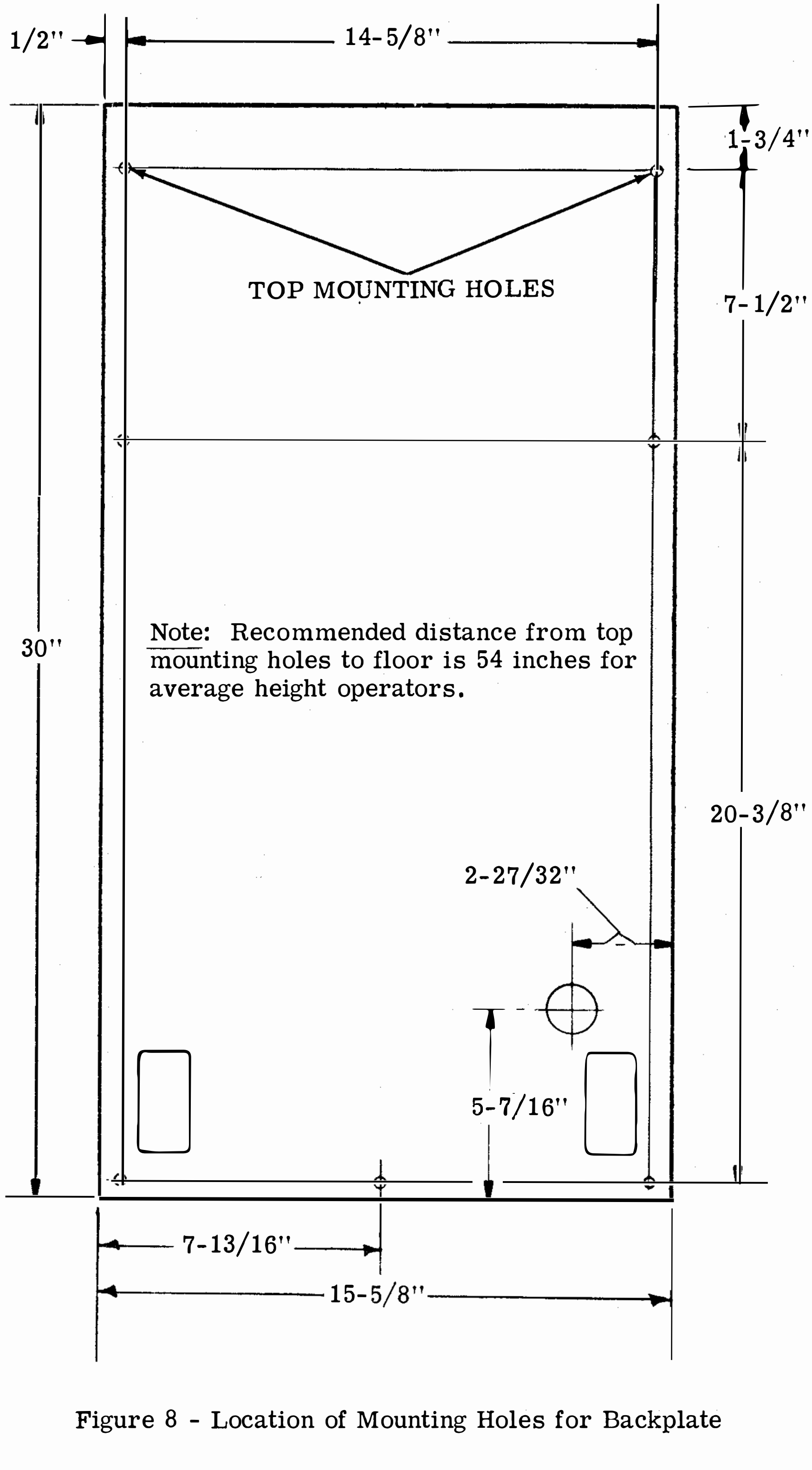


Figure 8 - Location of Mounting Holes for Backplate

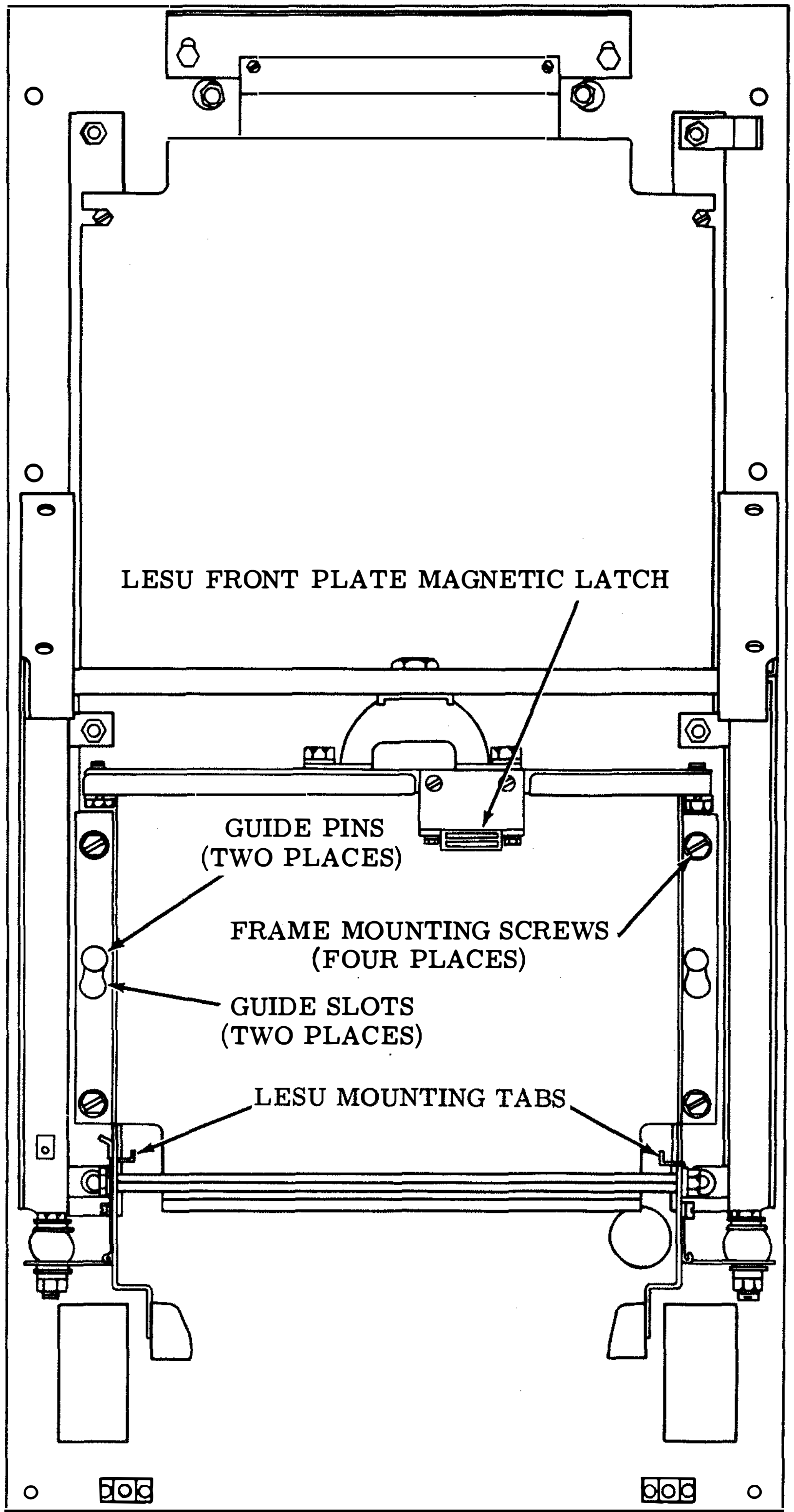


Figure 9 - Backplate Framework

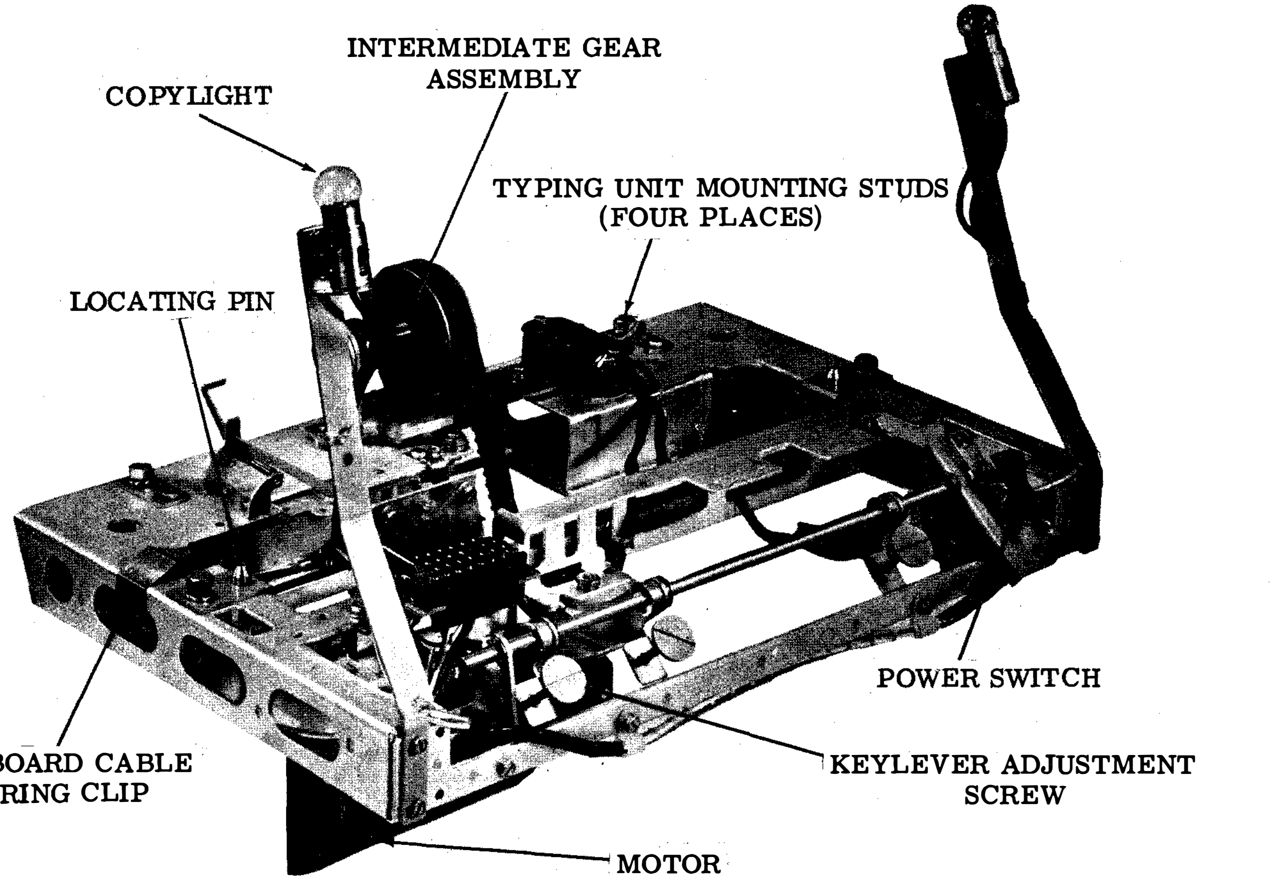


Figure 10 - Wall Mounted Printer Base

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.

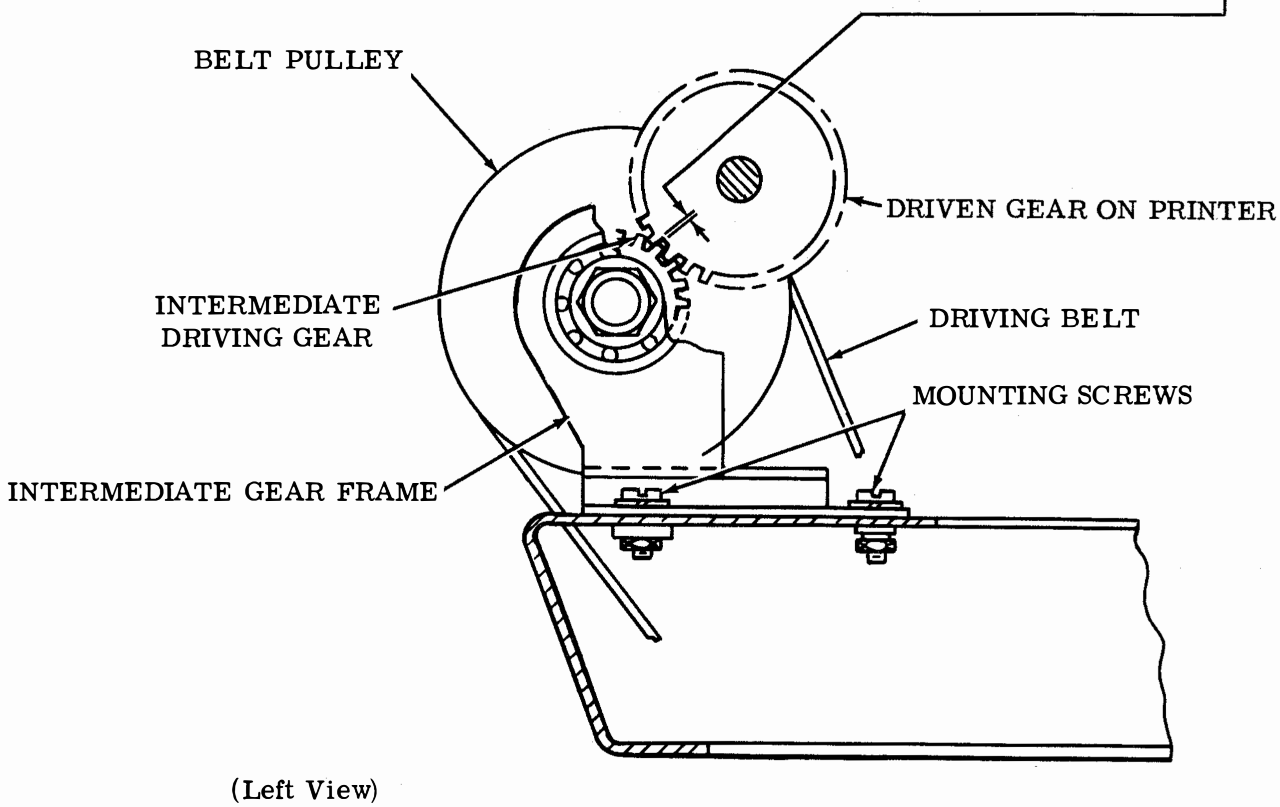


Figure 11 - Intermediate Gear Assembly

Requirement

Force of 2 ±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.

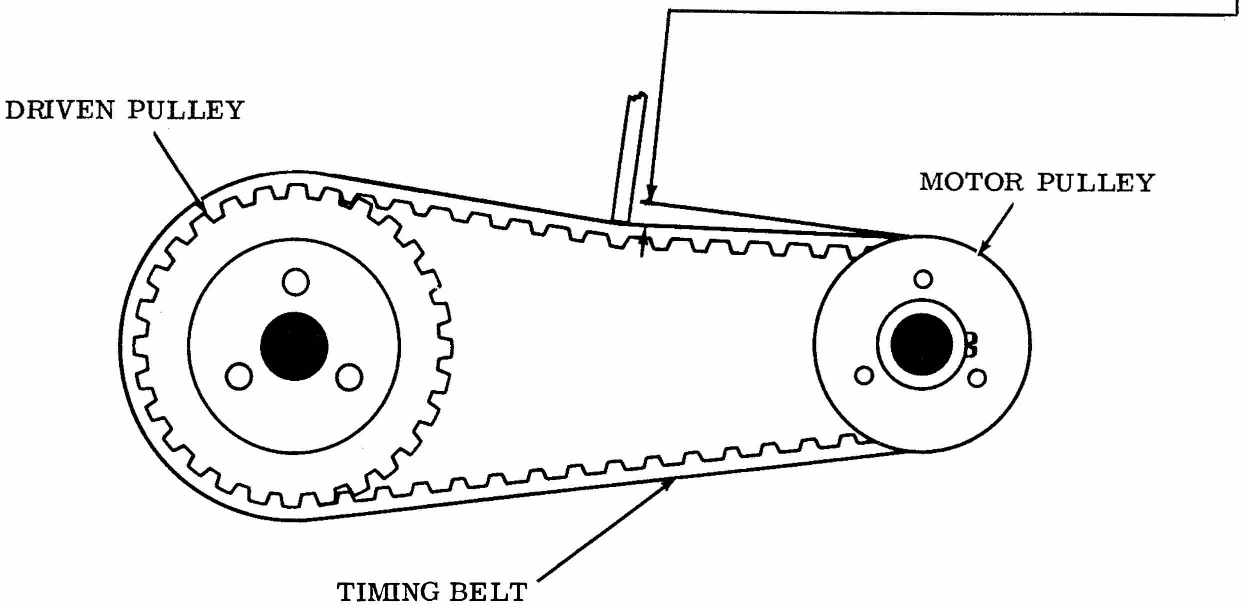


Figure 12 - Timing Belt Adjustment

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.

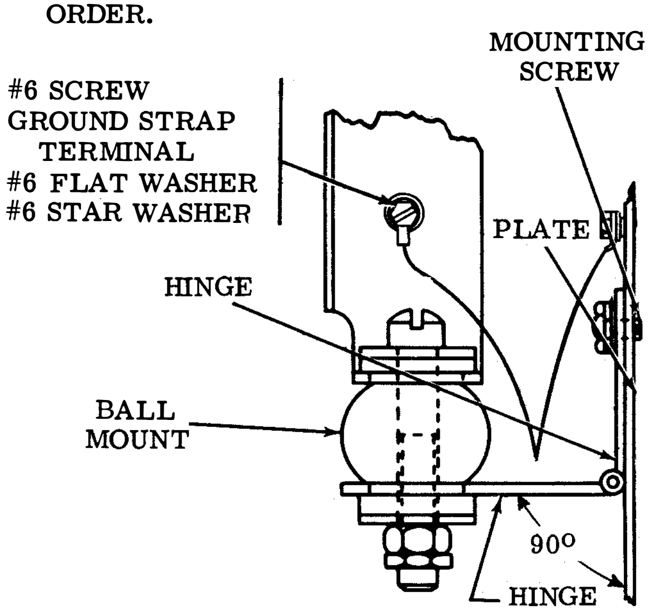


Figure 13 - Ground Strap Installation

(b) Clip the lamp shields on the two copylight 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.

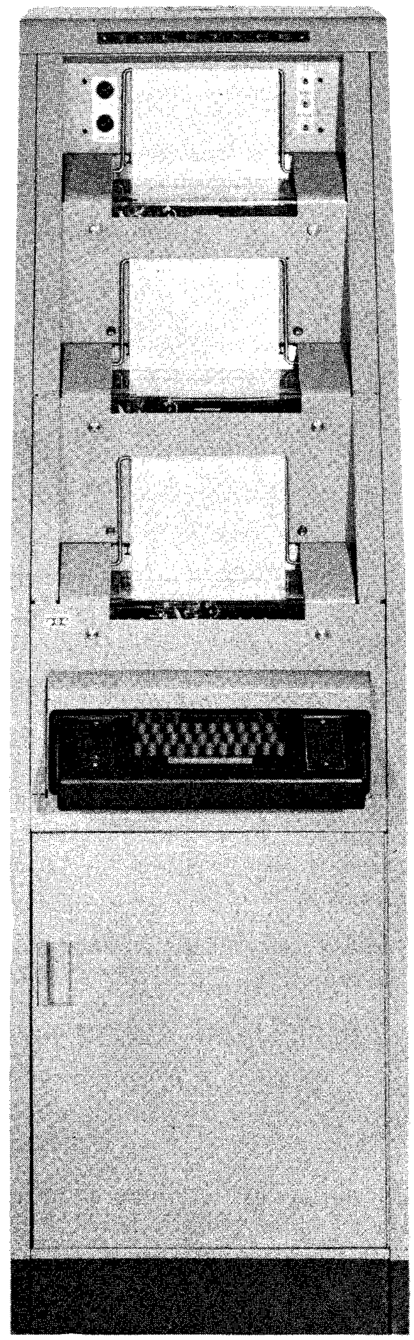
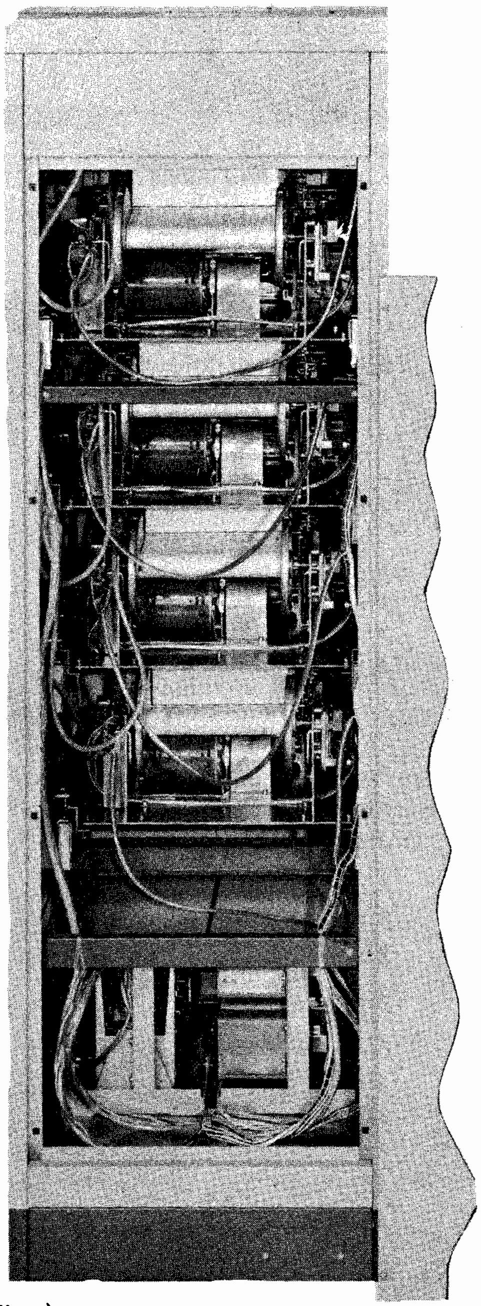
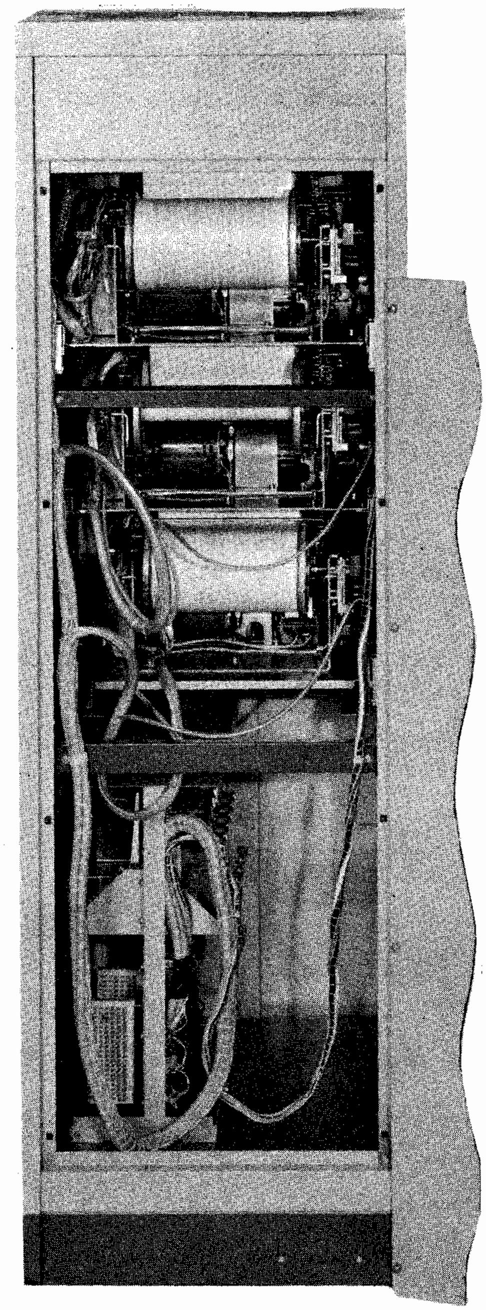


Figure 14 - Multiple Mounted KSR and RO Set



(Rear View)

Figure 15 - Four Unit Multiple Mounted RO Set



(Rear View)

Figure 16 - Three Unit Multiple Mounted Set; One KSR and Two RO

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 keyboard 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.

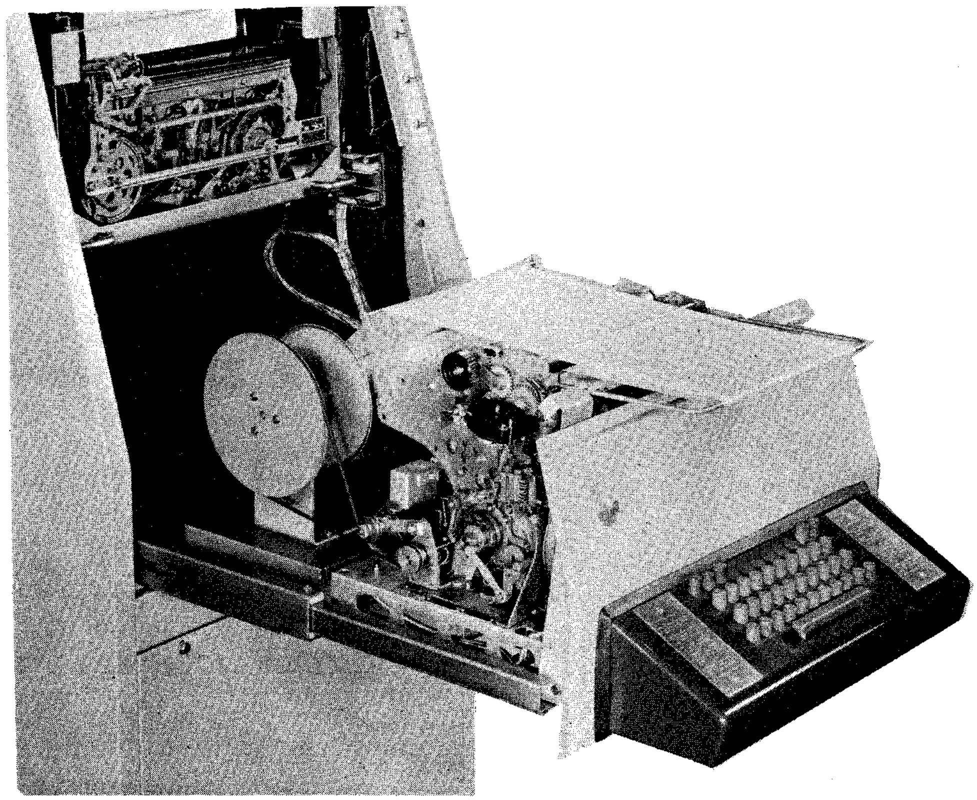


Figure 17 - KSR Unit Pulled Out of Multiple Mounted Set

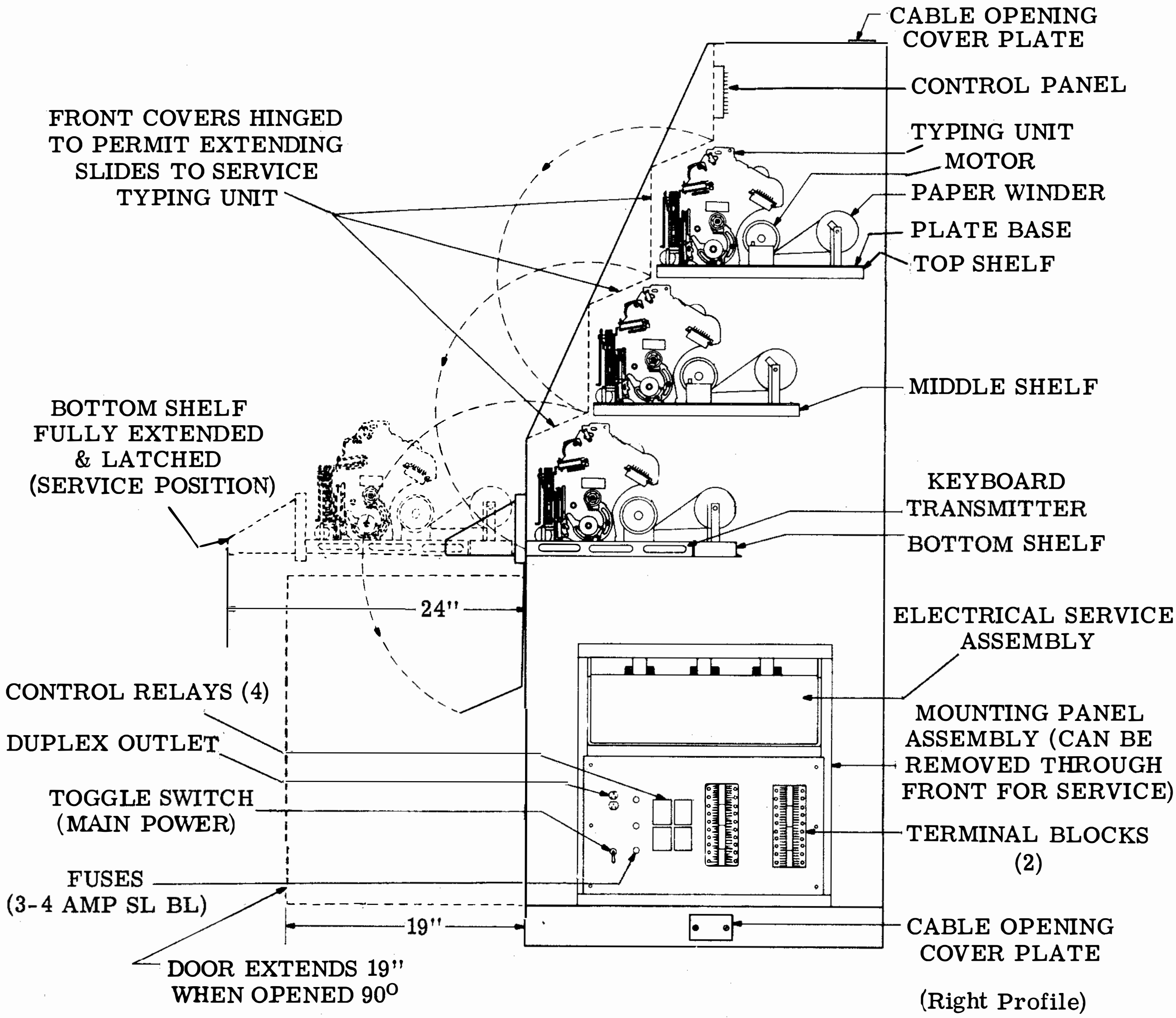


Figure 18 - Multiple Mounted Set

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:

SPEED	7.42 UNIT CODE GEAR SET		7.00 UNIT CODE GEAR SET
	60 Cycle	50 Cycle	60 Cycle
60 wpm	TP161293	TP307850	TP173795
67 wpm	-	TP307851	-
75 wpm	TP161294	-	TP163504
100 wpm	TP161295	TP307852	TP163505

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

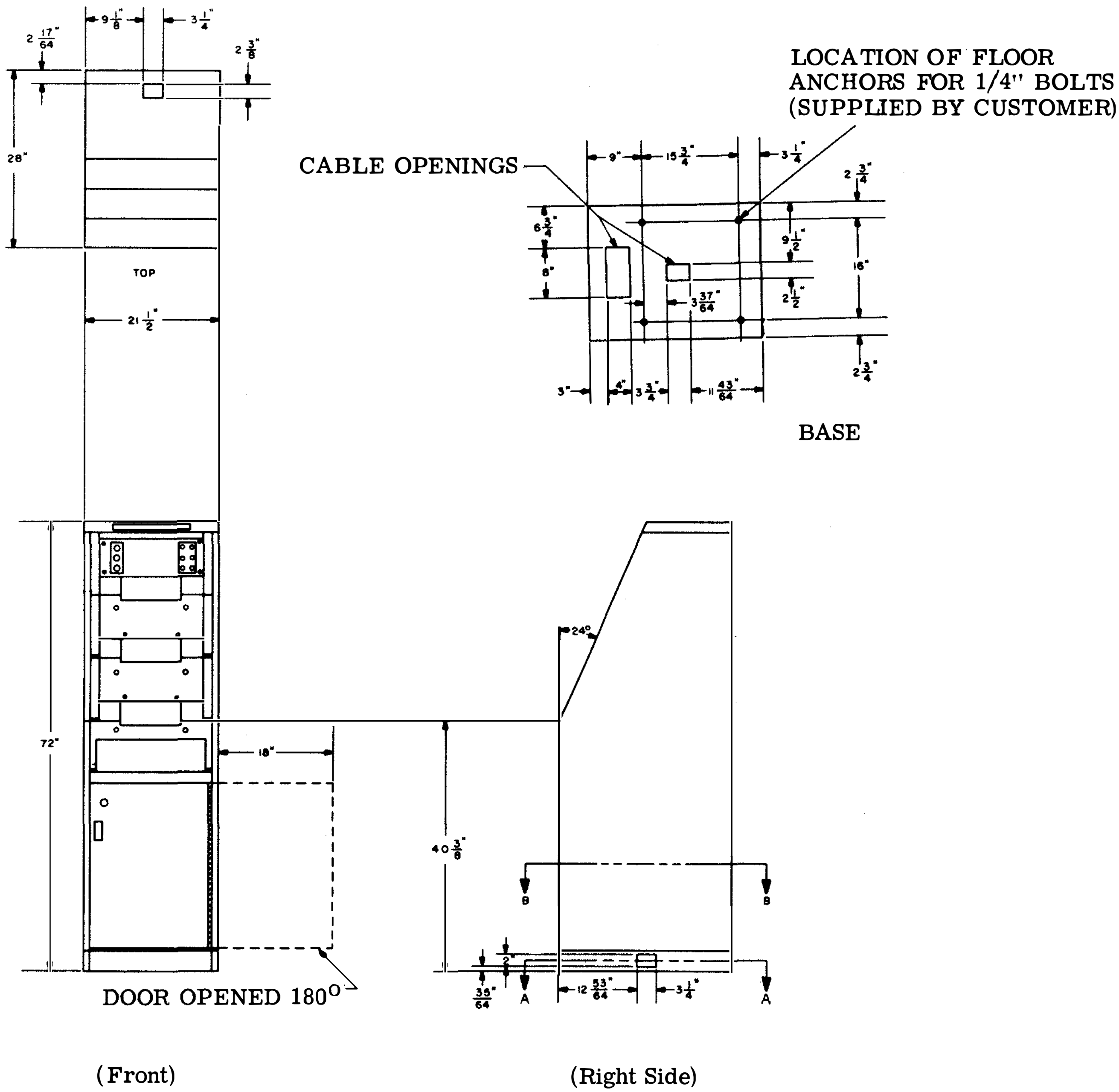


Figure 19 - Multiple Mounted Cabinet Dimensions

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

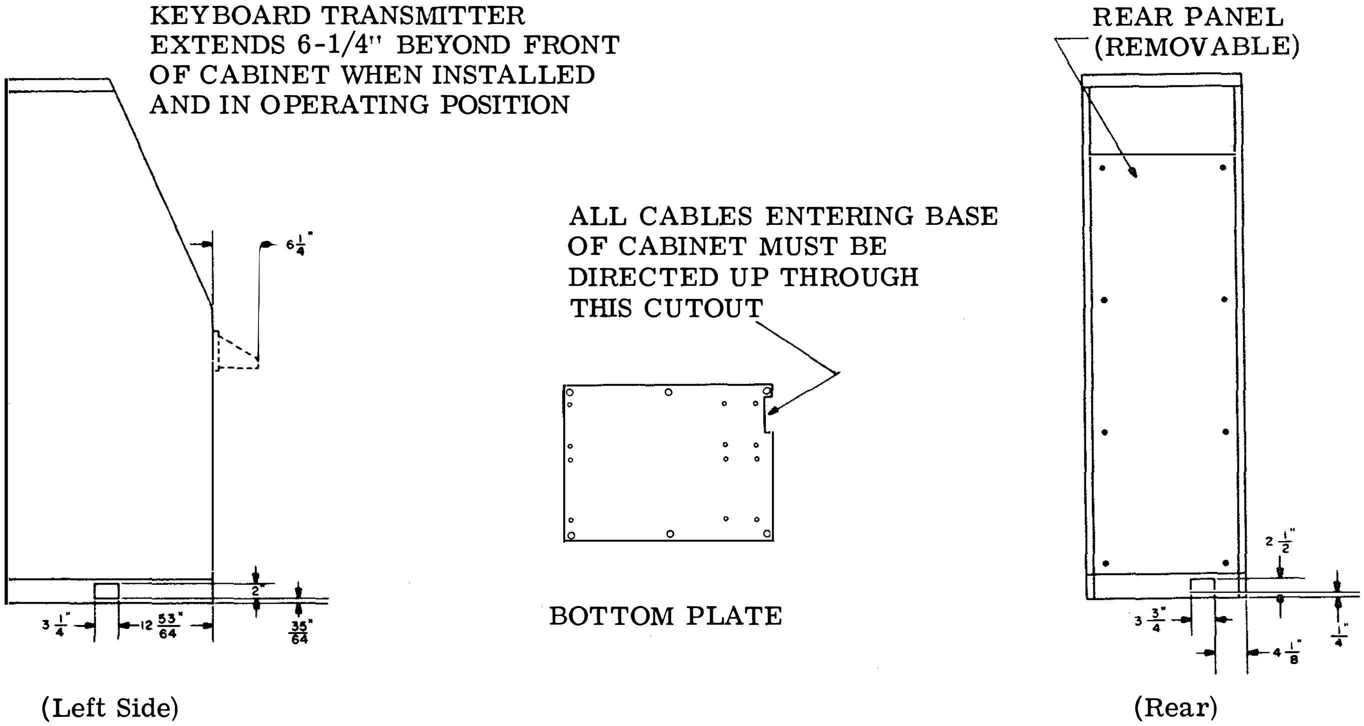


Figure 20 - Multiple Mounted Cabinet Dimensions (continued)

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

2.79 Adjust the typing unit gear and the intermediate gear to provide a barely perceptible 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, procede 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 forward 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 typebox 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.

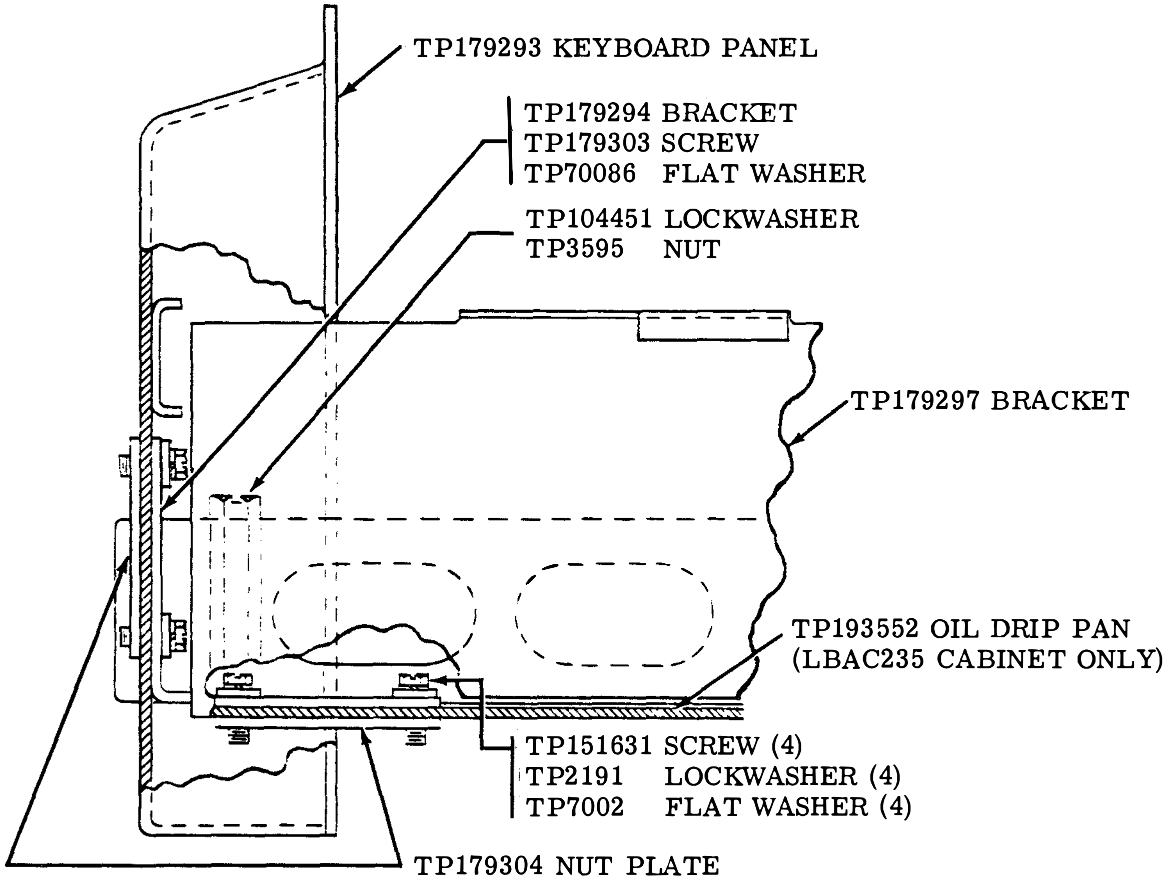


Figure 21 - Keyboard Panel Installation

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.

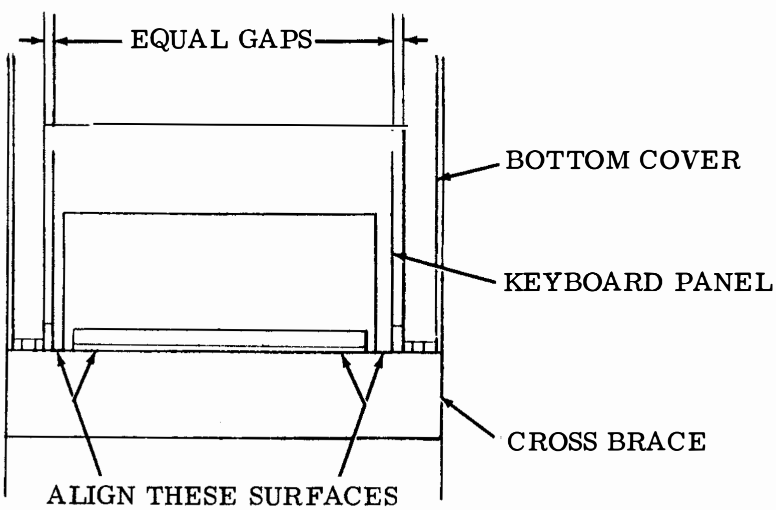


Figure 22 - Keyboard Panel Adjustments

28 KEYBOARD SEND-RECEIVE (KSR) AND RECEIVE-ONLY (RO) TELETYPEWRITER SETS

OPERATING TESTS

CONTENTS PAGE

1. GENERAL

1.01 This section describes the tests made to determine if the Keyboard Send-Receive (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) TELETYPEWRITER SETS

DISASSEMBLY AND REASSEMBLY

CONTENTS PAGE

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.

SINGLE UNIT CONSOLE OR TABLE MODEL SETS

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 locklever 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.

28 TELETYPEWRITER ENCLOSURES

DESCRIPTION

CONTENTS PAGE

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 1. ENCLOSURE DIMENSIONS

	Height (Inches)	Width (Inches)	Depth (Inches)
Floor Model	39	20-1/2	18-1/2
Table Model	16	20-1/2	18-1/2
Rack Mounted	12	17	24
Wall Mounted	30-3/4	16-1/2	14-1/4
Multiple KSR and RO	72	21-1/2	28

2. DESCRIPTION

FLOOR MODEL ENCLOSURE (Figures 1 and 2)

2.01 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.

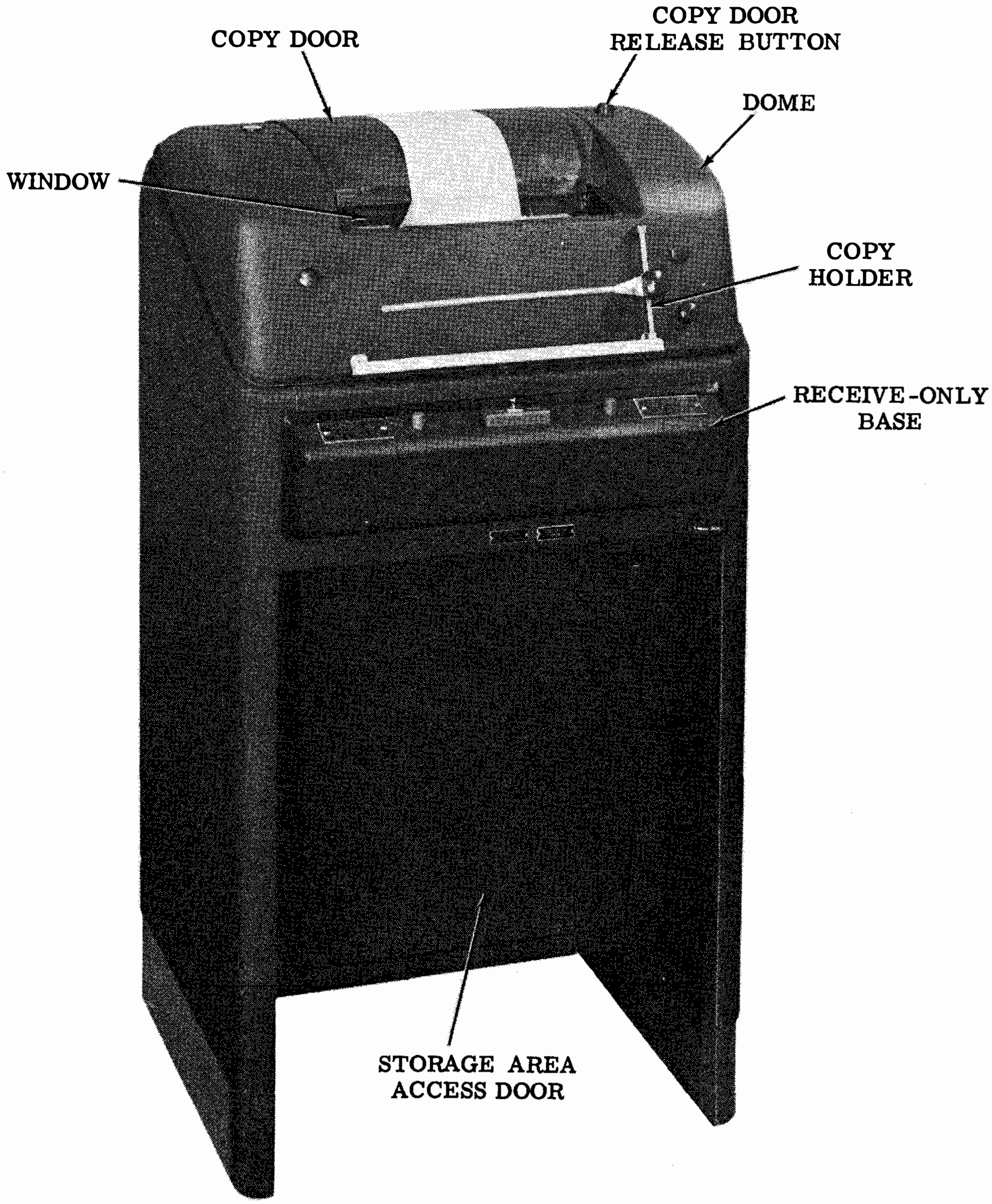


Figure 1 - Floor Model Enclosure

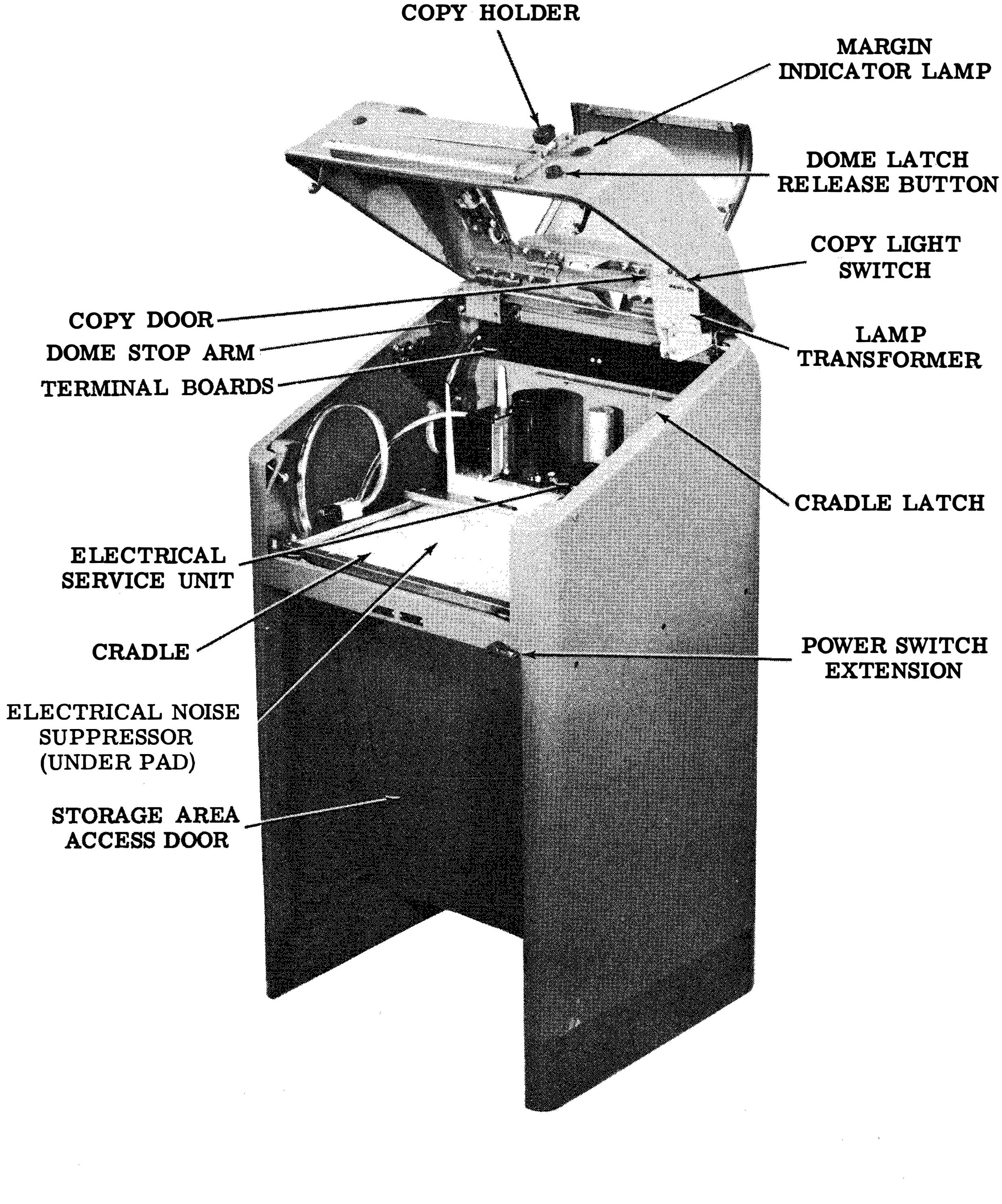


Figure 2 - Floor Model Enclosure (with Electrical Service Unit)

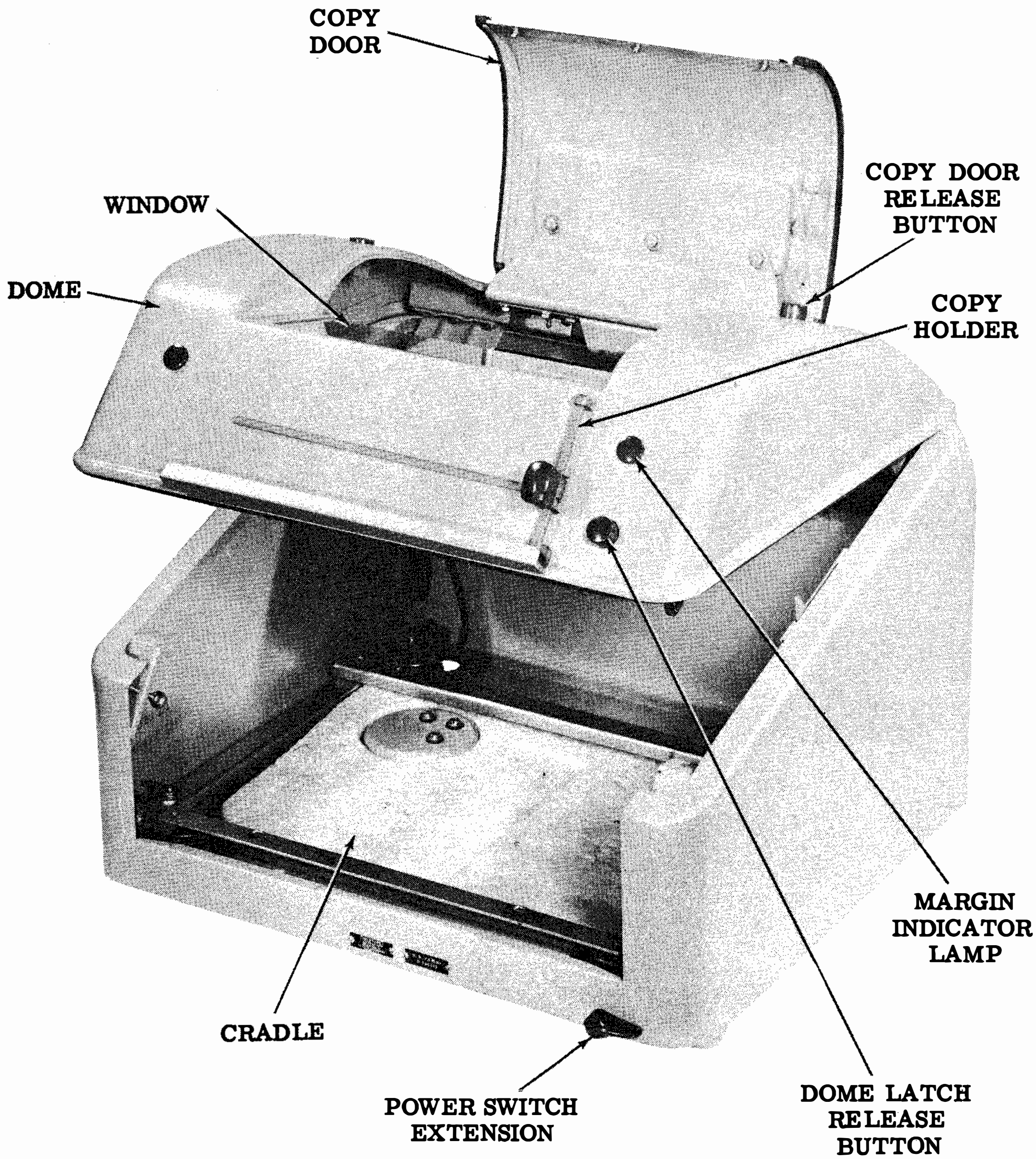


Figure 3 - Table Model Enclosure

(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.

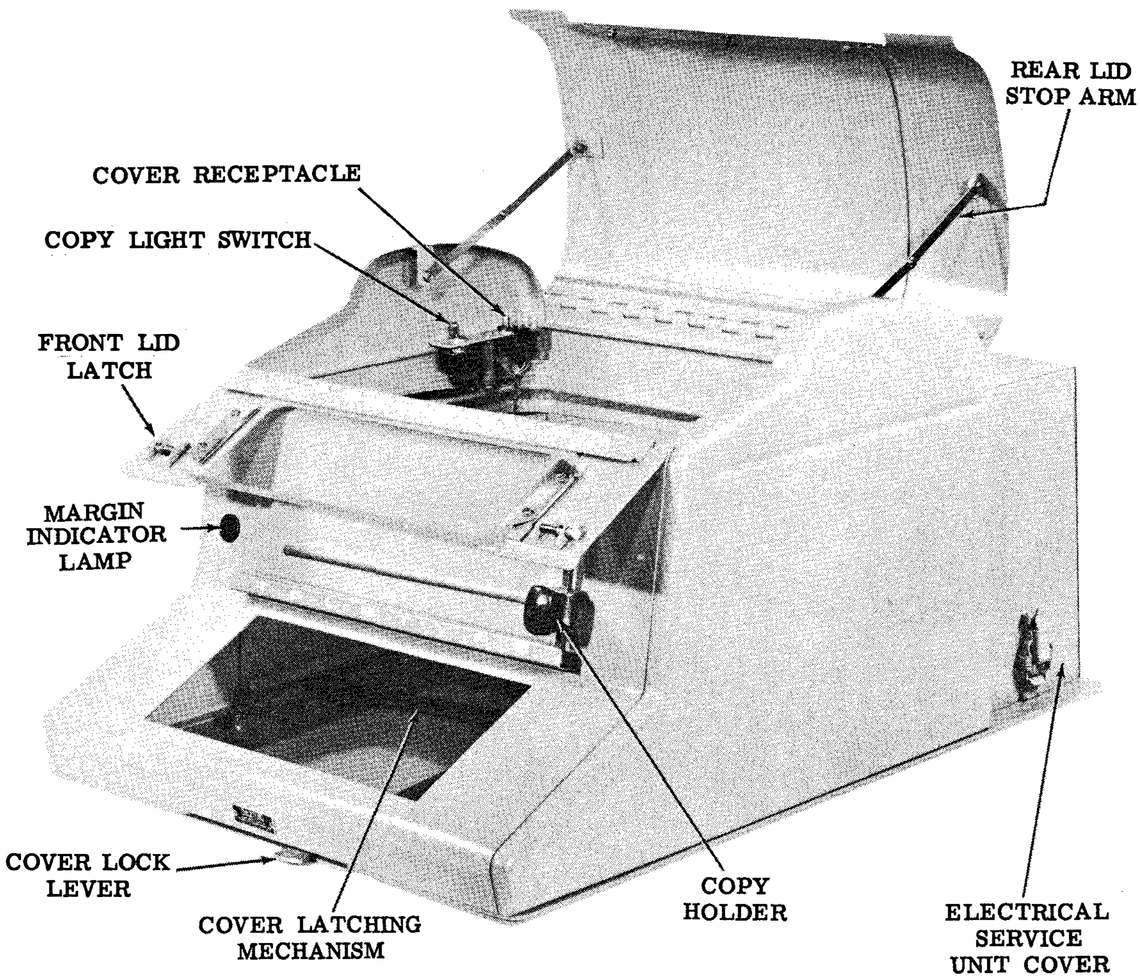


Figure 4 - Rack Mounted Cover

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: masonary, 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-

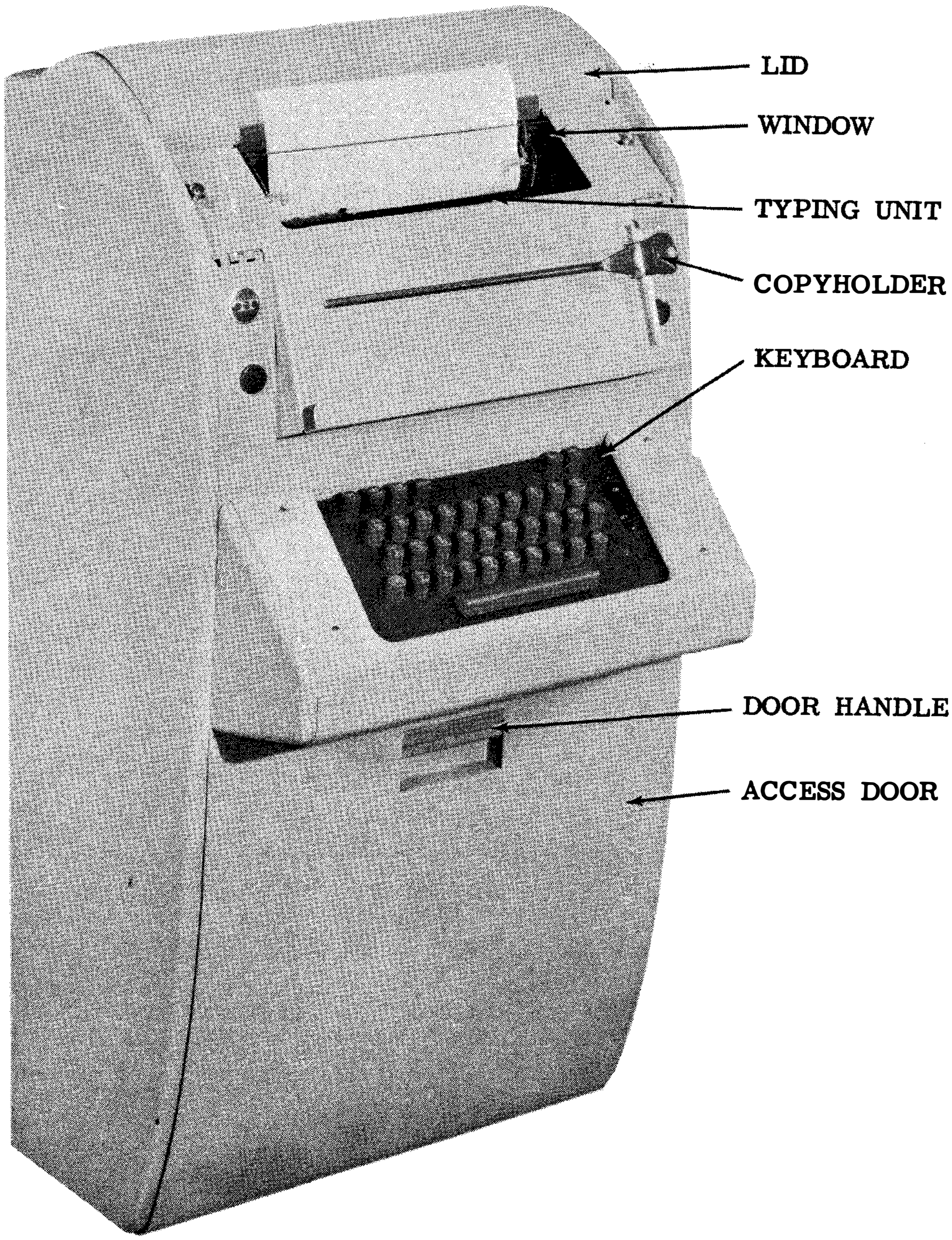


Figure 5 - Wall Mounted Enclosure

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.

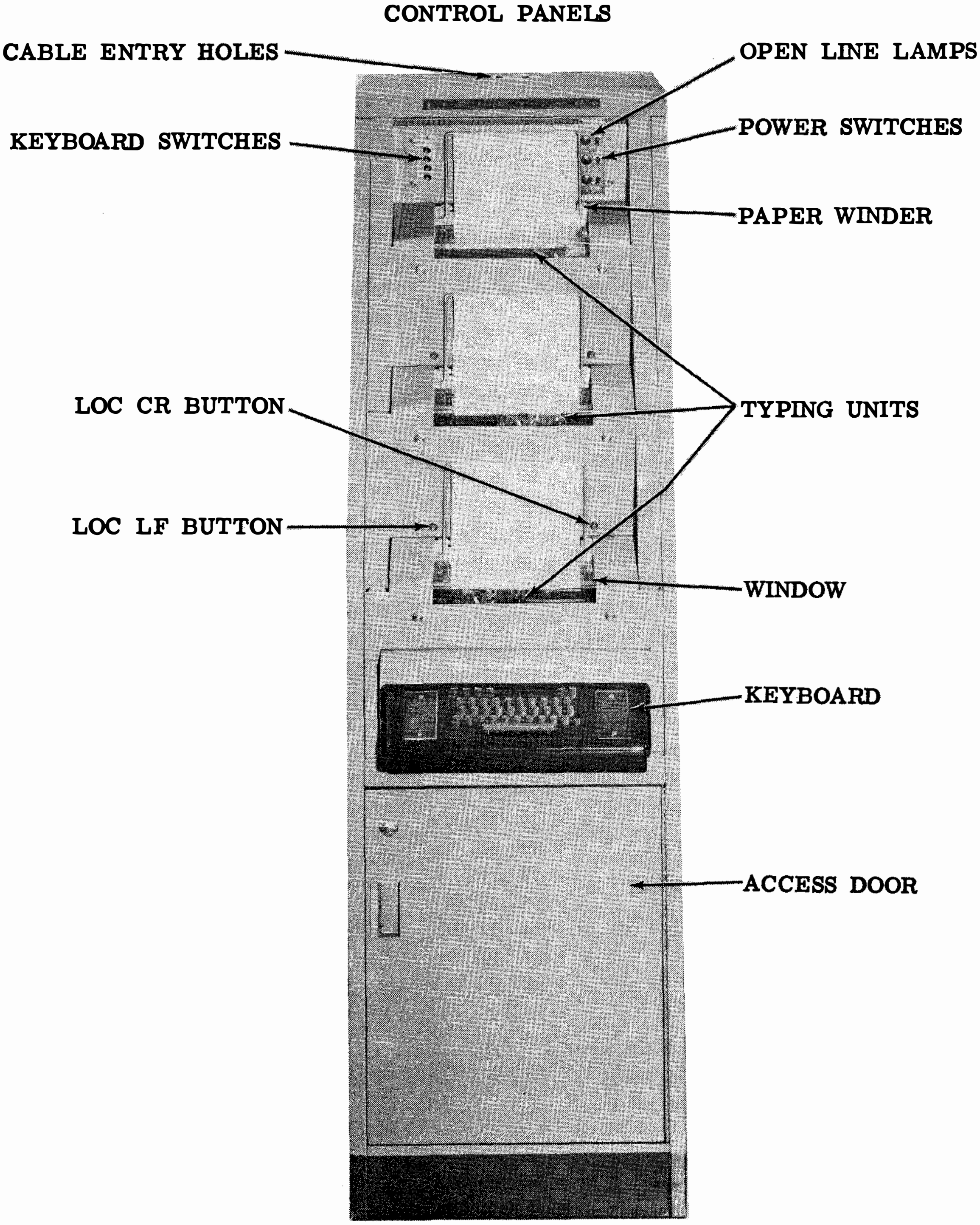


Figure 6 - Multiple KSR and RO Enclosure

(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.

28 ELECTRICAL SERVICE UNIT

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS PAGE

1. GENERAL

1.01 The 28 electrical service units serve as an area of concentration for the wiring of 28-type apparatus and provide mounting facilities for various electrical assemblies and components.

1.02 The operational facilities provided by the electrical service unit vary, depending upon the number and complexity of functions performed by the set.

1.03 Complete operation of an electrical service unit requires connection with other components of the set with which it is used. Additional information concerning the support 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.

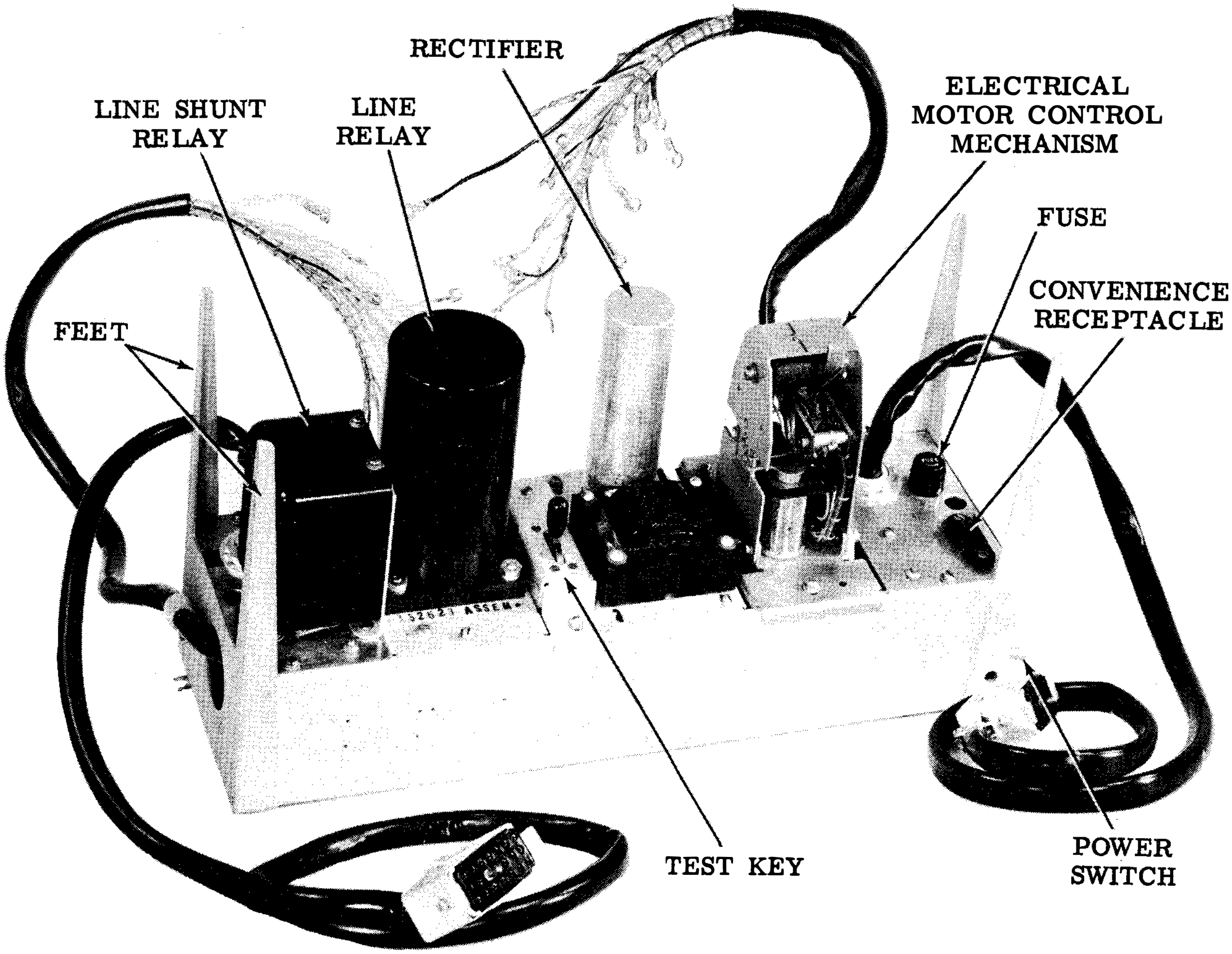


Figure 1 - Typical 28 Electrical Service Unit

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; eg, 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

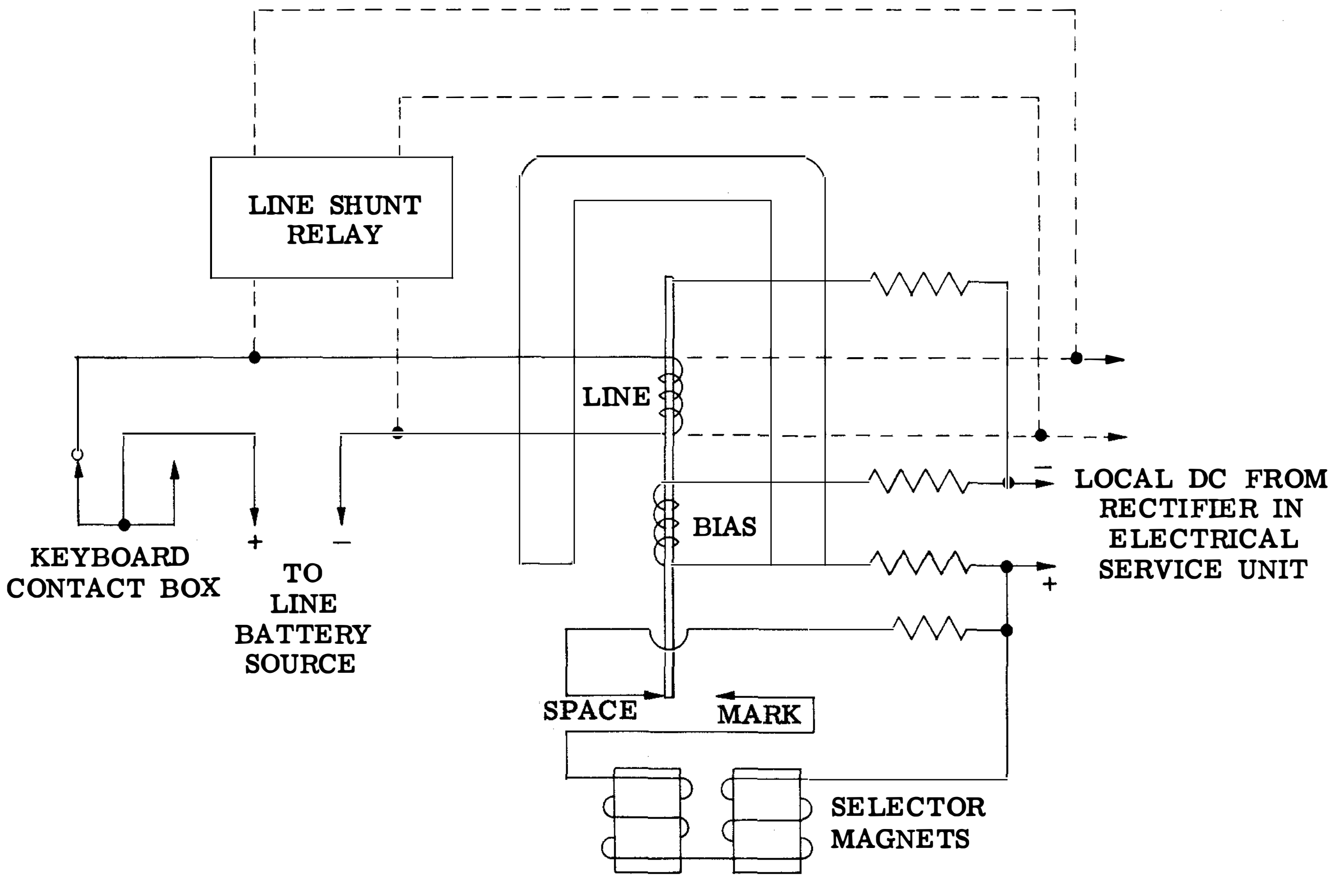


Figure 2 - Line Relay Circuit

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 ($\pm$ 5v), 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 solenoid causing 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

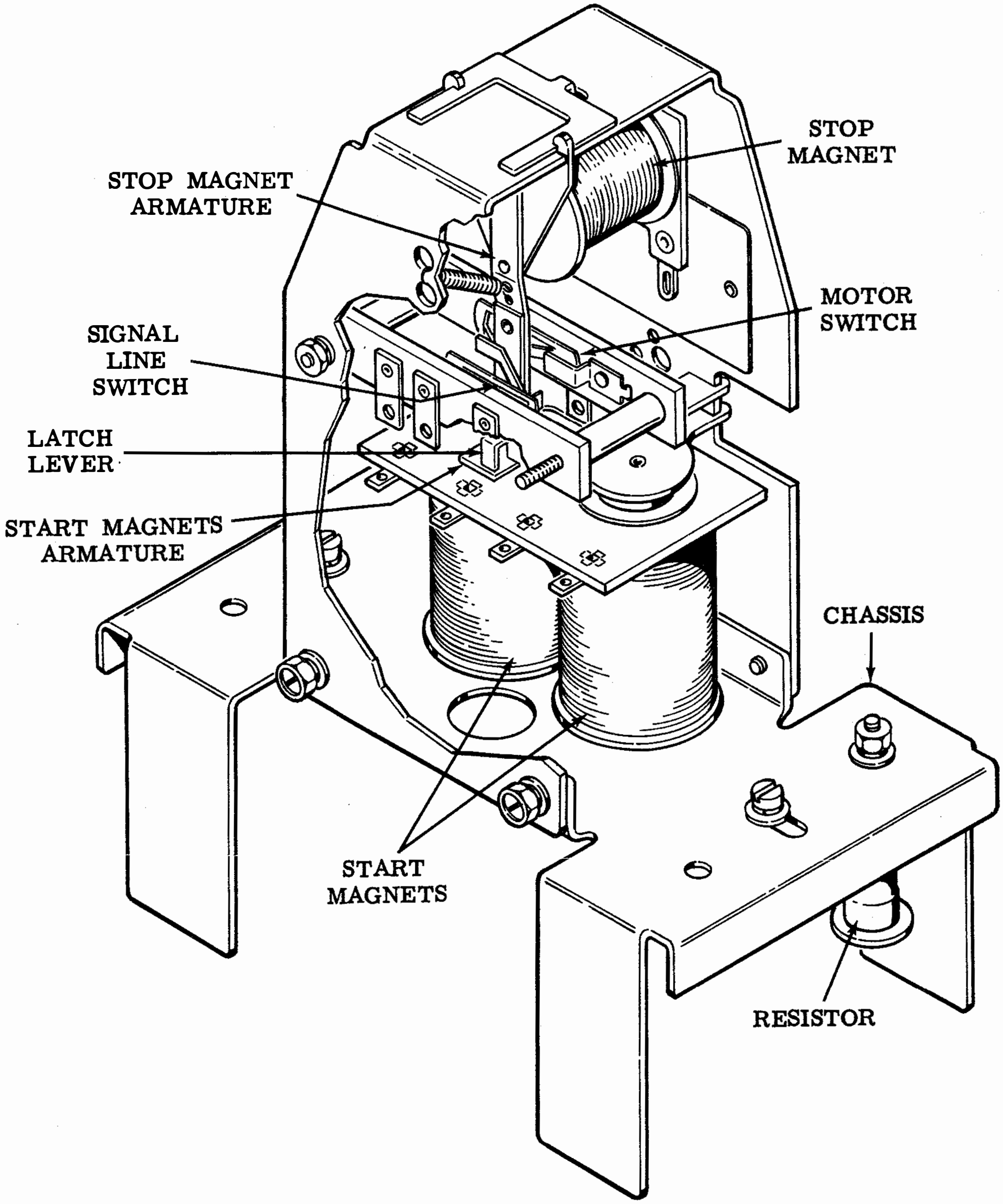


Figure 3 - Electrical Motor Control Mechanism

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

CONTENTS PAGE

CONTENTS PAGE

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.

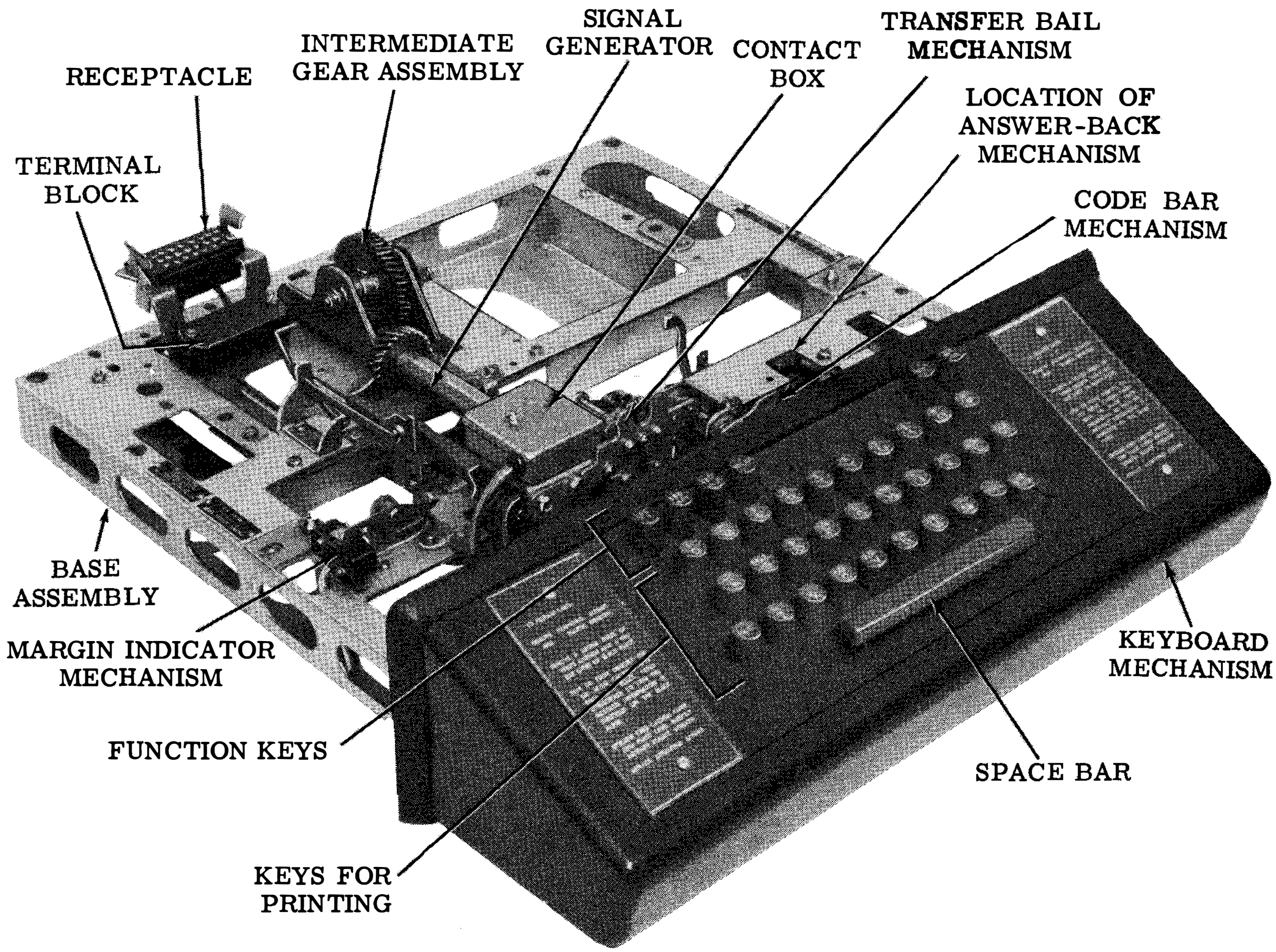


Figure 1 - 28 Teletypewriter Keyboard

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 368, 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

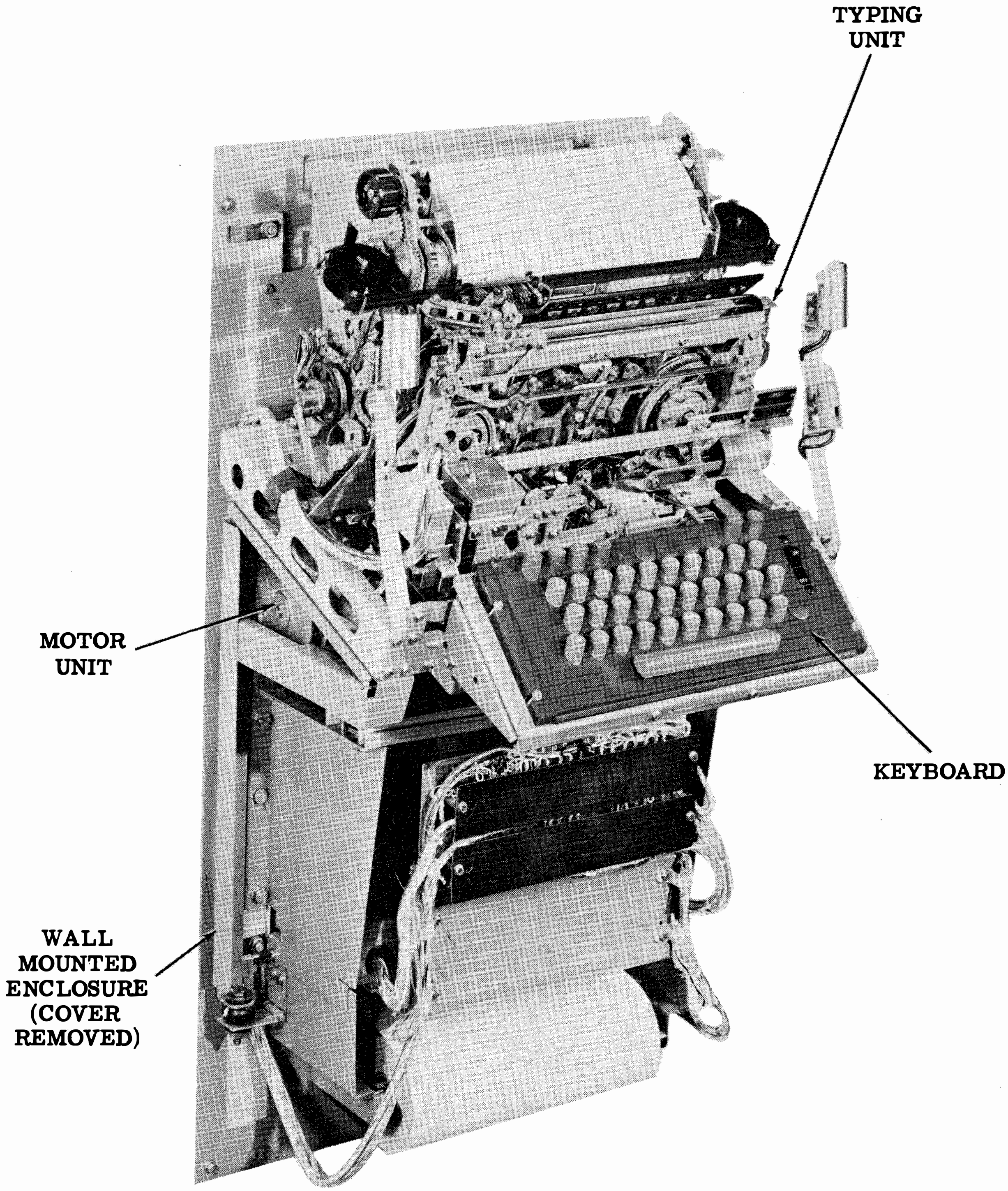


Figure 2 - 28 Teletypewriter Keyboard in Wall Mounted Set (Cover Removed)

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-

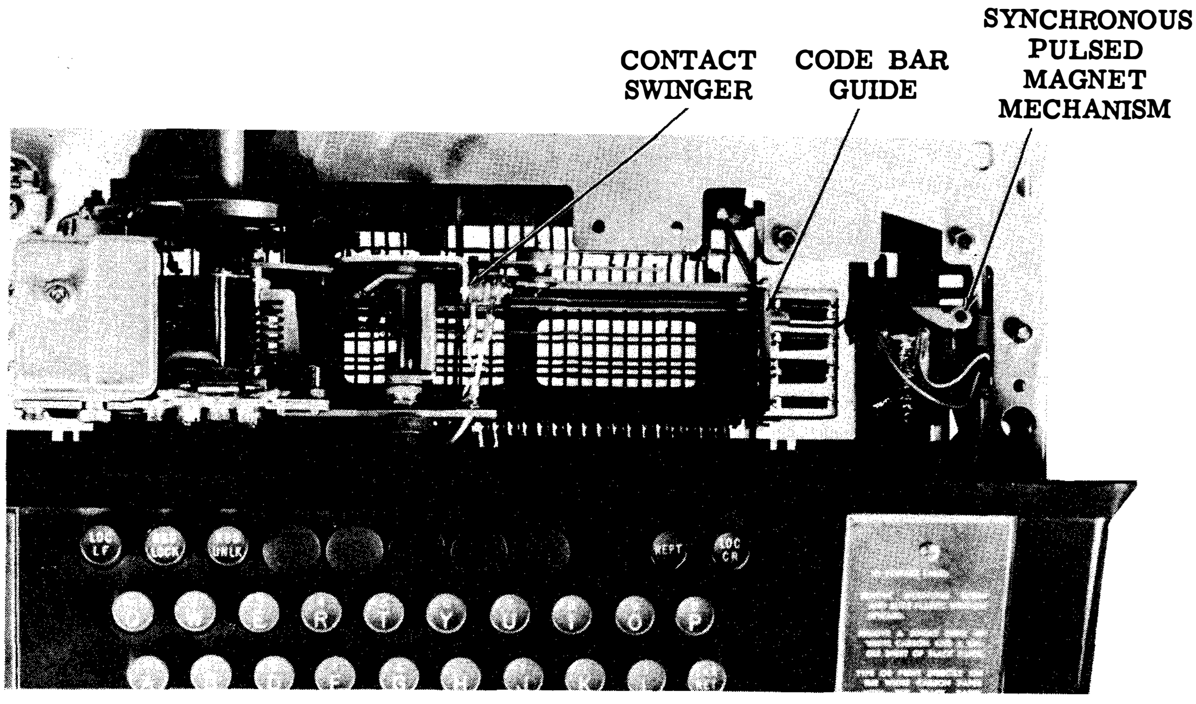


Figure 3 - 28 Teletypewriter Keyboard (Top View)

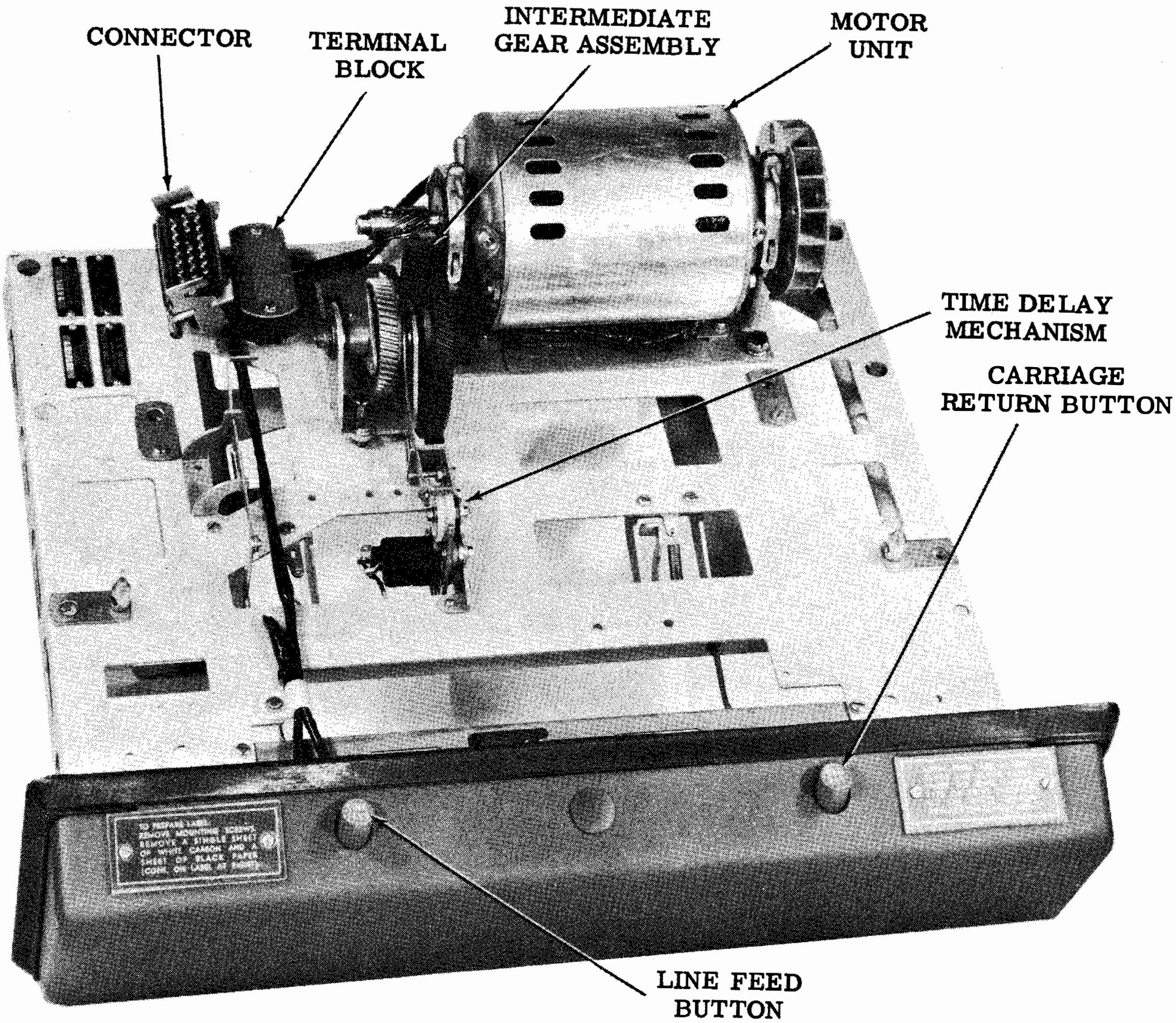


Figure 4 - 28 Teletypewriter Receive-Only Base with Motor Unit

sembly. 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.

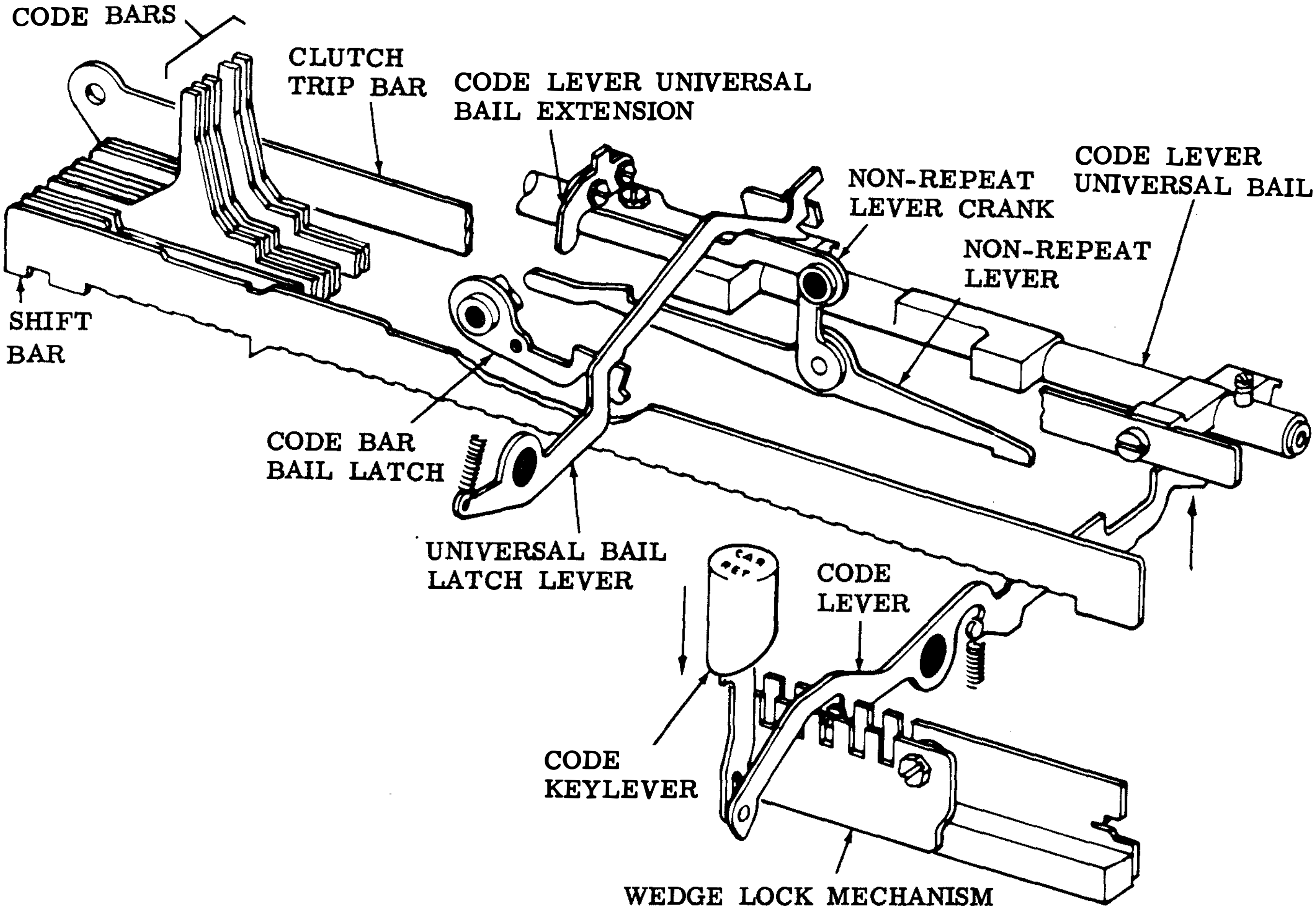


Figure 5 - Code Bar and Code Lever Universal Bail Mechanism

RECEIVE-ONLY BASE (Fig. 4)

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 bail latch then moves downward under spring force developed by the universal bail latch spring. As this latch comes down, it strikes the code bar reset bail latch lever and carries it downward. When the corner of the reset bail latch descends beyond the center line of the needle bearing (mounted on the reset bail), the various spring forces acting on the reset bail 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 keylever (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-

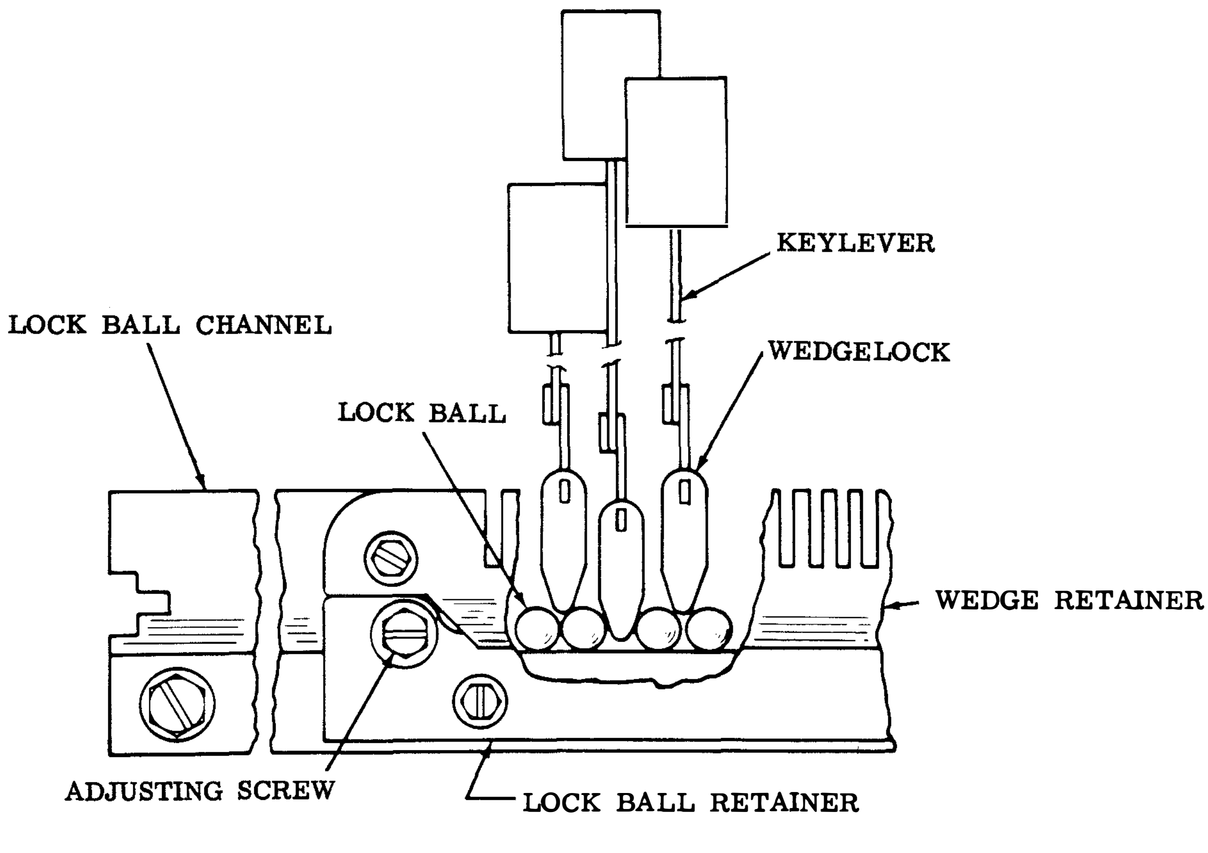


Figure 6 - Wedgelock Mechanism

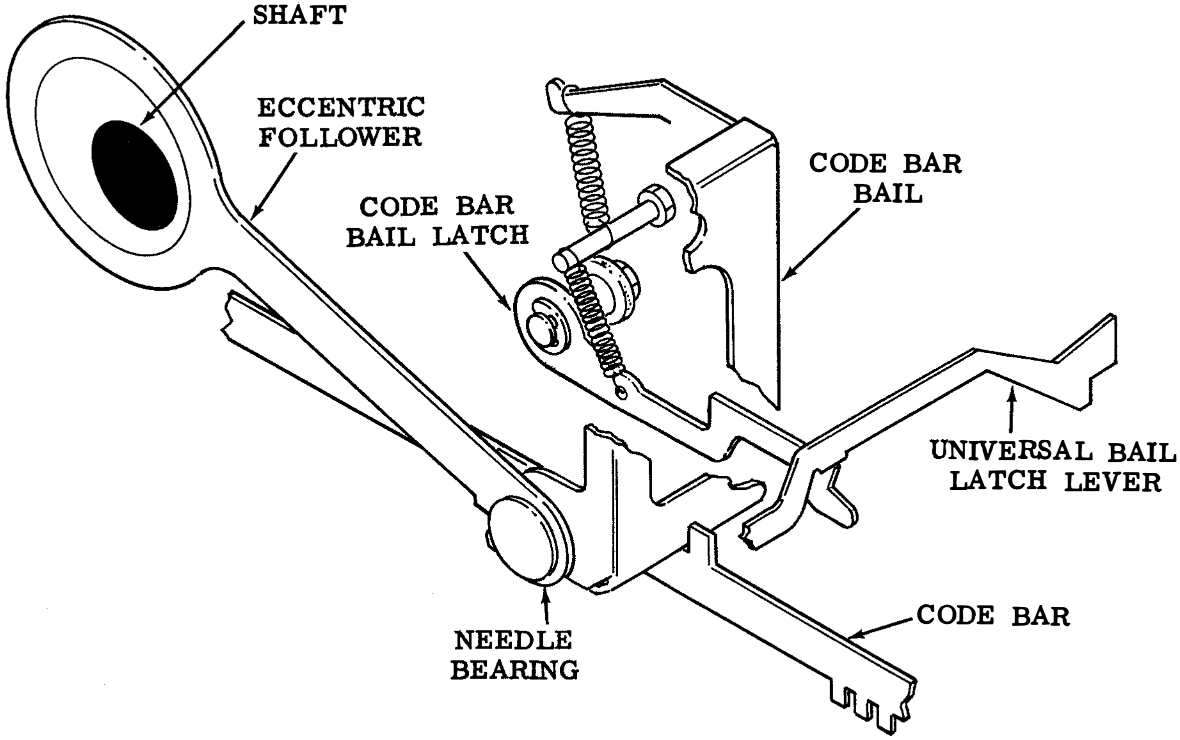


Figure 7 - Code Bar Mechanism

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 bail upward. The blade portion of this locking bail goes up beside a downward projection on each transfer lever. The locking projection is left or right of the locking bail, 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 permutated 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) bail. This tips the transfer bail 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 bail (holding it to the right or tilting it back to the left). This pushes the drive link to the left (or right) resulting in closing 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 bail 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 nonrepeat lever. Thus, all of these elements are moved to the left into latched reset position.

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

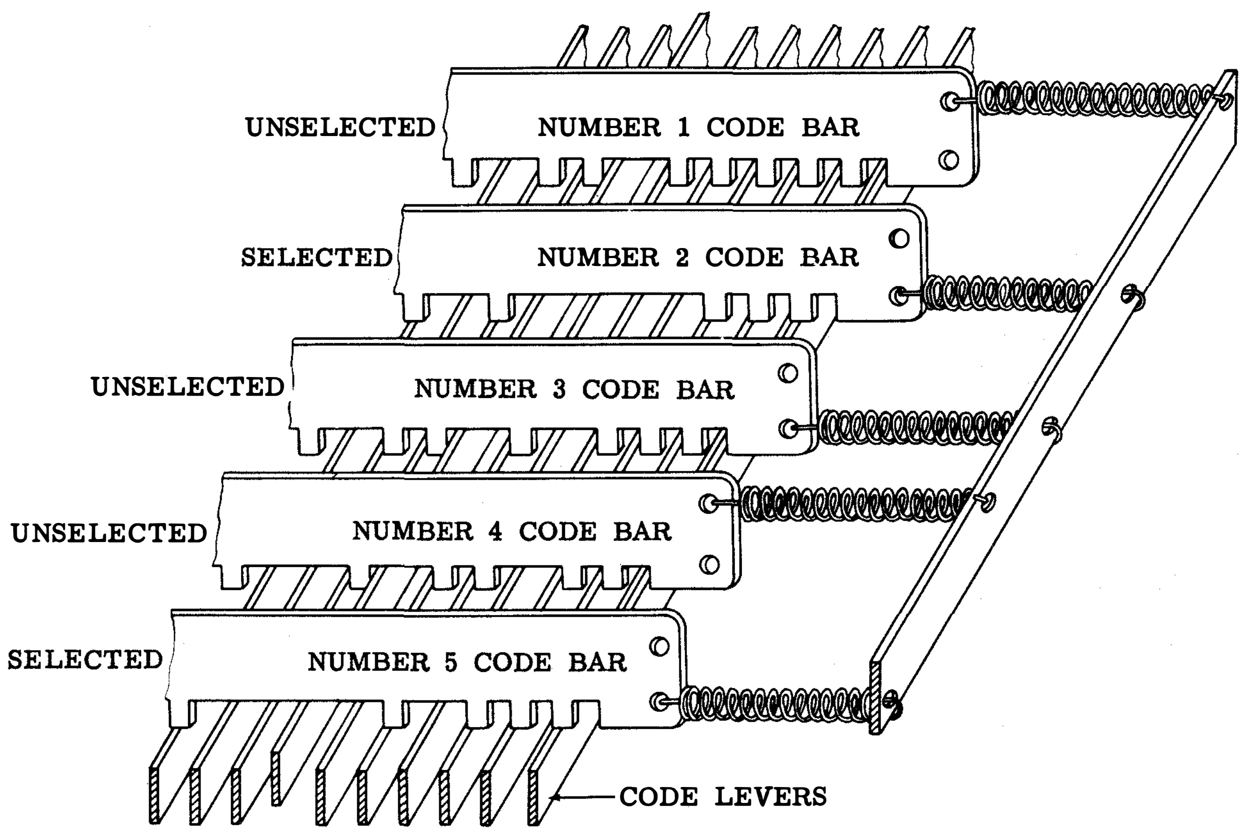


Figure 8 - Code Bar Selection

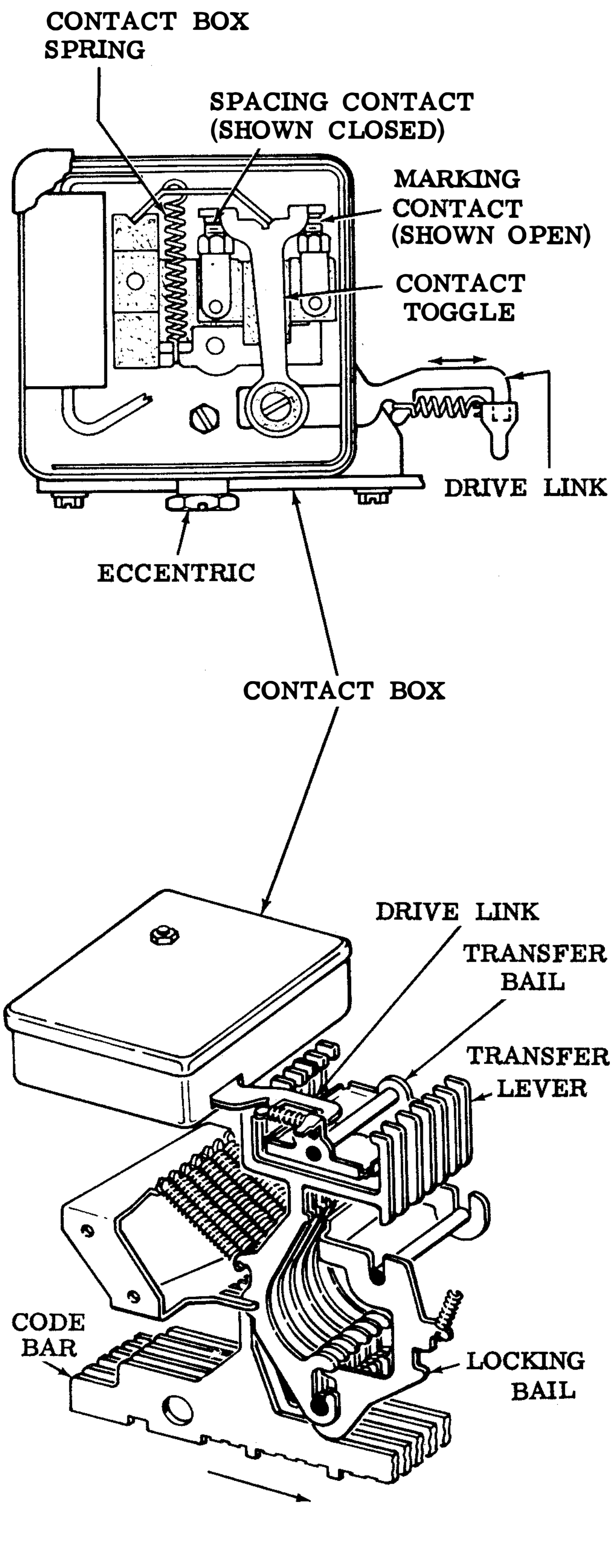


Figure 9 - Transfer Lever Mechanism and Contact Box Mechanism

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 bail (Figure 10). The bail 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 bail (Fig. 12). The bail 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 bail, lifting it upward. The upper area of the signal break bail 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 bail upward, closing the signal line circuit.

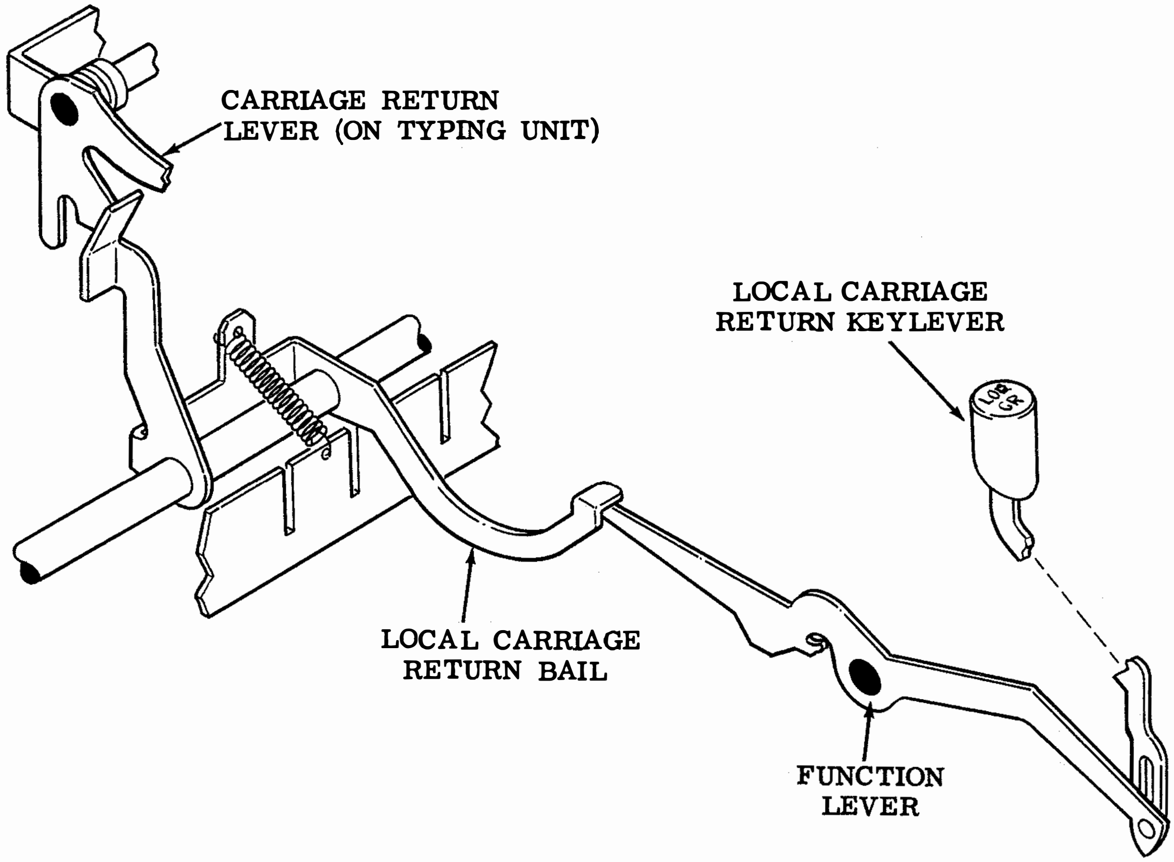


Figure 10 - Local Carriage Return Mechanism

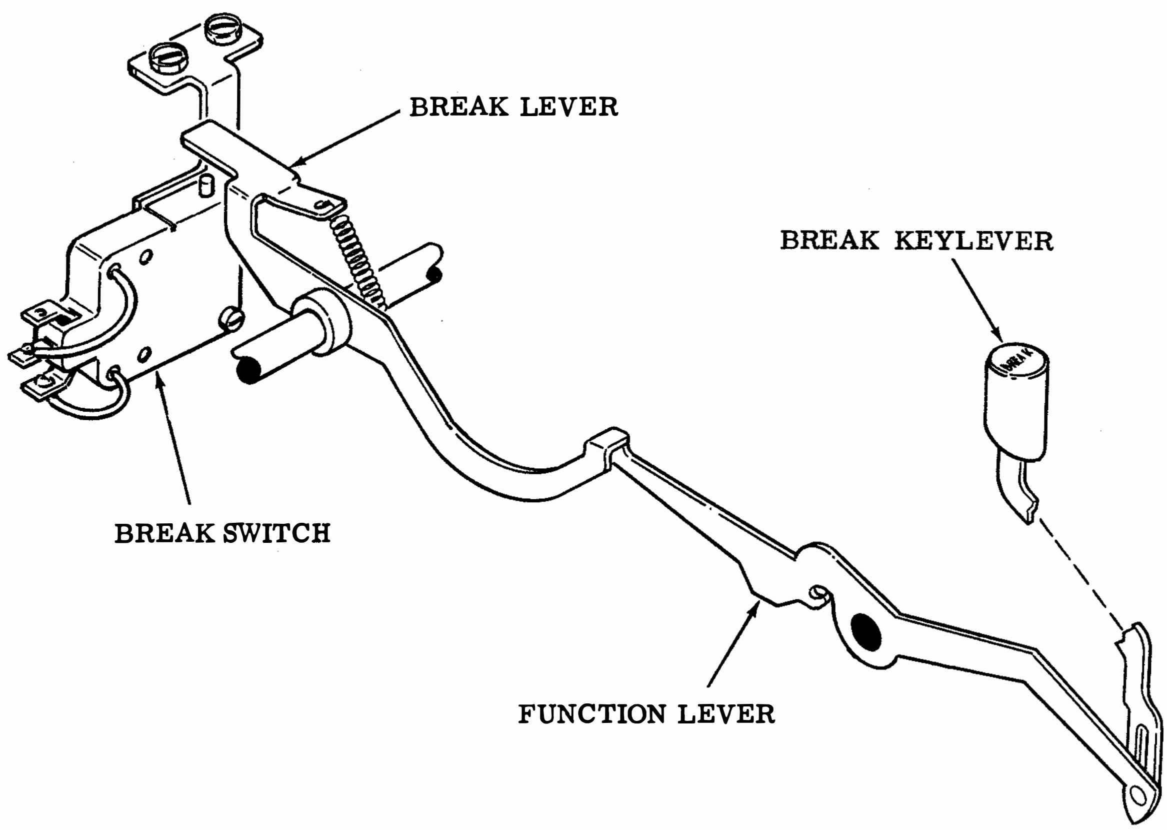


Figure 11 - Signal Line Break Mechanism

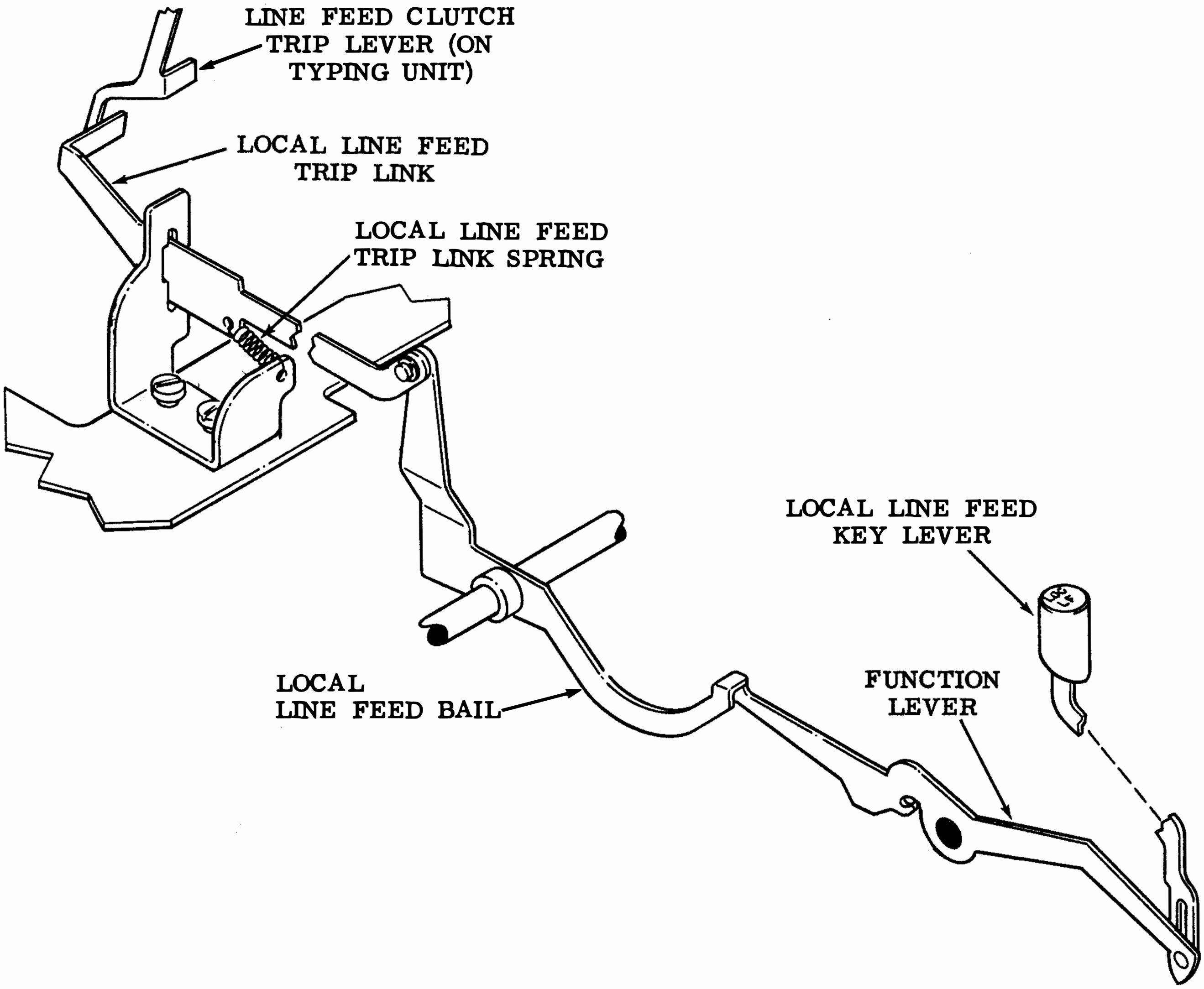


Figure 12 - Local Line Feed Mechanism

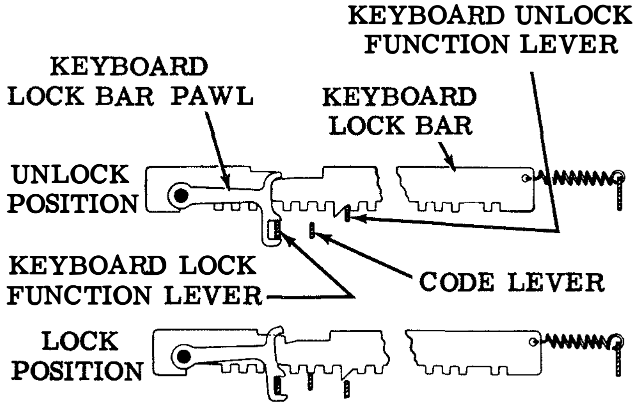


Figure 13 - Keyboard Lock Mechanism

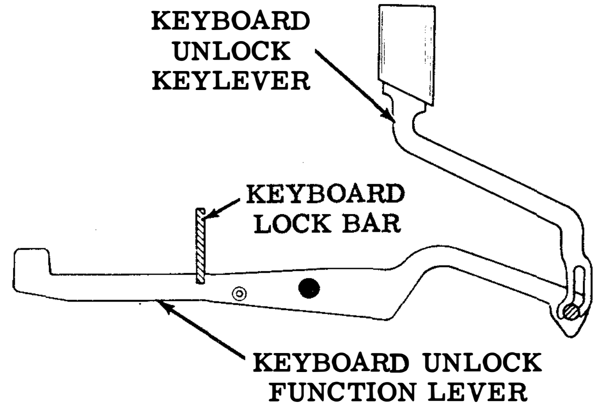


Figure 14 - Keyboard Unlock Mechanism

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 bail. The lock bail 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

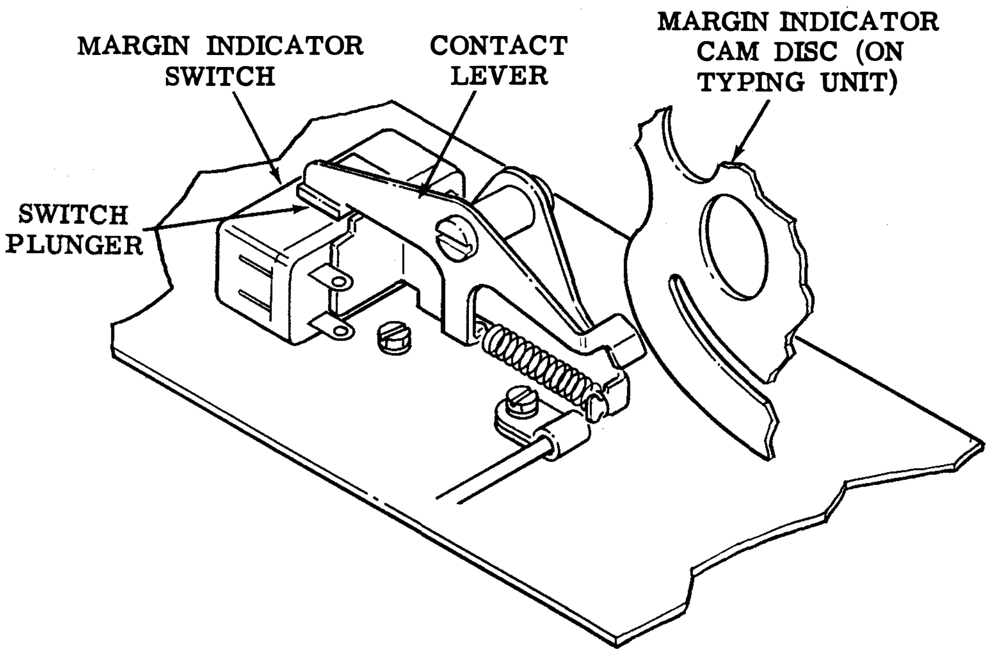


Figure 15 - Margin Indicator Mechanism

(local line feed) key is depressed. This operation may be performed independent of the position of the main power switch.

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 keylever).

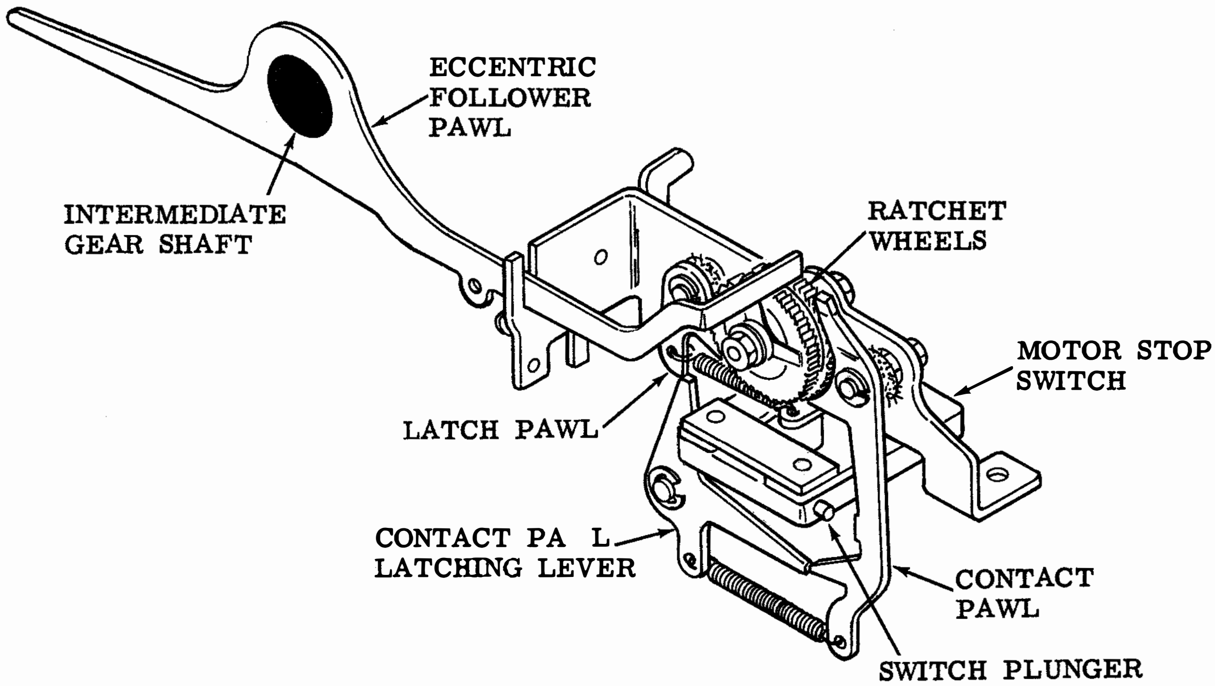


Figure 16 - Time Delay Mechanism

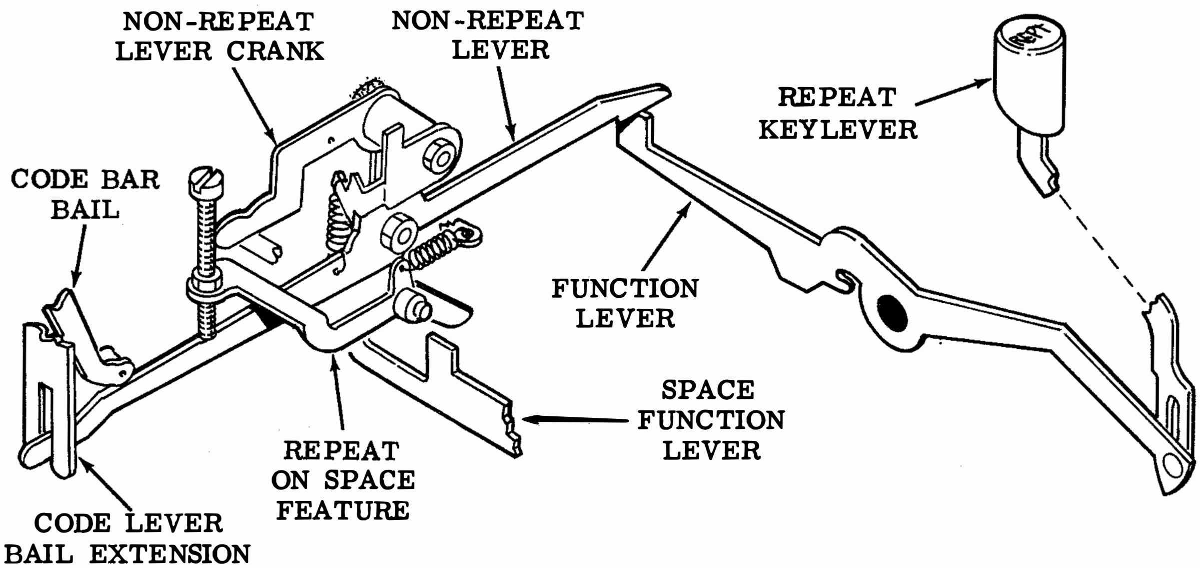


Figure 17 - Repeat Mechanism

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 back space 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.

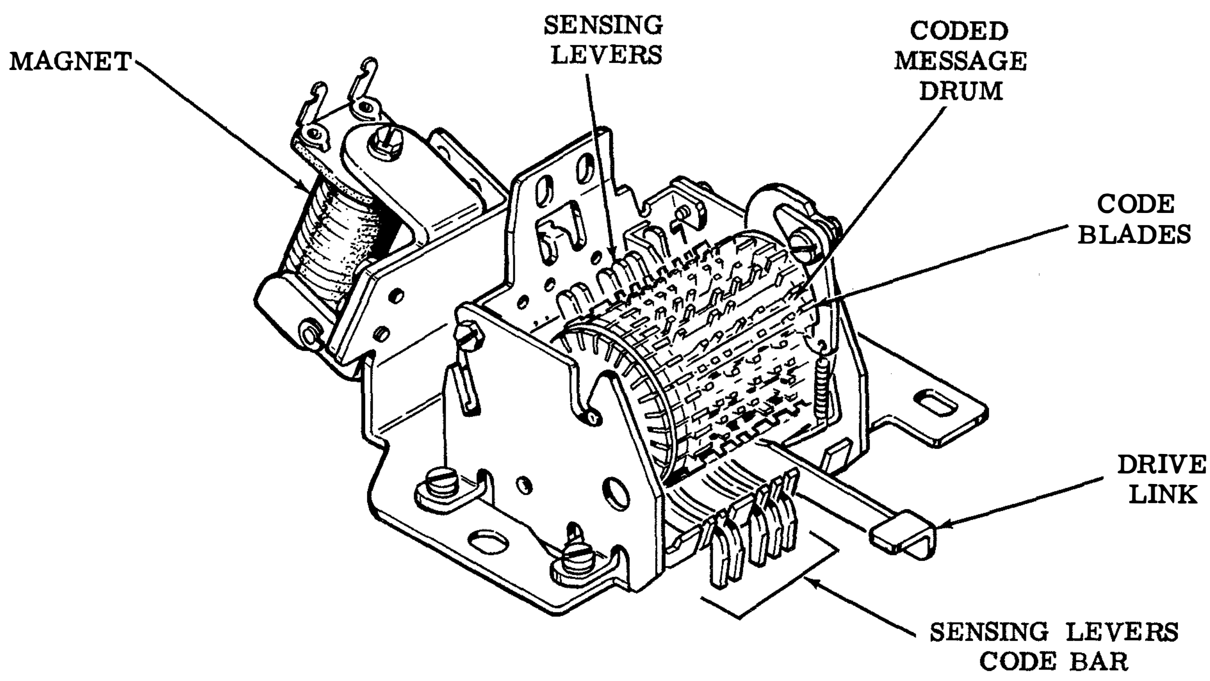


Figure 18 - Answer-Back Mechanism

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 LTRS 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 unblocking and releasing the stop lever. Under the bias of a spring attached to the code bar bail 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 bail latch operating lever rotates clockwise, striking the code bar bail latch. The latch rotates clockwise and releases the code bar bail. The code bar bail 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 bail is pulled to the left by a cam eccentric, causing it to rotate clockwise. The bail 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 bail latch operating lever also maintains the code bar bail 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

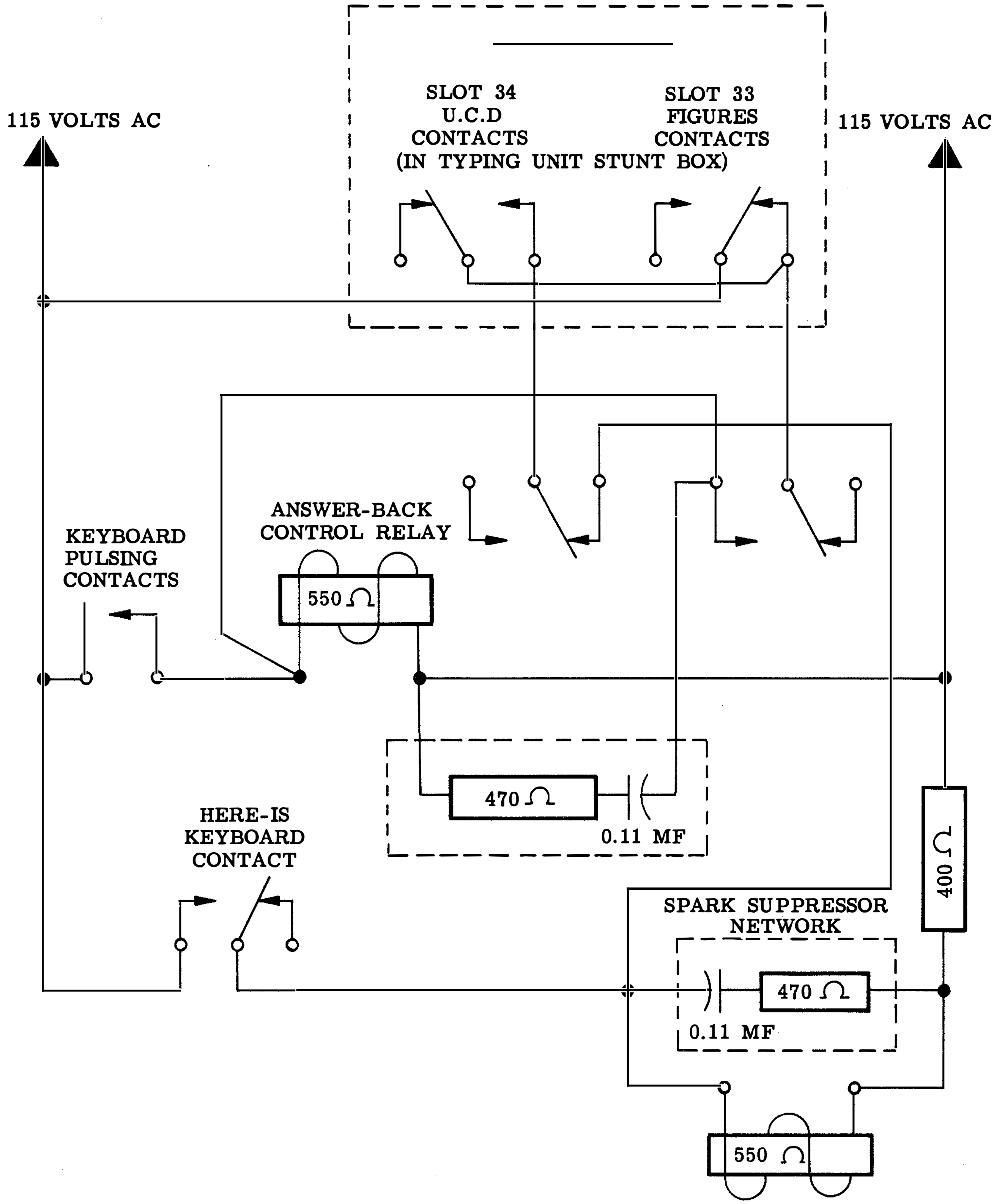


Figure 19 - Typical Answer-Back Circuit

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 bail latch operating lever counterclockwise, which in turn releases the code bar bail 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 bail 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 bail latch is released to its spring action, it rotates counterclockwise in contact with the code bar bail latch roller until it latches the code bar bail. At this point the blocking lever is also released to its spring action and it rotates counter-clockwise 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 bail. 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 answer-back 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 bail. 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

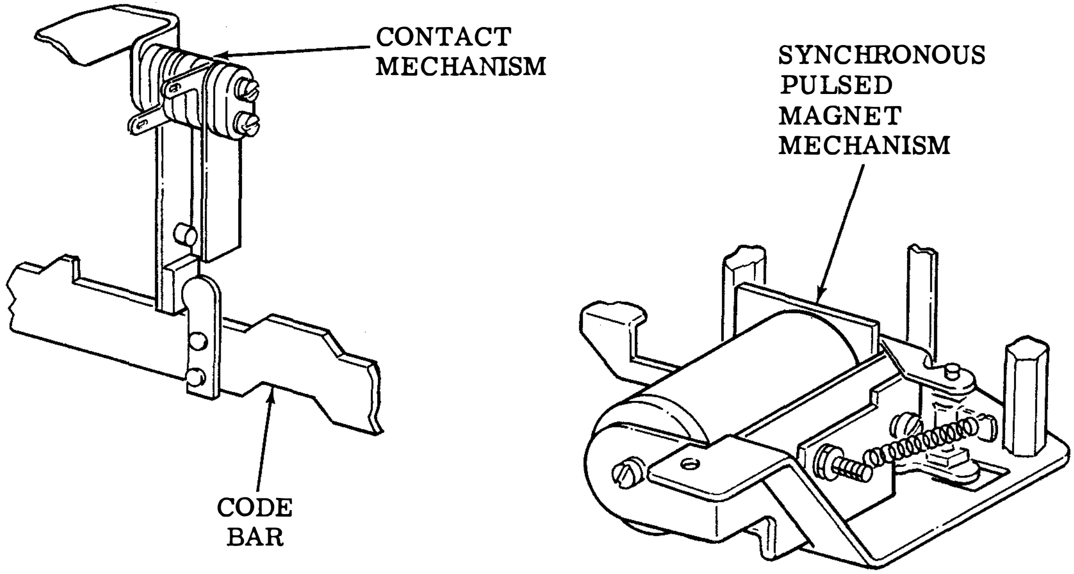


Figure 20 - Synchronous Pulsed Transmission Mechanism

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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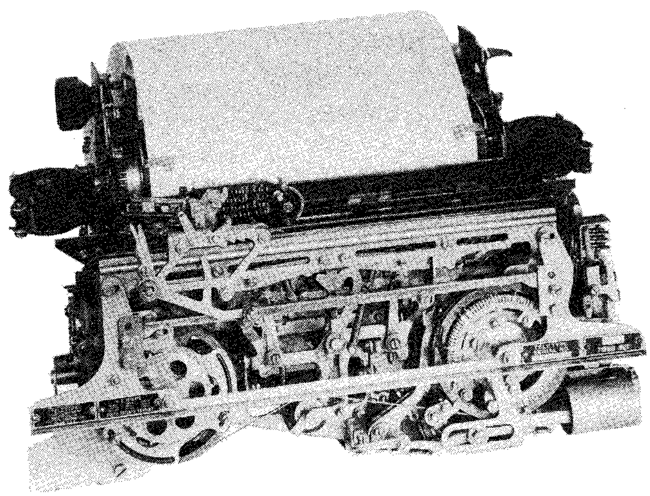

Figure 1 - 28 Typing Unit

CONTENTS PAGE

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 elipses 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

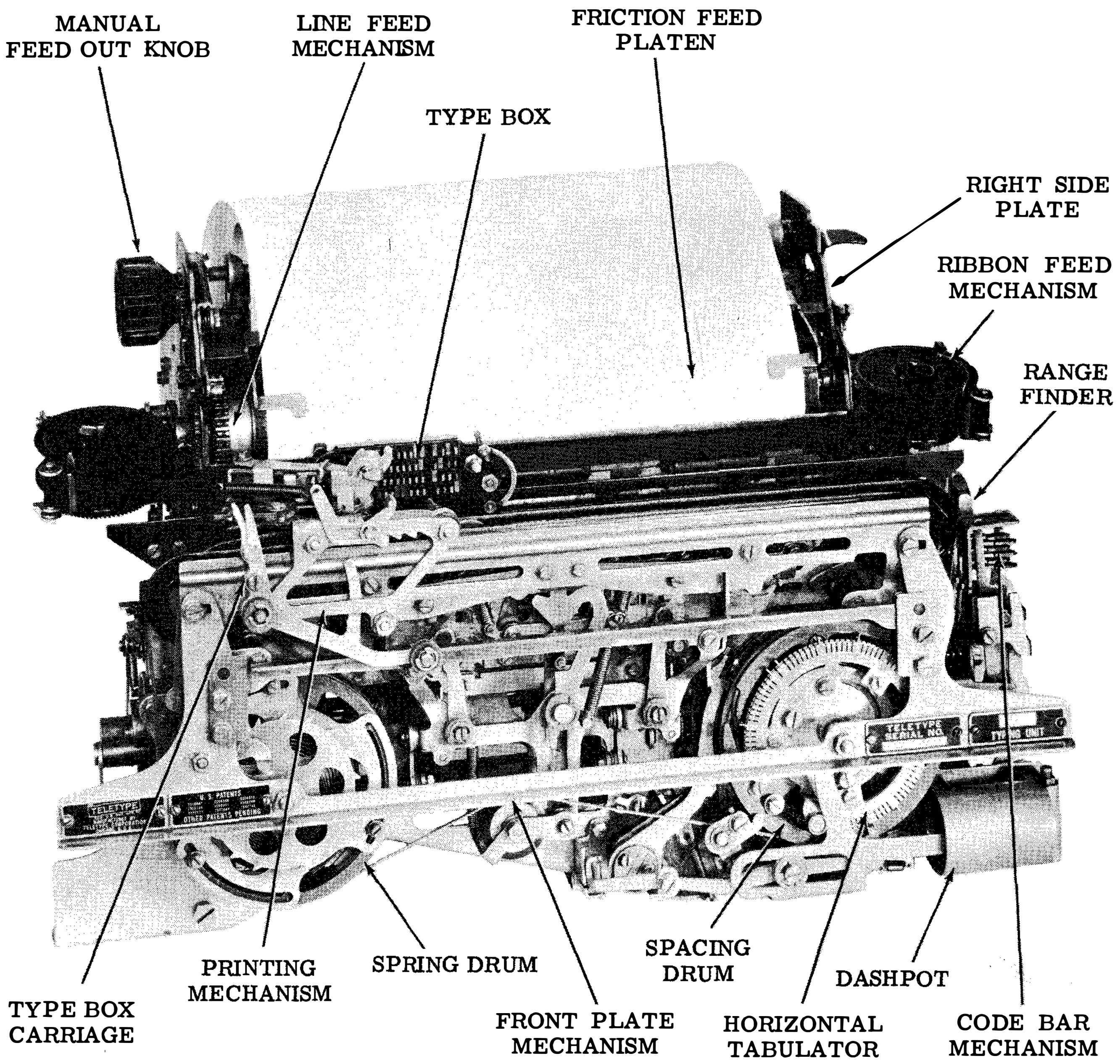

Figure 2 - 28 Typing Unit (Friction Feed) (Front View)

independently of the signal line from the local keyboard or base mechanism.

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 line feed, 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 driven gear, 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

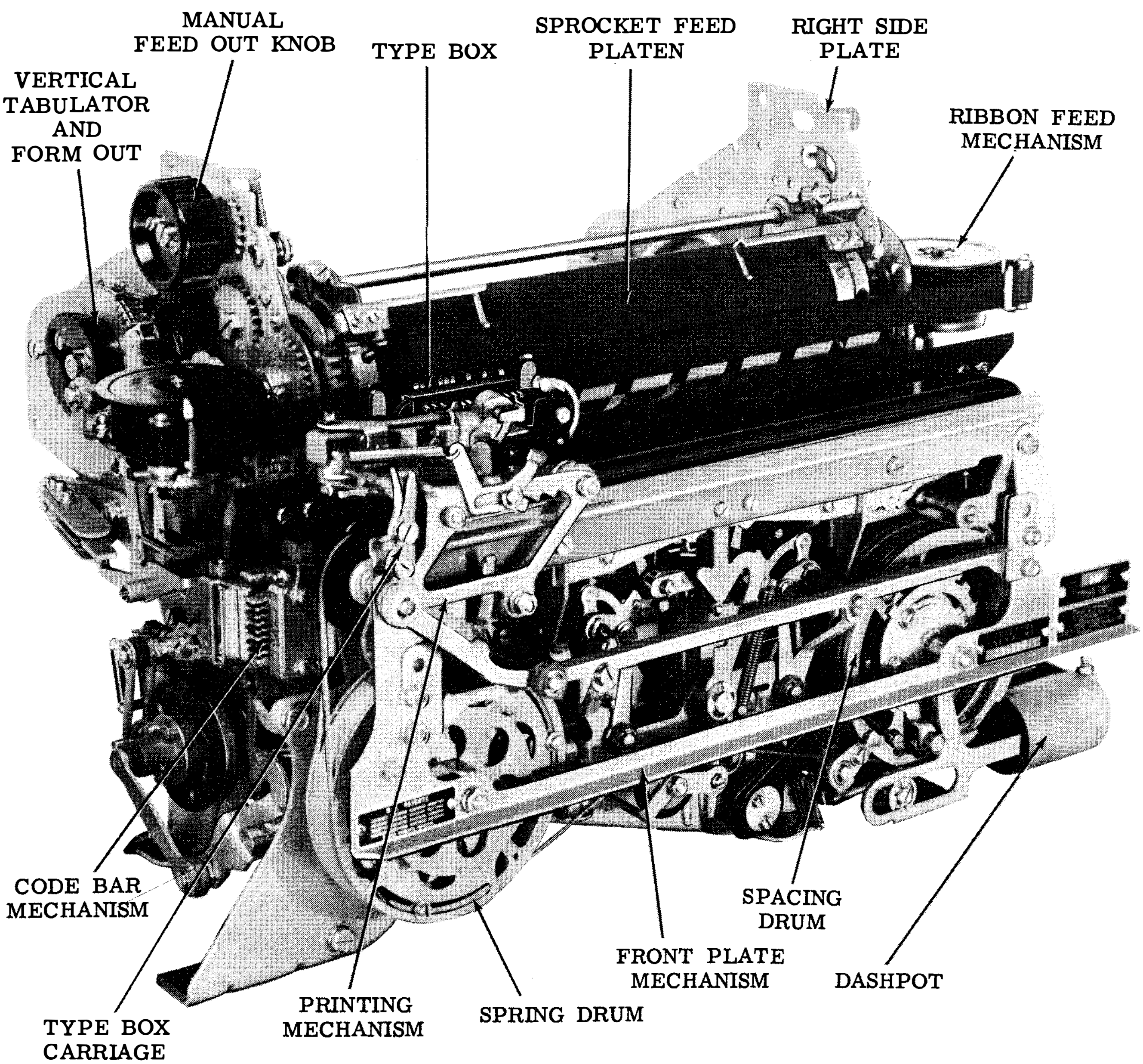

Figure 3 - 28 Typing Unit (Sprocket Feed) (Right Front View)

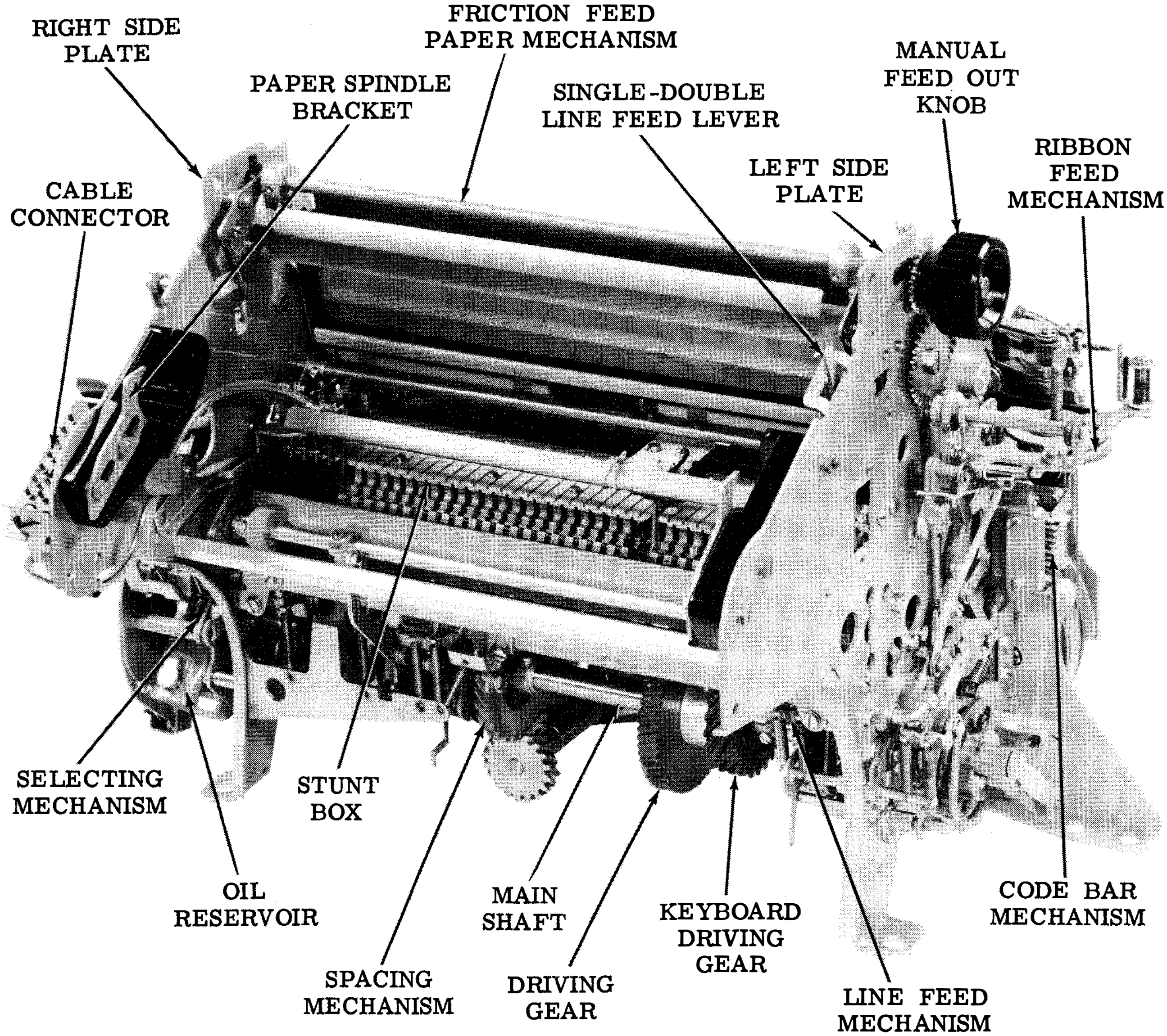

Figure 4 - 28 Typing Unit (Left Rear View)

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

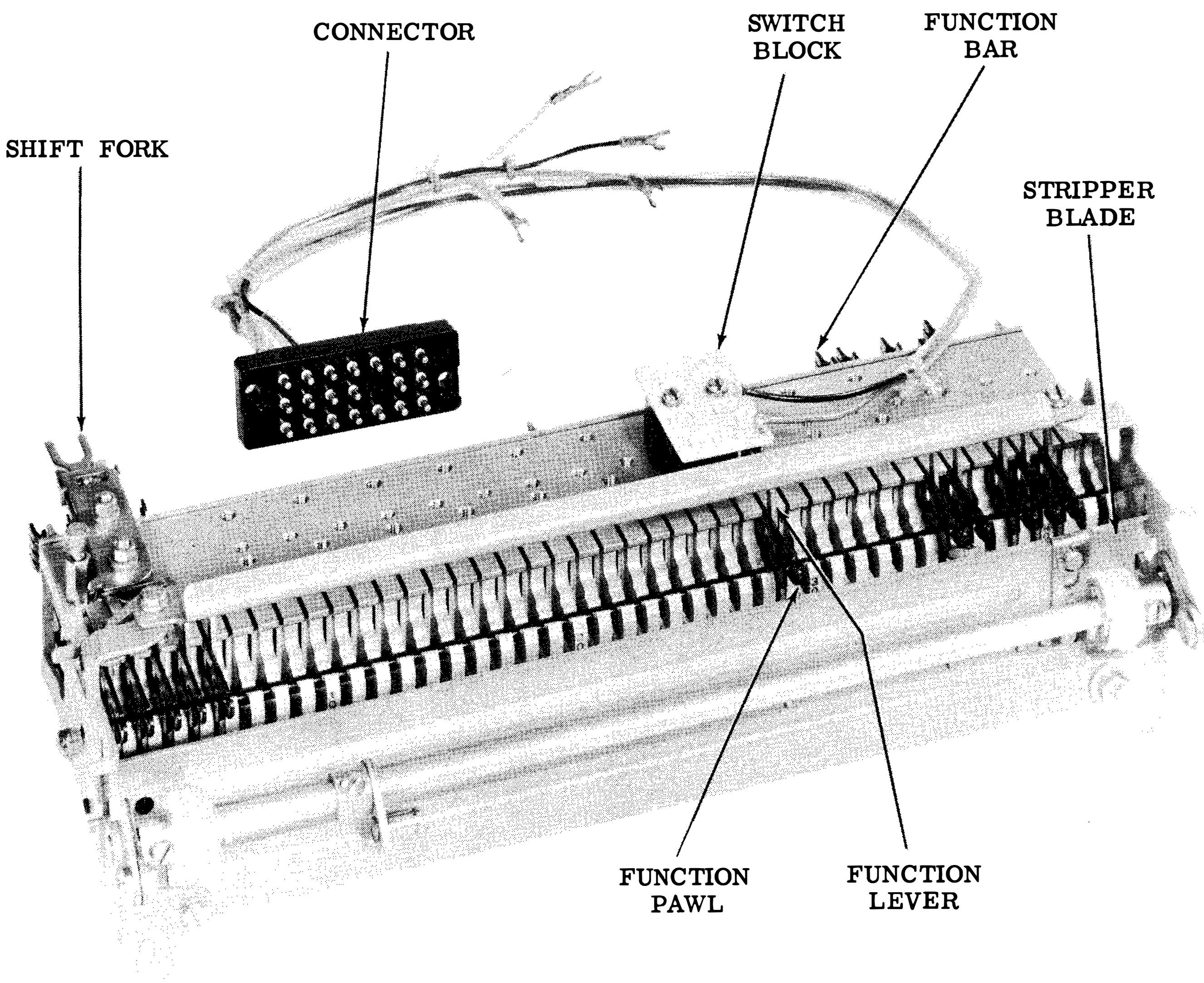

Figure 5 - Stunt Box (Rear View)

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 code bar 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, [illegible] without the sacrifice of
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RIBBON FEED MECHANISM

2.14 A ribbon feed mechanism passes an inked fabric ribbon between the type box and the paper. The mechanism advances the ribbon 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

Width	15-1/4 inches
Depth	10 inches
Height	9-3/4 inches
Weight	
Friction Feed	19 pounds
Sprocket Feed	22 pounds

SIGNAL REQUIREMENTS

Code	Sequential, 7.42 unit, Start-Stop
Current	
Selector coils in series	0.020 amperes
Selector coils in parallel	0.060 amperes

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).

vertical tabulator and form out generally require 115 vac circuitry. The circuits to stunt box switching contacts are determined by the specific nature of external controls operated by the contacts.

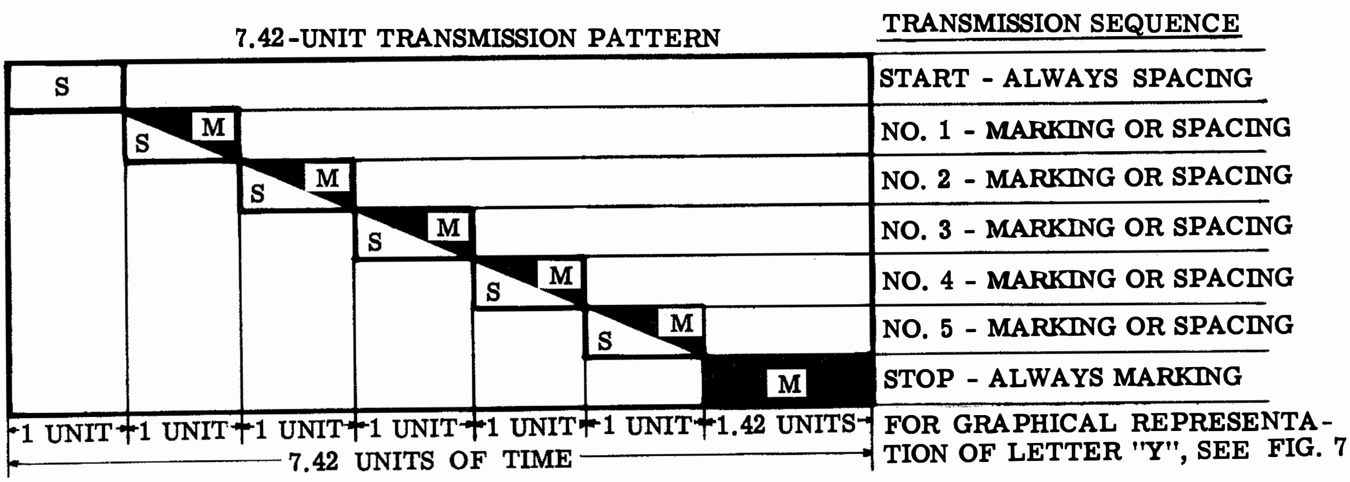
SIGNALING CODE (Fig. 6)

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.



a.

(TYPICAL CHARACTER ARRANGEMENT) b.

Figure 6 - Signaling Code

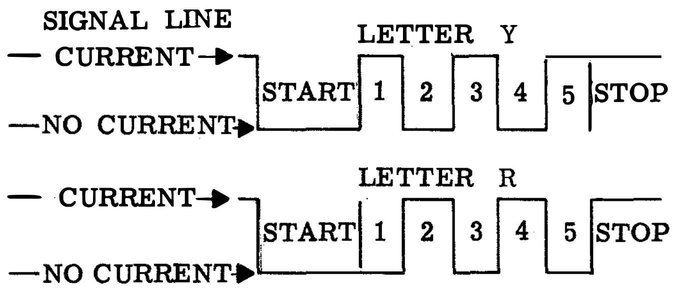


Figure 7 - Code Representation of R and Y

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 bail 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 bail, 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.

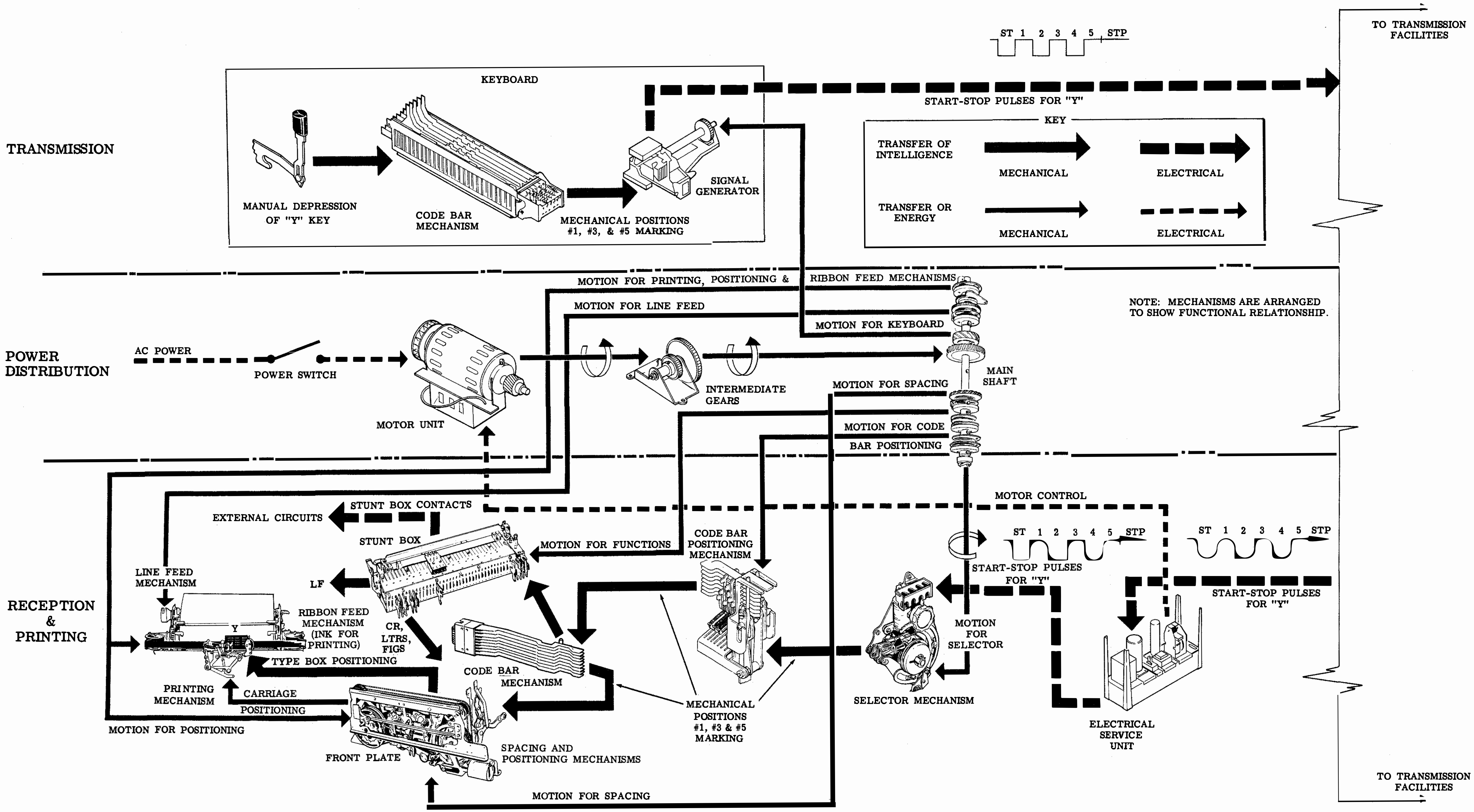


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Figure 8 - 28 Typing Unit, Schematic Diagram

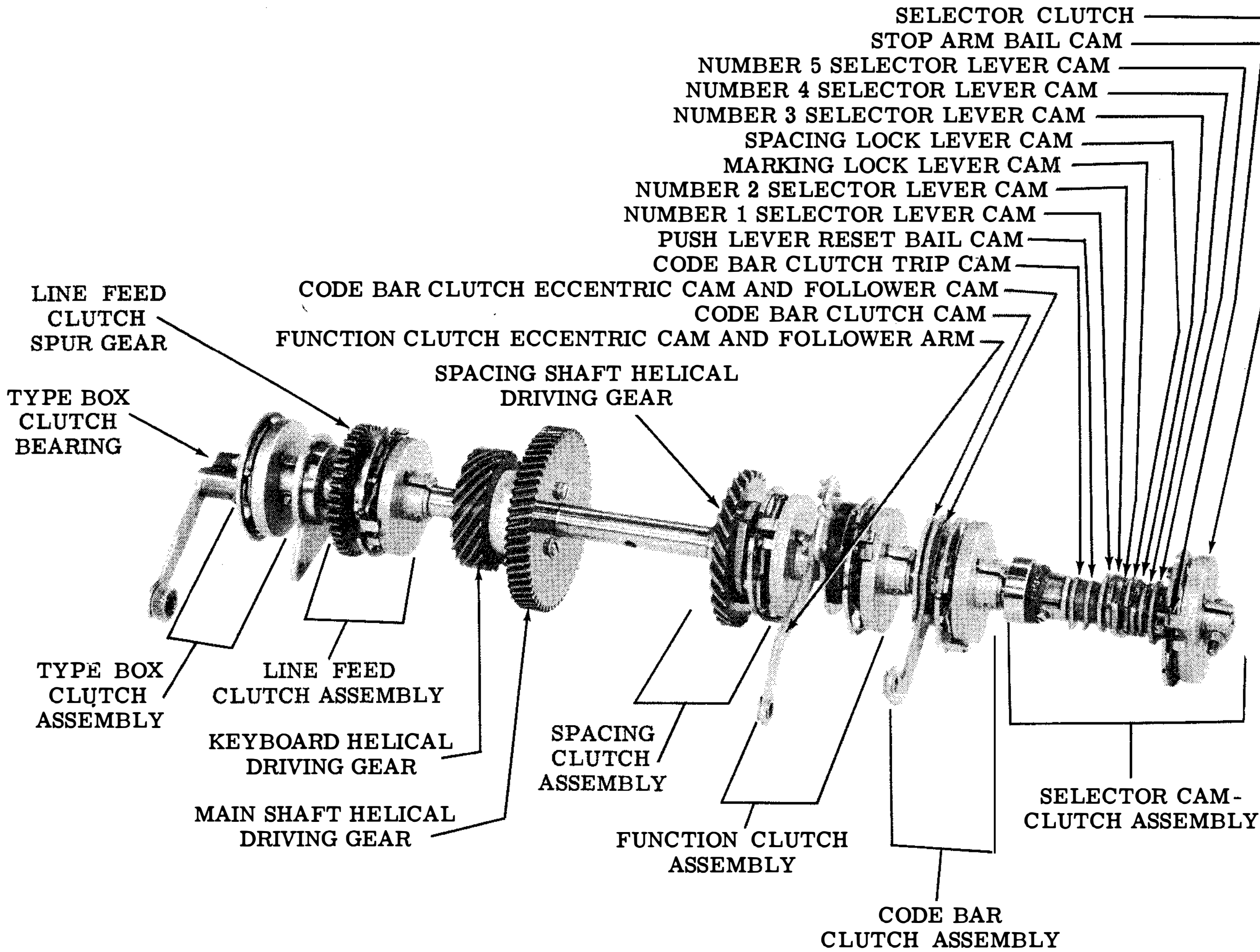


Figure 9 - Main Shaft

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.

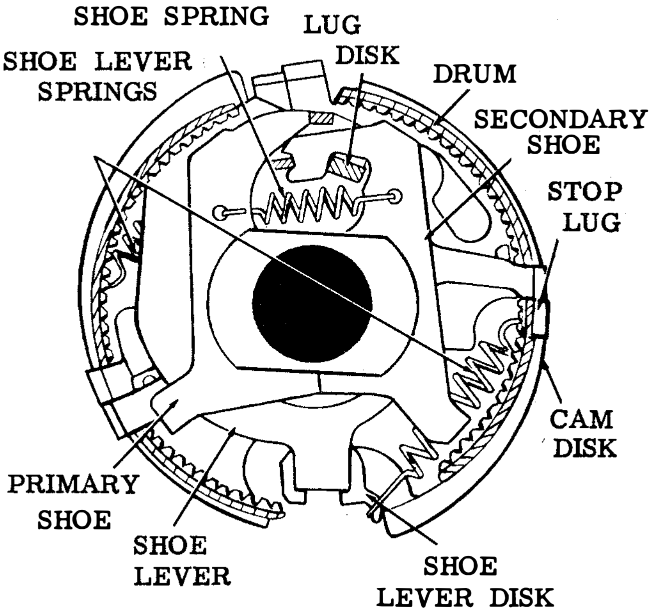


Figure 10 - Three Stop Clutch

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 stoparm 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.

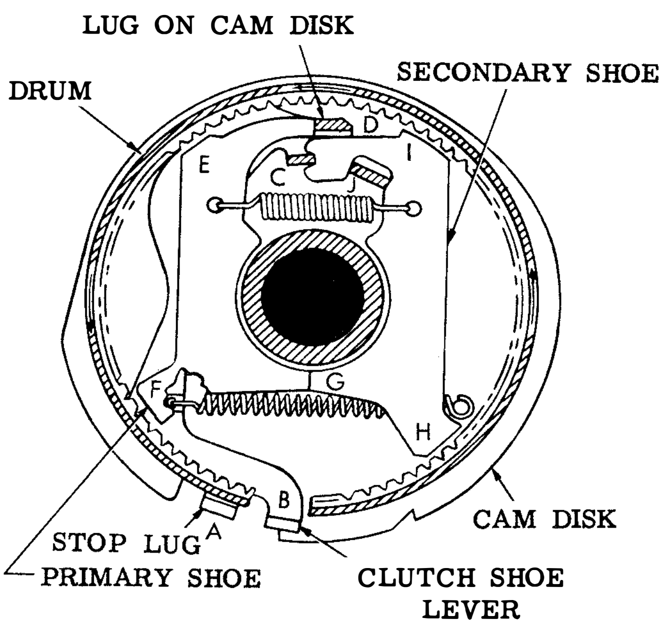


Figure 11 - One Stop Clutch (Disengaged)

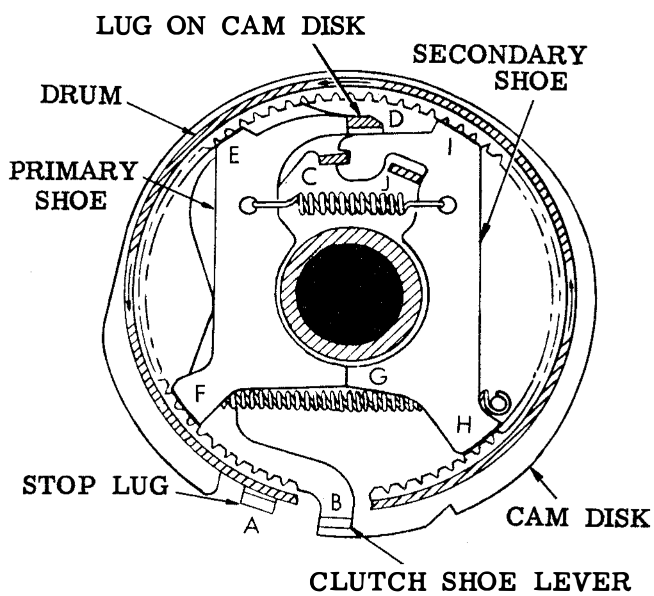


Figure 12 - One Stop Clutch (Engaged)

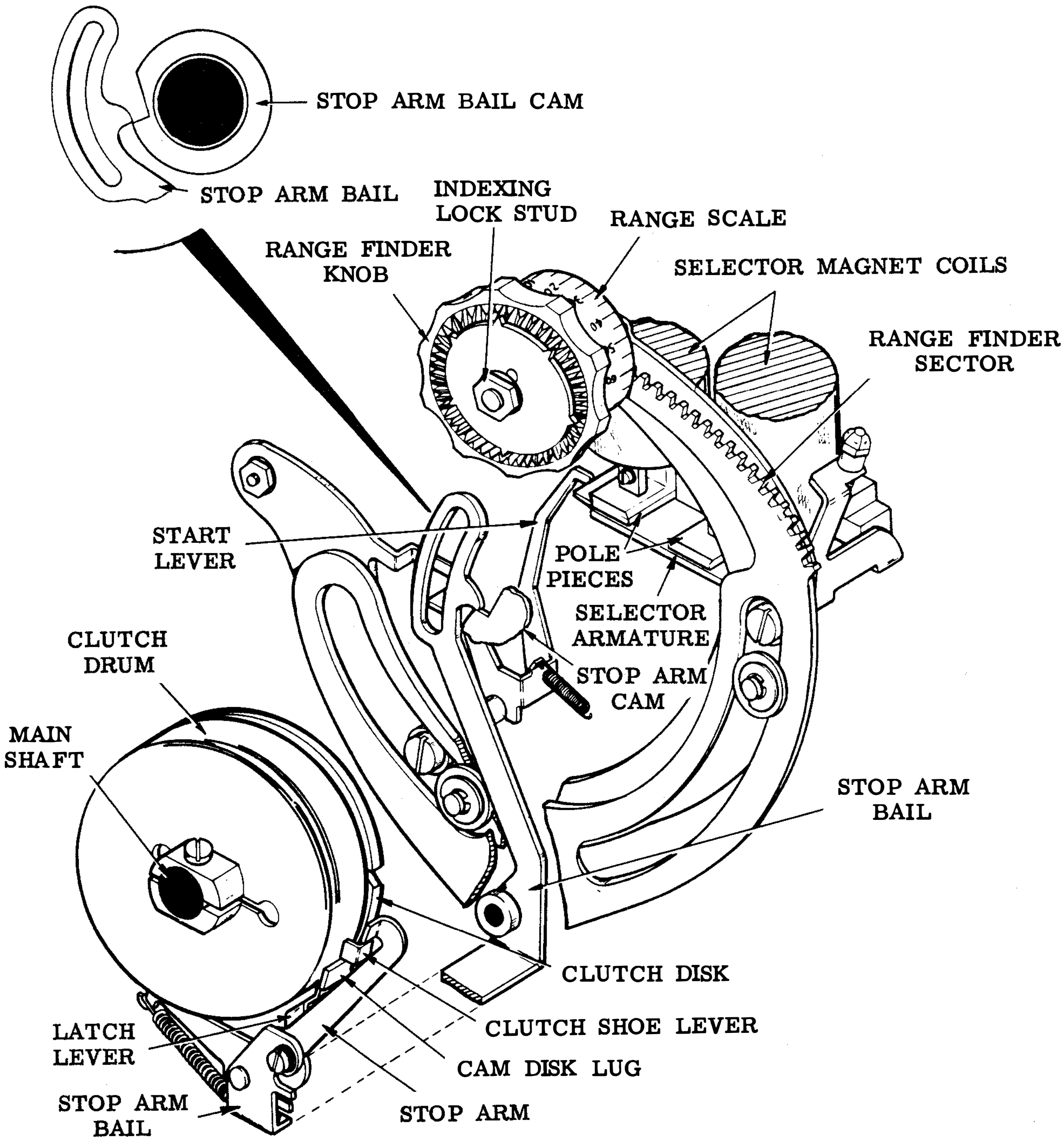


Figure 13 - Selector Clutch and Range Finder

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

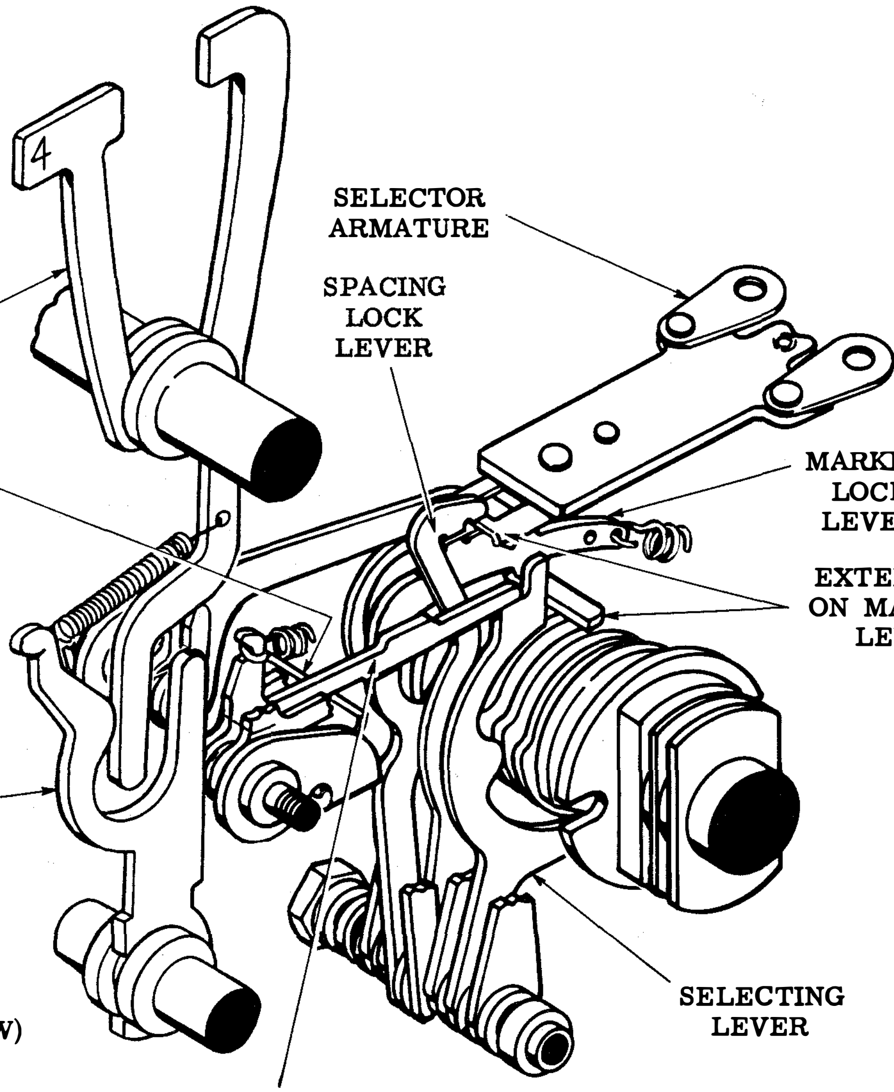


Figure 14 - Selecting Mechanism and Transfer Mechanism

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 range finder 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

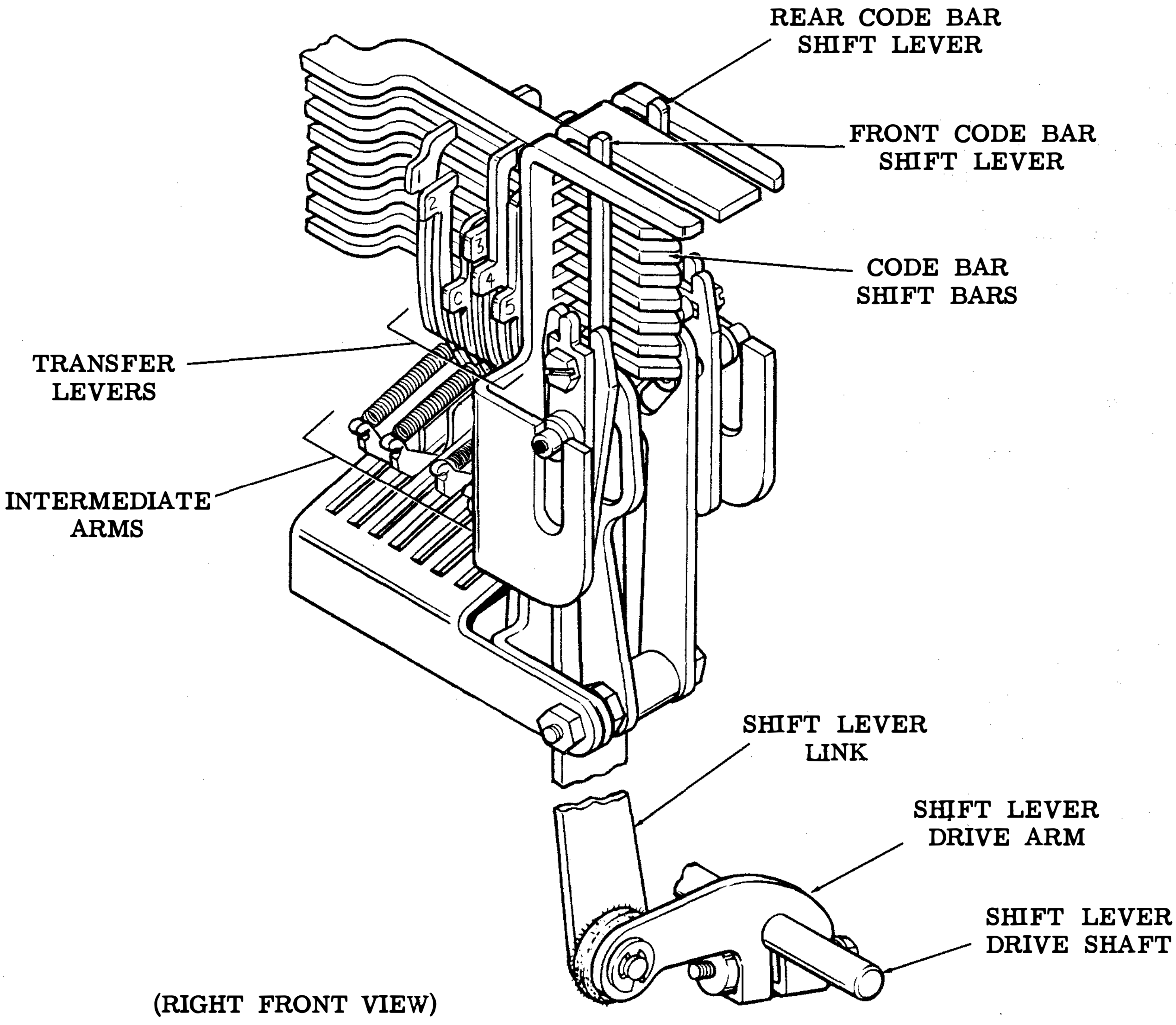


Figure 15 - Code Bar Mechanism

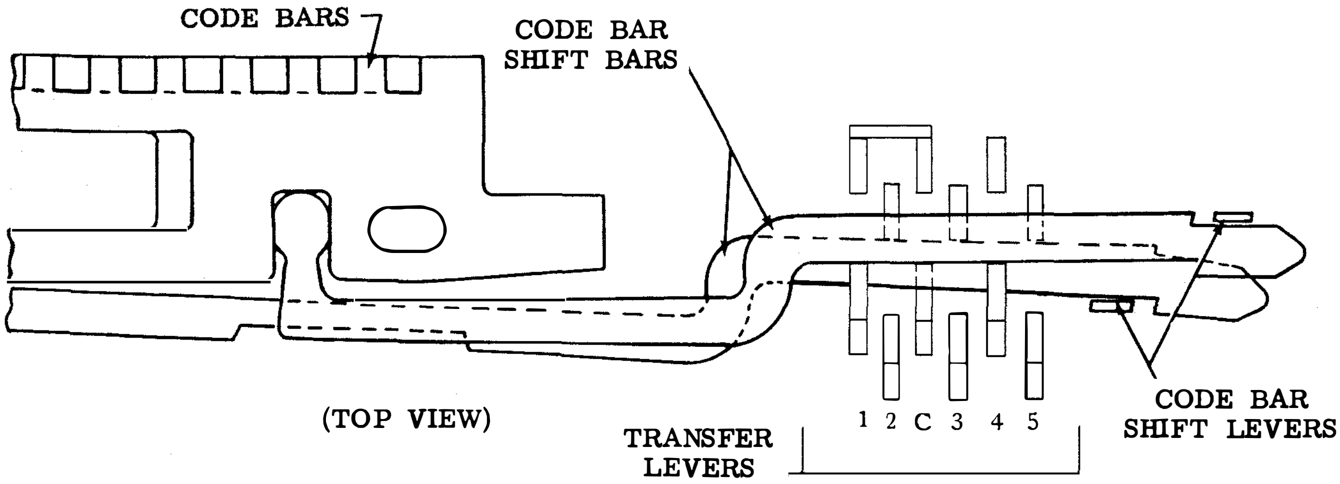


Figure 16 - Code Bar Shift Bar Positioning

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).

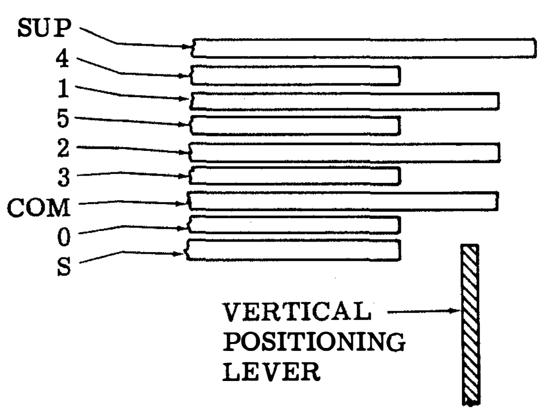


Figure 17 - Vertical Arrangement of Code Bars

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. Rotation 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 operating 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, completing the transfer of intelligence from the selecting 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 mechanically 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 character 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 vertically. 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 carriage 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 spacing drum. From this point, it passes part way around the spacing drum, upward and around

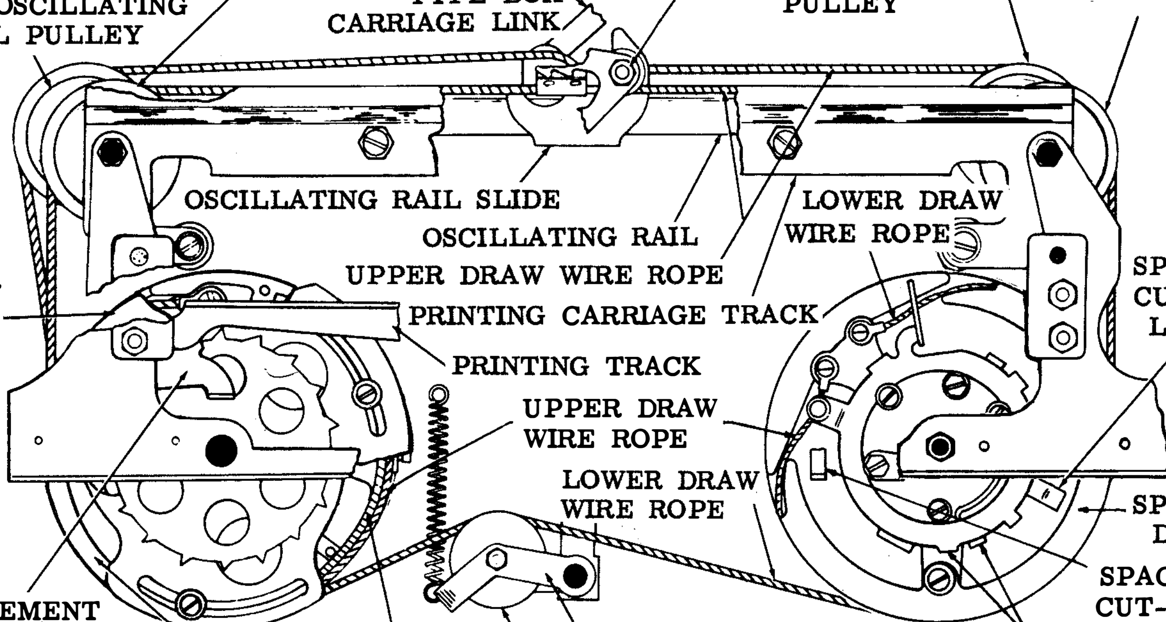


Figure 19 - Draw Wire Rope and Drums

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 bail 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.

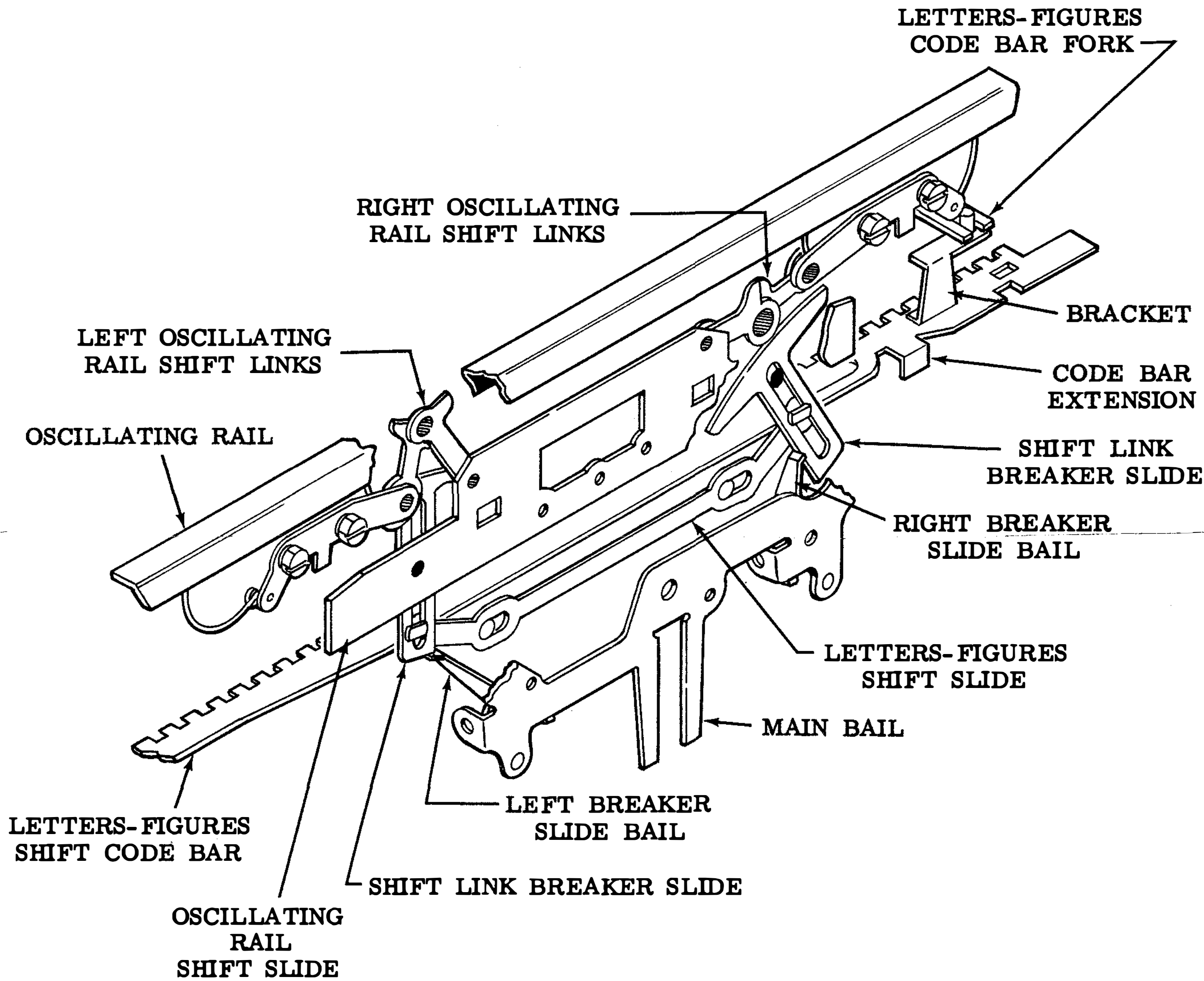


Figure 20 - Letters-Figures Shift Mechanism

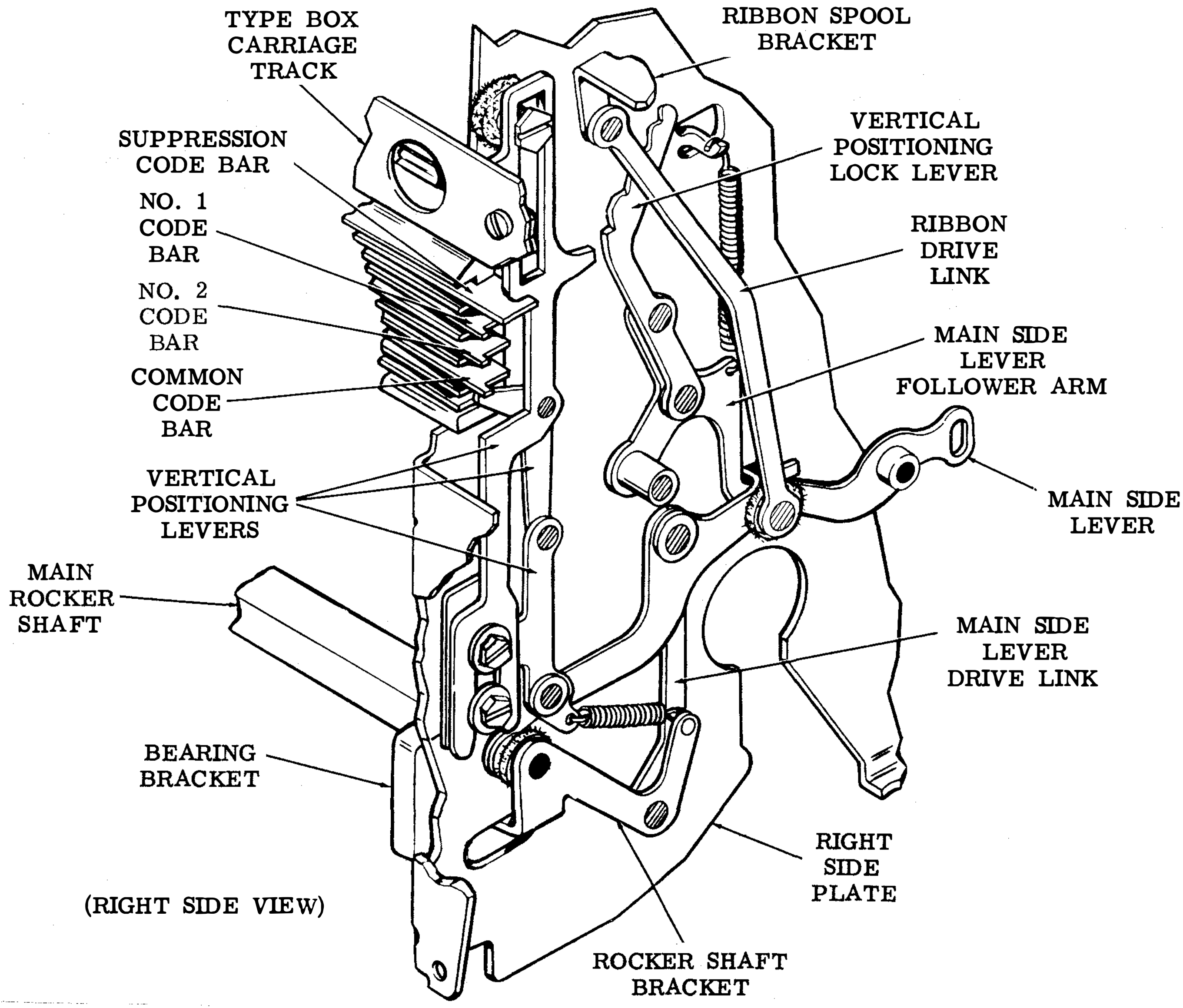


Figure 21 - Right Side Plate Mechanisms

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,

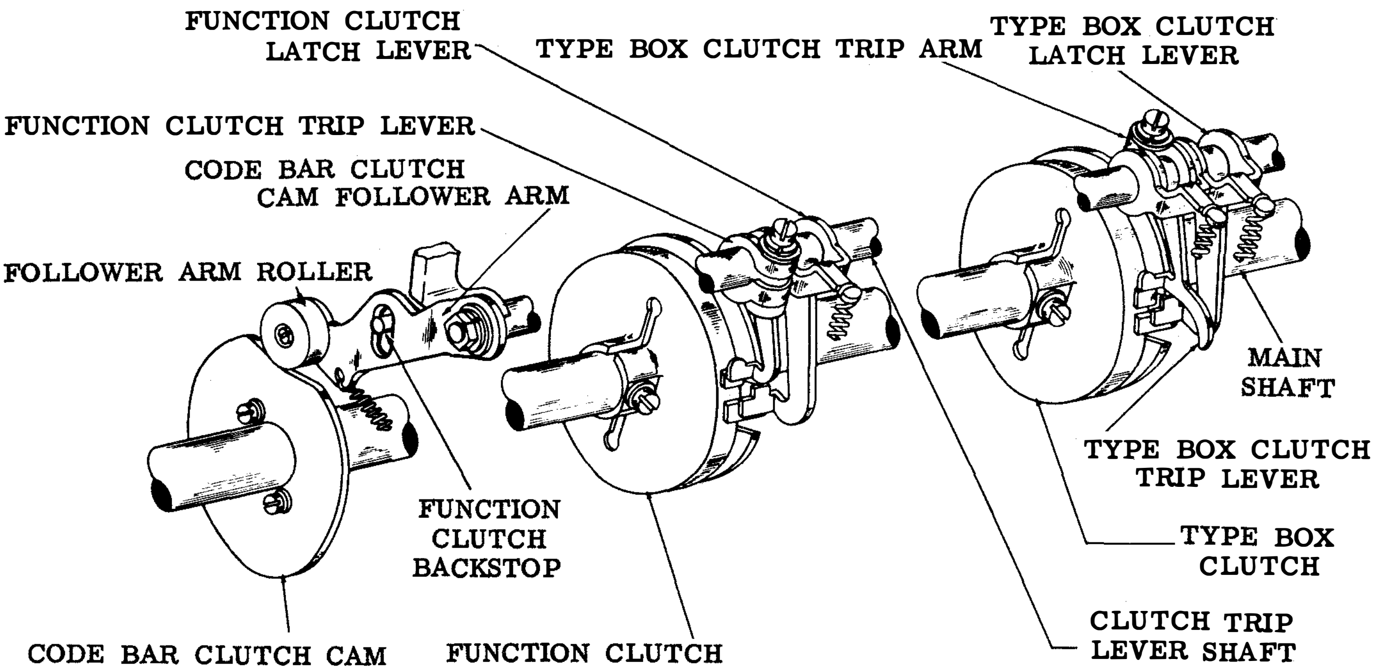


Figure 22 - Clutch Trip Mechanism

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 was 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 bail by means of two main bail links (Fig. 23). Attached to each end of the oscillating rail shift

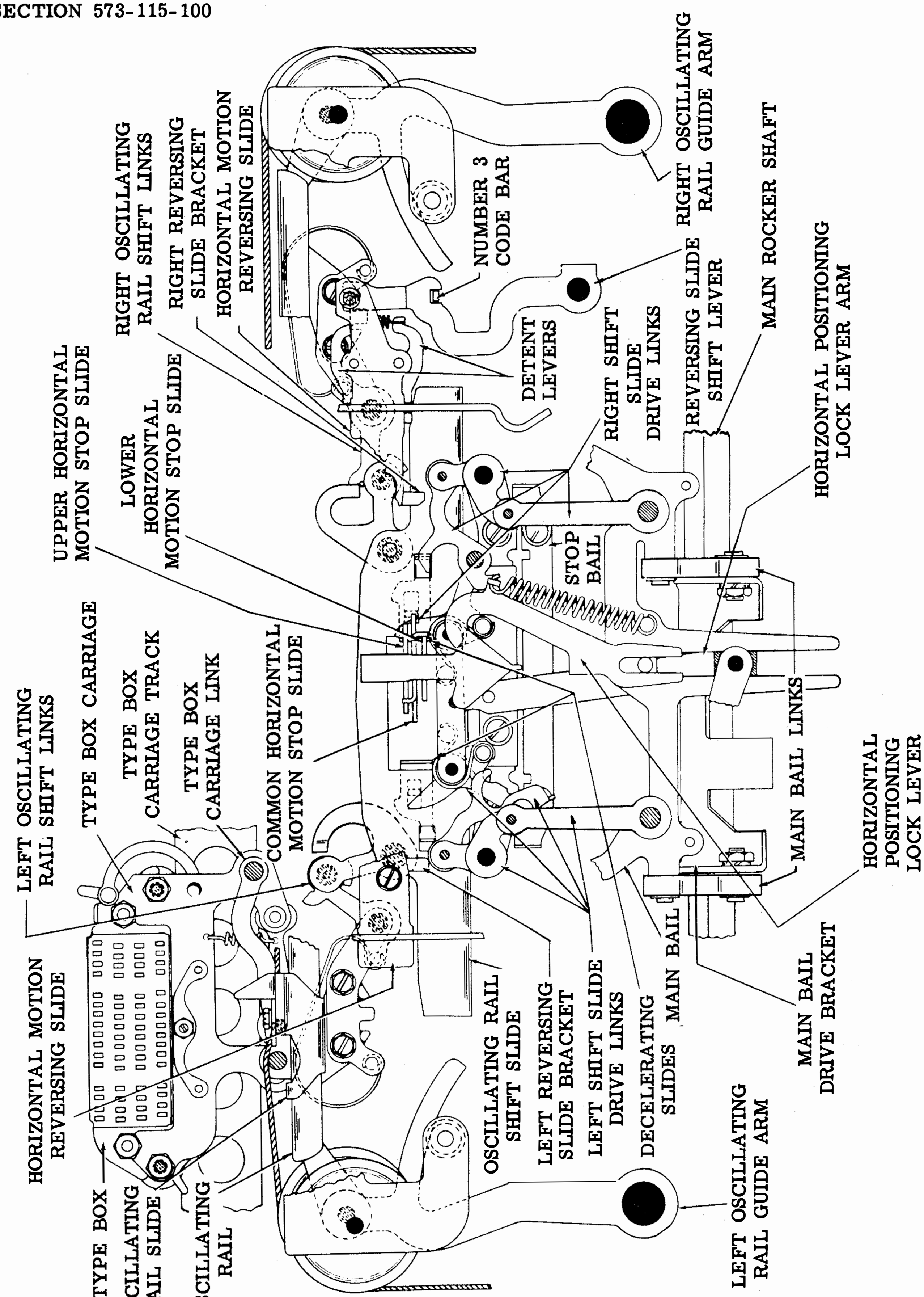


Figure 23 - Horizontal Positioning Mechanisms

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

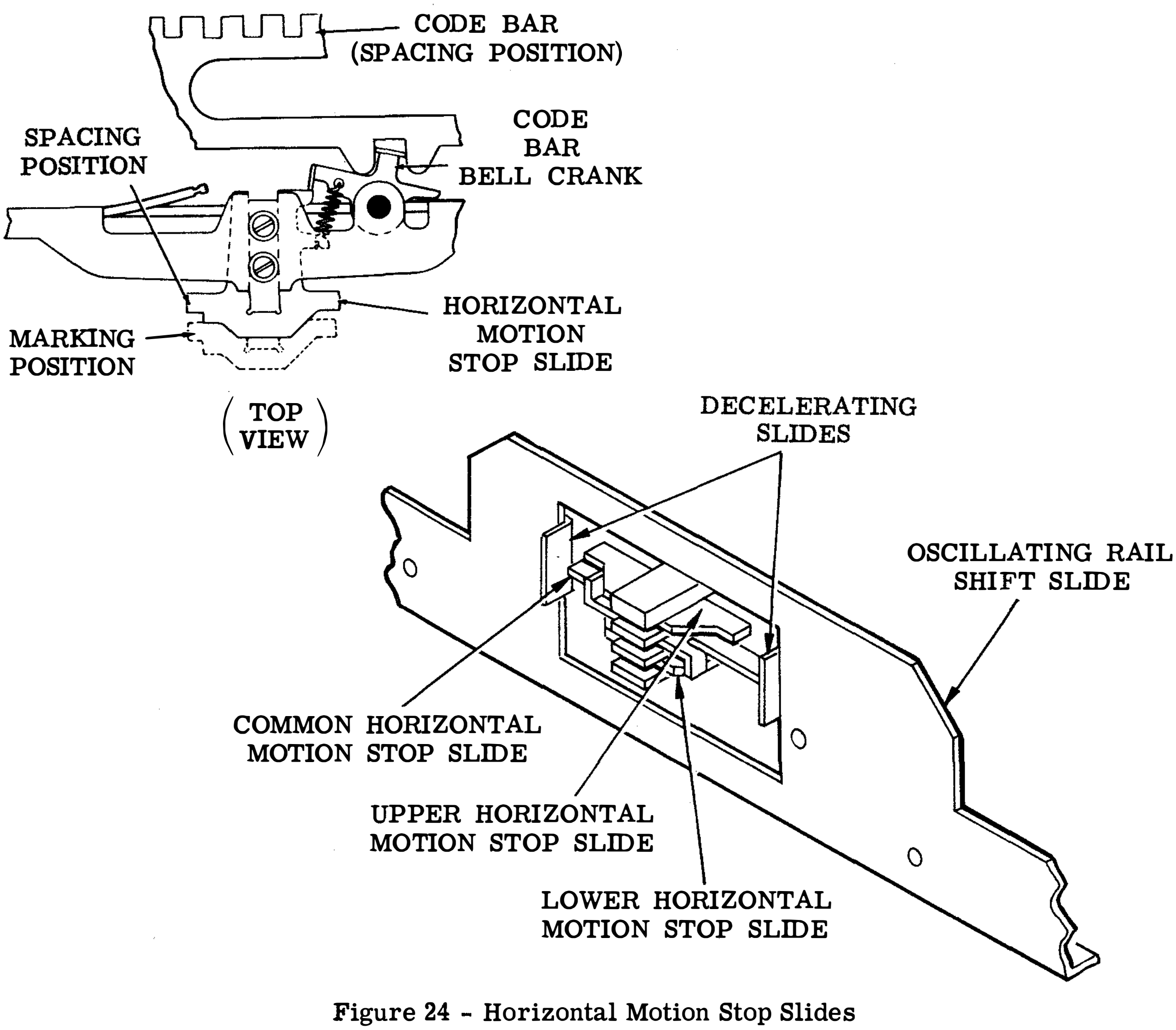


Figure 24 - Horizontal Motion Stop Slides

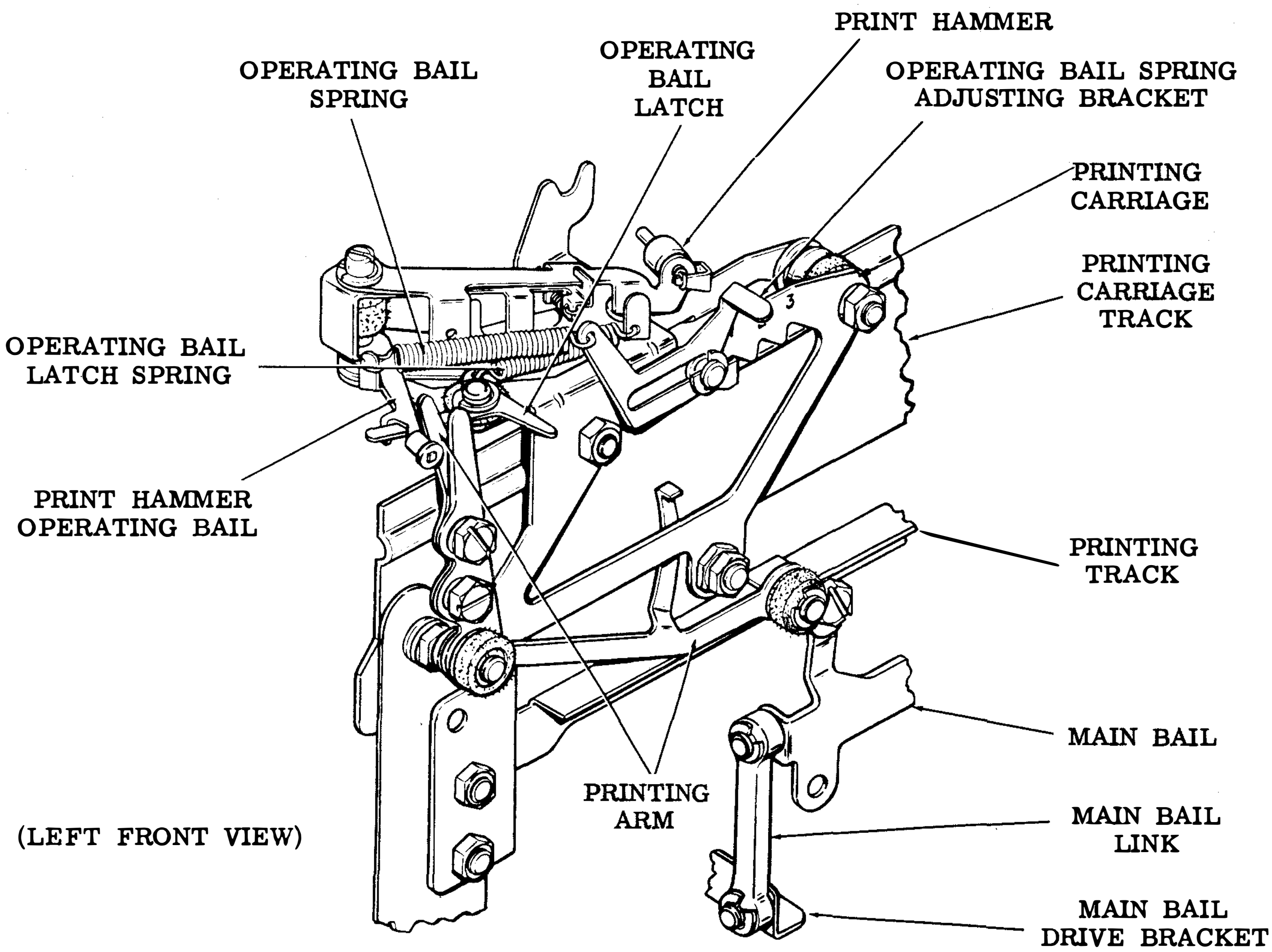


Figure 25 - Print Hammer and Carriage

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 bail clockwise against its spring tension until it becomes latched by the operating bail latch.

9.04 The print hammer operating bail draws the print hammer away from the type box by means of the print hammer bail 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 bail. The operating bail is swung in a counterclockwise direction by the operating bail spring until it strikes its stop. The print hammer bail, in being driven by the operating bail, is swung toward the type box. When the operating bail is stopped, momentum causes the print hammer bail to continue its travel against the tension of the print hammer bail 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

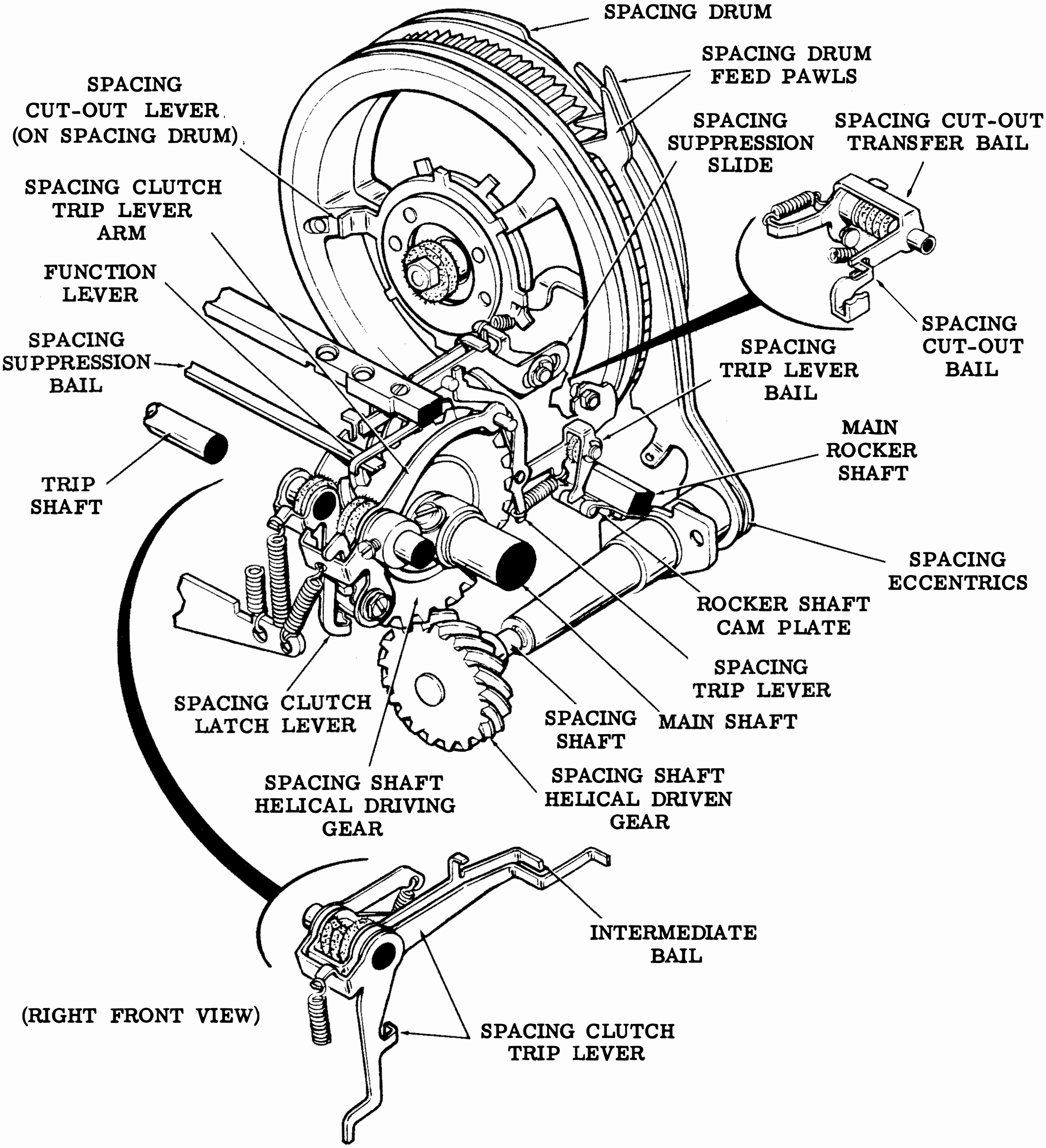


Figure 26 - Spacing Mechanism

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 bail. As this bail 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 bail 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 bail. 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.

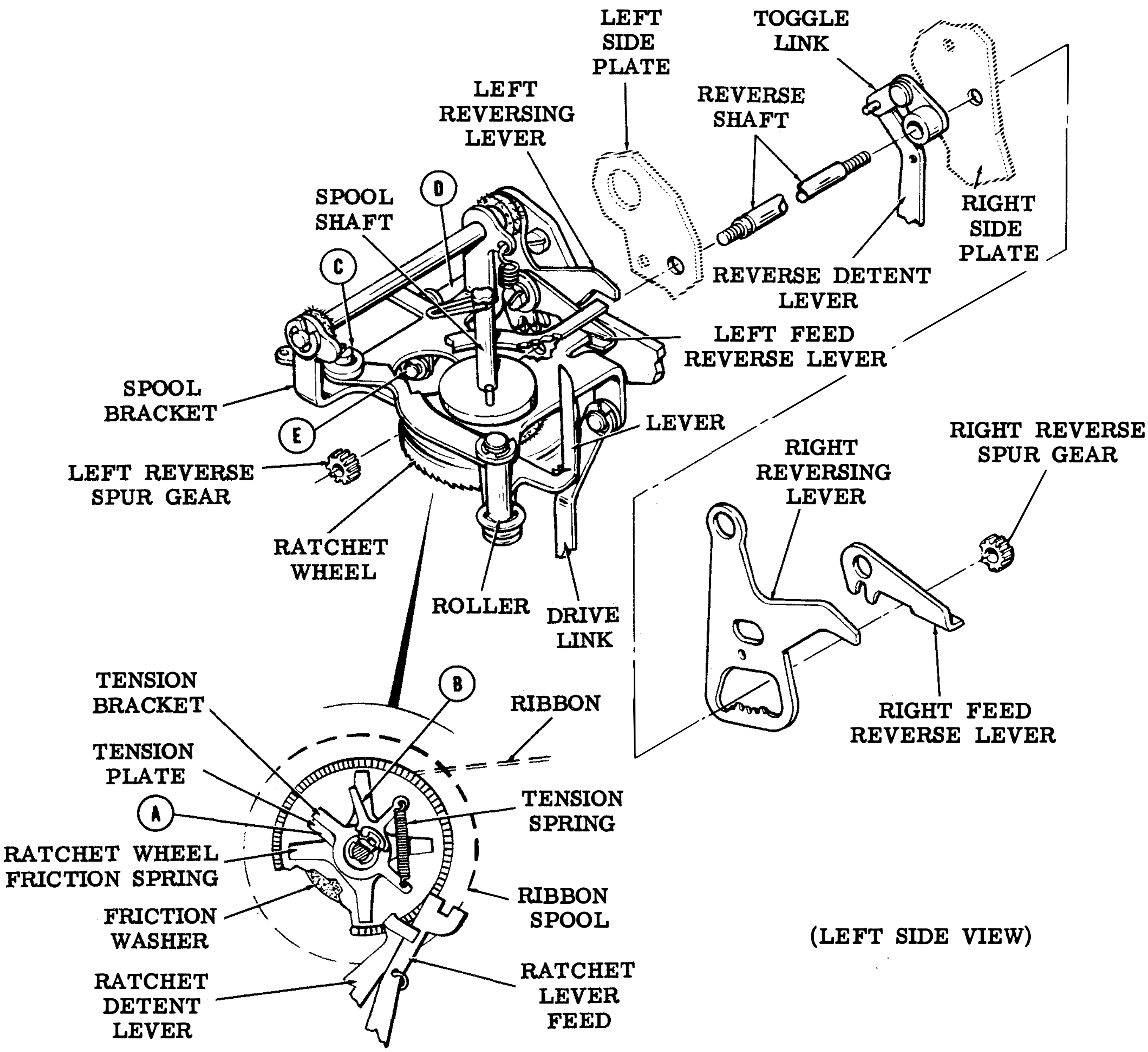


Figure 27 - Ribbon Feeding Mechanism

11.02 Each of the ribbon mechanisms consist 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 point C. The ratchet feed and ratchet detent levers pivot 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

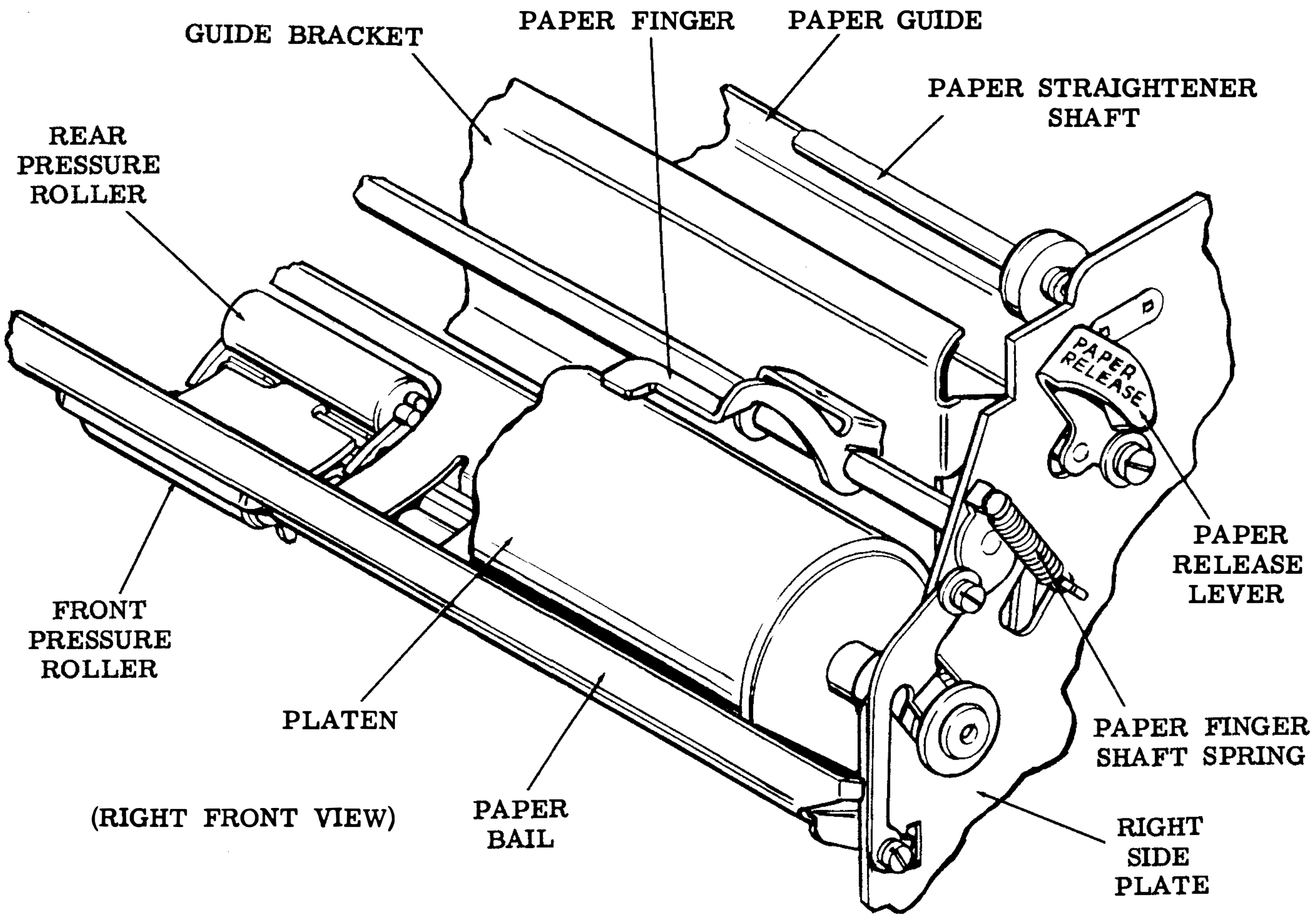


Figure 28 - Friction Feed Platen Mechanism

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 bail (through the intervening cam and follower arm and function rocker shaft) to cause the function bar reset bail 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

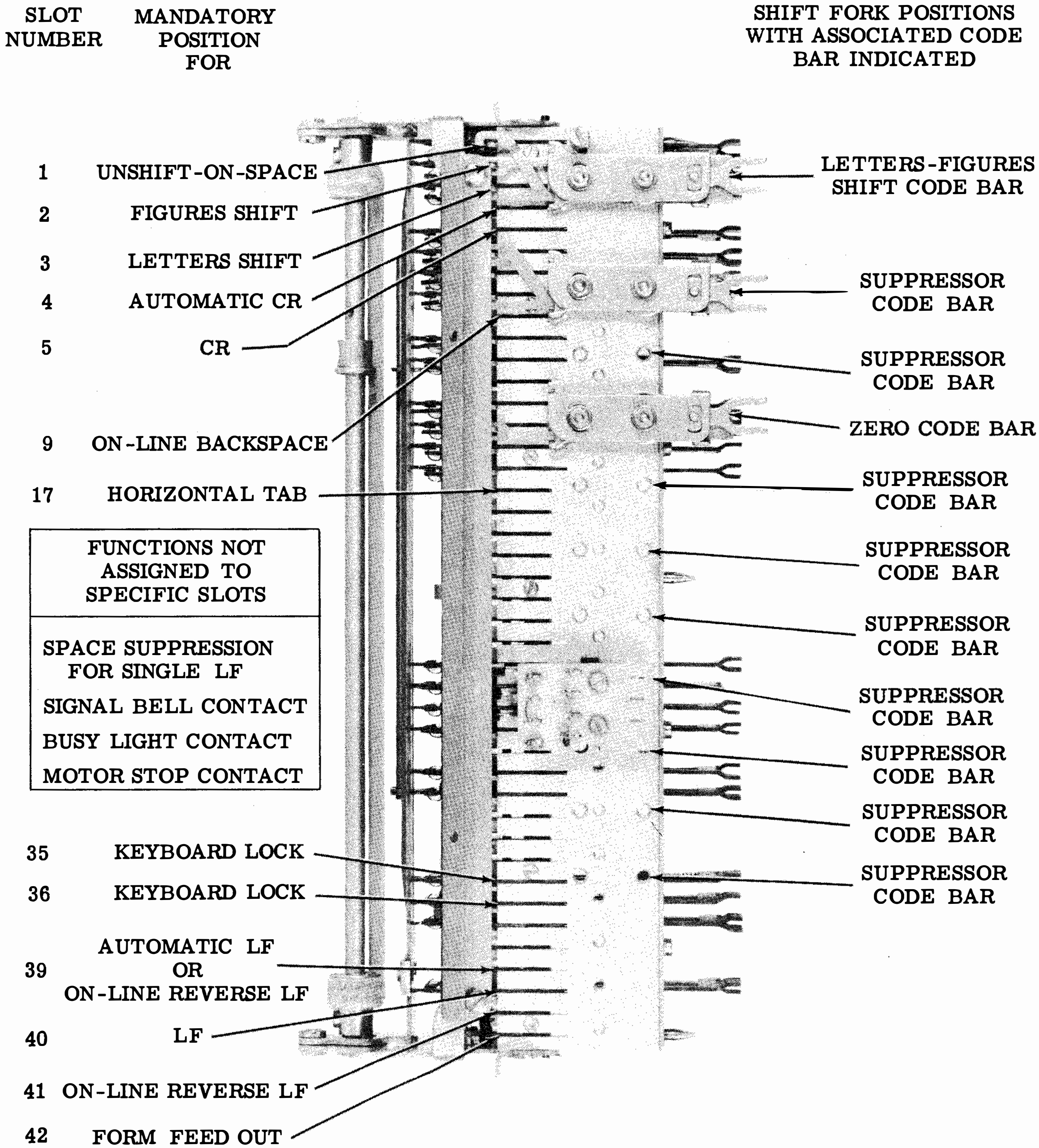


Figure 29 - Stunt Box (Top View)

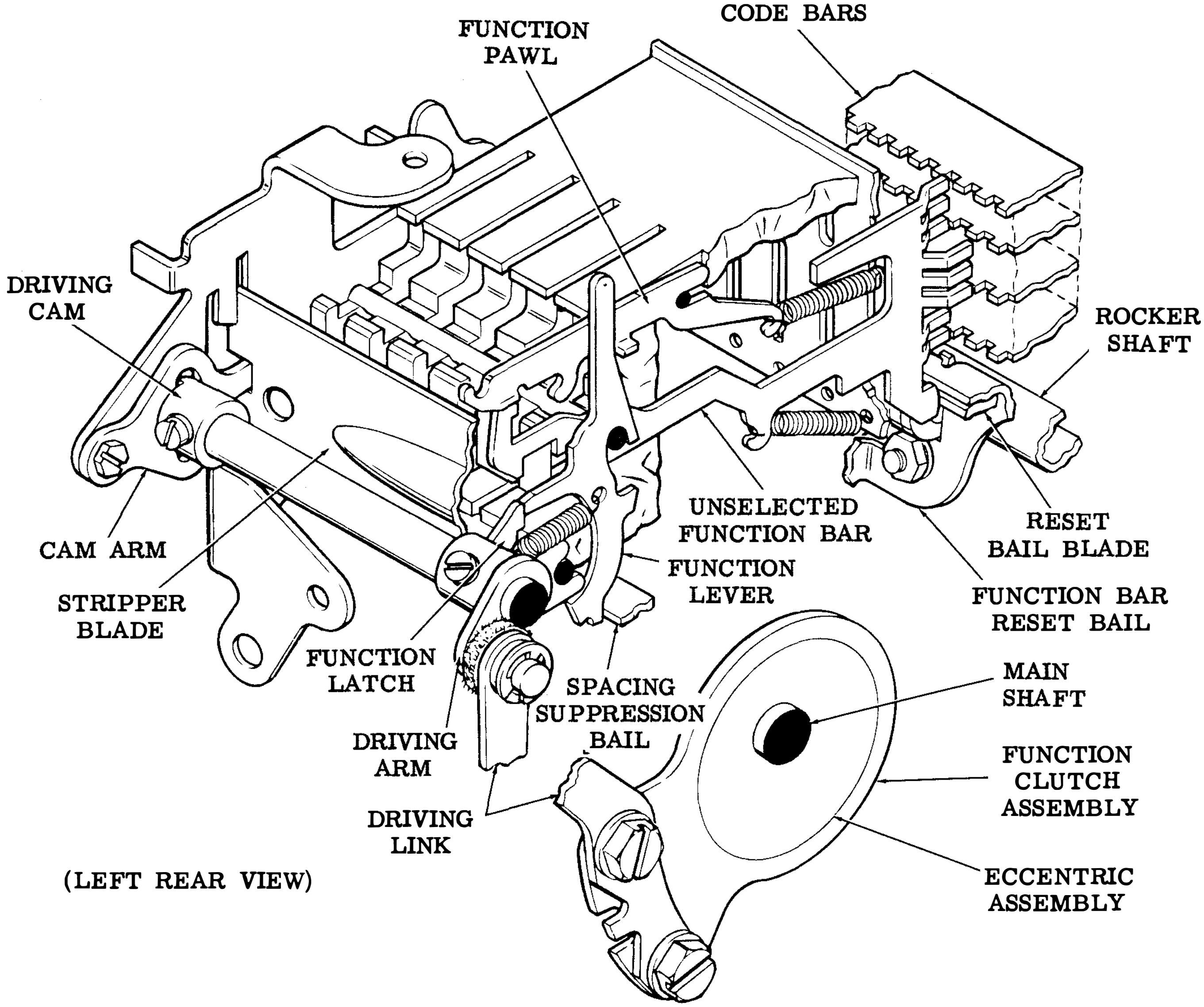
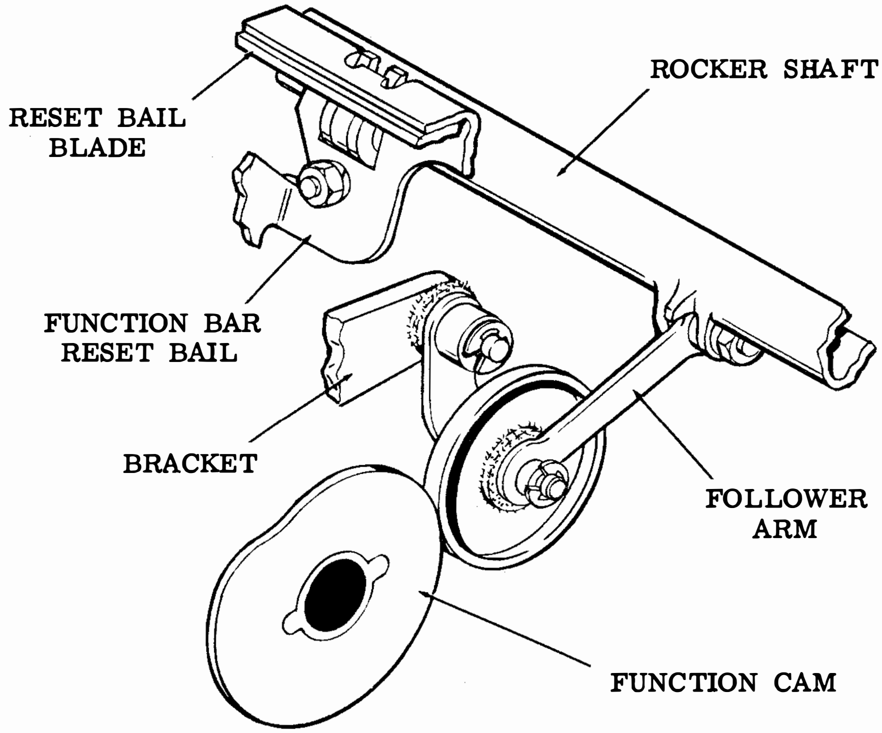


Figure 30 - Stunt Box (Function Linkage Unselected)

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 bail 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.



(LEFT REAR VIEW)

Figure 31 - Reset Bail Mechanism

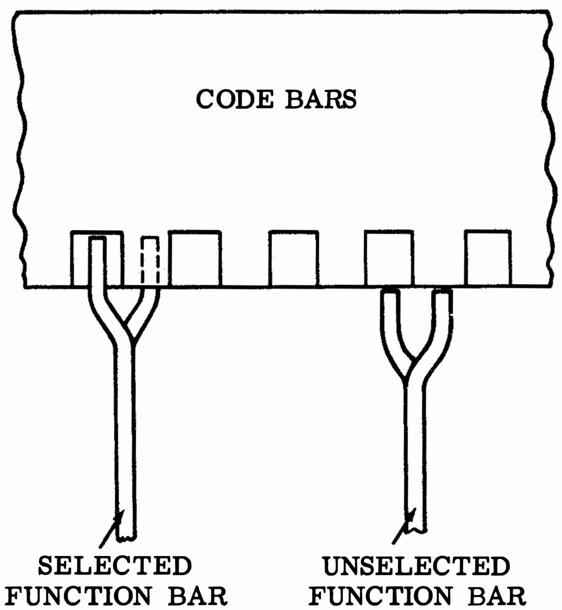


Figure 32 - Function Bar Selection

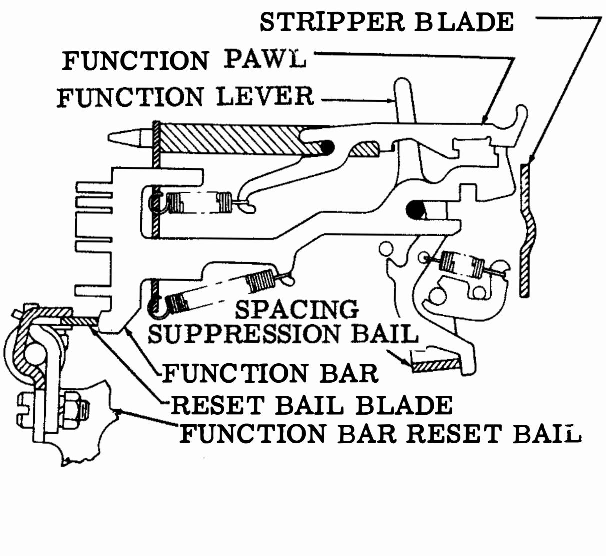


Figure 33 - Typical Function Linkage
(Unselected)

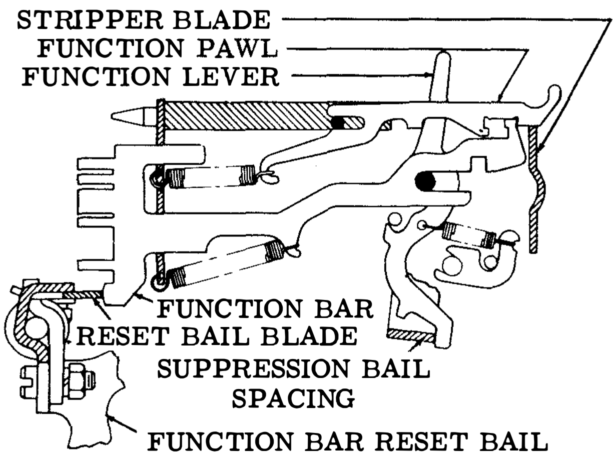


Figure 34 - Typical Function Linkage (Selected)

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 bail 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 bail 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 bail plate, which is fastened to the carriage return latch bail. The latch bail 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

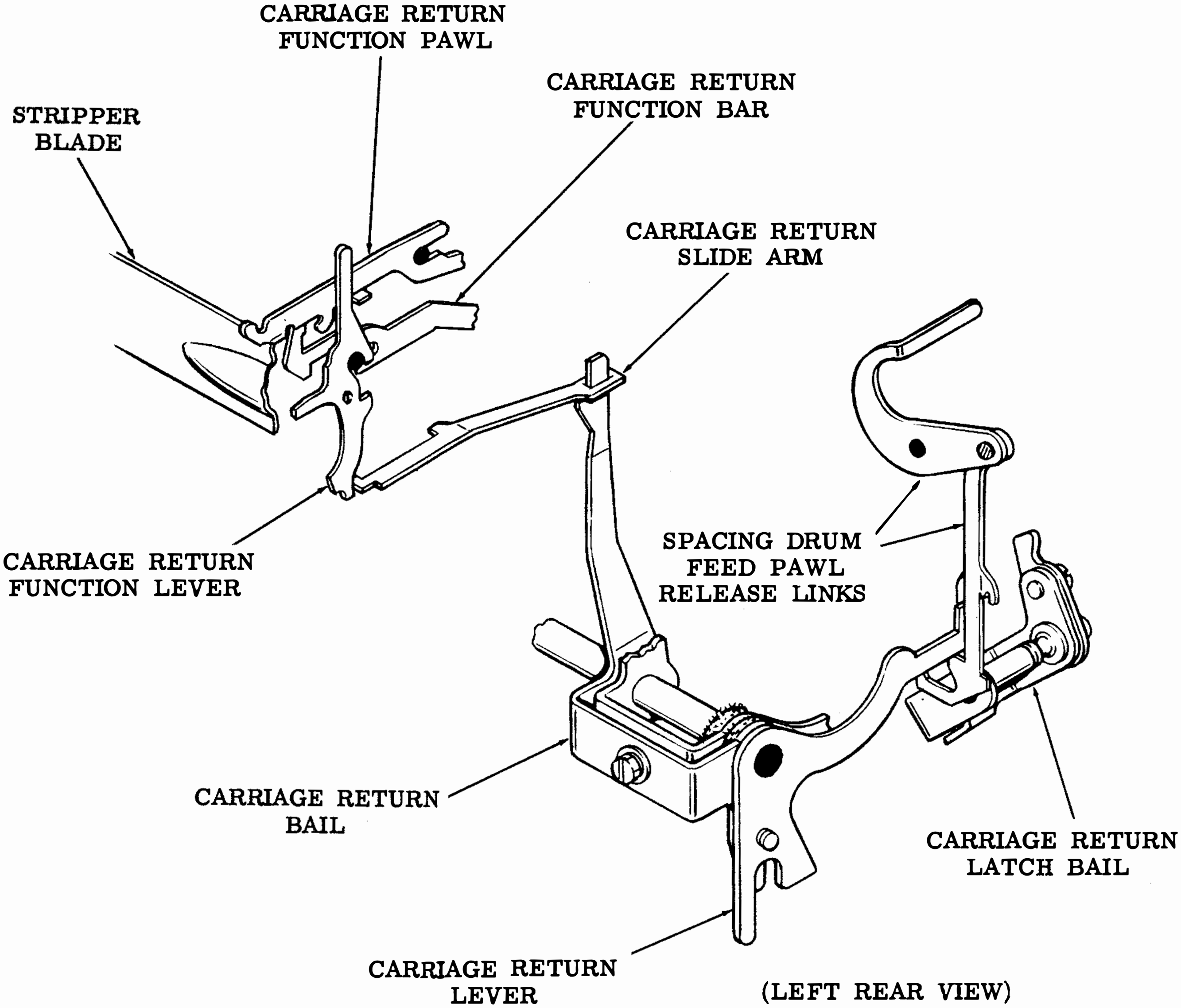


Figure 35 - Carriage Return Function Mechanism

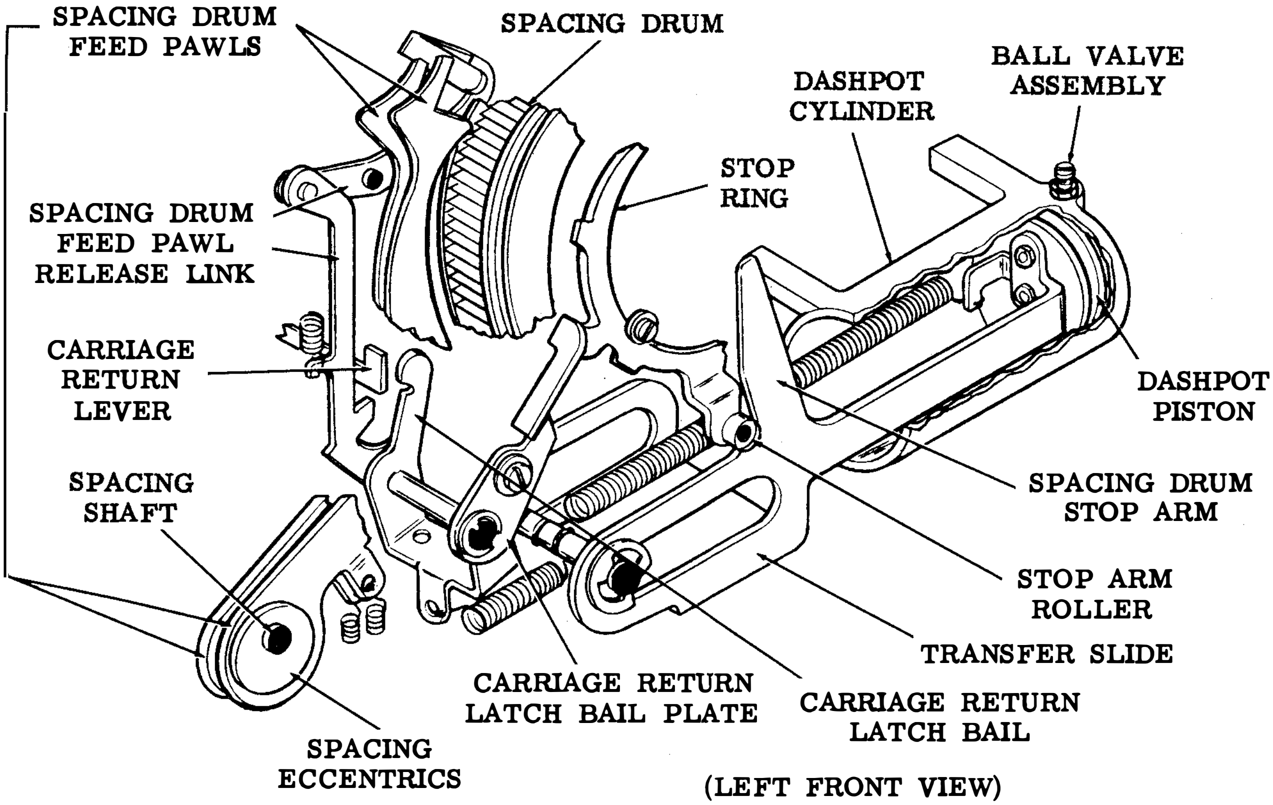


Figure 36 - Carriage Return Mechanism

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 revolution, or double line feed, has occurred. When single line feed is desired, it is necessary to strip the function pawl from the line feed function 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 bail. The cam disk on the three-stop line feed clutch provides the motive force to operate the stripper bail once each one-third revolution of the line feed clutch.

13.11 The stripper bail 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 function 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 installed in a slot of the stunt box for the purpose of suppressing spacing on single line feed

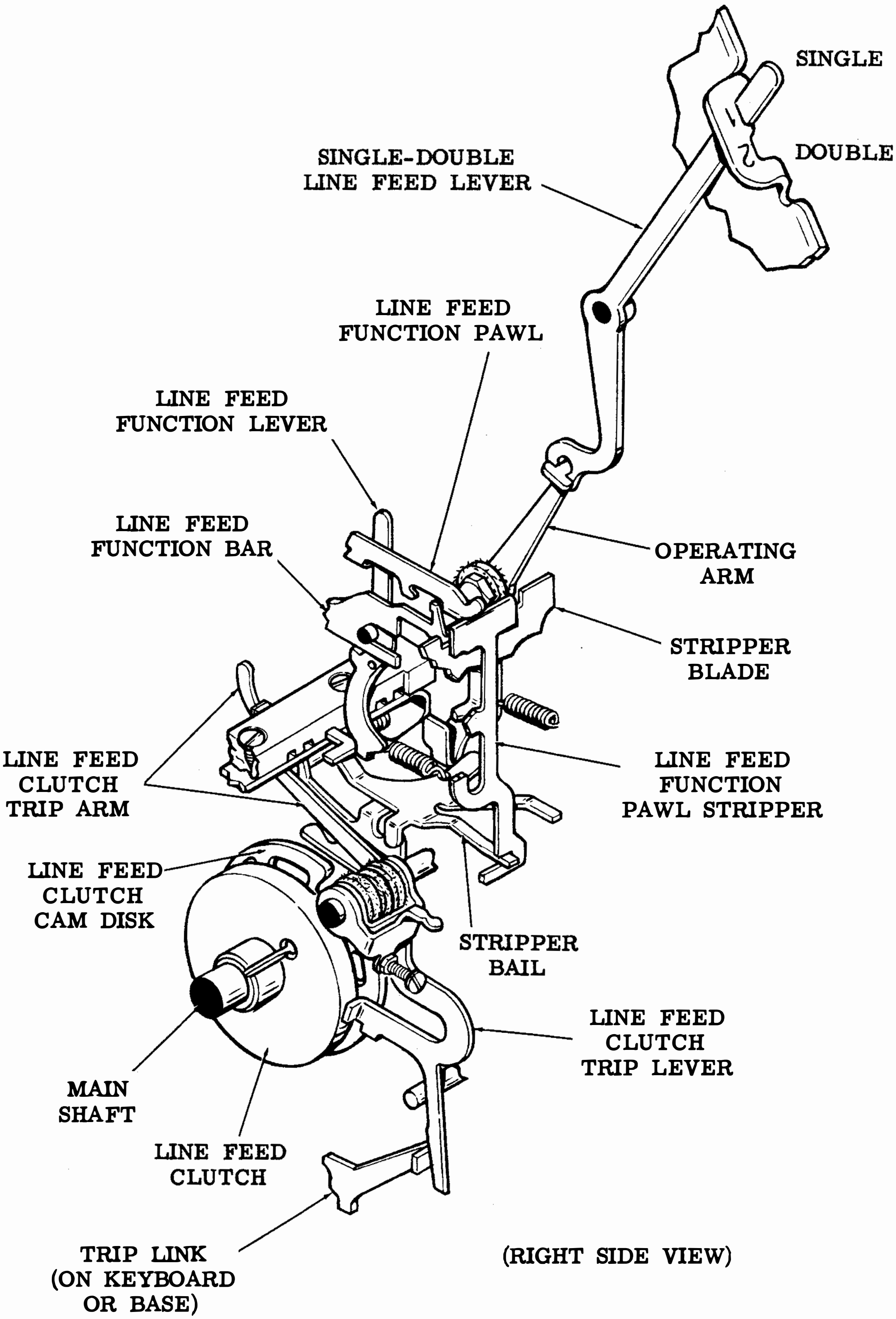


Figure 37 - Line Feed Mechanism

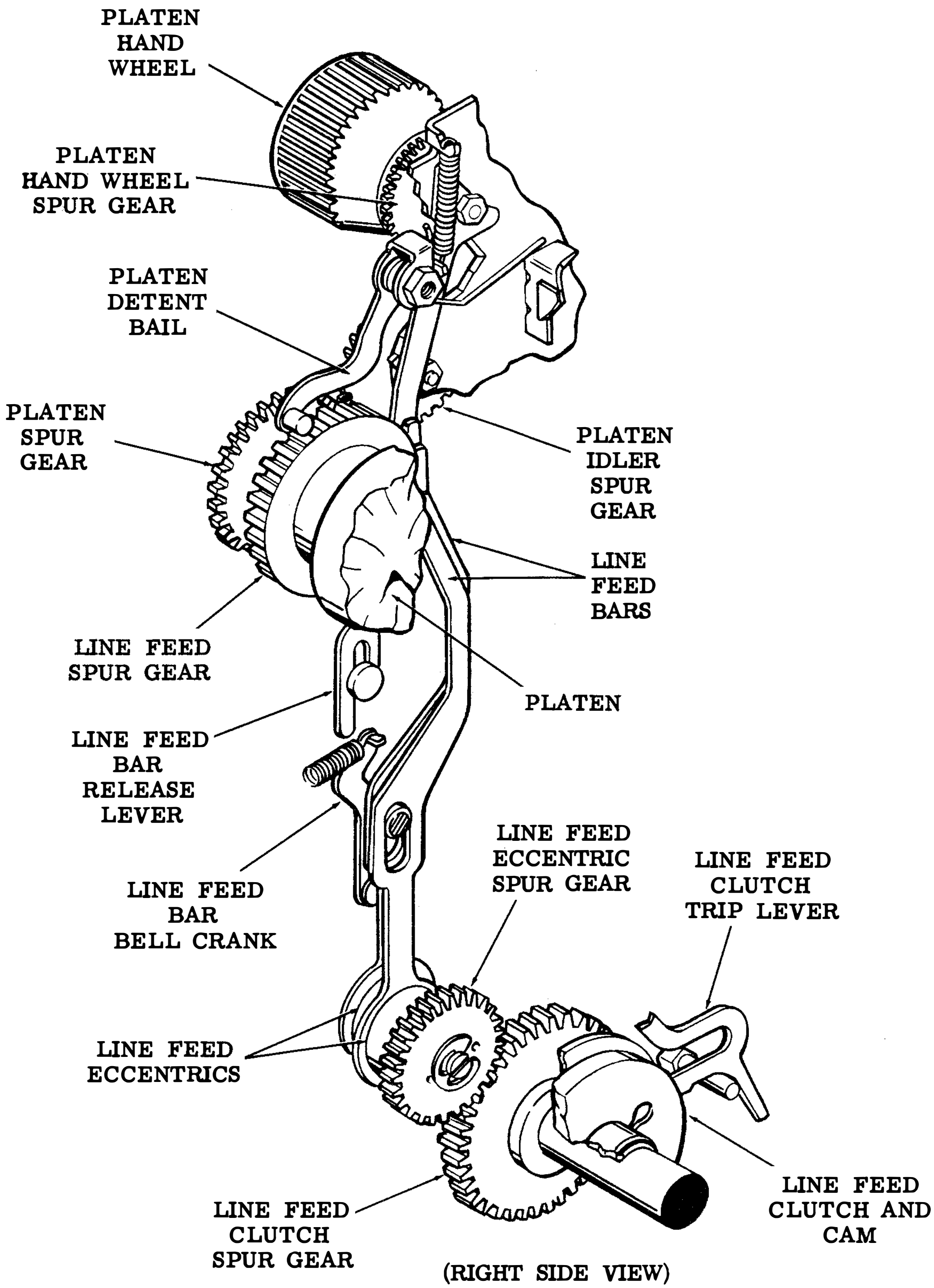


Figure 38 - Line Feed Mechanism

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 bail 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 bail 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,

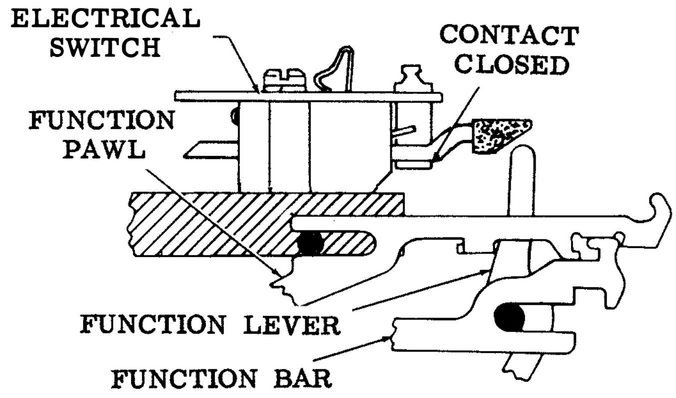


Figure 39 - Typical Stunt Box Contact (Unoperated)

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,

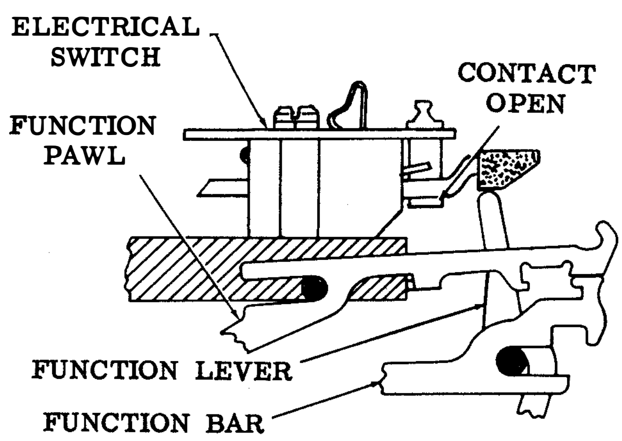


Figure 40 - Typical Stunt Box Contact (Operated)

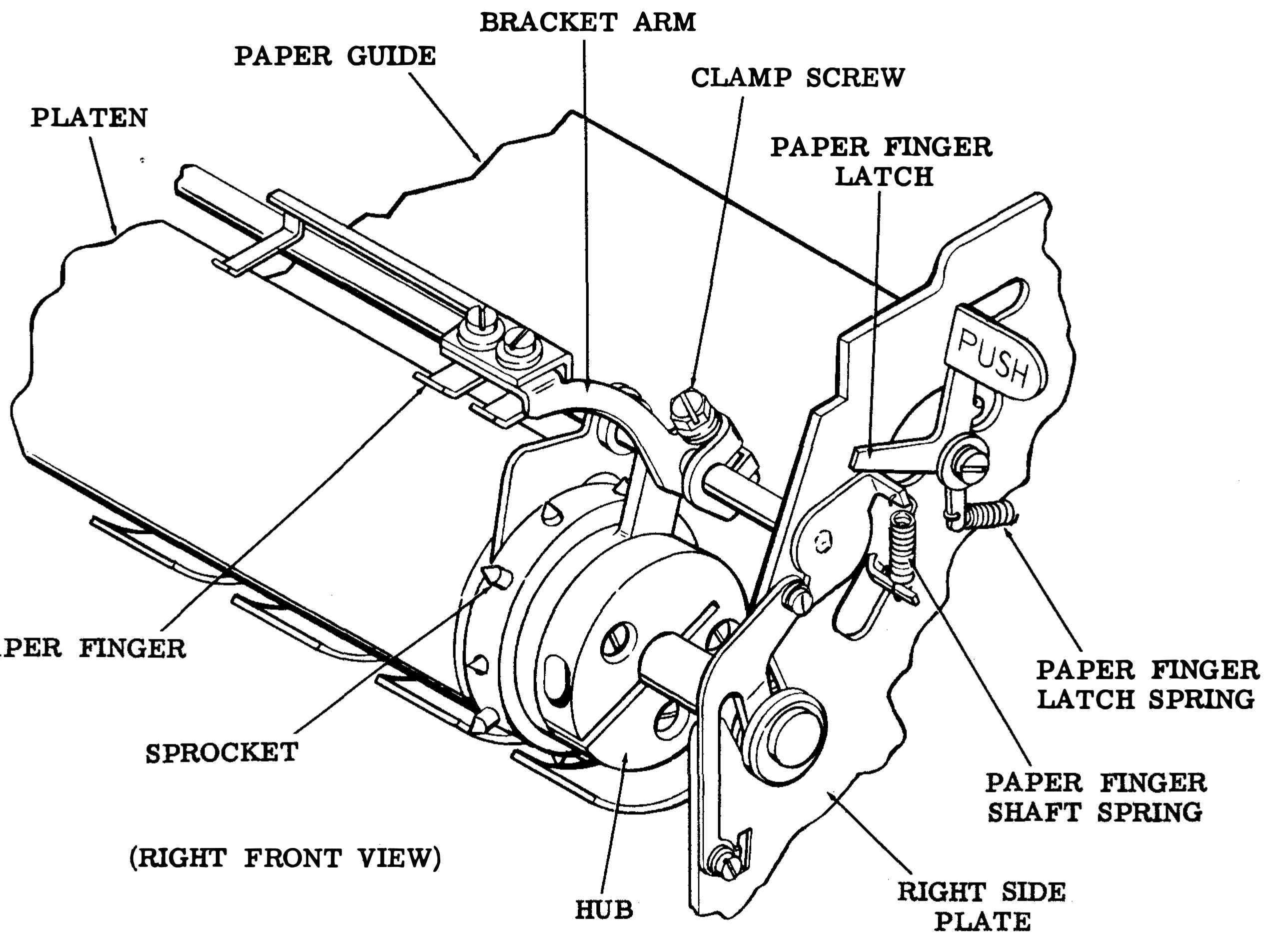


Figure 41 - Sprocket Feed Platen Mechanism

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 fingers 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.

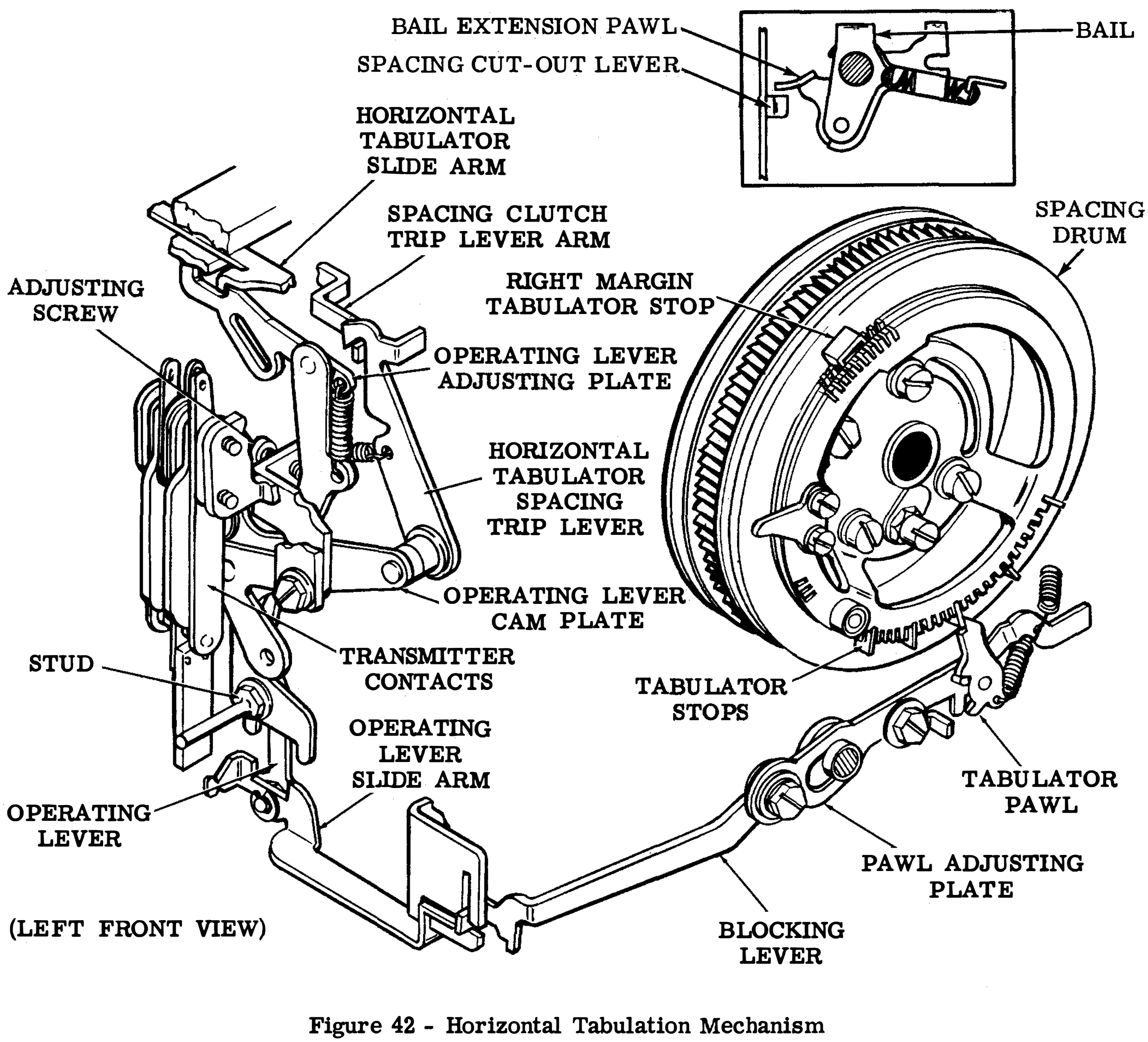


Figure 42 - Horizontal Tabulation Mechanism

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 bail (Fig. 43). The intermediate bail 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 bail.

15.04 Fastened to and moving as part of the operating lever is the latch bail adjusting plate (Fig. 43). Mounted to the stud on the upper end of the adjusting plate is the stop lever arm latch bail. The latch bail 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 bail moves with it until the upper end of the latch bail 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 bail 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 bail. The latch bail 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 bail (Fig. 43) engages the cam lobe on the spacing clutch restoring cam. This pivots the stripper bail 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 bail, 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 bail 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 bail rotate together due to the pawl spring until the bail is fully operated. When the transfer bail 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 bail 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 bail 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 feed 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.

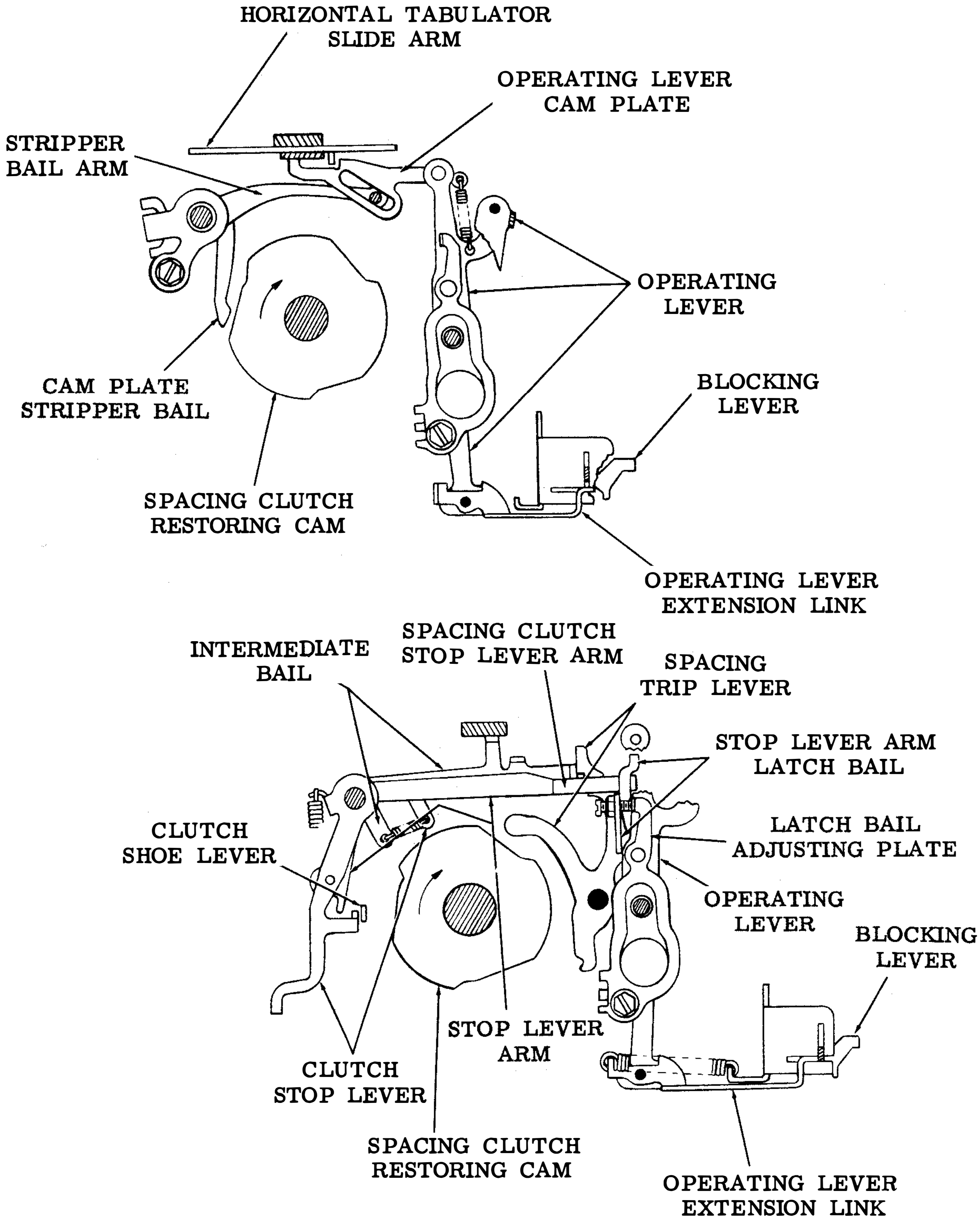


Figure 43 - Horizontal Tabulation

15.10 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.

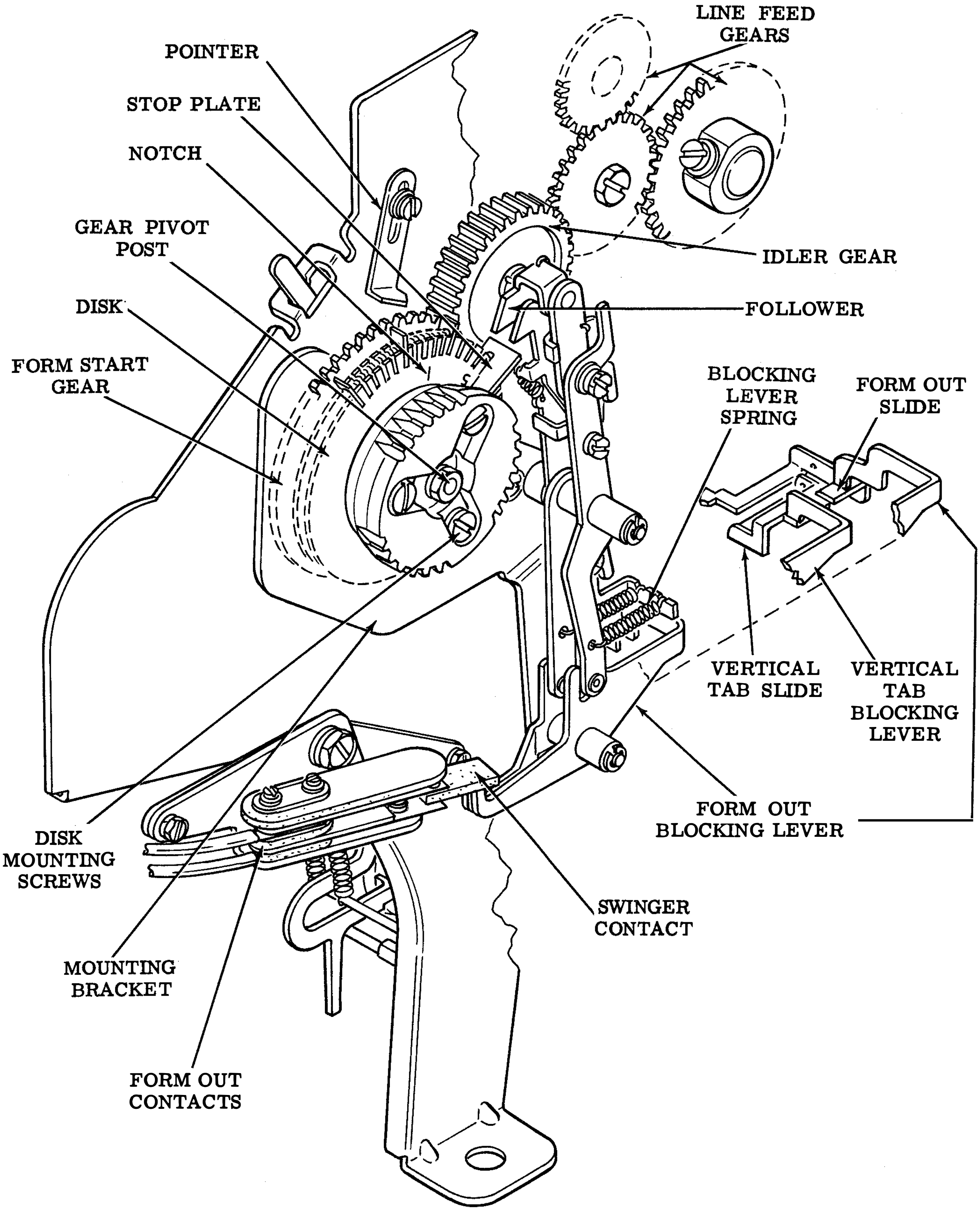


Figure 44 - Vertical Tabulation and Form Out Mechanisms

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 keylever, 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.

MOTOR UNITS

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS PAGE

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 electromechanical 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

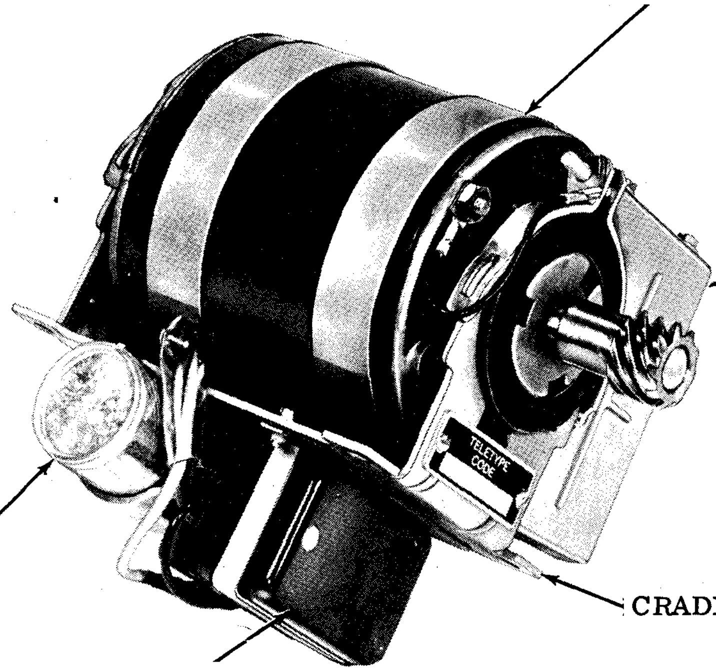


Figure 1 - Typical Miniature Synchronous Motor Unit

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.

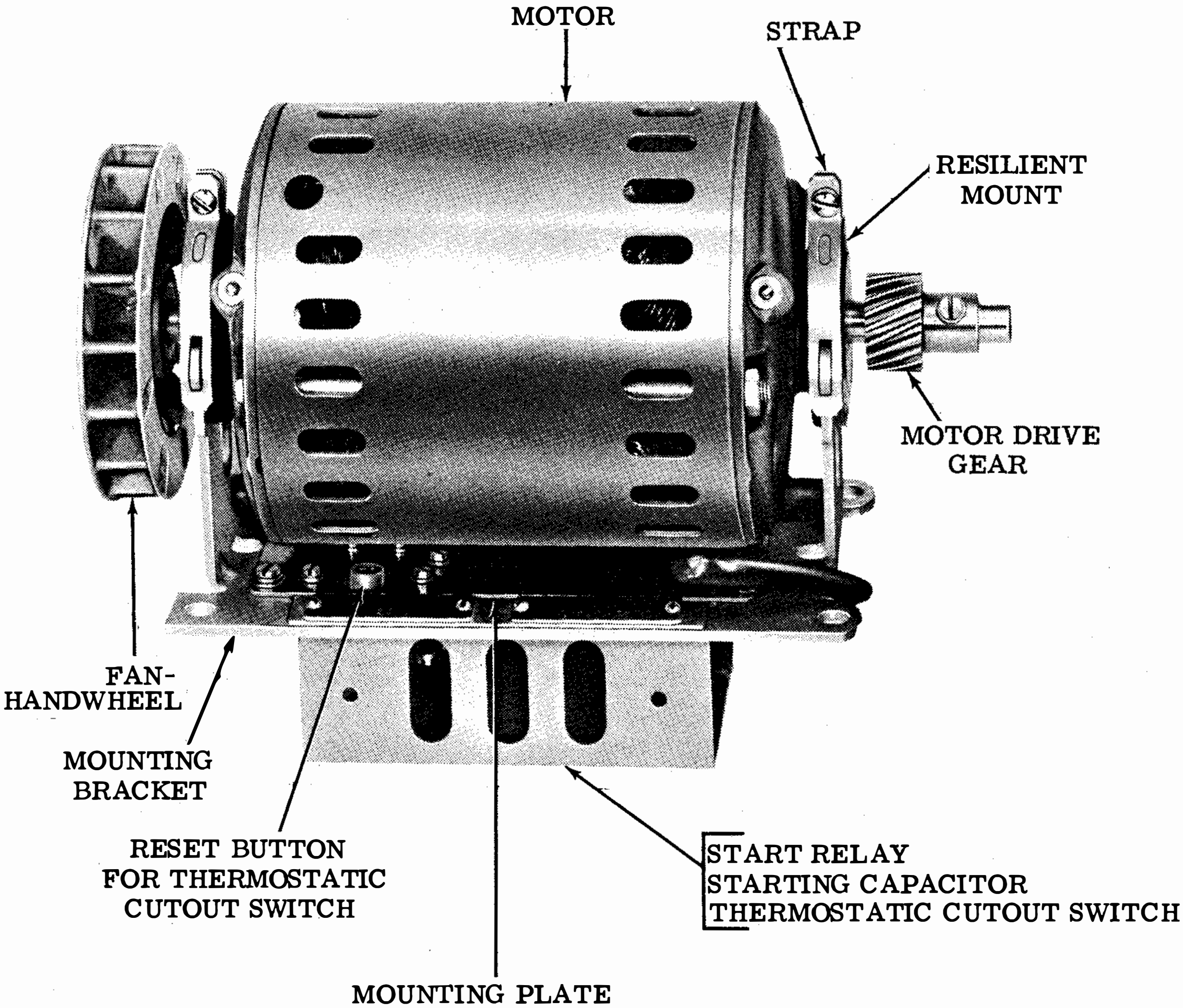


Figure 2 - Typical Standard or Heavy Duty Synchronous Motor Unit

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.

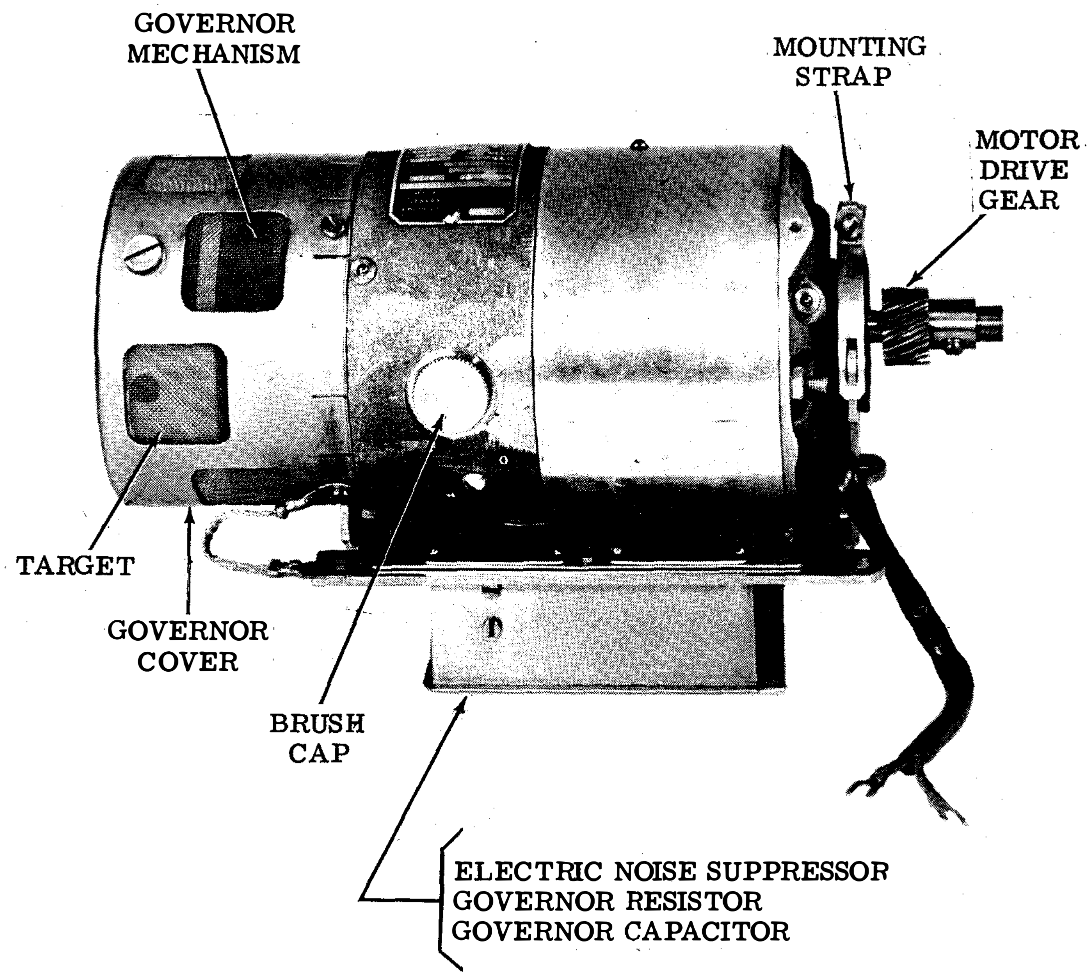


Figure 3 - Typical Series (Governed) Motor Unit

2.08 A variation of the motor unit described in 2.07 is available with electrostatic shielding and radio frequency noise suppression.

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. The higher horsepower rating accommodates, for example, the requirements of the Automatic Send-Receive Set.

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 1. TECHNICAL CHARACTERISTICS OF MINIATURE SYNCHRONOUS MOTOR UNITS

CHARACTERISTICS	LMU19, LMU20, LMU24, LMU26, LMU31, LMU45, MU43 (Bell 28F)	LMU35, LMU40
Rated Horsepower	25 Millihorsepower	25 Millihorsepower
Input Voltage	115 ±10% AC	115 ±10% AC
Phase	Single	Single
Frequency	60 Cycles, ±0.75%	50 Cycles, ±1%
Input Current (Full Load - Amperes)		
Starting	4.0-5.0	3.0
Running	1.25	0.47
Power Factor (Full Load)		89%
Watts Input (Full Load)		50
Start Capacitor	88-108UF (130-156UF, MU43 (Bell 28F))	64-77
Run Capacitor	-	7.0
Speed	3600 RPM	3000 RPM
Rotation	Clockwise viewed from pinion end	Clockwise viewed from pinion end
Mounting	Upright	Upright
Other Distinguishing Characteristics	LMU19 - Relay, capacitor, and thermostatic cutout switch mounted on motor bracket. LMU20, LMU26 - Relay, capacitor, and thermostatic cutout switch mounted on motor bracket. LMU20 has single ventilator, LMU26 none. LMU24 - Twin exhaust ducts. Relay and capacitor mounted on motor bracket. No thermostatic cutout switch. Fused externally. Latest design have double shaft. LMU31 - Capacitor and thermostatic cutout switch mounted on motor bracket. Relay mounted on bracket assembly. LMU45, MU43 (Bell 28F) - Relay, thermostatic cutout switch mounted on motor bracket. Capacitor mounted on motor shield. Wiring for external start switch noise suppressor (LMU45 only).	LMU35, LMU40 - Contain no thermostatic cutout device. Fused (0.8A) externally. Relay and capacitors mounted on motor mounting bracket. Equipped with an air shield.

TABLE 2. TECHNICAL CHARACTERISTICS OF STANDARD AND HEAVY DUTY SYNCHRONOUS MOTOR UNITS

CHARACTERISTICS	LMU3 (Bell 28A), LMU15 (Bell 35A), LMU21 (Bell 28LA), LMU30, LMU37, LMU42, LMU46	LMU33, LMU36, LMU38, LMU51, LMU52	LMU11, LMU12 (Bell 28C), YMU-1	LMU50
Rated Horsepower	1/20	1/20	1/12	1/12
Input Voltage	115 ±10%, AC	115 ±10%, AC	115 ±10%, AC	115 ±10%, AC
Phase	Single	Single	Single	Single
Frequency	60 Cycles, ±0.75%	50 Cycles, ±0.75%	60 Cycles, ±0.75%	50 Cycles, ±0.75%
Input Current (Amperes)				
Starting	9.0	9.0	12.25	14.5
Running	1.85	2.4	2.8	2.8
Power Factor (Full Load)	30%	35%	44.75%	46.8%
Watts Input (Full Load)	65	107	132.9	150
Heat Dissipation (Watts)	50	70	70.6	63.38
Start Capacitor Rating	43-48 UF	43-48 UF	170-226 UF	161-193 UF
Speed	3600 RPM	3000 RPM	3600 RPM	3000 RPM
Rotation	LMU42 CW, others CCW viewed from fan or short shaft end.	CCW viewed from fan or short shaft end.	CCW viewed from fan end.	CCW viewed from fan end.
Mounting	All upright except LMU27 and LMU30 which are inverted.	All upright except LMU36 which is inverted.	LMU11 - Inverted LMU12 (Bell 28C) - Upright	Upright
Other Distinguishing Characteristics	LMU3 (Bell 28A) - Control parts in compartment under motor. Fan cooled. Thermostatic cut-out switch. Latest design have more compact control parts arrangement.	LMU33 - Similar to LMU3 (Bell 28A). No fan. LMU36 - Similar to LMU3 (Bell 28A) except for inverted mounting with control parts above motor.	LMU11 - Control parts located above motor for inverted mounting. Fan cooled. Thermostatic cut-out switch.	Similar to LMU11 but with control parts in motor mounting cradle. Starting relay is voltage sensitive type.

TABLE 2. TECHNICAL CHARACTERISTICS OF STANDARD AND HEAVY DUTY SYNCHRONOUS MOTOR UNITS - Continued

CHARACTERISTICS	LMU3 (Bell 28A), LMU15 (Bell 35A), LMU21 (Bell 28LA), LMU30, LMU37, LMU42, LMU46	LMU33, LMU36, LMU38, LMU51, LMU52	LMU11, LMU12 (Bell 28C), YMU-1	LMU50
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^{o} 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

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

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 deenergizes. 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.

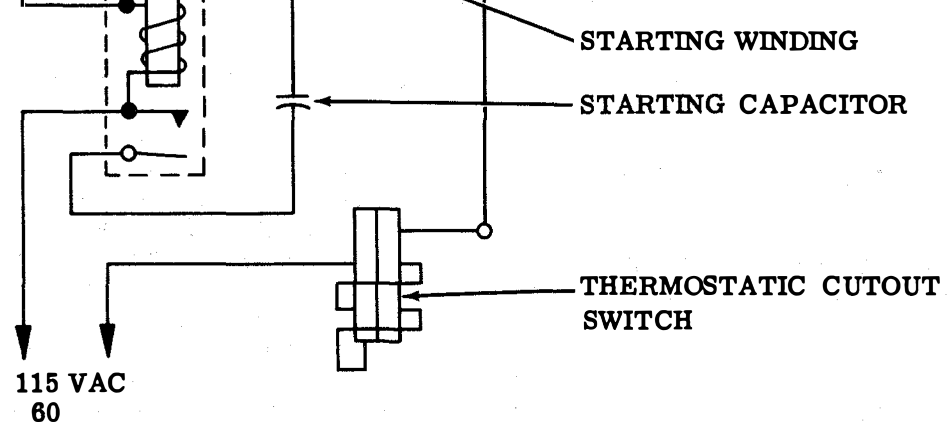


Figure 4 - Typical Synchronous Motor Unit Schematic Diagram

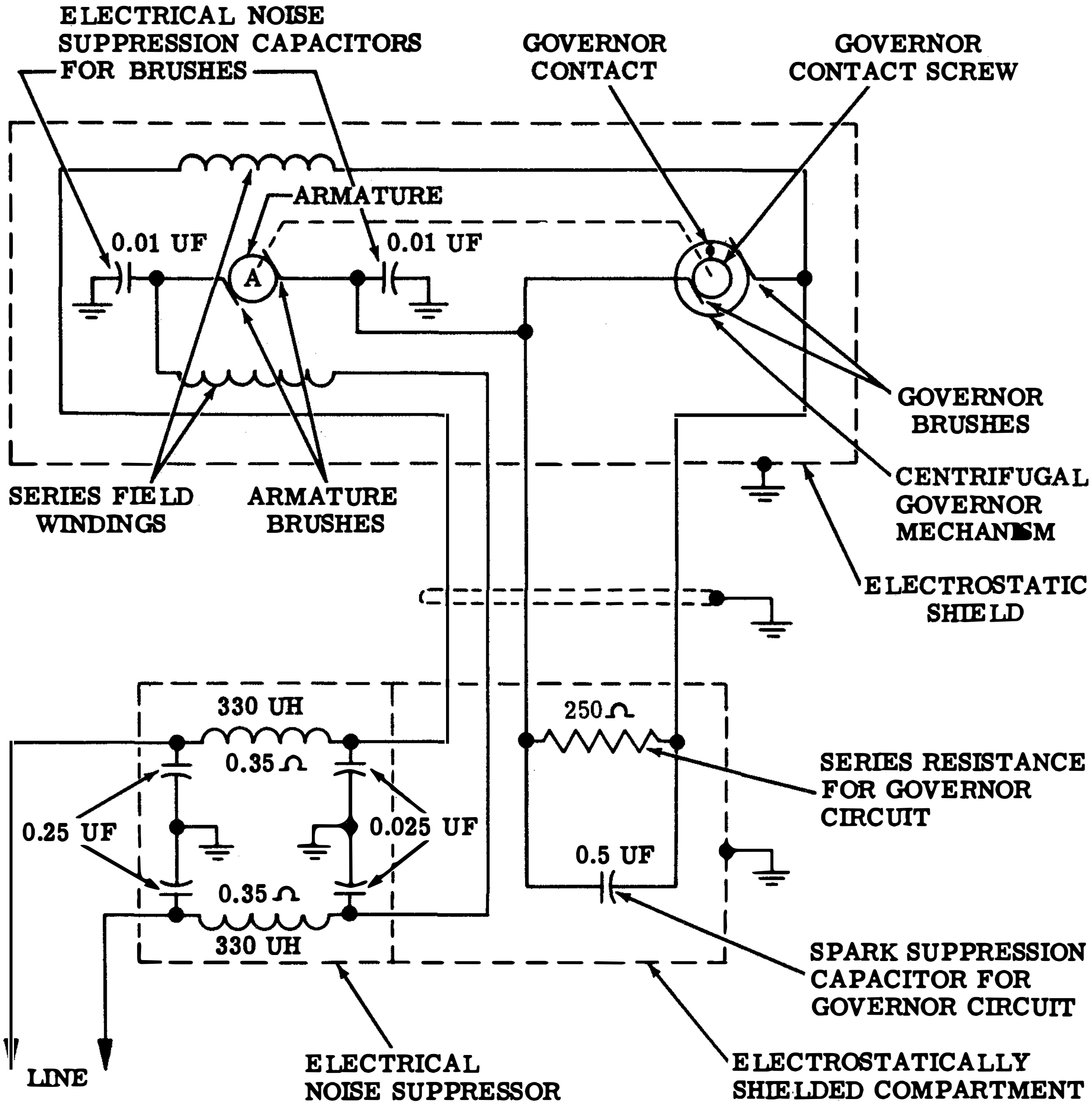


Figure 5 - Typical Series (Governed) Motor Unit Schematic Diagram

SERIES (GOVERNED) MOTOR UNITS (Figs. 3 and 5)

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.

LPW300** PAPER WINDER

CONTENTS   PAGE

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.

1.03 The following copy display racks are used in conjunction with the paper winder and should be ordered as separate items:

(a) TP193950 copy display rack - For 28 or 35 application.

(b) TP195259** modification kit (includes copy display rack) - For 32 or 33 application. The kit provides for easy removal of the winder for access to the removable cabinet back panel.

1.04 For parts ordering information, refer to appropriate set parts publication. Double asterisk (**) denotes suffix indicating paint finish.

2. DESCRIPTION

CONFIGURATION

2.01 The paper winder (Figure 1) consists, basically, of a mounting bracket, motor, paper spindle assembly, mercury switch with associated paper-slack bail, and ON-OFF switch.

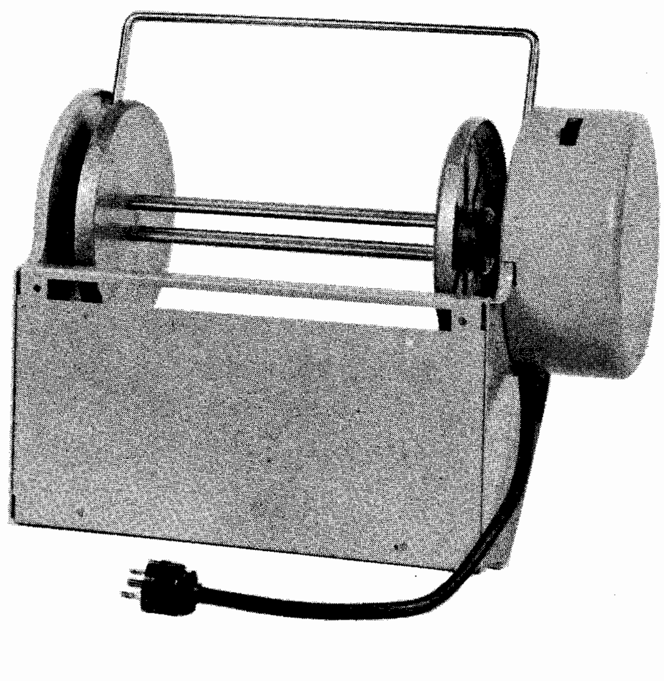


Figure 1 - LPW300 (Bell 1A) Paper Winder (Right Rear View)

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

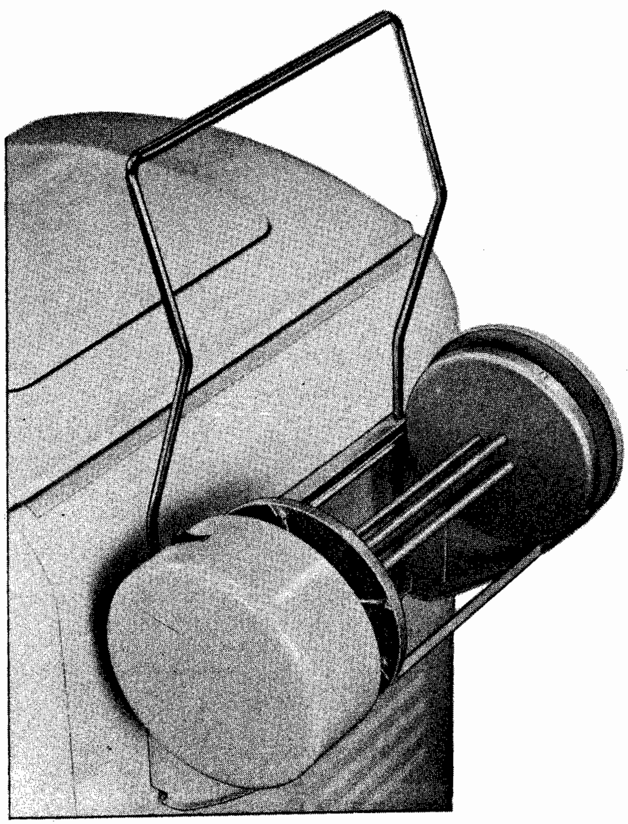


Figure 2 - Paper Winder (With Copy Display Rack) Mounted on Back of 28 Console Cabinet (Left Rear View)

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:

4	TP1253	Screw
4	TP3646	Lockwasher
1	5830WD	Diagram, Wiring
4	TP49514	Nut
2	TP49612	Screw
4	TP78469	Foot, Rubber
3	TP82474	Terminal (Spade)
1	TP97347	Screw, Set
1	TP114466	Connector, Receptacle
2	TP165255	Screw, Sheet Metal
2	TP192007	Terminal
1	TP193951	Guide, Paper

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.

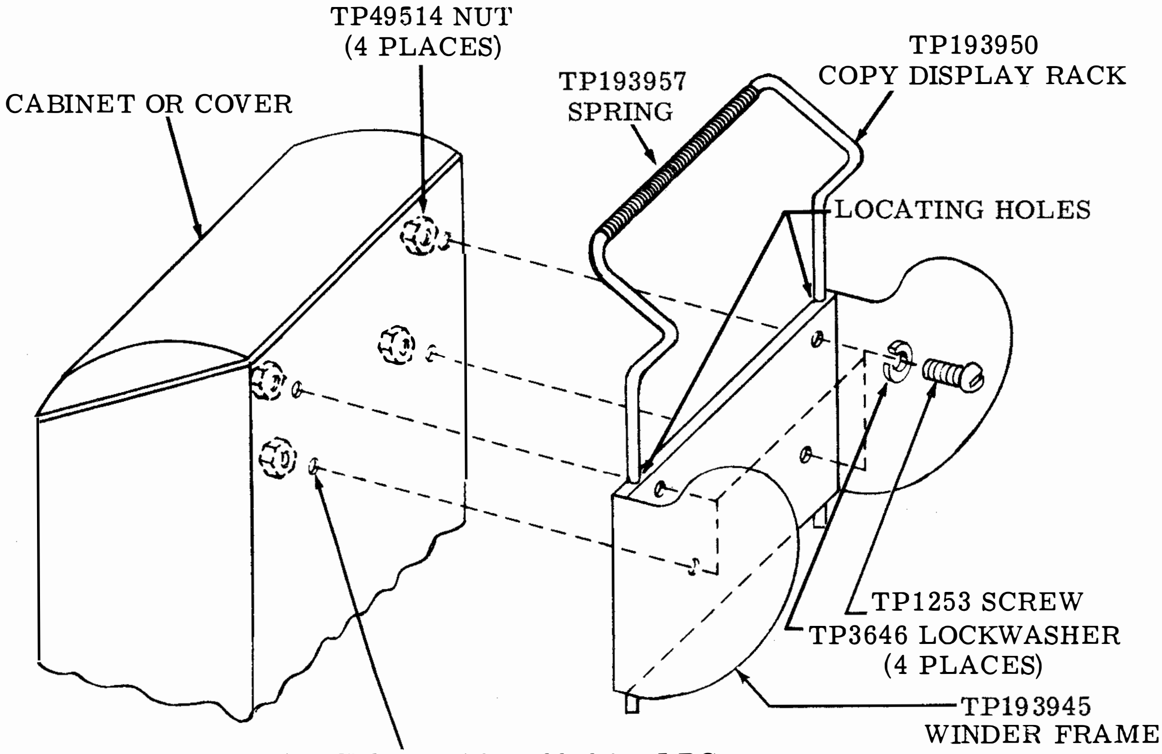


Figure 3 - Installing Paper Winder on 28 Console Cabinet (LAC or LAAC) or 28 LPC204, LPC205 (Bell 28A), or LPC206 Cover

(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:

4	TP2191	Lockwasher
4	TP6345	Nut
4	TP195180	Bumper, Rubber
1	TP195253	Rack, Copy Display
2	TP195256**	Hanger

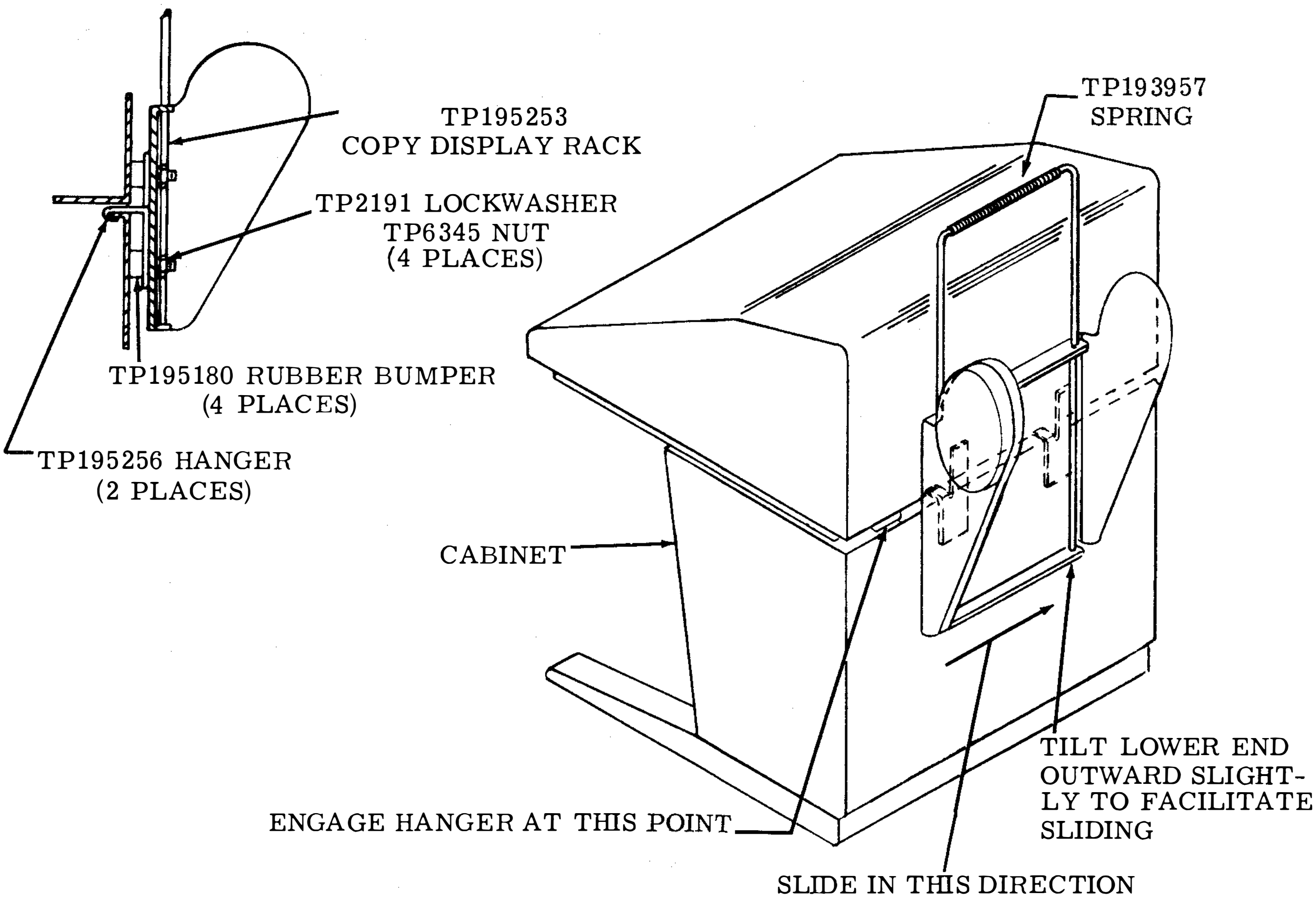


Figure 4 - Installing Paper Winder on 32 or 33 Console Cabinet Using TP195259 Modification Kit

(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).

35 EQUIPMENT

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.

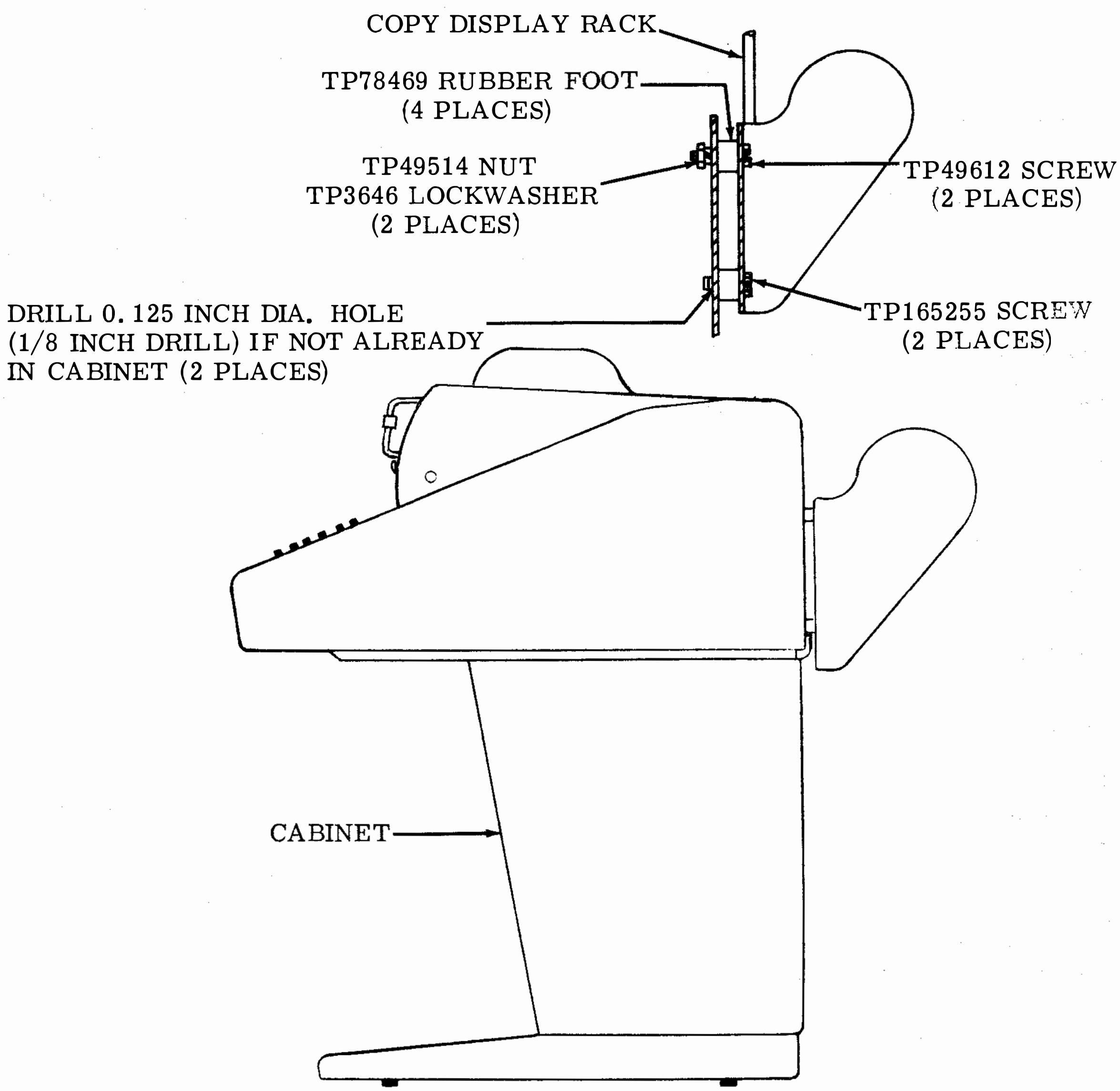


Figure 5 - Installing Paper Winder on 35 Console Cabinet

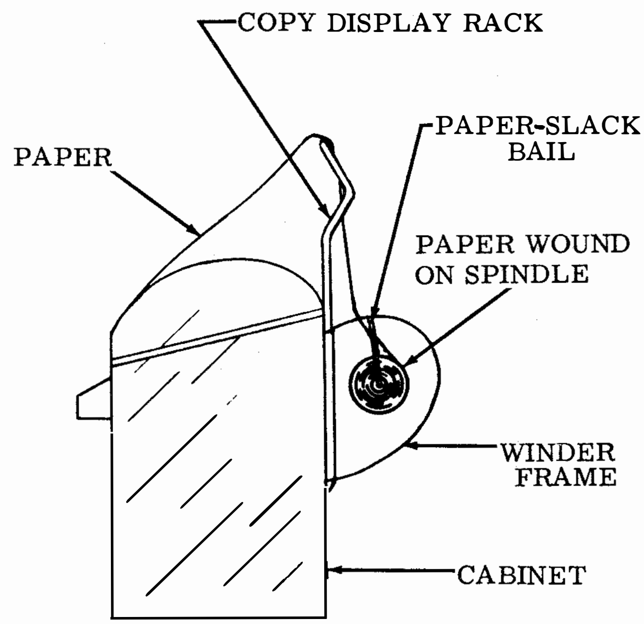


Figure 6 - Path of Paper from Printer Unit to Paper Winder Spindle

(3) Two of the TP82474 terminals and a TP192007 terminal may be used when power is to be obtained from terminals 1 and 2 of the "K" terminal board of the call control unit and terminal AA5 of the electrical service unit.

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

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.

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.

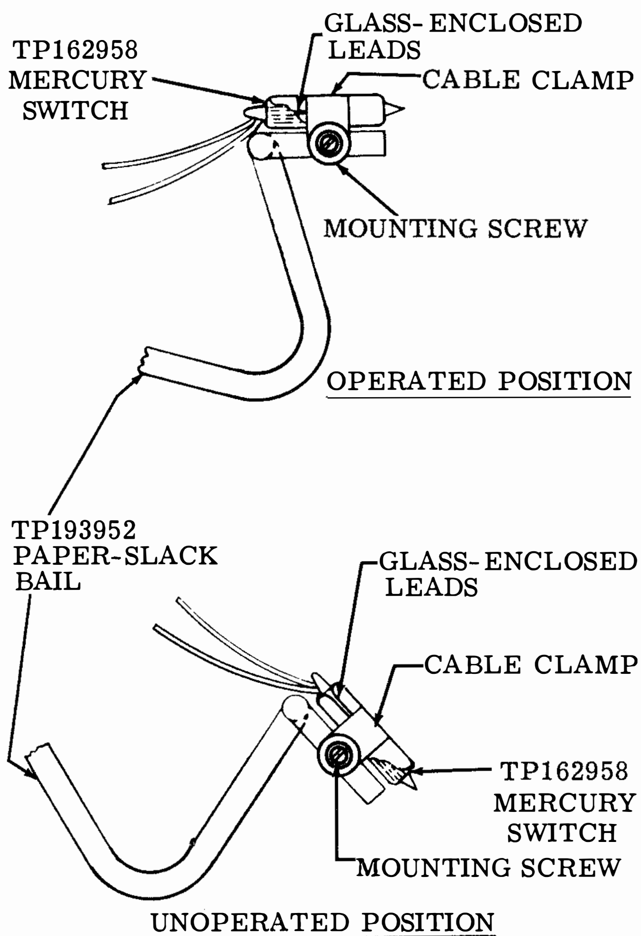
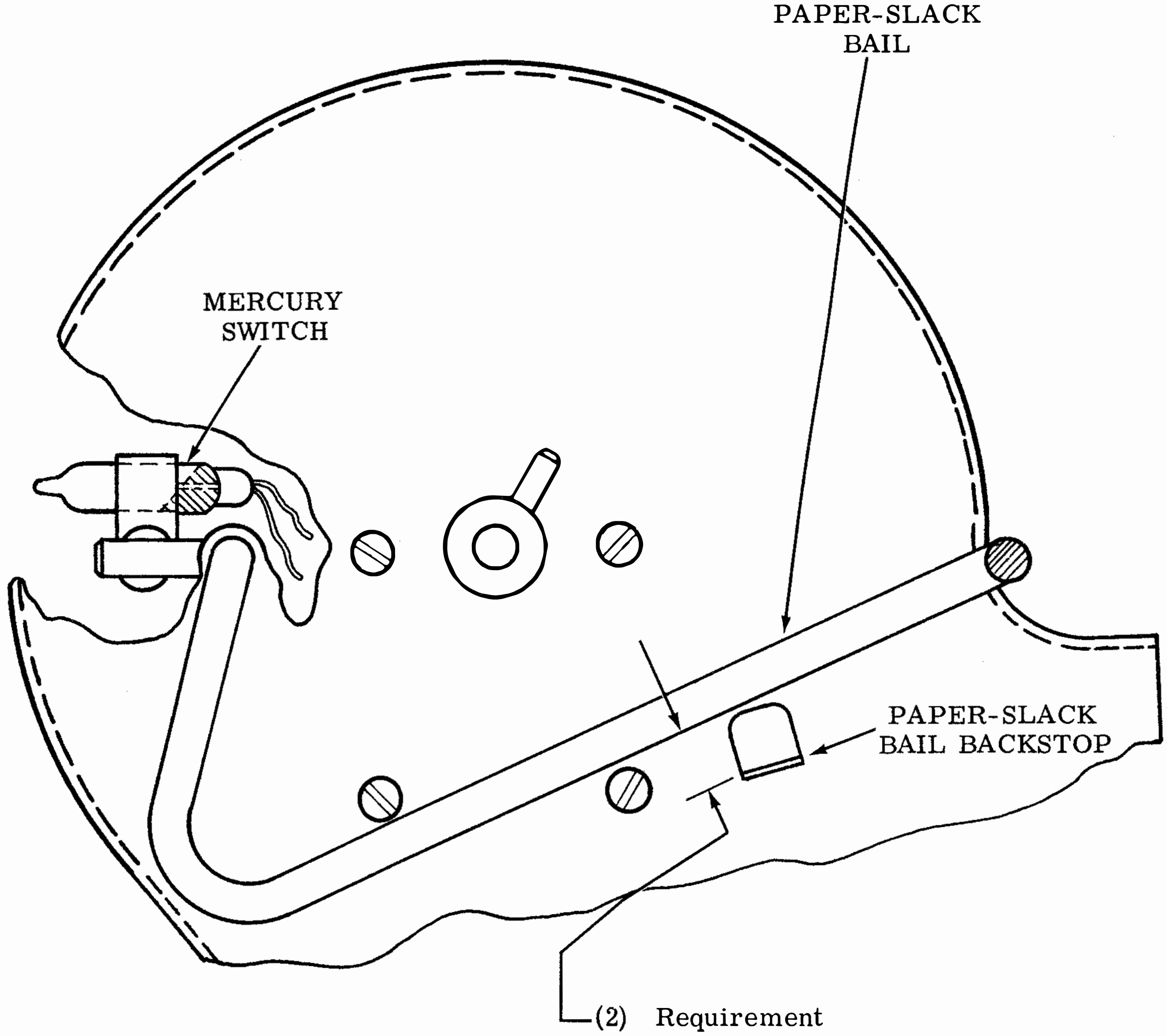


Figure 7 - Operation of the Mercury Switch on Paper Winder (Left Side View)



(RIGHT SIDE VIEW)

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

CONTENTS PAGE

CONTENTS PAGE

1. 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.

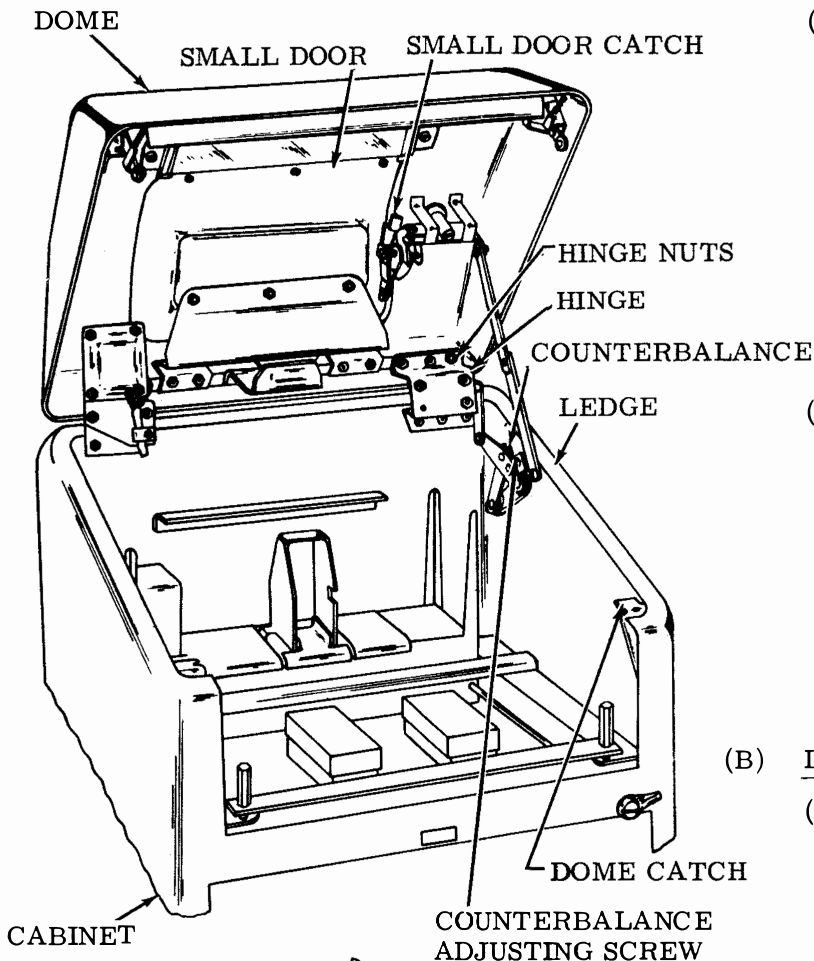
1.02 In this issue, cabinets for the Automatic Send-Receive Sets have been removed. Wall-mounted cabinets for housing single 28 KSR or RO sets have been added, multiple page printer cabinets for housing three or four printer sets have also been added. Since this is a general revision, marginal arrows ordinarily used to indicate changes and additions have been omitted.

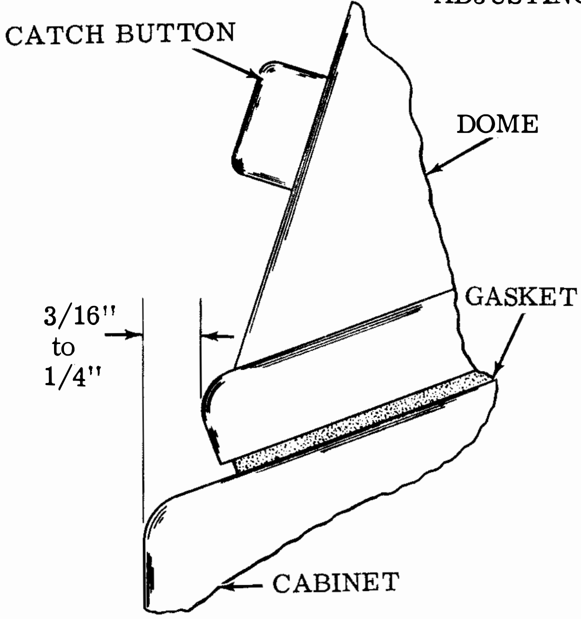
1.03 Most cabinet adjustments are initial adjustments that are made at the factory and do not require routine adjusting unless mounting screws have become loosened or parts have been removed and replaced. Adjustments most likely to need checking or remaking are outlined and illustrated herein. The figures 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.

(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.

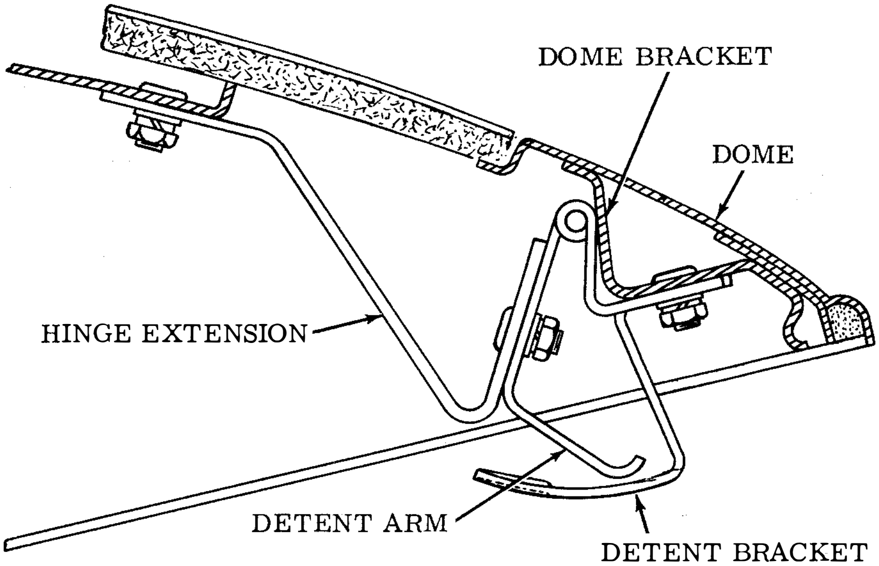
(C) SMALL DOOR CATCH

(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 nor 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.

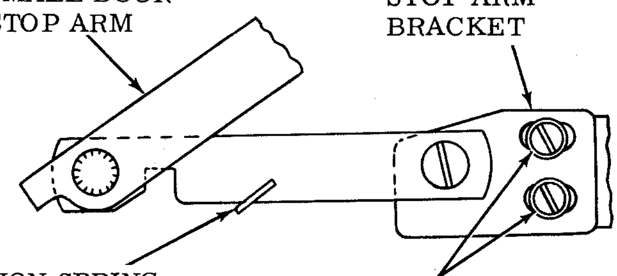
(B) DETENT ARM AND DETENT BRACKET

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

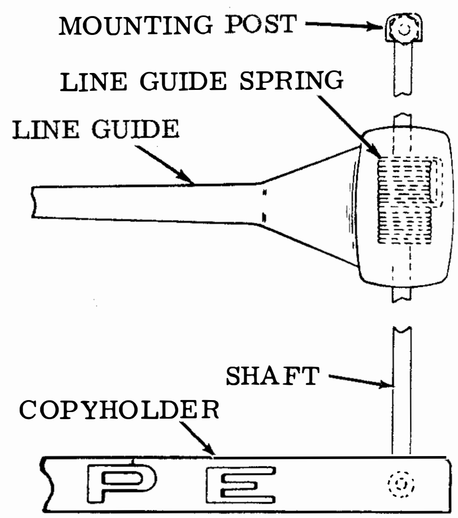
Requirement

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.)

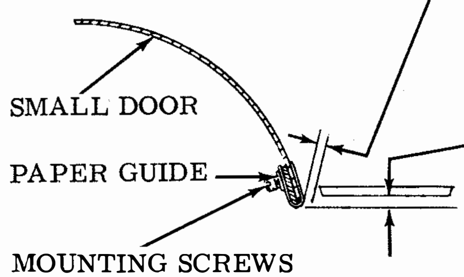
2.03 Copyholder, Copy Lamp



(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)

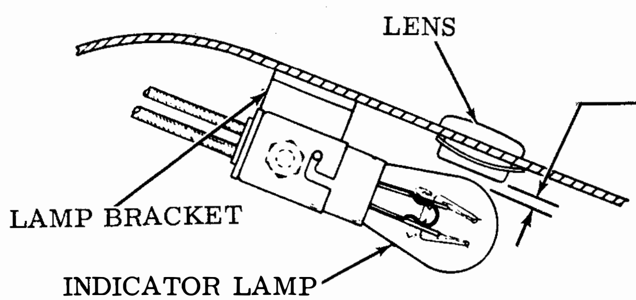
(1) Requirement
When the small door is opened or closed, the window should clear paper guide by 1/16 inch.

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.

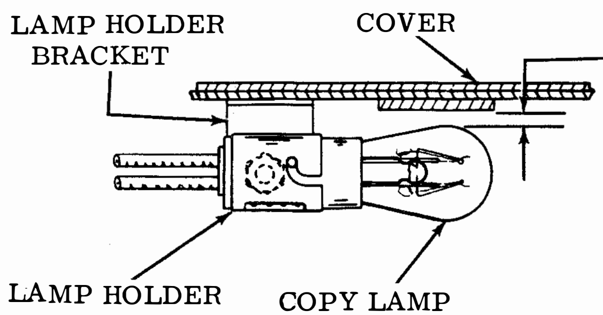
To Adjust
Position the paper guide with its mounting screws loosened.



(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

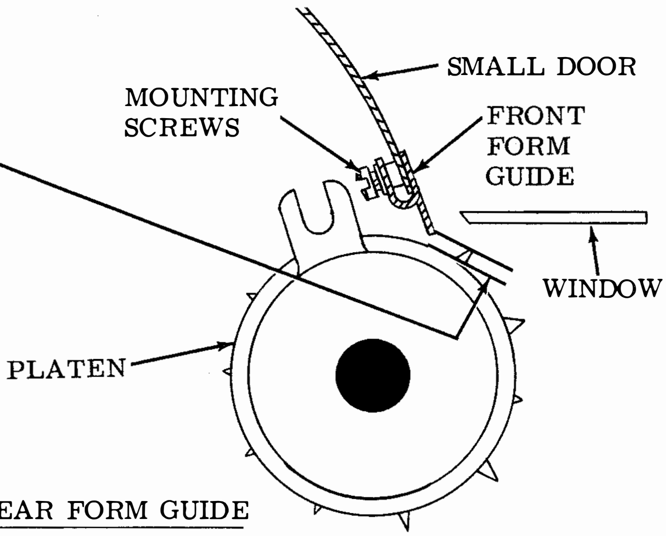
Requirement

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.



GUIDE BRACKET

Requirement

The guide bracket should be placed as far as possible to the left (rear view).

To Adjust

Position the guide bracket with its mounting screws loosened.

REAR FORM GUIDE

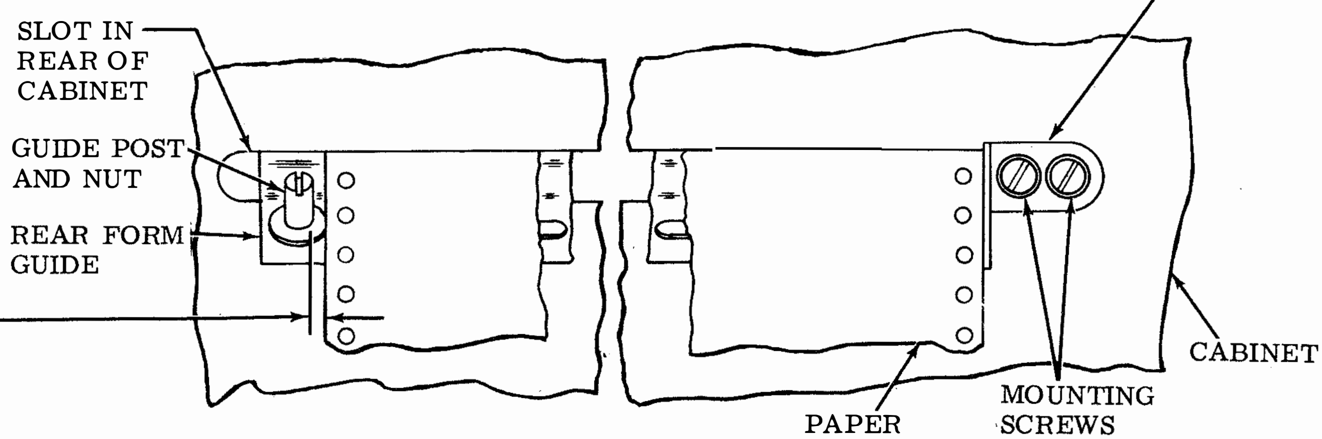
Requirement

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

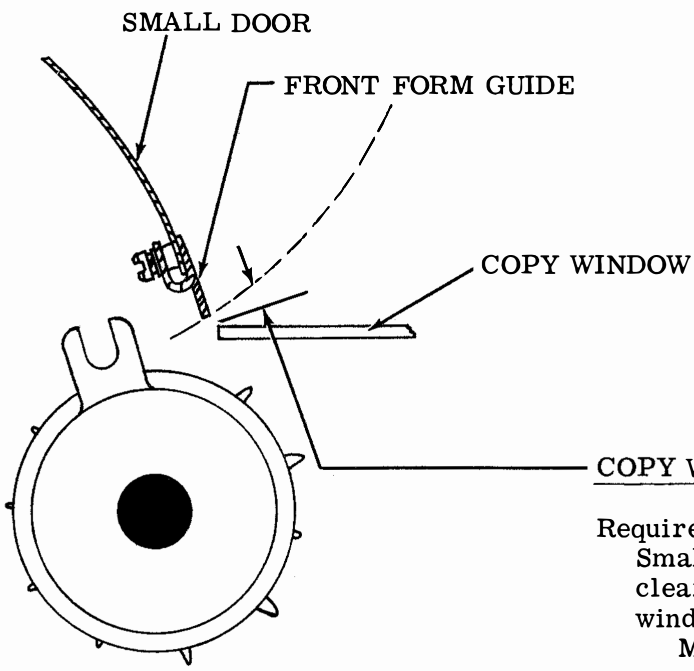
Min 3/64 inch---Max 5/64 inch

To Adjust

Position the guide post with its mounting nut loosened.



2.05 Form Guide (continued)



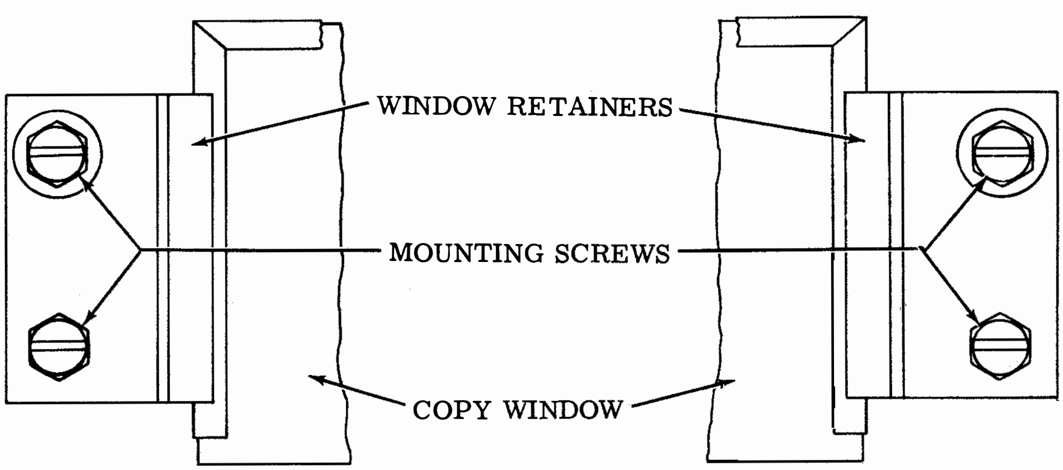
(LEFT SIDE VIEW)

COPY WINDOW

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.



(BOTTOM VIEW)

2.06 Signal Bell and Cradle

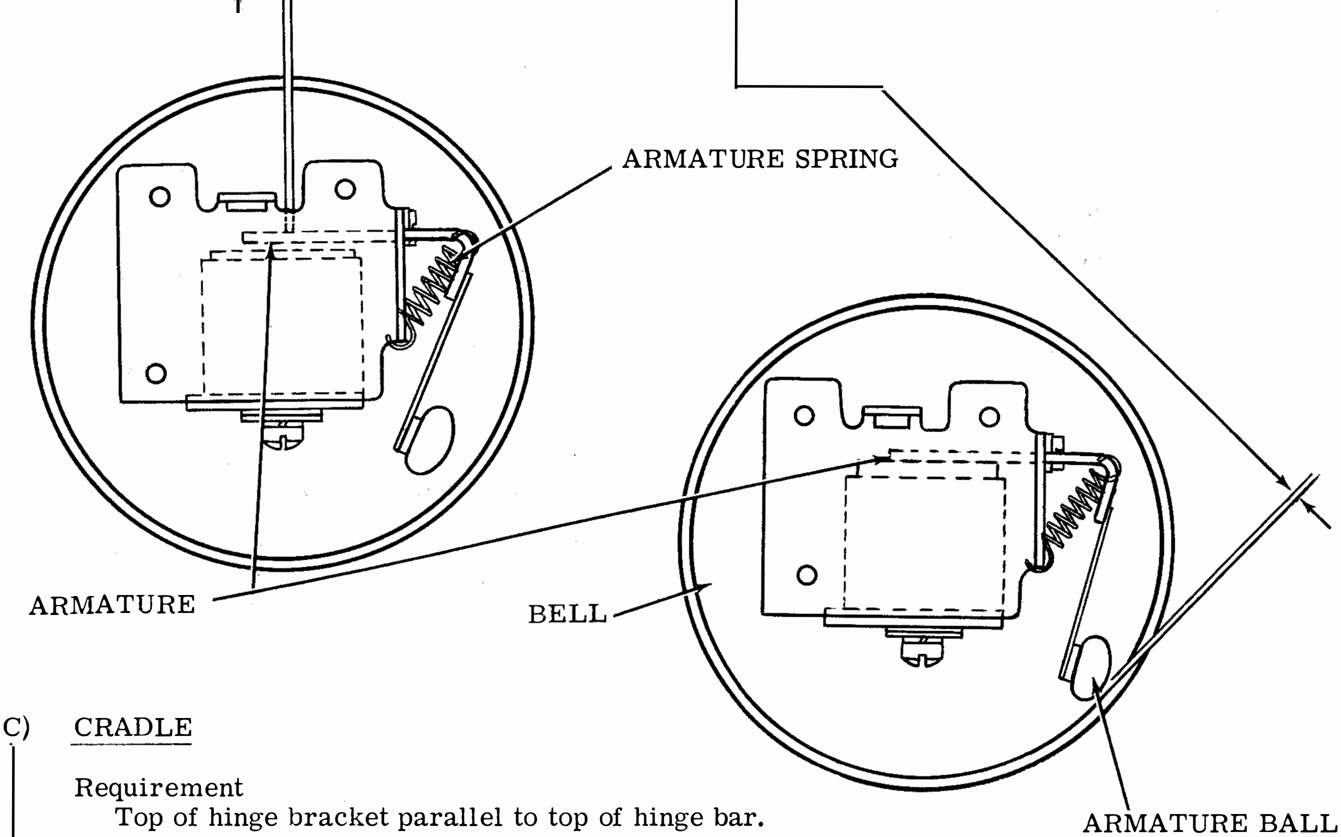
(A) ARMATURE SPRING TENSION

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

(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

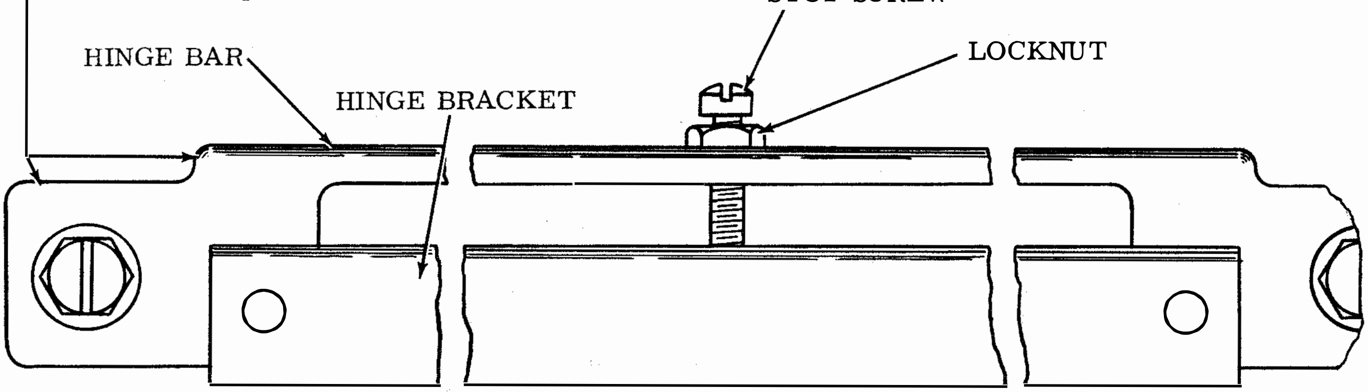
To Adjust
Bend the armature extension just below the armature spring.



(C) CRADLE

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

To Adjust
Turn stop screw with locknut loosened.

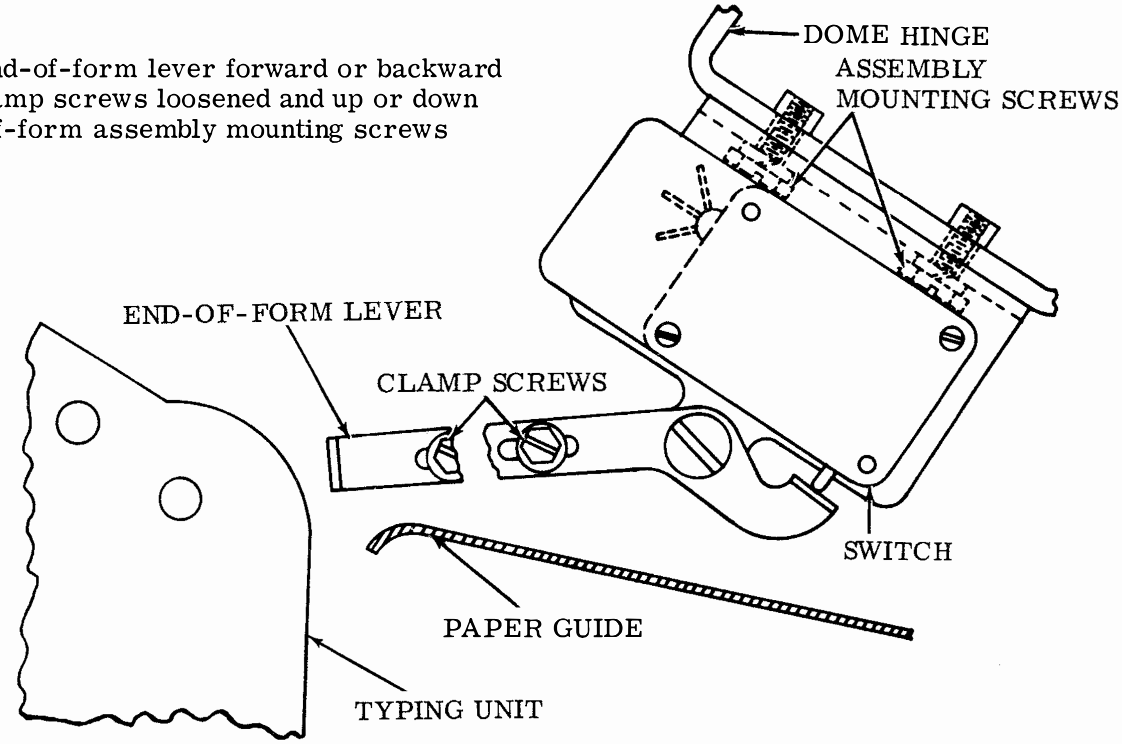


2.07 End-Of-Form Alarm Mechanism and Low-Paper and Paper-Out Switch Assembly

END-OF-FORM LEVER

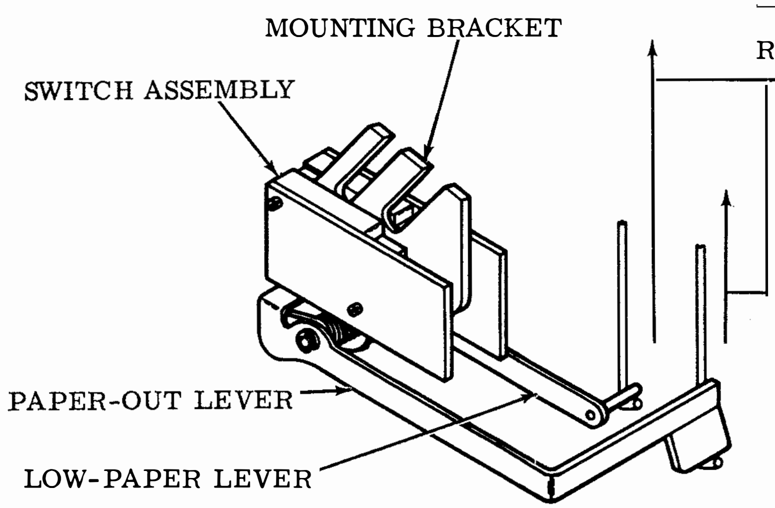
Requirement
End-of-form lever should move freely between typing unit and paper guide on the cabinet. Check with dome closed and small door open.

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.

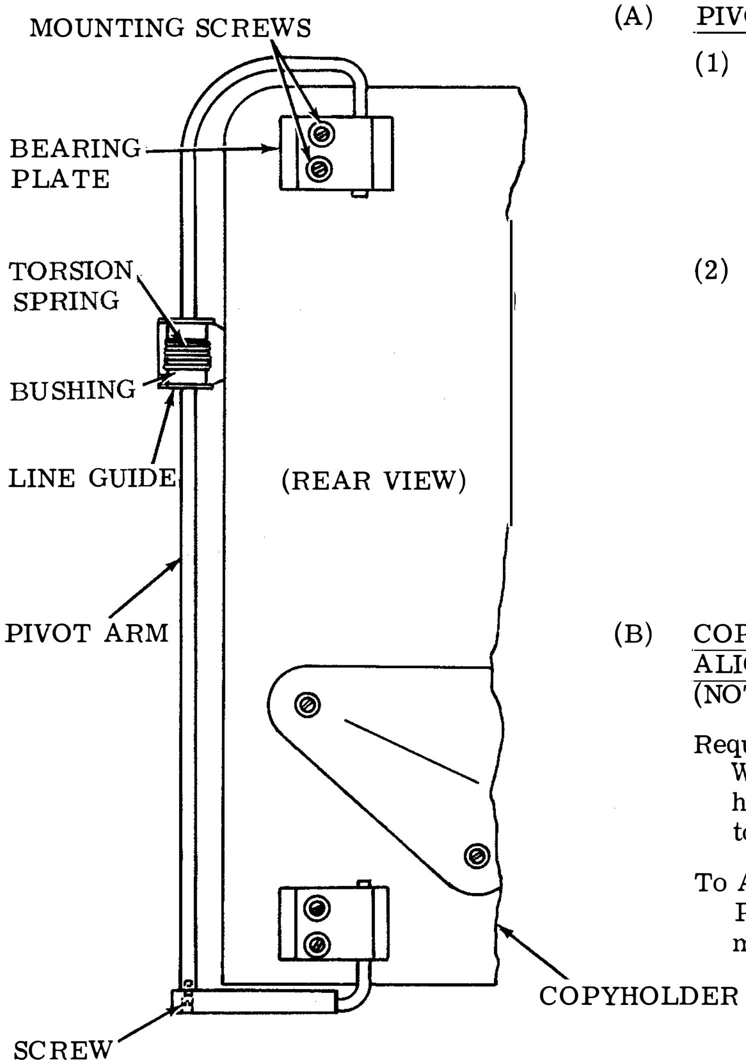


LOW-PAPER AND PAPER-OUT SPRING

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



(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.

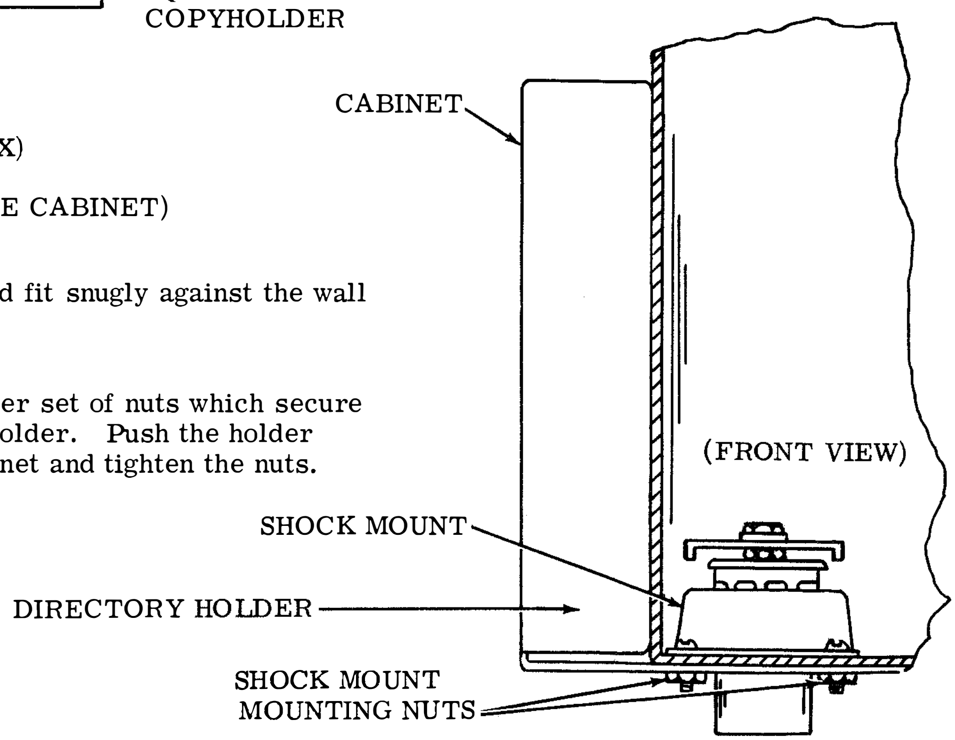
To Adjust
Position lower bracket along its elongated mounting holes by means of its two nuts.

2.09 Directory Holder (TWX)

DIRECTORY HOLDER (TABLE CABINET)

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

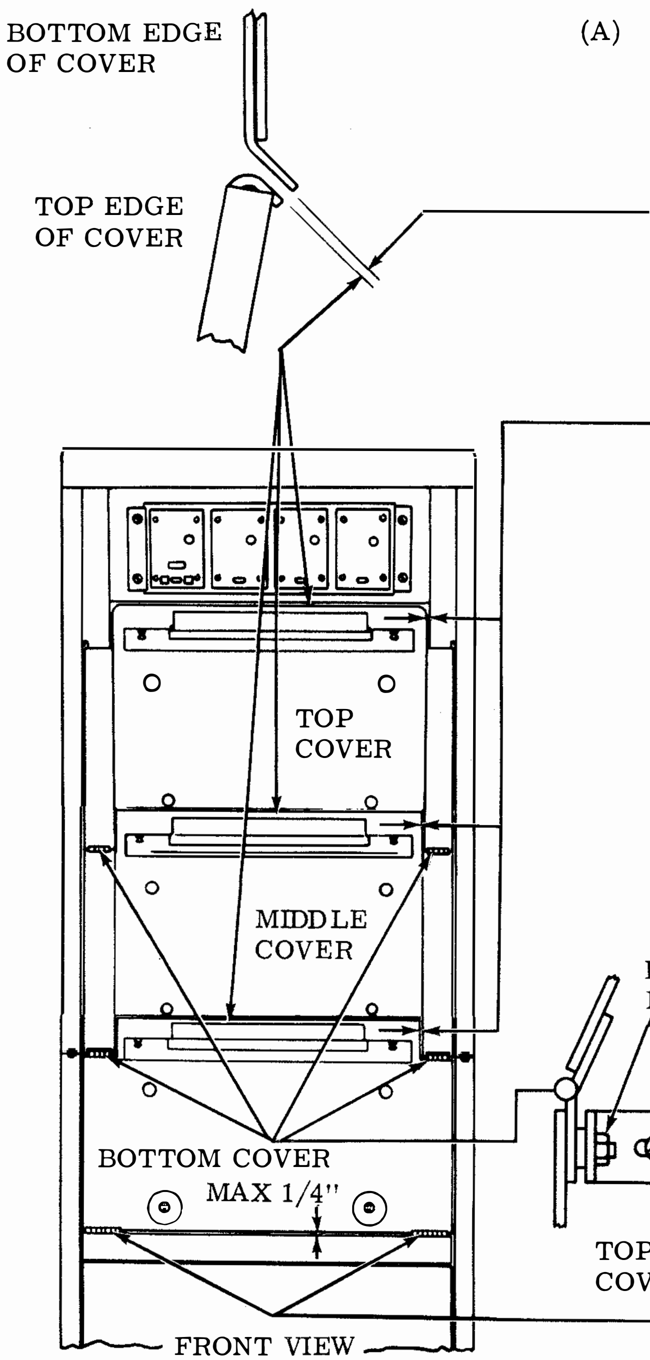
To Adjust
Loosen the four bottom inner set of nuts which secure the shock mounts and the holder. Push the holder against the wall of the cabinet and tighten the nuts.



LBAC — 28 LA Teletypewriter Cabinets

2.10 Printer Cover

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.

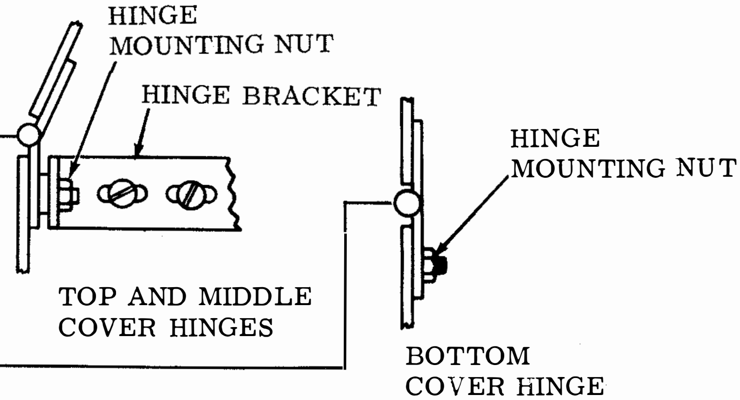
(2) Requirement
With covers closed, clearance between top edge of covers and bottom edge of adjacent covers should be approximately 1/16 inch. Covers must not touch when being opened.

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

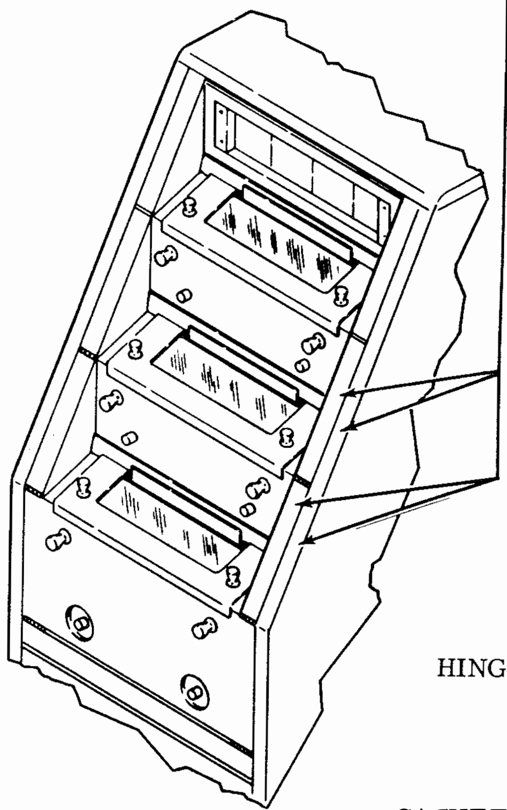
To Adjust
Position the covers with their hinge nuts friction tight.

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



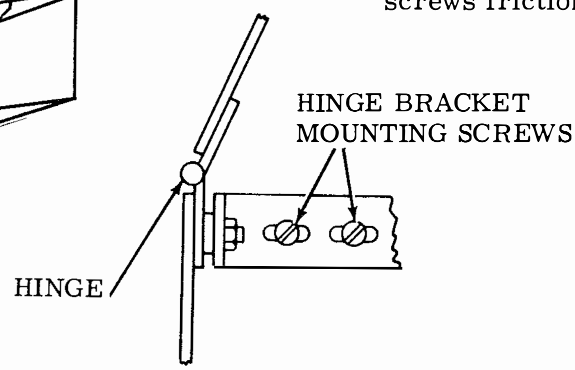
(A) TOP AND MIDDLE PRINTER COVER DEPTH

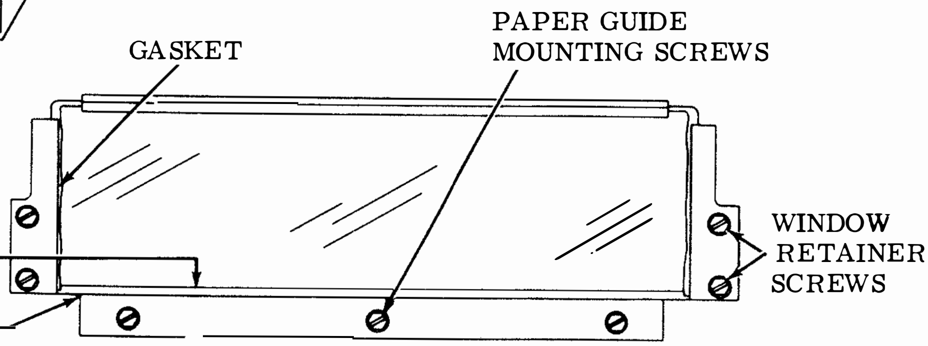
Requirement

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

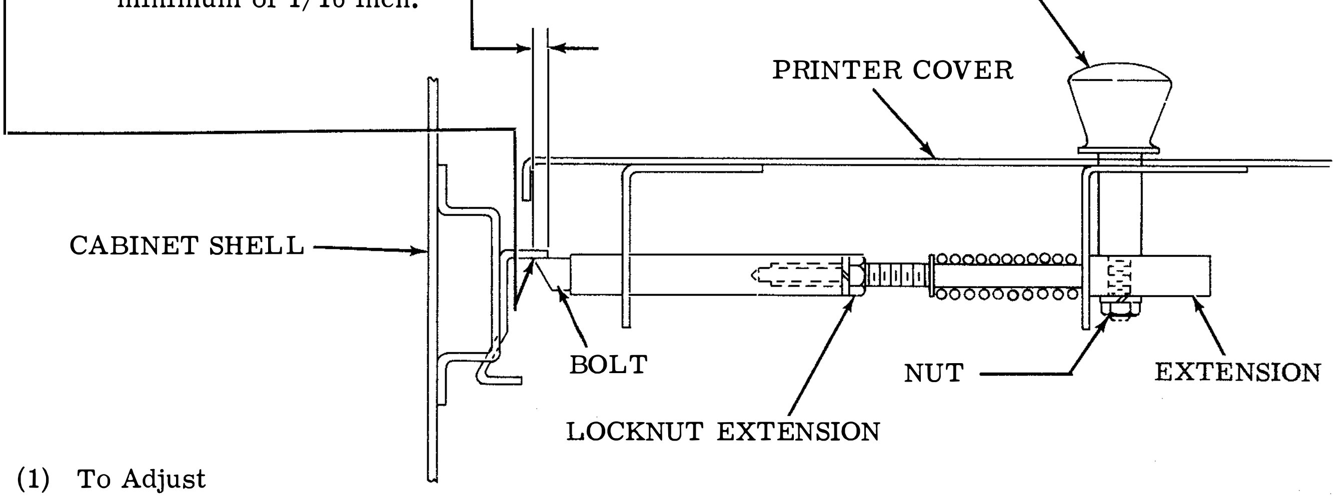
Position window with four window retainer screws loosened. Make sure gasket is between glass window and metal surface.

2.12 Cover Latches

PRINTER COVER LATCHES

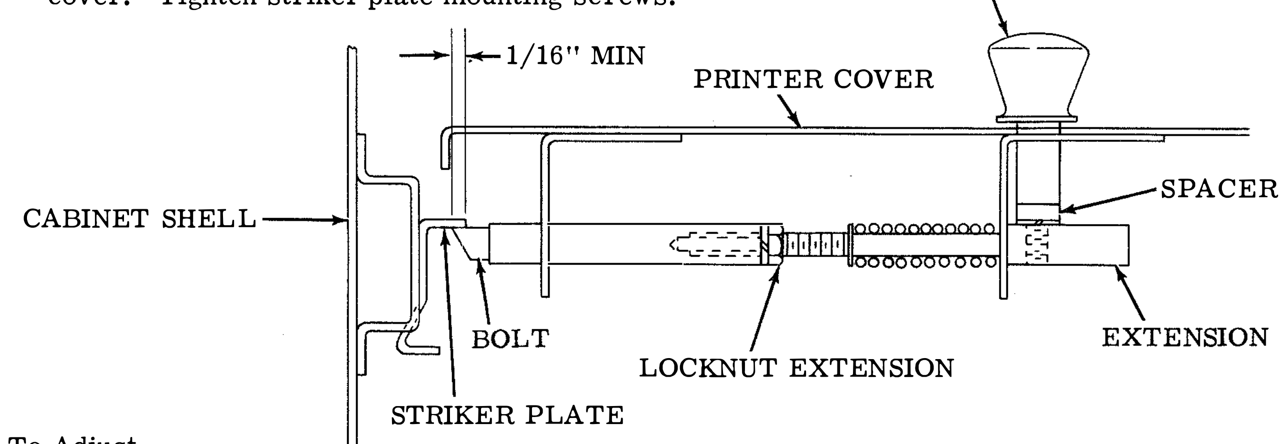
(1) Requirement
With cover in closed position, bolts should touch striker plates.

(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.

MIDDLE AND TOP COVER LATCHES



(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 thrumbscrews and lockwashers. Tighten extension locknuts.

LOWER COVER LATCHES

2.13 Shelf Slide Stops

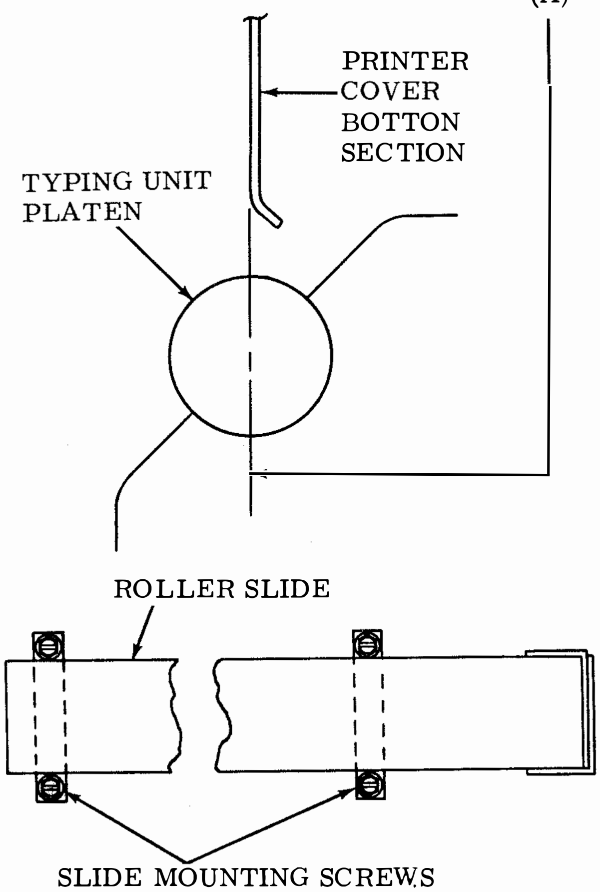
(A) SLIDE STOPS

(1) Requirement
With each printer unit in rearmost position, center of typing unit platen should be in line with front edge, plus or minus 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 1/16 inch forward - 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.

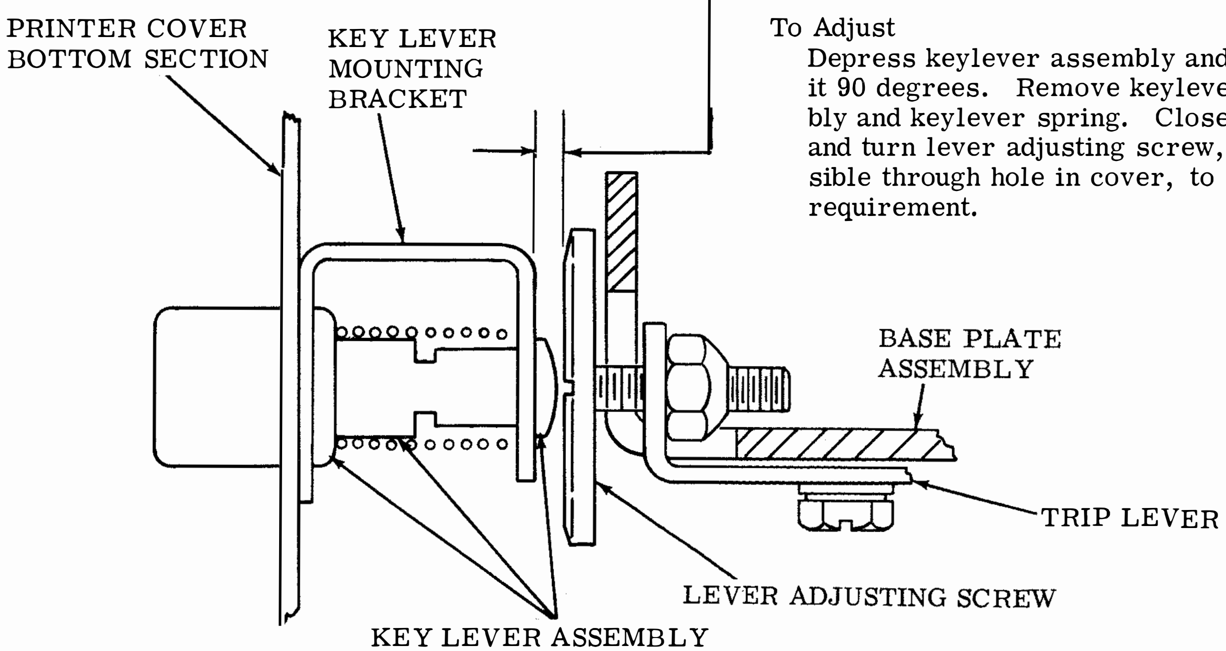
Note: This adjustment affects carriage return and line feed lever adjustments. Therefore, if slide stops are readjusted, carriage return and line feed levers should also be readjusted.



(B) CARRIAGE RETURN AND LINE FEED LEVERS

Requirement (each printer cover)
With printer cover closed
Min 3/32 inch---Max 5/32 inch clearance between head of lever adjusting screw and rear surface of keylever mounting bracket.

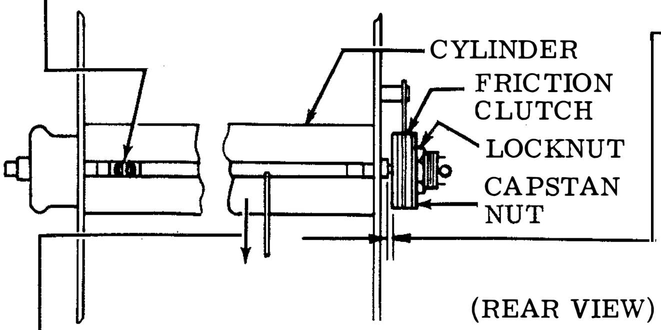
To Adjust
Depress keylever assembly and rotate it 90 degrees. Remove keylever assembly and keylever spring. Close cover and turn lever adjusting screw, accessible through hole in cover, to meet requirement.



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.



(REAR VIEW)

(A) PAPER SPINDLE SHAFT ENDPLAY

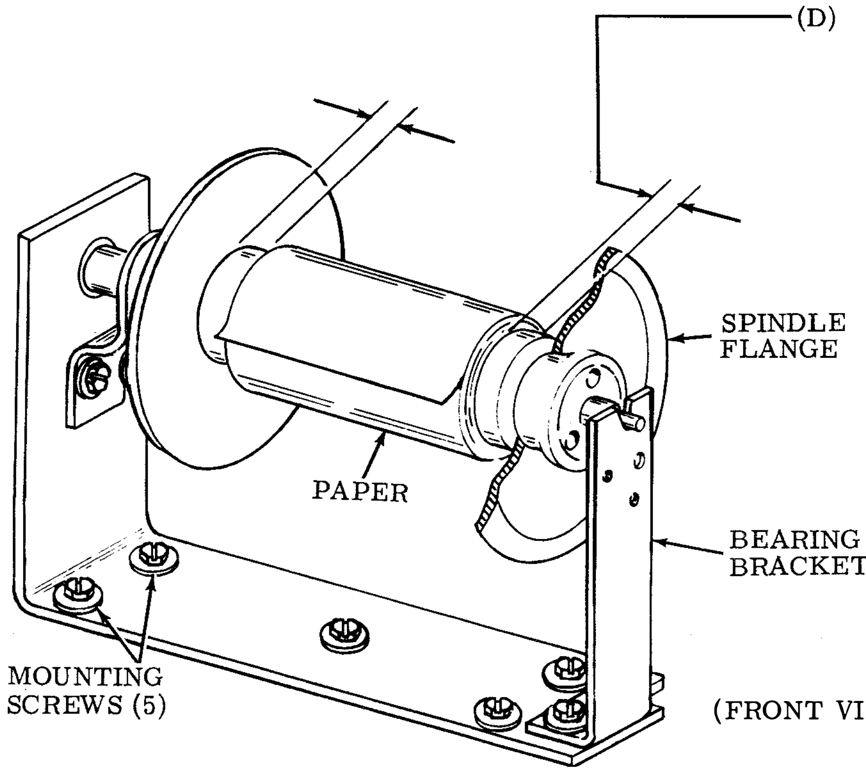
Requirement
Clearance between shoulder of shaft and friction drive assembly should be 1/32 inch. Left end of shaft should touch wick in friction drive assembly.

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.



(FRONT VIEW)

(D) WINDER ASSEMBLY

Requirement
Equal clearance between edges of paper and spindle flanges.

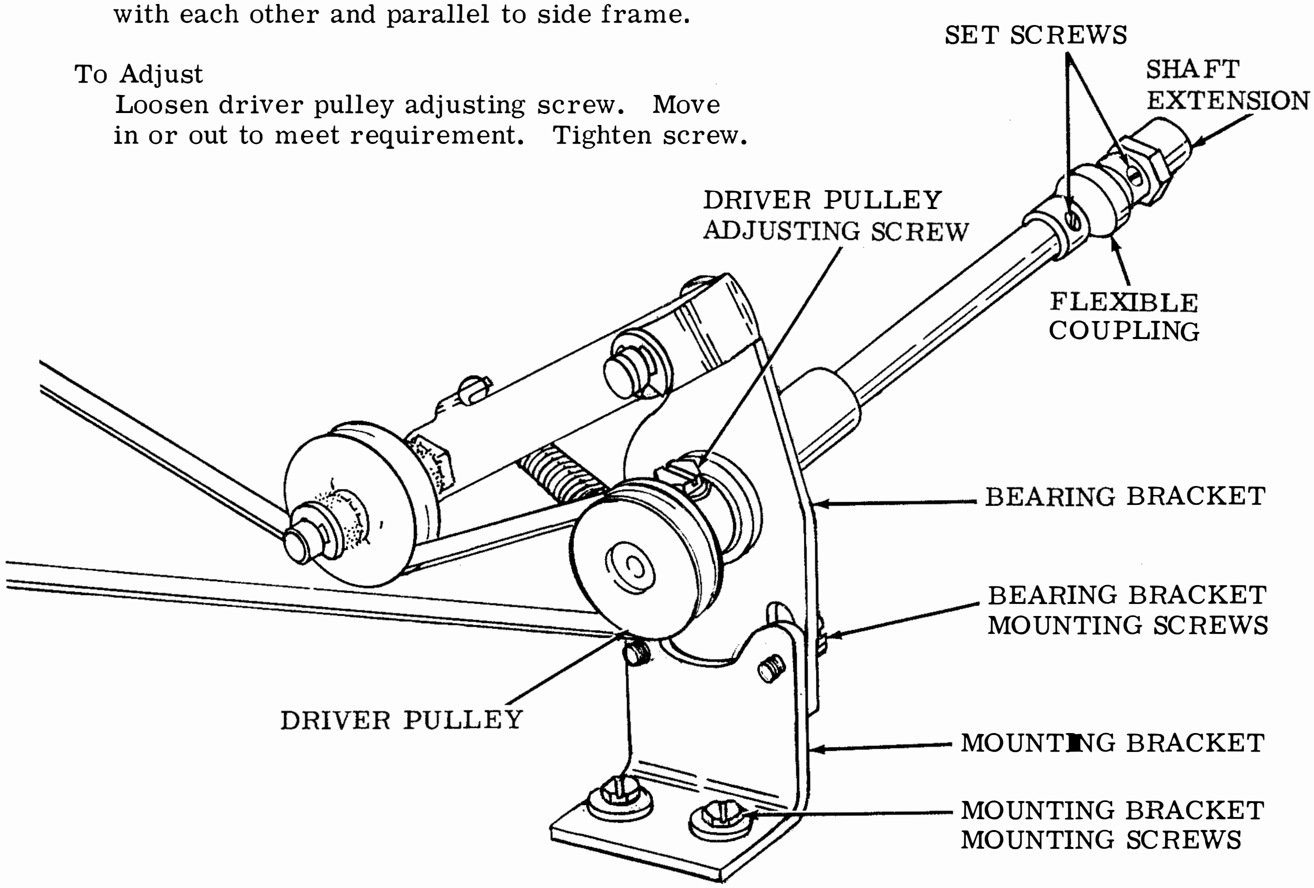
To Adjust
Thread paper around platen of typing unit. Grasp edges of paper as it comes around top of platen roller and align them with edges of paper being fed into platen. Pull top free edge of paper so there is no slack and lock paper on platen. Feed paper manually until it can be threaded onto winder 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.

LPC (Skintight) — 28A Teletypewriter Cabinets

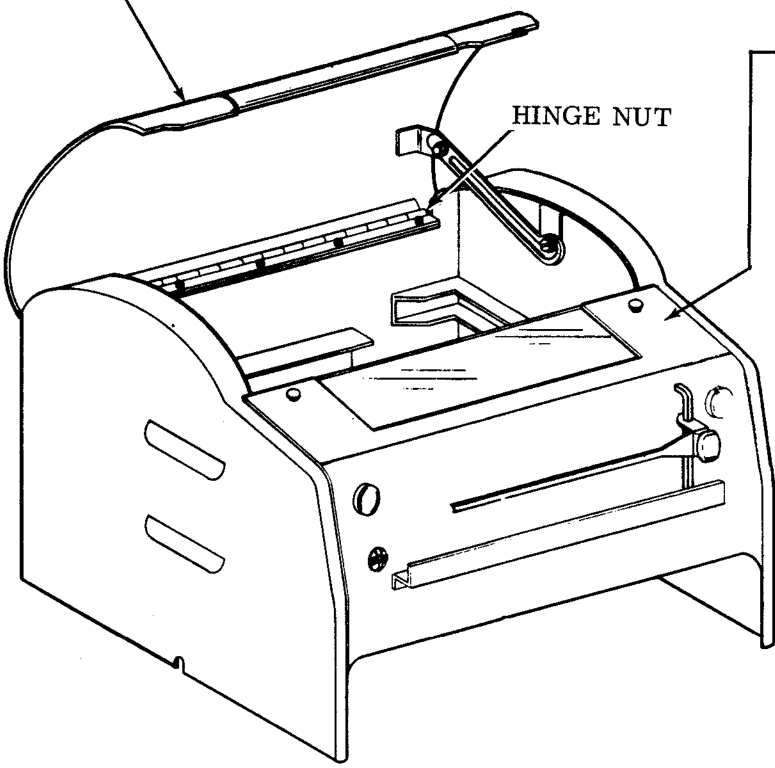
2.16 Dome

(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)

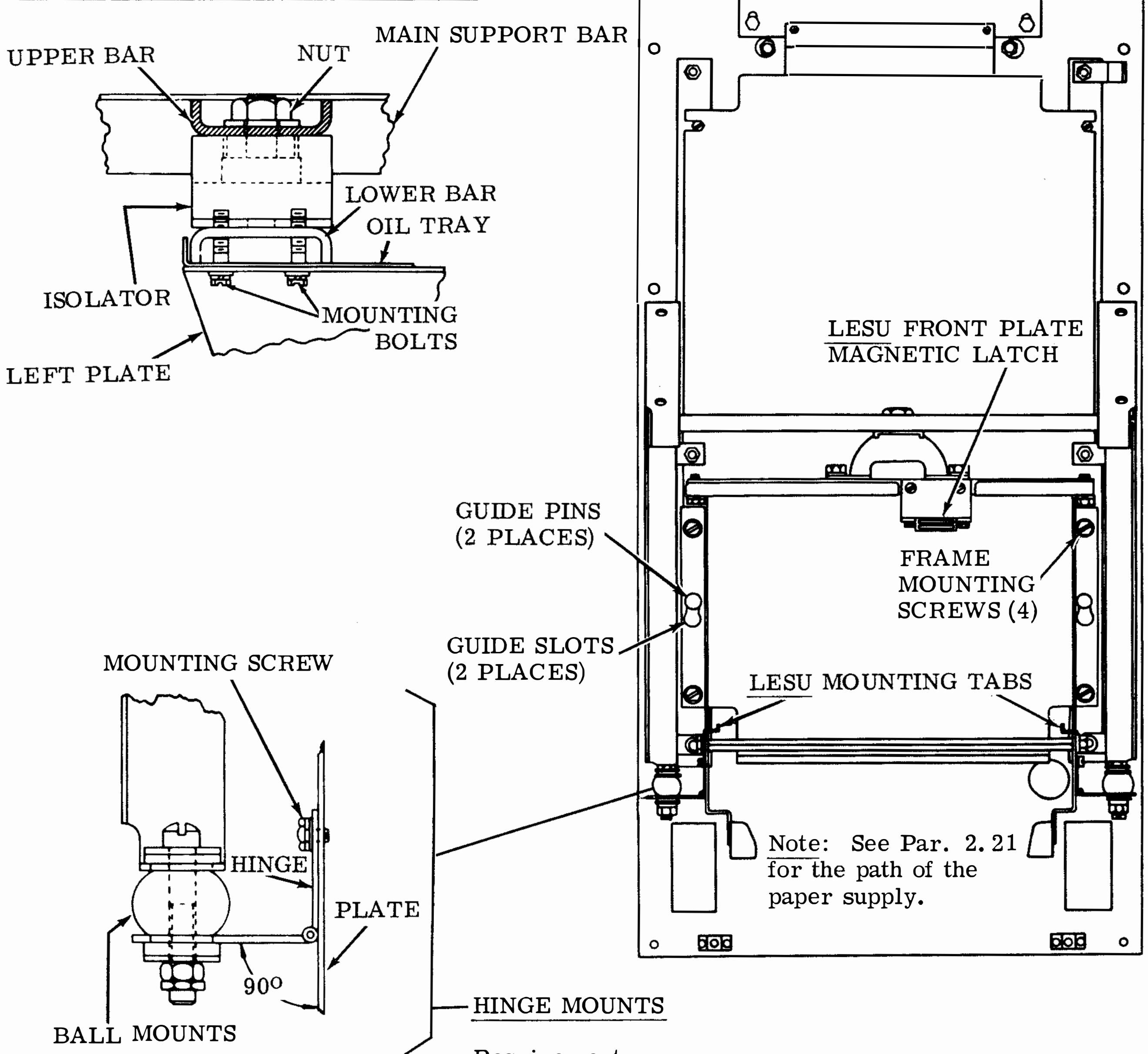
Requirement
As small door is opened, it should clear projection on rear lid by
Min 0.005 inch---Max 0.015 inch

To Adjust
Position the window with its mounting screws (4) loosened.

LPC (Multiple Mount) — 28L and 28M Teletypewriter Cabinets

2.17 Hinge Mount

WALL MOUNTED PRINTER CABINET



HINGE MOUNTS

Requirement

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

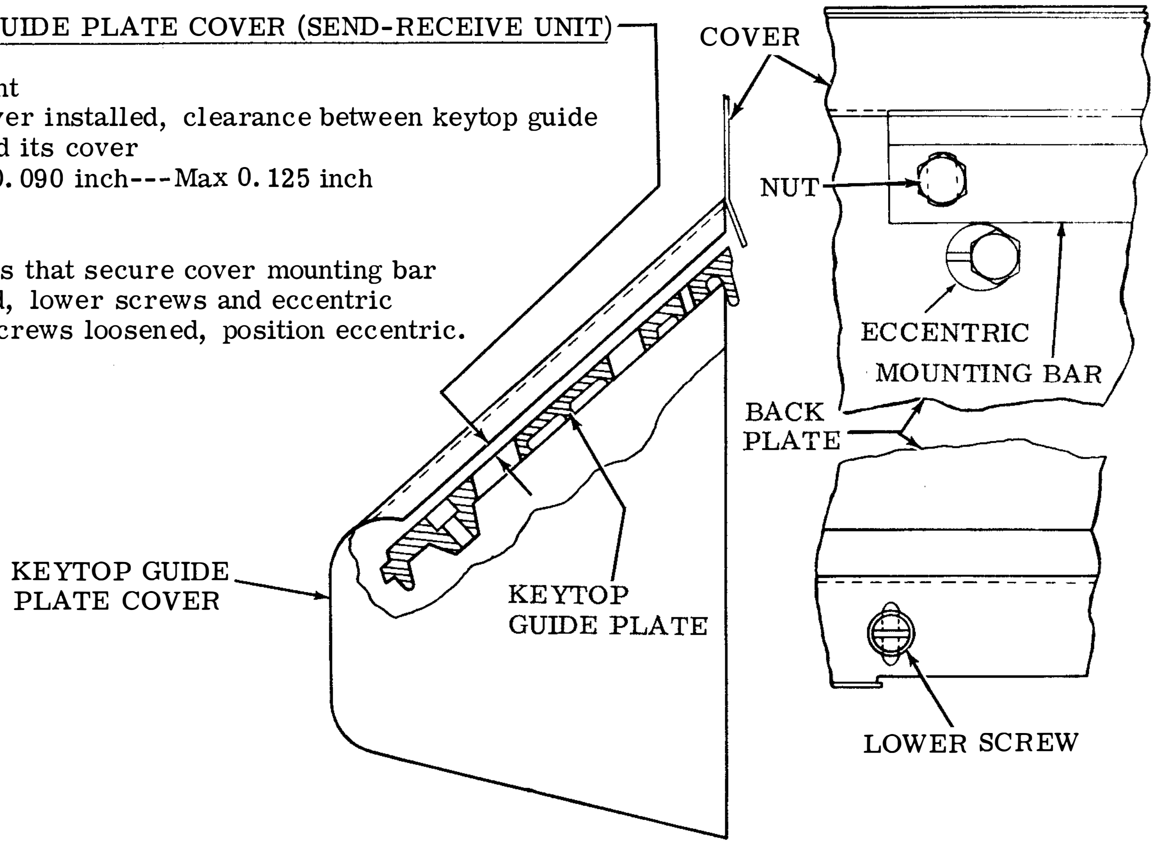
Position right and/or left hinge upward or downward with its mounting screws loosened.

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

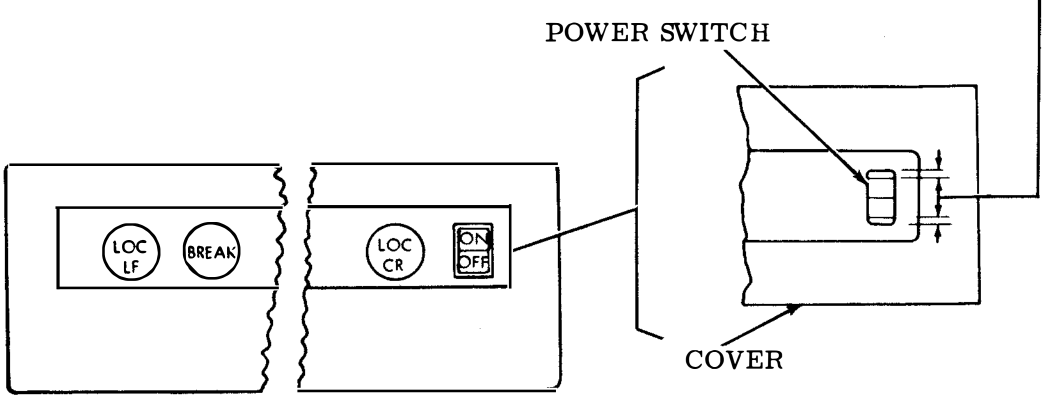
To Adjust
With nuts that secure cover mounting bar loosened, lower screws and eccentric clamp screws loosened, position eccentric.



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.



KEYTOP LOCATION

2.19 Keytop Guide Plate continued

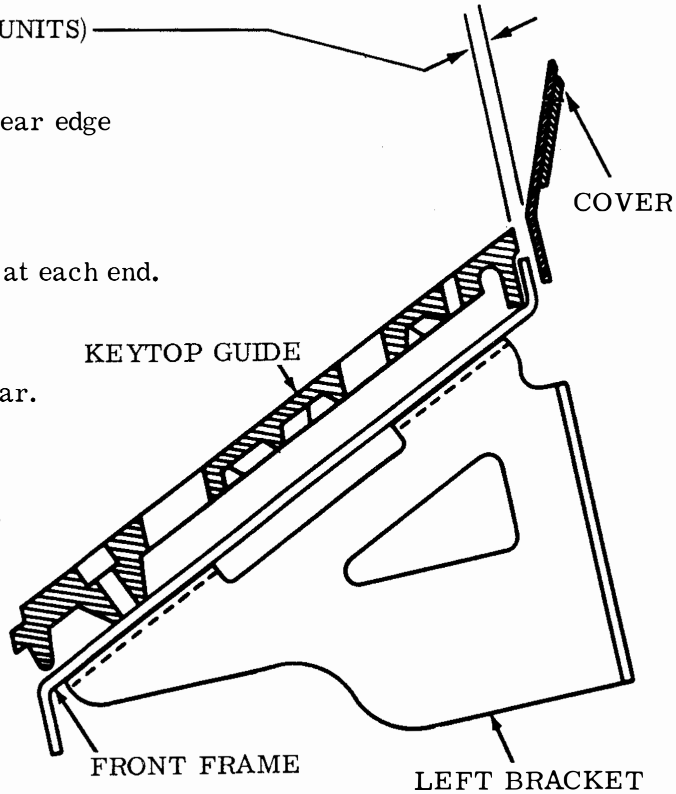
KEYTOP GUIDE AND COVER (SEND-RECEIVE UNITS)

(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.

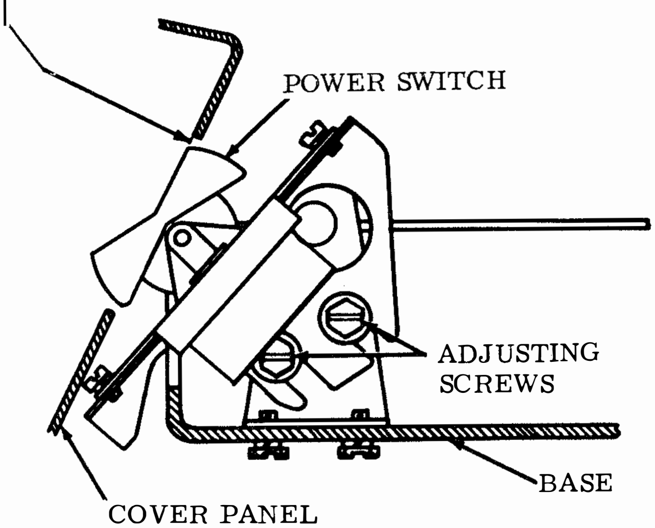
(2) To Adjust
With four bolts that secure lower support bar loosened, position lower support bar.

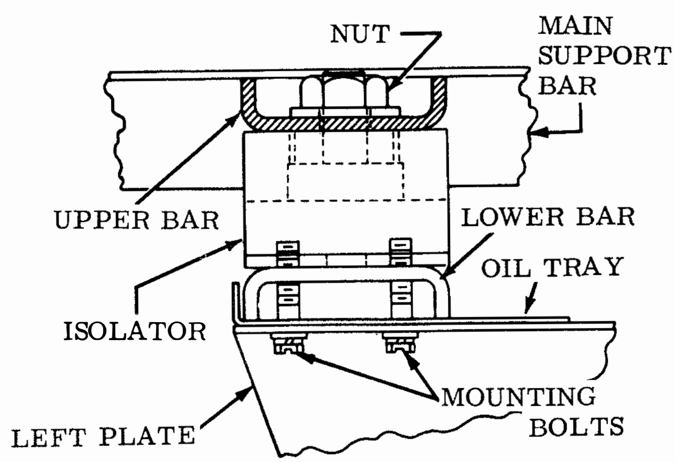


POWER SWITCH

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).

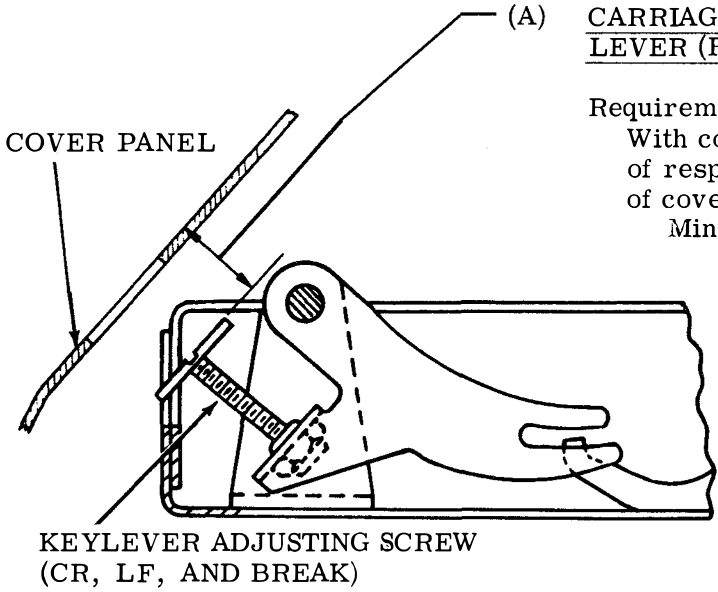
To Adjust
With cover removed, position switch with its adjusting screws loosened.





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

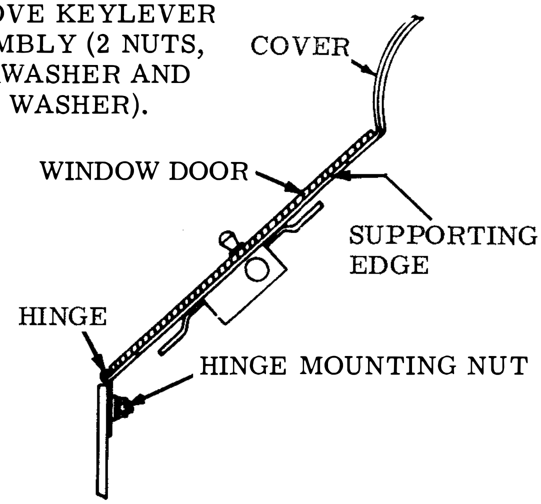
To Adjust
Remove each keylever assembly (3) from cover (see Par. 2.18). Then replace cover and position each adjusting screw through hole in cover (slot in screw should be horizontal after adjusting).

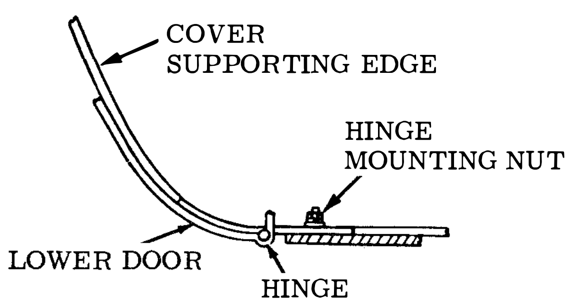
REMOVE KEYLEVER ASSEMBLY (2 NUTS, LOCKWASHER AND FLAT WASHER).

(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

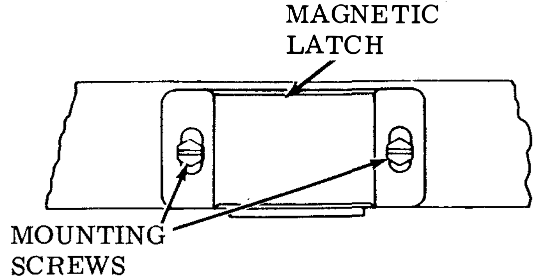
Requirement
Door should lie flat against cover.

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

(D) LOWER DOOR LATCHES

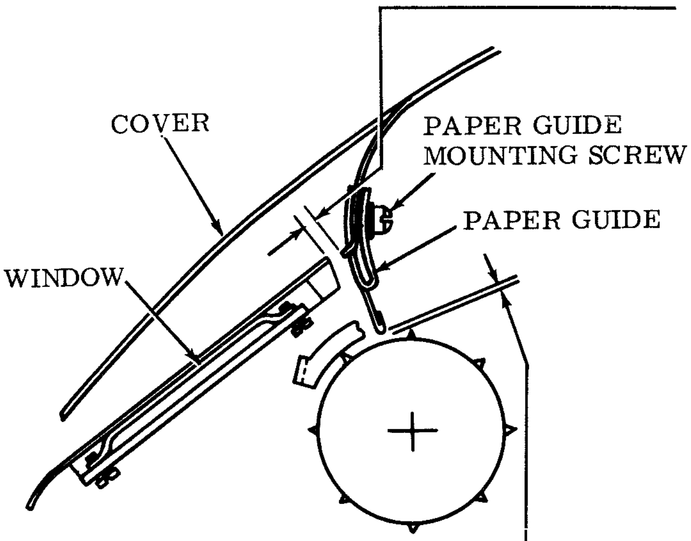
Requirement
Door should latch firmly and lie flat against cover.

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



(B) WINDOW

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

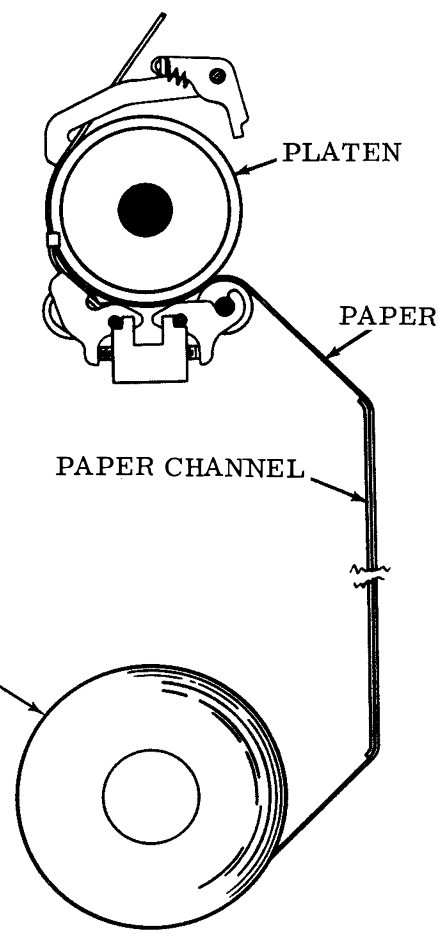
To Adjust
With window clamp mounting screws loosened (4), position the window.

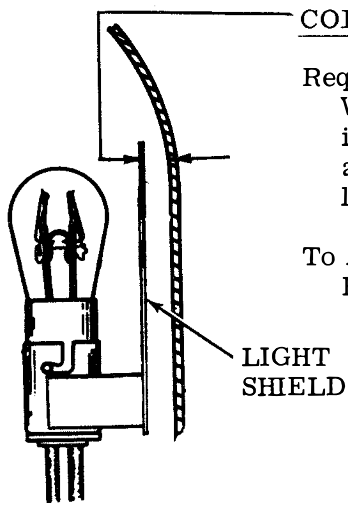
(A) PAPER GUIDE

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.

PATH OF PAPER





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.

28 ELECTRICAL SERVICE UNITS

ADJUSTMENTS

CONTENTS PAGE

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.

2. REQUIREMENTS AND ADJUSTMENTS

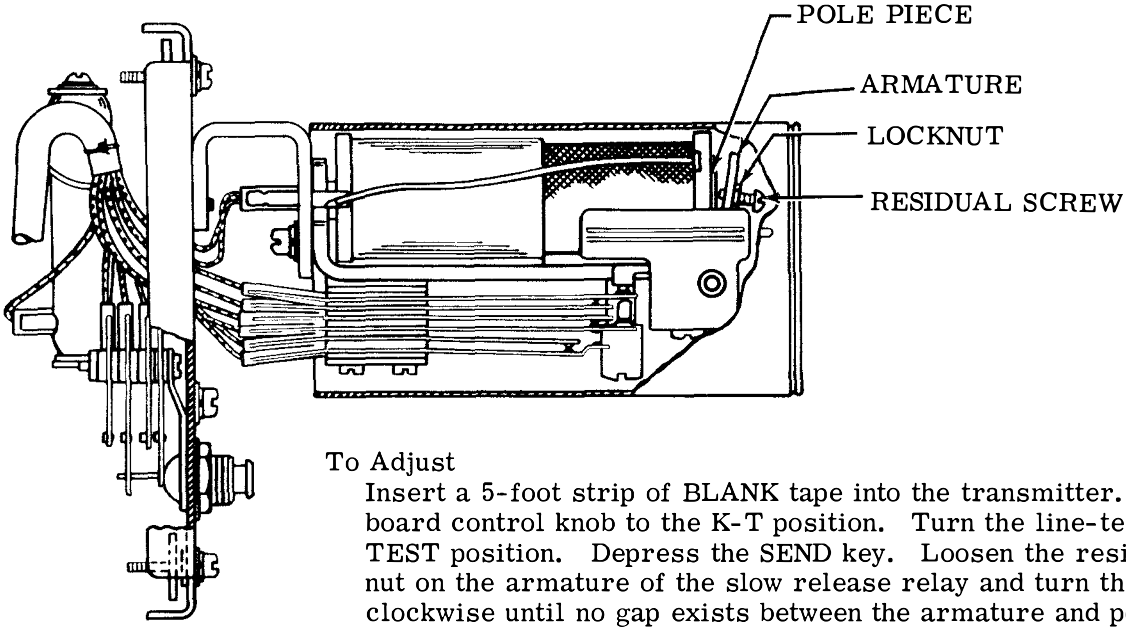
2.01 28G and 28G-1 Electrical Service Unit

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.

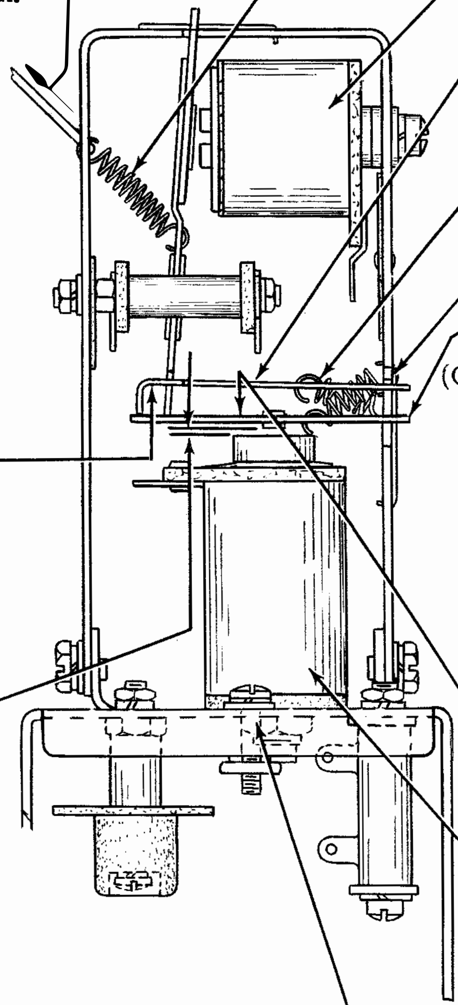
2.02 Electrical Motor-Control Mechanism (if Equipped)

(A) STOP ARMATURE SPRING

Requirement
Stop armature latched on start armature. Stop armature spring unhooked.
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

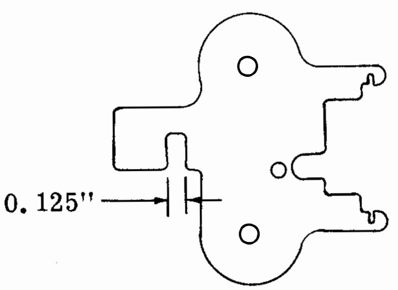
Requirement
Stop armature in attracted position. Intermediate lever held upward. 8 oz scale applied to start armature at right of intermediate lever lower extension
Min 2-1/2 oz
Max 4 oz
to hold start armature against cores.

(D) START MAGNET CORE

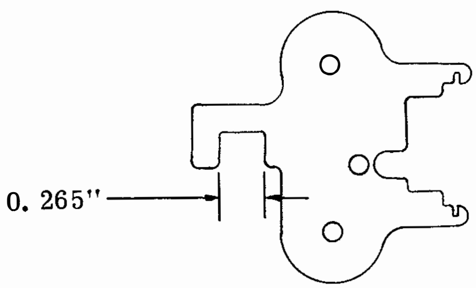
Requirement
Stop armature in unattracted position. Clearance between the start magnet core and anti-freeze rivet on the start armature

Armature	TP151409	TP152849
Min	0.003 inch	0.010 inch
Max	0.010 inch	0.015 inch

To Adjust
Advance or retard the start magnet cores with screwdriver (locknut loosened).



TP151409 ARMATURE



TP152849 ARMATURE

2.03 Relay Motor-Control Mechanism (if Equipped)

SWITCH POSITICN (IF UNIT IS SO EQUIPPED)

Requirement

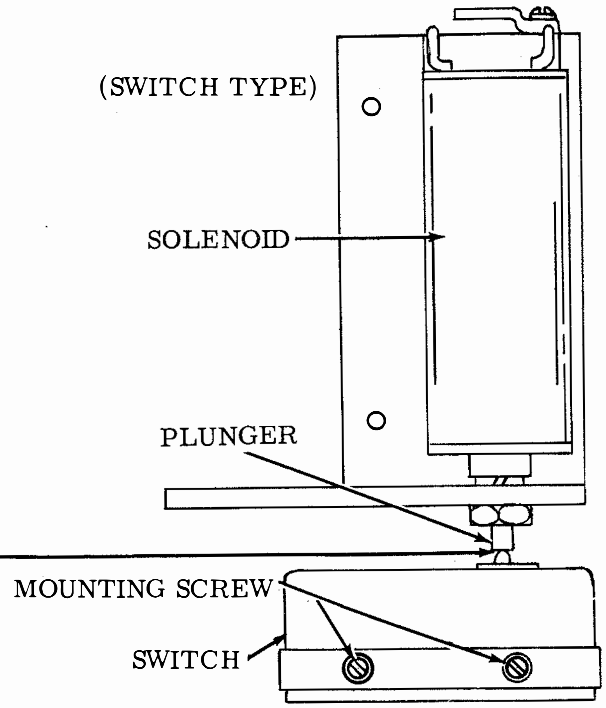
When the solenoid plunger is depressed slowly, the switch should operate when the plunger is within

Max 0.005 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

Min 2 oz---Max 3 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.

Min 12 oz---Max 16 oz

to break contact with the middle contact spring.

To Adjust

Form outer contact spring with suitable spring bender.

(C) INNER CONTACT SPRING GAP

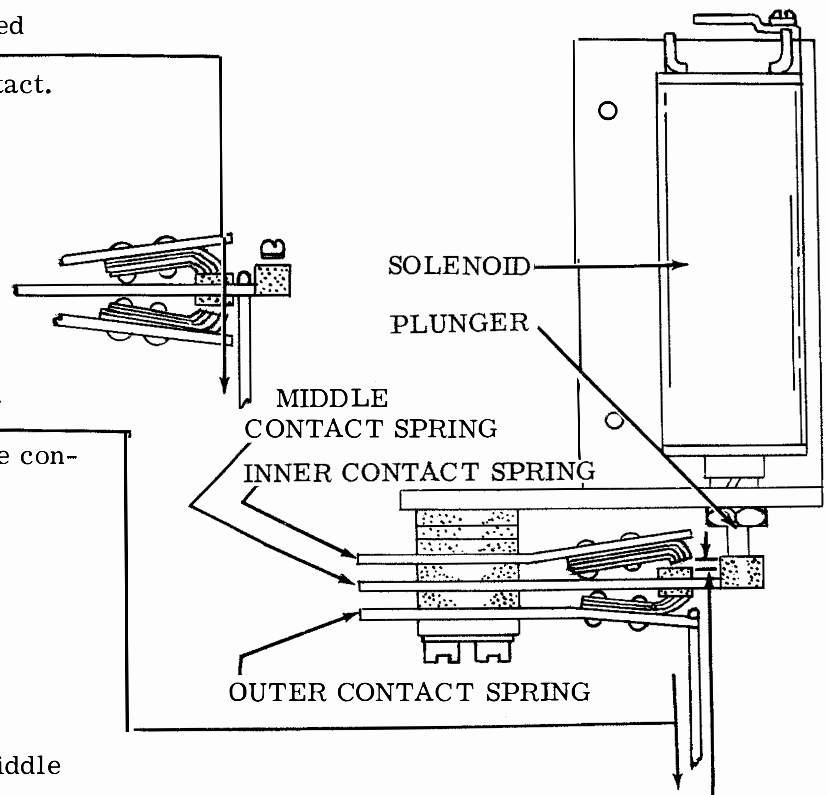
Requirement

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

Min 0.025 inch---Max 0.030 inch

To Adjust

Form inner contact spring with suitable spring bender.



2.04 Signal Bell

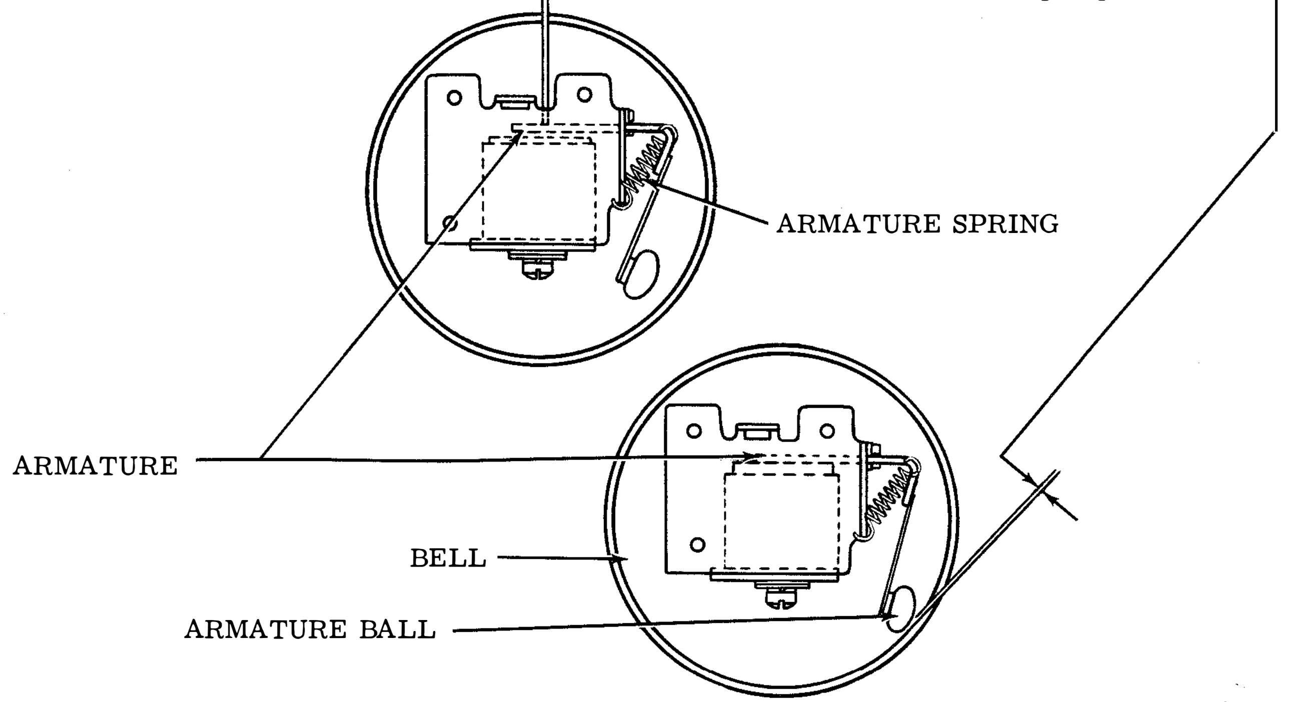
(A) ARMATURE SPRING TENSION

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

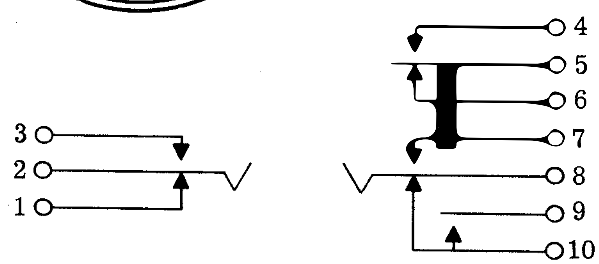
To Adjust
Bend the armature extension just below the armature spring.

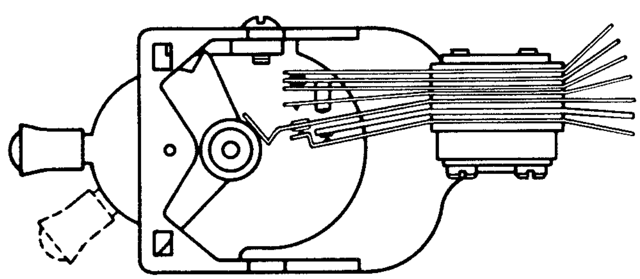


2.05 Line Test Key Assembly (if Equipped)

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.

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.

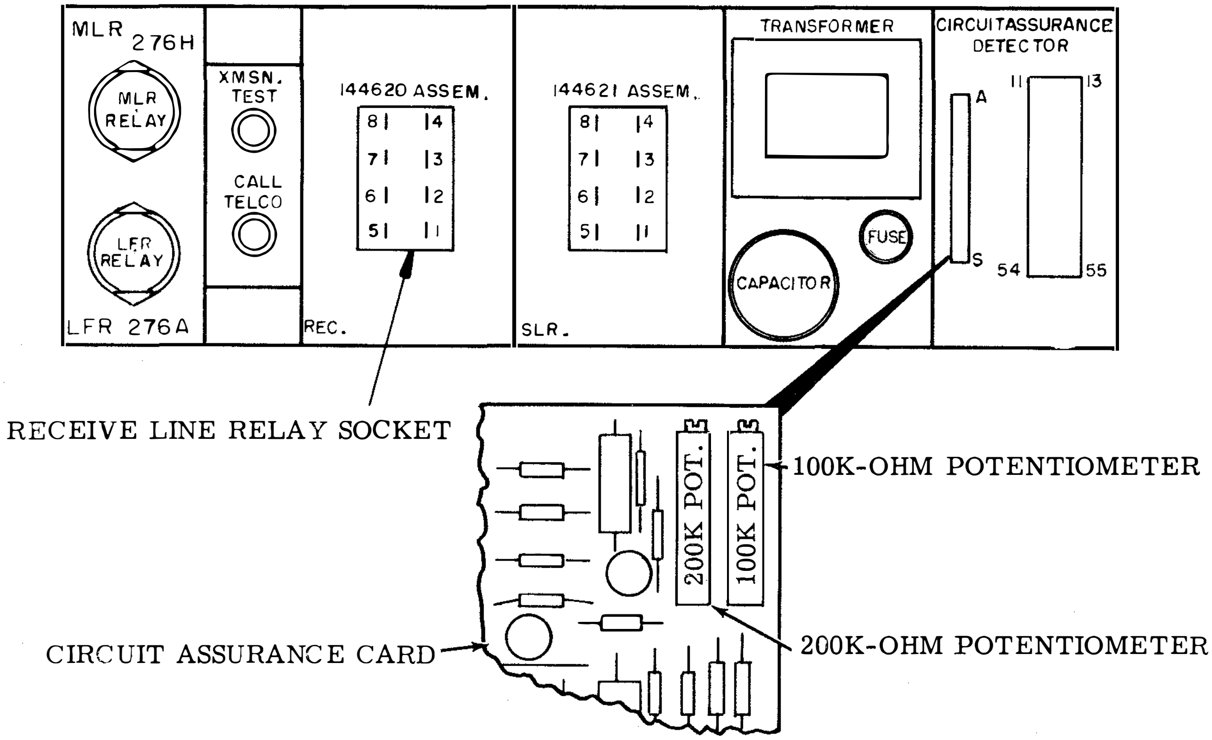
(d) Three feet punched with V only.

(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.



(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 CONNECTION LOST alarm operates. Then rotate the adjusting screw clockwise until the CONNECTION LOST 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)

ADJUSTMENTS

CONTENTS PAGE

CONTENTS PAGE

CONTENTS PAGE

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.

Note: When the signal generator shaft is rotated by hand, the clutch does not fully disengage upon reaching its stop position. In order to relieve drag and permit the main shaft to rotate freely, apply pressure on the lug of the clutch disc with a screwdriver to cause it to engage its latchlever and fully disengage the clutch.

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

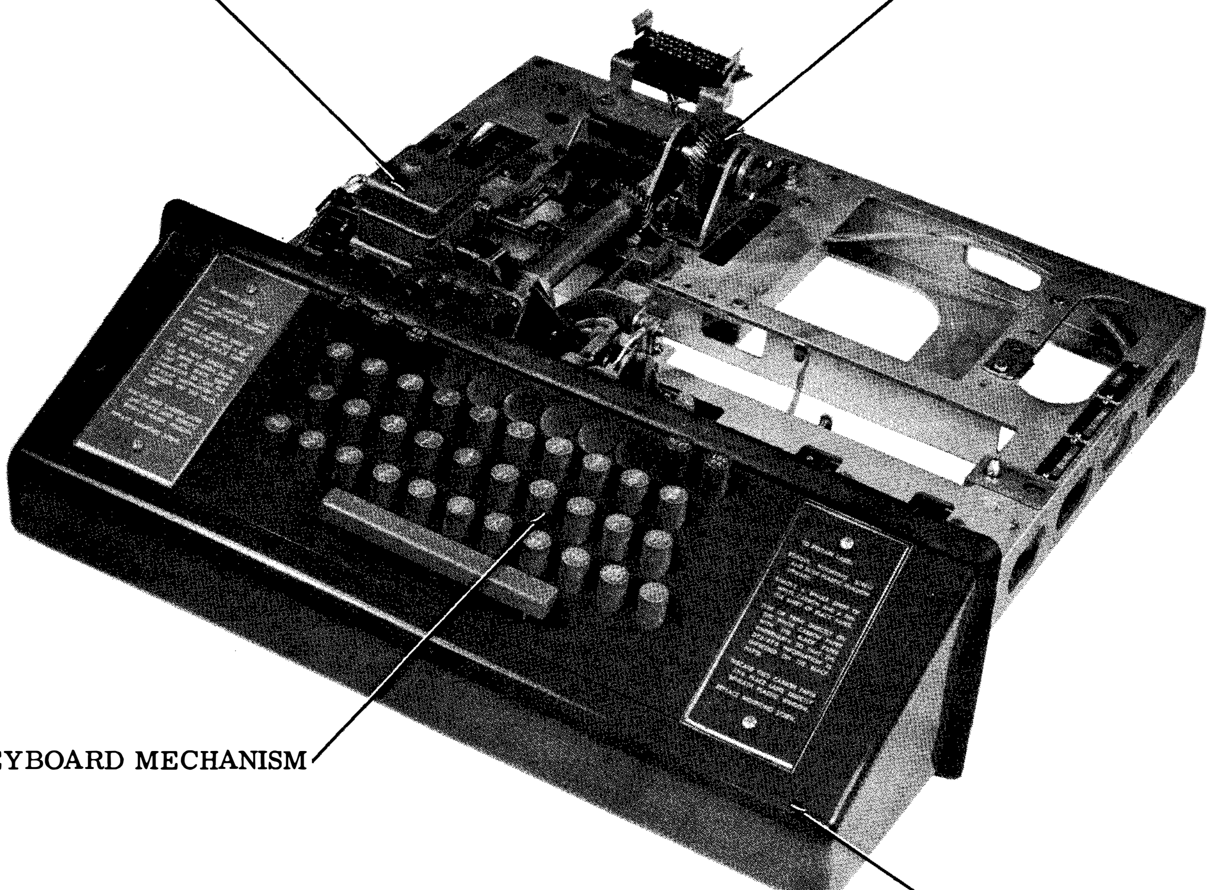


Figure 1 - 28 Teletypewriter Base (KSR)

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.

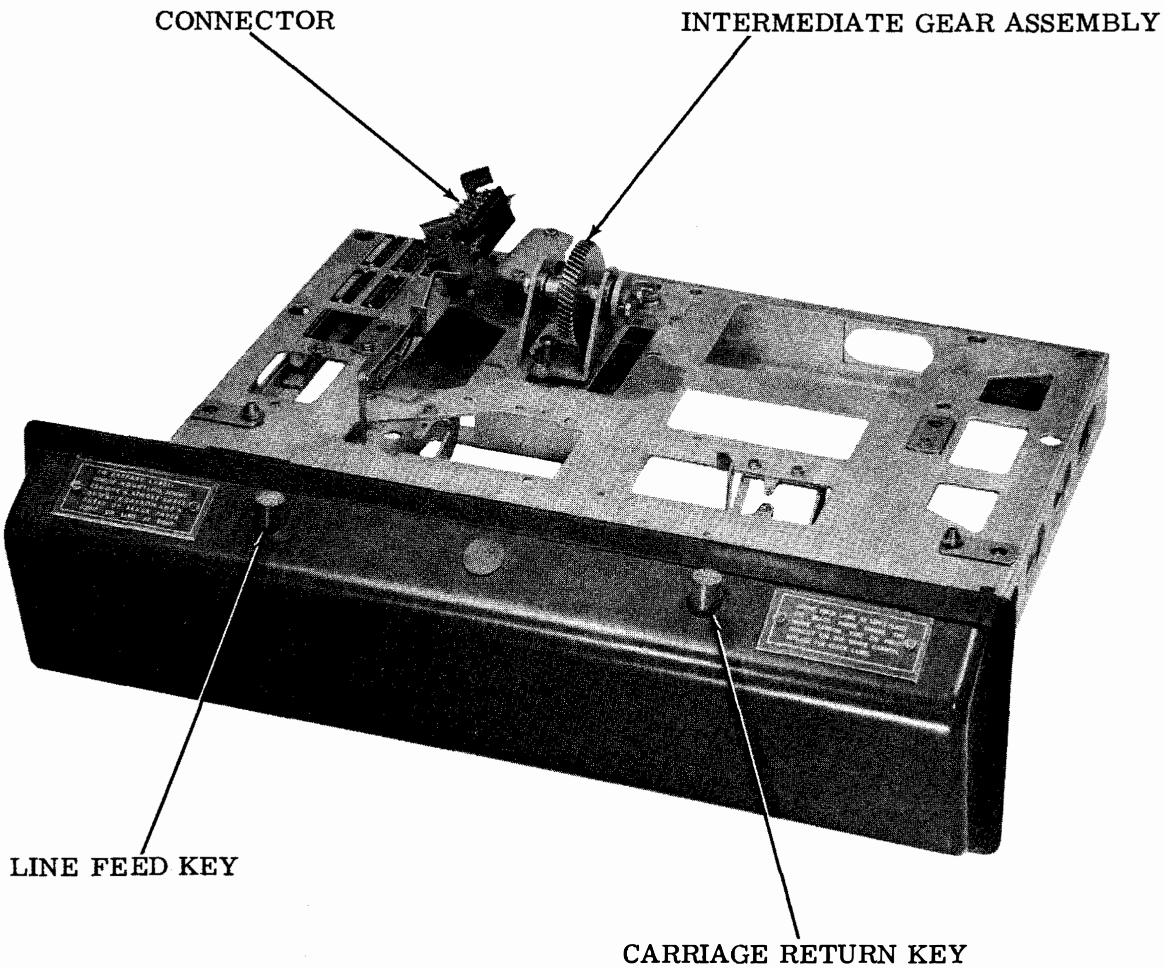


Figure 2 - 28 Teletypewriter Base (Receiving-Only)

2. BASIC UNIT

2.01 Codebar Assembly

NOTE: REMOVE PERFORATOR TRANSMITTER BASE FROM CABINET BEFORE ADJUSTING CODE BARS.

(B) CODE LEVER UNIVERSAL BAIL SPRING

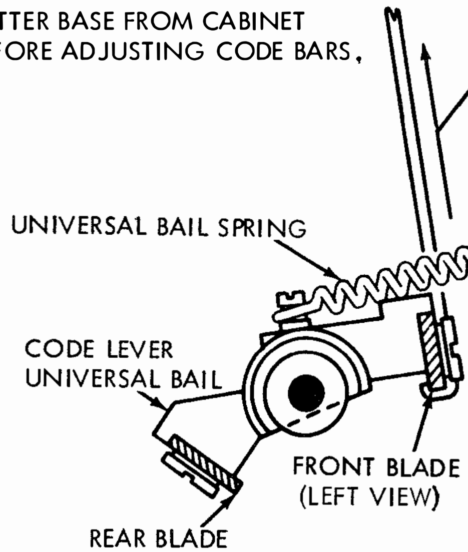
REQUIREMENT

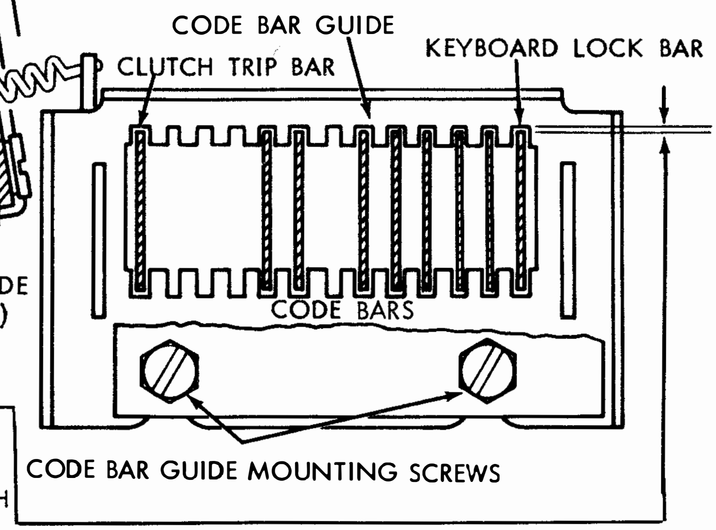
GENERATOR CLUTCH DISENGAGED. UNIVERSAL BAIL LATCH IS HELD OUT OF CONTACT WITH THE BAIL.

MIN 1 OZ

MAX 2 OZ

TO START BAIL MOVING.





(A) CODE BAR GUIDE CLEARANCE

REQUIREMENT

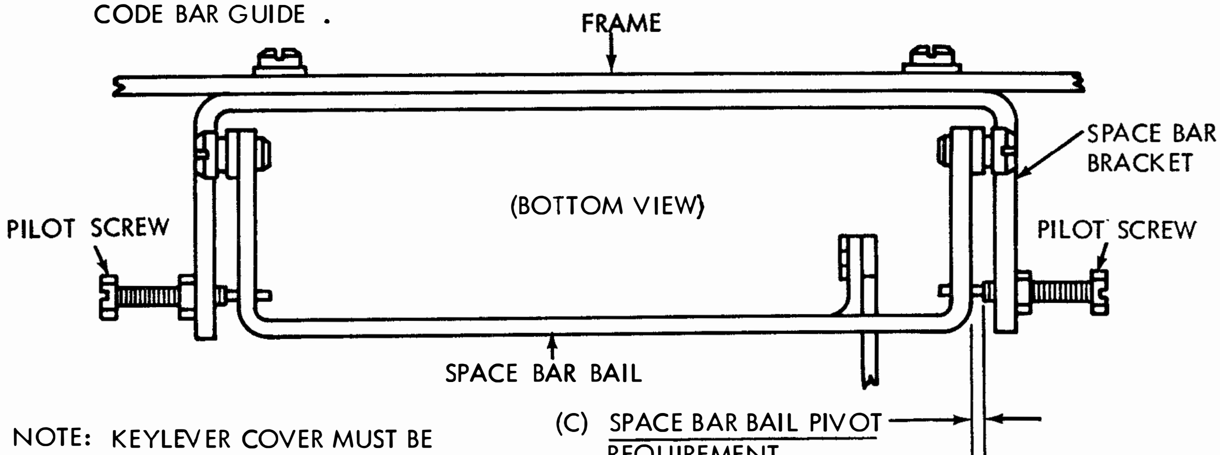
ALL CODE BARS SHOULD MOVE FREELY WITHOUT BINDS INCLUDING THE CLUTCH TRIP BAR AND KEYBOARD LOCK BAR.

MIN SOME

MAX 0.010 INCH

TO ADJUST

LOOSEN MOUNTING SCREWS AND POSITION CODE BAR GUIDE .



NOTE: KEYLEVER COVER MUST BE REMOVED. SEE DISASSEMBLY AND REASSEMBLY.

(C) SPACE BAR BAIL PIVOT

REQUIREMENT

MIN SOME END PLAY.

MAX 0.010 INCH

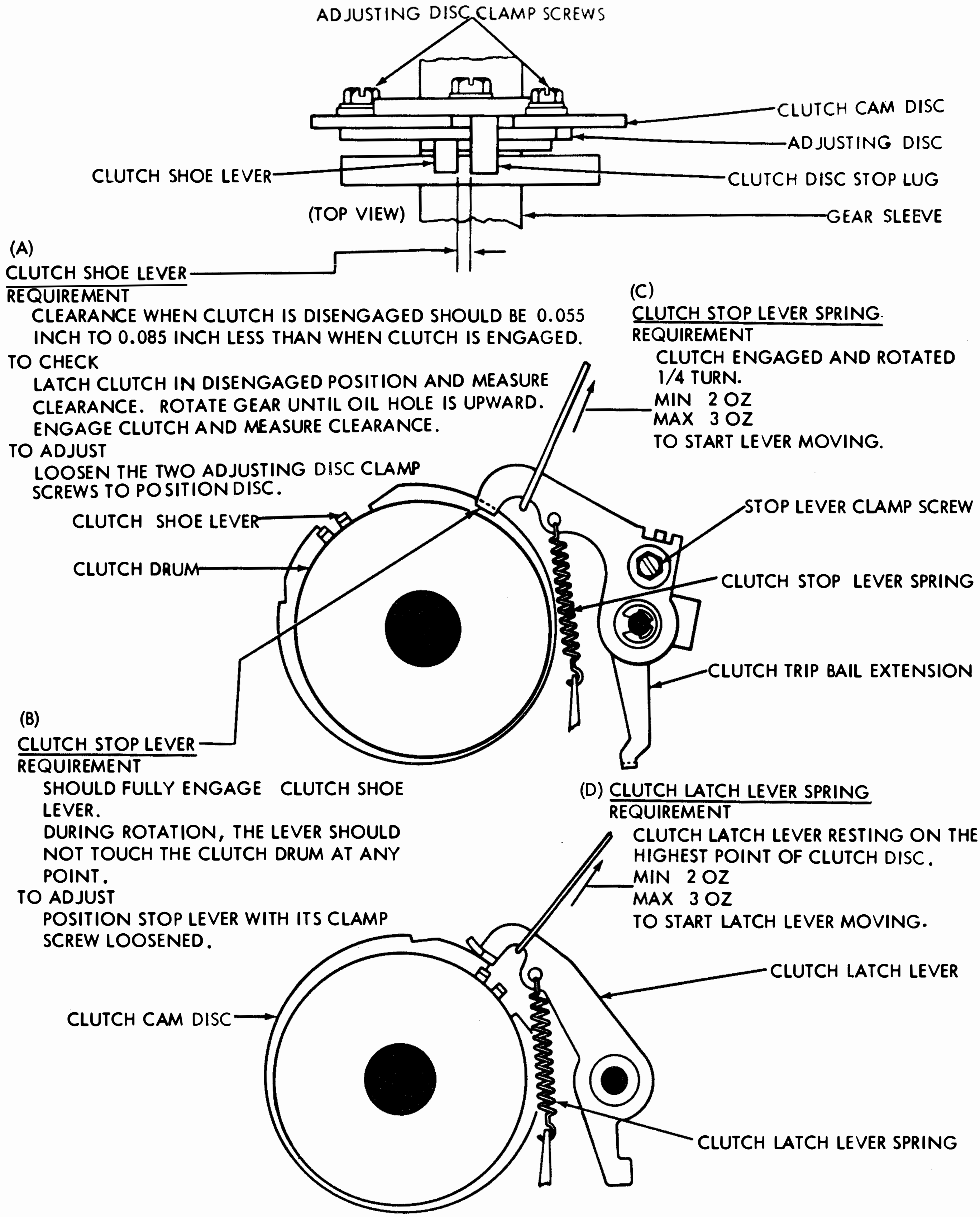
SPACE BAR FREE FROM BIND.

TO ADJUST

POSITION SPACE BAR WITH PILOT SCREWS LOOSENED.

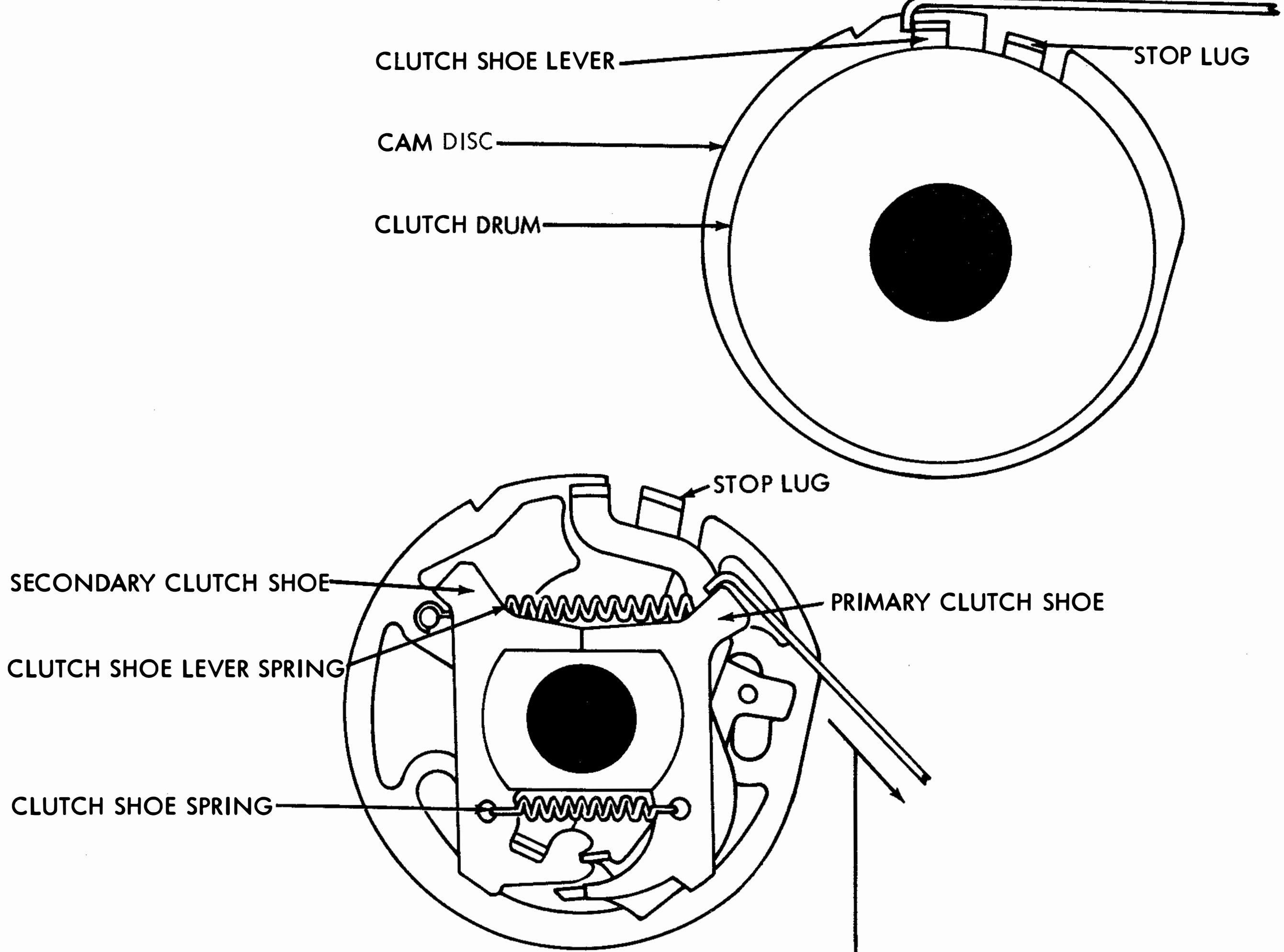
NOTE: THE BAIL SHOULD BE SO ADJUSTED THAT THE SPACE BAR CAN BE OPERATED WITHOUT BINDING IN THE HOLES IN THE GUIDE PLATE AND THE FRAME.

2.02 Signal Generator Mechanism



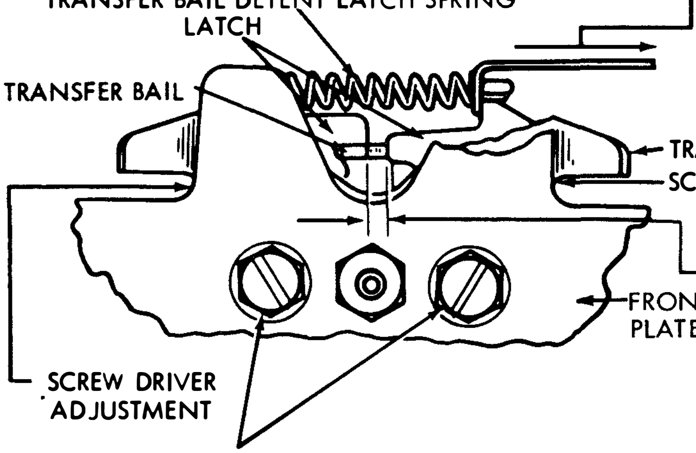
2.03 Signal Generator Mechanism continued

(A) <u>CLUTCH SHOE LEVER SPRING</u>
REQUIREMENT
CLUTCH ENGAGED.
CAM DISC HELD TO PREVENT TURNING.
MIN 15 OZ
MAX 20 OZ
TO MOVE SHOE LEVER IN CONTACT WITH STOP LUG.



(B) <u>CLUTCH SHOE SPRING</u>
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

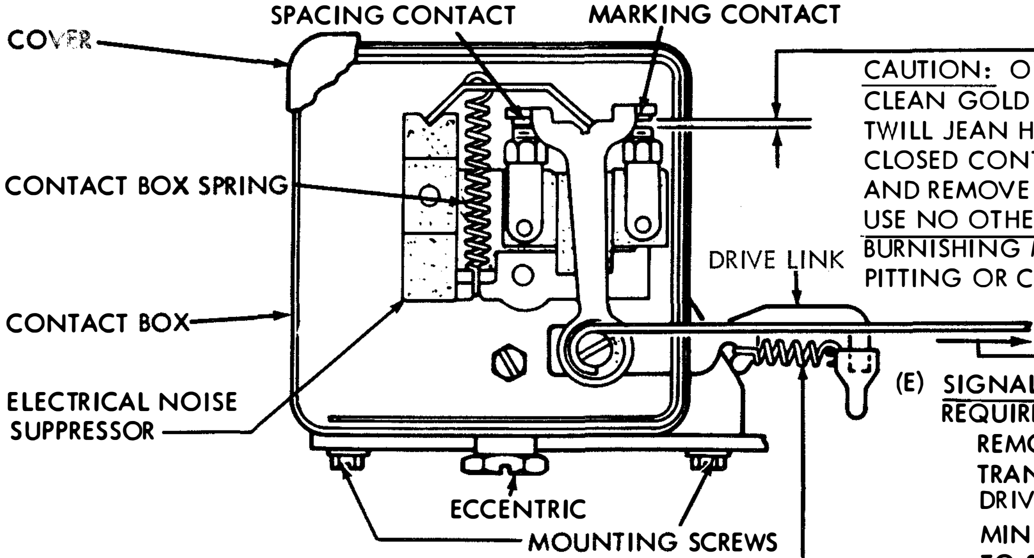


(B) TRANSFER BAIL DETENT LATCH SPRING
REQUIREMENT
MIN 2-3/4 OZ
MAX 4-1/4 OZ
TO START LATCH MOVING.
HOLD TRANSFER BAIL TO LEFT.

(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 OCCUR IN A CHARACTER BETWEEN START AND NO. 1 PULSES ONLY.
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 REFINE THE ADJUSTMENT TO ELIMINATE ALL BIAS FROM THE SIGNALS BY EQUALIZING THE CURRENT-ON AND CURRENT-OFF INTERVALS

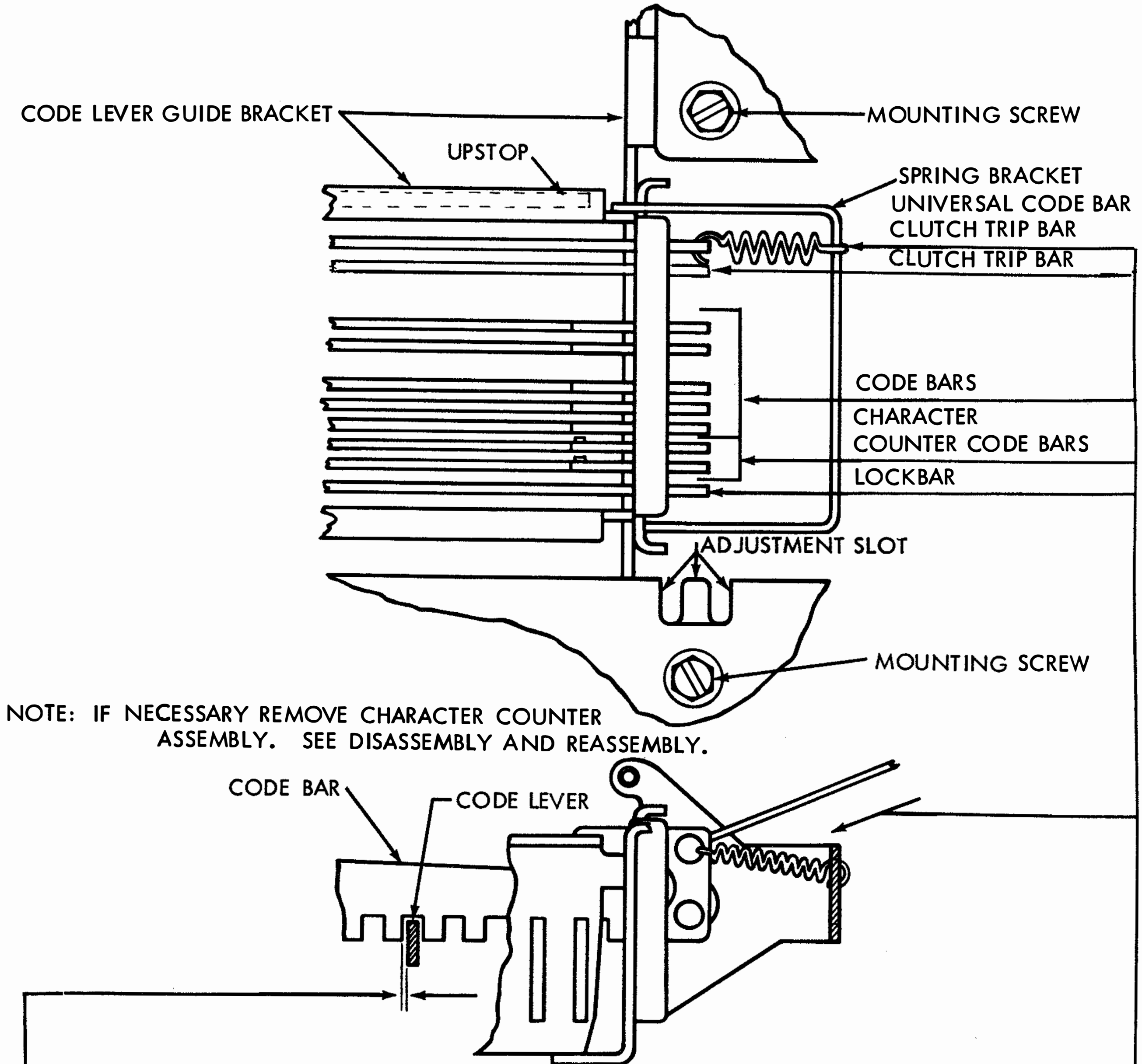


CAUTION: ON UNITS SO EQUIPPED - CLEAN GOLD CONTACTS BY PULLING TWILL JEAN HALF WAY THROUGH THE CLOSED CONTACTS, OPEN CONTACTS AND REMOVE TWILL JEAN.
USE NO OTHER CLEANING OR BURNISHING METHODS. AVOID PITTING OR CHIPPING THE CONTACTS.

(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.

(D) SIGNAL CONTACT DRIVE LINK
REQUIREMENT
WITH MAINSHAFT IN STOP POSITION AND TRANSFER BAIL DETENT LATCH SPRING UNHOOKED (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.

2.05 **Codebar Assembly continued**



(A) CODE BAR 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.

(C) CLUTCH TRIP BAR (USED FOR SYNCHRONOUS PULSED TRANSMISSION)

REQUIREMENT

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.

MIN 9 OZ --- MAX 12 OZ

TO START CLUTCH TRIP BAR MOVING.

NOTE: HOLD THE SWINGER OF THE CONTACT ASSEMBLY AWAY FROM THE UNIVERSAL CODE BAR WHEN MEASURING THE CLUTCH TRIP SPRING TENSION.

(D) UNIVERSAL CODE BAR (USED FOR SYNCHRONOUS PULSED TRANSMISSION)

REQUIREMENT

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.

MIN 8 OZ --- MAX 12 OZ

TO PULL SPRING TO INSTALLED LENGTH.

(E) CODE BAR SPRING

REQUIREMENT

LETTERS KEYLEVER DEPRESSED (POWER OFF) HOLD TRANSFER LEVERS TO THE RIGHT SO THEY DO NOT AFFECT THE CODE BARS.

MIN 3 OZ --- MAX 5 OZ

TO START CODE BAR MOVING.

(F) LOCK BAR SPRING

REQUIREMENT

CLUTCH DISENGAGED, KEYBOARD LOCK KEYLEVER DEPRESSED. APPLY PUSH END OF SCALE AGAINST R H END OF LOCK BAR.

MIN 2-1/2 OZ --- MAX 6 OZ

TO START LOCK BAR MOVING.

2.06 Codebar Assembly continued

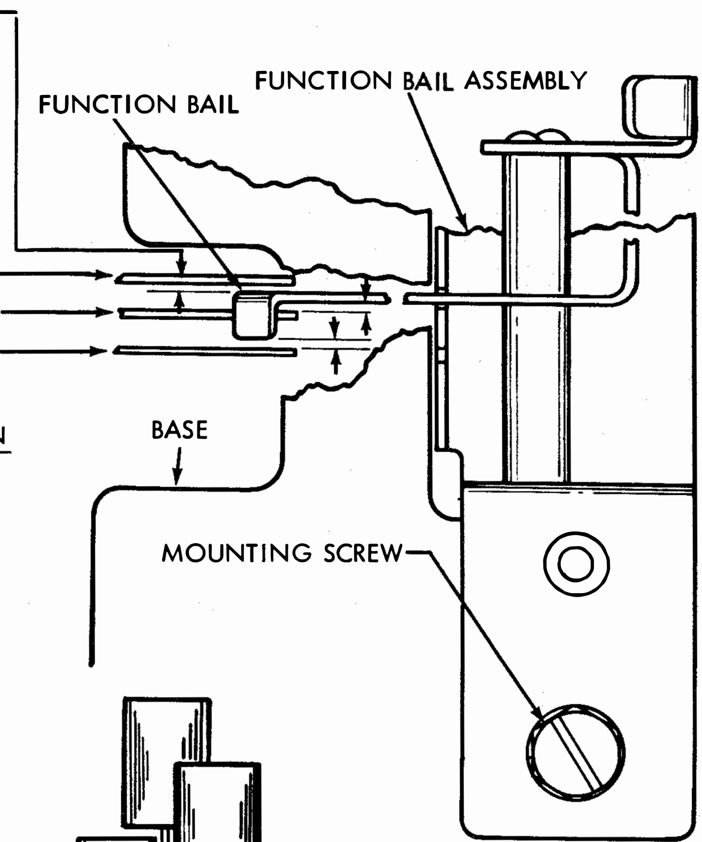
(A) FUNCTION BAIL AND CODE LEVER CLEARANCE

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

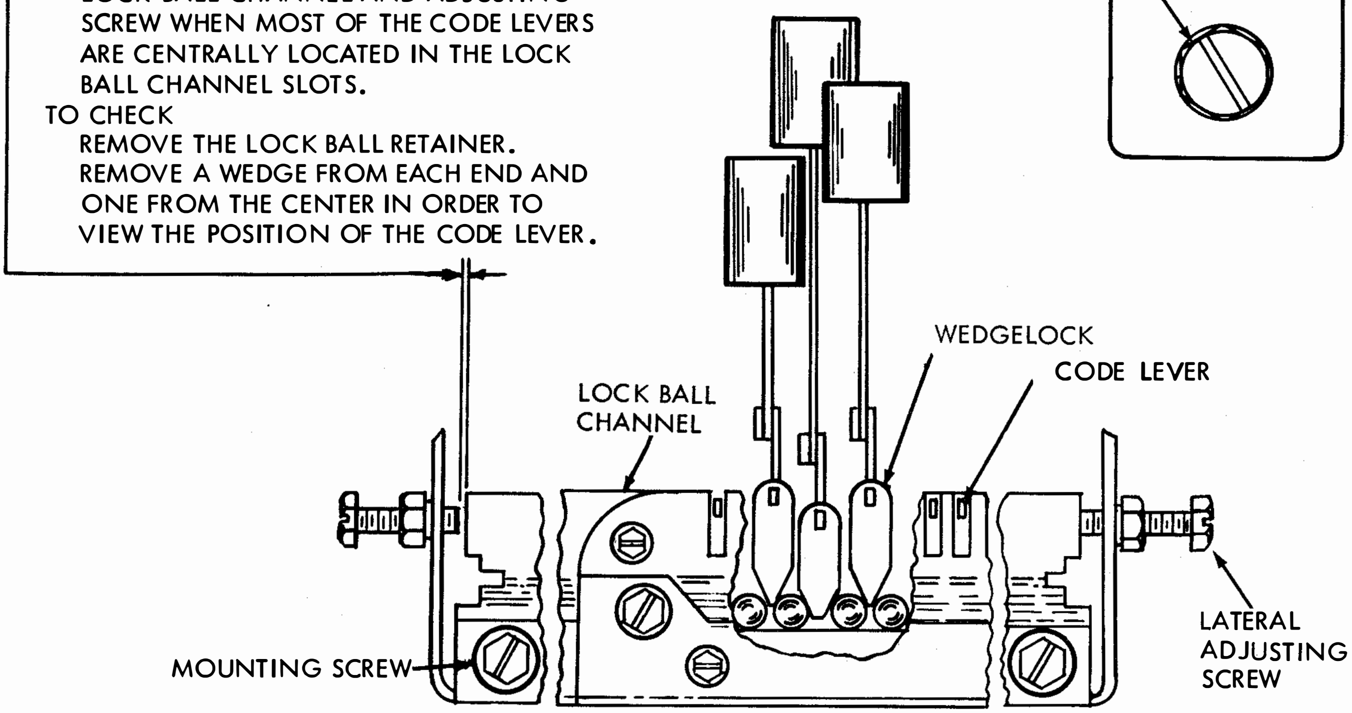
(B) LOCK BALL CHANNEL

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

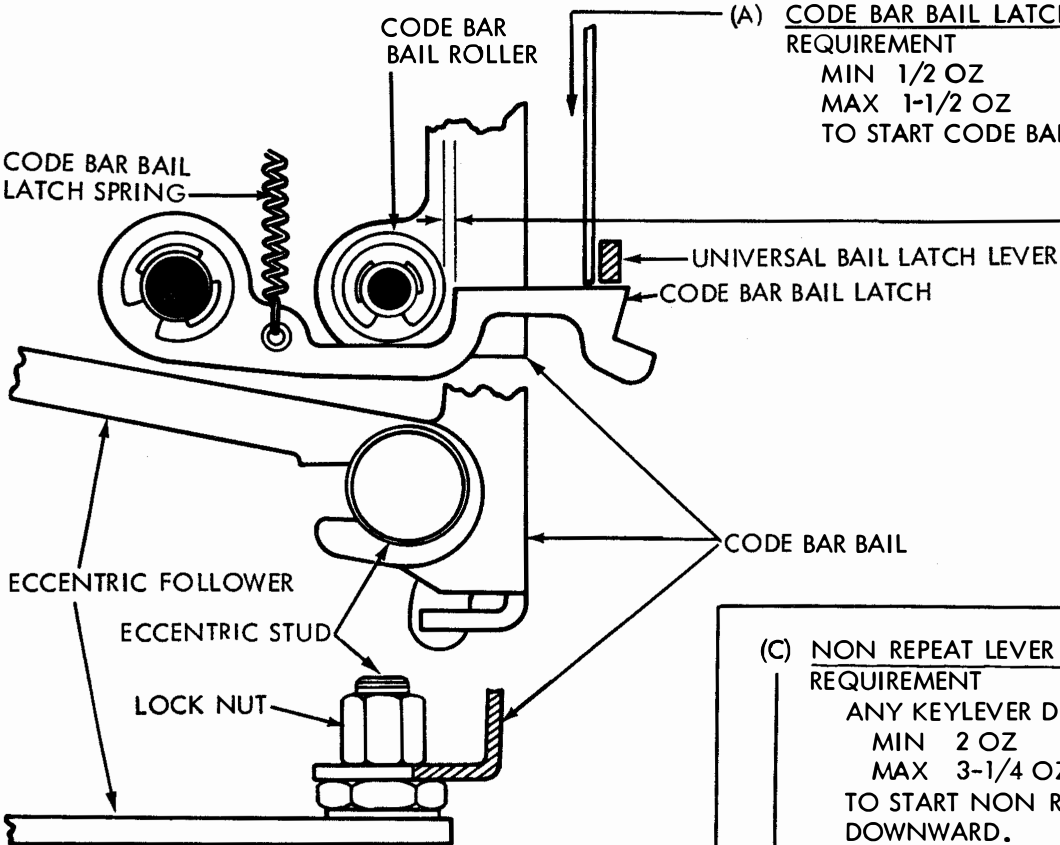
REMOVE THE LOCK BALL RETAINER.
REMOVE A WEDGE FROM EACH END AND ONE FROM THE CENTER IN ORDER TO VIEW THE POSITION OF THE CODE LEVER.



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.

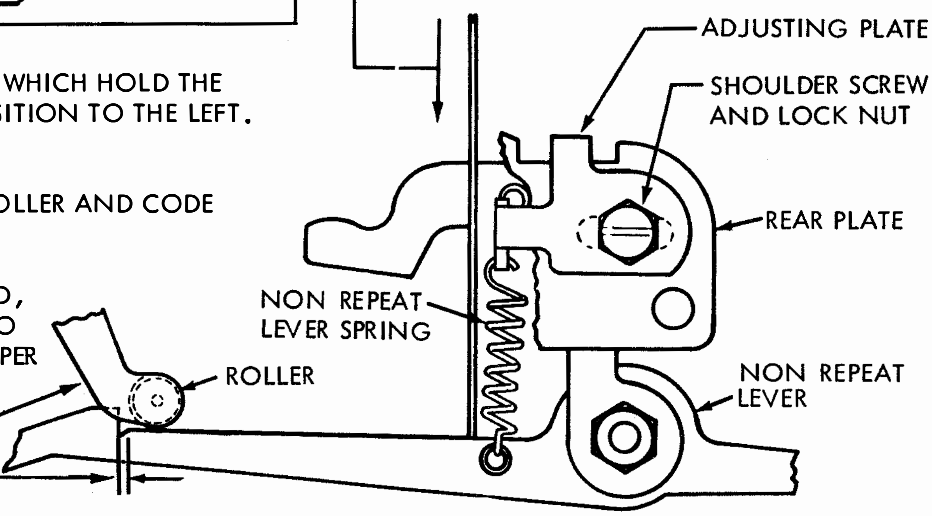
2.08 Codebar Assembly continued



(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 KEYLEVER 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 WEDGELOCK AND THE BALL TRACK.

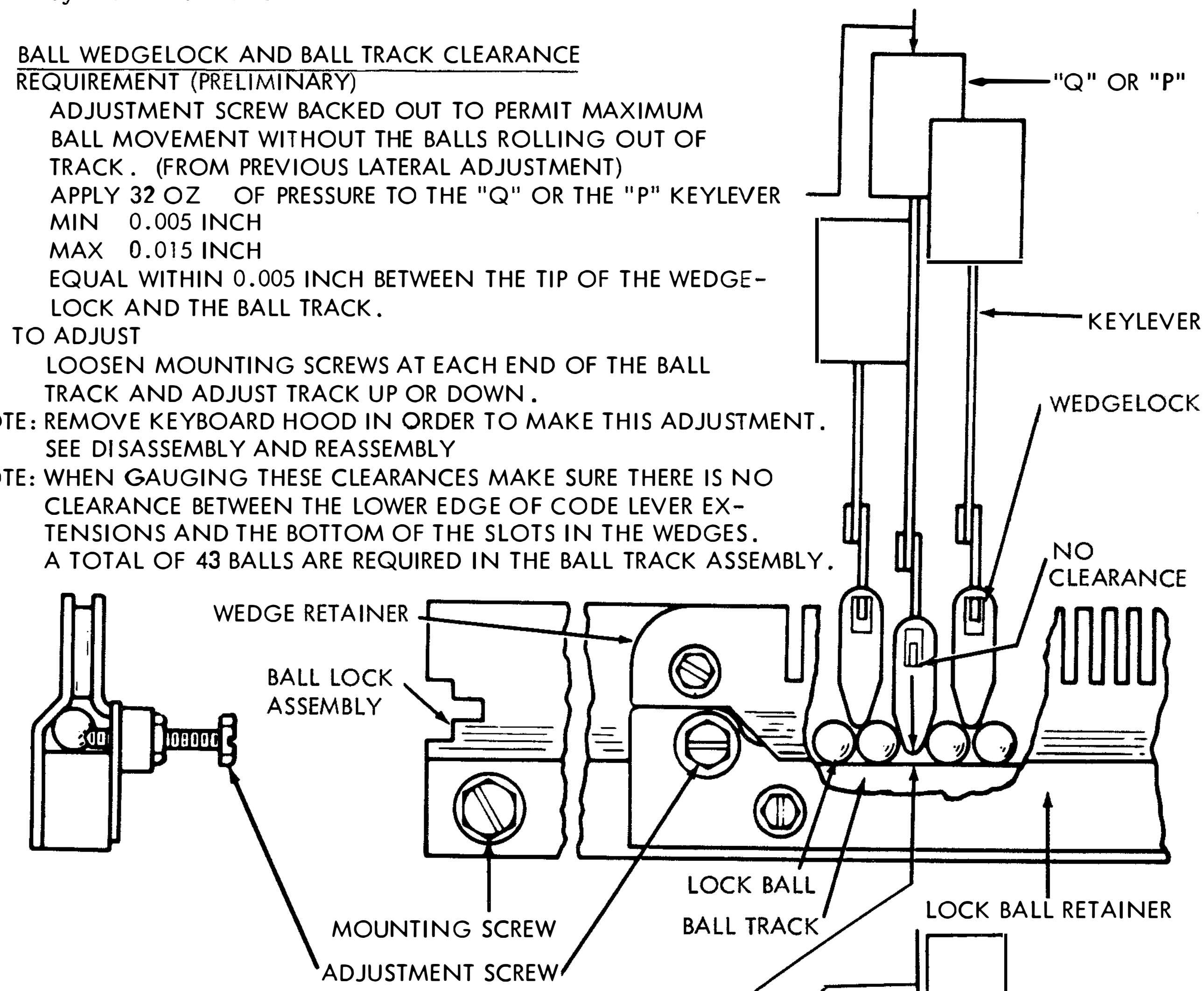
TO ADJUST

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

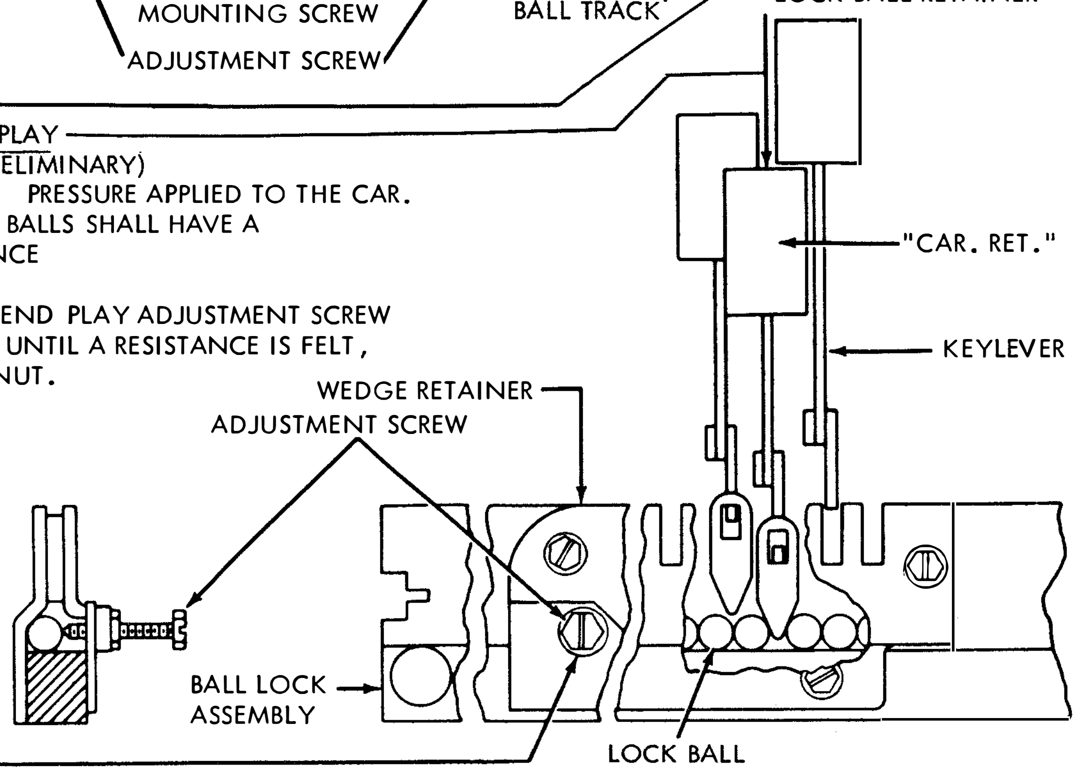
REQUIREMENT (PRELIMINARY)

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.

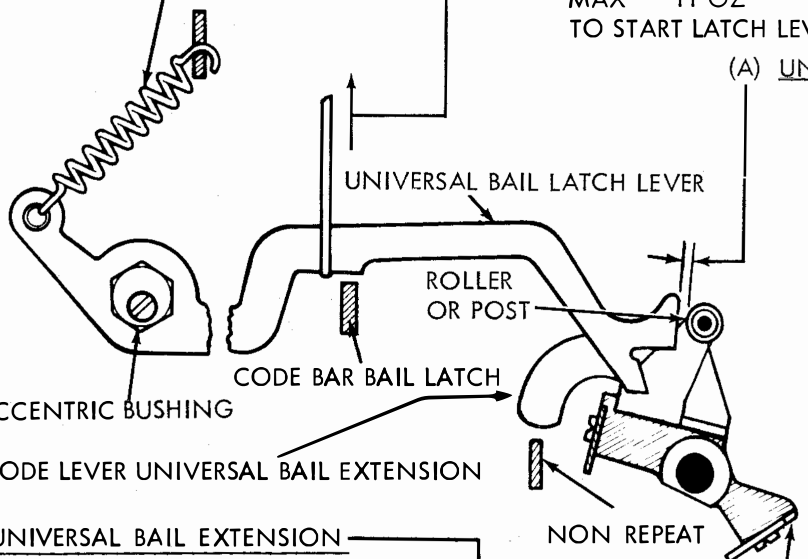


2.10 Codebar Assembly continued

(B) UNIVERSAL BAIL LATCH SPRING

REQUIREMENT

CLUTCH DISENGAGED, UNIVERSAL BAIL HELD AWAY FROM LATCH LEVER. NON REPEAT LEVER BELL CRANK HELD DOWN AGAINST ITS STOP POST.
MIN 7-1/2 OZ
MAX 11 OZ
TO START LATCH LEVER MOVING.



(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)

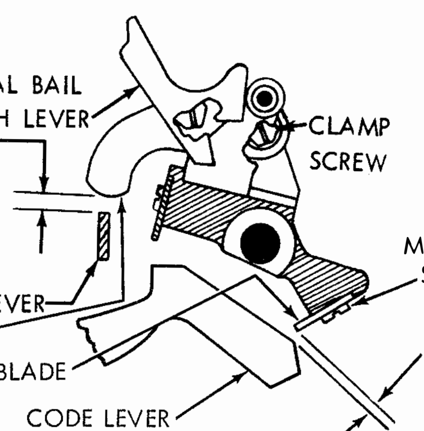
UNIVERSAL BAIL EXTENSION POST RESTING AGAINST END OF UNIVERSAL BAIL LATCH LEVER
MIN 0.050 INCH
MAX 0.080 INCH
BETWEEN EXTENSION AND NON REPEAT LEVER

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.

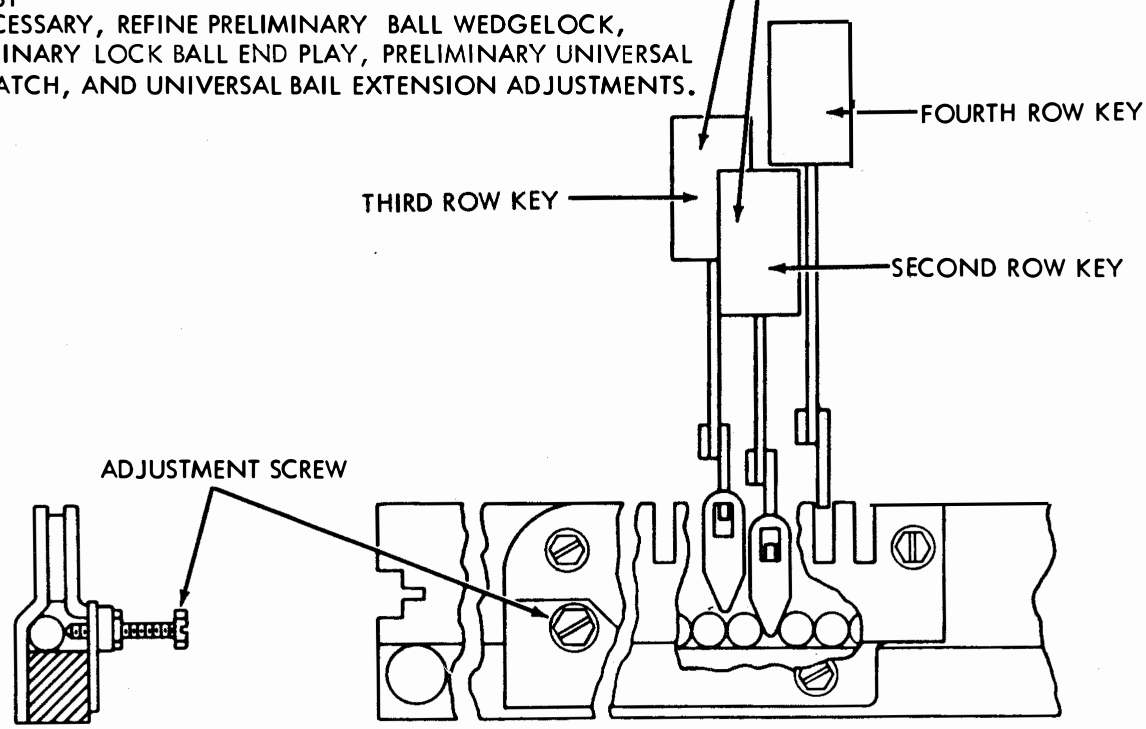
(3) REQUIREMENT
THE CLUTCH SHALL NOT TRIP WHEN ANY TWO KEYS ARE DEPRESSED SIMULTANEOUSLY.

(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.

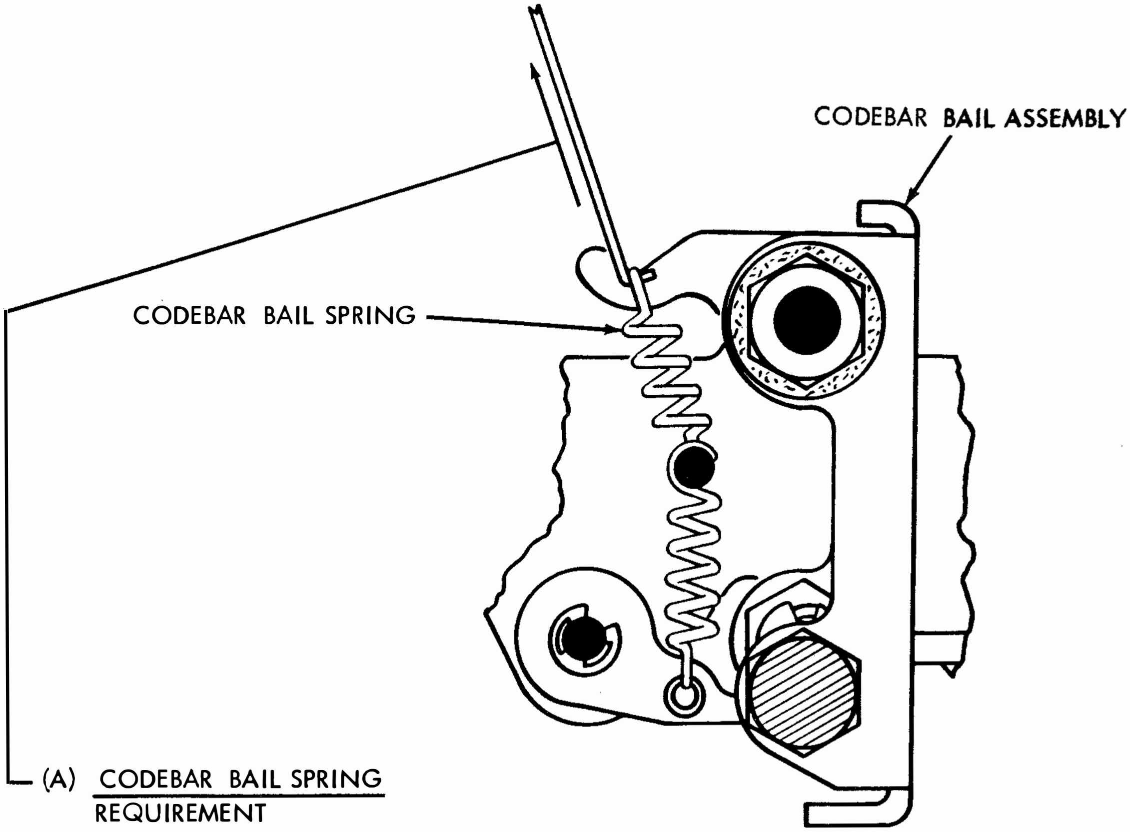
NOTE

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



(A) CODEBAR BAIL SPRING

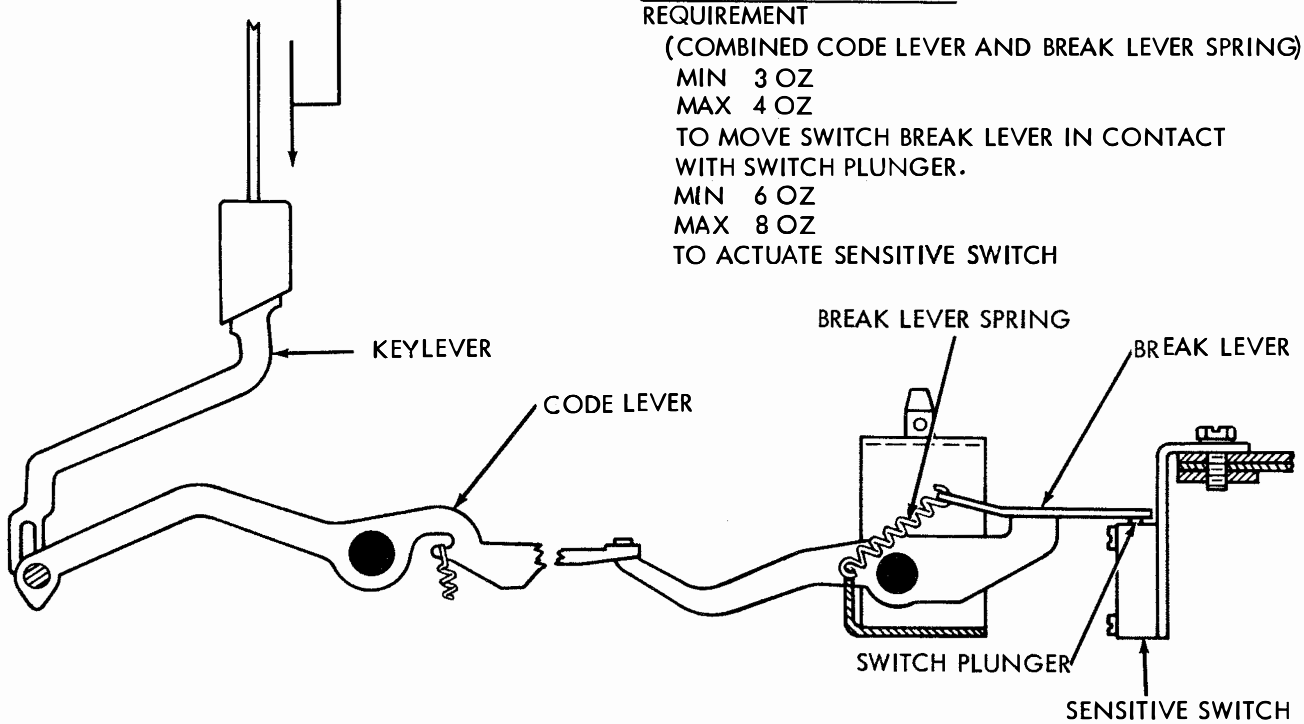
REQUIREMENT

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

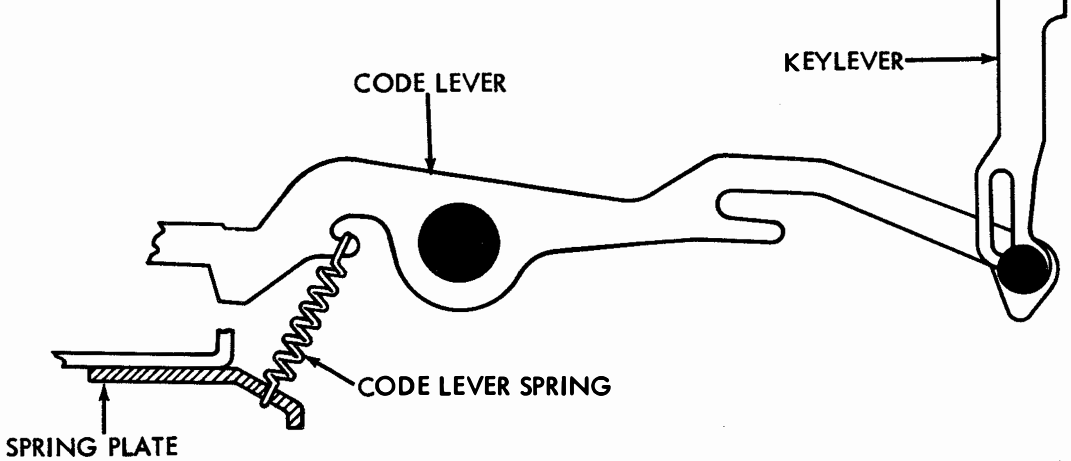
(A) <u>CODE LEVER SPRING</u>

(1)REQUIREMENT

MIN 1 OZ
MAX 2 OZ
TO START CODE LEVER MOVING DOWNWARD.

(2)REQUIREMENT

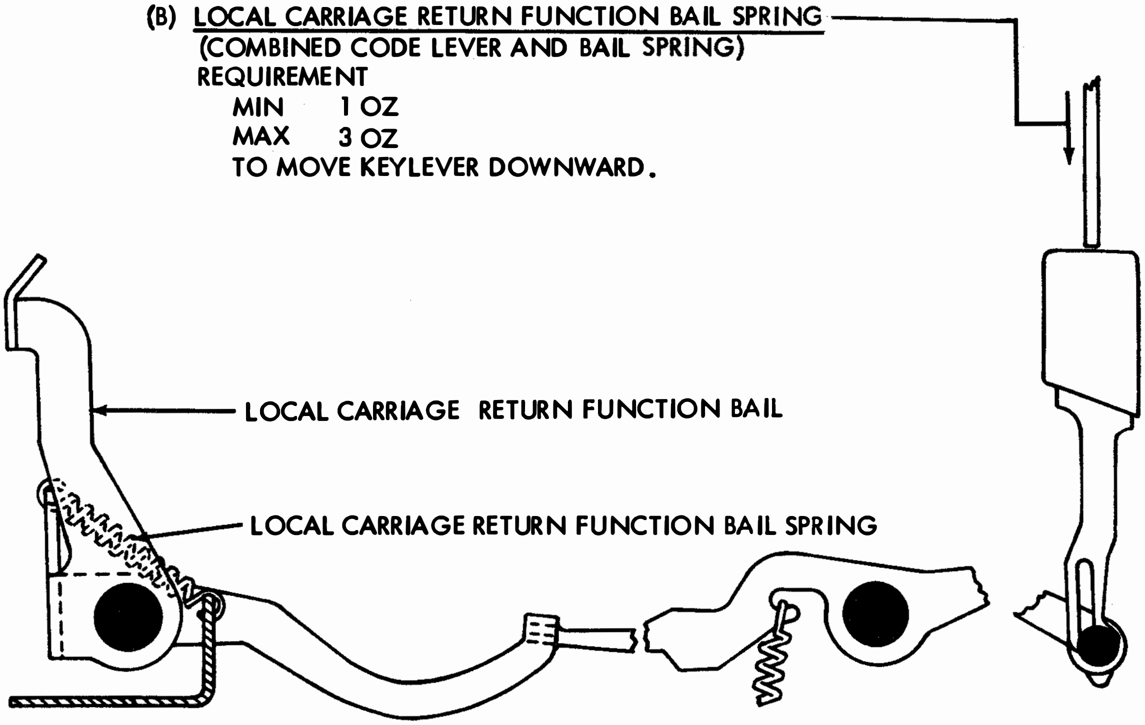
POWER ON.
GENERATOR CLUTCH DISENGAGED.
MIN 3 OZ
MAX 5 OZ
TO OPERATE KEYLEVER OR SPACE BAR.



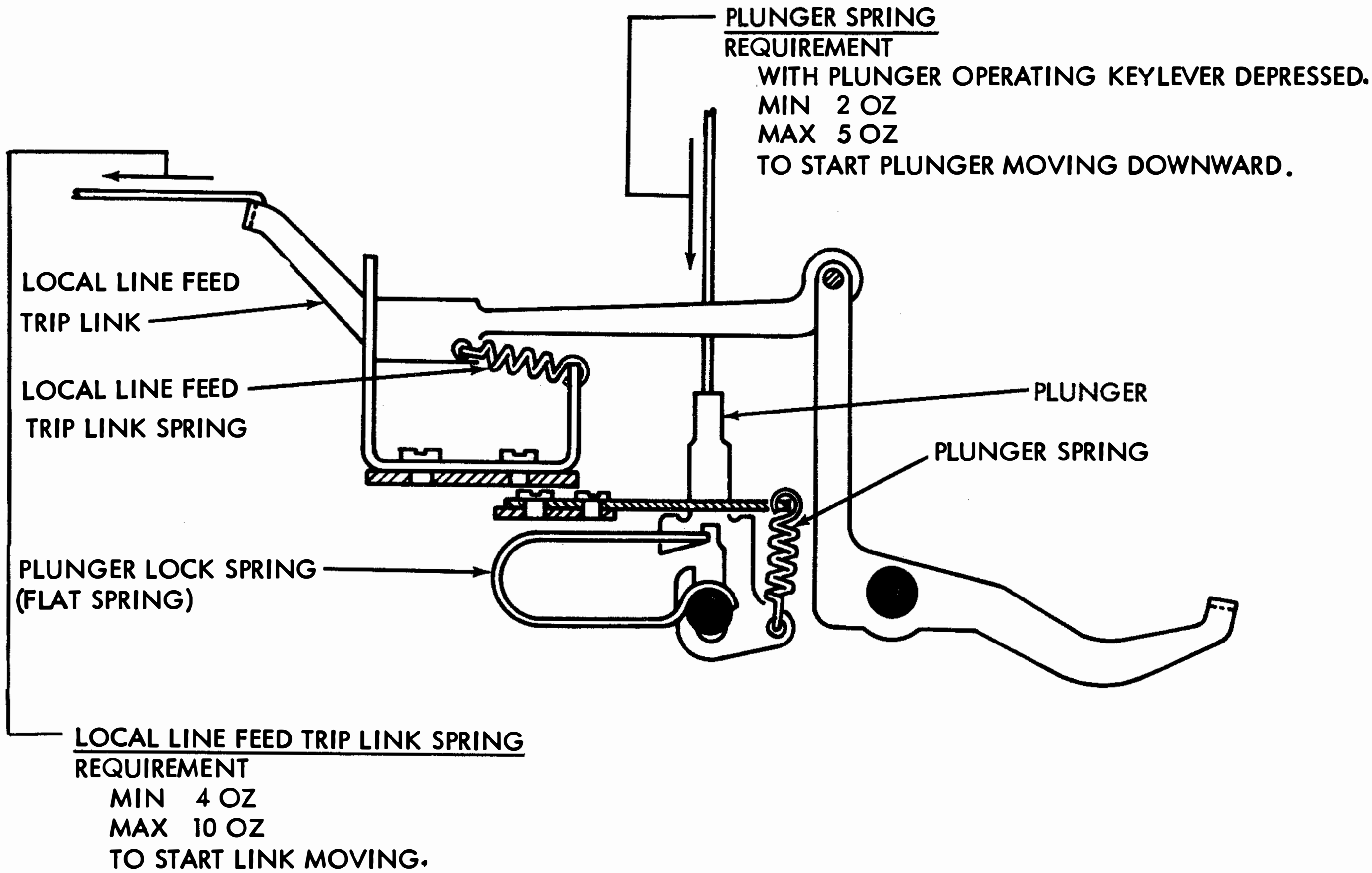
(B) <u>LOCAL CARRIAGE RETURN FUNCTION BAIL SPRING</u>
(COMBINED CODE LEVER AND BAIL SPRING)

REQUIREMENT

MIN 1 OZ
MAX 3 OZ
TO MOVE KEYLEVER DOWNWARD.



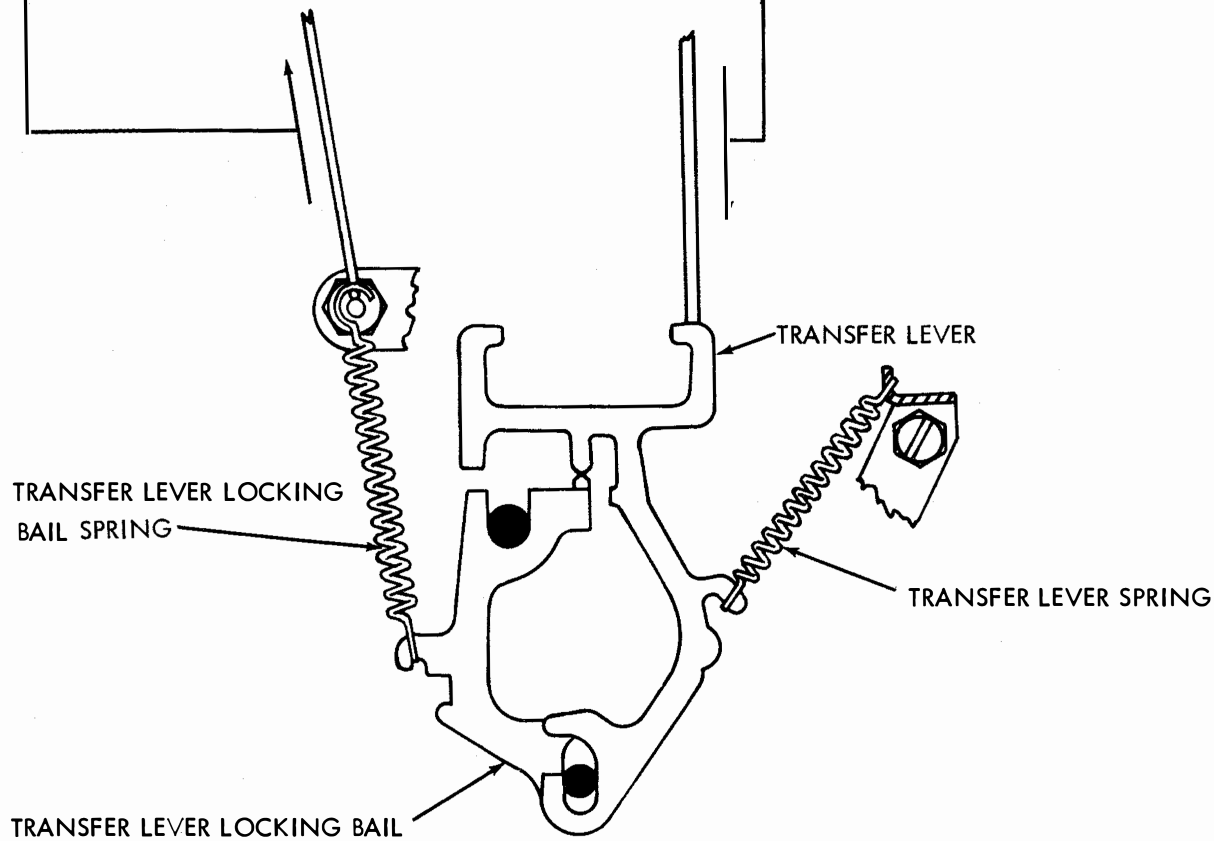
2.14 Keyboard Mechanism continued



2.15 Codebar Assembly and Signal Generator Mechanism continued

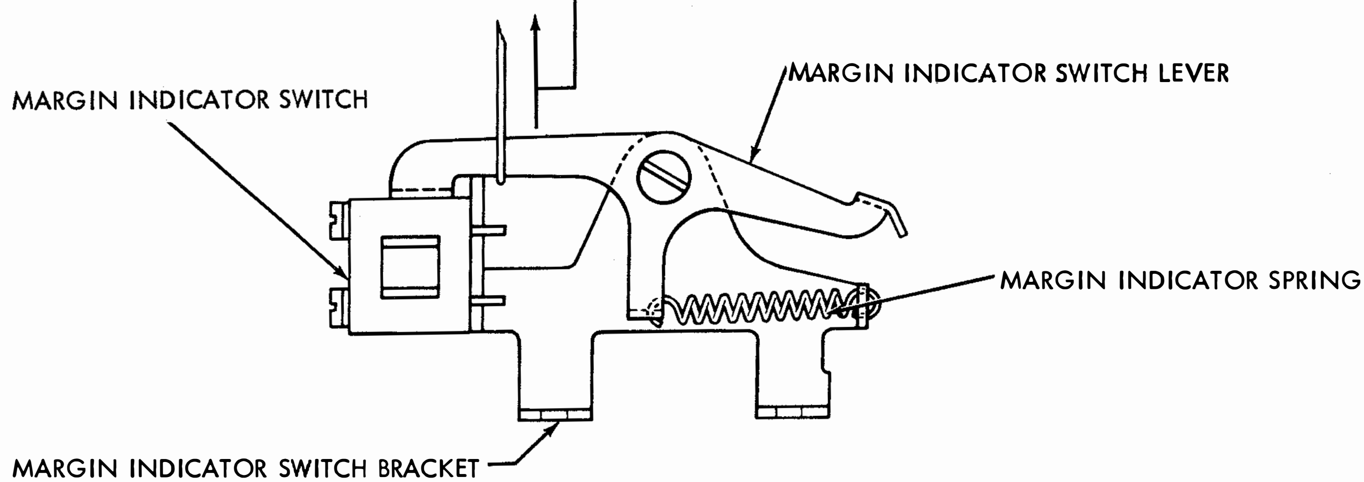
(B) TRANSFER LEVER LOCKING BAIL SPRING
REQUIREMENT
SPRING UNHOOKED FROM POST.
MIN 5 OZ
MAX 6 OZ
TO PULL TO INSTALLED LENGTH.

(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.



2.17 Interrelated Features continued

NOTE
NOT APPLICABLE TO WALL MOUNTED PRINTER
REFER TO PAR. 2.20

INTERMEDIATE GEAR BRACKET

(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

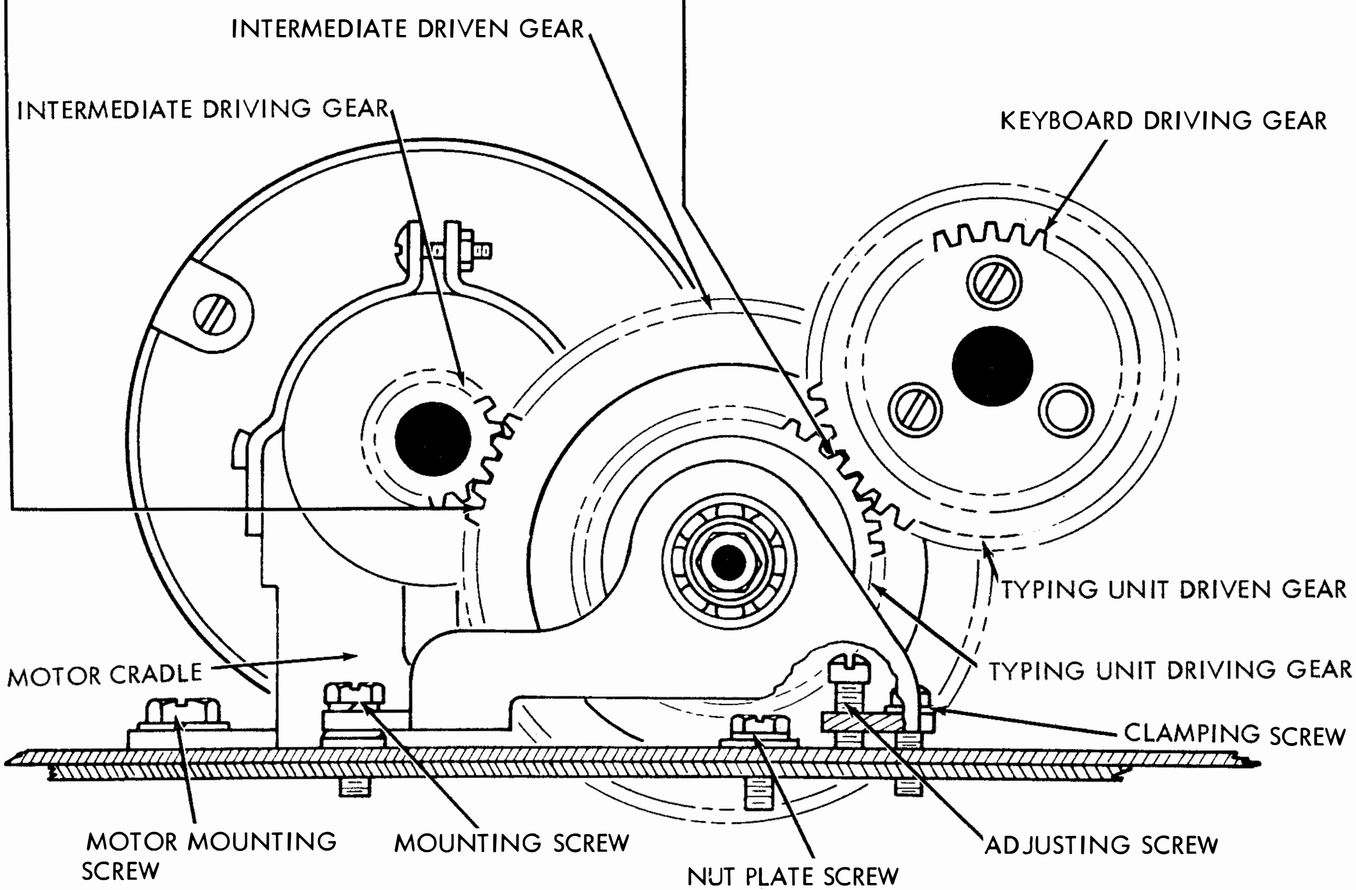
POSITION THE COMPLETE INTERMEDIATE GEAR MECHANISM BRACKET BY UTILIZING THE ADJUSTING SLOTS WITH THE THREE HEXAGON HEAD SCREWS LOOSENED. ALIGN THE GEARS AT THIS TIME.

(2) REQUIREMENT

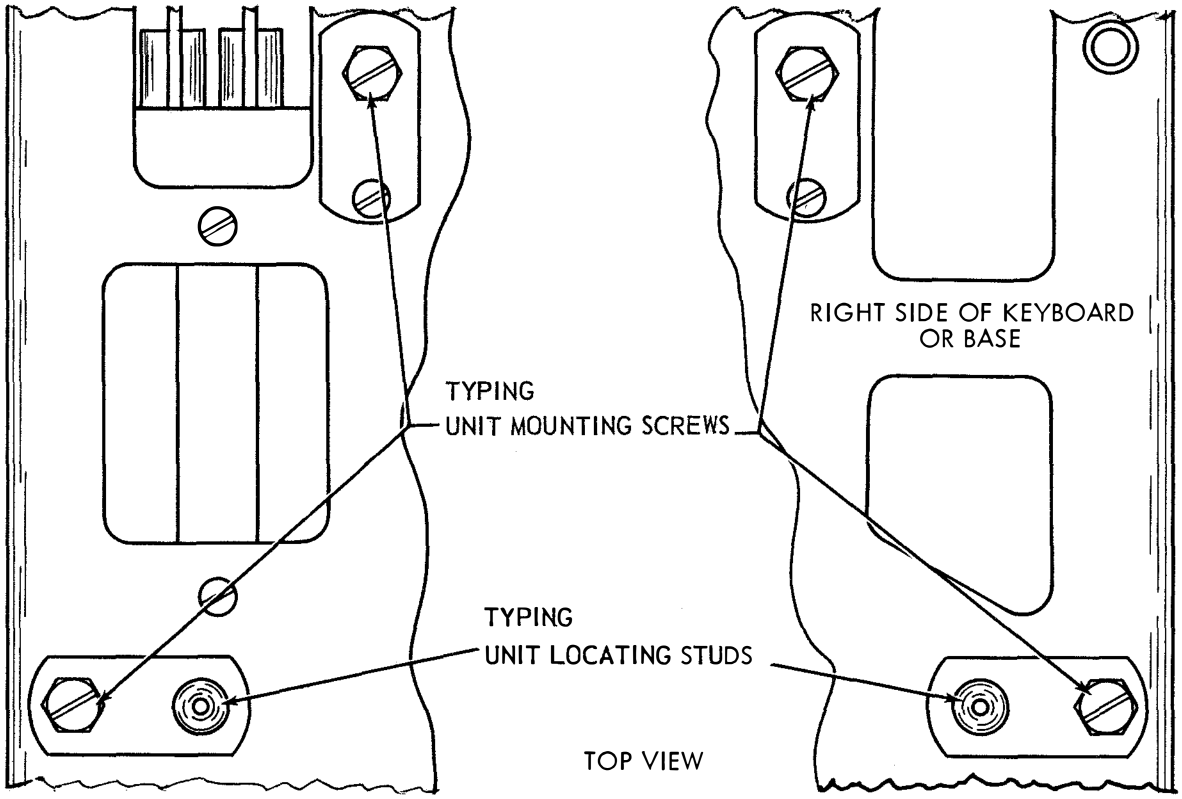
THERE SHOULD BE A BARELY PRECEPTIBLE AMOUNT OF BACKLASH BETWEEN THE INTERMEDIATE DRIVING GEAR AND THE INTERMEDIATE DRIVEN GEAR AT THE POINT WHERE THE BACKLASH IS THE LEAST.

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.



2.18 Interrelated Features continued



SIMILAR REQUIREMENTS FOR WALL MOUNTED PRINTER SEE PAR. 2.09

(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.

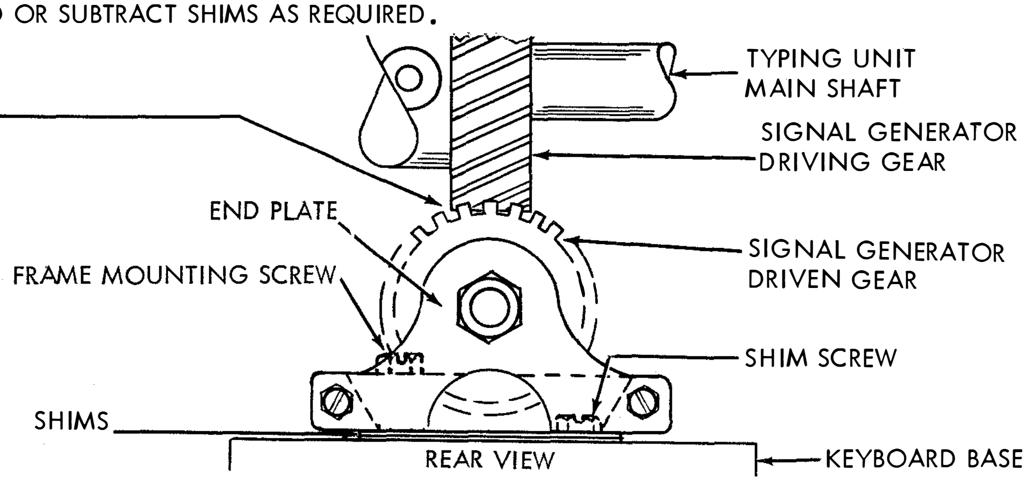
(B) SIGNAL GENERATOR FRAME

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.

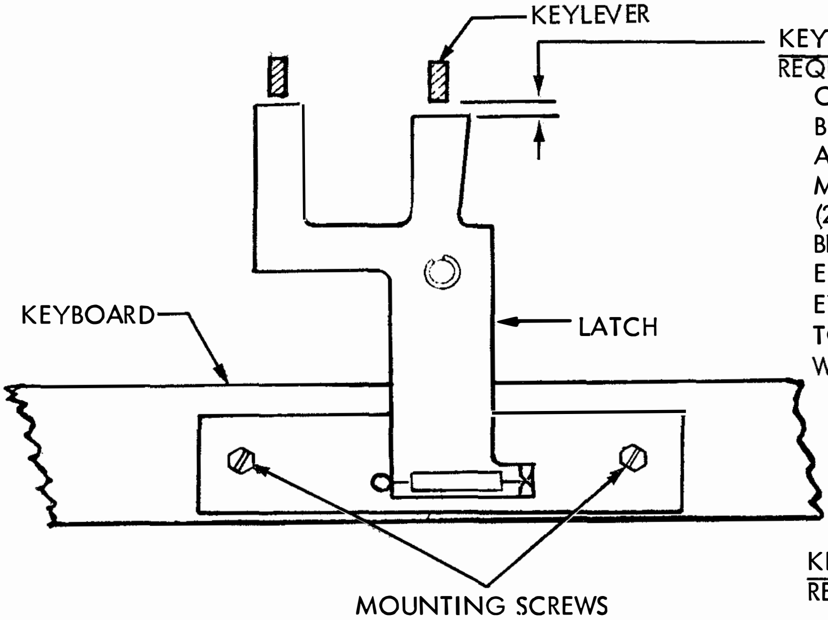
TO ADJUST

REMOVE THE SIGNAL GENERATOR FRAME REAR MOUNTING SCREW AND LOOSEN THE SHIM SCREW. ADD OR SUBTRACT SHIMS AS REQUIRED.



2.19 Wall Mounted Keyboard

WALL MOUNTED PRINTER (28K, 28N TELETYPEWRITER BASES)



KEYTOP MECHANISM

REQUIREMENT --- WITH KEYBOARD IN UN-OPERATED 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 KEY-TOP 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

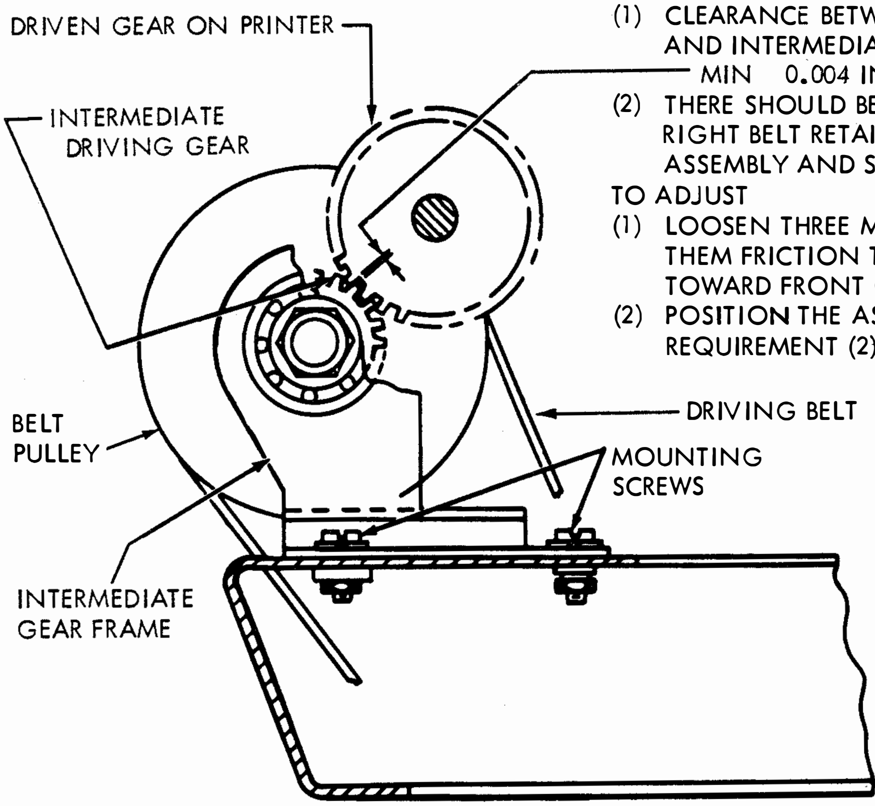
(1) CLEARANCE BETWEEN DRIVEN GEAR ON PRINTER AND INTERMEDIATE GEAR SHOULD BE
MIN 0.004 INCH --- MAX 0.008 INCH

(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.



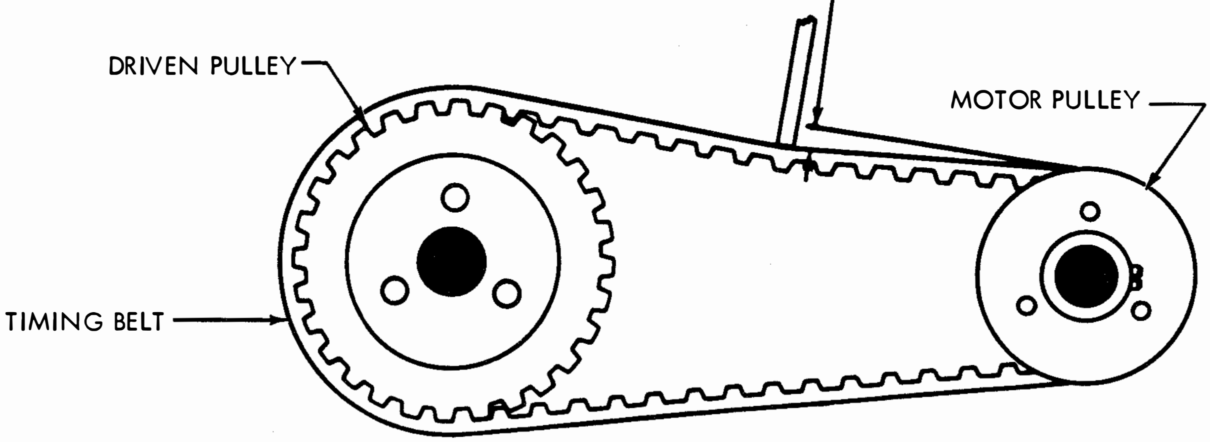
TIMING BELT

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).

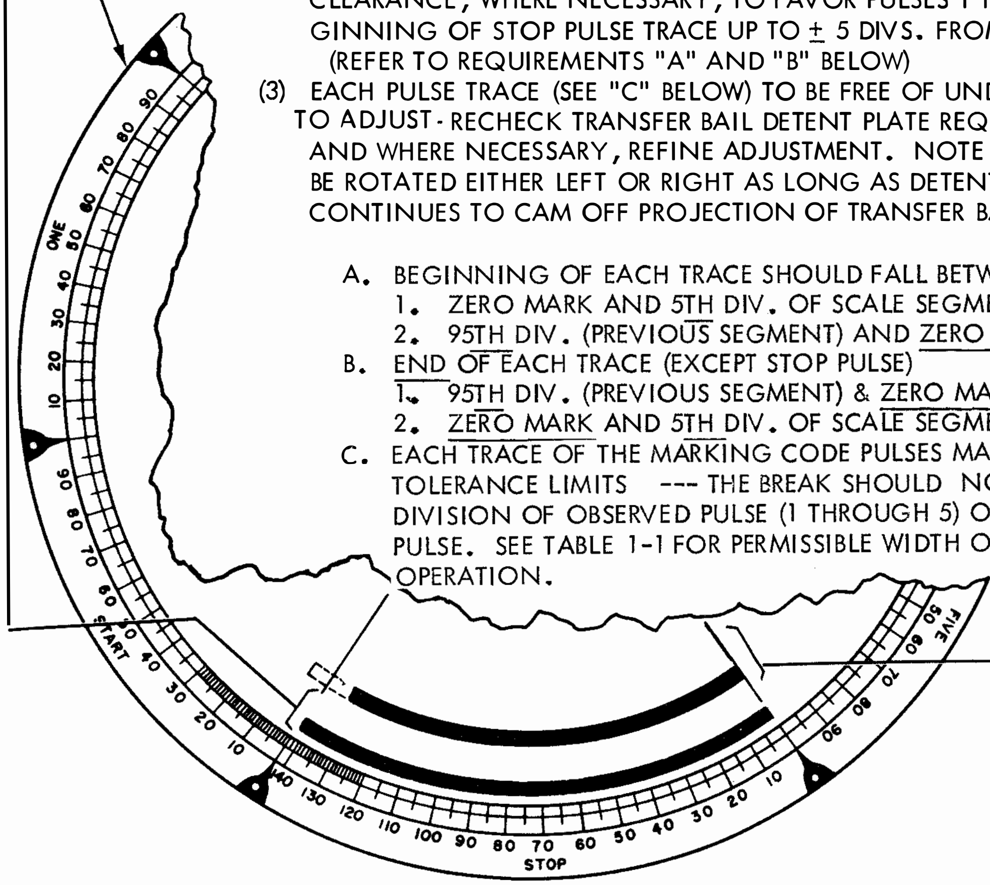
REQUIREMENTS

(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.

TEST SET SCALE



A. BEGINNING OF EACH TRACE SHOULD FALL BETWEEN
   1. ZERO MARK AND 5TH 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 5TH DIV. OF SCALE SEGMENT.

SEE "R" & "Y" COMBINATION PAR. 2.22

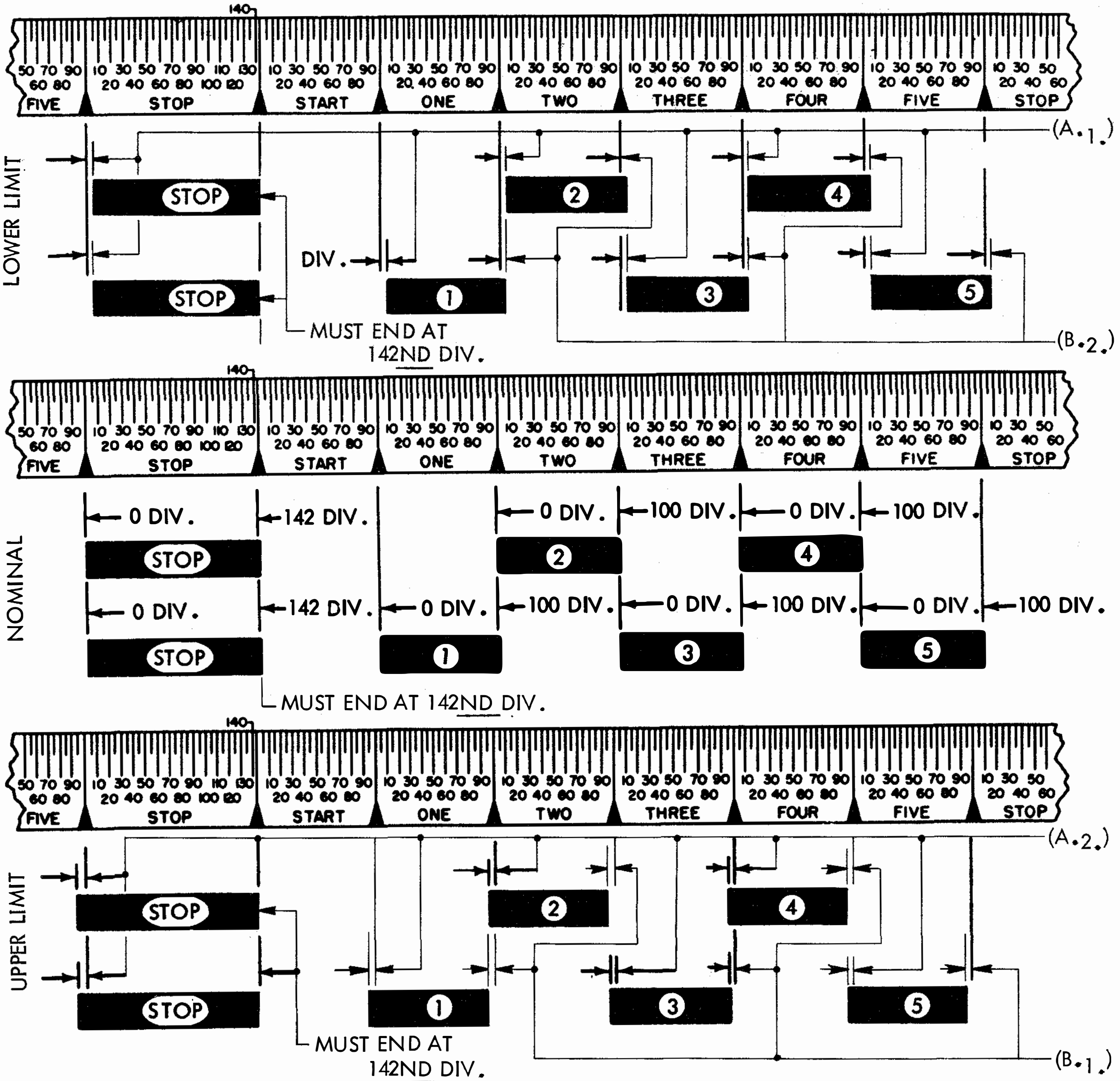
C. EACH TRACE OF THE MARKING CODE PULSES MAY HAVE A BREAK WITHIN TOLERANCE LIMITS --- THE BREAK SHOULD NOT OCCUR PRIOR TO 95TH DIVISION OF OBSERVED PULSE (1 THROUGH 5) OR 137TH DIVISION OF STOP PULSE. SEE TABLE 1-1 FOR PERMISSIBLE WIDTH OF BREAK AT SPEED OF OPERATION.

TABLE 1-1 SIGNALING PULSE SPEED AND PERMISSIBLE WIDTH OF BREAK

SPEED	OPERATIONS PER MINUTE	WIDTH OF BREAK NOT TO EXCEED	REMARKS
60 WPM	368.182	1 DIVISION	MARKING PULSES (1 THROUGH 5 & STOP)
75 WPM	460.00	1-1/2 DIVISIONS	MARKING PULSES (1 THROUGH 5 & STOP)
100 WPM	600.00	2 DIVISIONS	MARKING PULSES (1 THROUGH 5 & STOP)

2.22 Signal Generator Mechanism continued

"R" AND "Y" COMBINATION



"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 END 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 END NO LATER THAN 6TH DIV. OF NO. 1. SEGMENT.

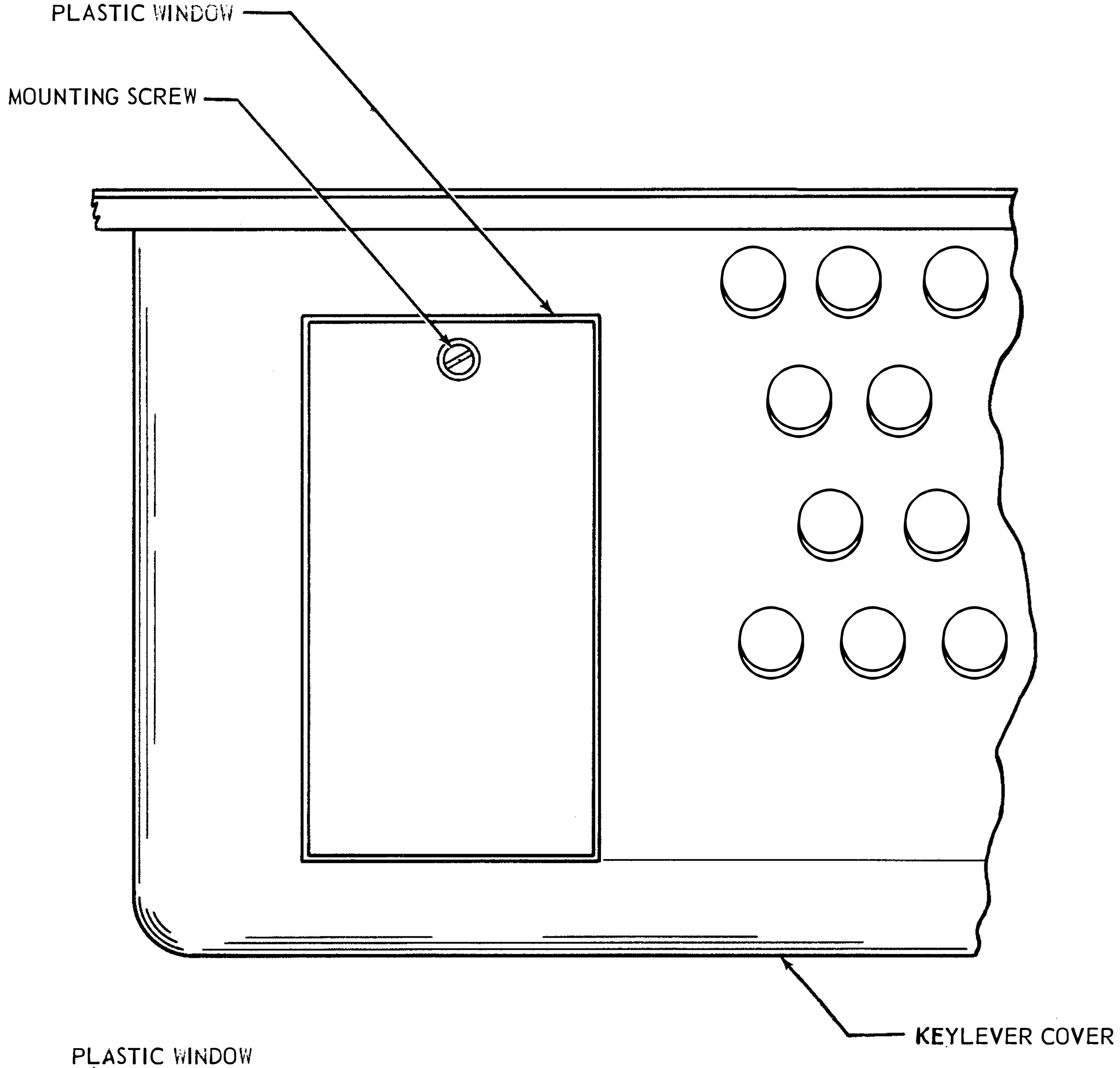
(4) SPACING PULSE MAY HAVE A BREAK PROVIDED THE BREAK IS NOT OVER ONE DIVISION WIDE AND IT DOES NOT OCCUR PRIOR TO 95TH DIV. OF PULSE UNDER OBSERVATION.

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

REQUIREMENT

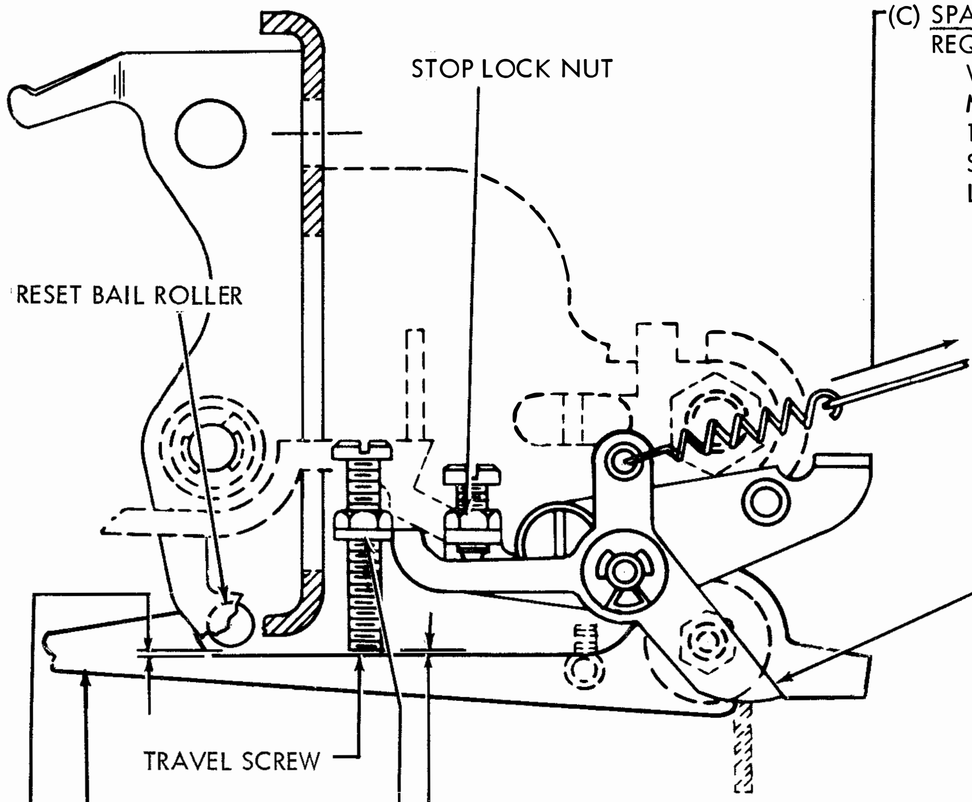
PLASTIC WINDOW SHOULD BE FULLY SEATED IN POSITION BEFORE TIGHTENING MOUNTING SCREW.

TO ADJUST

POSITION WINDOW WITH MOUNTING SCREW LOOSENED.

3. VARIABLE FEATURES

3.01 Repeat-On-Space Mechanism



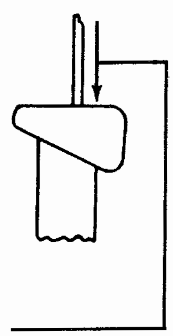
(C) <u>SPACE - REPEAT LEVER SPRING</u>
REQUIREMENT
WITH SPRING UNHOOKED
MIN 13-1/2 OZ --- MAX 16-1/2 OZ TO STRETCH SPRING TO INSTALLED LENGTH.

(B) <u>STOP</u>
REQUIREMENT
MIN 0.002 INCH --- MAX 0.020 INCH BETWEEN SPACE - REPEAT LEVER TRAVEL SCREW AND NON REPEAT LEVER.
TO ADJUST
DEPRESS "G" KEYLEVER TO TRIP KEYBOARD CLUTCH. POSITION STOP BY LOOSENING STOP LOCK NUT. RECHECK AFTER ADJUSTMENT.

(A) <u>TRAVEL SCREW</u>
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 ADJUSTMENT. TO GET A LIGHTER TOUCH ADJUST TO UPPER LIMIT. TO OBTAIN A HEAVIER TOUCH ADJUST TO THE LOWER LIMIT.



(D) <u>SPACE BAR</u>
(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 CONTINUOUS SPACE TRANSMISSION.

3.02 Time Delay Mechanism

TIME DELAY RATCHET WHEEL TENSION

REQUIREMENT

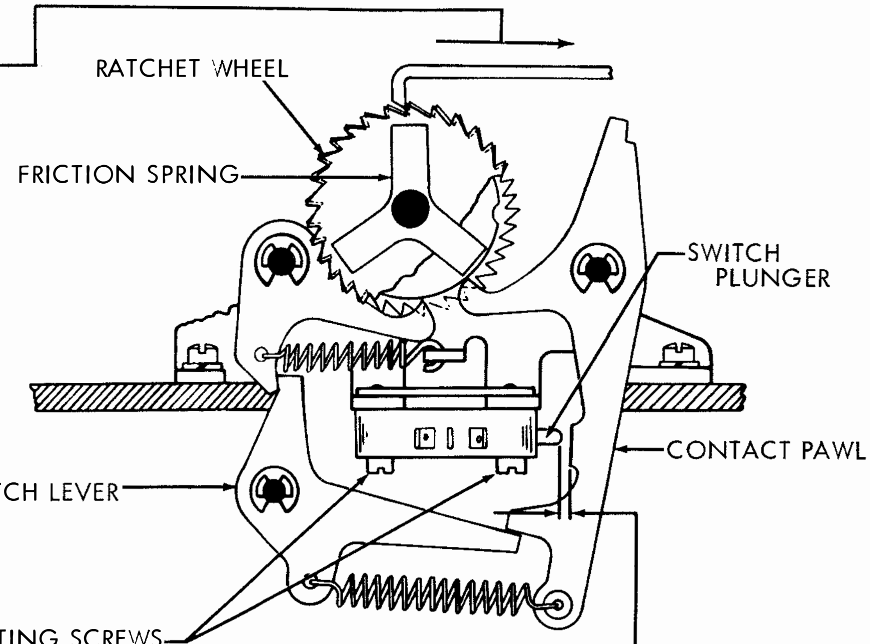
HOLD OFF ALL PAWLS.

MIN 2 OZ --- MAX 8 OZ

TO MOVE RATCHET WHEEL

TO ADJUST

REMOVE AND BEND THE FRICTION 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 LOOSENED.

3.03 Time Delay Mechanism continued

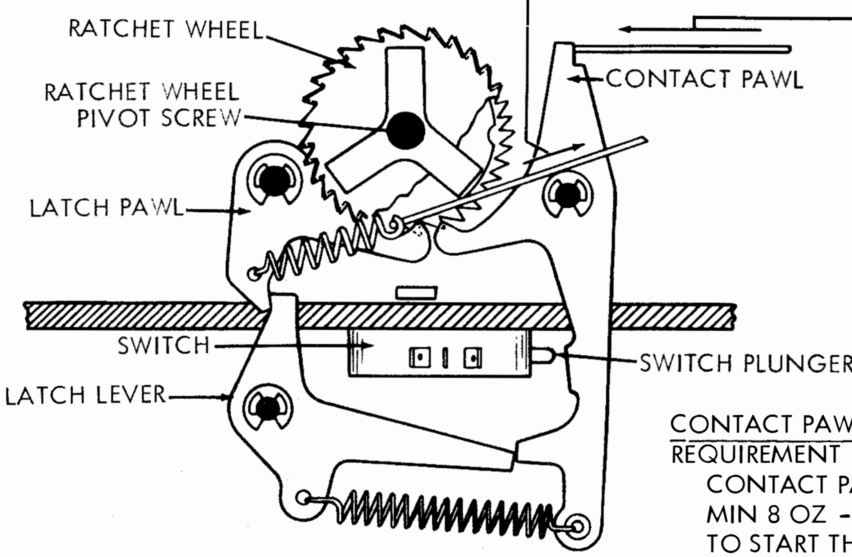
CONTACT LATCH PAWL SPRING

REQUIREMENT

LATCH PAWL SPRING UNHOOKED AT ANCHOR.

MIN 12 OZ --- MAX 15 OZ

TO STRETCH SPRING TO INSTALLED LENGTH AS SHOWN.



CONTACT PAWL SPRING

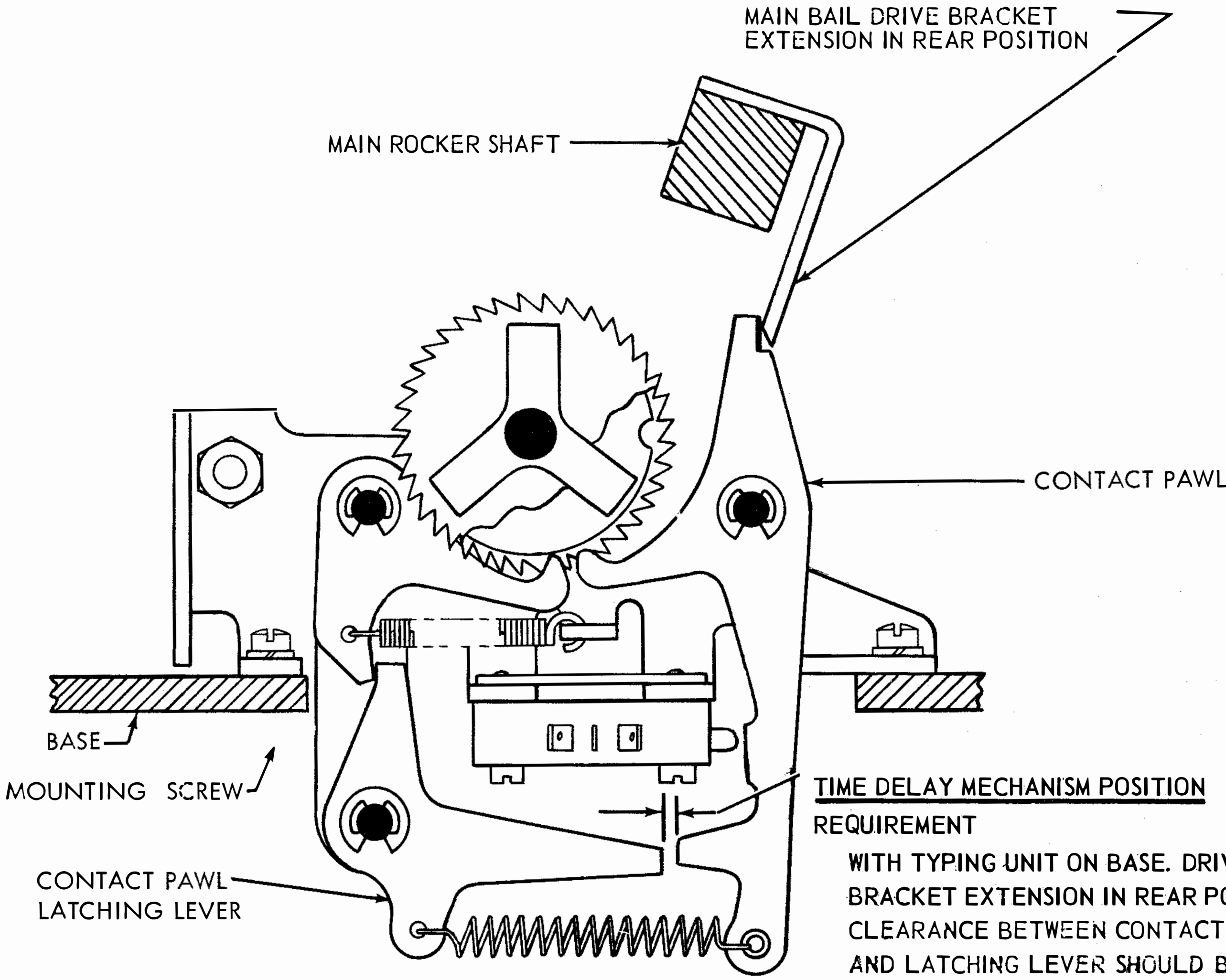
REQUIREMENT

CONTACT PAWL LATCHED ON END OF LATCH LEVER.

MIN 8 OZ --- MAX 12 OZ

TO START THE PAWL MOVING.

3.04 Time Delay Mechanism continued

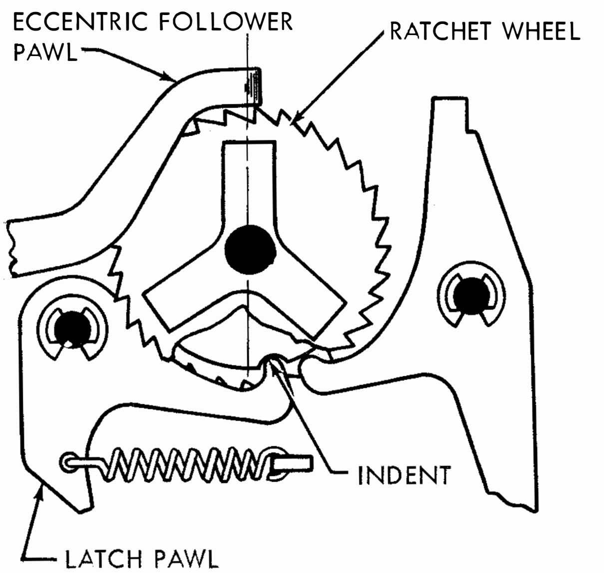


TIME DELAY MECHANISM POSITION

REQUIREMENT

WITH TYPING UNIT ON BASE. DRIVE BRACKET EXTENSION IN REAR POSITION. CLEARANCE BETWEEN CONTACT PAWL AND LATCHING LEVER SHOULD BE

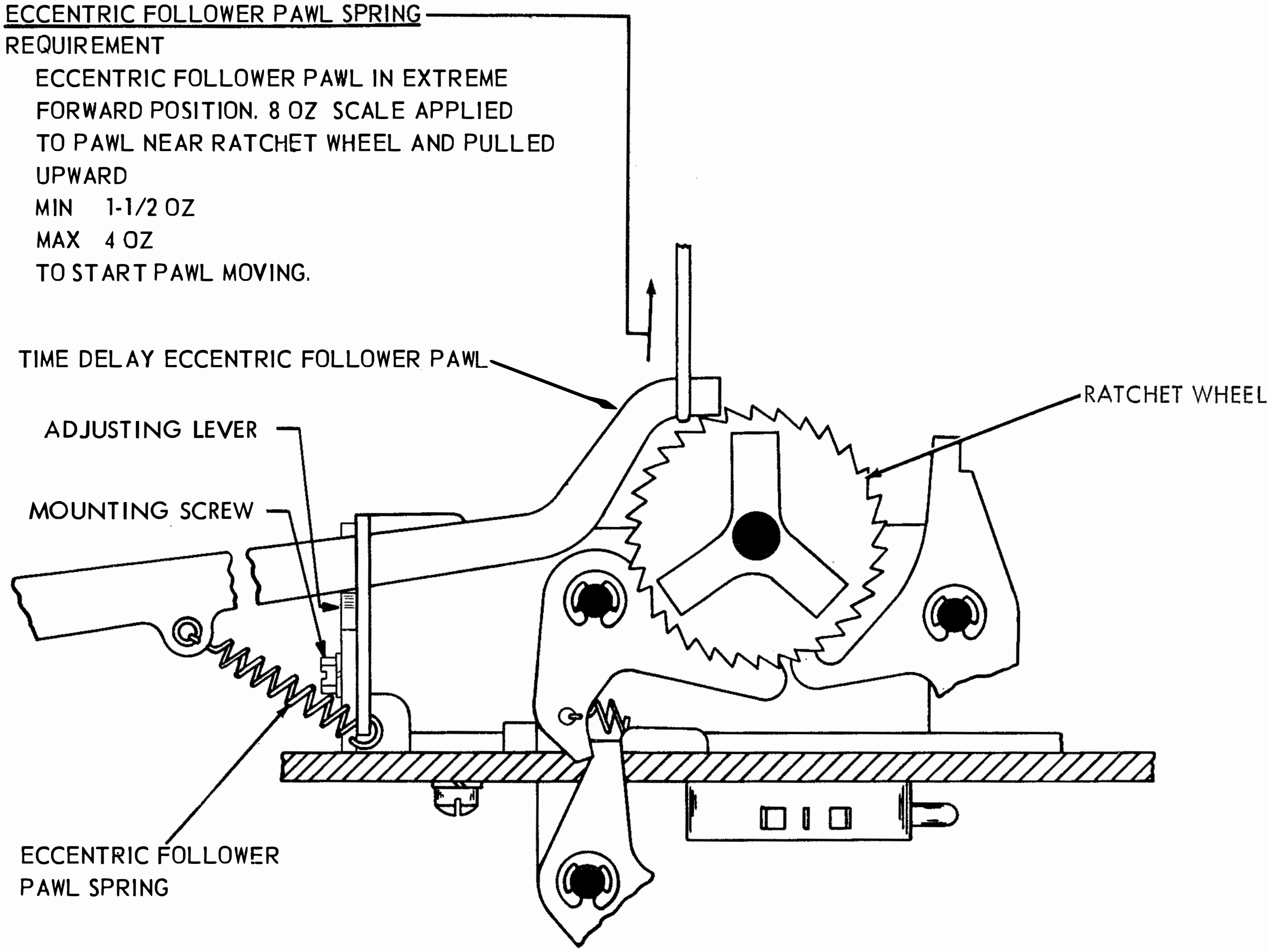
MIN 0.020 INCH



TO ADJUST

REMOVE THE TYPING UNIT FROM THE BASE. LOOSEN THE TIME DELAY MOUNTING SCREWS. ROTATE THE RATCHET WHEELS UNTIL THE LATCH PAWL DROPS INTO THE INDENTS IN THE TWO RATCHET WHEELS. LIFT THE ECCENTRIC FOLLOWER PAWL UPWARD. TAKE UP THE PLAY BY PRESSING THE RATCHET WHEELS BACKWARD. 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. RECHECK MINIMUM CLEARANCE OF 0.020 INCH WITH TYPING UNIT ON KEYBOARD BASE. IF NECESSARY, REFINE ADJUSTMENT.

3.05 Time Delay Mechanism continued



TIME DELAY DISABLING DEVICE

REQUIREMENT

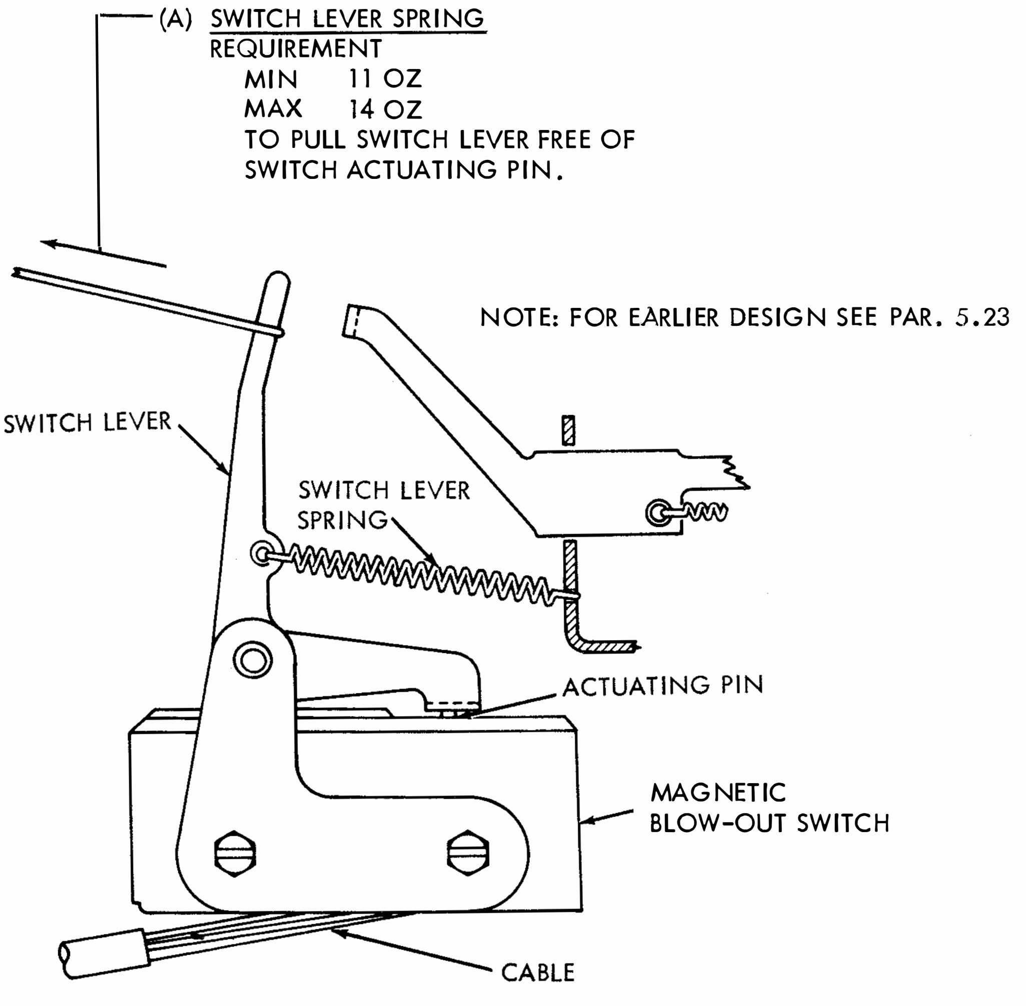
DISABLE THE TIME DELAY MECHANISM WHEN NOT REQUIRED.

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.

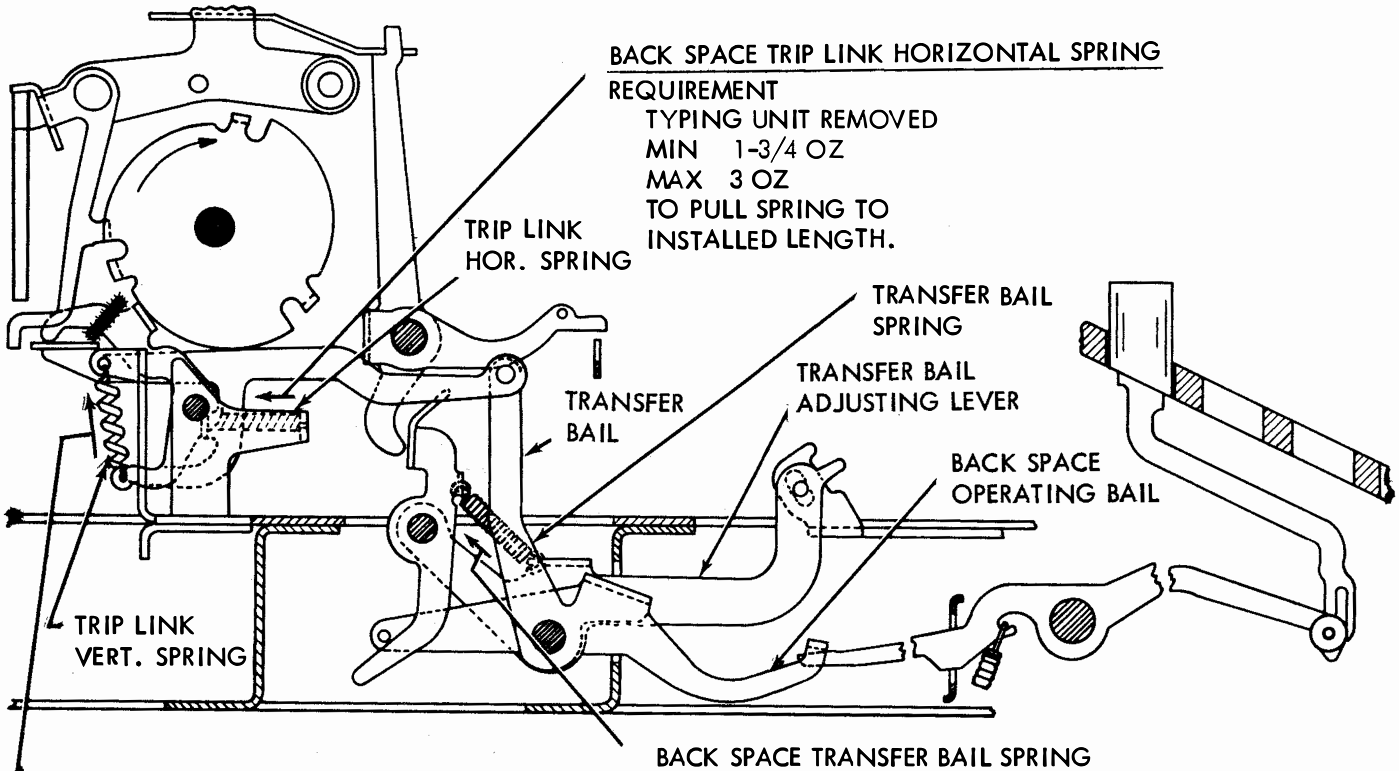
NOTE: FOR ADJUSTMENT OF EARLIER DESIGN MECHANISMS SEE PAR. 5.24

3.06 Local Paper Feed-Out Mechanism



3.07 Local Backspace Mechanism

NOTE: FOR EARLIER DESIGN SEE PAR. 5.27



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 TRIP LINK VERTICAL SPRING

REQUIREMENT
TYPING 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

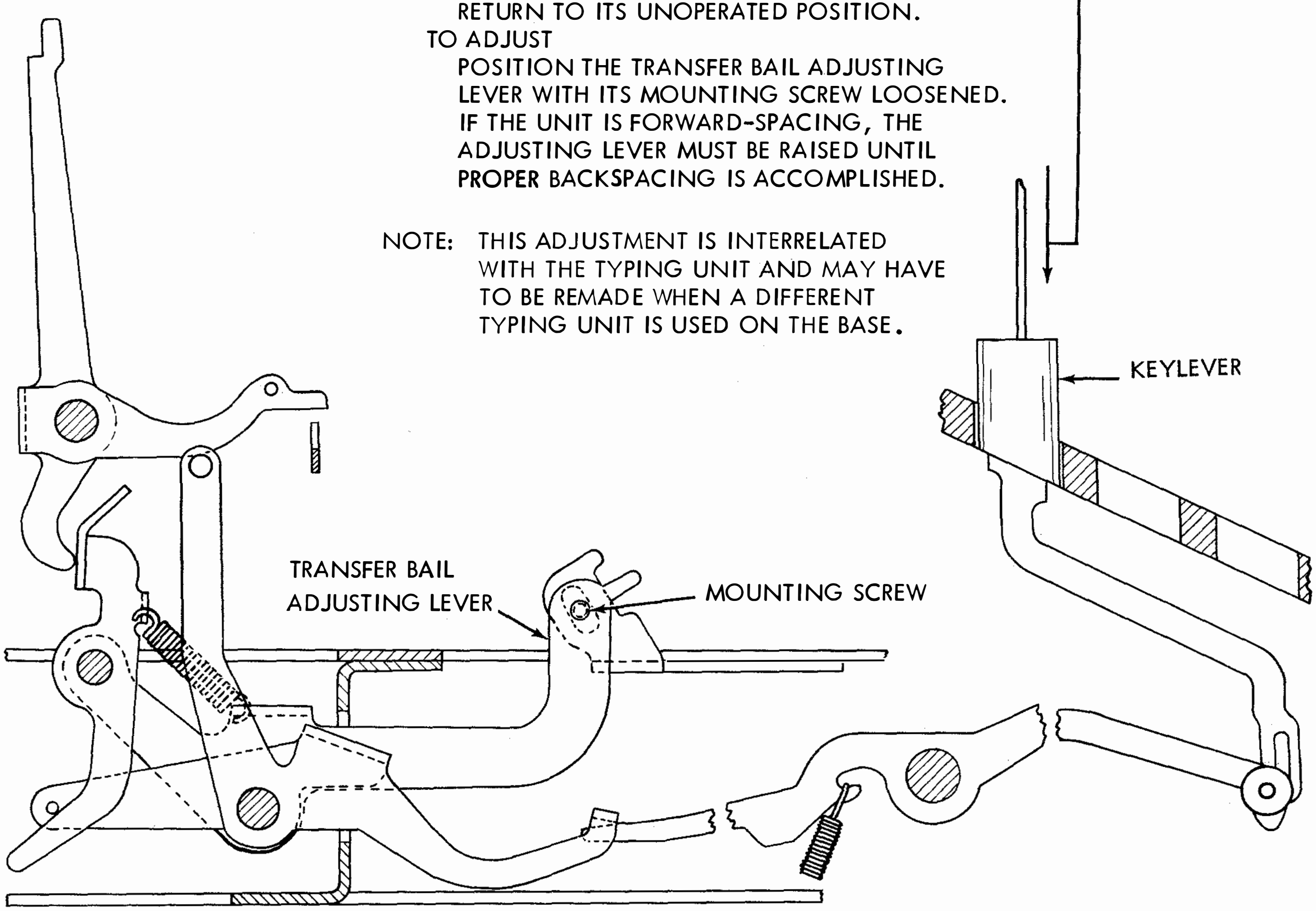
TRANSFER BAIL ADJUSTING LEVER

(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.

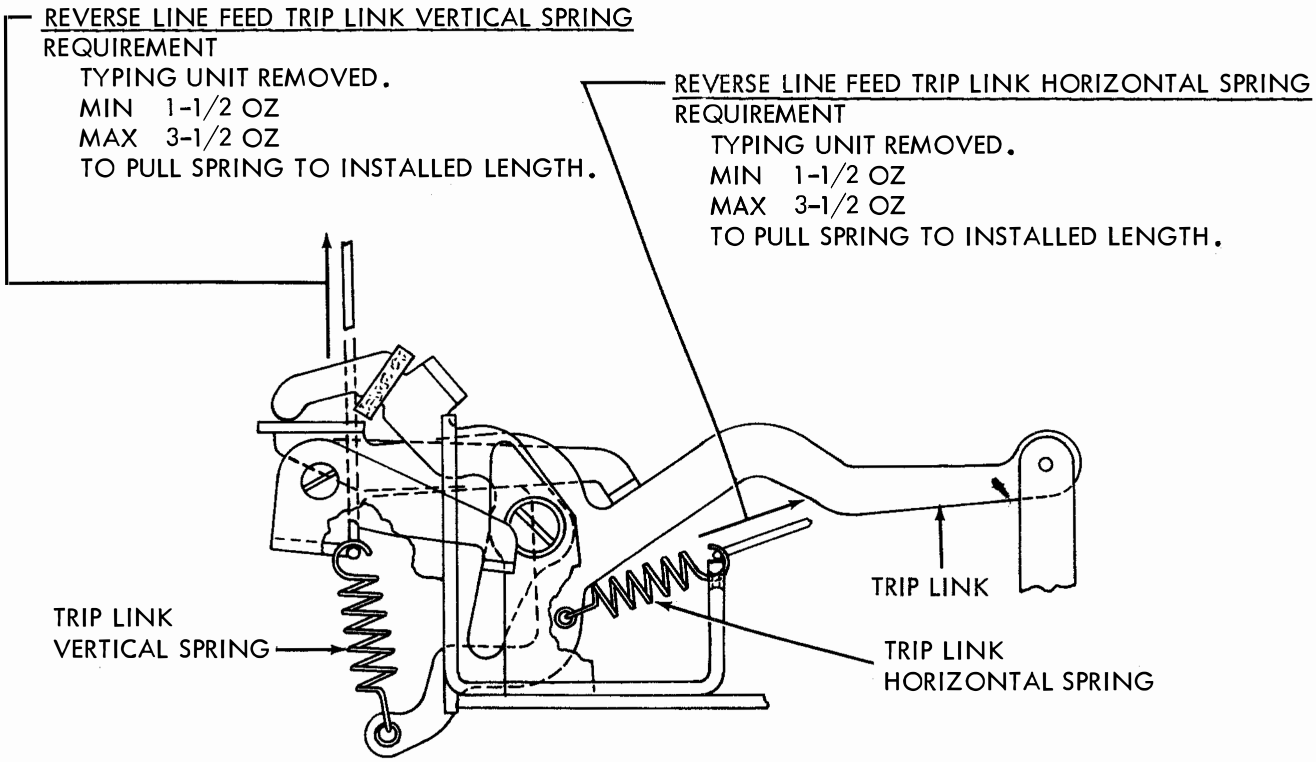
TO ADJUST
POSITION THE TRANSFER BAIL ADJUSTING LEVER WITH ITS MOUNTING SCREW LOOSENED. IF THE UNIT IS FORWARD-SPACING, THE ADJUSTING LEVER MUST BE RAISED UNTIL PROPER BACKSPACING IS ACCOMPLISHED.

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.



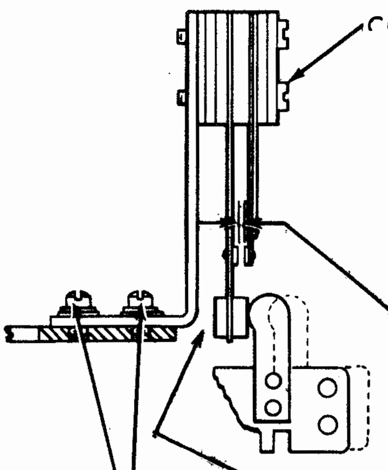
NOTE: FOR EARLIER DESIGN SEE PAR. 5.28

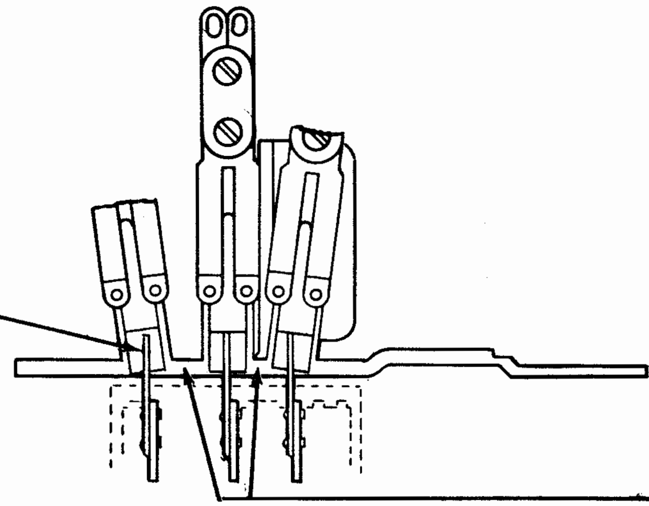
3.09 Reverse Line Feed Mechanism



KEYBOARD

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.

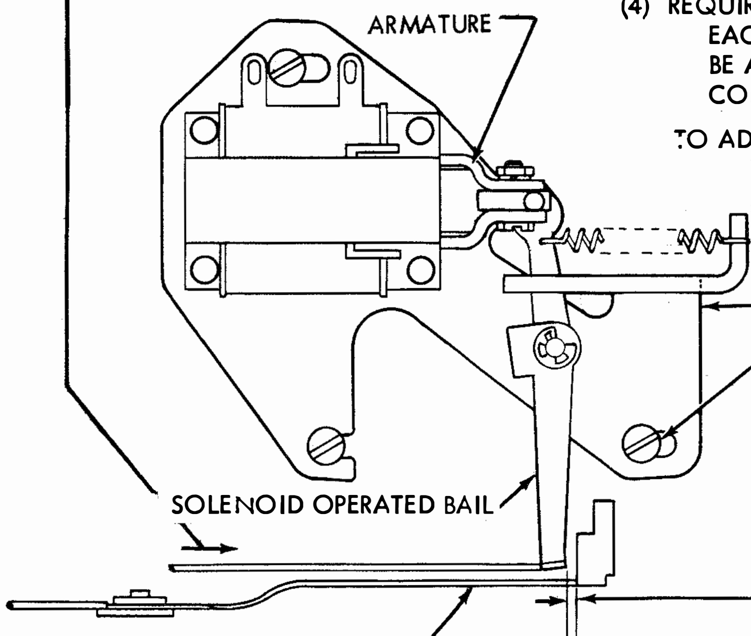
(C) SOLENOID BAIL SPRING

REQUIREMENT

BACKSPACE LINK HELD AWAY

MIN 2 OZ MAX 3 OZ

TO MOVE SOLENOID ARMATURE AWAY FROM SWITCH PLUNGER.



(B)

SOLENOID MOUNTING BRACKET POSITION

REQUIREMENT

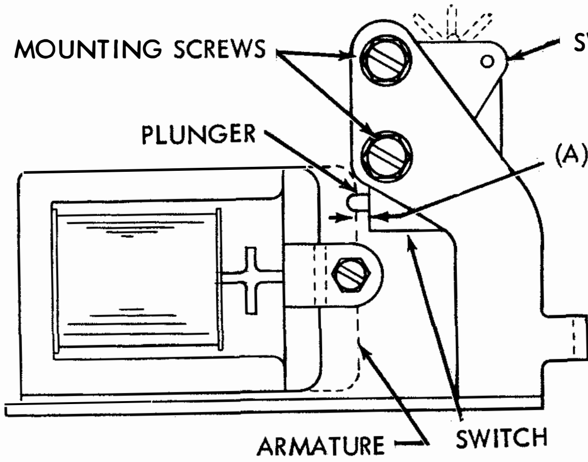
WITH THE SOLENOID ATTRACTED AND WITH 12 OZ OF PRESSURE APPLIED TO THE TRIP LINK IN A REARWARD DIRECTION THE CLEARANCE BETWEEN THE TRIP LINK AND THE SOLENOID OPERATED BAIL SHOULD BE

MIN SOME---MAX 0.010 INCH

TO ADJUST

POSITION THE SOLENOID MOUNTING BRACKET WITH ITS MOUNTING SCREWS LOOSENED.

3.11 Offline Contact continued



(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

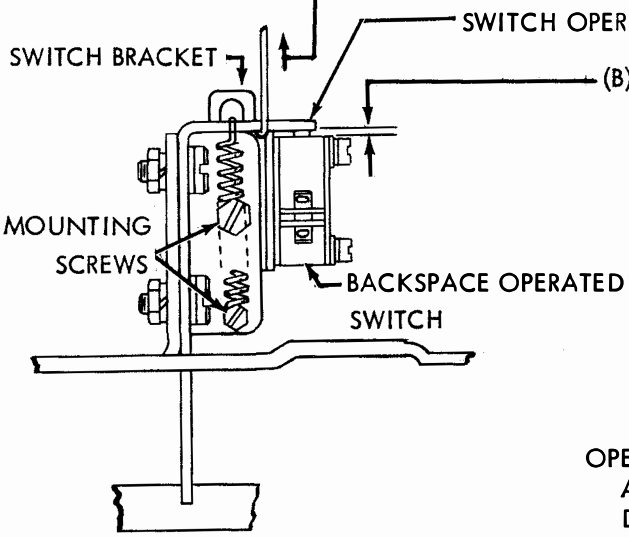
POSITION THE SWITCH PLATE WITH ITS MOUNTING SCREWS LOOSENED.

(C) SWITCH OPERATING LEVER SPRING

REQUIREMENT

MIN 7-1/2 OZ MAX 10-1/2 OZ

TO MOVE LEVER AWAY FROM PLUNGER.



(B) BACKSPACE KEYLEVER OPERATED SWITCH POSITION

REQUIREMENT

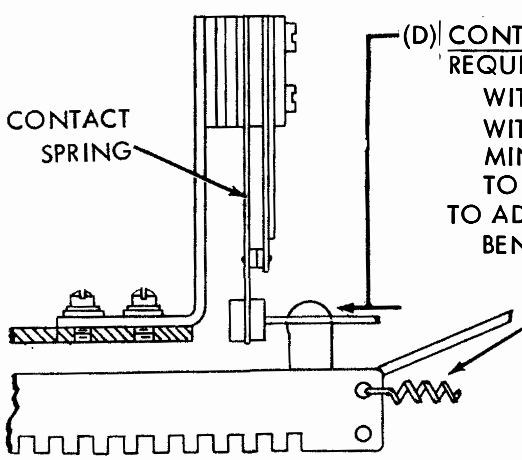
WITH THE BACKSPACE KEYLEVER IN ITS NORMAL UNOPERATED POSITION, THE CLEARANCE BETWEEN THE BACKSPACE KEYLEVER OPERATED SWITCH AND THE SWITCH OPERATING LEVER SHOULD BE

MAX 0.055 INCH

TO ADJUST

POSITION THE SWITCH BRACKET WITH ITS MOUNTING SCREWS LOOSENED.

OPERATIONAL CHECK: WITH A TYPING UNIT ON THE BASE, AND AC POWER APPLIED (SELECTOR MAGNETS ENERGIZED), DEPRESS LOCAL BACKSPACE KEYLEVER. CUT OFF AC POWER. RELEASE THE LOCAL BACKSPACE KEYLEVER SO THAT THE BACKSPACE LINK CLEARS THE SOLENOID OPERATED BAIL EXTENSION AND LATCHES UP UNDER IT BY AT LEAST 0.010 INCH CLEARANCE. WITH AC POWER APPLIED THE BACKSPACE SOLENOID SHOULD BECOME ENERGIZED. IF NECESSARY, REFINE THE SOLENOID OPERATED SWITCH PLATE POSITION.



(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.

(E) CODE BAR SPRING

REQUIREMENT

SPACE BAR DEPRESSED

MIN 3 OZ MAX 4 OZ

TO START EACH CODE BAR MOVING

3.12 Universal Keyboard Switch

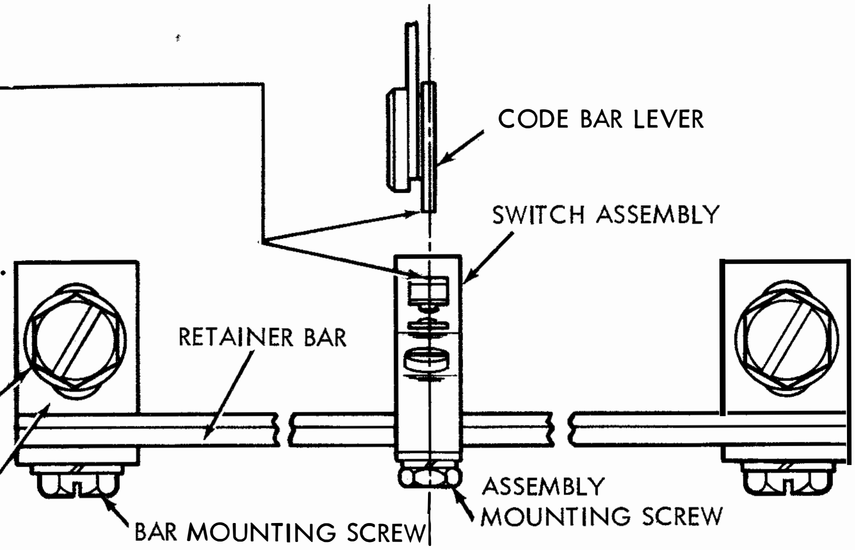
(A) KEYBOARD UNIVERSAL SWITCH PRELIMINARY

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 RETAINER BAR WITH ITS MOUNTING SCREW LOOSENED.



FRONT VIEW

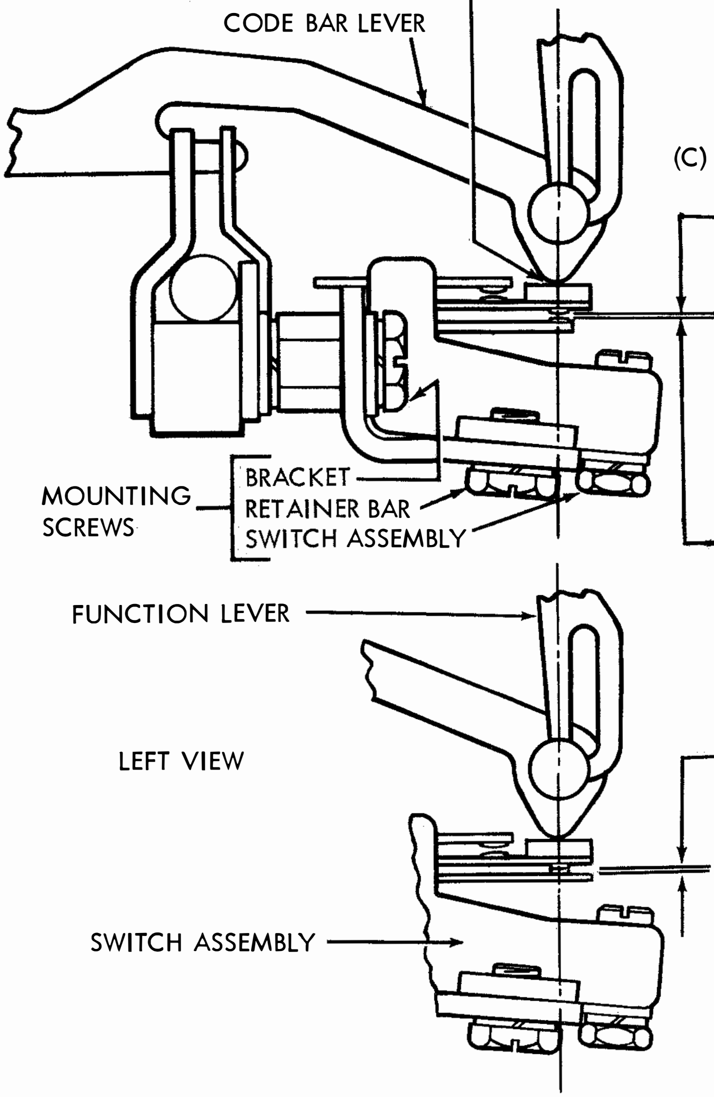
(B) KEYBOARD UNIVERSAL SWITCH - HORIZONTAL

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.



LEFT VIEW

(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

PULL 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

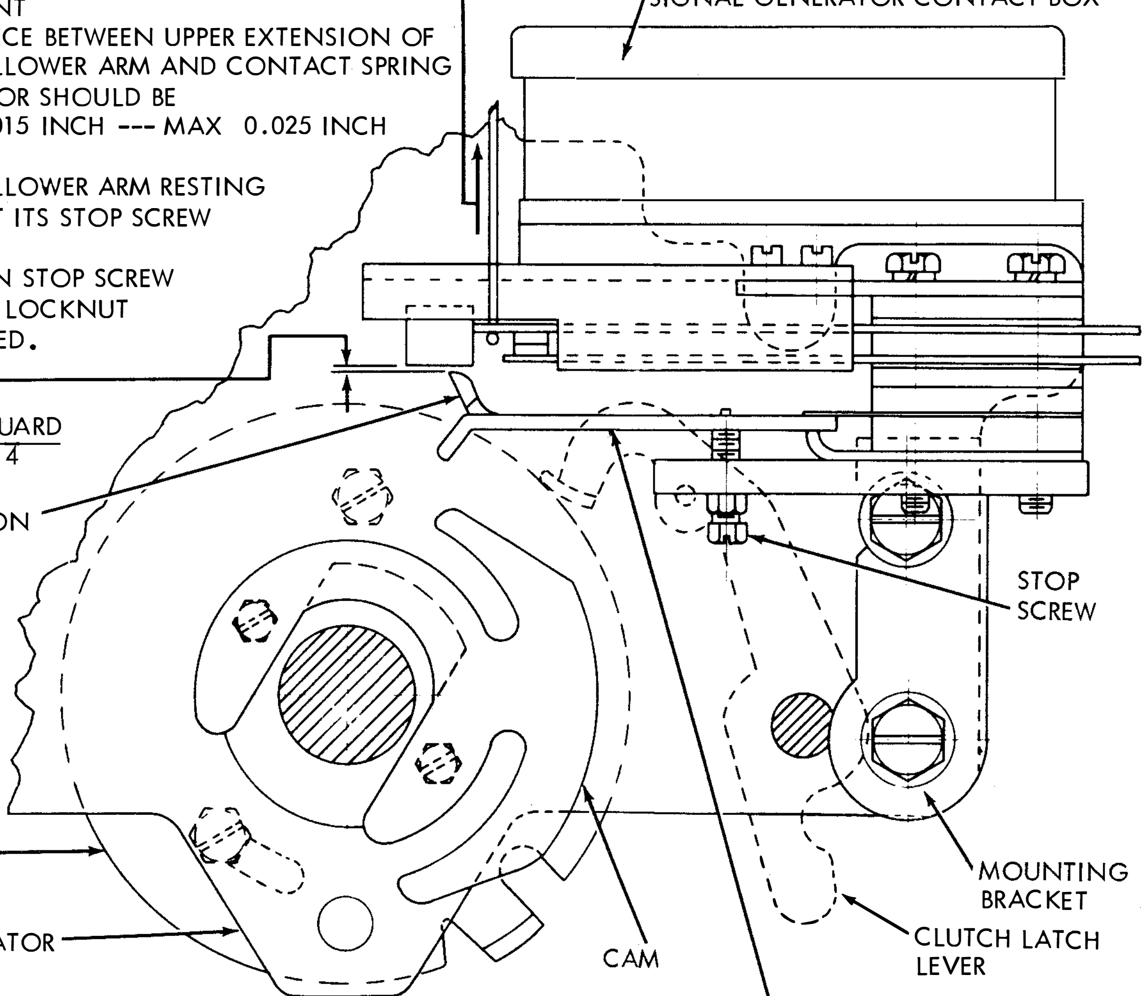
TO JUST SEPARATE THE CONTACTS

TO ADJUST

BEND LARGE CONTACT SPRING. RECHECK (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

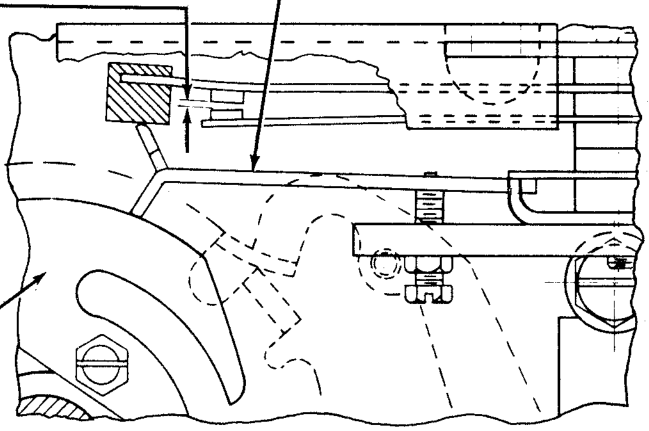
MIN 0.015 INCH --- MAX 0.025 INCH

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.

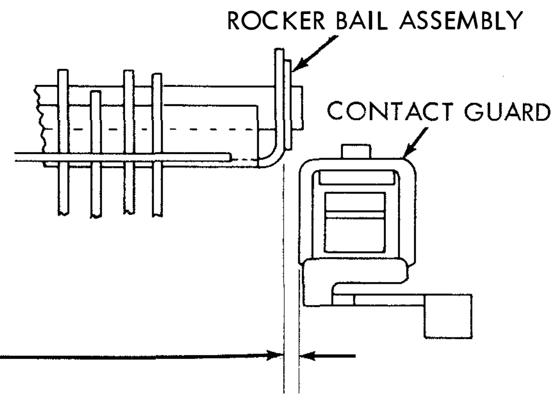
(D) CONTACT GUARD

REQUIREMENT

CLEARANCE BETWEEN CONTACT GUARD AND ROCKER BAIL ASSEMBLY SHOULD BE MIN 0.010 INCH

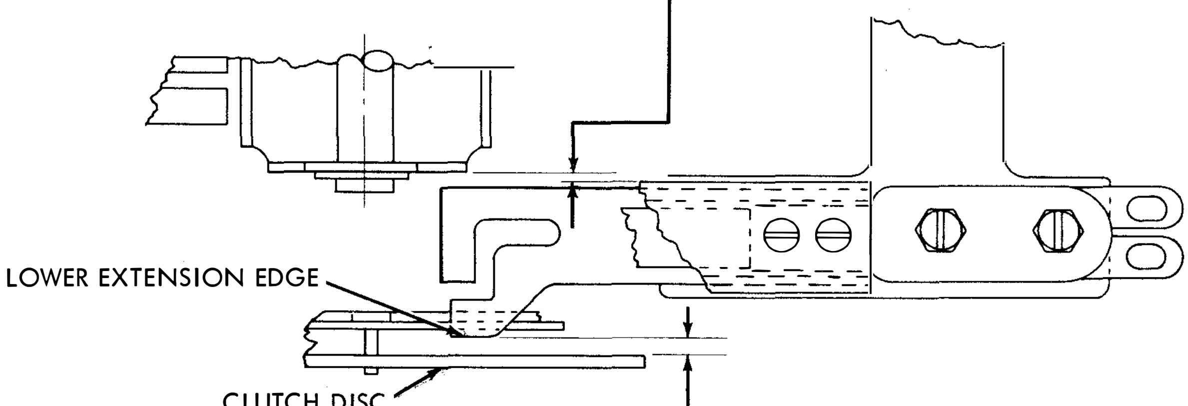
TO ADJUST

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

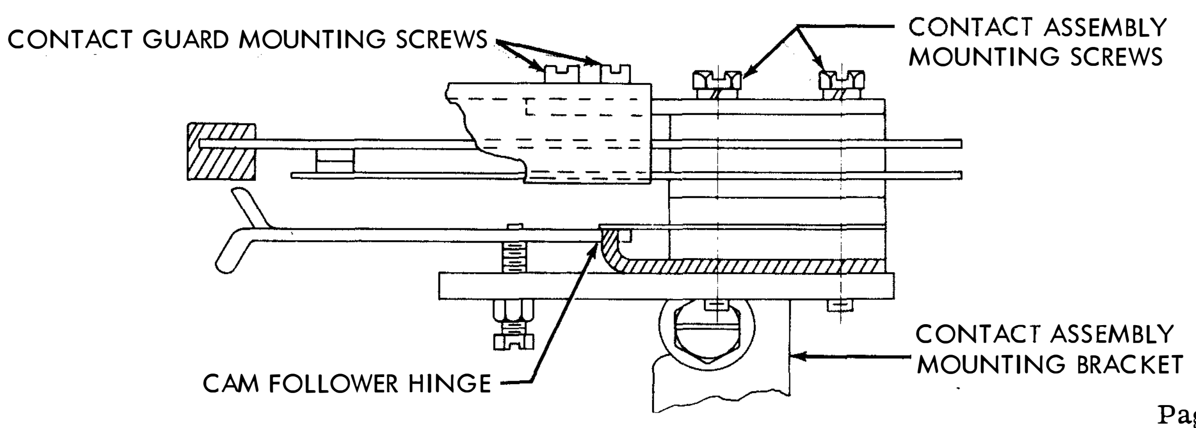
CLEARANCE BETWEEN LOWER EXTENSION EDGE OF CAM FOLLOWER ARM AND INSIDE SURFACE OF CLUTCH DISC SHOULD BE

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.

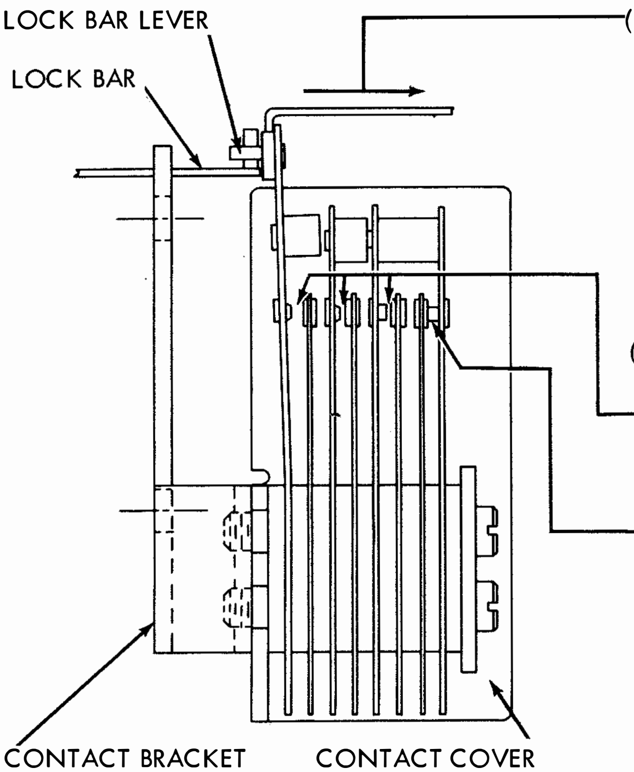
(H) STROBE REQUIREMENTS (FOLLOWING INSTALLATION OF SIGNAL GENERATOR) IF A DISTORTION TEST SET IS AVAILABLE.

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)



BOTTOM VIEW
(LOCK BAR IN "REC" POSITION)

(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

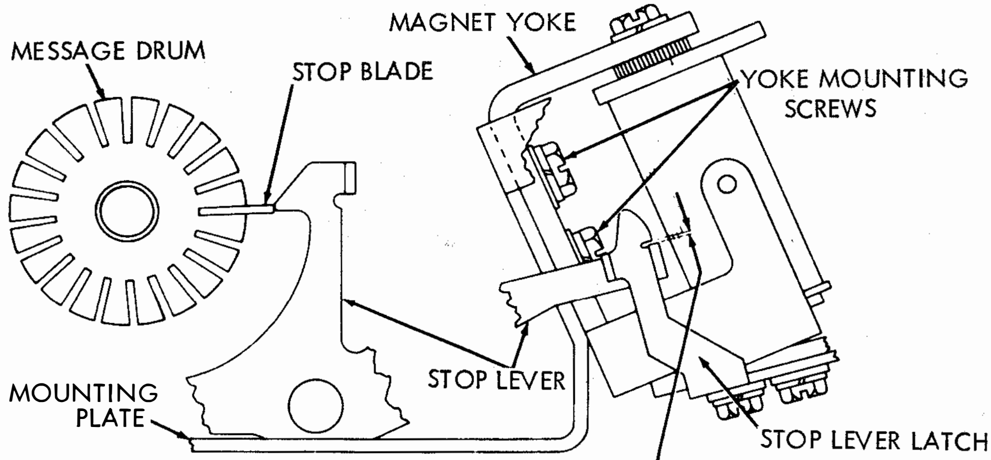
1. GAP BETWEEN NORMALLY OPEN CONTACTS SHOULD BE
   MIN 0.008 INCH --- MAX 0.012 INCH
   TO CHECK --- DEPRESS "REC" KEY
2. GAP BETWEEN NORMALLY CLOSED CONTACTS SHOULD BE
   MIN 0.008 INCH --- MAX 0.012 INCH
   TO CHECK --- DEPRESS "SEND" KEY AND RELEASE
3. ALL CONTACTS SHOULD CLOSE WITH A SMALL AMOUNT 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

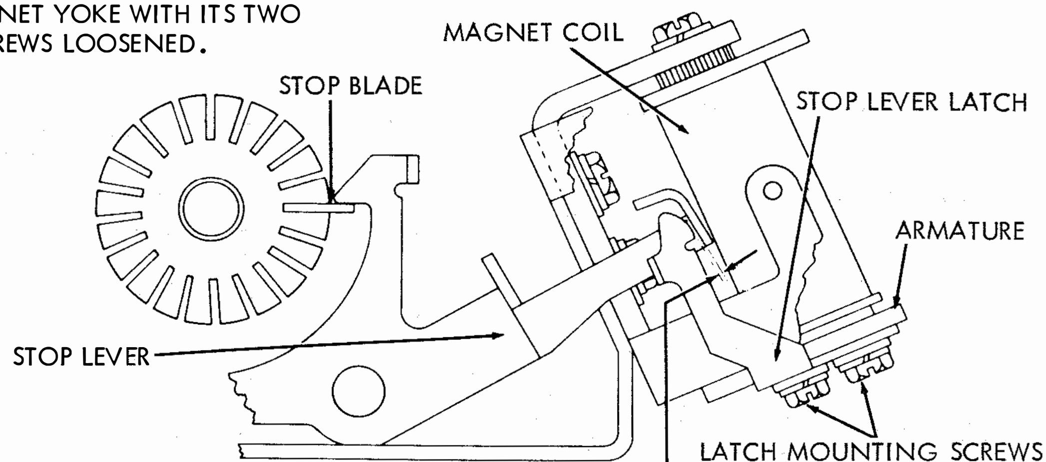
TO CHECK

HOLD TIP OF STOP LEVER AGAINST STOP BLADE.

TO ADJUST

POSITION MAGNET YOKE WITH ITS TWO MOUNTING SCREWS LOOSENED.

FOR "HERE-IS" KEYLEVER SWITCH REQUIREMENTS SEE KEYBOARD UNIVERSAL SWITCH ADJUSTMENTS, PAR. 3.12. FOR PULSING CONTACT REQUIREMENT, SEE BLINDING CONTACT ADJUSTMENTS, PAR. 3.13 THROUGH 3.16.



(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

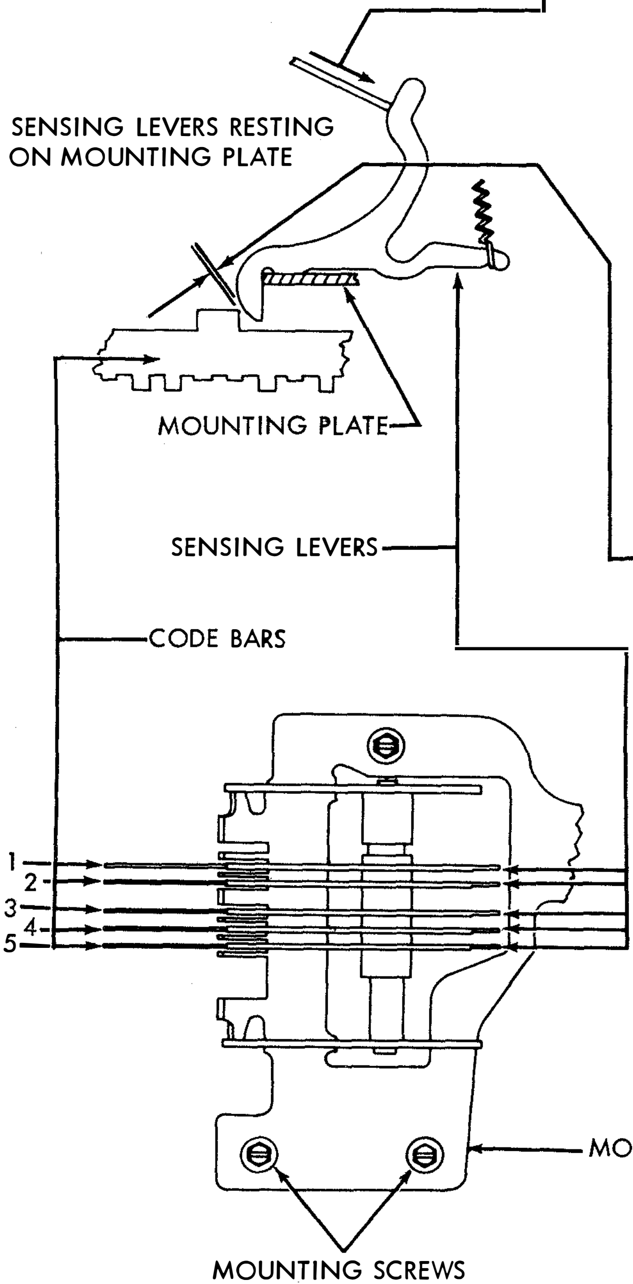
NOTE: TO FACILITATE MAKING THIS ADJUSTMENT, REMOVE MESSAGE DRUM AND DRIVE PLATE ASSEMBLY FROM MECHANISM.

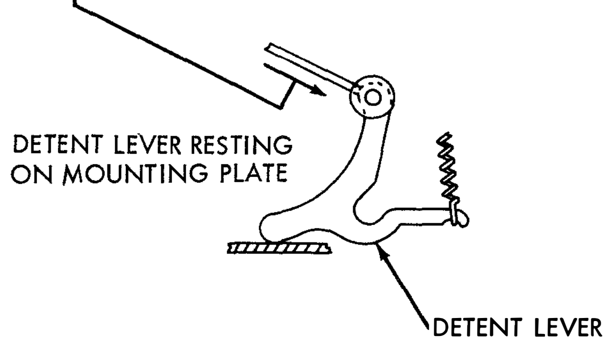
(B) SENSING LEVER SPRINGS

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.

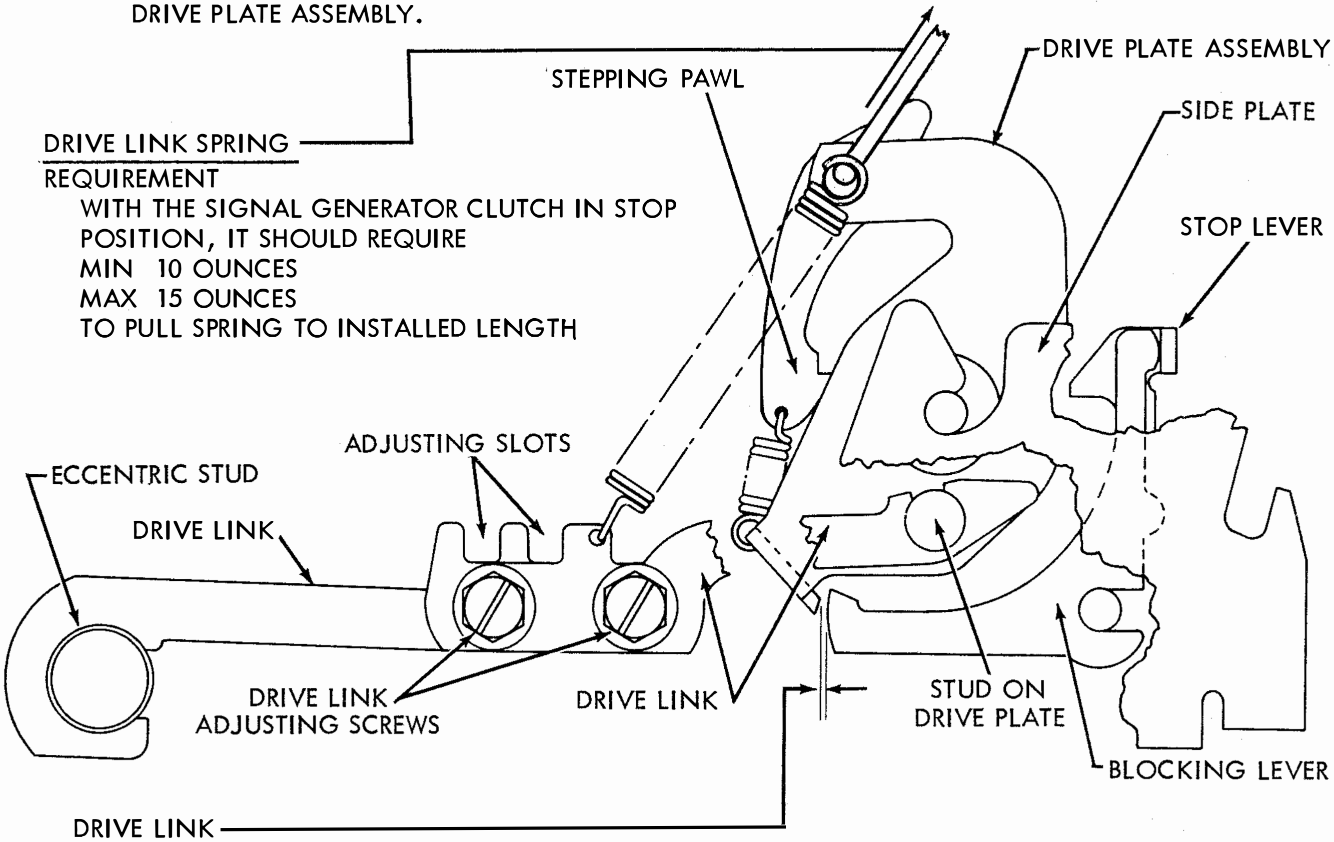
3.19 Answer-Back Mechanism (Switched Circuit Network)
Keyboards LK6 and Up (Bell 28D and Up) "FIGS" "C" continued

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

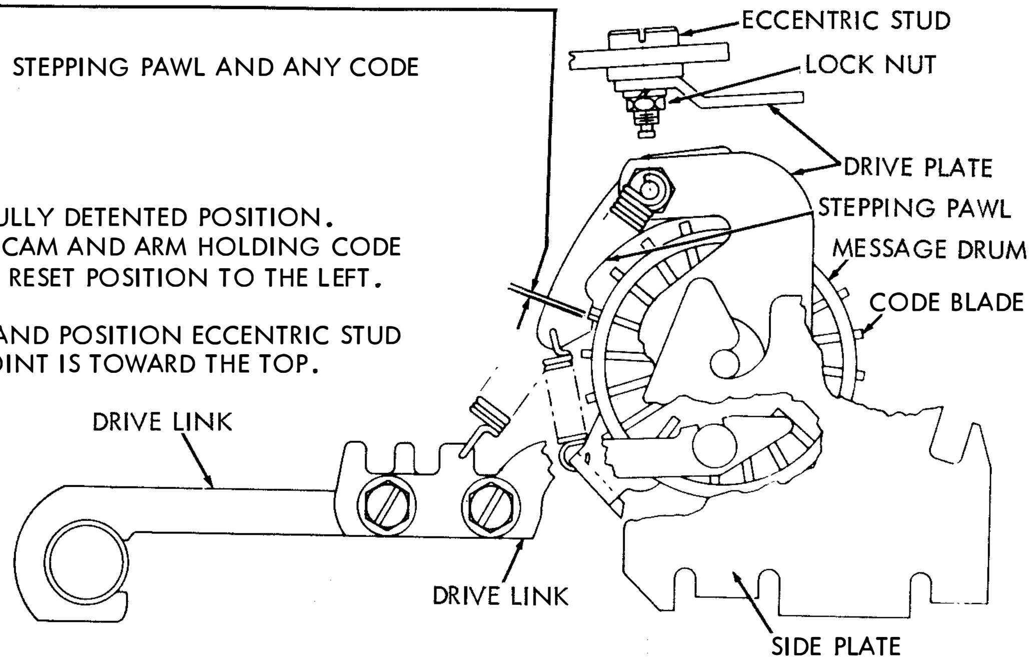
THE FOLLOWING FINAL ADJUSTMENTS FOR ANSWER-BACK MECHANISM SHOULD BE MADE AFTER INSTALLATION OF THE MECHANISM ON THE KEYBOARD.

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.

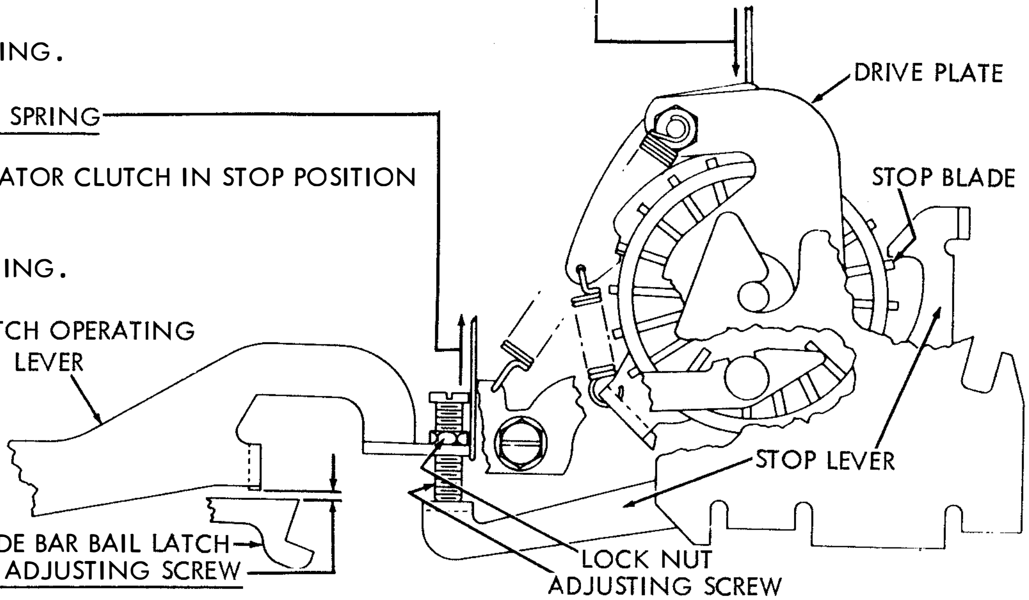


STEPPING PAWL SPRING

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.



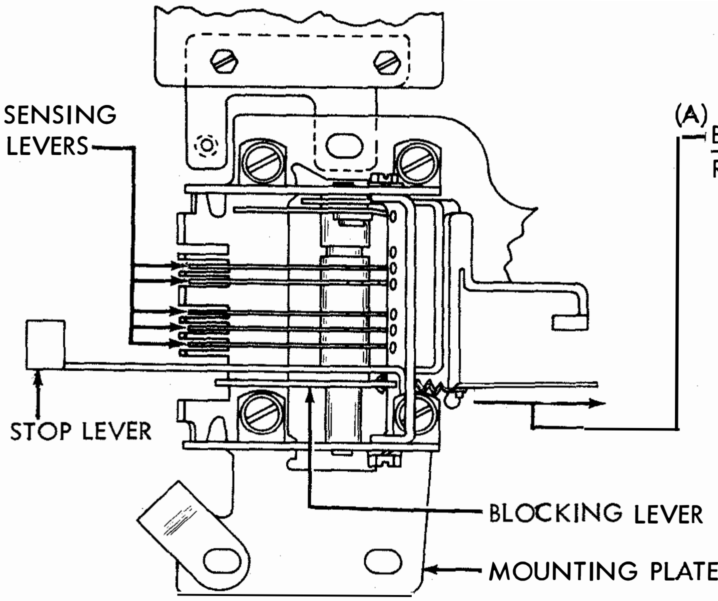
LATCH OPERATING LEVER ADJUSTING SCREW

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.

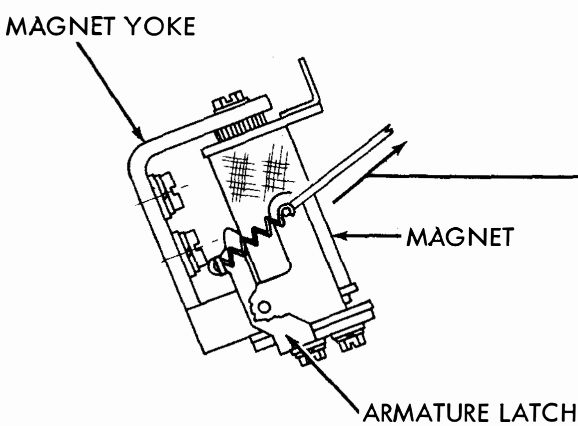
3.21 Answer-Back Mechanism (Switched Circuit Network)
Keyboards LK6 and Up (Bell 28D and Up) "FIGS" "C" continued



(A) BLOCKING LEVER SPRING

REQUIREMENT

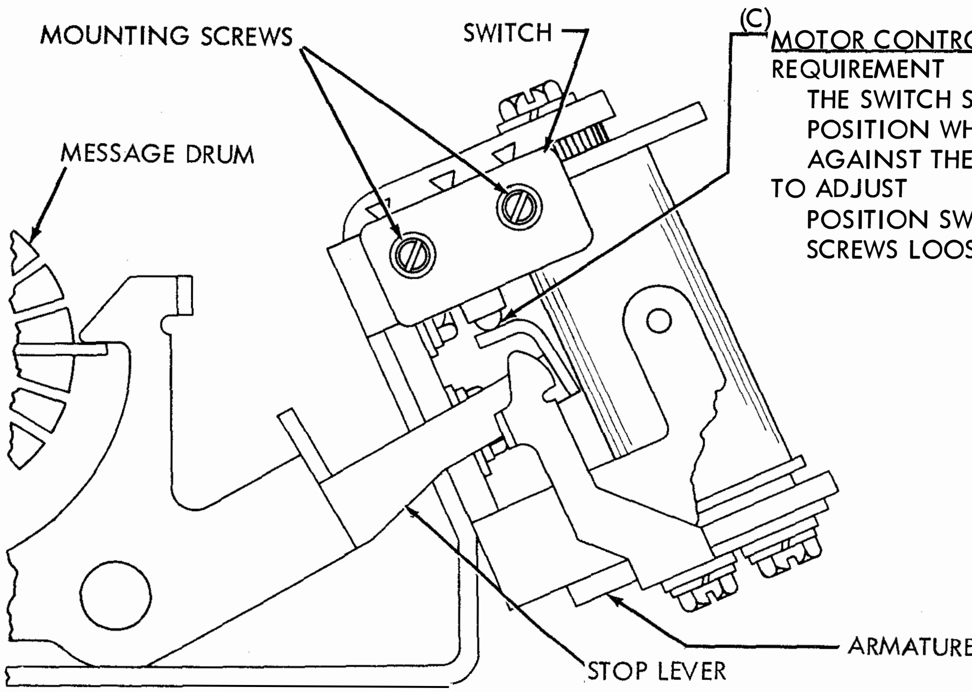
WITH SIGNAL GENERATOR CLUTCH IN STOP POSITION, UNHOOK BLOCKING LEVER SPRING FROM STOP LEVER.
MIN 1 OUNCE
MAX 2 OUNCES
TO PULL SPRING TO INSTALLED LENGTH



(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

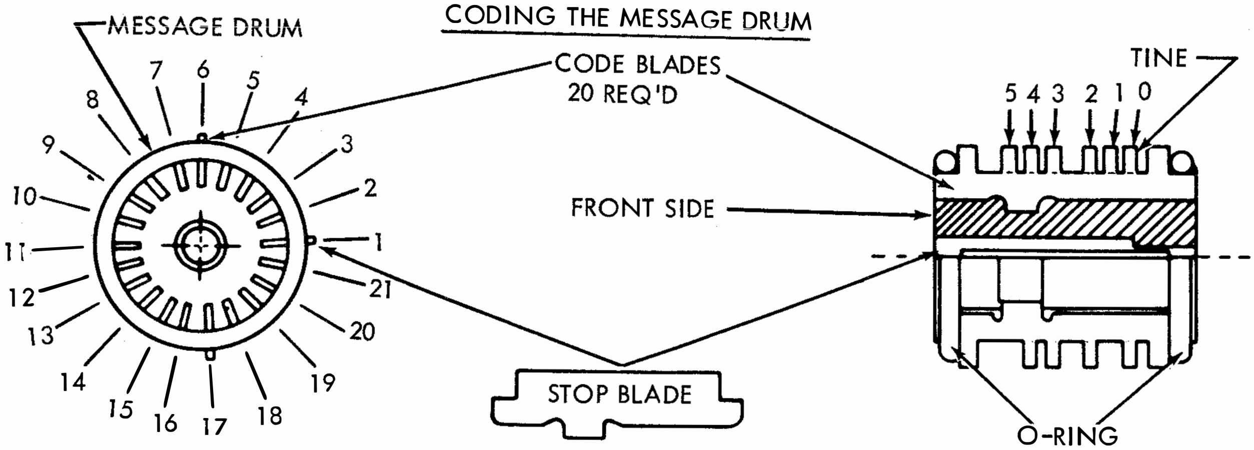
THE SWITCH SHOULD BE IN ITS OPERATED POSITION WHEN THE ARMATURE IS HELD AGAINST THE MAGNET CORE.

TO ADJUST

POSITION SWITCH WITH ITS MOUNTING SCREWS LOOSENED.

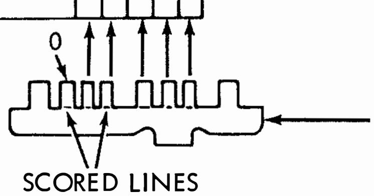
3.22 Answer-Back Mechanism (Switched Circuit Network)
Keyboards LK6 and Up (Bell 28D and Up) "FIGS" "C" continued

CODING THE MESSAGE DRUM



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.

LETTERS	TYPICAL FIG. ARRGT.	CODE 1	2	3	4	5
A	—	■	■	□	□	□
B	?	■	□	□	■	■
C	:	□	■	■	■	□
D	$	■	□	□	■	□
E	3	■	□	□	□	□
F	!	■	□	■	■	□
G	&	□	■	□	■	■
H	#	□	□	■	□	■
I	8	□	■	■	□	□
J	'	■	■	□	■	□
K	(	■	■	■	■	□
L	)	□	■	□	□	■
M	.	□	□	■	■	■
N	,	□	□	■	■	□
O	9	□	□	□	■	■
P	0	□	■	■	□	■
Q	1	■	■	■	□	■
R	4	□	■	□	■	□
S	BELL	■	□	■	□	□
T	5	□	□	□	□	■
U	7	■	■	■	□	□
V	;	□	■	■	■	■
W	2	■	■	□	□	■
X	/	■	□	■	■	■
Y	6	■	□	■	□	■
Z	"	■	□	□	□	■
CARRIAGE RETURN		□	□	□	■	□
LINE FEED		□	■	□	□	□
LETTERS SHIFT		■	■	■	■	■
FIGURES SHIFT		■	■	□	■	■
SPACE		□	□	■	□	□
BLANK		□	□	□	□	□



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

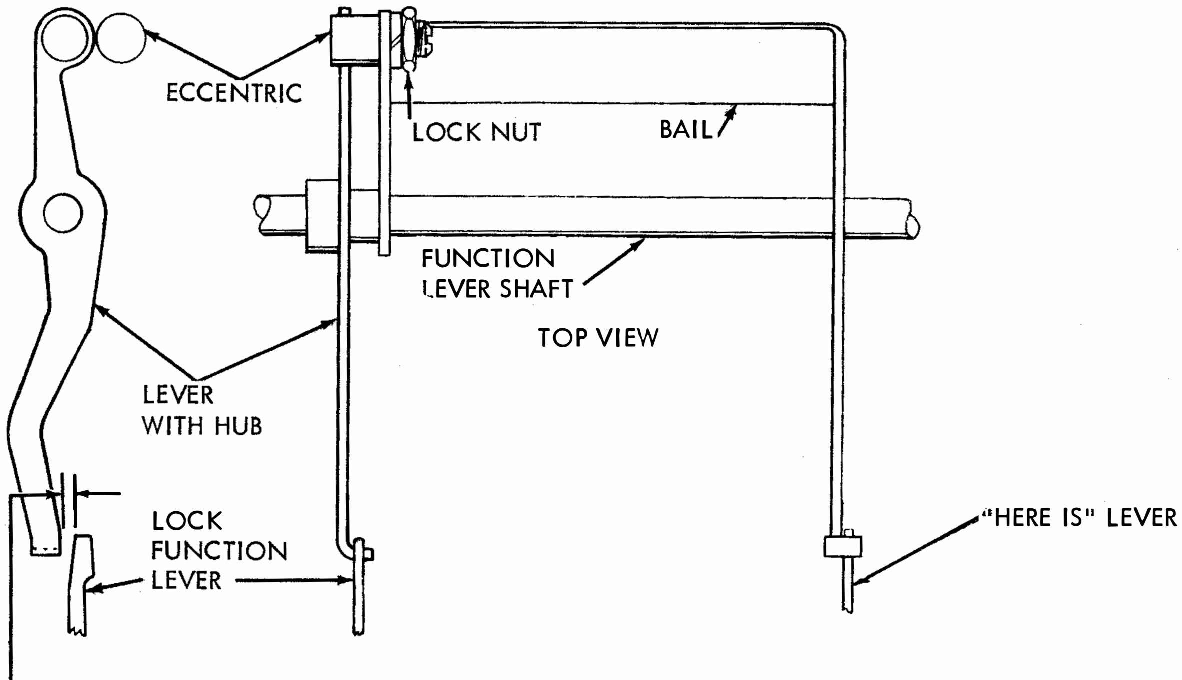
5. APPLY GREASE TO SHAFT OF MESSAGE DRUM. REASSEMBLE MECHANISM REVERSING PROCEDURE OF STEP 1. BE SURE PARTS ARE PROPERLY SEATED. LUBRICATE PER INSTRUCTION IN APPROPRIATE SECTION.

■ — LEAVE TINE

□ — REMOVE TINE

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.



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

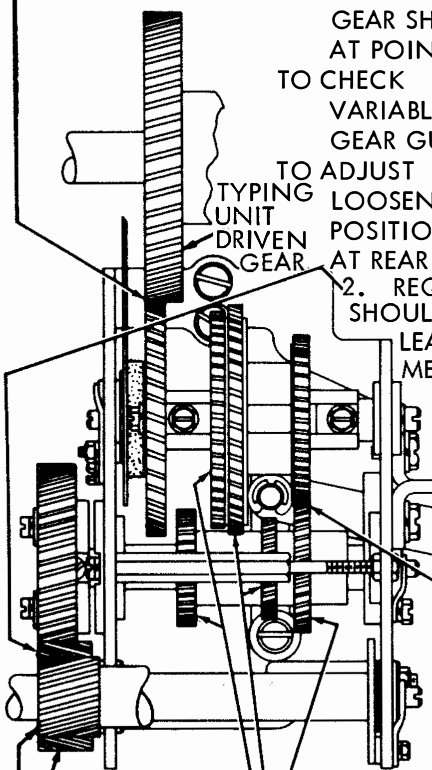
VARIABLE SPEED DRIVE MECHANISM AND TYPING UNIT MOUNTED IN PLACE AND GEAR GUARD REMOVED.

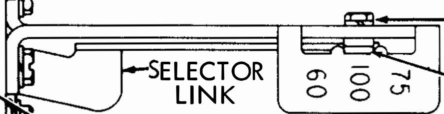
TO ADJUST

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.





TOP VIEW FROM REAR

(B) SELECTOR LEVER

REQUIREMENT

THERE SHOULD BE FULL MESH OF MATING GEARS.

TO CHECK

PLACE SPEED SELECTOR LEVER IN DETENTED POSITION AT 100 WPM.

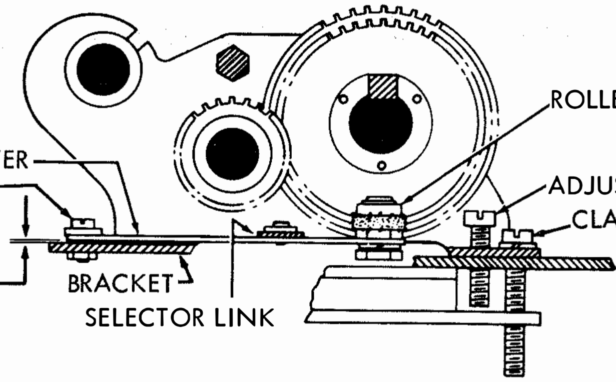
TO ADJUST

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)



(A) 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

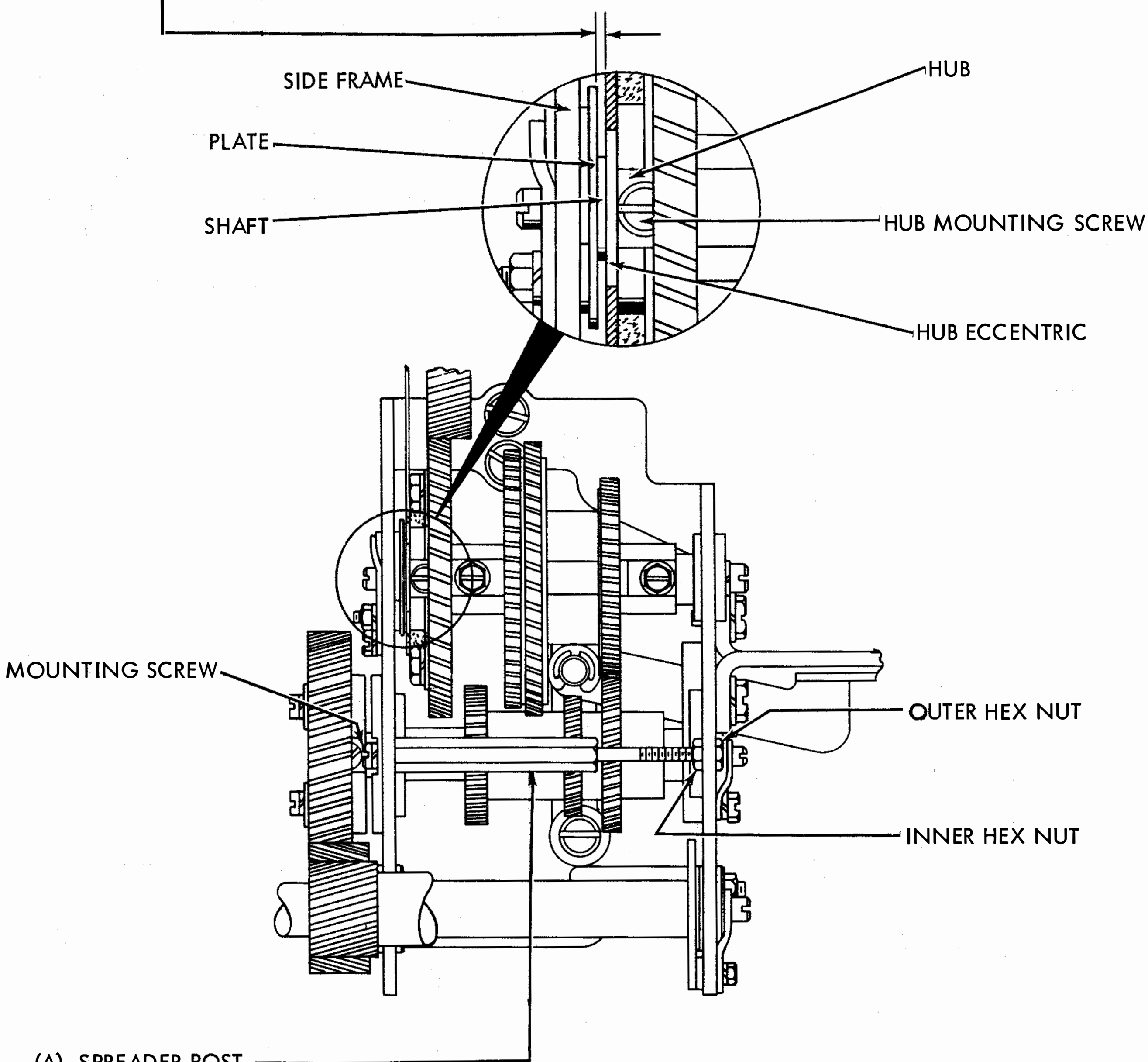
(B) HUB POSITION

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.

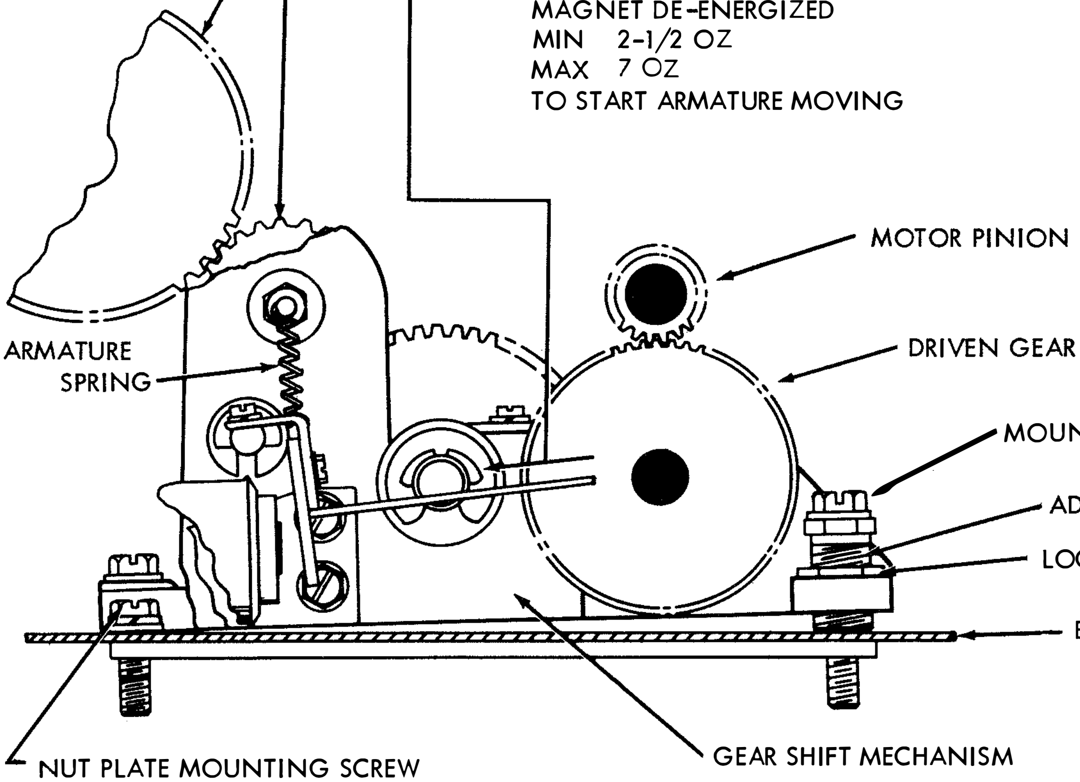
TO ADJUST

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 BUSHING NEAREST THE MOTOR. POSITION OTHER BUSHING AGAINST BASE PLATE AND TIGHTEN ALL SCREWS AND LOCK NUT.

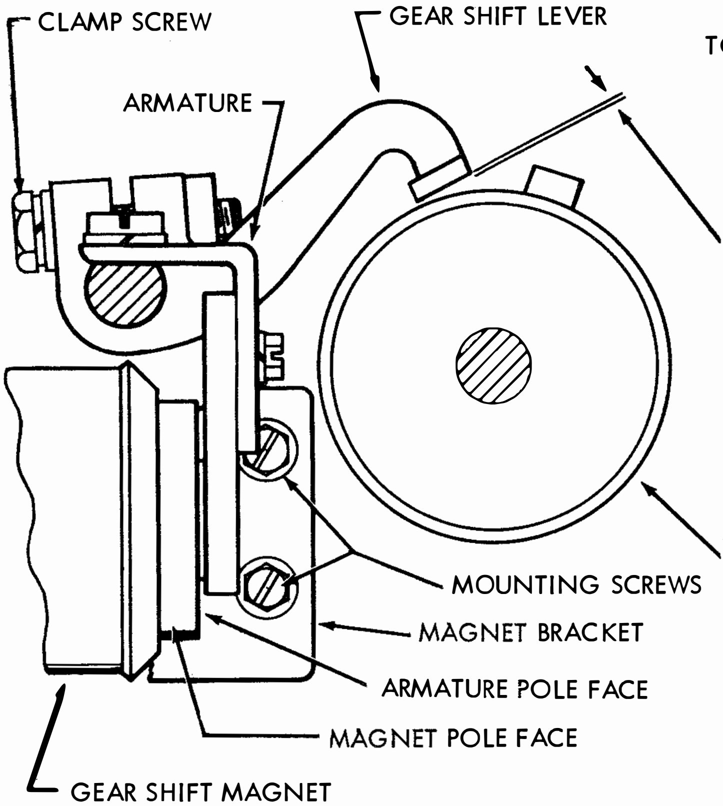
GEAR SHIFT MAGNET ARMATURE SPRING

REQUIREMENT

MAGNET DE-ENERGIZED
MIN 2-1/2 OZ
MAX 7 OZ
TO START ARMATURE MOVING



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

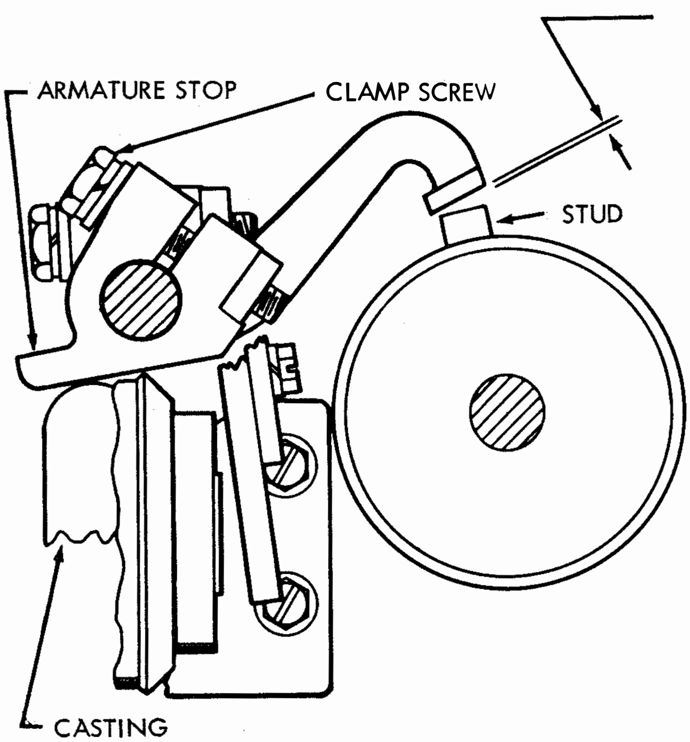
ARMATURE RESTING AGAINST MAGNET POLE FACE, CLEARANCE BETWEEN GEAR SHIFT LEVER AND THE SLEEVE

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

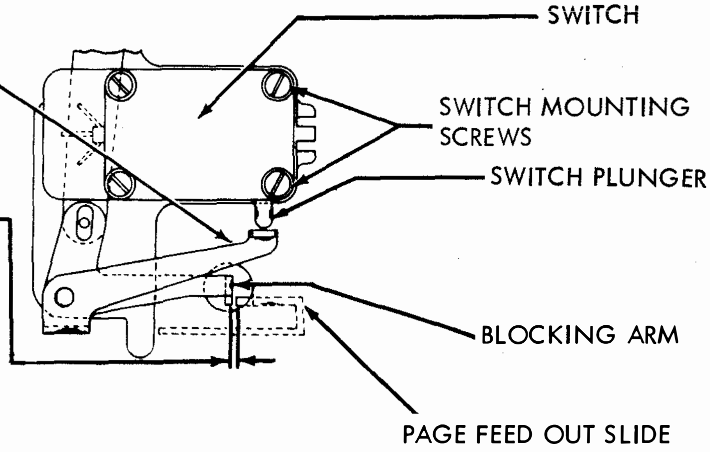
MIN 0.010 INCH

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



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

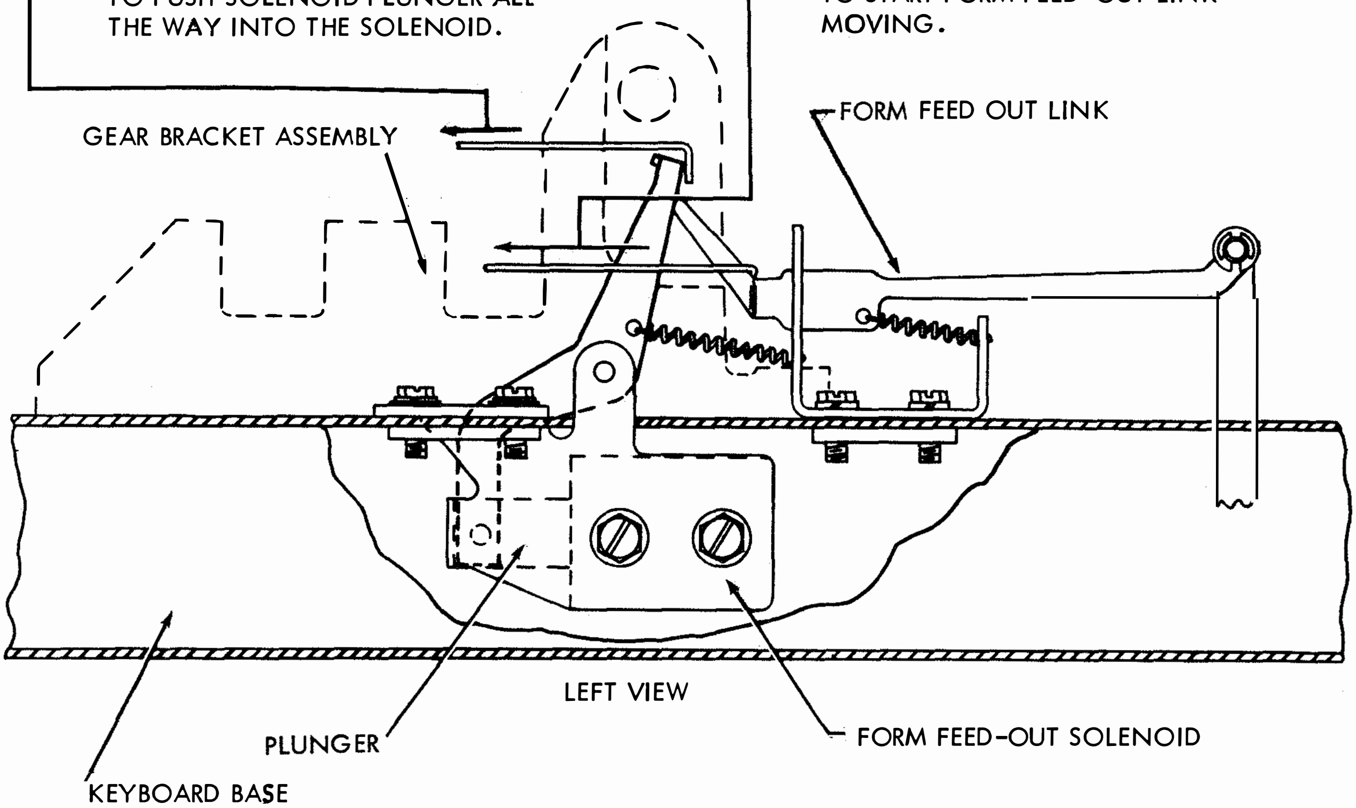
REQUIREMENT

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.



3.29 Synchronous Pulse Mechanism

MOUNTING BRACKET

TO CHECK

WITH MAGNET NOT ATTRACTED AND CLUTCH TRIP BAR IN FURTHEST LEFT POSITION.

REQUIREMENT

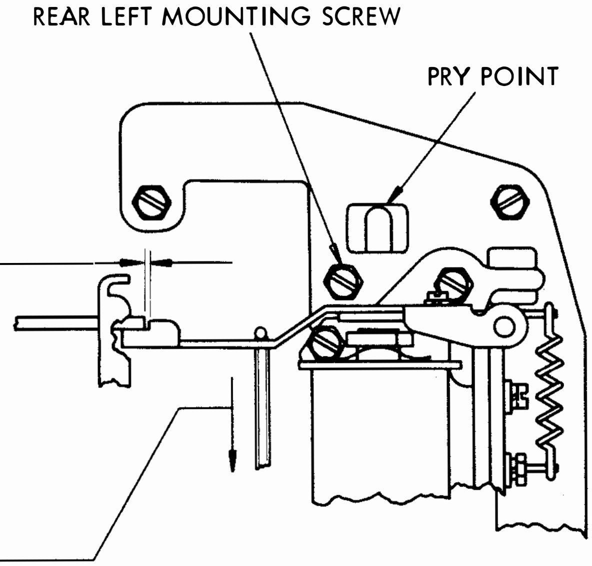
MIN 0.005 INCH --- MAX 0.015 INCH BETWEEN CLUTCH TRIP BAR AND ARMATURE LEVER.

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

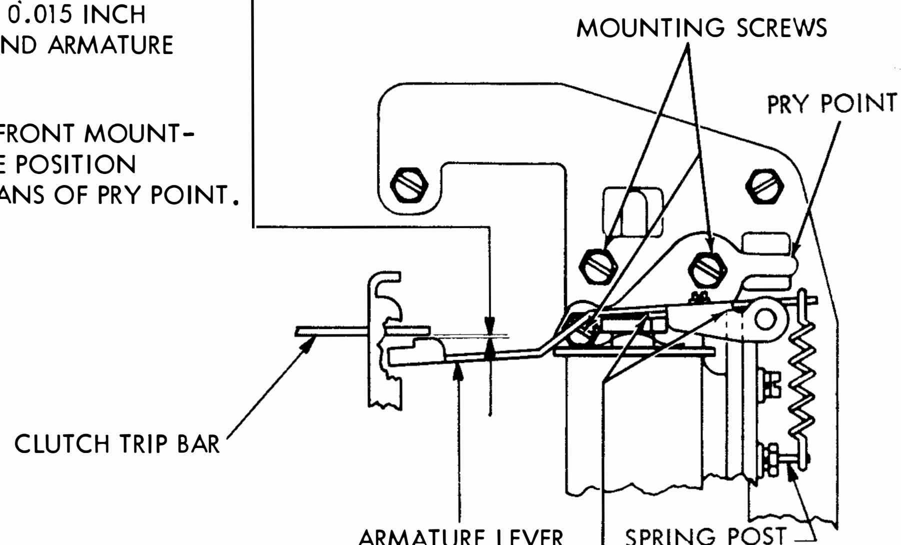
WITH ARMATURE LEVER HELD AGAINST MAGNET POLE FACE AND CLUTCH TRIP BAR IN FURTHEST RIGHT POSITION.

REQUIREMENT

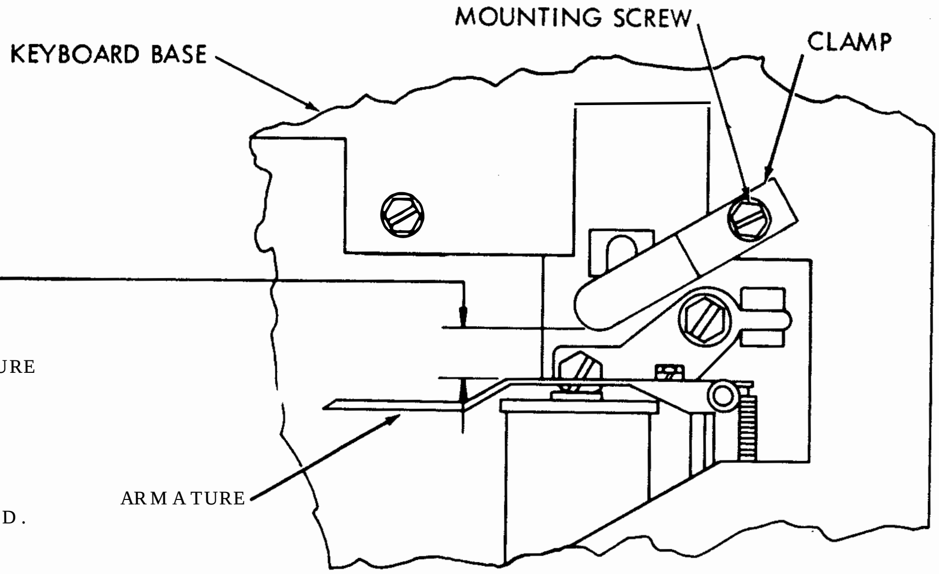
MIN 0.005 INCH --- MAX 0.015 INCH BETWEEN CLUTCH TRIP BAR AND ARMATURE LEVER.

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

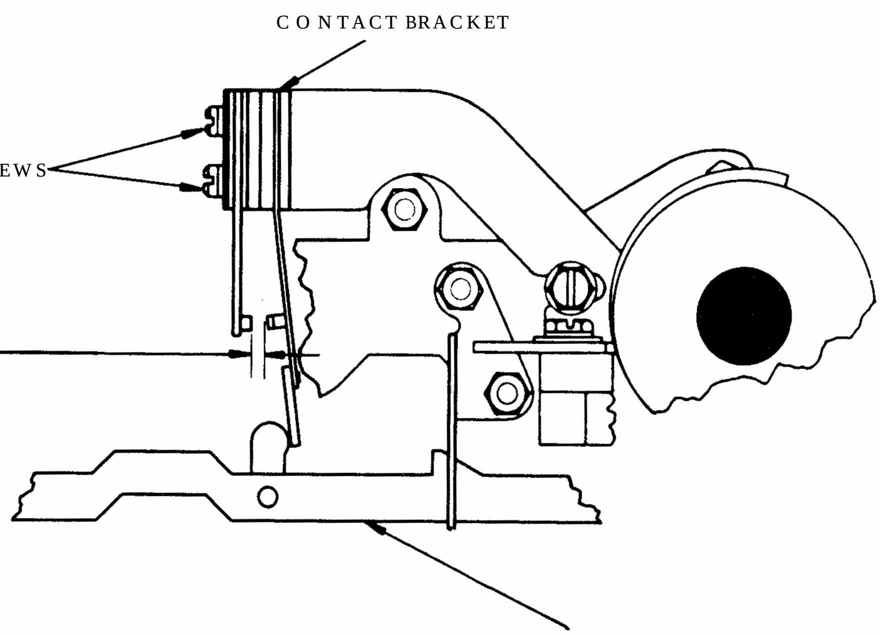
REQUIREMENT

WITH A ATURE OPERATED, CLEARANCE BETWEEN ARMATURE CLAMP AND A ATURE

APPROX 3/8 INCH

TO ADJUST

POSITION CLAMP WITH ITS MOUNTING SCREW LOOSENED.



CONTACT GAP

REQUIREMENT

WITH UNIVERSAL CODE BAR IN STOP POSITION (TO RIGHT AS VIEWED FROM REAR) CONTACT GAP SHOULD BE

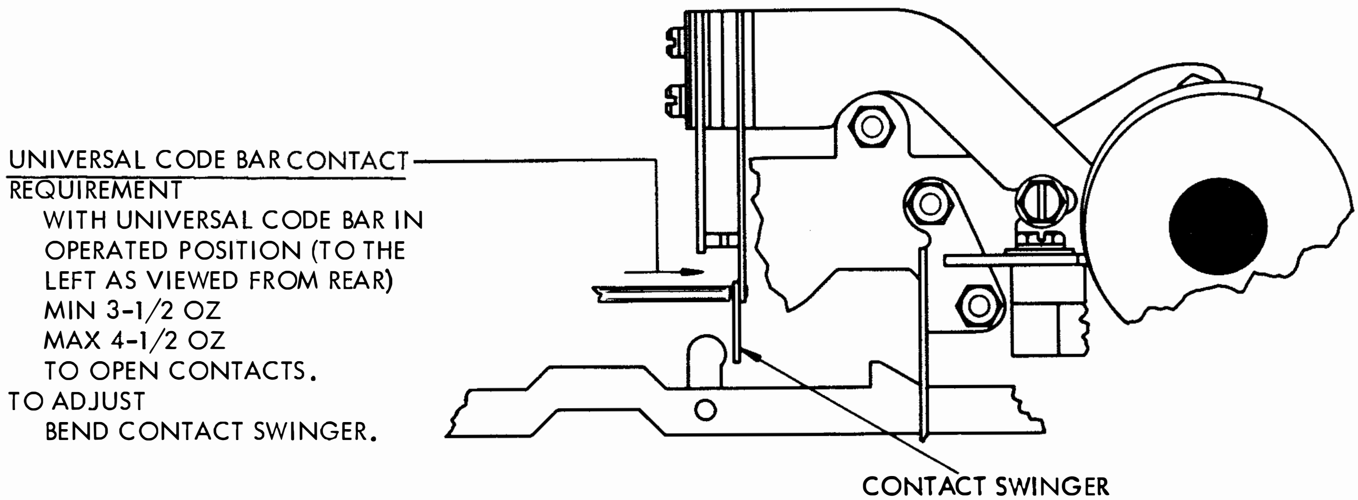
MIN 0.020 INCH

MAX 0.035 INCH

TO ADJUST

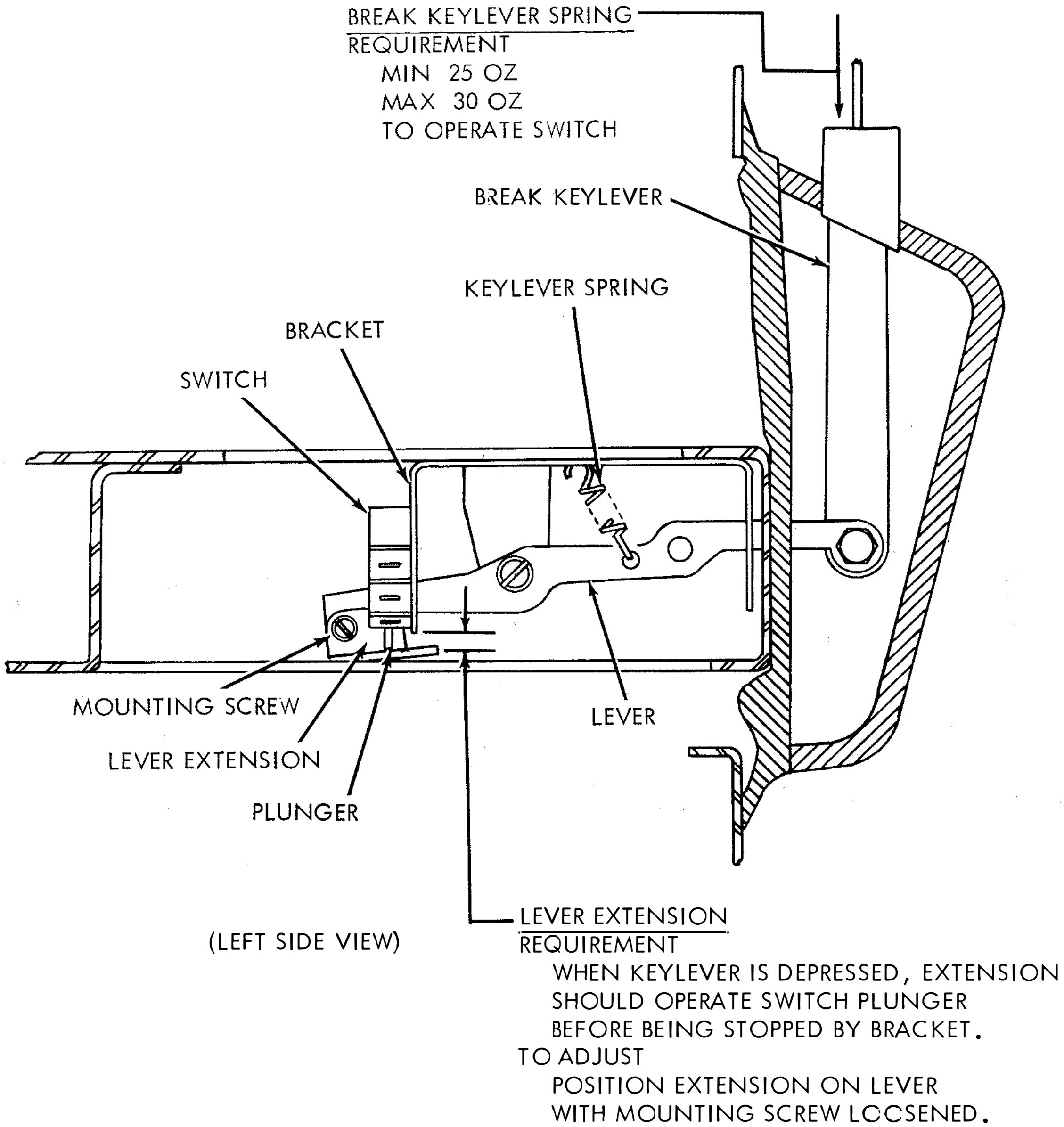
POSITION CONTACT MOUNTING BRACKET WITH MOUNTING SCREWS LOOSE.

3.31 Synchronous Pulse Mechanism continued



4. BASE (RECEIVE-ONLY)

4.01 Signal Line Break Mechanism



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

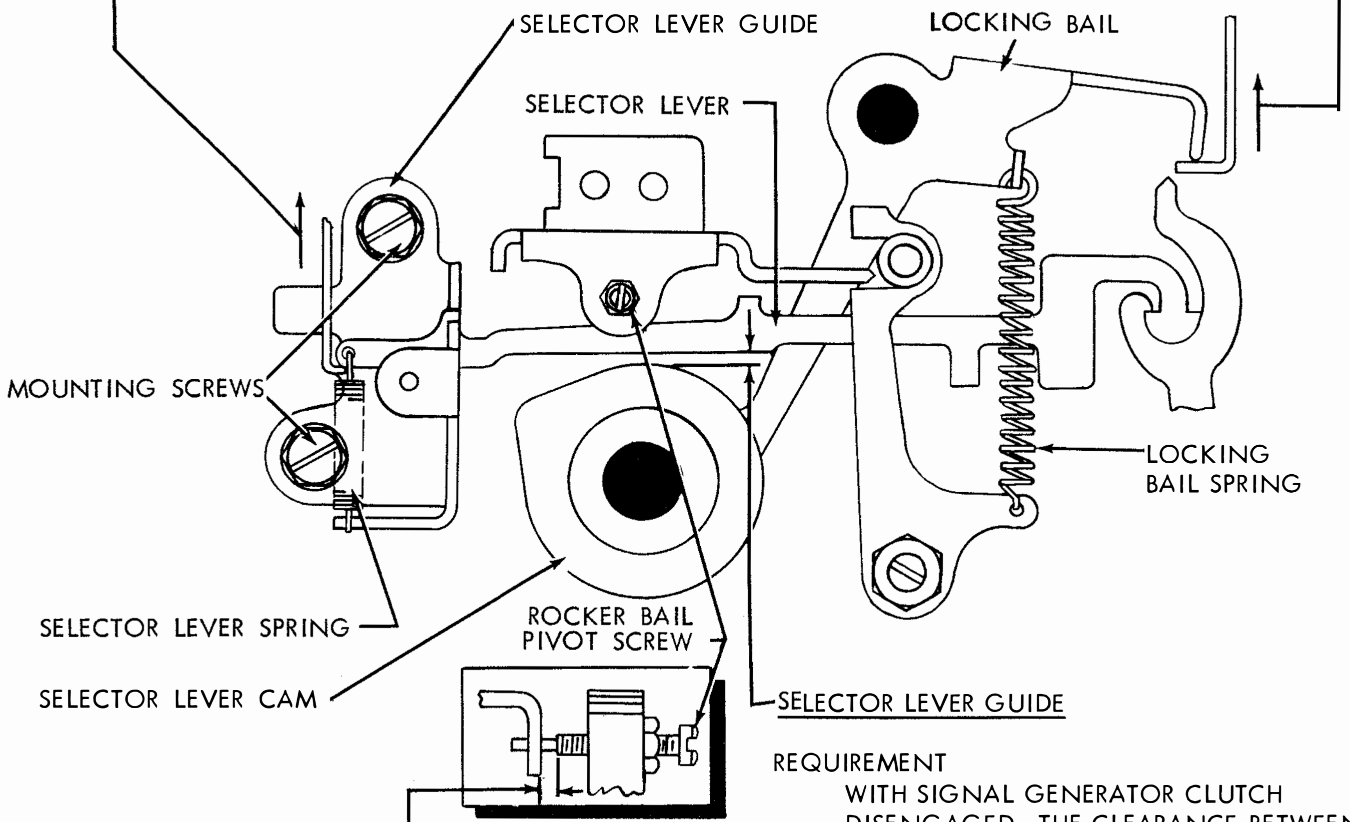
NOTE: IN ORDER TO PERFORM ALL SIGNAL GENERATOR ADJUSTMENTS, IT WILL BE NECESSARY TO REMOVE GENERATOR FROM THE KEYBOARD. SEE APPROPRIATE SECTION.

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.

ROCKER BAIL PIVOT SCREW

REQUIREMENT
ROCKER BAIL FREE ON PIVOT WITH SOME END PLAY
MAX 0.010 INCH

TO ADJUST
ROTATE PIVOT SCREW.

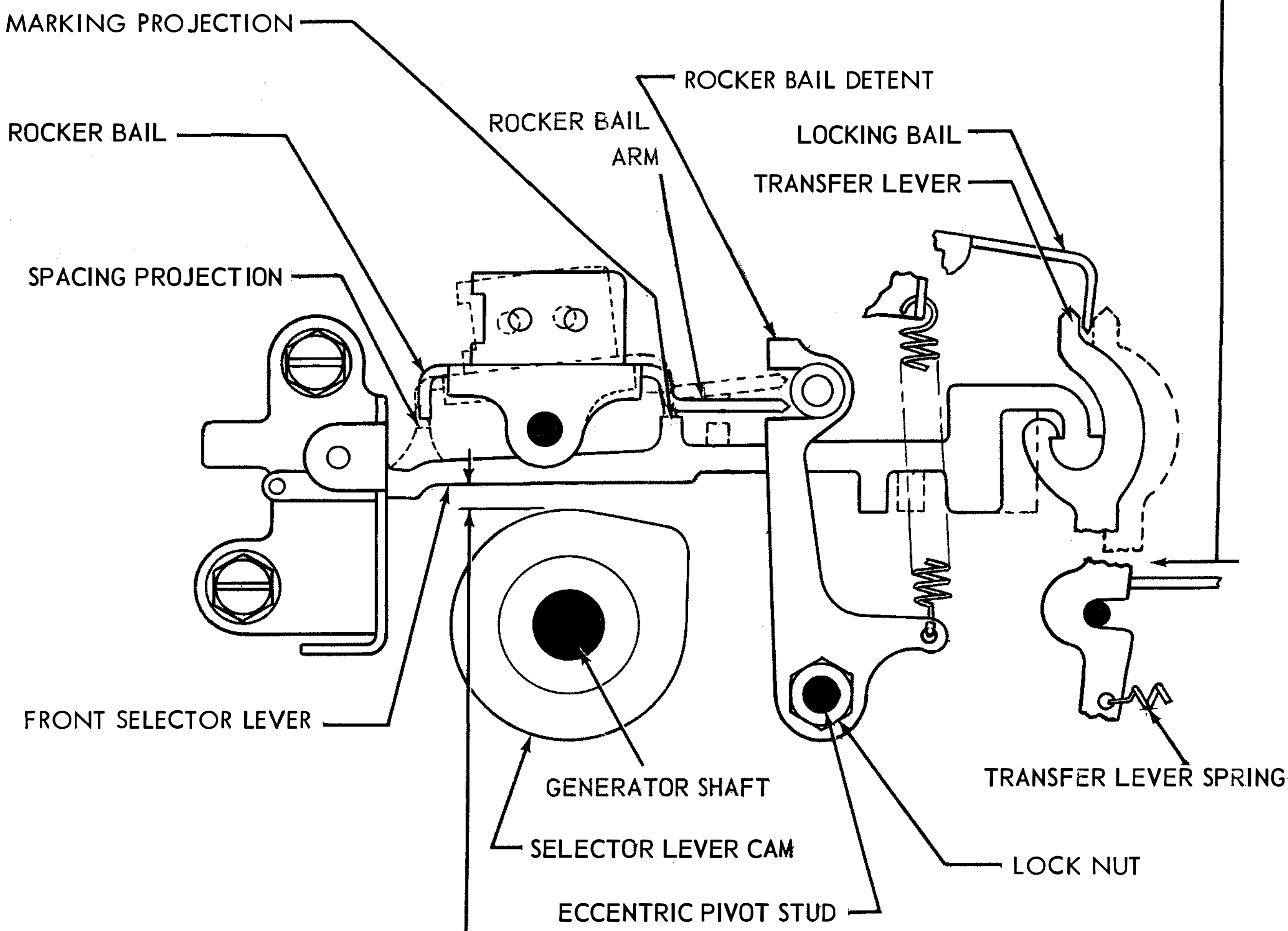
5.02 Signal Generator Mechanism continued

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	START LEVER
MIN	5-1/2 OZ	7-1/2 OZ
MAX	8 OZ	10 OZ TO START LEVER MOVING.



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

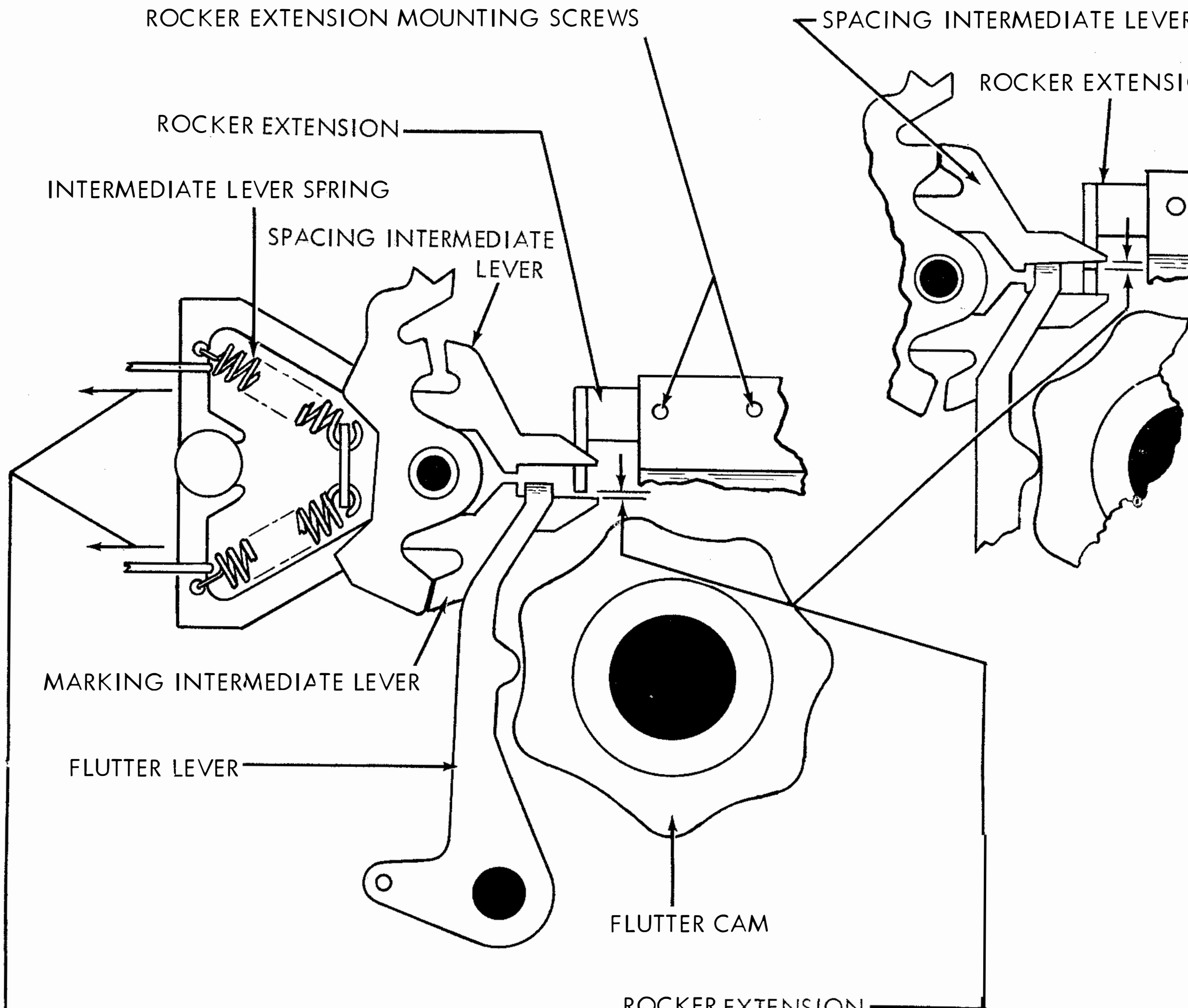
ROTATE THE CAM SLEEVE UNTIL THE FRONT SELECTOR LEVER HAS COME DOWN OFF THE PEAK OF ITS CAM AND IS OPPOSITE THE LOW PART OF ITS CAM. WITH THE FRONT SELECTOR LEVER IN THE MARKING (LEFT) POSITION, AND THE ROCKER BAIL ARM AGAINST THE LOWER STOP OF ITS DETENT, HOLD THE SELECTOR LEVER LIGHTLY UP AGAINST THE ROCKER BAIL AND GAUGE THE CLEARANCE BETWEEN THE SELECTOR LEVER AND THE CAM. SHIFT THE ROCKER BAIL ARM AGAINST THE UPPER STOP OF ITS DETENT AND HOLD FRONT SELECTOR LEVER TO THE RIGHT AND UP SO THAT THE SPACING PROJECTION TOUCHES THE ROCKER BAIL. GAUGE THE CLEARANCE BETWEEN THE SELECTOR LEVER AND THE CAM. THESE TWO CLEARANCES SHOULD BE EQUAL WITHIN 0.005 INCH.

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.



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

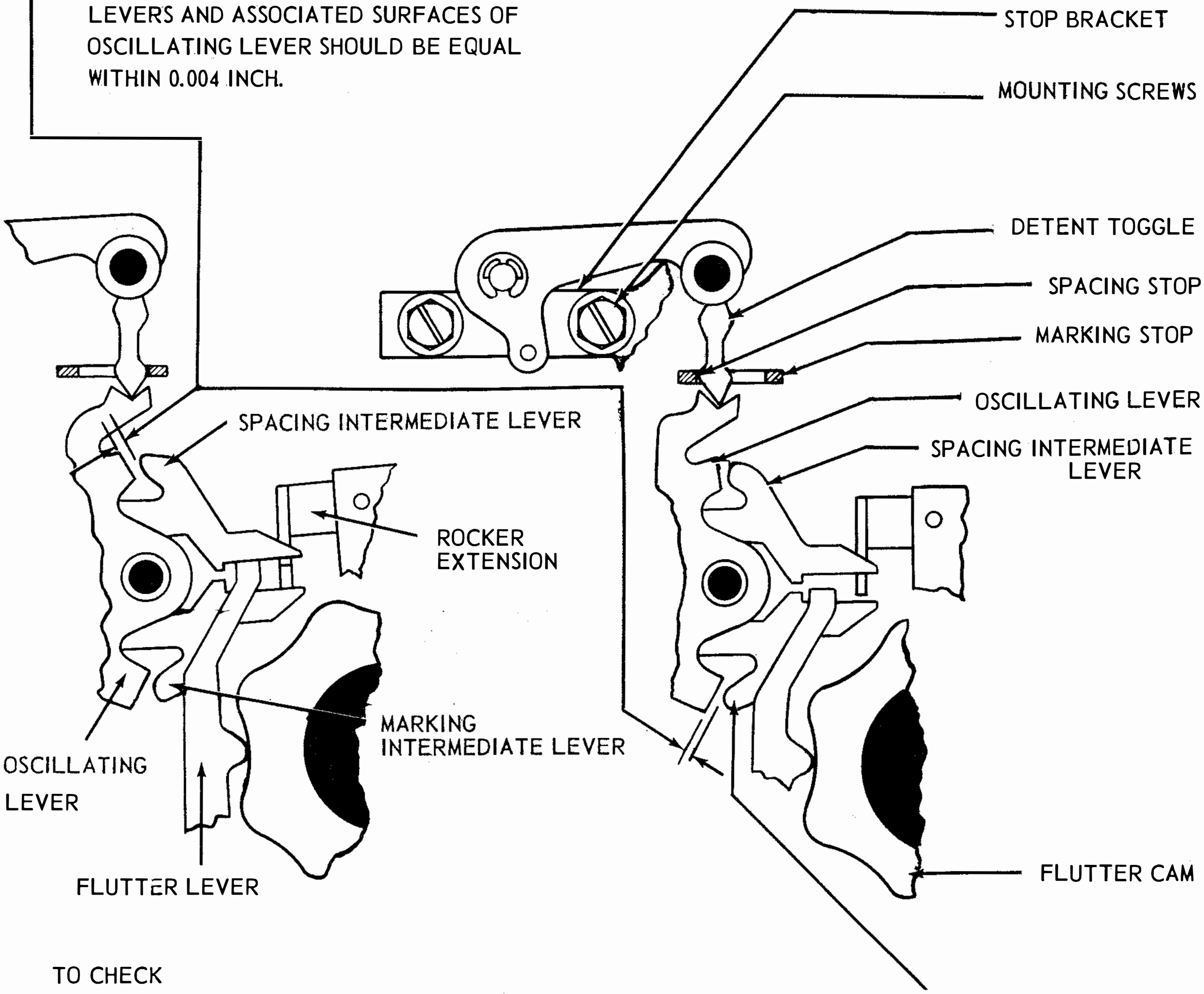
EQUALIZE CLEARANCES BY POSITIONING THE ROCKER EXTENSION WITH ITS MOUNTING SCREWS LOOSENED.

5.04 Signal Generator Mechanism continued

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

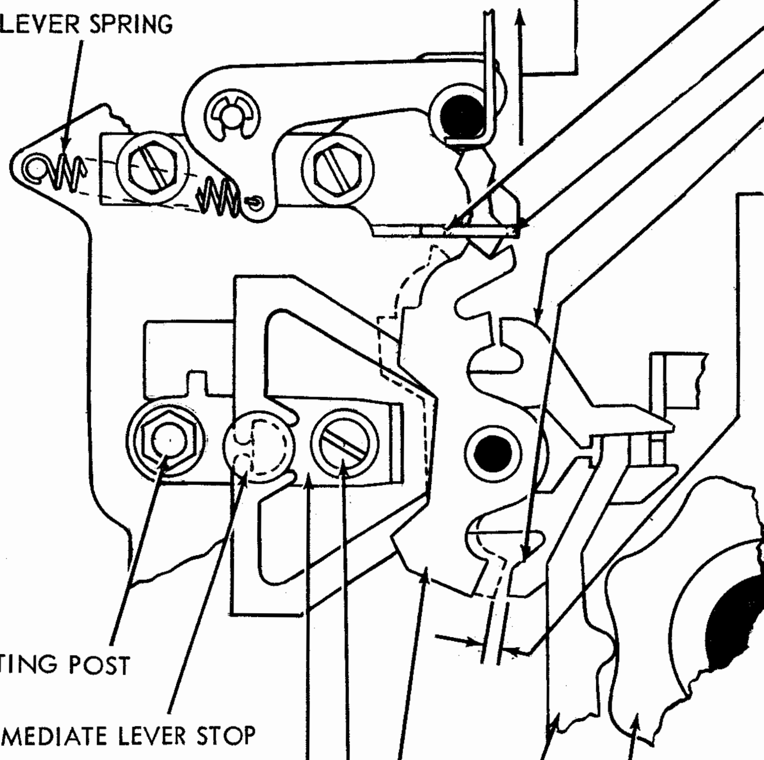
DETENT LEVER SPRING

REQUIREMENT

MIN 8-1/2 OZ

MAX 10-1/2 OZ

TO START DETENT LEVER MOVING.



INTERMEDIATE LEVER STOP PLATE

REQUIREMENT

CLEARANCE BETWEEN ENGAGING SURFACES OF INTERMEDIATE LEVERS AND OSCILLATING LEVER

MIN 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.

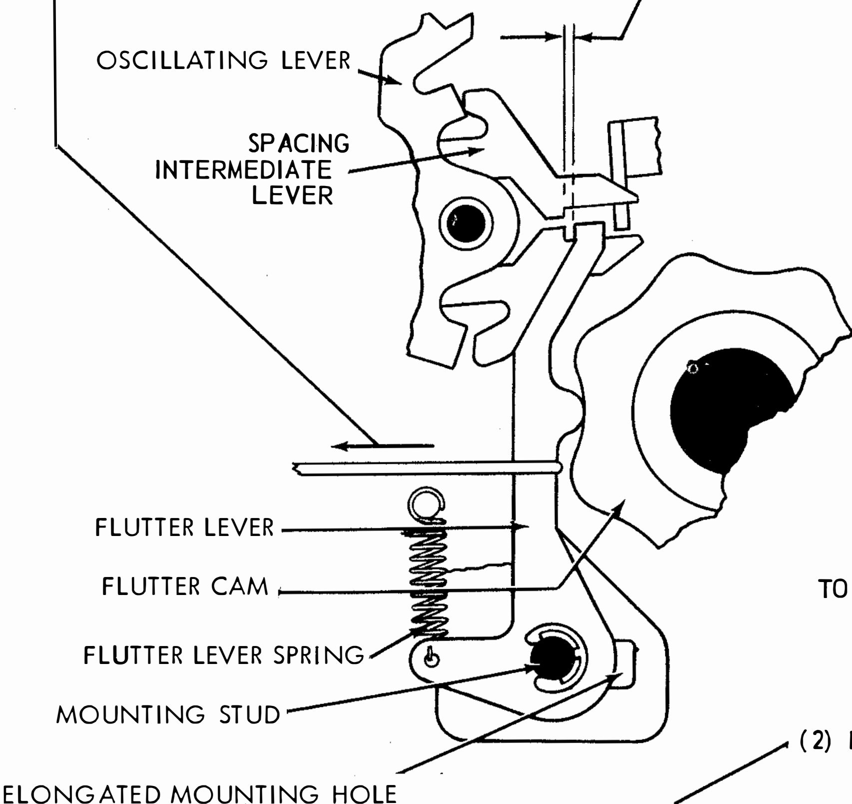
NOTE: REPLACE THE BREAK LEVER AND ASSOCIATED PARTS

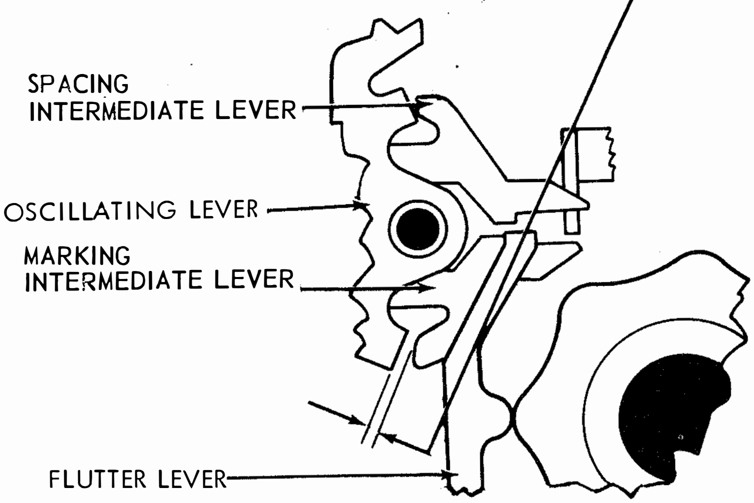
5.06 Signal Generator Mechanism continued

(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.

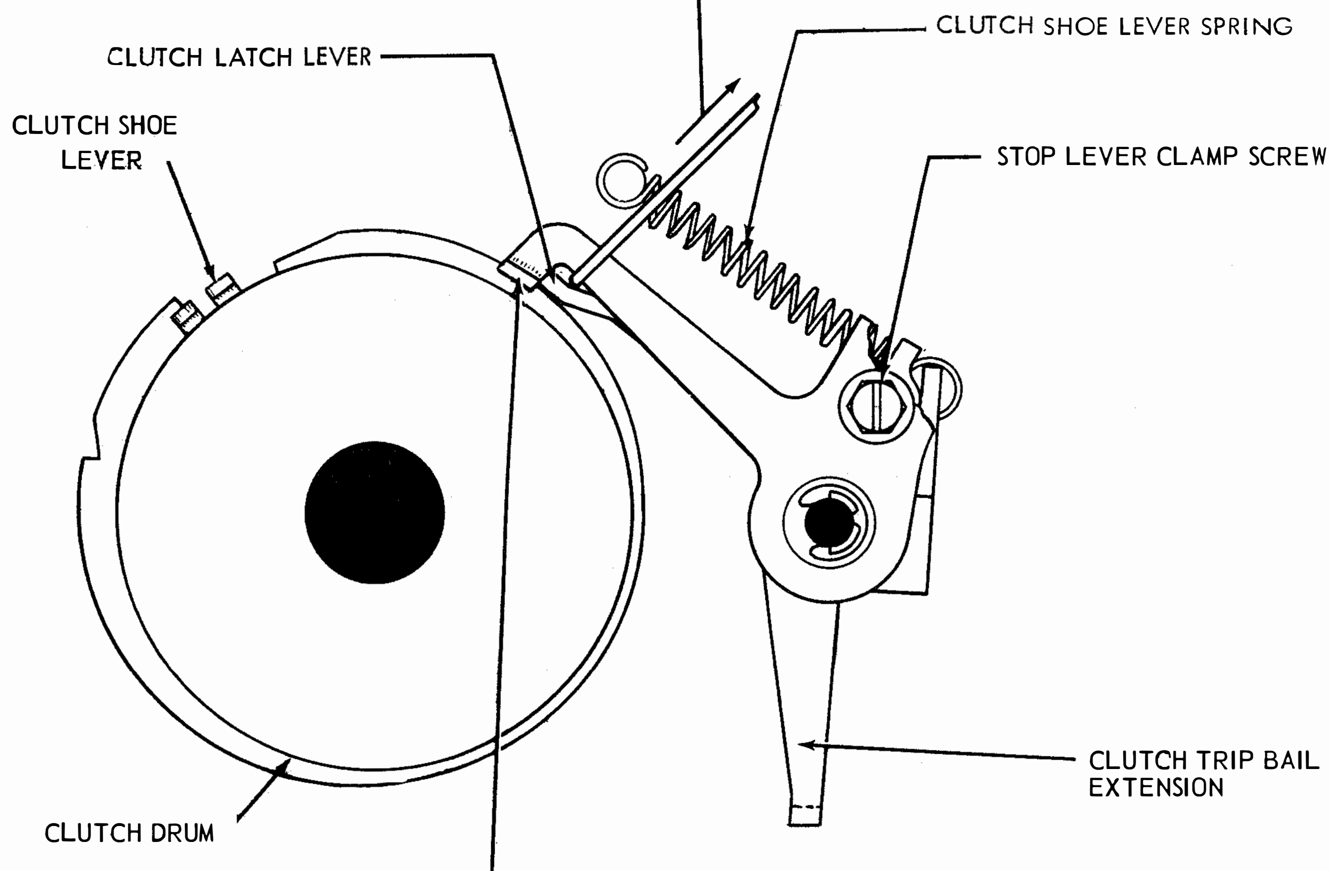
(2) REQUIREMENT

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).

5.07 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 STOP LEVER

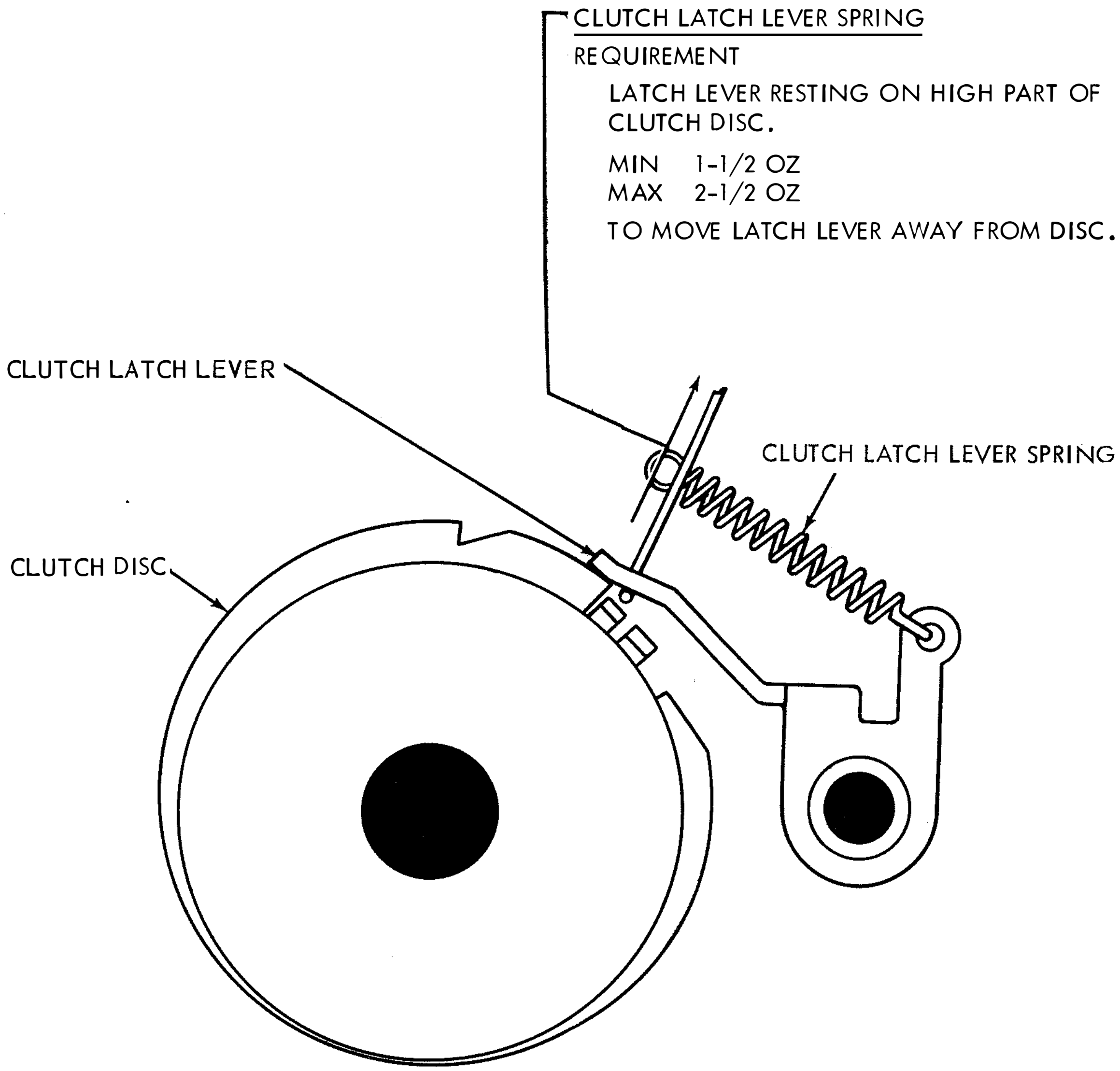
REQUIREMENT

CLUTCH STOP LEVER SHOULD FULLY ENGAGE THE CLUTCH SHOE LEVER VERTICALLY.

TO ADJUST

POSITION THE STOP LEVER WITH ITS CLAMP SCREW LOOSENED.

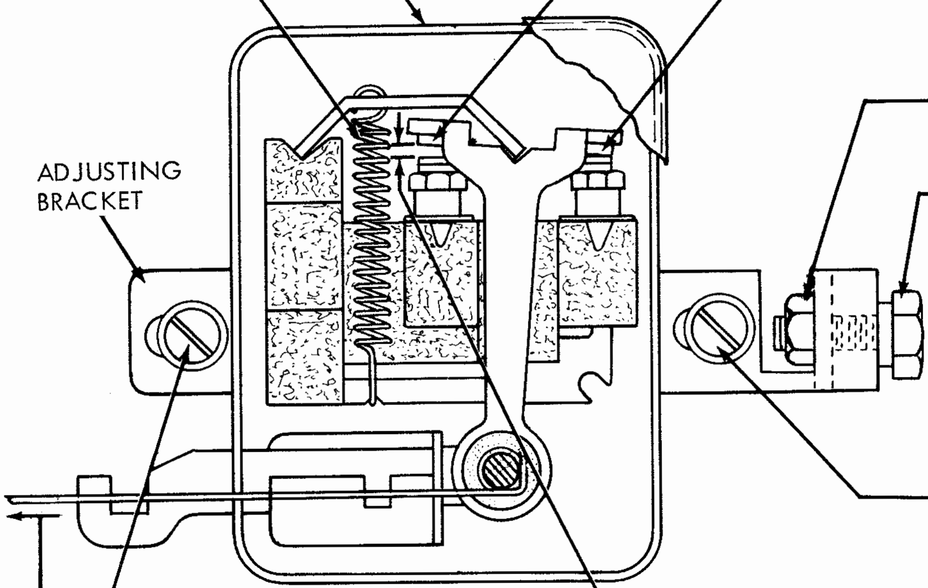
5.08 Signal Generator Mechanism continued



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



(TOP VIEW)

(A) GENERATOR CONTACT

REQUIREMENT

THE MARKING AND SPACING CONTACT GAPS SHOULD BE EQUAL

TO CHECK

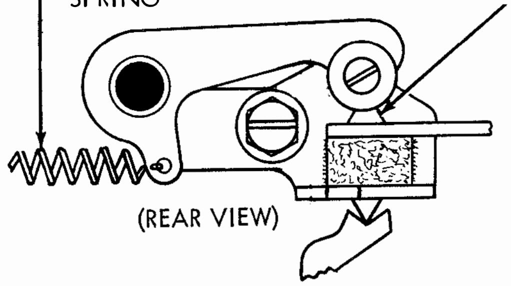
REMOVE THE COVER FROM THE CONTACT BOX. FIRST, MOVE THE DETENT TOGGLE AGAINST ITS SPACING STOP AND GAUGE THE MARKING CONTACT GAP. THEN MOVE THE DETENT TOGGLE AGAINST ITS MARKING STOP AND GAUGE SPACING CONTACT GAP.

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.



(REAR VIEW)

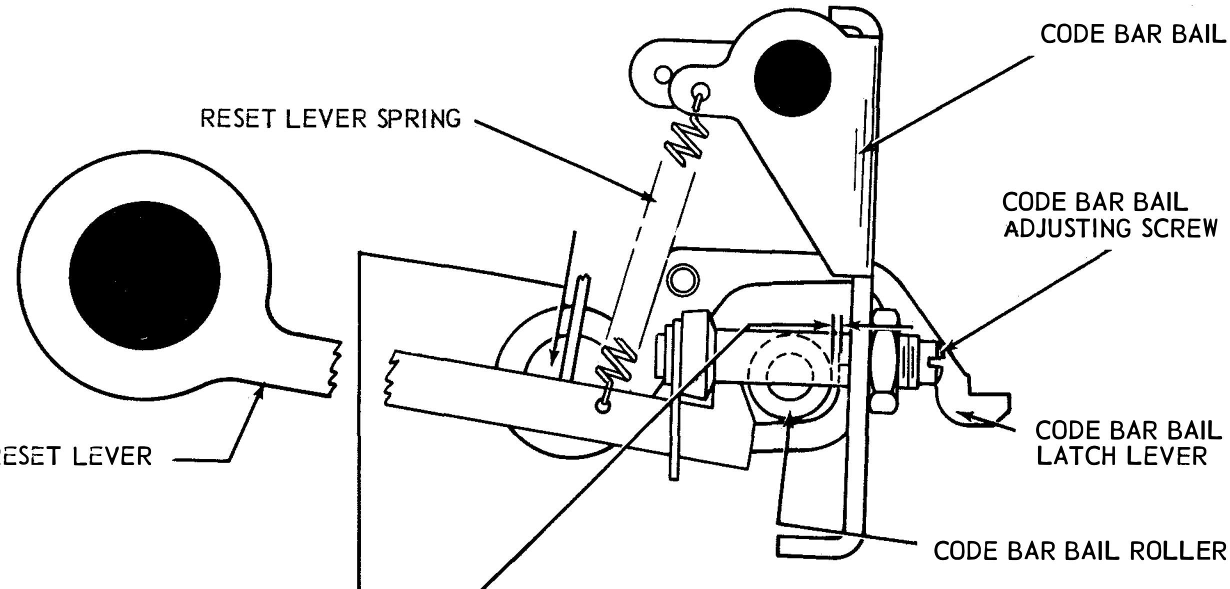
(B) CONTACT BOX SPRING

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.

CODE BAR BAIL ADJUSTING SCREW

REQUIREMENT

CLUTCH ENGAGED. LTRS. COMBINATION SELECTED CLUTCH ROTATED 1/2 TURN UNTIL RESET LEVER IS IN EXTREME LEFT HAND POSITION

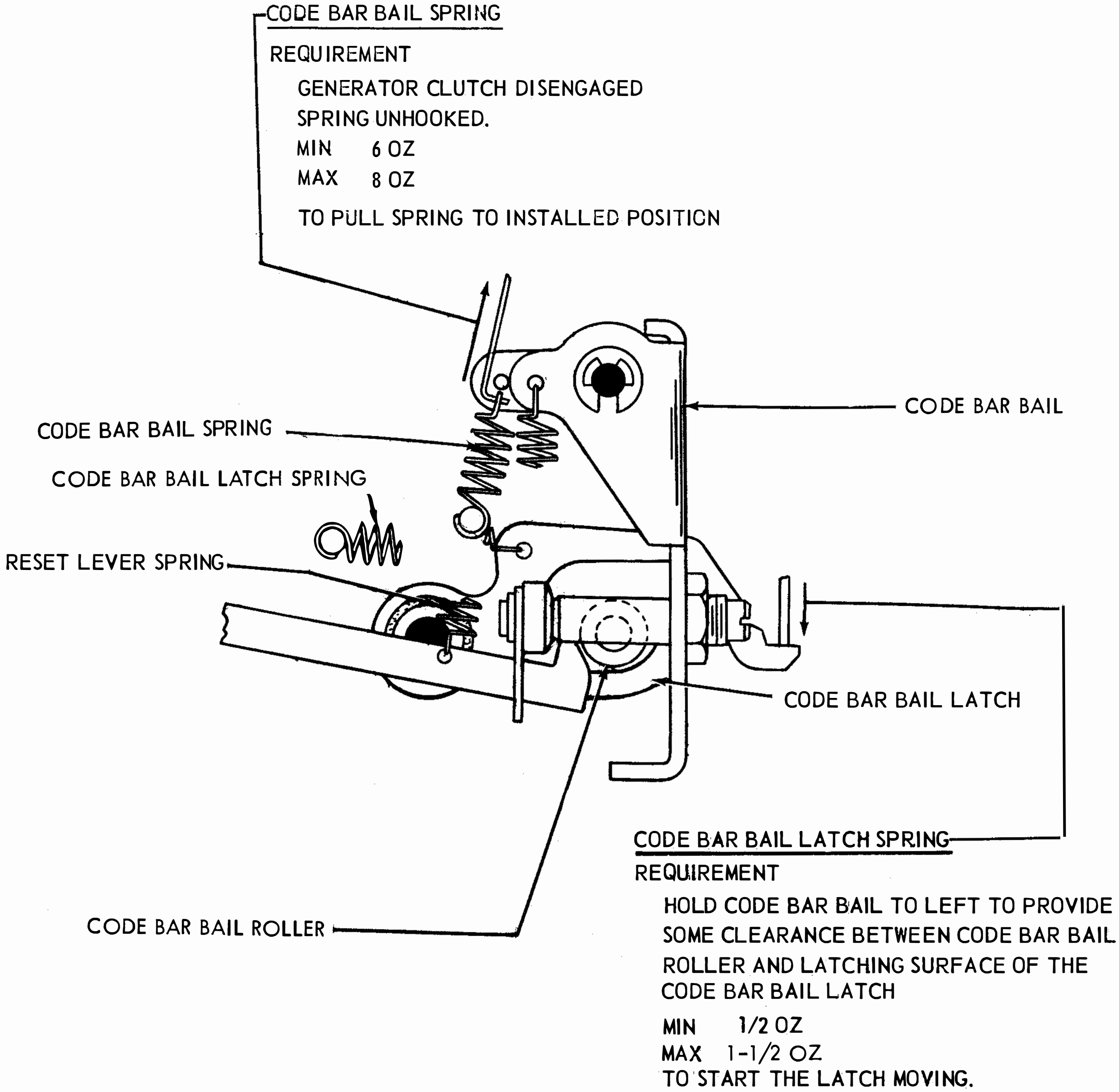
CLEARANCE BETWEEN THE CODE BAR BAIL LATCH LEVER AND CODE BAR BAIL ROLLER.

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



5.12 Codebar Assembly continued

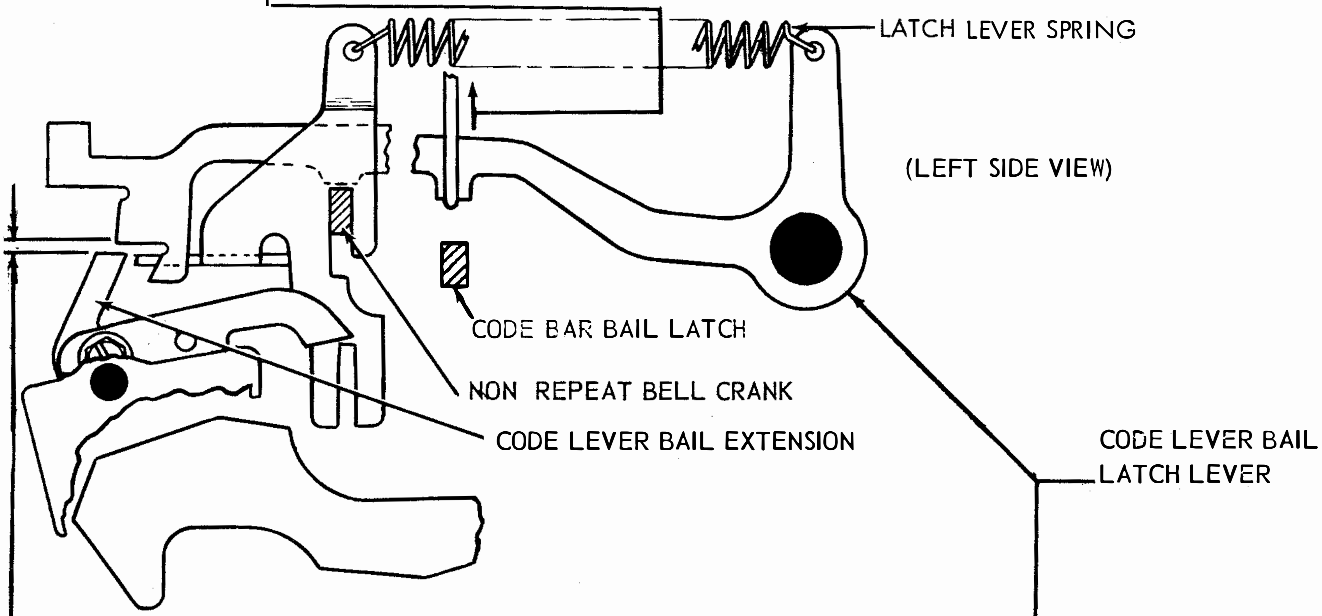
CODE LEVER BAIL LATCH LEVER SPRING

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.



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

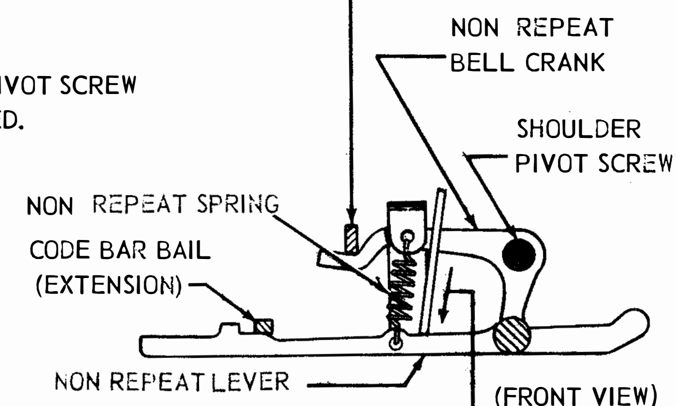
MIN 0.020 INCH

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

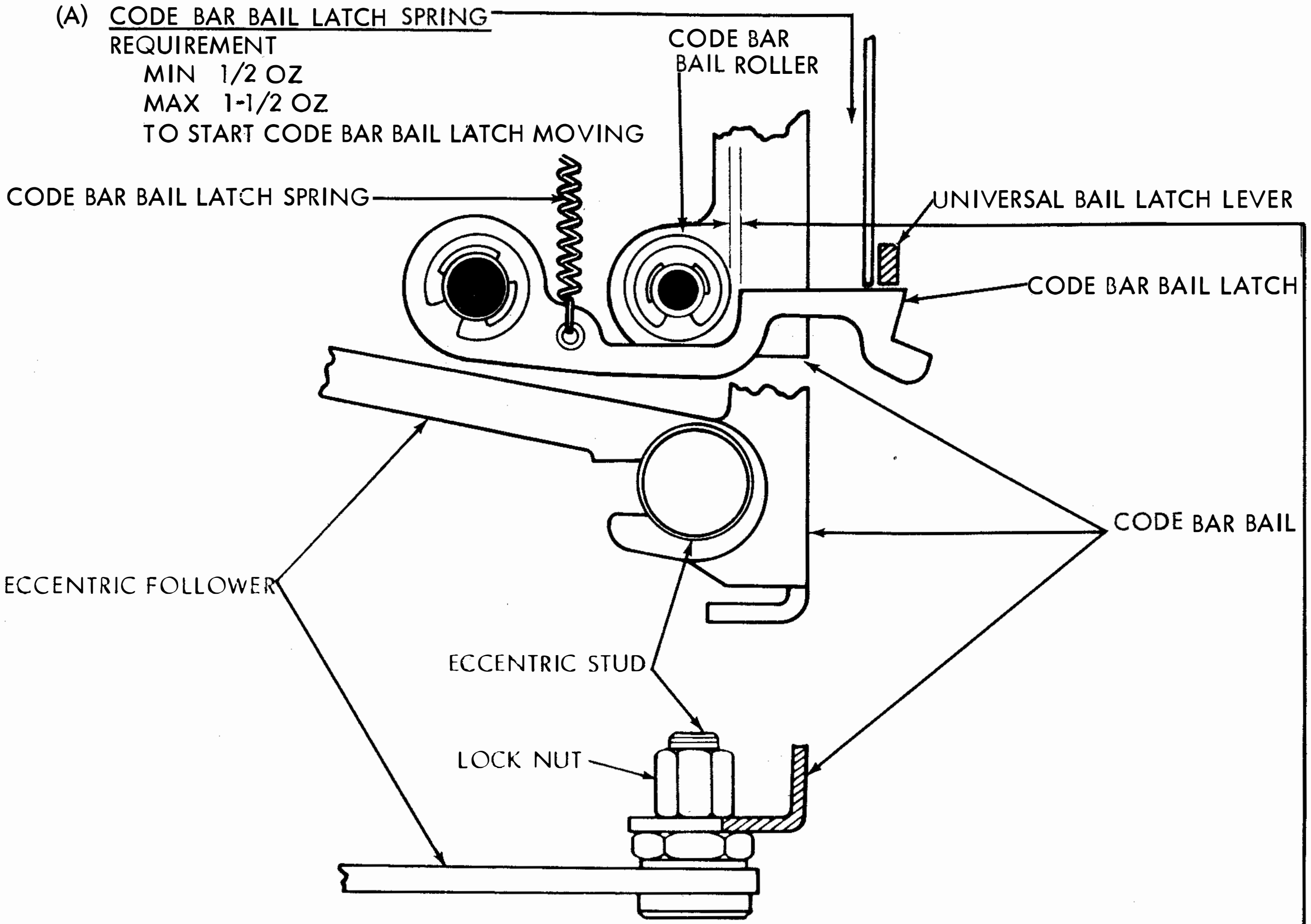
GENERATOR CLUTCH DISENGAGED. ANY KEYLEVER DEPRESSED.

MIN 1/2 OZ ---MAX 1-1/2 OZ

TO START NON REPEAT LEVER MOVING DOWNWARD.

5.13 Codebar Assemblv 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

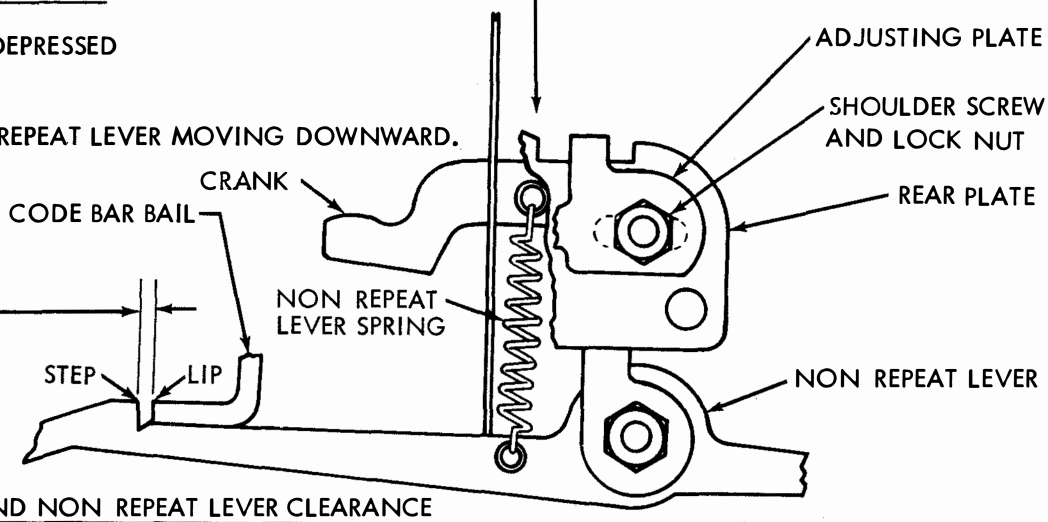
REQUIREMENT

ANY KEYLEVER DEPRESSED

MIN 2 OZ

MAX 3-1/4 OZ

TO START NON REPEAT LEVER MOVING DOWNWARD.



(FRONT VIEW)

(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

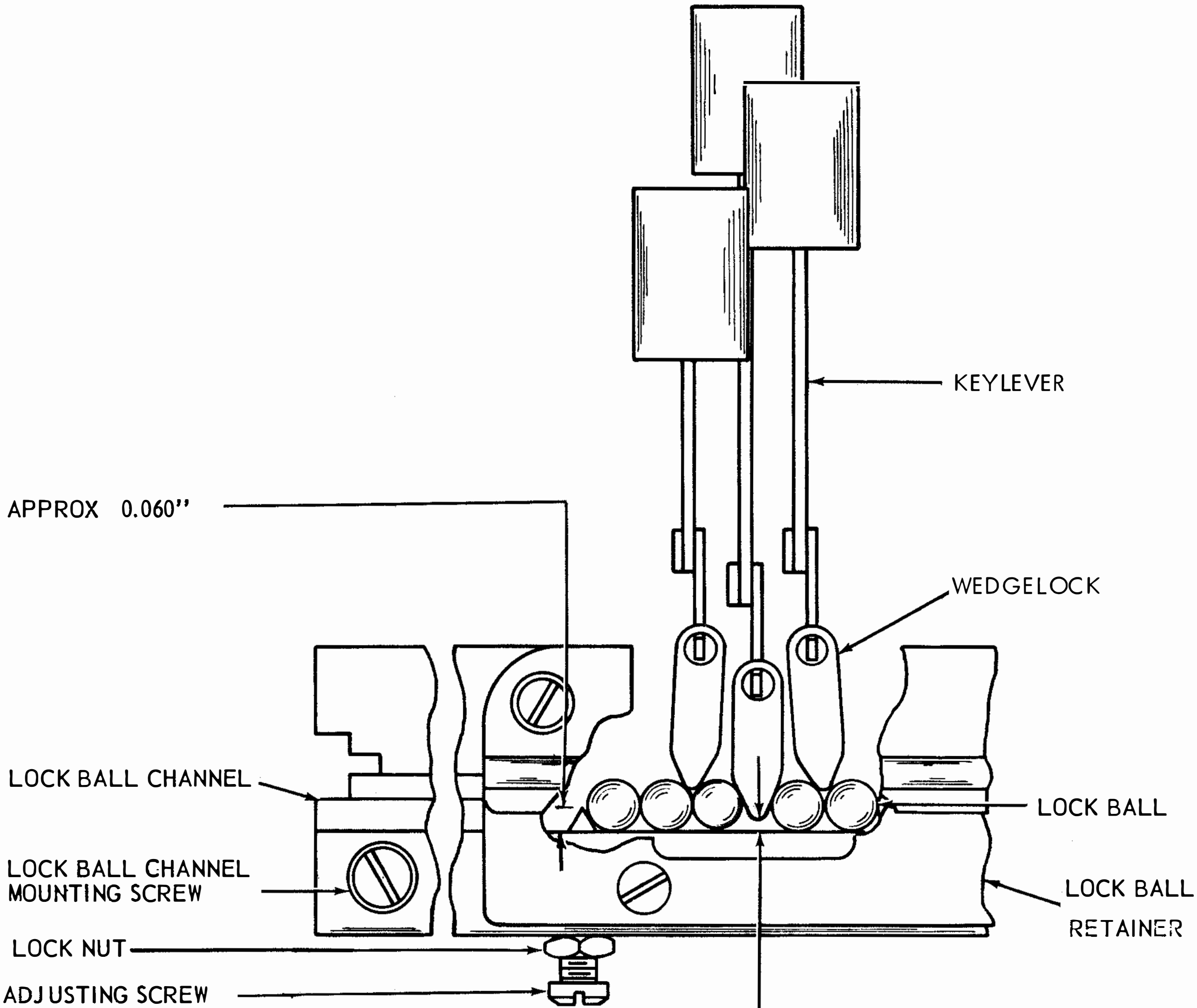
MAX 0.020 INCH

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 SOME CLEARANCE

MAX 0.020 INCH

BETWEEN TIP OF WEDGELOCK 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 CHANNNEL.

5.16 Codebar Assembly continued.

CODE LEVER BAIL LATCH LEVER ECCENTRIC

(1) REQUIREMENT

KEYLEVER 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

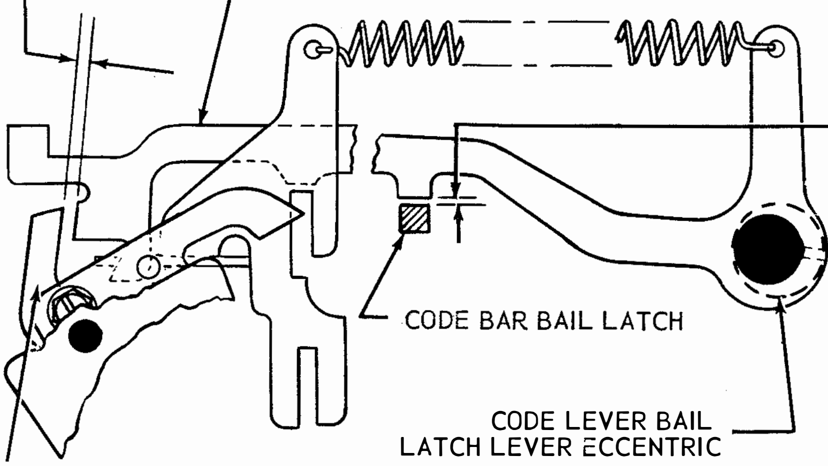
(2) REQUIREMENT

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 SPRING

REQUIREMENT

GENERATOR CLUTCH DISENGAGED.
NON REPEAT LEVER HELD AWAY.

MIN 1-3/4 OZ
MAX 3 OZ
TO START THE BAIL MOVING.

CODE BAR GUIDES

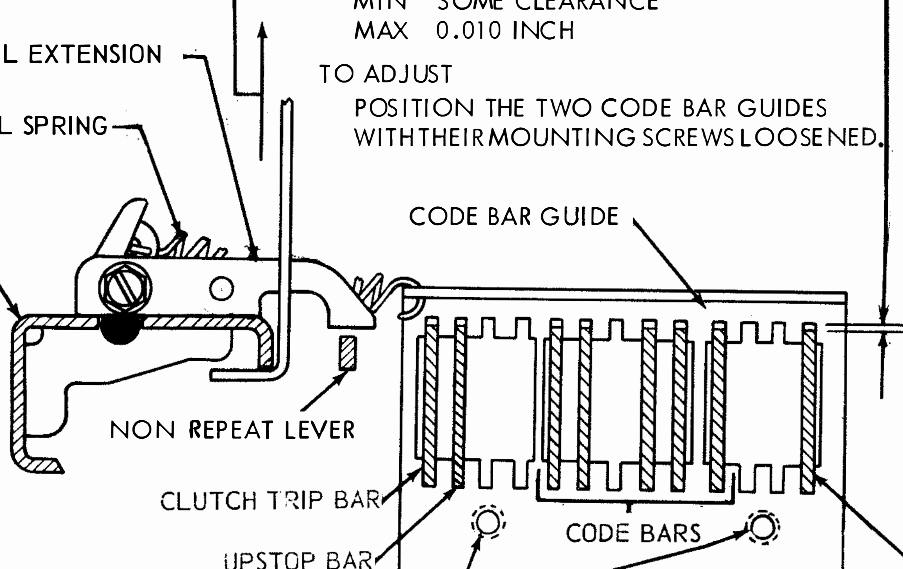
REQUIREMENT

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 LOOSENED.



5.17 Codebar Assembly continued

CODE LEVER BAIL NON REPEAT EXTENSION

REQUIREMENT

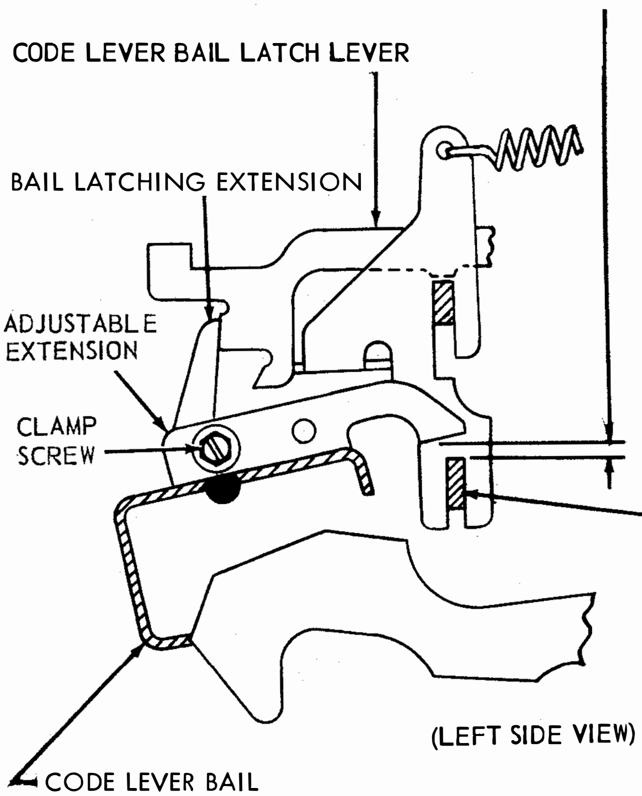
GENERATOR CLUTCH DISENGAGED. CODE LEVER BAIL ROTATED UNTIL CODE LEVER BAIL LATCH LEVER JUST TRIPS. WITH BAIL LATCHING EXTENSION RESTING AGAINST VERTICAL SURFACE OF LATCH LEVER AND SHAFT ROTATED UNTIL NON REPEAT LEVER IS FULLY LATCHED ON CODE BAR BAIL EXTENSION

MIN SOME CLEARANCE---MAX 0.015 INCH

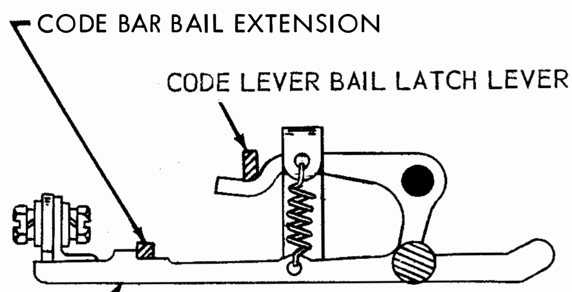
BETWEEN ADJUSTABLE EXTENSION AND NON REPEAT LEVER.

TO ADJUST

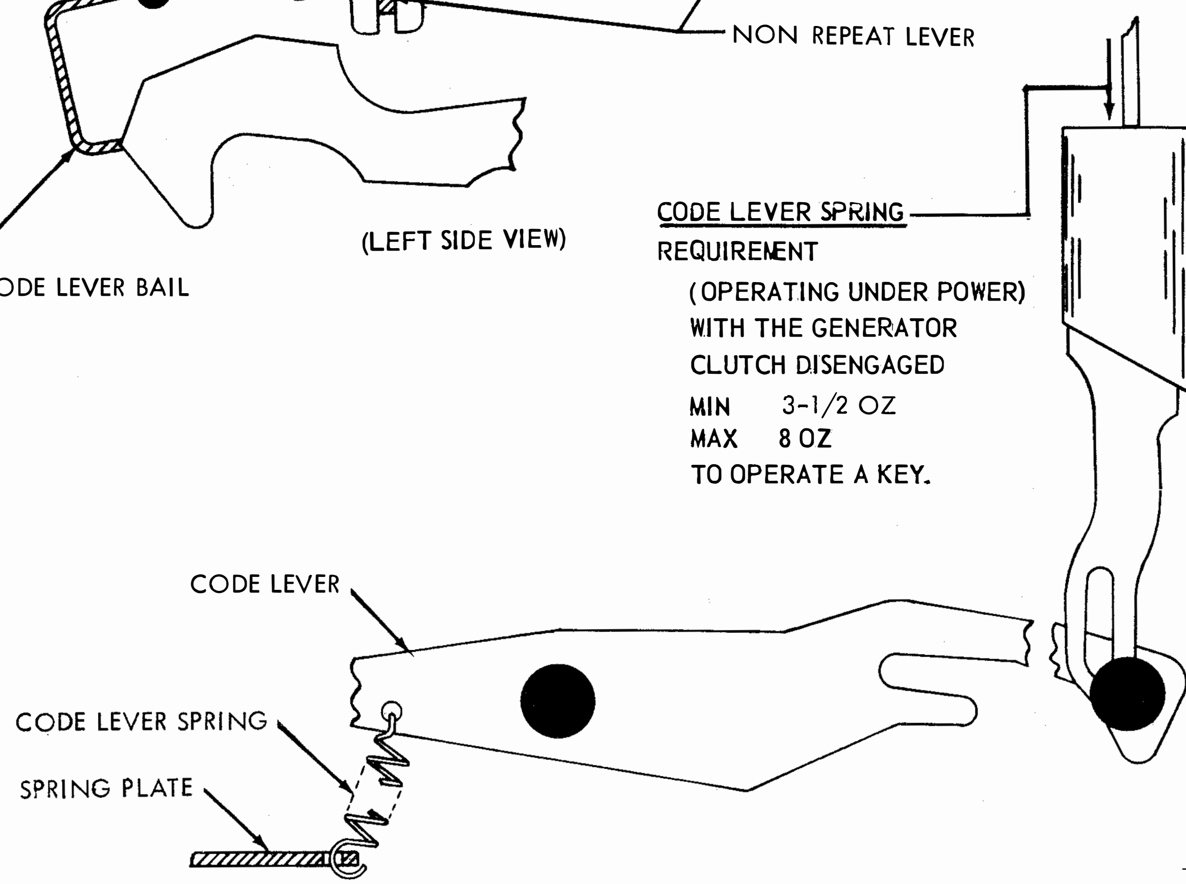
POSITION ADJUSTABLE EXTENSION WITH CLAMP SCREW LOOSENED.



(LEFT SIDE VIEW)



(FRONT VIEW)



CODE LEVER SPRING

REQUIREMENT

(OPERATING UNDER POWER) WITH THE GENERATOR CLUTCH DISENGAGED

MIN 3-1/2 OZ

MAX 8 OZ

TO OPERATE A KEY.

5.18 Codebar Assembly continued

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

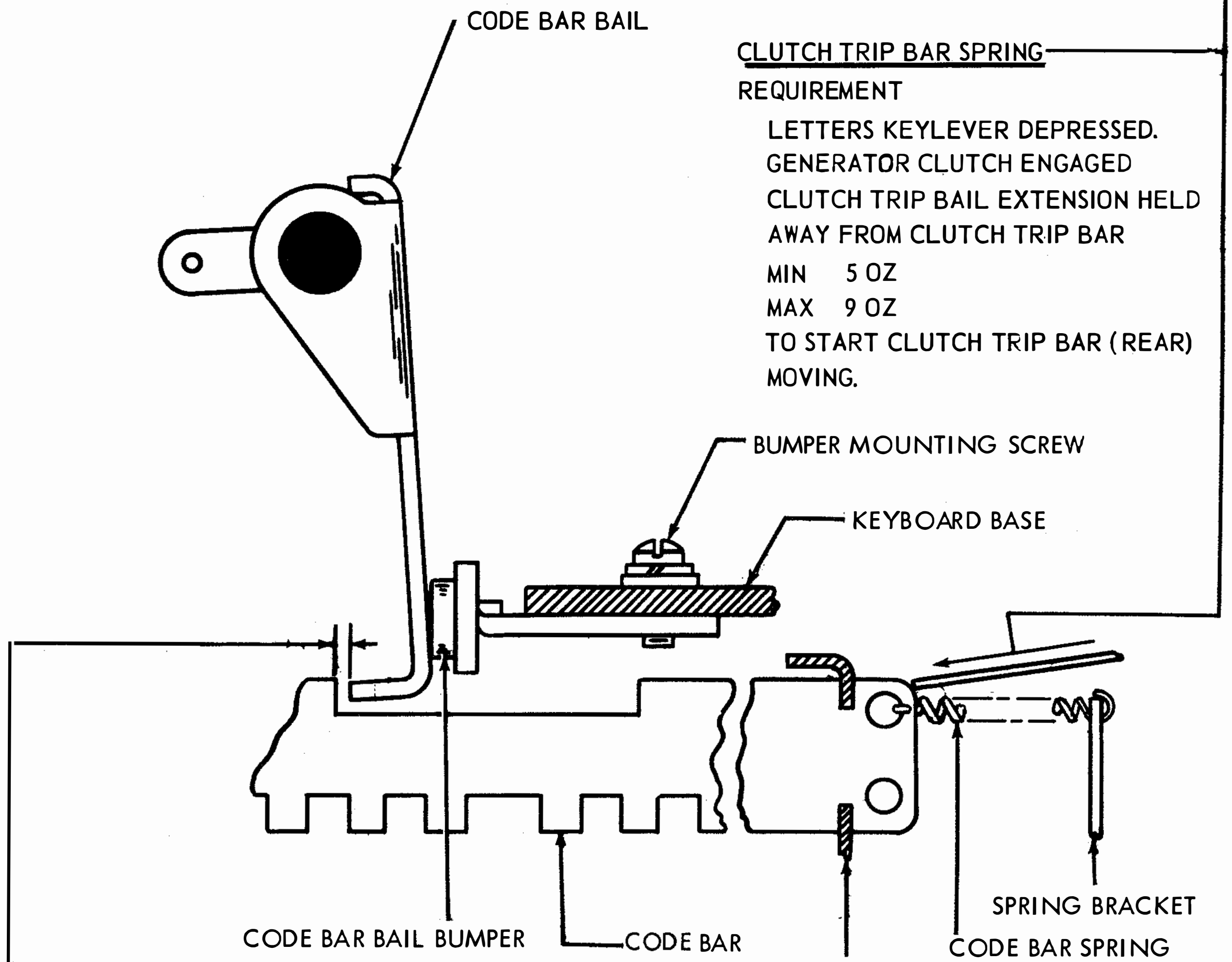
REQUIREMENT

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.



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

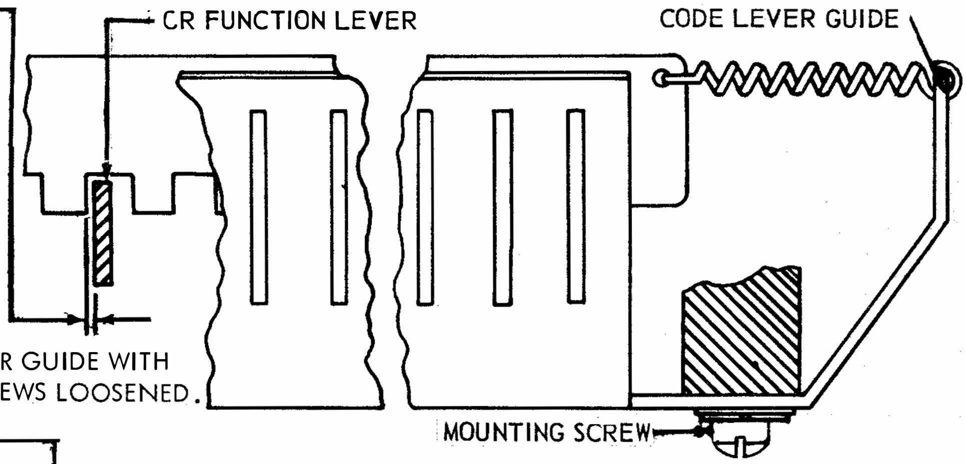
CR KEYLEVER HELD DEPRESSED WHILE DISENGAGING CLUTCH. CLEARANCE BETWEEN CR FUNCTION LEVER AND STOPPING EDGE OF NUMBER 5 CODEBAR

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 BOUNCE SUPPRESSOR BRACKET SUPPORT SCREW

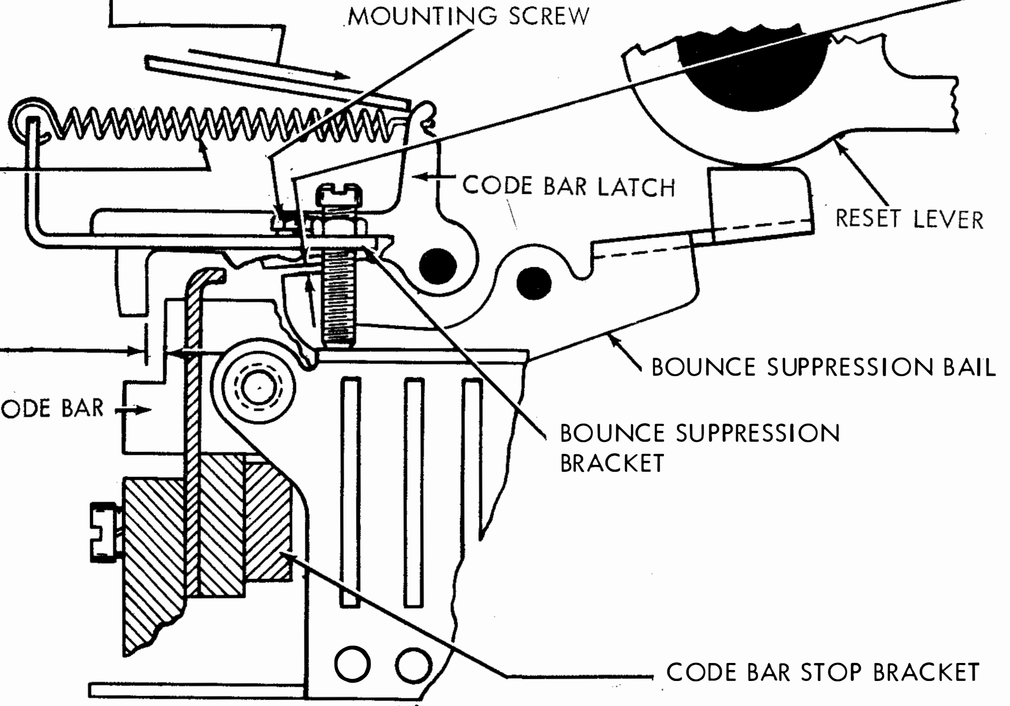
REQUIREMENT

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.



CODE BAR LATCH

(1) 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

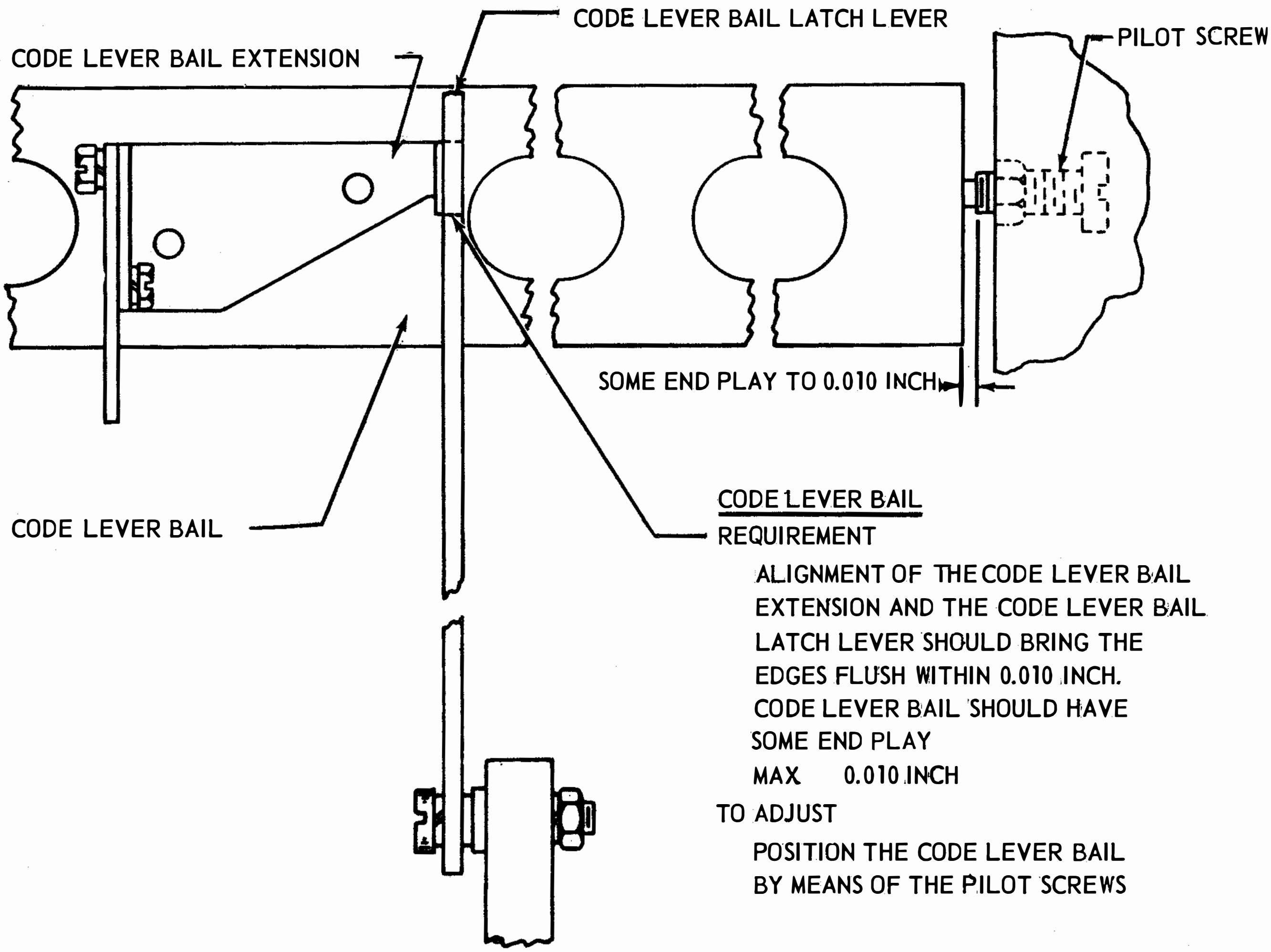
(2) REQUIREMENT

BOUNCE SUPPRESSOR BAIL SHOULD RIDE CENTRALLY ON RESET LEVER.

TO ADJUST

POSITION BOUNCE SUPPRESSOR BRACKET WITH MOUNTING SCREWS LOOSENED.

5.20 Keyboard Assembly



CODE LEVER BAIL

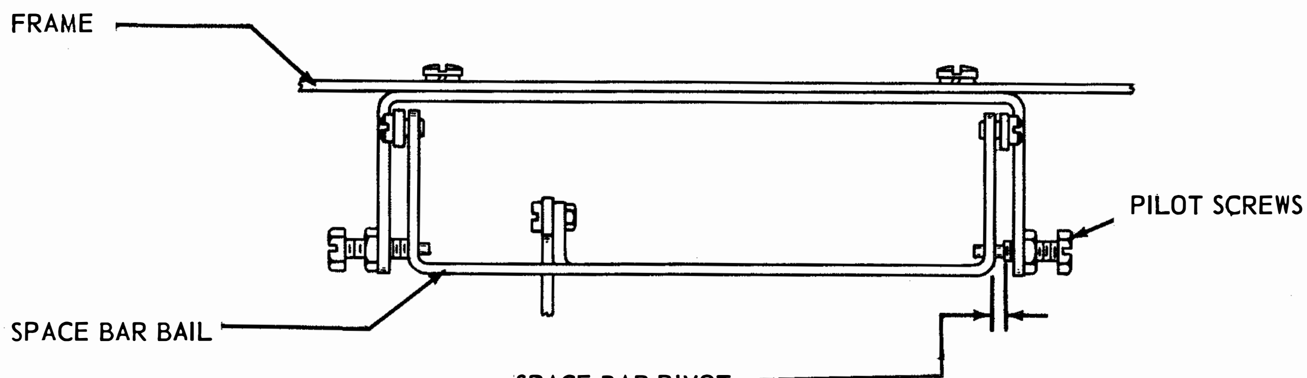
REQUIREMENT

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



SPACE BAR PIVOT

REQUIREMENT

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.

5.21 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

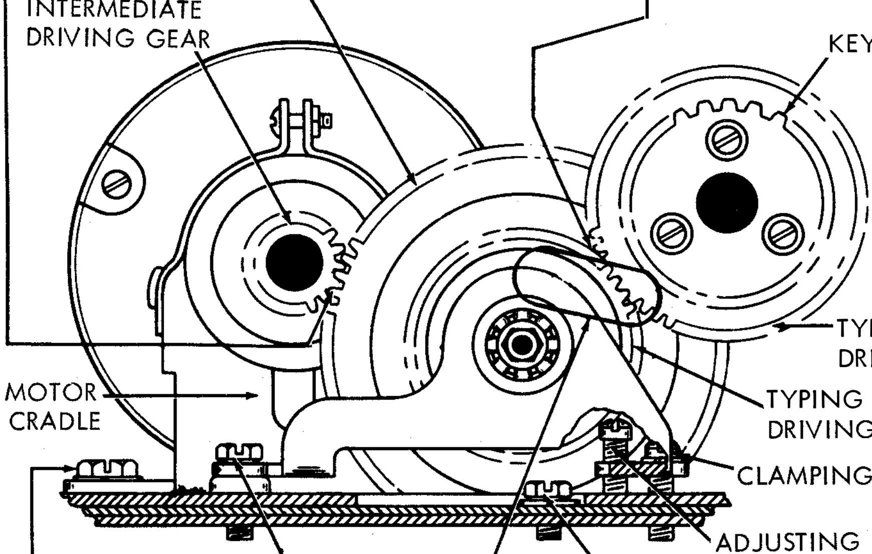
(A) INTERMEDIATE GEAR BRACKET

(1) REQUIREMENT

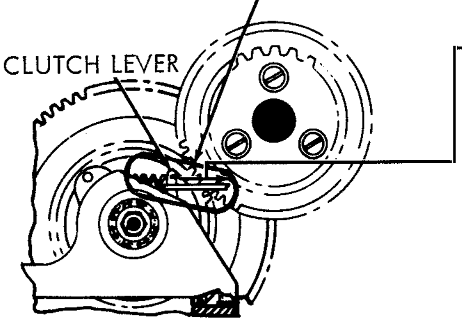
THERE SHOULD BE A BARELY PERCEPTIBLE AMOUNT OF BACKLASH BETWEEN THE TYPING UNIT DRIVEN GEAR AND THE TYPING UNIT DRIVING GEAR AT THE POINT WHERE BACKLASH IS THE LEAST.

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.



NOTE: OVERLOAD MECHANISM SPRING ADJUSTMENT APPLIES ONLY TO UNITS SO EQUIPPED



(B) OVERLOAD MECHANISM SPRING

REQUIREMENT

OVERLOAD CLUTCH LEVER IN ITS NOTCH

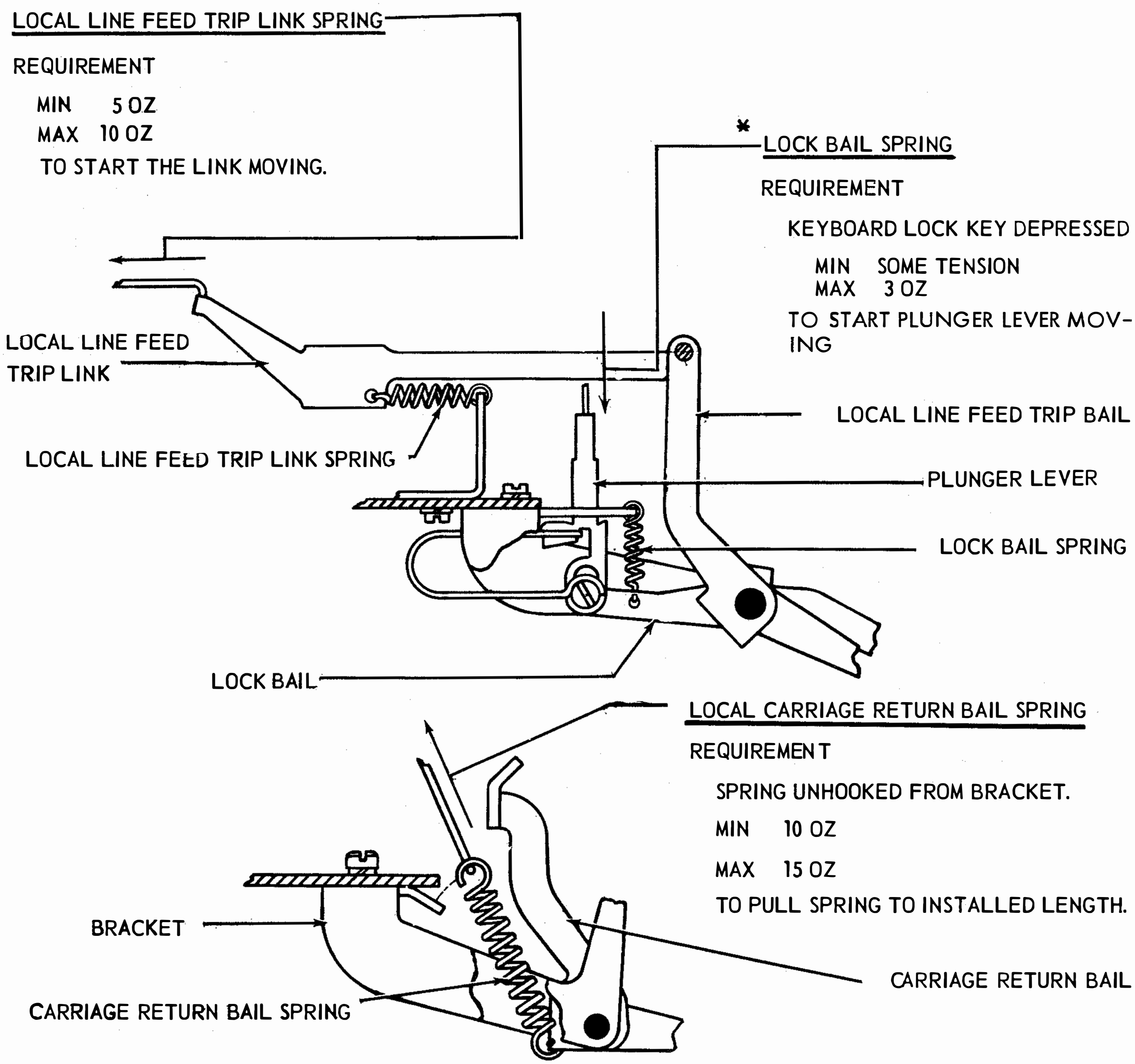
MIN 40 OZ

MAX 64 OZ

TO START LEVER MOVING

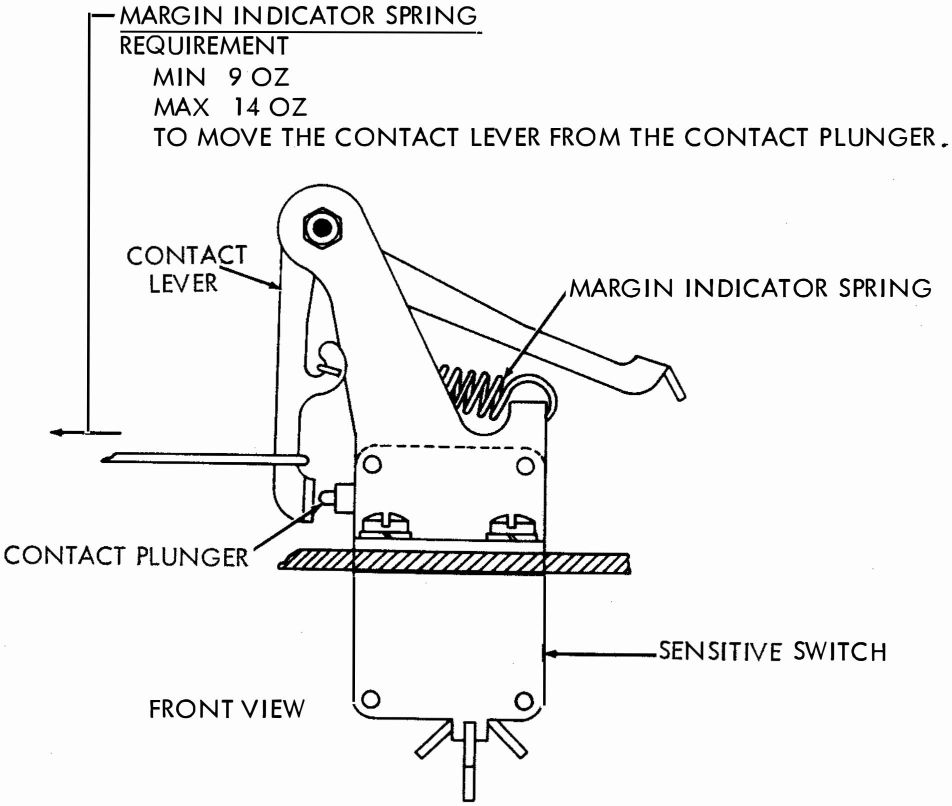
LEVER MUST NOT JUMP FROM NOTCH WITH LESS THAN 64 OUNCES.

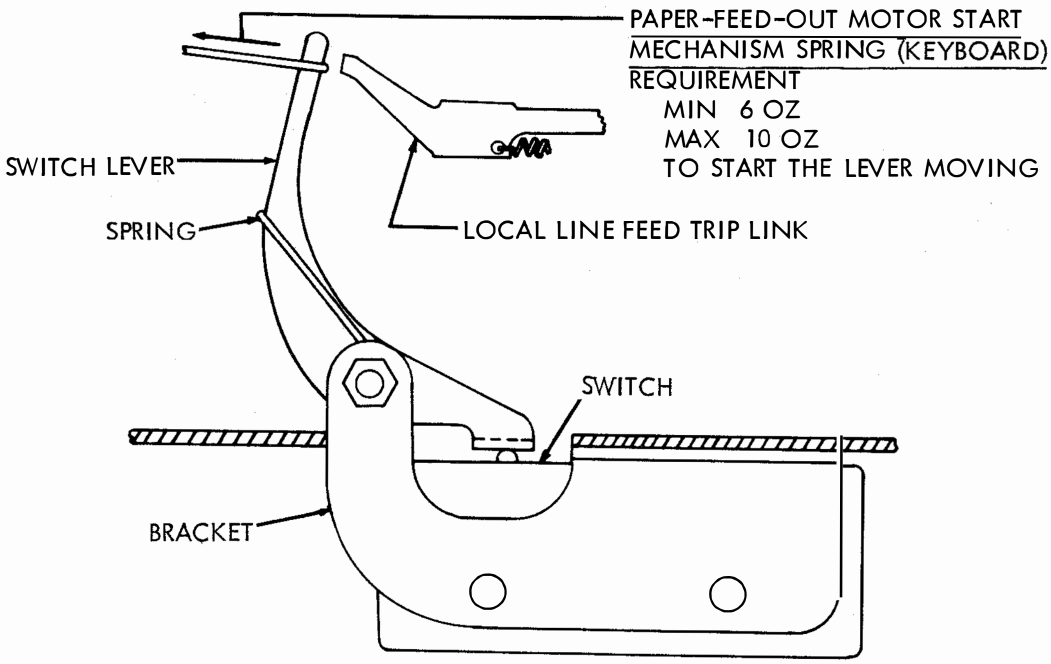
5.22 Keyboard Assembly continued



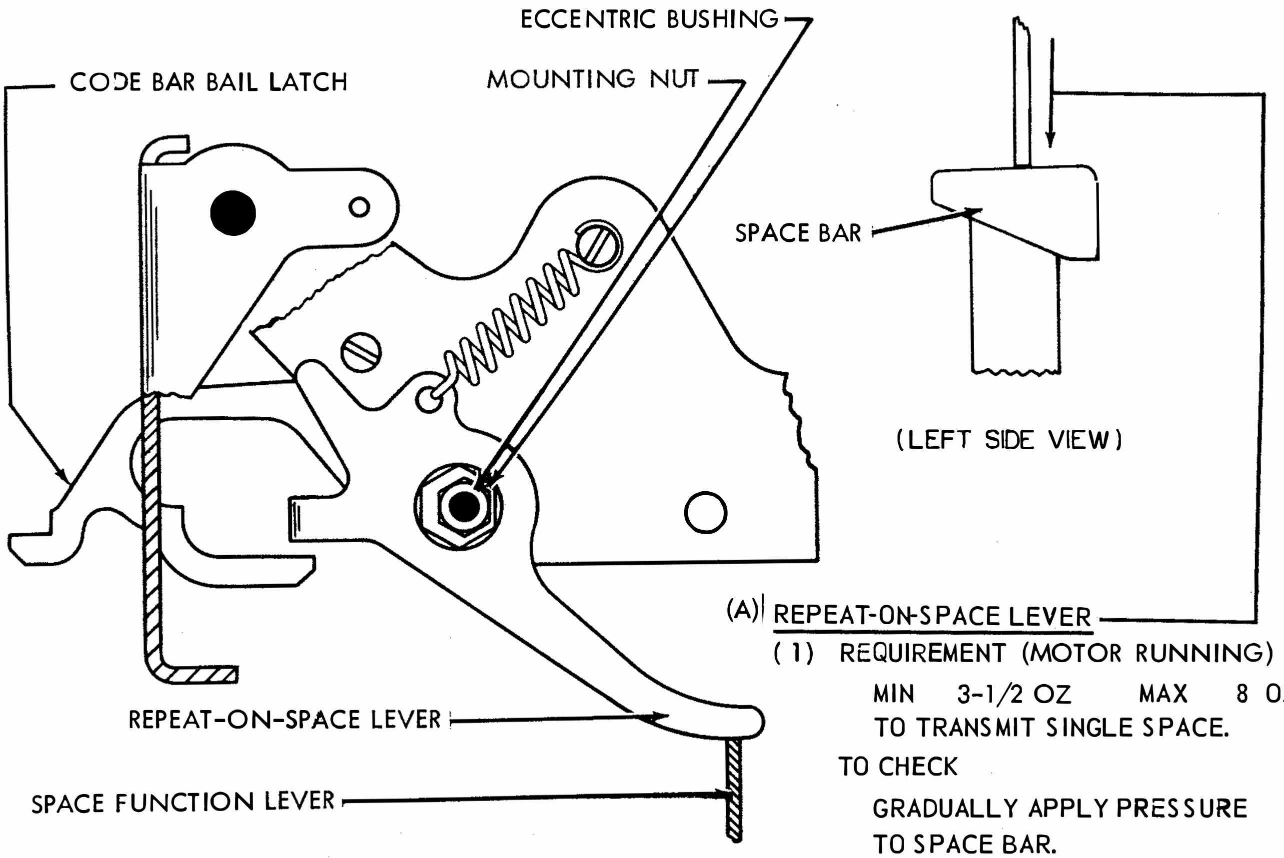
* APPLIES TO KEYBOARD ONLY

5.23 Keyboard Assembly continued





5.24 Variable Features



(A) REPEAT-ON-SPACE LEVER

(1) 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.

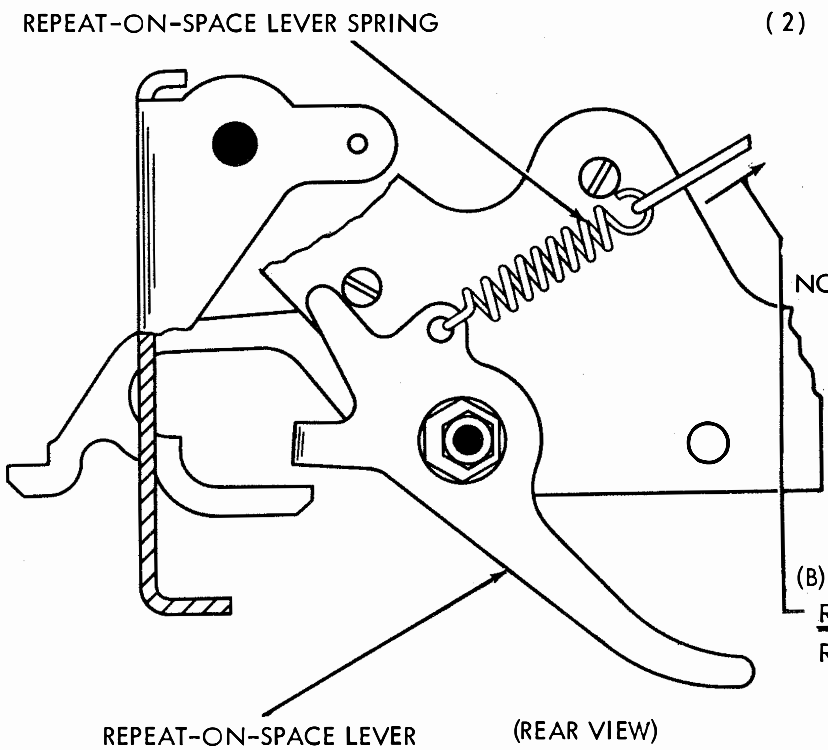
TO CHECK

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.



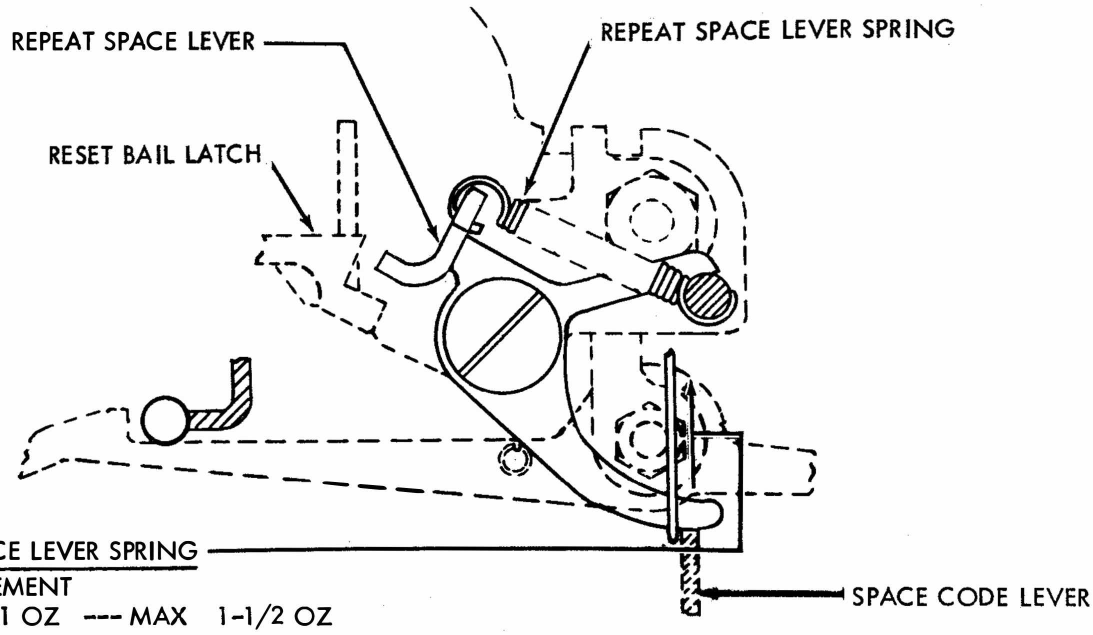
(B) REPEAT-ON-SPACE LEVER SPRING

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.

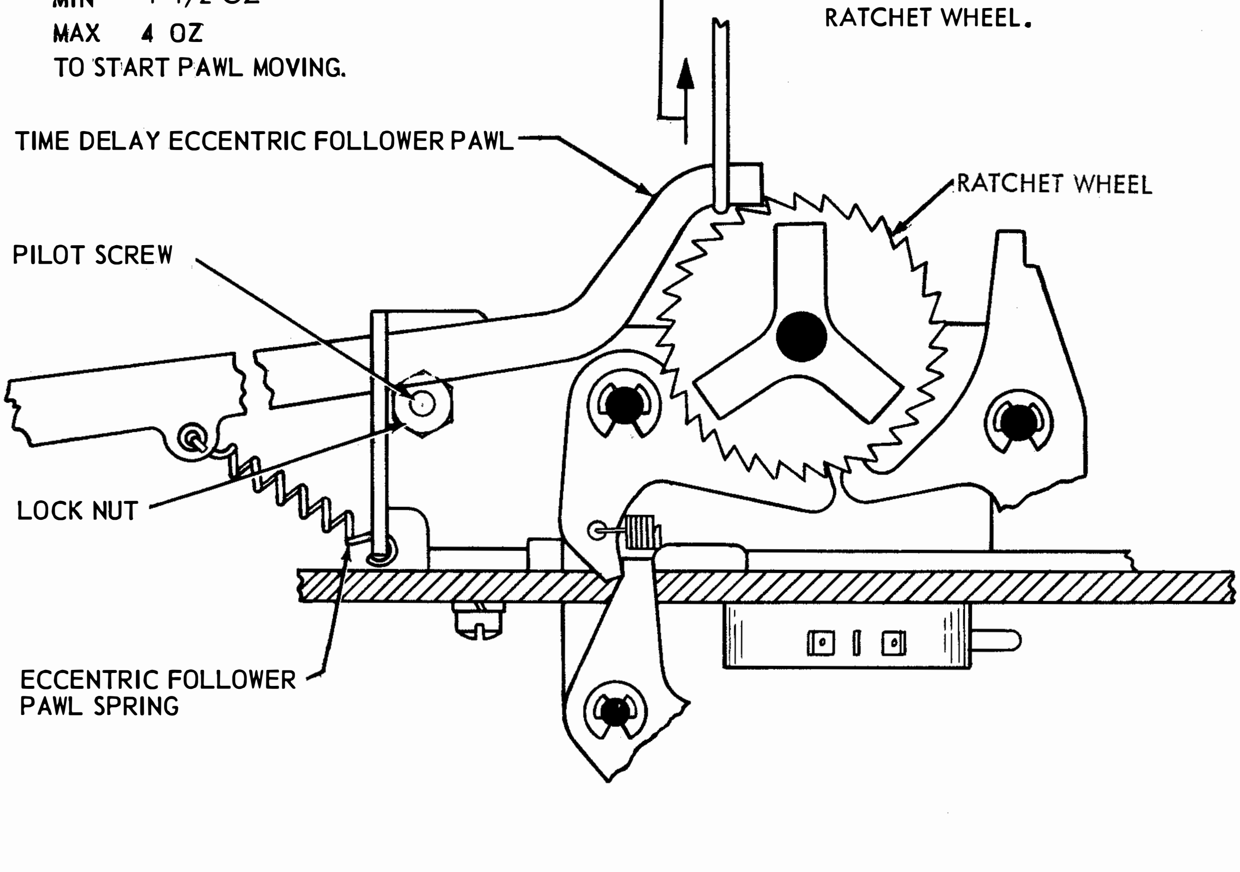
ECCENTRIC FOLLOWER PAWL SPRING

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.

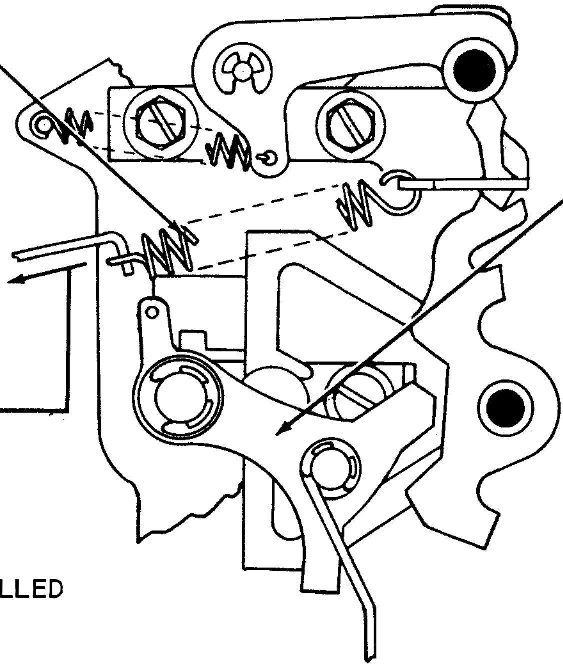
TIME DELAY DISABLING DEVICE

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 CLEARS THE RATCHET WHEEL.

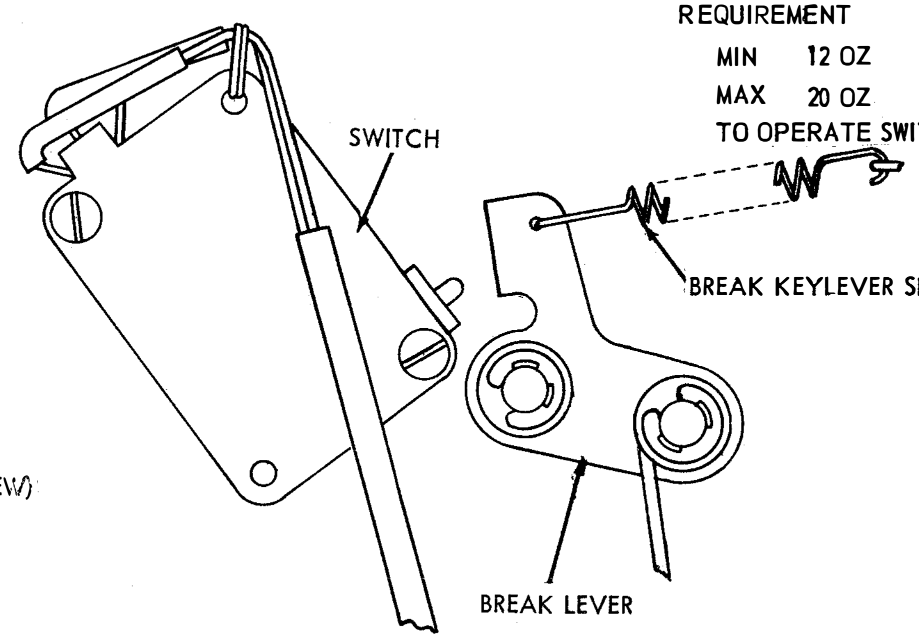


5.26 Variable Features continued



MECHANICAL
(REAR VIEW)

(RIGHT SIDE VIEW)



ELECTRICAL
(REAR VIEW)

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

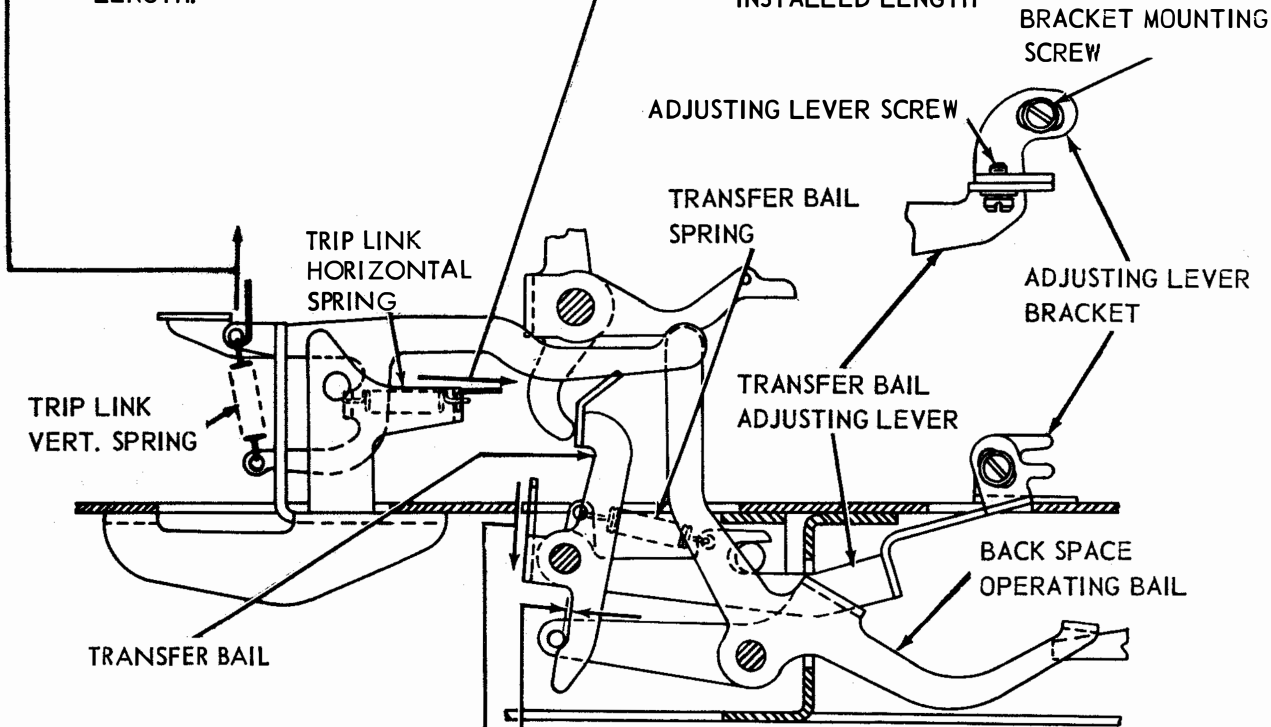
REQUIREMENT

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)

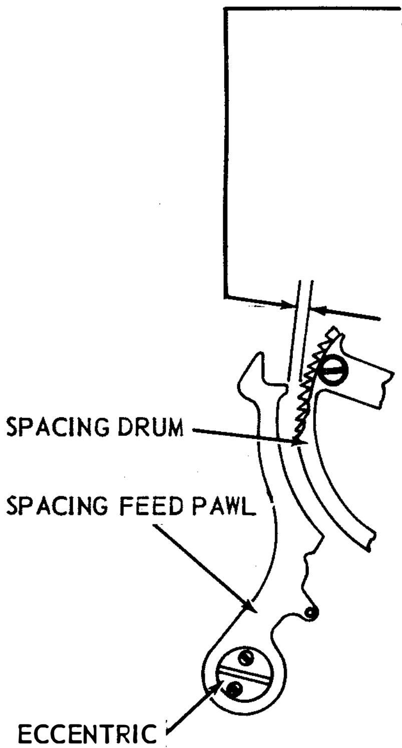
WITH THE TYPING UNIT REMOVED, THERE SHOULD BE SOME CLEARANCE BETWEEN THE TRANSFER BAIL AND THE STUD ON THE BACK SPACE OPERATING BAIL.

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 FRICTION 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:

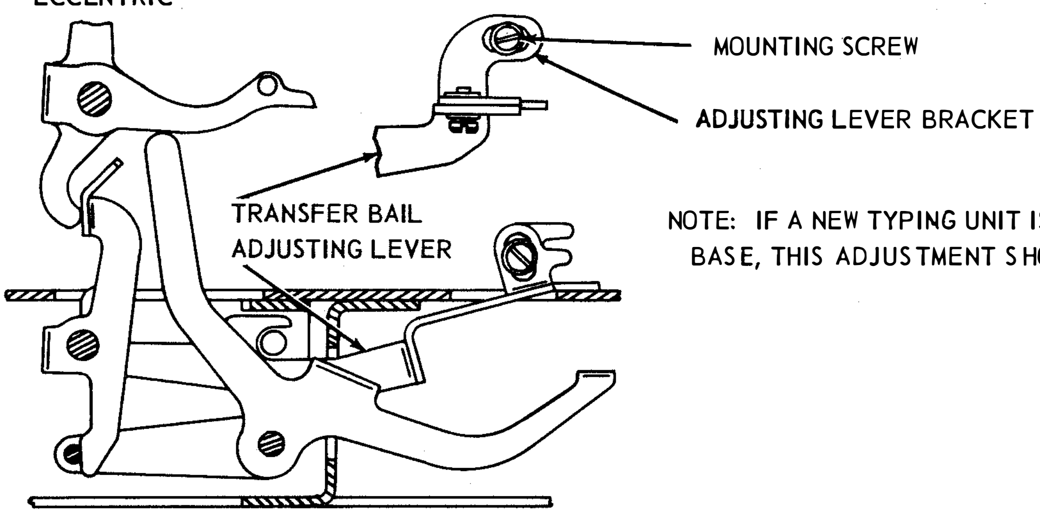
MIN 0.020
MAX 0.035

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

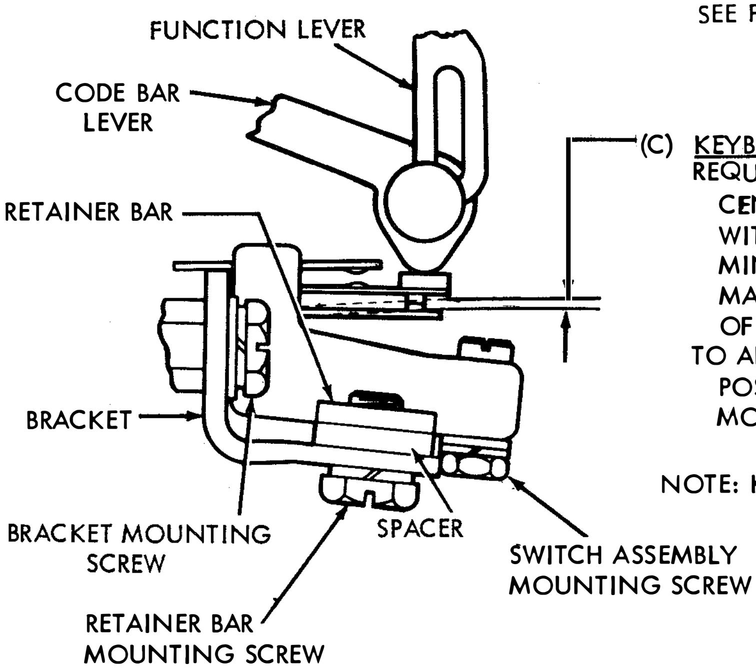
AFTER THIS ADJUSTMENT THE CAMMING BAIL SHOULD RETURN TO ITS UNOPERATED POSITION WHEN THE KEY LEVER IS RELEASED. IF IT DOES NOT RETURN REFINE THE ADJUSTMENT. RECHECK THE TRANSFER BAIL VERTICAL ADJUSTMENT



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

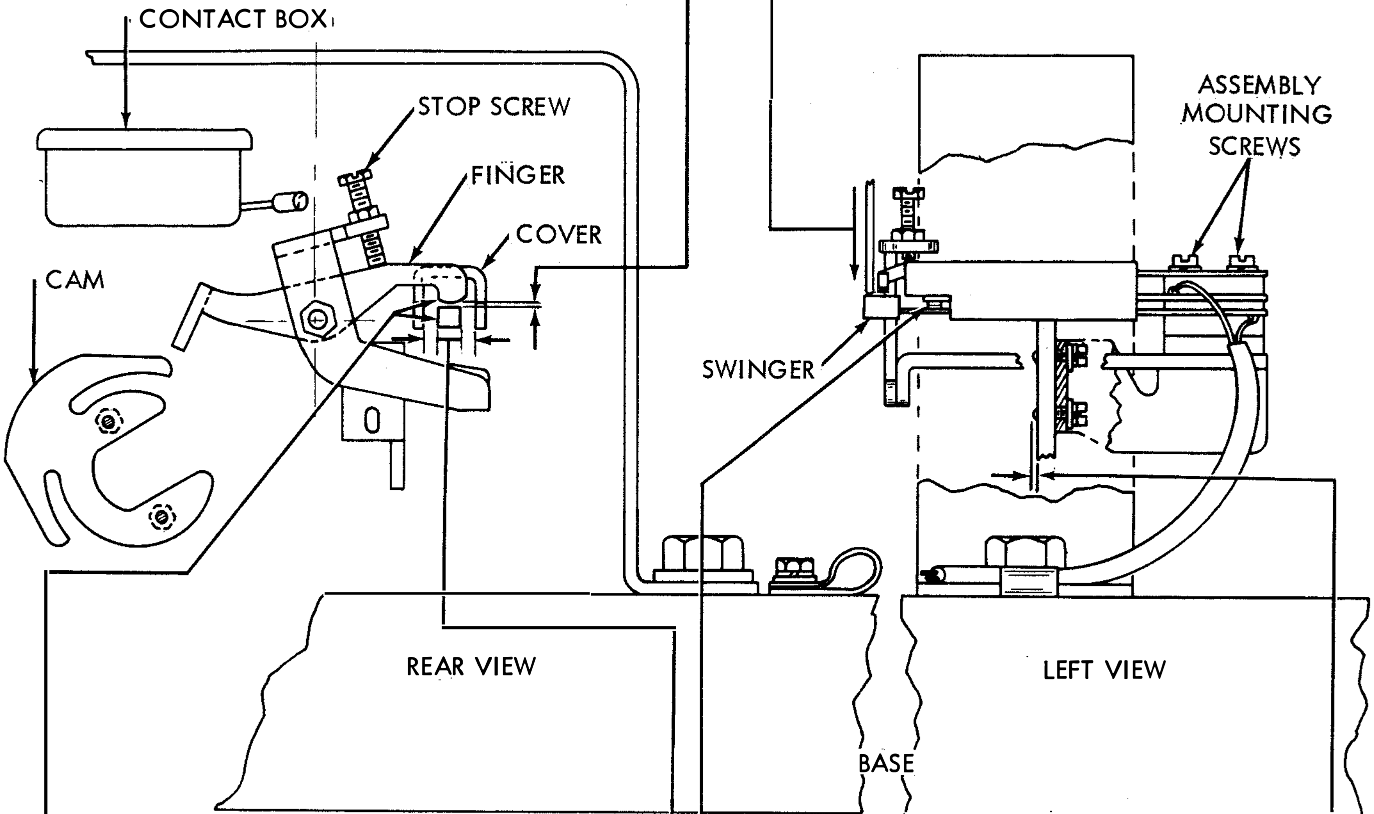
5.30 Answer-Back Mechanism (Switched Circuit Network)
For Keyboards LK3, LK4 and LK5 (Bell 28A and 28C) "FIGS" "C" continued

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).

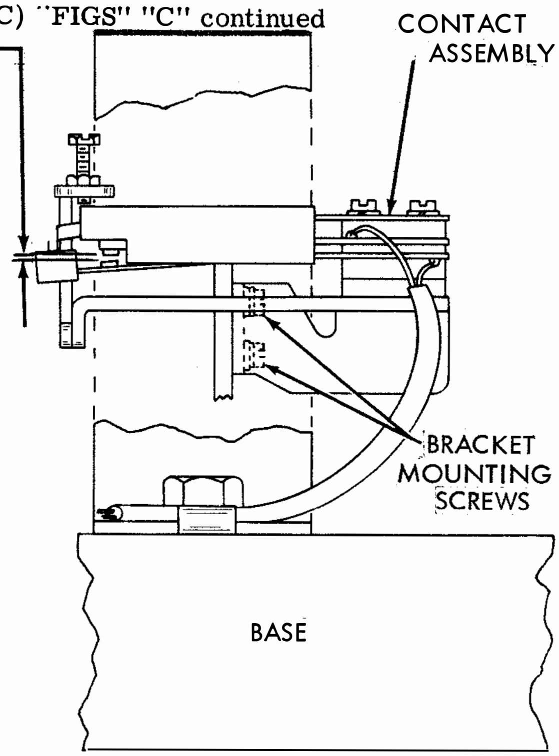


(A) CONTACT ASSEMBLY
REQUIREMENT
1. CLEARANCE BETWEEN CONTACT SWINGER INSULATOR AND SIDES OF CONTACT COVER SHOULD BE EQUAL WITHIN 0.015 INCH. GAUGE BY EYE.
2. SWINGER AND SWINGER OPERATING FINGER SHOULD ALIGN WITHIN 0.015 INCH GAUGE BY EYE.
3. CONTACTS ON CONTACT ASSEMBLY SHOULD ALIGN WITHIN 0.015 INCH
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.

5.31 Answer-Back Mechanism (Switched Circuit Network)
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.

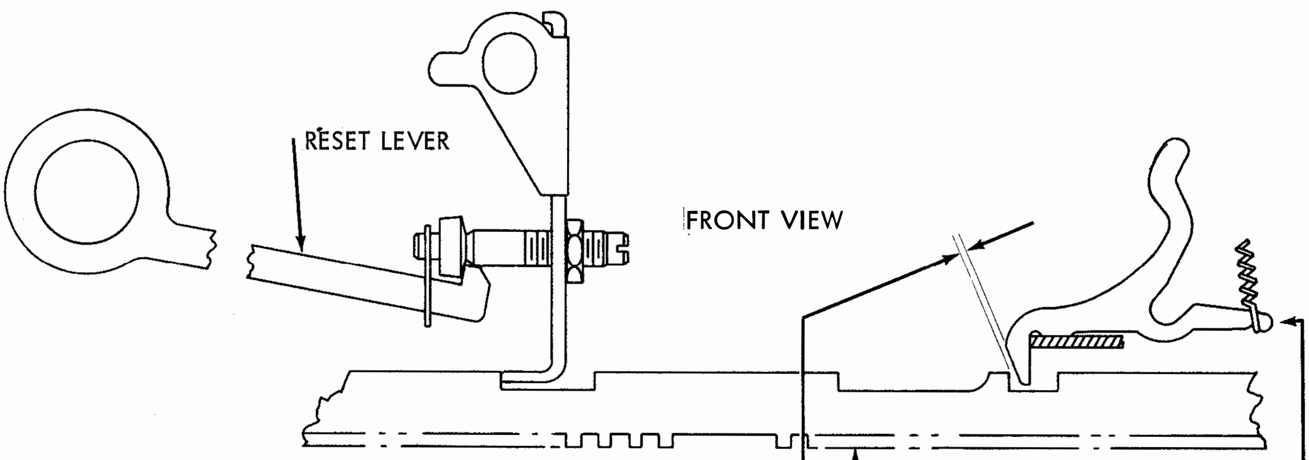


LEFT VIEW

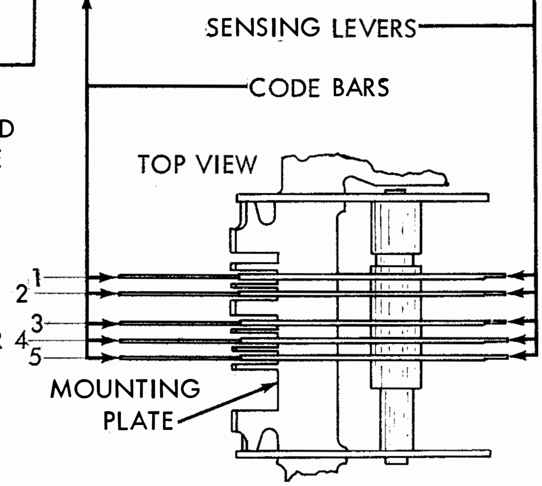
KEEP CONTACTS FREE OF OIL AND GREASE

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)

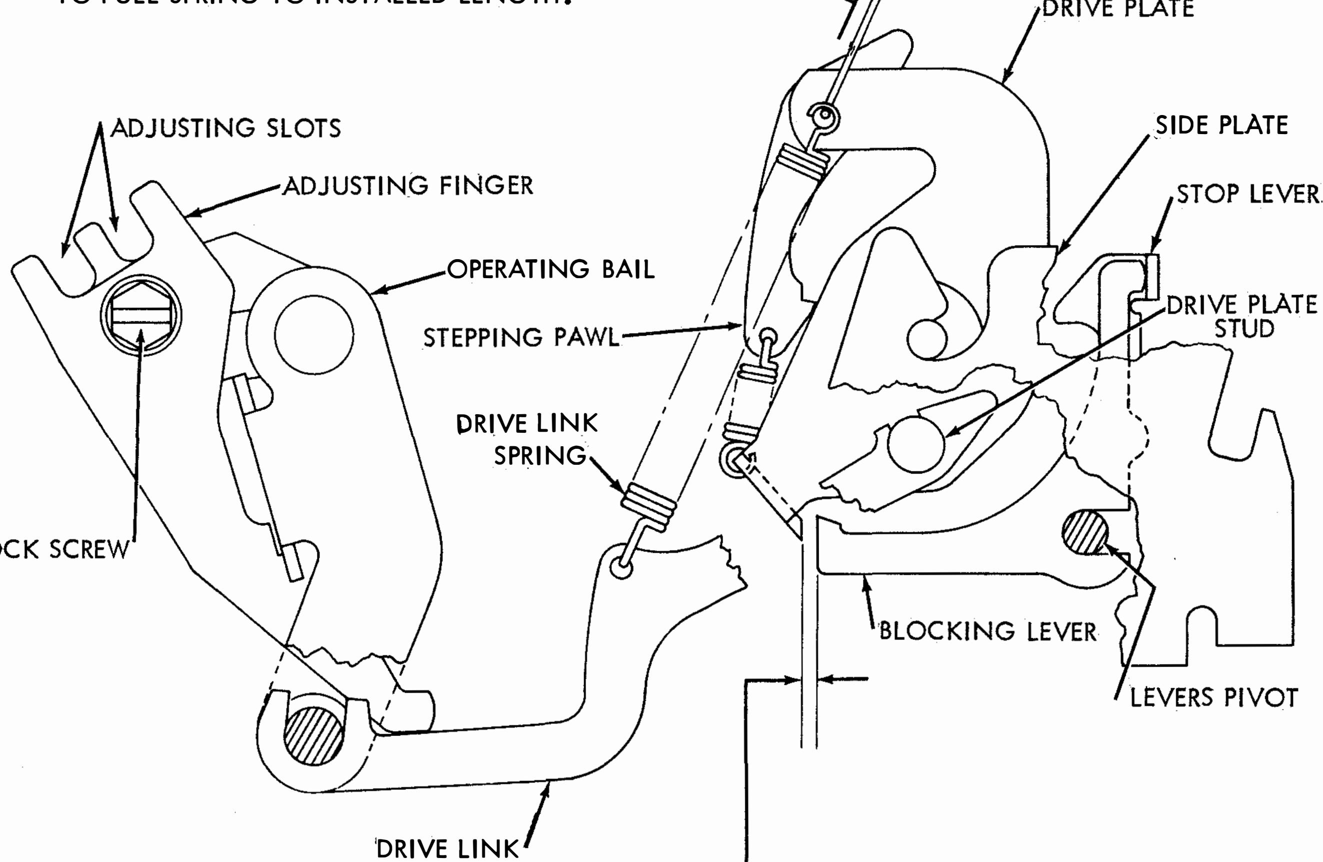


(F) CHARACTER GENERATOR MOUNTING PLATE
REQUIREMENT
1. CLEARANCE BETWEEN SHOULDERS OF CODE BARS #1 AND #5 AND THEIR ASSOCIATED SENSING LEVERS SHOULD BE MIN 0.008 INCH --- MAX 0.018 INCH
2. SENSING LEVERS SHOULD BE ALIGNED WITH THEIR ASSOCIATED CODE BARS.
TO CHECK
WITH THE CLUTCH ENGAGED AND LETTERS COMBINATION SELECTED ROTATE MAIN SHAFT UNTIL RESET LEVER IS IN EXTREME LEFT POSITION.
TO ADJUST
POSITION MOUNTING PLATE WITH THE THREE MOUNTING SCREWS LOOSENED.



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.



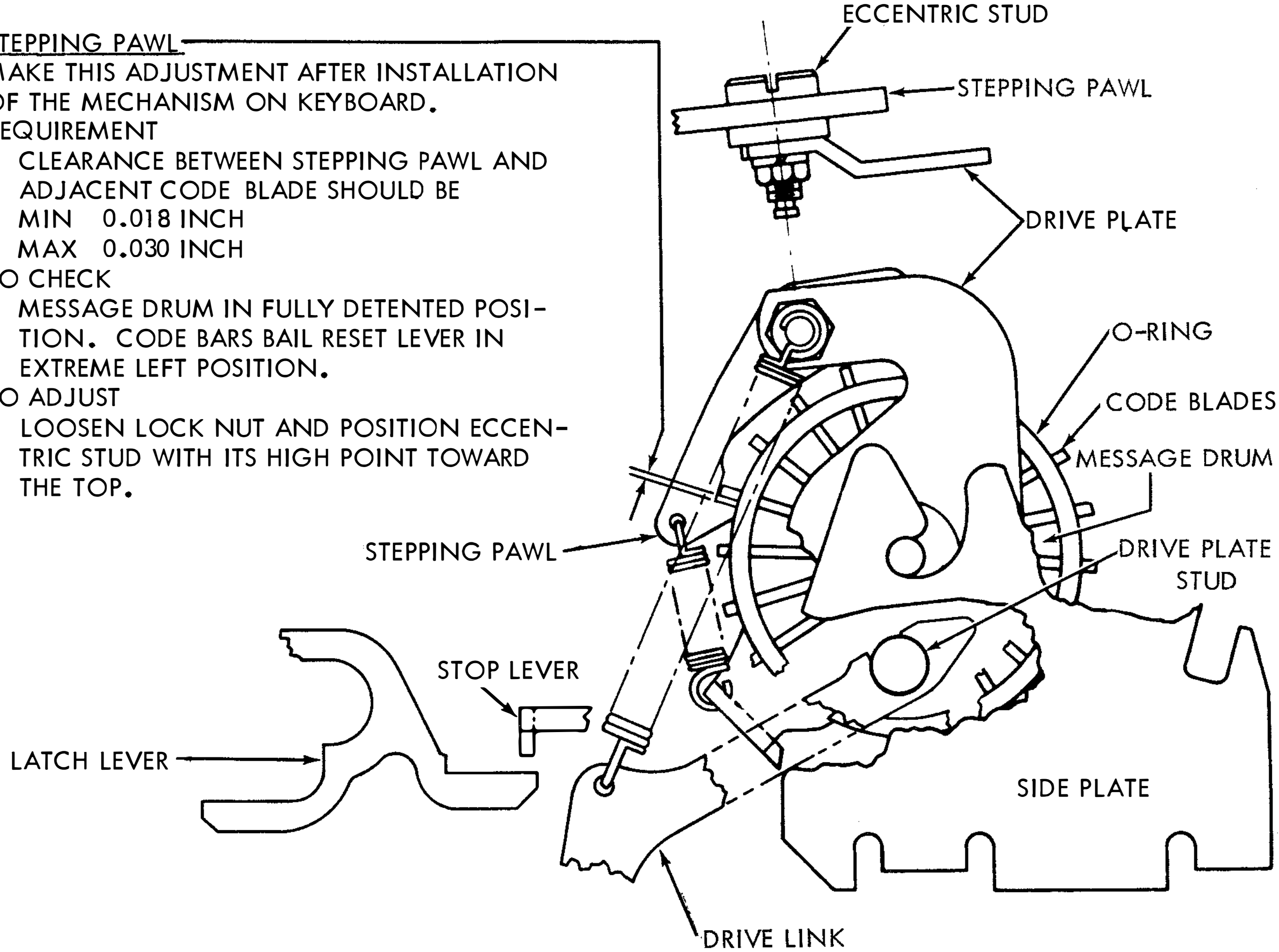
(B) DRIVE LINK
PERFORM THIS ADJUSTMENT BEFORE INSTALLATION OF MESSAGE DRUM AND DRIVE PLATE ASSEMBLY.
REQUIREMENT
CLEARANCE BETWEEN DRIVE PLATE EXTENSION AND BLOCKING LEVER SHOULD BE
MIN 0.002 INCH
MAX 0.007 INCH
TO CHECK
CODE BAR BAIL RESET LEVER IN EXTREME LEFT POSITION.
TO ADJUST
POSITION ADJUSTING 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

5.33 Answer-Back Mechanism (Switched Circuit Network)
For Keyboards LK3, LK4 and LK5 (Bell 28A and 28C) "FIGS" "C" continued

(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.

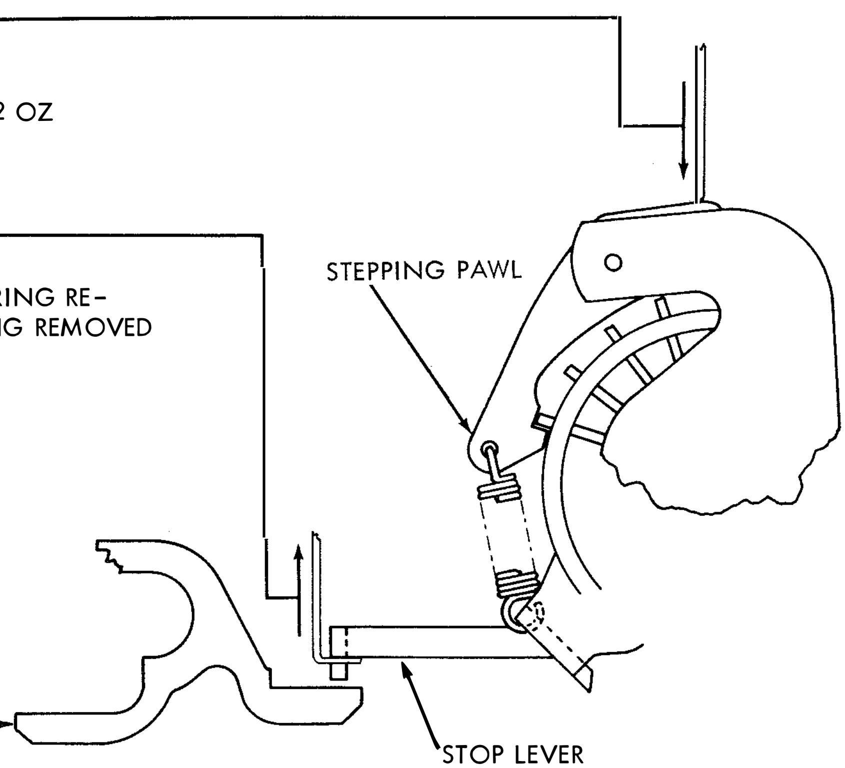


(B) STEPPING PAWL SPRING
REQUIREMENT
MECHANISM IN STOP POSITION
MIN 2-1/2 OZ --- MAX 3-1/2 OZ
TO START PAWL MOVING.

(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)



CODING THE MESSAGE DRUM
SEE PAR. 3.22

28 TYPING UNIT

ADJUSTMENTS

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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 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 Reassembly.

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 brackets 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).

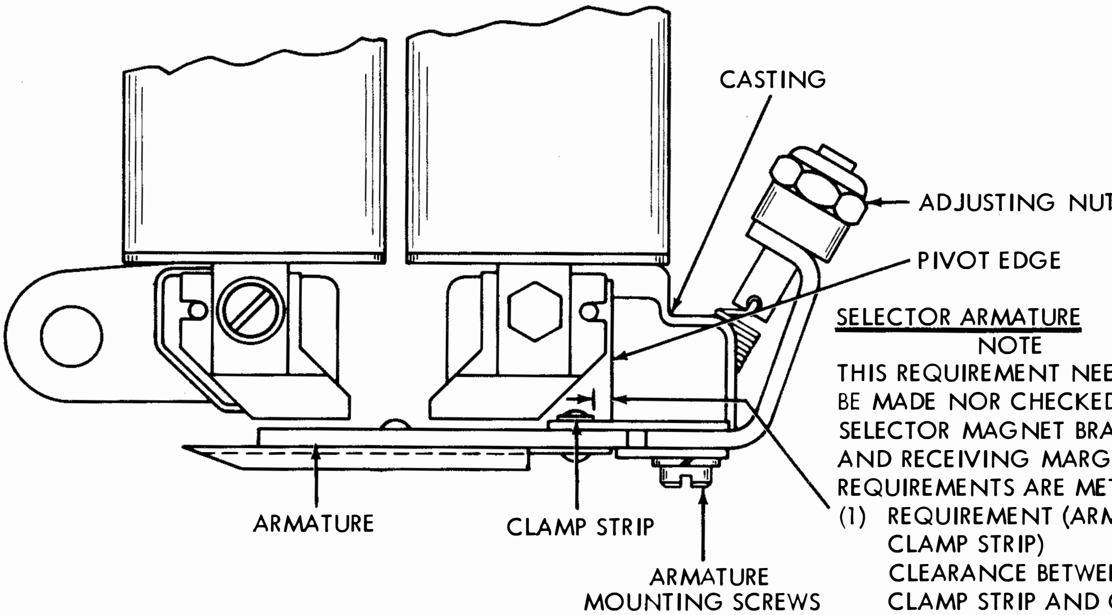
(j) Loosen the clamp nuts on the shift code bar guide plates (Par. 2.33).

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.

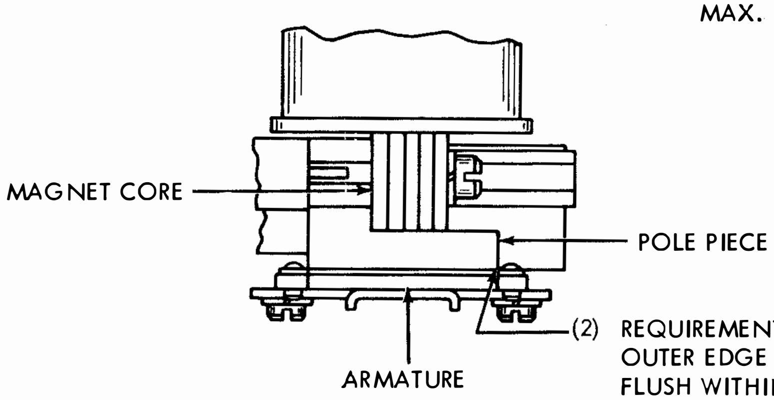


SELECTOR ARMATURE

NOTE

THIS REQUIREMENT NEED NOT BE MADE NOR 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

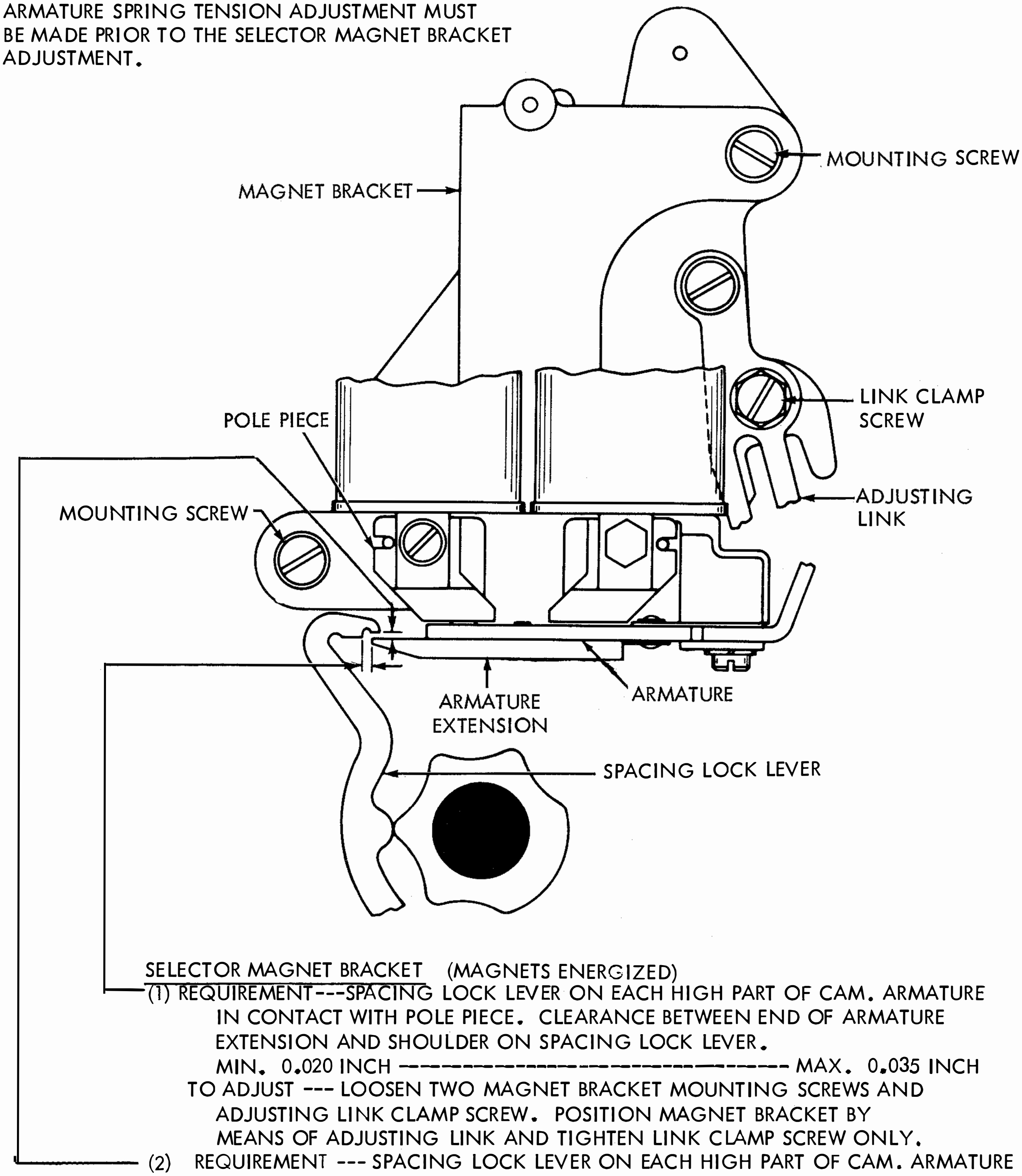


(FRONT VIEW)

(2) REQUIREMENT (ARMATURE ALIGNMENT)
OUTER EDGE OF ARMATURE SHOULD BE FLUSH WITHIN 0.015 INCH WITH OUTER EDGE OF POLE PIECES.

2.02 Selector Mechanism (Cont.)

NOTE
THE APPROPRIATE PRELIMINARY SELECTOR ARMATURE 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. ARMATURE IN CONTACT WITH POLE PIECE. CLEARANCE BETWEEN END OF ARMATURE 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. ARMATURE 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).

2.03 Selector Mechanism (Cont.)

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:

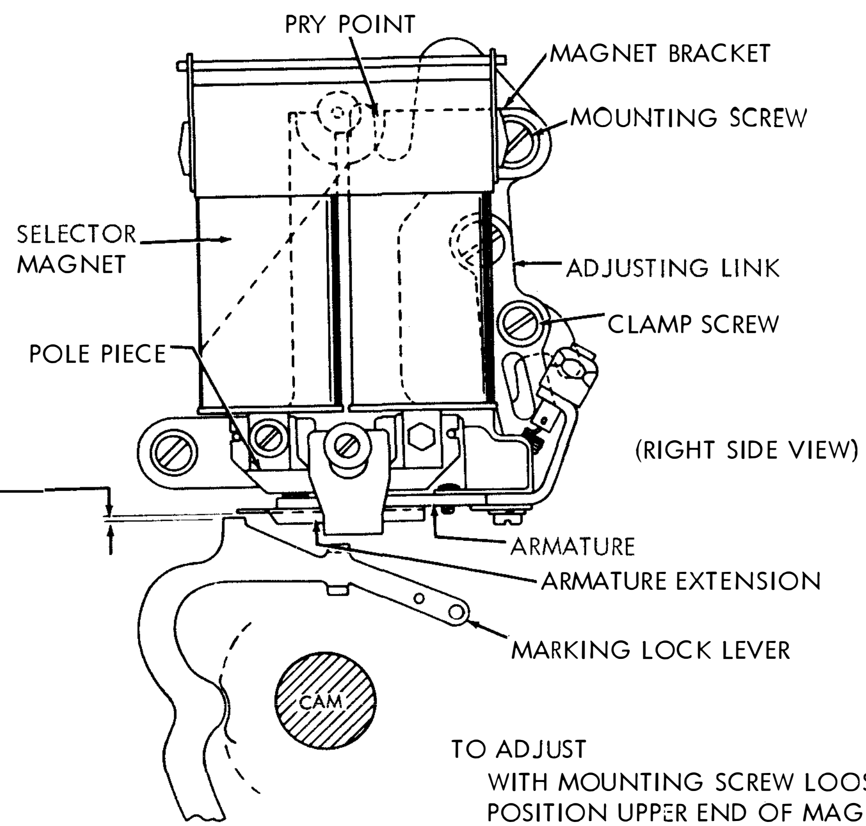
(1) DISCONNECT ARMATURE SPRING.
(2) REMOVE ARMATURE MOUNTING SCREWS.
(3) WITHDRAW ARMATURE FROM SELECTOR.

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

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

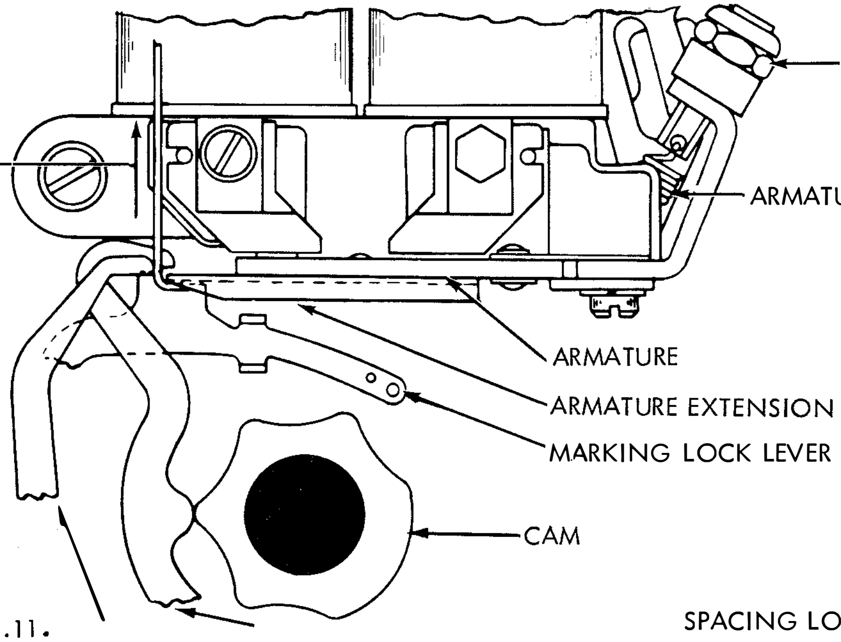
(a) MIN. 1-1/2 OZS. ---------------------------- MAX. 2 OZS. FOR 20 MA OPERATION.

(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. REFINE 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)

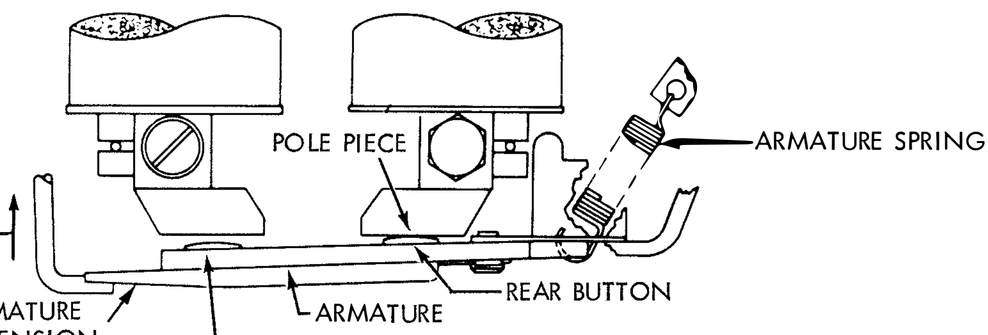
REQUIREMENT --- (PRELIMINARY) WITH START LEVER, MARKING AND SPACING LOCK LEVERS ON HIGH PART OF THEIR CAMS, HOOK SCALE UNDER END OF ARMATURE EXTENSION (HOLD AS NEARLY VERTICAL AS POSSIBLE). IT SHOULD REQUIRE

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.

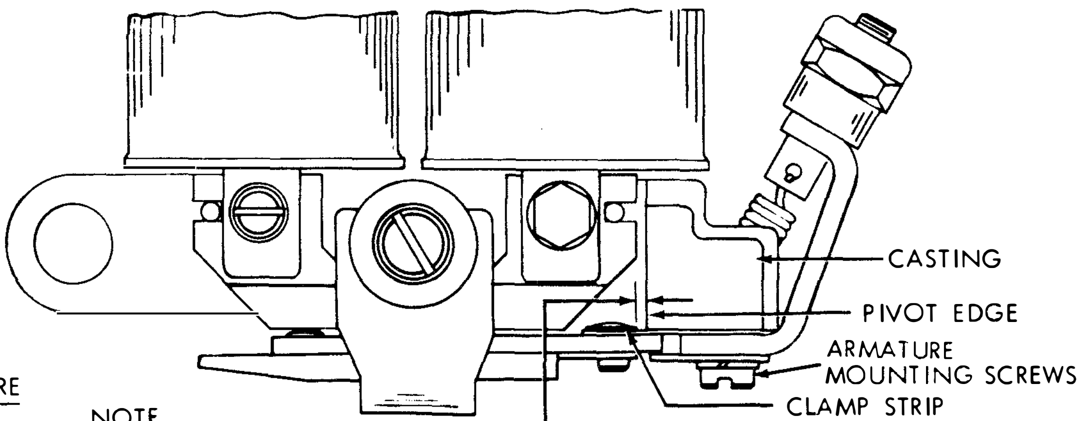
REQUIREMENT --- (FINAL) WHEN A DISTORTION TEST SET IS AVAILABLE, REFINE SELECTOR ARMATURE SPRING ADJUSTMENT TO MEET SELECTOR RECEIVING MARGIN PAR. 2.11. NOTE --- WITH SELECTOR MAGNETS ENERGIZED, FRONT ANTI-FREEZE BUTTON MUST BE IN CONTACT WITH ITS MAGNET CORE.



2.06 Selector Mechanism (Cont.)

NOTE

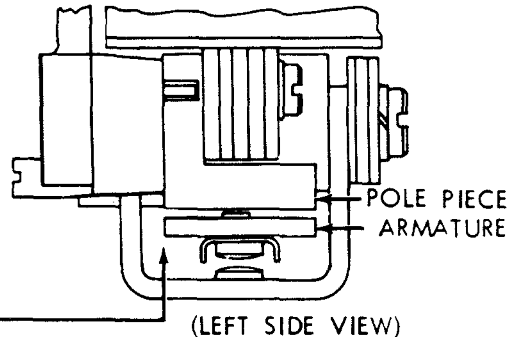
TO FACILITATE MAKING THE FOLLOWING ADJUSTMENTS, REMOVE THE RANGE FINDER ASSEMBLY AND SELECTOR MAGNET ASSEMBLY. TO INSURE BETTER OPERATION, PULL A PIECE OF BOND PAPER BETWEEN THE ARMATURE AND THE POLE PIECES TO REMOVE ANY OIL OR FOREIGN MATTER THAT MAY BE PRESENT. MAKE CERTAIN THAT NO LINT OR PIECES OF PAPER REMAIN BETWEEN THE POLE PIECES AND THE ARMATURE.



SELECTOR ARMATURE

NOTE

THESE REQUIREMENTS NEED NOT BE MADE NOR CHECKED IF THE SELECTOR MAGNET BRACKET AND RECEIVING MARGIN REQUIREMENTS ARE MET.

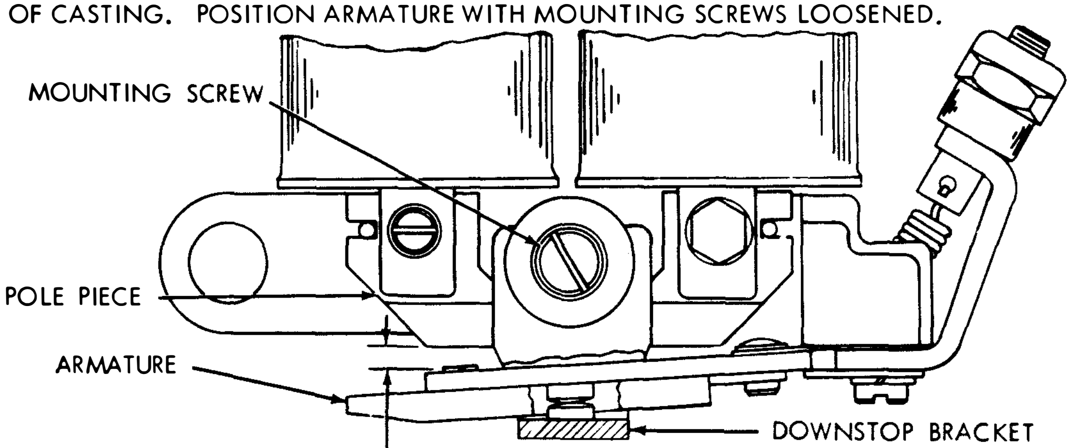


(1) REQUIREMENT
CLEARANCE
MIN. 0.025 INCH
MAX. 0.045 INCH
BETWEEN ARMATURE CLAMP STRIP AND MAGNET BRACKET CASTING.

(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.



SELECTOR ARMATURE DOWNSTOP BRACKET

REQUIREMENT
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.

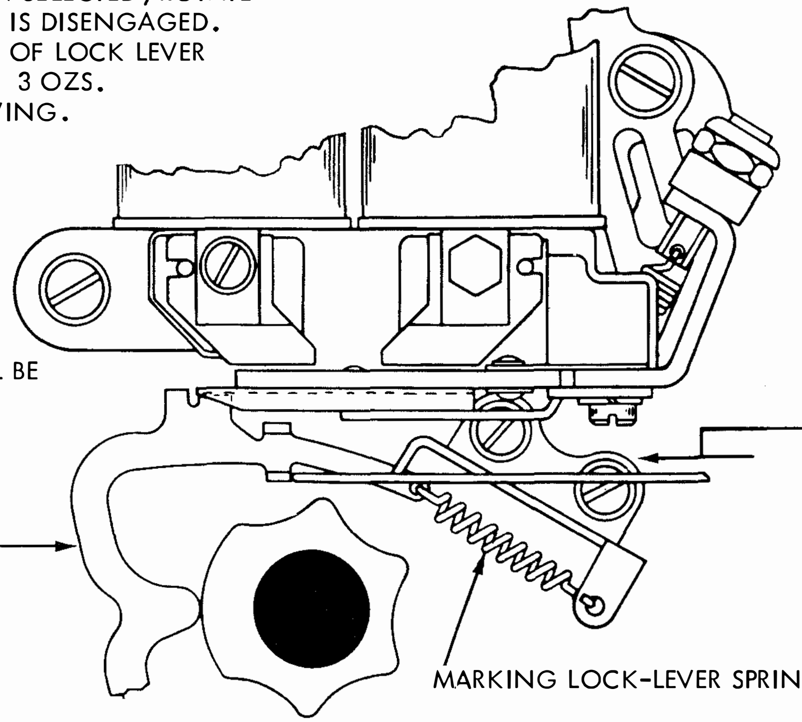
2.07 Selector Mechanism (Cont.)

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.

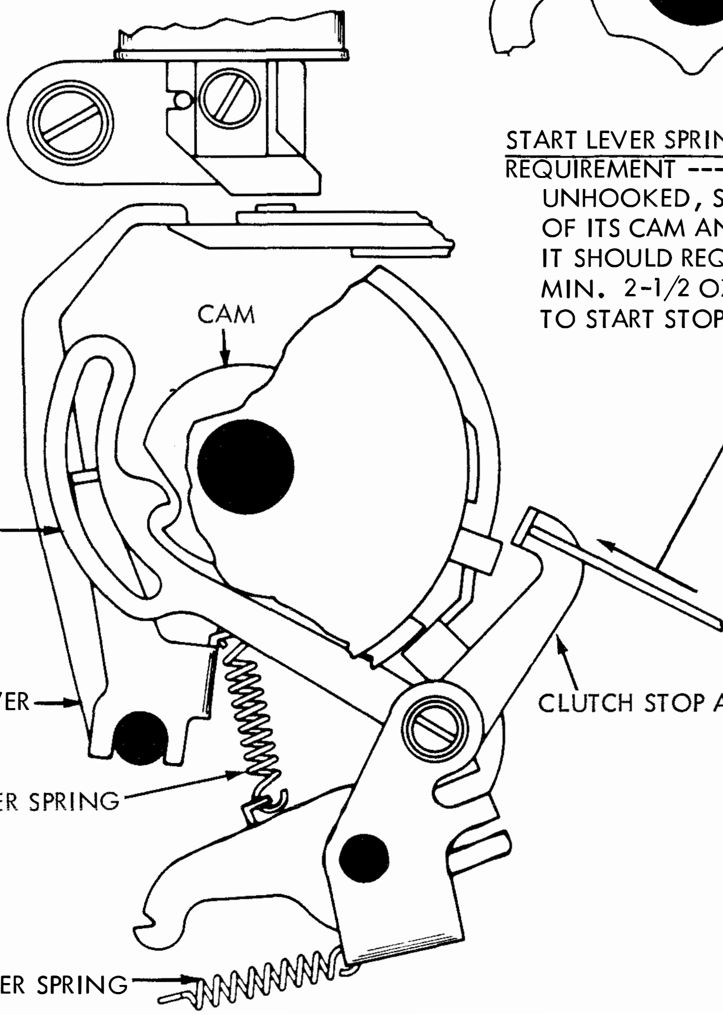
NOTE FOR BELL SERVICE ONLY

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.



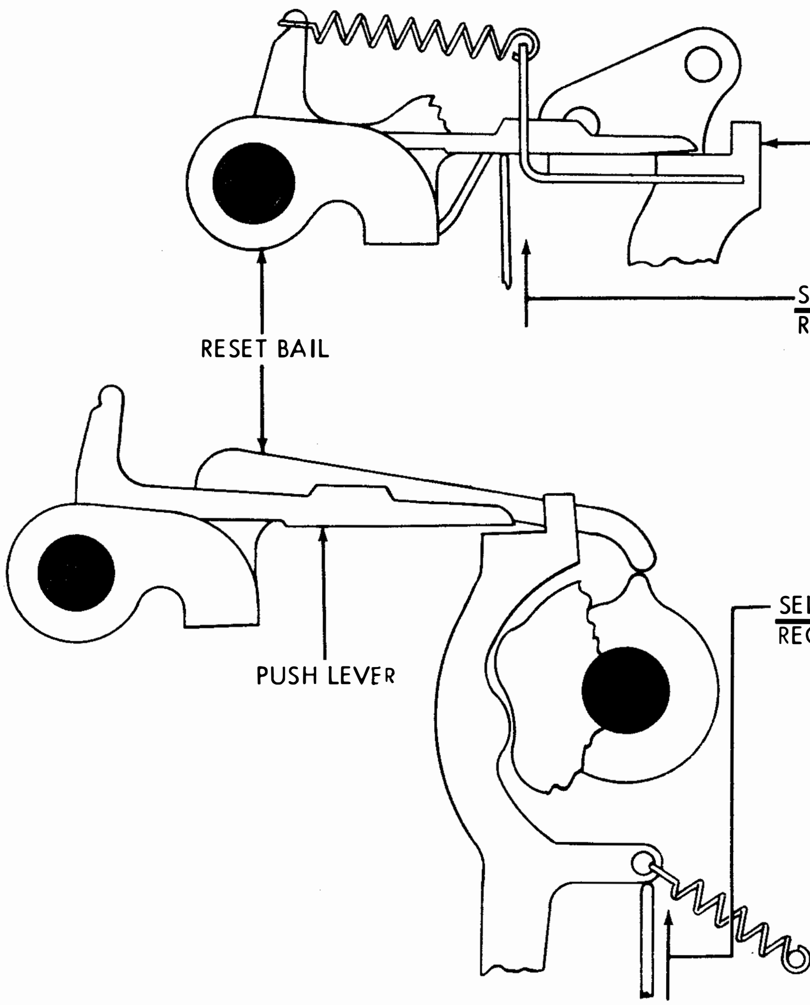
START LEVER SPRING

REQUIREMENT --- WITH LATCH LEVER SPRING UNHOOKED, 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.

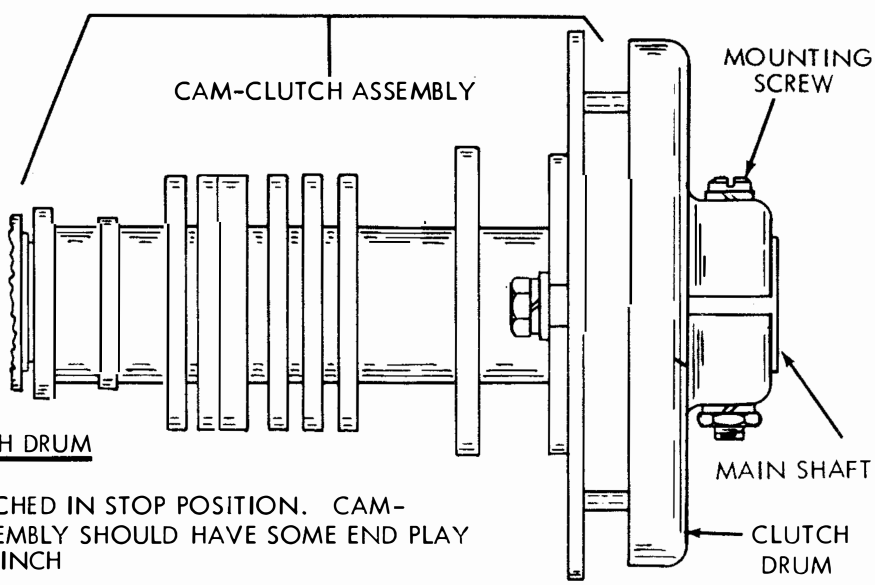
2.08 Selector Mechanism (Cont.)

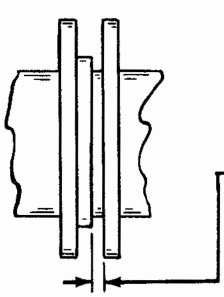


SELECTOR PUSH LEVER SPRING
REQUIREMENT
PUSH LEVER IN SPACING POSITION
MIN. 3/4 OZ.
MAX. 1-1/2 OZS.
TO MOVE PUSH LEVER FROM SELECTOR LEVER. CHECK FIVE SPRINGS.

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.

FRONT VIEW

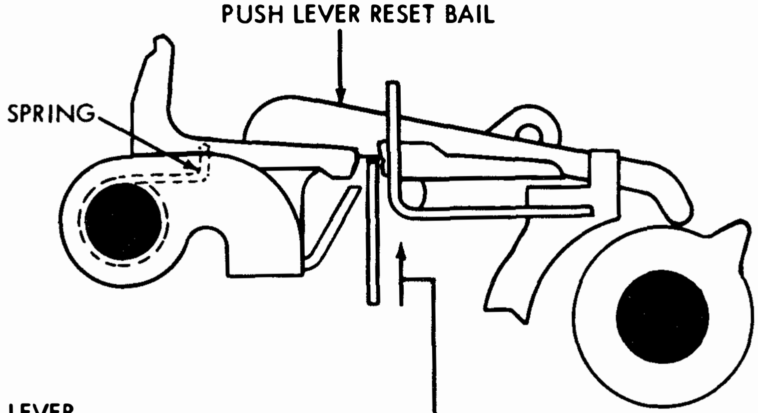


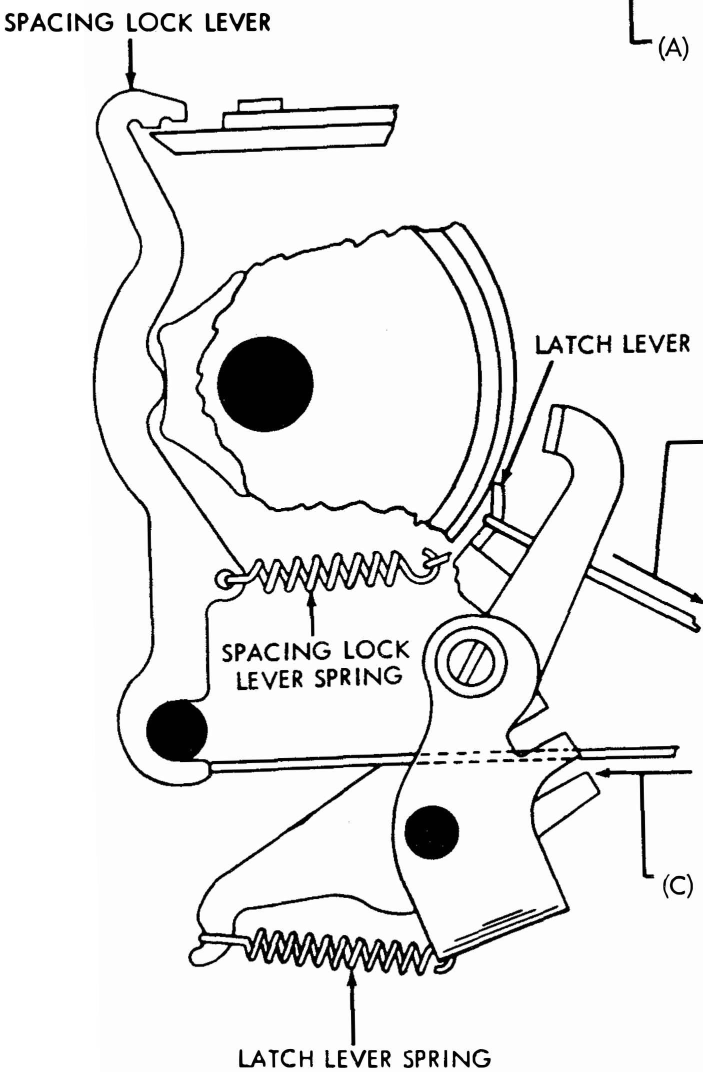


SELECTOR CLUTCH DRUM
REQUIREMENT
CLUTCH LATCHED IN STOP POSITION. CAM-CLUTCH ASSEMBLY SHOULD HAVE SOME END PLAY
MAX. 0.010 INCH

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

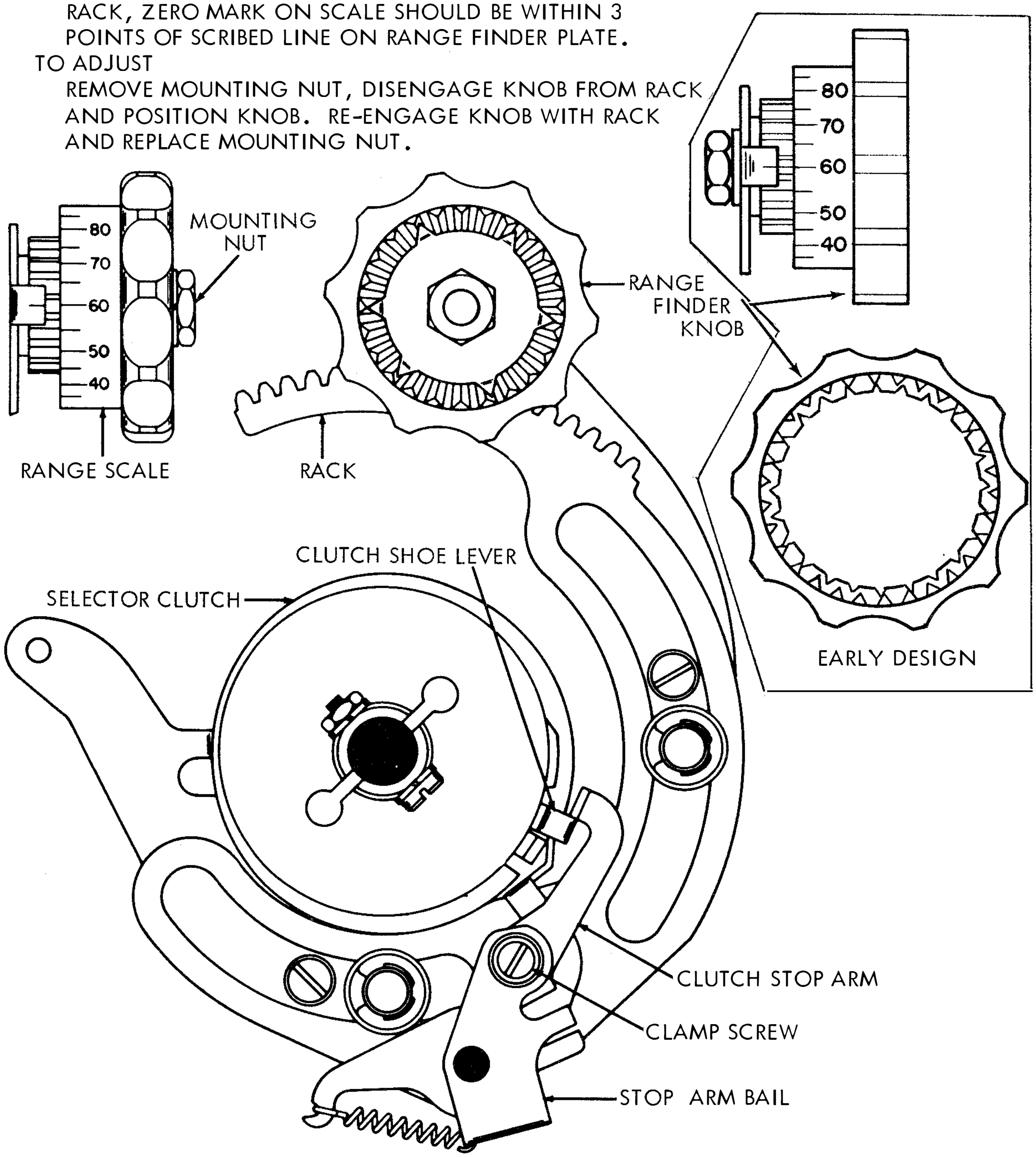
(A) RANGE FINDER KNOB PHASING

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

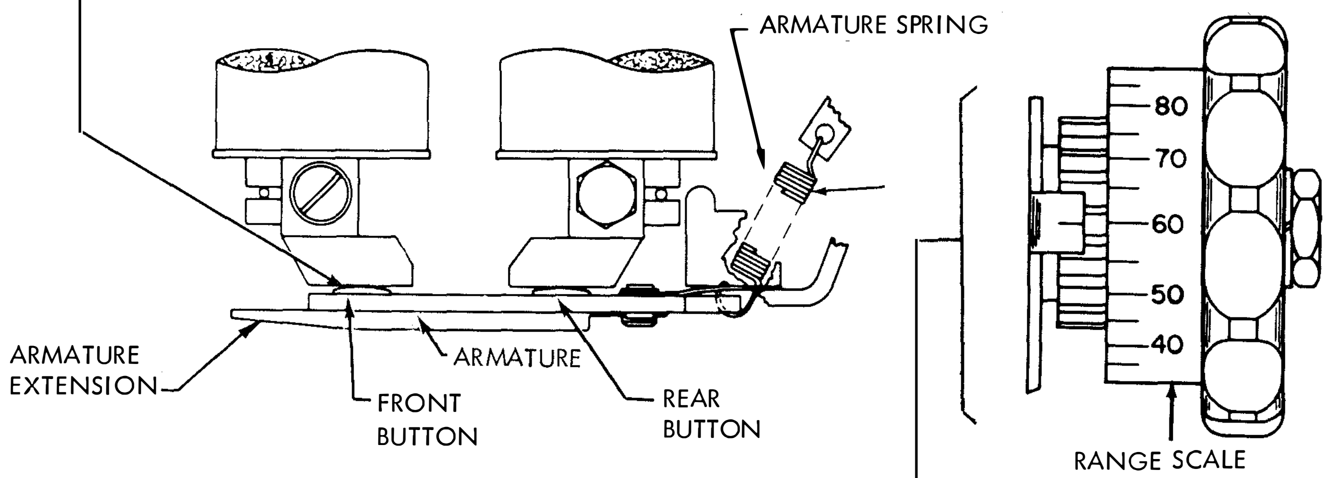
RANGE SCALE SET AT 60. SELECTOR CLUTCH DISENGAGED. ARMATURE IN MARKING POSITION. CLUTCH STOP ARM SHOULD ENGAGE CLUTCH SHOE LEVER BY APPROXIMATELY FULL THICKNESS OF SHOE LEVER.

TO ADJUST

POSITION STOP ARM ON STOP ARM BAIL WITH CLAMP SCREW LOOSENED.

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

CURRENT	SPEED WPM	POINTS RANGE (ZERO DISTORTION)	PERCENT MARKING AND SPACING BIAS TOLERATED	END DISTORTION TOLERATED (SCALE SET AT BIAS OPTIMUM)
0.060 AMP. (WINDINGS PARALLEL)	60 75 100	72	40	35
0.020 AMP. (WINDINGS SERIES)	60 75	72	40	35

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

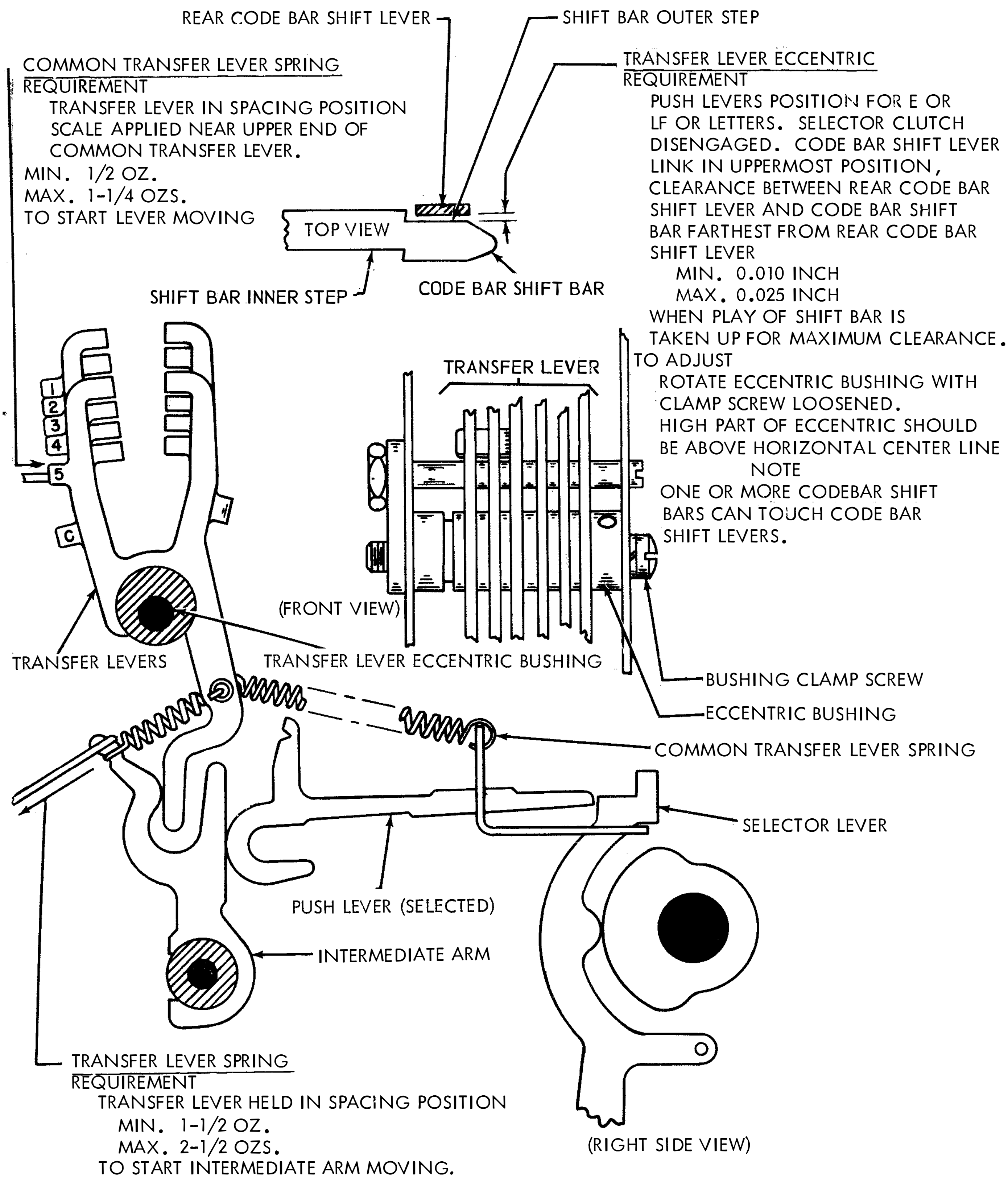
1. BIAS SELECTOR BETWEEN LIMITS OF 0% TO -7% INTERNAL BIAS AT 100 WPM. (DO NOT READJUST FOR 60 WPM).
2. OBTAIN RECEIVING MARGINS AT 60 AND 100 WPM.
3. CALCULATE COMMON OPTIMUM BIAS SETTING AS FOLLOWS: $O_c = \frac{UMB_{100} + LSB_{60}}{2}$ WHERE

O_c = COMMON OPTIMUM BIAS SETTING

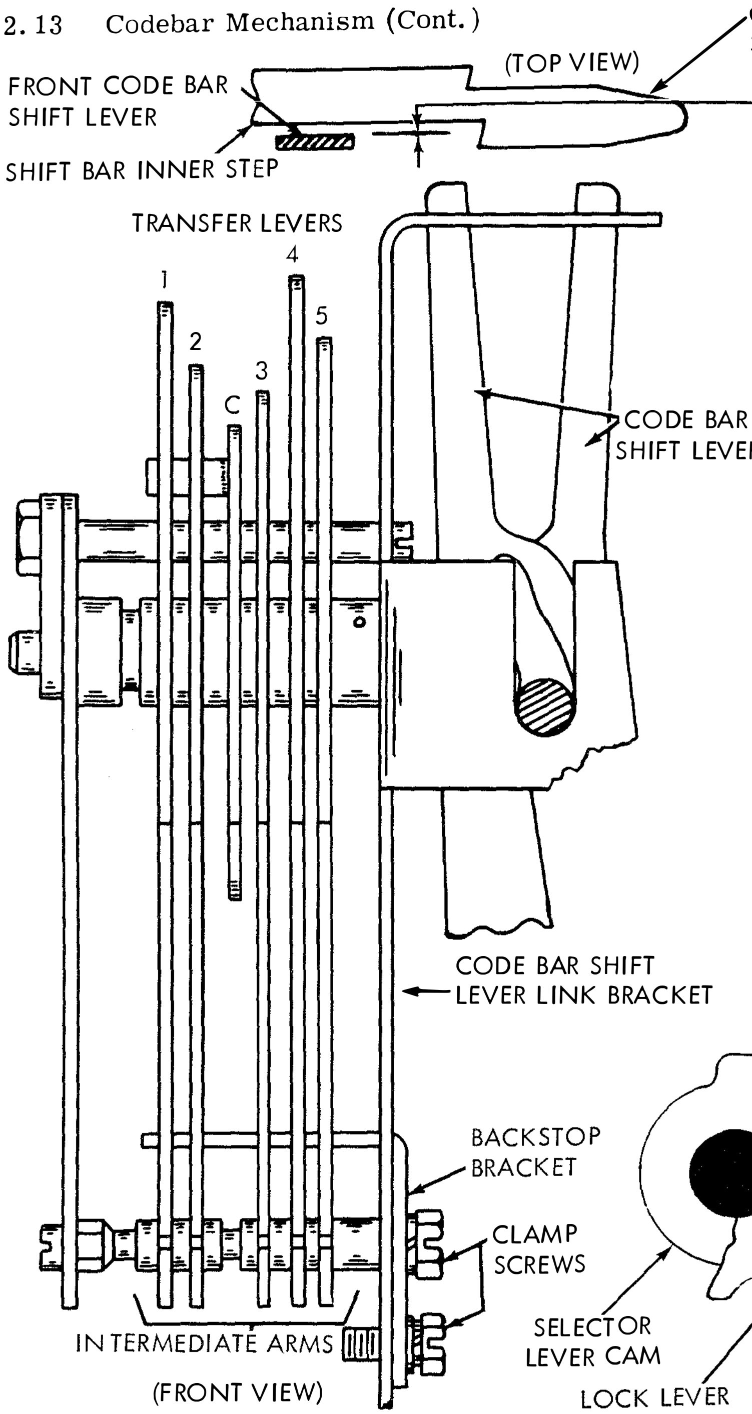
UMB_{100} = UPPER ORIENT LIMIT MARKING BIAS AT 100 WPM

LSB_{60} = LOWER ORIENT LIMIT SPACING BIAS AT 60 WPM

2.12 Codebar Mechanism



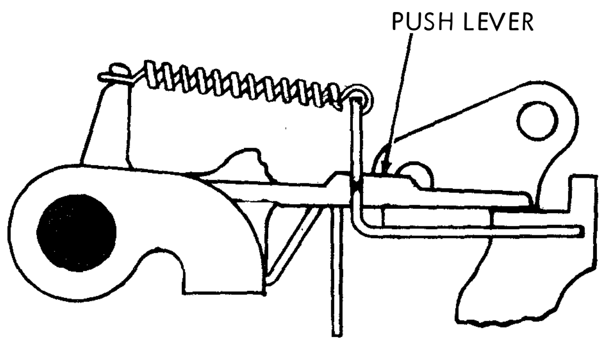
2.13 Codebar Mechanism (Cont.)

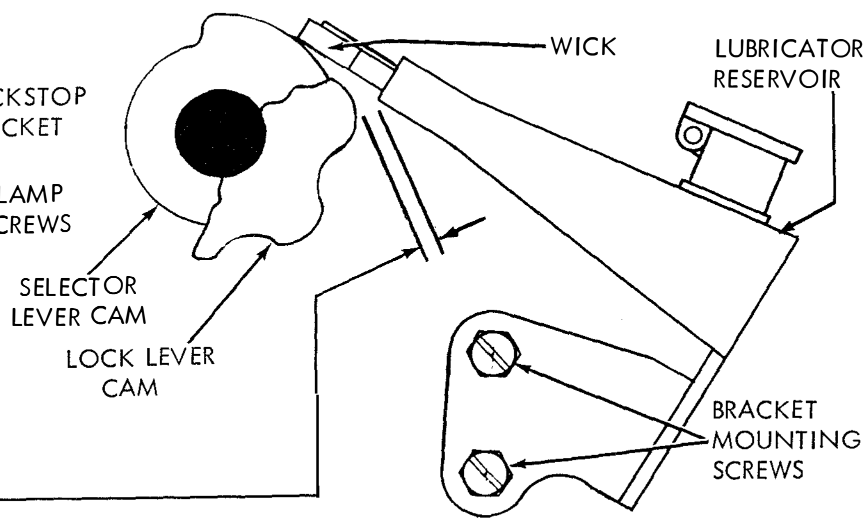


(A) INTERMEDIATE ARM BACKSTOP BRACKET

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.





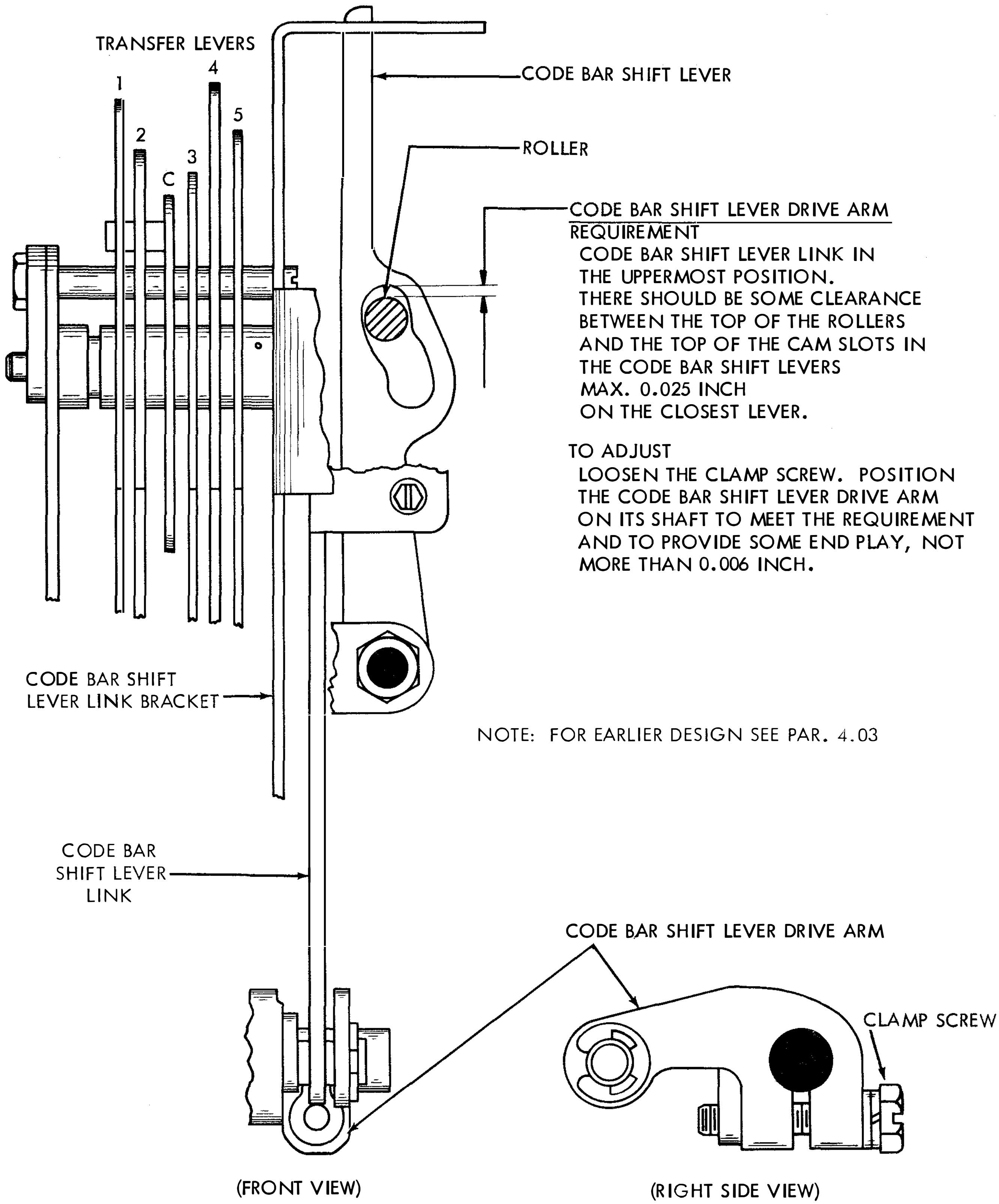
2.14 Selector Mechanism (Cont.)

(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.)



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

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)

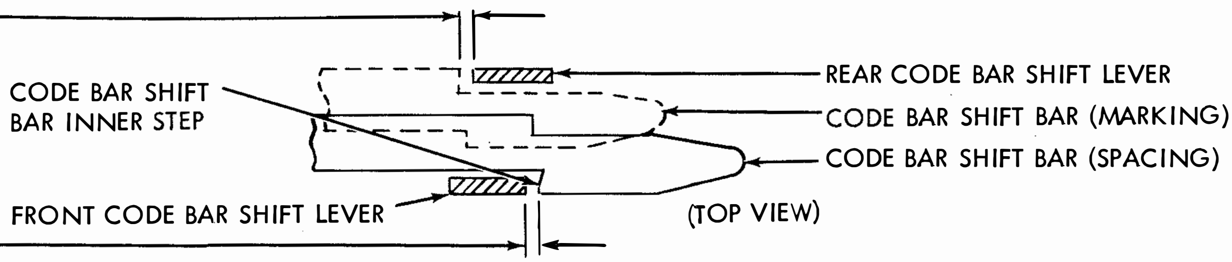
SELECT LETTERS COMBINATION. CHECK CLEARANCE BETWEEN REAR CODE BAR SHIFT LEVER AND SHOULDER ON NEAREST CODE BAR SHIFT BAR IN SAME WAY.

MIN. 0.002 INCH

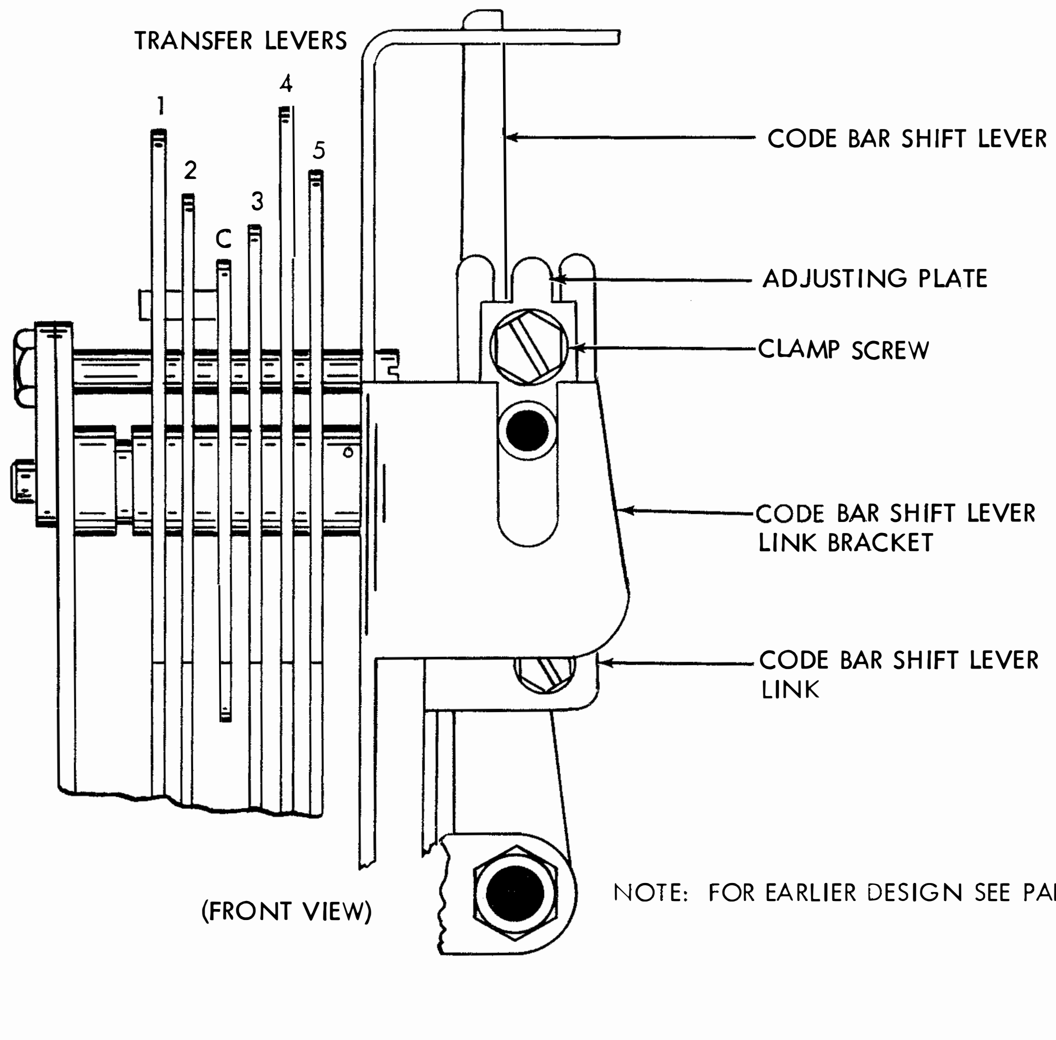
MAX. 0.025 INCH

TO ADJUST

POSITION ADJUSTING PLATES (FRONT AND REAR) WITH CLAMP SCREWS LOOSENED.



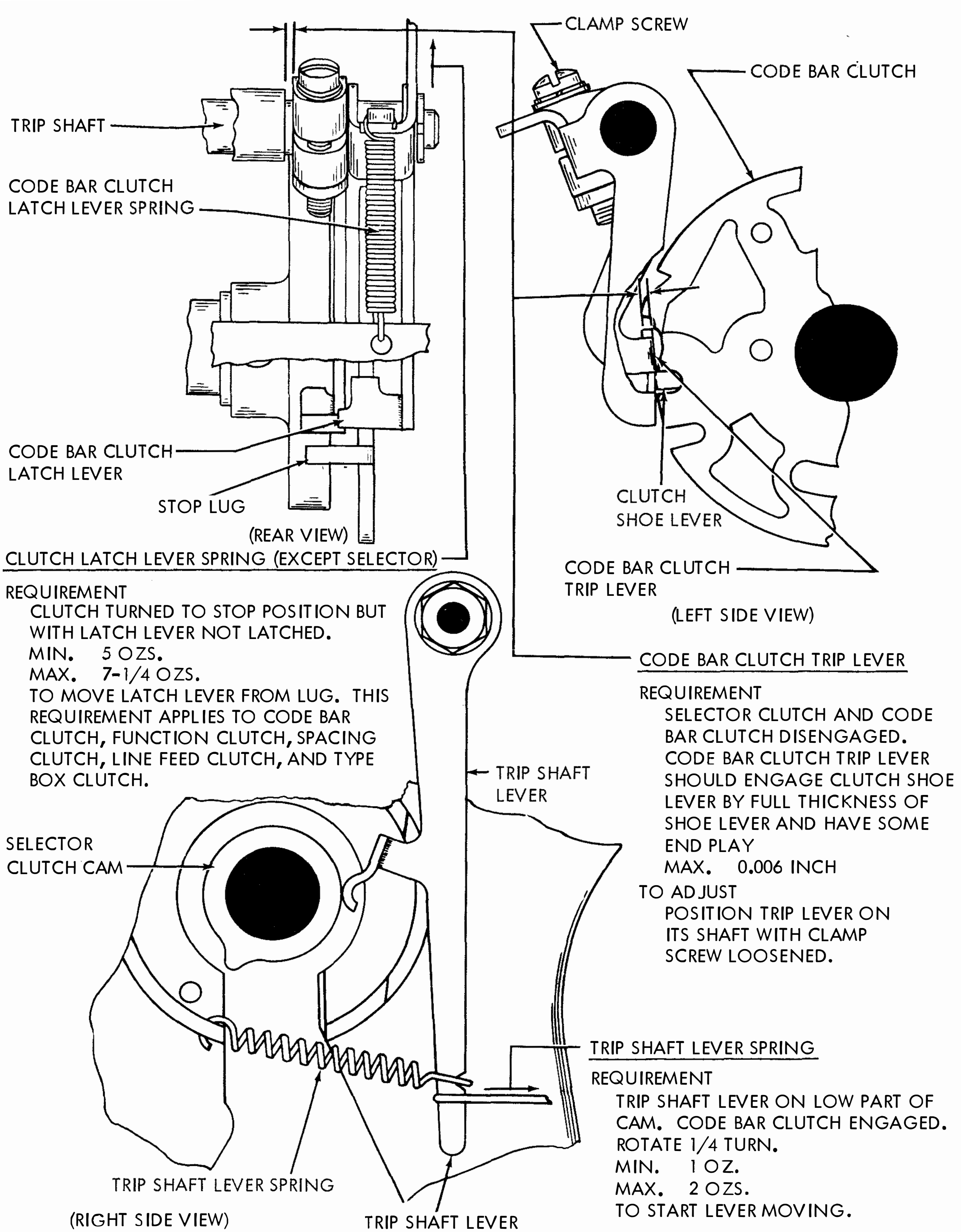
(TOP VIEW)



(FRONT VIEW)

NOTE: FOR EARLIER DESIGN SEE PAR. 4.04

2.17 Main Shaft and Trip Shaft Mechanisms



CLUTCH LATCH LEVER SPRING (EXCEPT SELECTOR)

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.

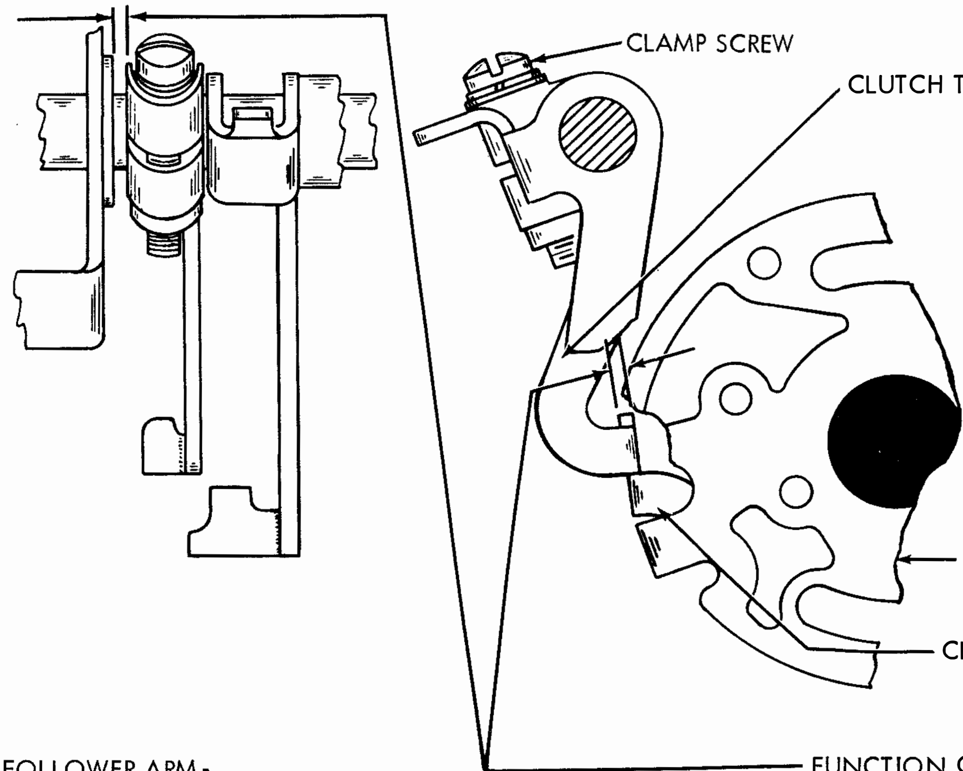
CODE BAR CLUTCH TRIP LEVER

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.

TRIP SHAFT LEVER SPRING

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.

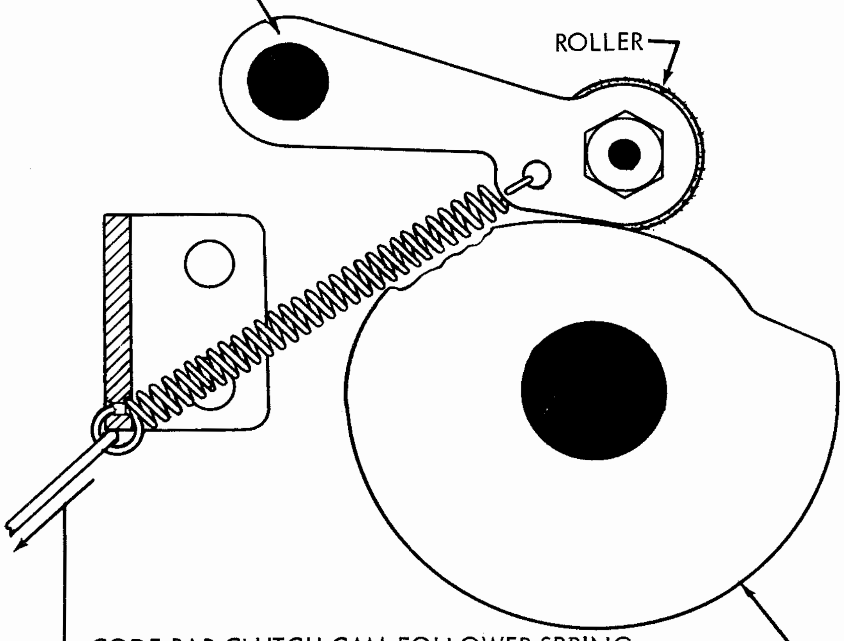
2.18 Main Shaft and Trip Shaft Mechanisms (Cont.)



FUNCTION CLUTCH TRIP LEVER

REQUIREMENT
CODE BAR 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



CODE BAR CLUTCH CAM FOLLOWER SPRING

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.

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. SOME
MAX. 0.008 INCH

TO ADJUST

POSITION SPACING CUT-OUT LEVER SET COLLAR

NOTE: FOR EARLIER DESIGN SEE PAR. 4.05.

(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.

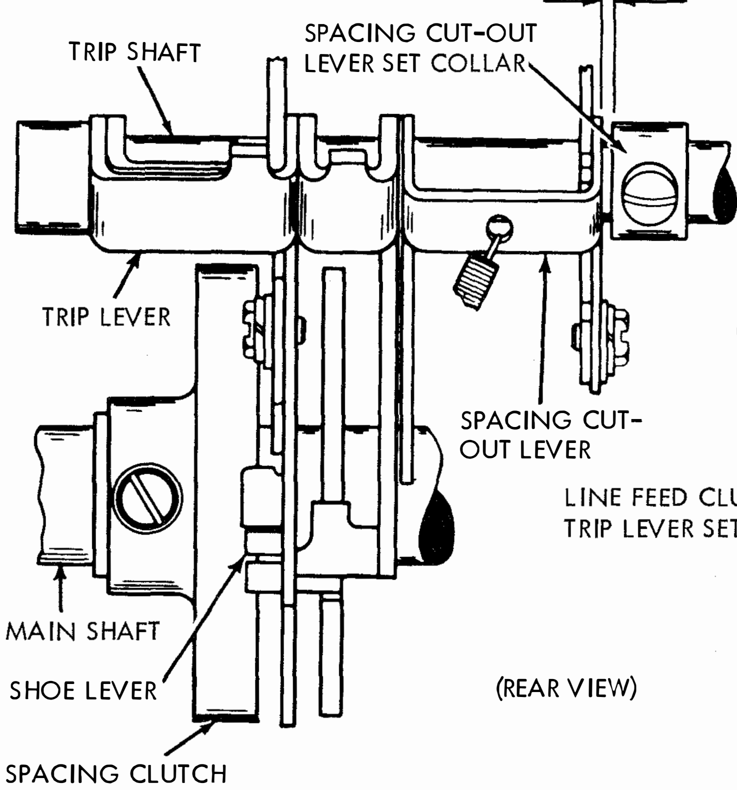
(3) REQUIREMENT

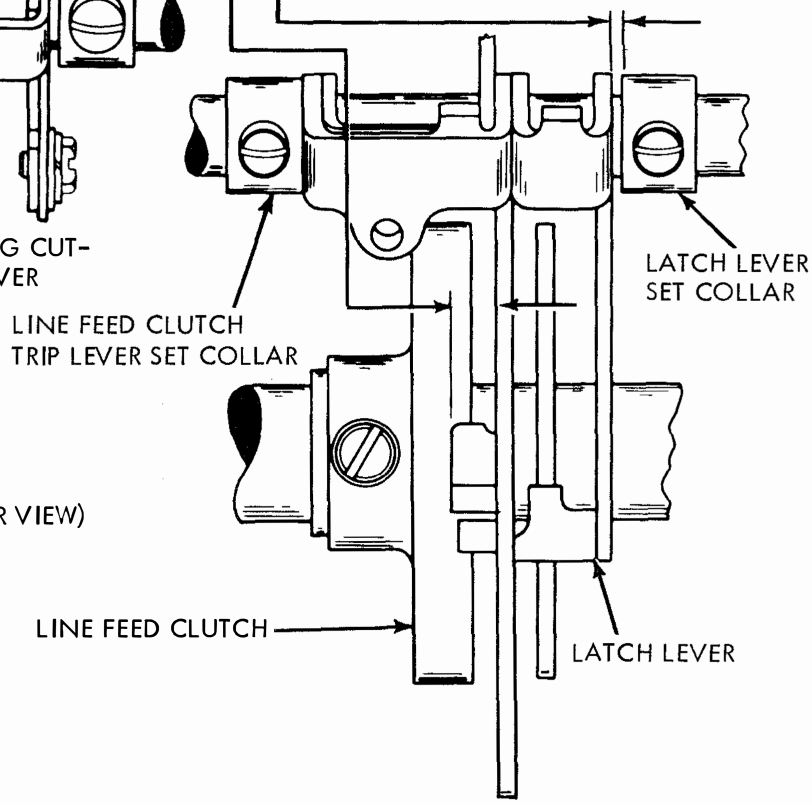
LINE FEED CLUTCH LATCH LEVER SHOULD HAVE SIDE PLAY.

MIN. SOME
MAX. 0.008 INCH

TO ADJUST

POSITION LINE FEED CLUTCH LATCH LEVER SET COLLAR.





(REAR VIEW)

2.20 Main Shaft and Trip Shaft Mechanisms (Cont.)

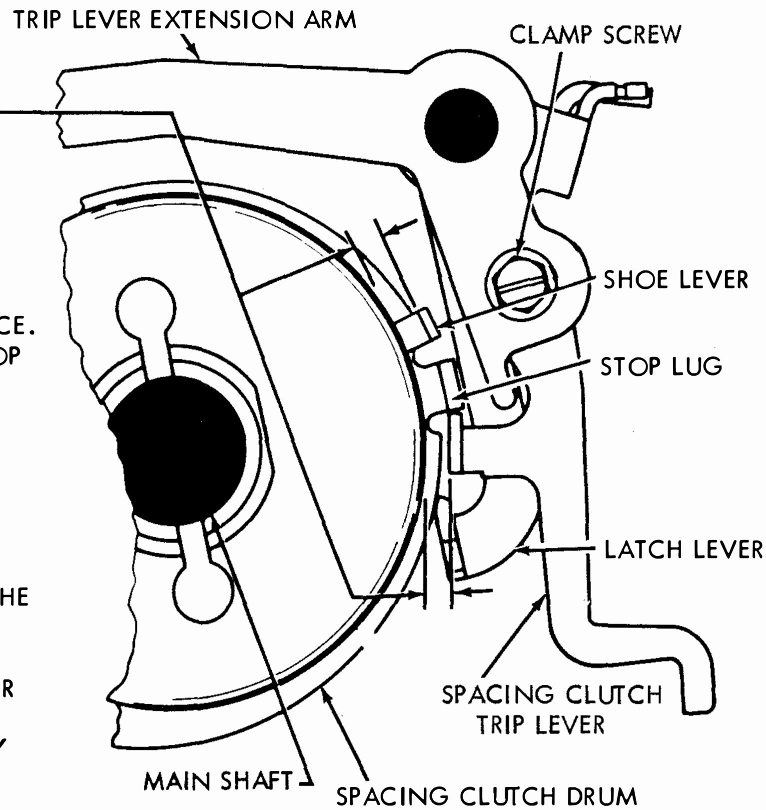
SPACING CLUTCH TRIP LEVER

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 SNAPPING 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.



(RIGHT SIDE VIEW)

TO ADJUST

POSITION THE TRIP LEVER BY MEANS OF ITS CLAMP SCREW.

NOTE: FOR EARLIER DESIGN
SEE PAR. 4.06.

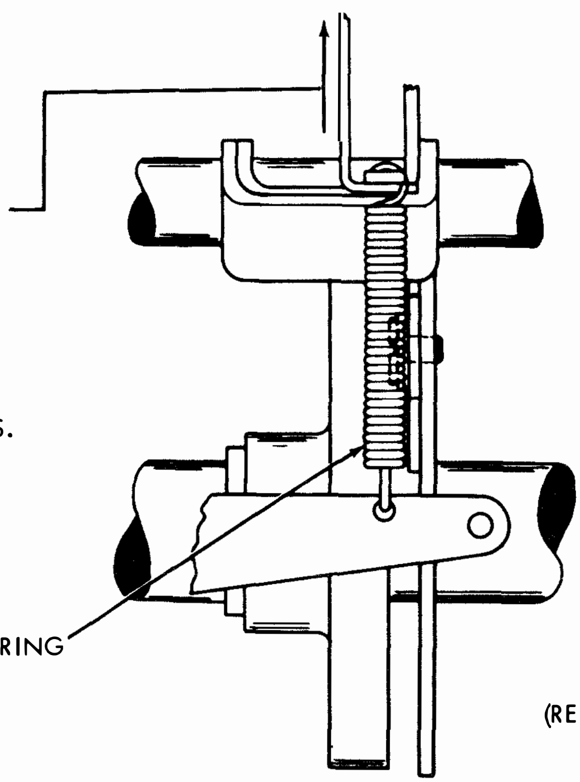
CLUTCH TRIP LEVER SPRING

REQUIREMENT

CLUTCH ENGAGED AND ROTATED UNTIL TRIP LEVER RESTS ON STOP LUG

CLUTCH	MIN.	MAX.
SPACING	11 OZS.	16 OZS.
LINE FEED	9 OZS.	12 OZS.
TYPE BOX	5 OZS.	7-1/4 OZS.

TO MOVE LEVER AWAY FROM STOP LUG.



(REAR VIEW)

2.21 Main Shaft and Trip Shaft Mechanisms (Cont.)

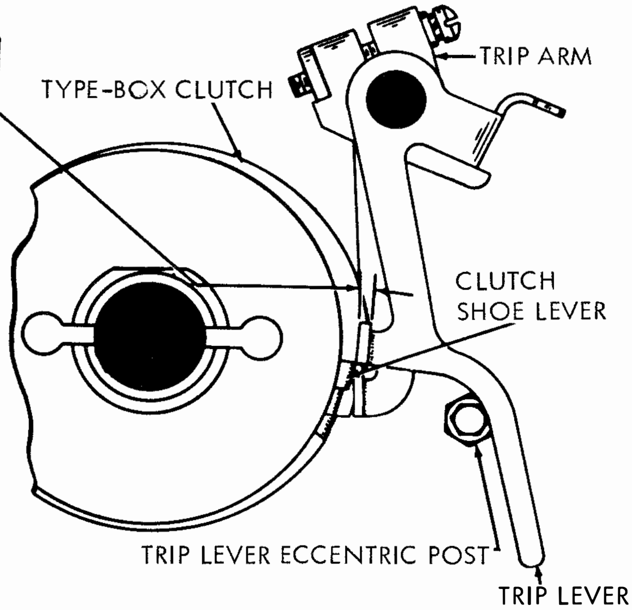
(A) TYPE BOX CLUTCH TRIP LEVER ECCENTRIC POST

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.

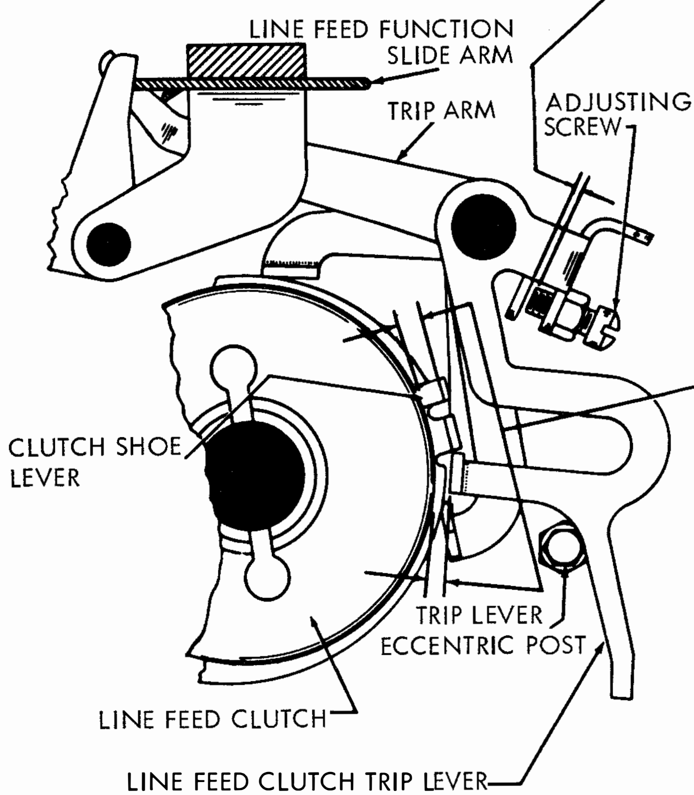
TRIP ARM HELD AGAINST ITS FUNCTION SLIDE ARM.

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.

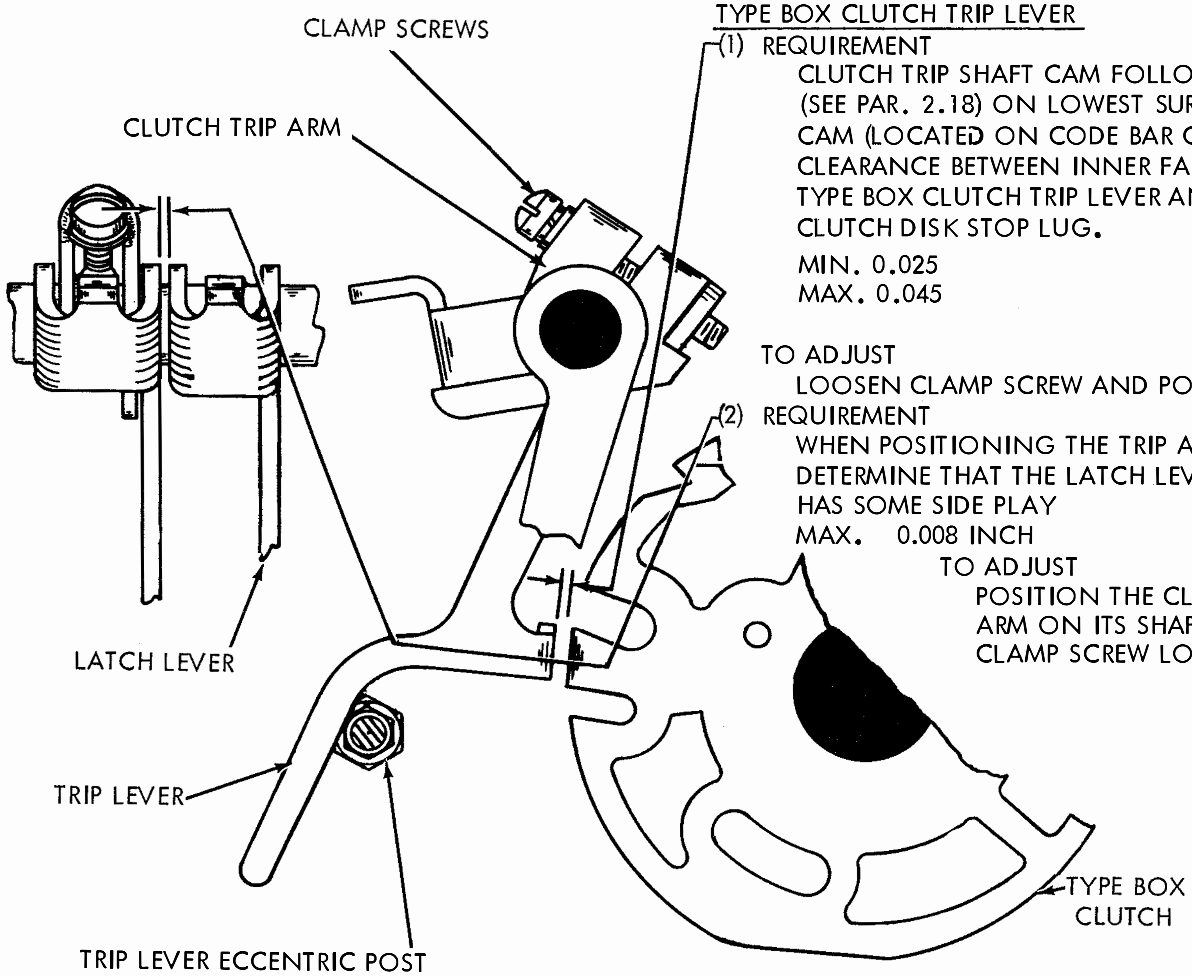
TO CHECK

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.

2.22 Main Shaft and Trip Shaft Mechanisms (Cont.)



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.

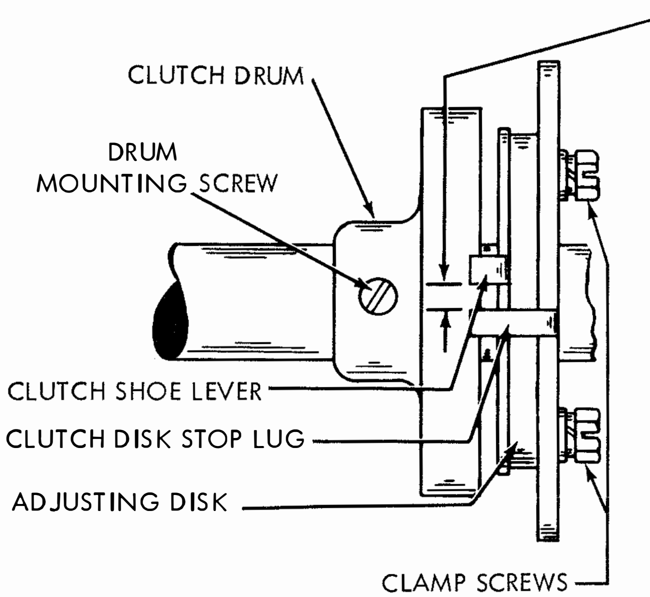
(2) REQUIREMENT

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.

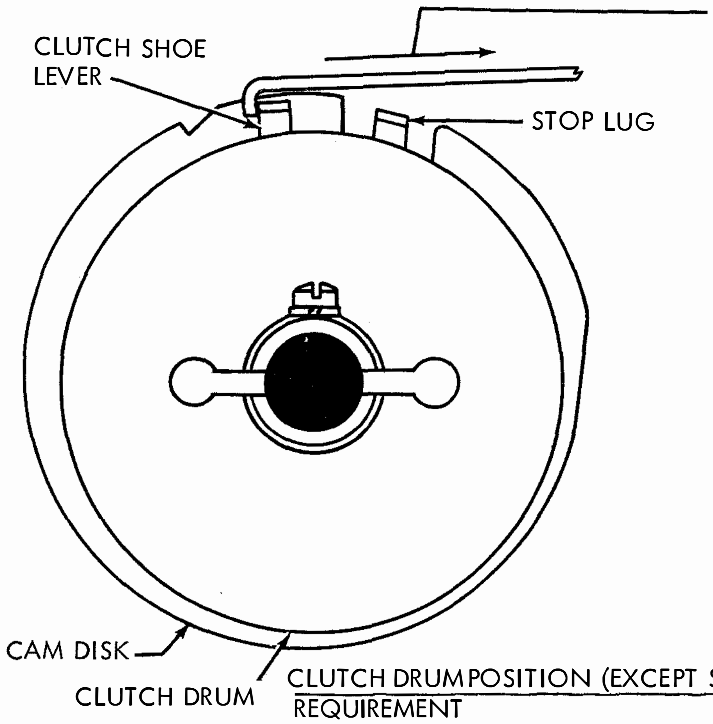
NOTE

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)

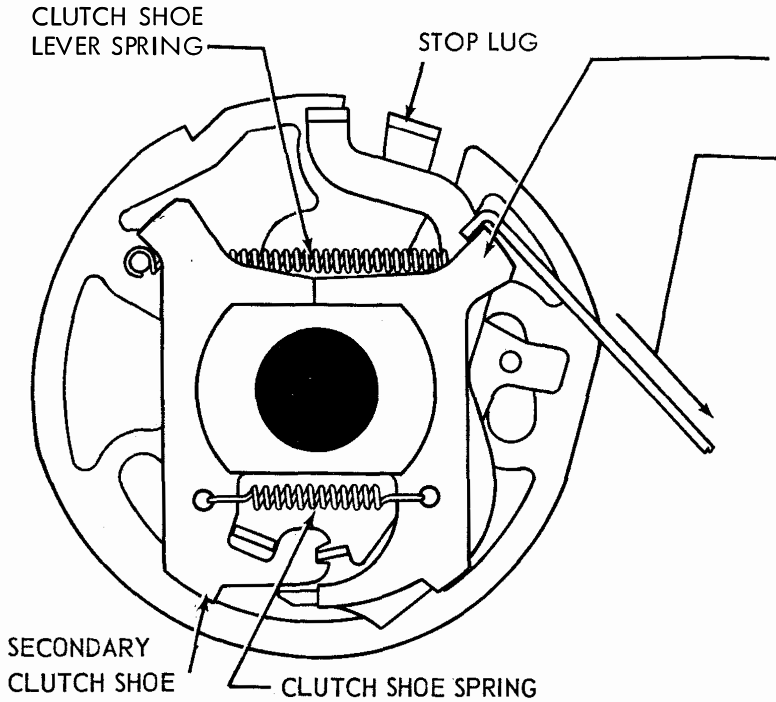
REQUIREMENT

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 SPRING

NOTE

IN ORDER TO CHECK THIS SPRING TENSION, IT IT 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.

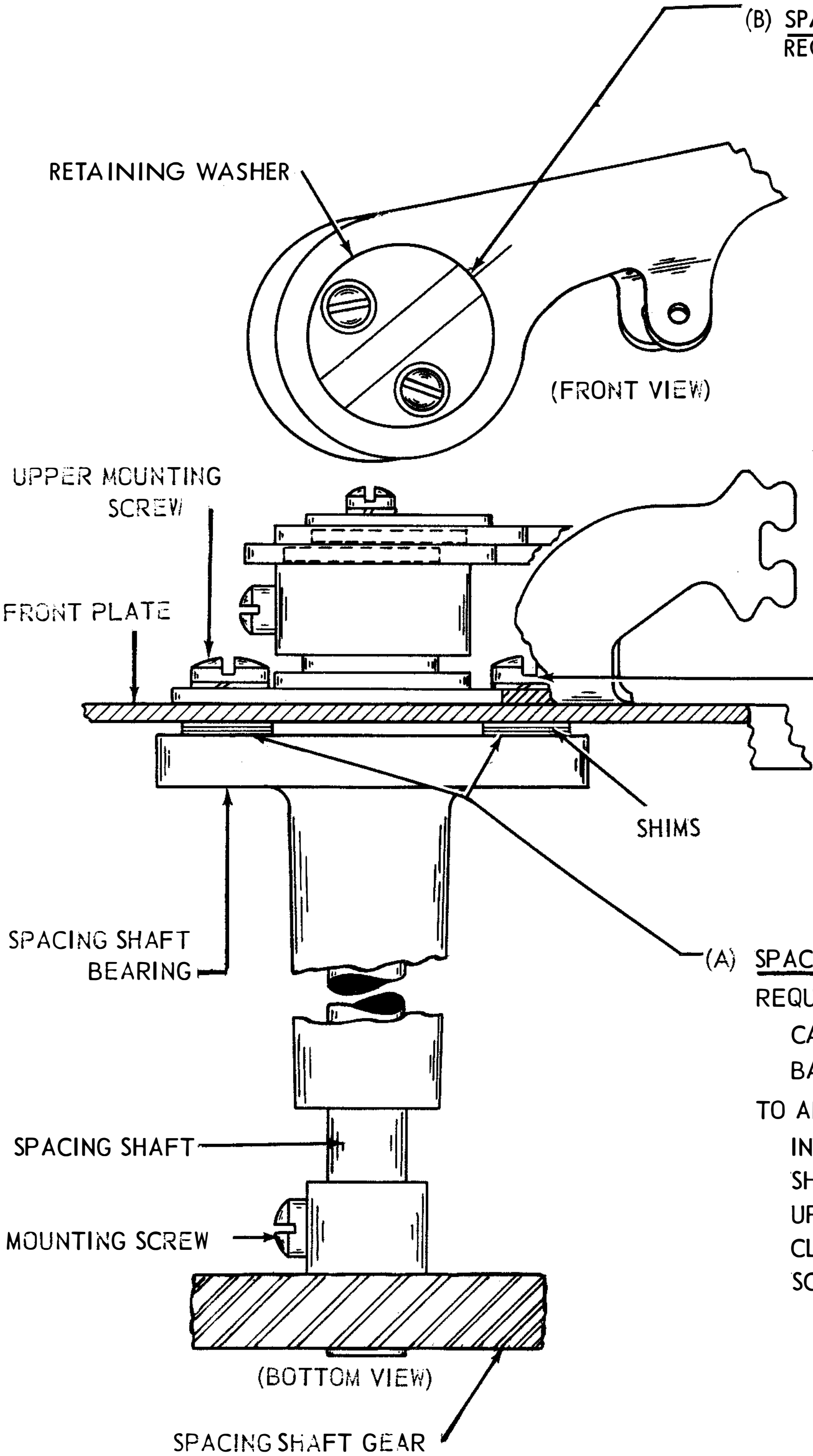
REQUIREMENT

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

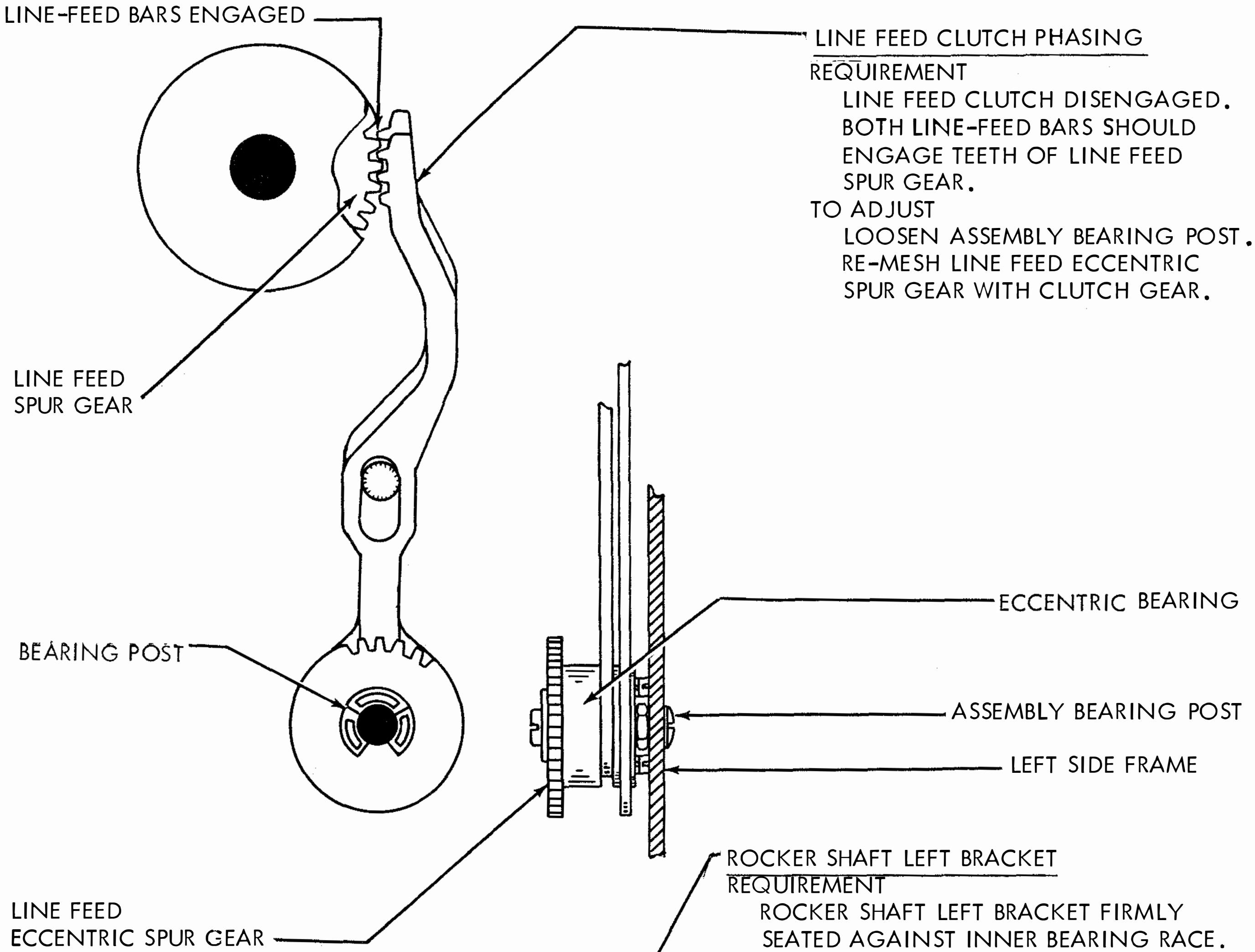
REQUIREMENT

CARRIAGE FULLY RETURNED. MINIMUM BACKLASH OF SPACING GEARS WITHOUT BIND.

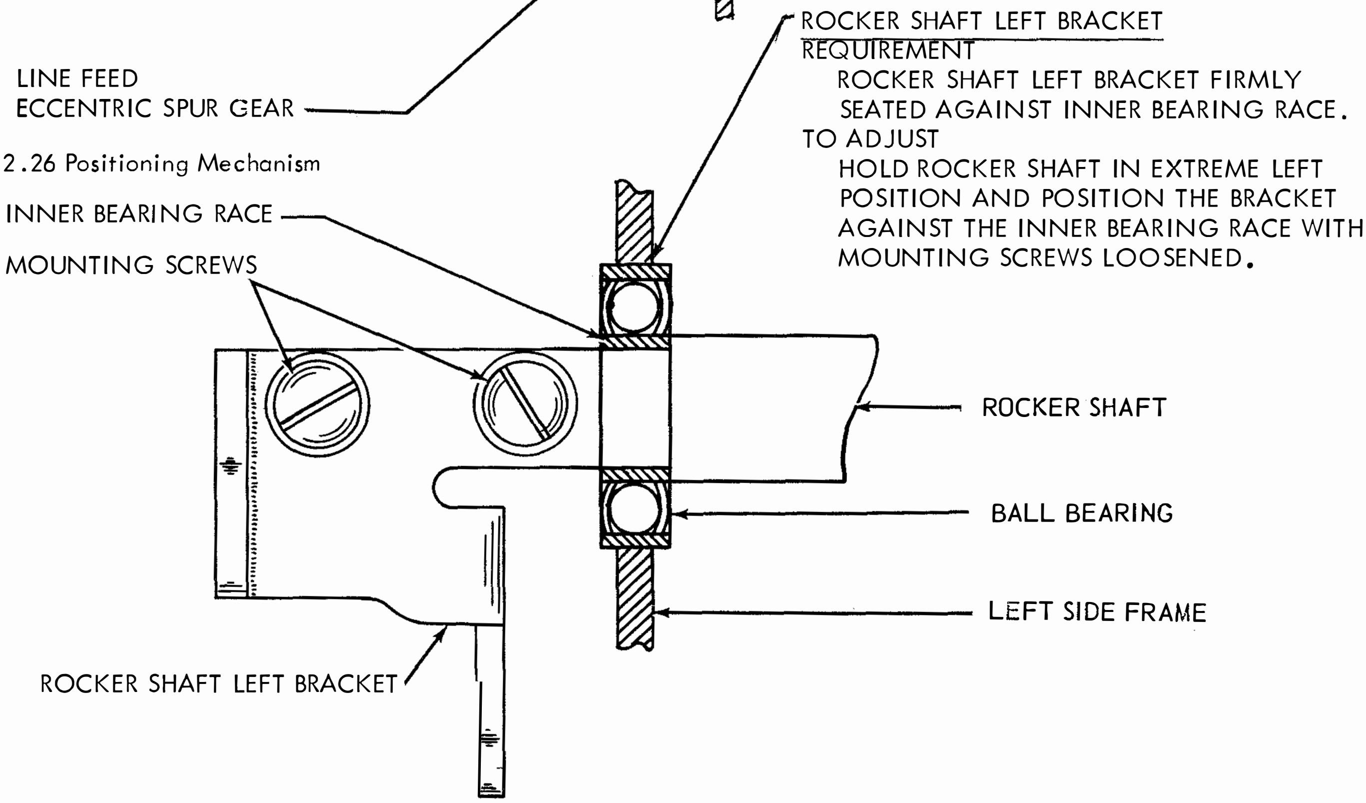
TO ADJUST

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



2.26 Positioning Mechanism



2.27 Positioning Mechanism (Cont.)

ROCKER SHAFT BRACKET ECCENTRIC STUD

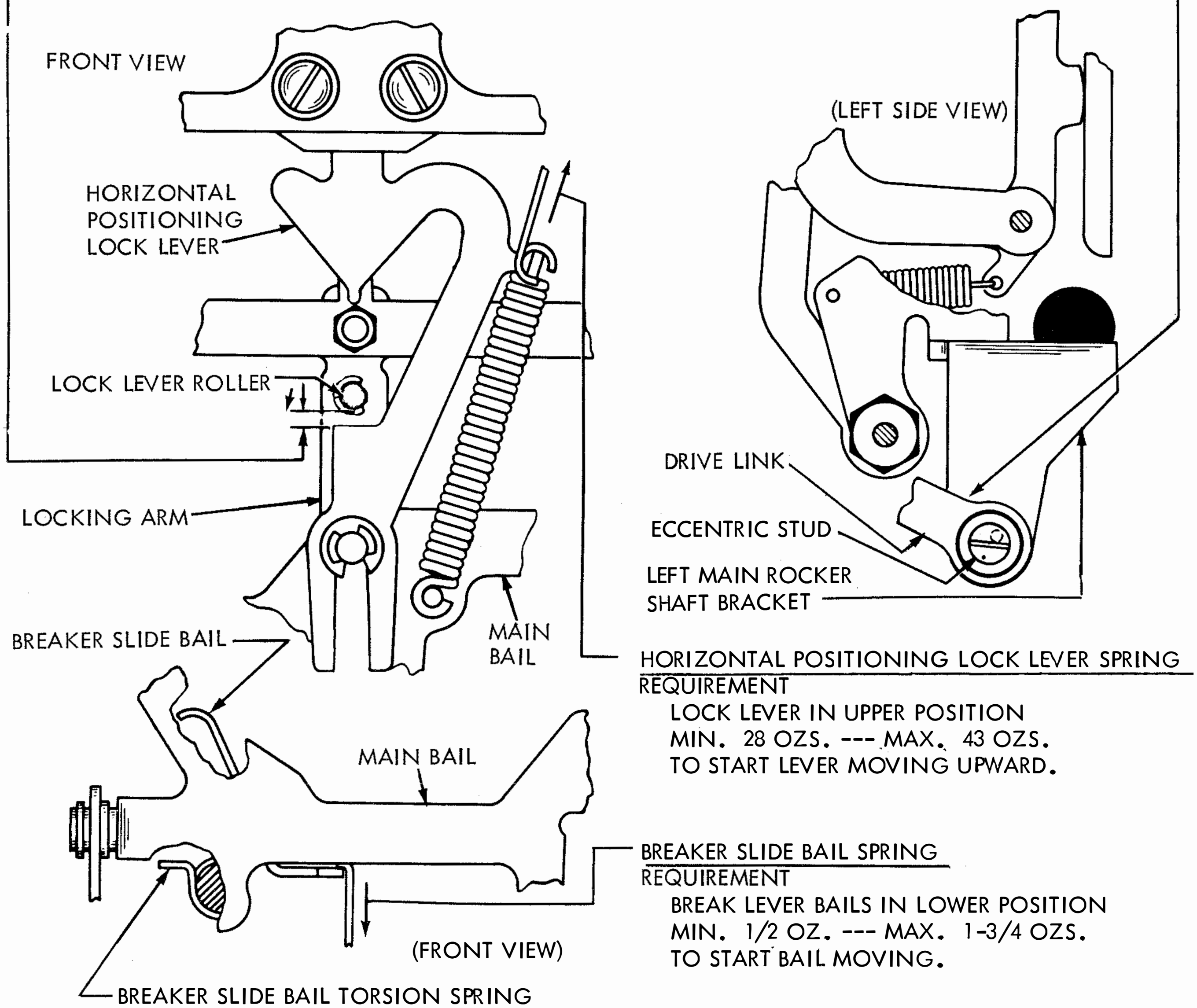
(1) REQUIREMENT --- WITH TYPE BOX CLUTCH DISENGAGED AND PLAY IN LOCKING ARM TAKEN UP TOWARD FRONT, GAP BETWEEN LOWER SIDE OF LOCK LEVER ROLLER AND TOP EDGE OF SHOULDER ON HORIZONTAL POSITIONING LOCK LEVER SHOULD BE:

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) VERTICAL POSITIONING LOCK LEVER (PAR. 2.36), RIBBON FEED LEVER BRACKET(PAR. 2.53), FUNCTION STRIPPER BLADE ARMS (PAR. 4.18), SPACING TRIP LEVER BAIL CAM PLATE (PAR. 2.31). 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).



HORIZONTAL POSITIONING LOCK LEVER SPRING

REQUIREMENT

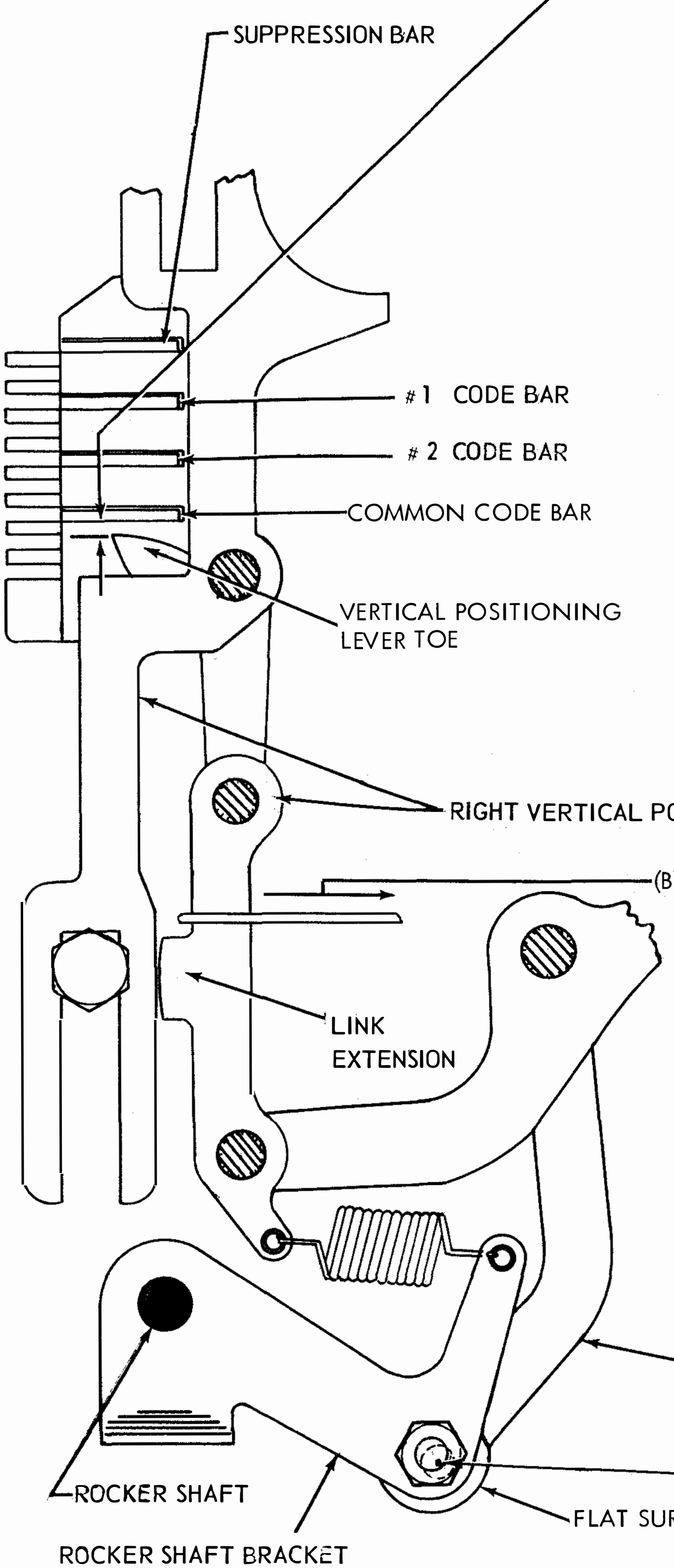
LOCK LEVER IN UPPER POSITION
MIN. 28 OZS. --- MAX. 43 OZS.
TO START LEVER MOVING UPWARD.

BREAKER SLIDE BAIL SPRING

REQUIREMENT

BREAK LEVER BAILS IN LOWER POSITION
MIN. 1/2 OZ. --- MAX. 1-3/4 OZS.
TO START BAIL MOVING.

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

CLEARANCE BETWEEN THE TOE OF VERTICAL POSITIONING LEVER AND THE BOTTOM OF THE COMMON CODE BAR WHEN PLAY IS TAKEN UP TO MAKE CLEARANCE A MINIMUM

TO ADJUST

POSITION THE ECCENTRIC STUD IN THE RIGHT ROCKER SHAFT BRACKET. POSITION HIGH PART OF ECCENTRIC (MARKED WITH DOT) TOWARD THE REAR. THE HIGH PART OF THE ECCENTRIC CAN ALSO BE IDENTIFIED BY THE EXPOSED PORTION OF THE FLAT SURFACE OF THE VERTICAL POSITIONING LINK.

(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.

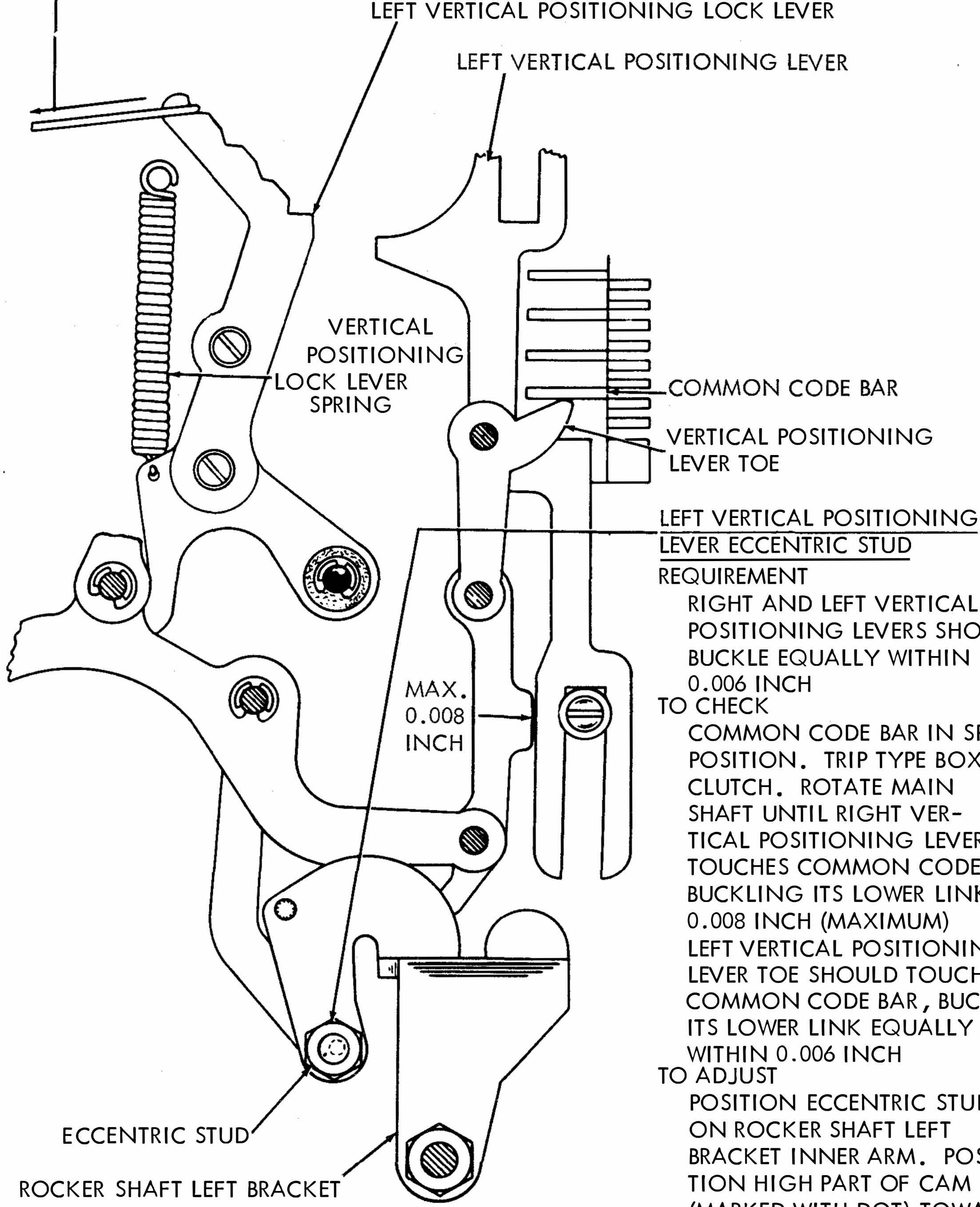
TO MOVE THE LINK EXTENSION AWAY FROM THE VERTICAL POSITIONING LEVER.

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 LEVER ECCENTRIC STUD

REQUIREMENT
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 VERTICAL 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. POSITION 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.

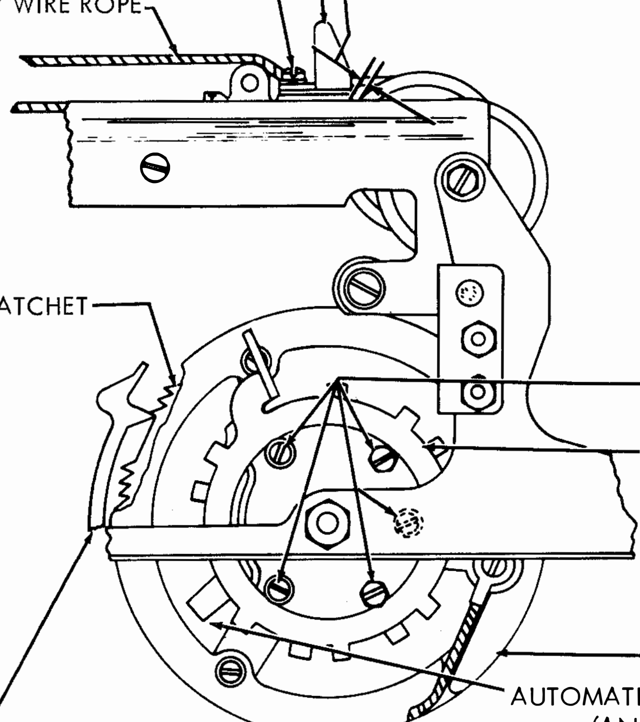
OSCILLATING RAIL SLIDE POSITION

REQUIREMENT

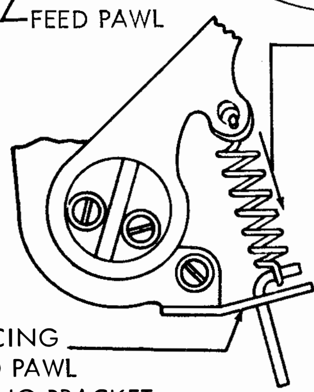
CARRIAGE RETURN RING AND AUTOMATIC CARRIAGE RETURN-LINE FEED RING FREE TO ROTATE ON SPACING DRUM (FIVE MOUNTING SCREWS LOOSENED). SPACING CLUTCH DISENGAGED. FEED PAWL, WHICH IS FARTHEST ADVANCED, ENGAGING TOOTH IMMEDIATELY ABOVE CUT-AWAY SECTION OF RATCHET. CLEARANCE BETWEEN SLIDE AND PULLEY MIN. 0.025 INCH---MAX. 0.050 INCH

TO ADJUST

POSITION SLIDE ON WIRE ROPE WITH CLAMP SCREWS LOOSENED.



NOTE: FOR EARLIER DESIGN SEE PAR. 4.07.



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

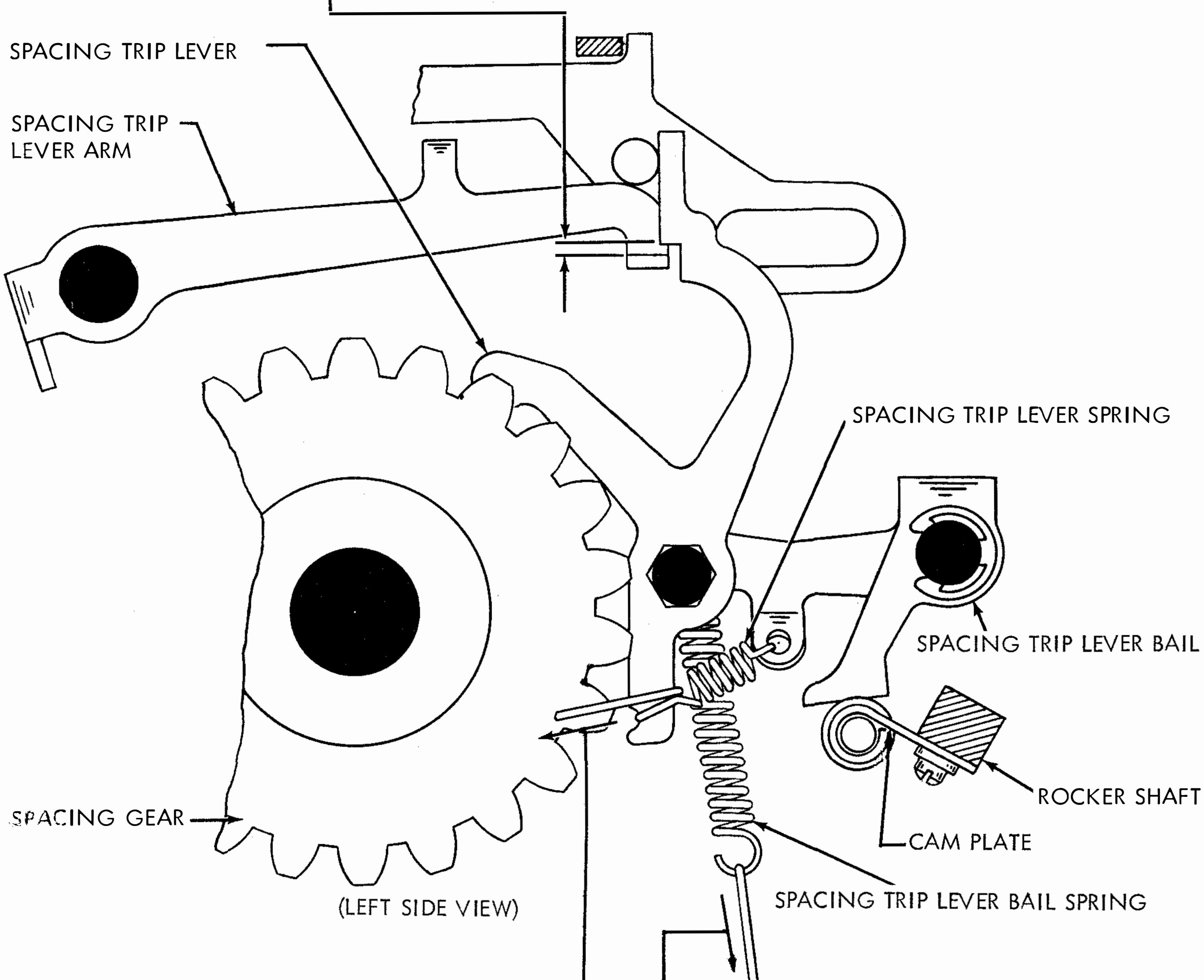
SPACING TRIP LEVER ARM IN UPWARD POSITION. TYPE BOX CLUTCH ROTATED THROUGH APPROXIMATELY ONE-HALF OF ITS CYCLE. ALL FUNCTION PAWLS DISENGAGED FROM FUNCTION BAR. CLEARANCE BETWEEN TOP SURFACE OF TRIP LEVER ARM EXTENSION AND SPACING TRIP LEVER SHOULDER.

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.



(LEFT SIDE VIEW)

(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.

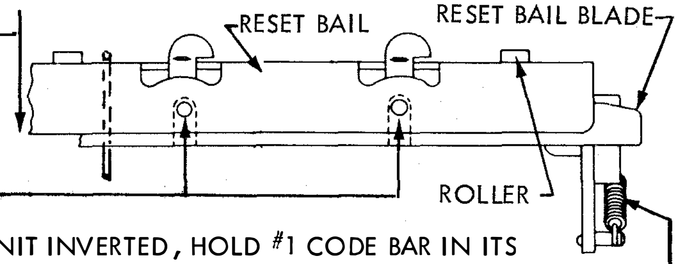
SPACING TRIP LEVER BAIL SPRING UNHOOKED.

MIN. 8 OZS.

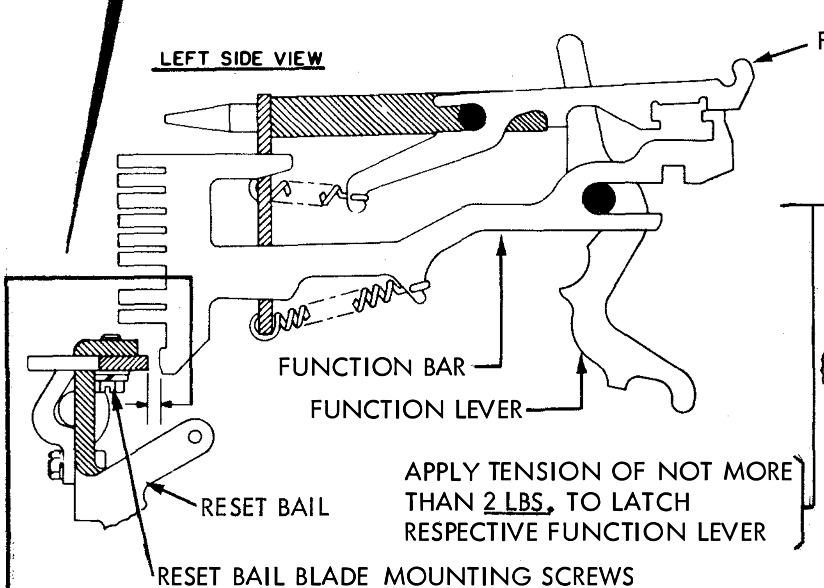
MAX. 12 OZS.

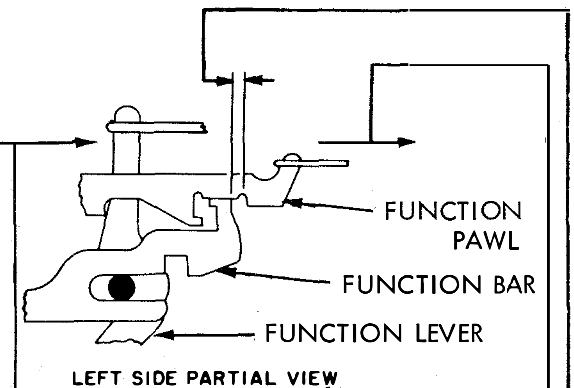
TO PULL SPRING TO INSTALLED LENGTH.

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. UNLATCH 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.

2.33 Function Mechanism (Cont.)

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

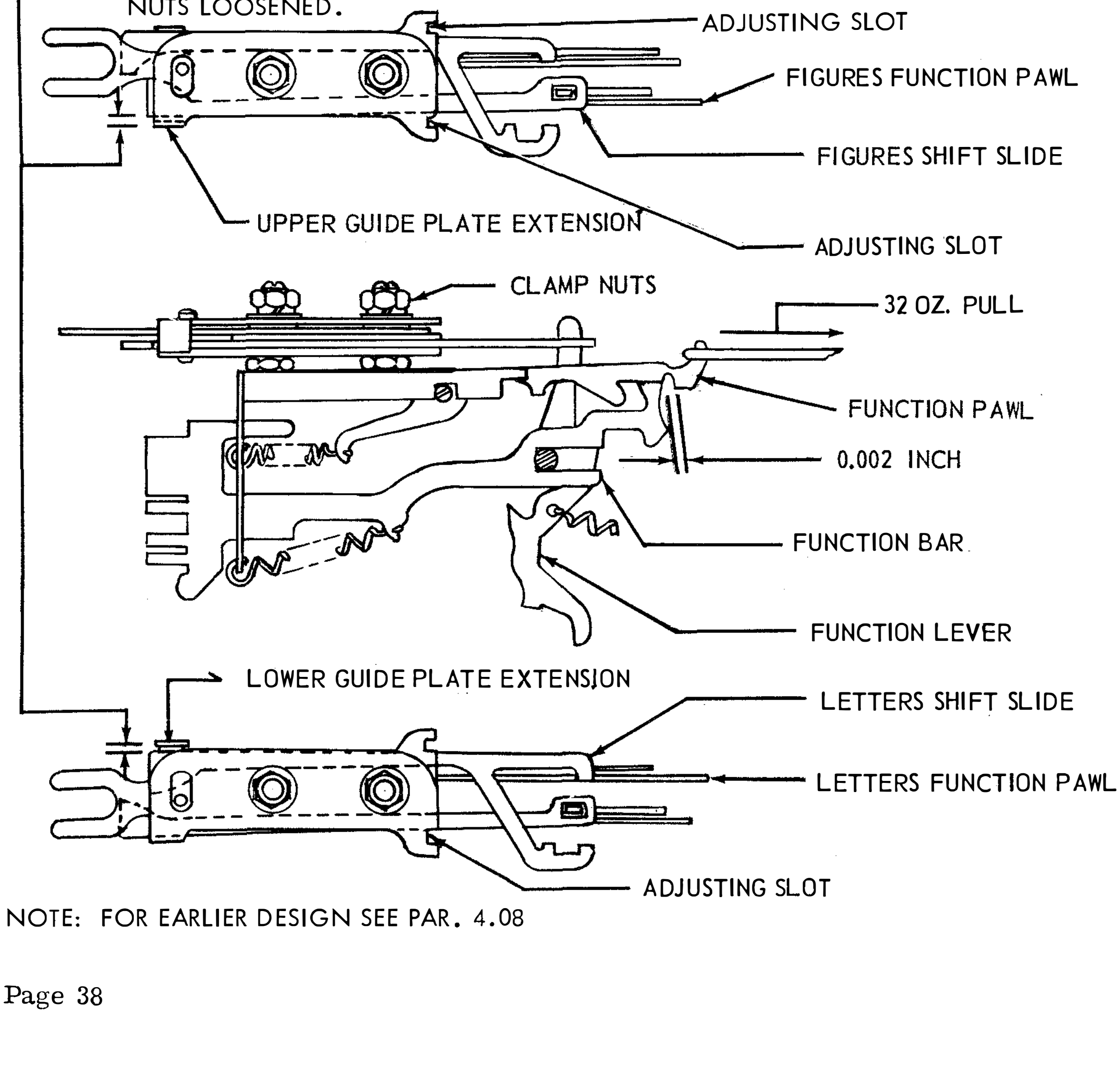
(1) REQUIREMENT
WITH FUNCTION CLUTCH ROTATED UNTIL CLUTCH DISK STOP LUG IS TOWARD BOTTOM OF UNIT, HOOK FIGURES FUNCTION PAWL OVER THE END OF THE FUNCTION BAR. CLEARANCE BETWEEN UPPER GUIDE PLATE EXTENSION AND SHIFT SLIDE.
MAX. 0.020 WHEN PLAY IS TAKEN UP FOR MAXIMUM.

(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.

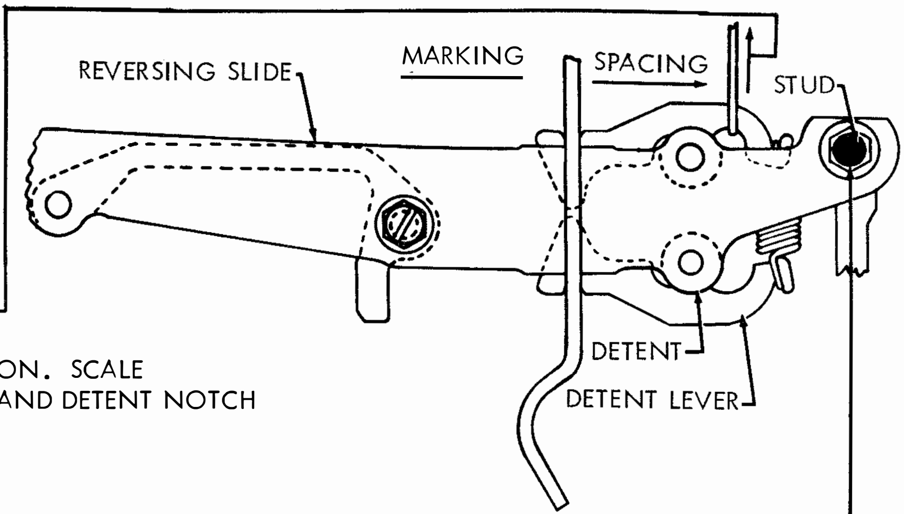
NOTE: THERE SHOULD BE SOME CLEARANCE BETWEEN THE UNOPERATED SHIFT SLIDE AND ITS GUIDE PLATE, WHEN THE SHIFT SLIDE HAS REACHED ITS POSITION OF MAXIMUM TRAVEL.

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

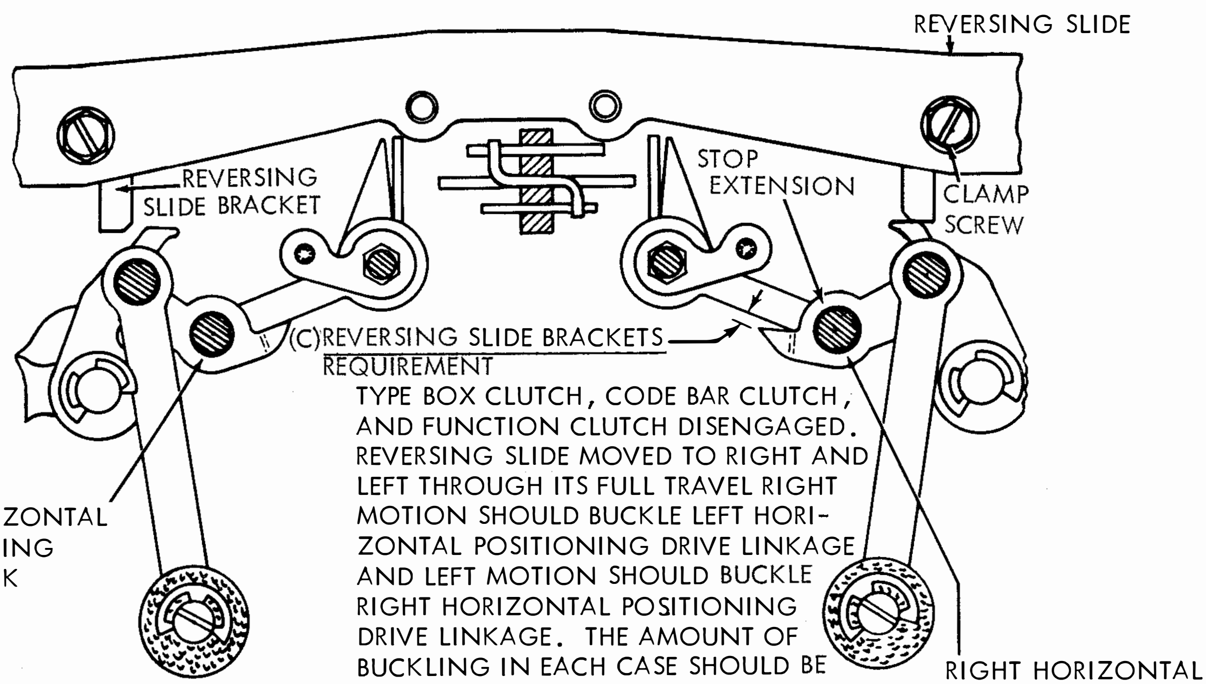
(B) REVERSING SLIDE ADJUSTING STUD

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

TO ADJUST

POSITION EACH REVERSING SLIDE BRACKET WITH THEIR CLAMP SCREWS LOOSENED.

2.35 Positioning Mechanism (Cont.)

NOTE: THESE ADJUSTMENTS APPLY ONLY TO HORIZONTAL POSITIONING DRIVE MECHANISMS EQUIPPED WITH TORSION SPRINGS.

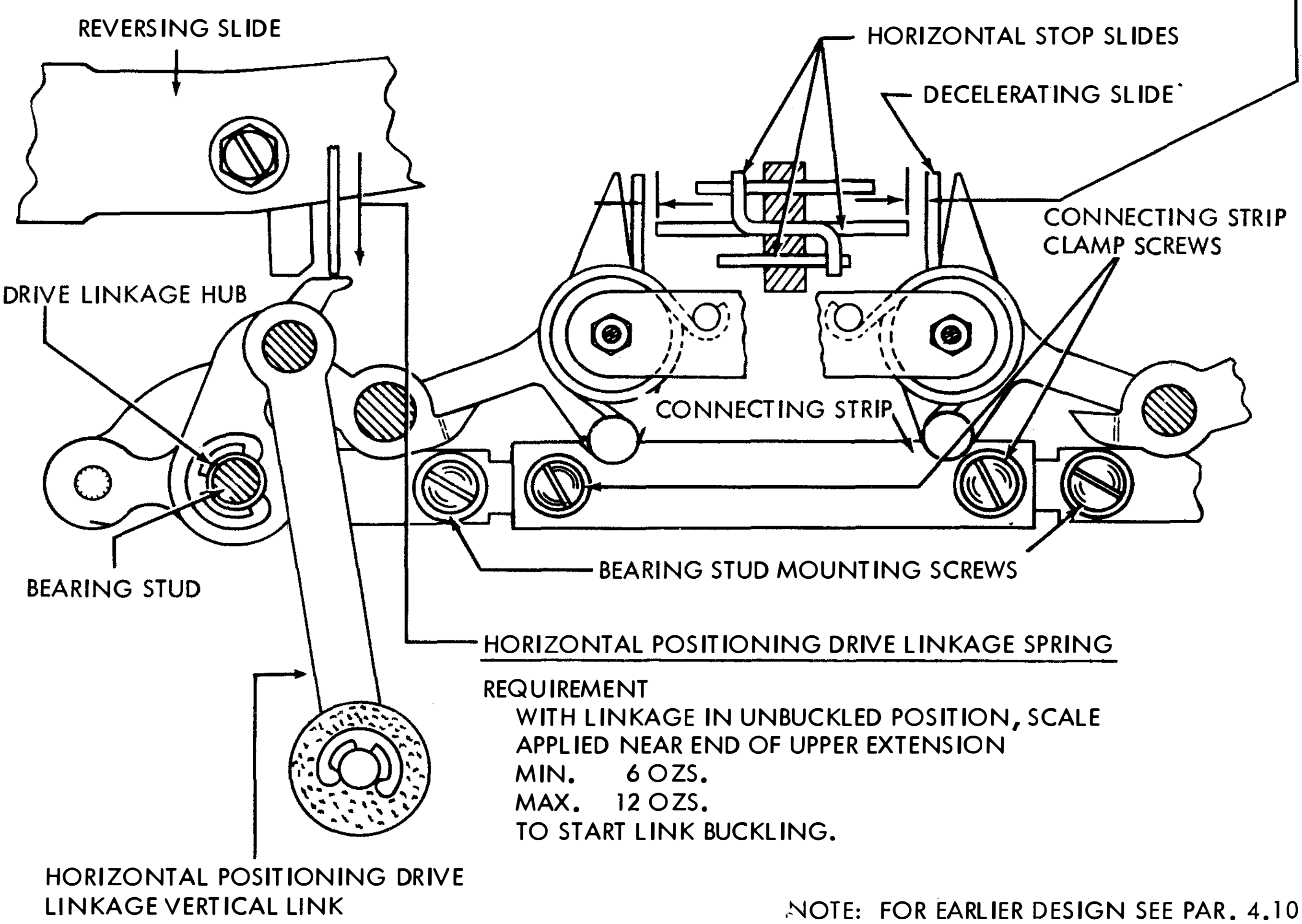
HORIZONTAL POSITIONING DRIVE LINKAGE

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

LOOSEN 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.



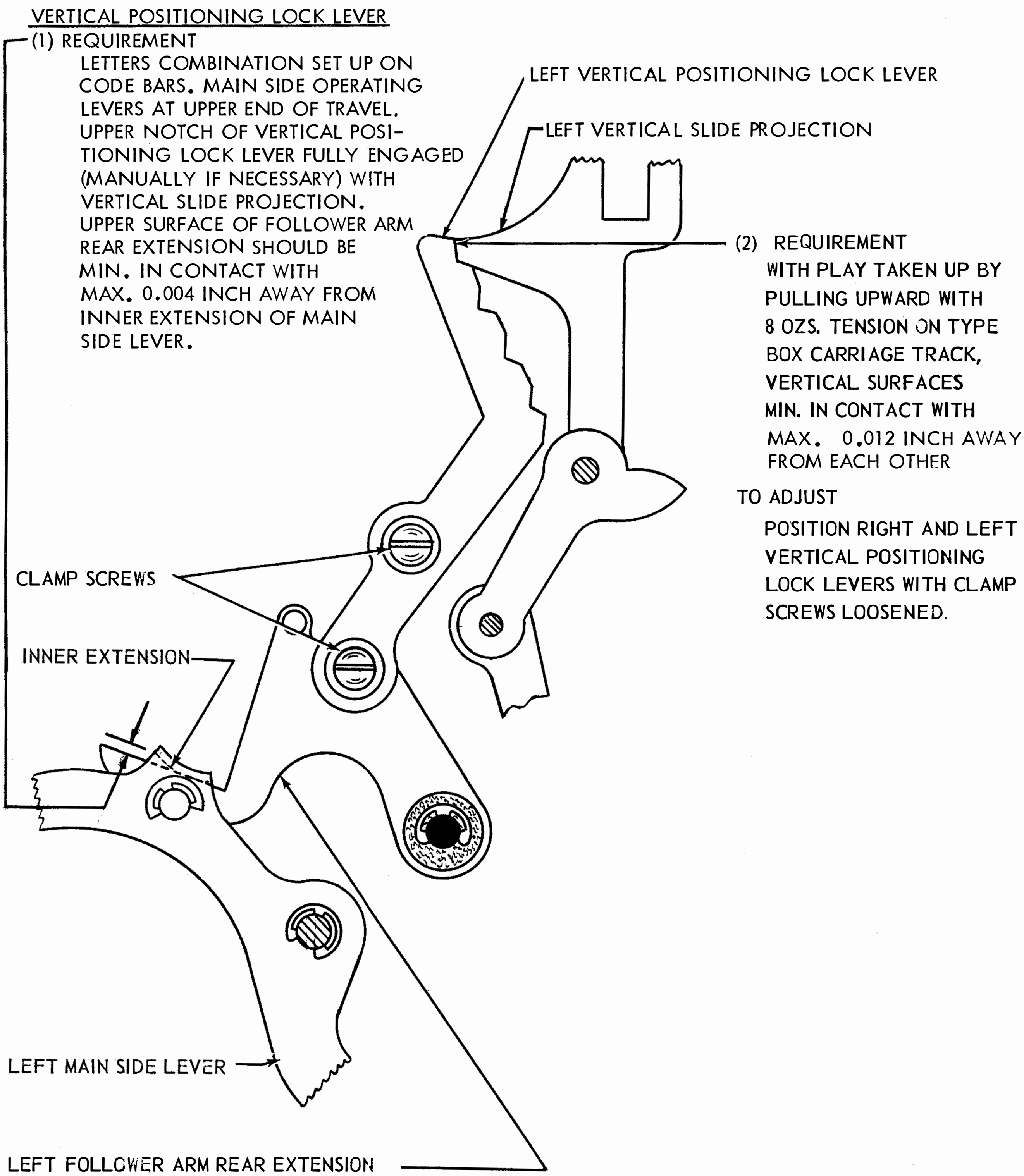
HORIZONTAL POSITIONING DRIVE LINKAGE SPRING

REQUIREMENT

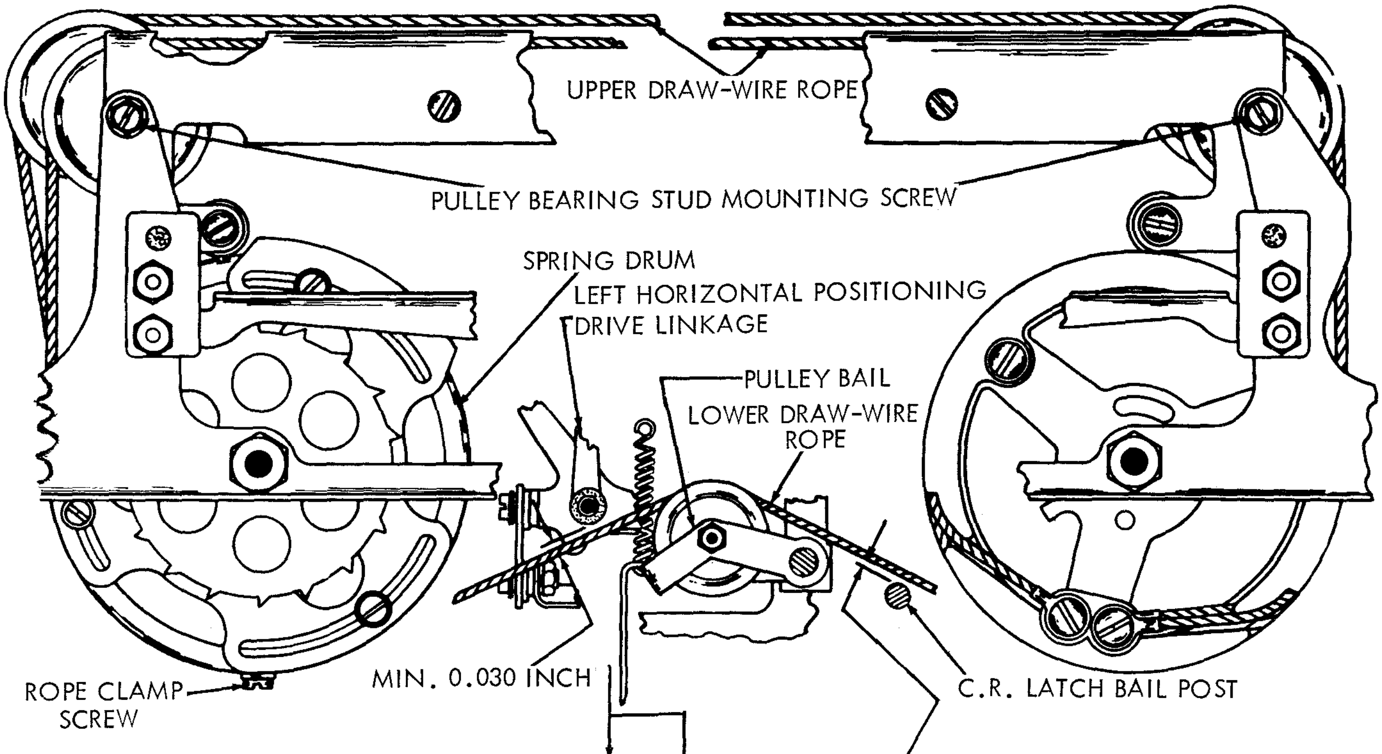
WITH LINKAGE IN UNBUCKLED POSITION, SCALE APPLIED NEAR END OF UPPER EXTENSION
MIN. 6 OZS.
MAX. 12 OZS.
TO START LINK BUCKLING.

NOTE: FOR EARLIER DESIGN SEE PAR. 4.10

2.36 Positioning Mechanism (Cont.)



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

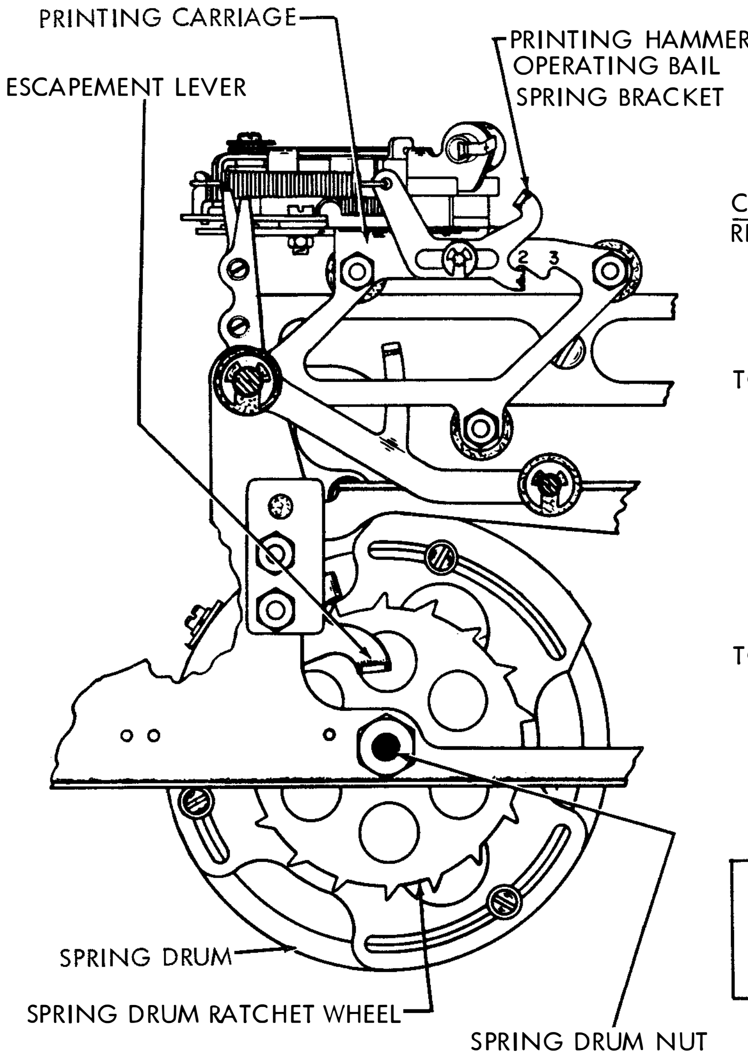
REQUIREMENT

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.

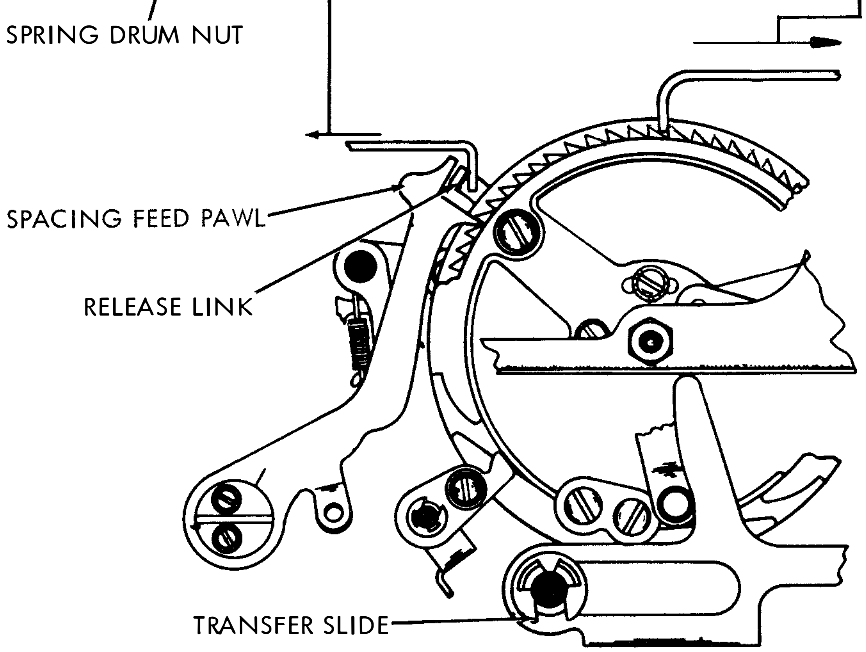
TO ADJUST

SPRING DRUM NUT LOOSENED. ROTATE SPRING DRUM RATCHET WHEEL TO INCREASE TENSION. OPERATE ESCAPEMENT LEVER TO DECREASE TENSION.

SPACING FEED PAWL RELEASE LINK SPRING

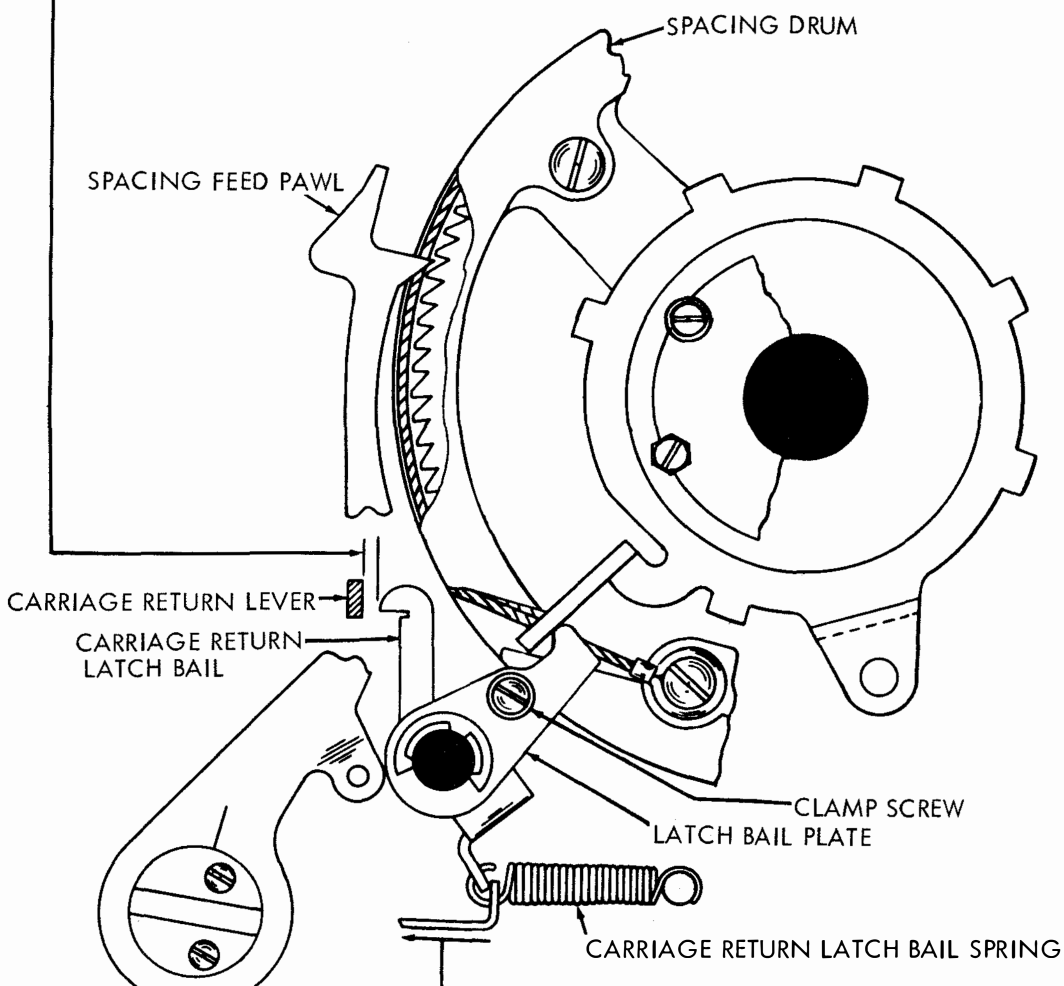
REQUIREMENT

MIN. 1/2 OZ.
MAX. 2-1/2 OZS.
TO START SPRING STRETCHING.



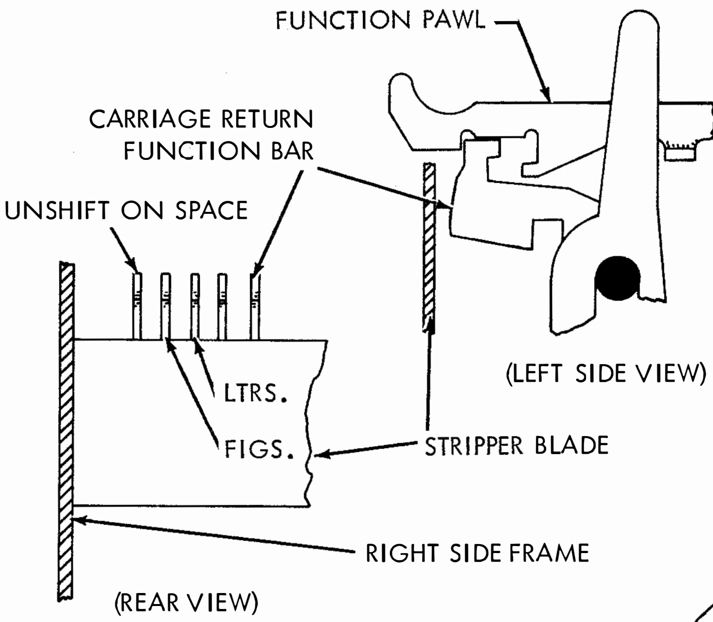
2.39 Spacing Mechanism (Cont.)

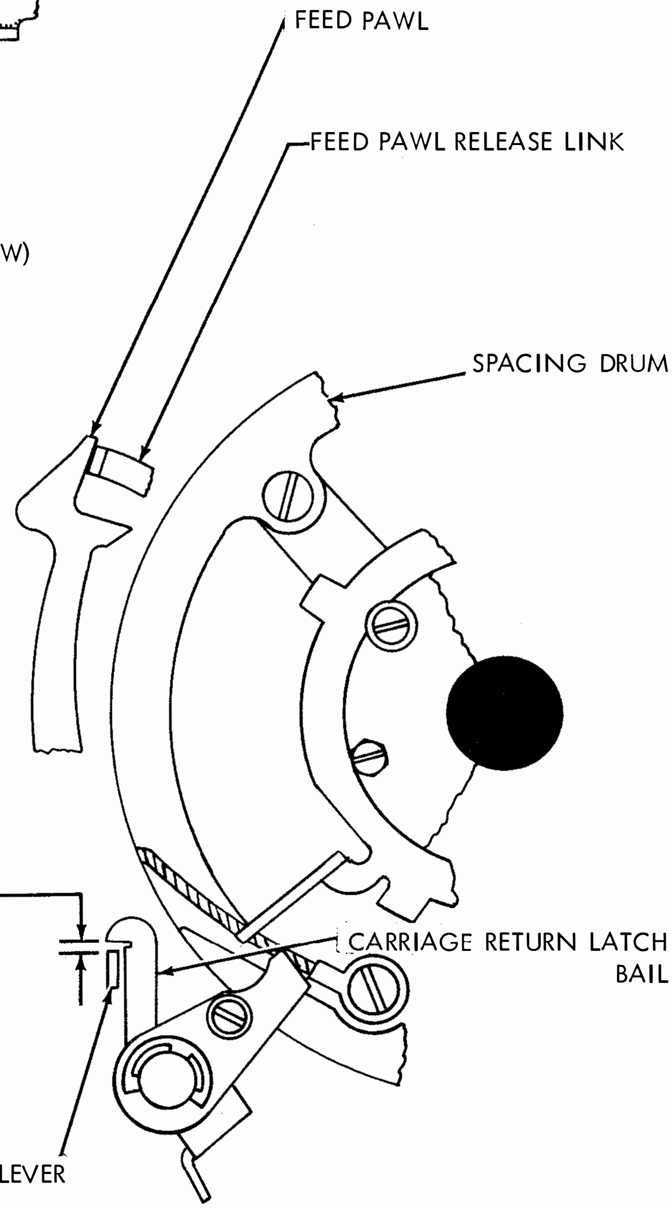
(A)
CARRIAGE RETURN LATCH BAIL
REQUIREMENT
CARRIAGE FULLY RETURNED (SEE PAR. 2.43)
PLAY IN CARRIAGE RETURN BAIL TAKEN UP
TO RIGHT BY HOLDING RIGHT SIDE OF BAIL
AGAINST ITS RETAINER. CLEARANCE BETWEEN
CARRIAGE RETURN LATCH BAIL AND CARRIAGE
RETURN LEVER.
MIN. 0.004 INCH
MAX. 0.040 INCH
TO ADJUST
POSITION 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.)





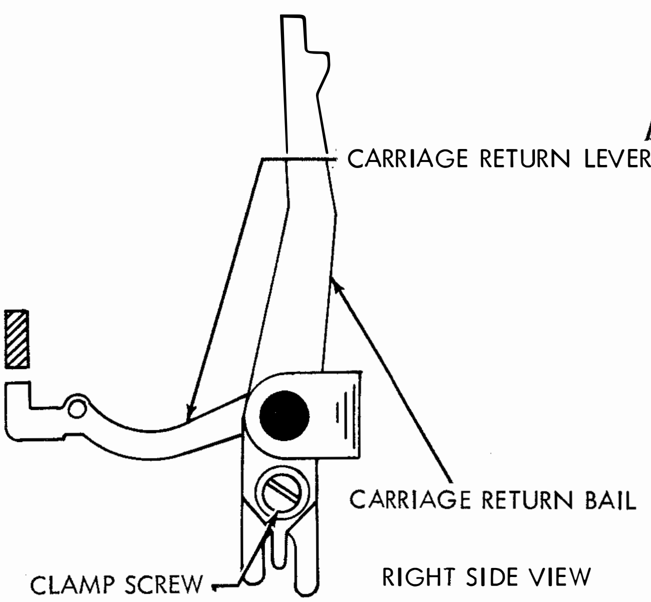
CARRIAGE RETURN LEVER

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



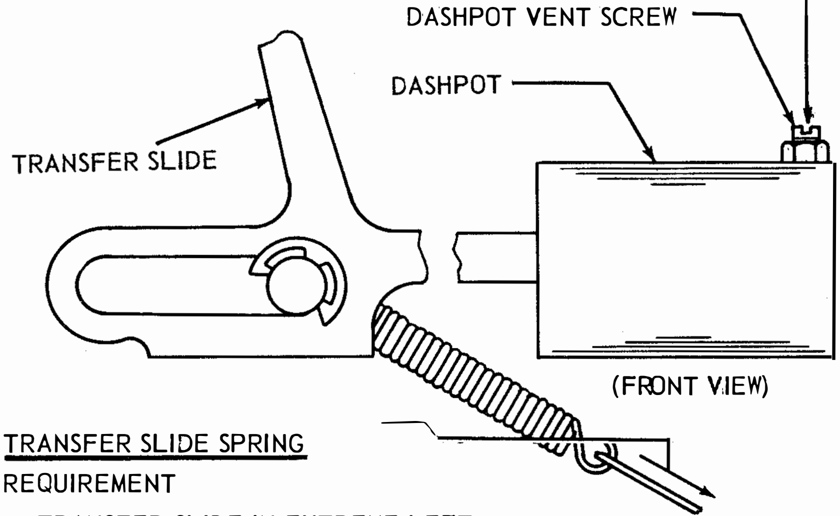
REQUIREMENT (UNITS EQUIPPED WITH TWO-STOP FUNCTION CLUTCH)

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

REQUIREMENT

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.

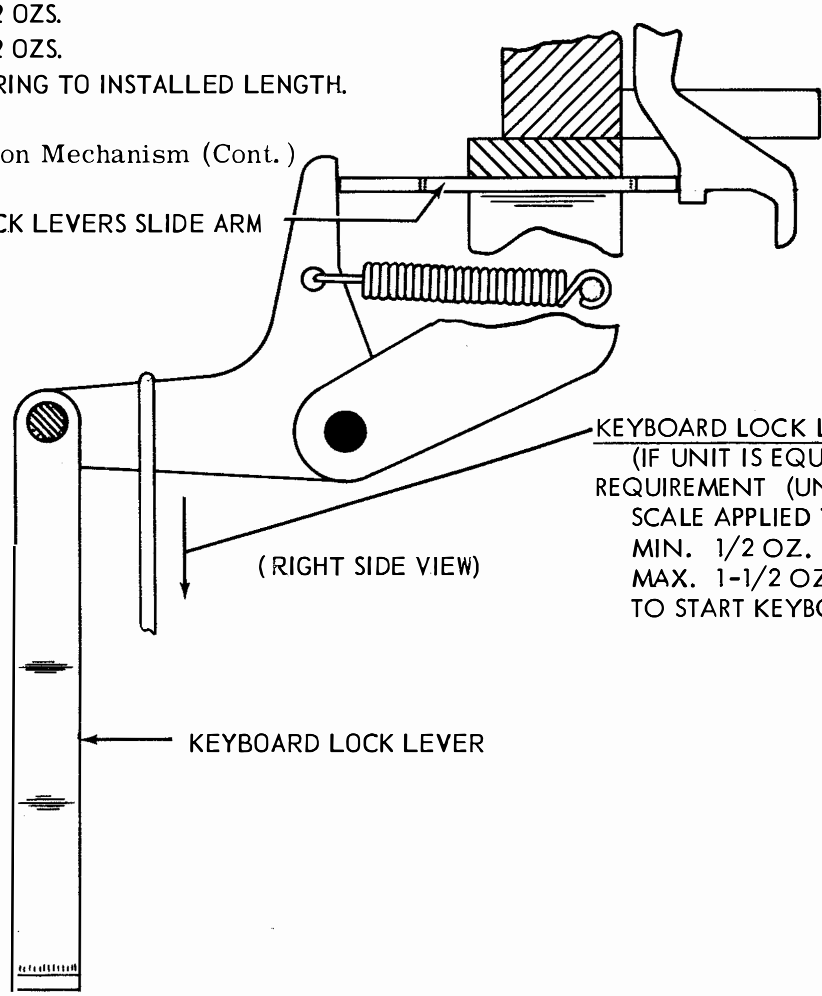
SPRING UNHOOKED.

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)

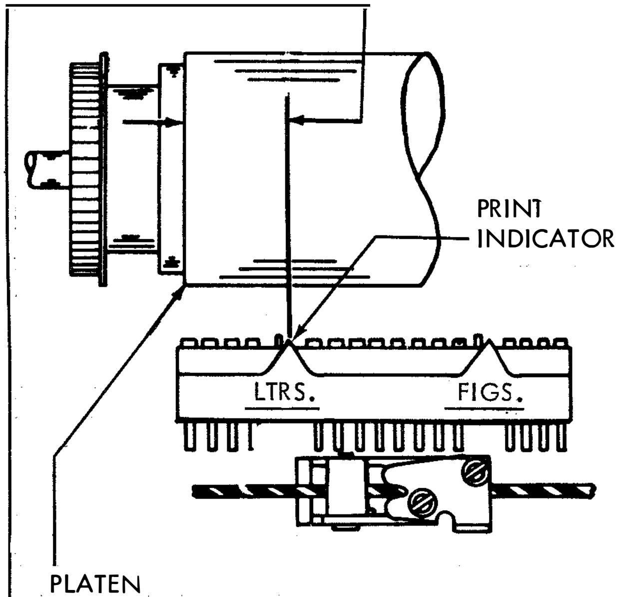
SCALE APPLIED TO BELL CRANK

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.

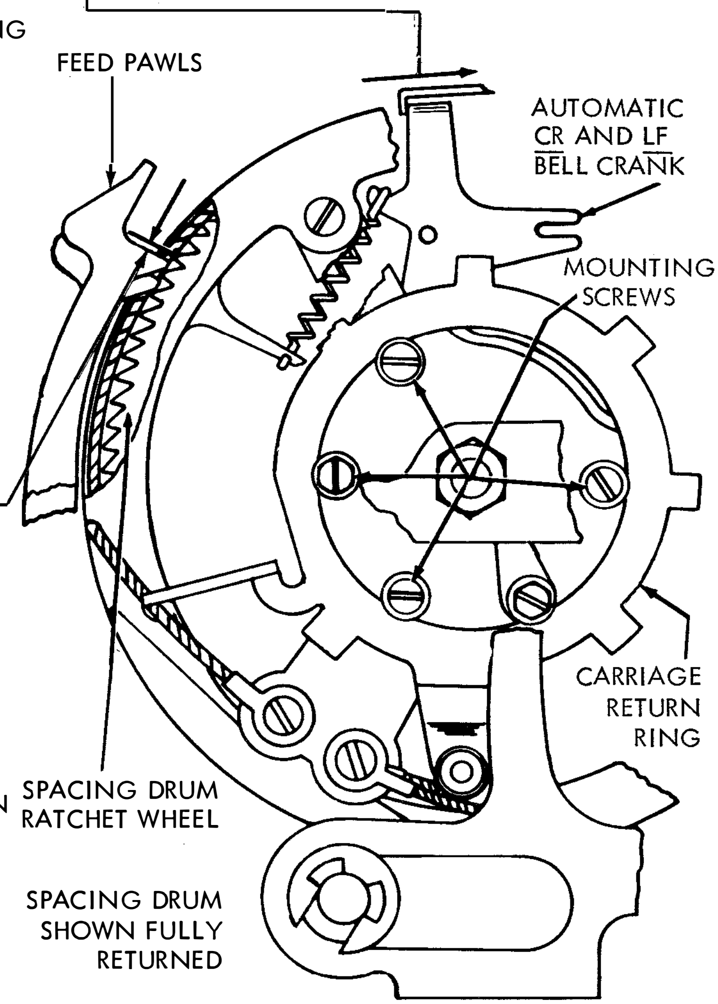
TO ADJUST --- POSITION STOP ARM OF SPACING DRUM* WITH ITS CLAMP SCREWS LOOSENED.

(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*.

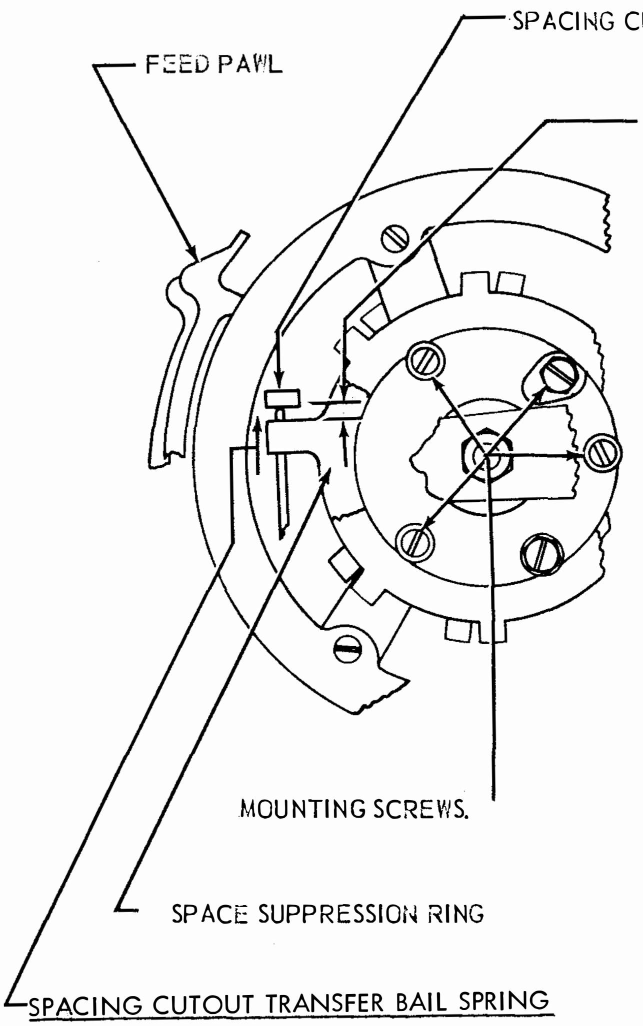
*SHIFT TYPE BOX TO LTRS. POSITION, RETURN PRINT CARRIAGE TO ITS LEFT POSITION AND LOOSEN CARRIAGE RETURN RING MOUNTING SCREWS (4). HOLD CARRIAGE RETURN RING IN ITS COUNTER-CLOCKWISE POSITION, AND POSITION TYPE BOX SO THAT ITS LTRS. INDICATOR ALIGNS WITH REQUIRED MARGIN. TIGHTEN MOUNTING SCREWS.



SPACING DRUM
SHOWN FULLY
RETURNED

2.44 Spacing Mechanism (Cont.)

NOTE: CHECK RELATED ADJUSTMENTS, PARS. 2.30, 2.43 AND 2.47 IF THE FOLLOWING ADJUSTMENTS ARE REMADE.



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)

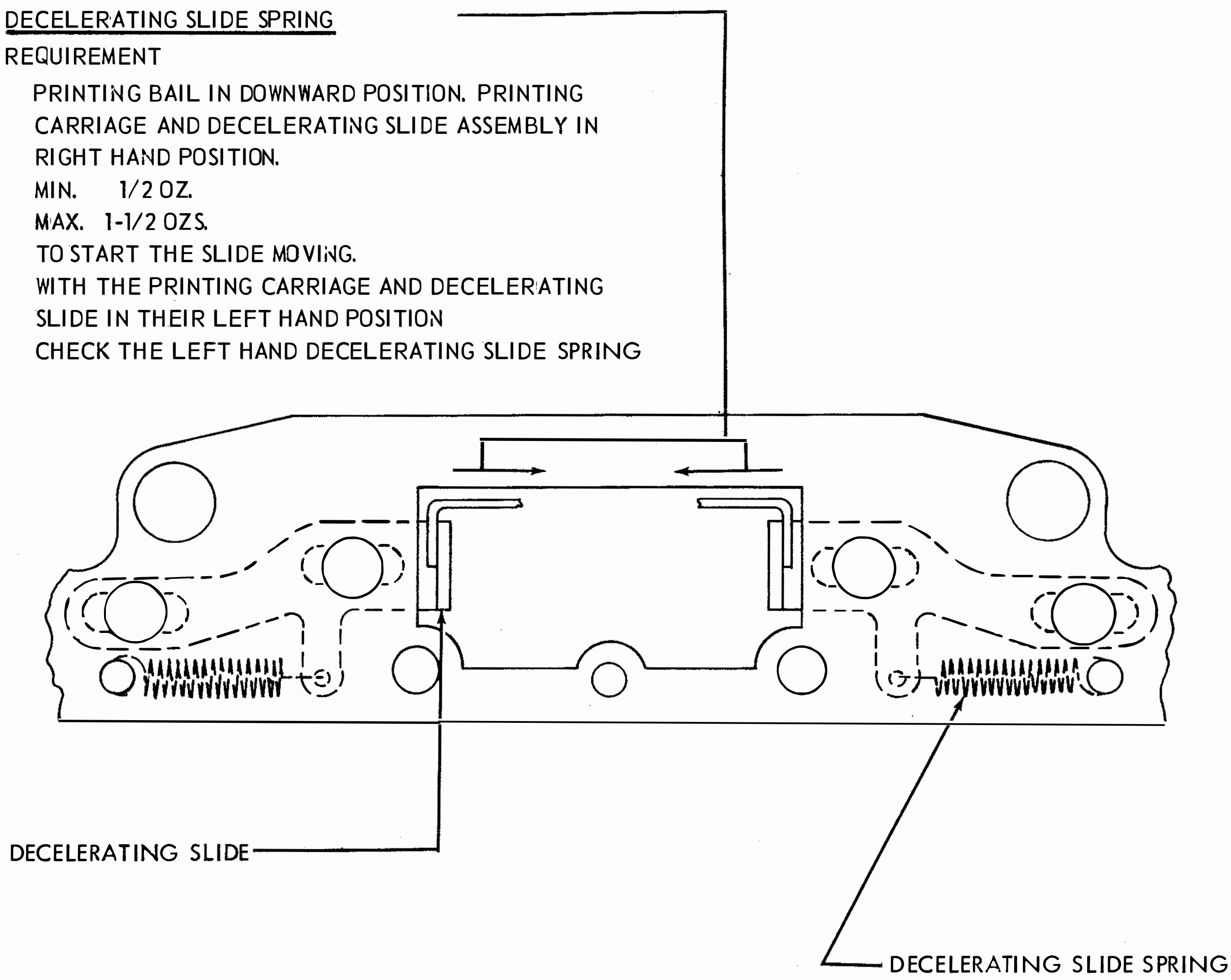
SPACING CUTOUT TRANSFER BAIL SPRING

REQUIREMENT

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

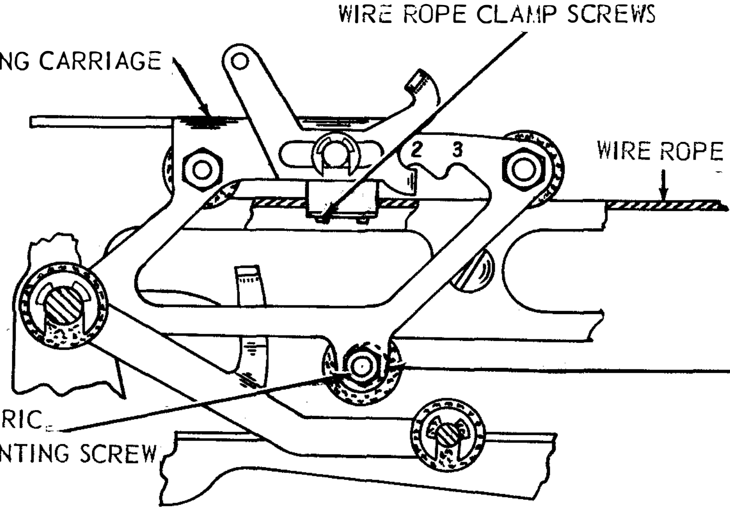
NOTE: FOR EARLIER DESIGN SEE PAR. 4.13

2.45 Positioning Mechanism (Cont.)



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.

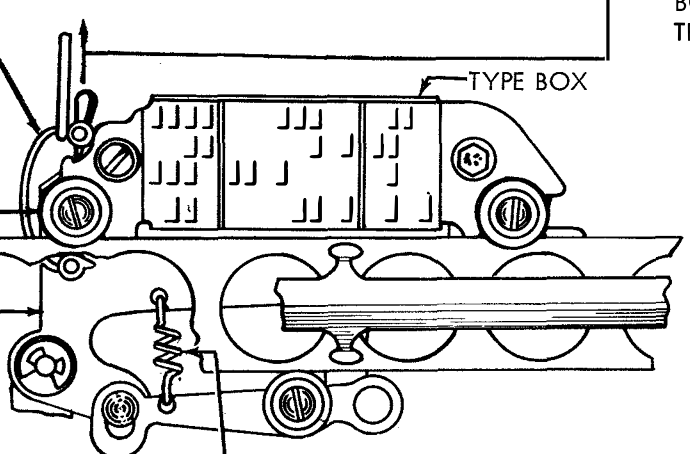
TYPE BOX CARRIAGE ROLLER ARM SPRING

REQUIREMENT

MIN. 28 OZS.

MAX. 36 OZS.

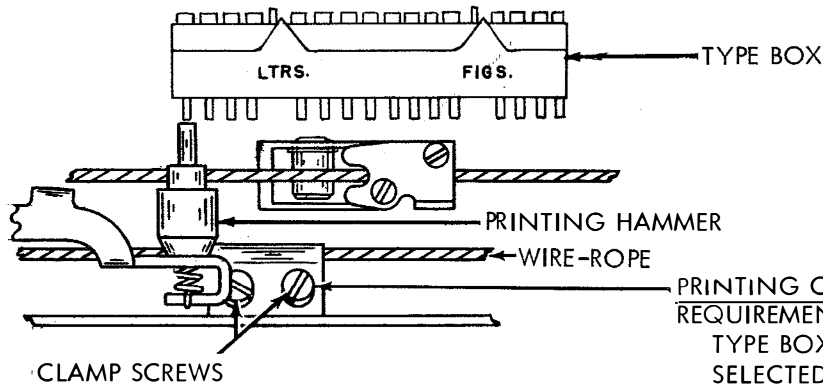
TO START UPPER ROLLER, NEAREST TYPE BOX LATCH, MOVING AWAY FROM CARRIAGE TRACK.



NOTE: FOR EARLIER DESIGN SEE PAR. 4.14

2.47 Printing Mechanism (Cont.)

NOTE: CHECK RELATED ADJUSTMENTS, PARS. 2.30, 2.38, AND 2.44, IF THE FOLLOWING ADJUSTMENTS ARE REMADE. FOR TYPING UNITS OF EARLIER DESIGN, CHECK RELATED ADJUSTMENTS, PARS. 4.07, 2.38, 2.39, AND 4.13.



(TOP VIEW)

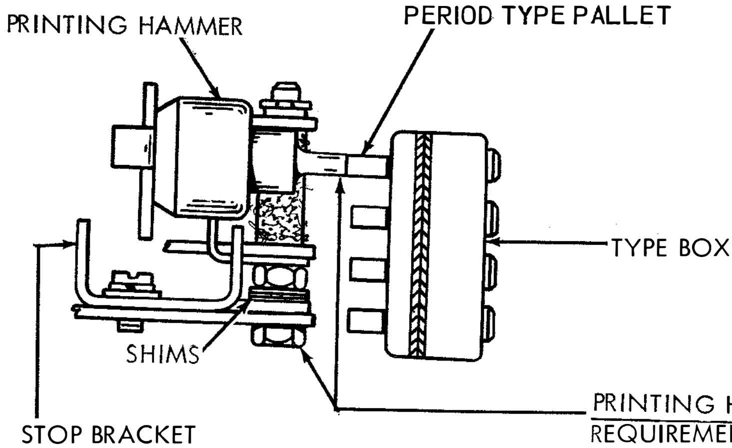
PRINTING CARRIAGE POSITION

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.



(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

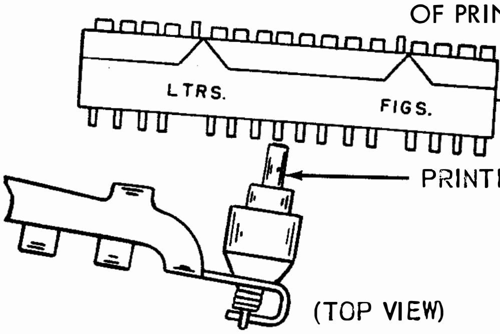
ADD OR REMOVE SHIMS BETWEEN SHOULDER ON BEARING POST AND STOP BRACKET

2.48 Positioning Mechanism (Cont.)

(A) <u>SHIFT LINKAGE</u>

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.



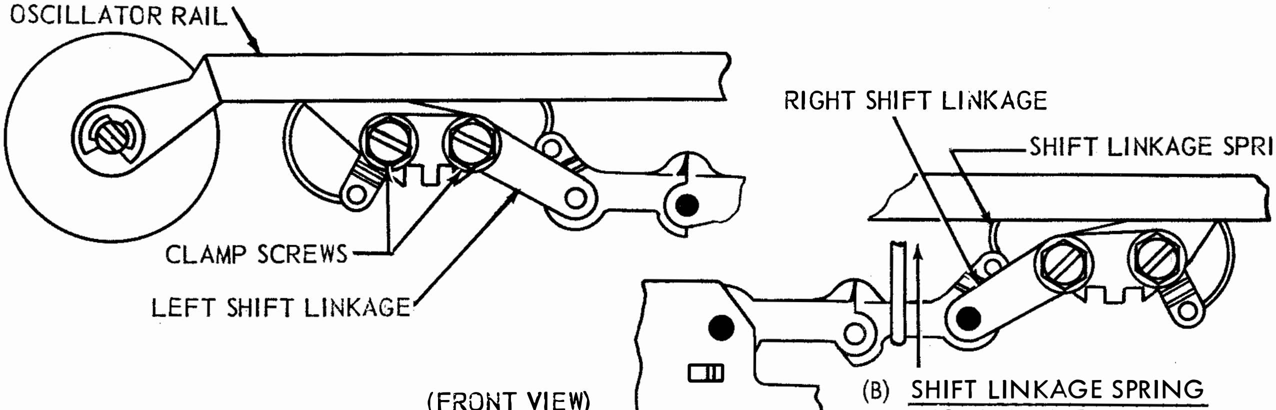
(TOP VIEW)

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.



(FRONT VIEW)

(B) <u>SHIFT LINKAGE SPRING</u>

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.)

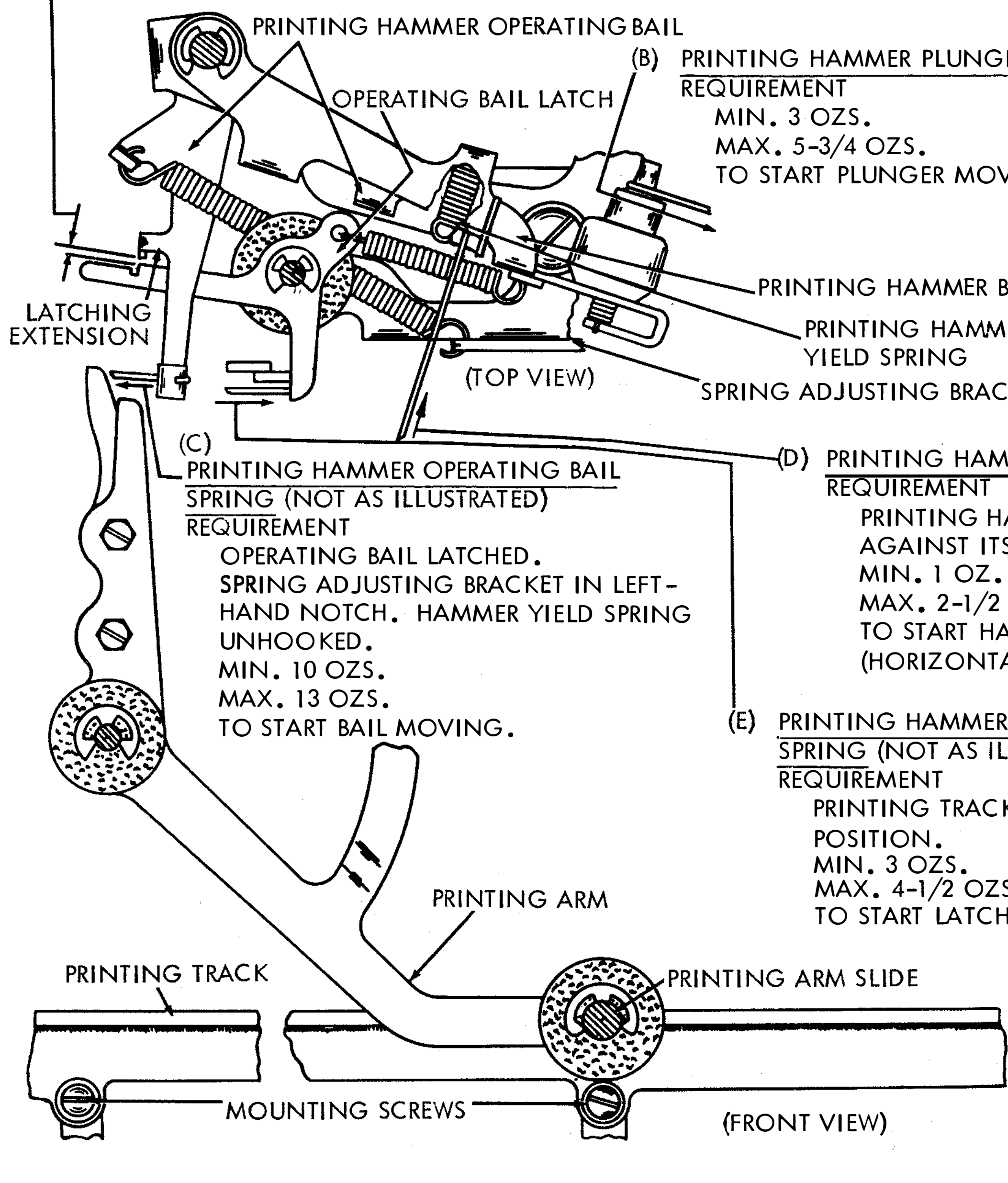
(A) PRINTING TRACK

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.

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.

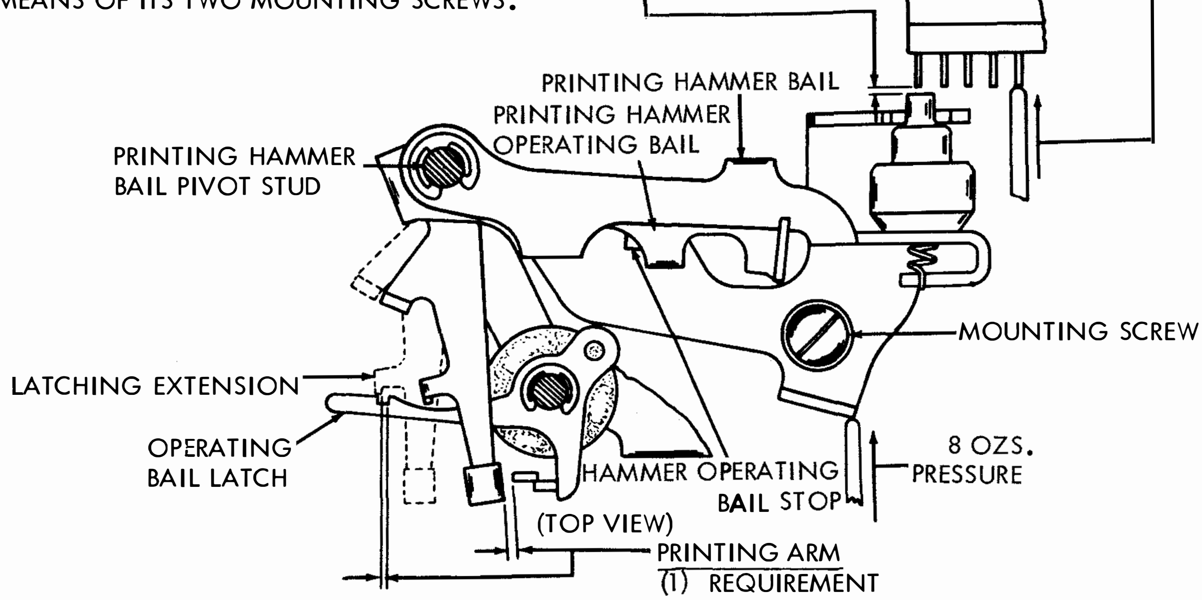
TO ADJUST---POSITION STOP BRACKET BY MEANS OF ITS TWO MOUNTING SCREWS.

TYPE PALLET SPRING

REQUIREMENT

TYPE BOX REMOVED FROM THE UNIT. 8 OZS. SCALE APPLIED VERTICALLY TO THE END OF THE PALLET SHANK.

MIN. 1/4 OZS.
MAX. 3/4 OZS.
TO START PALLET MOVING.



PRINTING ARM

(1) REQUIREMENT

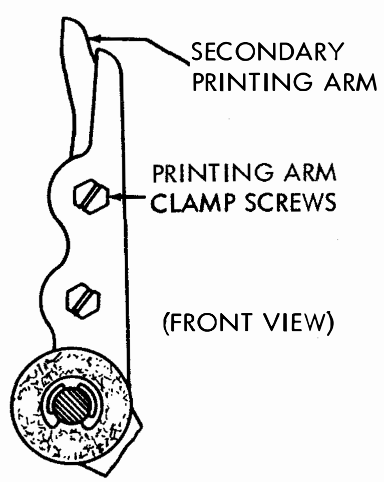
PRINTING TRACK IN MAXIMUM DOWNWARD POSITION.
PRINTING HAMMER OPERATING BAIL AGAINST ITS STOP.
SOME CLEARANCE BETWEEN SECONDARY PRINTING ARM AND FORWARD EXTENSION OF HAMMER OPERATING BAIL.
MAX. 0.015 INCH
WHEN PRINTING ARM SLIDE IS HELD DOWNWARD OVER EACH PRINTING TRACK MOUNTING SCREW FOR MAXIMUM CLEARANCE.

(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.

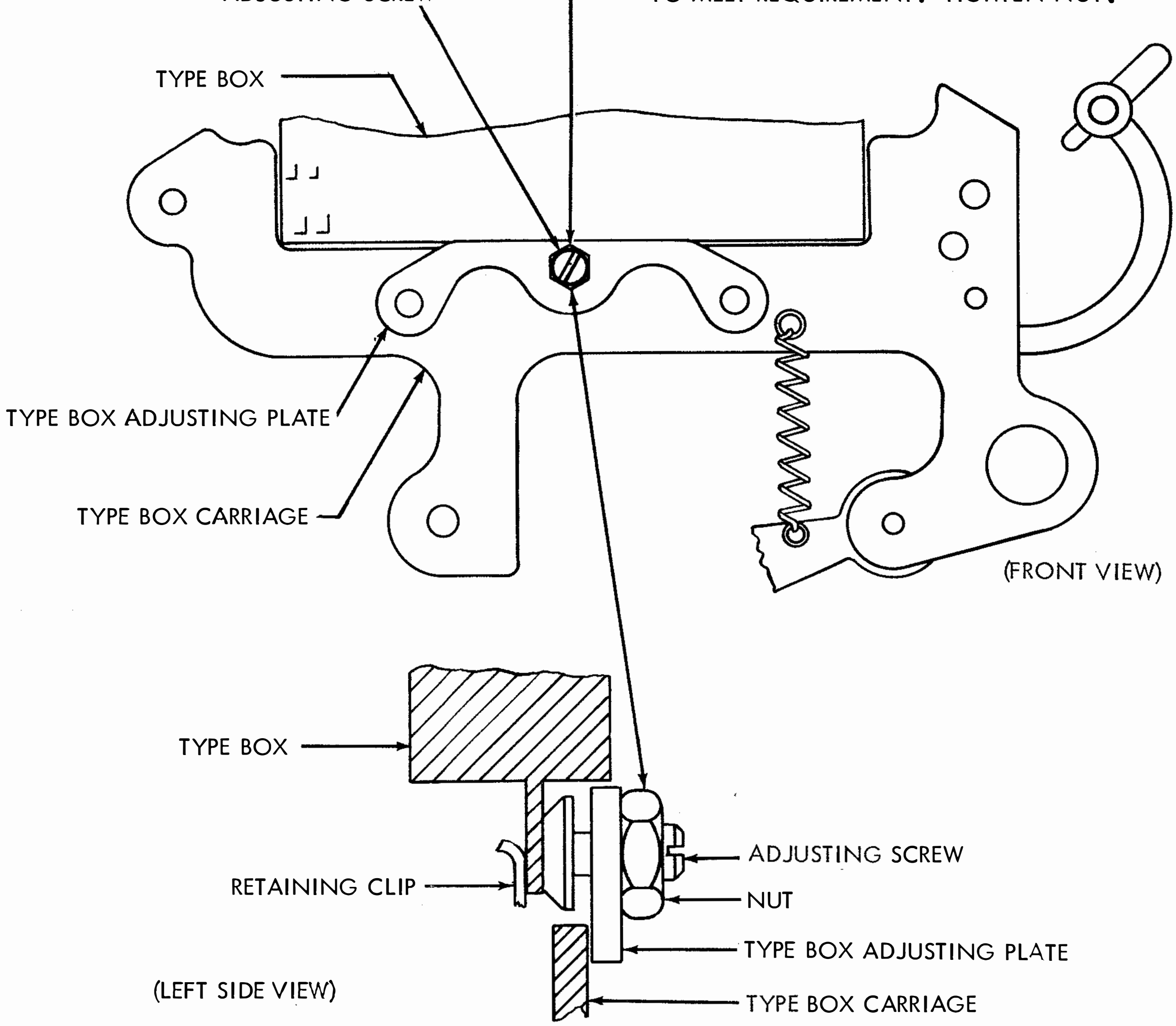
TYPE BOX ALIGNMENT

REQUIREMENT

PRINTED IMPRESSION OF CHARACTERS AT TOP AND AT BOTTOM SHOULD BE EQUAL. (GAUGE VISUALLY)

TO ADJUST

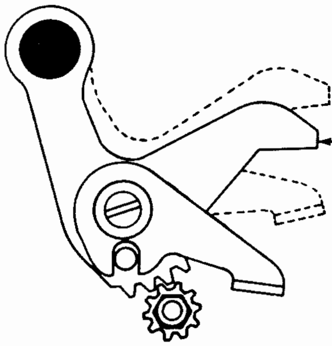
LOOSEN NUT. OPERATE PRINTER UNDER POWER. REPEAT CHARACTERS E AND Z. TURN ADJUSTING SCREW IN OR OUT (IN STEPS OF 1/4 TURN) TO MEET REQUIREMENT. TIGHTEN NUT.

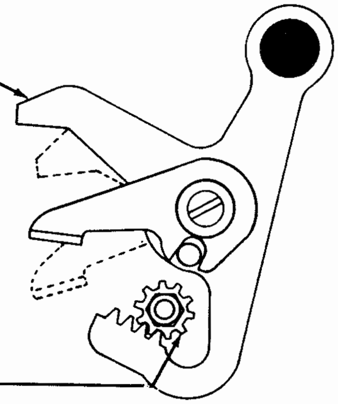


NOTE: SOME TYPING UNITS ARE EQUIPPED WITH A RIBBON GUIDE WHICH HAS A TYPE BOX RETAINING CLIP WITH A LIMITED YIELD. IN CASES WHERE IT IS NECESSARY TO BACK THE ADJUSTING SCREW OUT TO PROVIDE HEAVIER PRINTING AT THE TOP OF A CHARACTER, IT MAY BE NECESSARY TO BEND THE SPRING CLIP ON THE RIBBON GUIDE TOWARD THE FRONT SO THAT THE TAB AT THE BOTTOM OF THE TYPE BOX IS HELD AGAINST THE HEAD OF THE ADJUSTING SCREW.

2.52 Printing Mechanism (Cont.)

CHECK THE TWO COLOR RIBBON REQUIREMENTS PARS. 3.44 AND 3.45 ON UNITS SO EQUIPPED.





(A) RIBBON REVERSE SPUR GEAR

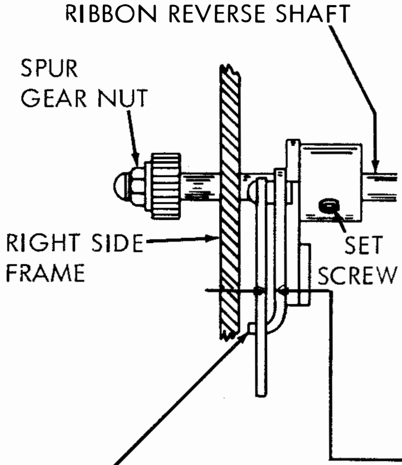
REQUIREMENT

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 ADJ. IF NECESSARY



(B) RIBBON REVERSE DETENT

REQUIREMENT

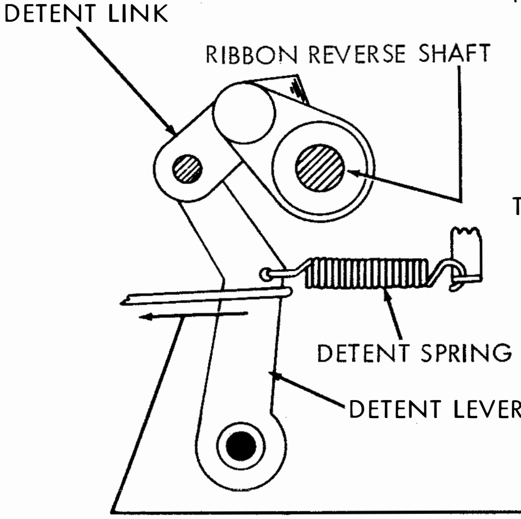
RIBBON REVERSE DETENT LINK BUCKLED IN ITS DOWNWARD POSITION, CLEARANCE BETWEEN DETENT LINK AND DETENT LEVER.

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.)

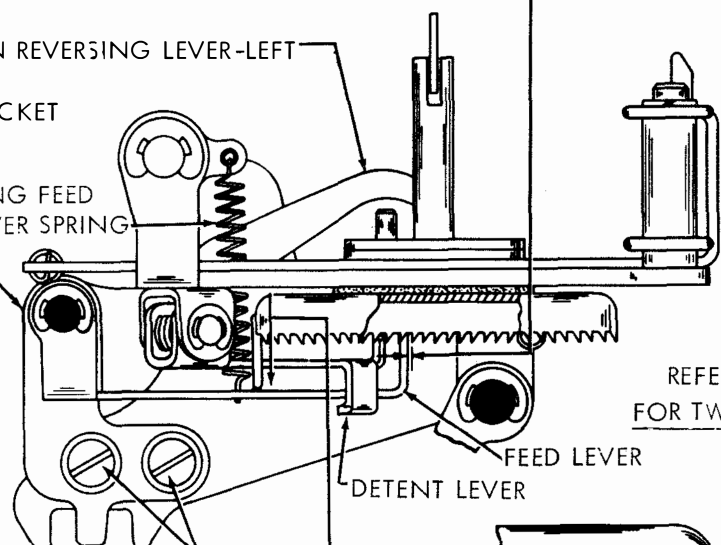
RIBBON FEED LEVER BRACKET

(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

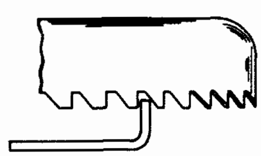
TO ADJUST
POSITION THE FEED LEVER BRACKET WITH ITS MOUNTING SCREWS LOOSENED.

(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 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.

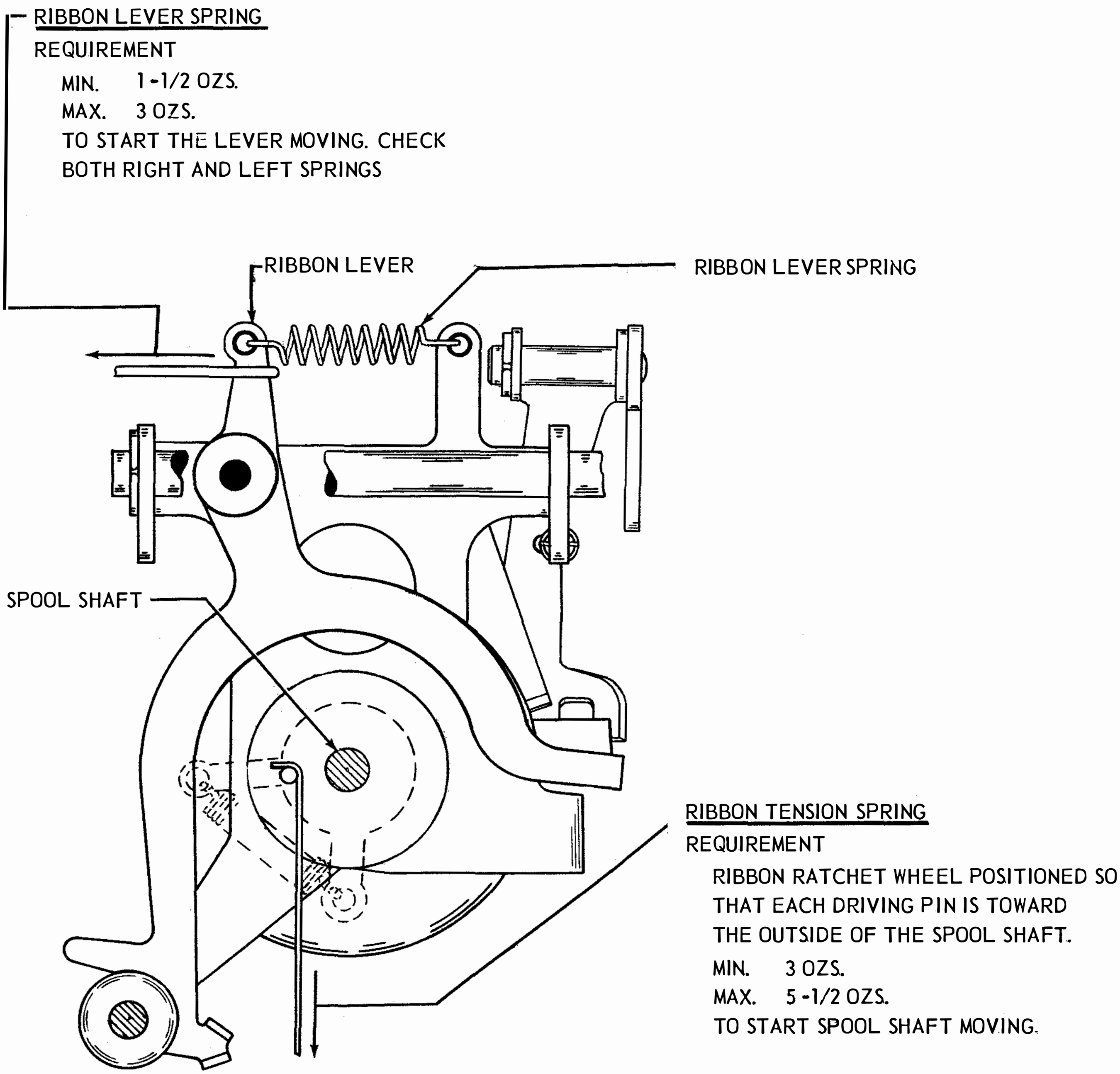
NOTE: IF MINIMUM REQUIREMENT OF SHORT LEVER IS NOT MET, PULL LOWER END OF TORSION SPRING TO REAR.

RIBBON RATCHET WHEEL FRICTION 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.

2.54 Printing Mechanism (Cont.)



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	LEVER WITH STUD THAT OPERATES TWO CONTACTS
MIN.	1-1/2 OZS.	2 OZS.
MAX.	2-3/4 OZS.	3-1/2 OZS.

TO START FUNCTION LEVER MOVING.
CHECK EACH SPRING.

(B) FUNCTION PAWL SPRING

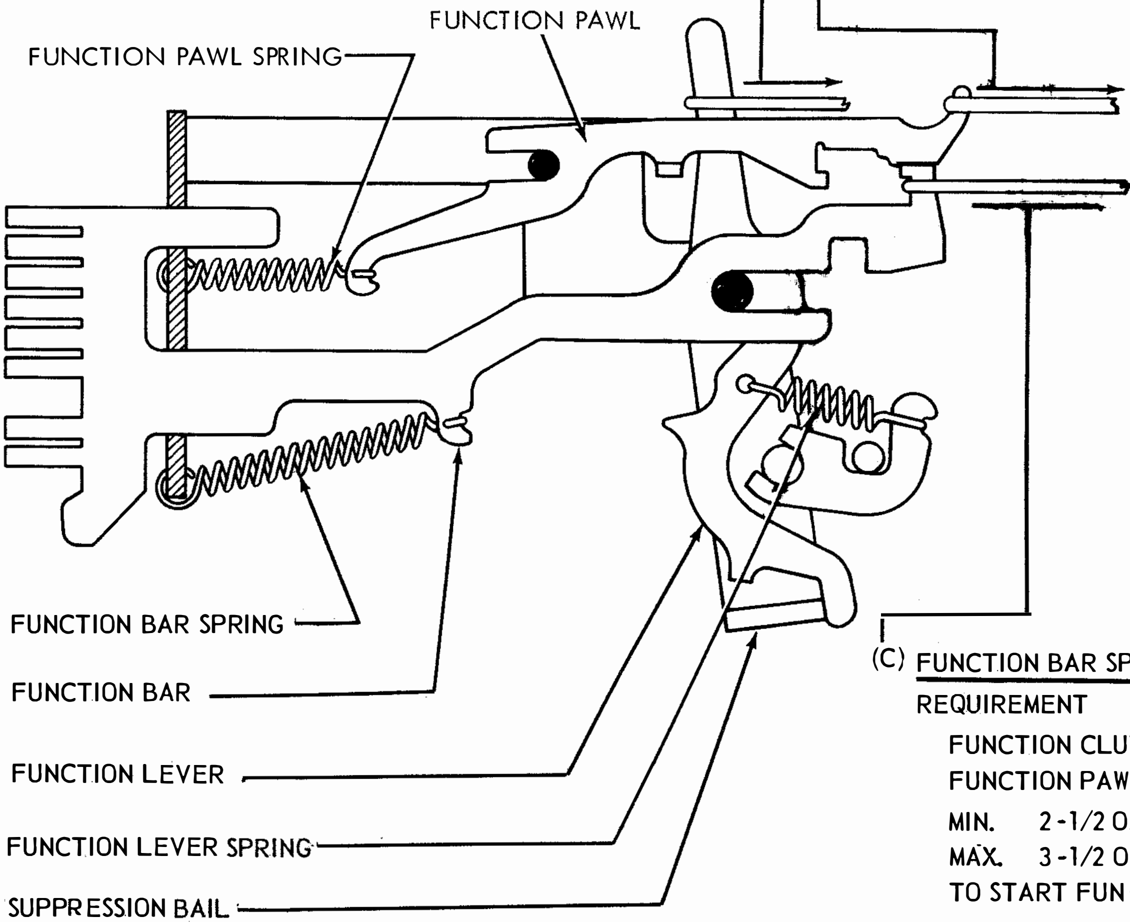
REQUIREMENT

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

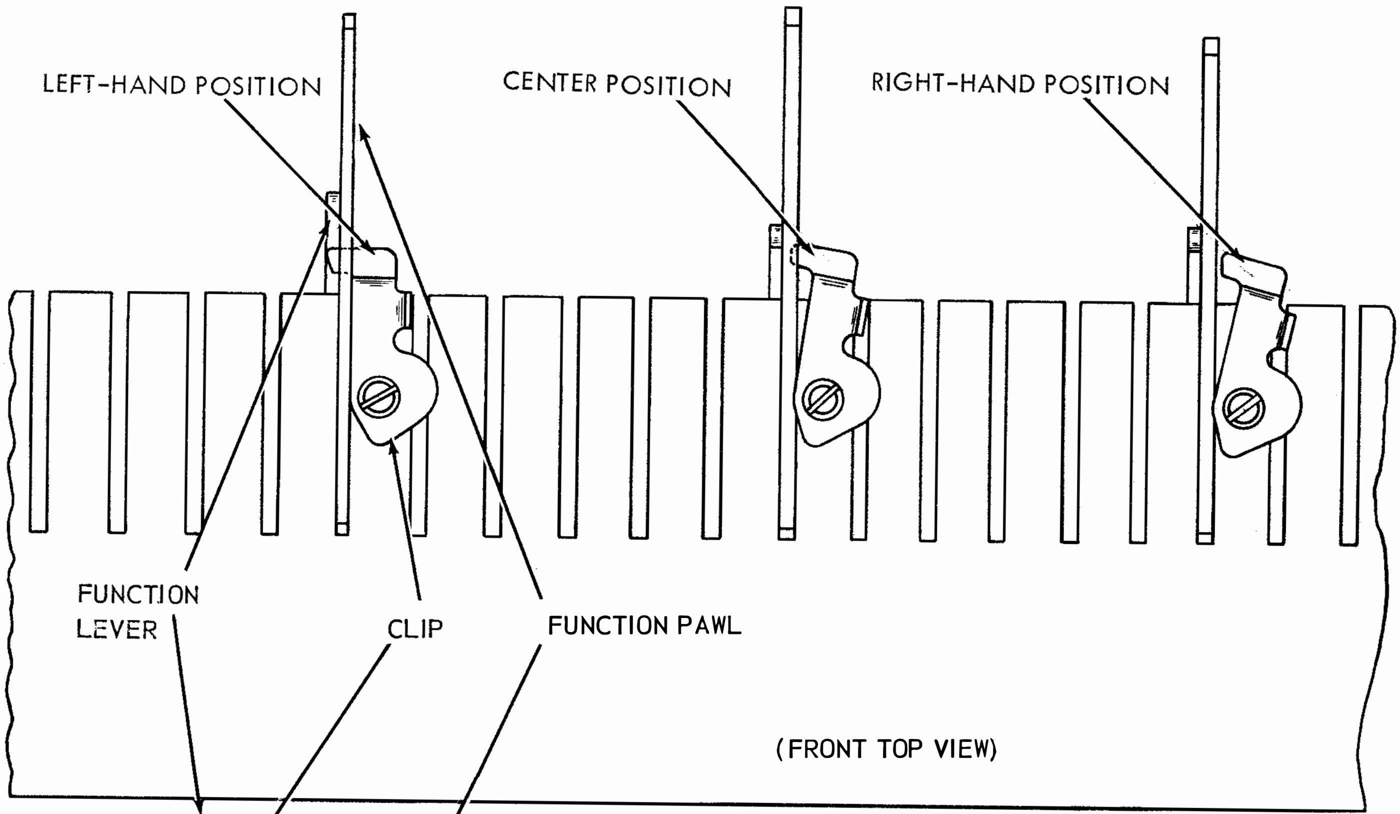
FUNCTION CLUTCH DISENGAGED.
FUNCTION PAWL HELD AWAY.

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

TO START FUNCTION BAR MOVING.

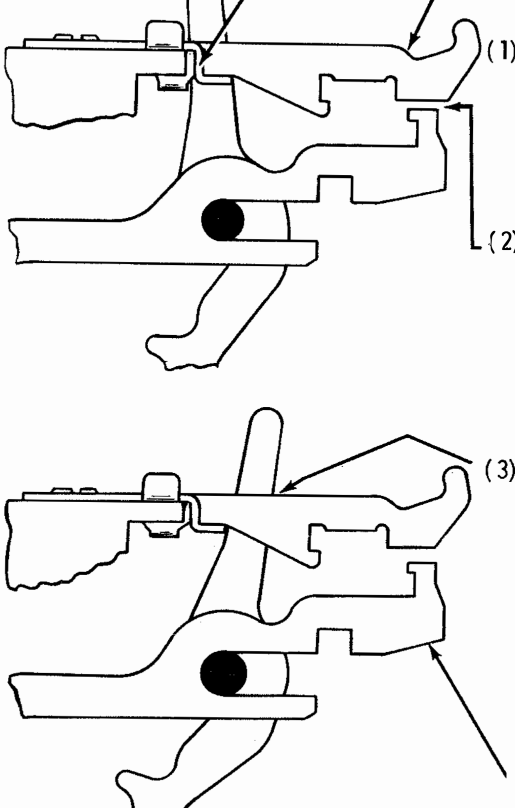
CAUTION: SEVERE WEAR TO THE POINT OF OPERATIONAL FAILURE WILL RESULT IF THE TELETYPEWRITER IS OPERATED WITHOUT EACH FUNCTION PAWL HAVING EITHER A RELATED FUNCTION BAR OR, WHERE A FUNCTION BAR IS MISSING, A RELATED FUNCTION PAWL CLIP TO HOLD THE FUNCTION PAWL AWAY FROM THE STRIPPER BLADE.

2.56 Function Mechanism (Cont.)



(FRONT TOP VIEW)

STUNT BOX CLIP (FOR UNITS EQUIPPED WITH CLIPS ONLY)



(RIGHT SIDE VIEW)

(1) REQUIREMENT (RIGHT-HAND POSITION)

THE CLIP SHOULD NOT PREVENT THE ASSOCIATED FUNCTION PAWL FROM ENGAGING ITS FUNCTION BAR.

TO ADJUST

POSITION THE CLIP TO ITS EXTREME RIGHT–HAND POSITION

(2) REQUIREMENT (CENTER POSITION)

THE CLIP SHOULD HOLD THE FUNCTION PAWL OUT OF ENGAGEMENT WITH ITS FUNCTION BAR BUT SHOULD NOT INTERFERE WITH THE FUNCTION LEVER.

TO ADJUST

POSITION THE CLIP WITH ITS MOUNTING SCREW LOOSENED.

(3) REQUIREMENT (LEFT-HAND POSITION)

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.

TO ADJUST

POSITION THE CLIP TO ITS EXTREME LEFT–HAND POSITION.

2.57 Line Feed and Platen Mechanism (Cont.)

(B) PLATEN DETENT BAIL SPRING

REQUIREMENT

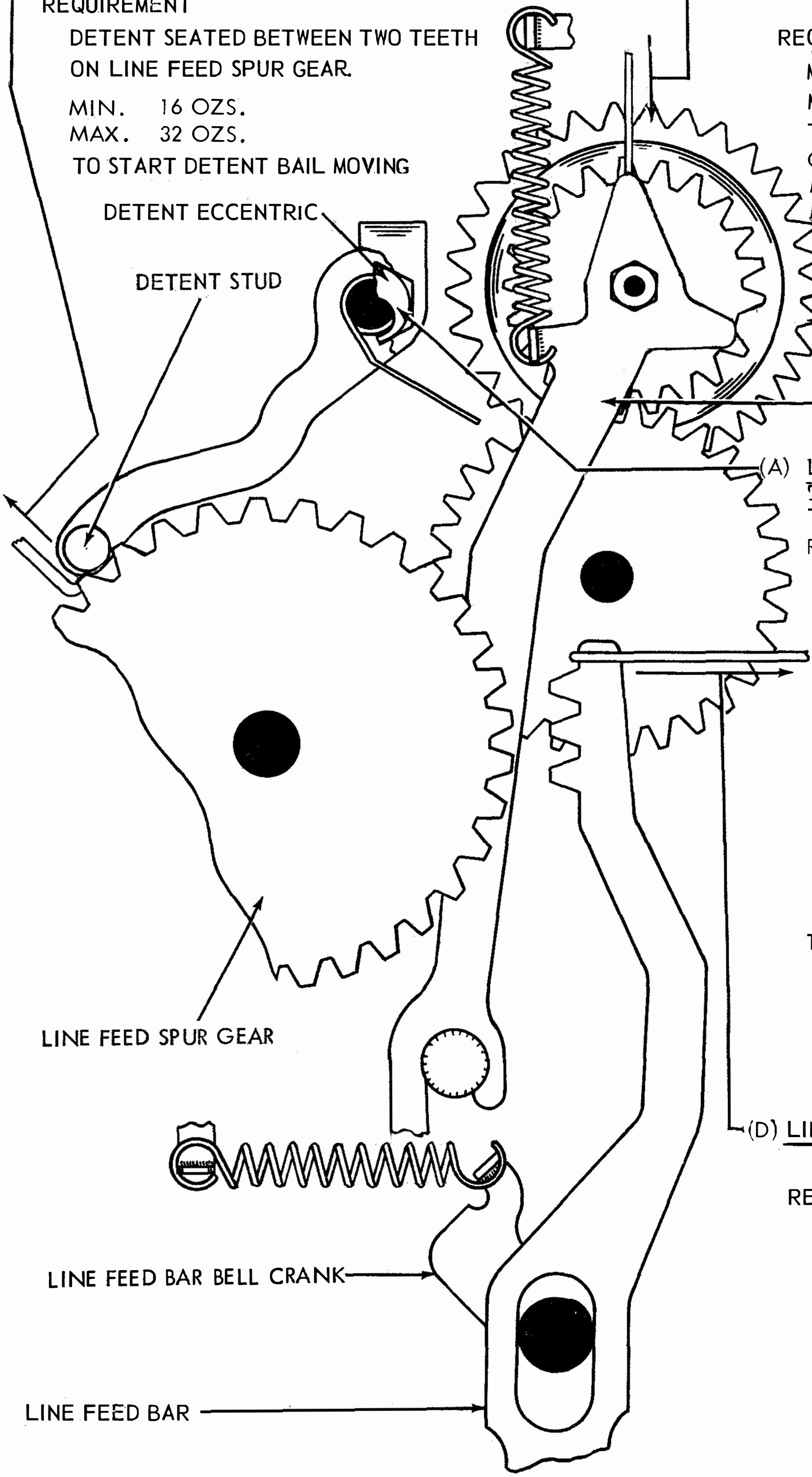
DETENT SEATED BETWEEN TWO TEETH ON LINE FEED SPUR GEAR.

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.
ON LP68
MIN. 8 OZS.
MAX. 12 OZS.



(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.

(D) LINE FEED BAR BELL CRANK SPRING

REQUIREMENT

LEFT-HAND LINE FEED BAR IN REAR POSITION.

	FRICTION FEED	SPROCKET FEED
MIN.	19 OZS.	28 OZS.
MAX.	24 OZS.	38 OZS.

TO START BAR MOVING.

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

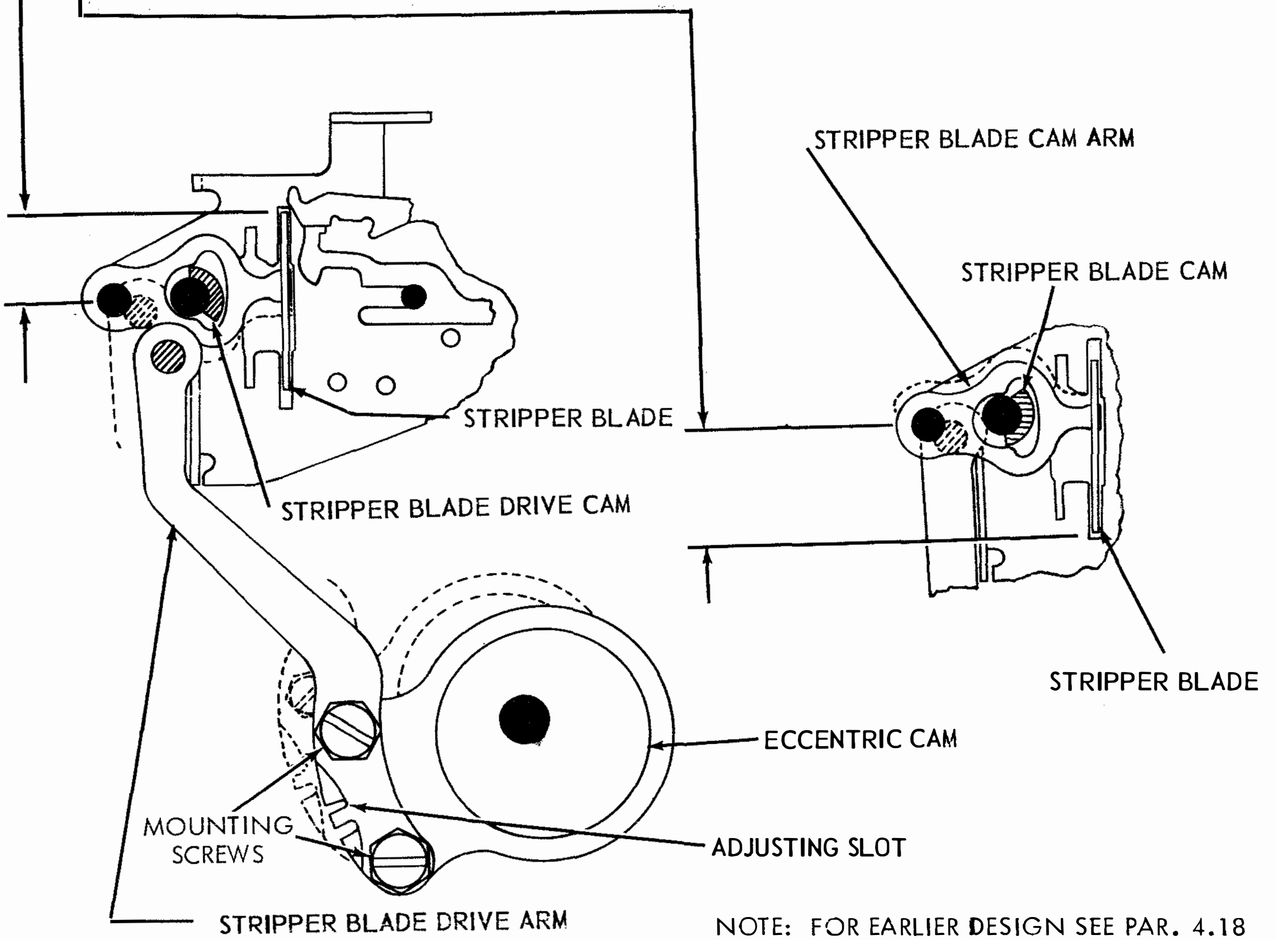
B. DOWNWARD DIRECTION

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.

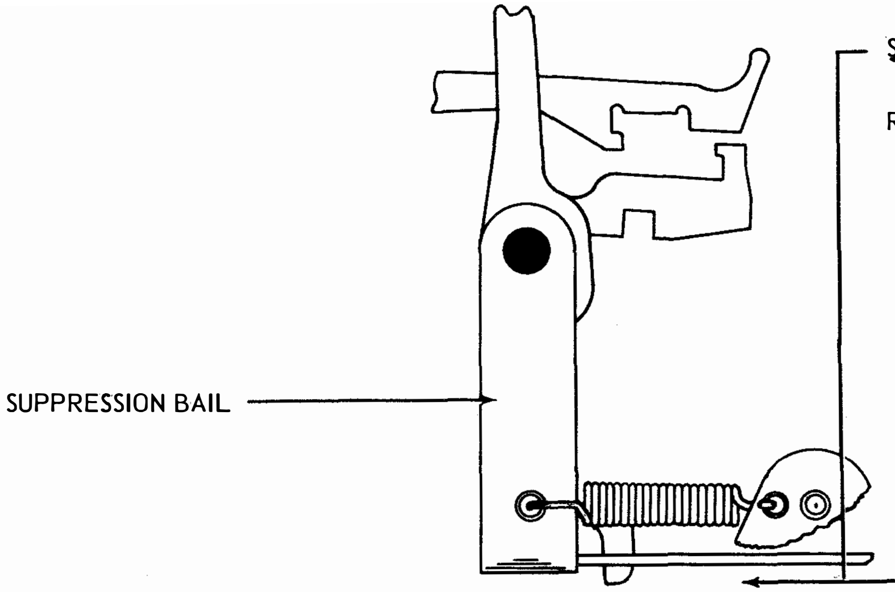
TO ADJUST

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.)



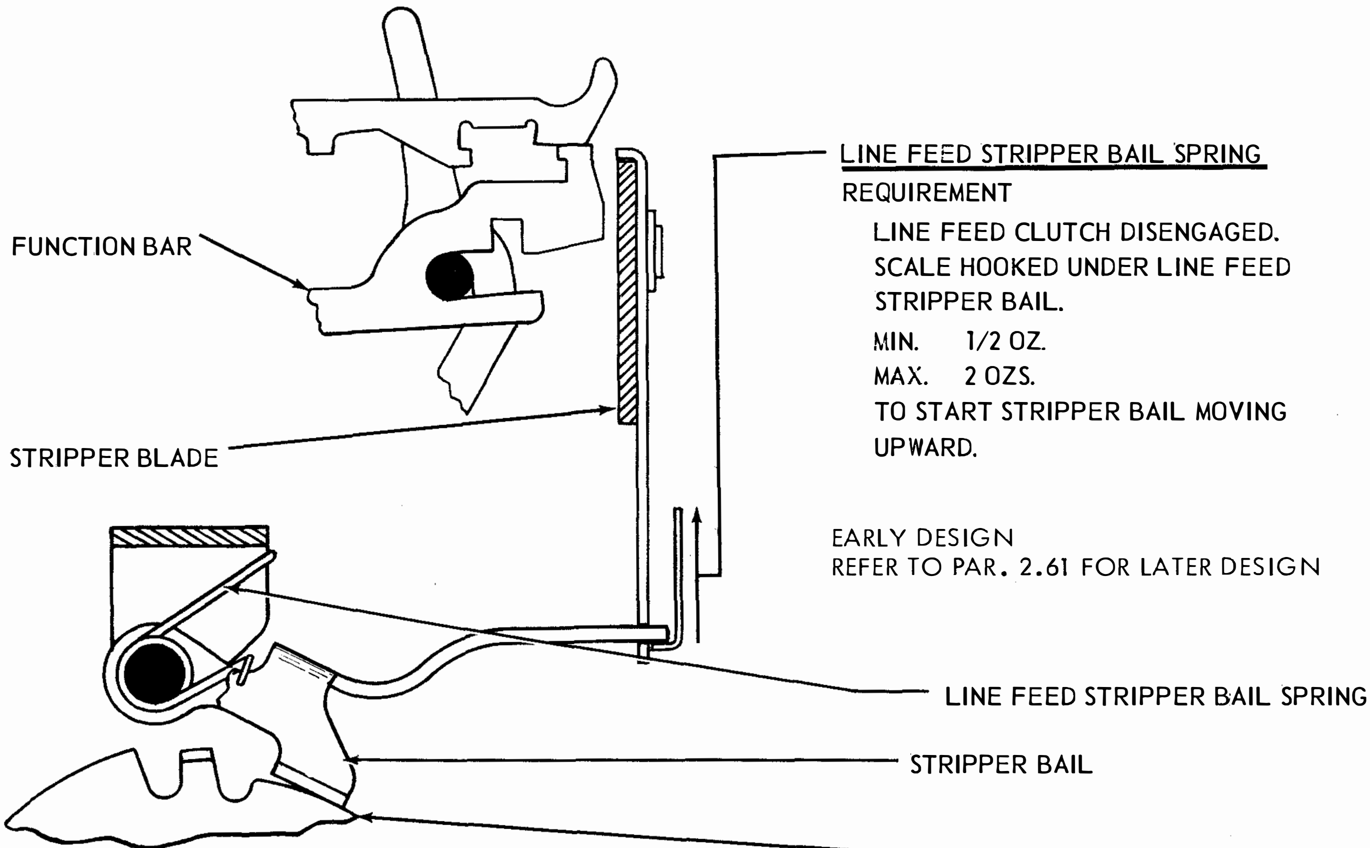
SPACING SUPPRESSION BAIL SPRING

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

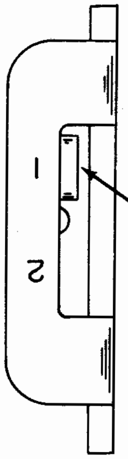
REQUIREMENT

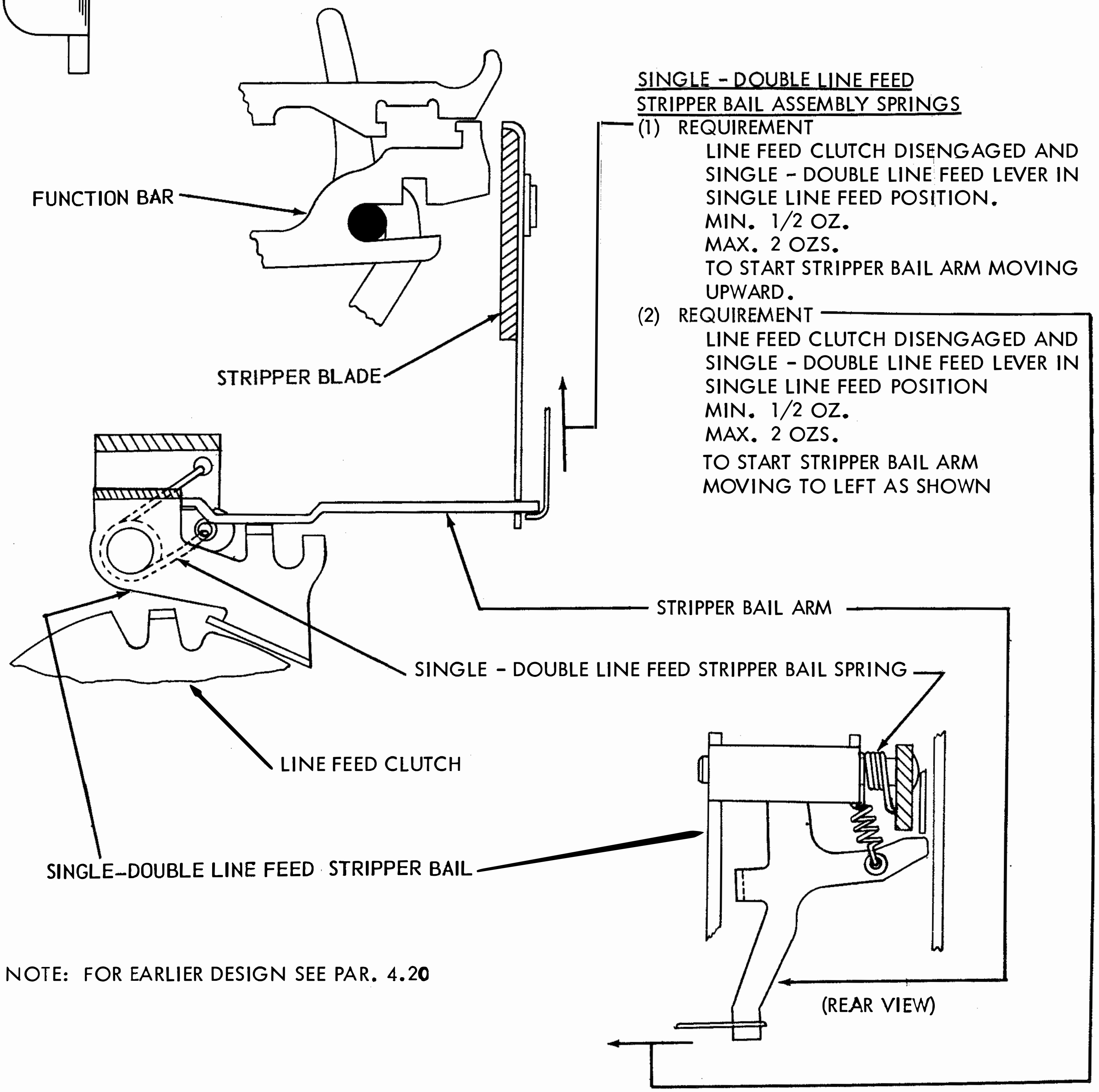
LINE FEED CLUTCH DISENGAGED. SCALE HOOKED UNDER LINE FEED STRIPPER BAIL.

MIN. 1/2 OZ.
MAX. 2 OZS.
TO START STRIPPER BAIL MOVING UPWARD.

EARLY DESIGN
REFER TO PAR. 2.61 FOR LATER DESIGN

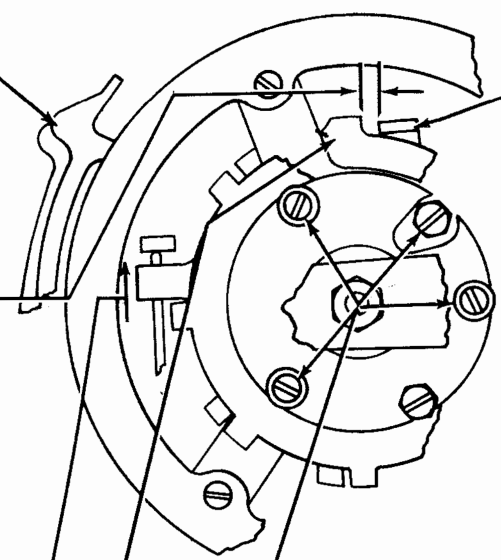
2.61 Line Feed and Platen Mechanism (Cont.)





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

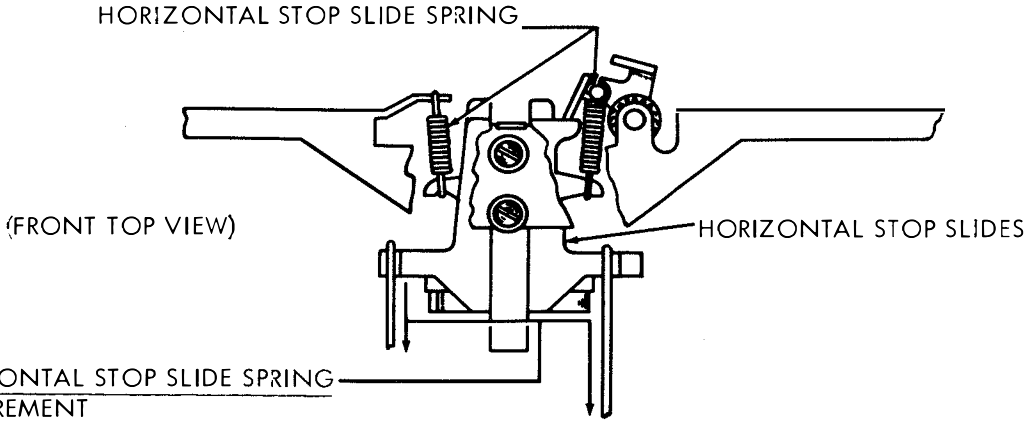
POSITION RING WITH FOUR INDICATED MOUNTING SCREWS LOOSENED.

NOTE

RANGE OF LINE ADJUSTMENT IS FROM 0 TO 85 CHARACTERS

NOTE: FOR ADJUSTMENT ON EARLIER MODELS SEE PAR. 4.19

2.63 Positioning Mechanism (Cont.)

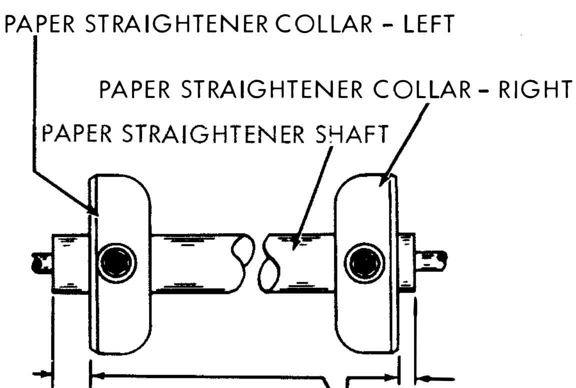


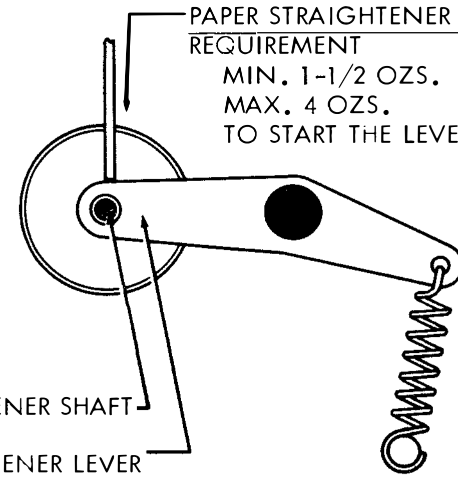
HORIZONTAL STOP SLIDE SPRING

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 LEVER SPRING

REQUIREMENT

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

PAPER STRAIGHTENER COLLAR

REQUIREMENT

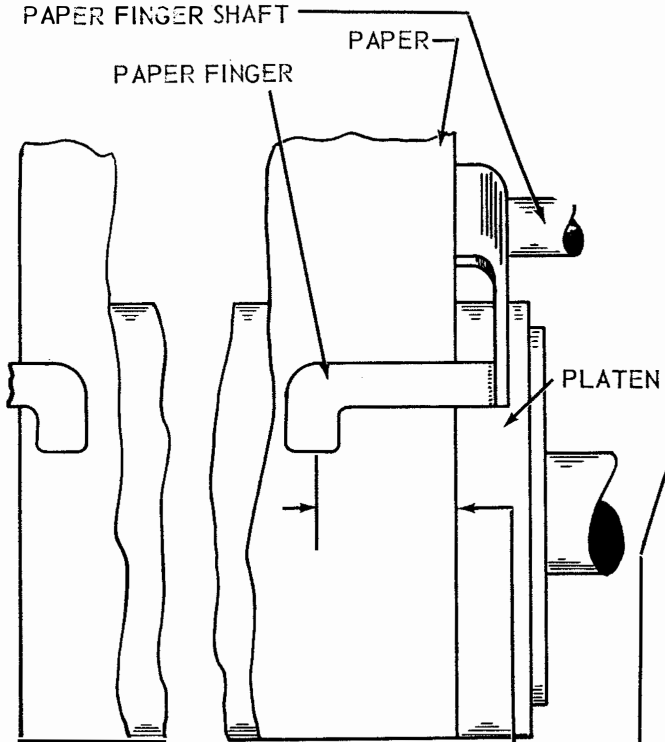
LEFT COLLAR SPACE
MIN. 9/32 INCH
MAX. 21/64 INCH
FROM THE LEFT SHOULDER ON THE PAPER STRAIGHTENER SHAFT.
RIGHT COLLAR SPACED.
MIN. 1/16 INCH
MAX. 5/64 INCH
FROM THE RIGHT SHOULDER.

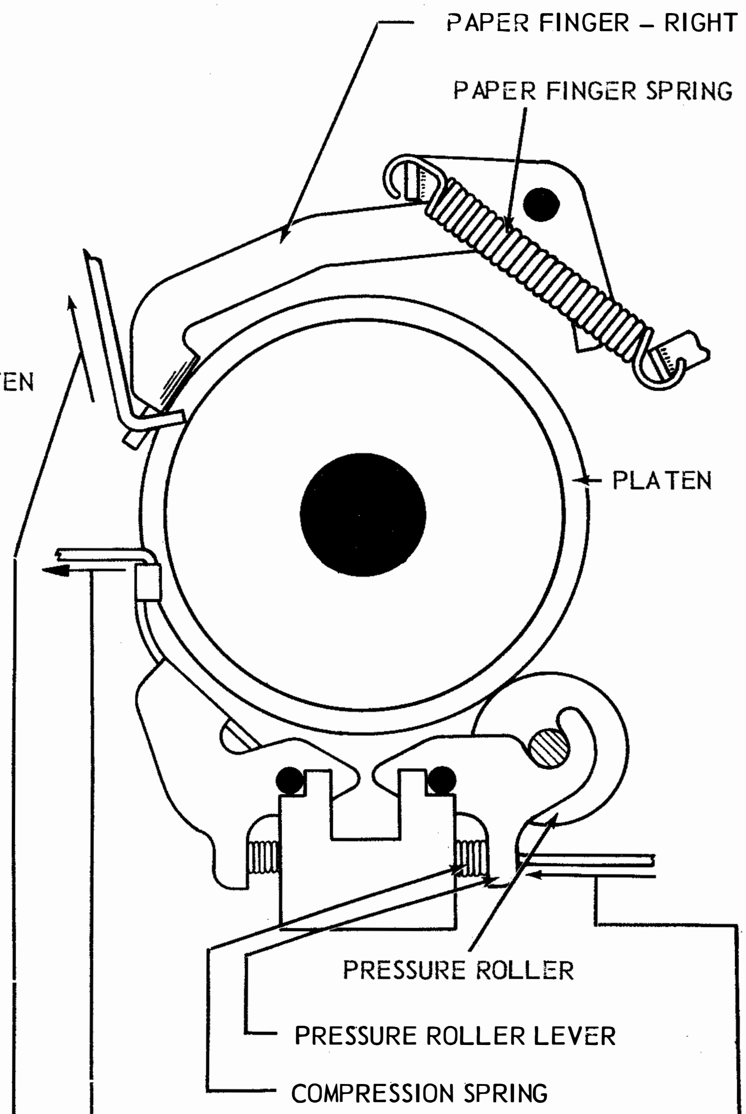
TO ADJUST

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

REQUIREMENT

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.

PAPER FINGER SPRING

REQUIREMENT

PULL UPWARD ON RIGHT PAPER FINGER TO START LEFT PAPER FINGER MOVING FROM PLATEN.

MIN. 3 OZS.

MAX. 6 OZS.

PRESSURE ROLLER LEVER SPRING

REQUIREMENT

MIN. 28 OZS.

MAX. 36 OZS.

TO START EACH CENTER LEVER MOVING. ALTERNATELY

PAPER PRESSURE BAIL SPRING

REQUIREMENT

SCALE HOOKED OVER PRESSURE BAIL AT EACH END OF PLATEN.

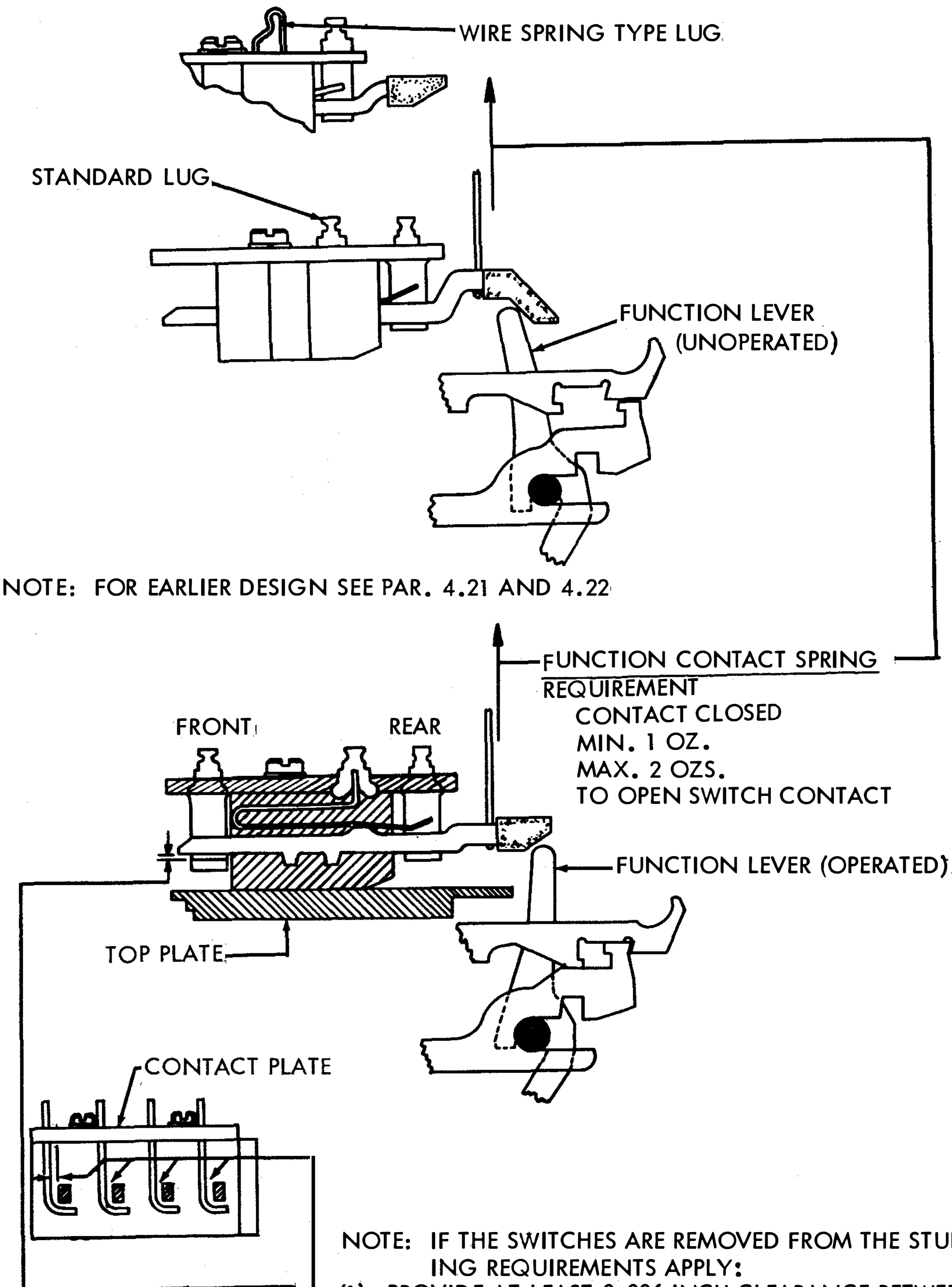
MIN. 7 OZS.

MAX. 20 OZS.

TO MOVE PRESSURE BAIL FROM PLATEN.

NOTE: FOR SPROCKET FEED MECHANISM SEE PAR. 2.73

2.66 Function Mechanism (Cont.)

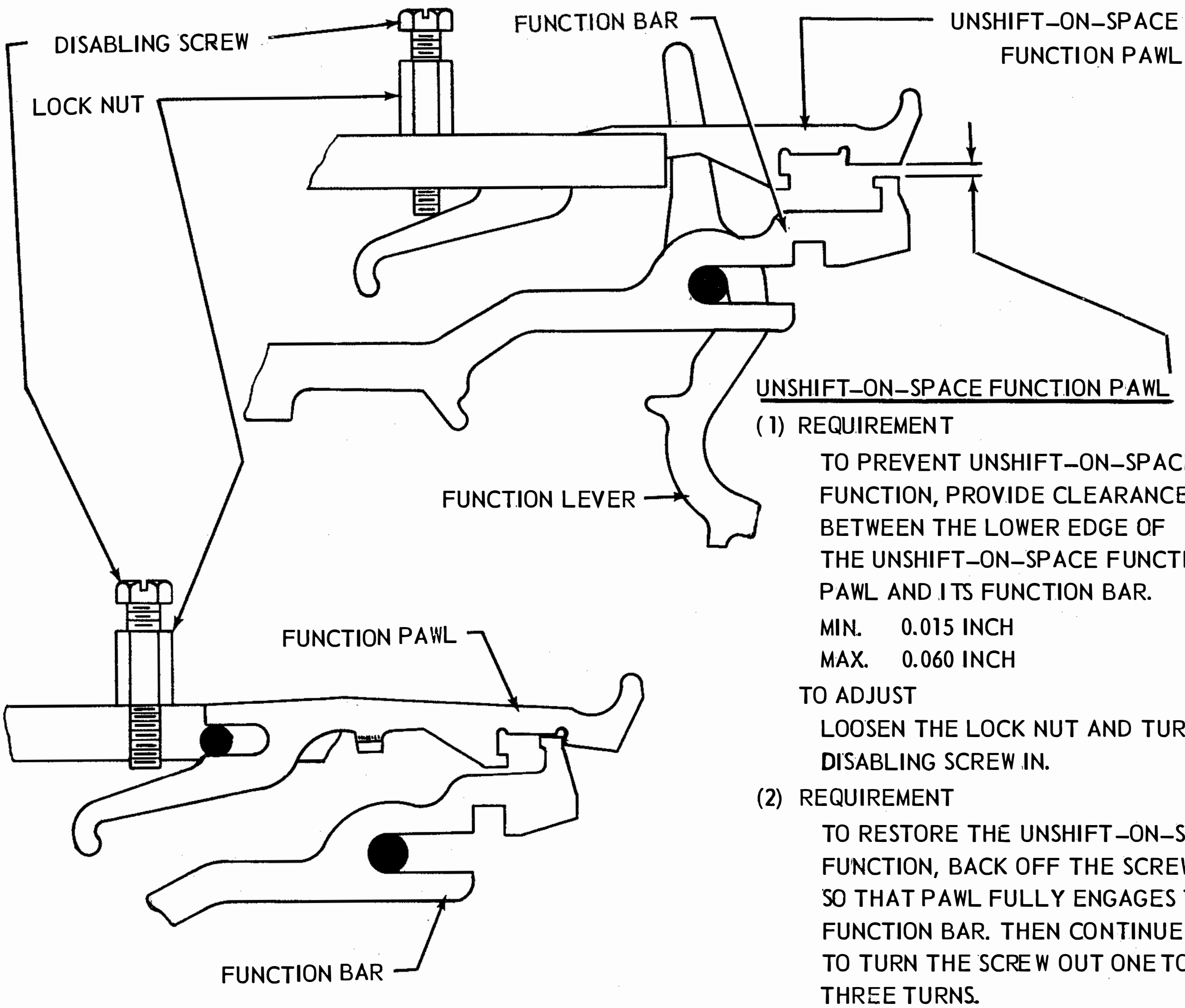


NOTE: IF THE SWITCHES ARE REMOVED FROM THE STUNT BOX, THE FOLLOWING REQUIREMENTS APPLY:

(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.)



UNSHIFT-ON-SPACE FUNCTION PAWL

(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.

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 SPRING

NOTE

UNLESS THERE IS REASON TO BELIEVE THAT THESE SPRINGS ARE CAUSING OPERATING FAILURE DO NOT CHECK THIS REQUIREMENT.

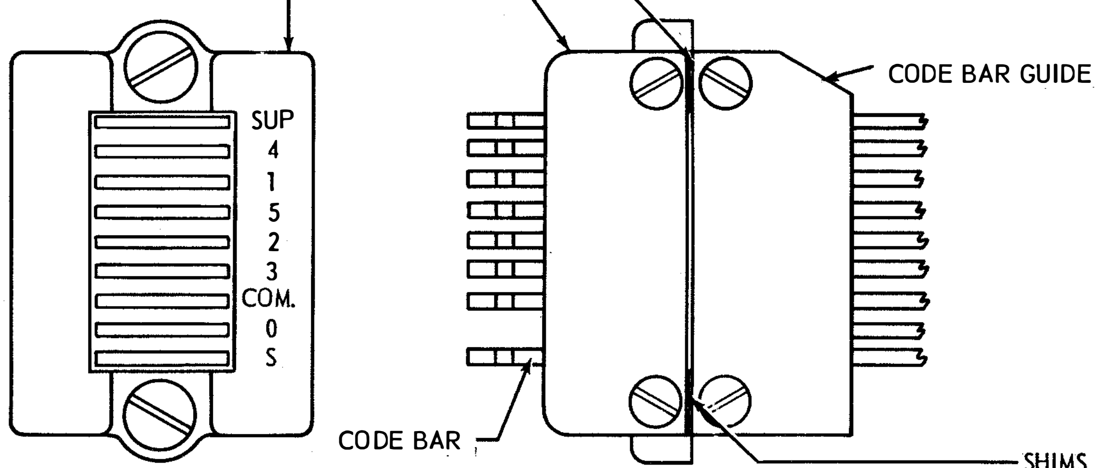
REQUIREMENT

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

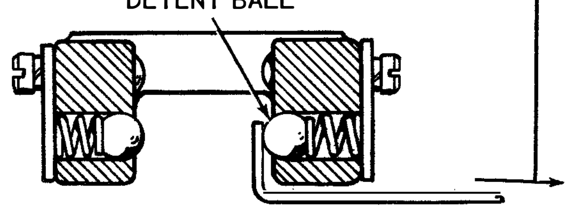
MIN. 1-1/2 OZS.

MAX. 3-1/2 OZS.

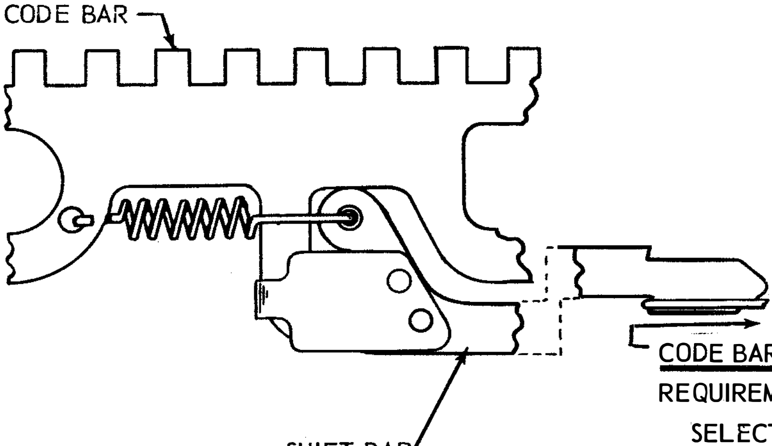
TO START BALL MOVING AGAINST COMPRESSION OF SPRING. CHECK EACH BALL



(LEFT SIDE VIEW) (FRONT VIEW)



(TOP CROSS SECTION)



CODE BAR YIELD SPRING (IF SO EQUIPPED)

REQUIREMENT

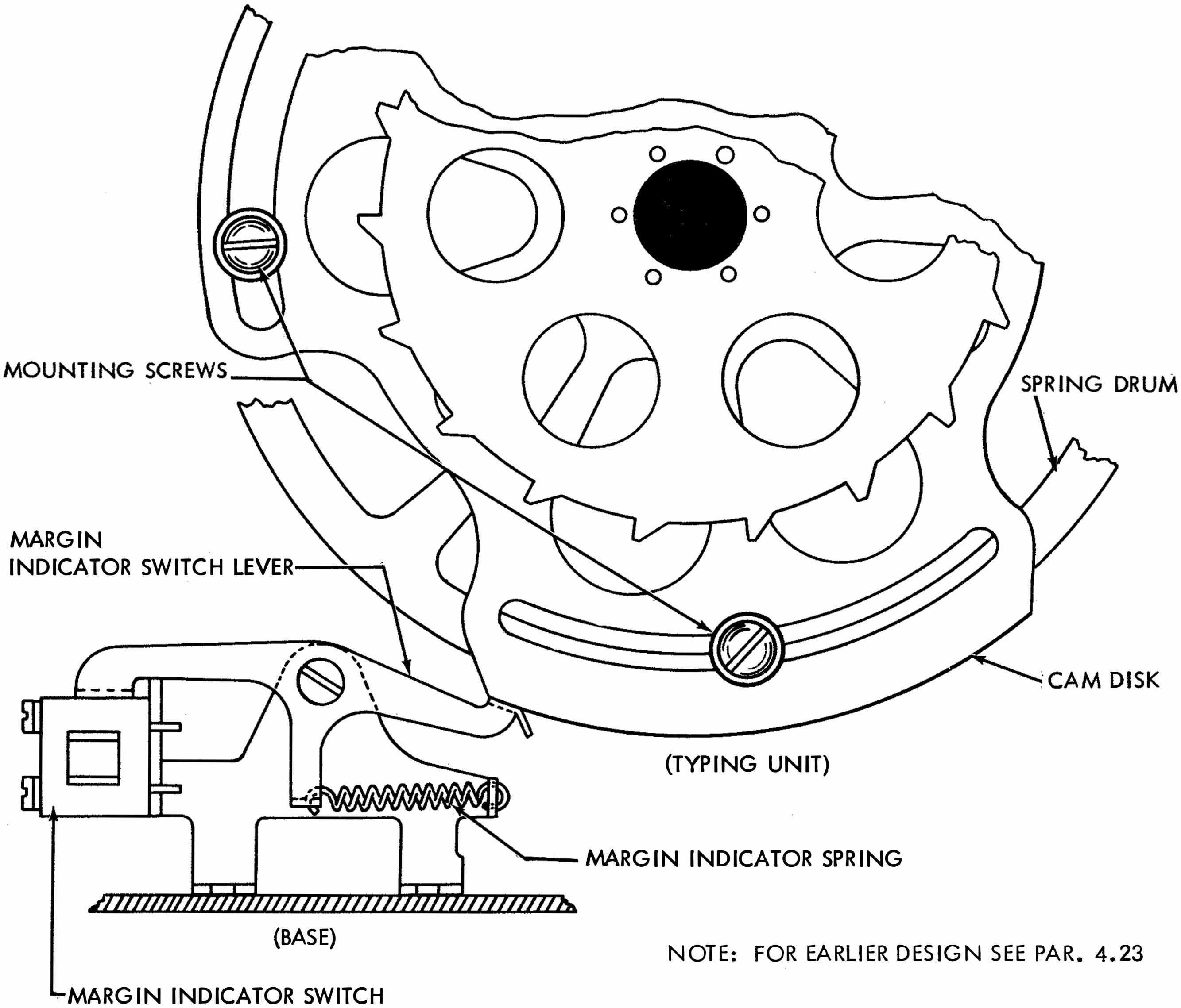
SELECTOR CLUTCH, CODE BAR CLUTCH, AND TYPE BOX CLUTCH DISENGAGED. NO. 1 CODE BAR IN SPACING POSITION

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.)

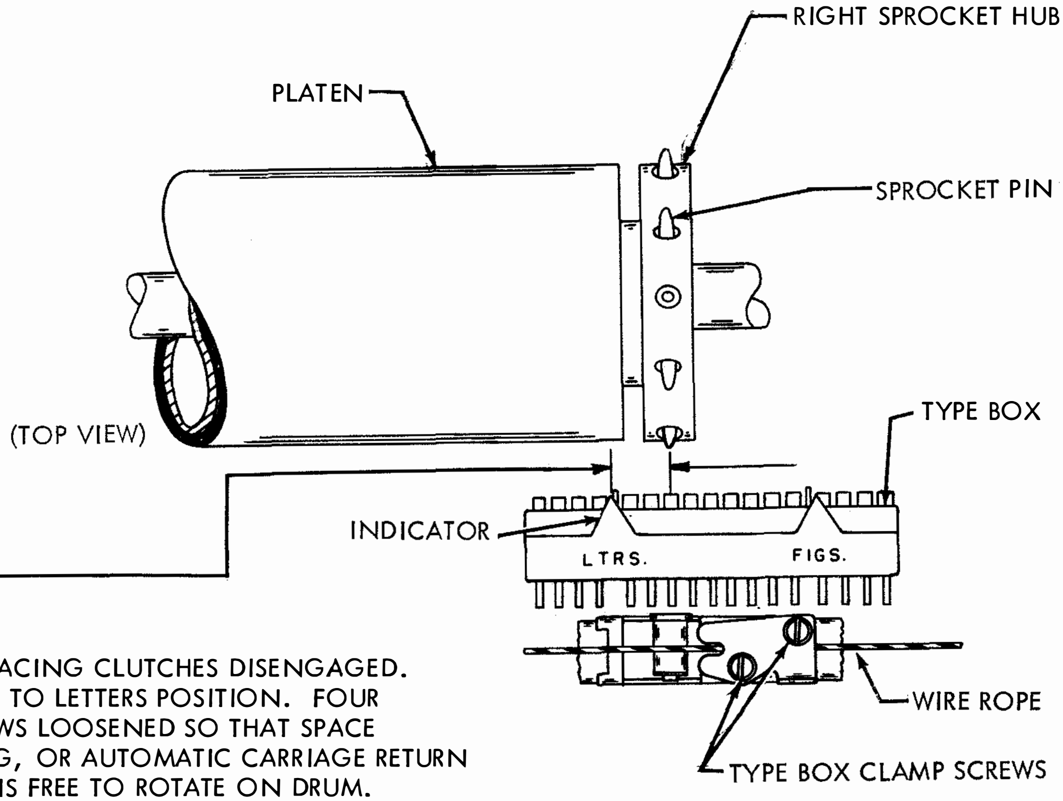


MARGIN INDICATOR LAMP

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.

2.70 Positioning Mechanism (Cont.)



TYPE BOX POSITION

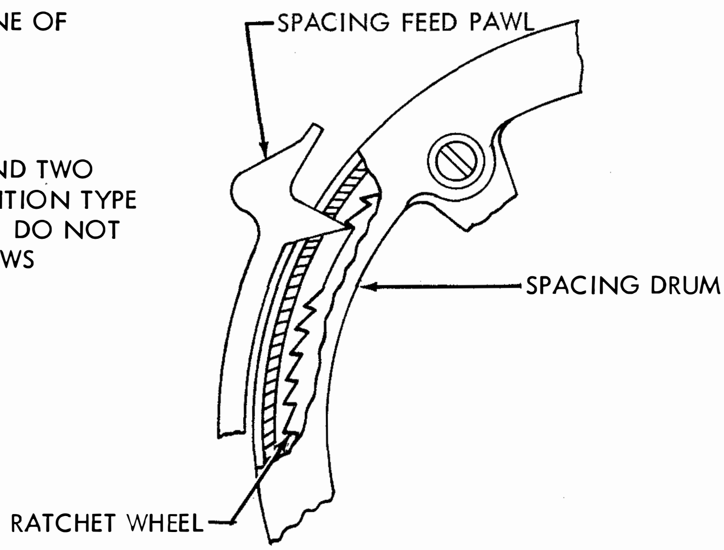
REQUIREMENT

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:

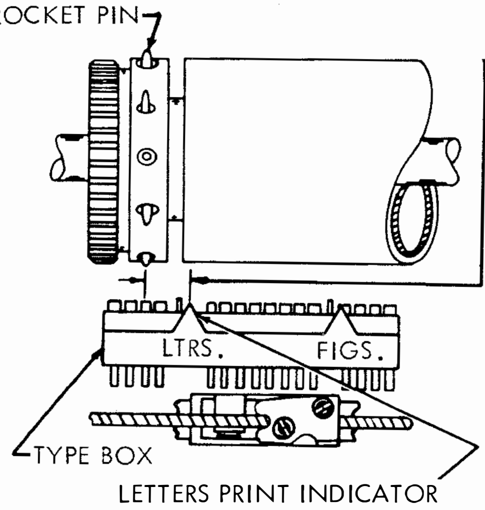
MIN. 5/16 INCH
MAX. 7/16 INCH

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)



(TOP VIEW)

(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

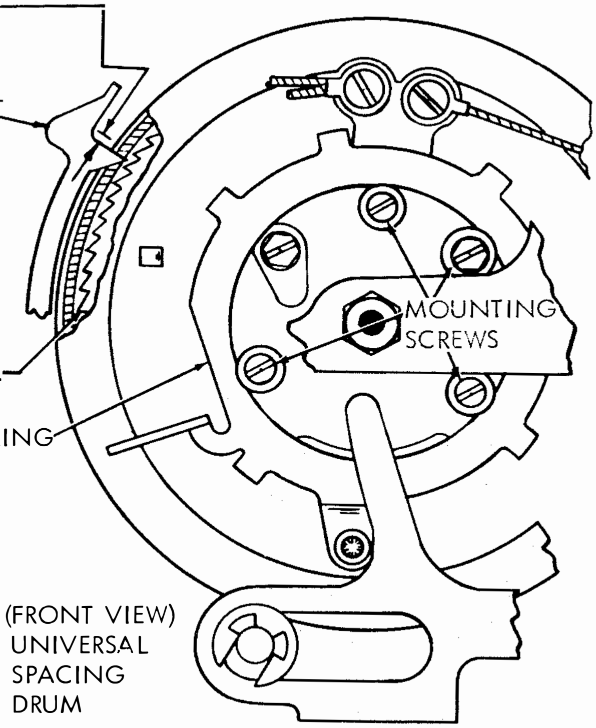
(2) FOR UNITS WITH THIN TYPEBOX - NO DUMMY TYPE PALLETS, USE CORRESPONDING STANDARD ADJUSTMENT.

(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.



(FRONT VIEW)
UNIVERSAL
SPACING
DRUM

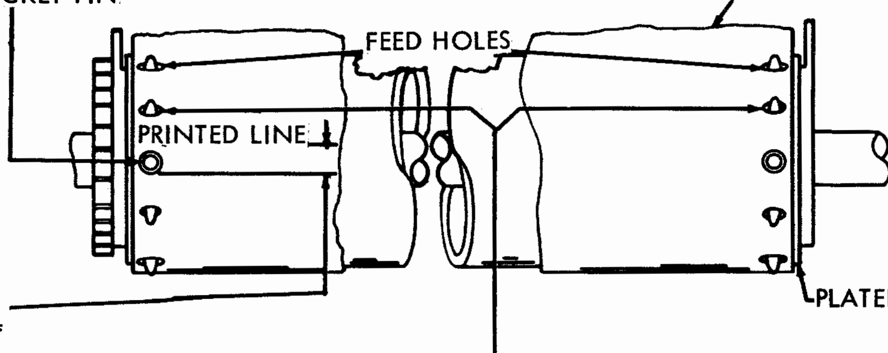
(D) PRINTING CARRIAGE POSITION
USE PAR. 2.47

(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.

(D)
SPROCKET PIN SEPARATION

(1) REQUIREMENT
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

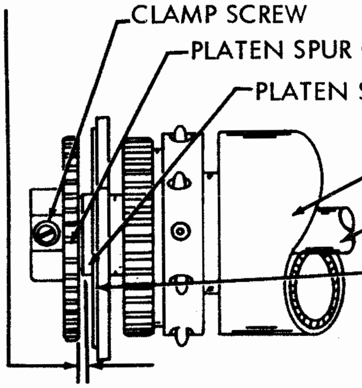
(2) REQUIREMENT
PRINTED LINE SHOULD BE PARALLEL TO A LINE DRAWN PERPENDICULAR TO EDGE OF PAPER WITHIN PLUS OR MINUS 1/32 INCH

TO ADJUST
POSITION RIGHT SPROCKET WITH CLAMP SCREW LOOSENED.

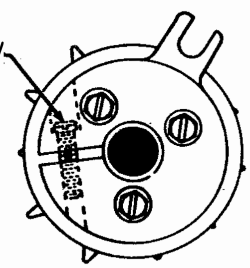
(C) PLATEN END PLAY

REQUIREMENT
LINE FEED PAWLS DISENGAGED.
PLATEN SHAFT SHOULD HAVE SOME END PLAY
MAX. 0.010 INCH

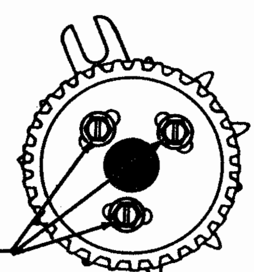
TO ADJUST
POSITION PLATEN SPUR GEAR WITH CLAMP SCREW LOOSENED.



(FRONT VIEW)

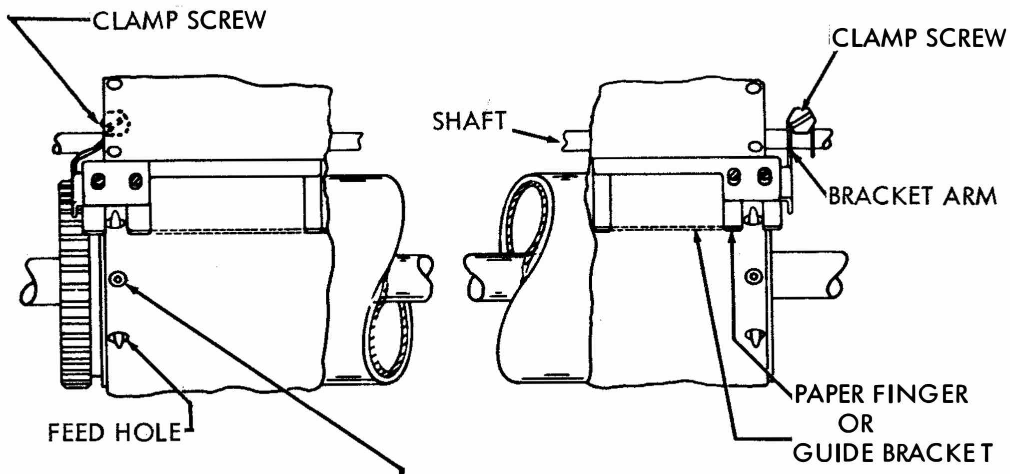


(RIGHT SIDE SPROCKET)



(LEFT SIDE SPROCKET)

2.73 Line Feed and Platen Mechanism (Con't)



PAPER FINGER OR GUIDE BRACKET

(1) REQUIREMENT

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 MULTIPLE COPY	SINGLE COPY OR UNSTAPLED MULTIPLE COPY
MIN. 0.050 INCH	0.020 INCH
MAX. 0.105 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).

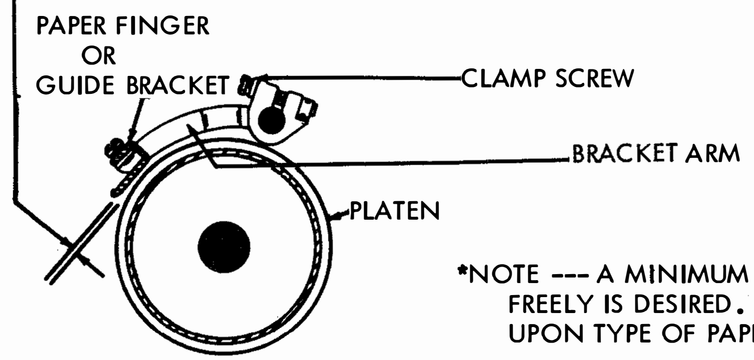
(3) REQUIREMENT (NOT ILLUSTRATED)

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.

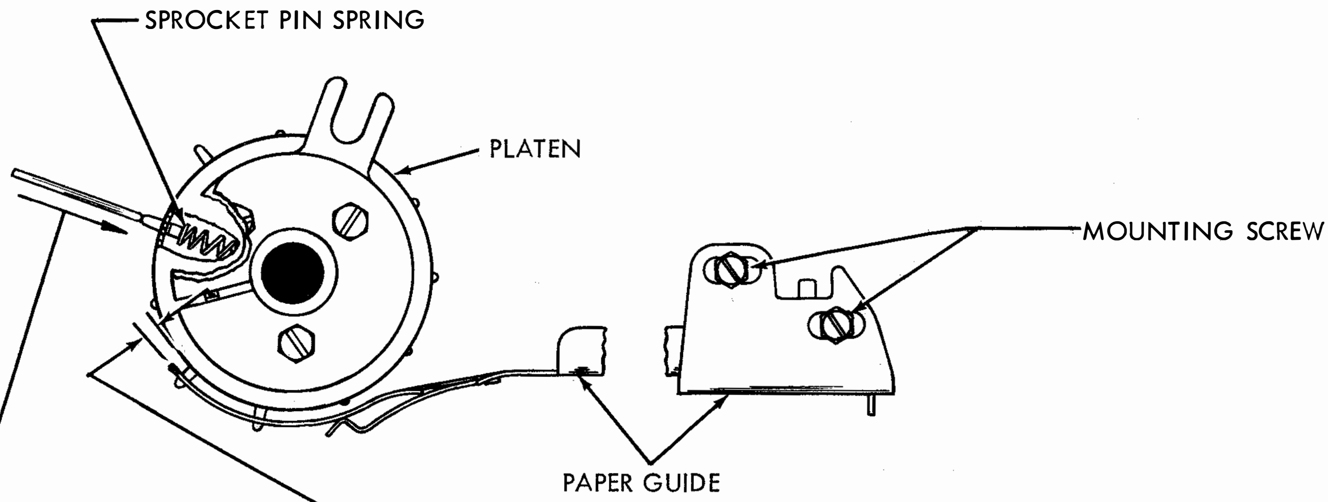
TO ADJUST

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.)



(B)
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 MULTIPLE COPY	SINGLE COPY OR UNSTAPLED 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

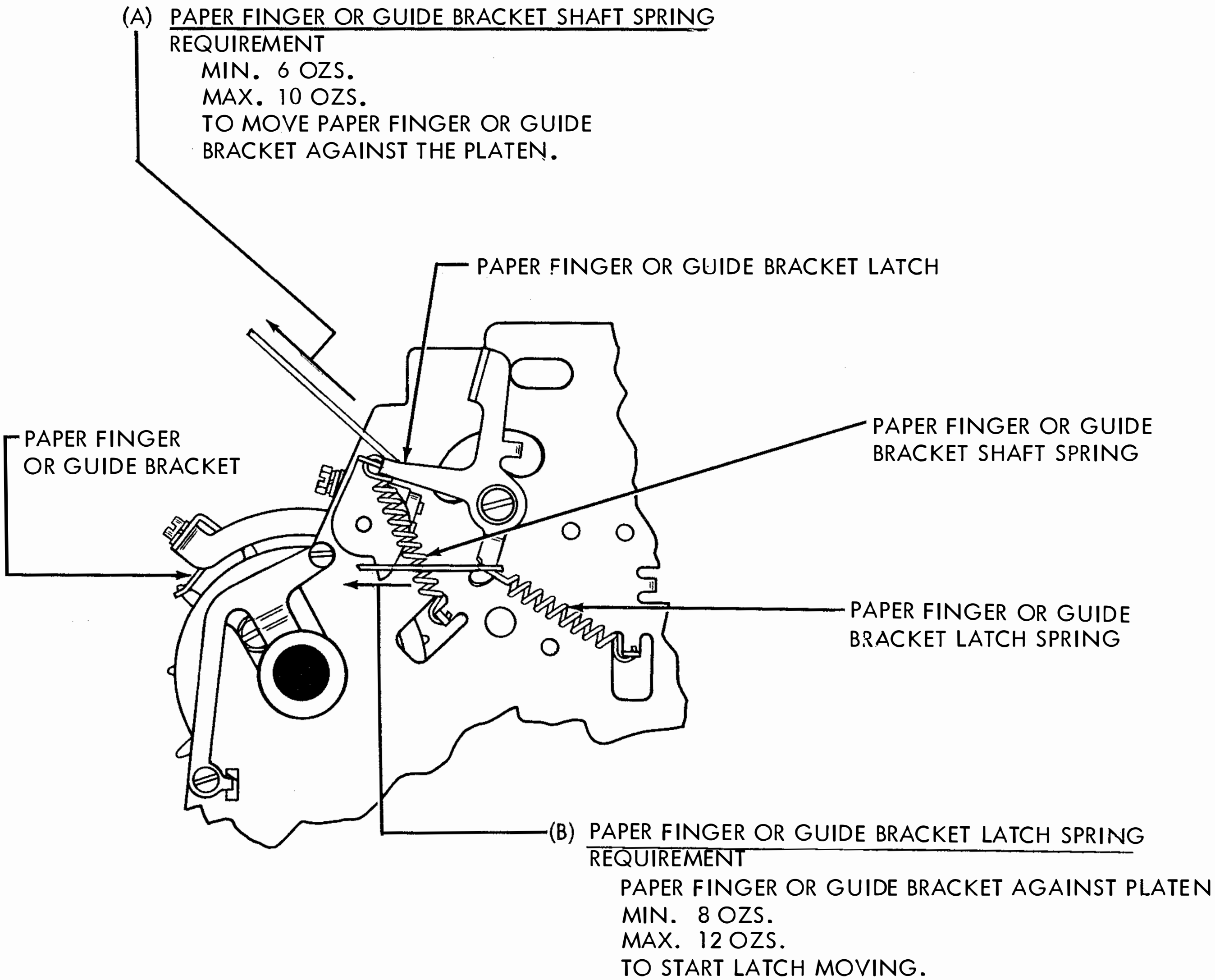
(D)RIBBON REVERSE DETENT

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)



NOTE
SPROCKET FEED MECHANISM WITH RETRACTABLE PINS

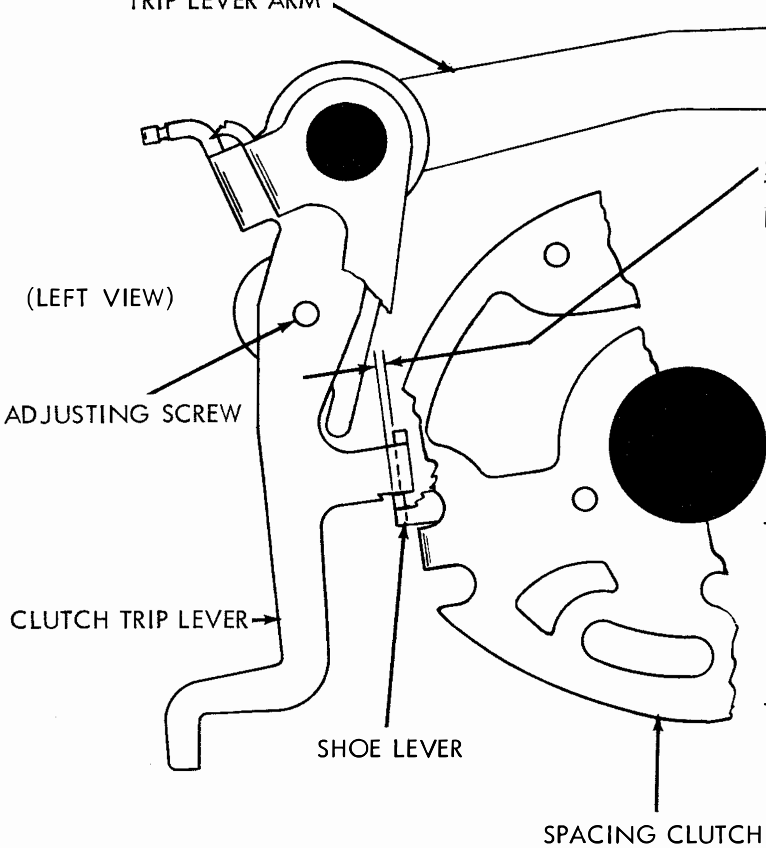
PAPER FINGER LOCKING ARM SPRING
REQUIREMENT --- IT SHALL REQUIRE
MIN 1 OZ --- MAX 1-1/2 OZS
TO MOVE ARM AWAY FROM PLATEN

PLATEN DETENT BAIL SPRING
USE PAR. 2.57

3. VARIABLE FEATURES

3.01 Horizontal Tabulator Mechanism

NOTE: FOR EARLIER DESIGN SEE PARS. 4.24 THROUGH 4.29.



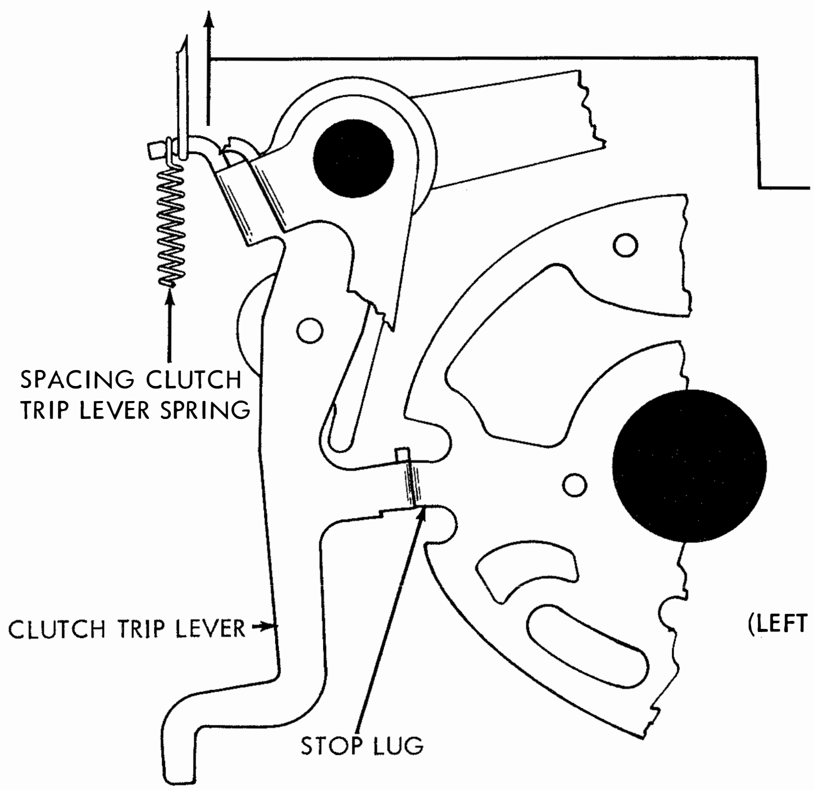
SPACING CLUTCH TRIP LEVER

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



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

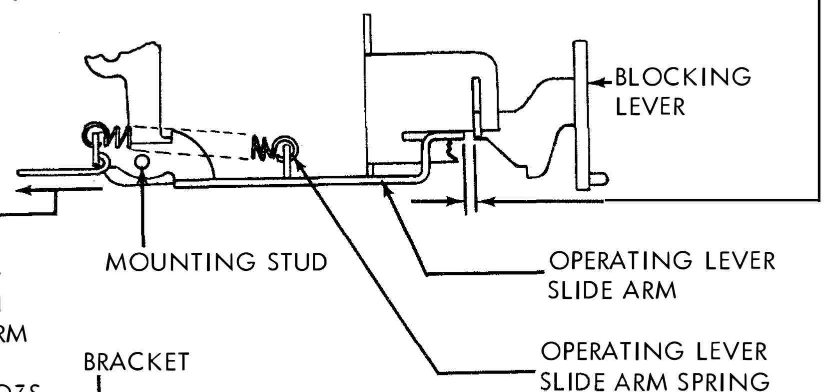
TO ADJUST

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)



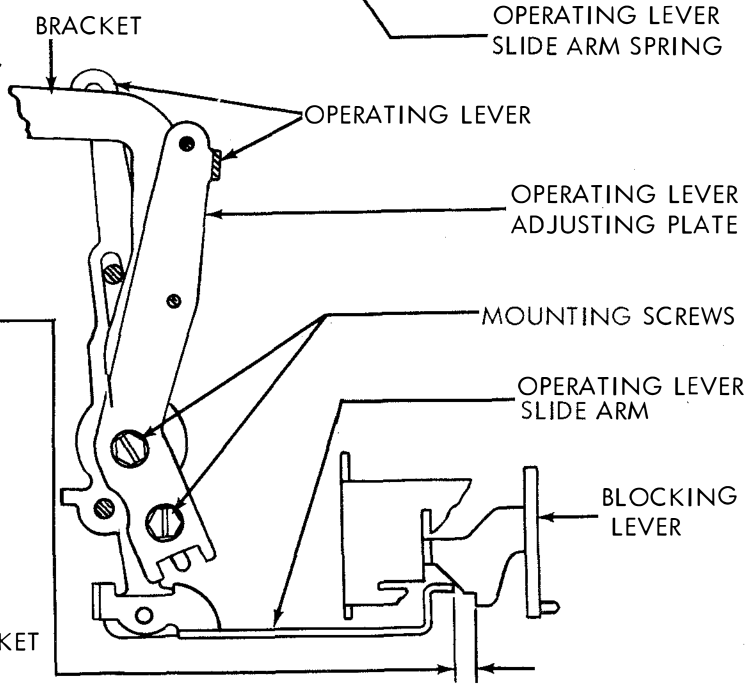
OPERATING LEVER SLIDE ARM SPRING

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

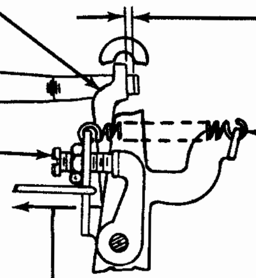
TO ADJUST

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.

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.

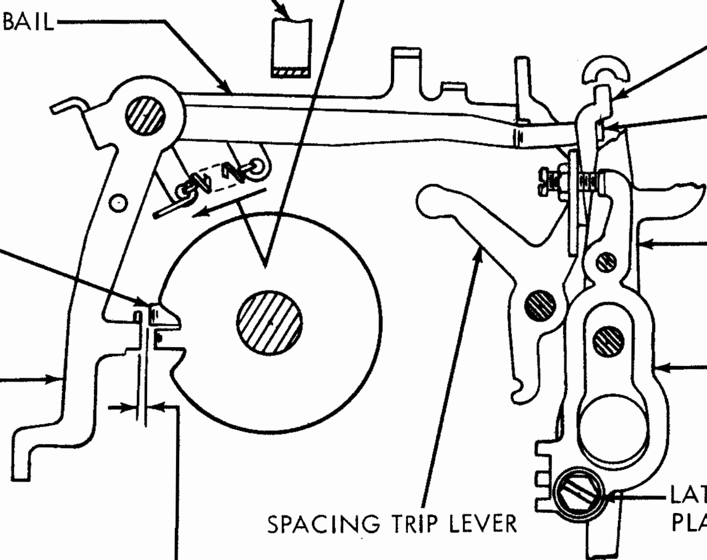
MIN. 2-1/2 OZS.---MAX. 4-1/2 OZS. TO START LATCH BAIL MOVING.

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.



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

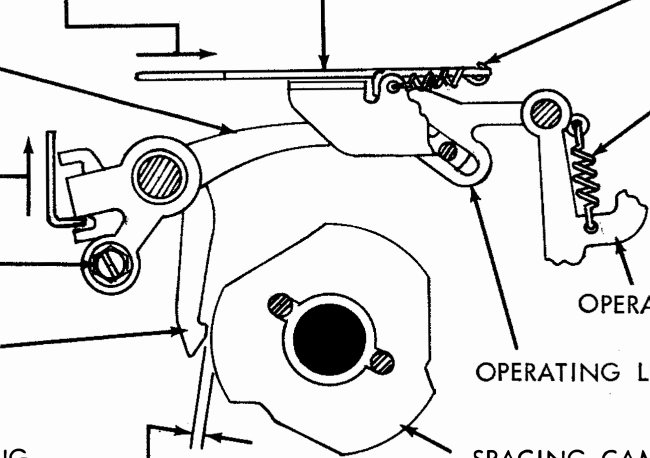
TO ADJUST

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 OPERATED POSITION.
SLIDE ARM IN UNOPERATED POSITION.
MIN. 1 OZ.
MAX. 4 OZS.
TO START SLIDE ARM MOVING.



(LEFT SIDE VIEW)

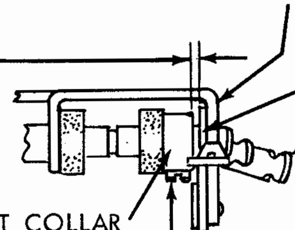
OPERATING LEVER CAM ARM SPRING

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 FRICTION TIGHT.



(BOTTOM VIEW)

SPACING CUT-OUT TRANSFER BAIL SET COLLAR

REQUIREMENT
TRANSFER BAIL SHOULD HAVE SOME END PLAY.
MAX. 0.008 INCH

TO ADJUST
POSITION SET COLLAR WITH ADJUSTING SCREW LOOSENED

3.05 Horizontal Tabulator Mechanism (Cont.)

SPACE SUPPRESSION BY-PASS SPRING

REQUIREMENT
MIN. 20 OZS.
MAX. 26 OZS.
TO START BAIL EXTENSION MOVING

RIGHT MARGIN

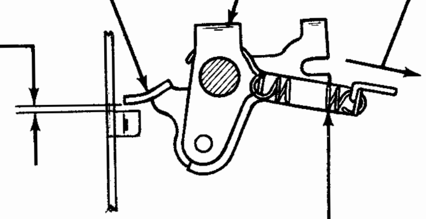
REQUIREMENT
CLEARANCE BETWEEN SPACING CUT-OUT LEVER ON SPACING DRUM AND BAIL EXTENSION ARM

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.

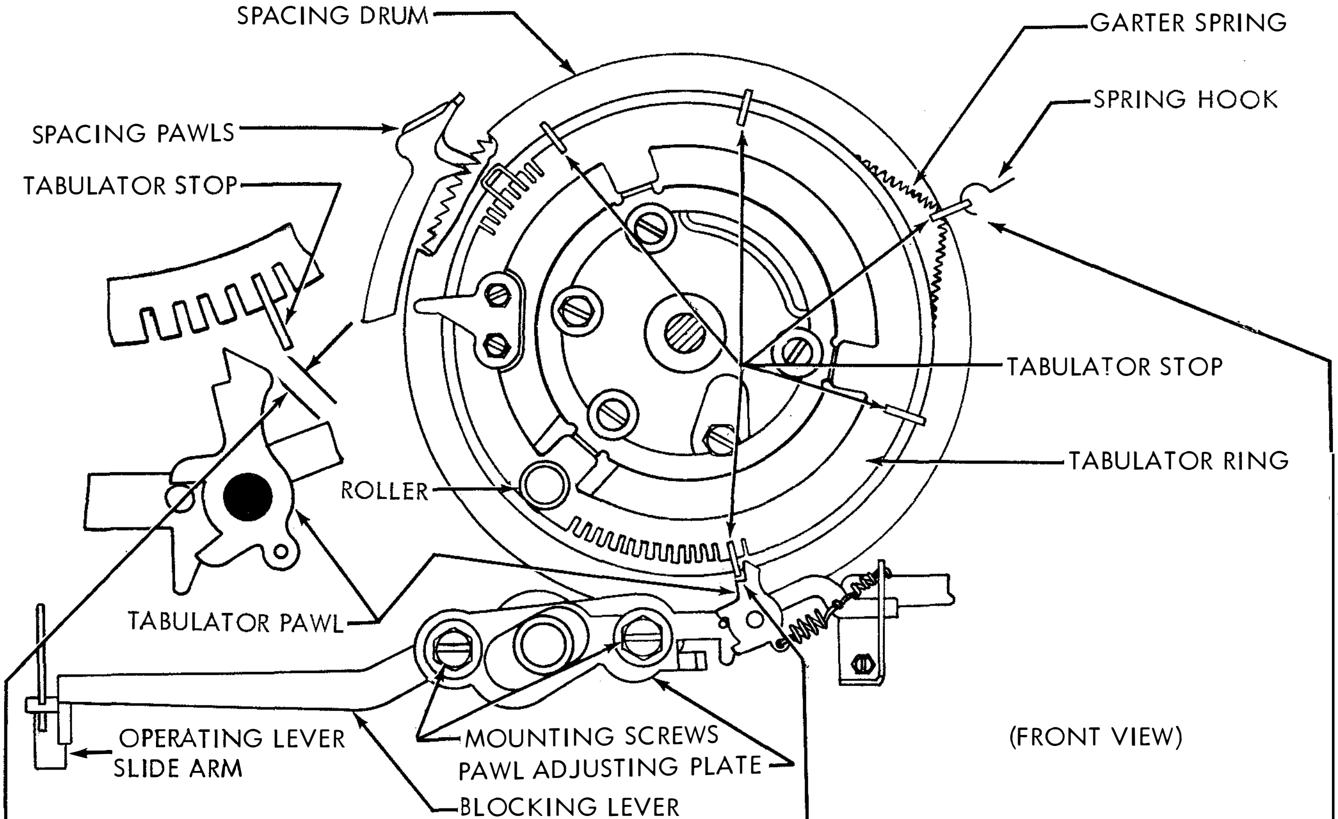
TO ADJUST
POSITION CUT-OUT LEVER WITH CLAMP SCREW LOOSENED.

NOTE
FOUR SCREWS MUST BE LOOSENED TO ADJUST CIRCULAR CUT-OUT LEVERS. DO NOT LOOSEN HEX. HEAD SCREW THAT CLAMPS FRONT RING.



(RIGHT SIDE VIEW)

3.06 Horizontal Tabulator Mechanism (Con't)



TABULATOR PAWL (PRELIMINARY)

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 RADIALLY 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.

3.07 Horizontal Tabulator Mechanism (Cont.)

TABULATOR PAWL - VERTICAL (FINAL)

TO CHECK

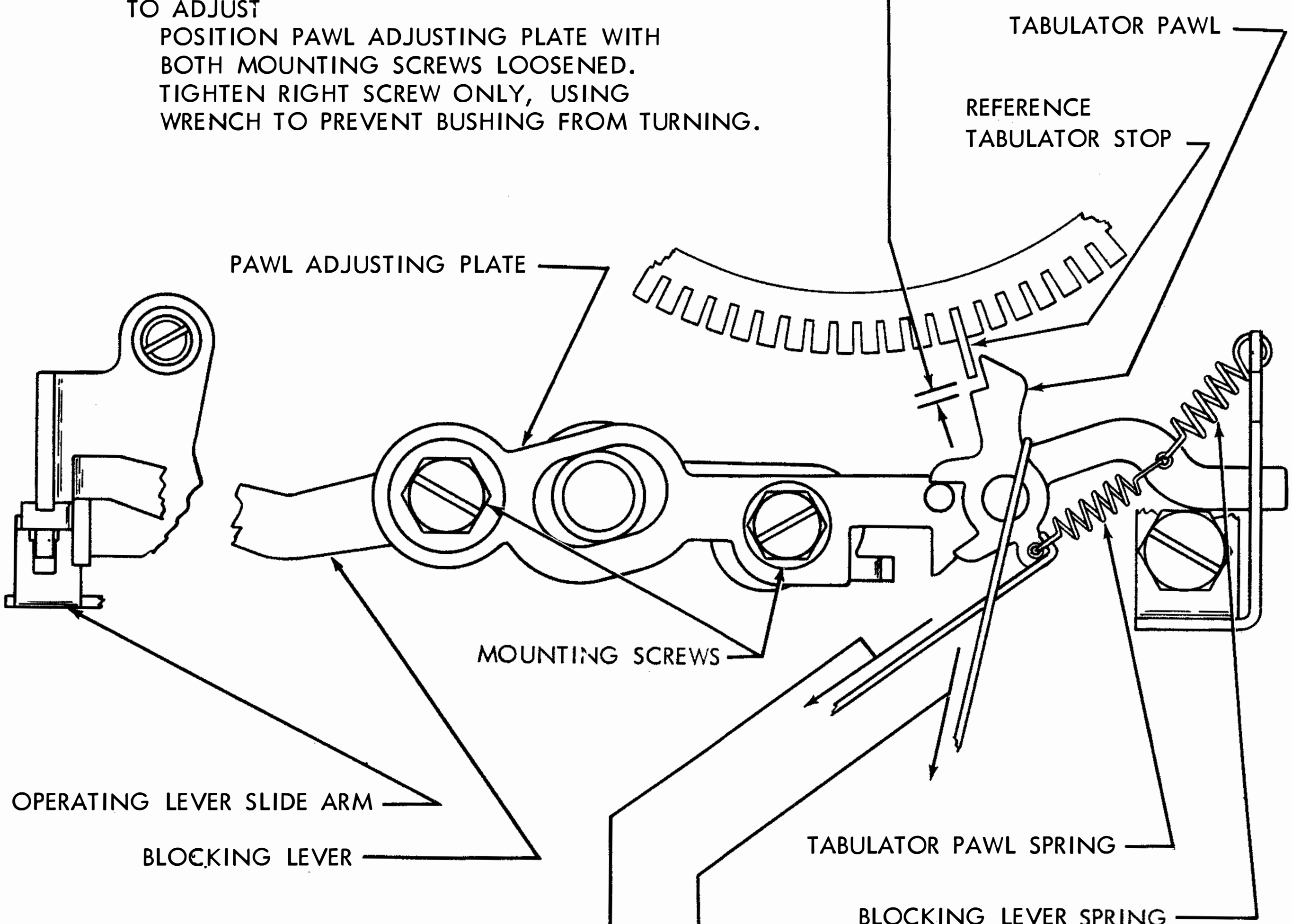
POSITION SPACING DRUM SUCH THAT REFERENCE TABULATOR STOP, AS DETERMINED BY PRELIMINARY TABULATOR PAWL ADJUSTMENT (PAR. 3.06), IS OPPOSITE SHOULDER ON PAWL. BLOCK OPERATING LEVER SLIDE ARM WITH BLOCKING LEVER.

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.



(FRONT VIEW)

TABULATOR PAWL SPRING

REQUIREMENT

MIN. 3 OZS. MAX. 5 OZS.
TO START PAWL MOVING.

BLOCKING LEVER SPRING

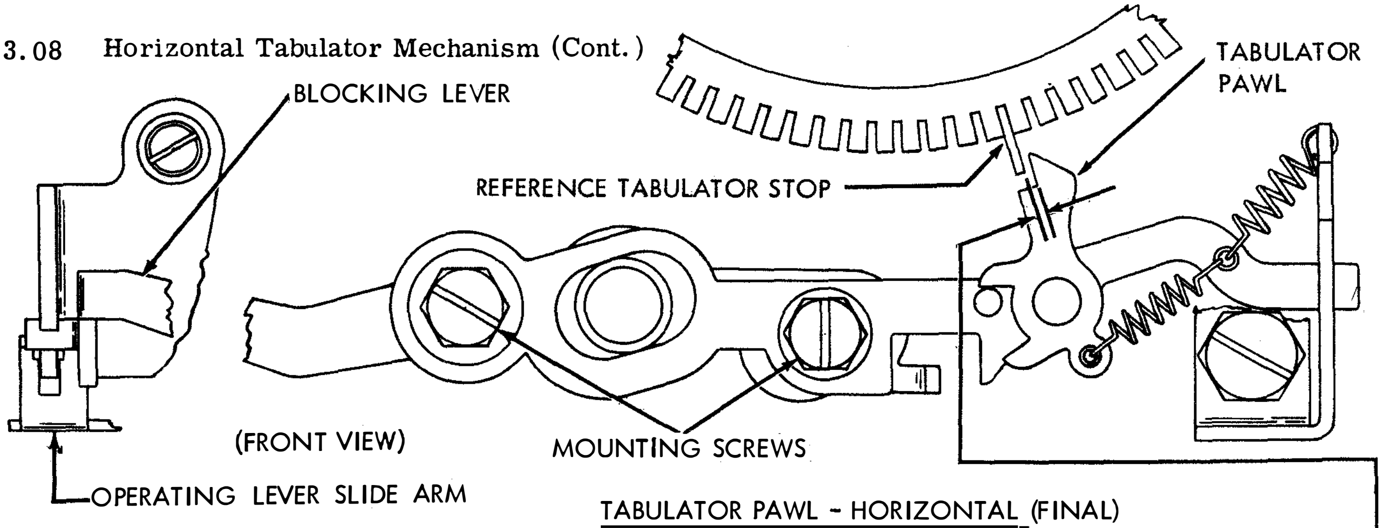
TO CHECK

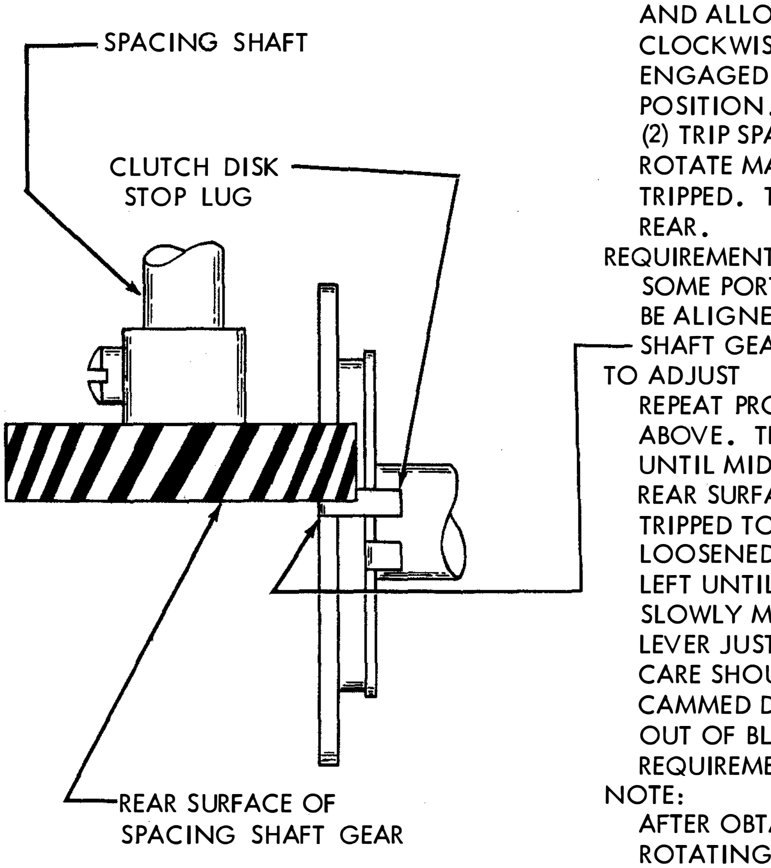
HOLD OPERATING LEVER SLIDE ARM TO THE REAR.

REQUIREMENT

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

3.08 Horizontal Tabulator Mechanism (Cont.)





(BOTTOM VIEW)

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 COUNTER-CLOCKWISE. 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

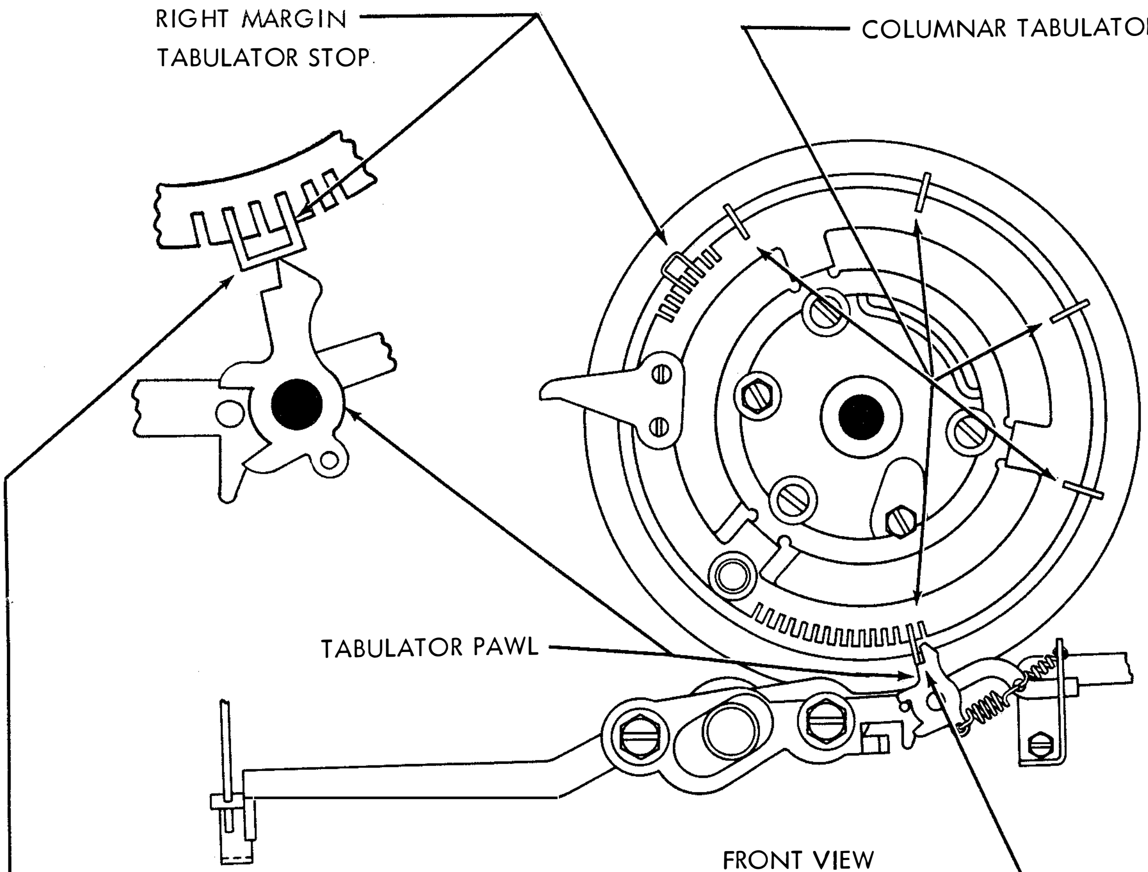
REPEAT PROCEDURE SET FORTH IN PARAGRAPH (1) ABOVE. TRIP SPACING CLUTCH AND ROTATE SHAFT UNTIL MIDDLE OF STOP LUG IS IN LINE WITH REAR SURFACE OF GEAR. IF BLOCKING LEVER TRIPPED TOO SOON, WITH LEFT MOUNTING SCREW LOOSENED, POSITION PAWL ADJUSTING PLATE TO LEFT UNTIL SLIDE ARM CAN BE BLOCKED. SLOWLY MOVE 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.)



TABULATOR STOP SETTINGS

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.

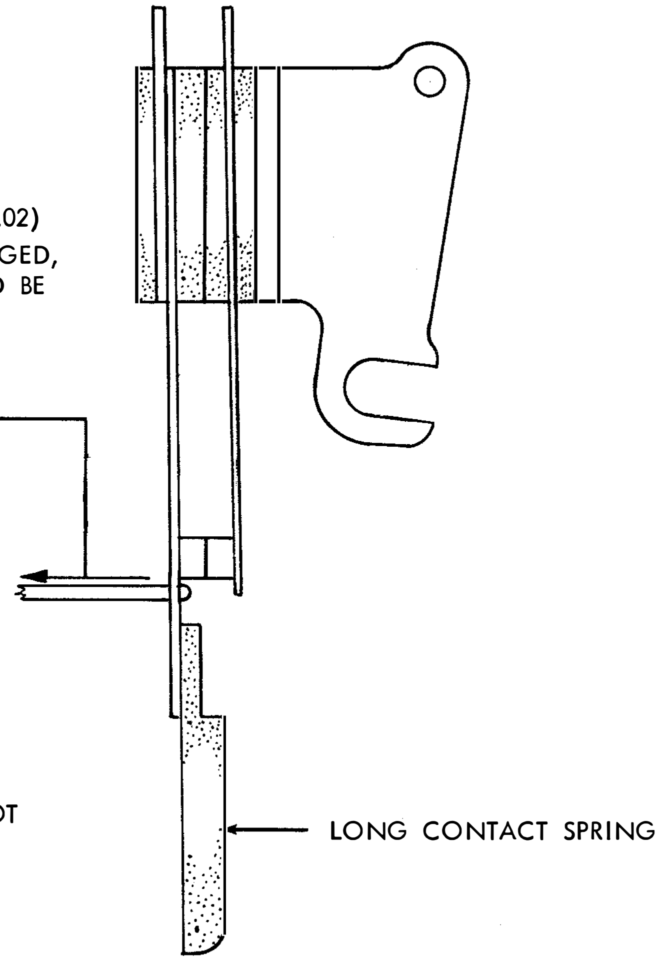
3.10 Horizontal Tabulator Mechanism (Cont.)

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

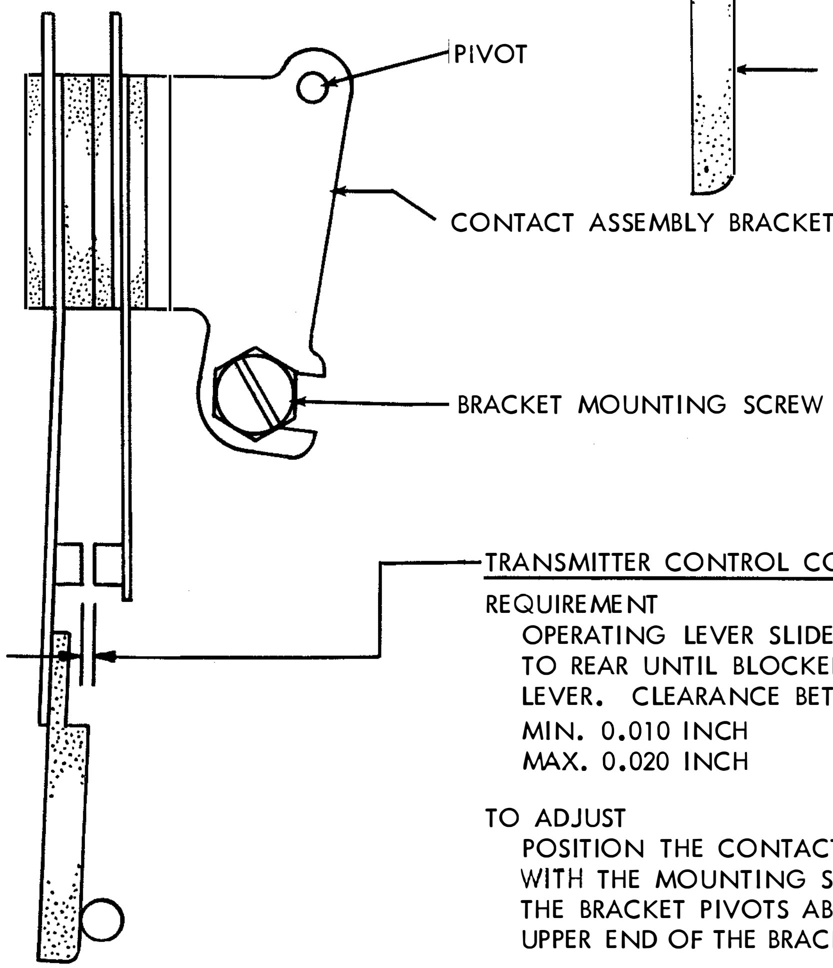
OPERATING LEVER IN UNOPERATED POSITION.

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

TO JUST OPEN CONTACTS.

TO ADJUST

BEND THE LONG CONTACT SPRING



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

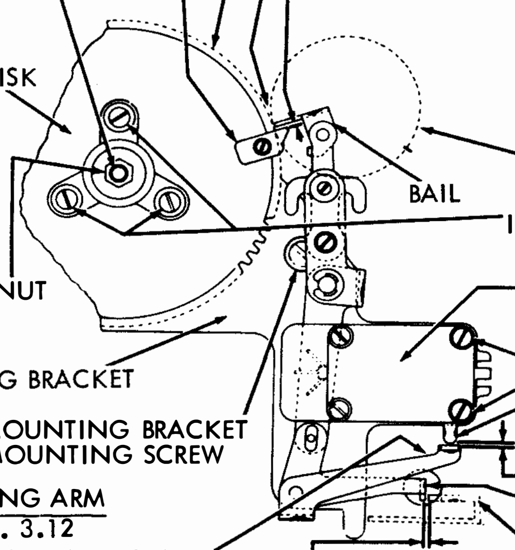
TO ADJUST

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.

(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.



(C) BLOCKING ARM
SEE PAR. 3.12

(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.

(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.

3.12 **Page Feed-Out Mechanism (Cont.)**

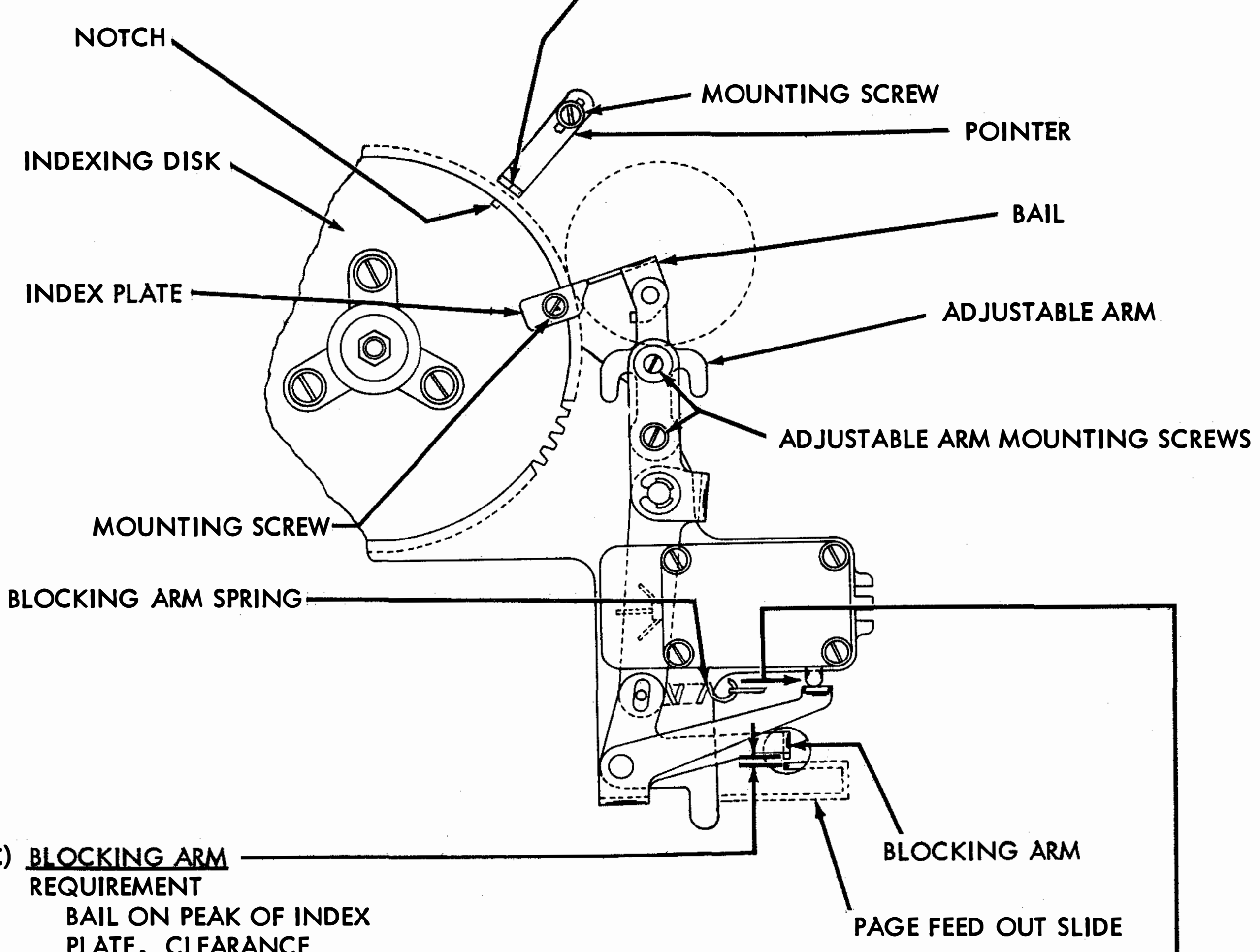
(F) POINTER

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

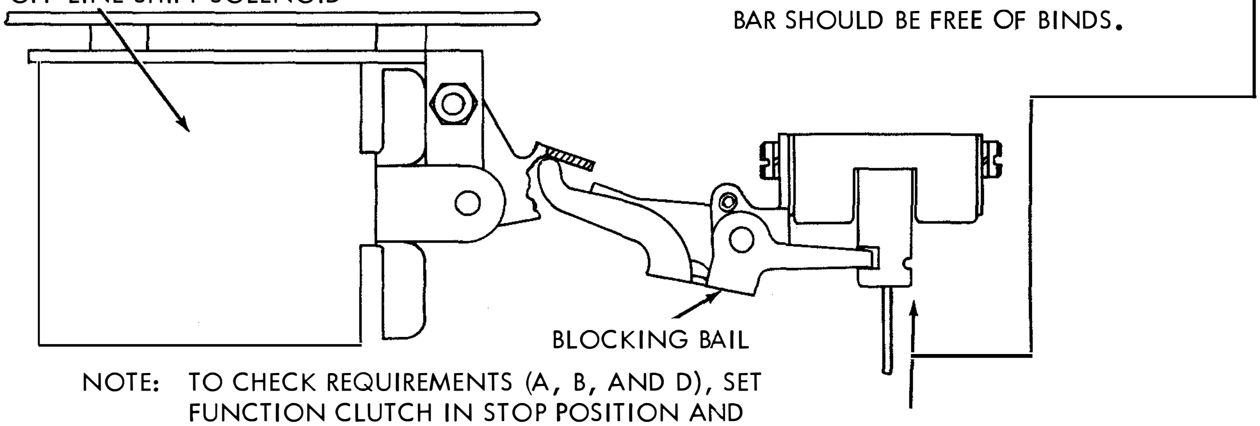
REQUIREMENT

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.

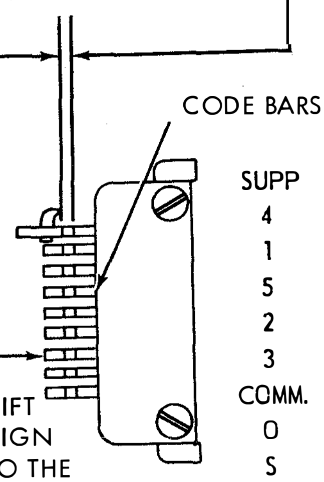
PRINT SUPPRESSOR CODE BAR SPRING
REQUIREMENT
SUPPRESSOR CODE BAR TO LEFT.
MIN. 4-1/2 OZS.---MAX. 7-1/2 OZS. TO START CODE BAR MOVING. CODE BAR SHOULD BE FREE OF BINDS.



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.

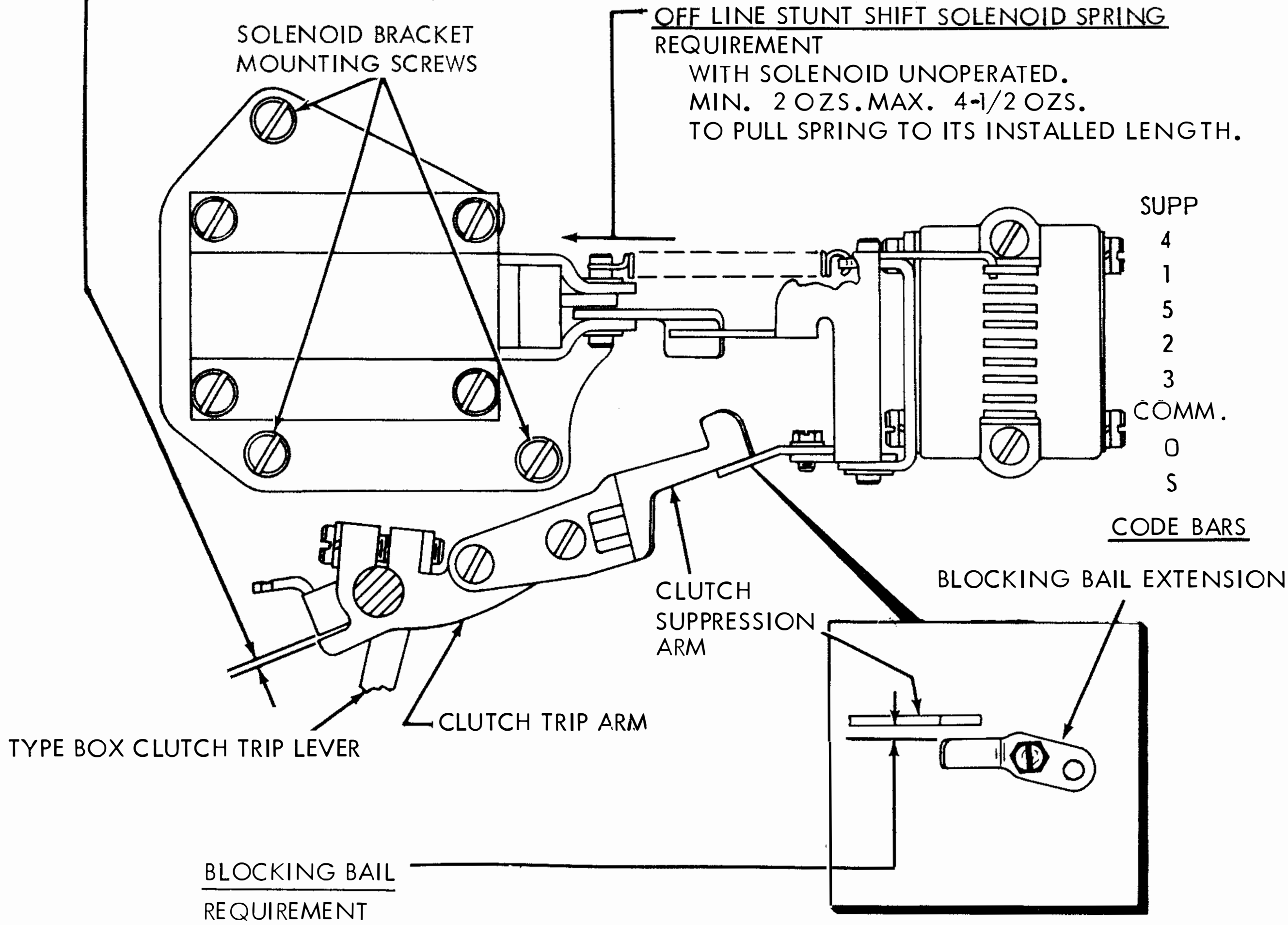
TO ADJUST

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.



BLOCKING BAIL

REQUIREMENT

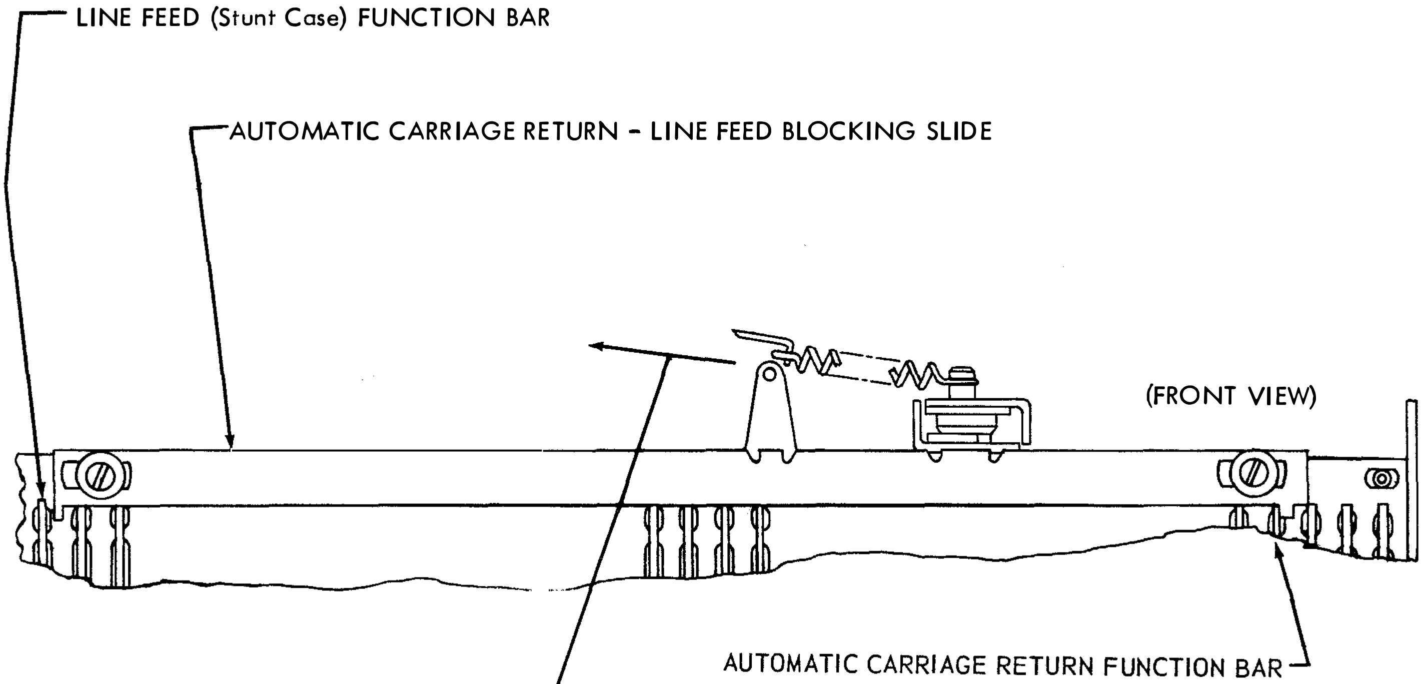
1. LATCH FUNCTION LEVER OF ANY STUNT CASE CODE BAR SHIFT MECHANISM AND ROTATE MAIN SHAFT UNTIL LOWER SURFACE OF THE SUPPRESSION ARM IS ALIGNED (APPROX) WITH BOTTOM SURFACE OF BLOCKING BAIL EXTENSION. CLEARANCE BETWEEN SUPPRESSION ARM AND BLOCKING BAIL EXTENSION, WITH PLAY TAKEN UP TO PRODUCE MINIMUM 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.

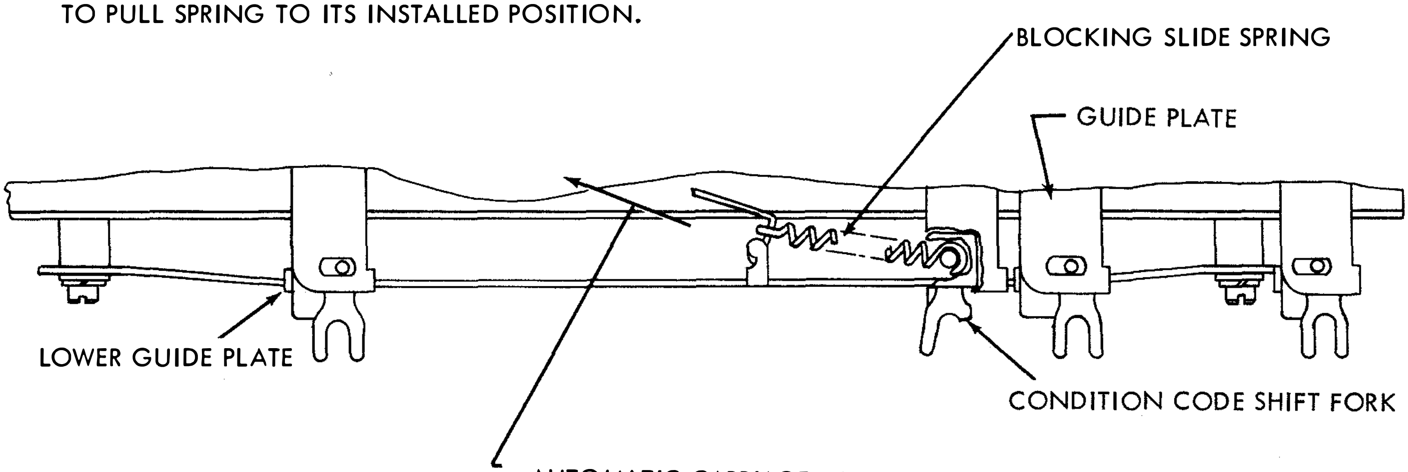
2. REFINE THE STUNT CASE CODE BAR SHIFT MECHANISM ADJUSTMENT OF ANY SHIFT MECHANISM THAT DOES NOT MEET THE ABOVE REQUIREMENT.

3.15 Selective Calling Mechanism (Cont.)



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.



(TOP VIEW)

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

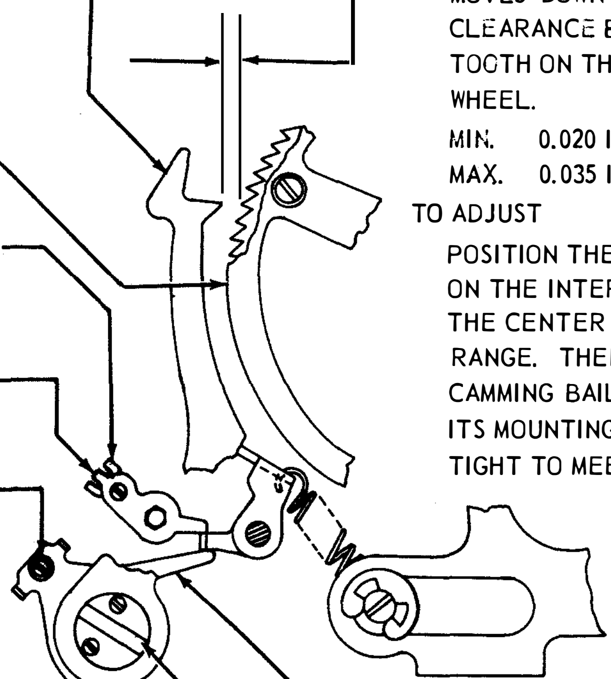
REQUIREMENT

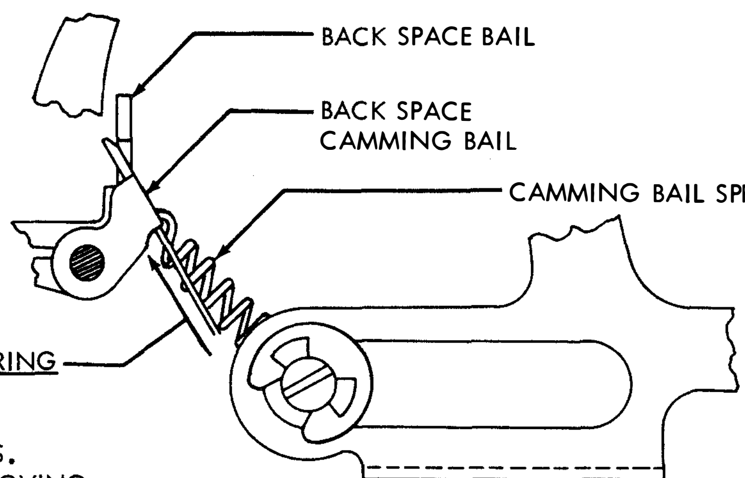
SPACING CLUTCH DISENGAGED, FRONT FEED PAWL IN LOWER POSITION, BACK SPACE BAIL HELD OPERATED, CLUTCH TRIPPED AND MAIN SHAFT ROTATED UNTIL THE FRONT FEED PAWL TOOTH IS OPPOSITE THE PEAK OF THE FIRST SPACING DRUM TOOTH THAT MOVES DOWN PAST THE PAWL TOOTH. CLEARANCE BETWEEN PAWL TOOTH AND THE TOOTH ON THE 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 FRICTION TIGHT TO MEET THE REQUIREMENT.



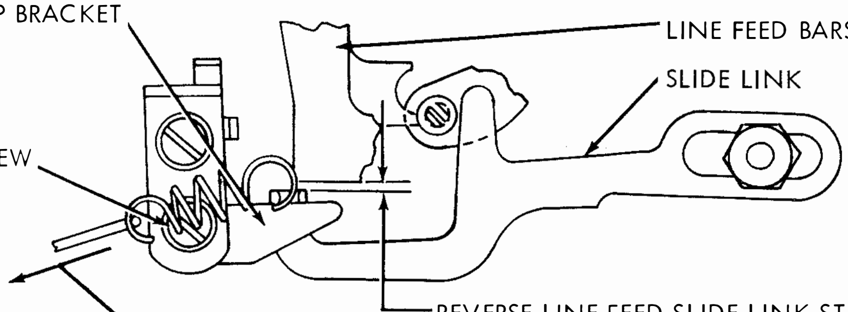


CAMMING BAIL SPRING

REQUIREMENT

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

3.17 Reverse Line Feed Mechanism



REVERSE LINE FEED SLIDE LINK SPRING
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.

REVERSE LINE FEED SLIDE LINK STOP BRACKET
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

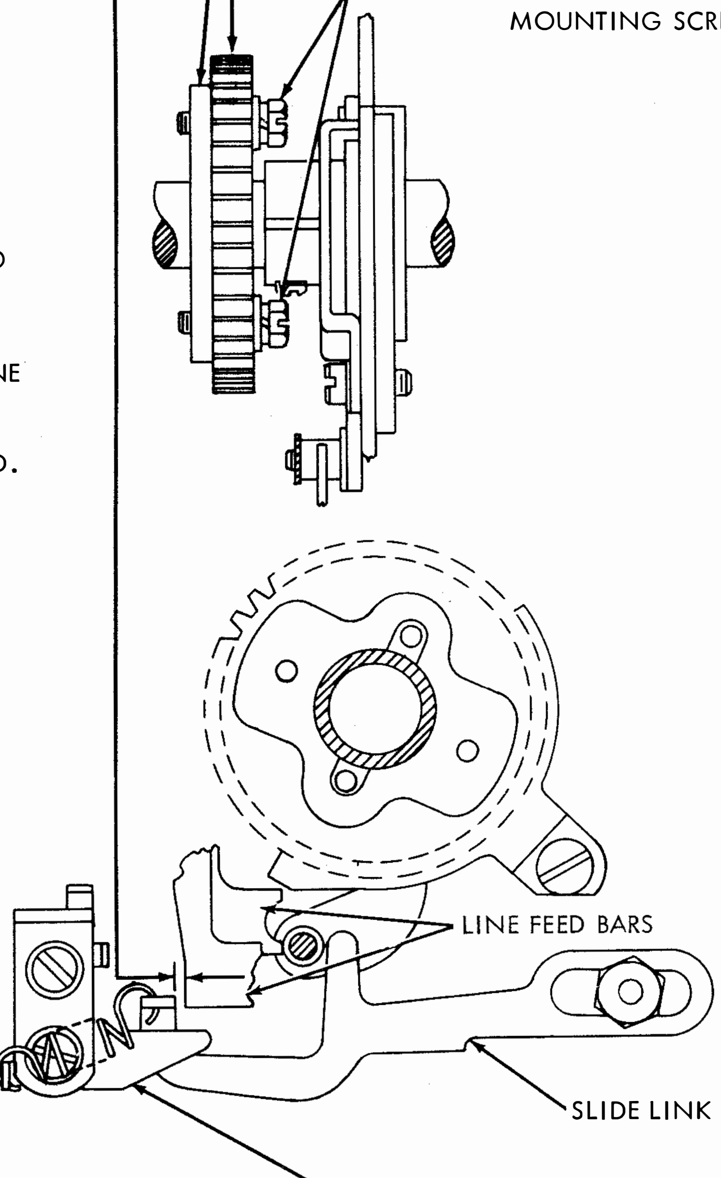
LINE FEED CLUTCH DISENGAGED. SLIDE LINK RAISED UPWARD SO AS TO FULLY ENGAGE THE END OF THE LOWER LINE FEED BAR, SLIDE HELD FORWARD BY ITS SPRING CLEARANCE BETWEEN SLIDE LINK AND LOWER LINE FEED BAR.

MIN. 0.005 INCH

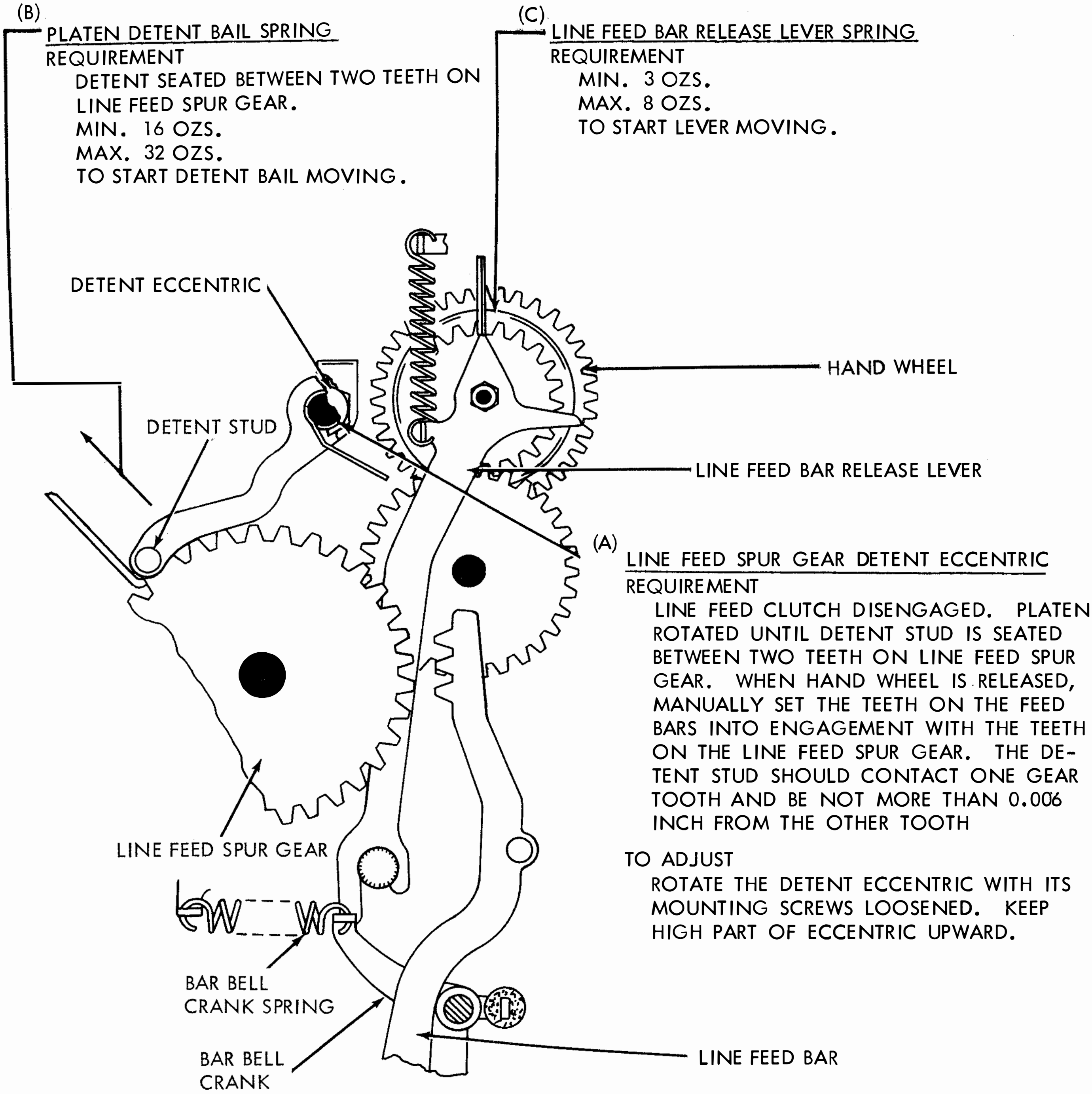
MAX. 0.040 INCH

TO ADJUST

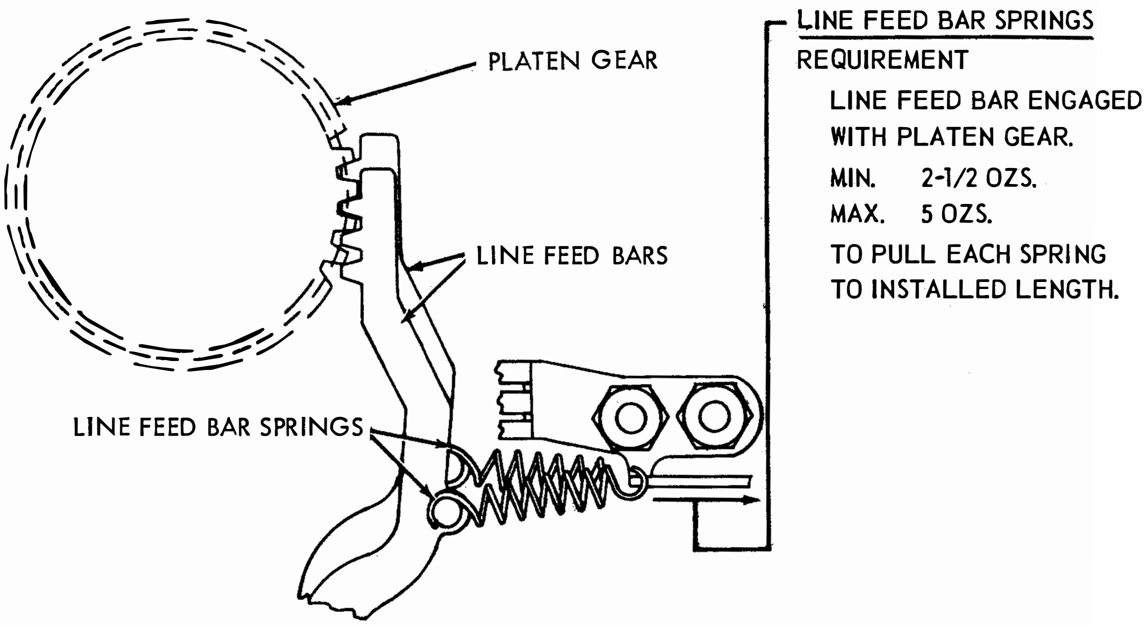
SET LINE FEED CLUTCH SPUR GEAR AT CENTER OF ADJUSTING RANGE DISENGAGE LINE FEED CLUTCH, LOOSEN ECCENTRIC ASSEMBLY BEARING POST. MESH THE TWO GEARS SO THAT THE FOWARD EDGES OF THE LOWER ENDS OF THE LINE FEED BARS ARE IN LINE WITH EACH OTHER WITHIN 0.040 INCH. ROTATE THE LINE FEED CLUTCH SPUR GEAR RELATIVE 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.)



3.20 Reverse Line Feed Mechanism (Cont.)

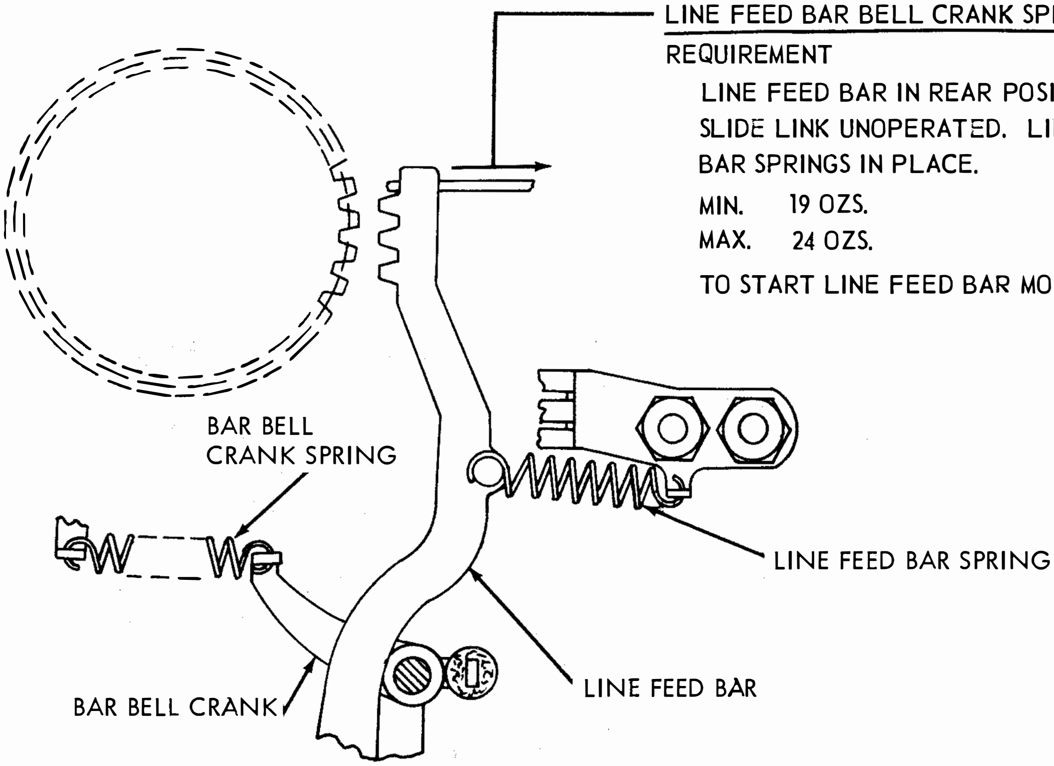


3.21 Reverse Line Feed Mechanism (Cont.)

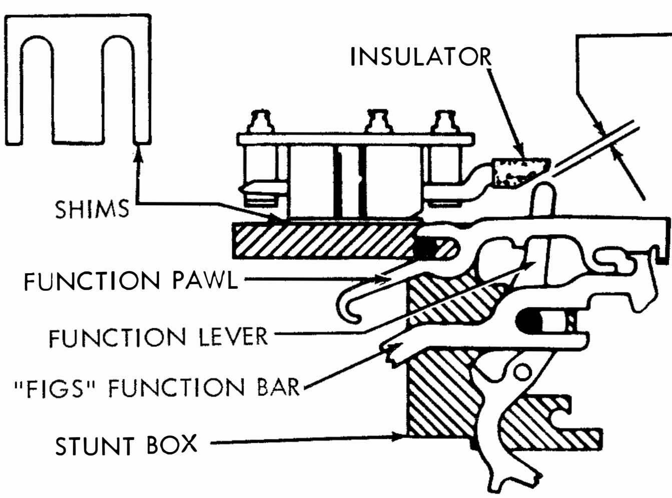
LINE FEED BAR BELL CRANK SPRING

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.



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

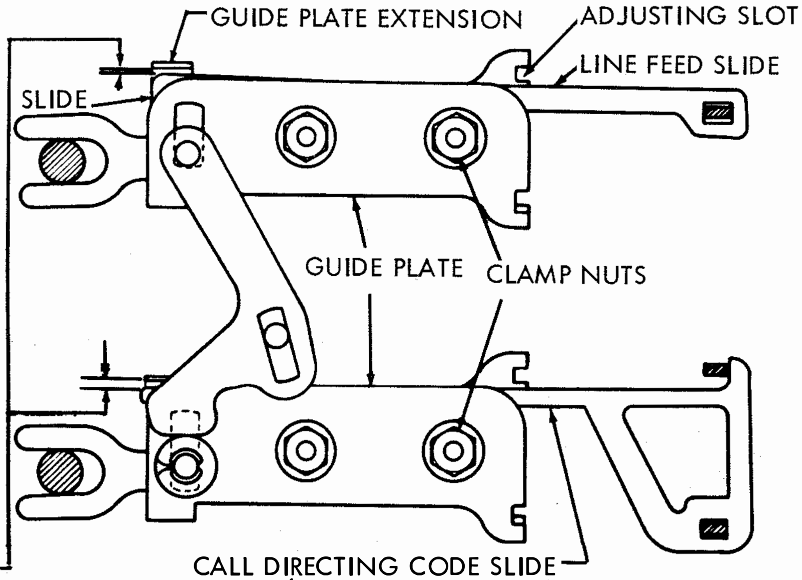
TO CHECK

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 LOOSEN-
ED, 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.

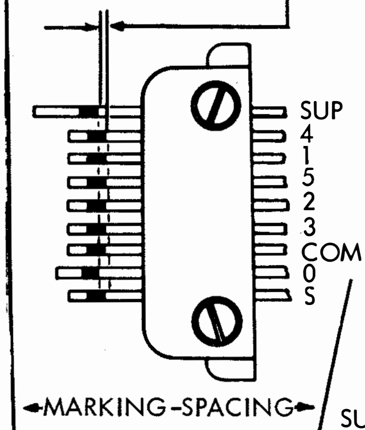
(2) REQUIREMENT

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.

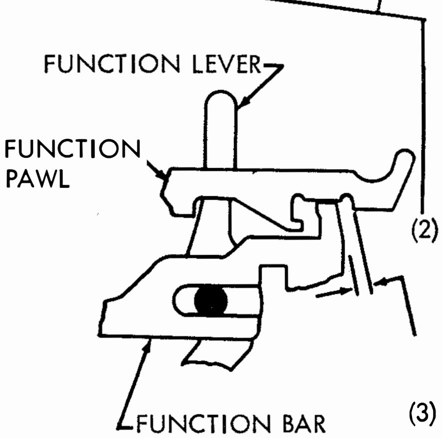
TO ADJUST

POSITION THE GUIDE PLATE BY ITS LOWER ADJUSTING SLOT WITH ITS CLAMP NUTS LOOSENED.

(3) REQUIREMENT

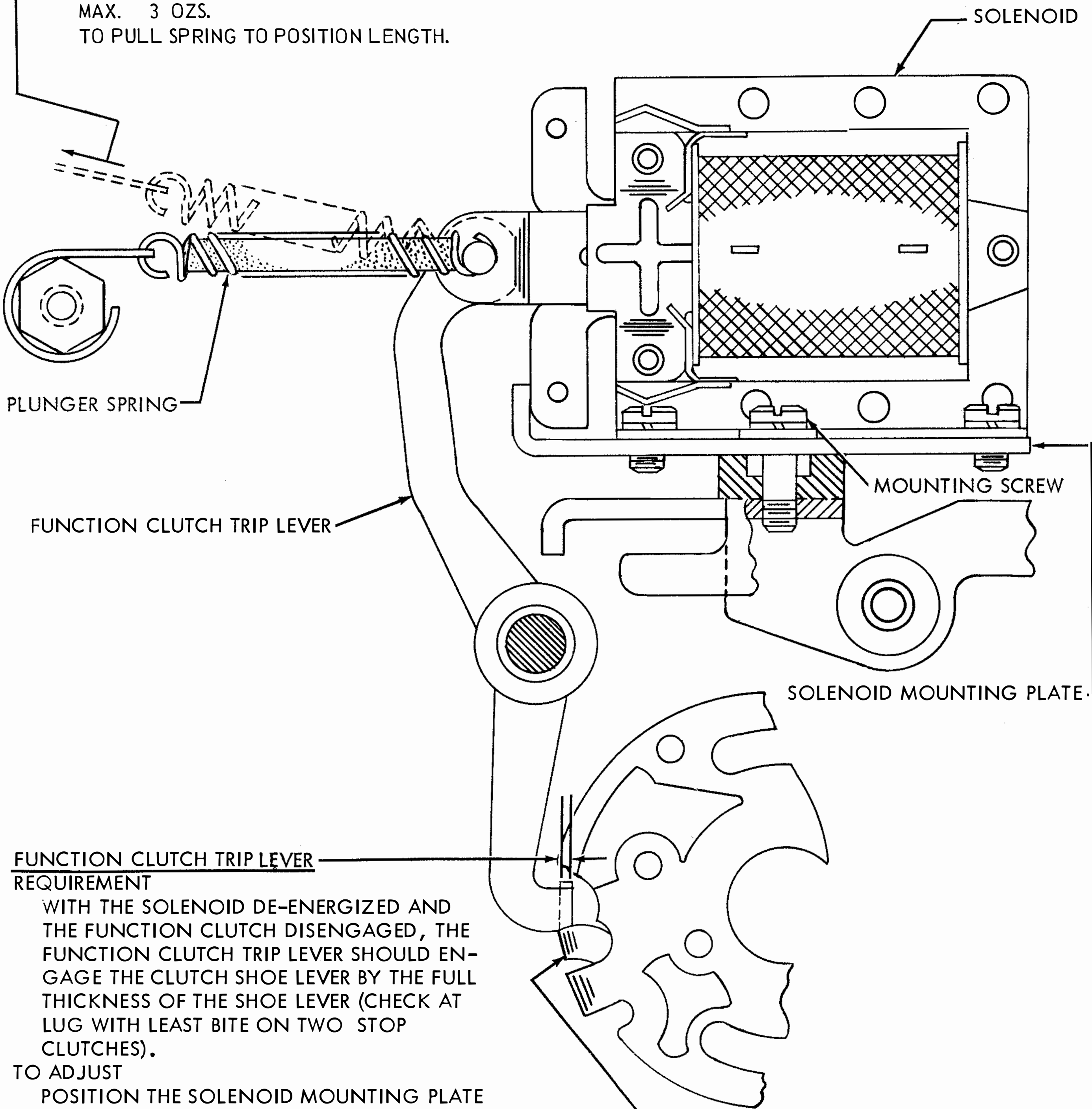
THERE SHOULD BE SOME CLEARANCE BETWEEN THE REAR END OF THE FUNCTION BAR AND THE FACE OF THE NOTCH ON THE FUNCTION PAWL WHEN THE LINE FEED FUNCTION PAWL AND CALL DIRECTING FUNCTION PAWL ARE ALTERNATELY HOOKED OVER THEIR RESPECTIVE FUNCTION BAR.

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
WITH THE SOLENOID DE-ENERGIZED AND THE FUNCTION CLUTCH DISENGAGED, THE FUNCTION CLUTCH TRIP LEVER SHOULD ENGAGE THE CLUTCH SHOE LEVER BY THE FULL THICKNESS OF THE SHOE LEVER (CHECK AT LUG WITH LEAST BITE ON TWO STOP CLUTCHES).
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

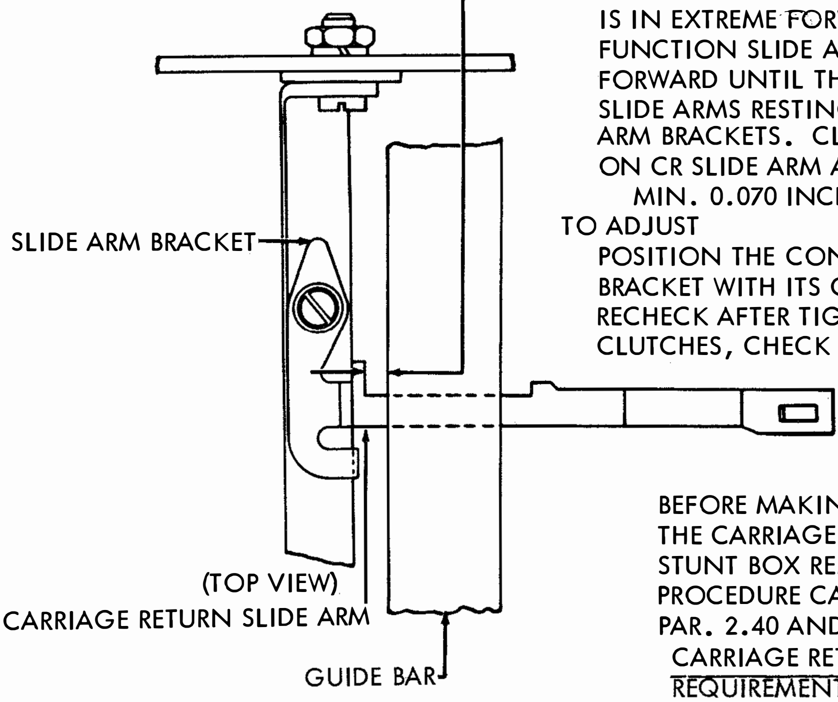
REQUIREMENT

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.



(TOP VIEW)

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.

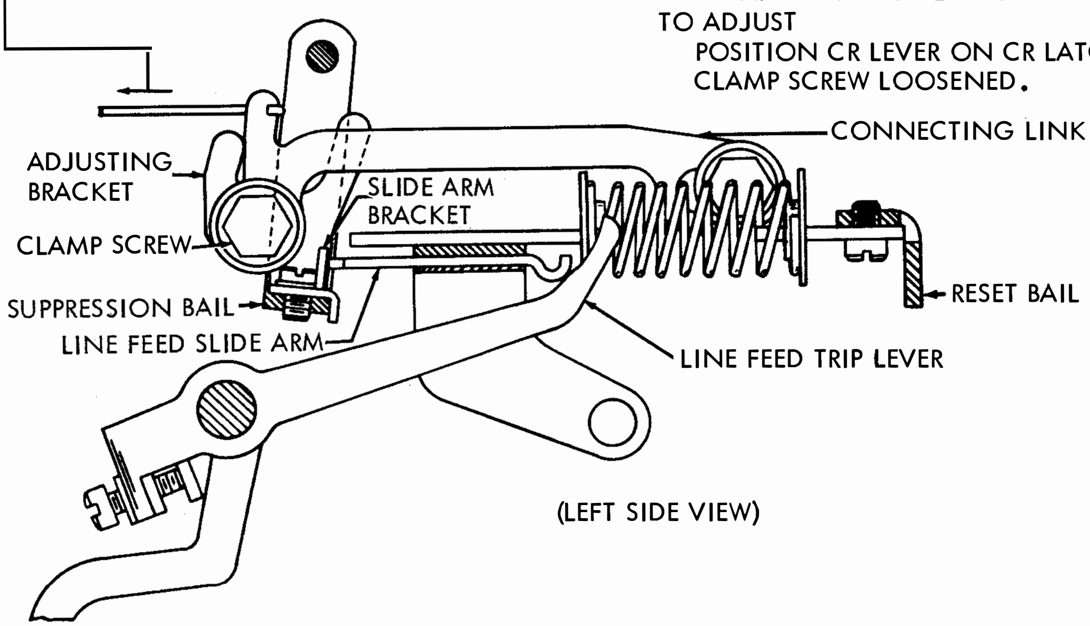
RESET BAIL OPERATING SPRING

REQUIREMENT

FUNCTION RESET BAIL IN FORWARD POSITION

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

TO START BAIL MOVING.



(LEFT SIDE VIEW)

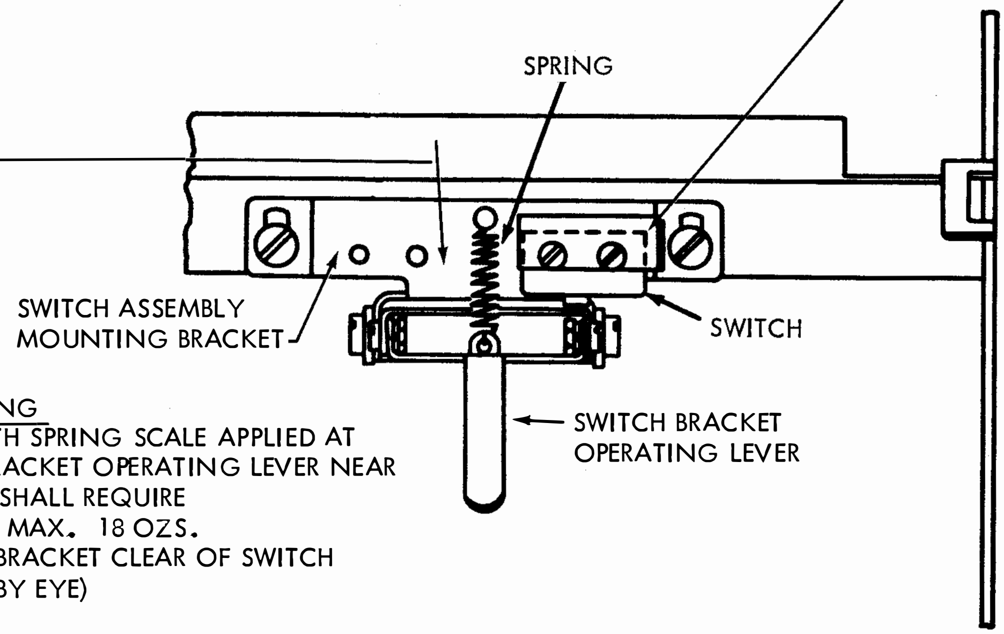
3.26 Paper-Out Alarm Mechanism

FOR EARLY DESIGN
SEE PARAGRAPH 4.30

(A) SWITCH POSITION

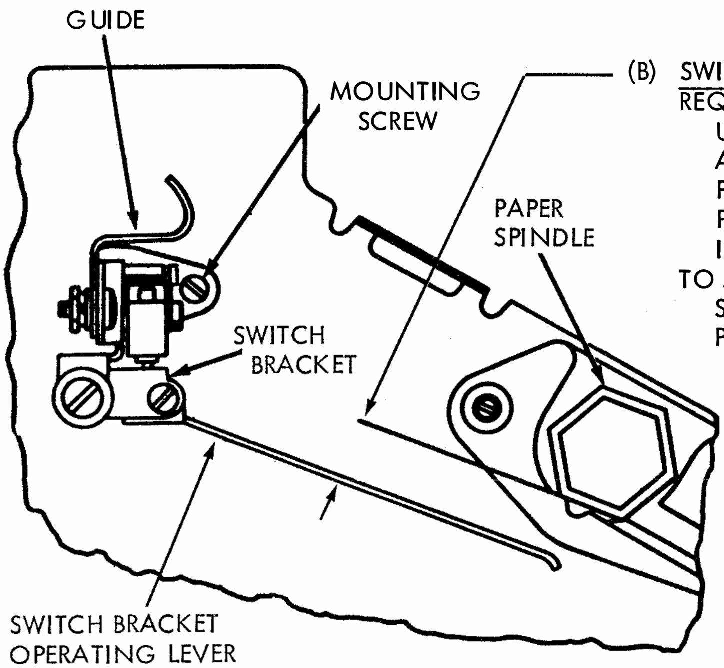
REQUIREMENT --- HORIZONTAL AXIS OF SWITCH SHALL LIE IN A PLANE PARALLEL TO THE SWITCH BRACKET WHEN THE SWITCH IS MOVED TOWARD UPPER LIMIT OF ITS TRAVEL IN THE MOUNTING HOLES.

TO ADJUST --- WITH ITS MOUNTING SCREWS (2) LOOSENED, POSITION AND ALIGN THE SWITCH.



(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)



(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.

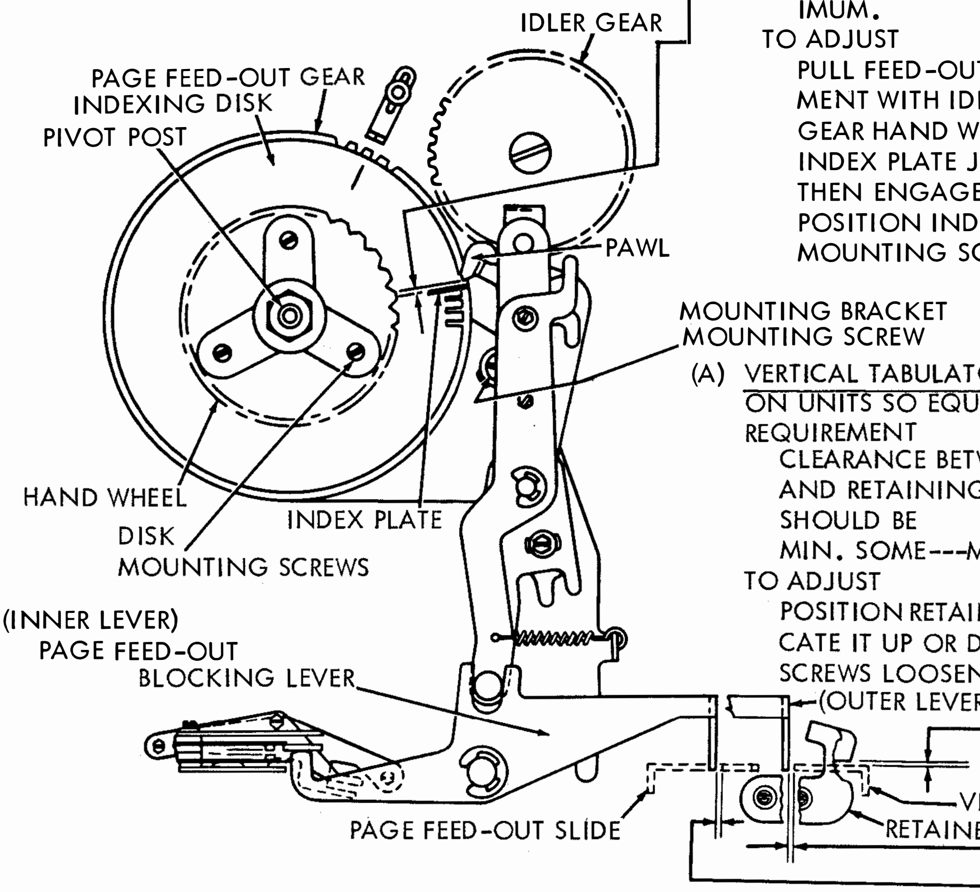
TO ADJUST --- LOOSEN SCREW THAT SECURE THE SWITCH ASSEMBLY MOUNTING BRACKET AND POSITION THE ASSEMBLY UPWARD OR DOWNWARD

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.

(D) BLOCKING LEVER
SEE PAR. 3.28

(E) INDEXING DISK
REQUIREMENT
CLEARANCE BETWEEN INDEX PLATE AND PAWL SHOULD BE
MIN. 0.015 INCH---MAX. 0.040 INCH
TO CHECK
LINE FEED CLUTCH DISENGAGED. INDEX PLATE ADJACENT TO PAWL. SLACK IN GEARS 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.



(A) VERTICAL TABULATOR SLIDE RETAINER
ON UNITS SO EQUIPPED
REQUIREMENT
CLEARANCE BETWEEN VERTICAL TAB SLIDE AND RETAINING EDGE OF RETAINER SHOULD BE
MIN. SOME---MAX. 0.012
TO ADJUST
POSITION RETAINER FORWARD AND LOCATE IT UP OR DOWN WITH MOUNTING SCREWS LOOSENED.

(B) MOUNTING BRACKET
REQUIREMENT
1. CLEARANCE BETWEEN FEED-OUT BLOCKING LEVER (INNER LEVER) AND FEED-OUT SLIDE
MIN. SOME---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.

3.28 Vertical Tabulation and Transmitter Distributor Control Mechanism (Cont.)

(H) POINTER

REQUIREMENT

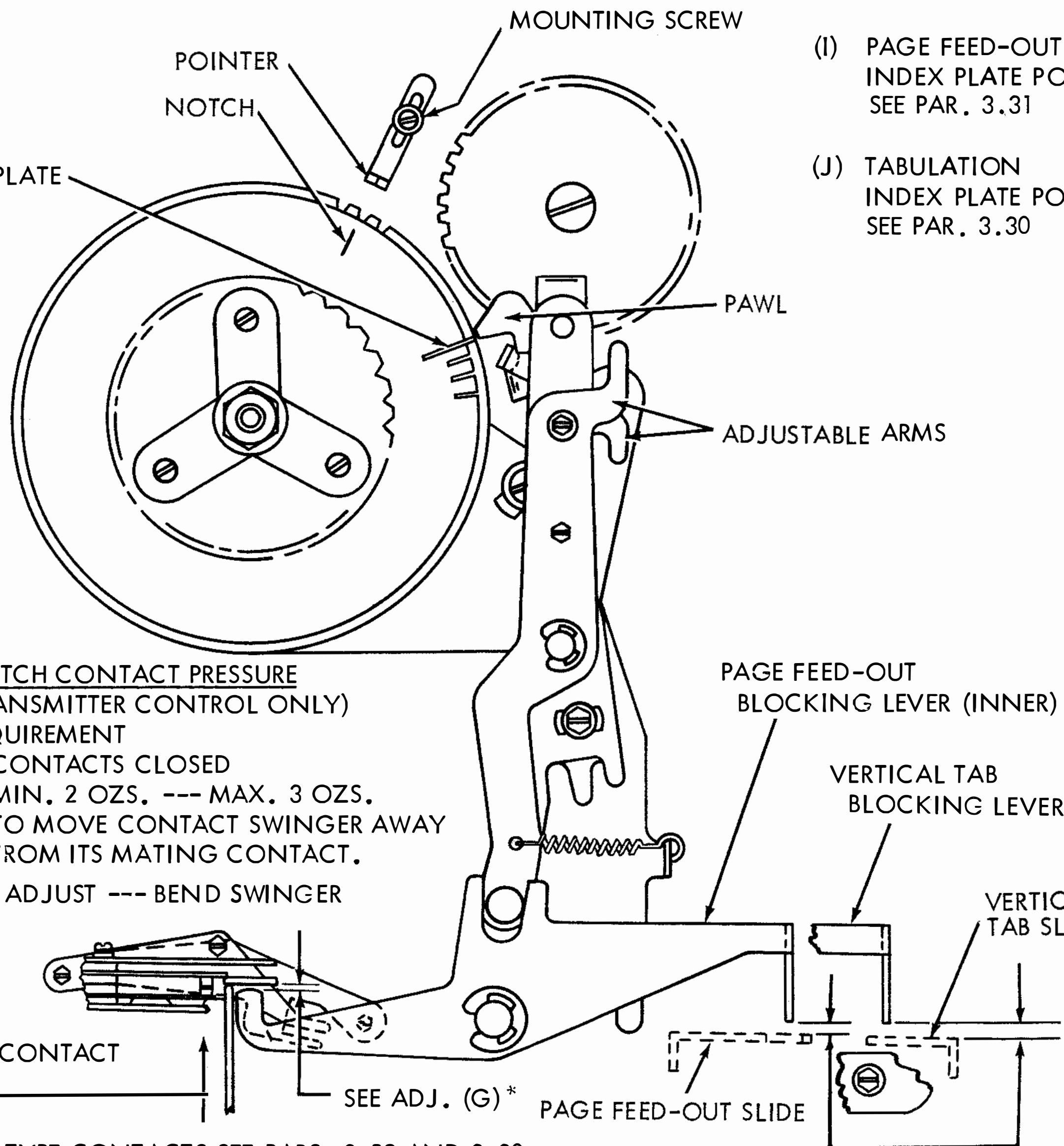
LINE FEED CLUTCH DISENGAGED. INDEX PLATE ADJACENT TO PAWL. POINTER SHOULD LINE UP WITH NOTCH IN INDEXING DISK AND CLEAR ANY INDEX PLATE BY APPROXIMATELY 1/16 INCH.

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

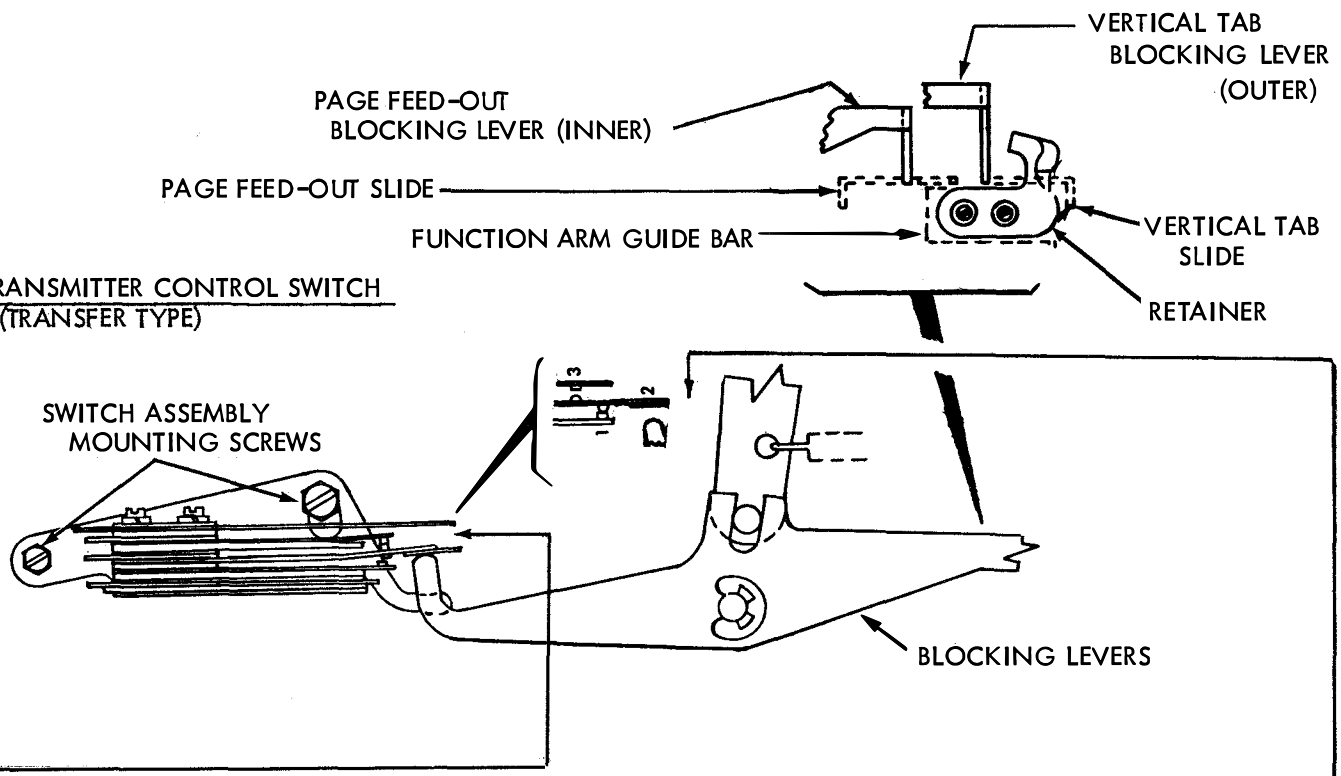
CLEARANCE BETWEEN BOTTOM OF BLOCKING LEVER AND TOP OF SLIDE WHEN PAWL IS ON PEAK OF INDEX PLATE SHOULD BE

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.)**



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 IT STIFFENER AS THE UPPER CONTACT CLOSES.

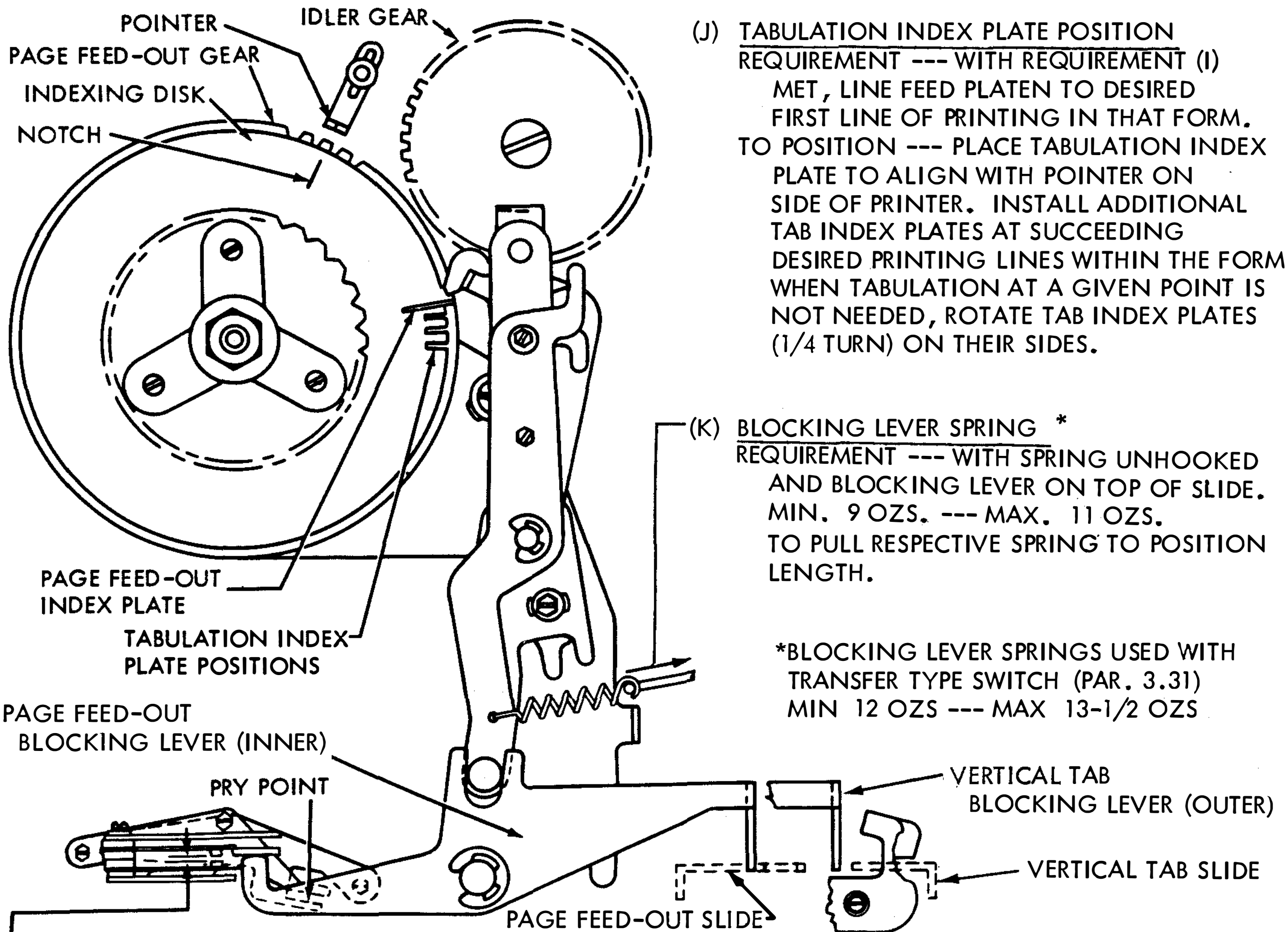
   TO CHECK --- SELECT FEED-OUT CODE COMBINATION, ROTATE MAIN SHAFT UNTIL FEED-OUT SLIDE IS IN ITS EXTREME FORWARD POSITION AND FEED-OUT BLOCKING LEVER DROPS BEHIND ITS SLIDE TO CLOSE NORMALLY OPENED CONTACTS.

   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.)

(l) PAGE FEED-OUT INDEX PLATE POSITION

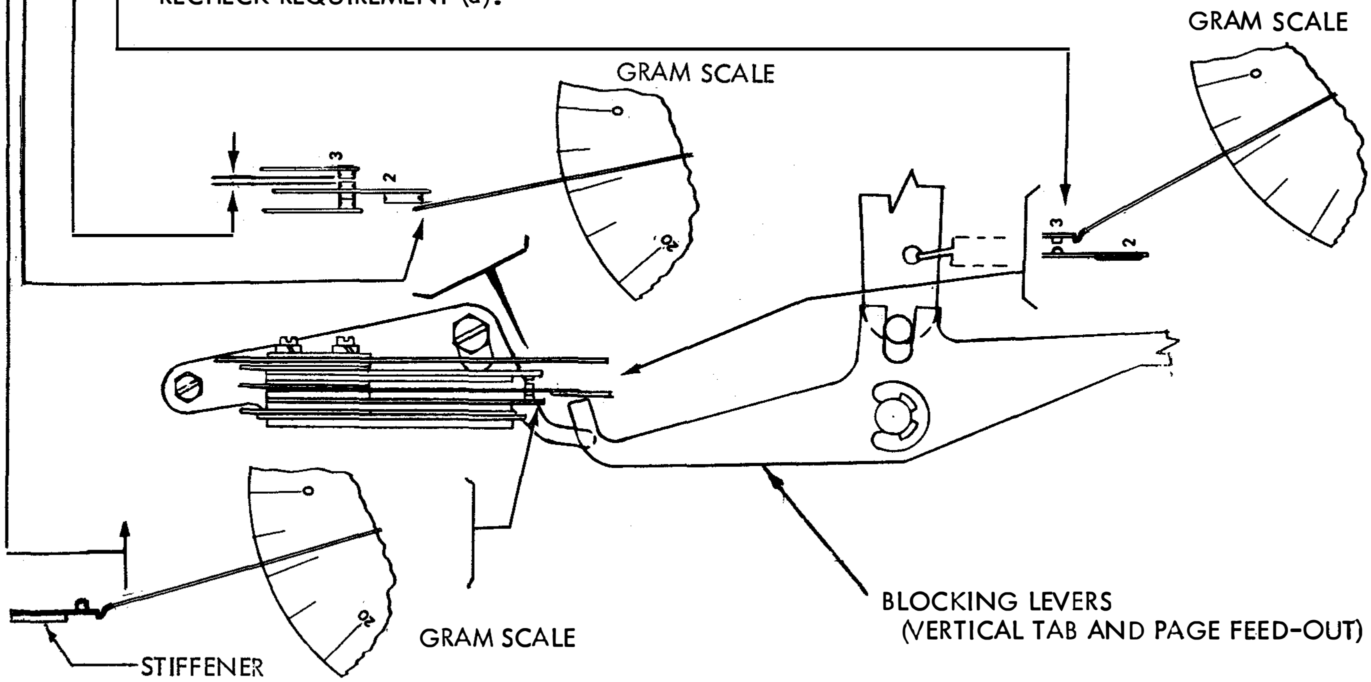
REQUIREMENT --- PLACE AN INDEX PLATE IN THE NUMBERED SLOTS ON DISK CORRESPONDING TO LENGTH OF PAGE FORM TO BE USED. SYNCHRONIZE PAGE FEED-OUT WITH A FORM BY POSITIONING FORM SO THAT TYPING UNIT WILL PRINT IN FIRST TYPING LINE OF THE FORM. WHEN TYPING UNIT IS IN STOP POSITION, TOP OF RIBBON GUIDE SHOULD 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

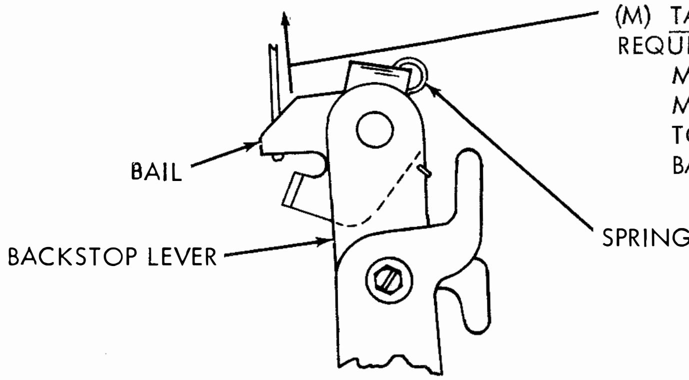
1. WITH NORMALLY CLOSED (LOWER) CONTACTS CLOSED, LIFT SWINGER FREE OF MATING CONTACT. IT SHALL REQUIRE A MINIMUM OF 30 GRAMS TO MOVE LOWER CONTACT SPRING AWAY FROM ITS STIFFENER.
   TO ADJUST - FORM THE LOWER CONTACT SPRING BY BENDING.
2. WITH LOWER CONTACT CLOSED
   MIN 30 GRAMS -- MAX 45 GRAMS.
   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.)

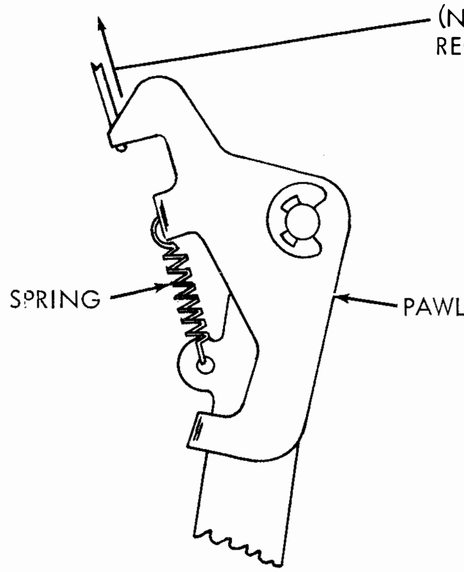
(L) LINE FEED CLUTCH TRIP LEVER SPRING
SEE PAR. 2.20

(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.

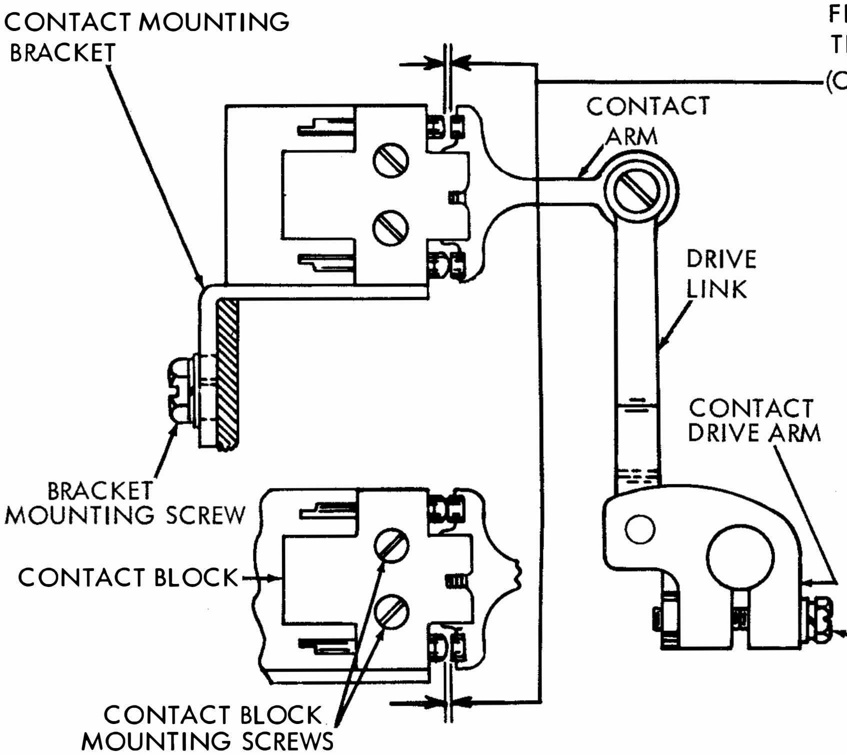
(B) CONTACT BLOCK

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

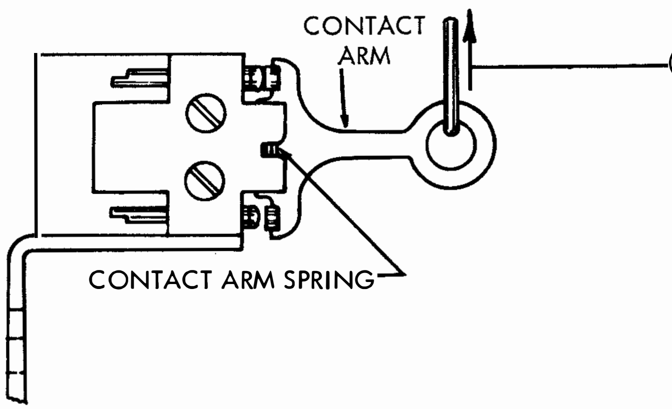
THE CONTACTS SHOULD OPEN EQUALLY WITHIN 0.010 INCH

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.

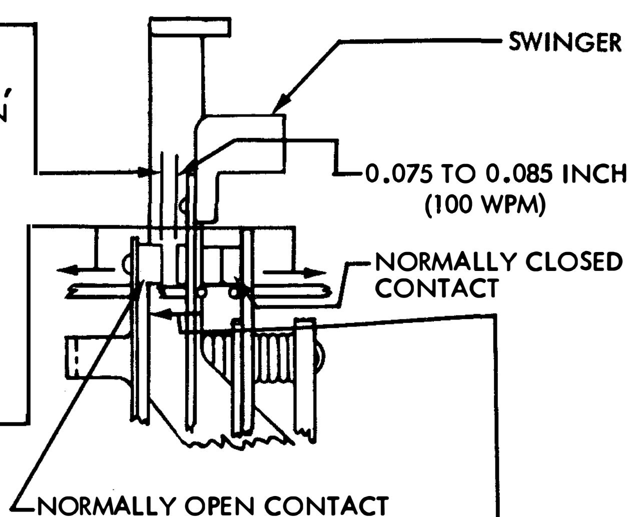
3.34 Universal Contact (Stunt Box) Mechanism

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

3.35 **Universal Contact (Stunt Box) Mechanism (continued)**

TRIP CAM

REQUIREMENT

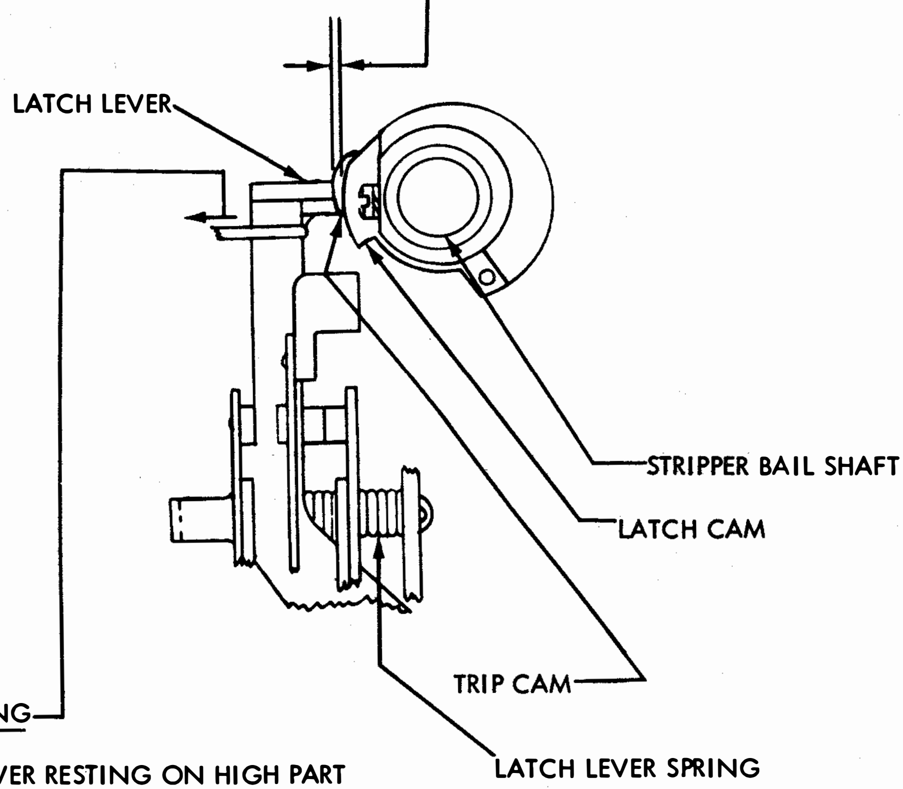
WITH STRIPPER BAIL SHAFT DRIVE LINK AT ITS LOWEST POINT, THE CLEARANCE BETWEEN THE LATCH LEVER AND THE LATCH CAM SHOULD BE

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.

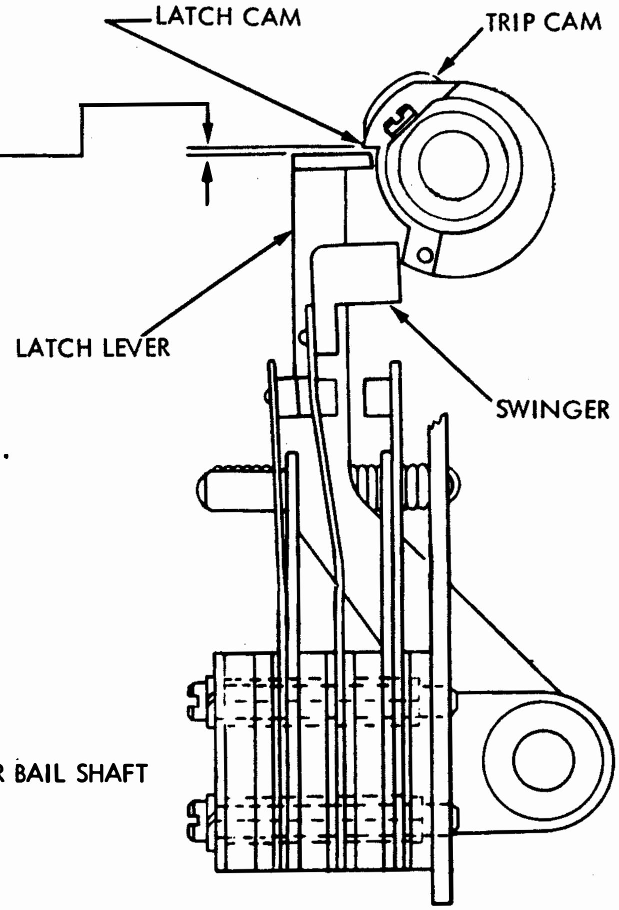
3.36 Universal Contact (Stunt Box) Mechanism (continued)

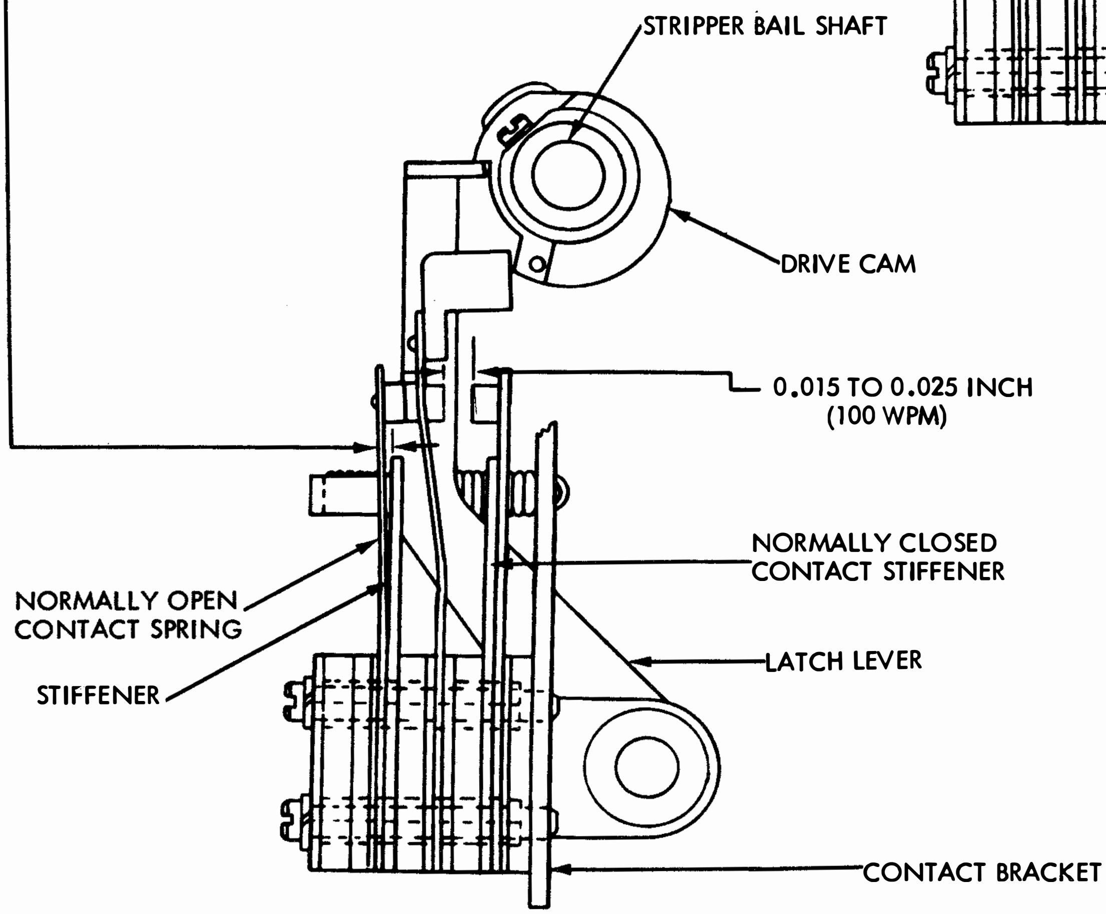
NOTE: THE FOLLOWING ADJUSTMENTS ARE TO BE MADE WITH THE CONTACT ASSEMBLY INSTALLED ON THE STUNT BOX

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.





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 ± 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 -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).

NOTE: THE RELATION BETWEEN THE NORMALLY CLOSED UNIVERSAL CONTACT MARKING PULSE AND THE STOP IMPULSE OF THE RECEIVED SIGNAL VARIES WITH THE RANGE SCALE SETTING OF THE UNIT.

3.38 Universal Contact (Stunt Box) Mechanism (continued)

B. 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 + 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.

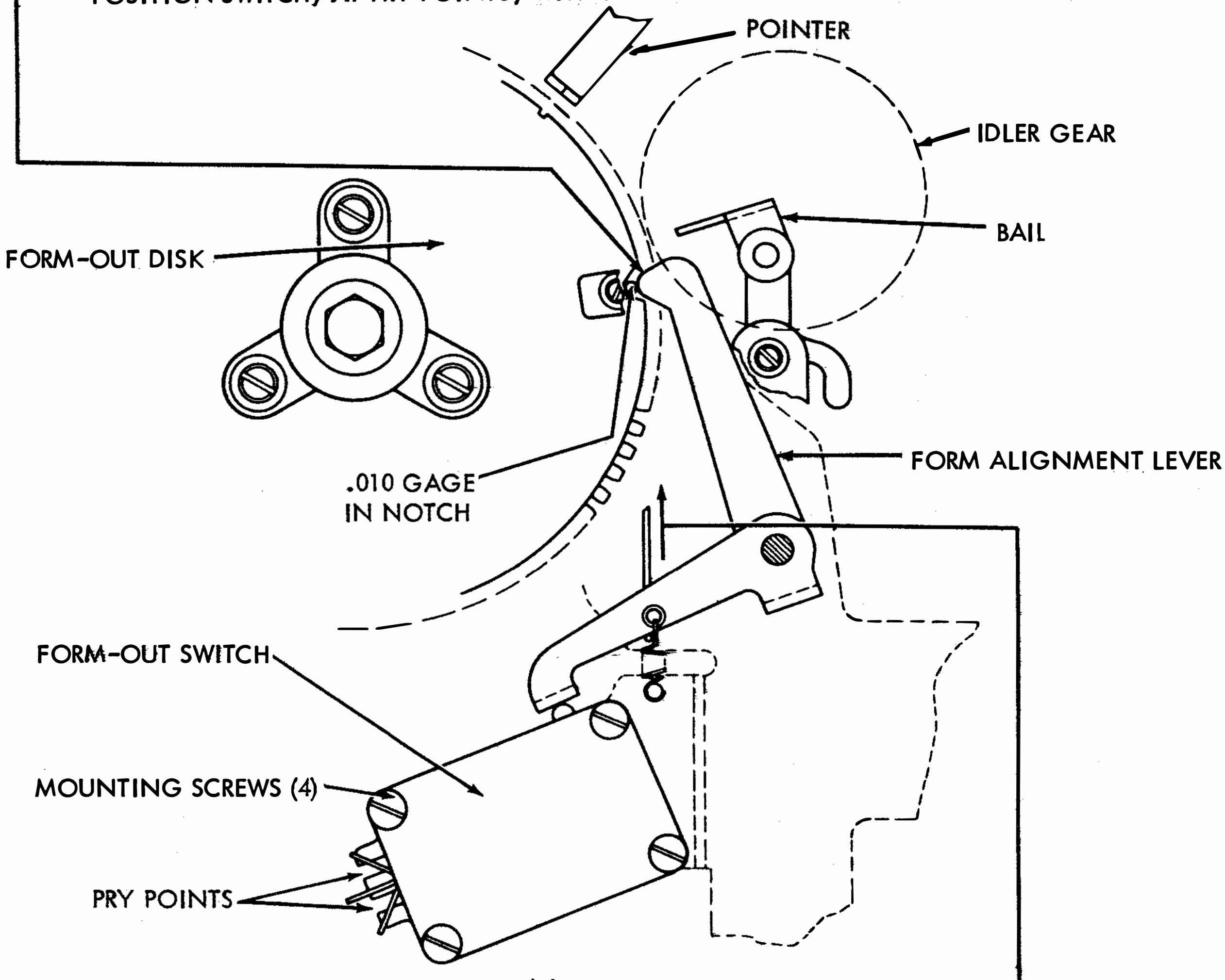
C. WITH THE LATCH CAM IN ITS LATCHED POSITION, THERE SHALL BE AT LEAST 0.005 INCH CLEARANCE BETWEEN THE NORMALLY OPEN CONTACT SPRING AND THE UPPER END OF ITS STIFFENER.

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 PARS. 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)

LEFT VIEW

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.

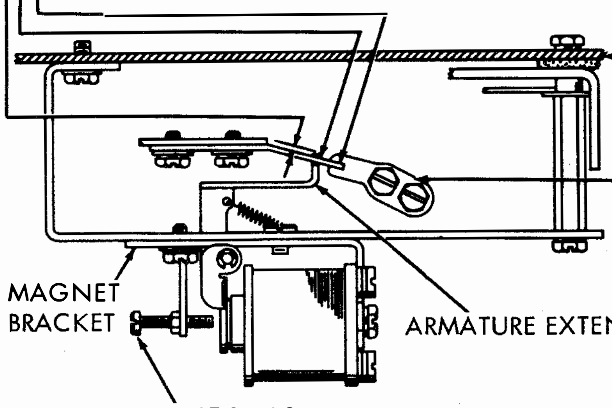
3. ROTATE BLOCKING BAIL EXTENSION. IT SHOULD SLIDE UNDER THE SUPPRESSION ARM WITH NO PERCEPTIBLE CLEARANCE.

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

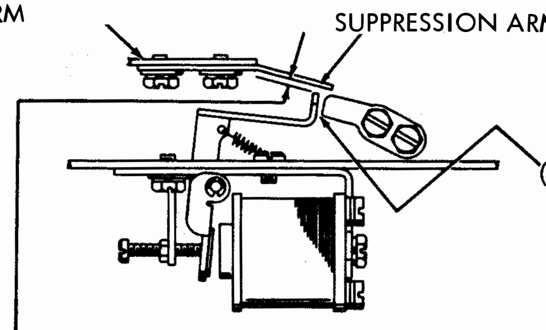
SEE PAR. 2.22 AND REFINE REQUIREMENT TO MIN. 0.040 INCH---MAX. 0.055 INCH

(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

REFINE 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

(A) SUPPRESSION CODE BAR POSITION

REQUIREMENT

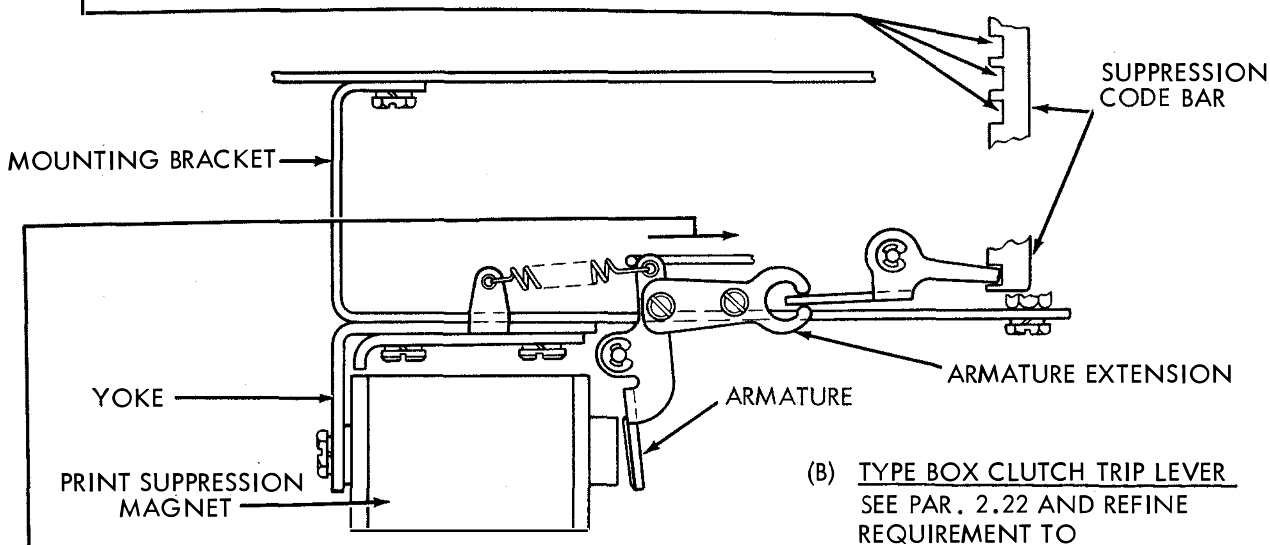
NOTCHES IN SUPPRESSION CODE BAR SHOULD ALIGN WITH NOTCHES IN OTHER CODE BARS. VIEW FROM REAR OF UNIT ABOVE STUNT BOX. GAGE BY EYE.

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.



TOP VIEW LEFT SIDE

(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

(E) PRINT SUPPRESSION MAGNET ARMATURE RETURN SPRING

REQUIREMENT

MIN. 7 OZS.
MAX. 10-1/2 OZS.
TO START MAGNET ARMATURE MOVING TOWARD CORE

TO CHECK

PRINT SUPPRESSION MAGNET UNOPERATED

NOTE: KEEP POLE FACE FREE OF OIL AND GREASE.

3.42 Letters - Figures Codebar Shift Magnet Mechanism

(A) SHIFT MAGNET YOKE

REQUIREMENT

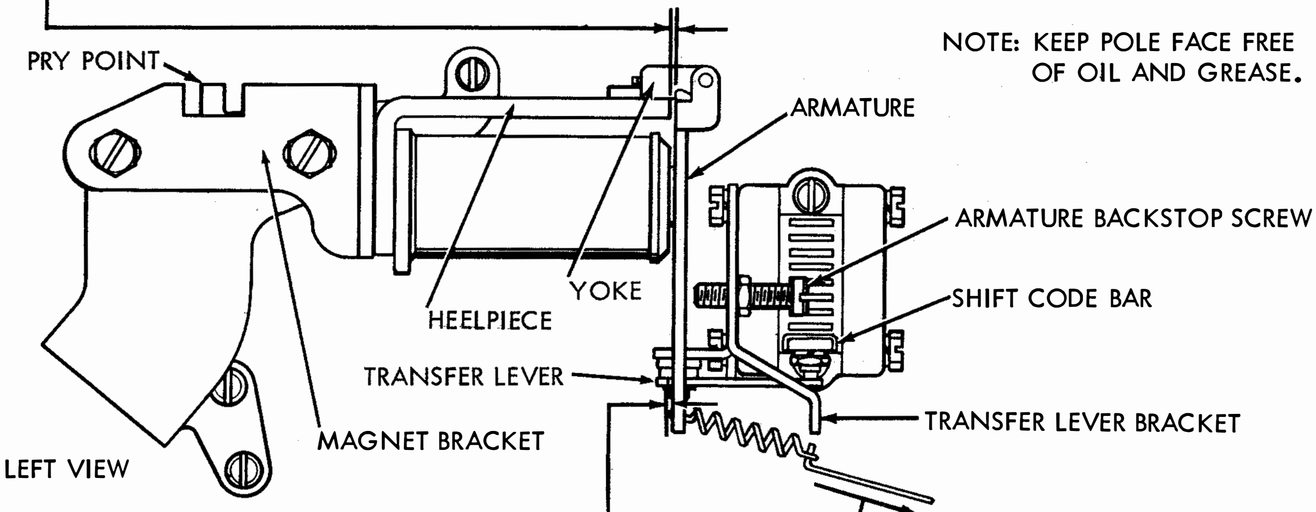
CLEARANCE BETWEEN ARMATURE AND END OF HEELPIECE SHOULD BE
MIN. SOME --- MAX. 0.003 INCH

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.

(C) SHIFT MAGNET ARMATURE RETURN SPRING

REQUIREMENT

MIN. 1 OZ. --- MAX. 3 OZS.
TO PULL SPRING TO INSTALLED LENGTH

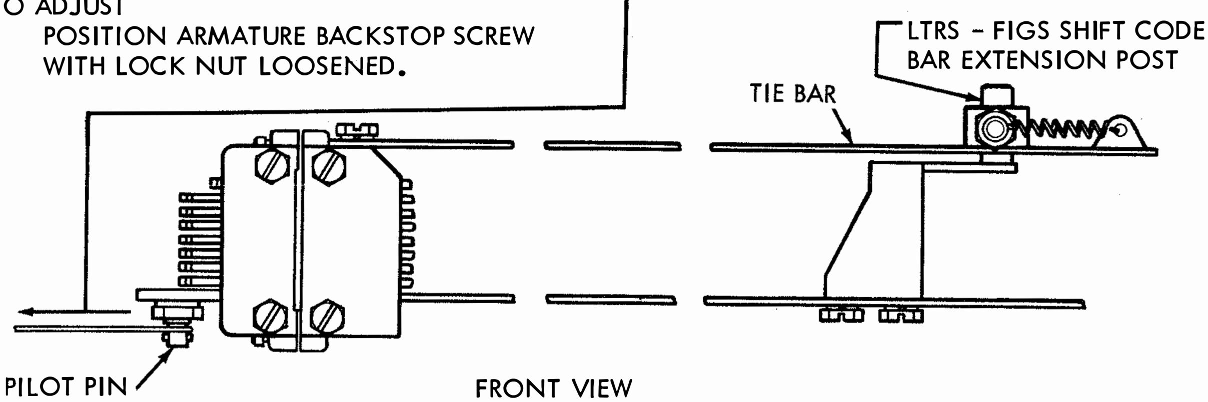
(D) SHIFT CODE BAR RETURN SPRING

REQUIREMENT

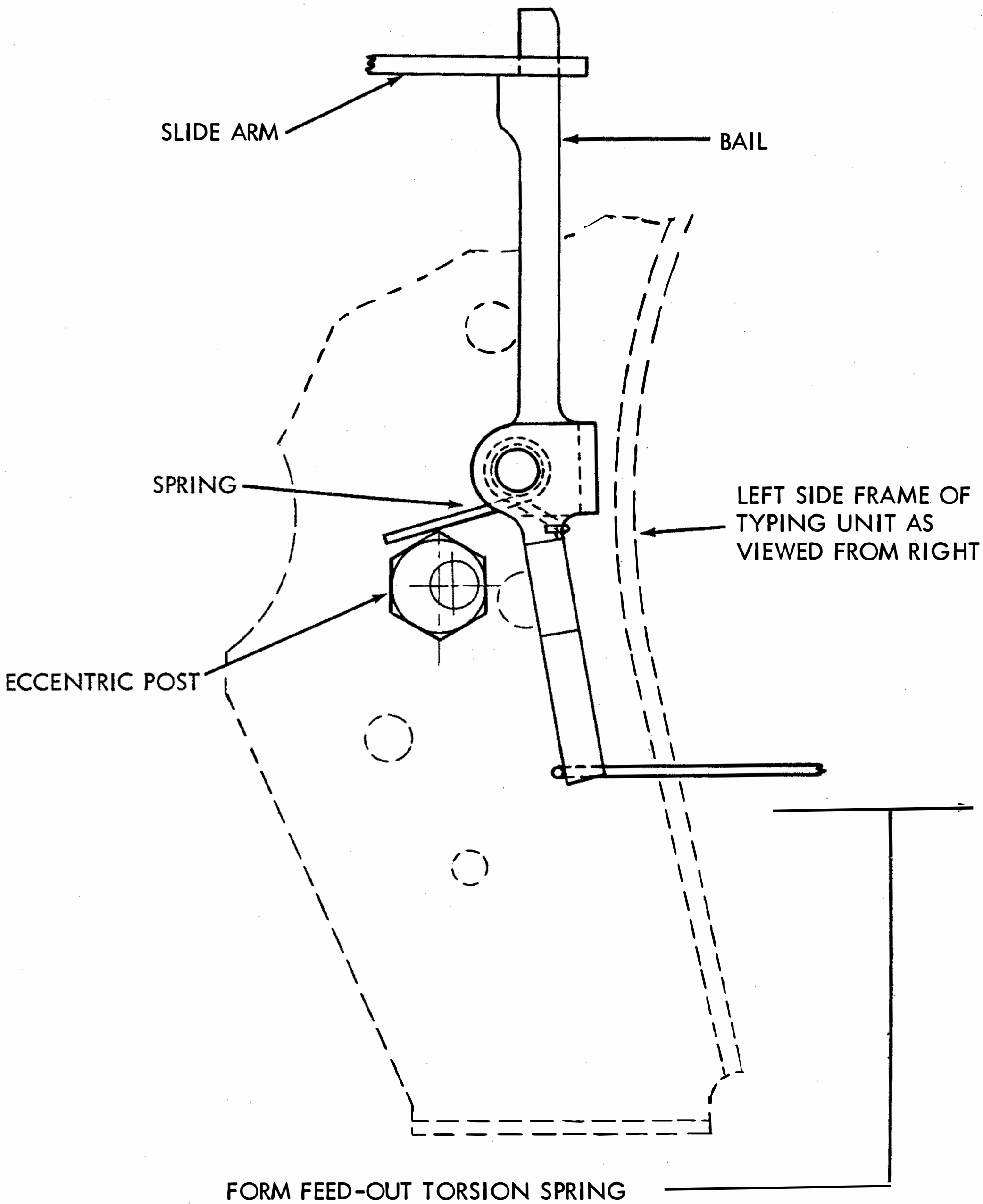
MIN. 3 OZS. --- MAX. 7 OZS.
TO START CODE BAR MOVING

TO CHECK

TRIP TYPE BOX CLUTCH, ROTATE MAIN SHAFT UNTIL PRINTING TRACK IS IN LOWEST POSITION



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

3.44 Two Color Ribbon Mechanism

SEE NOTES 1 THROUGH 5 ON FOLLOWING PAGE

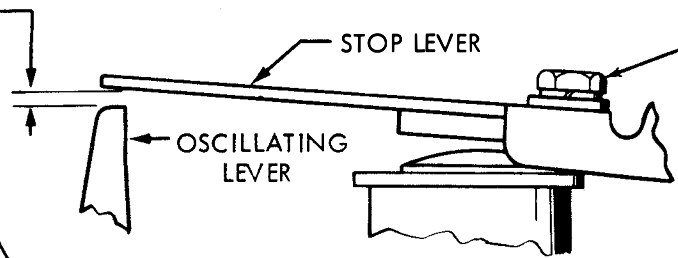
(A) RIBBON MAGNET HINGE BRACKET (LEFT AND RIGHT) (PRELIMINARY)
REQUIREMENT --- MAGNET ENERGIZED OR IN ATTRACTED POSITION, ARMATURE ON POLE PIECE. CLEARANCE BETWEEN ARMATURE AND POLE PIECE SHOULD BE NOT MORE THAN .005 INCH.
TO ADJUST --- POSITION HINGE BRACKET WITH MOUNTING SCREWS LOOSENED.

(B) RIBBON MAGNET BRACKET (LEFT AND RIGHT) (PRELIMINARY)
REQUIREMENT --- ADJUSTING SCREW IN LOWEST POSITION, ALL CLUTCHES DISENGAGED, POSITION RIBBON MAGNET BRACKET AS FOLLOWS:

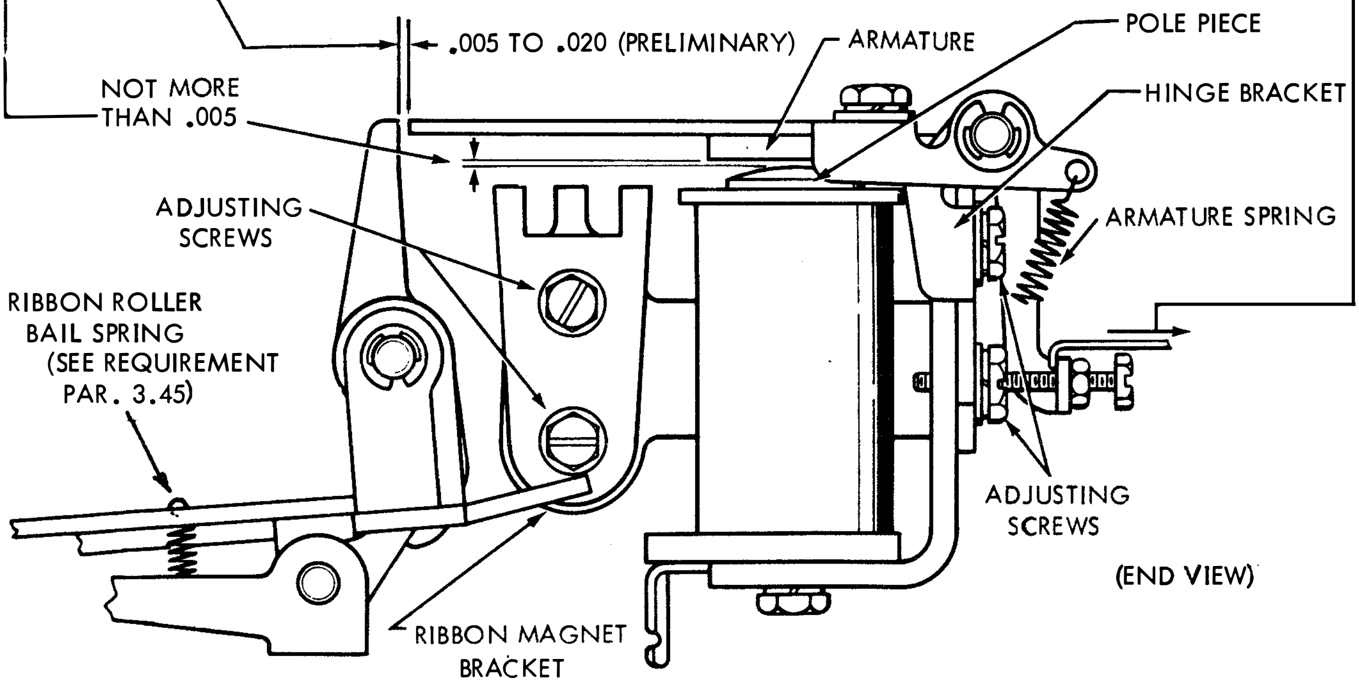
1. HOLD MAGNET ARMATURE STOP LEVER AGAINST MAGNET CORE, LEVER SHOULD BE PARALLEL TO OSCILLATING LEVER TOP SURFACE AND ENGAGE THE OSCILLATING LEVER BY AT LEAST 1/2 OF THE STOP LEVER THICKNESS. GAUGE BY EYE.
2. STOP LEVER HELD AGAINST MAGNET CORE. CLEARANCE BETWEEN STOP LEVER AND OSCILLATING LEVER SHOULD 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.



ARMATURE SPRING (LEFT AND RIGHT)
REQUIREMENT---MIN. 2-1/2 OZS.---MAX. 3-1/2 OZS. TO SEAT ARMATURE AGAINST POLE PIECE.

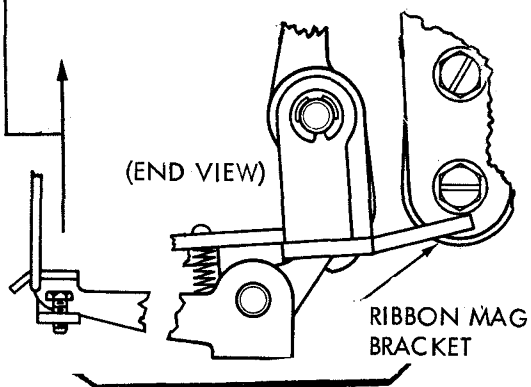


(END VIEW)

3.45 Two Color Ribbon Mechanism

OPERATIONAL REQUIREMENT - RIBBON MAGNET BRACKET (FINAL) (SEE PRECEDING FIGURE)
PRINTER OPERATING AT 60, 75, OR 100 WPM, TEST BEING PRINTED.
REQUIREMENT
PRINTS RED WHEN RIBBON MAGNETS ARE ENERGIZED.
TO ADJUST
TURN LEFT AND RIGHT RIBBON BRACKET ROLLER BAIL ADJUSTING SCREWS 1/2 TURN UP. REFINE RIBBON AND RIBBON HINGE BRACKET ADJUSTMENTS. REPEAT ABOVE PROCEDURE IF BLACK IS PRINTED.

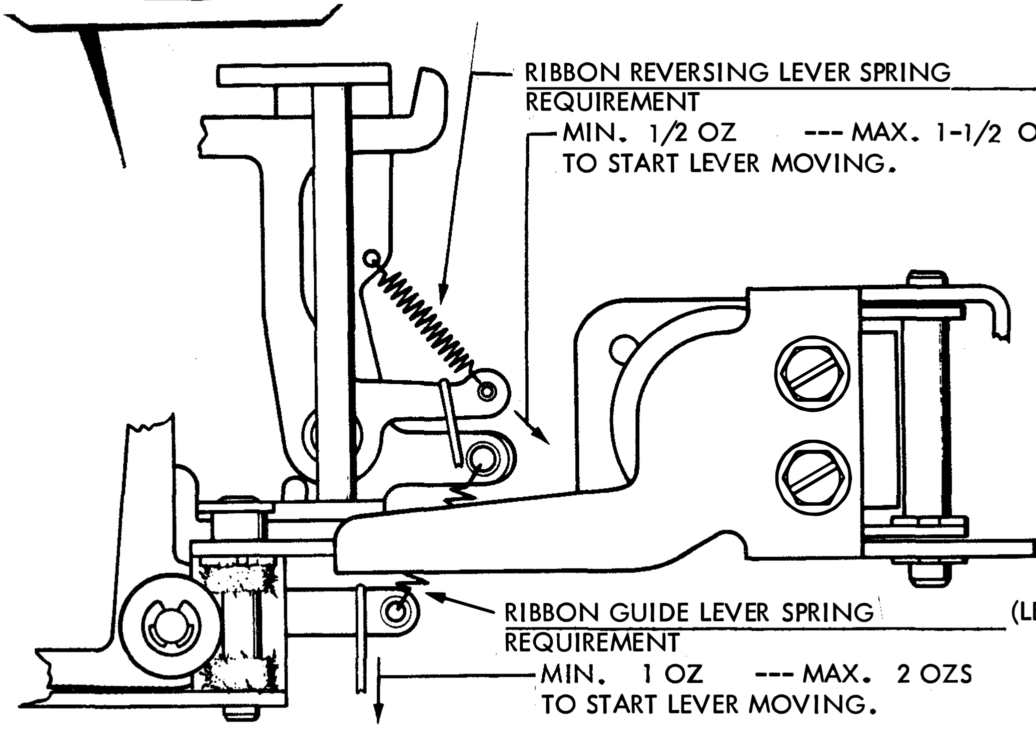
RIBBON ROLLER BAIL SPRING (LEFT AND RIGHT) (SEE PRECEDING FIGURE)
REQUIREMENT
ALL CLUTCHES DISENGAGED, ADJUSTING SCREW IN LOWEST POSITION
MIN. 4 OZS. --- MAX. 6 OZS.
TO START LIFTER BAIL MOVING.



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

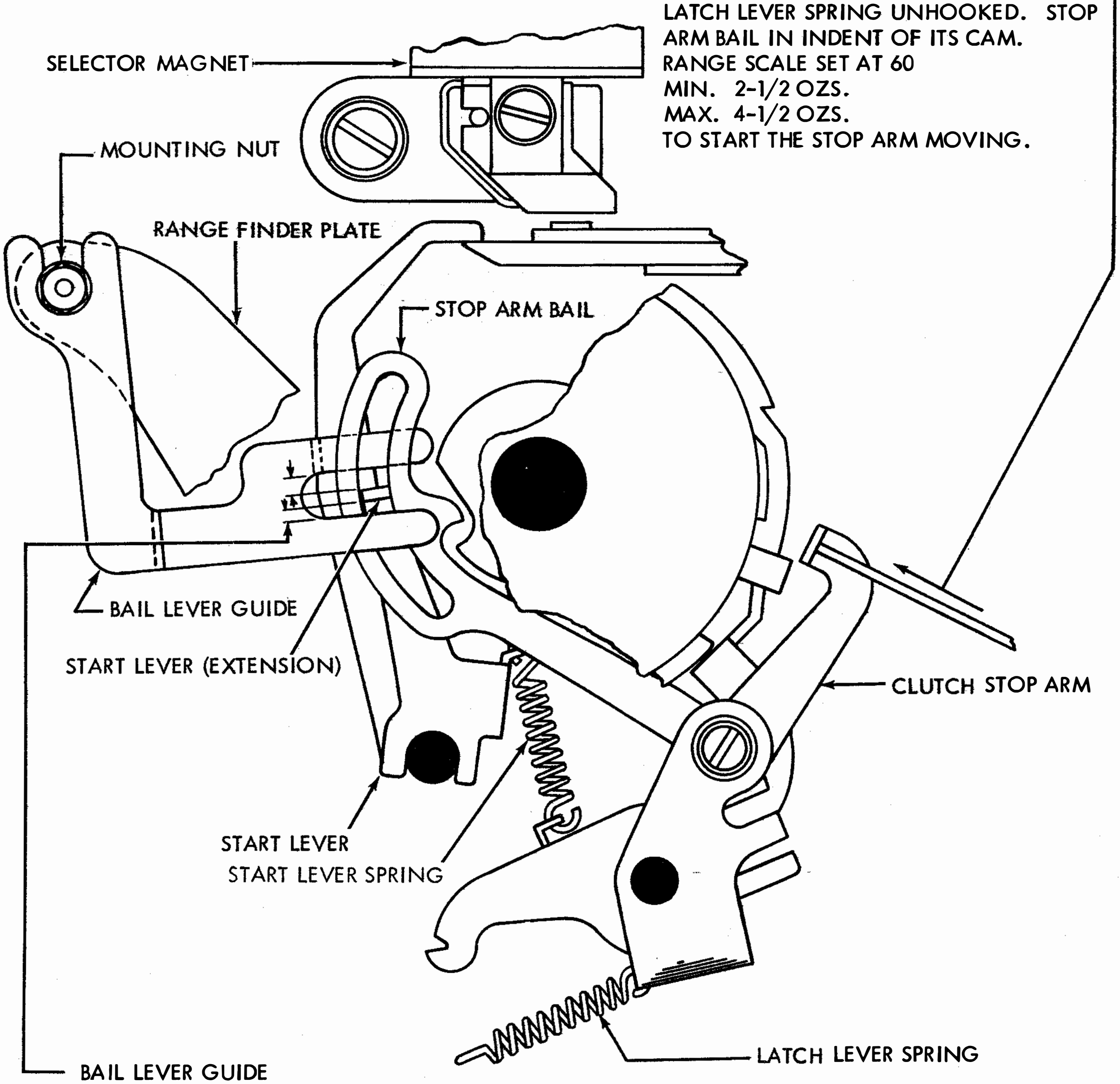
4.01 SELECTOR MECHANISM

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

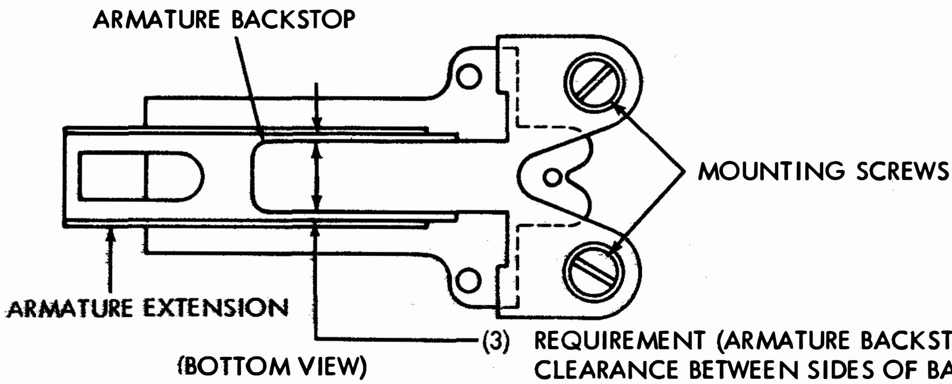
POSITION BAIL LEVER GUIDE WITH MOUNTING NUT LOOSENED.

(RIGHT SIDE VIEW)

4.02 Selector Mechanism

SELECTOR ARMATURE

FOR REQUIREMENTS (1) AND (2) SEE PAR. 2.01 UNDER BASIC UNITS

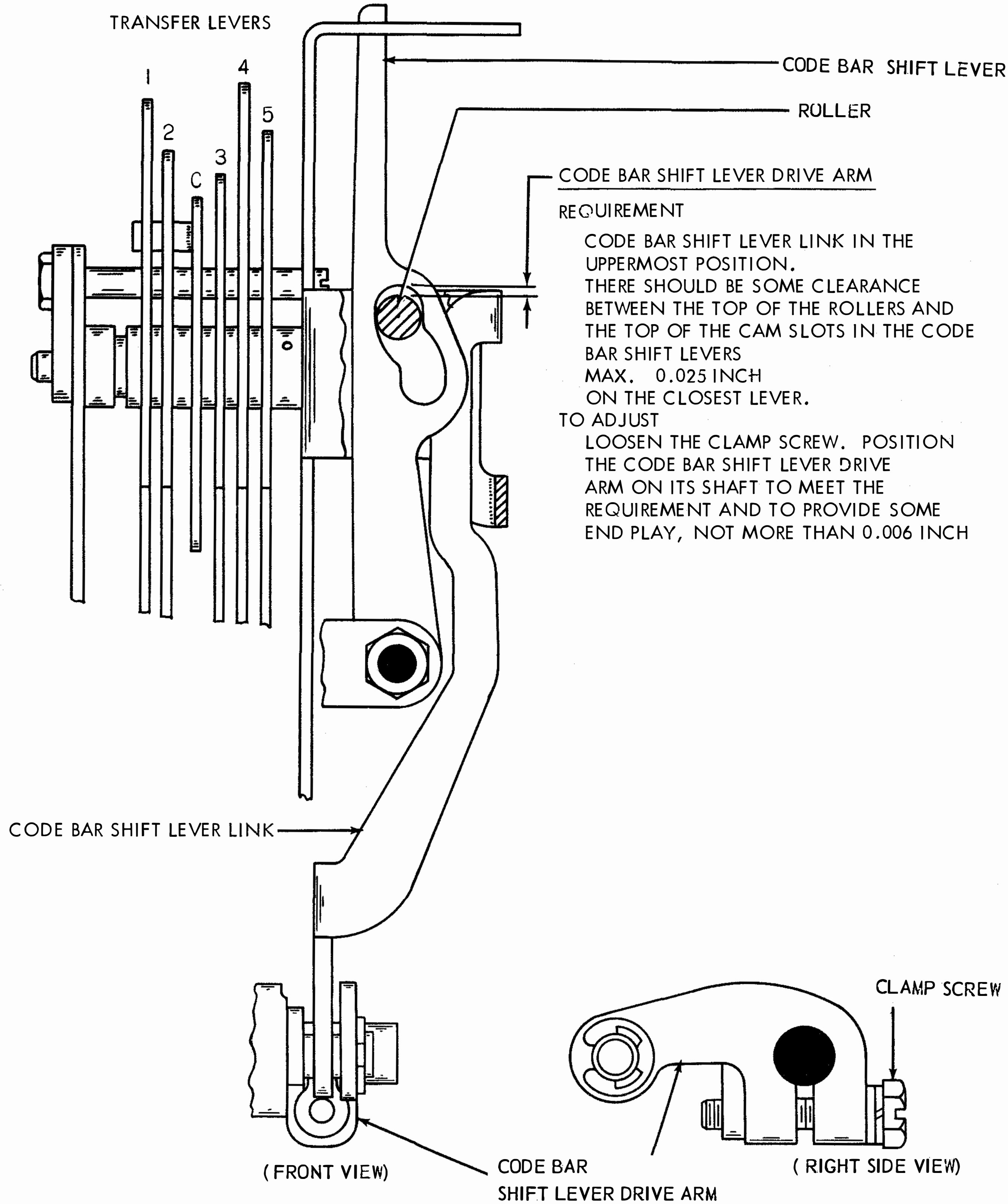


(3) REQUIREMENT (ARMATURE BACKSTOP ALIGNMENT)
CLEARANCE BETWEEN SIDES OF BACKSTOP AND SIDES OF ARMATURE EXTENSION.
MIN. 0.010 INCH

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.

4.03 Codebar Mechanism



CODE BAR SHIFT LEVER DRIVE ARM

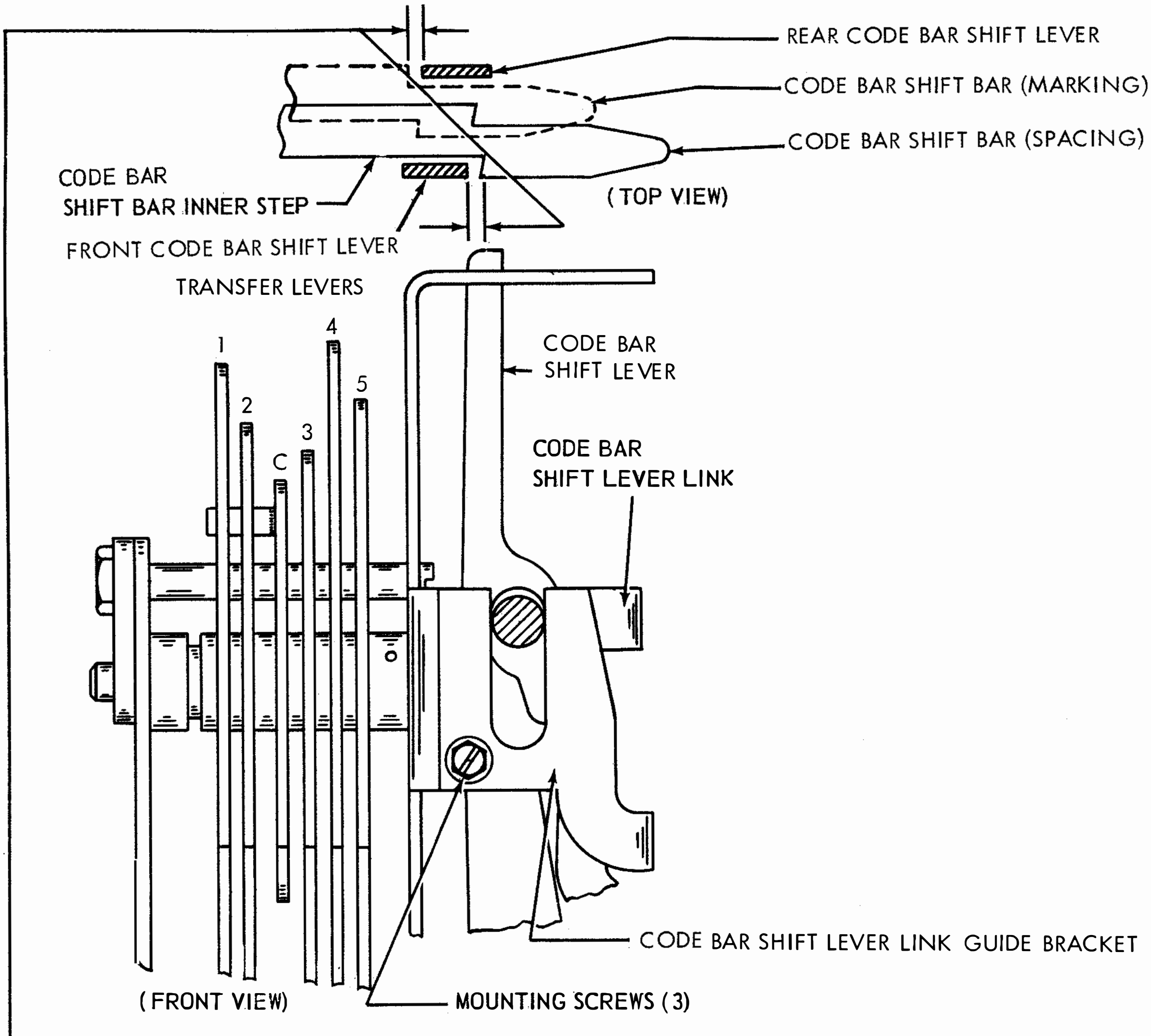
REQUIREMENT

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.)



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).

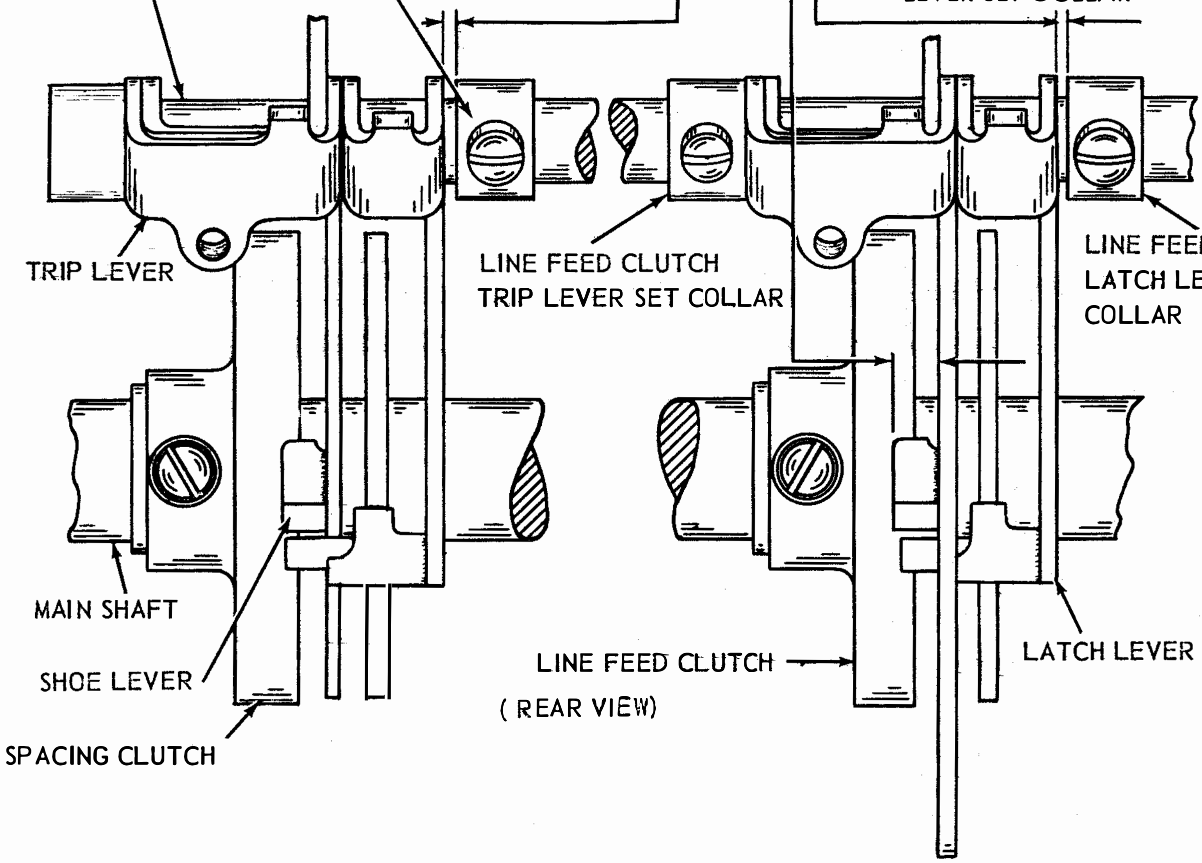
4.05 Main Shaft and Trip Shaft Mechanisms

(A) CLUTCH TRIP SHAFT SET COLLARS

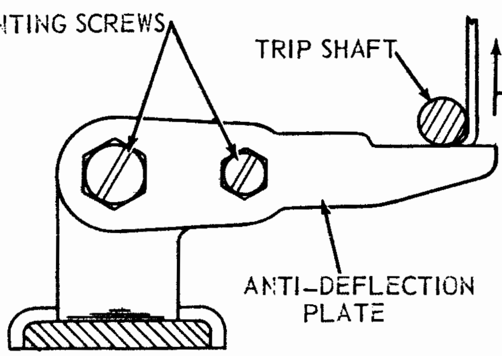
(1) REQUIREMENT
SPACING CLUTCH LATCH LEVER SHOULD HAVE SIDE PLAY
MIN. SOME
MAX. 0.008 INCH
TO ADJUST
POSITION SPACING CLUTCH LATCH LEVER SET COLLAR.

(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. SOME
MAX. 0.008 INCH
TO ADJUST
POSITION LINE FEED CLUTCH LATCH LEVER SET COLLAR



(REAR VIEW)



(LEFT SIDE VIEW, UPSIDE DOWN)

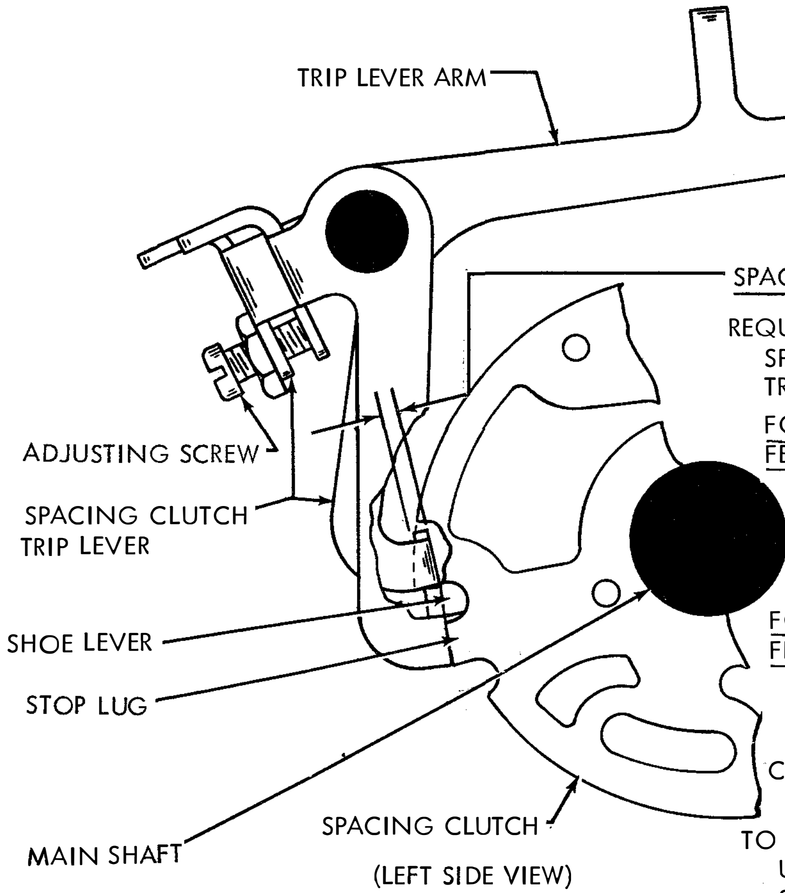
NOTE: ANTI-DEFLECTION PLATE ADJUSTMENT APPLIES ONLY TO UNITS SO EQUIPPED.

(B) ANTI-DEFLECTION PLATE

REQUIREMENT
WITH TYPING UNIT UPSIDE DOWN AND FUNCTION, SPACING, LINE FEED, AND TYPE BOX CLUTCHES LATCHED DISENGAGED.
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.)



(LEFT SIDE VIEW)

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.

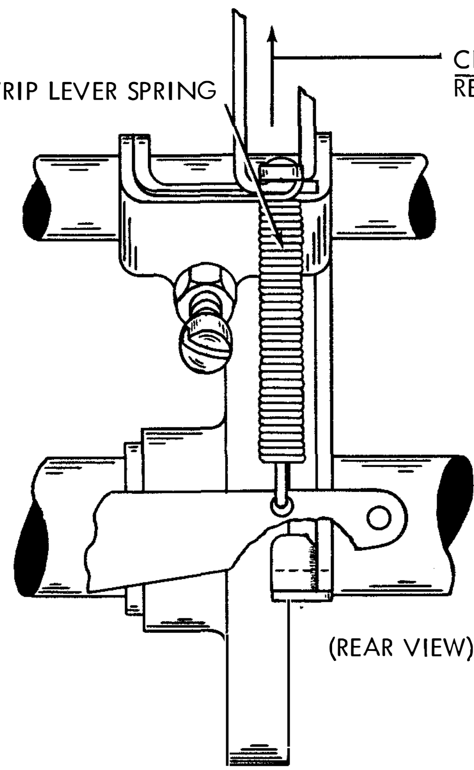
FOR UNITS WITH U-SHAPED LINE FEED CLUTCH TRIP LEVER:

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.



(REAR VIEW)

CLUTCH TRIP LEVER SPRING

REQUIREMENT

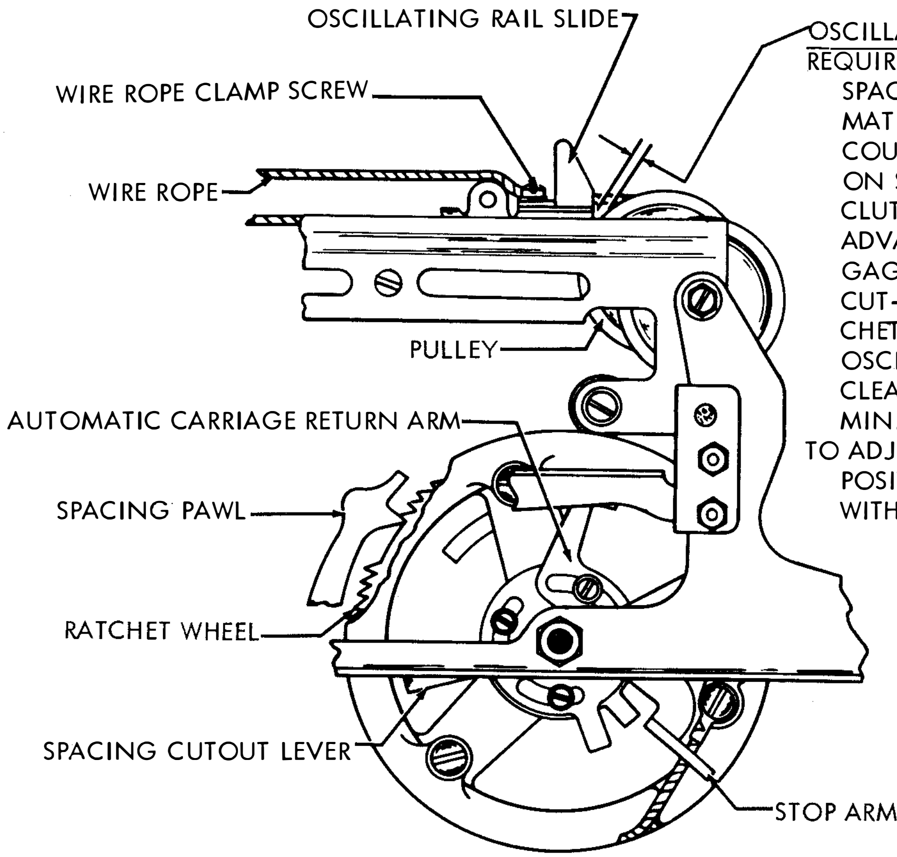
CLUTCH ENGAGED AND ROTATED UNTIL TRIP LEVER RESTS ON STOP LUG.

CLUTCH	MIN.	MAX.
SPACING	11 OZS.	16 OZS.
LINE FEED	9 OZS.	12 OZS.
TYPE BOX	5 OZS.	7-1/4 OZS.

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

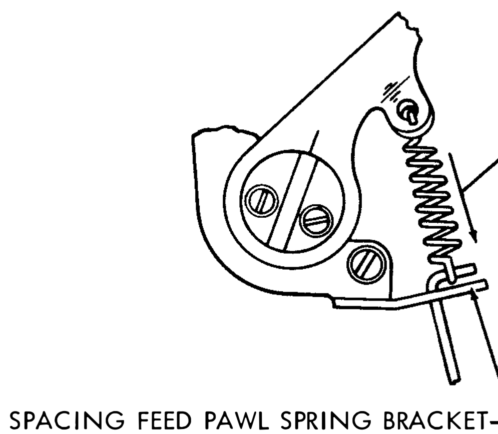
REQUIREMENT

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 RACHET WHEEL. EACH SPRING UNHOOKED FROM BRACKET

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

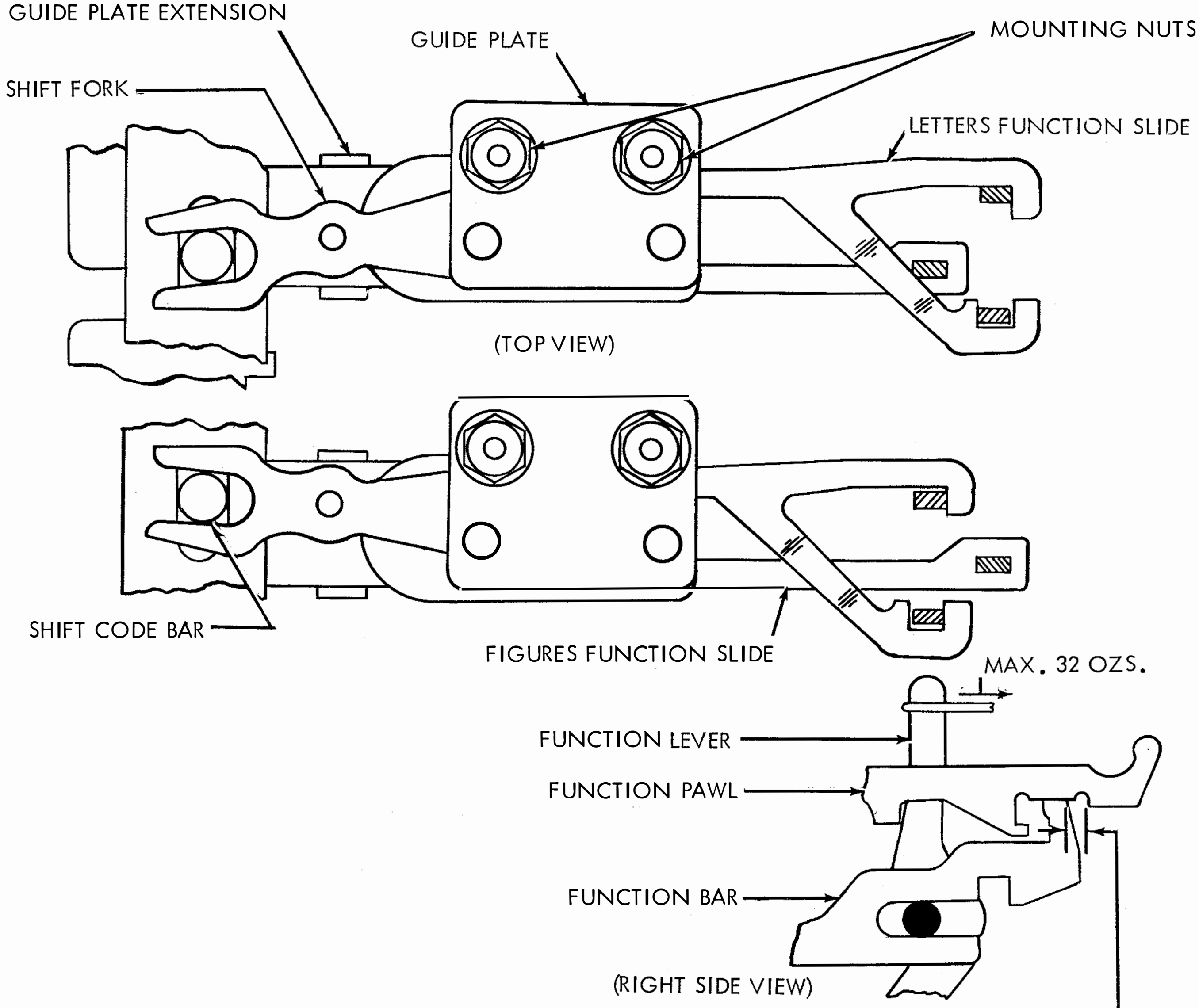
TO PULL SPRINGS TO INSTALLED LENGTH.

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.



FIGS - LTRS 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.

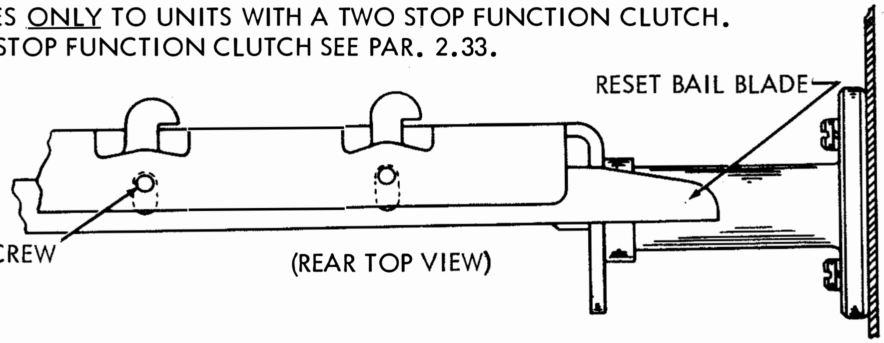
TO ADJUST

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.

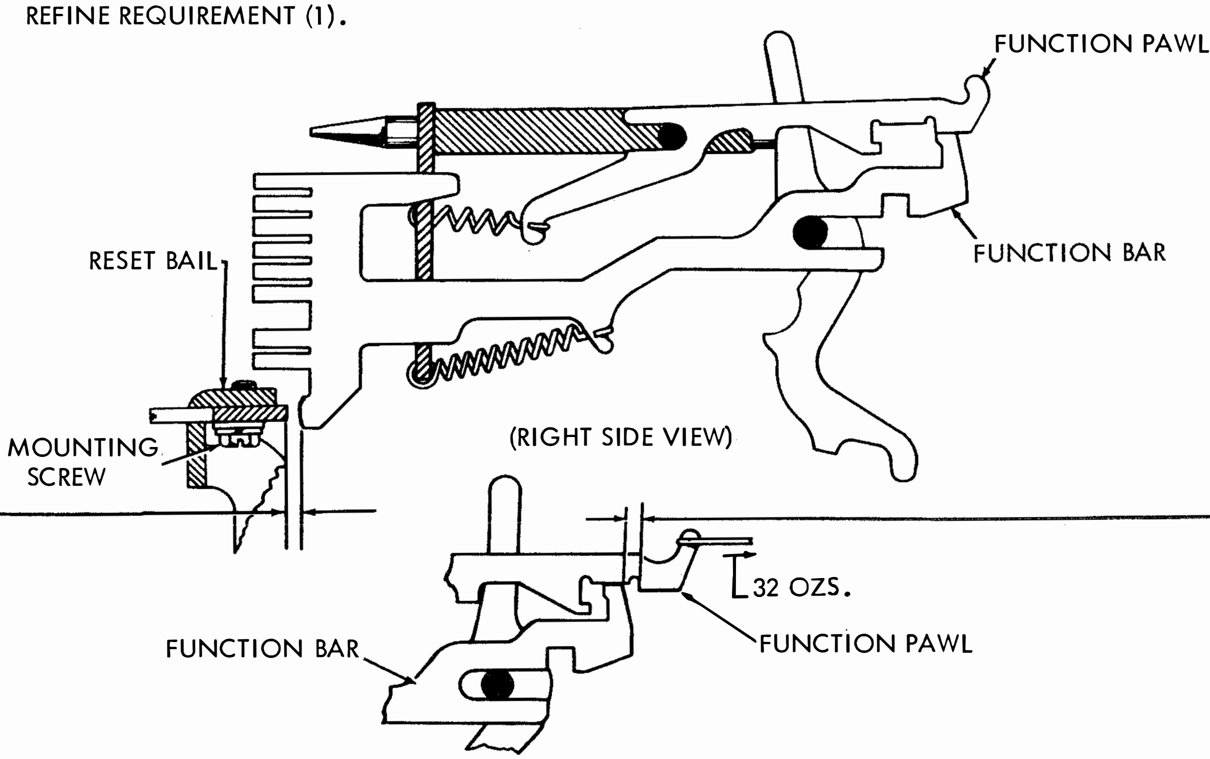
(2) REQUIREMENT

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

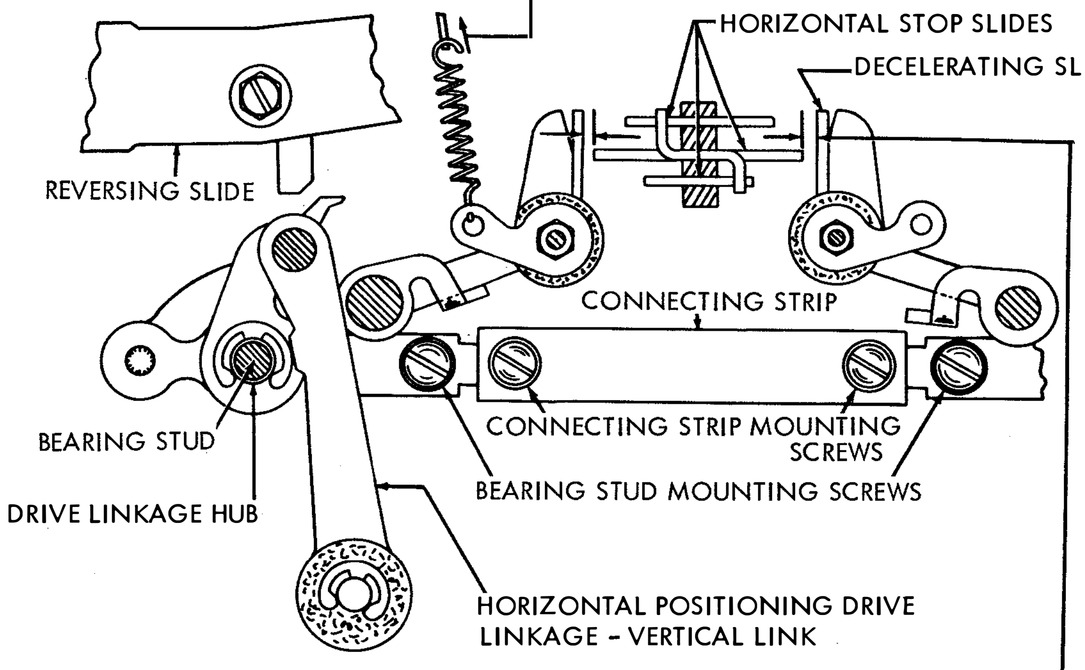
NOTE: THESE ADJUSTMENTS APPLY ONLY TO HORIZONTAL POSITIONING DRIVE MECHANISMS EQUIPPED WITH TENSION SPRINGS.

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

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 FRICTION 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.

4.11 Positioning Mechanism (Cont.)

NOTE: THESE ADJUSTMENTS APPLY ONLY TO HORIZONTAL POSITIONING DRIVE MECHANISMS EQUIPPED WITH TORSION SPRINGS.

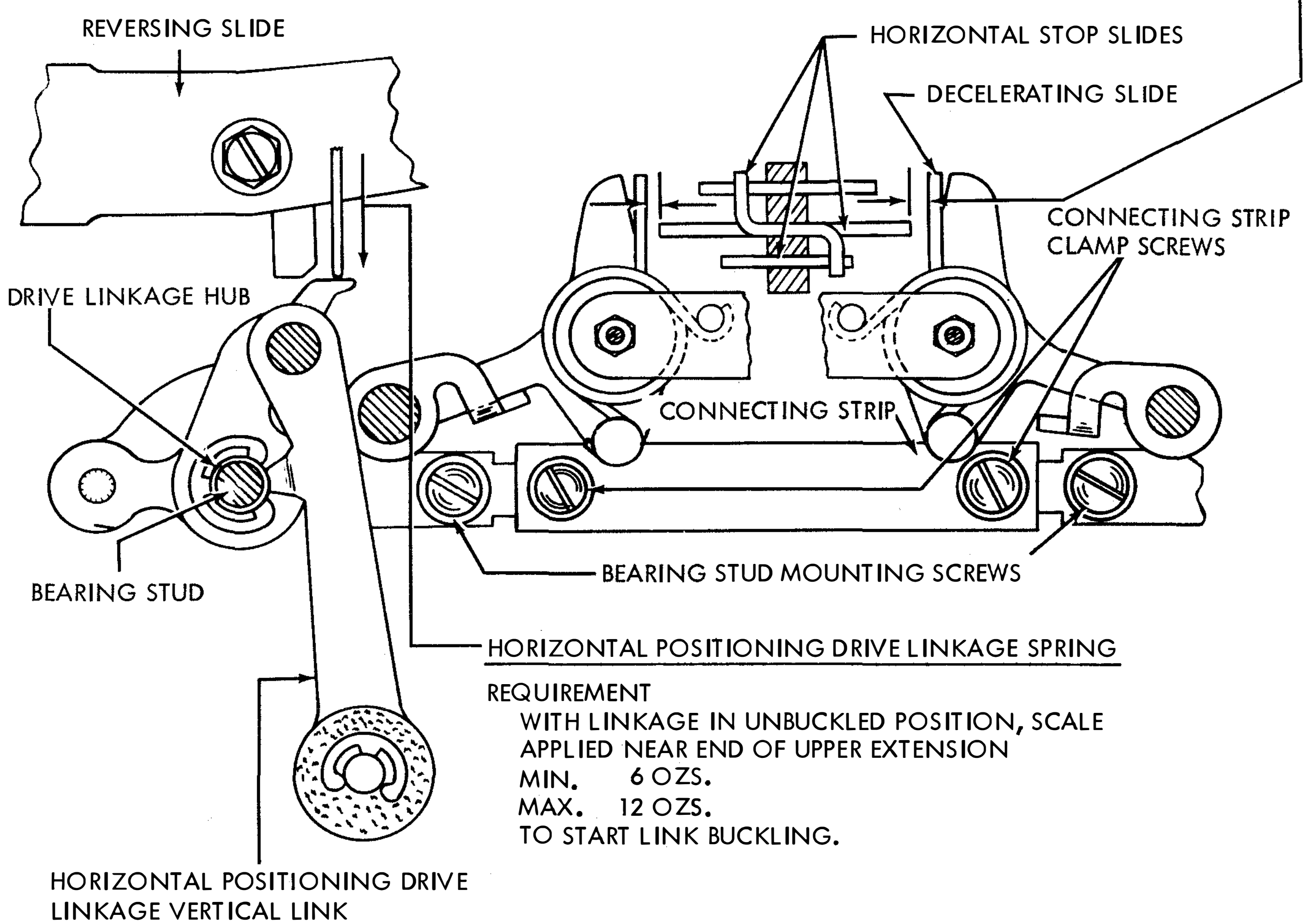
HORIZONTAL POSITIONING DRIVE LINKAGE

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 FRICTION 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.



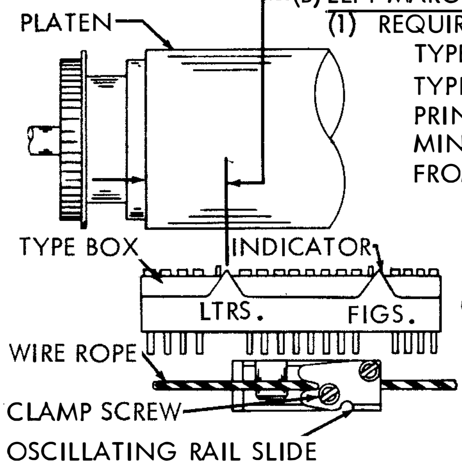
HORIZONTAL POSITIONING DRIVE LINKAGE SPRING

REQUIREMENT

WITH LINKAGE IN UNBUCKLED POSITION, SCALE APPLIED NEAR END OF UPPER EXTENSION
MIN. 6 OZS.
MAX. 12 OZS.
TO START LINK BUCKLING.

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 (FOR SPROCKET FEED UNITS SEE PAR. 2.71)

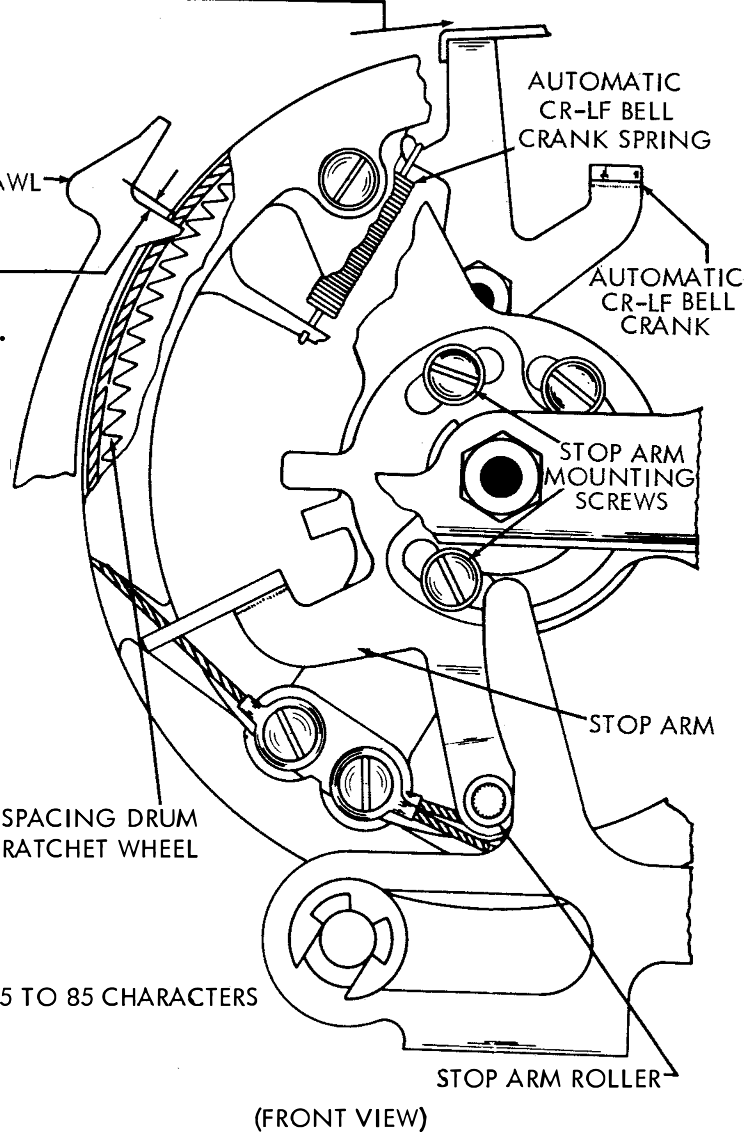
(1) REQUIREMENT (FOR 72 CHARACTER LINE)

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.

(C) AUTOMATIC CR-LF BELL CRANK SPRING

REQUIREMENT

FUNCTION CLUTCH DISENGAGED.
MIN. 6-1/2 OZS.---MAX. 11 OZS.
TO MOVE THE BELL CRANK.



(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.

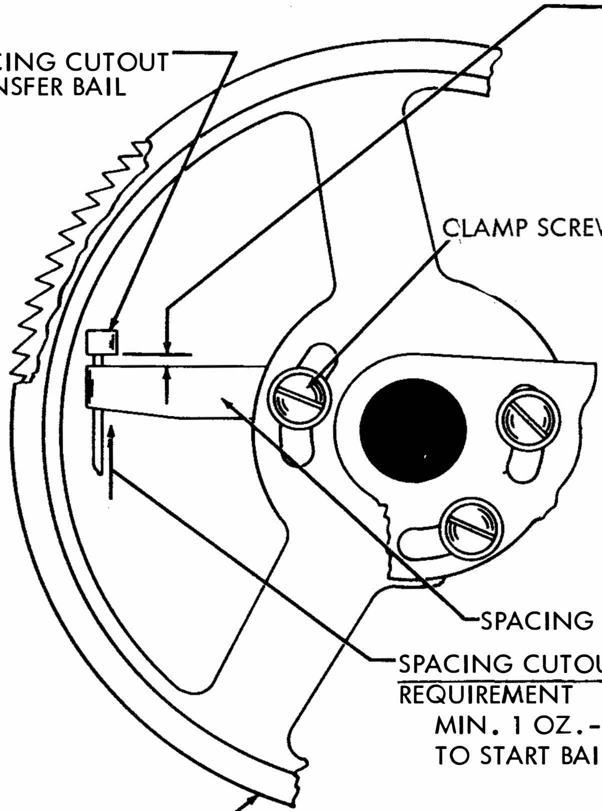
(A) PRINTING CARRIAGE POSITION
(USE STANDARD ADJUSTMENT PAR. 2.47)

NOTE:
FOR OTHER LENGTHS OF LINE, RANGING FROM 65 TO 85 CHARACTERS THE MARGIN CAN BE VARIED AS REQUIRED.

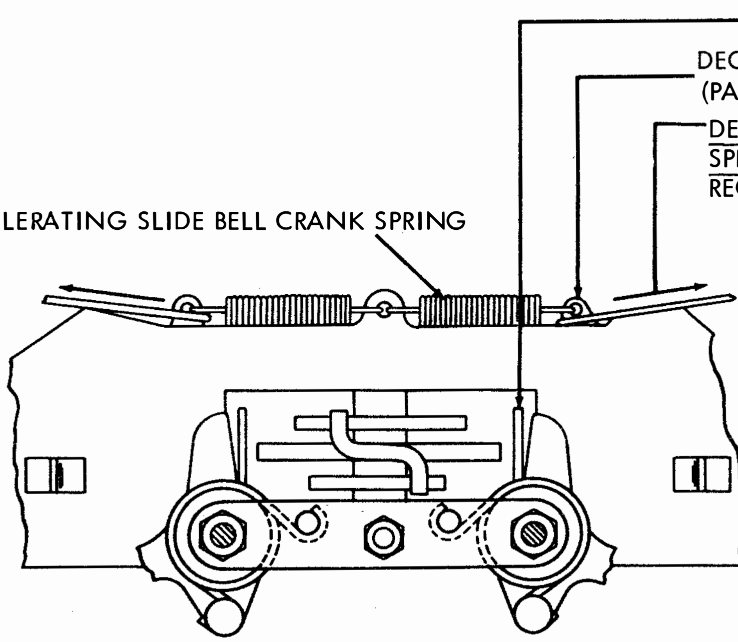
NOTE
THIS VIEW SHOWS THE SPACING DRUM FULLY RETURNED.

4.13 Spacing Mechanism (Cont.)

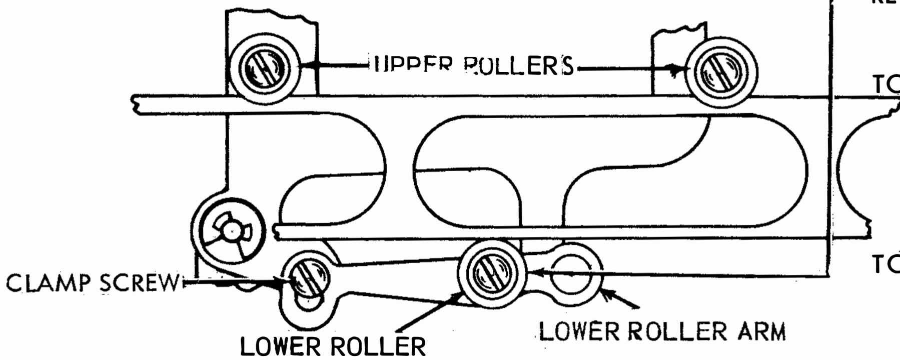
NOTE: CHECK RELATED ADJUSTMENTS, PARS. 4.07, 2.38 AND 2.47, IF THE FOLLOWING ADJUSTMENT ARE REMADE.



(FRONT VIEW)



4.14 Printing Mechanism



TYPE BOX CARRIAGE ROLLER

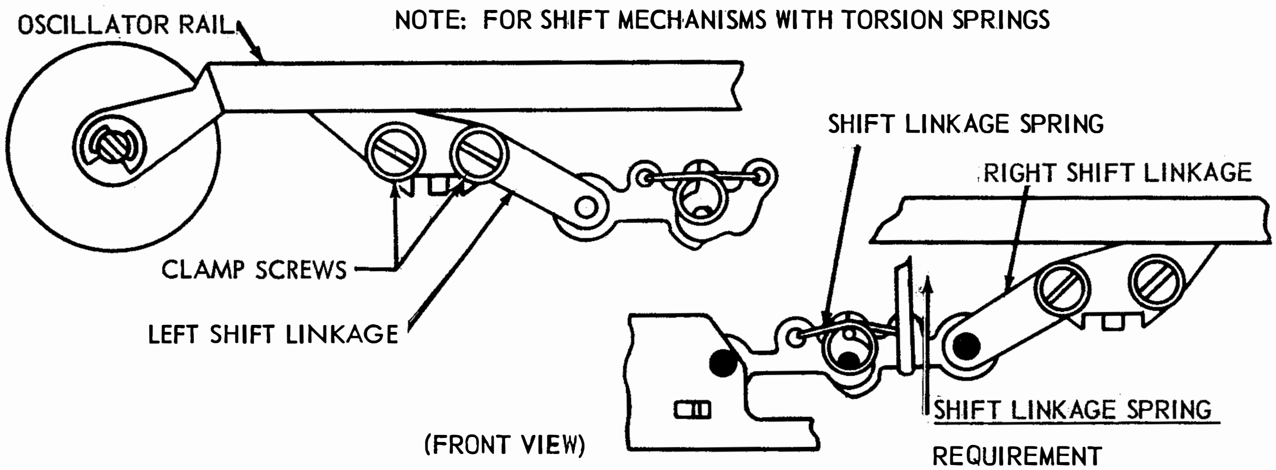
REQUIREMENT
MINIMUM VERTICAL PLAY WITHOUT BIND IN TYPE BOX CARRIAGE

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



(FRONT VIEW)

SHIFT LINKAGE SPRING

REQUIREMENT
LINK IN STRAIGHT POSITION.
MIN. 7 OZS.
MAX. 16 OZS.
TO START EACH LINK MOVING.

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

FRICTION 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 LOOSENED.

(FOR SPROCKET FEED UNITS, SEE PAR. 2.71)

(C) TYPE PALLET SPRING

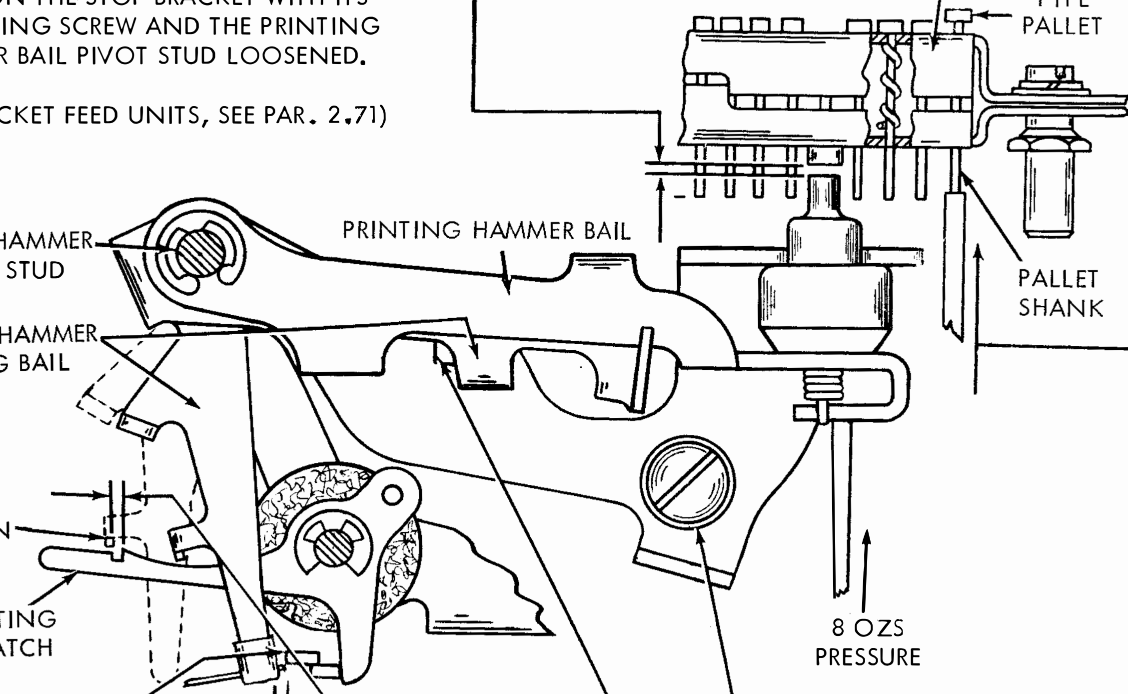
REQUIREMENT

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



(TOP VIEW)

(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

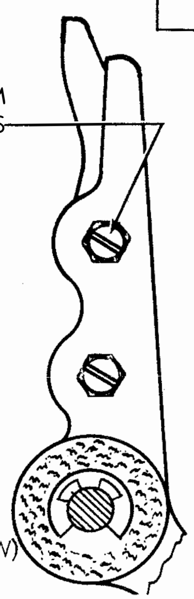
PRINTING TRACK IN UPPERMOST POSITION. LATCHING EXTENSION OF PRINTING HAMMER OPERATING BAIL SHOULD OVERTRAVEL LATCHING SURFACE OF OPERATING BAIL LATCH BY

MIN. 0.006 INCH

CHECK RIGHT AND LEFT POSITION

TO ADJUST

POSITION SECONDARY PRINTING ARM WITH CLAMP SCREWS LOOSENED.

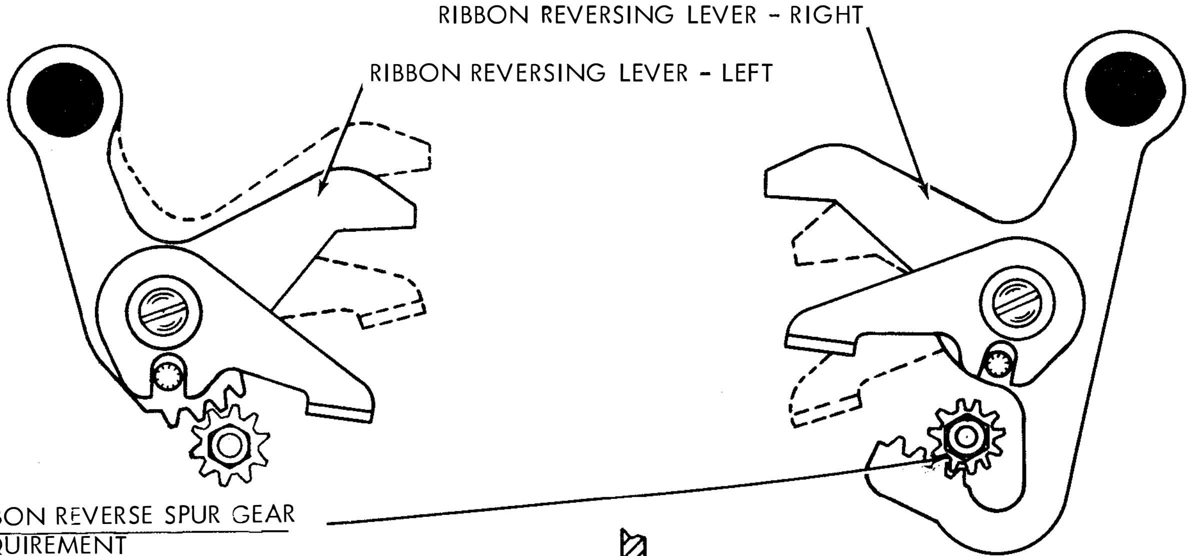


(FRONT VIEW)

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.

4.17 Printing Mechanism (Cont.)



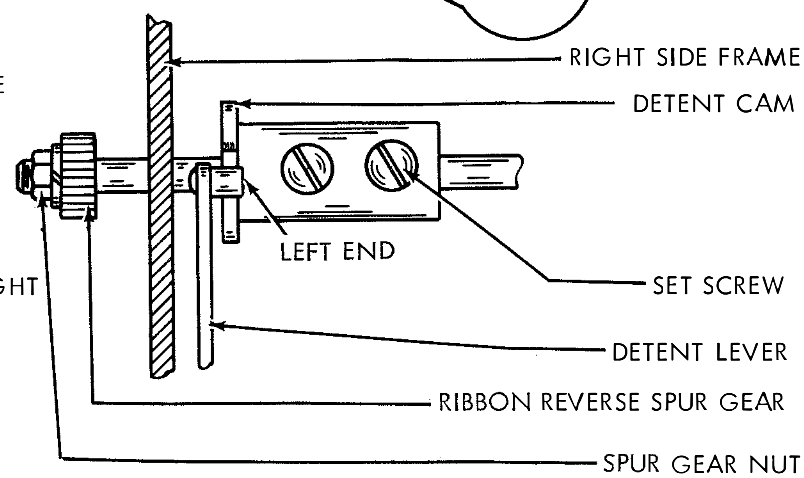
(A) RIBBON REVERSE SPUR GEAR

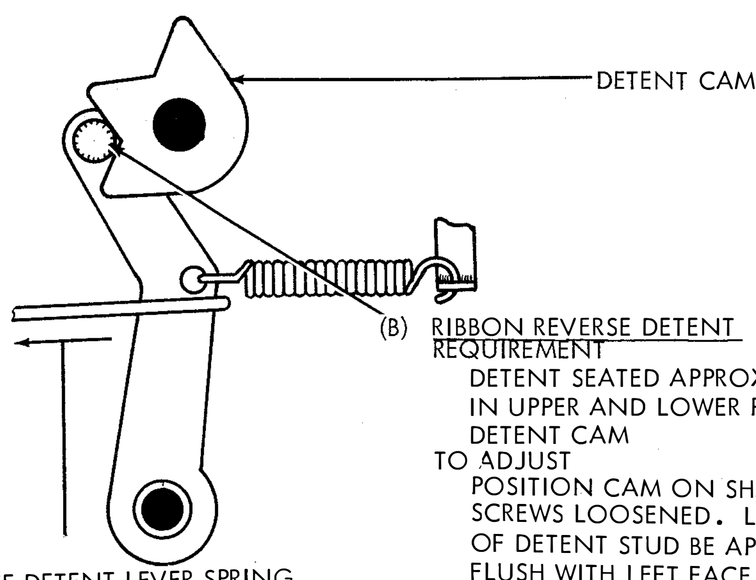
REQUIREMENT

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.





(B) RIBBON REVERSE DETENT

REQUIREMENT

DETENT SEATED APPROXIMATELY EQUAL IN UPPER AND LOWER POSITIONS OF DETENT CAM

TO ADJUST

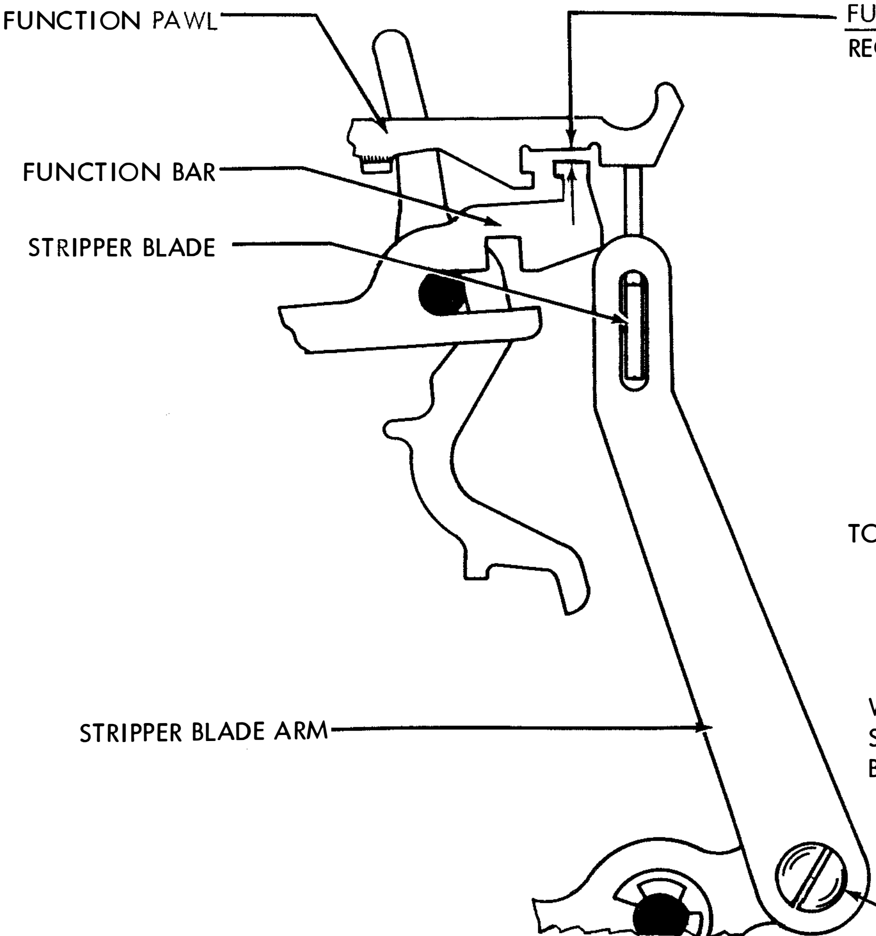
POSITION CAM ON SHAFT WITH SET SCREWS LOOSENED. LET LEFT END OF DETENT STUD BE APPROXIMATELY FLUSH WITH LEFT FACE OF CAM (PLAY IN DETENT TAKEN TO RIGHT OF PRINTER)

(C) 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.

4.18 Function Mechanism (Cont.)



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.

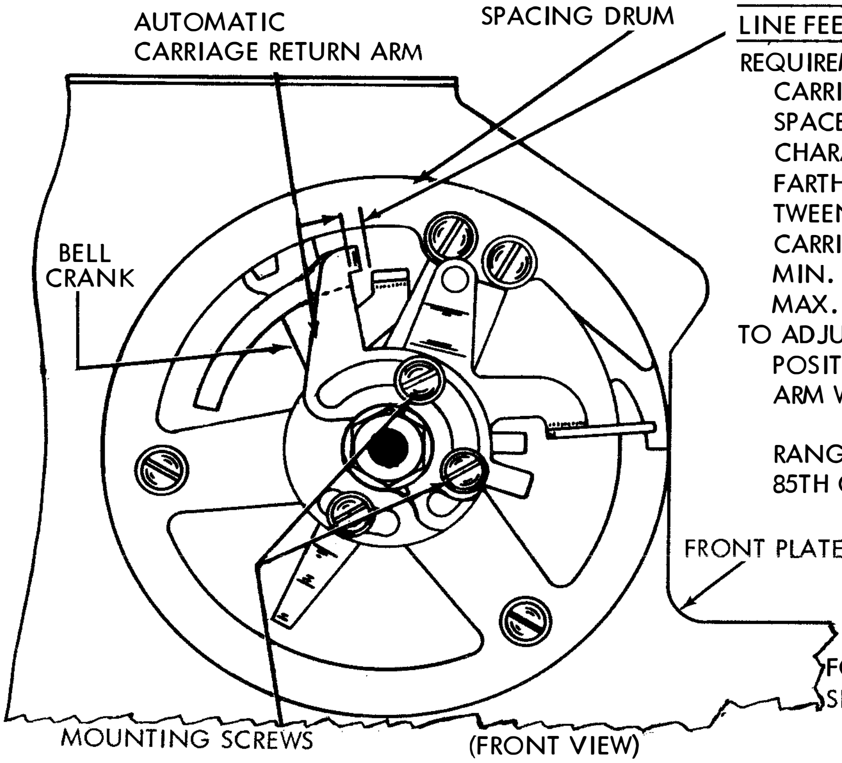
TO ADJUST

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

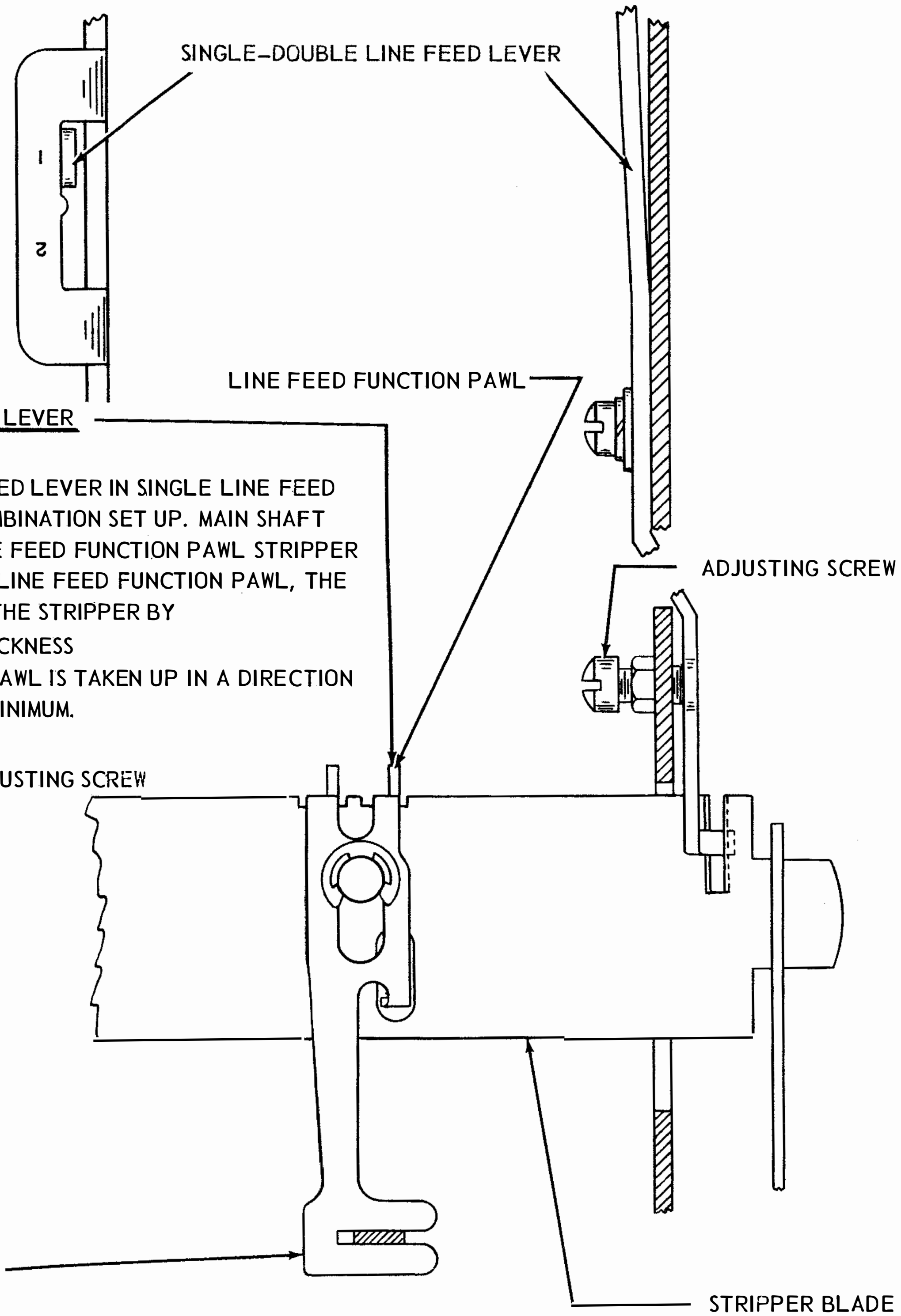
RANGE OF ADJUSTMENT IS FROM 65TH TO 85TH CHARACTERS.

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

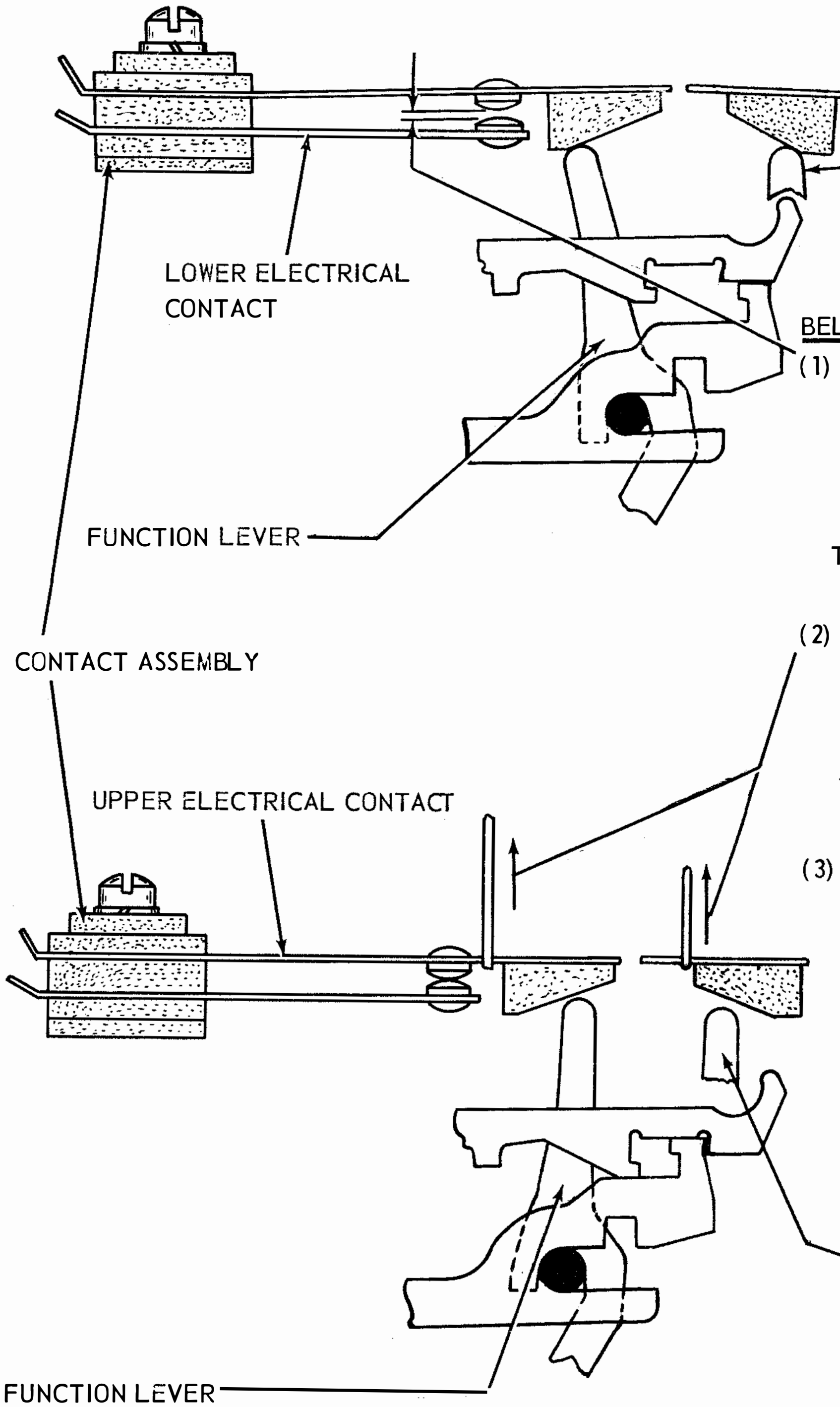
MIN. 1/2 THE PAWL THICKNESS

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.)



<u>BELL OR MOTOR STOP FUNCTION CONTACT</u>

(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.

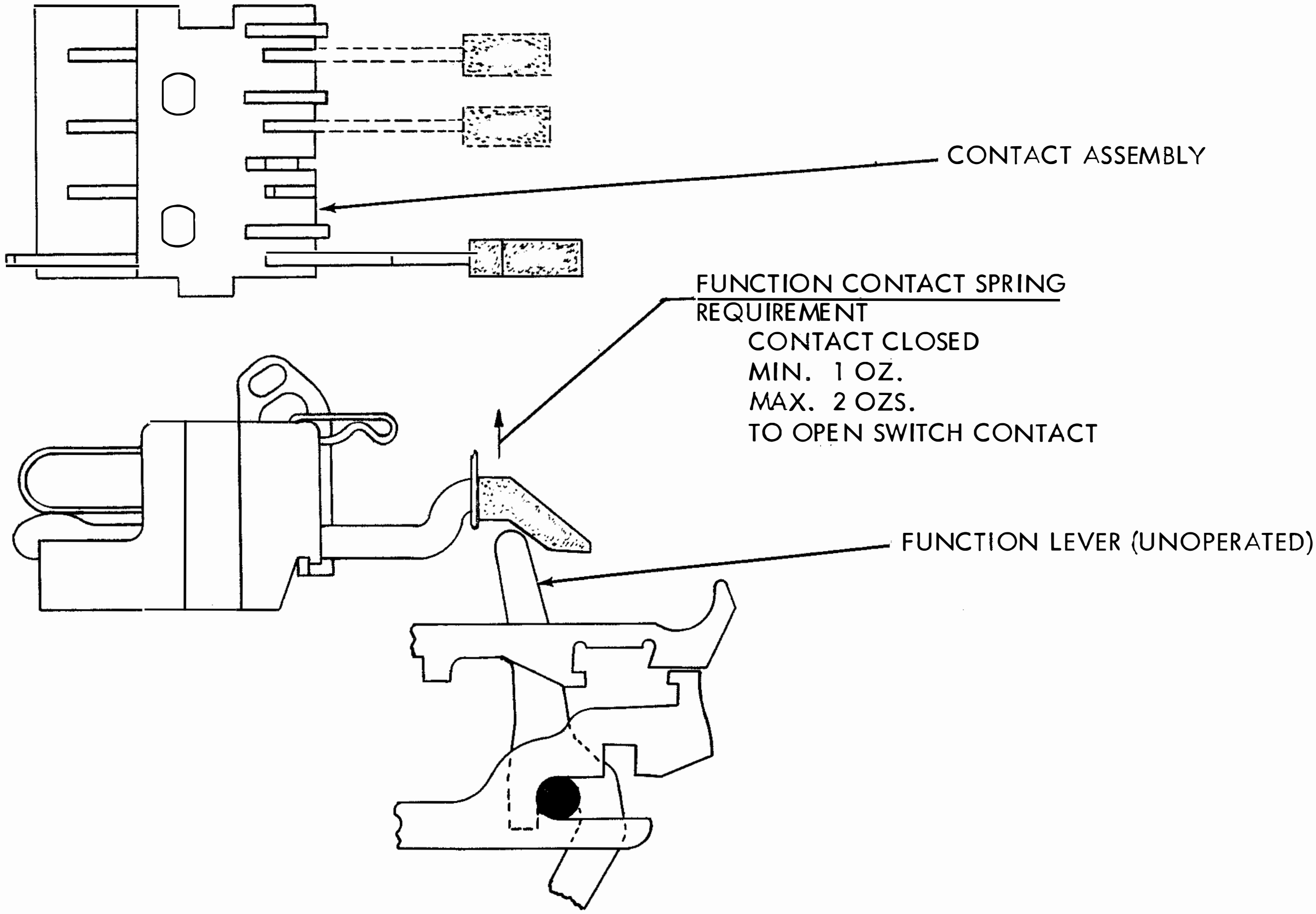
TO ADJUST

BEND THE UPPER ELECTRICAL CONTACT

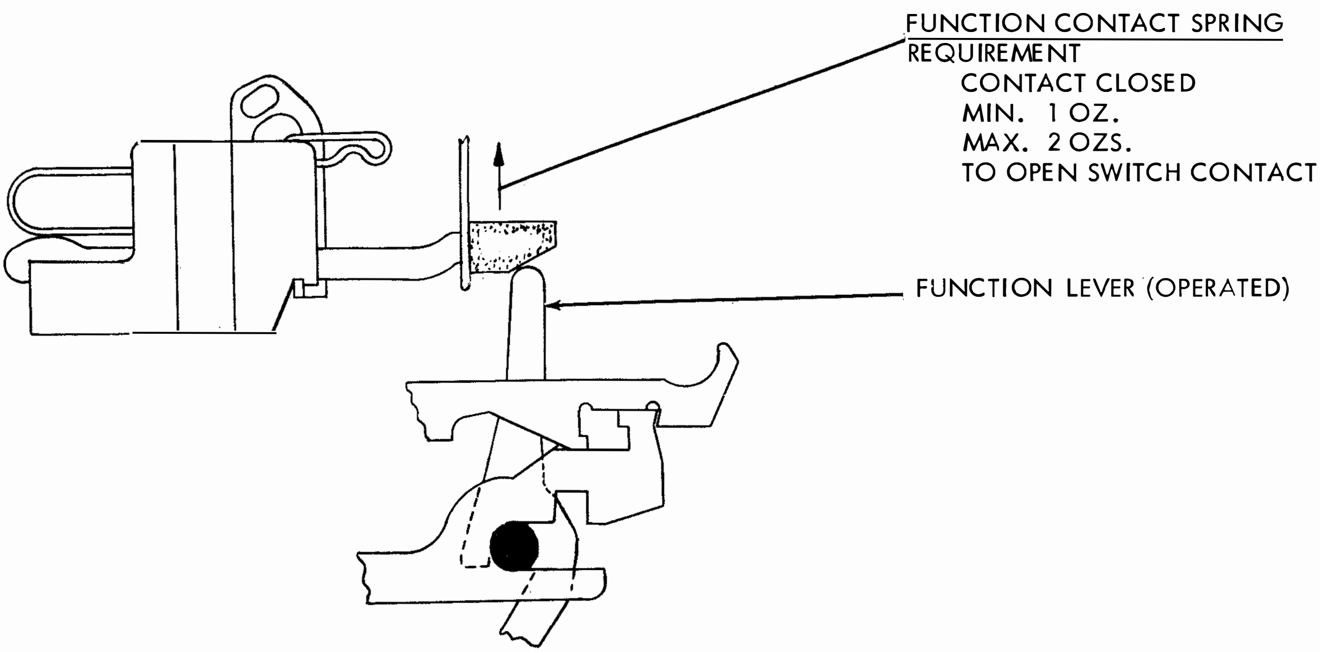
(3) REQUIREMENT

RECHECK REQUIREMENT (1)

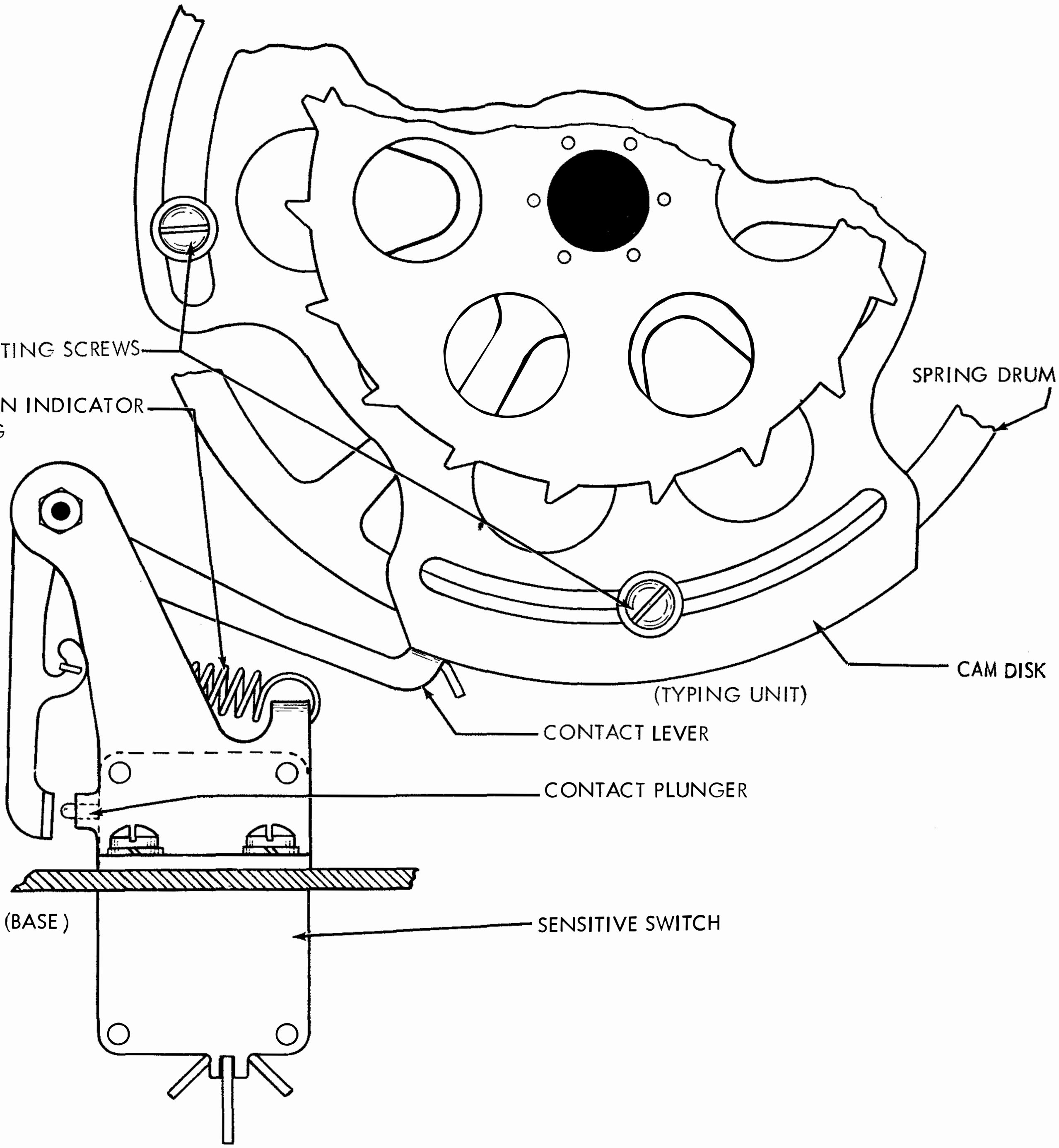
4.22 Function Mechanism (Cont.)



CAUTION: CARE SHOULD BE EXERCISED IN SOLDERING TO CONTACT SPRINGS SINCE EXCESSIVE HEAT WILL ANNEAL THE SPRINGS.



4.23 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 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

(D) TABULATOR SHAFT SPRING
(TORSION)

NOTE

FOR LOCATION OF SPRING SEE PAR.4.27

REQUIREMENT

OPERATING LEVER IN UNOPERATED POSITION.
(AS IN LOWER FIGURE)
MIN. 1-1/2 OZS.
MAX. 3-1/2 OZS.
TO START SLIDE ARM MOVING.

(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

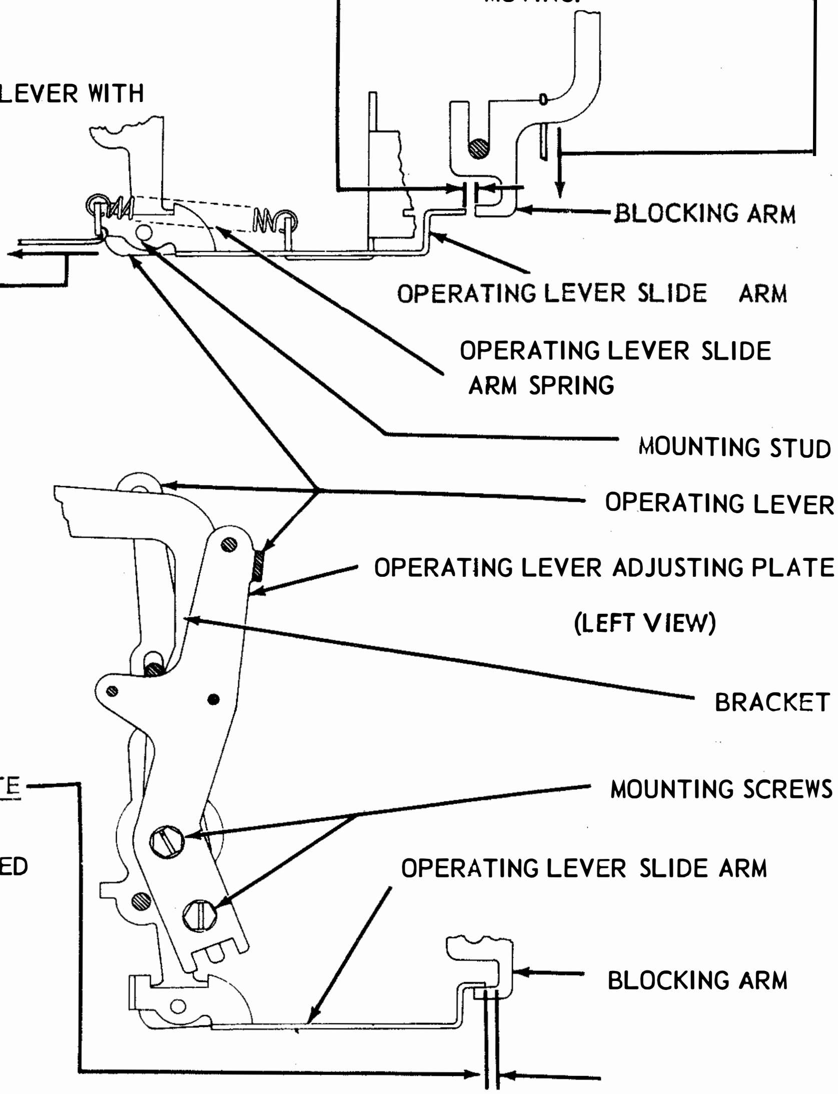
REQUIREMENT

OPERATING LEVER IN UNOPERATED POSITION. CLEARANCE

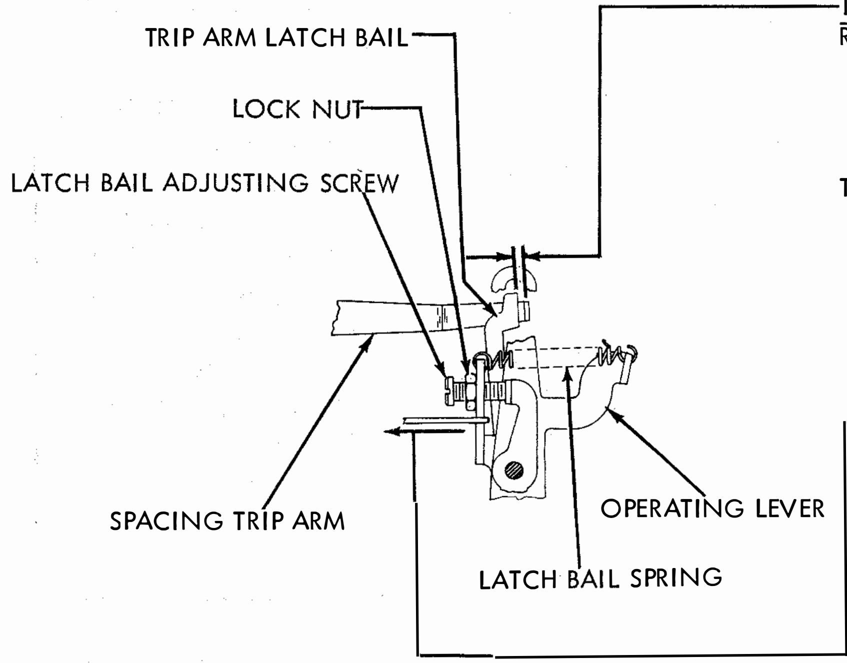
MIN. 0.070 INCH
MAX. 0.085 INCH

TO ADJUST

POSITION ADJUSTING PLATE ON BRACKET WITH MOUNTING SCREWS LOOSE.



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.

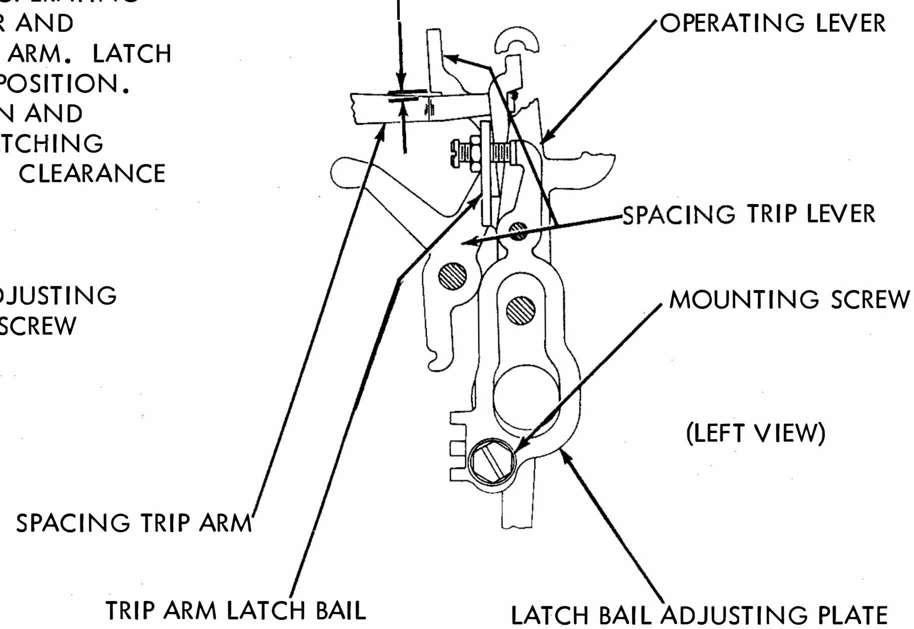
TRIP ARM LATCH BAIL SPRING

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

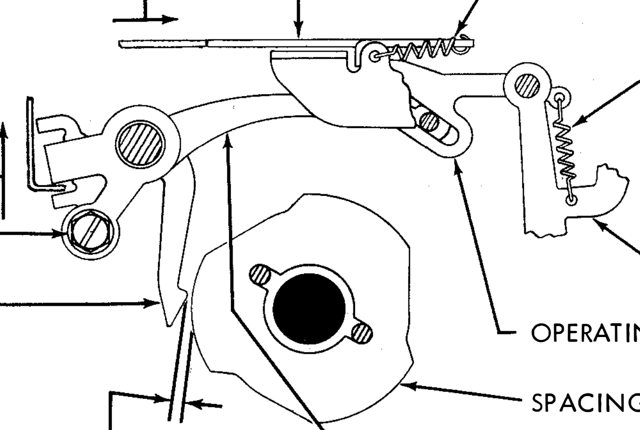
REQUIREMENT
SPACING CLUTCH AND TYPE BOX CLUTCH DISENGAGED. OPERATING LEVER SLIDE ARM TO REAR AND LATCHED ON BLOCKING ARM. LATCH BAIL IN FULLY LATCHED POSITION. SPACING TRIP ARM DOWN AND BEARING UP AGAINST LATCHING SURFACE OF LATCH BAIL. CLEARANCE
MIN. SOME
MAX. 0.008 INCH

TO ADJUST
POSITION LATCH BAIL ADJUSTING PLATE WITH MOUNTING SCREW FRICTION TIGHT.



4.26 Horizontal Tabulator Mechanism (Cont.)

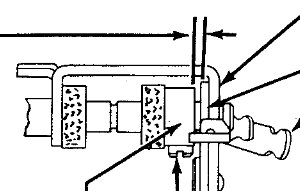
(C)
HORIZONTAL TABULATOR SLIDE ARM SPRING
REQUIREMENT
OPERATING LEVER IN OPERATED POSITION.
SLIDE ARM IN UNOPERATED POSITION.
MIN. 1 OZ.
MAX. 4 OZS.
TO START SLIDE ARM MOVING.



(LEFT SIDE VIEW)

(D)
OPERATING LEVER CAM PLATE SPRING
REQUIREMENT
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
REQUIREMENT
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
REQUIREMENT
TRANSFER BAIL SHOULD HAVE SOME END PLAY.
MAX. 0.008 INCH.
TO ADJUST
POSITION SET COLLAR WITH ADJUSTING SCREW LOOSENED.

4.27 Horizontal Tabulator Mechanism (Cont.)

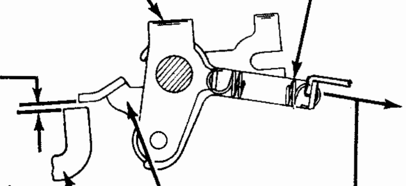
(A) RIGHT MARGIN

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)

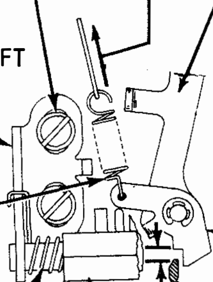
NOTE: FOUR SCREWS MUST BE LOOSENED TO ADJUST CIRCULAR CUTOUT LEVERS.



(RIGHT SIDE VIEW)

(B) SPACE SUPPRESSION BY-PASS SPRING

REQUIREMENT
MIN. 20 OZS.
MAX. 26 OZS.
TO START ARM MOVING.



(D) TABULATOR PAWL SPRING

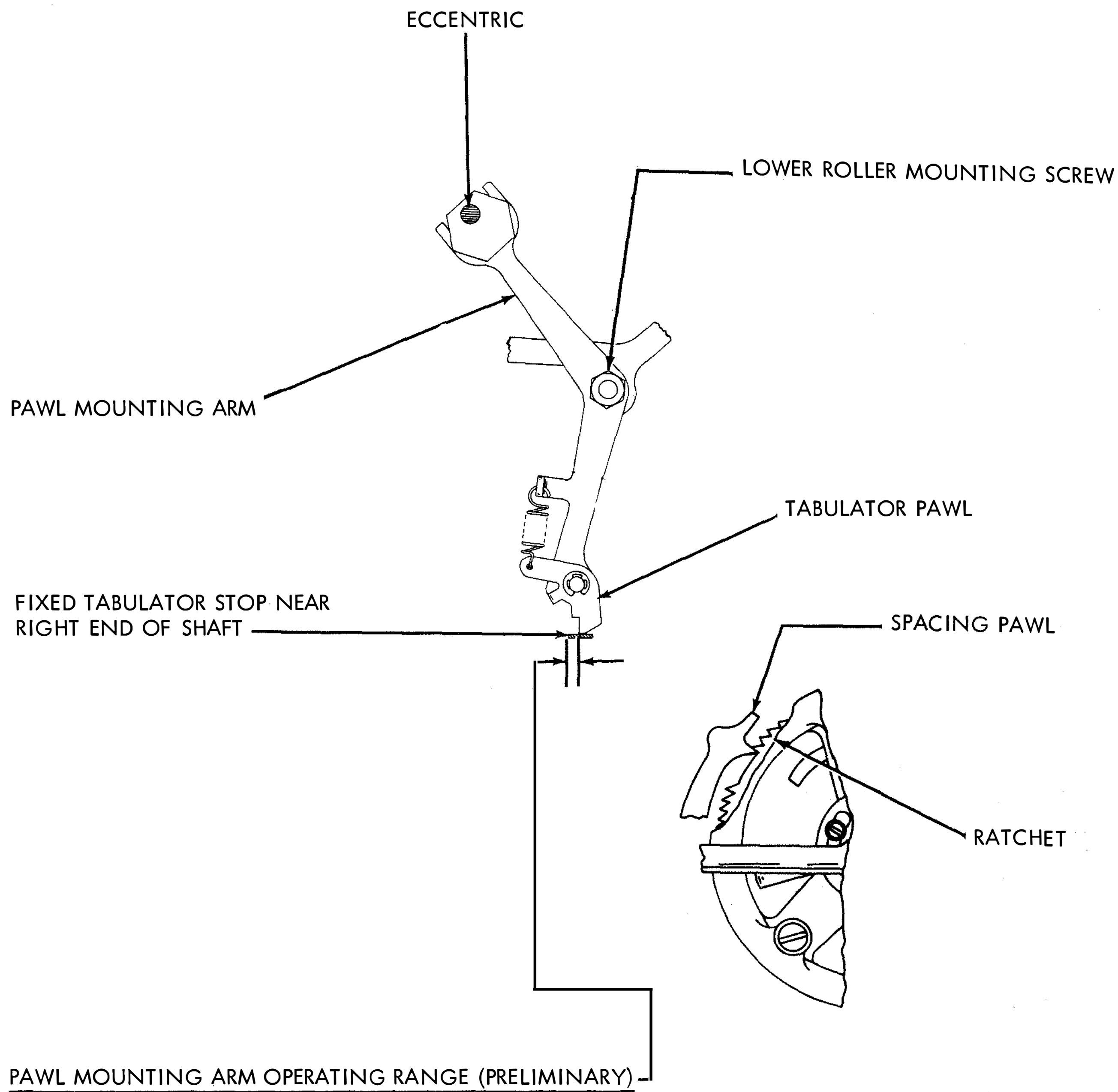
REQUIREMENT
MIN. 1-3/4 OZS.
MAX. 3 OZS.
TO PULL SPRING TO INSTALLED LENGTH.

(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.

4.28 Horizontal Tabulator Mechanism (Cont.)



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 PLATENS)

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

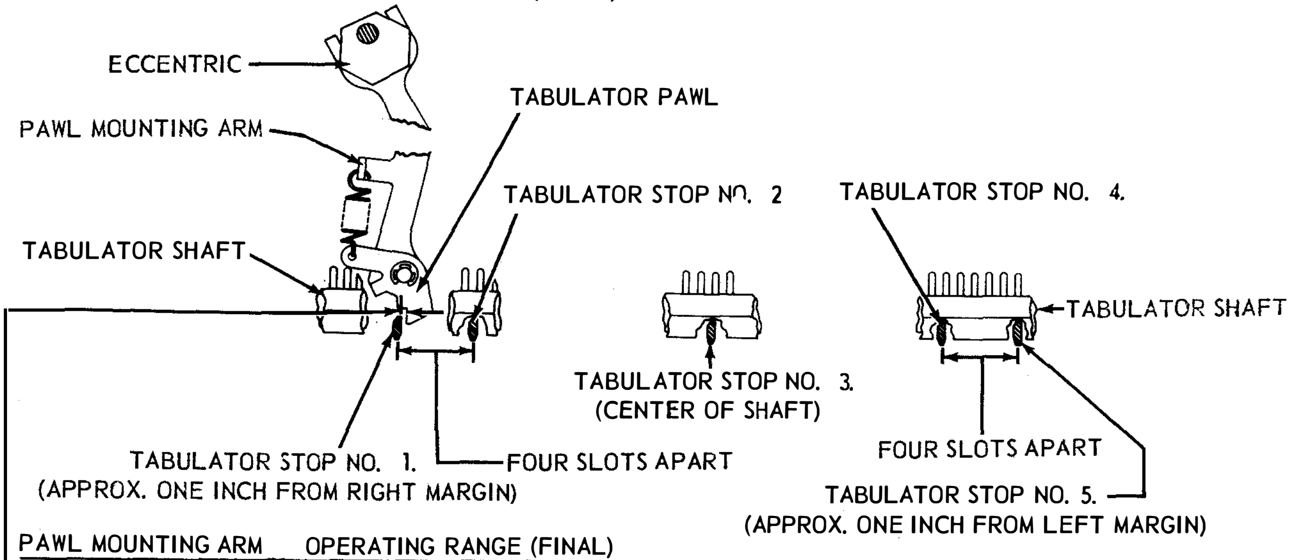
REQUIREMENT (UNITS WITH SPROCKET FEED PLATENS)

HIGH PART OF ECCENTRIC TOWARD LOWER ROLLER MOUNTING SCREW.

TO ADJUST

POSITION ECCENTRIC.

4.29 Horizontal Tabulator Mechanism (Cont.)



PAWL MOUNTING ARM OPERATING RANGE (FINAL)

REQUIREMENT

CLEARANCE MIDWAY BETWEEN MINIMUM AND MAXIMUM LIMITS OF OPERATING RANGE.

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 UNTILTEN LINES OF TABULAR OPERATION CAN BE MADE WITHOUT ERROR. (1) 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. (1) 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

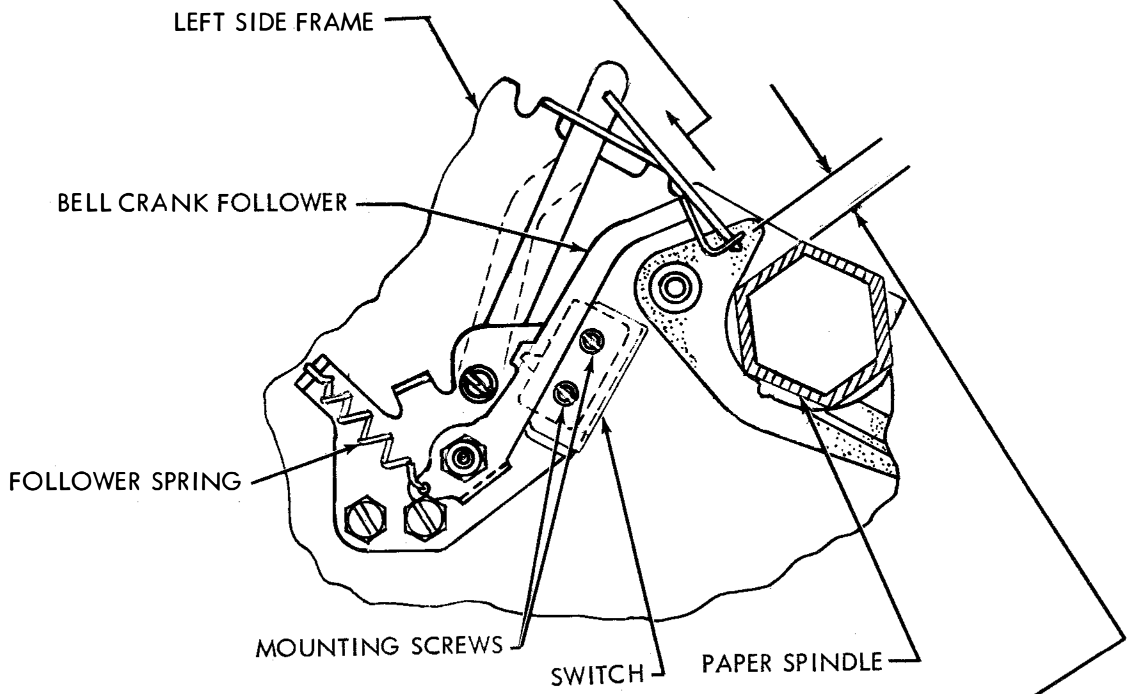
REQUIREMENT

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.

MOTOR UNITS

ADJUSTMENTS

CONTENTS PAGE

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

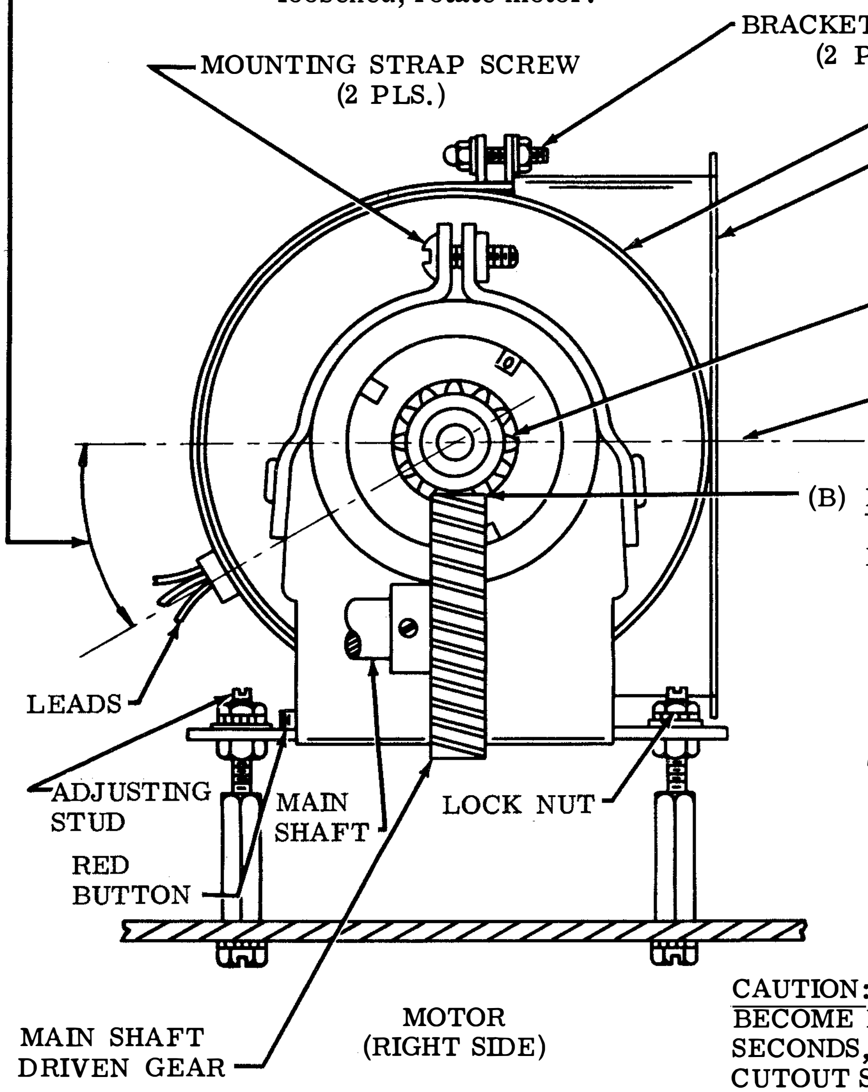
2.01 Motor Positioning

(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.



MOTOR
(RIGHT SIDE)

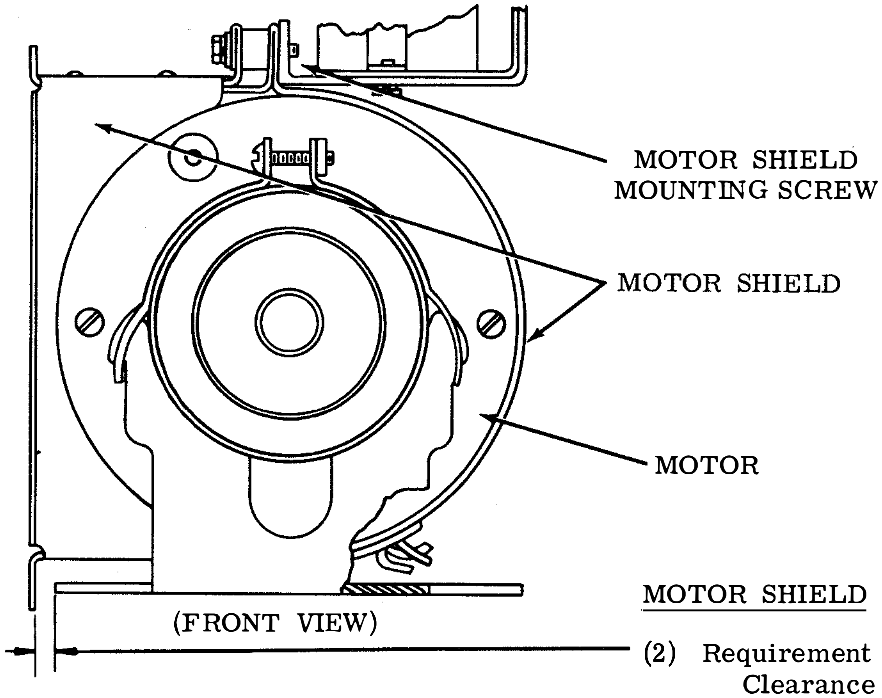
(B) MOTOR GEAR

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

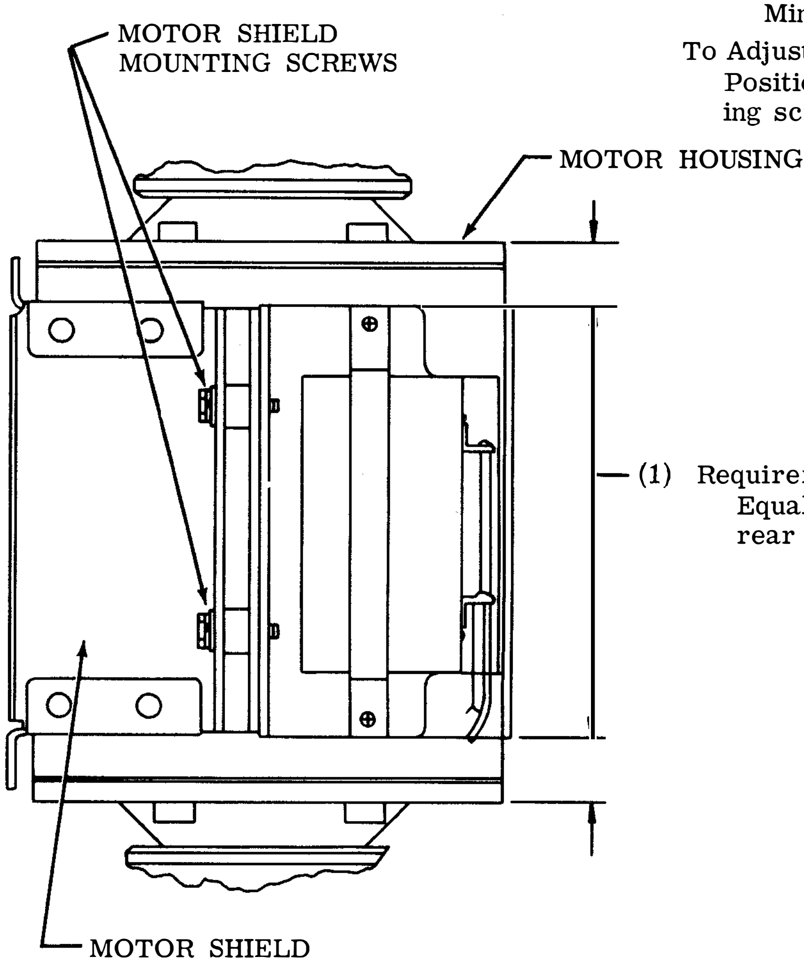


(FRONT VIEW)

MOTOR SHIELD (IF SO EQUIPPED)

(2) Requirement
Clearance between motor shield and motor mounting bracket should be
Min 0.062 inch

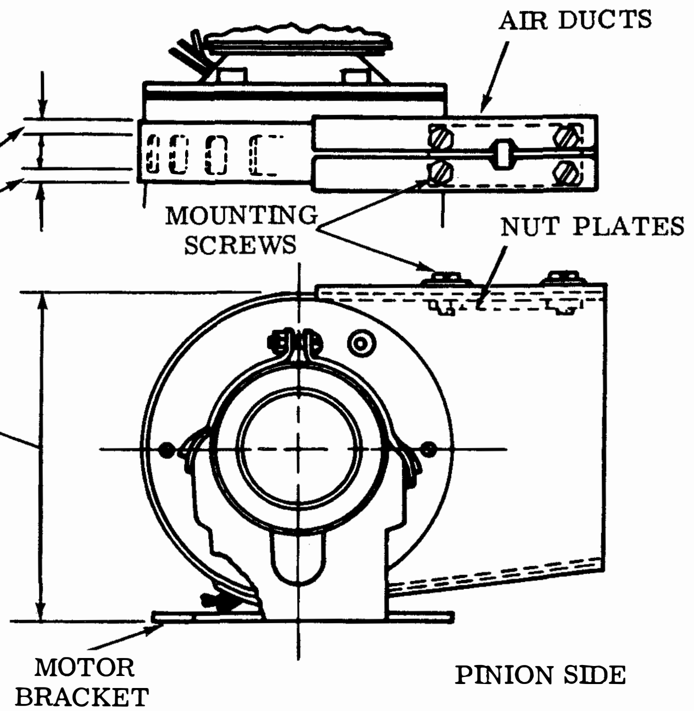
To Adjust
Position motor shield with its mounting screws loosened.



(1) Requirement
Equal clearance between front and rear ends of motor and motor shield.

(TOP VIEW)

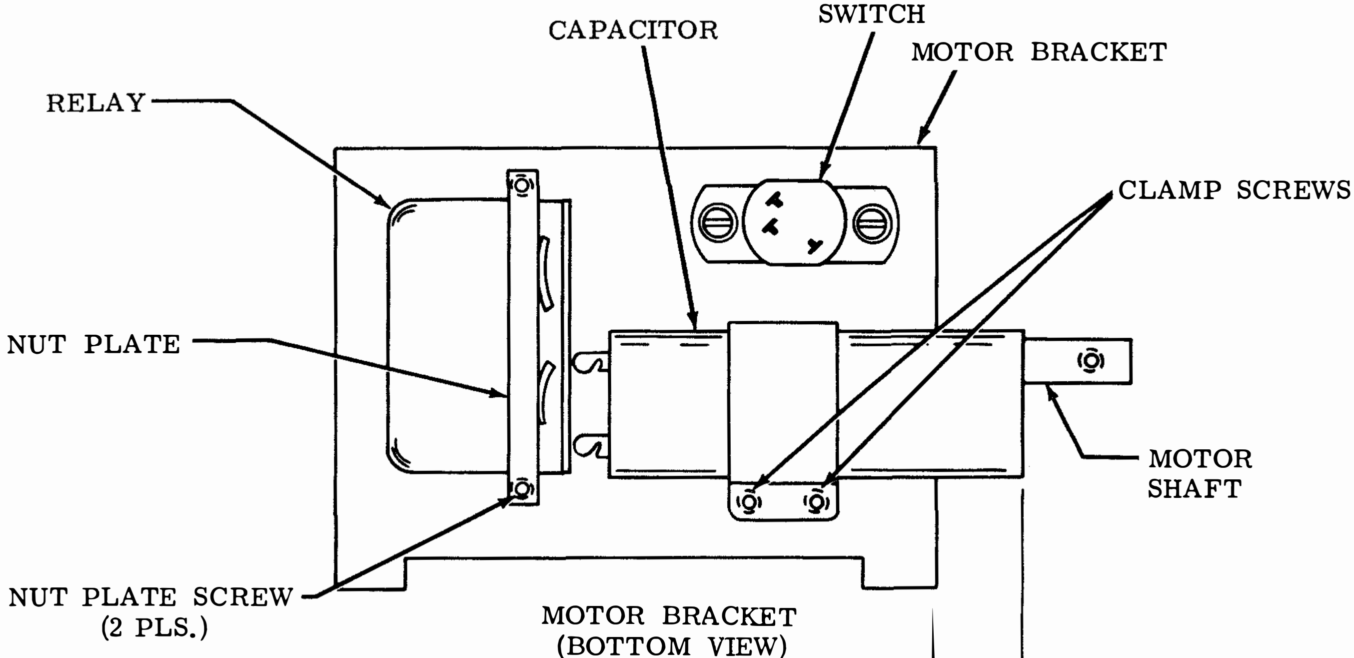
2.03 Air Ducts and Capacitor Position



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.



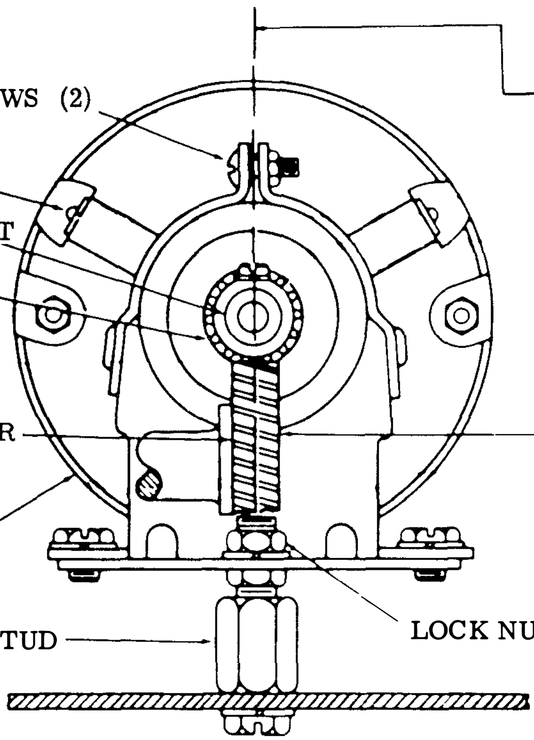
CAPACITOR POSITION

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)

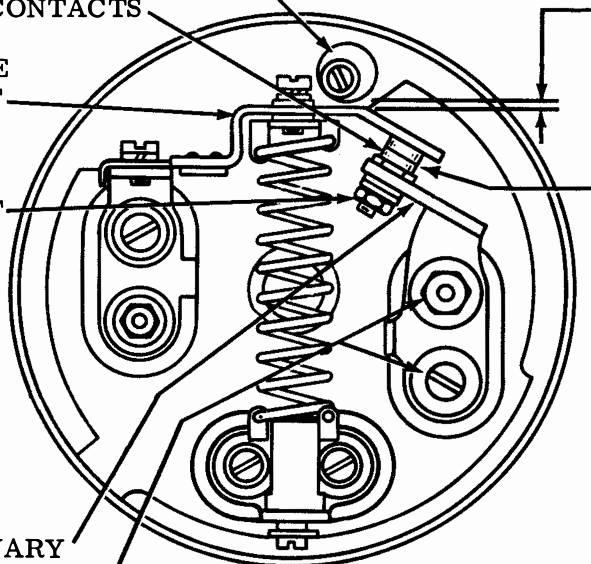
Requirement
Barely perceptible backlash between drive gear and driven gear at point where backlash is least.

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.
Min 0.020 inch---Max 0.040 inch

To Adjust
Rotate the eccentric backstop with clamping screw loosened.

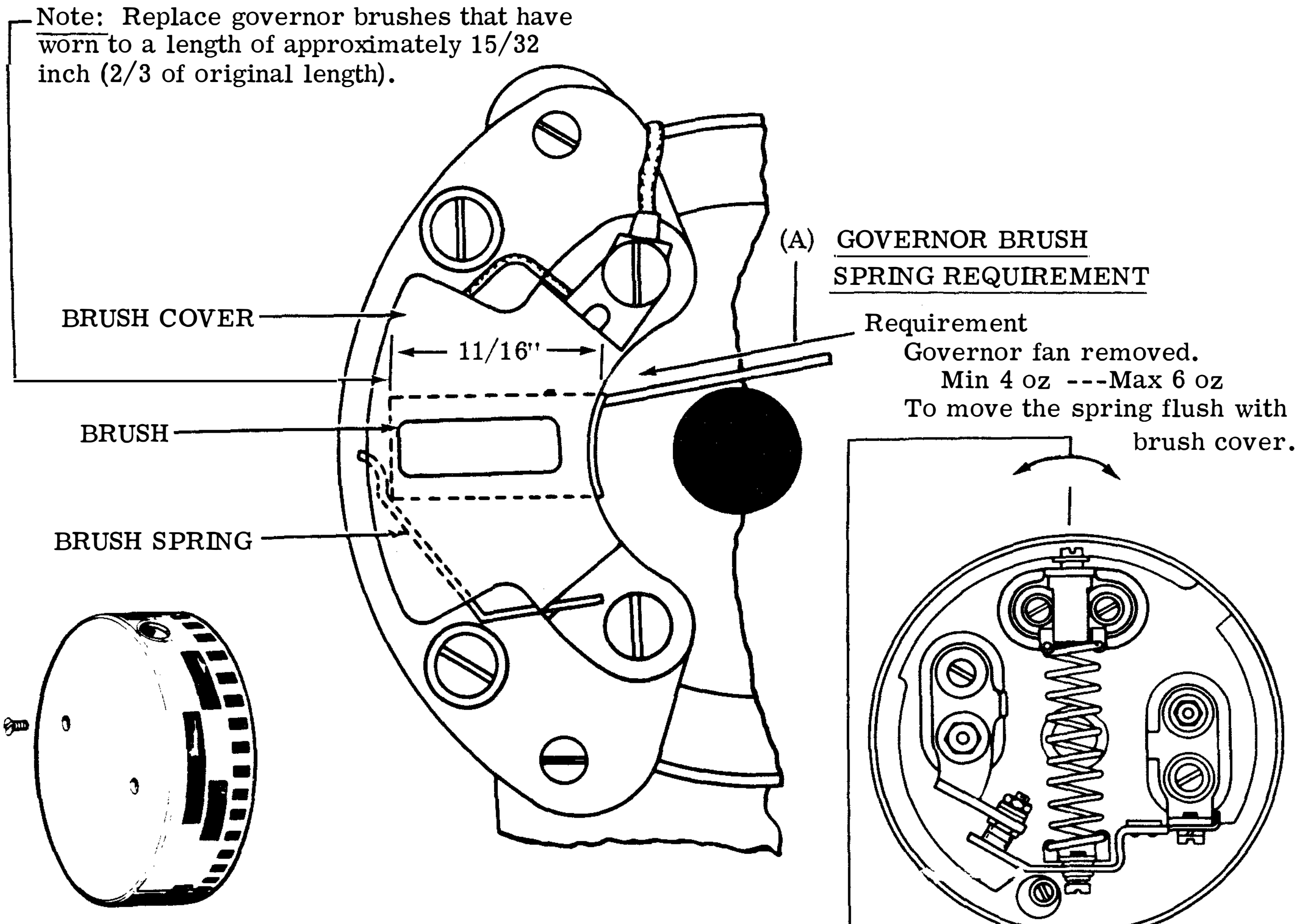
(B) GOVERNOR CONTACT

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



(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:

WPM	PRINTED CHARACTERS	REQUIRED TIME
60	70	10 seconds
75	44	5 seconds
100	57	5 seconds

28 TELETYPEWRITER CABINETS - FOR KSR AND RO SETS

LUBRICATION

CONTENTS PAGE

1. GENERAL

1.01 This section provides specific lubrication procedures for the 28 teletypewriter cabinets which house Keyboard Send-Receive (KSR) and Receive-Only (RO) Sets.

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.

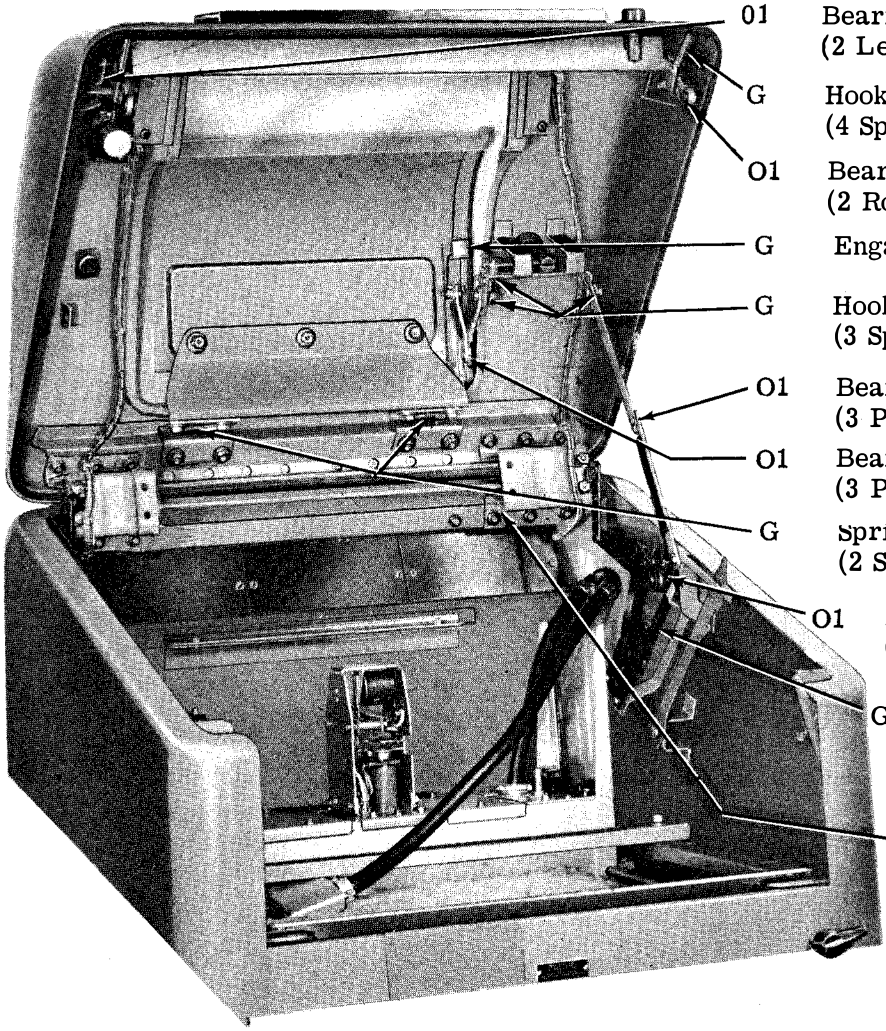
1.04 The lubricating symbols in the text of the figures indicate lubricating directions as follows:

- 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.

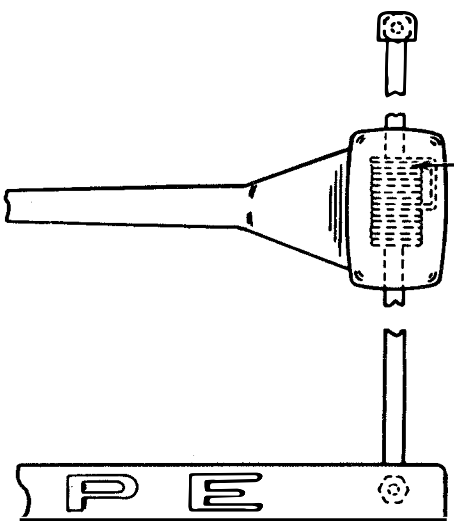
2. LUBRICATION DETAILS

2.01 LAC - 28B to 28E and 28J Teletypewriter Cabinets



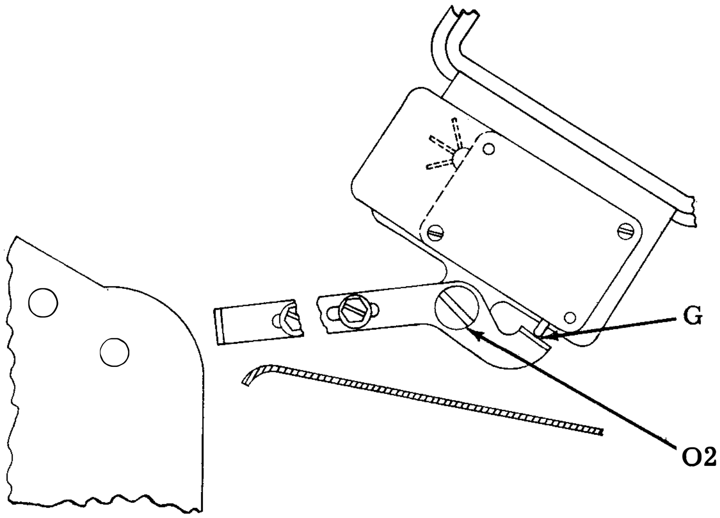
01	Bearing Surfaces (2 Levers)	Dome Latch Lever
G	Hooks - Each End (4 Springs)	Spring
O1	Bearing Surfaces (2 Rollers)	Dome Latch Roller
G	Engaging Surface	Door Latch
G	Hooks - Each End (3 Springs)	Spring
O1	Bearing Surfaces (3 Places)	Door Stop Arm
O1	Bearing Surfaces (3 Places)	Dome Stop Arm
G	Spring Loops (2 Springs)	Spring
O1	Bearing Surfaces (4 Places)	Dome Counter-Balance Arms
G	Sliding Groove	Dome Counter-Balance Arm
O2	Bearing Surfaces (2 Hinges)	Dome Hinges

2.02 Line Guide



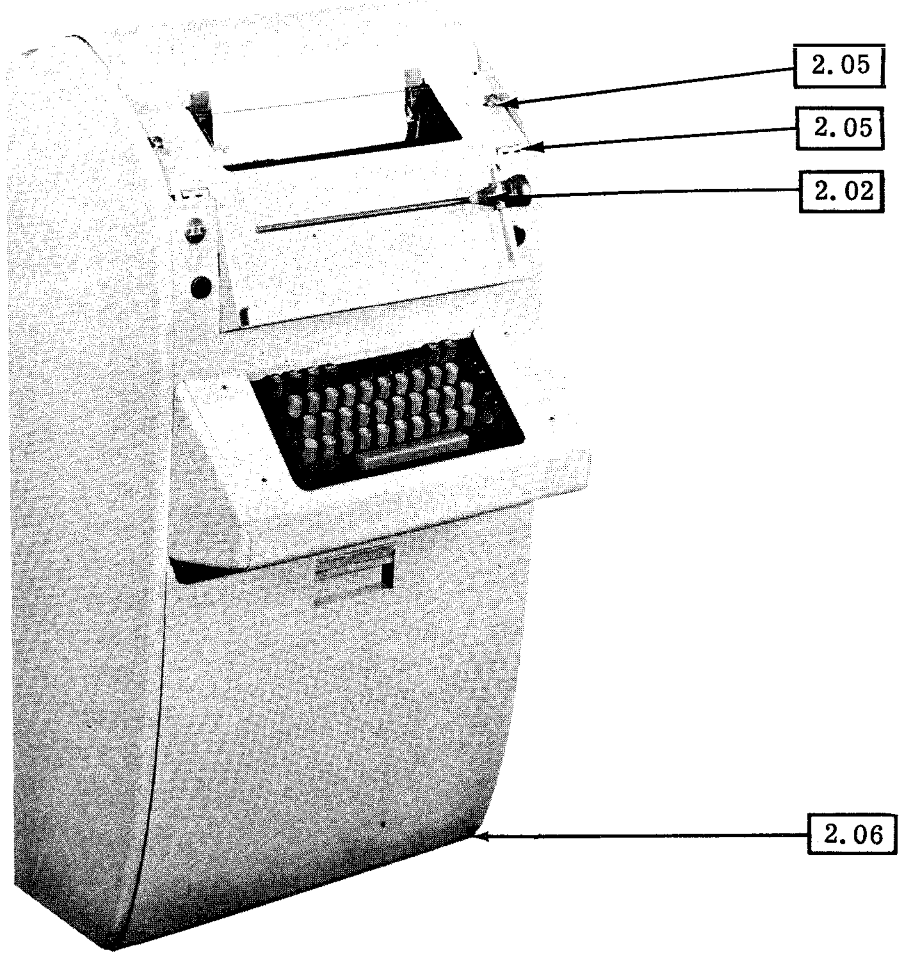
O1	Line Guide	Bushing

2.03 End-of-Form Alarm (Variable Feature)

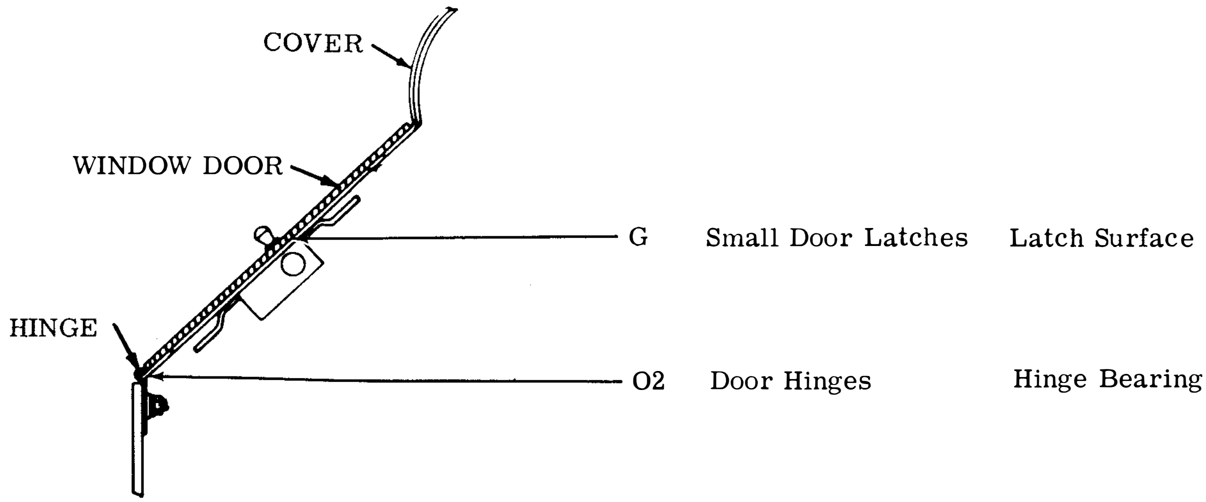


G	Engaging Surface Thin Film	Switch Plunger
O2	Bearing Surface	End-of-Form Lever

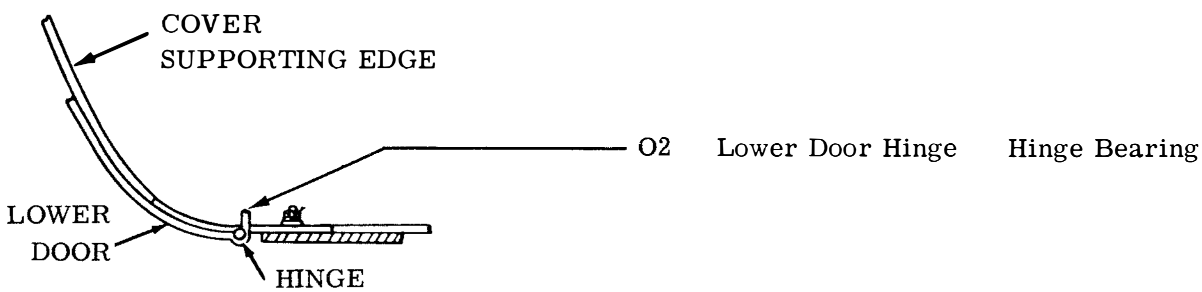
2.04 LPC - 28L and 28M Teletypewriter Cabinets (Wall Mounted)



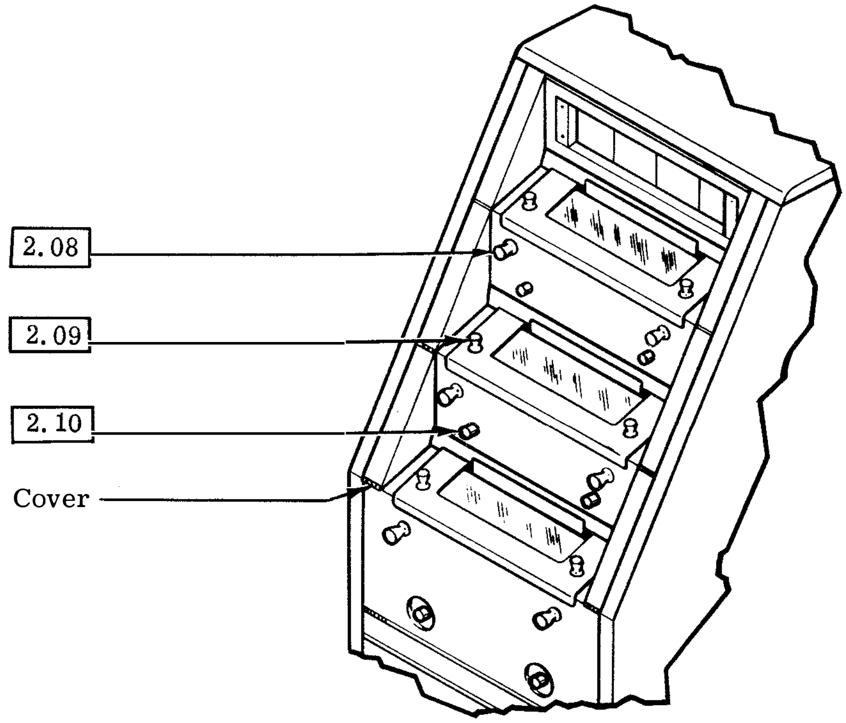
2.05 Window Door



2.06 Lower Door

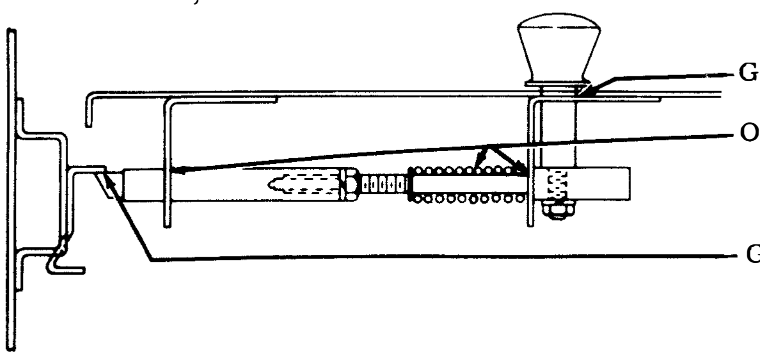


2.07 LBAC - 28LA Teletypewriter Cabinets



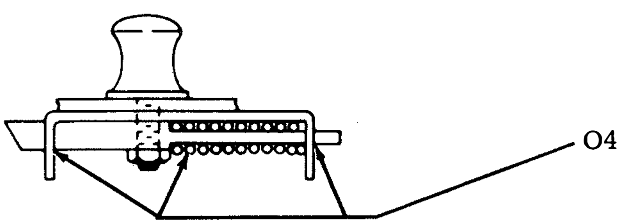
O4 Hinges (6)

2.08 Cabinet, Cover Latches



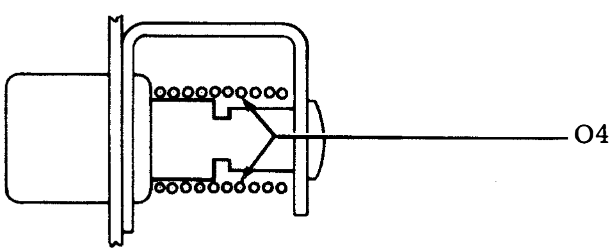
G	Sliding Members	Cover Latches (6)
O4	Springs and Brackets	Cover Latches (6)
G	Sliding Members	Latch Bolt (6)

2.09 Cabinet, Paper Access Door Latches (if present)



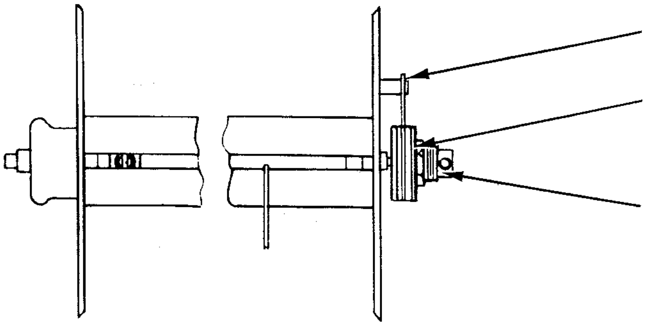
O4	Springs and Brackets	Access Door Latches (6)

2.10 Cabinet, Carriage Return and Line Feed Keylevers



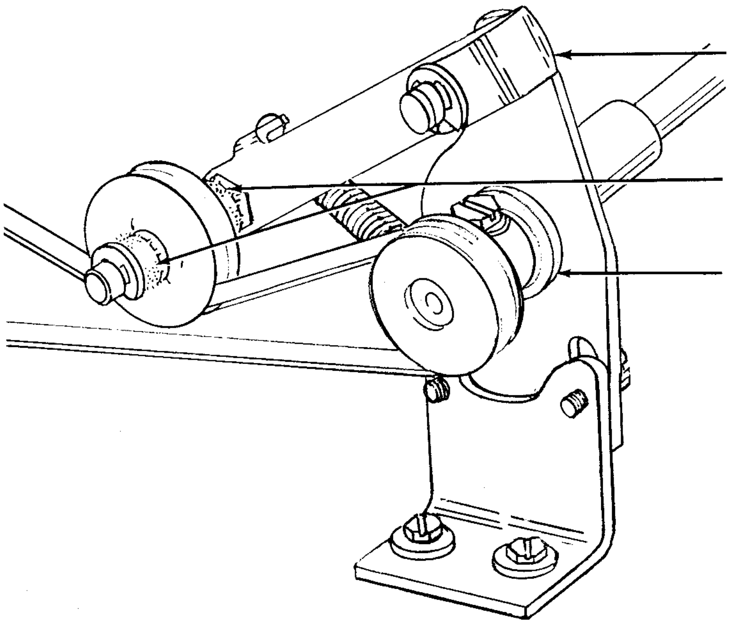
O4	Spring	Keylever (6)

2.11 Paper Winder Clutch Mechanism



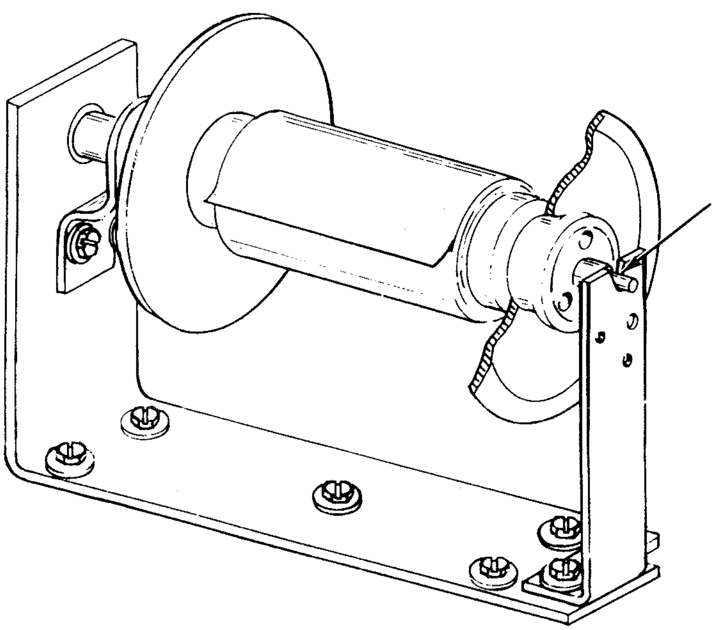
O1	Contacting Point	Friction Drive Fork
SAT	Felt Washers	Friction Clutch
SAT	Wick	Friction Clutch

2.12 Paper Winder Drive Mechanism



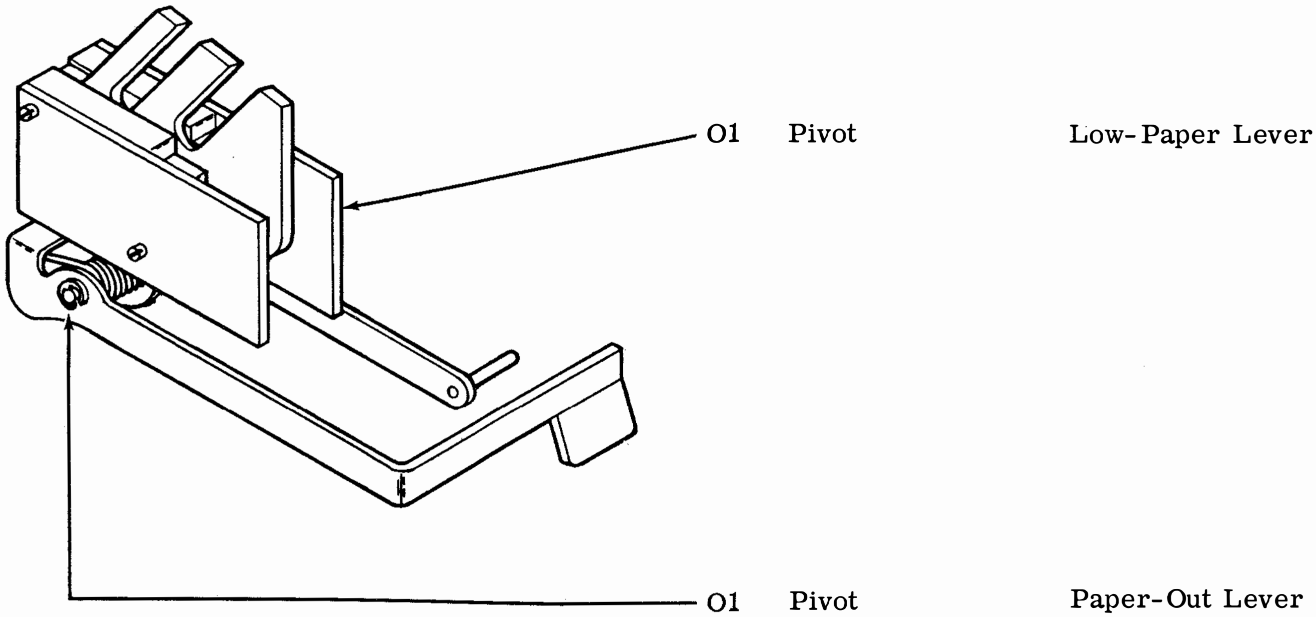
O1	Pivot	Idler Pulley Lever
SAT	Felt Washers	Idler Pulley
O2	Bearing	Drive Pulley Shaft

2.13 Paper Winder Bracket

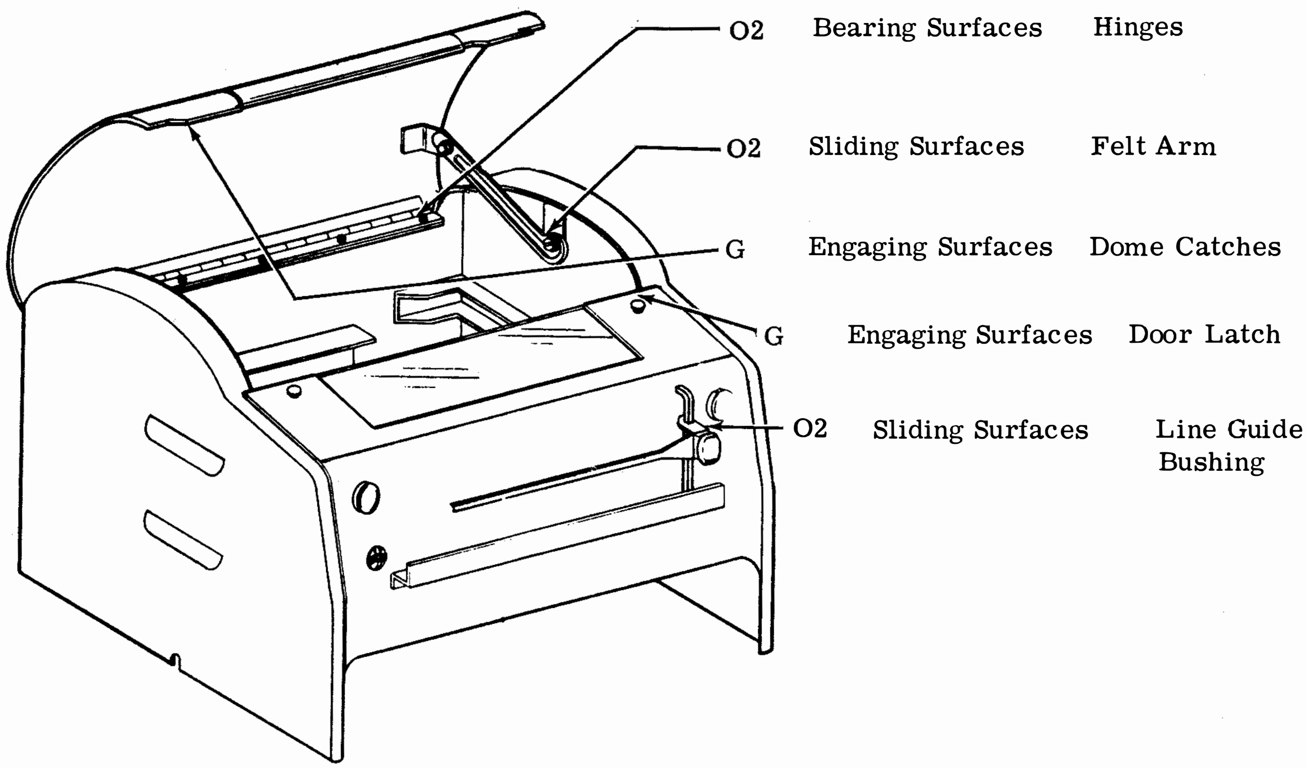


O1	Bearing	Bearing Bracket

2.14 Low Paper and Paper-Out Switch Mechanism



2.15 LPC - 28A Cabinets



28 ELECTRICAL SERVICE UNIT

LUBRICATION

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.

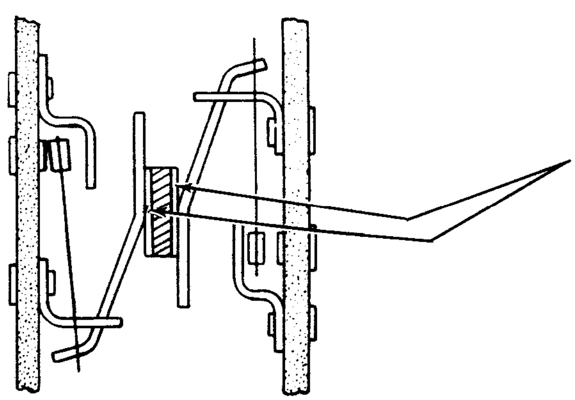
1.03 The lubricating symbol in the text of the figure indicates lubrication directions as follows:

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.

2. LUBRICATION DETAILS

2.01 Stop Magnet



G Engaging Surfaces Stop Magnet Armature

28 TELETYPEWRITER KEYBOARD AND BASE (KSR AND RO)

LUBRICATION

CONTENTS PAGE

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:

Operating Speed (WPM)	Lubrication Intervals
60	3000 hours or 1 year*
75	2400 hours or 9 months*
100	1500 hours or 6 months*

*Whichever occurs first.

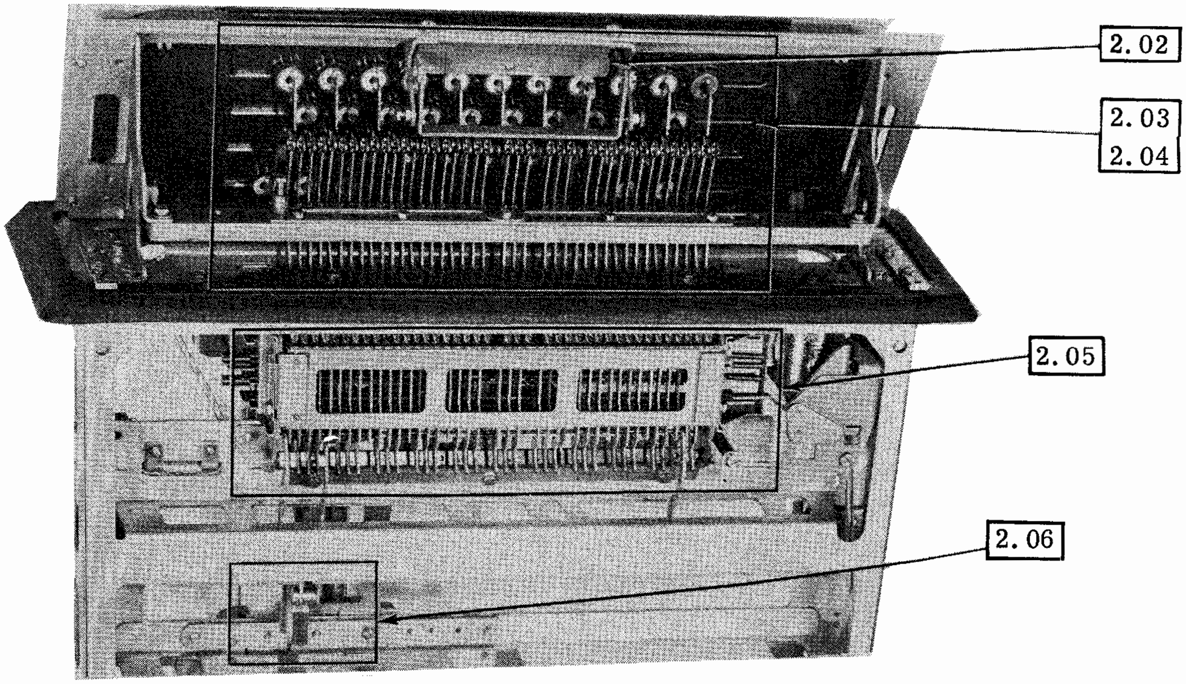
1.06 All spring eyes, spring wicks and felt oilers should be saturated. The friction surfaces of all moving parts should be thoroughly lubricated. However, over-lubrication, which will permit oil or grease to drip or be thrown on other parts should be avoided.

CAUTION: SPECIAL CARE MUST BE TAKEN TO PREVENT ANY OIL OR GREASE FROM GETTING BETWEEN ELECTRICAL CONTACTS.

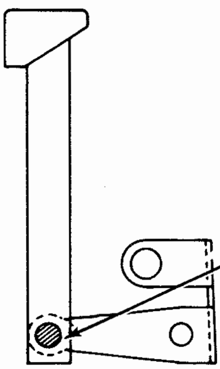
1.07 Apply a thick film of grease to all gears. Apply oil to all cams, including the camming surfaces of each clutch discs.

2. LATER DESIGN KEYBOARD

2.01 Keyboard - Bottom View

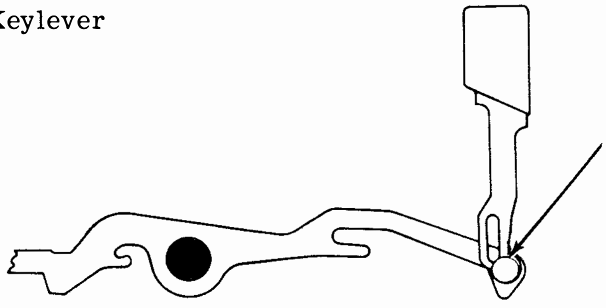


2.02 Spacebar



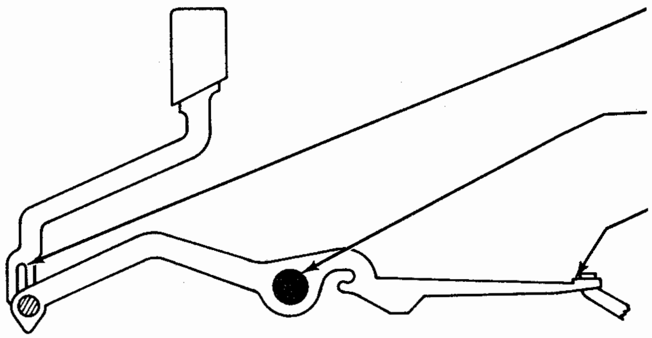
O1	Bearing Surface (Left & Right)	Spacebar

2.03 Keylever



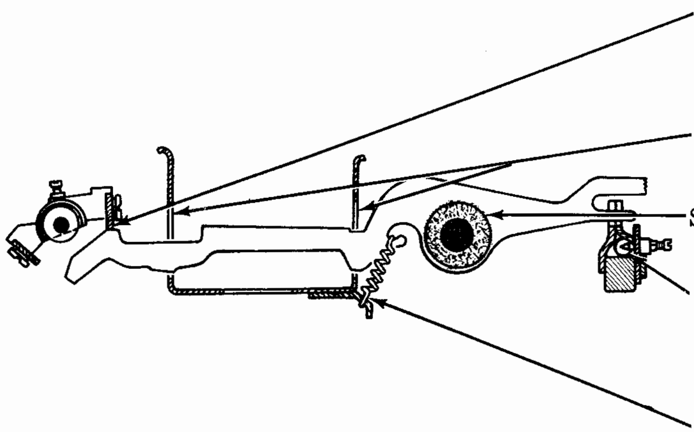
O1	Engaging Surface (36 Levers)	Keytop Levers

2.04 Breaklever



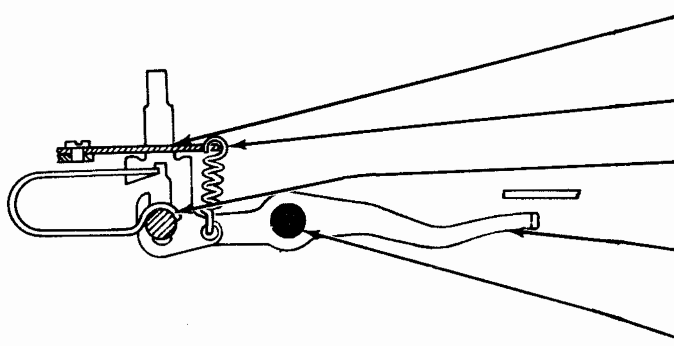
O1	Engaging Surface	Break Keylever
O1	Bearing Surface	Function Lever
G	Contact Surface	Breaklever

2.05 Codelever



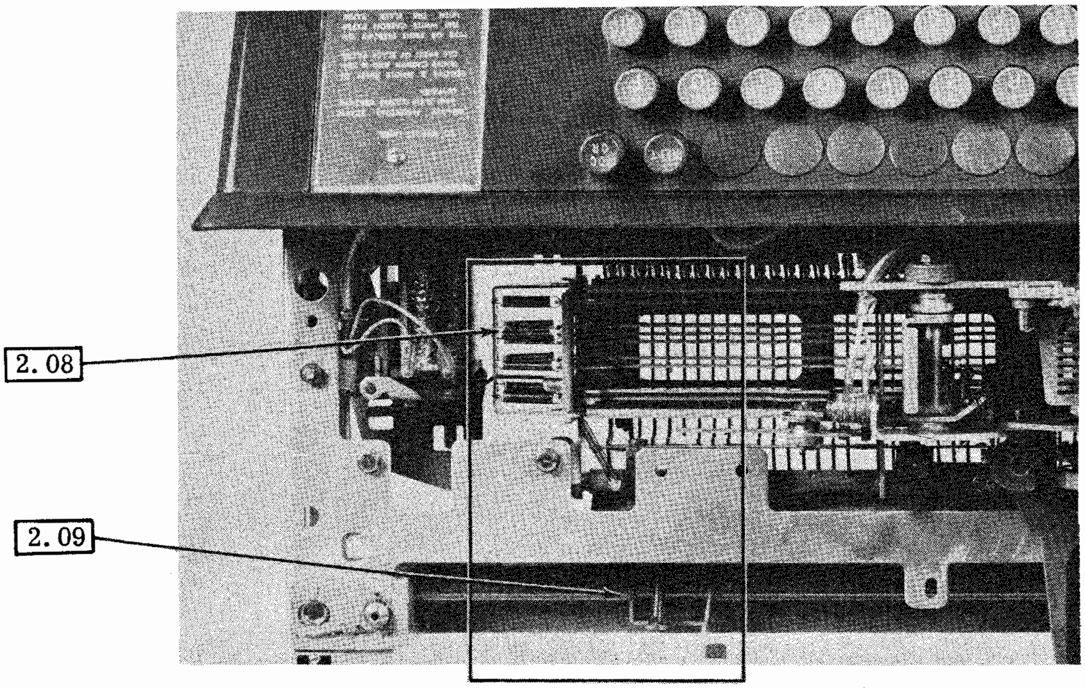
G	Contacting Surface (32 Levers)	Codelever Universal Bail
O1	Guide Slots (32 Levers)	Codelevers
SAT	Felt Washers (6 Washers)	Codelever Shaft
O1	Bearing Surface (32 Wedges)	Lock Ball Track
O1	Hooks - Each End (40 Springs)	Spring

2.06 Keyboard Lock

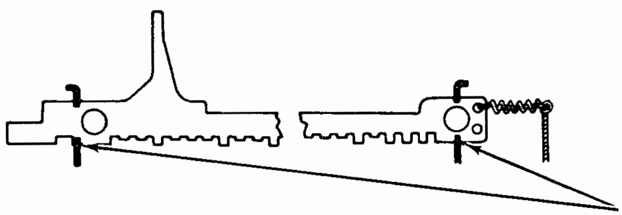


O1	Guide Slot	Keyboard Lock Plunger
O1	Hooks - Each End	Spring
O1	Bearing Surface	Keyboard Locklever
G	Engaging Sur-face	Keyboard Lock Function Lever
O1	Bearing Surface	Function Bail

2.07 Keyboard - Top View

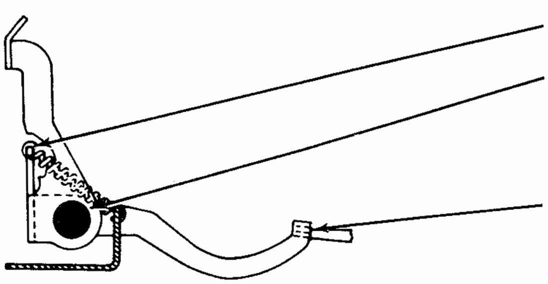


2.08 Codebar



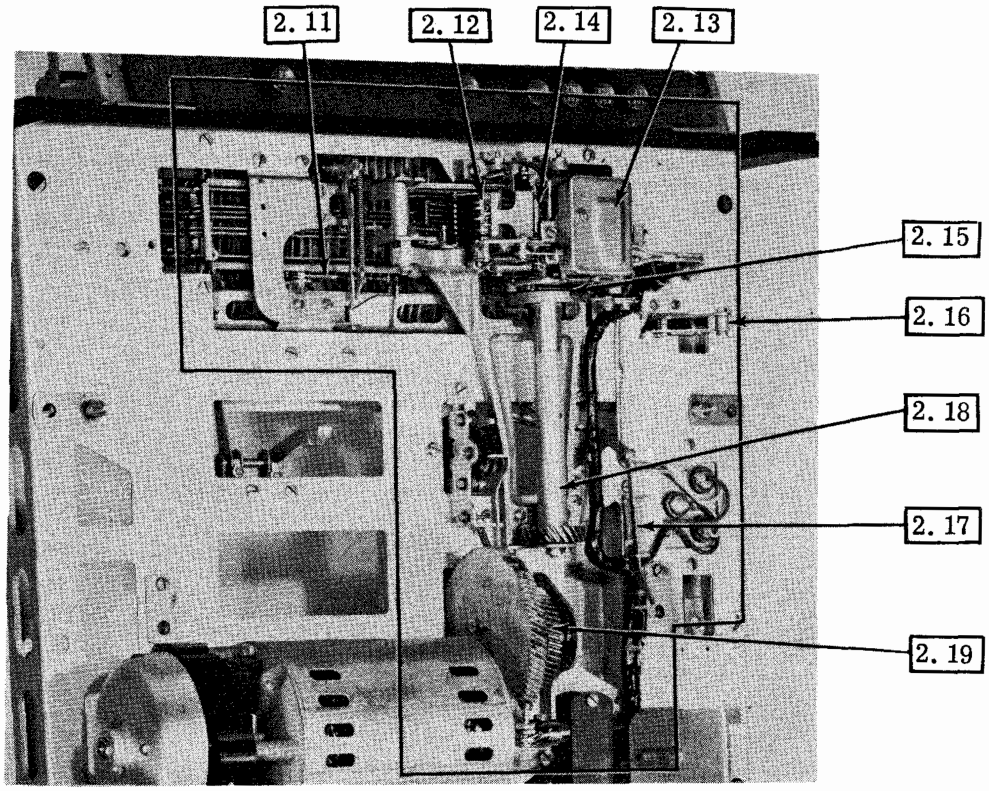
O1	Hooks - Each End (7 Springs)	Spring
O1	Guide Slots (Left and Right - Top and Bottom)	Codebar Guides

2.09 Local Carriage Return



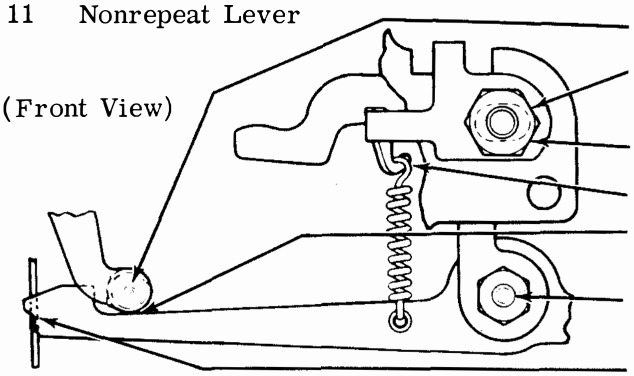
O1	Hooks - Each End	Spring
O1	Bearing Surface (2 Places)	Local Carriage Return Function Bail
G	Engaging Surface	Local Carriage Return Function Lever

2.10 Signal Generator Mechanism - Top Rear View



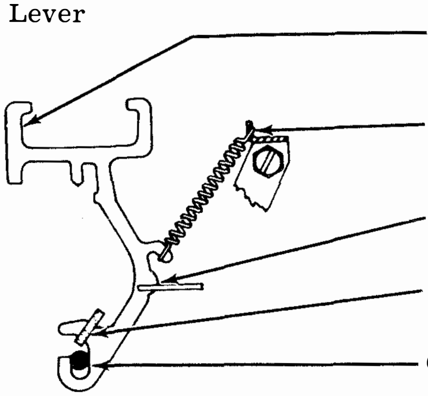
2.11 Nonrepeat Lever

(Front View)



O1	Bearing Surface	Codebar Bail Roller
SAT	Felt Washer (Rear View)	Nonrepeat Lever Crank
O2	Bearing Surface	Nonrepeat Lever Crank
O1	Hooks - Each End	Spring
G	Engaging Surface	Nonrepeat Lever
O2	Bearing Surface	Nonrepeat Lever
O2	Guide Slot	Nonrepeat Lever

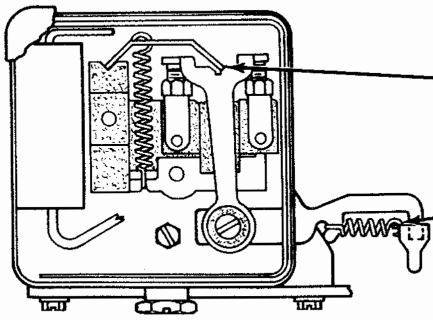
2.12 Transfer Lever



O1	Guide Slots	Transfer Levers (7 Levers)
O1	Hooks - Each End (7 Springs)	Spring
O1	Guide Slots	Transfer Levers (7 Levers)
SAT	Felt Washers (4 Washers)	Camming Surfaces
O1	Guide Slots	Transfer Levers (7 Levers)

2.13 Contact Box

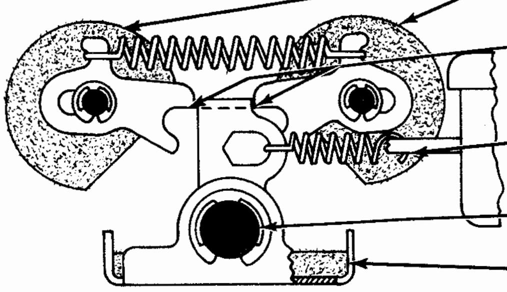
Note: Contact box cover must be removed prior to lubrication. To remove contact box cover, remove securing nut and lockwasher.



G	Engaging Surface	Contact Toggle
O1	Hooks - Each End	Spring

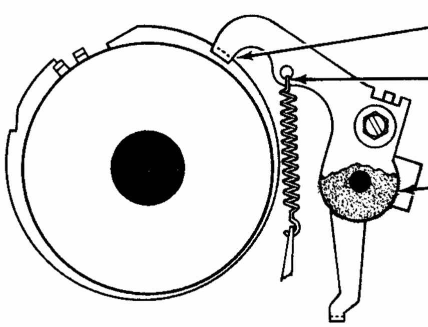
CAUTION: GREASE SPARINGLY - KEEP CONTACTS FREE OF OIL OR GREASE.

2.14 Transfer Bail



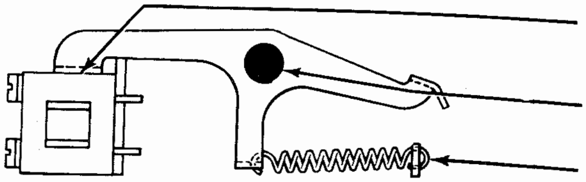
SAT	Felt Washers (2 Washers)	Latches
G	Engaging Surface	Transfer Bail
O1	Hooks - Each End (2 Springs)	Spring
O2	Bearing Surface	Transfer Bail
SAT	Oil Wick	Transfer Bail

2.15 Function Clutch



O2	Latching Surface	Clutch Stop Lever and Clutch Latchlever
O1	Hooks - Each End (2 Springs)	Spring
SAT	Felt Washers (2 Front & Rear)	Clutch Tripbail

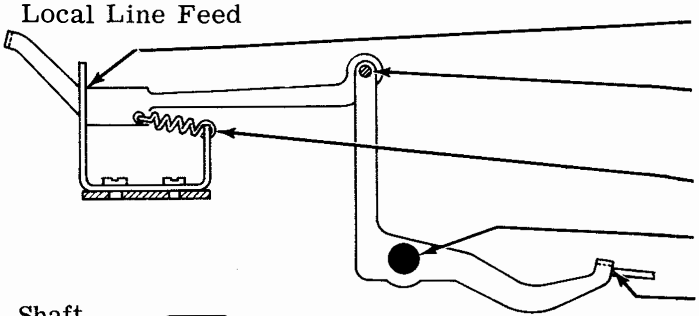
2.16 Margin Indicator



O1	Engaging Surface (See Note)	Margin Indicator Switch
O1	Bearing Surface	Switch Lever
O1	Hooks - Each End	Spring

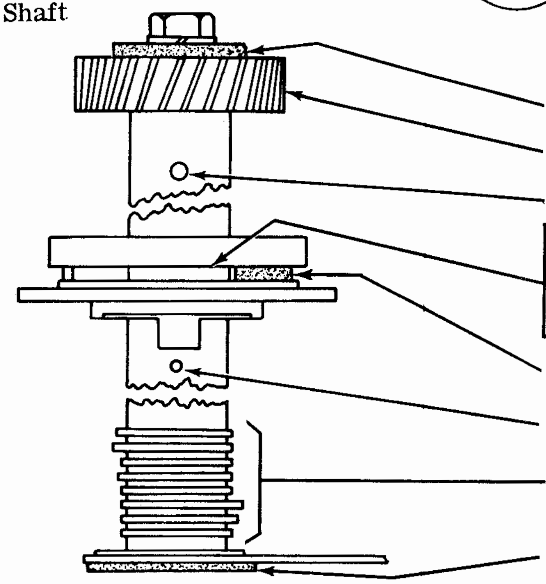
Note: Engaging surface of switch and lever shall not be lubricated if switch has a nylon actuator.

2.17 Local Line Feed



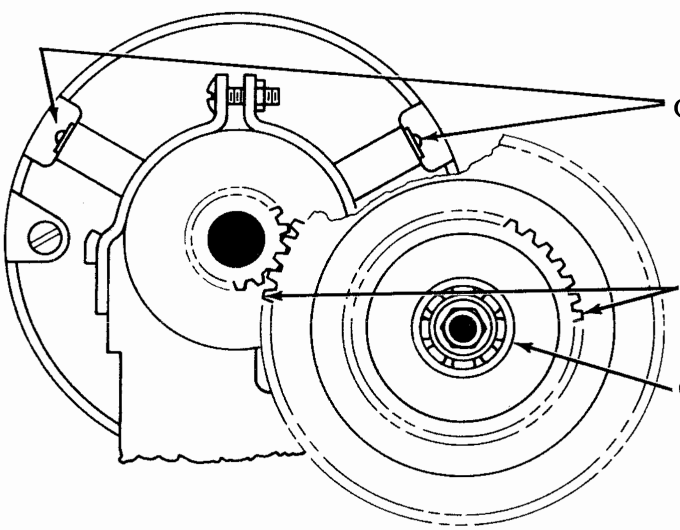
O2	Guide Slot	Local Line Feed Trip Link
O1	Bearing Surface	Local Line Feed Function Lever
O1	Hooks - Each End	Spring
O1	Bearing Surface	Function Bail
G	Engaging Surface	Local Line Feed Function Lever

2.18 Shaft



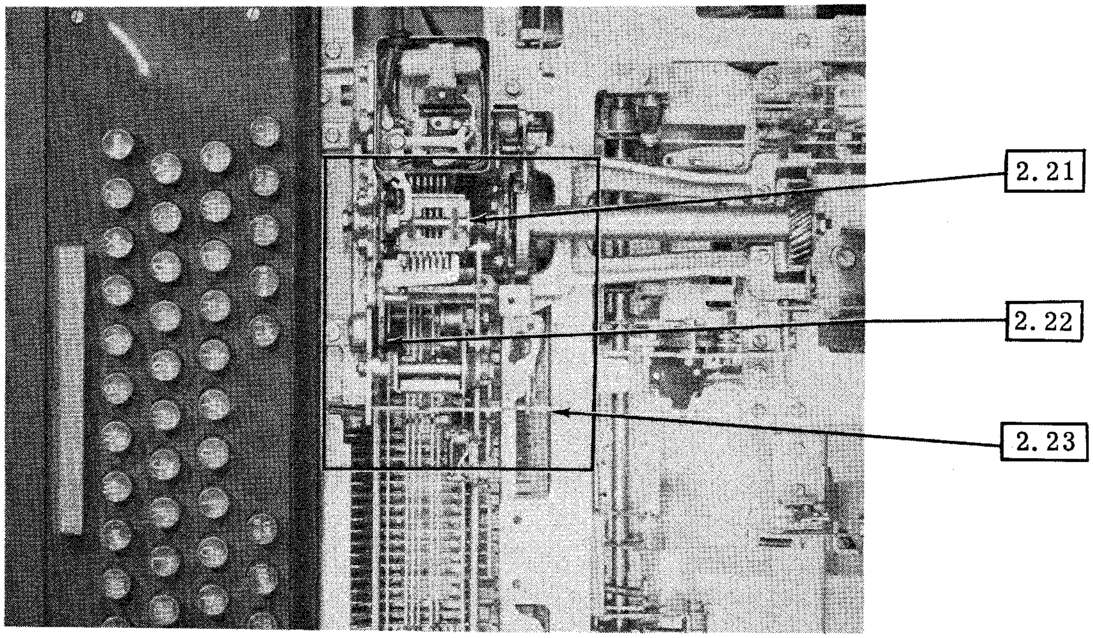
SAT	Felt Washer	Signal Generator Shaft
G	Gear Teeth	Signal Generator Shaft
O20	Oil Hole	Signal Generator Shaft
G	Each Hook	Shoe Lever Spring
SAT	Internal Mechanism	Keyboard Clutch
SAT	Felt Wick	
O20	Oil Hole	Signal Generator Cam
O2	Camming Surface Each Cam	Signal Generator Cam
SAT	Felt Washer	Signal Generator Shaft

2.19 Intermediate Gear

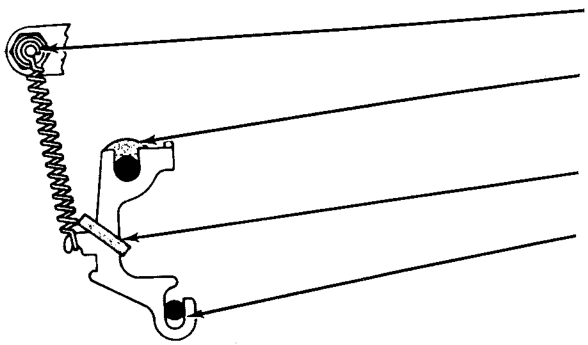


O6	Each Oiler (Total 4 Oilers)	Motor Shaft
G	Teeth (2 Gears)	Intermediate Gears
O2	Ball Bearing (2 Bearings)	Intermediate Gear Shaft

2.20 Signal Generator Mechanism - Right Top View

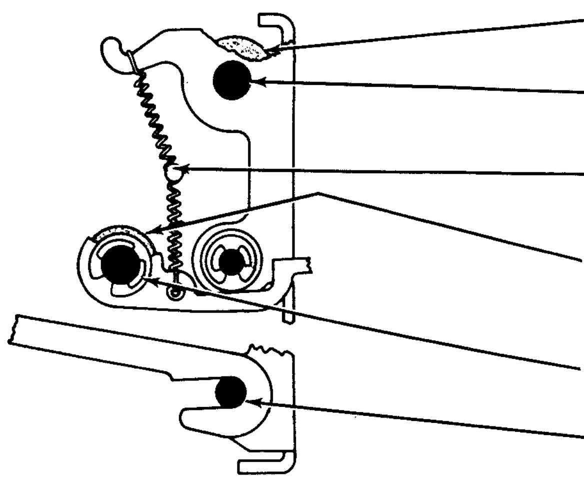


2.21 Locking Bail



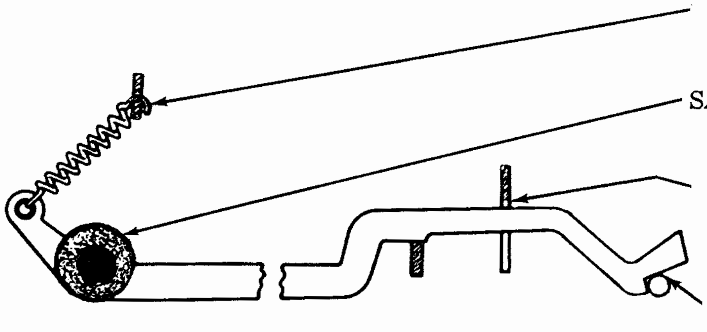
O1	Hooks - Each End	Spring
SAT	Felt Washers (2 Front & Rear)	Locking Bail Post
SAT	Felt Wick	Camming Surfaces
O1	Guide Slots (3 Slots)	Locking Bail

2.22 Codebar Bail



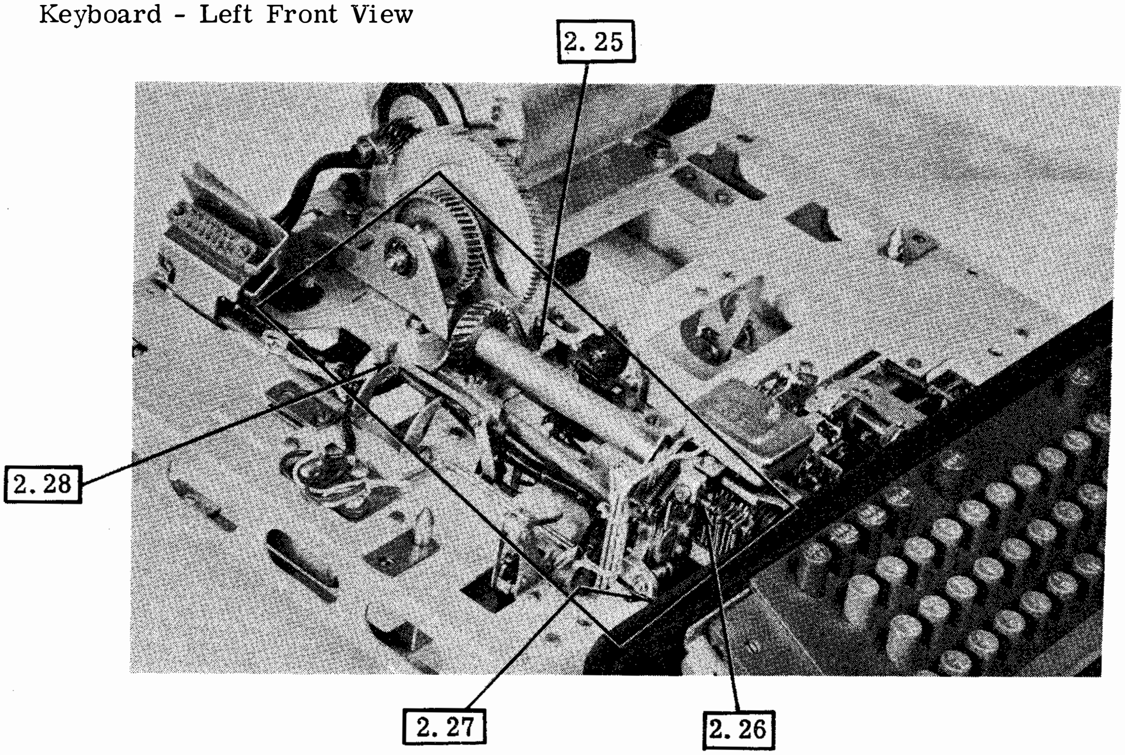
SAT	Felt Washers (2 Washers)	Codebar Bail
O1	Bearing Surface (2 Places)	Codebar Bail
O1	Hooks - Each End (2 Springs)	Spring
SAT	Felt Washer	Codebar Bail
O4	Bearing	Codebar Bail Latch
O2	Bearing Surface	Codebar Bail Latch
O2	Engaging Surface	Eccentric Follower

2.23 Universal Bail Latchlever

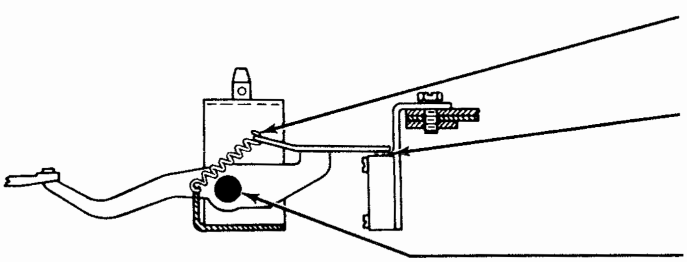


O1	Hooks - Each End	Spring
SAT	Felt Washer	Universal Bail Latchlever
O2	Guide Slot (Each Side of Slot)	Universal Bail Latchlever
G	Engaging Surface	Reset Bail Latch

2.24 Keyboard - Left Front View

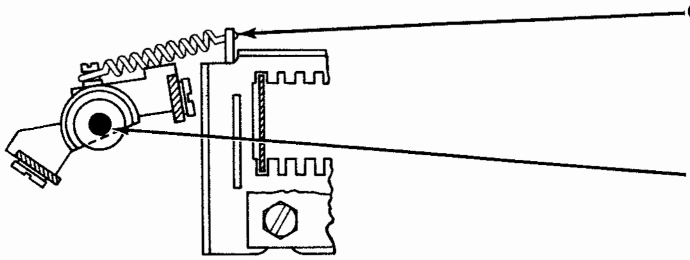


2.25 Electrical Line Break



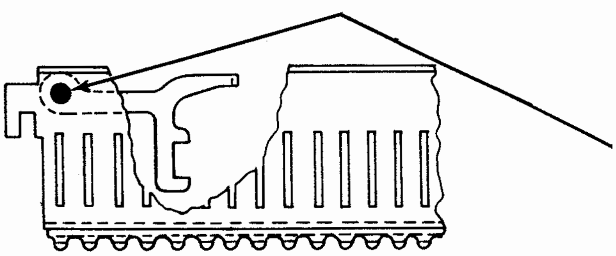
O1	Hooks - Each End	Spring
G	Contact Surface	Sensitive Switch
O1	Bearing Surface	Breaklever

2.26 Codelever Universal Bail



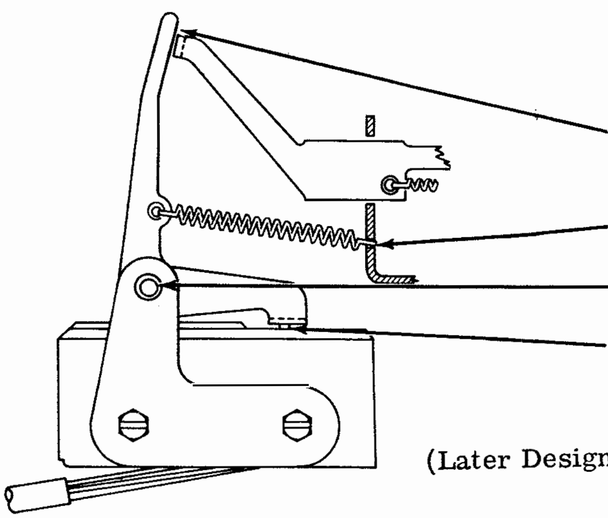
O1	Hooks - Each End	Spring
O2	Bearing Surface	Codelever Universal Bail

2.27 Lockbar Latch



O1	Bearing Surface	Lockbar Latch

2.28 Local Paper Feed-Out

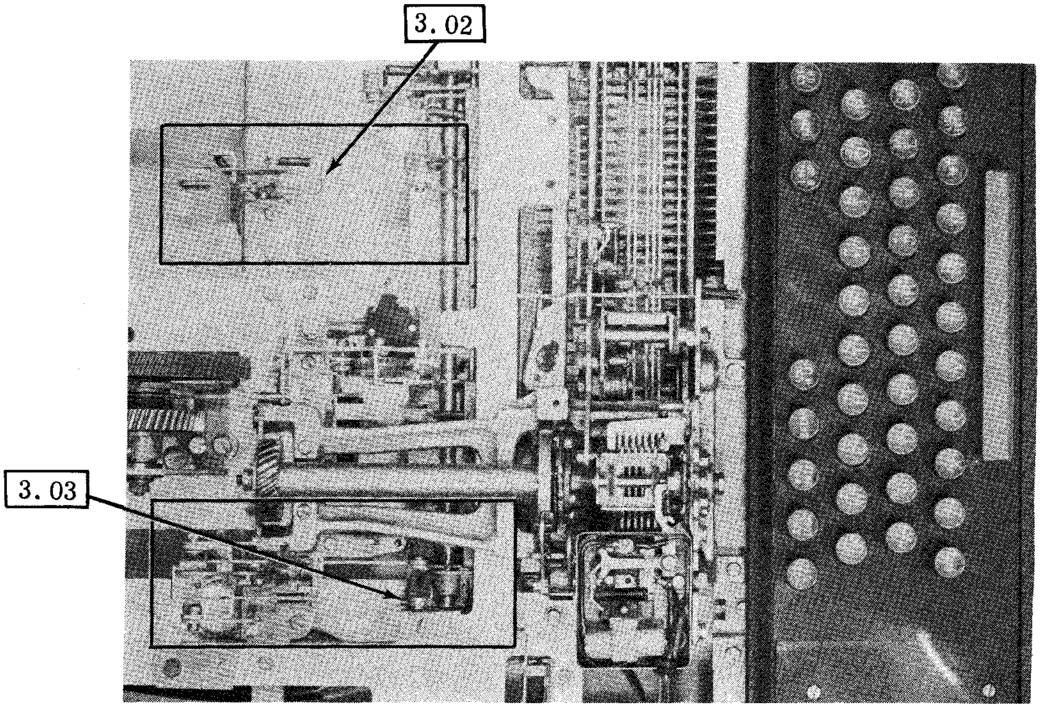


G	Engaging Surface	Local Line Feed Trip Link
O1	Hooks - Each End	Spring
O2	Bearing Surface	Lever
G	Engaging Surface	Magnetic Blowout Switch

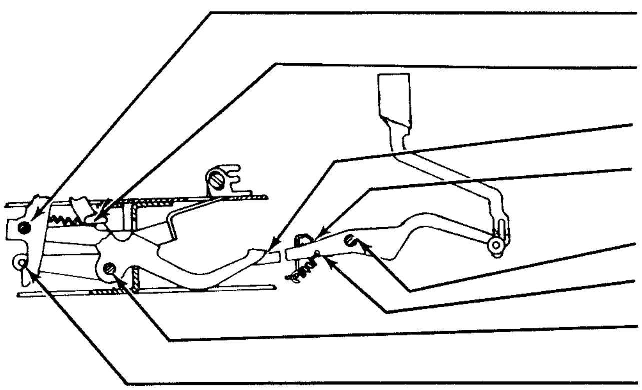
(Later Design)

3. VARIABLE FEATURES (KEYBOARD)

3.01 Local Backspace and Line Feed Mechanisms - Left Top View



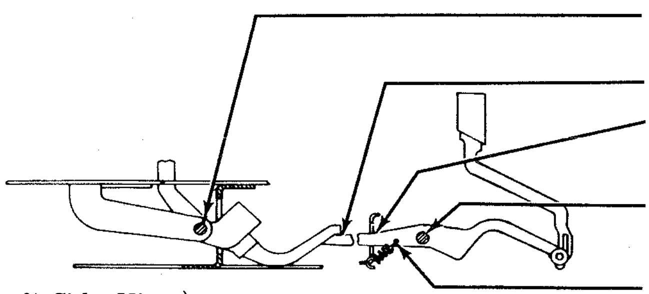
3.02 Local Backspace



(Left Side View)

O2	Bearing Surface	Local Backspace Transfer Bail
O1	Hooks - Each End	Spring
G	Engaging Surface	Function Lever
O1	Guide Slots (2 Places)	Guide Bracket
O1	Bearing Surface	Function Lever
O1	Hooks - Each End	Spring
O2	Bearing Surfaces (2 Places)	Operating Bail
O2	Engaging Surface	Operating Bail

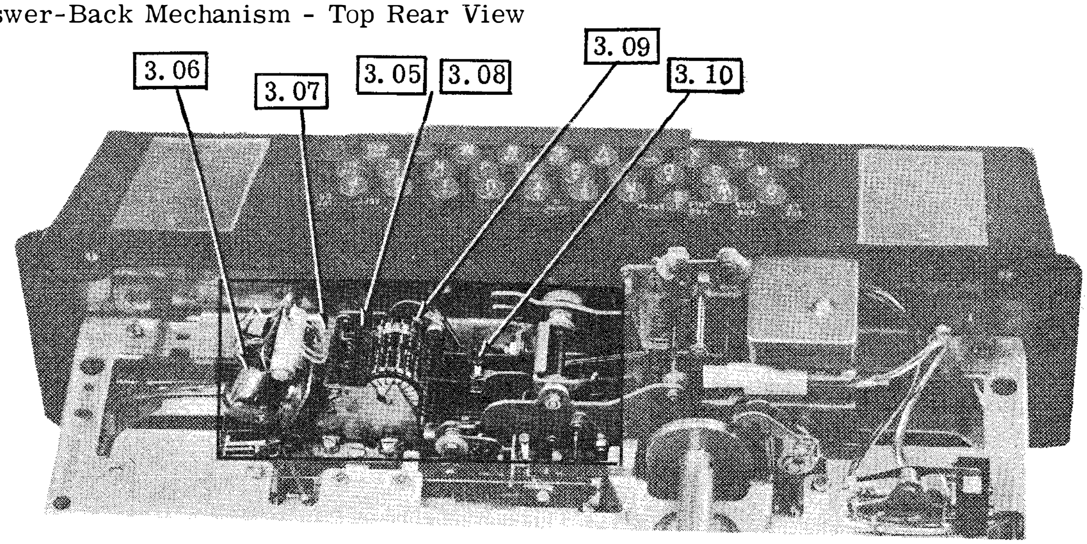
3.03 Local Reverse Line Feed



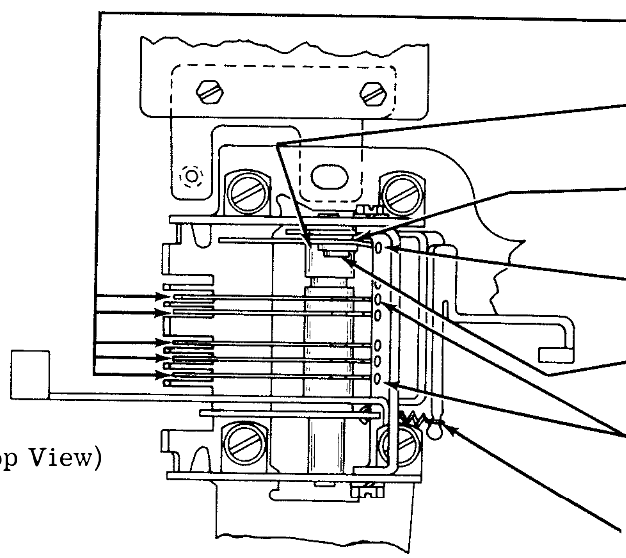
(Left Side View)

O2	Bearing Surface	Local Reverse Line Feed Operating Bail
G	Engaging Surface	Function Lever
O1	Guide Slots (2 Slots)	Function Lever
O1	Bearing Surface	Function Lever
O1	Hooks - Each End	Spring

3.04 Answer-Back Mechanism - Top Rear View



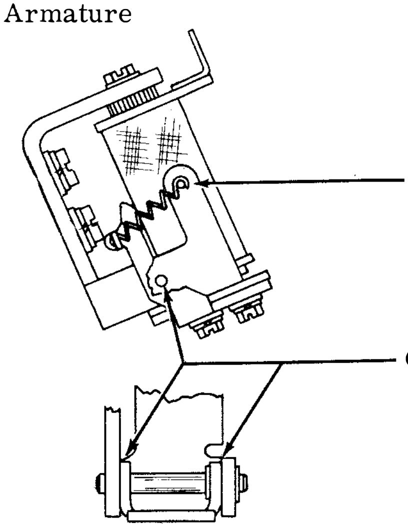
3.05 Answer-Back - Sensing Levers



(Top View)

O1	Camming Surfaces (5 Places)	Sensing Levers
O2	Bearing Surface	Detent Lever
O2	Bearing Surface	Detent Lever and Roller
O1	Hook - Each End	Spring
O1	Bearing Surface	Detent Lever Roller
O1	Hooks - Each End (5 Springs)	Springs
O1	Hook - Each End	Spring

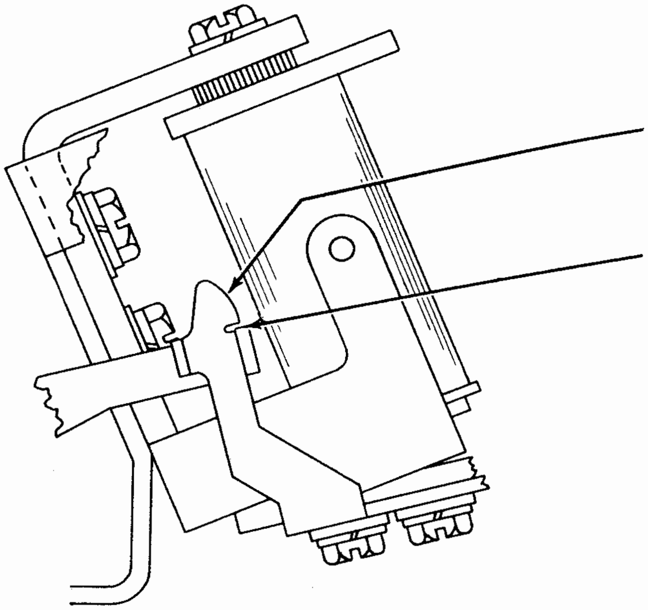
3.06 Answer-Back - Armature



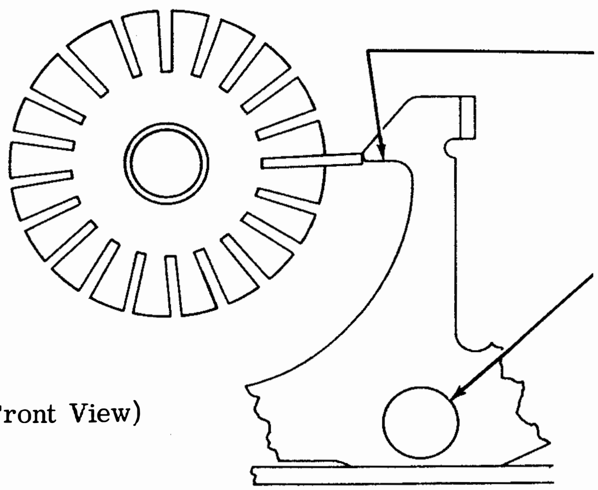
(Front View)

O1	Hook - Each End	Spring
O1	Bearing Surfaces (2 Places)	Armature and Shaft

3.07 Answer-Back Stop Lever



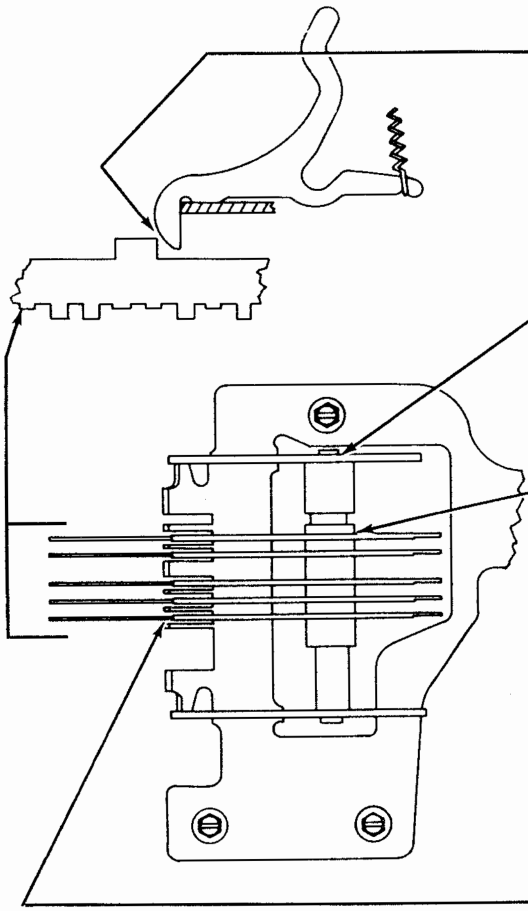
O1	Contacting Surface	Latch and Stop Lever
O1	Latching Surface	Latch and Stop Lever



O1	Camming Surface	Stop Lever
O2	Bearing Surface (2 Places)	Stop Lever and Lever Pivot

(Front View)

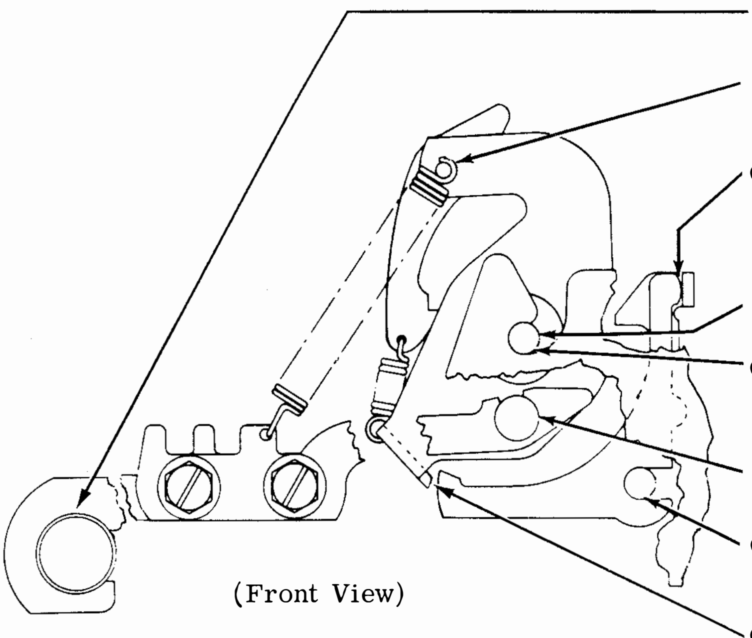
3.08 Answer-Back - Codebars and Sensing Levers



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)

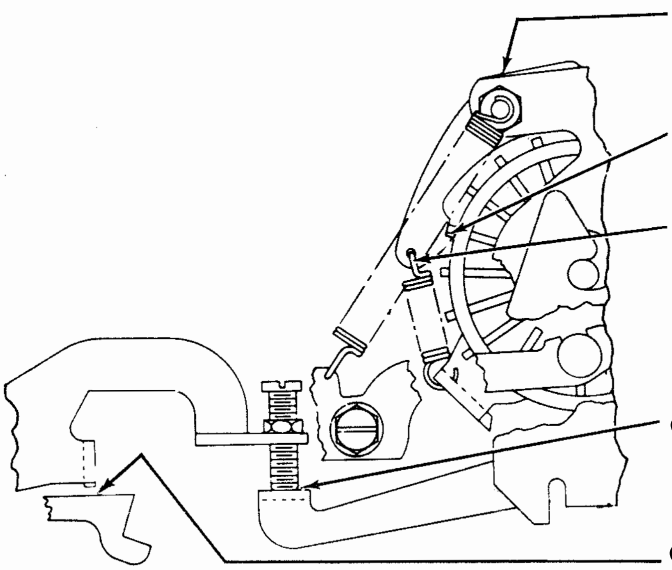
3.09 Answer-Back Driving Mechanism



(Front View)

O2	Bearing Surface	Eccentric Stud and Drive Link
O1	Hook - Each End	Spring
O1	Engaging Surface	Blocking Lever and Stop Lever
G	Shaft	Drive Plate
O2	Bearing Surface (2 Plates)	Drive Plate Shaft and Side Plate
O1	Engaging Surface	Drive Link and Stud
O2	Bearing Surface	Blocking Lever and Lever Pivot
O1	Engaging Surface	Blocking Lever and Extension

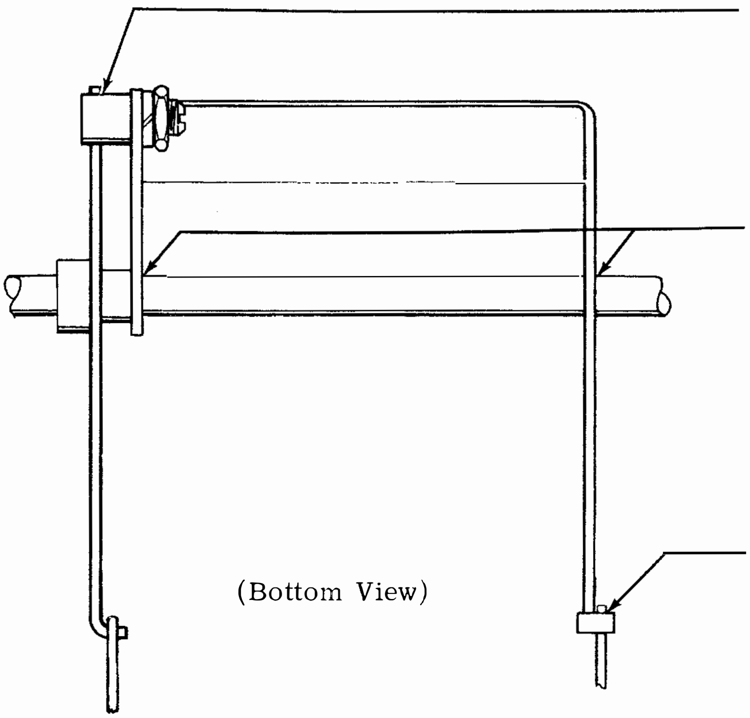
3.10 Answer-Back Stepping Pawl



(Front View)

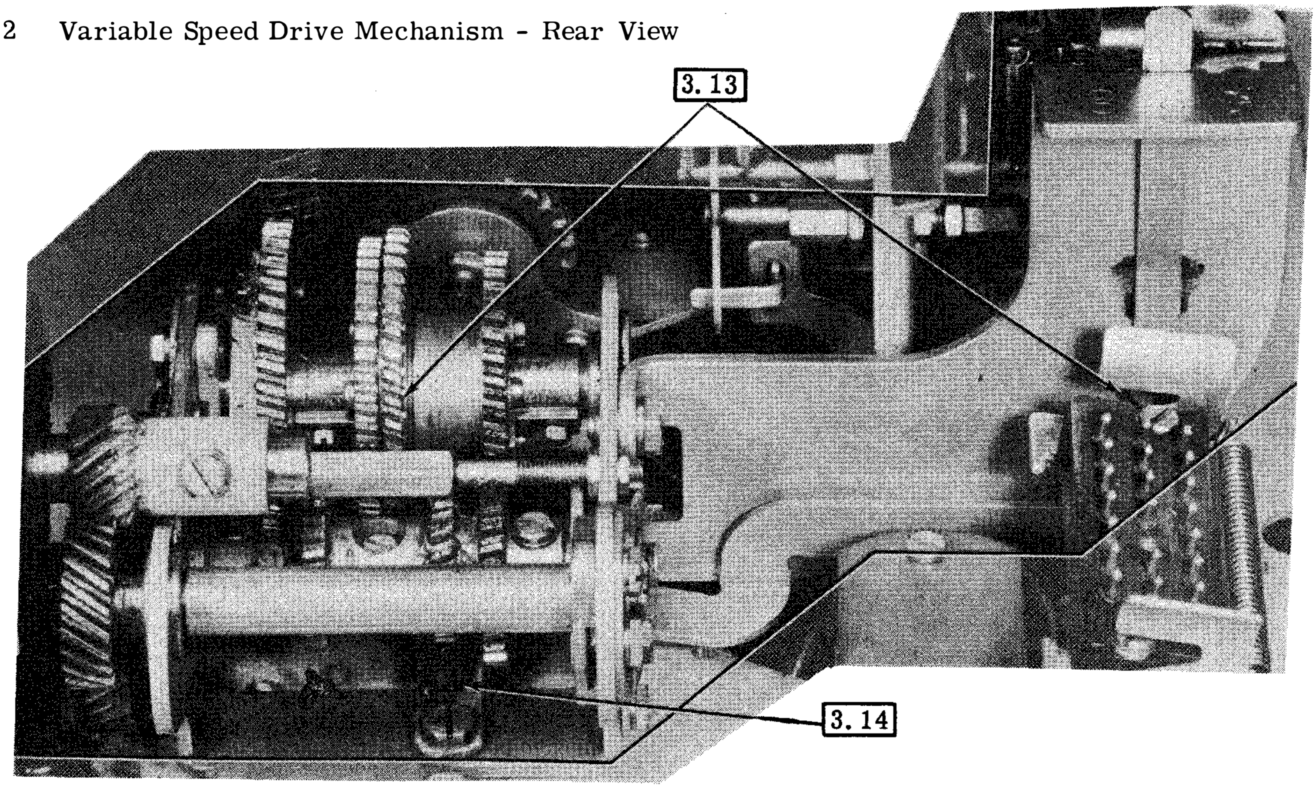
O2	Bearing Surface	Stepping Pawl and Eccentric Stud
O1	Contacting Surfaces	Stepping Pawl and Codeblades
O1	Hook - Each End	Spring
O1	Contacting Surface	Adjusting Screw
O1	Contacting Surface	Lever and Latch

3.11 Answer-Back Keyboard Lock Bail

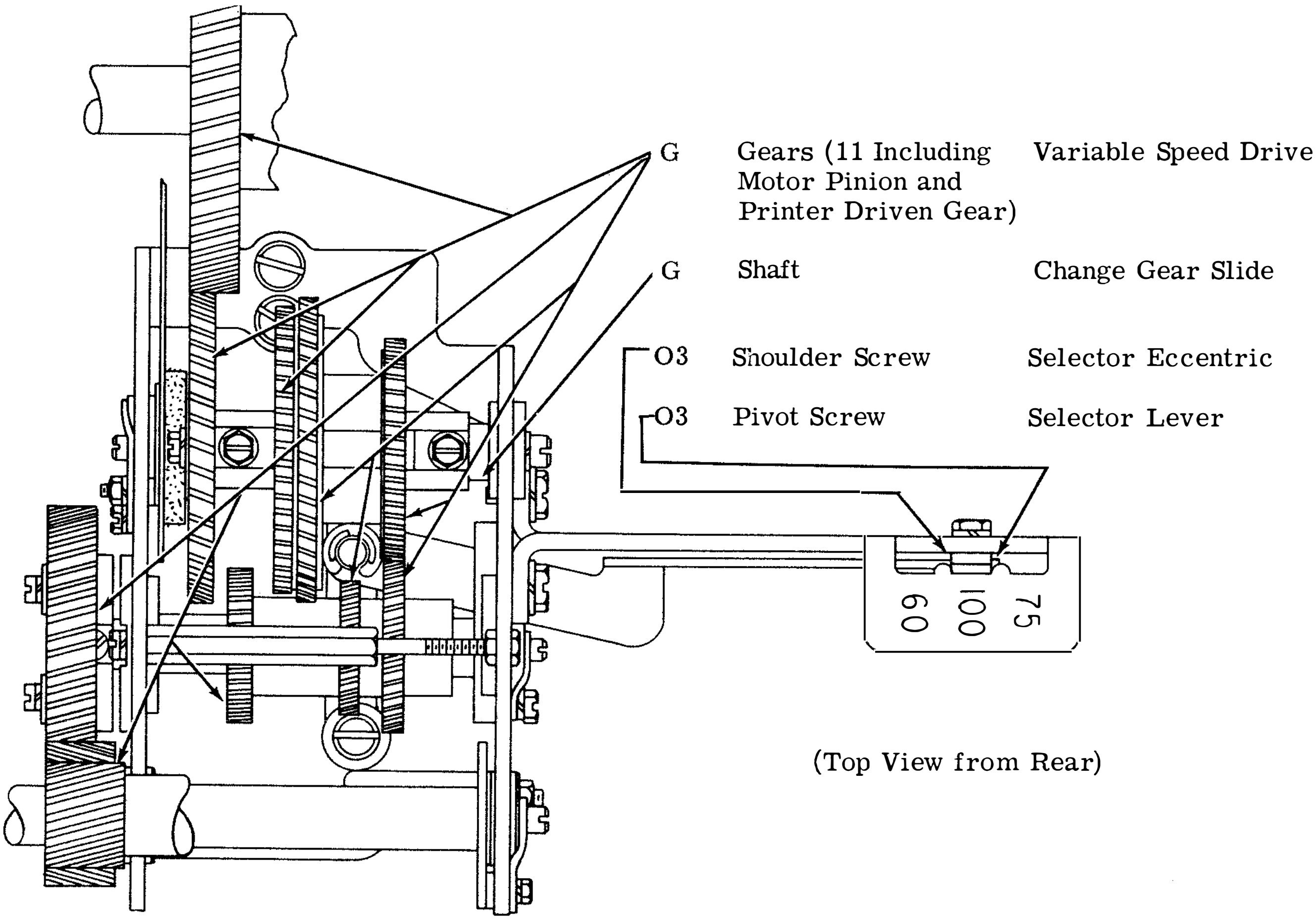


O1	Engaging Surfaces	Eccentric and Locklever
O1	Bearing Surfaces	Function Lever and Bail
G	Contacting Surface	"Here Is" Lever and Bail

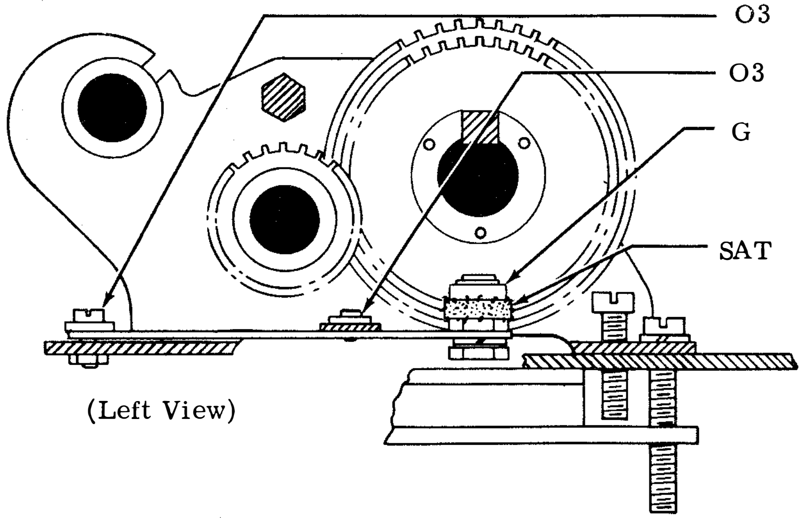
3.12 Variable Speed Drive Mechanism - Rear View



3.13 Variable Speed Drive - Speed Selecting Mechanism



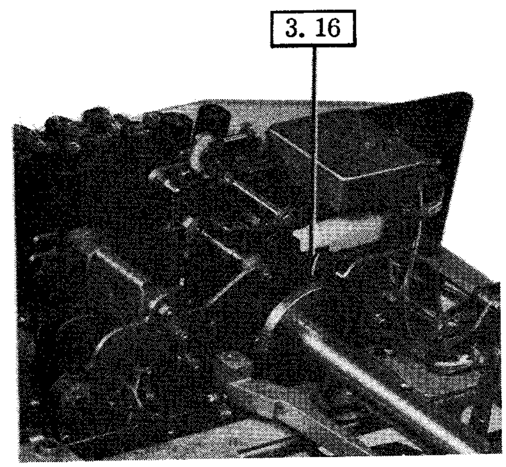
3.14 Variable Speed Drive - Speed Selecting Mechanism (Continued)



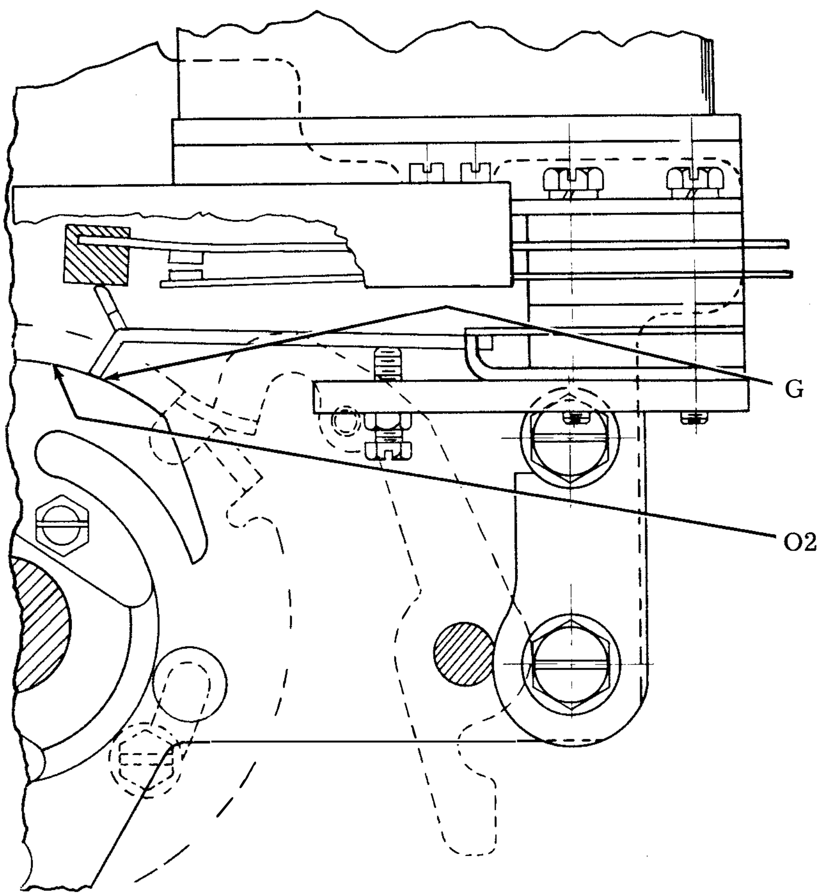
O3	Pivot Post	Selecting Lever
O3	Pivot Post	Selector Link
G	Roller and Sides of Gears	Selecting Lever
SAT	Felt Washer	Roller

(Left View)

3.15 Blinding (Pulsing) Contact - Left Rear View



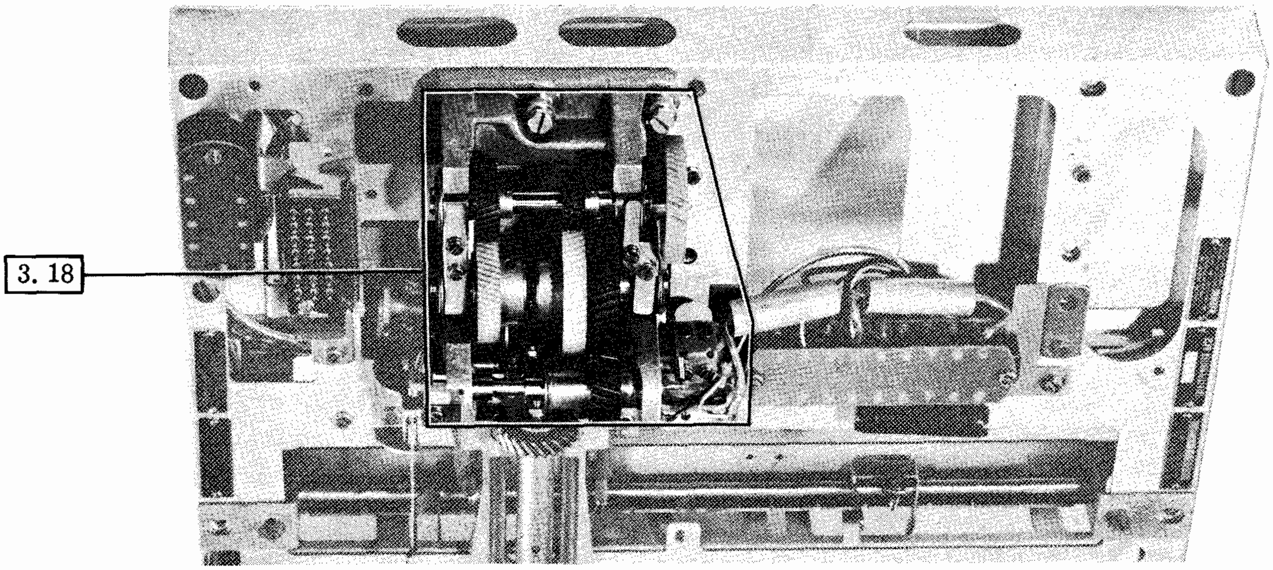
3.16 Cam Follower



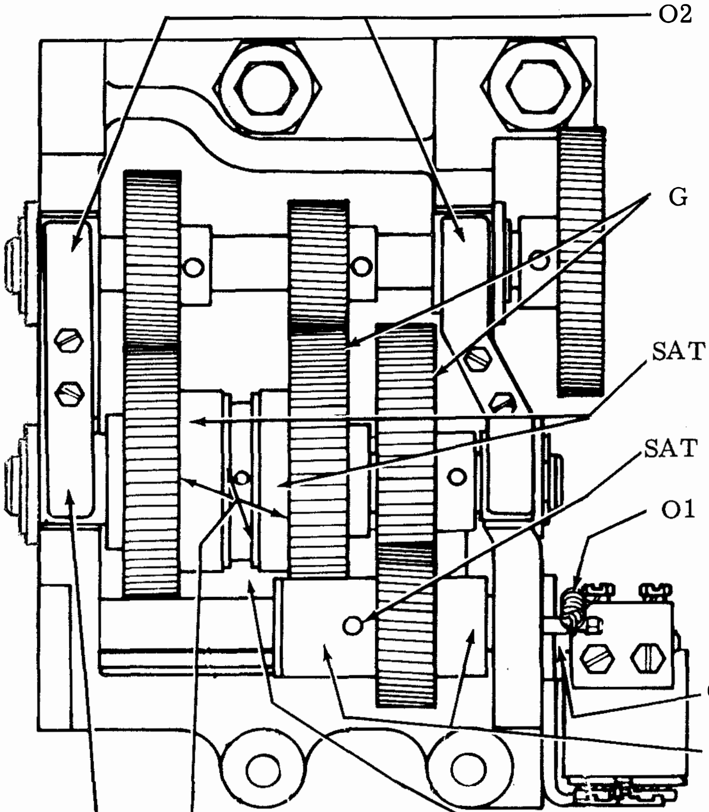
G	Engaging Surface	Cam Follower Extension
O2	Camming Surface	Cam Segment

Note: Avoid getting grease or oil on contact surfaces.

3.17 Remote Control Gear Shift Mechanism - Top View (Tilted Forward)

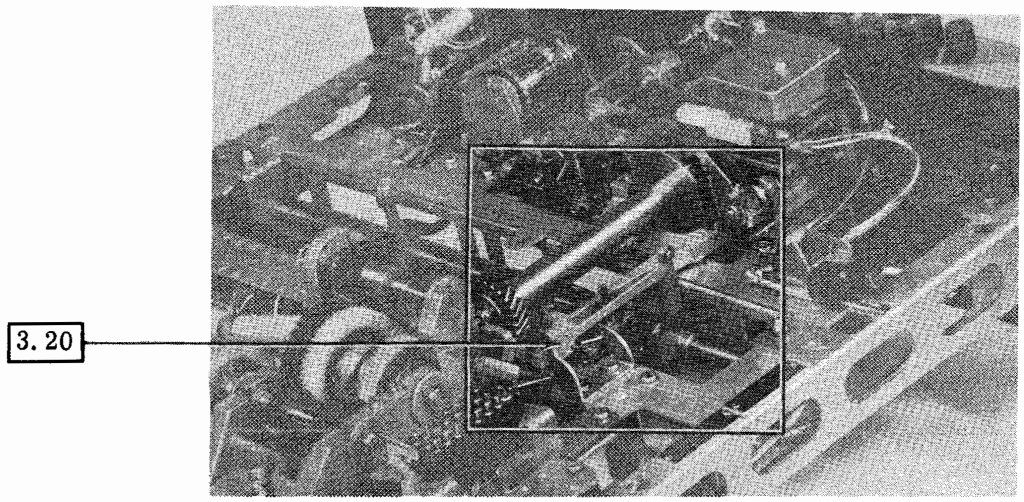


3.18 Remote Control Gear Shift

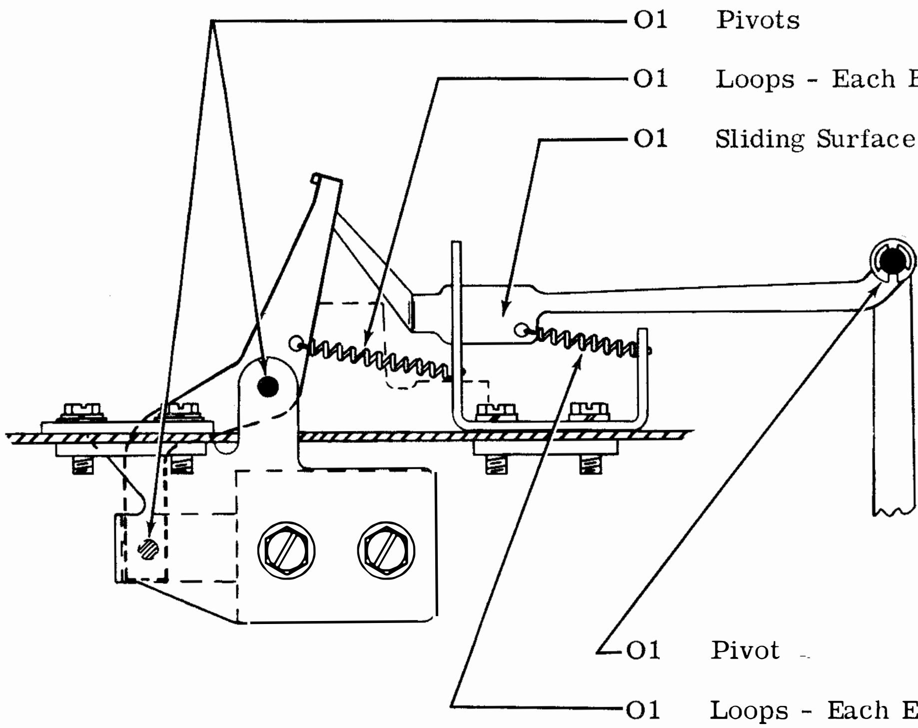


O2	Oilite Bearing (2) (Oil Each Side Of Bearings)	Driven Gear Bearings
G	Gear Teeth	Eight Gear Including Motor Pinion
SAT	Felt Wicks (2)	Spring Clutches
SAT	Felt Wick	Idler Gear
O1	Loops - Each End	Armature Spring
O2	Bearing Points	Armature Shaft
O2	Oilite Bearings (2) (Oil Each Side Of Bearings)	Idler Gear Bearings
O1	Clutch Springs and Hubs (Light Film During Reassembly)	Spring Clutches
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



01 Pivots — Trip Lever

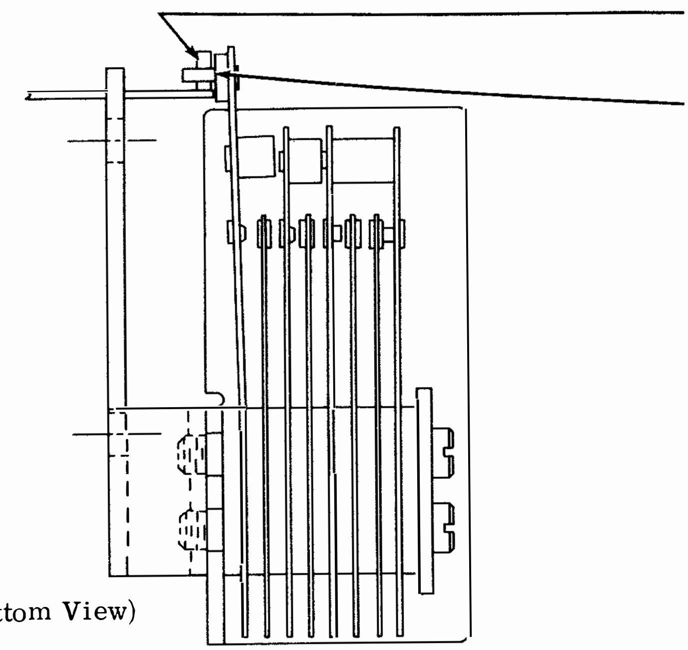
01 Loops - Each End — Solenoid Torsion Spring

01 Sliding Surface — Form Feed-Out Link

01 Pivot — Form Feed-Out Link

01 Loops - Each End — Form Feed-Out Link Spring

3.21 Lockbar Contact

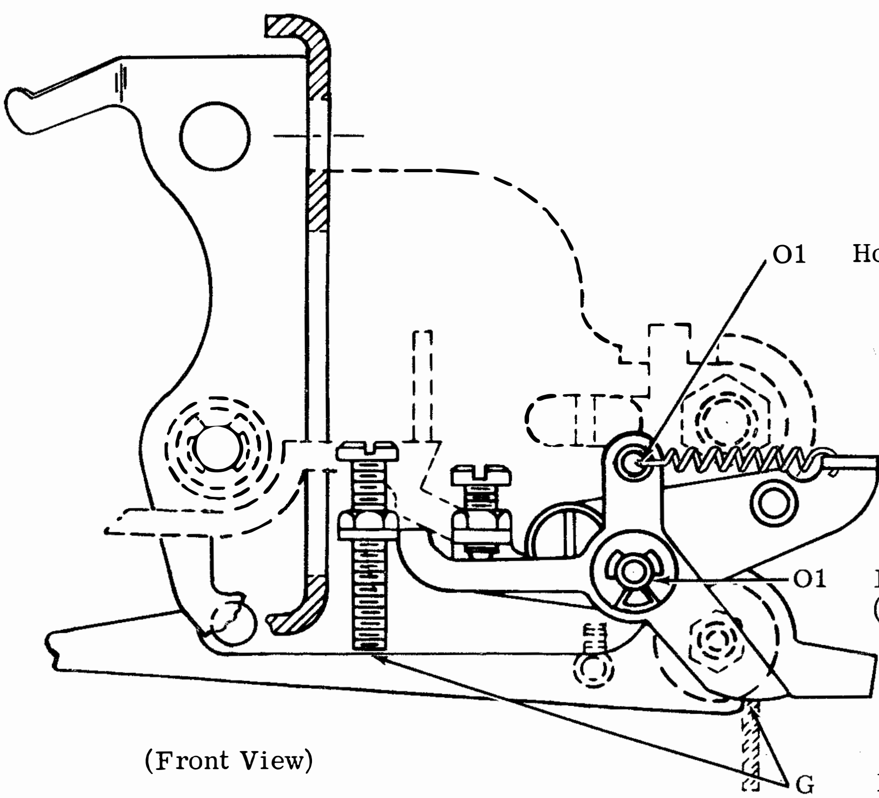


O1	Pivot Point	Lever
G	Engaging Surface	Lockbar Lever and Contact Insulator

Note: Avoid getting oil or grease on contact surfaces.

(Bottom View)

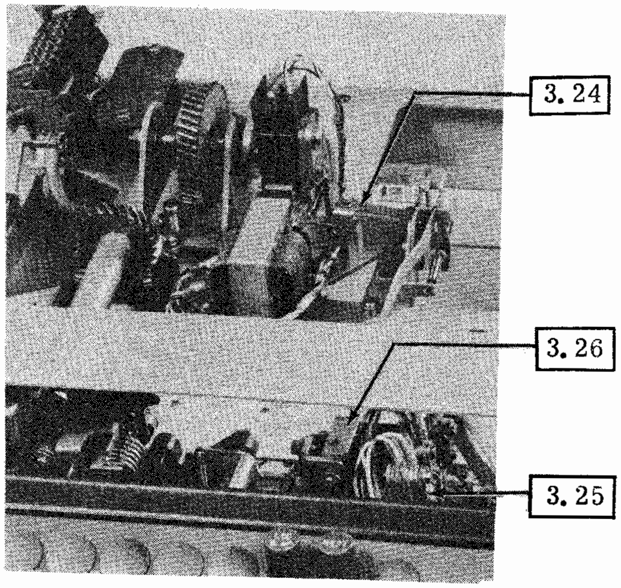
3.22 Repeat on Space Mechanism



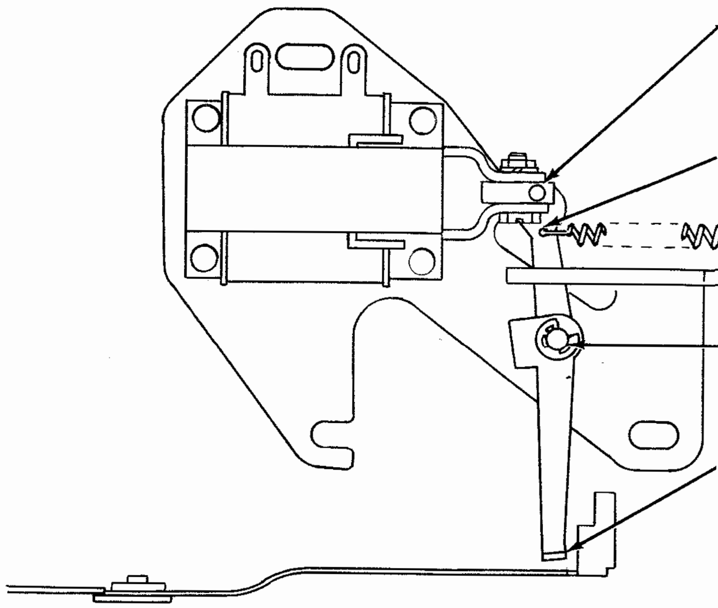
O1	Hooks	Spring
O1	Pivot (Both Sides)	Space Repeat Lever
G	Engaging Surfaces	Nonrepeat Lever and Space Keylever

(Front View)

3.23 Keyboard - Top View

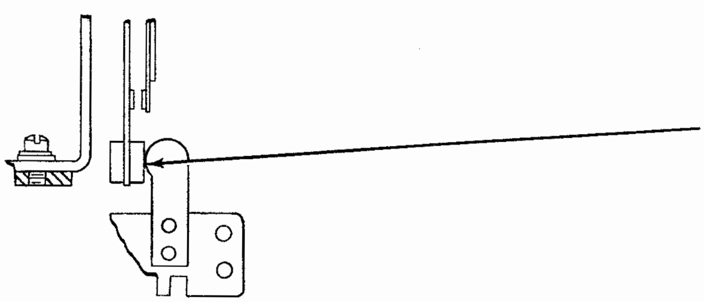


3.24 Solenoid Bail



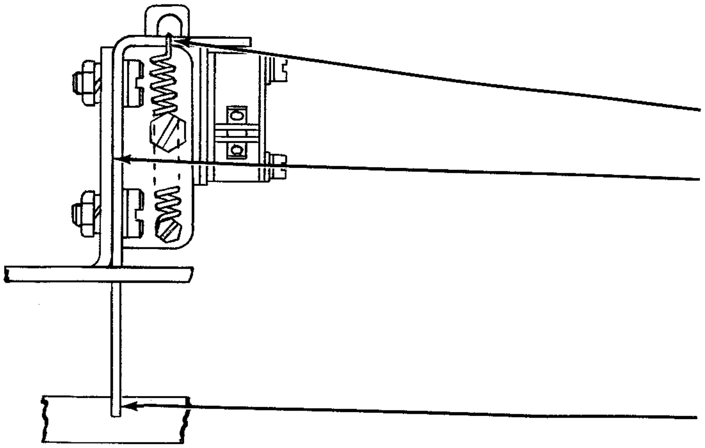
G	Fork and Pin	Solenoid Armature
O1	Hooks - Each End	Spring
G	Bearing Surface and Retaining Ring	Solenoid
G	Engaging Surface	Backspace Link

3.25 Off-Line Contacts



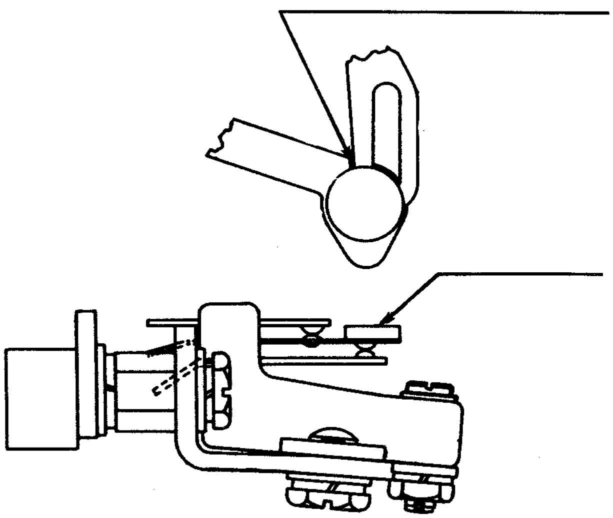
G	Engaging Surface	Contact Insulator

3.26 Switch Operating Lever



O1	Hooks - Each End	Spring
O2	Sliding Surface	Operating Lever
G	Engaging Surface	Function Lever

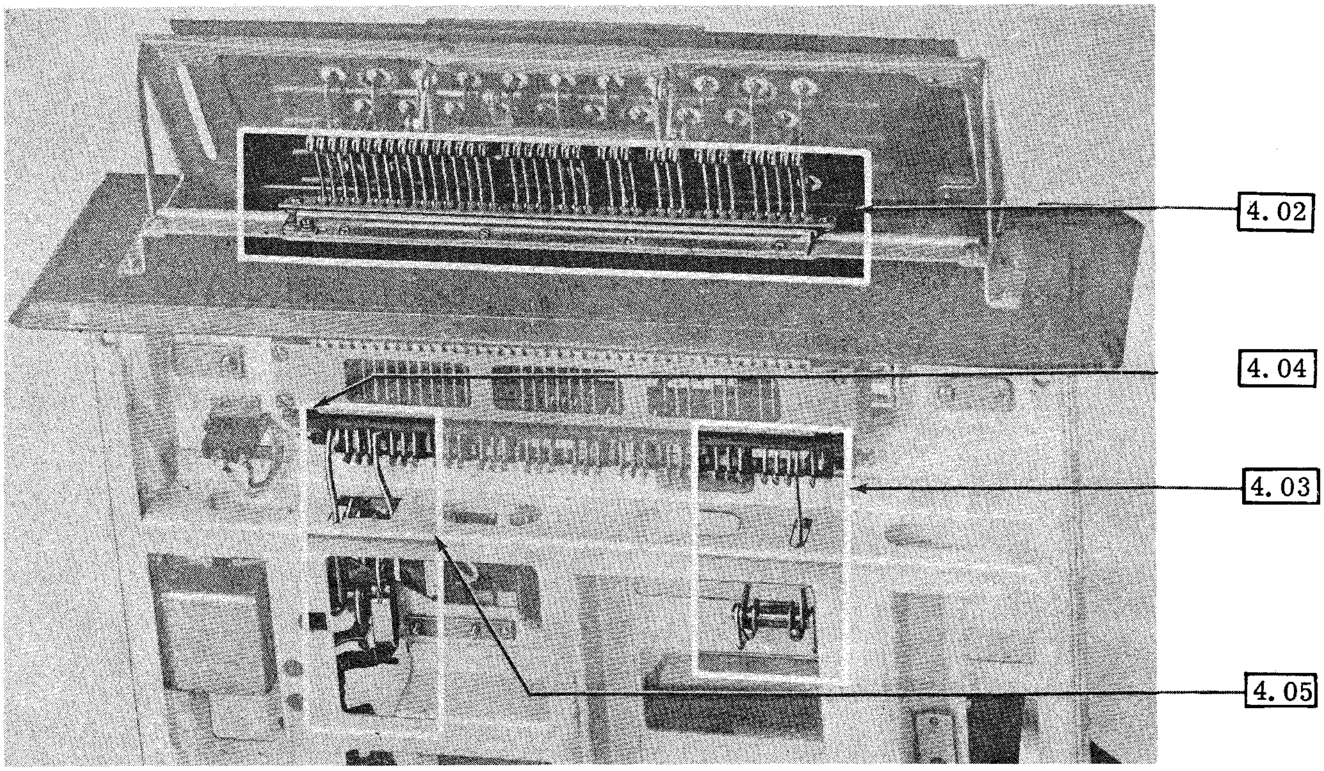
3.27 Universal Keyboard Switch (Not Shown on a Locator Photograph)



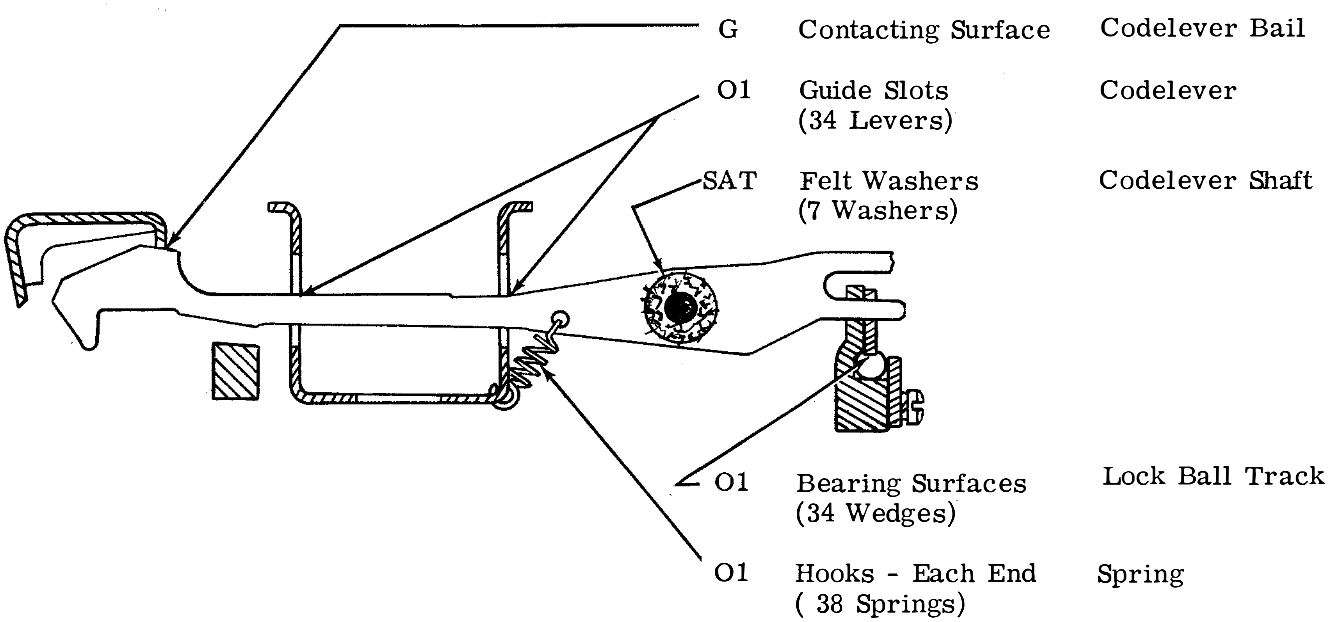
O1	Bearing Surface	Function Lever and "Here Is" Keylever Assembly
G	Bearing Surface	Contact Insulator

4. EARLIER DESIGN KEYBOARD

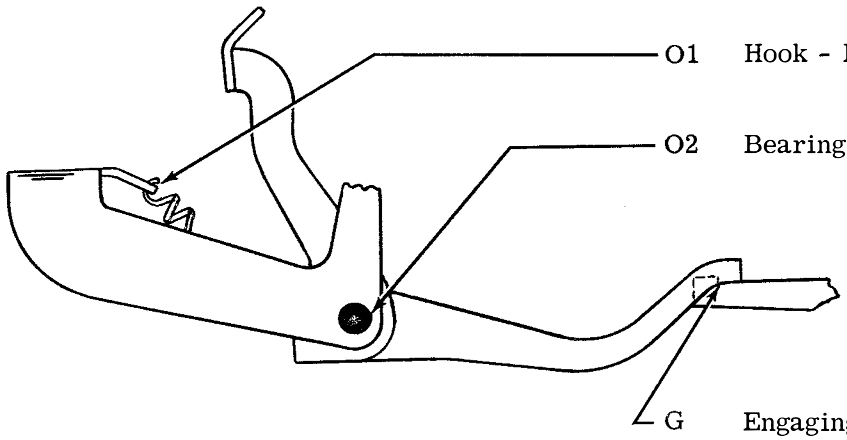
4.01 Keyboard - Bottom View



4.02 Codelever

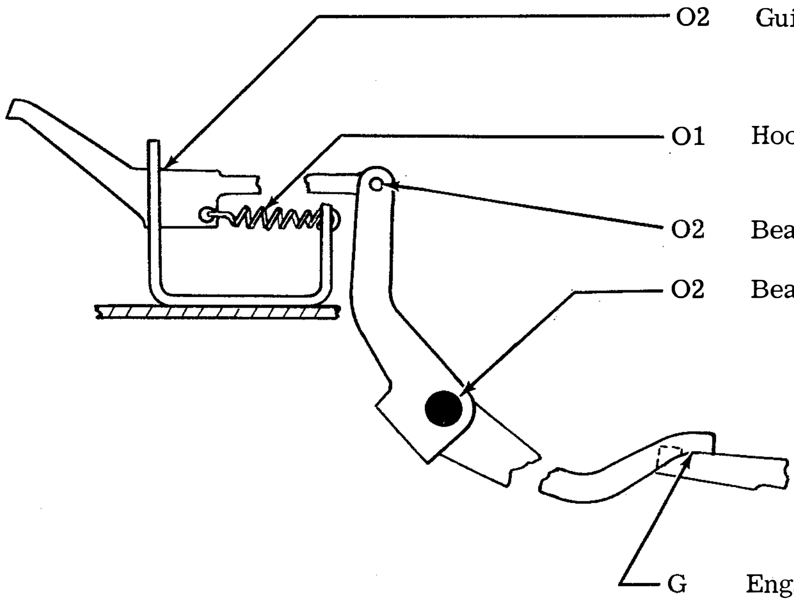


4.03 Local Carriage Return



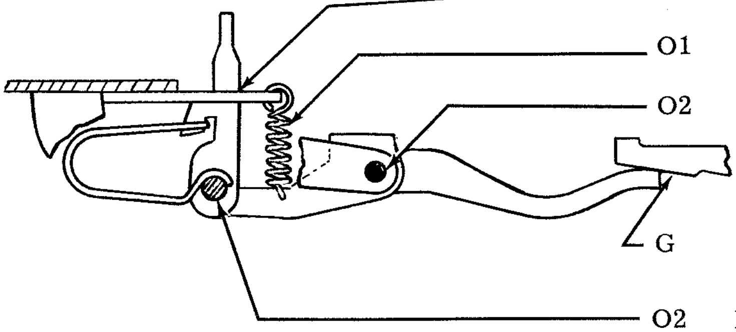
O1	Hook - Each End	Spring
O2	Bearing Surface	Local Carriage Return Trip Shaft
G	Engaging Surface	Local Carriage Return Function Arm

4.04 Local Line Feed



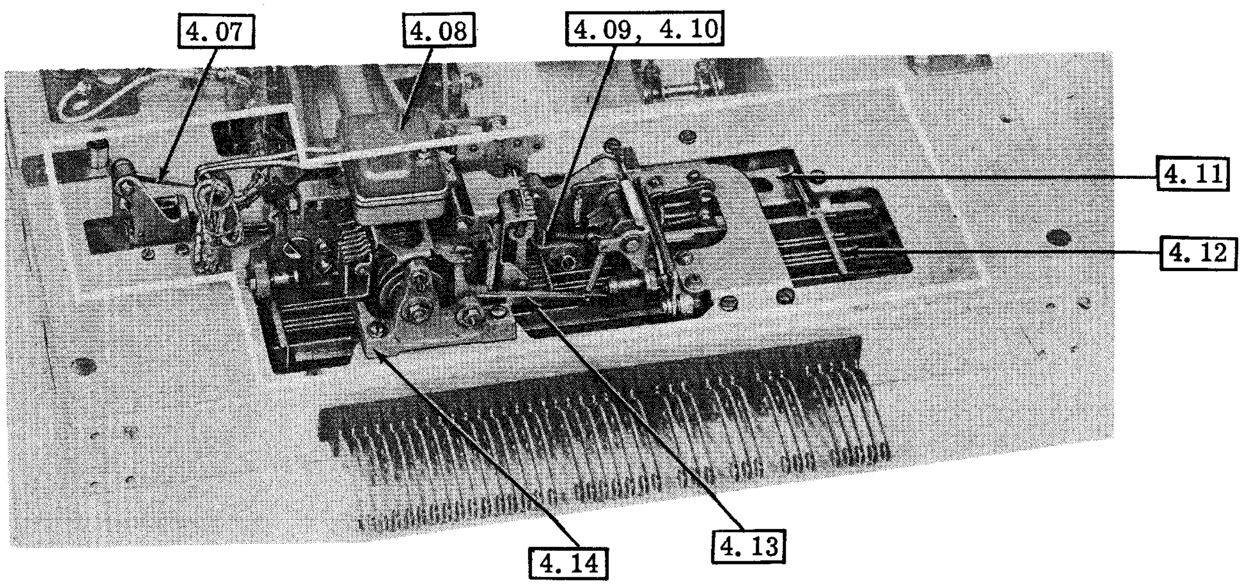
O2	Guide Slot	Local Line Feed Trip Link
O1	Hooks - Each End	Spring
O2	Bearing Surface	Local Line Feed Arm
O2	Bearing Surface	Local Line Feed Trip Shaft
G	Engaging Surface	Local Line Feed Function Arm

4.05 Keyboard Lock

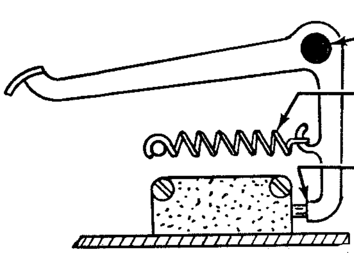


O2	Guide Slot	Keyboard Lock Plunger
O1	Hooks - Each End	Spring
O2	Bearing Surface	Keyboard Lock Plunger
G	Engaging Surface	Keyboard Lock Function Arm
O2	Bearing Surface	Keyboard Lock Arm Trip Shaft

4.06 Codebar Mechanism - Top Front View

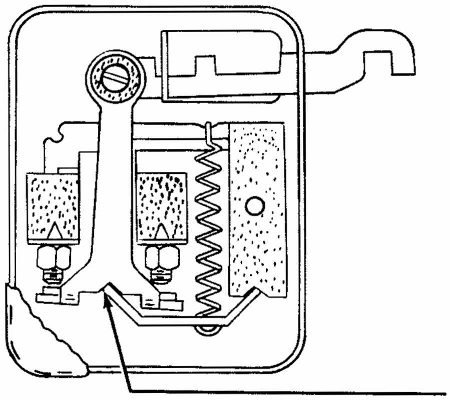


4.07 Margin Indicator



O2	Bearing Surface	Margin Indicator Contact Lever
O1	Hooks - Each End	Spring
O1	Contacting Surface	Switch Plunger

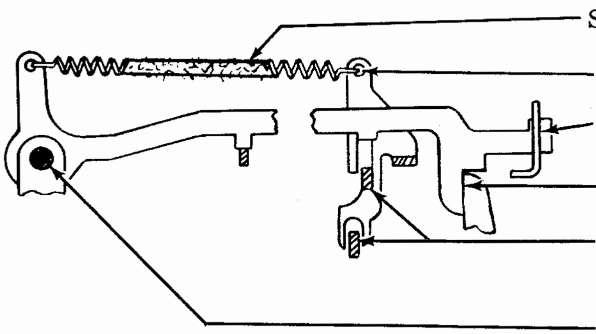
4.08 Contact Box



Disassembly: Remove nut and lockwasher securing contact box cover and remove cover.

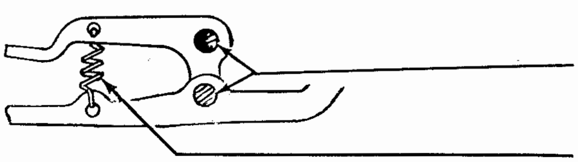
G	Engaging Surface	Contact Toggle

4.09 Codebar



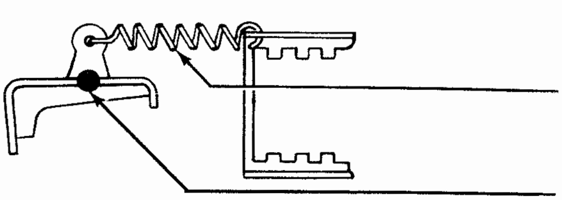
SAT	Felt Wick	Spring Wick
O1	Hooks - Each End	Spring
O2	Guiding Surface	Codelever Bail Latchlever
G	Engaging Surface	Codelever Bail
O2	Guiding Surfaces (2 Places)	Nonrepeat Bell Cranks
O2	Bearing	Codelever Bail Latchlever

4.10 Codebar (Continued)



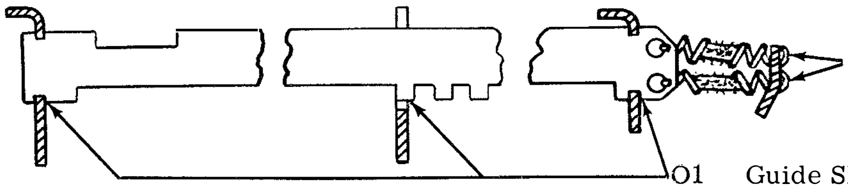
O2	Bearing Surfaces (2 Places)	Nonrepeat Bell Crank
O1	Hooks - Each End	Spring

4.11 Codelever Bail



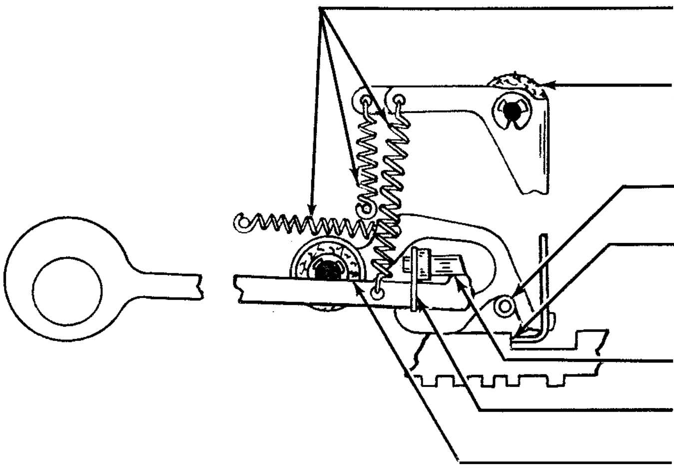
O1	Hooks - Each End	Spring
O2	Bearing Surfaces (Right and Left)	Codelever Bail

4.12 Codebar (Continued)



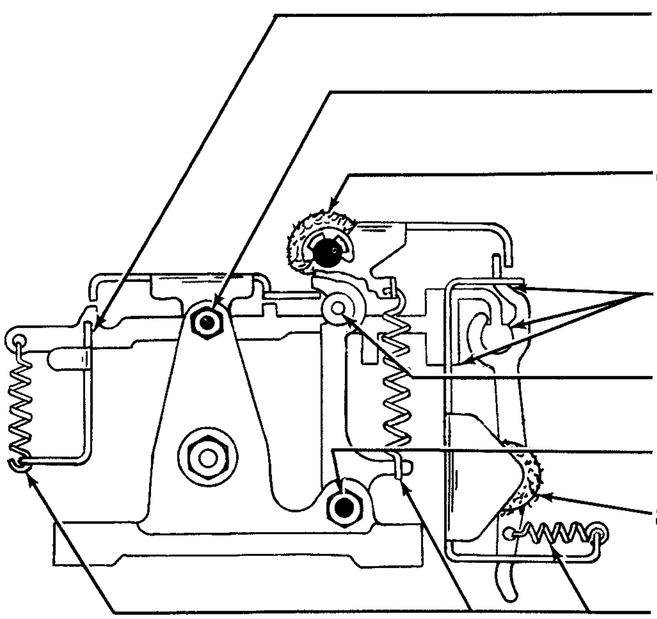
O1	Hooks - Each End (7 Springs)	Spring
O1	Guide Slots - Left, Right and Center (7 Codebars)	Codebar Guides

4.13 Codebar Bail and Eccentric Follower



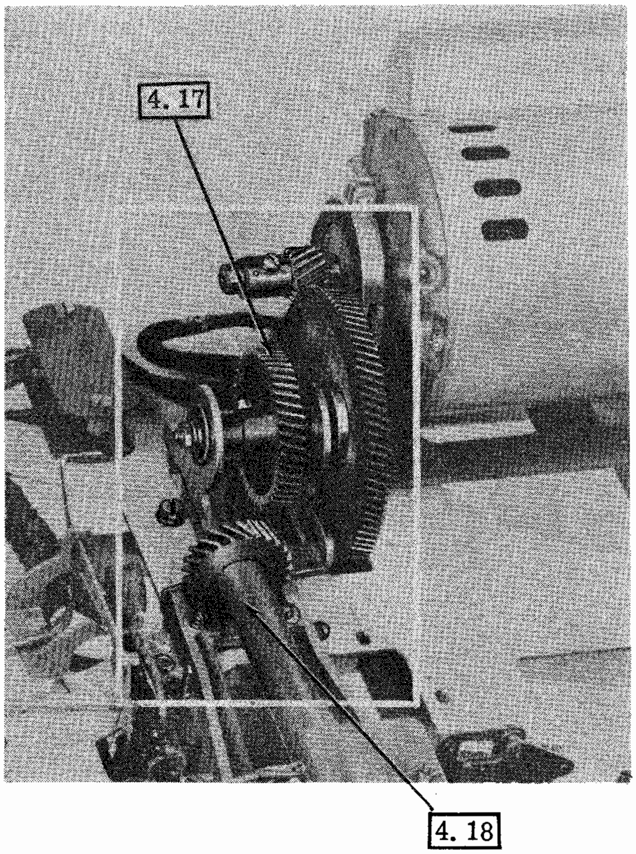
O1	Hooks - Each End (4 Springs)	Spring
SAT	Felt Washers (Front and Rear)	Codebar Bail Bearing
O2	Bearing Surface	Codebar Bail Roller
O1	Engaging Surface (7 Places)	Codebar Bail
O2	Engaging Surface	Eccentric Follower
O2	Guide Slot	Eccentric Follower
SAT	Felt Washer	Codebar Bail Latch-lever

4.14 Keyboard Selector

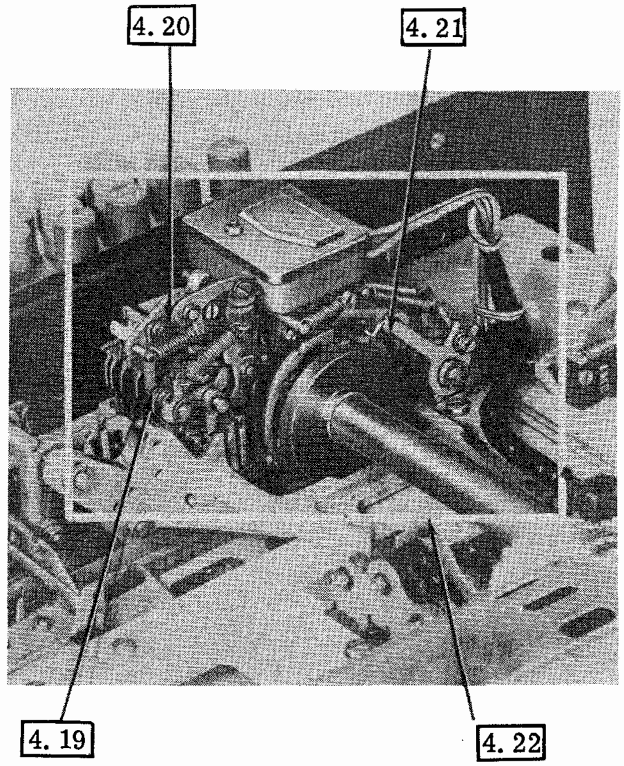


O2	Guide Slots (7 Slots)	Selector Levers
O2	Bearing Surface (Front and Rear)	Rocker Bail
SAT	Felt Washers (2 Washers - Front and Rear)	Locking Bail Shaft
O2	Guide Slots (7 Slots)	Selector and Transfer Levers
O2	Roller Bearings (2 Rollers)	Rocker Bail Detent
O2	Bearing Surface	Rocker Bail Detent
SAT	Felt Washers (2 Washers - Front and Rear)	Transfer Levers Shaft
O1	Hooks - Each End (3 Springs)	Spring

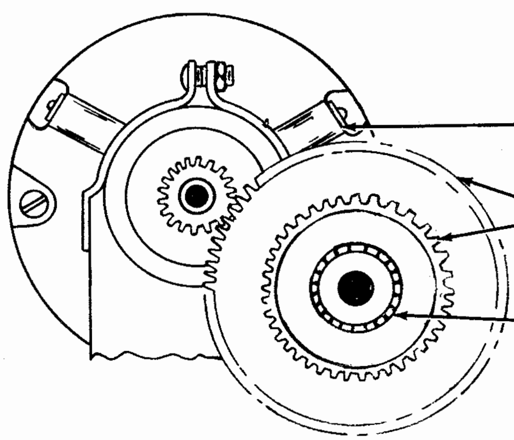
4.15 Intermediate Gear - Front View



4.16 Signal Generator Mechanism - Left Rear View

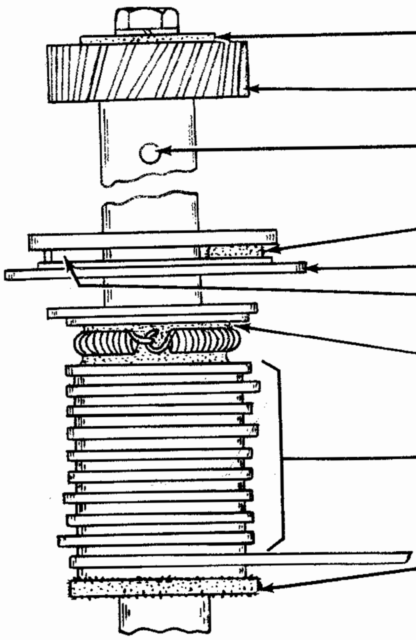


4.17 Intermediate Gears



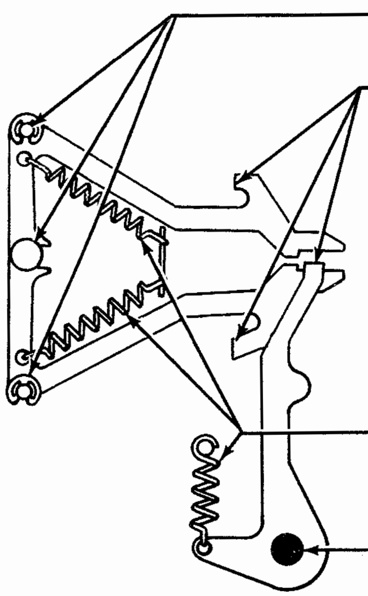
O6	Each Oiler (Total 4 Oilers)	Motor Shaft
G	Teeth (2 Gears)	Intermediate Gears
O2	Ball Bearing	Intermediate Gear Shaft

4.18 Signal Generator Shaft



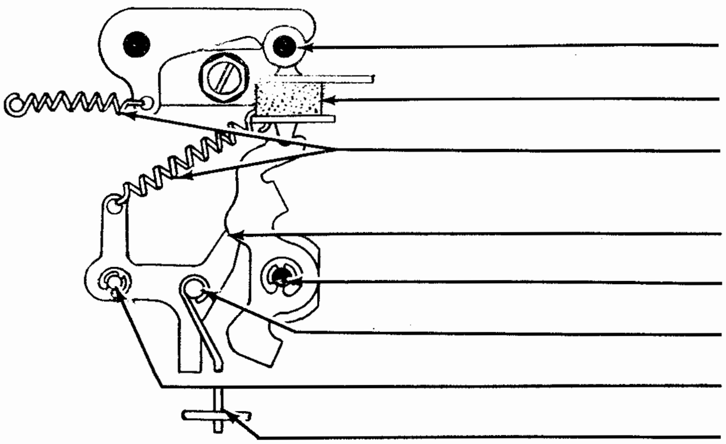
SAT	Felt Washer	Signal Generator Shaft
G	Gear Teeth	Signal Generator Gear
O20	Oil Hole	Signal Generator Shaft
SAT	Internal Mechanism	Keyboard Cam Clutch
O2	Camming Surface	Clutch Disc
G	Each Eye	Shoe Lever Spring
SAT	Felt Oiler	Cam Sleeve Felt
O2	Camming Surface Each Cam	Signal Generator Cam Sleeve
SAT	Felt Washer	Signal Generator Shaft

4.19 Intermediate Levers



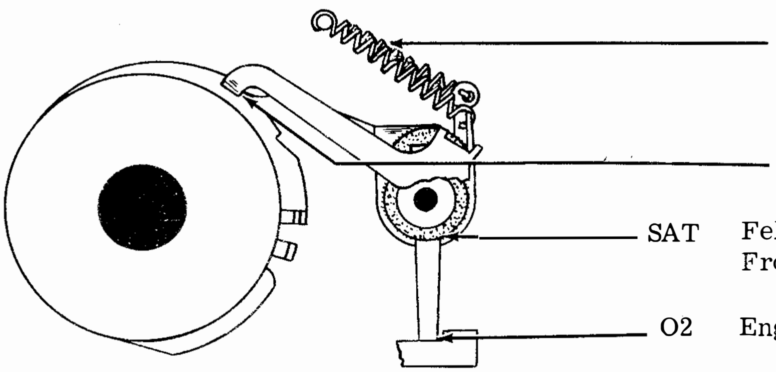
O2	Bearing Surface (3 Guides)	Intermediate Lever Rollers
O2	Engaging Surfaces (3 Places)	Intermediate Levers
O1	Hooks (Each End)	Spring
O2	Bearing Surface	Flutter Lever

4.20 Signal Generator Mechanism



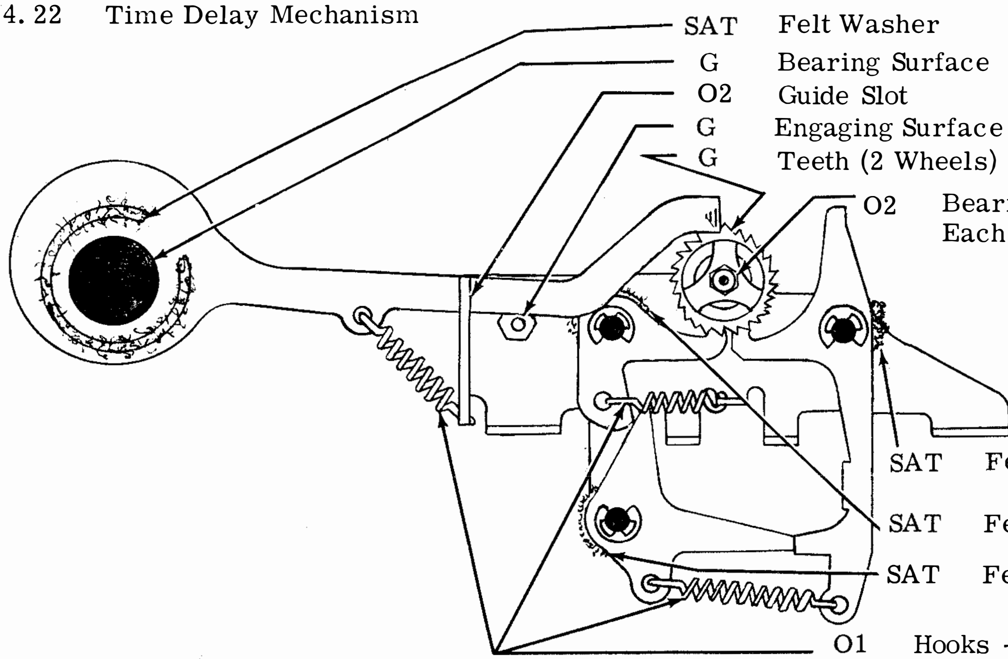
O2	Bearing Surface	Detent Toggle
SAT	Felt Washer	Detent Toggle
O1	Hooks - Each End (2 Springs)	Spring
O2	Engaging Surface	Break Bail
O2	Bearing Surface	Oscillating Lever
O2	Bearing Surface	Break Rod
O2	Bearing Surface	Break Lever
O2	Guide Hole	Break Rod

4.21 Signal Generator Clutch



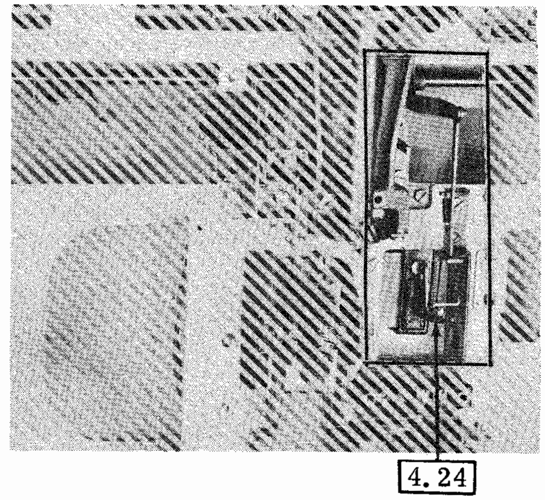
SAT	Felt Washers (2 Front & Rear)	Throwout Bail and Tripbail
O2	Engaging Surface	Clutch Tripbail

4.22 Time Delay Mechanism

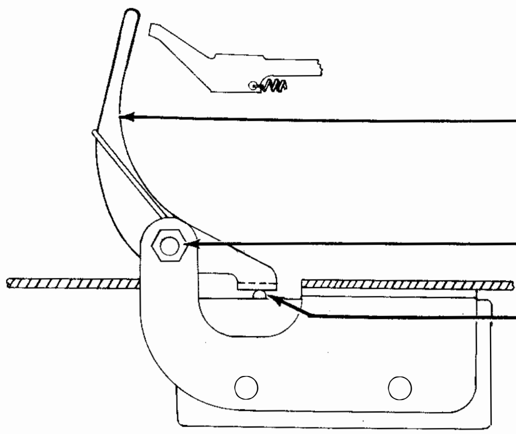


SAT	Felt Washer	Eccentric Follower Pawl
G	Bearing Surface	Eccentric Follower Pawl
O2	Guide Slot	Eccentric Follower Pawl
G	Engaging Surface	Eccentric Follower Pawl
G	Teeth (2 Wheels)	Ratchet Wheels
O2	Bearing Surface Each End	Ratchet Wheel Shaft
SAT	Felt Washer	Contact Pawl
SAT	Felt Washer	Latch Pawl
SAT	Felt Washer	Latchlever
O1	Hooks - Each End (3 Springs)	Spring

4.23 Paper Feed-Out Mechanism - Top View

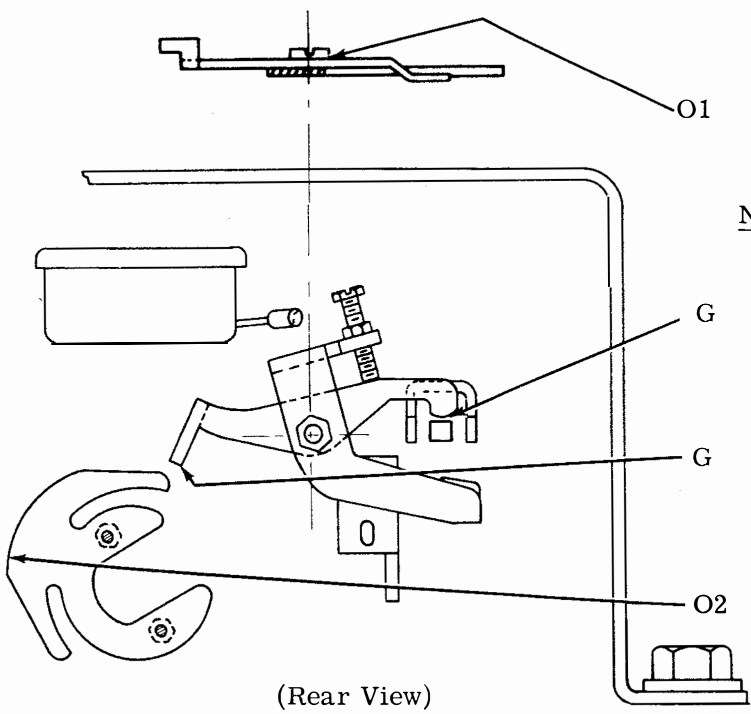


4.24 Paper Feed-Out



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)



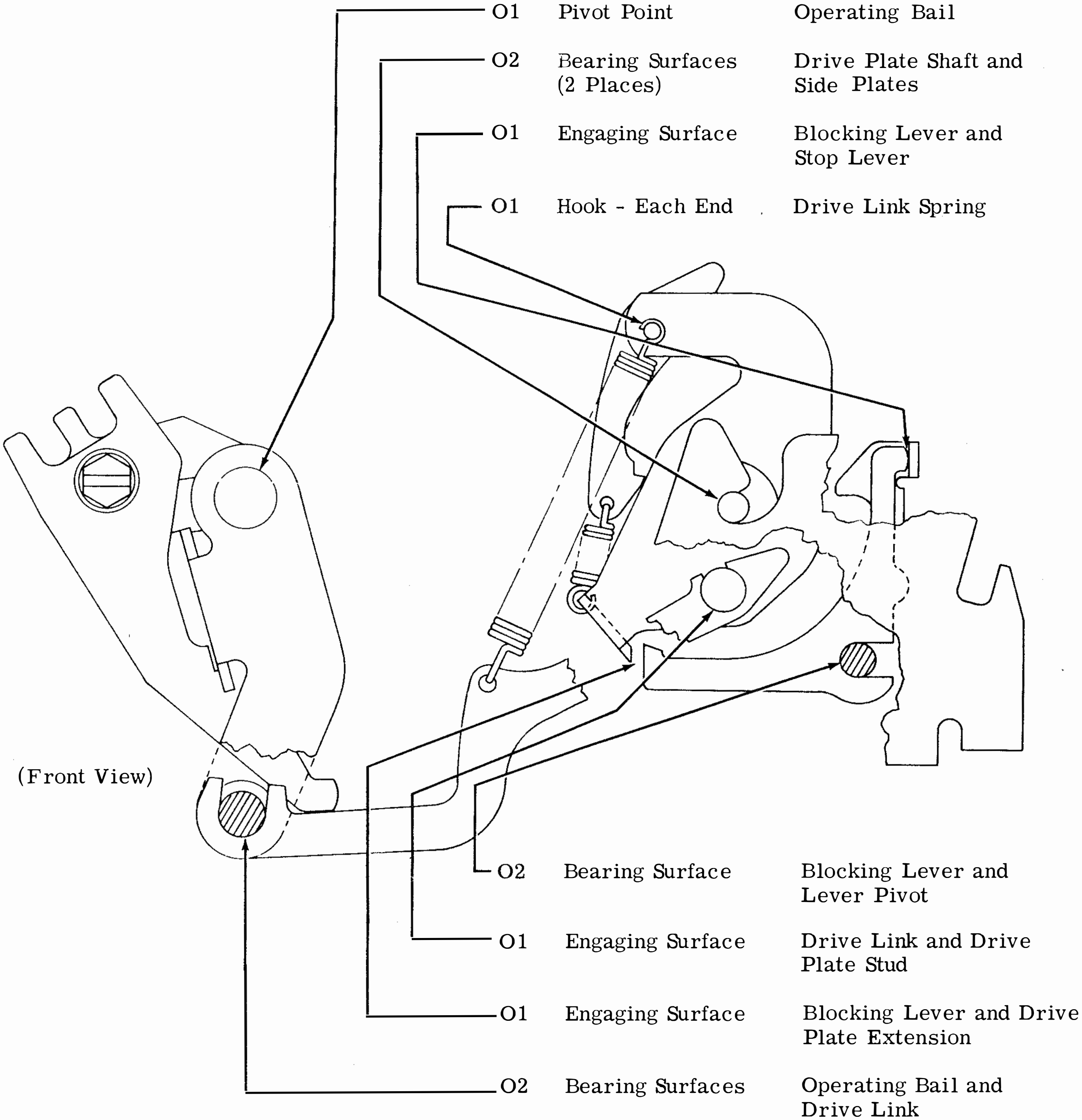
(Rear View)

O1	Head of Shoulder Screw (Do Not Over Lubricate)	Finger Pivot

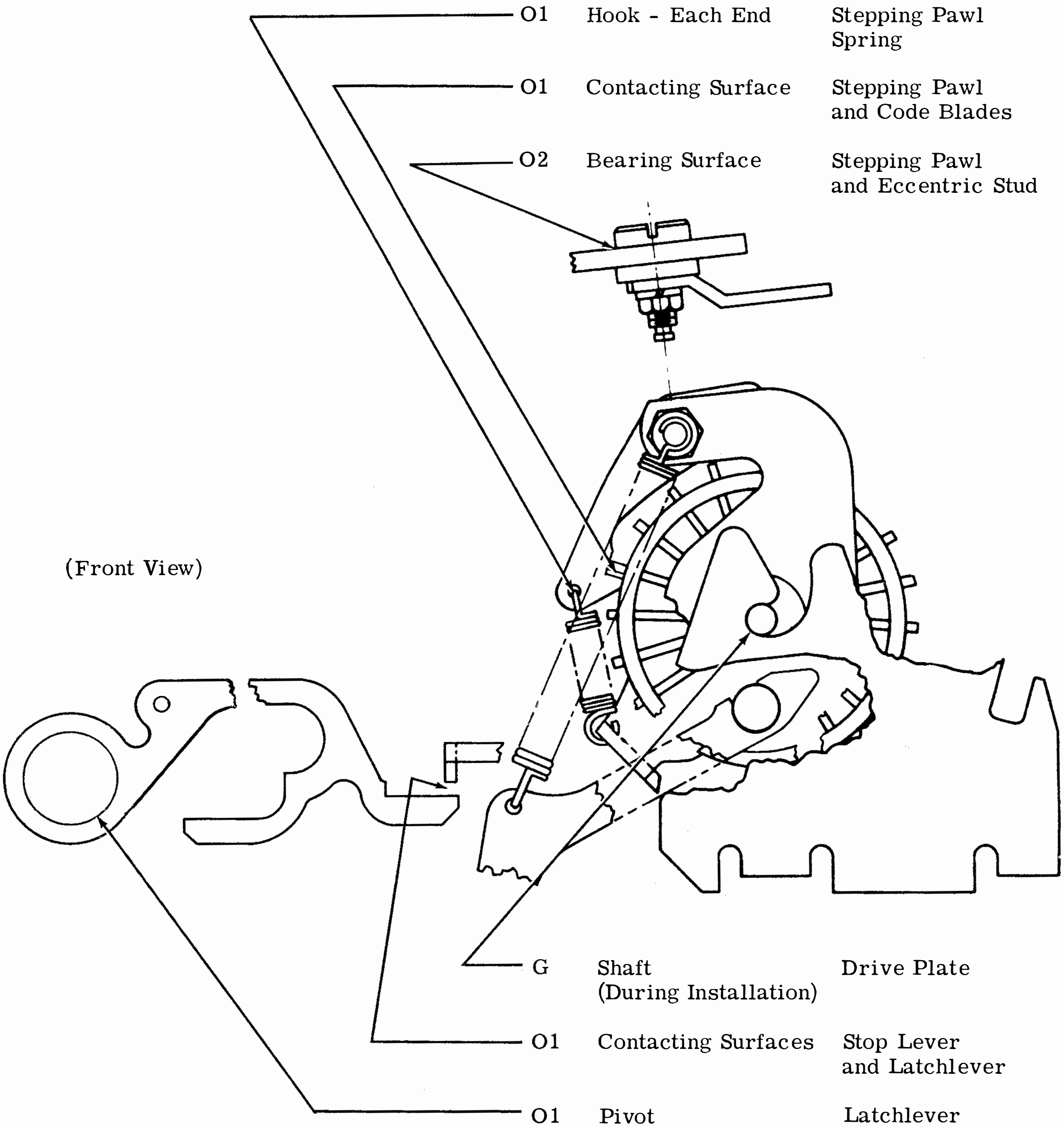
Note: Keep oil and grease off of contacts

G	Contacting Surface	Finger and Swinger
G	Camming Surface	Finger Extension
O2	Contacting Surface	Cam

4.26 Answer-Back Drive Mechanism

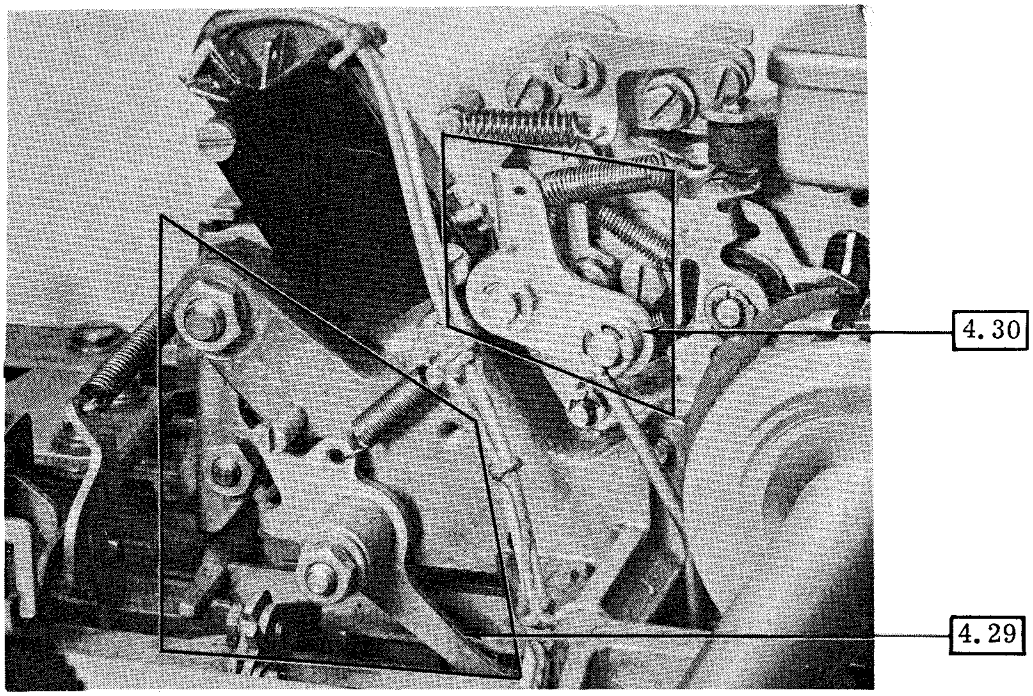


4.27 Answer-Back Drive Mechanism (Continued)

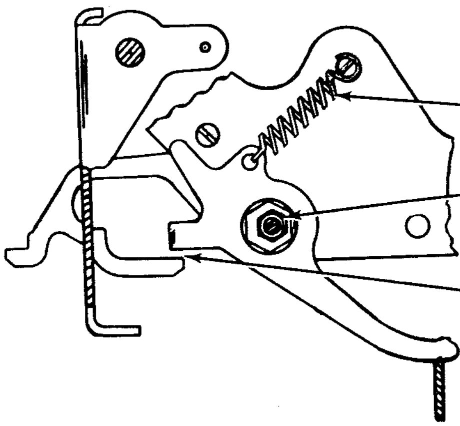


Note: Lubricate Sensing Lever and Codebar Mechanisms per Paragraphs 3.05, 3.06, 3.07 and 3.08.

4.28 Repeat Space and Signal Line Break - Left Rear View

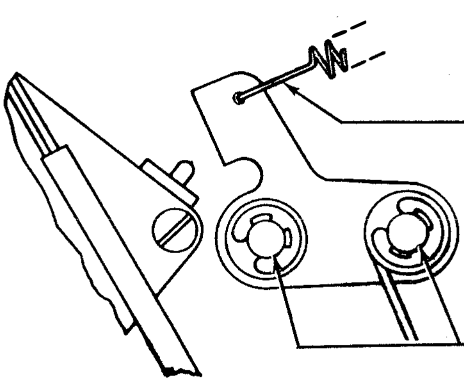


4.29 Repeat on Space



O2	Hooks - Each End	Spring
O2	Bearing Surfaces (2 Places)	Mounting Stud
G	Contact Surfaces (2 Places)	Repeat Trip Lever

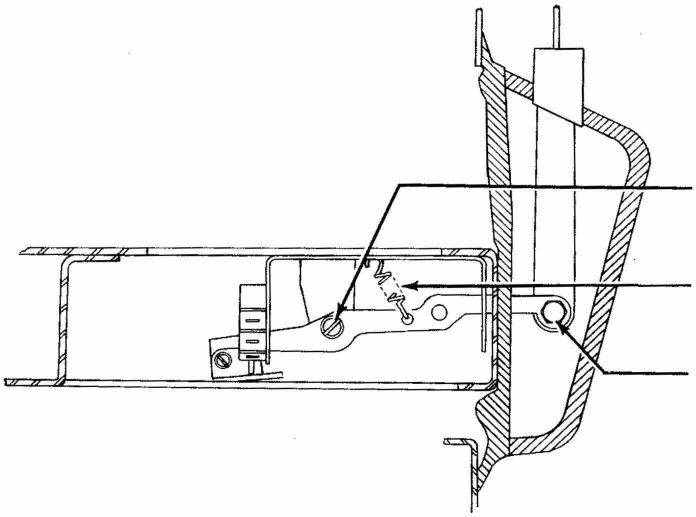
4.30 Signal Line Break (Electrical)



O1	Hooks - Each End	Spring
O2	Pivots (2 Places)	Break Lever

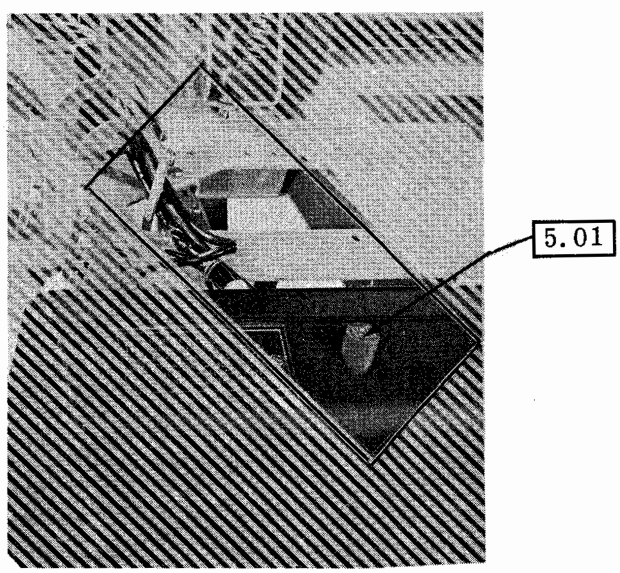
5. RECEIVE-ONLY (RO) BASE

5.01 Signal Line Break



O2	Pivot	Transfer Lever
O	Hooks - Each End	Spring
O2	Pivot	Keylever

5.02 Signal Line Break Mechanism - Left Top View



28 TYPING UNIT

LUBRICATION

CONTENTS PAGE

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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:

Operating Speed (WPM)	Lubrication Interval
60	3000 hr or 1 yr*
75	2400 hr or 9 mo*
100	1500 hr or 6 mo*

*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, overlubrication, 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

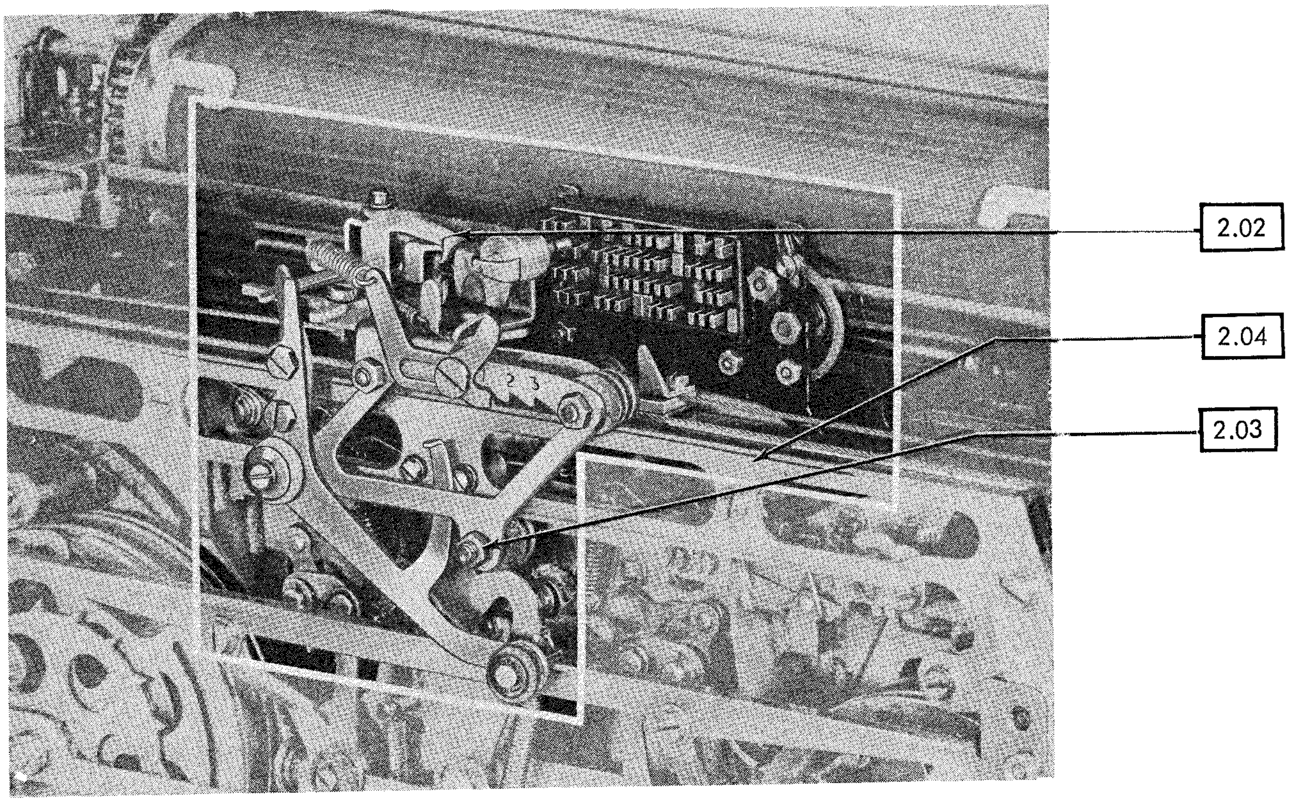
(4) Printing Hammer Stop Bracket (Also see Note 2, Par. 2.48, 573-115-700 which refers to Printing Hammer Operating Bail Spring Bracket Position.)

(5) Carriage Draw Wire Rope

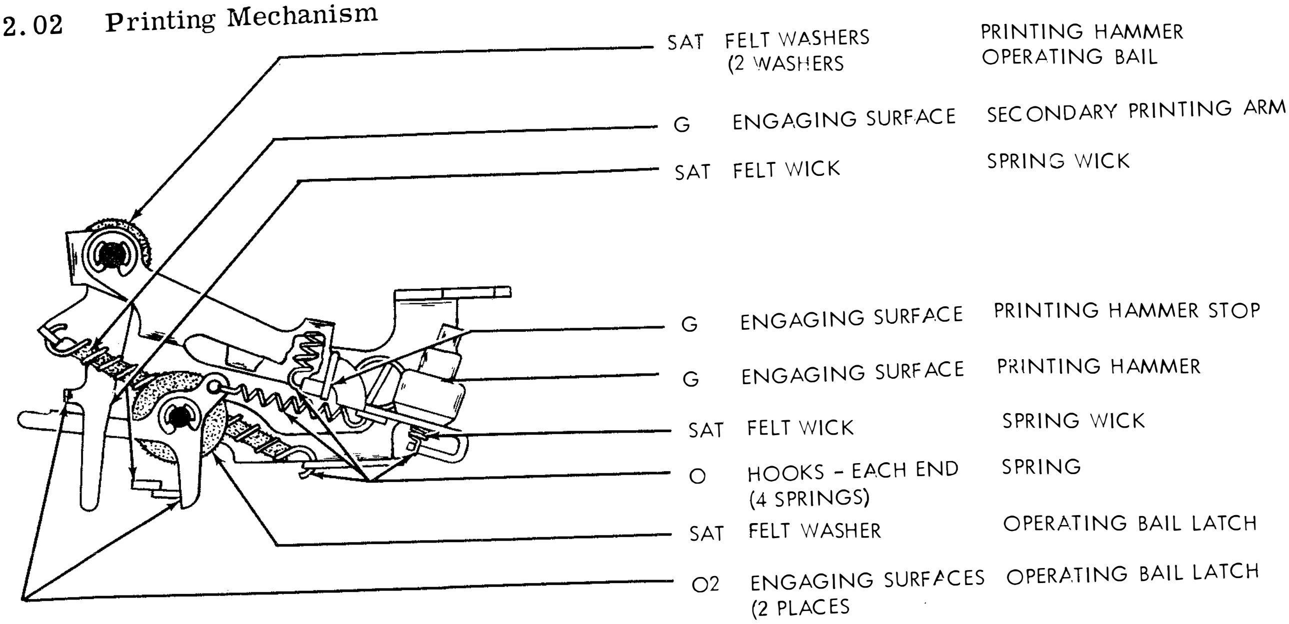
(6) Dashpot Vent Screw (Check dashpot transfer slide for freeness.)

2. BASIC UNITS

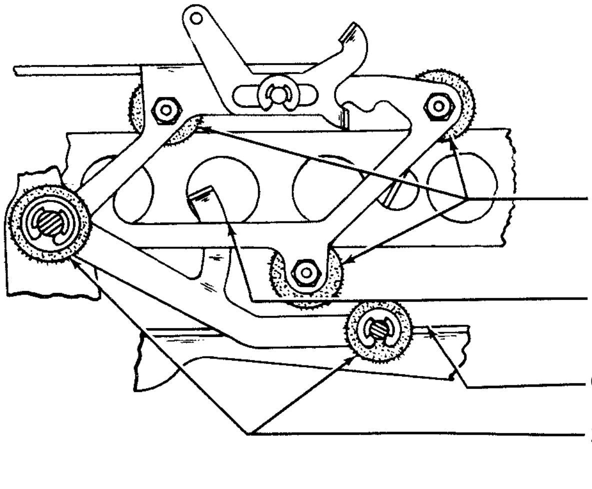
2.01 Typing Unit - Front View



2.02 Printing Mechanism

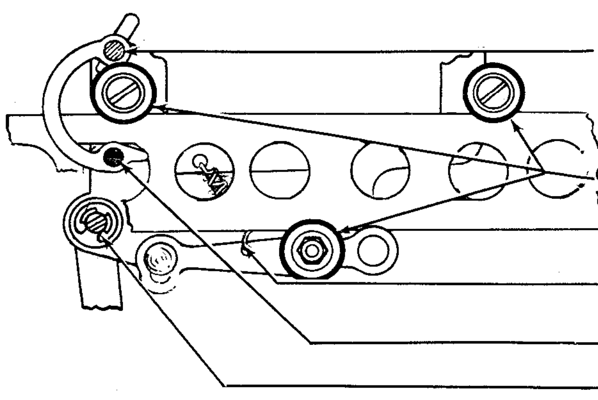


2.03 Printing Mechanism (Cont'd)



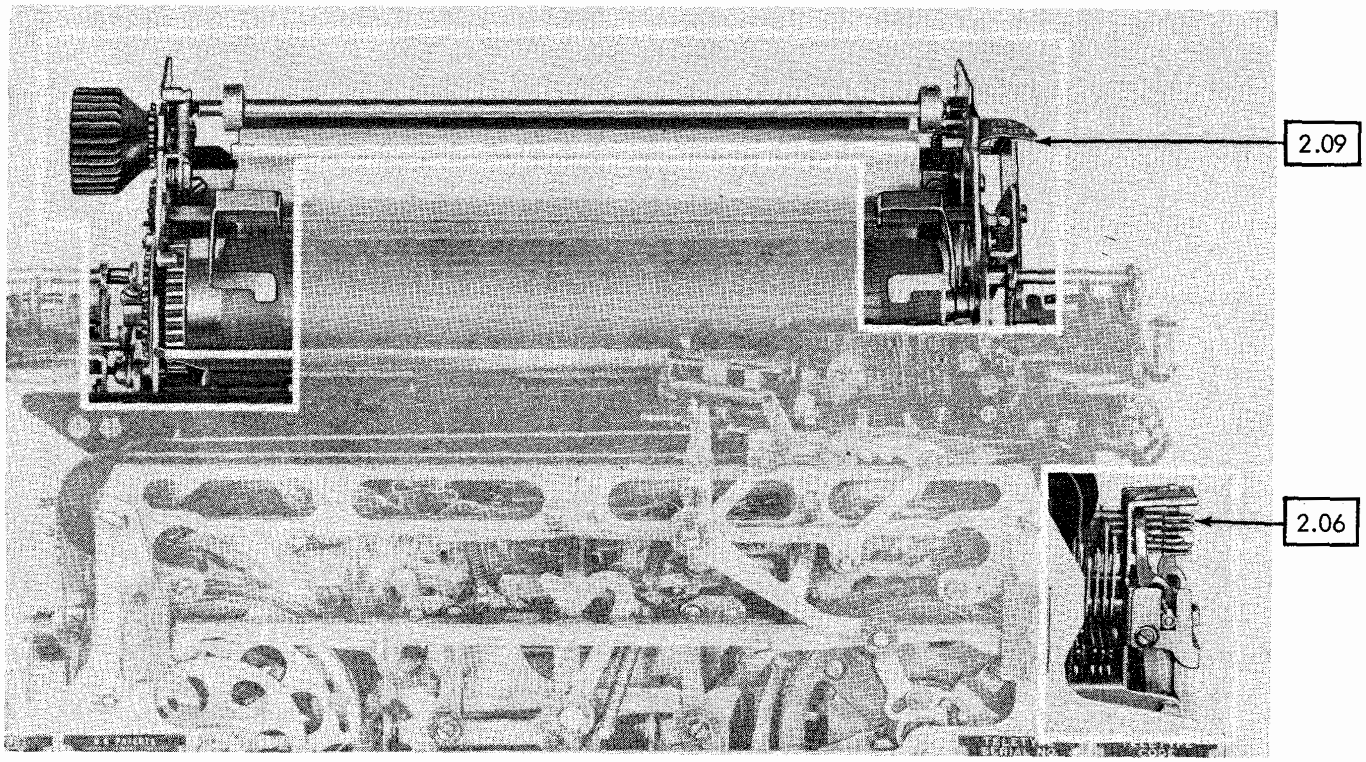
SAT	FELT WASHERS (3 WASHERS)	PRINTING CARRIAGE ROLLERS
G	GUIDING SURFACE	PRINTING ARM EXTENSION
O10	TRACK SURFACE	PRINTING TRACK
SAT	FELT WASHERS (2 WASHERS)	PRINTING ARM

2.04 Type Box Carriage Mechanism

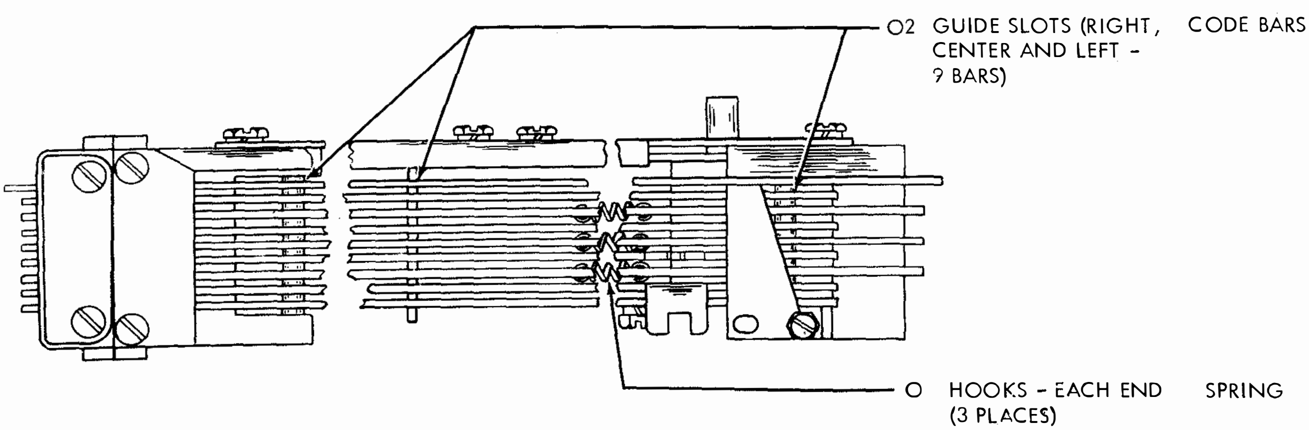


O	BEARING SURFACE	TYPE BOX CARRIAGE LATCH TOGGLE
O2	BEARINGS (3 ROLLERS)	TYPE BOX CARRIAGE ROLLERS
O SAT	HOOK - EACH END FELT WICK	SPRING
O	BEARING SURFACE	TYPE BOX CARRIAGE LATCH
O2	BEARING SURFACE	TYPE BOX CARRIAGE LINK

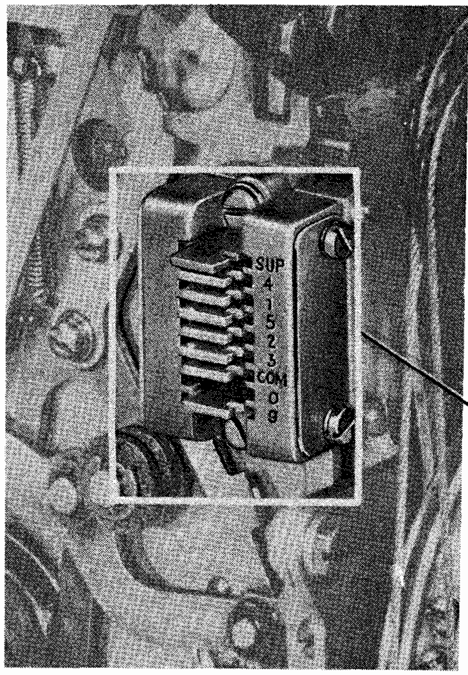
2.05 Typing Unit - Front View



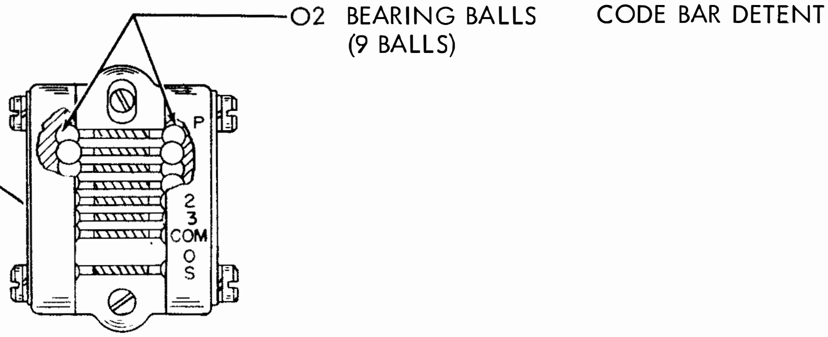
2.06 Codebar Mechanism



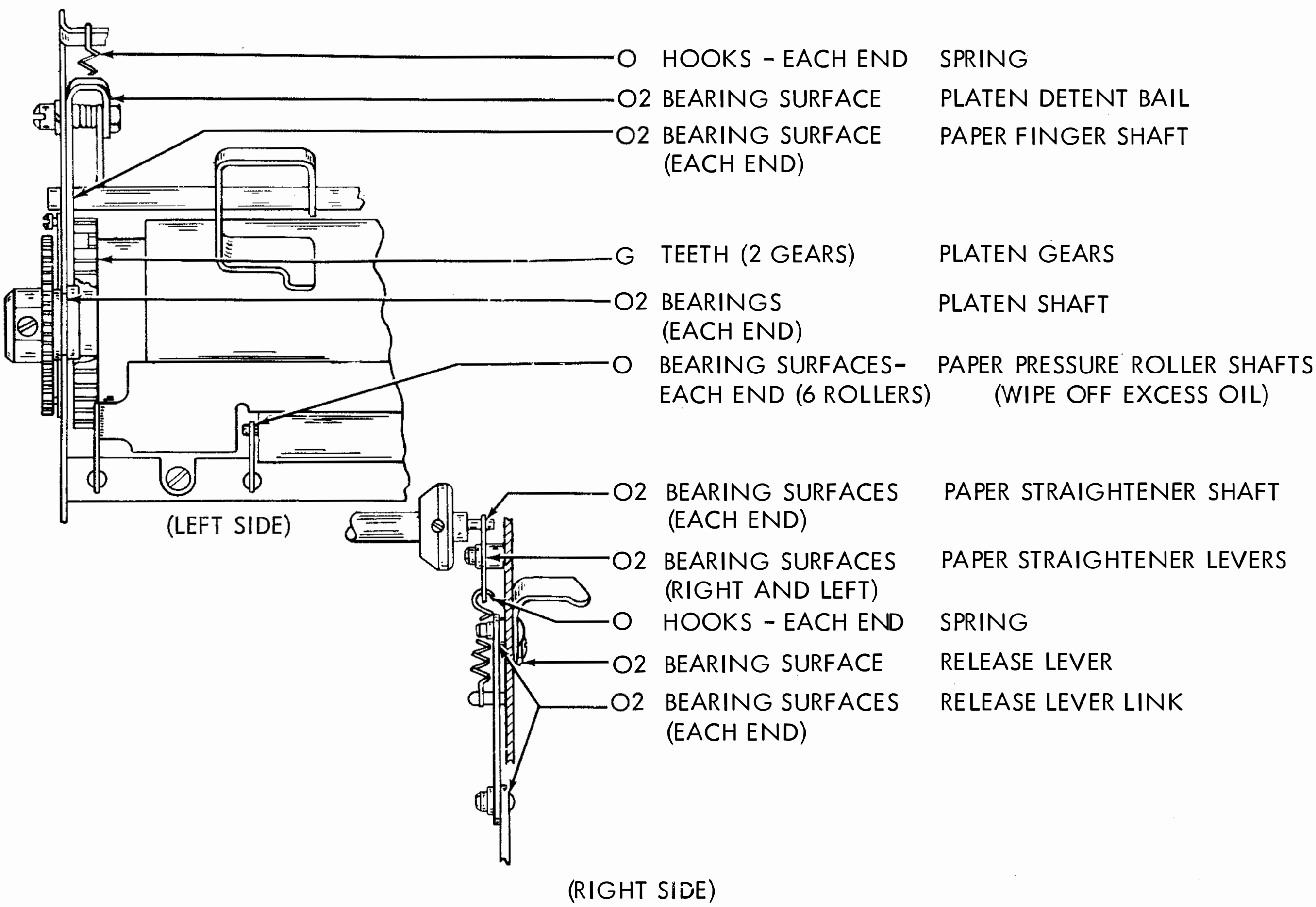
2.07 Typing Unit - Left Front View



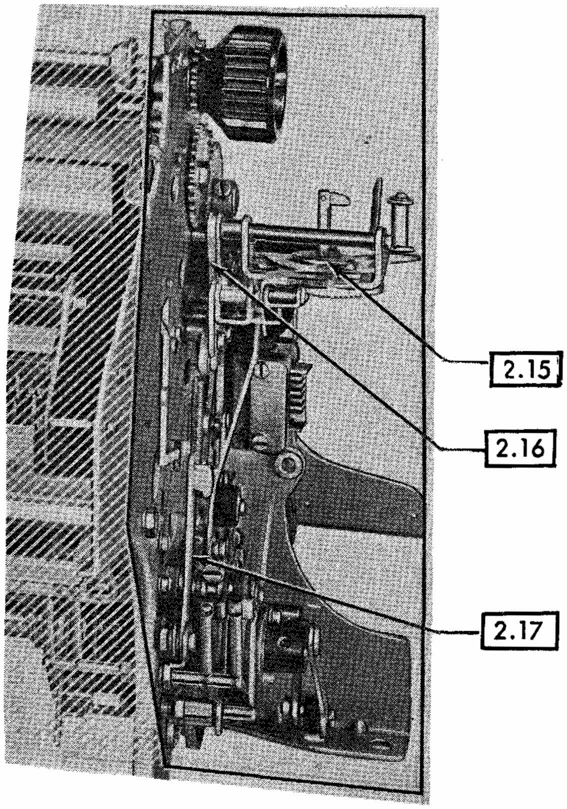
2.08 Codebar Detents



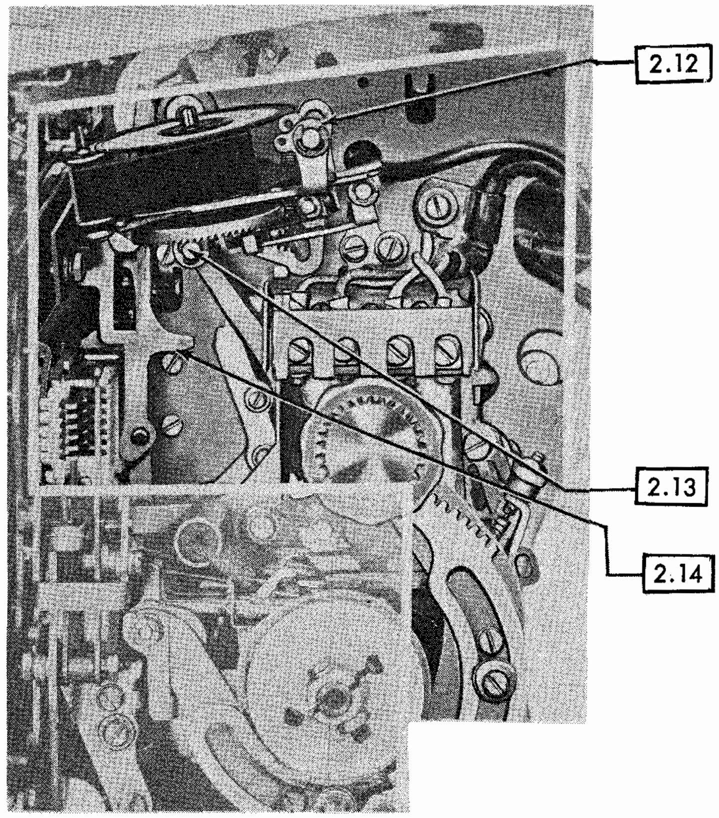
2.09 Paper Feed Mechanism - Front View



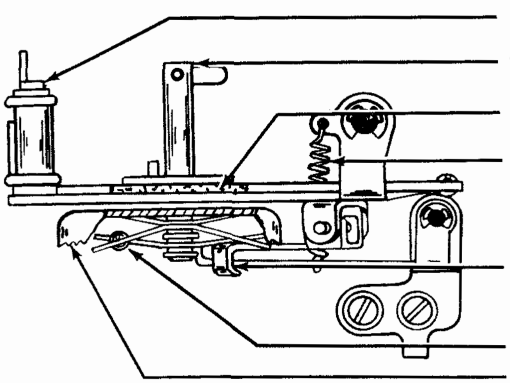
2.10 Typing Unit - Rear Left End View



2.11 Typing Unit - Right End View

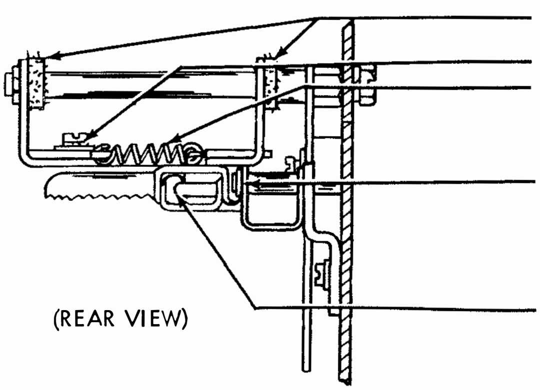


2.12 Ribbon Feed Mechanism - Right Side



(RIGHT SIDE VIEW)

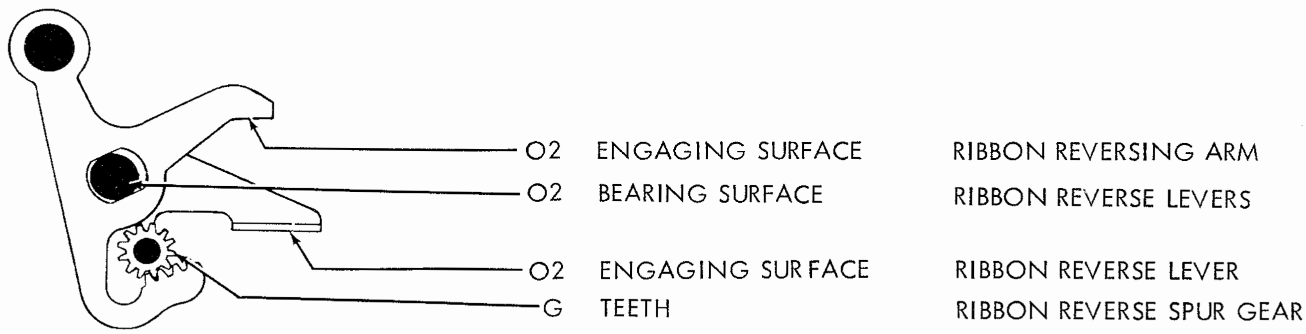
02	BEARING SURFACE	RIBBON ROLLER SHAFT
02	BEARING SURFACE	RIBBON SPOOL TOGGLE
SAT	FELT WASHER	RIBBON SPOOL SHAFT
0	HOOKS-EACH END	RIBBON FEED LEVER SPRING
02	ENGAGING SURFACE	RIBBON DETENT LEVER
0	HOOKS-EACH END	RIBBON RATCHET WHEEL SPRING
G	TEETH	RIBBON RATCHET WHEEL



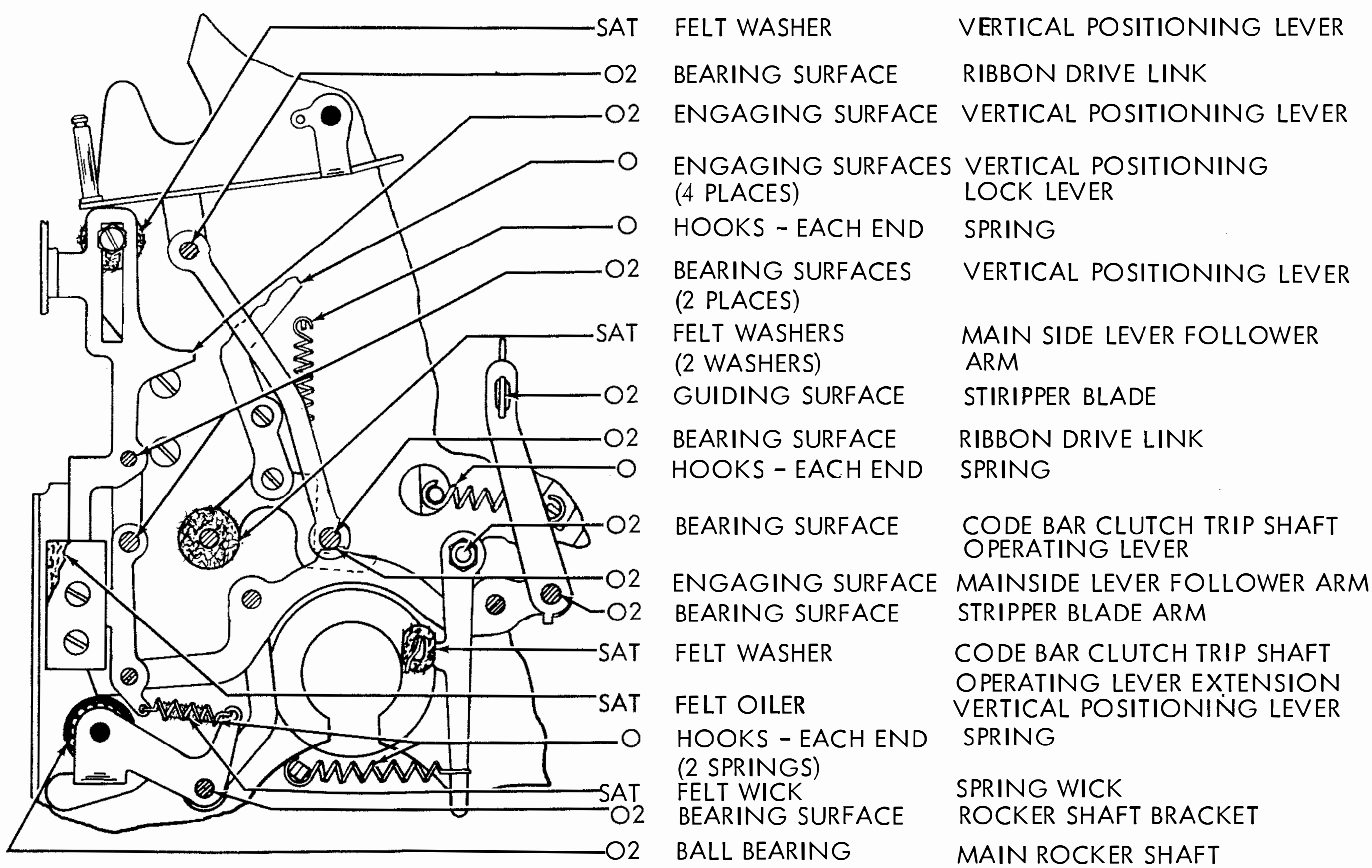
(REAR VIEW)

SAT	FELT WASHERS (2 WASHERS)	RIBBON FEED LEVER BAIL
02	BEARING SURFACE	RIBBON LEVER
0	HOOKS-EACH END	SPRING
02	BEARING SURFACES	RATCHET FEED LEVER SHAFT
02	BEARING SURFACE (2 PLACES)	RIBBON DETENT LEVER SHAFT

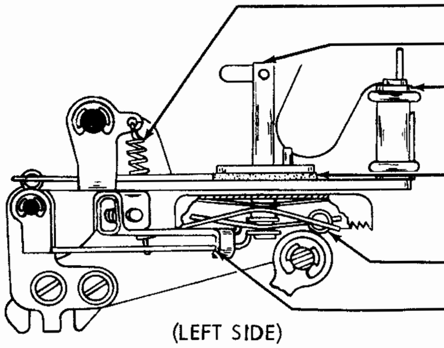
2.13 Ribbon Feed Mechanism - Right Side (Cont'd)



2.14 Vertical Positioning Mechanism - Right Side

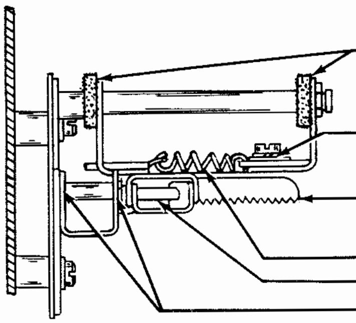


2.15 Ribbon Feed Mechanism - Left Side



(LEFT SIDE)

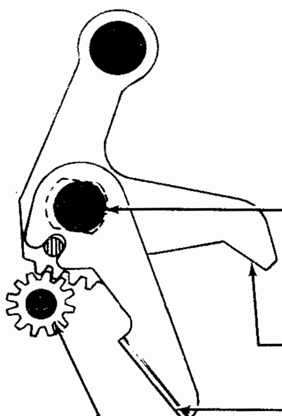
0	HOOKS–EACH END	SPRING
0	BEARING SURFACE	RIBBON SPOOL SHAFT
02	BEARING SURFACE	RIBBON ROLLER SHAFT
SAT	FELT WASHER	RIBBON SPOOL SHAFT
0	HOOKS - EACH END	SPRING
02	ENGAGING SURFACE	RIBBON DETENT LEVER



(REAR VIEW)

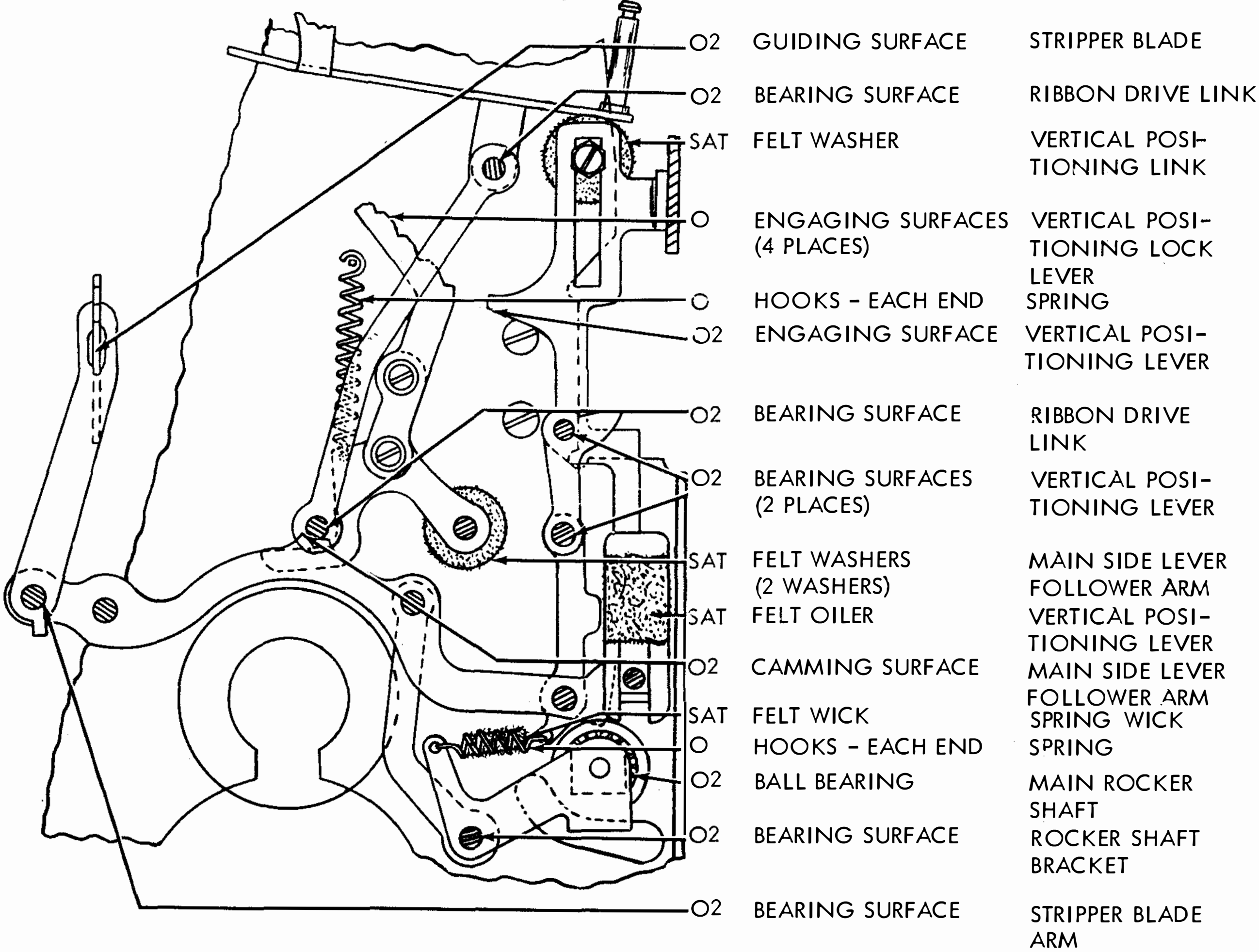
SAT	FELT WASHERS (2 WASHERS)	RIBBON FEED LEVER BAIL
02	BEARING SURFACE	RIBBON REVERSE LEVER
G	TEETH	RIBBON RATCHET WHEEL
0	HOOKS - EACH END	SPRING
02	ENGAGING SURFACE	RIBBON DETENT LEVER SHAFT
02	BEARING SURFACES (2 PLACES)	RATCHET FEED LEVER SHAFT

2.16 Ribbon Feed Mechanism - Left Side (Cont'd)

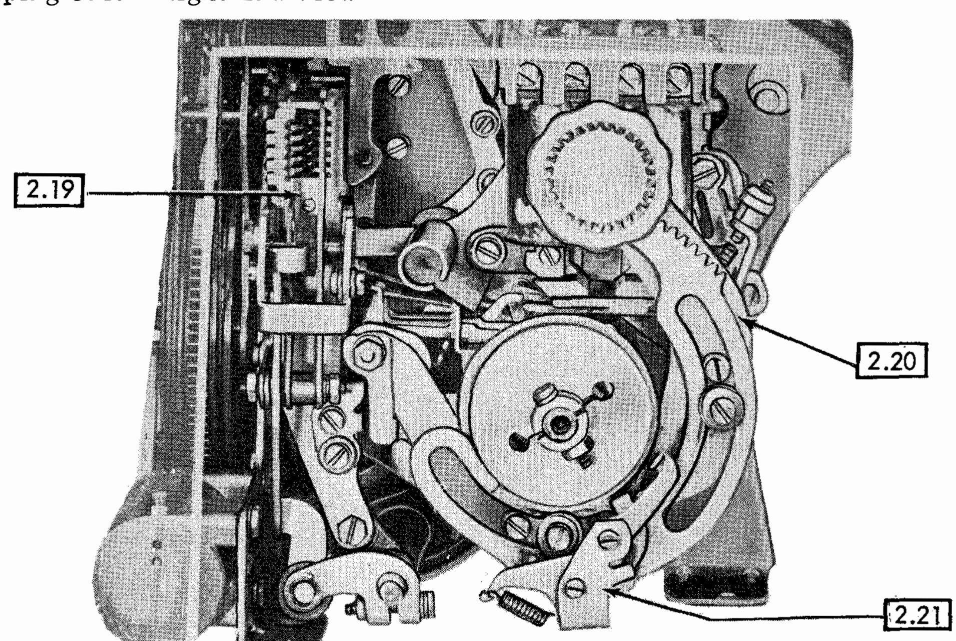


02	BEARING SURFACE	RIBBON REVERSE LEVER
02	ENGAGING SURFACE	RIBBON REVERSING LEVER
02	ENGAGING SURFACE	RIBBON REVERSE LEVER
G	TEETH	RIBBON REVERSE SPUR GEAR

2.17 Vertical Positioning Mechanism - Left Side

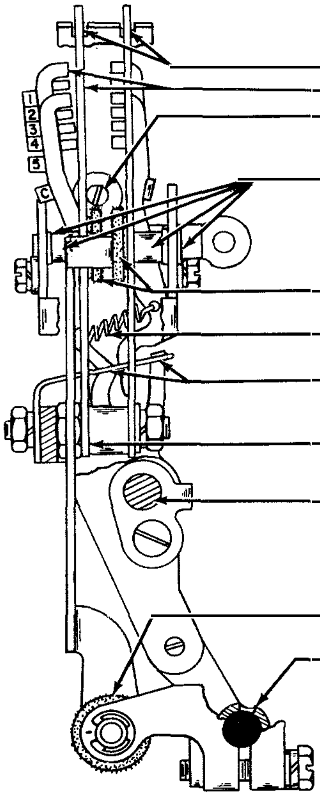


2.18 Typing Unit - Right End View



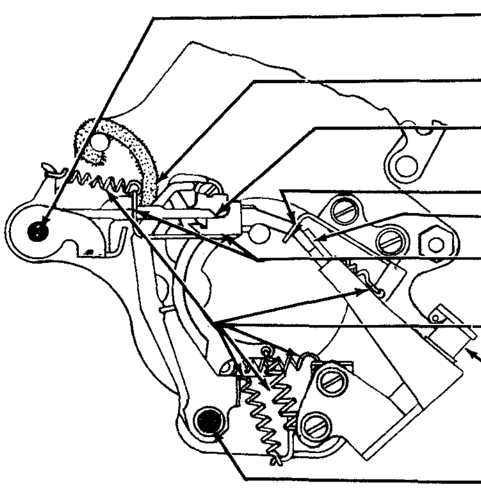
(RIGHT SIDE VIEW)

2.19 Codebar Mechanism



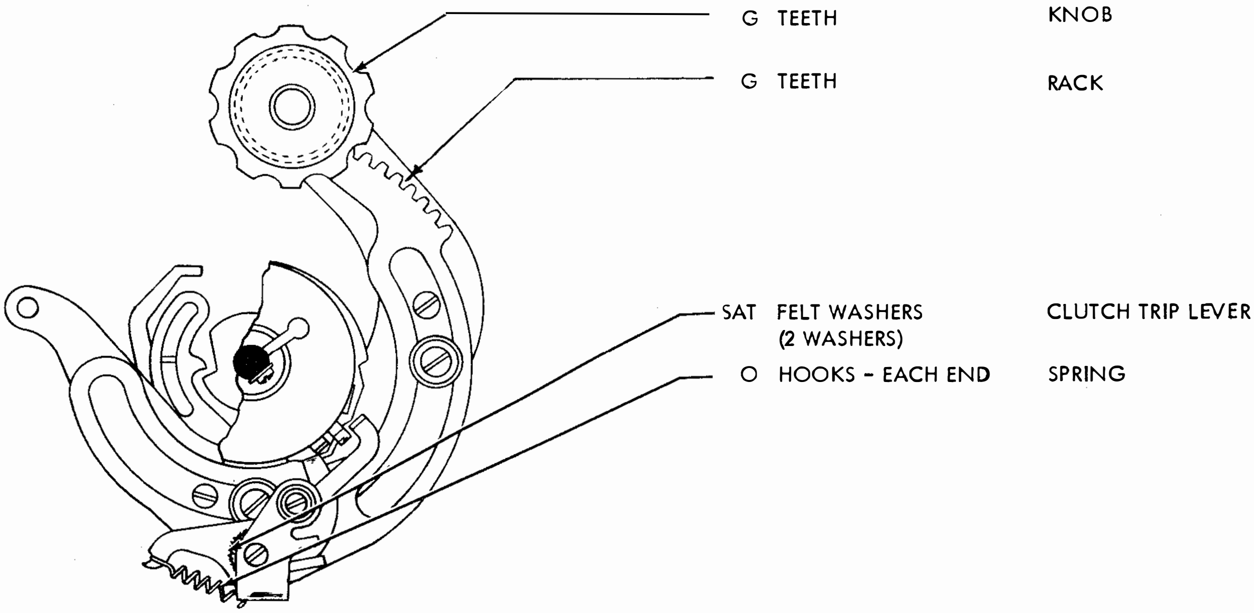
02	GUIDE SLOTS	SHIFT LEVERS
02	ENGAGING SURFACE	SHIFT AND TRANSFER LEVERS
02	BEARING GUIDE SLOTS (6 SLOTS)	TRANSFER LEVER GUIDE BEARING
02	ROLLER BEARINGS (4 ROLLERS)	SHIFT LEVER LINK ROLLERS
SAT	FELT WASHERS (2 WASHERS)	SHIFT LEVER LINK SHAFT
0	HOOKS–EACH END (5 SPRINGS)	SPRING
02	GUIDE SLOTS (5 SLOTS)	INTERMEDIATE ARMS AND TRANSFER LEVERS
02	BEARING SURFACES (2 PLACES)	SHIFT LEVERS
02	BEARING GUIDE SLOTS (5 SLOTS)	INTERMEDIATE ARM GUIDE BEARING
SAT	FELT WASHER	SHIFT LEVER LINK
03	OIL HOLE	SHIFT LEVER DRIVE ARM SHAFT

2.20 Selector Mechanism

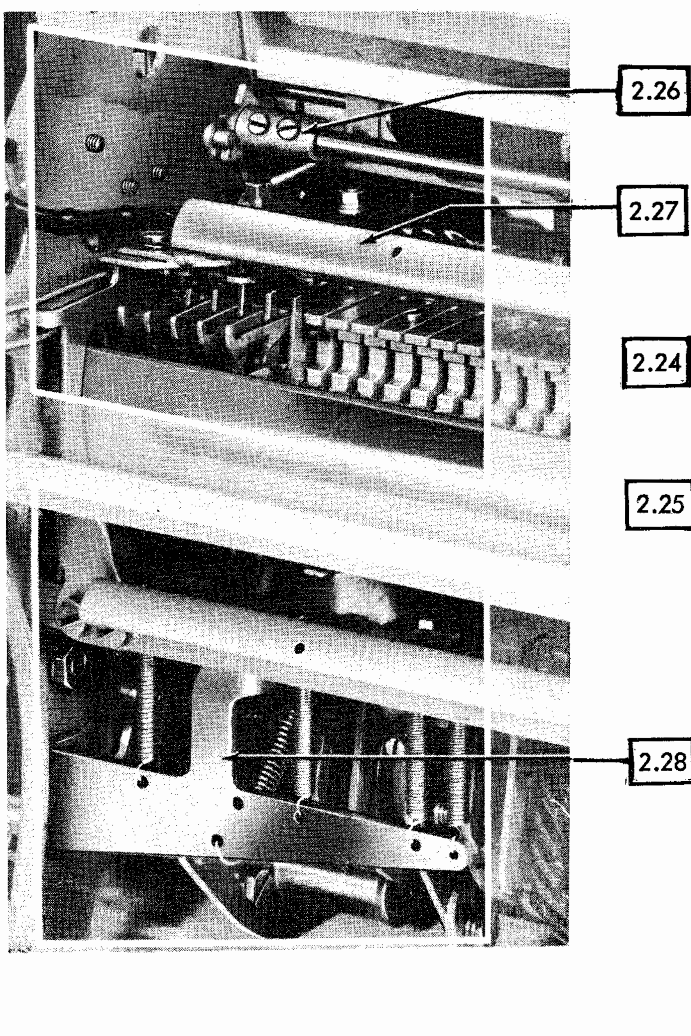


02	BEARING GUIDE SLOTS (5 SLOTS)	PUSH LEVER GUIDE BEARING
SAT	FELT WICK	SELECTOR WICK
02	ENGAGING SURFACES (5 LEVERS)	PUSH LEVERS
02	GUIDE SLOT	MARKING LOCK LEVER
02	WICK	LUBRICATOR WICK
02	GUIDE SLOTS	SELECTOR AND PUSH LEVERS
0	HOOKS–EACH END (12 SPRINGS)	SPRINGS
	FILL CUP (AVOID AIR LOCK)	LUBRICATOR RESERVOIR
02	BEARING GUIDE SLOTS (6 SLOTS)	SELECTOR LEVER GUIDE BEARING

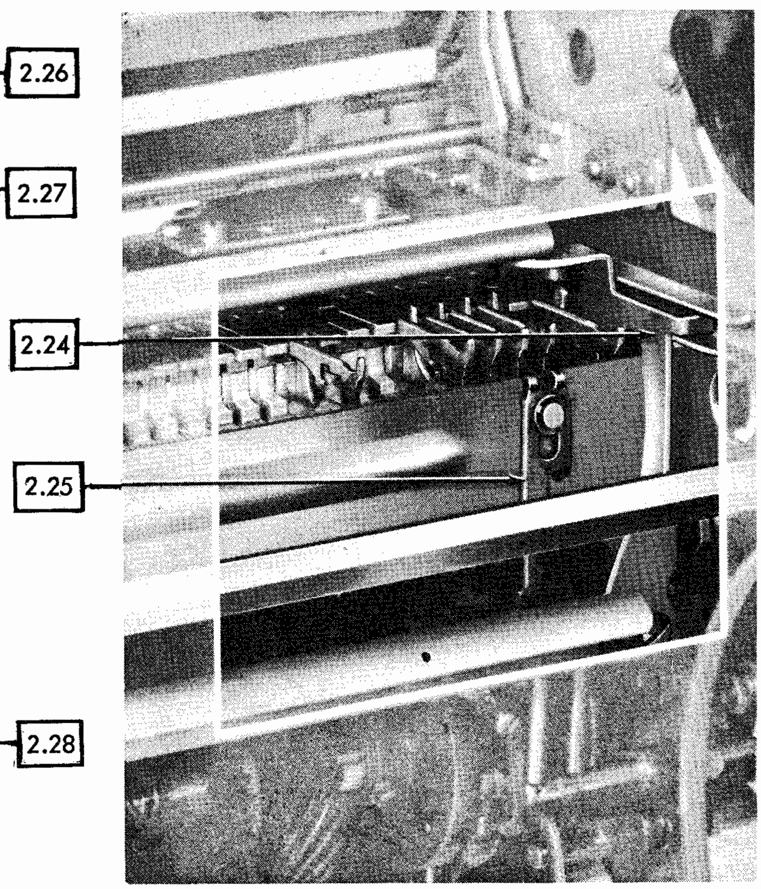
2.21 Selector Mechanism (Cont'd)



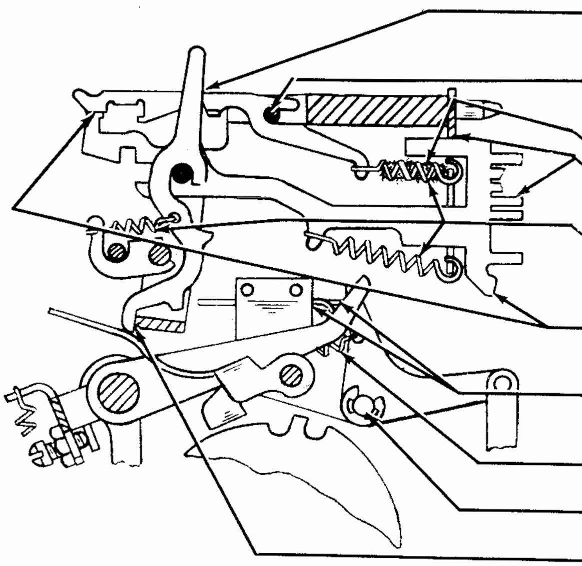
2.22 Typing Unit - Rear View



2.23 Typing Unit - Rear View

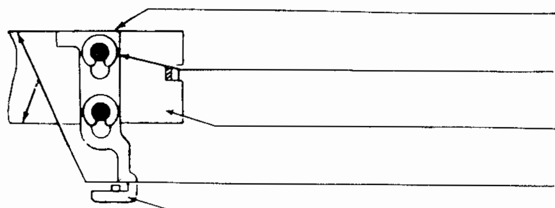


2.24 Stunt Box Mechanism



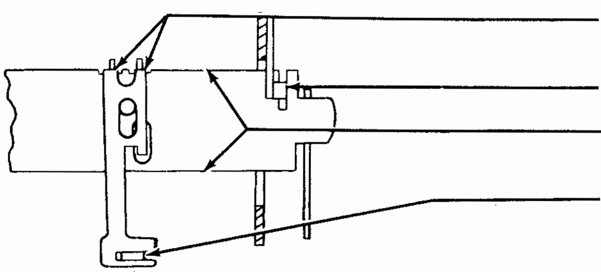
O2	GUIDE SLOTS (11 LEVERS)	FUNCTION LEVERS
O2	GUIDE SLOTS (11 PAWLS)	FUNCTION PAWLS
SAT	EACH FELT WICK	FUNCTION PAWL SPRINGS
O2	GUIDE SLOTS (11 LEVERS)	FUNCTION BARS
O	HOOKS - EACH END (33 SPRINGS)	SPRING
O2	ENGAGING SURFACES (FRONT & REAR - 11 BARS)	FUNCTION BARS
O2	GUIDE AND ENGAGING SURFACES	LINE FEED SLIDE ARM
O	HOOKS - EACH END	SPRING
O2	BEARING SURFACE	KEYBOARD LOCK LEVER
O2	ENGAGING SURFACES (11 LEVERS)	FUNCTION LEVERS

2.25 Stripper Blade Mechanism



NEW STYLE

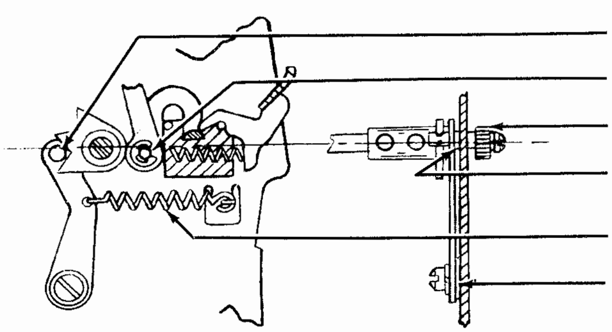
O	ENGAGING SURFACE	LINE FEED STRIPPER SLIDE
O2	GUIDE SURFACES (2 PLACES)	STRIPPER SLIDE
O2	GUIDE SURFACES (EACH END)	STRIPPER BLADE
G	ENGAGING SURFACES	STRIPPER BLADE
O2	ENGAGING SURFACE	STRIPPER BLADE



OLD STYLE

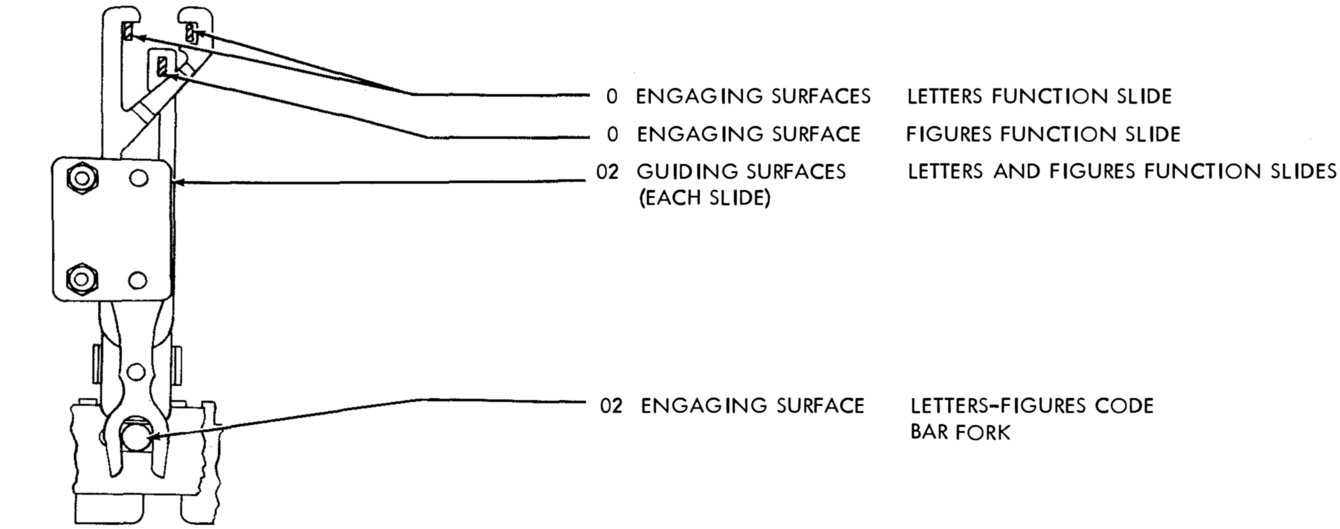
O	ENGAGING SURFACES (2 PLACES)	LINE FEED FUNCTION PAWL STRIPPER
O2	GUIDING SURFACE	STRIPPER BLADE
G	UPPER AND LOWER WORKING SURFACES	STRIPPER BLADE
O2	GUIDING SURFACE	STRIPPER BAIL

2.26 Ribbon Reverse Mechanism

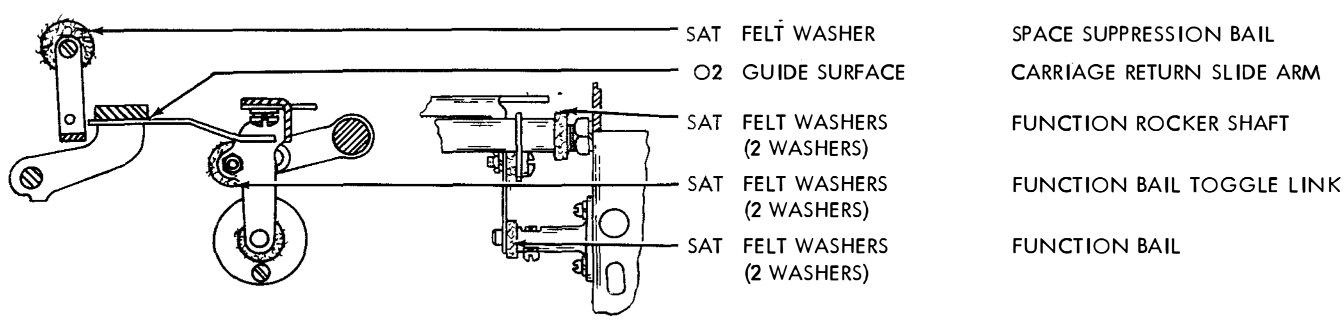


O2	ENGAGING SURFACE	RIBBON REVERSE DETENT
O2	BEARING SURFACE	PAPER RELEASE LEVER
G	TEETH	RIBBON REVERSE SPUR GEAR
O2	BEARING (RIGHT AND LEFT)	RIBBON REVERSE SHAFT
O	HOOKS - EACH END	SPRING
O2	BEARING SURFACE	RIBBON REVERSE DETENT LEVER

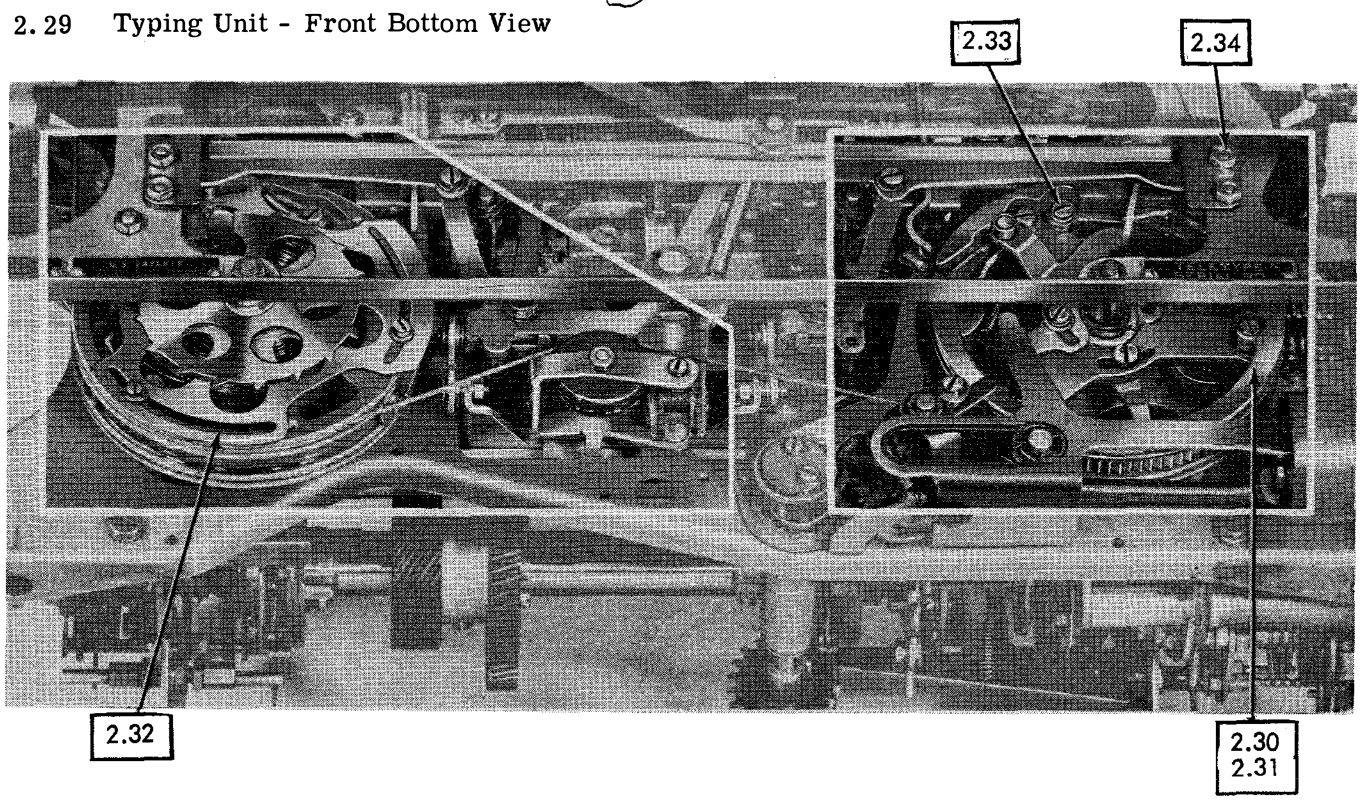
2.27 Shift Mechanism



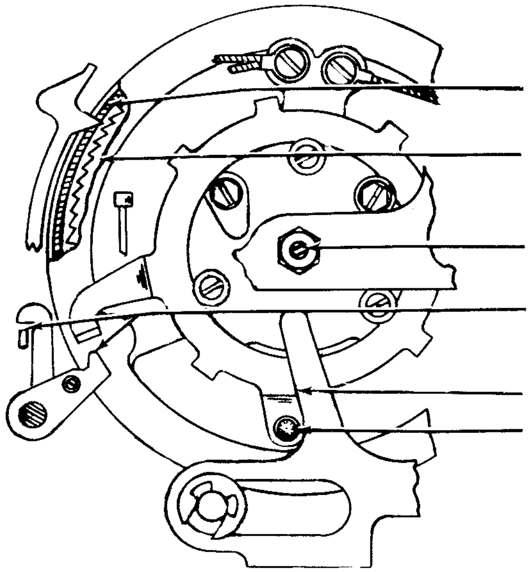
2.28 Function Rocker Shaft Mechanism



2.29 Typing Unit - Front Bottom View

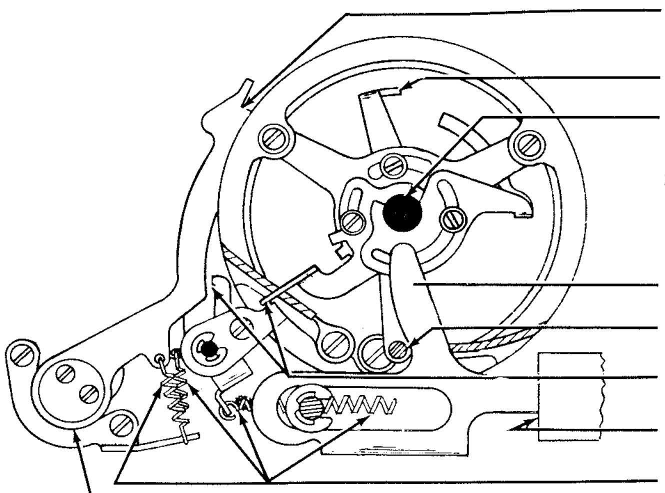


2.30 Spacing Drum Drive Mechanism - Later Design

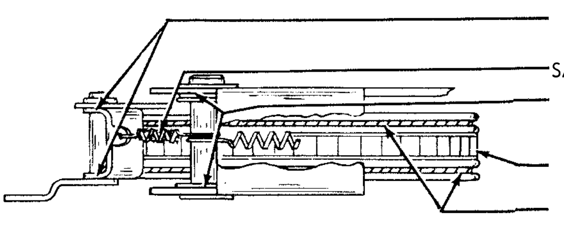


(FRONT VIEW)

2.31 Spacing Drum Drive Mechanism - Earlier Design



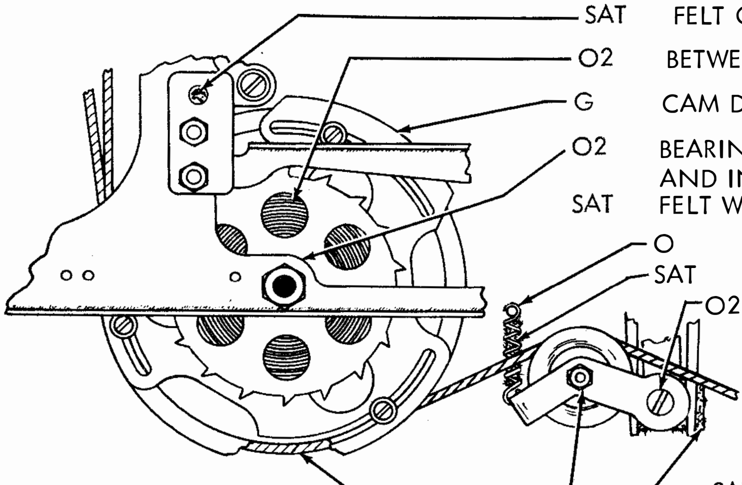
(FRONT VIEW)



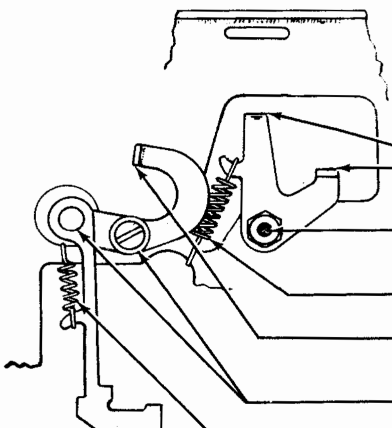
(BOTTOM VIEW)

(SEE PARAGRAPH 6.08)

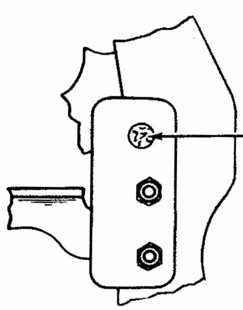
2.32 Carriage Return Mechanism



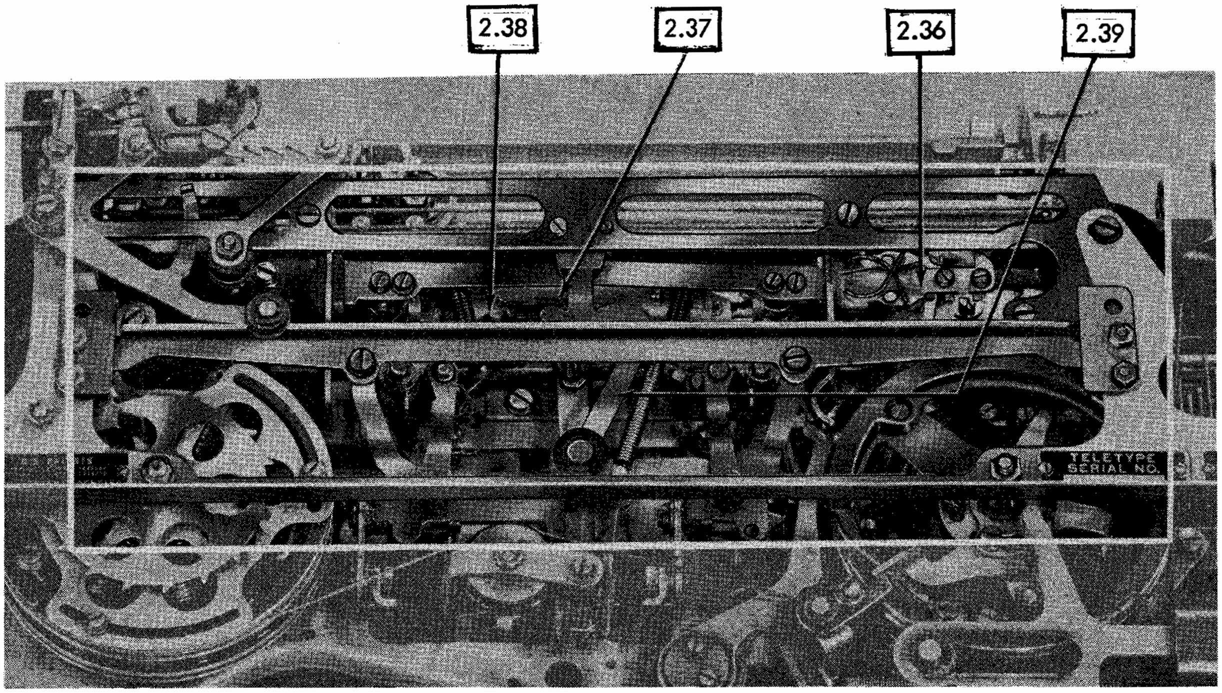
2.33 Spacing Drum Feed Mechanism



2.34 Track Guide Mechanism

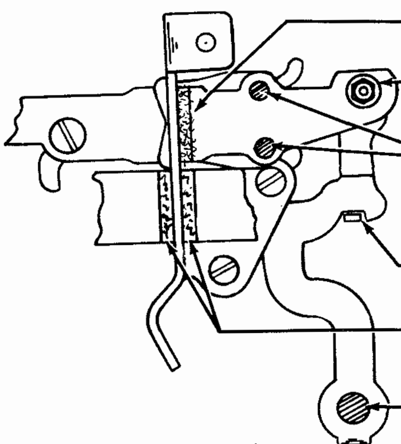


2.35 Typing Unit - Front View



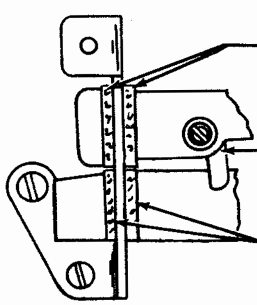
(FRONT VIEW)

2.36 Horizontal Positioning Mechanism



SAT	FELT WASHER	HORIZONTAL REVERSING SLIDE
02	ENGAGING SURFACE	HORIZONTAL REVERSING SLIDE SHIFT LEVER
02	DETENTS (2 DETENTS)	DETENT BAILS
02	ENGAGING SURFACE	HORIZONTAL REVERSING SLIDE SHIFT LEVER
SAT	FELT WASHERS (2 WASHERS)	OSCILLATING RAIL SHIFT SLIDE
02	BEARING SURFACE	HORIZONTAL REVERSING SLIDE SHIFT LEVER

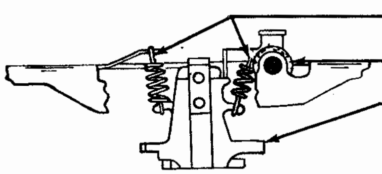
(RIGHT SIDE)



SAT	FELT WASHERS (2 WASHERS)	HORIZONTAL REVERSING SLIDE
02	ENGAGING SURFACES (2 PLACES)	HORIZONTAL REVERSING SLIDE
SAT	FELT WASHERS (2 WASHERS)	OSCILLATING RAIL SHIFT SLIDE

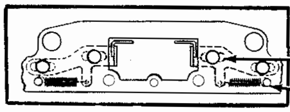
(LEFT SIDE)

2.37 Horizontal Positioning Mechanism (Cont'd)



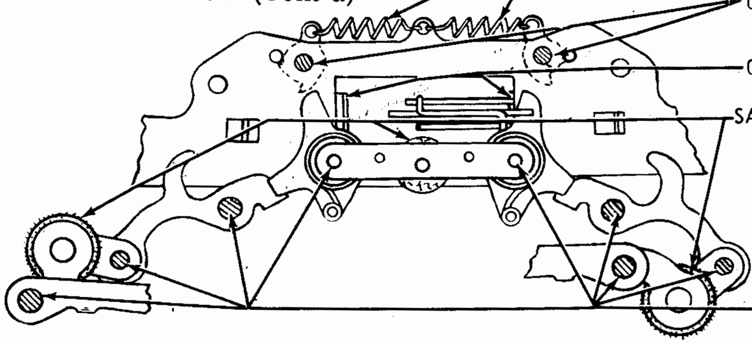
(TOP VIEW)

O	HOOKS–EACH END	SPRING
SAT	FELT WASHER	CODE BAR BELL CRANK
O2	ENGAGING SURFACES (3 SLIDES)	HORIZONTAL MOTION STOP SLIDES



(NEW STYLE)

2.38 Horizontal Positioning Mechanism (Cont'd)

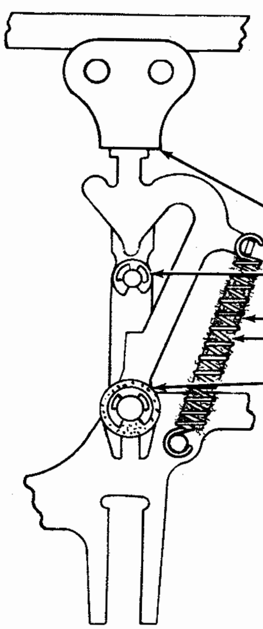


(FRONT VIEW)

O2	ENGAGING SURFACES	DECELERATING SLIDE (SEE NOTE 1)
O	HOOKS–EACH END (2 SPRINGS)	SPRING
O2	BEARING SURFACES (2 BELL CRANKS)	DECELERATING SLIDE BELL CRANKS
O2	ENGAGING SURFACES (2 SLIDES)	DECELERATING SLIDES (SEE NOTE 2)
SAT	FELT WASHERS (3 WASHERS)	SHIFT SLIDE DRIVE LINKS
O	BEARING SURFACES (8 PLACES)	SHIFT SLIDE DRIVE LINKS

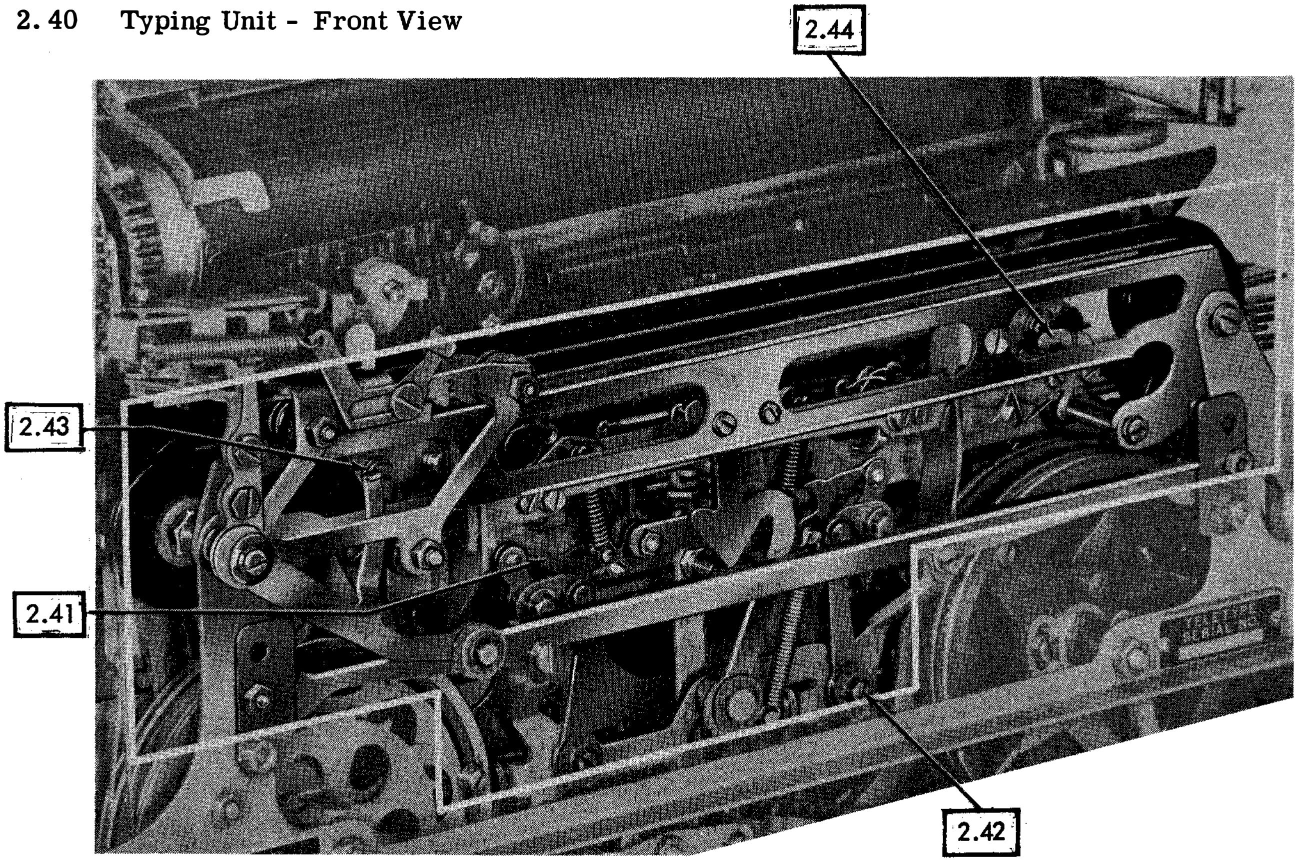
NOTES
1. WITH SPRINGS LOCATED ON REAR SIDE OF SLIDE
2. WITH SPRINGS LOCATED ABOVE THE SLIDE

2.39 Horizontal Positioning Mechanism (Cont'd)



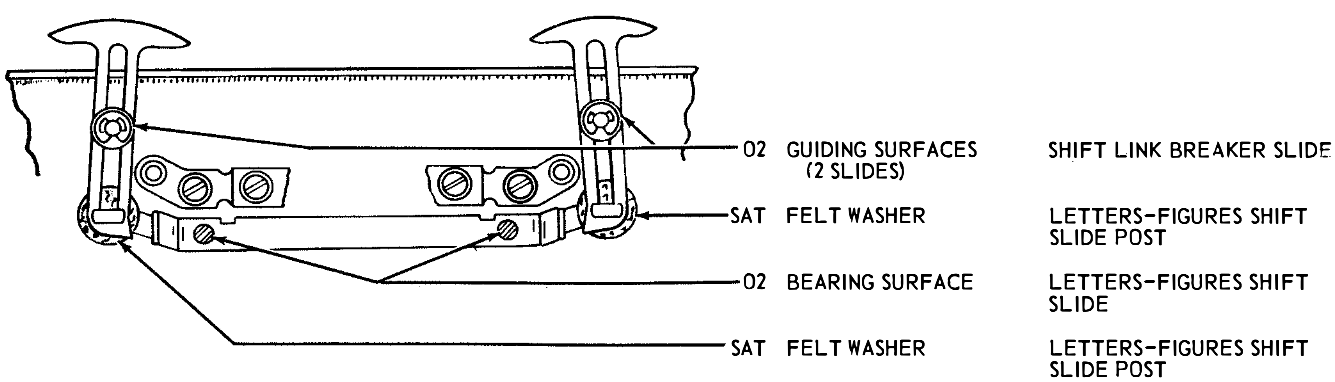
O2	GUIDING SURFACE	HORIZONTAL POSITIONING LOCK LEVER
O2	BEARING SURFACE	HORIZONTAL LOCK LEVER ARM ROLLER
SAT	FELT WICK	SPRING WICK
O	HOOKS–EACH END	SPRING
SAT	FELT WASHER	HORIZONTAL POSITIONING LOCK LEVER

2.40 Typing Unit - Front View

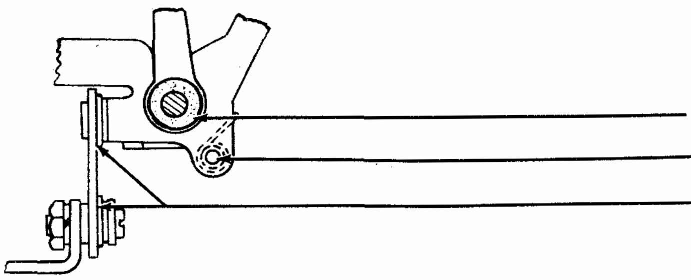


(FRONT VIEW)

2.41 Letters - Figures Shift Mechanism

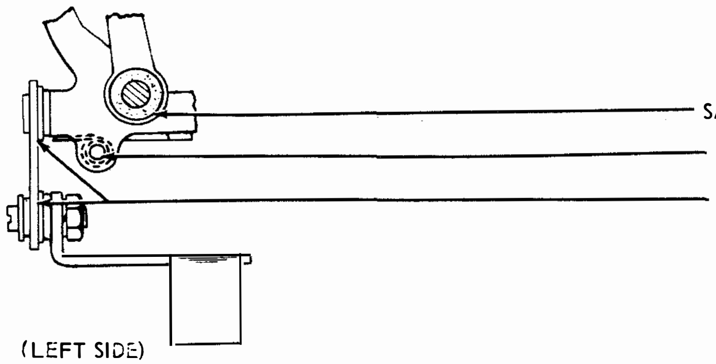


2.42 Letters - Figures Shift Mechanism (Cont'd)



SAT	FELT WASHER	SHIFT SLIDE DRIVE LINK
02	BEARING SURFACE	BREAKER SLIDE BAIL
02	BEARING SURFACES (2 PLACES)	MAIN BAIL LINK

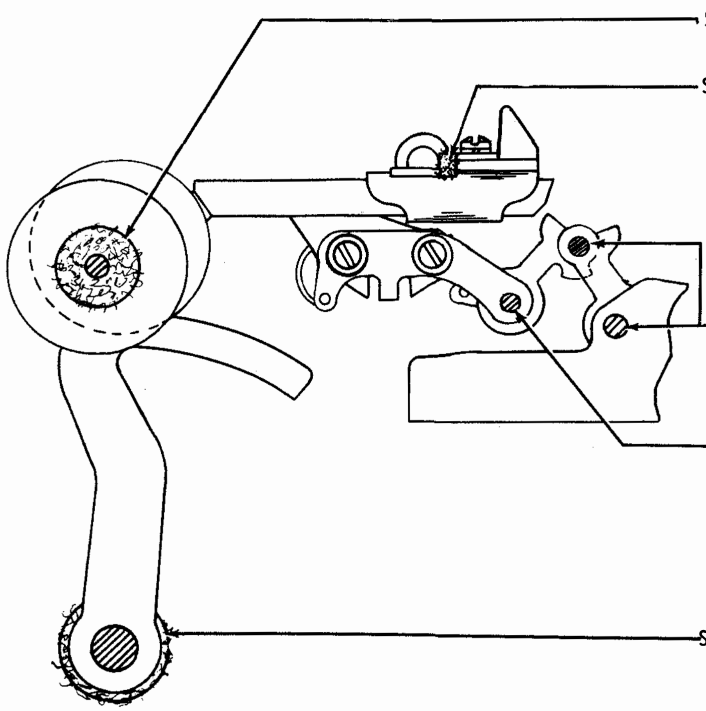
(RIGHT SIDE)



SAT	FELT WASHER	SHIFT SLIDE DRIVE LINK
02	BEARING SURFACE	BREAKER SLIDE BAIL
02	BEARING SURFACES (2 PLACES)	MAIN BAIL LINK

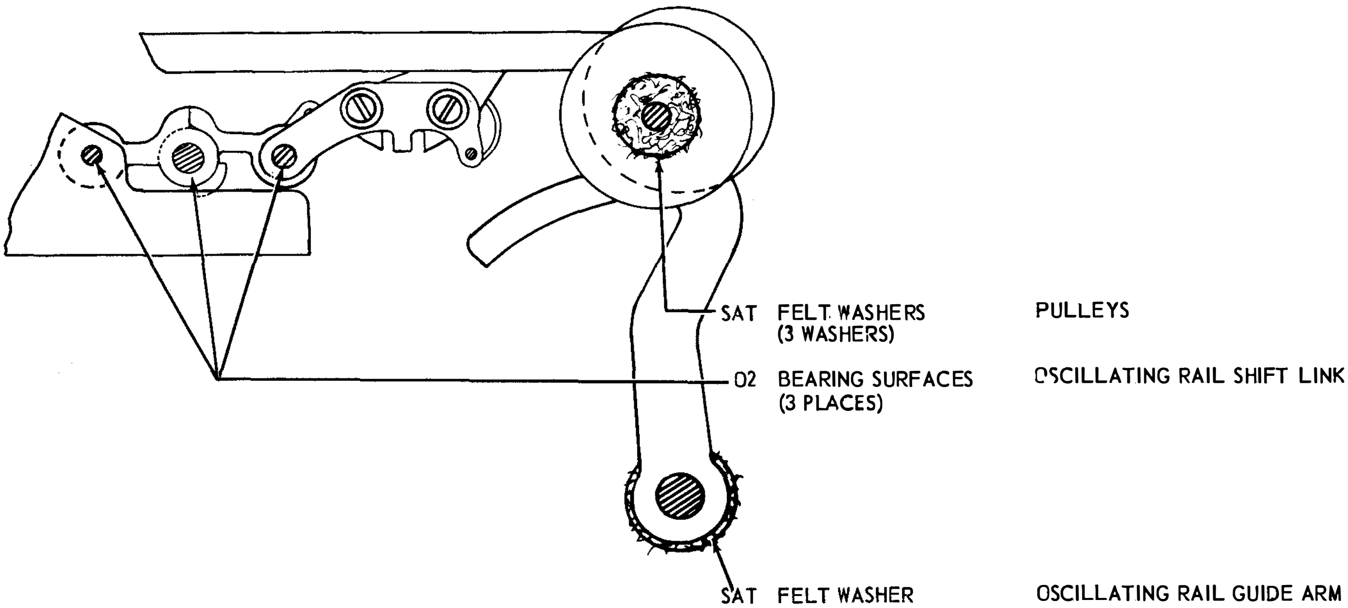
(LEFT SIDE)

2.43 Oscillating Mechanism

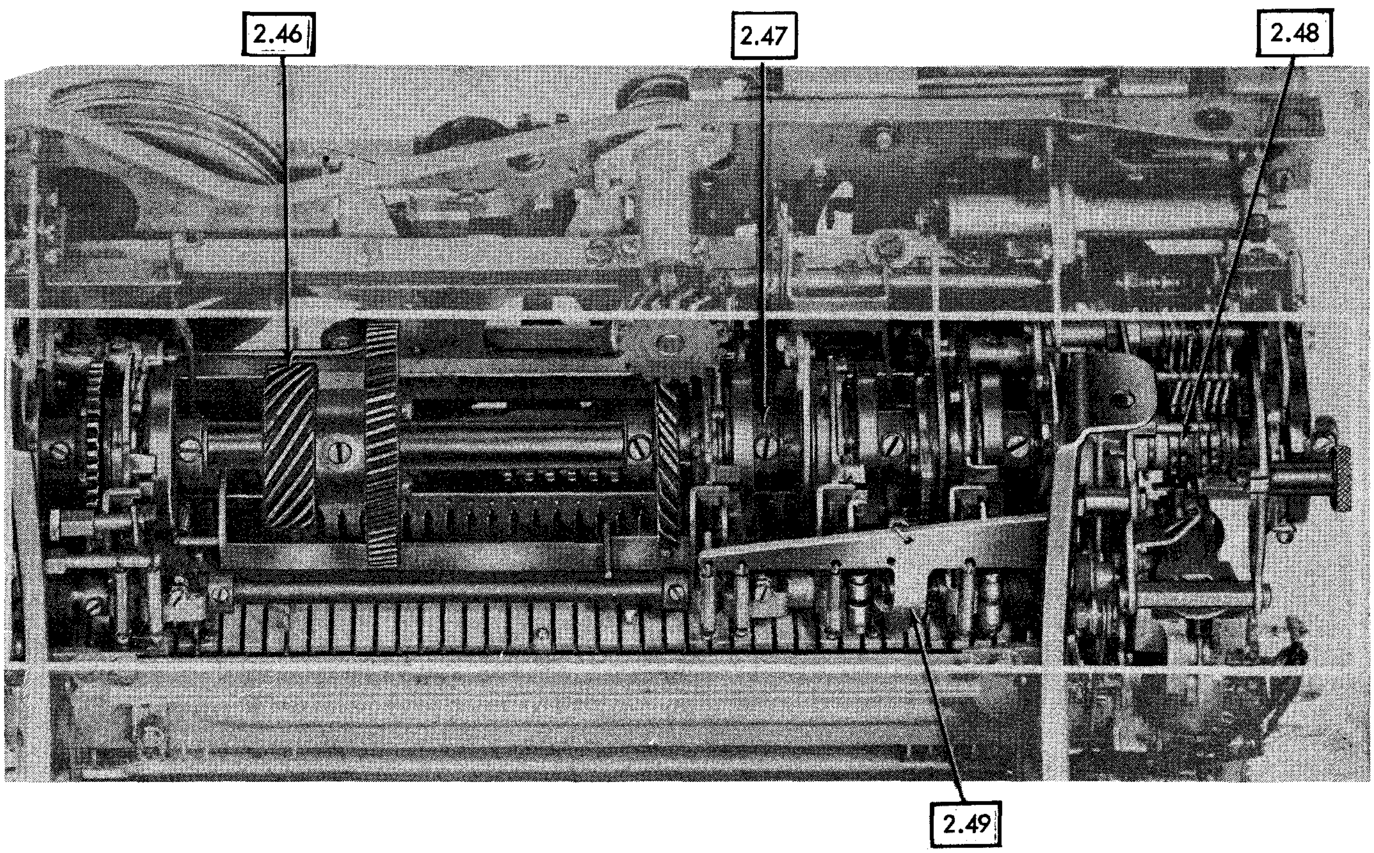


SAT	FELT WASHERS (3 WASHERS)	PULLEYS
SAT	FELT OILER	OSCILLATING RAIL SLIDE
02	BEARING SURFACE	OSCILLATING RAIL SHIFT LINK
02	BEARING SURFACE	OSCILLATING RAIL SHIFT LINK
SAT	FELT WASHER	OSCILLATING RAIL GUIDE ARM

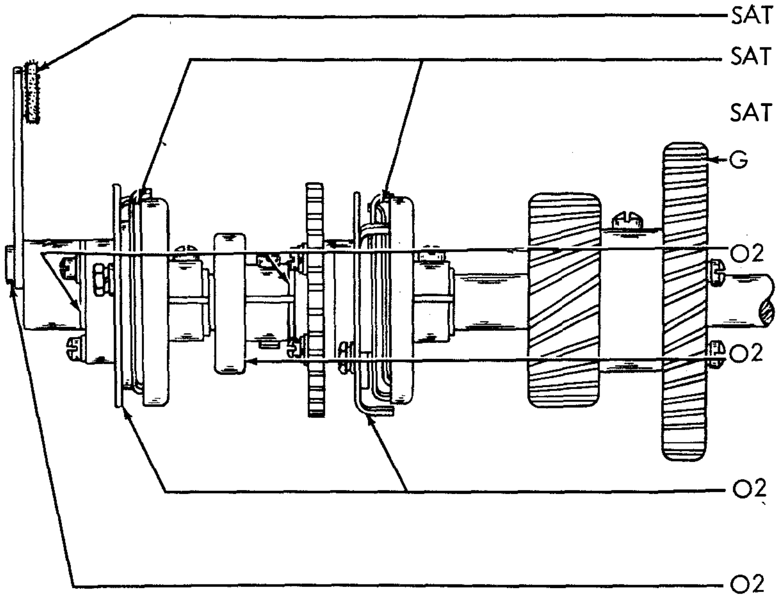
2.44 Oscillating Mechanism (Cont'd)



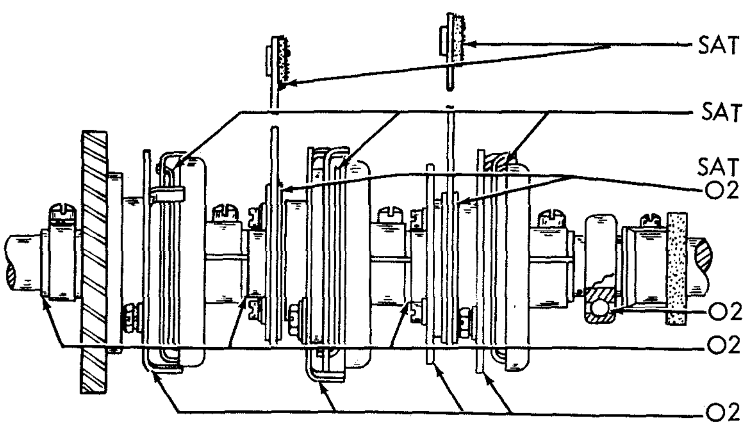
2.45 Typing Unit - Bottom View



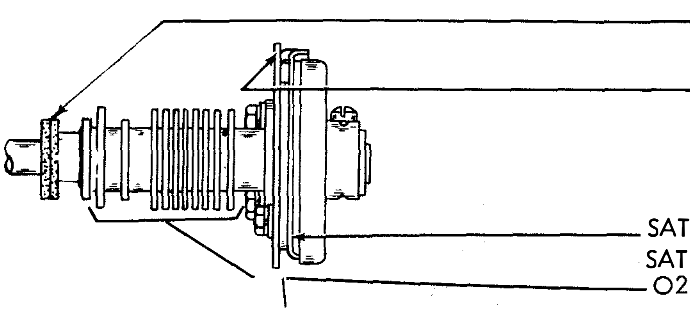
2.46 Main Shaft - Clutches, Gears, Etc.



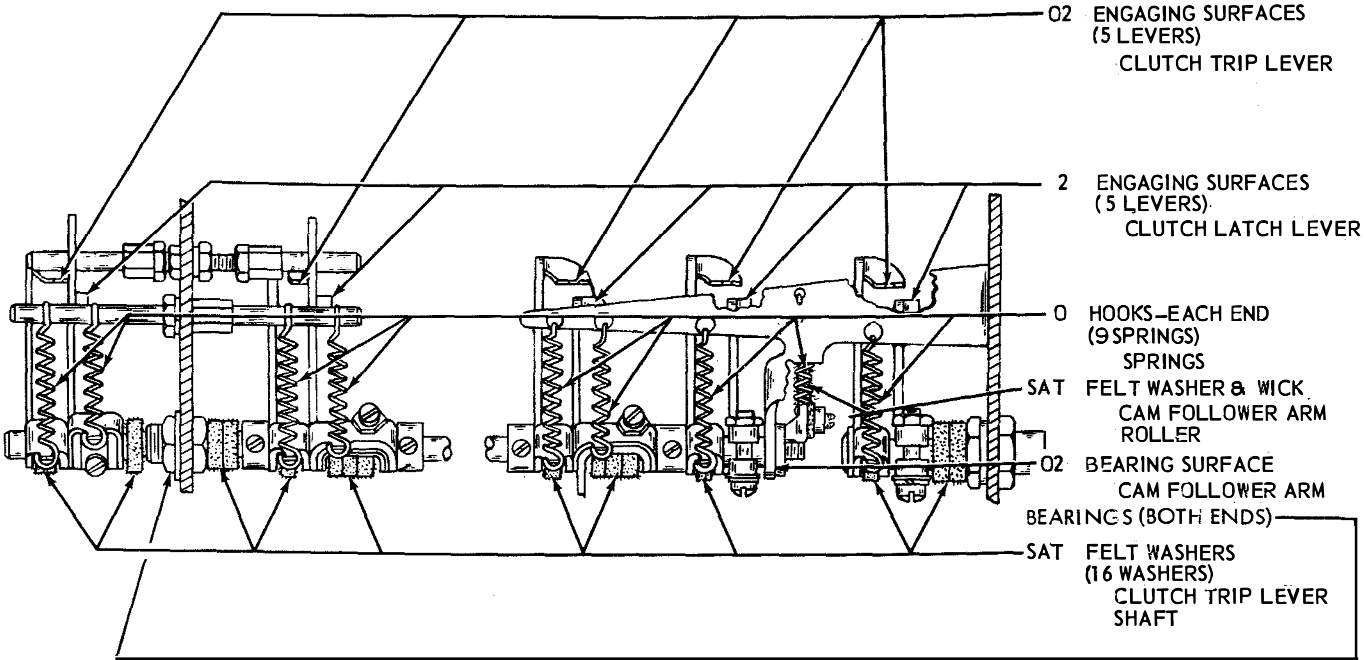
2.47 Main Shaft Mechanism



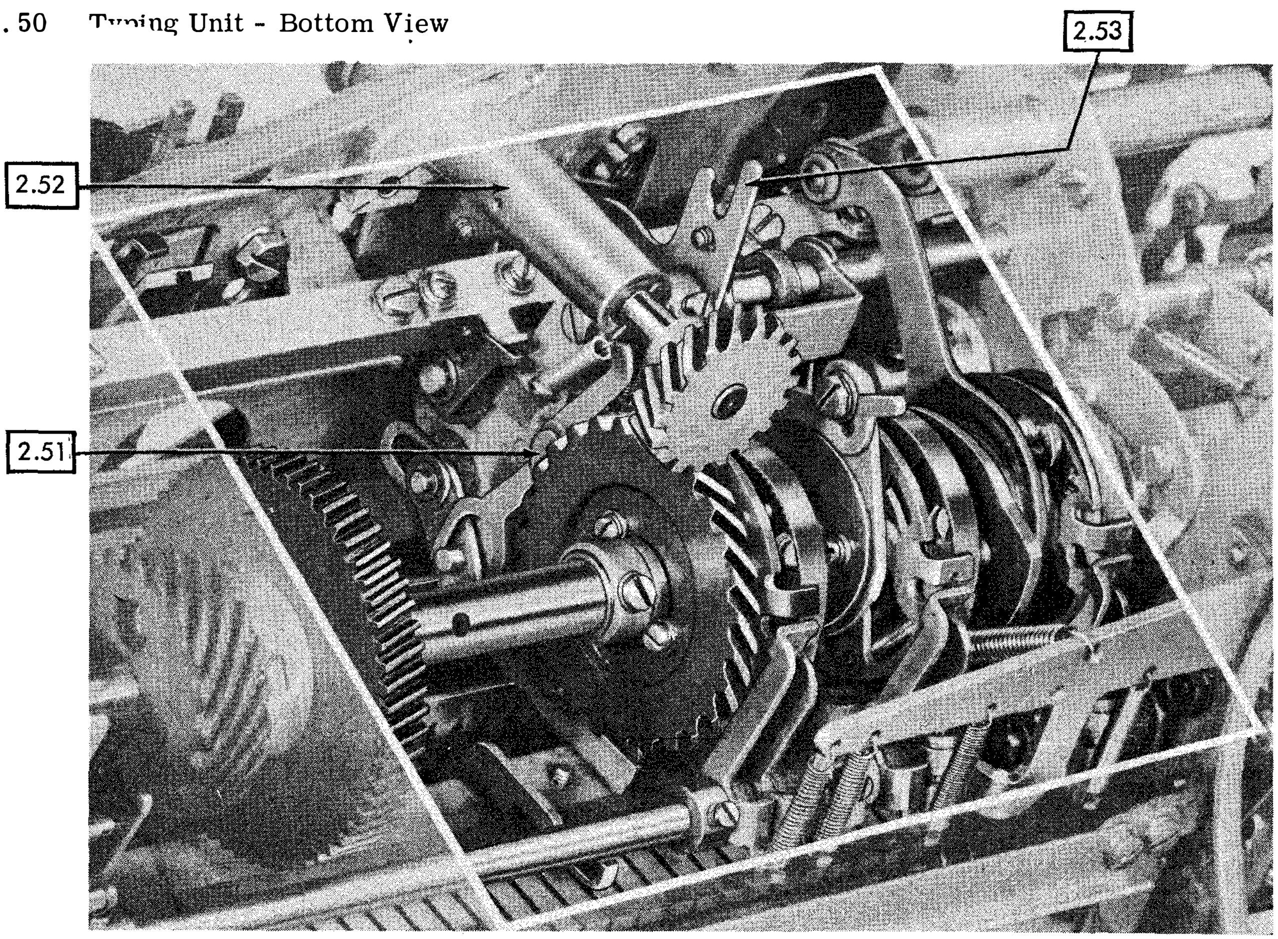
2.48 Selector Cam Clutch Assembly



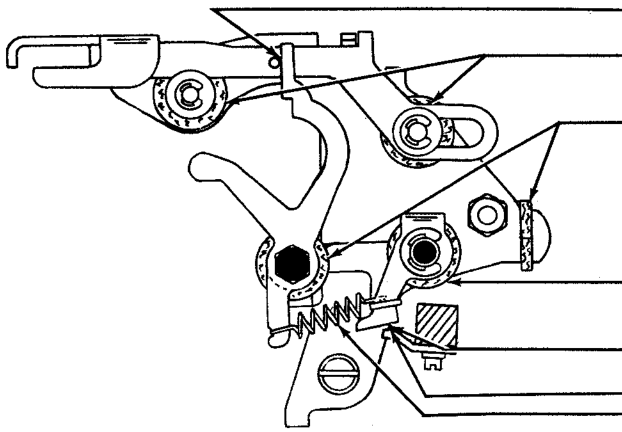
2.49 Main Shaft - Clutches, Gears, Etc. (Cont'd)



2.50 Typing Unit - Bottom View

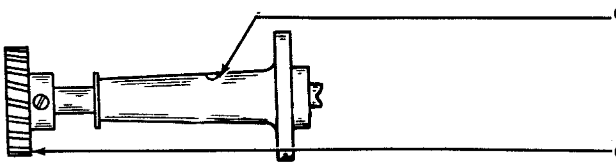


2.51 Spacing Mechanism



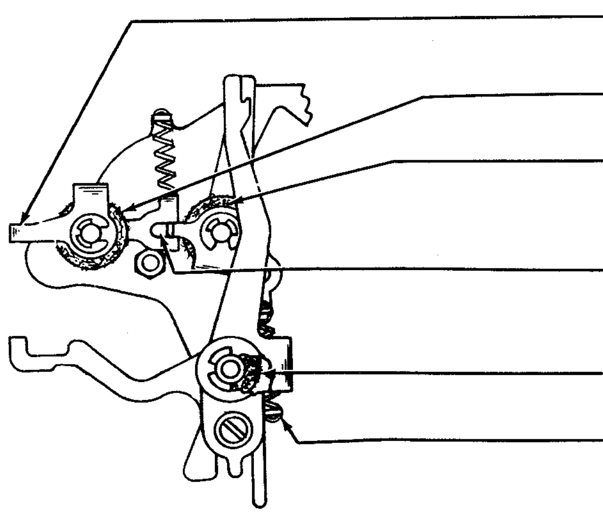
O2	ENGAGING SURFACES	SPACING TRIP LEVER
SAT	FELT WASHERS (2 WASHERS)	SPACING SUPPRESSION SLIDE
SAT	FELT WASHER	SPACING TRIP LEVER
SAT	FELT WASHER	SPACING TRIP LEVER BAIL SHAFT
O2	ENGAGING SURFACE	SPACING TRIP LEVER BAIL
G	ENGAGING SURFACE	TRIP RESET CAM
O	HOOKS - EACH END (2 SPRINGS)	TRIP RESET CAM SPRING PLATE

2.52 Spacing Mechanism (Cont'd)



O2	OIL HOLE	SPACING SHAFT
G	TEETH	SPACING SHAFT GEAR

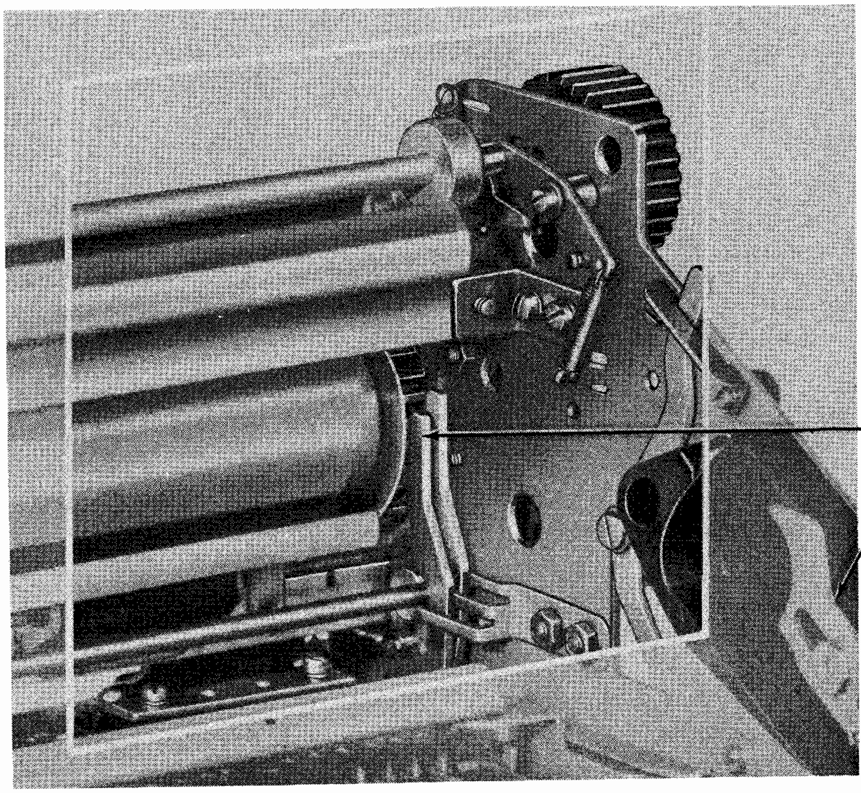
2.53 Spacing Mechanism (Cont'd)



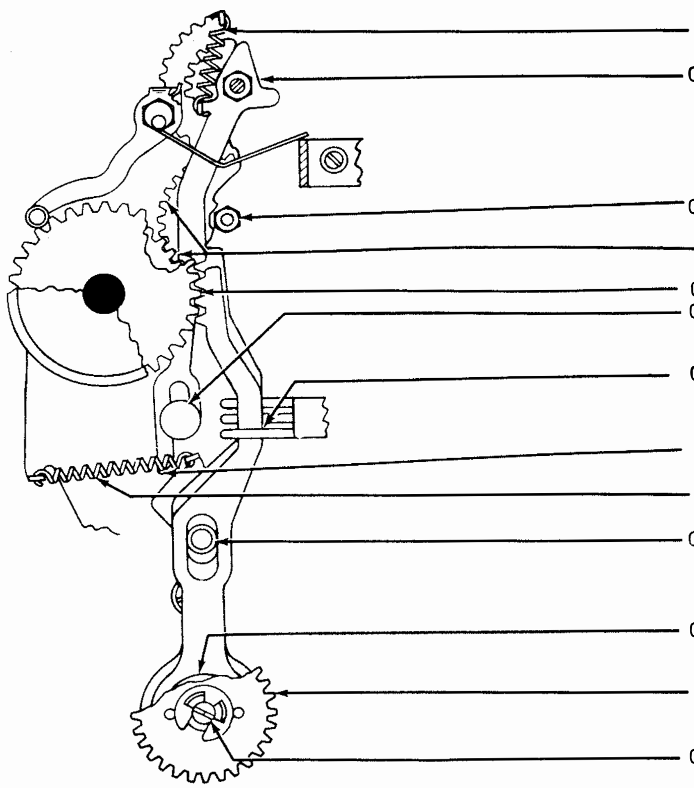
O2	ENGAGING SURFACE	SPACING CUT-OUT TRANSFER BAIL
SAT	FELT WASHERS (2 WASHERS)	SPACING CUT-OUT TRANSFER BAIL
SAT	FELT WASHER	SPACING CUT-OUT BAIL
O2	ENGAGING SURFACE	SPACING CUT-OUT BAIL
SAT	FELT WASHERS (2 WASHERS)	CARRIAGE RETURN BAIL SHAFT
O	HOOKS - EACH END	SPRING

2.54 Typing Unit - Rear Left View

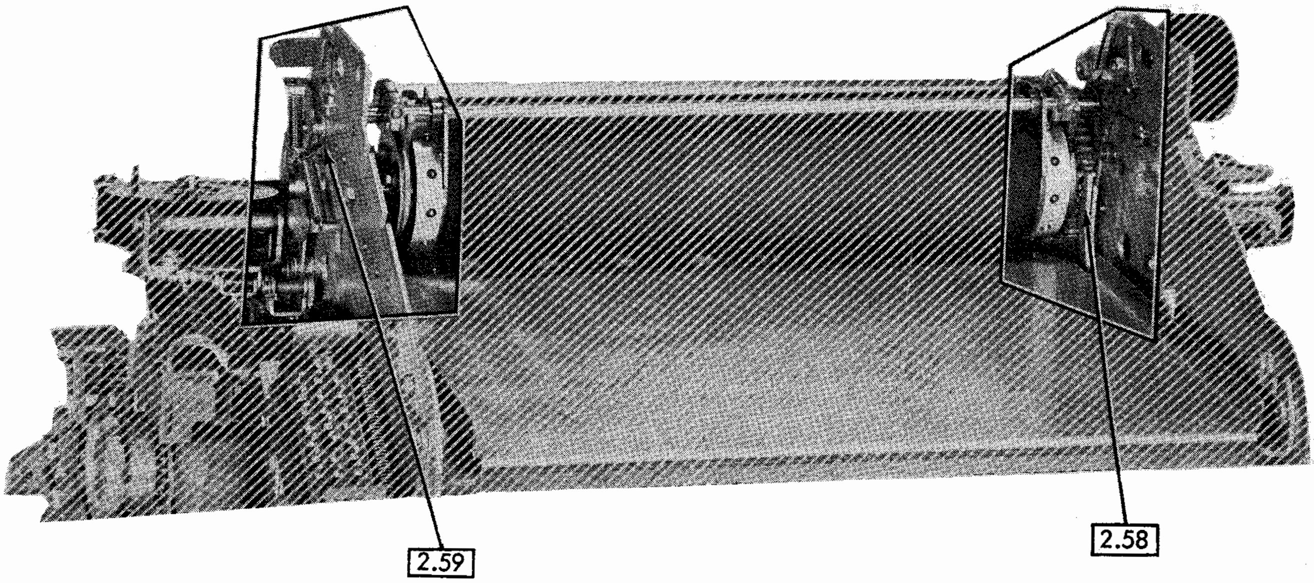
2.55 Paper Spindle Latch Mechanism



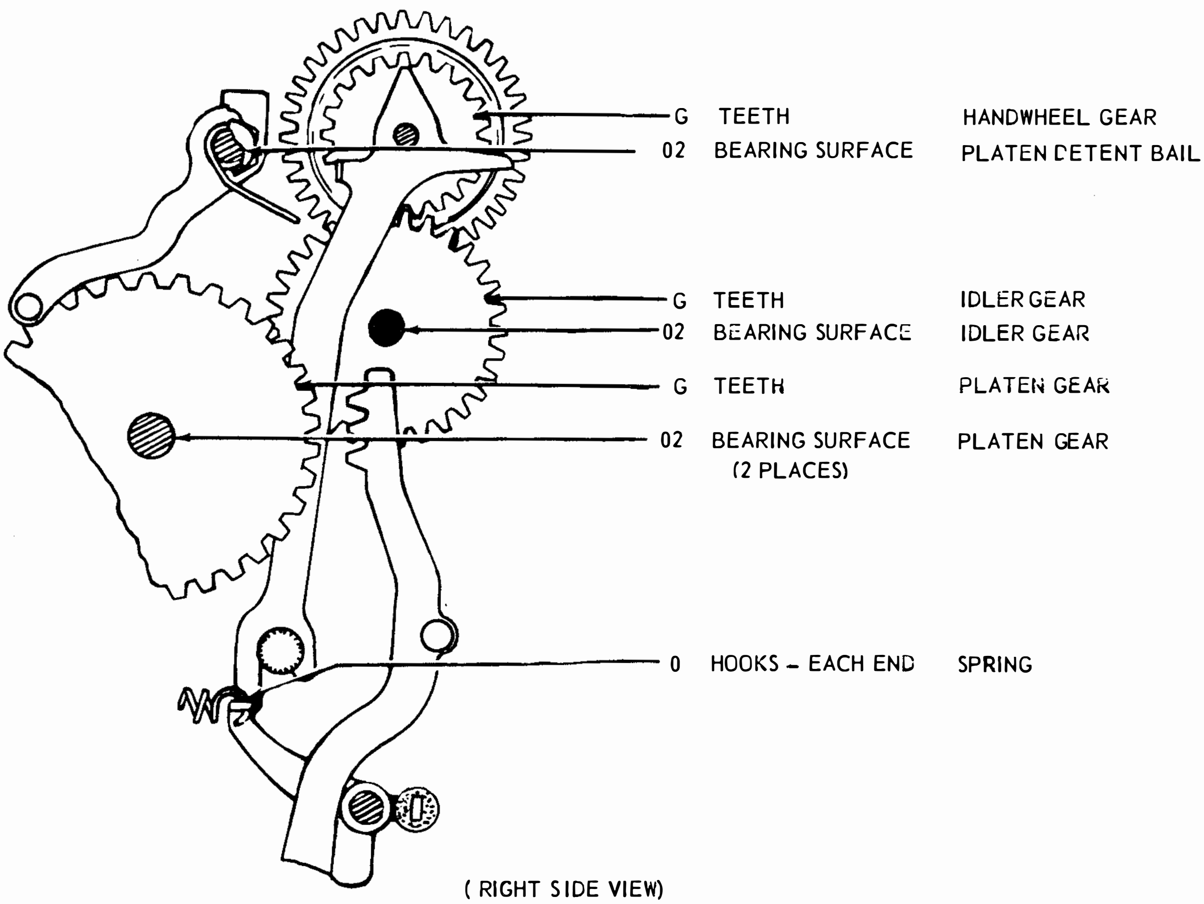
2.56 Line Feed Mechanism - Friction Feed



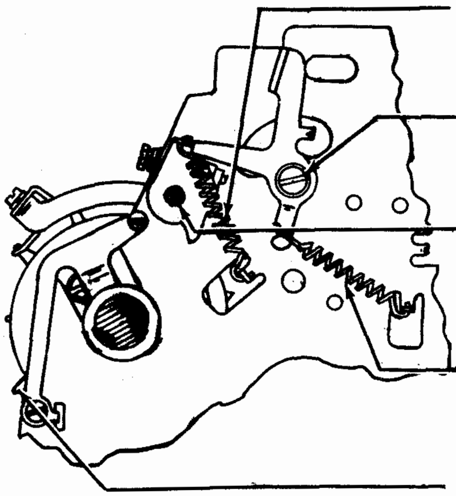
2.57 Typing Unit - Rear Top View



2.58 Line Feed Mechanism - Sprocket Feed



2.59 Paper Guide Mechanism - Sprocket Feed



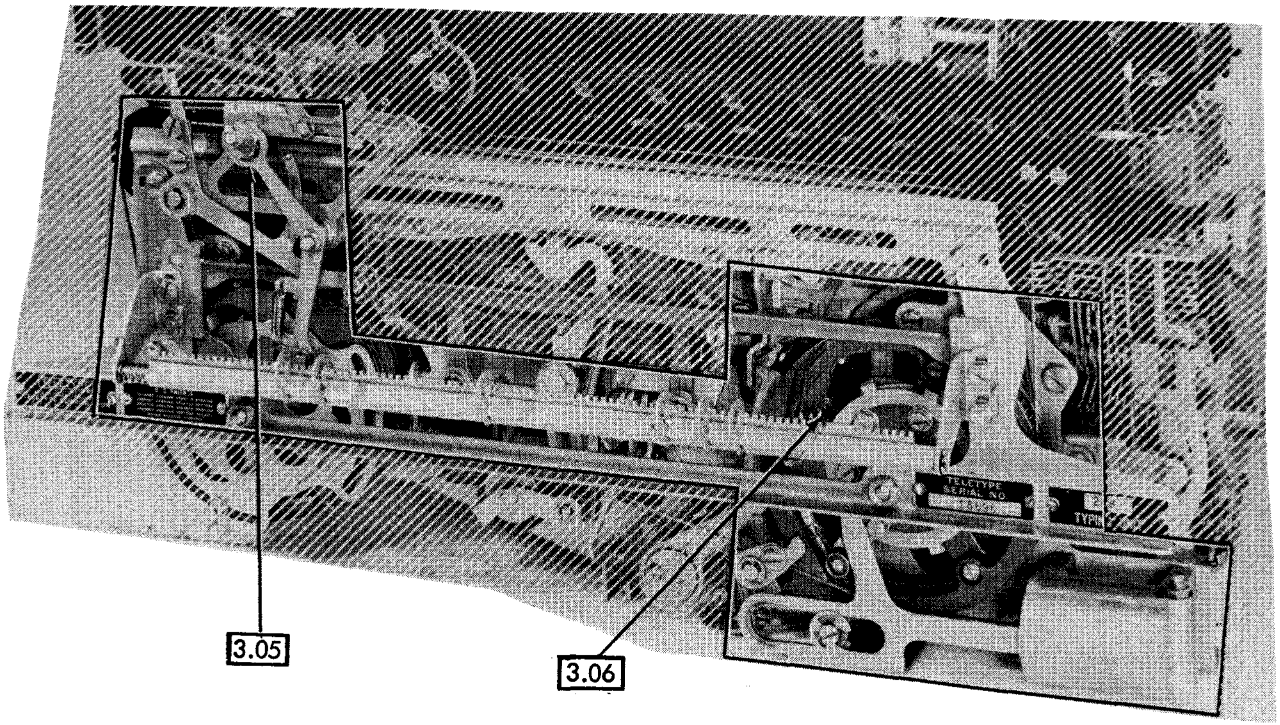
(RIGHT SIDE VIEW)

NOTE: BEFORE ATTEMPTING TO DISASSEMBLY THE 153700 PLATEN HUB, SEE DISASSEMBLY AND REASSEMBLY INSTRUCTIONS, SECTION 573-115-702.

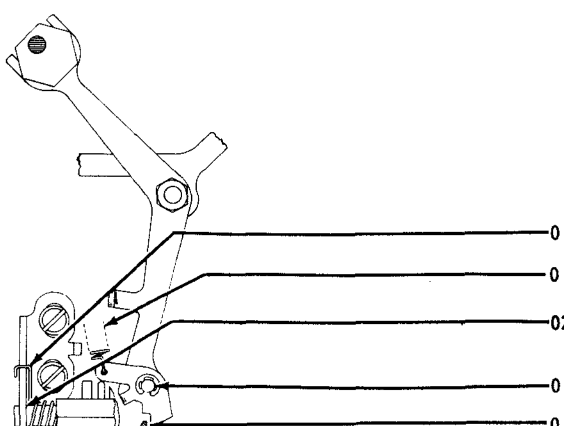
3. VARIABLE FEATURES

HORIZONTAL TABULATOR MECHANISM - EARLIER DESIGN

3.01 Typing Unit - Front View



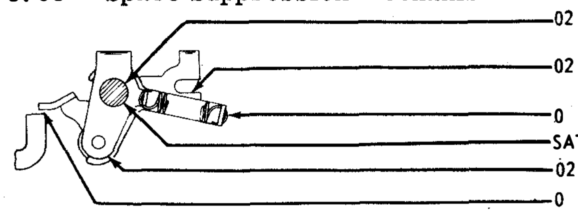
3.02 Tabulator Shaft Mechanism



0	HOOKS – EACH END	SPRING
0	HOOKS – EACH END COILS	SPRING (TORSION)
02	BEARING SURFACES (2 PLACES)	TABULATOR SHAFT
0	BEARING SURFACE	TABULATOR PAWL
0	ENGAGING SURFACES (2 PLACES)	TABULATOR STOP CLIP

(FRONT VIEW)

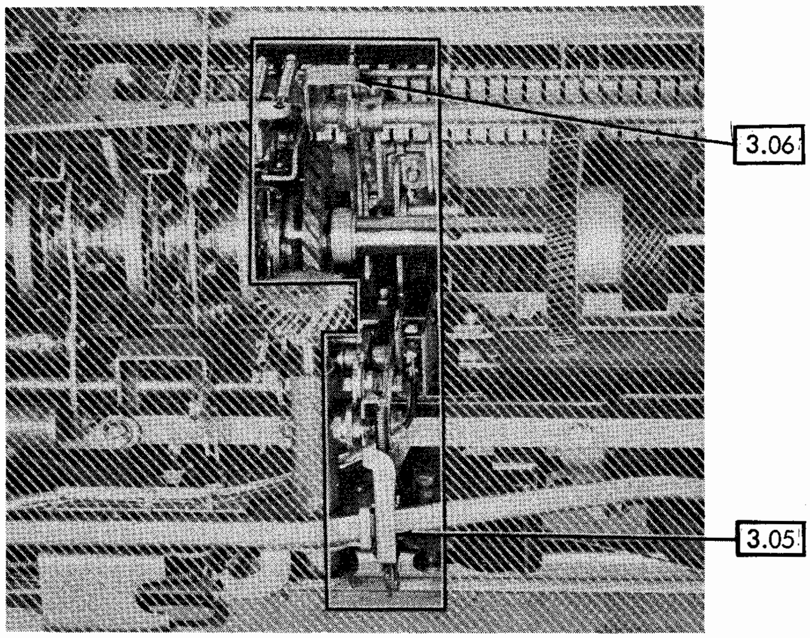
3.03 Space Suppression Mechanism



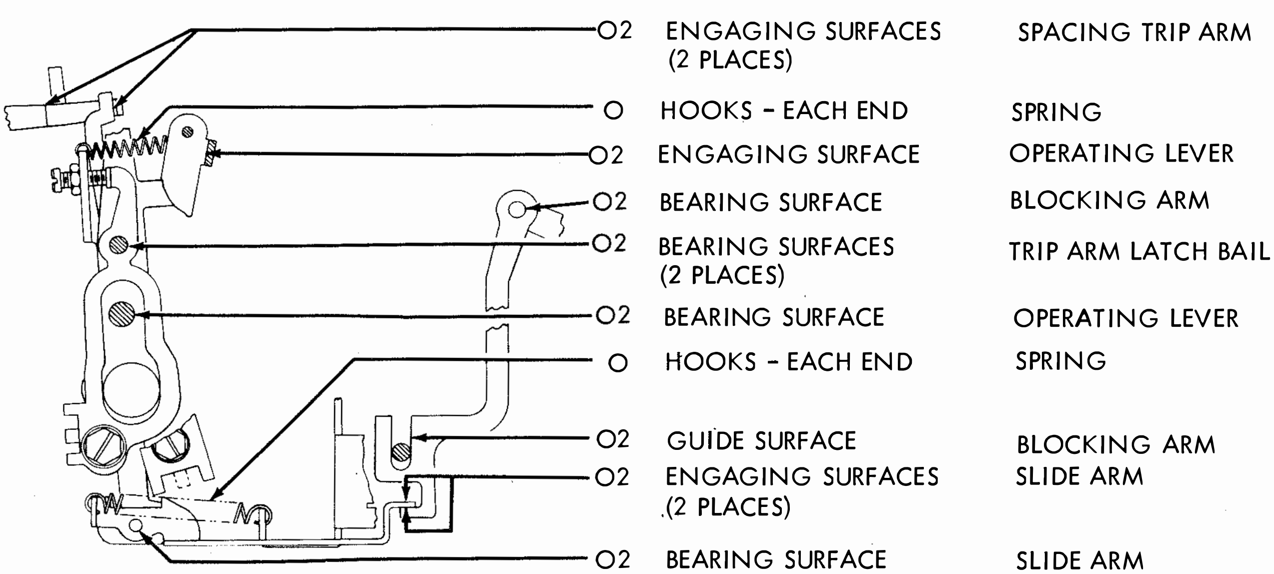
02	BEARING SURFACES (2 PLACES)	SPACING CUTOUT TRANSFER BAIL
02	ENGAGING SURFACE	SPACING CUTOUT TRANSFER BAIL
0	HOOKS – EACH END	SPRING
SAT	FELT WASHERS (2)	BAIL STUD
02	BEARING SURFACE	BAIL EXTENSION ARM
0	ENGAGING SURFACE	SPACING CUTOUT TRANSFER BAIL

(RIGHT SIDE VIEW)

3.04 Typing Unit - Bottom View

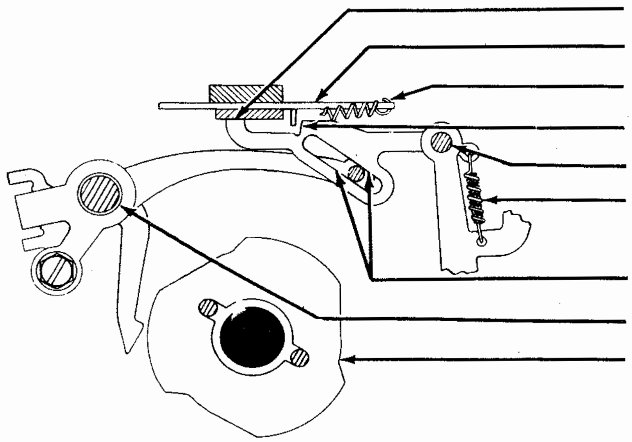


3.05 Operating Lever Mechanism



(LEFT SIDE VIEW)

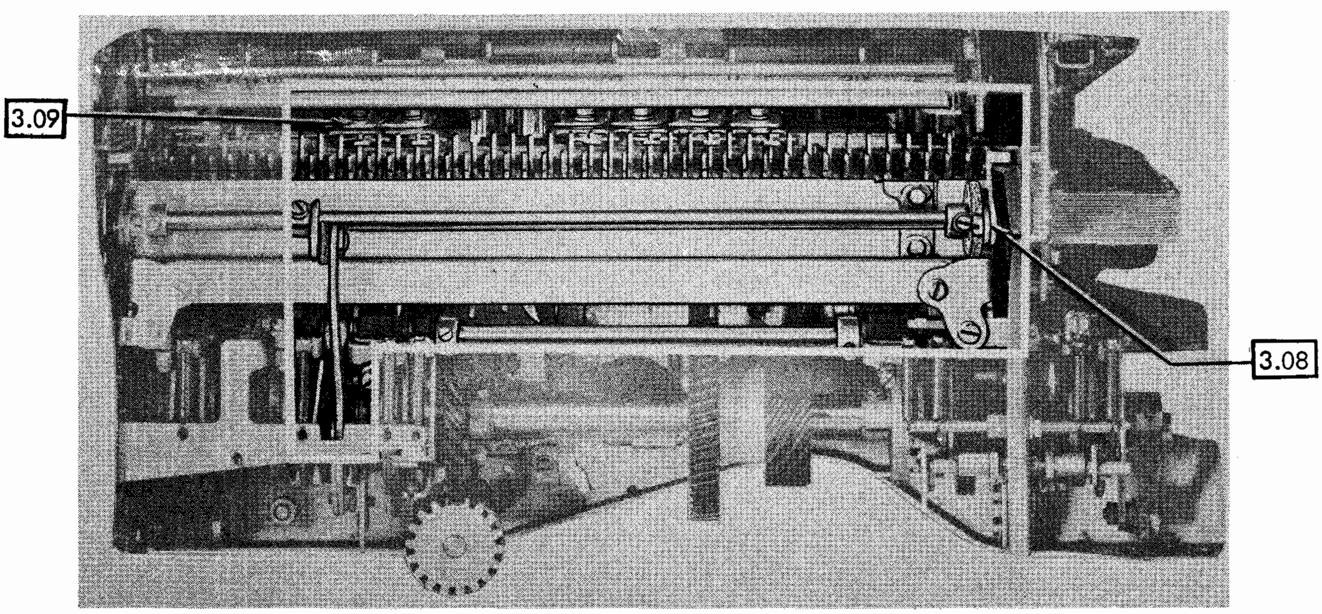
3.06 Spacing Clutch Mechanism



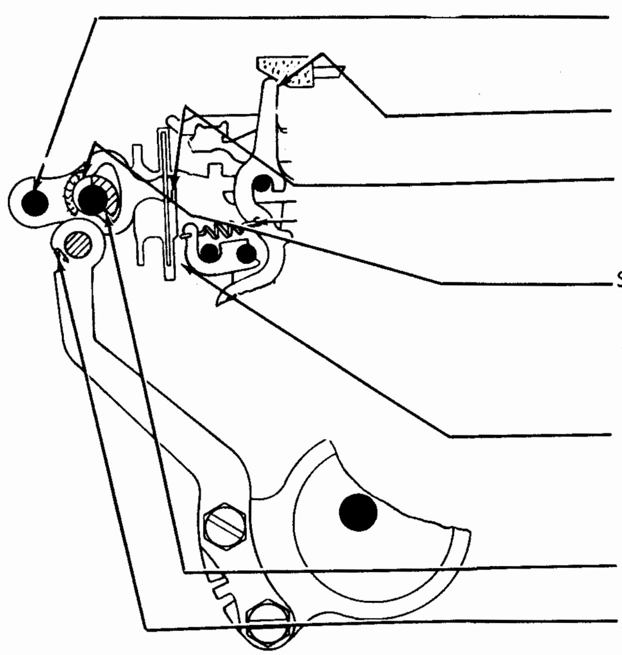
O2	GUIDE SURFACE	CAM ARM
O2	GUIDE SURFACE	TABULATOR SLIDE ARM
O	HOOKS - EACH END	SPRING
O2	ENGAGING SURFACE	CAM ARM
O2	BEARING SURFACES	CAM ARM
O	HOOKS - EACH END	SPRING
SAT	FELT WICK	
O2	CAMMING SURFACE	CAM ARM
SAT	FELT WASHERS (5)	CLUTCH TRIP SHAFT
G	CAMMING SURFACE	SPACING CLUTCH RESTORING CAM

SELECTIVE CALLING MECHANISM

3.07 Typing Unit - Rear View



3.08 Stripper Bail Mechanism

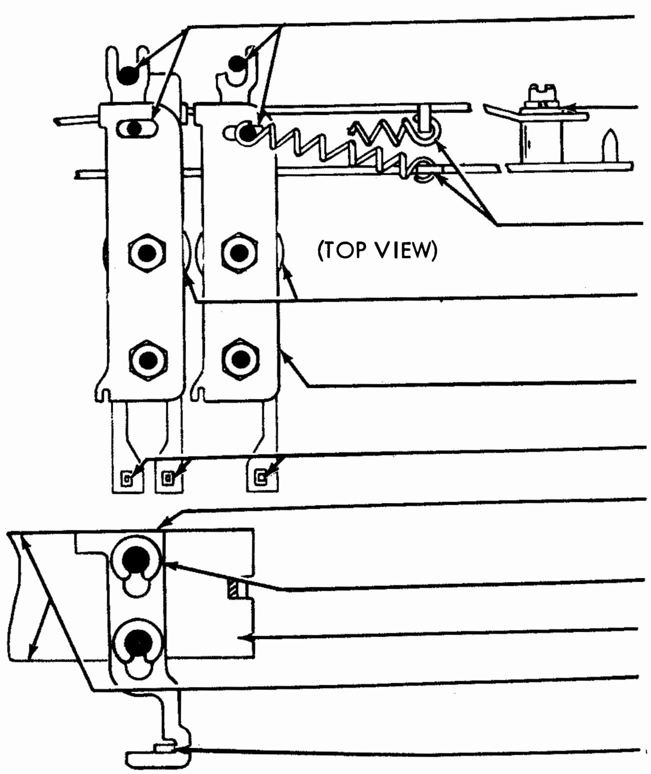


02	BEARING SURFACES (2 BEARINGS)	CAM ARMS
G	ENGAGING SURFACES * (EACH ARM)	CONTACT ARM
G	ENGAGING SURFACES (2 ARMS)	CAM ARMS
SAT	FELT WASHERS (4 WASHERS)	DRIVING CAM
02	GUIDE SLOTS (EACH END)	STRIPPER BLADE
G	CAMMING SURFACES (2 CAMS)	DRIVING CAM
SAT	FELT WASHER	STRIPPER BLADE DRIVING ARM

(LEFT SIDE VIEW)

* APPLY LIGHT FILM OF GREASE AND WIPE OFF SURPLUS WITH CLOTH. LUBRICATION IS REQUIRED ON INITIAL BREAK-IN ONLY.

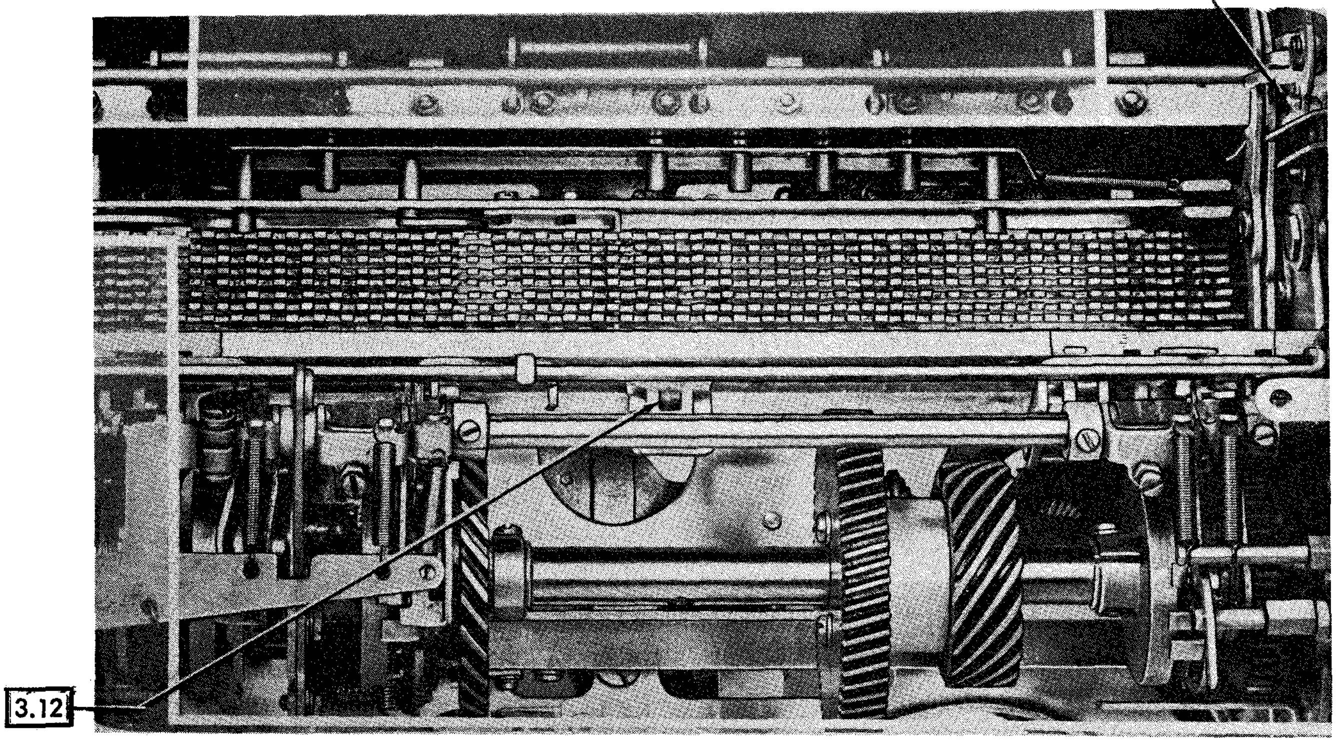
3.09 Shift and Stripper Bail Mechanisms



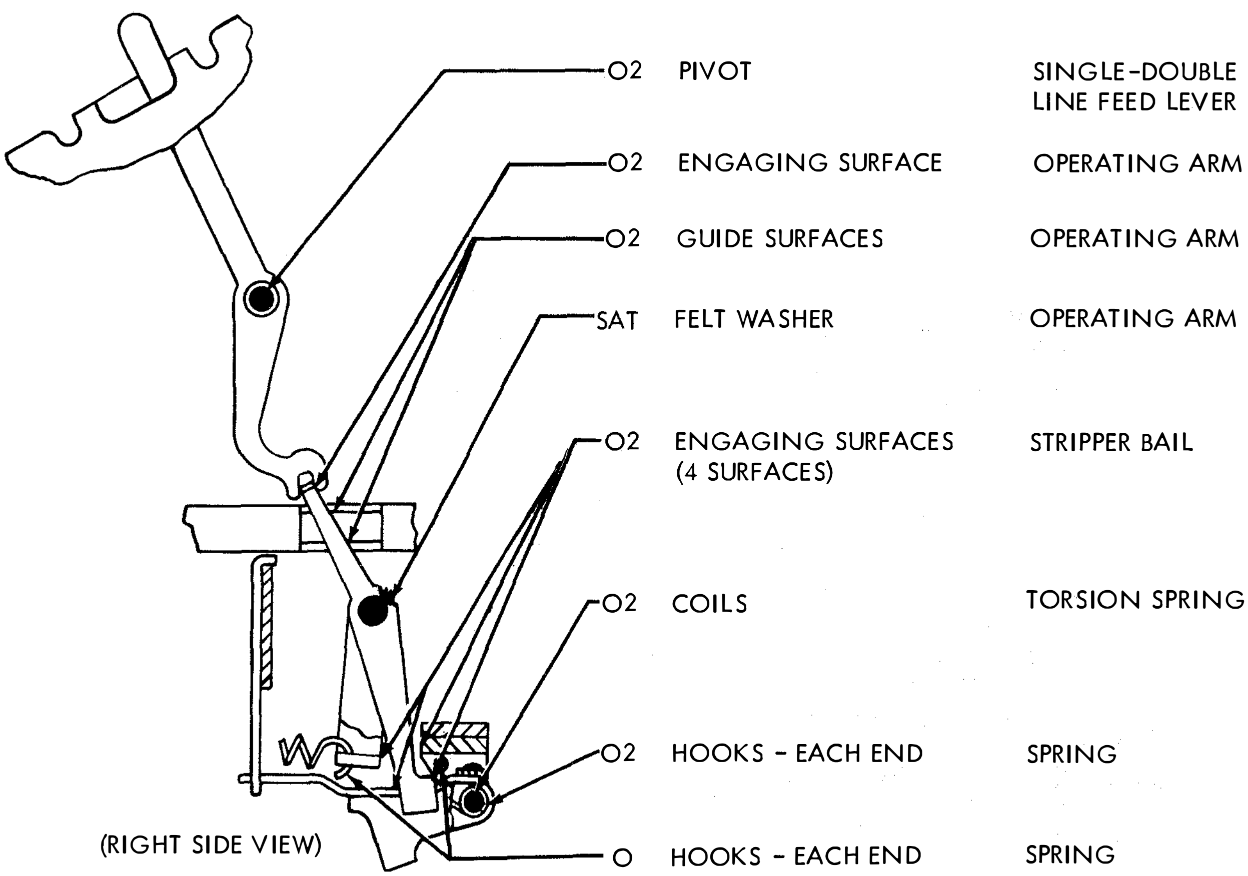
02	ENGAGING SURFACES	CODE BAR FORKS
02	SLIDING SURFACES (2 SLIDES)	BLOCKING SLIDE
0	HOOKS–EACH END (2 SPRINGS)	SPRINGS
02	ROLLERS AND PIVOTS	FUNCTION SLIDES
02	SLIDING SURFACES	FUNCTION SLIDES
0	ENGAGING SURFACES	FUNCTION SLIDES
0	ENGAGING SURFACE	LINE FEED STRIPPER SLIDE STRIPPER SLIDE
02	GUIDE SURFACES (2 PLACES)	STRIPPER SLIDE
02	GUIDE SURFACES (EACH END)	STRIPPER BLADE
G	ENGAGING SURFACES (2 PLACES)	STRIPPER BLADE
02	ENGAGING SURFACE	STRIPPER BAIL

(REAR VIEW)

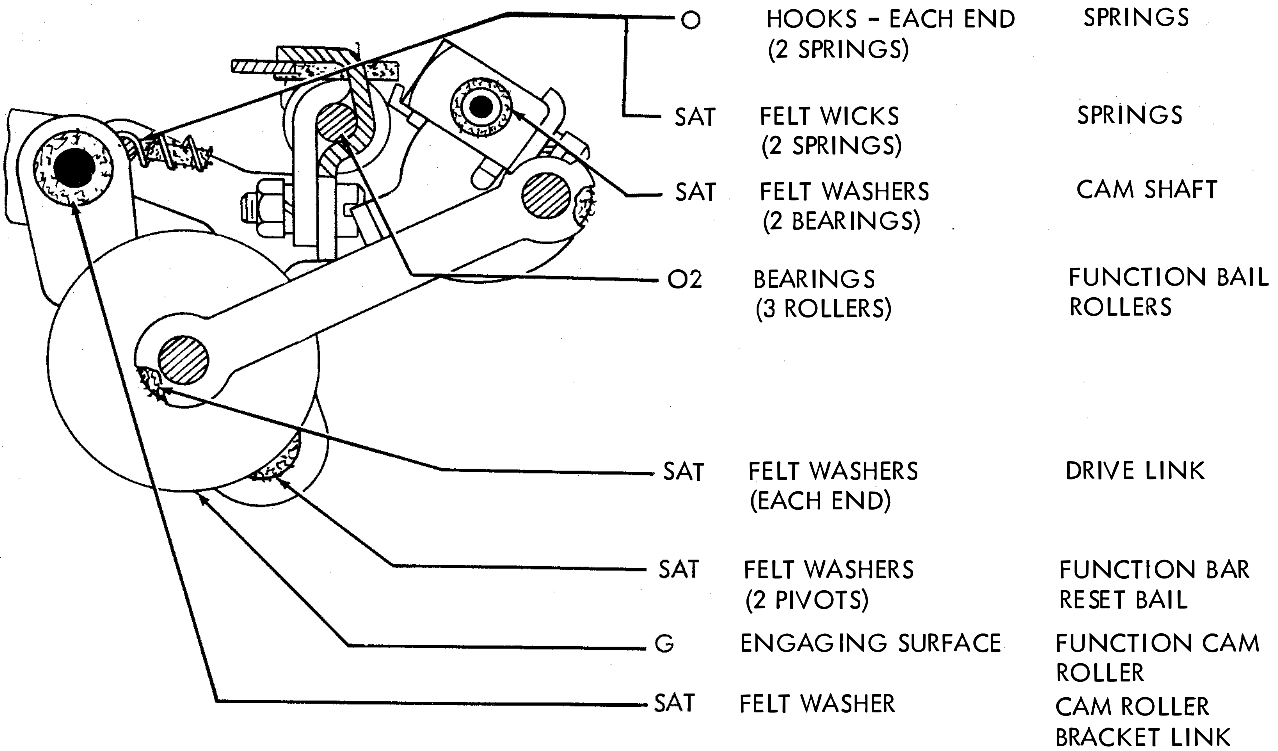
3.10 Typing Unit - Rear View - Stunt Box Removed



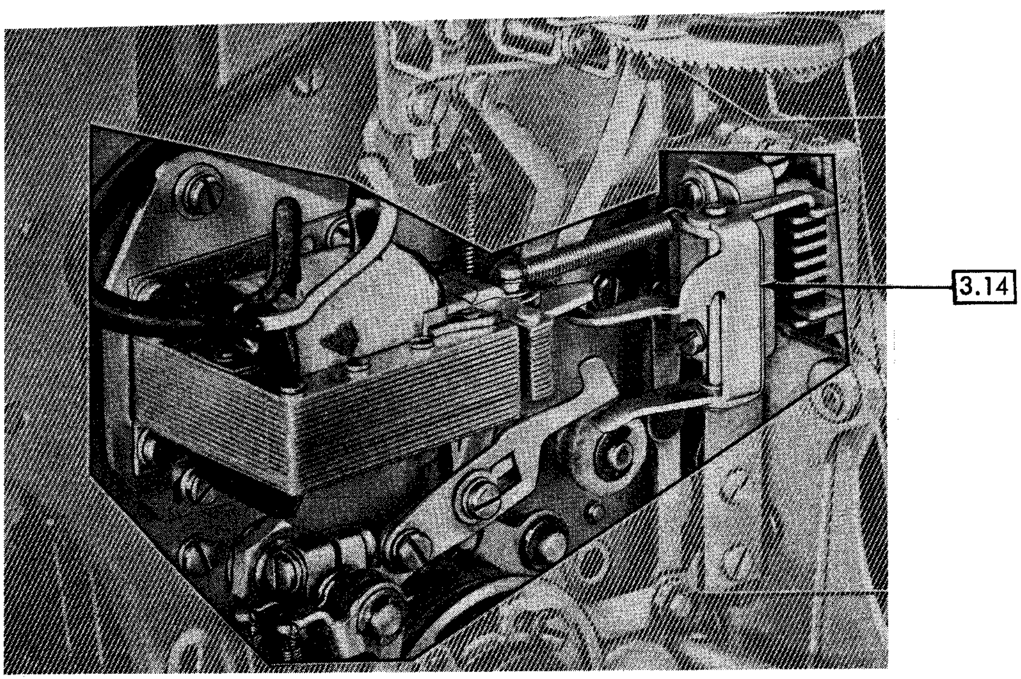
3.11 Single-Double Line Feed Mechanism



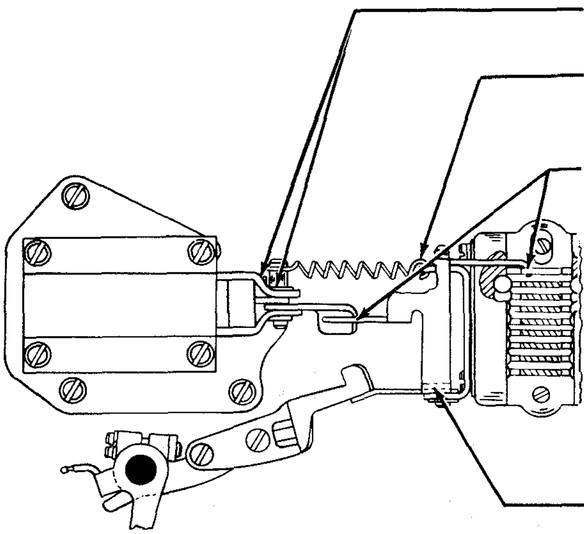
3.12 Function Reset Bail Mechanism



3.13 Typing Unit - Left End View



3.14 Clutch Suppression Mechanism

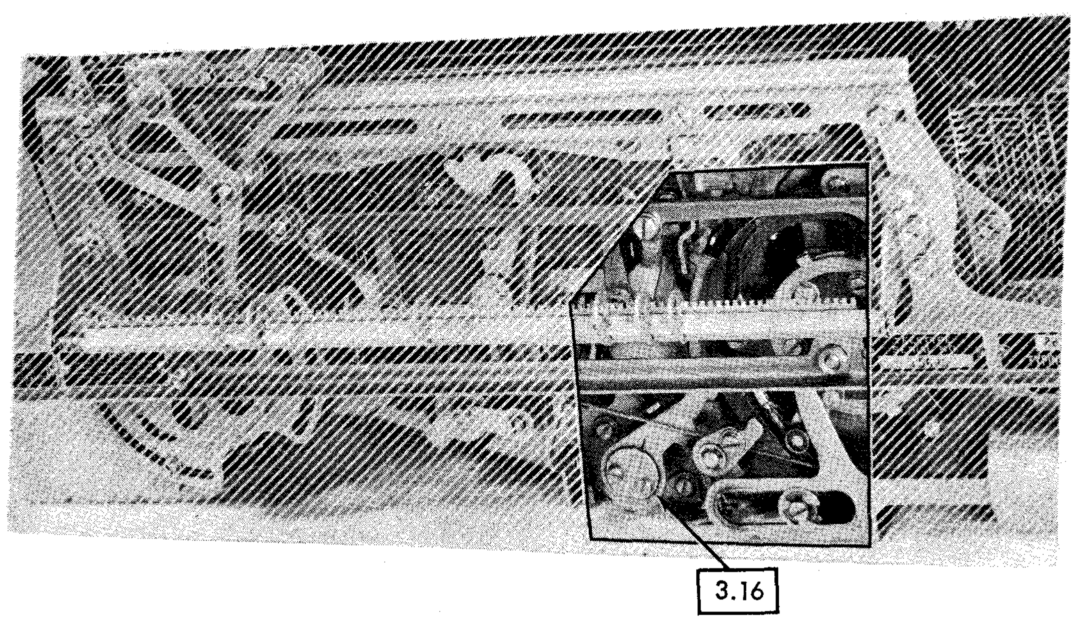


O2	BEARING SURFACES (2 PLACES)	SOLENOID BELL CRANK LEVER
O	HOOKS - EACH END	SPRING
O2	ENGAGING SURFACES (2 PLACES)	BLOCKING BAIL
SAT	FELT WASHERS (2 PLACES)	BLOCKING BAIL

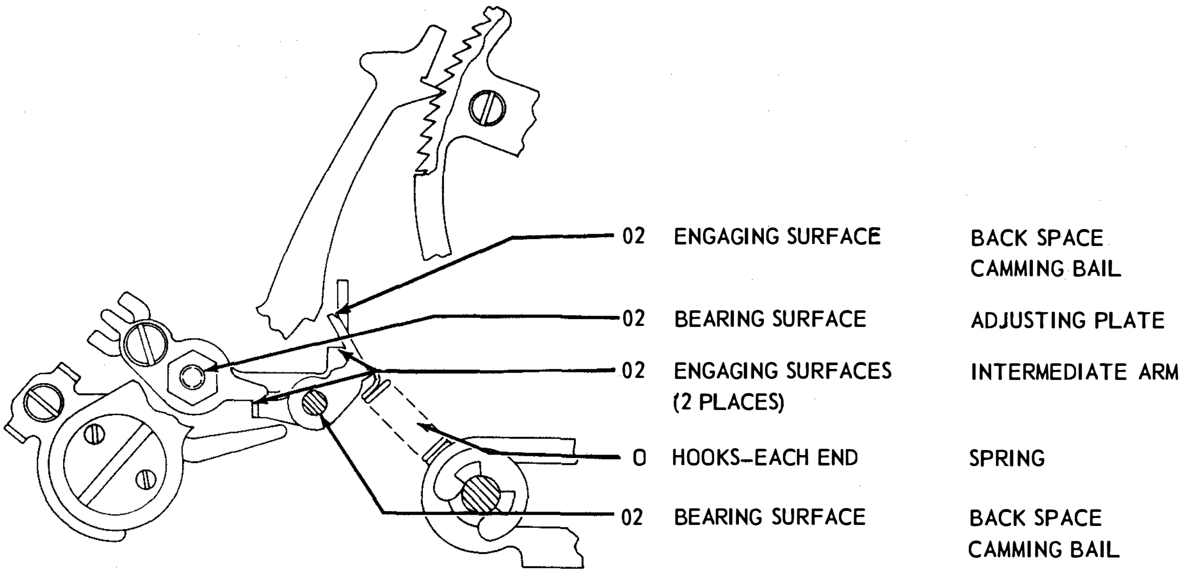
(LEFT SIDE VIEW)

LOCAL BACKSPACE MECHANISM

3.15 Typing Unit - Front View



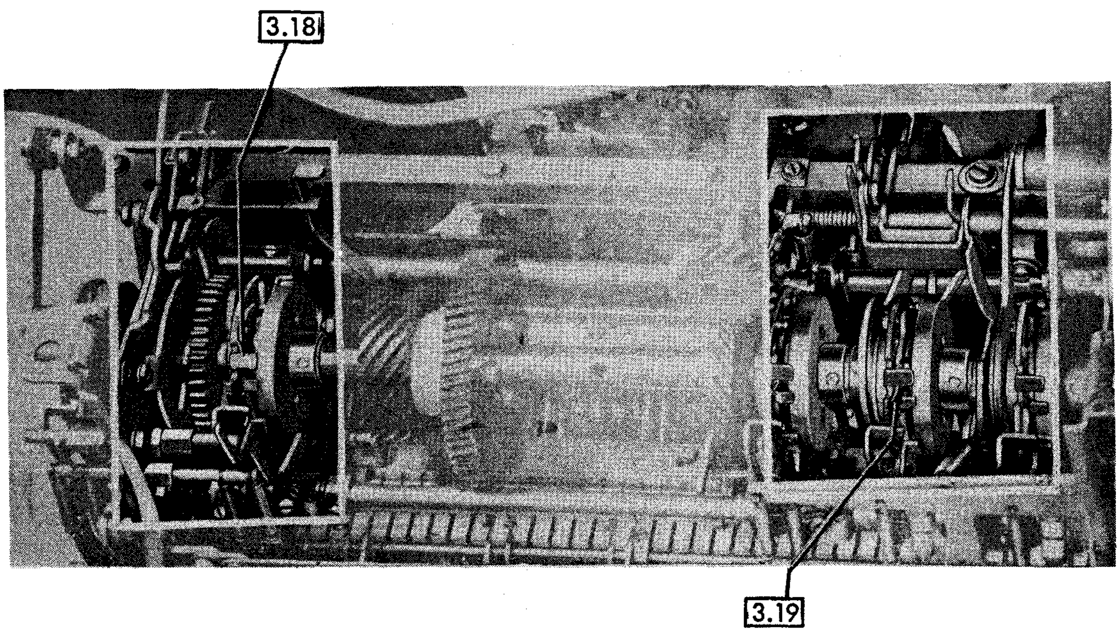
3.16 Pawl Mechanism



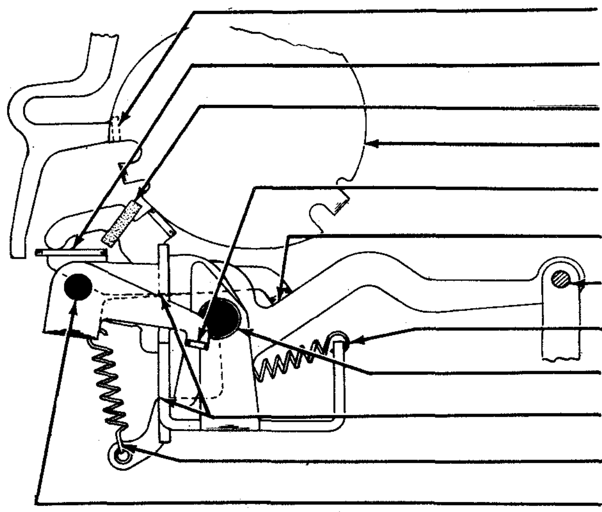
(FRONT VIEW)

REVERSE LINE FEED MECHANISM

3.17 Typing Unit - Bottom View



3.18 Trip Mechanism

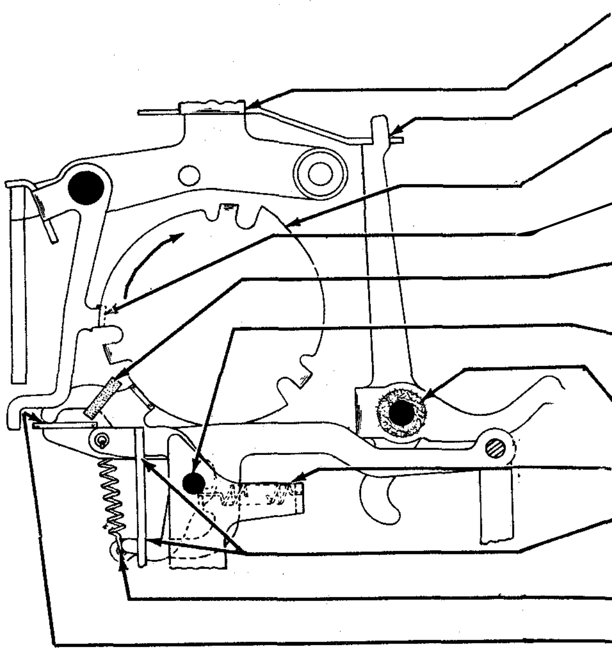


02	ENGAGING SURFACE	LINE FEED CLUTCH TRIP LEVER
02	ENGAGING SURFACE	TRIP LINK
SAT	FELT OILER	STRIPPER LEVER
G	CAMMING SURFACE	CAM DISK
02	ENGAGING SURFACE	TRANSFER BAIL
02	BEARING SURFACE	TRIP LINK
02	BEARING SURFACE	TRIP LINK
0	HOOKS–EACH END	SPRING
02	BEARING SURFACE	STRIPPER LEVER
02	GUIDE SLOTS	TRIP LINK
0	HOOKS – EACH END	SPRING
02	BEARING SURFACE	TRANSFER BAIL

(LEFT SIDE VIEW)

LOCAL BACKSPACE MECHANISM (Cont'd)

3.19 Trip Mechanism

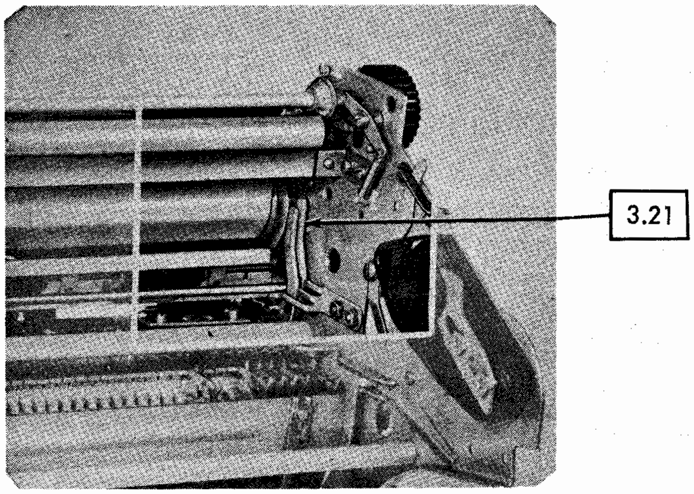


02	GUIDE SURFACES	BACK SPACE SLIDE ARM
02	ENGAGING SURFACE	BACK SPACE BAIL
G	CAMMING SURFACE	SPACING CLUTCH CAM DISK
02	ENGAGING SURFACE	SPACING CLUTCH CAM DISK
SAT	FELT OILER	TRIP LINK STRIPPER LEVER
02	BEARING SURFACE	TRIP LINK STRIPPER LEVER
SAT	FELT WASHERS (2 PLACES)	BACK SPACE BAIL
0	HOOKS–EACH END	SPRING
02	GUIDE SLOTS	TRIP LINK STRIPPER LEVER
0	HOOKS–EACH END	SPRING
02	ENGAGING SURFACE	TRIP LINK STRIPPER LEVER

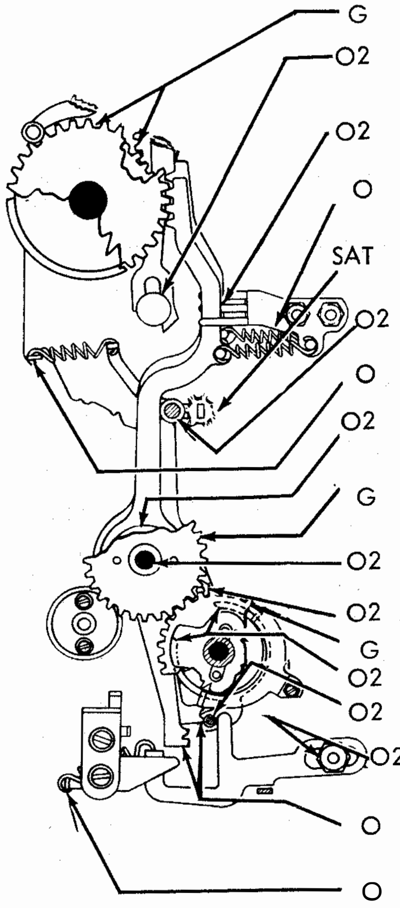
(LEFT SIDE VIEW)

REVERSE LINE FEED MECHANISM (Cont'd)

3.20 Typing Unit - Rear Left View



3.21 Line Feed Mechanism

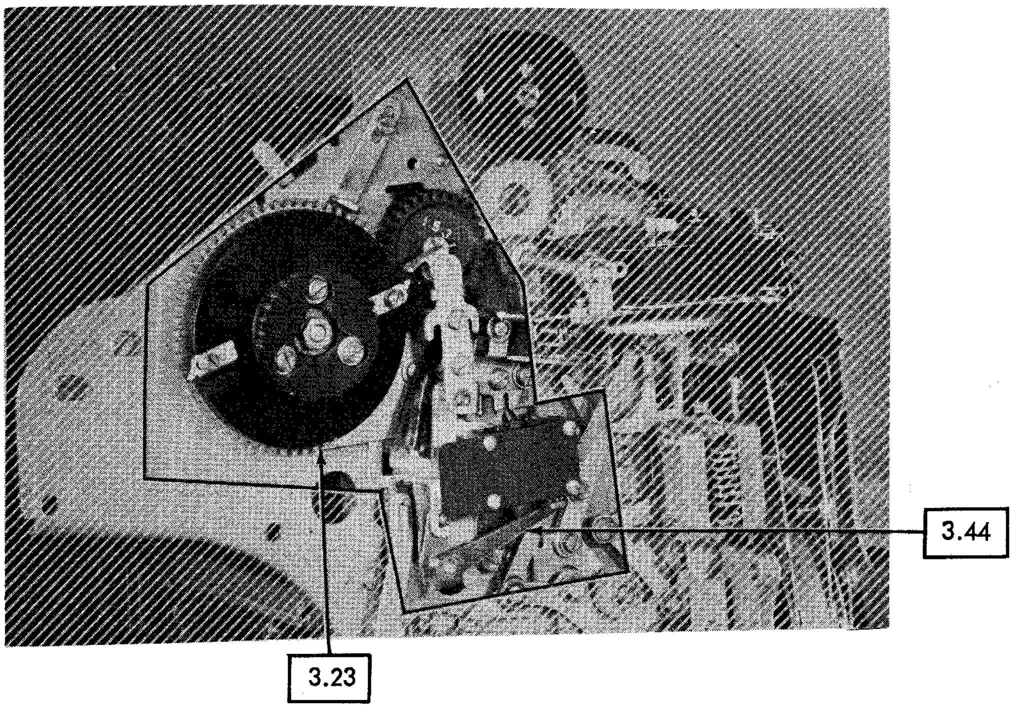


G	TEETH (2 GEARS)	PLATEN SPUR GEARS
O2	GUIDE SURFACE	LINE FEED BAR RELEASE LEVER
O2	GUIDE SURFACES (2 BARS)	LINE FEED BARS
O	HOOKS - EACH END	SPRINGS (2)
SAT	FELT OILER	LINE FEED BAR BELL CRANK
O2	BEARING SURFACE	LINE FEED BAR BELL CRANK
O	HOOKS - EACH END	SPRING
O2	BEARING SURFACES (2 BEARINGS)	LINE FEED BAR ECCENTRIC
G	TEETH	LINE FEED CLUTCH SPUR GEAR
O2	BEARING SURFACE	SPUR GEAR
O2	BEARING SURFACE	LINE FEED BAR BELL CRANK
G	TEETH	PLATEN SPUR GEAR
O2	BEARING SURFACES	INTERMEDIATE LEVER
O2	BEARING SURFACE	ROLLER
O2	BEARING SURFACE	REVERSE LINE FEED SLIDE LINK
O	ENGAGING SURFACES (2 PLACES)	LINE FEED BARS (2)
O	HOOKS - EACH END	SPRING

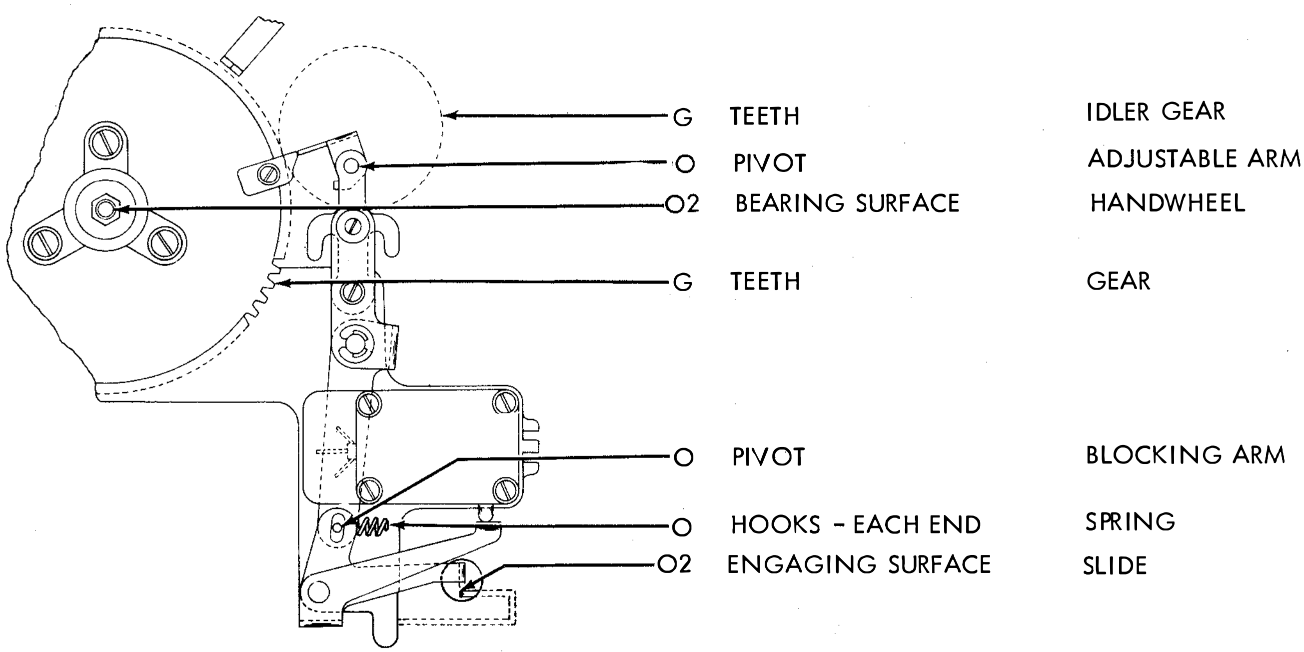
(RIGHT SIDE VIEW)

PAGE FEED-OUT MECHANISM

3.22 Typing Unit - Rear Left End View



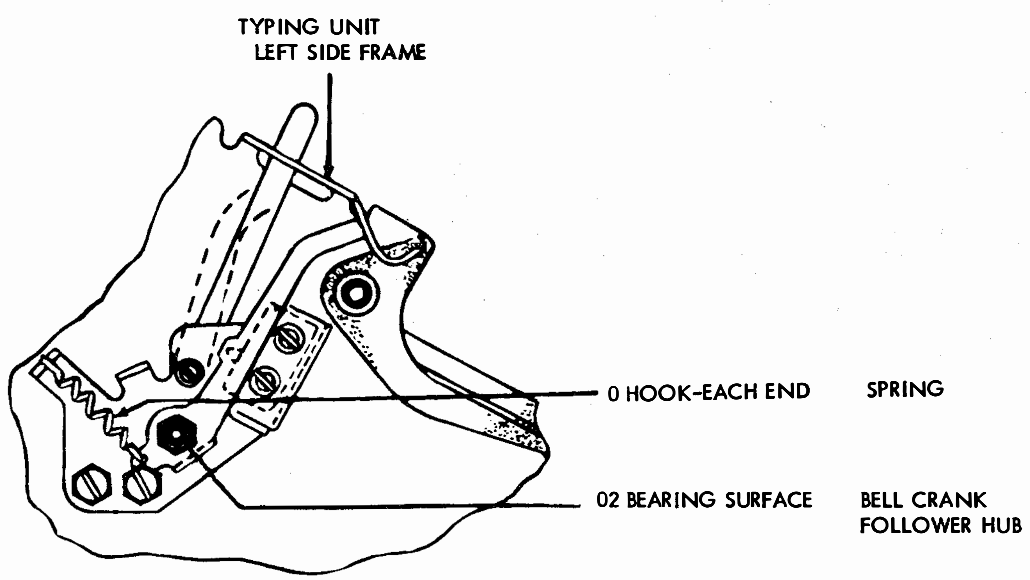
3.23 Drive Mechanism



(LEFT SIDE)

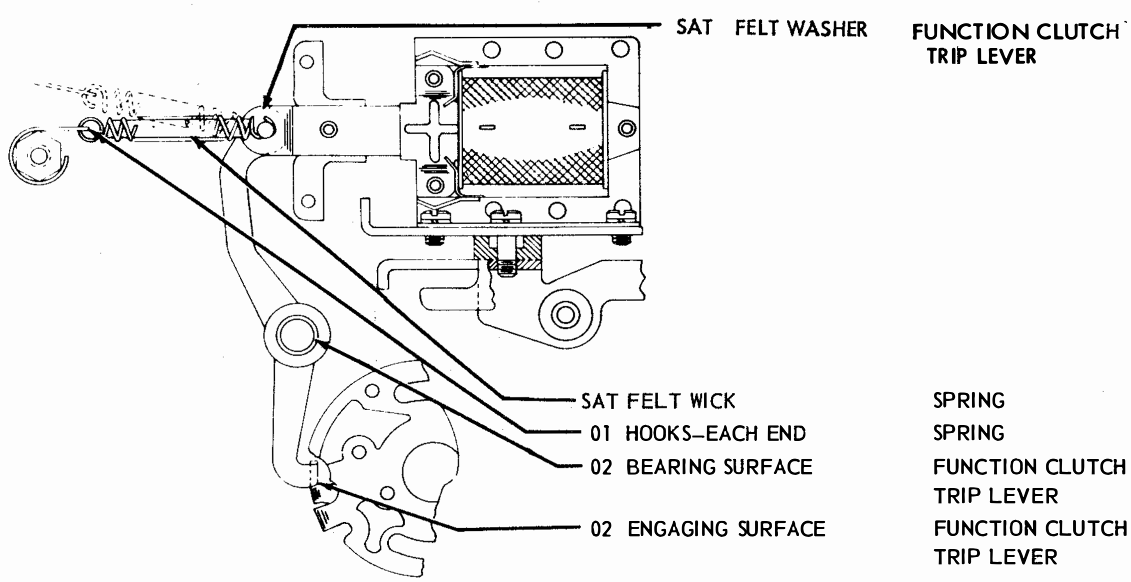
PAPER-OUT ALARM MECHANISM

3.24 Operating Mechanism

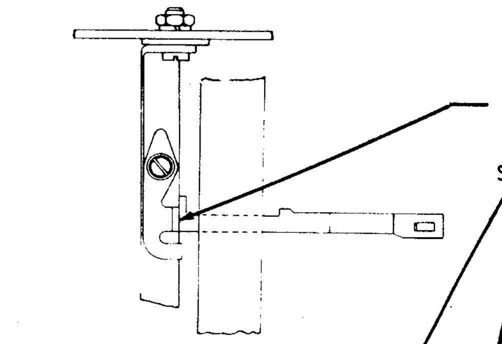


CONTINUOUS SPACING MECHANISM

3.25 Trip Mechanism

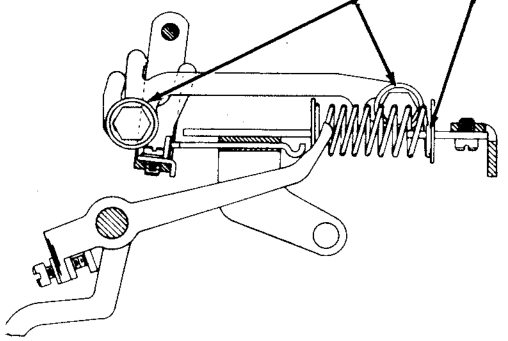


3.26 Slide Arm Bracket

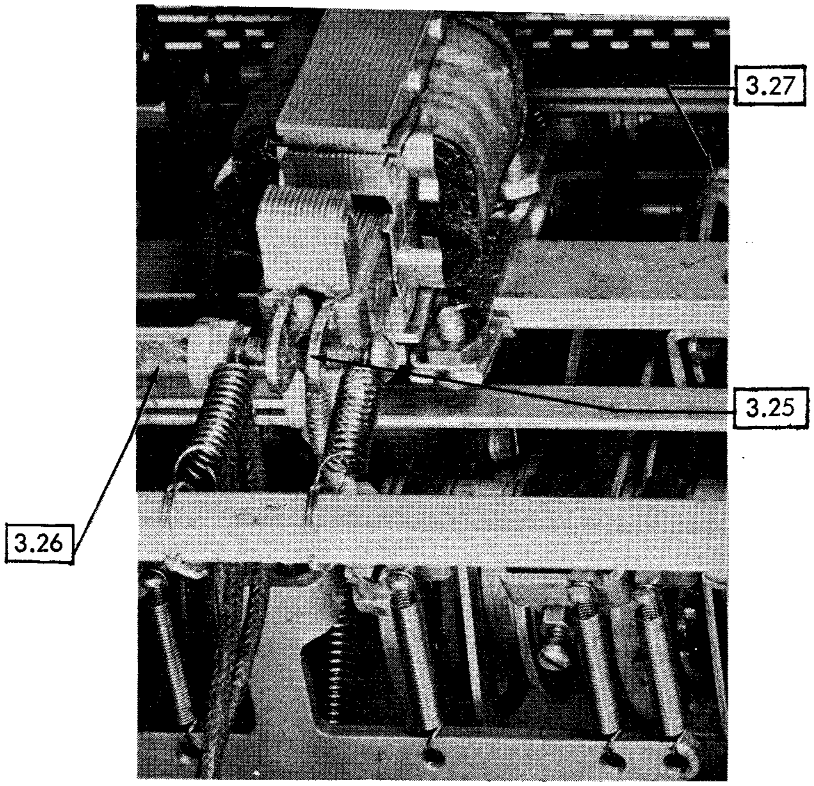


02 ENGAGING SURFACE (TWO BRACKETS)	C.R. SLIDE ARM BRACKET L.F. SLIDE ARM BRACKET
SAT FELT WASHERS (EACH END)	CONNECTING LINK
02 ENGAGING SURFACE (EACH END)	COMPRESSION SPRING (LP 6 & 9 ONLY)

3.27 Compression Spring

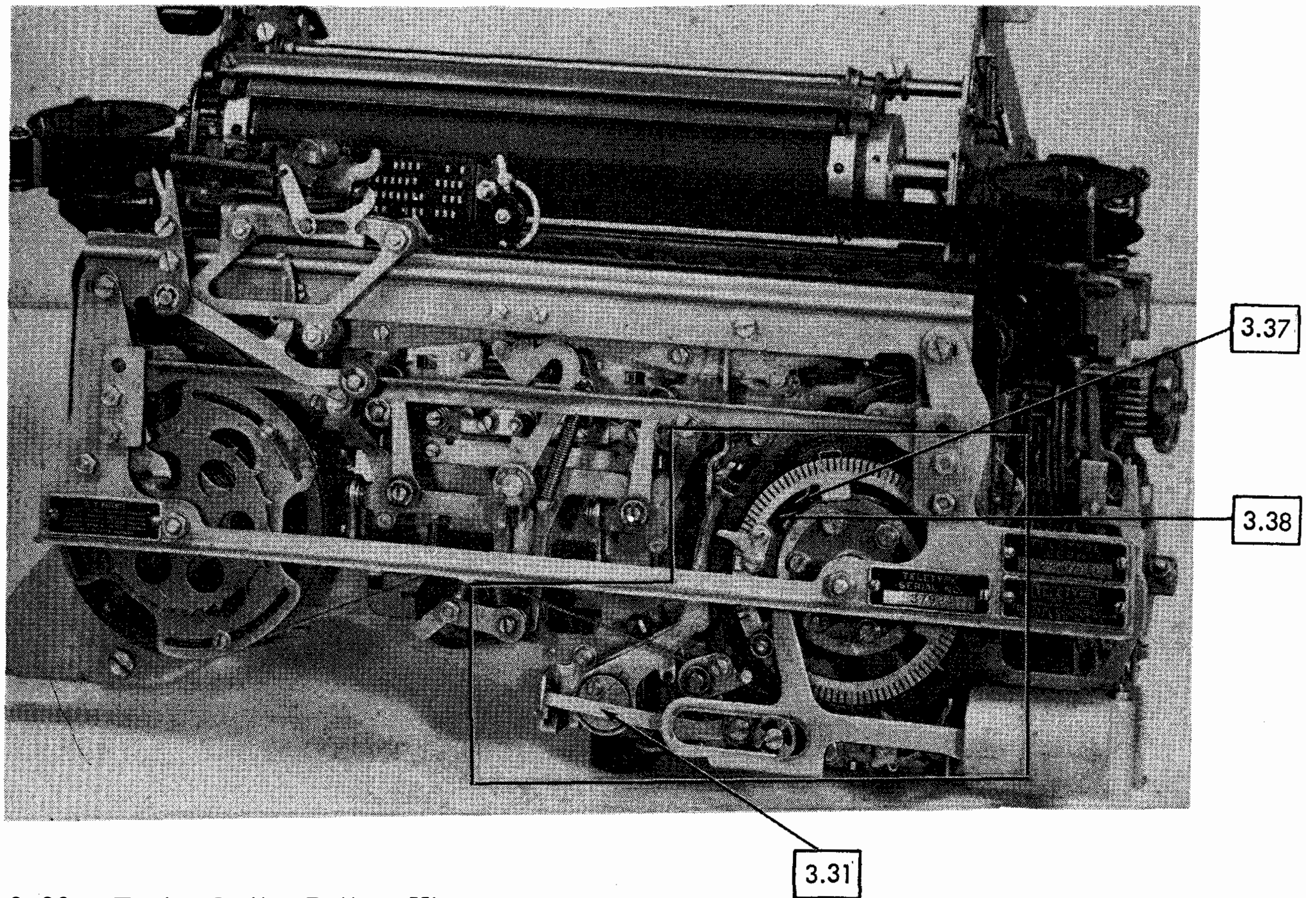


3.28 Typing Unit - Rear View

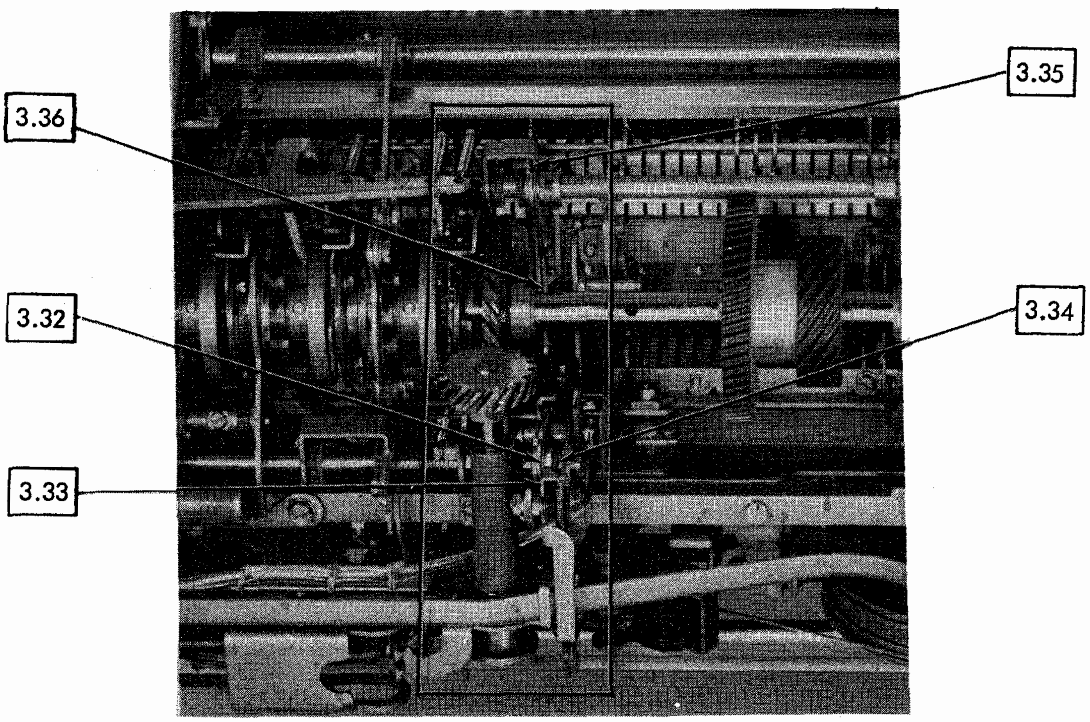


HORIZONTAL TABULATOR MECHANISM - LATER DESIGN

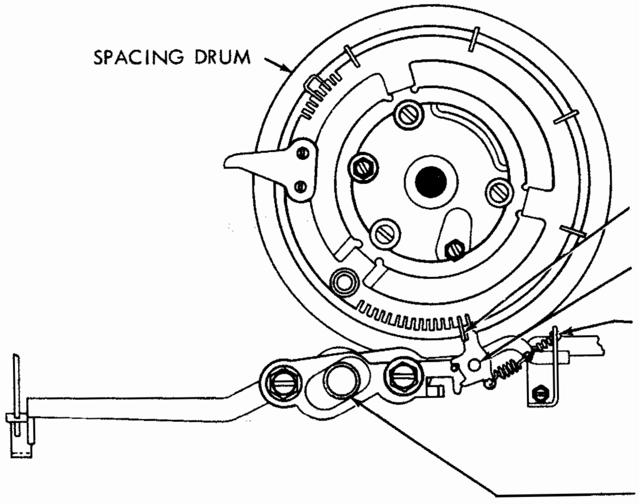
3.29 Typing Unit - Front View



3.30 Typing Unit - Bottom View



3.31 Blocking Lever



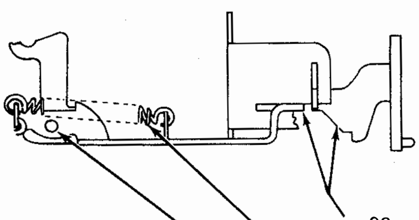
02 ENGAGING SURFACE TABULATOR STOPS

02 BEARING SURFACE TABULATOR PAWL

0 HOOKS - EACH END SPRINGS

02 BEARING AND GUIDE SURFACE BLOCKING LEVER

3.32 Slide Arm

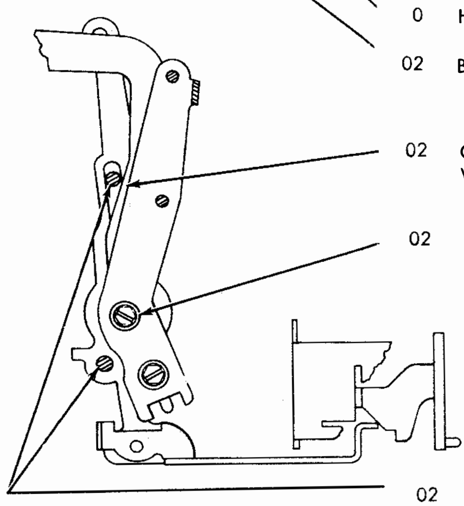


02 ENGAGING SURFACE WITH BLOCKING LEVER AND BRACKET OPERATING LEVER SLIDE ARM

0 HOOKS - EACH END SLIDE ARM SPRING

02 BEARING SURFACE OPERATING LEVER SLIDE ARM

3.33 Operating Lever

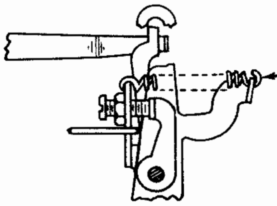


02 CONTACTING SURFACE WITH ADJUSTING PLATE OPERATING LEVER

02 BEARING SURFACE TRIP LEVER ARM LATCH BAIL

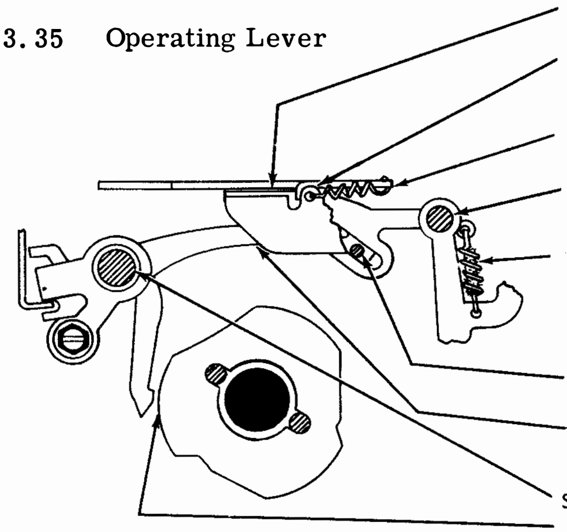
02 BEARING SURFACE OPERATING LEVER

3.34 Latch Bail



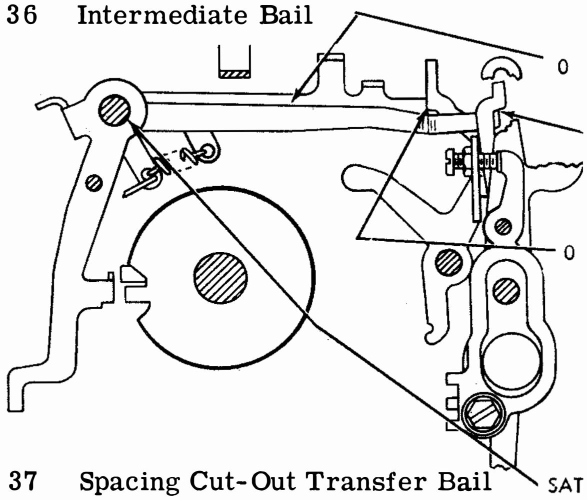
0	HOOKS - EACH END	LATCH BAIL SPRING

3.35 Operating Lever



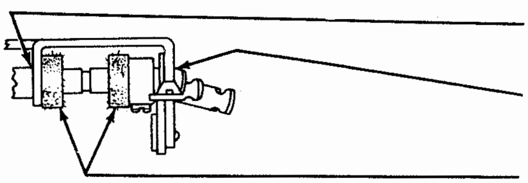
02	GUIDE SURFACES	OPERATING LEVER
02	CONTACT WITH SLIDE ARM	OPERATING LEVER
0	HOOKS - EACH END	SLIDE ARM SPRING
02	BEARING SURFACE	OPERATING LEVER
SAT	FELT WICK	SPRING
02	SLOT CAMMING SURFACE	OPERATING LEVER
02	BRACKET CONTACT SURFACE	OPERATING LEVER
SAT	FELT WASHERS	STRIPPER BAIL SHAFT
G	CAMMING SURFACE	SPACING CLUTCH RESTORING CAM

3.36 Intermediate Bail



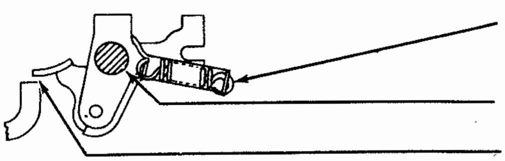
0	CONTACT SURFACE TRIP LEVER ARM	INTERMEDIATE BAIL
02	CONTACTING SURFACE	SPACING TRIP LEVER ARM
0	CONTACT SURFACE SPACING TRIP LEVER	INTERMEDIATE BAIL
SAT	FELT WASHER	TRIP LEVER ARM SHAFT

3.37 Spacing Cut-Out Transfer Bail



02	BEARING SURFACE	SPACING CUTOUT TRANSFER BAIL
02	BAIL CONTACTING SURFACE	SPACING CUTOUT TRANSFER BAIL
SAT	FELT WASHER	TRANSFER BAIL STUD

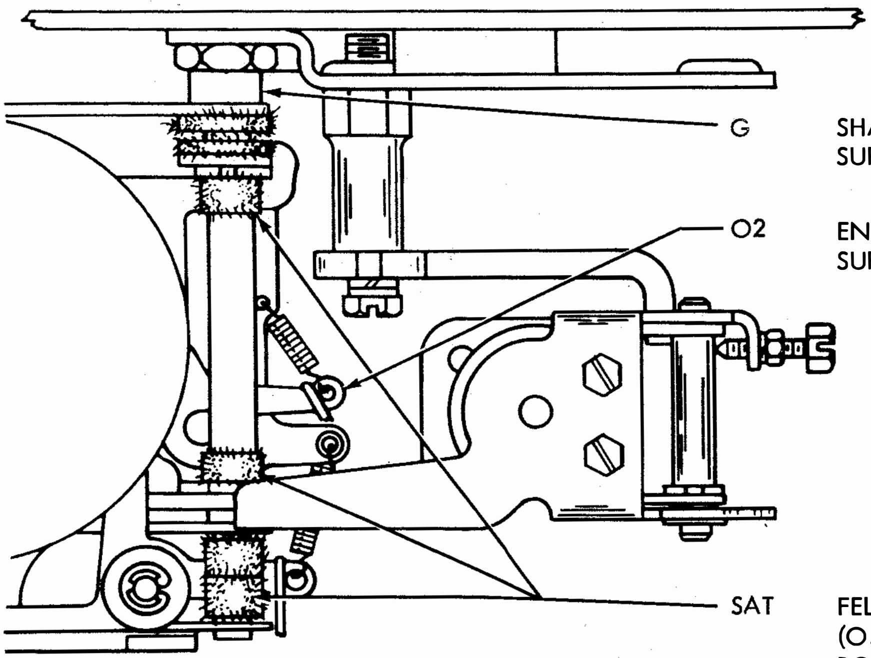
3.38 Bail Extension Arm



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

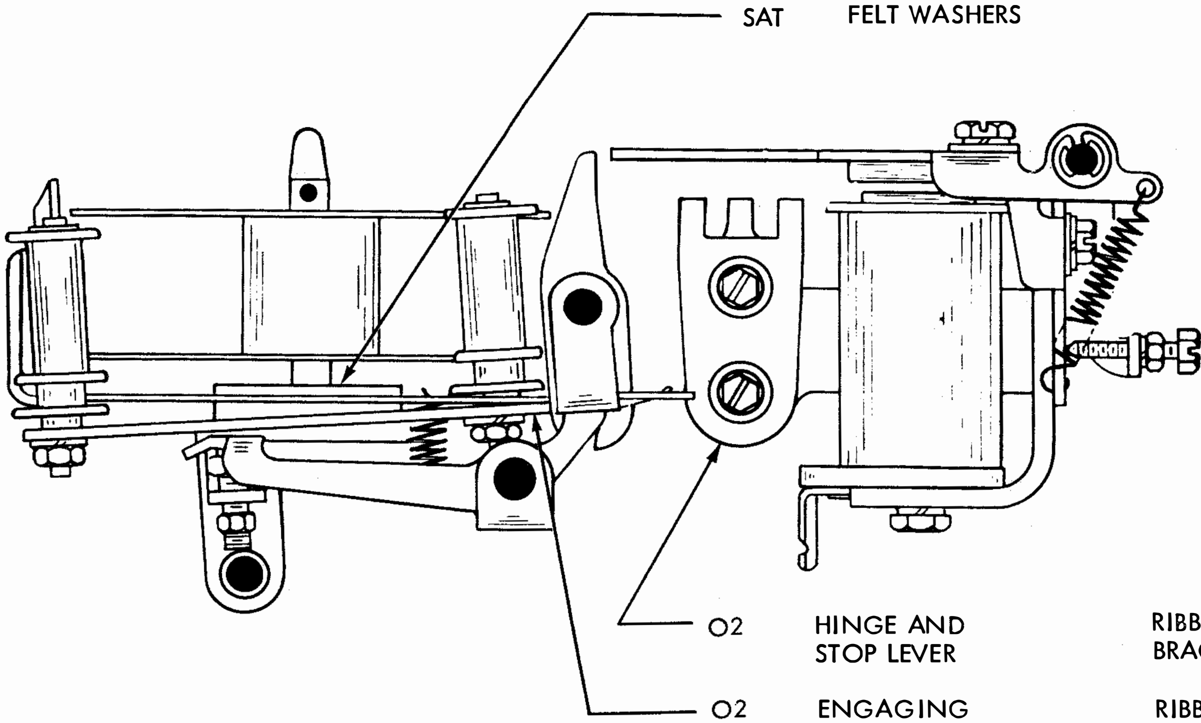
TWO COLOR RIBBON MECHANISM

3.39 Oscillating Lever



G	SHAFT MTG. SURFACE	OSC. LEVER & ROLLER BAIL SUPPORT SHAFT
O2	ENGAGING SURFACES	RIBBON REVERSING LEVERS
SAT	FELT WASHERS (OSC. LEVER & ROLLER BAIL)	RIBBON SPOOL BRACKET SHAFT

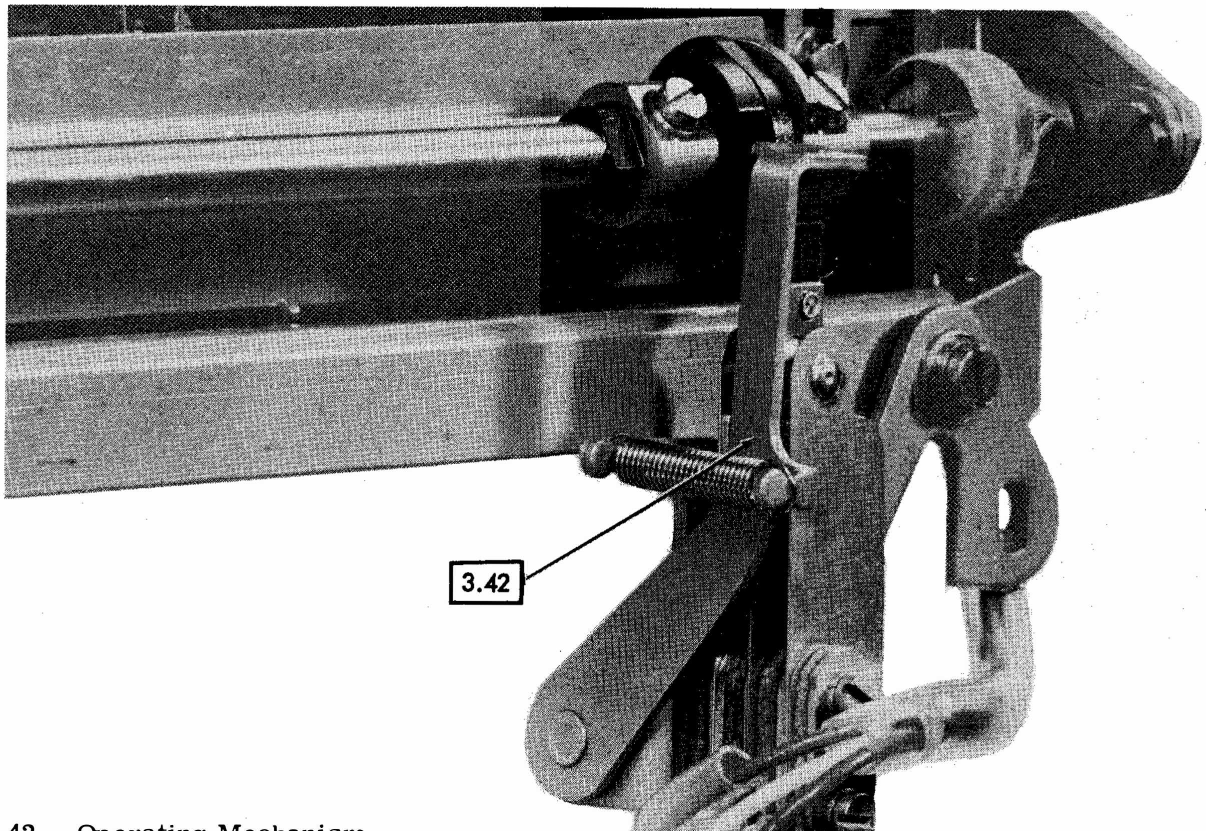
3.40 Ribbon Operating Mechanism



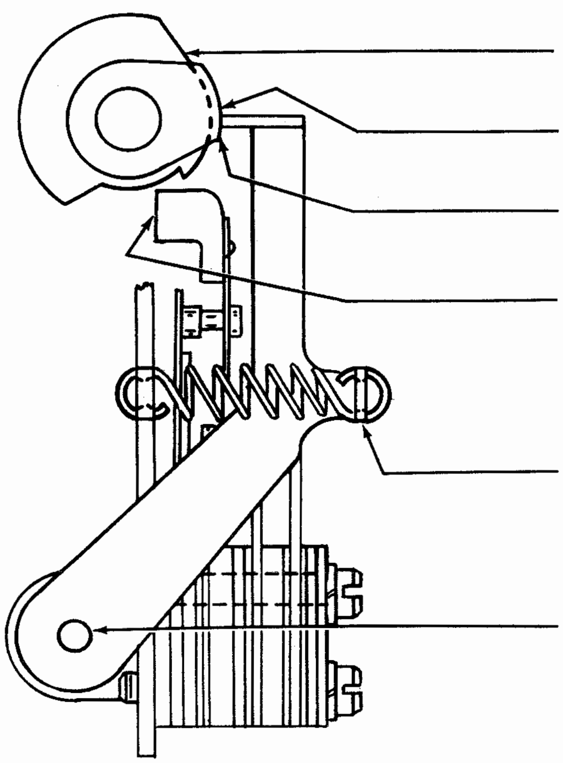
SAT	FELT WASHERS	RIBBON RATCHET
O2	HINGE AND STOP LEVER	RIBBON MAGNET BRACKET
O2	ENGAGING SURFACES	RIBBON SPOOL BRACKET

UNIVERSAL CONTACT (STUNT BOX) MECHANISM

3.41 Stunt Box - Rear View

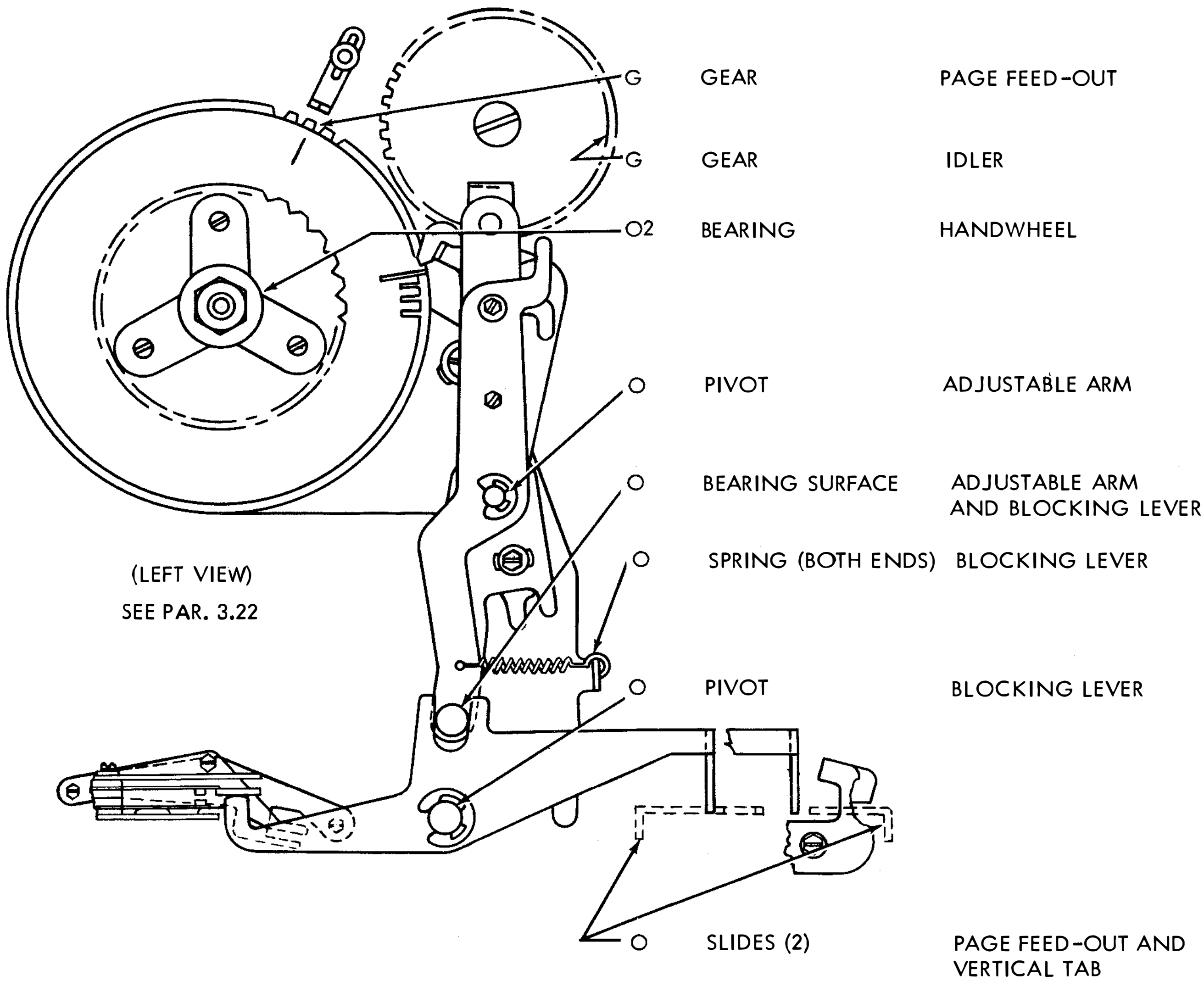


3.42 Operating Mechanism



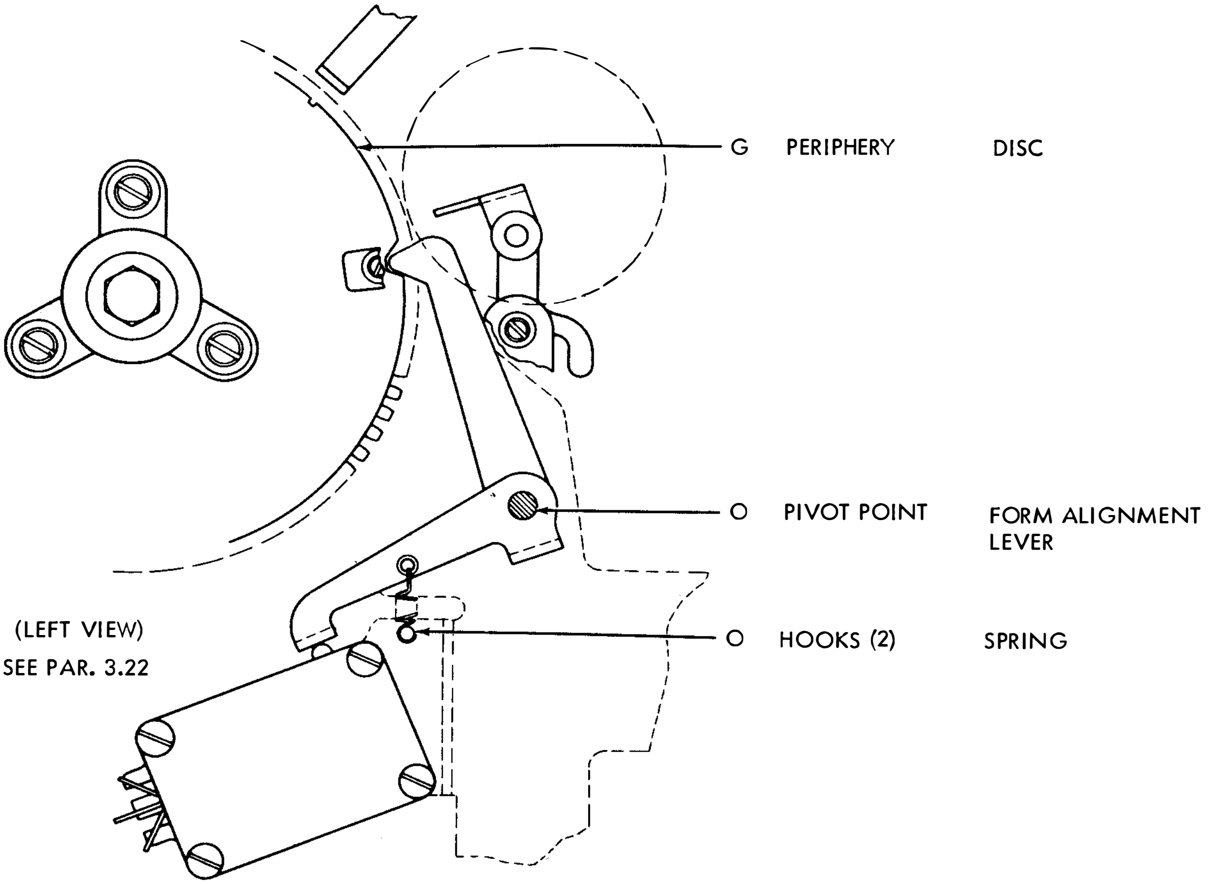
VERTICAL TABULATION AND TRANSMITTER DISTRIBUTOR CONTROL MECHANISM

3.43 Control Mechanism



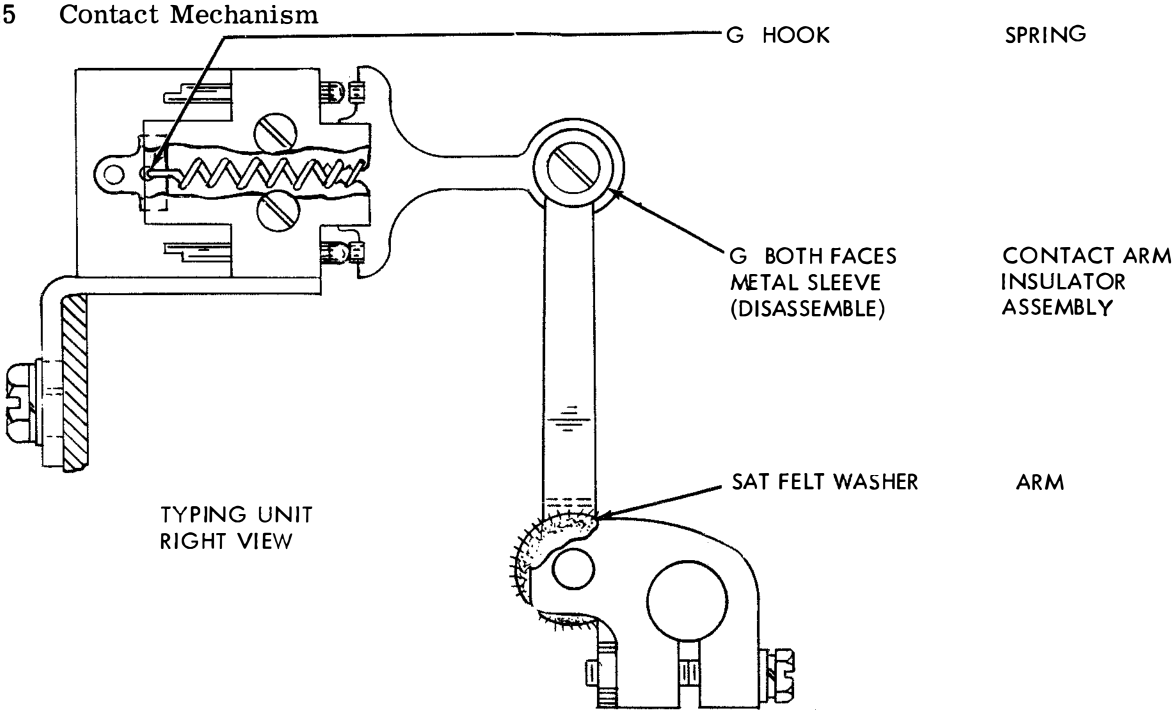
FORM ALIGNMENT SWITCH MECHANISM

3.44 Operating Mechanism



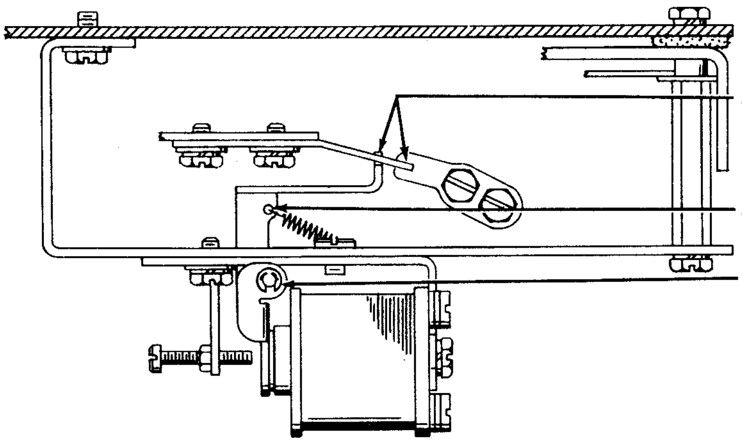
UNIVERSAL CONTACT (SELECTOR)MECHANISM

3.45 Contact Mechanism



DC MAGNET OPERATED PRINT SUPPRESSION MECHANISM

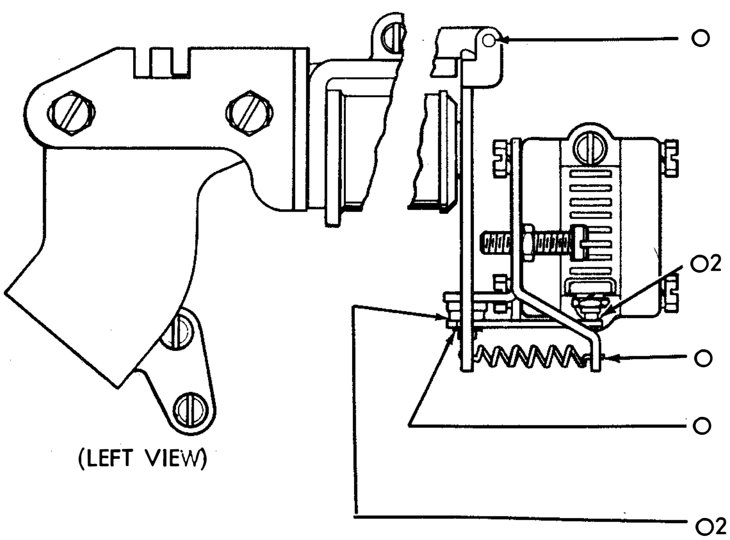
3.46 Suppression Mechanism



TOP VIEW - LEFT SIDE

LETTERS-FIGURES CODEBAR SHIFT MAGNET MECHANISM

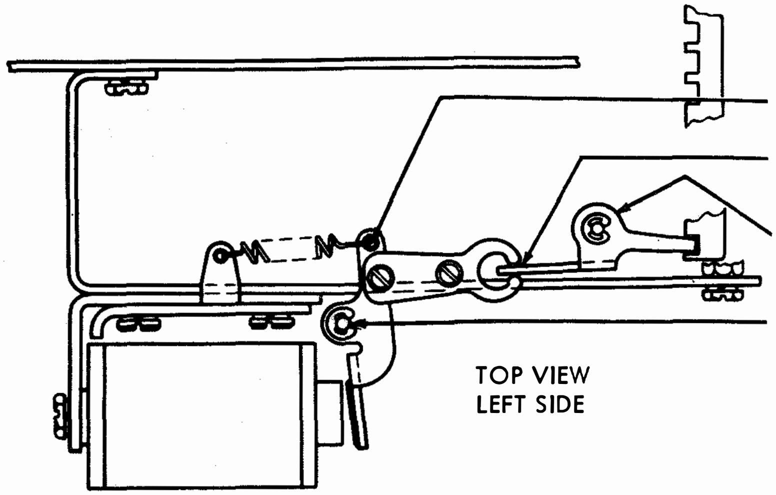
3.47 Shift Magnet Mechanism



(LEFT VIEW)

PRINT SUPPRESSION AND OFF-LINE STUNT SHIFT CONTROL MECHANISM

3.48 Shift Mechanism

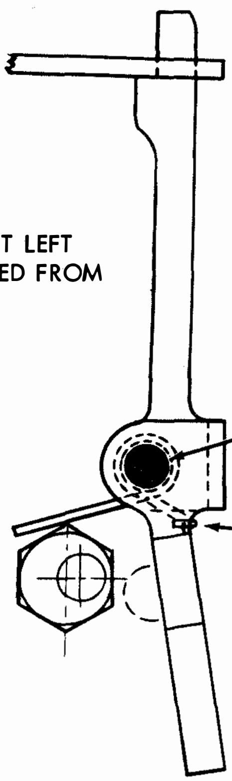


O	HOOKS (2)	SPRING
G	BEARING SURFACE	ARMATURE EXT. AND BLOCKING LEVER EXT.
SAT	FELT WASHERS	BLOCKING LEVER
O	PIVOT POINT (2)	ARMATURE

NOTE --- AVOID GETTING OIL OR GREASE ON MAGNET POLE FACE.

FORM FEED-OUT MECHANISM

3.49 Feed-Out Bail



O	PIVOT	FORM FEED-OUT BAIL
O	LOOP	TORSION SPRING

MOTOR UNITS

LUBRICATION

CONTENTS PAGE

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.

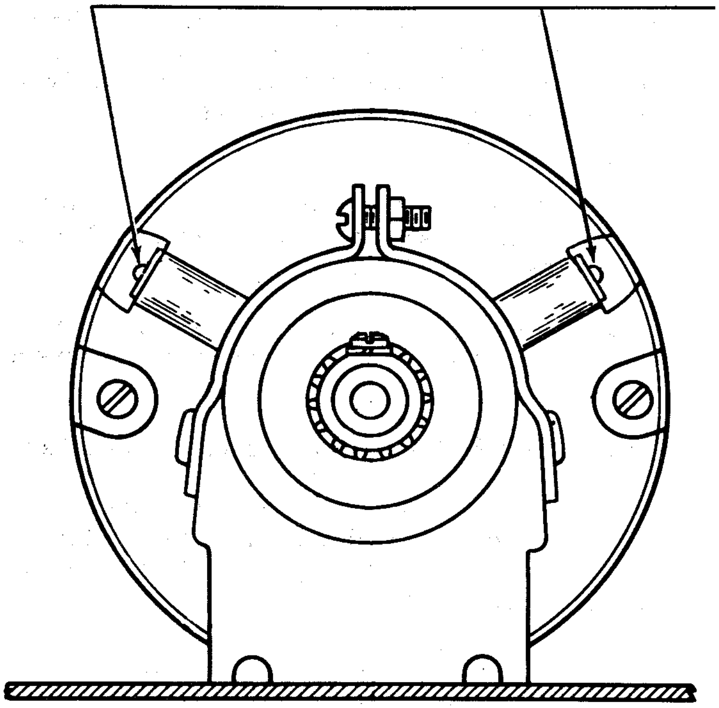
CAUTION: DO NOT USE GREASE GUN ON 28, 32, 33 & 37 MOTOR UNITS.

LUBRICATION INTERVAL

Motor Unit	Interval
Standard and heavy duty units	1500 consecutive operating hours or 6 months, whichever occurs first
Miniature units	750 consecutive operating hours or 3 months, whichever occurs first.

2. LUBRICATION

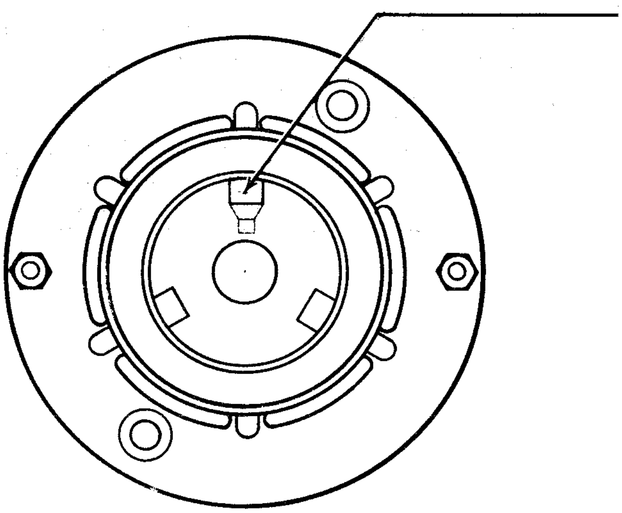
2.01 Motor Bearings - Standard Motors
Lubrication of motor bearings with ball type oilers.



O6 Two Oilers at Each End (Depress Oiler With Metal Object) — Motor Bearings

Note: If motor is disassembled at any time, do not replace bearings until they have been repacked with (Teletype 195298) (Beacon 325 or its equivalent) grease.

2.02 Motor Bearings - Miniature Motors



O6 Oil Hole (2) — Oil Hole (One at Each End of Motor)

28 TELETYPEWRITER CABINETS - FOR KSR AND RO SETS

DISASSEMBLY AND REASSEMBLY

CONTENTS PAGE

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.

28 ELECTRICAL SERVICE UNITS

DISASSEMBLY AND REASSEMBLY

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

CONTENTS PAGE

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.

CAUTION: REMOVE POWER FROM UNIT.

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 SPRING 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 keylever so that the keyboard lock function lever will go into its position over its bail, instead 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 bail 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 bail spring.

(4) Take out the transfer lever locking bail by unlatching the clutch and rotating the shaft to position the cam in such a way that the transfer lever locking bail can be unhooked and dropped down from its guide post. Turn the transfer lever locking bail 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 bail 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 bail 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-bail 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 bail 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.

(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 reassembly 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 teletypewriter 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 keylever is restored 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 codelevers.

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 keylevers (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 keylevers 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 code-lever-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 lock-bar 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.

28 TYPING UNIT

DISASSEMBLY AND REASSEMBLY

CONTENTS PAGE

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.

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.

CAUTION: TO AVOID SPRINGING THE TYPE BOX LATCH, THE TYPE BOX SHOULD BE FIRMLY SEATED ON THE BEARING STUD AND THE POINT OF THE LATCH SHOULD BE PLACED IN THE NOTCH OF THE TYPE BOX PLATE BEFORE MOVING THE LATCH TO ITS LOCKED POSITION.

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 bail 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 interference 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 TP152548 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 bail.

(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 "O" 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 bail 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) TELETYPEWRITER 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.

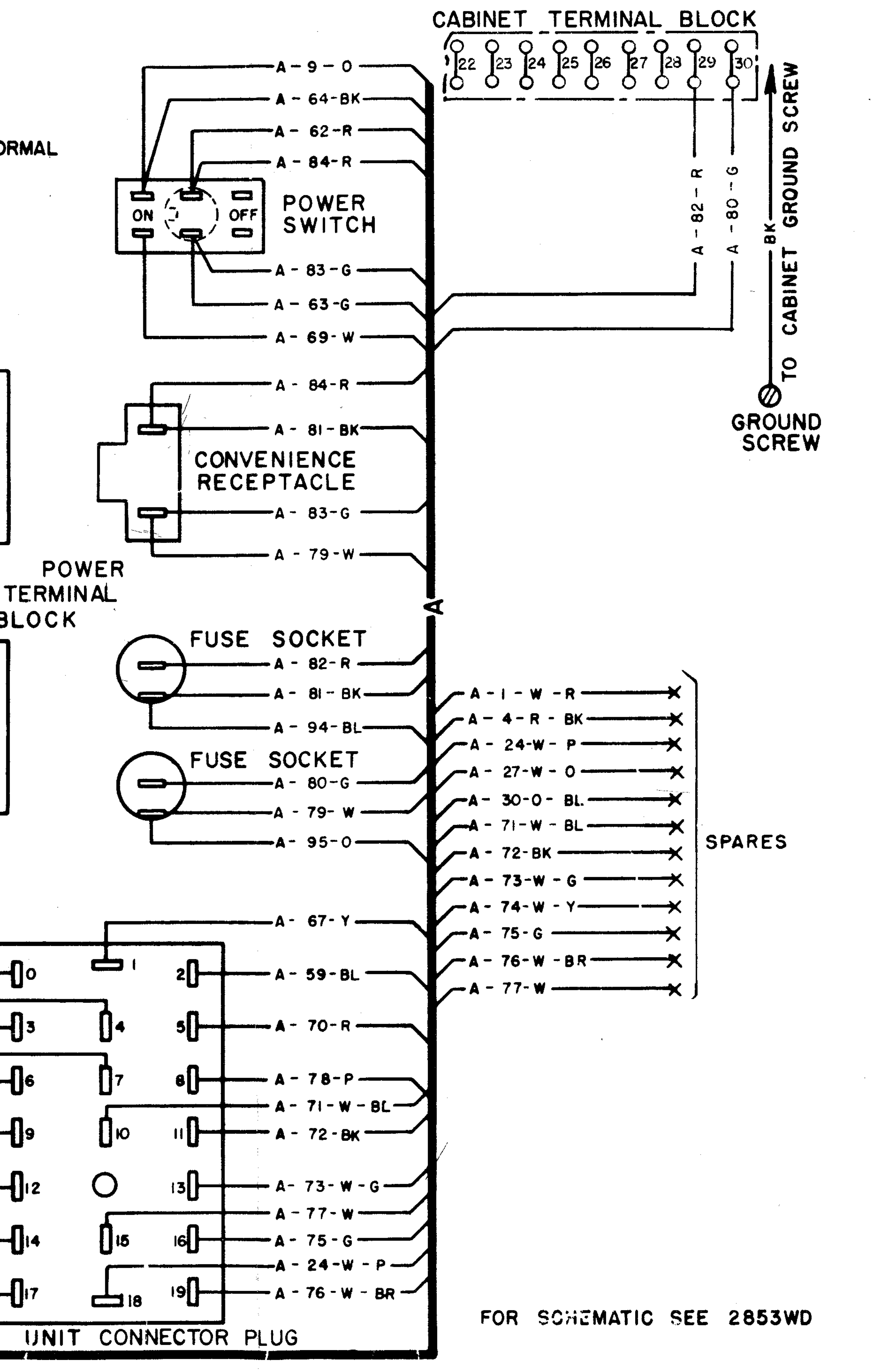
Note: Wiring diagram numbers are followed with suffix A or S to designate actual or schematic. The numbers are arranged numerically in the section but not in the diagram index.

2. WIRING DIAGRAM INDEX

SUBJECT	NAVY DESIGNATION	DESIGNATION OF MANUFACTURER	WIRING DIAGRAM NUMBER	ISSUE
ELECTRICAL SERVICE UNIT	SB-154A/UG	LESU5/103	2852WD-A	D
			2853WD-S	D
	SB-408/UG	LESU6/119	2870WD-A	F
			2871WD-S	7
	SB-964/UG	LESU7/147	2892WD-A	5
			2893WD-S	10
RECEIVE-ONLY BASE	MT-1443/UG	LB4/161	2883WD-A	23
	MT-2787/UG	LB29/000	2883WD-A	23
MOTOR UNITS	PD-17A/U	LMU 3	2900WD-A	42
	PD-18/U	LMU 4	2900WD-A	42
	PD-18A/U	LMU 41	2900WD-A	42
	PD-96/UG	LMU 21	2900WD-A	42
	PD-97/UG	LMU 28	2900WD-A	42
	PD-108/U	LMU 38	2900WD-A	42
	PD-109/UG	LMU 52	2900WD-A	42
KEYBOARD	MX-1114B/UG	LK4RN126	CANCELLED	
	MX-1114C/UG	LK10ARN	2928WD-A	20
	MX-1421A/UG	LK3RE101	CANCELLED	
	MX1677A/UG	LK8ARN	2928WD-A	20
	TT357/UG	LK30ARN	4718WD-A	6
	TT-385/UG	LK36ARN	4718WD-A	6
	TT-387/UG	LK49ARN	6462WD-A	4
	TT388/UG	LK35ARN	4718WD-A	6
	TT389/UG	LK35ARE	4718WD-A	6
	TT-417/FG	LK39ARN	2928WD-A	20
	TT-434/UG	LK48ARN	4718WD-A	6
	TT-435/UG	LK10ARE	2928WD-A	20

2. WIRING DIAGRAM INDEX continued

SUBJECT	NAVY DESIGNATION	DESIGNATION OF MANUFACTURER	WIRING DIAGRAM NUMBER	ISSUE
KEYBOARD	TT-442/UG	LK49ARE	6462WD-A	4
	TT-498/UG	LK48ARE	4718WD-A	6
	TT-500/UG	LK51ARN	4262WD-A	8
			4763WD-A	C
TYPING UNITS	MX-1115B/UG	LP14RN/AY	3214WD-A	44
	MX-1422A/UG	LP14RE/AY	3214WD-A	44
	MX-2984/UG	LP14RN/AGH	3813WD-A	D
	MX-3080/UG	LP65RN/AGB	3214WD-A	44
	TT-358/UG	LP105RN/AGB	3214WD-A	44
	TT-372/UG	LP108RN/AY	3214WD-A	44
	TT-378/UG	LP108 RE/ACX	3214WD-A	44
	TT-386/UG	LP109RN/AY	3214WD-A	44
	TT-418/UG	LP113RN/AY	3214WD-A	44
	TT-436/UG	LP14RN/AJE	3813WD-A	D
	TT-437/UG	LP14RN/AJG	3214WD-A	44
	TT-438/UG	LP65RN/AJD	3214WD-A	44
	TT-443/UG	LP14RE/AJF	3214WD-A	44
	TT-499/UG	LP65RE/AGD	3214WD-A	44
PRINTER CABINET	CY-2320/SGA-3	LAC 207	3490WD-A	5
	CY-2538/UG	LAC 204	2876WD-A	L
			3236WD-A	10
	CY-2539/UG	LAC 203	2876WD-A	L
			3236WD-A	10
CABINETS	CY-3689/FGC-74	LBAC 241	4946WD-A	C4
			4947WD-S	B
			4948WD-A	7
	CY-4166/FGC-79	LBAC 248	4946WD-A	C4
			4947WD-S	B
			4948WD-A	7
	CY-4786/FGC-74A	LBAC 261	7531WD-A	2
			7532WD-S	2
			7533WD-A	3
	CY-4787/FGC-100	LBAC 264	7808WD-A	1-2&2-1
			7809WD-S	1-2&2-2
RECTIFIERS			5167WD-A	C
			5762WD-A	5
			7810WD-A&S	3
BASE			7556WD-A	2
ELECTRICAL SERVICE UNIT			7807WD-A	1
SELECTOR MAGNET DRIVER			7488WD-A	2
			7489WD-S	1
COVER	CW-354/UG	LPC202	5831WD-A	A



FOR SCHEMATIC SEE 2853WD

REVISIONS:

A	2-?-54	28-4078
B	3-16-?1	68761 # 6
C	3-28-62	69768-10
D	2-21-64	79691

2852 WD

3-9-53

ACTUAL WIRING DIAGRAM MODEL 28

ELECTRICAL SERVICE UNIT

LESU5/110

DRAWN: ADW

APPROVED:

ENG'D: AZP

CHECKED:

FILE: 1-30.65.156A

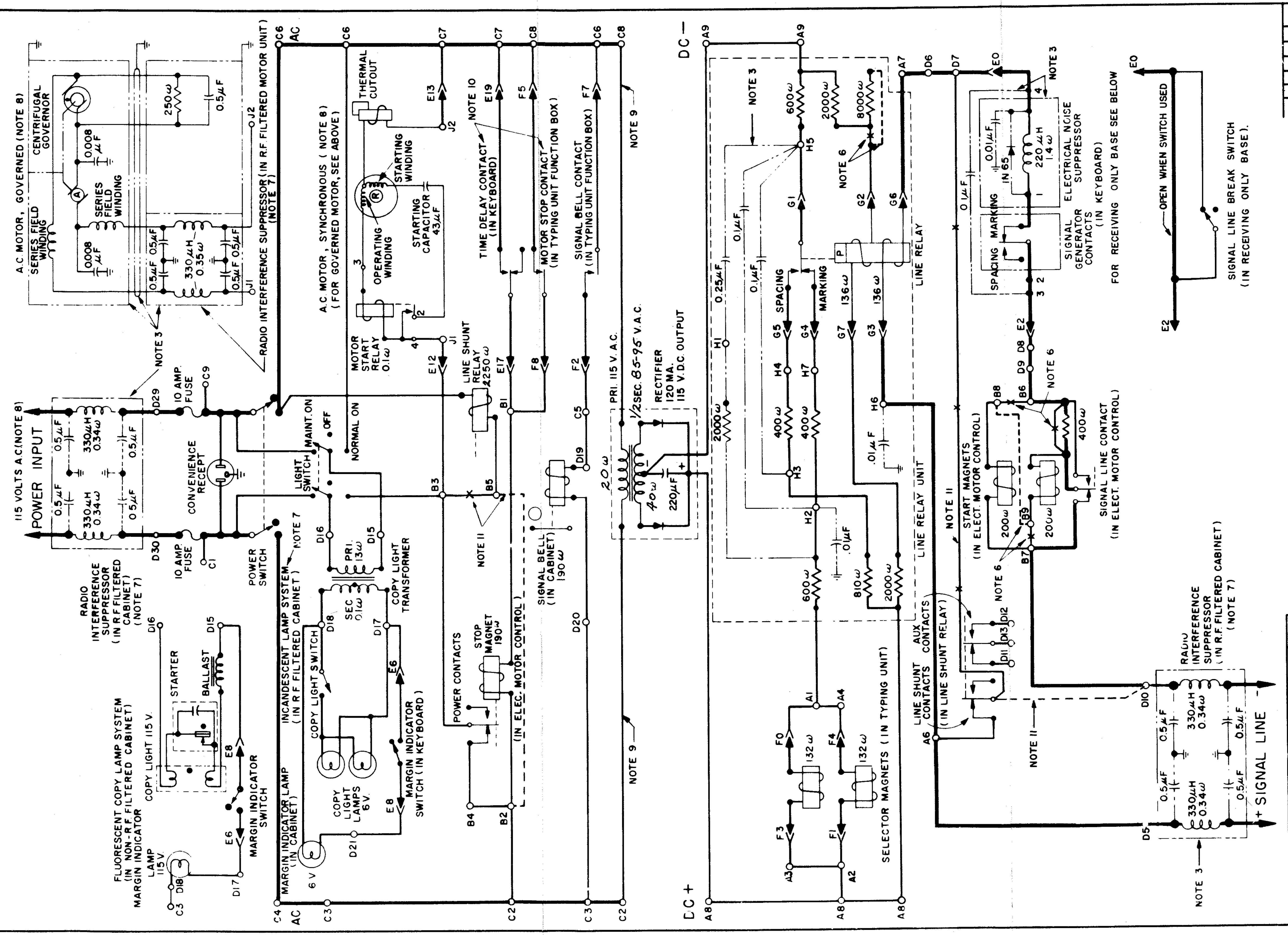
TELETYPE CORPORATION

NO.	NOTES
1.	WIRING CHANNEL DESIGNATED "A" DOES NOT REPRESENT CABLE, BUT ASSISTS IN TRACING CONNECTIONS.
2.	CHANNEL LEGEND: A - 1 - W - BL — CHANNEL IDENTIFICATION (A); CHANNEL WIRE NUMBER (1); WIRE COLOR CODE (W - BL)
3.	POWER CIRCUITS WIRED FOR 115V. 50-60 ∿ A.C. OPERATION ONLY, EXCEPT AS SHOWN.
4.	COLOR CODE: BK - BLACK W - WHITE R - RED G - GREEN O - ORANGE BL - BLUE Y - YELLOW BR - BROWN P - PURPLE S - SLATE R - BK - RED-BLACK W - P - WHITE-PURPLE W - R - WHITE-RED O - BL - ORANGE-BLUE W - BK - WHITE-BLACK W - BL - WHITE-BLUE W - BR - WHITE-BROWN W - G - WHITE-GREEN W - Y - WHITE-YELLOW W - O - WHITE-ORANGE
5.	——X DENOTES TAPED OR SPLICED AND TAPED WIRES.
6.	PLUGS VIEWED FROM SOLDER TERMINAL ENDS.
7.	WIRING IS SHOWN FOR OPERATION AT .060 AMP LINE CURRENT. FOR OPERATION AT .020 AMP LINE CURRENT MAKE THE FOLLOWING CHANGES: a. ON LINE RELAY MOUNTING ASSEMBLY; MOVE A-86-BR FROM ITS PRESENT POSITION ON THE 8000 OHM RESISTOR TO THE OPEN TERMINAL ON THE SAME RESISTOR. b. ON MOTOR CONTROL TERMINAL BLOCK REMOVE BK STRAP BETWEEN TERMS 7 & 9. REMOVE END OF STRAP FROM TERMINAL 6 & CONNECT TO TERMINAL 9 c. ON MOTOR CONTROL ASSEM. RESISTOR, REMOVE BK STRAP
8.	FOR CONTINUOUS RECTIFIER OPERATION: a. ON POWER TERMINAL BLOCK REMOVE A-18-G FROM TERMINAL 8 AND ATTACH TO TERMINAL 9. b. REMOVE A-15-W FROM TERMINAL 2 AND ATTACH TO TERMINAL 1.
9	FOR COMPLETE SHUNTING OF LINE AND CONTROL OF LINE SHUNT RELAY ONLY FROM POWER SWITCH, MAKE THE FOLLOWING CHANGES: a. ON MOTOR CONTROL TERMINAL BLOCK, MOVE LOWER END OF R STRAP FROM TERMINAL 3 TO TERMINAL 2. b. ON CABINET TERMINAL BLOCK, REMOVE A-19-W FROM TERMINAL 7 AND CONNECT TO TERMINAL 2.

NO	NOTES
	FOR ACTUAL WIRING DIAGRAM, SEE 2852 WD. ALSO SEE

WD NUMBER	FOR CODED UNITS
2856 WD	LAC 200, 201, 202, 203 CABINETS (R.F. FILTERED)
2858 WD	LAC 200, 201, 202, 203, CABINETS (NON-R.F. FILTERED)
2862 WD	LK 3 KEYBOARD, LB 3 REC. ONLY BASE
2864 WD	LP 3 TYPING UNIT
2900 WD	LMU 3 MOTOR UNIT (A.C. SYN.)
2900 WD	LMU 4 MOTOR UNIT (A.C. GOV. R.F. FILTERED)
2900 WD	LMU 6 MOTOR UNIT (A.C. GOV. NON-R.F. FILTERED)

NO	NOTES
2.	LEGEND O A SELECTOR MAGNET TERMINAL BLOCK (IN LESU) O B MOTOR CONTROL TERMINAL BLOCK (IN LESU) O C POWER TERMINAL BLOCK (IN LESU) O D CABINET TERMINAL BLOCK E KEYBOARD OR REC. ONLY BASE CONNECTOR F TYPING UNIT CONNECTOR G LINE RELAY CONNECTOR (IN LESU) O H LINE RELAY FILTER (IN LESU) O J MOTOR TERMINAL BLOCK (IN LK OR LB).
3	DOT DASH - ——— LINES INDICATE FILTERING, SHIELDING AND SUPPRESSION NETWORKS.
4	ALL APPARATUS IS SHOWN IN UNOPERATED OR DE-ENERGIZED POSITION
5	a RESISTANCE VALUES IN OHMS (ω) b. INDUCTANCE VALUES IN MICROHENRIES (μH) c. CAPACITANCE VALUES IN MICROFARADS (μF)
6	CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION. FOR .020 AMP. LINE CURRENT, ADD DASHED (- - - -) CONNECTIONS AND OMIT CONNECTIONS MARKED (—×—)
7	USE INCANDESCENT LAMP SYSTEM, POWER & SIGNAL LINE SUPPRESSORS, AND SYNC. OR GOV.-FILT., MOTOR FOR INSTALLATIONS REQUIRING MINIMUM R.F. INTERFERENCE.
8	USE SYNCHRONOUS MOTOR ON REGULATED 60~(±1%) A.C. POWER ONLY. GOVERNED MOTORS AND OTHER POWER CIRCUITS OPERABLE ON 50 TO 60~ UNREGULATED A.C.
9	RECTIFIER SHOWN CONTROLLED BY POWER SWITCH. FOR CONTINUOUS OPERATION, MOVE PRIMARY (INPUT) LEADS FROM C2 & C8 TO C1 & C9 (ABOVE POWER SW.)
10	SET MUST BE EQUIPPED WITH EITHER: a. TIME DELAY MECH., OR b. MOTOR STOP CONTACTS.
11	LINE SHUNT RELAY SHOWN CONTROLLED BY MOTOR CONTROL CONTACTS. FOR DIRECT CONTROL FROM POWER SWITCH, AND COMPLETE SHUNTING OF SIGNAL LINE, ADD DASHED (------) CONNECTIONS AND OMIT CONNECTIONS MARKED (—×—).



REVISIONS		
A	11-18-54	28-4650
B	2-3-55	28-4972
C	3-23-61	68761-16
D	3-28-62	69768-10

2853 WD
2-9-54

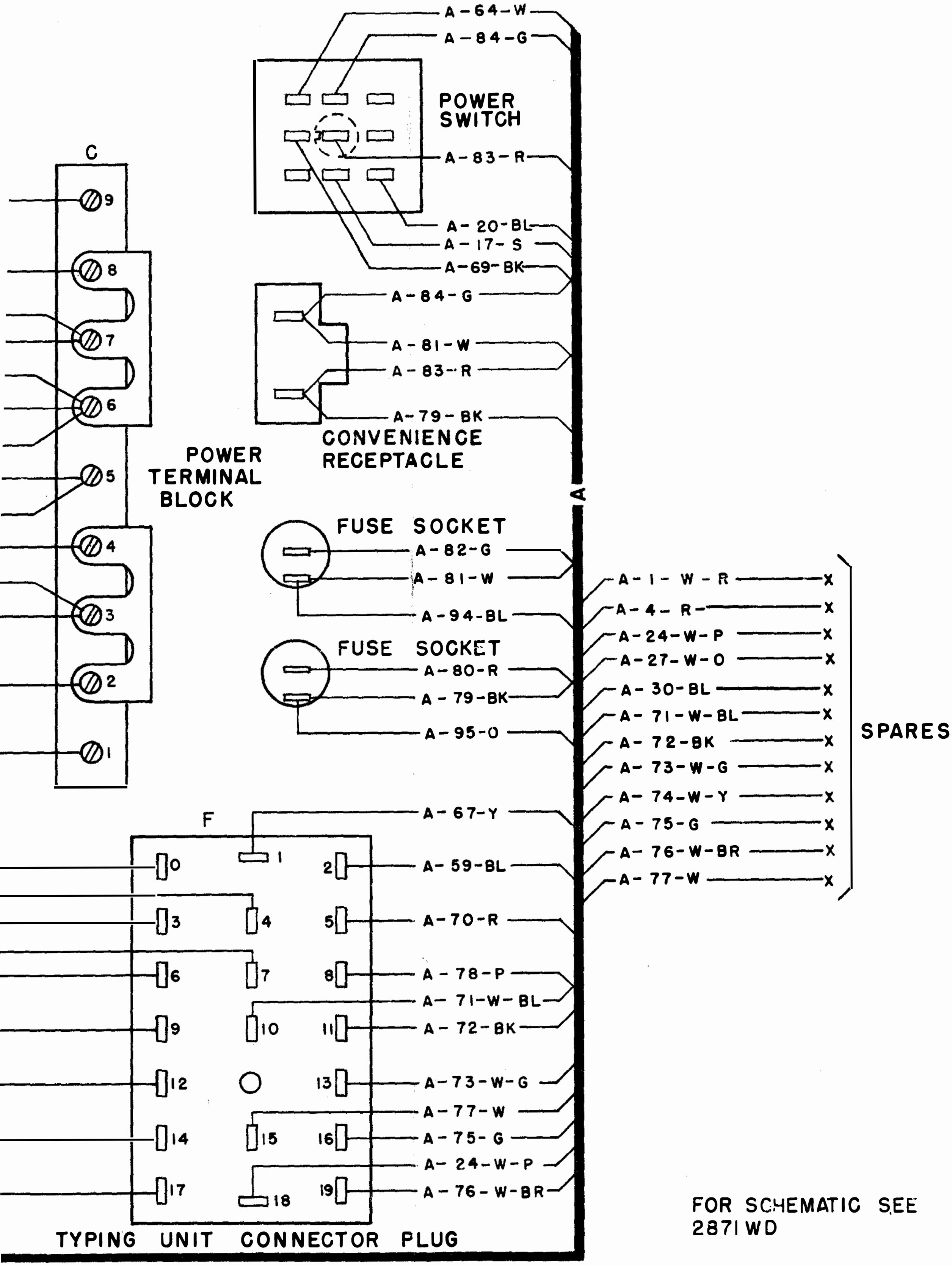
SCHEMATIC WIRING DIAGRAM ELECTRICAL SERVICE UNIT LESU 5/110 P ASSOCIATED MODE APPARATUS
INCLUDES:
ELEC MOTOR CONTROL
LINE RELAY
[illegible] LOCAL CIRCUIT SUPPLY)

DRAWN: G.R.W.	APPROVED
ENG'RD: V.A.C.	
CHECKED: RDS	
FILE: 1-30.65. 156A	

TELETYPE CORPORATION

2870 WD

REVISIONS		
ISSUE	DATE	AUTH NO
A	4-28-54	28-4242
B	6-2-54	28-4281
C	12-19-61	71910
D	3-28-62	69768-10
E	9-6-62	74429
F	10-16-62	74813



FOR SCHEMATIC SEE 2871 WD

TELETYPE CORPORATION

ACTUAL WIRING DIAGRAM FOR ELECTRICAL SERVICE UNIT

LESU6/119

DATE	3-10-54
FILE	25-30.65/120A
DRAWN J.K.	ENGD. A.Z.P.
CHECKED	APPROVED

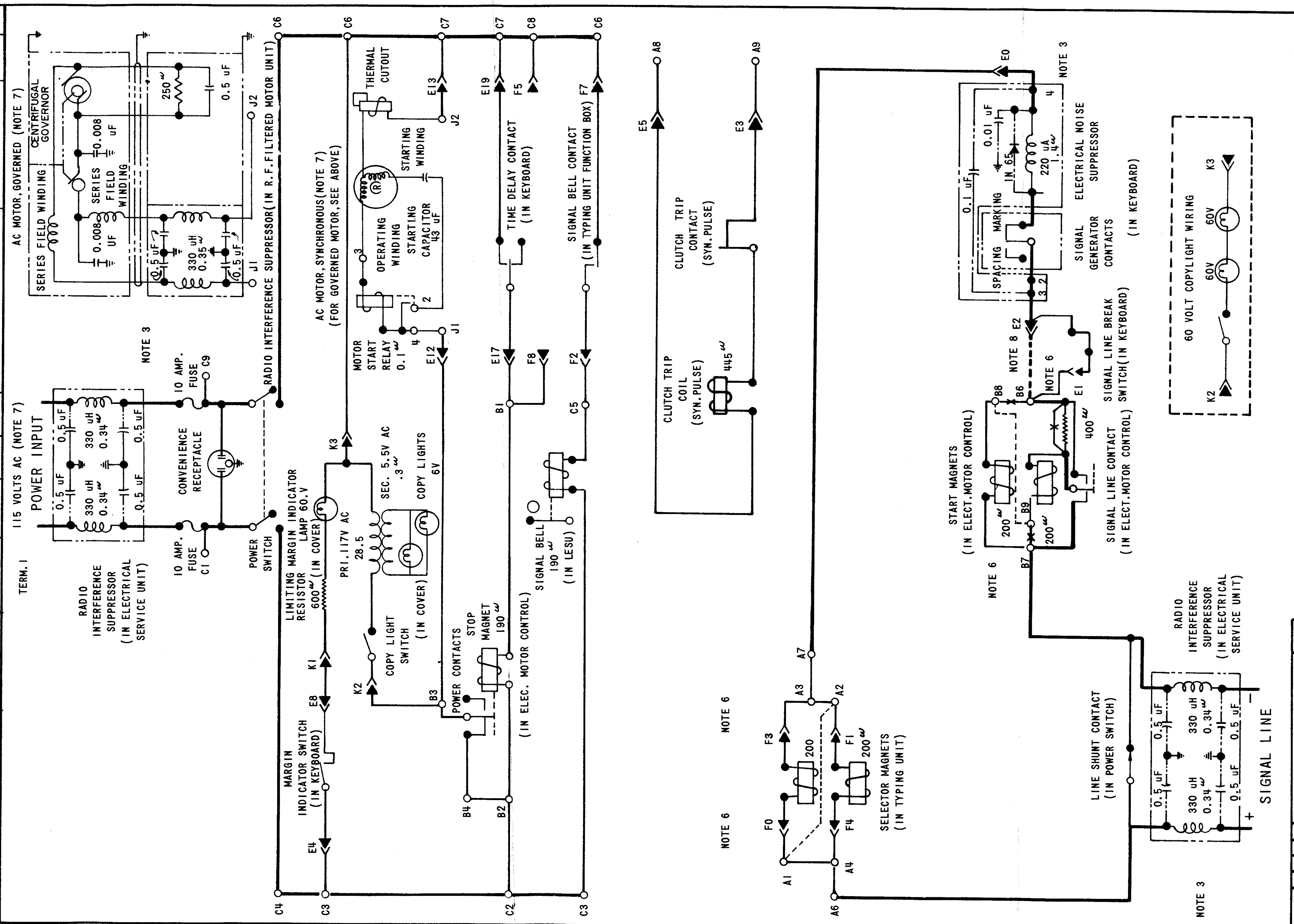
2870 WD

NO	NOTES
1.	WIRING CHANNEL DESIGNATED "A" DOES NOT REPRESENT CABLE, BUT ASSISTS IN TRACING CONNECTIONS.
2.	CHANNEL LEGEND A - 1 - W - BL CHANNEL IDENTIFICATION CHANNEL WIRE NUMBER WIRE COLOR CODE
3.	POWER CIRCUITS WIRED FOR 115V. A.C. OPERATION ONLY
4.	COLOR CODE: BK - BLACK W - WHITE R - RED G - GREEN O - ORANGE BL - BLUE Y - YELLOW BR - BROWN P - PURPLE S - SLATE R - BK - RED - BLACK W - P WHITE - PURPLE W - R - WHITE - RED O - BL - ORANGE - BLUE W - BK - WHITE - BLACK W - BL - WHITE - BLUE W - BR - WHITE - BROWN W - G - WHITE - GREEN W - Y - WHITE - YELLOW W - O - WHITE - ORANGE
5.	——X DENOTES TAPED OR SPLICED AND TAPED WIRES.
6.	PLUGS VIEWED FROM SOLDER TERMINAL ENDS
7.	WIRING IS SHOWN FOR OPERATION AT .060 AMP LINE CURRENT. FOR OPERATION AT .020 AMP LINE CURRENT MAKE THE FOLLOWING CHANGES. (A) ON MOTOR CONTROL TERMINAL BLOCK REMOVE END OF BK STRAP FROM TERMINAL 7 AND CONNECT TO TERMINAL 8, REMOVE END OF OTHER BK STRAP FROM TERMINAL 6 AND CONNECT TO TERMINAL 9. (B) ON MOTOR CONTROL ASSEM. RESISTOR, REMOVE BK STRAP. (C) ON SELECTOR MAGNET TERMINAL BLOCK, MOVE UPPER END OF OUTER BLACK STRAP FROM 4 TO TERMINAL 2. MOVE UPPER END OF INNER BLACK STRAP FROM TERMINAL 3 TO TERMINAL 1.
8	SET MUST BE GROUNDED THROUGH THE SCREW PROVIDED IN THE ELECT. NOISE SUPPRESSOR PRIOR TO BEING OPERATED.
9	WHEN ASSOCIATED KEYBOARD HAS MECHANICAL SIGNAL LINE, BREAK MOVE W-G WIRE FROM E1 TO E2

NO.	NOTES
1.	FOR ACTUAL WIRING DIAGRAM, SEE 2870WD. ALSO SEE

WD NO.	FOR CODE UNITS
4718WD	LK30,-35,-36,-48
2872WD	LPC203 COVER
2862WD	LK3&4 KEYBOARD
2864WD	LP3&4 TYPING UNIT
2900WD	LMU3 MOTOR UNIT (AC SYN.)
2900WD	LMU4 MOTOR UNIT (AC GOV.R.F.FILTERED)
2900WD	LMU6 MOTOR UNIT (AC GOV.NON-R.F.FILTERED)
5831WD	LPC202 COVER

NO.	NOTES
2.	LEGEND: A SELECTOR MAGNET TERMINAL BLOCK (IN LESU) B MOTOR CONTROL TERMINAL BLOCK (IN LESU) C POWER TERMINAL BLOCK (IN LESU) D CABINET TERMINAL BLOCK E KEYBOARD CONNECTOR F TYPING UNIT CONNECTOR J MOTOR TERMINAL BLOCK (IN LK) K LIGHTING CONNECTOR (IN COVER)
3.	DOT DASH ..---- LINES INDICATE FILTERING SHIELDING AND SUPPRESSION NETWORKS.
4.	ALL APPARATUS IS SHOWN UNOPERATED OR IN DE-ENERGIZED POSITION.
5.	a. RESISTANCE VALUES IN OHMS (ω) b. INDUCTANCE VALUES IN MICROHENRIES (uH) C. CAPACITANCE VALUES IN MICROFARADS (uF)
6.	CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION,FOR .020 AMP. LINE CURRENT, ADD DASHED (-----) CONNECTIONS AND OMIT CONNECTIONS MARKED (—x—)
7.	USE SYNCHRONOUS MOTOR ON REGULATED 60~(± 1%)AC POWER ONLY. GOVERNED MOTORS AND OTHER POWER CIRCUITS OPERABLE ON 50 TO 60~ UNREGULATED AC.
8.	ON UNITS EQUIPPED WITH MECHANICAL SIGNAL LINE BREAK, MOVE WIRE AT E1 TO E2.



REVISIONS		
2	2-3-55	28-4972
3	12-14-61	71910
4	3-28-62	69768-10
5	8-21-62	74293
6	10-16-62	74813
7	9-23-65	84561

2871 WD
4-1-54

SCHEMATIC WIRING DIAGRAM ELECTRICAL SERVICE UNIT LESU6/119 & ASSOCIATED MODEL 28 APPARATUS

INCLUDES:
ELEC. MOTOR CONTROL FILTER & BELL ASSEM.

DRAWN T.R.	APPROVED E.T.B.
ENGR.A.Z.P.	
CHECKED:	
FILE: 25-30.65/120AA	

TELETYPE
CORPORATION

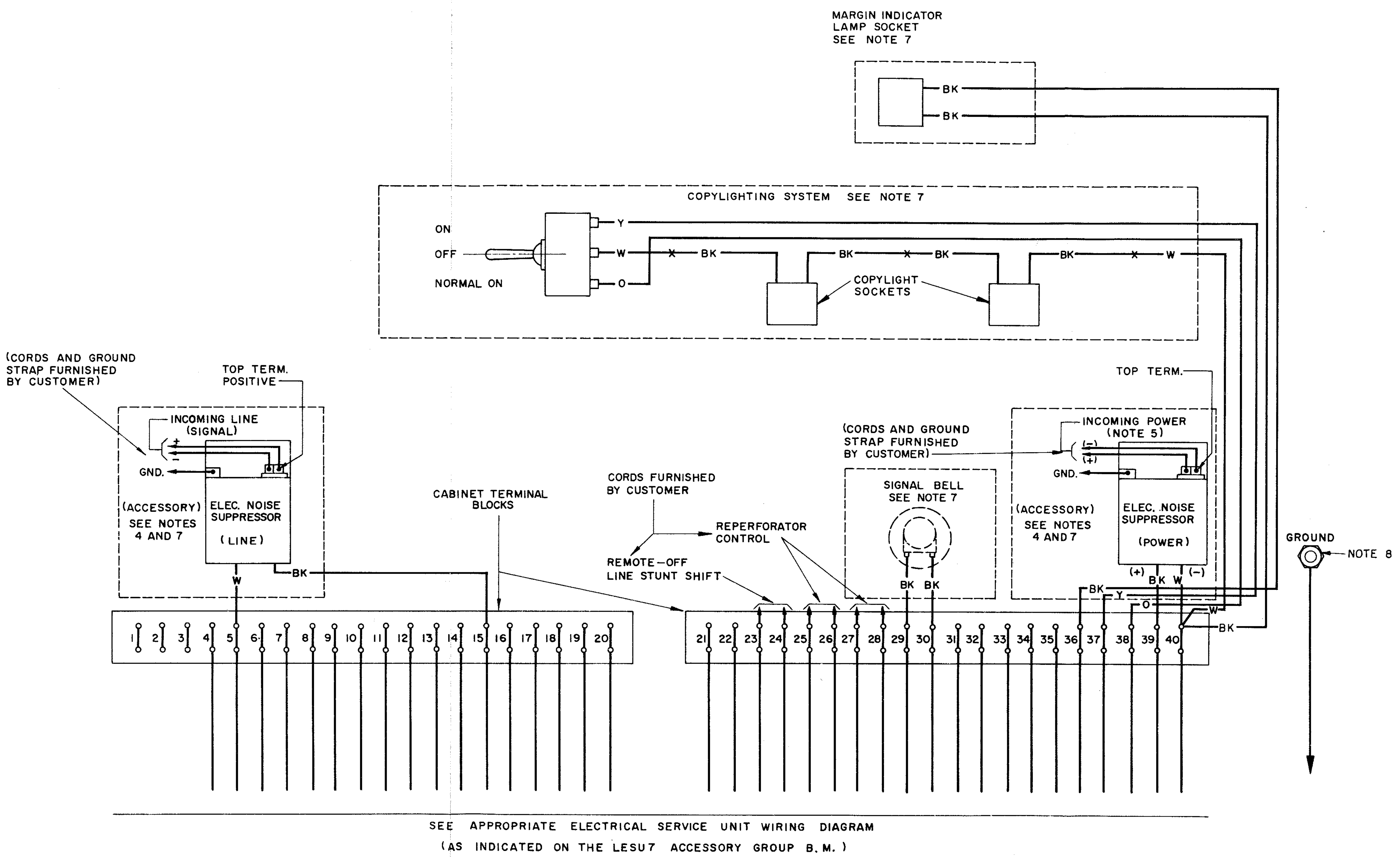
NO.	NOTES
1	COLOR CODE: BK — BLACK, W — WHITE, R — RED, G — GREEN, O — ORANGE, BL — BLUE, Y — YELLOW, BR — BROWN, P — PURPLE, S — SLATE
2	——X DENOTES SPLICED, SOLDERED, AND TAPED WIRES.
3	COMPONENTS SHOWN DOTTED ARE ACCESSORIES TO CABINET.
4	USE POWER AND SIGNAL LINE INTERFERENCE SUPPRESSORS FOR INSTALLATIONS REQUIRING MINIMUM R.F. INTERFERENCE. FOR OTHER INSTALLATIONS, OMIT SUPPRESSORS AND CONNECT INPUTS DIRECTLY TO TERMINALS SHOWN.
5	CABINET POWER CIRCUIT WIRED FOR 115V. D.C. OPERATION. CONNECT GROUNDED SIDE OF INPUT POWER, OR NEGATIVE SIDE OF UNGROUNDED POWER TO TERMINAL C40 OR THROUGH THIS SIDE OF FILTER. POLARITIES SHOWN (+) AND (−) ARE FOR NEGATIVE GROUNDED POWER. THE ASSOCIATED ELECTRICAL SERVICE UNIT MUST BE WIRED FOR D.C. OPERATION. SELECT THE DESIRED OPERATING CONDITIONS FROM THE FOLLOWING TABLE AND MAKE CONNECTIONS AT THE CABINET TERMINAL BLOCKS WITH THE TWO 153483 STRAPS FURNISHED WITH THE 152624 A.C. TO D.C. ASSEMBLY: (see table below) SEE APPROPRIATE ELECTRICAL SERVICE UNIT SCHEMATIC WIRING DIAGRAM.
6	NECESSARY STRAP CONNECTIONS AT THE CABINET TERMINAL BLOCKS ARE SHOWN ON THE ASSOCIATED ELECTRICAL SERVICE UNIT WIRING DIAGRAM. SEE THE LESU7 ACCESSORY GROUP B.M. FOR THE DIAGRAM NUMBER.
7	ACCESSORY GROUP ASSIGNMENTS (see table below)
8	GROUND SCREW IS LOCATED AT REAR OF CABINET, ADJACENT TO RIGHT HINGE.

SIGNAL LINE CIRCUIT ACCESSORY OPERATION.

POWER SOURCE		OPERATES CONTINUOUSLY	OPERATES WITH POWER SWITCH	OPERATES WITH MOTOR CONTROL
	NEGATIVE GROUND OR UNGROUNDED	C 21 – C 38 C 22 – C 40	C 21 – C 35 C 22 – C 40	C 21 – C 37 C 22 – C 40
	POSITIVE GROUND	C 22 – C 38 C 21 – C 40	C 22 – C 35 C 21 – C 40	C 22 – C 37 C 21 – C 40

ACCESSORY GROUP ASSIGNMENTS

ACCESSORY GROUP NO.	COPYLIGHT SYSTEM	MARGIN IND. LAMP	SIGNAL BELL	ELEC. NOISE SUPPRESSORS
130,150,240,241	X	X	X	



FOR SCHEMATIC SEE ASSOCIATED LESU WD

2876 WD

REVISIONS

ISSUE	DATE	AUTH. NO.
G	12-30-56	28-7216
H	12-5-57	28-8154
J	12-17-57	28-8195
K	3-25-59	28-10913
L	5-22-59	28-11141

ACTUAL WIRING DIAGRAM FOR MODEL 28 PRINTER CABINET LAC 203,204,205

ACCESSORY GROUPS 130,150,240,241 (FOR D.C. APPLICATION)

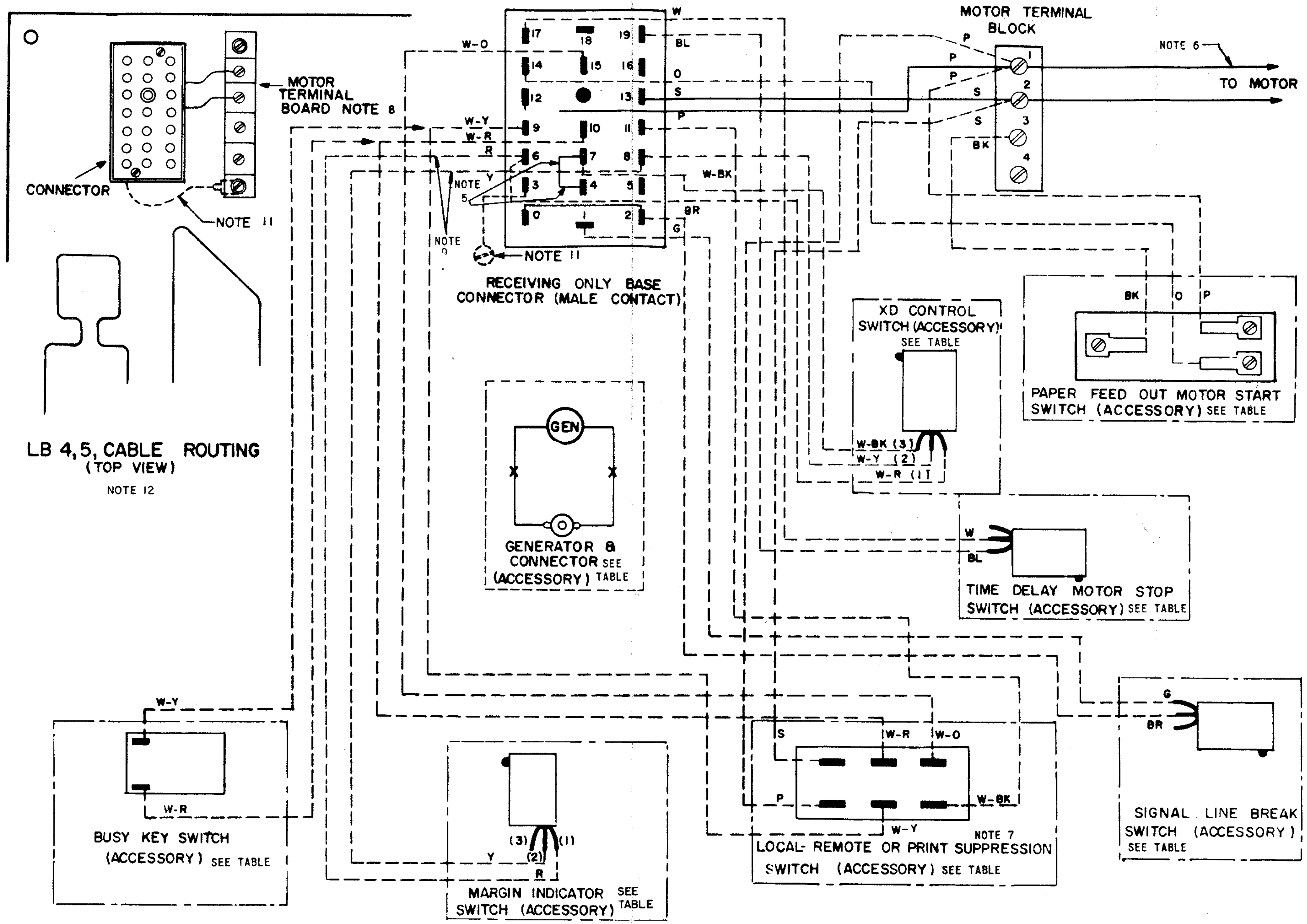
DATE: 4-20-54
P.D. FILE NO.: 2-30.65.156A
DRAWN: N.K.G. CHKD. R.D.
ENGD.: G.A.O. APPD.:

TELETYPE CORPORATION

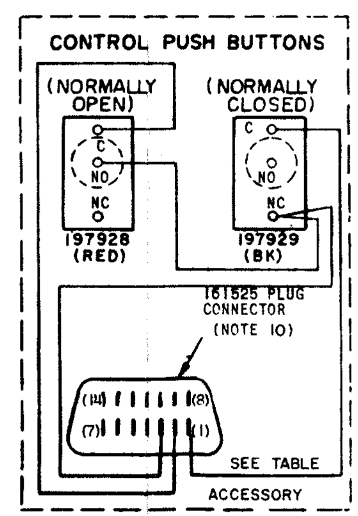
2876 WD

2883WD

NO.	NOTES
1.	POWER CIRCUITS WIRED FOR 115V AC OR DC OPERATION.
2.	WIRE COLOR CODE: BK-BLACK, BL-BLUE, BR-BROWN, W-WHITE, S-SLATE, P-PURPLE, R-RED, Y-YELLOW, G-GREEN, O-ORANGE
3.	CONNECTOR AND SWITCHES VIEWED FROM SOLDER TERMINAL ENDS.
4.	———— DENOTES BASIC WIRING. ----------- DENOTES LEADS FURNISHED WITH ACCESSORY.
5.	STRAP NECESSARY FOR OPERATION WITH LESU 7.
6.	WHEN THE PAPER-FEED OUT MOTOR START SWITCH IS SUPPLIED, MOTOR LEAD CONNECTS TO TERMINAL 3 OF MOTOR TERMINAL BLOCK INSTEAD OF TERMINAL 1.
7.	LOCAL-REMOTE SWITCH SHOULD HAVE A SLOT IN SWITCH TO THE LEFT OR TOWARD THE "LOCAL" SIDE.
8.	WHEN BUSY SWITCH ACCESSORY IS USED CONNECT LEADS TO TERMINALS 9 & 10.
9.	WHEN WIRING LB4/249 & LB200**/252 CONNECT RED WIRE TO TERMINAL 17 AND YELLOW WIRE TO 19.
10.	161525 PLUG CONNECTOR PART OF 164133 CABLE ASSEMBLY - MATES WITH 161526 RECEPTACLE ON 163965 PLATE ASSEMBLY IN LESU45 (LB8/253).
11.	195269 STRAP CONNECTED FROM TERMINAL 3 TO COVER MOUNTING SCREW OF MOTOR TERM. BOARD FOR 179613 R.F. SUPPRESSION MODIFICATION KIT.
12.	FOR ACCESSORY CABLE ROUTING SEE ASSOCIATED SPECIFICATION.
13.	FOR SCHEMATIC SEE ASSOCIATED LESU WD.



ACCESSORY GROUP NUMBER	XD CONTROL SWITCH 154794	BUSY KEY SWITCH 158359	GENERATOR FOR TACHOMETER 154749	PAPER FEED OUT MOTOR START SWITCH 152334	LOCAL-REMOTE SWITCH ASSEMBLY 152342	MARGIN INDICATOR SWITCH ASSEMBLY 152343	SIGNAL LINE BREAK SWITCH ASSEMBLY 152344	TIME DELAY MOTOR STOP SWITCH ASSEM. 152338	PRINT-SUPPRESSION SWITCH ASSEM. 154581	JACK ASSEMBLY FOR TACHOMETER 97143	197928 & 197929 CONTROL PUSH BUTTONS & 164133 CABLE ASSEMBLY (LB8 ONLY)
133					X	X					
146											
160									X		
161								X			
180				X							
202	X		X							X	
207	X										
218		X									
249						X					
252						X					
253											X
259						X			X		



REVISIONS

ISSUE	DATE	AUTH. NO.
~~1~~2	11-5-54	28-4597
~~2~~3	1-26-55	28-4871
~~3~~4	2-2-55	28-4911
5	2-16-55	28-4911-1
6	3-2-55	28-5054
7	3-11-55	28-5096
8	5-16-55	28-5395
9	9-3-55	28-5728
10	6-29-56	28-6799
11	8-31-56	28-6879
12	9-4-56	28-6905
13	12-14-56	28-7261
14	2-19-57	28-7414
15	3-24-59	28-10789
16	9-9-59	28-11778
17	9-14-59	28-11694
18	2-5-60	28-12554
19	10-4-61	71140
20	10-30-61	71425
21	10-1-63	77302
22	12-13-63	79185
23	3-31-65	86474

ACTUAL WIRING DIAGRAM FOR MODEL 28 RECEIVING ONLY BASE LB4, 5, 8, 12, 29, 200 ACCESSORY GROUPS 133, 146, 160, 161, 180, 202, 207, 218, 249, 252, 253, 259

APPROVALS	
D AND R	E OF M

E-NUMBER
PROD. NO. 2883WD
DATE 9-1-54
P.D. FILE NO. 1-30.65-11A
DRAWN J.G.W. CHKD.
ENGD. R.J.R. APPD.

TELETYPE CORPORATION

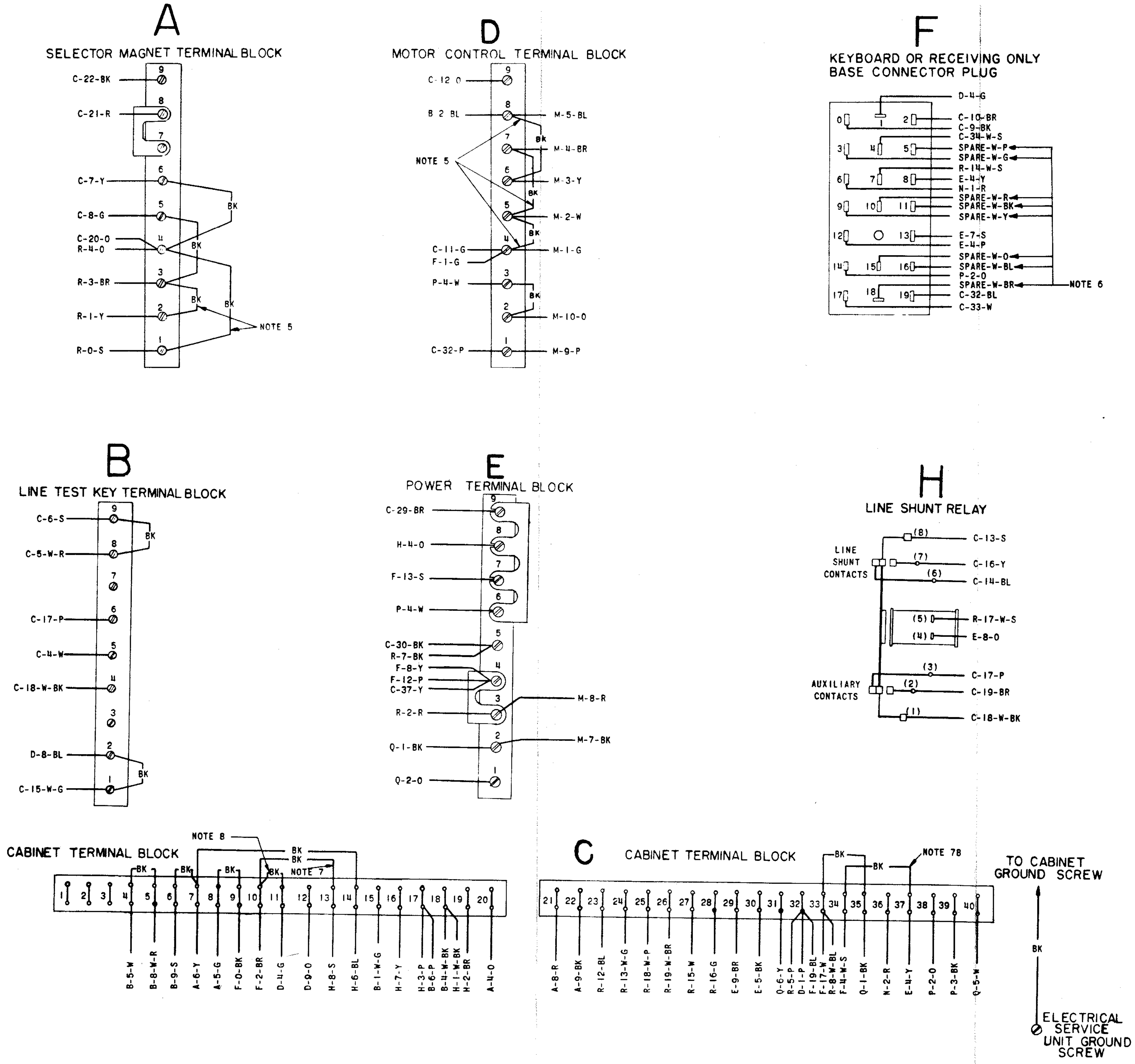
2883WD

NO.	NOTES
1.	WIRING LEGEND: A-1-W-BL — DISTANT TERMINATING AREA; DISTANT TERMINATING DESIGNATION; WIRE COLOR CODE
2.	COLOR CODE: BK - BLACK, BR - BROWN, R - RED, O - ORANGE, Y - YELLOW, G - GREEN, BL - BLUE, P - PURPLE, W - WHITE, S - SLATE
3.	UNIT WIRED FOR 115 VOLTS, 50 TO 60 CYCLE A.C. POWER INPUT ONLY.
4.	PLUGS VIEWED FROM SOLDER TERMINAL ENDS.
5.	CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION. FOR .020 AMP. OPERATION, REMOVE AND ADD CONNECTIONS AS TABULATED BELOW:
6.	THE SPARE LEADS FROM THE KEYBOARD (OR RECEIVE-ONLY BASE) AND TYPING UNIT CONNECTOR PLUGS ARE TERMINATED IN THE RIGHT AND LEFT ENDS OF THE ELECTRICAL SERVICE UNIT, RESPECTIVELY.
7.	LINE SHUNT RELAY SHOWN CONTROLLED BY MOTOR CONTROL CONTACTS AND SHUNTING SELECTOR MAGNETS AND KEYBOARD SIGNAL GENERATOR CONTACTS. A. IF KEYBOARD SHUNTING IS NOT DESIRED, REMOVE THE BLACK STRAP CONNECTED BETWEEN TERMINALS C-10 AND C-13 AND CONNECT TERMINALS C-9 AND C-13. B. FOR DIRECT CONTROL OF THE LINE SHUNT RELAY FROM THE POWER SWITCH, REMOVE STRAP BETWEEN TERMINALS C-34 AND C-37 AND CONNECT TERMINALS C-34 AND C-35. TERMINAL C-13 MAY THEN BE CONNECTED TO EITHER TERMINALS C-9, C-10, C-11, OR C-15 TO OBTAIN THE DESIRED SHUNTING OF THE SIGNAL LINE CIRCUIT.
8.	REMOVE THIS STRAP WHEN ASSOCIATED KEYBOARD OR RECEIVE-ONLY BASE IS EQUIPPED WITH AN ELECTRICAL BREAK SWITCH.
9.	FOR SCHEMATIC WIRING DIAGRAM, SEE 2893WD.

Table under note 5:

SIGNAL LINE CURRENT	CONNECTIONS REMOVED	CONNECTIONS ADDED
.020 AMP.	A1-A4, A2-A3, D4-D5, D5-D7, D6-D8	A1-A2*, D6-D7

* PLACE TWO STRAPS IN PARALLEL



2892 WD

REVISIONS		
ISSUE	DATE	AUTH. NO.
A 2	7-8-55	28-5583
B 3	1-26-56	28-6213
C 4	5-8-57	28-7615
5	3-28-62	69768-10

SHEET 1 OF 2

ACTUAL WIRING DIAGRAM FOR MODEL 28 ELECTRICAL SERVICE UNIT LESU7/147, 191 WITH ELECTRICAL MOTOR CONTROLS 153251(147) & 152336(191)

APPROVALS	
D AND R	E OF M
------	-----

E-NUMBER

PROD. NO. 2892WD

DATE 1-24-55

P.D. FILE NO. 1-30.65.156A

DRAWN U.S. ENG. CHKD. R.D.S.

ENGD. B.M.R. APPD.

TELETYPE CORPORATION

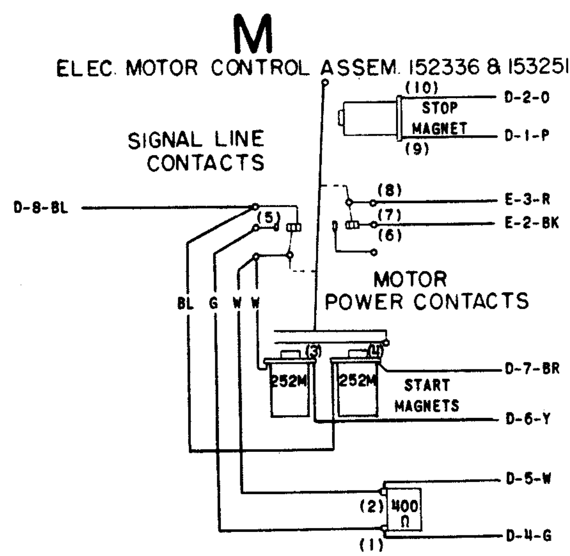
2892 WD

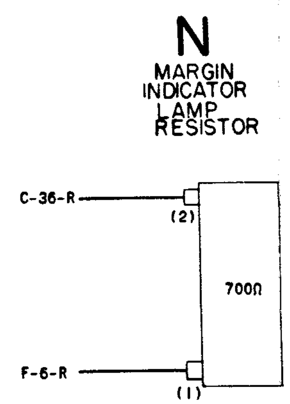
5

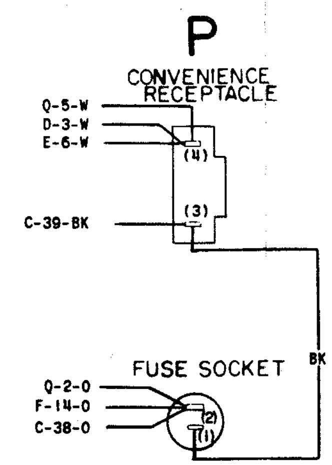
SEE SHEET 1 FOR NOTES.

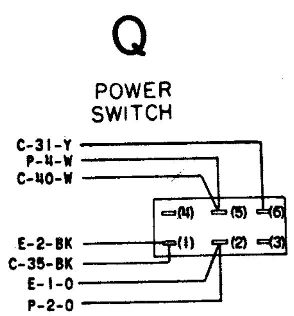
2892 WD

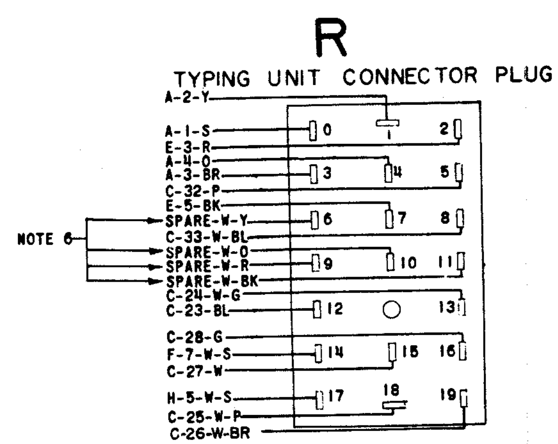
REVISIONS		
ISSUE	DATE	AUTH. NO.
A 2	7-8-55	28-5583
B 3	1-26-56	28-6213
C 4	5-8-57	28-7615
5	3-28-62	69768-10

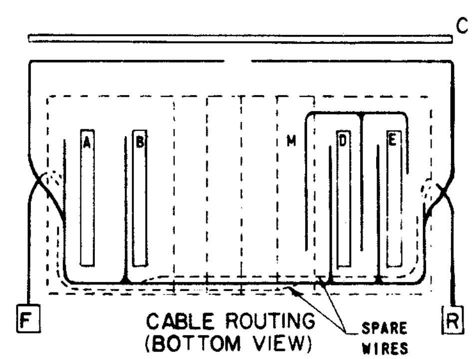












SHEET 2 OF 2

ACTUAL WIRING DIAGRAM FOR MODEL 28 ELECTRICAL SERVICE UNIT LESU7/147, 191 WITH ELECTRICAL MOTOR CONTROLS 153251(147) & 152336(191)

APPROVALS	
D AND R	E OF M
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E-NUMBER

PROD. NO. 2892WD

DATE 1-24-55

P.D. FILE NO. 1-30.65.156A

DRAWN U.S. ENG.	CHKD. R.D.S.
ENGD. B.M.R.	APPD.

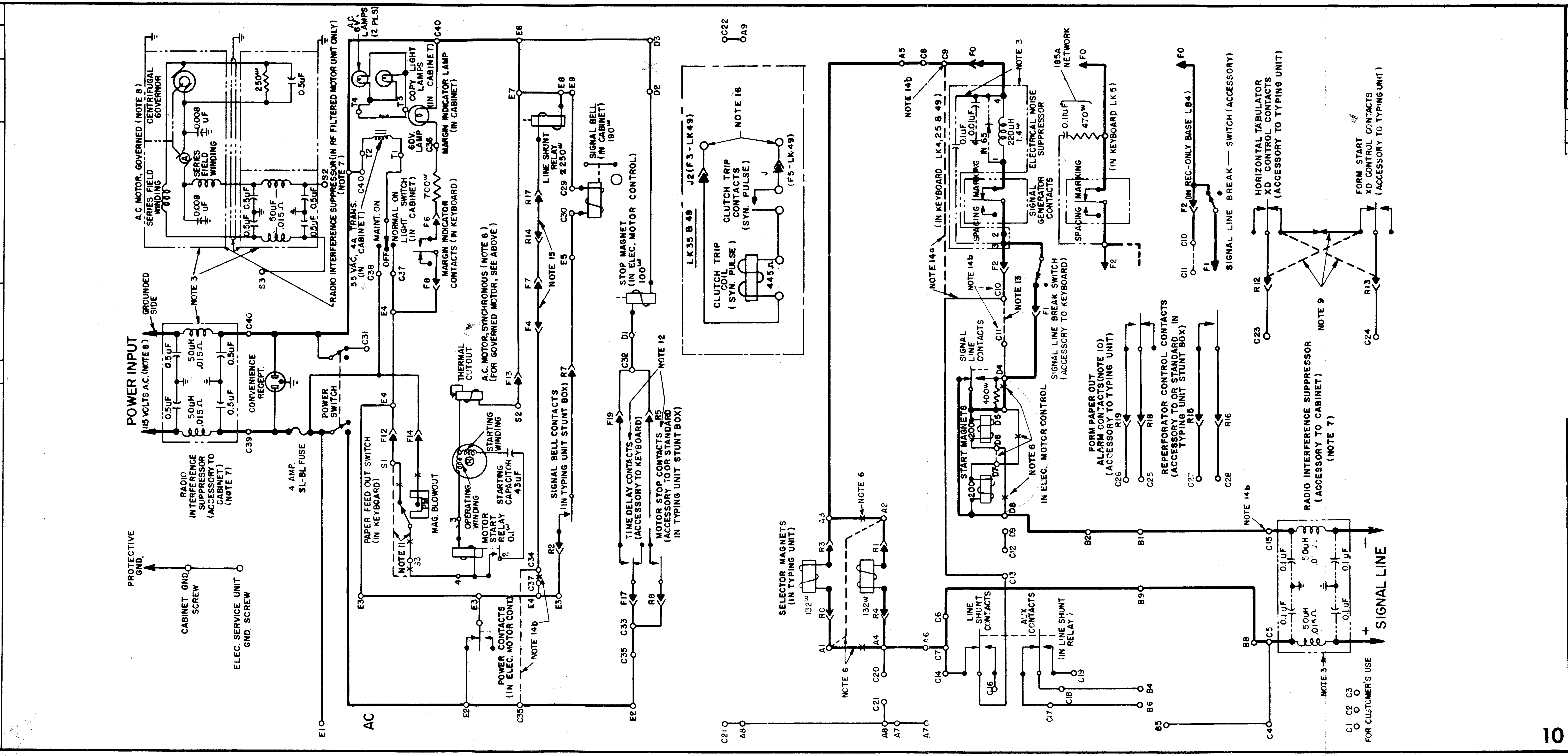
TELETYPE CORPORATION

2892 WD

5

NO.	NOTES
1.	FOR ACTUAL WIRING DIAGRAMS OF INDIVIDUAL UNITS, SEE: WD NUMBER | UNITS DIRECTLY OPERABLE WITH LESU7 2883 WD — BASE RECEIVING ONLY - LB4 3236 WD — CABINETS LAC203, 204, 205 2892 WD — ELECTRICAL SERVICE UNIT LESU7/147 4718 WD — KEYBOARDS - LK35 2882 WD — KEYBOARDS - LK4,5 6462 WD — KEYBOARDS - LK49 2900 WD — MOTOR UNITS - LMU 3,4,6 3214 WD — PAGE TYPING UNITS - LP14 2864 WD — PAGE TYPING UNITS - LP 4,5,7 2880 WD — PAGE TYPING UNITS - LP 6,8
2.	LEGEND: O A SELECTOR MAGNET TERMINAL BLOCK (IN LESU) O B LINE TEST KEY TERMINAL BLOCK (IN LESU) O C CABINET TERMINAL BLOCK O D MOTOR CONTROL TERMINAL BLOCK (IN LESU) O E POWER TERMINAL BLOCK (IN LESU) ≪ F KEYBOARD OR REC. ONLY BASE CONNECTOR ≪ R TYPING UNIT CONNECTOR O S MOTOR TERMINAL BLOCK (ON LK
3	DOT DASH —-—-— LINES INDICATE FILTERING, SHIELDING AND SUPPRESSION NETWORKS.
4.	ALL APPARATUS IS SHOWN IN UNOPERATED OR DE-ENERGIZED POSITIONS.
5.	a. RESISTANCE VALUES IN OHMS (ω) b. INDUCTANCE VALUES IN MICROHENRIES (uH) c. CAPACITANCE VALUES IN MICROFARADS (uF)
6.	CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION FOR .020 AMP. LINE CURRENT, ADD DASHED (- - -) CONNECTIONS AND OMIT CONNECTIONS MARKED (—✕—) IN SELECTOR MAGNETS AND ELEC. MOTOR CONTROL START MAGNETS CIRCUITS.
7.	a. USE POWER AND SIGNAL LINE SUPPRESSORS AND SYNC. OR GOV.-FILT. MOTOR FOR INSTALLATIONS REQUIRING MINIMUM R.F. INTERFERENCE. b. FOR OTHER INSTALLATIONS, OMIT SUPPRESSORS AND CONNECT INPUTS AND GOV. MOTOR, IF USED, DIRECT TO TERMINALS SHOWN.
8	USE SYNCHRONOUS MOTOR ON REGULATED 60∼ (±1%) A.C. POWER ONLY. GOVERNED MOTOR AND OTHER POWER CIRCUITS OPERABLE ON 50 - 60∼ UNREGULATED. A.C.
9.	CIRCUIT SHOWS BOTH HORIZONTAL TABULATOR AND FORM START CONTROL USED ON TYPING UNIT. WHEN ONLY ONE CONTROL IS USED, OMIT CONNECTION MARKED (—✕—) AND ADD PROPER DASHED (— — —) CONNECTION IN TYPING UNIT CIRCUITS.
10.	FORM PAPER OUT ALARM CONTACTS MAY BE MOUNTED ON EITHER THE TYPING UNIT OR EXTERNAL TO THE CABINET IN LATTER EVENT, CONNECTIONS ARE MADE DIRECTLY TO TERMINALS C25 AND C26.
11.	WHEN PAPER FEED-OUT SWITCH IS NOT USED ADD DASHED (— — —) CONNECTIONS AND OMIT CONNECTIONS MARKED (—✕—) IN MOTOR POWER CIRCUITS.

NO.	NOTES
12.	TO OPERATE MOTOR CONTROL, SET MUST BE EQUIPPED WITH EITHER: (A) TIME DELAY MECH., OR (B) MOTOR STOP CONTACTS.
13.	CIRCUITS SHOW A SIGNAL LINE BREAK SWITCH IN BOTH KEYBOARD AND RECEIVING ONLY BASE. WHEN SWITC' IS NOT USED, ADD DASHED (— — — —) CONNECTIONS AND OMIT CONNECTIONS MARKED (—✕—)
14.	a. LINE SHUNT RELAY SHOWN CONTROLLED BY MOTOR CONTROL CONTACTS AND SHUNTING SELECTOR MAGNETS AND KEYBOARD SIGNAL GENERATOR CONTACTS. SHUNTING CIRCUIT CONNECTION TO C13 MUST BE MOVED FROM C10 TO C9 IF KEYBOARD SHUNTING IS NOT REQUIRED OR WHEN SIGNAL LINE BREAK SWITCH IS ABSENT. b. FOR DIRECT CONTROL OF LINE SHUNT RELAY FROM POWER SWITCH, ADD DASHED (----) CONNECTION AND OMIT CONNECTION MARKED (—✕—) AT CABINET TERMINALS C34, C35, AND C37. CUSTOMER MAY THEN SELECT PORTION OF SIGNAL LINE CIRCUIT TO BE SHUNTED BY CONNECTING TERMINAL C13 TO EITHER C9, C10, C11 OR C15.
15.	IF LK3 KEYBOARD, LB3 REC. ONLY BASE, OR LP3 TYPING UNIT IS TO BE USED WITH LESU 7/147, & 191, STRAP F4 TO F7 AND/OR R14 TO R17 MUST BE ADDED TO ITS CONNECTOR, IN ORDER TO COMPLETE LINE SHUNT RELAY CIRCUIT. (EITHER STRAP MAY ALREADY BE IN CIRCUIT)
16.	CONNECTED BY CUSTOMER, TO TWO OPEN CABINET TERMINALS.



2893 WD

REVISIONS

ISSUE	DATE	AUTH. NO.
~~A~~ 2	7-8-55	28-5583
~~B~~ 3	8-4-55	28-5619
~~C~~ 4	12-31-5[illegible]	28-7216
~~D~~ 5	7-11-57	28-7723
~~E~~ 6	1-3-62	72044
~~F~~ 7	3-28-62	6976-10
~~G~~ 8	10-11-63	79301
~~H~~ 9	11-20-63	78859
10	1-3-66	88875

SCHEMATIC
WIRING DIAGRAM
MODEL 28
PAGE PRINTER SET
WITH FACILITIES PROVIDED BY
ELEC. SERVICE UNIT
LESU7/147,191
AND ASSOCIATED UNITS
WITH ELEC. MOTOR CONTROL 153251(147)&152336(191)

APPROVALS

D AND R	E OF M

E-NUMBER
PROD. NO.
DATE: [illegible]-24-55
P.O. FILE NO. [illegible]
DRAWN. [illegible] CHKD.
ENGD. [illegible] APPD.

TELETYPE CORPORATION

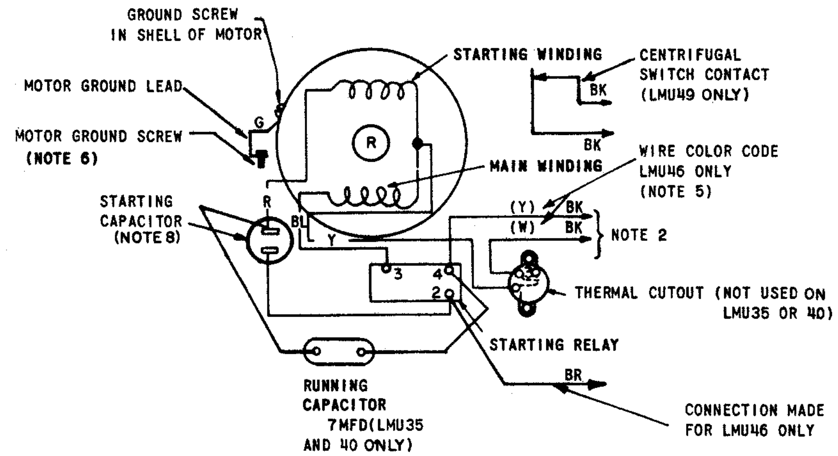
10 2893 WD

SYNCHRONOUS MOTOR UNITS

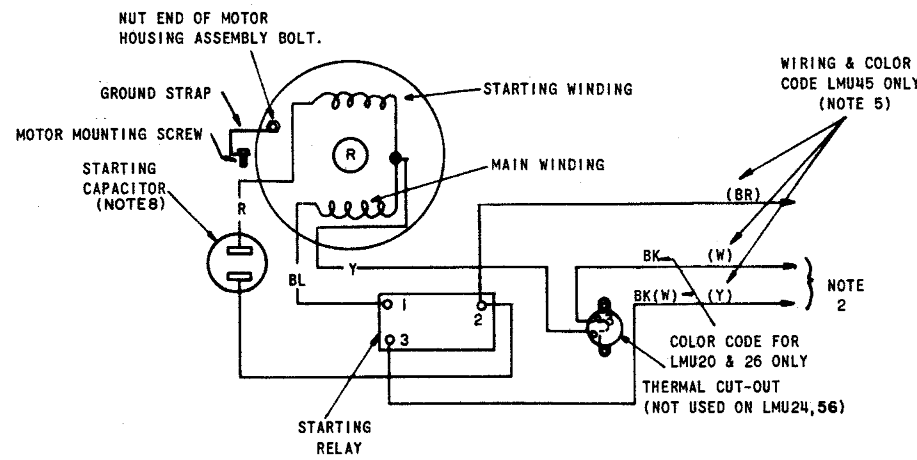
NOTE:
REVISION INFORMATION MUST ALSO BE REFLECTED ON THE ISSUE CONTROL RECORD, WHICH IS A PART OF THIS DRAWING.

NO.	NOTES
1.	SYNCHRONOUS MOTOR OPERATES ON REGULATED FREQUENCY (± 0.75%) MAXIMUM AC ONLY.
2.	CONNECT EITHER WIRE TO DESIGNATED TERMINALS OF UNIT TERMINAL BLOCK, PER WIRING DIAGRAM OF ASSOCIATED UNIT.
3.	MOTOR LEADS OF SAME COLOR ARE INTERCHANGEABLE.
5.	EXTERNAL NOISE SUPPRESSION NETWORK CONSISTING OF 100 OHM, 1/2 WATT RESISTOR IN SERIES WITH 0.25 MFD 1K V CAPACITOR CONNECTED ACROSS YELLOW AND BROWN WIRES. (FOR LMU45,46)
6.	MOTOR GROUND LEAD (GREEN) TERMINAL MUST BE FASTENED TO MOUNTING CRADLE OF MOTOR UNDER A SEPARATE GROUND SCREW ONLY. A SCREW USED FOR ANOTHER PURPOSE CANNOT BE USED FOR GROUNDING (UNDERWRITERS LABORATORIES REQUIREMENT).
7.	WIRE COLOR CODE: BK - BLACK, R - RED BL - BLUE, O - ORANGE BR - BROWN, Y - YELLOW P - PURPLE, S - SLATE W - WHITE, G - GREEN
8.	(see table below)

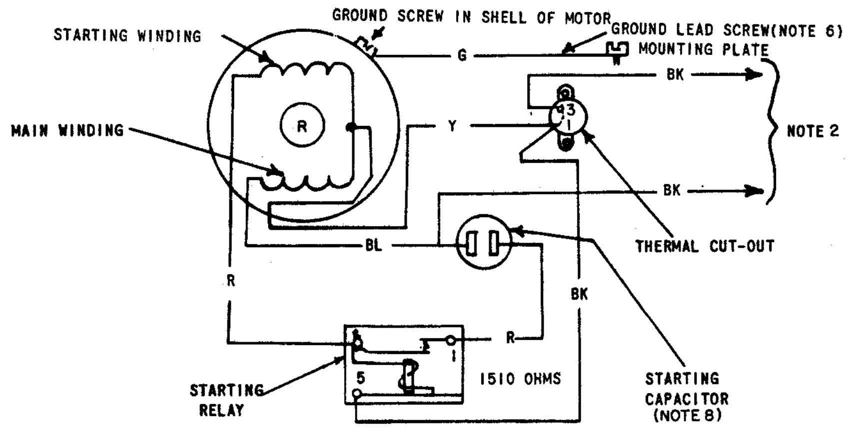
LMU	STARTING CAPACITOR VALUE
3,15,21,30,33, 36,37,38,42, 46,49,51,52	43–48 MFD
11,12	170–226 MFD
35, 40	64–77 MFD
55	15–18 MFD
19,20,24,26, 31,45,56	88–108 MFD
50,54	161–193 MFD



LMU 3,11,12,15,21,30,37,42,46,49
FOR USE WITH 115V.A.C. 60~POWER SUPPLY
LMU 33,35,36,38,40,51,52
FOR 115V.A.C. 50~POWER SUPPLY.
LMU 55
FOR 230 V.A.C. 50~POWER SUPPLY



LMU 19,20,24,26,31,45,56
FOR USE WITH 115V AC 60~POWER SUPPLY ONLY



LMU 50,54
FOR USE WITH 115V AC 50~POWER SUPPLY ONLY

2900WD

REVISIONS

ISSUE	DATE	AUTH. NO.
L	2-15-60	28-12447
M	5-17-60	28-13280
N	5-27-60	28-13361
P	7-6-60	28-13494
Q	9-13-60	28-13899
R	12-14-60	28-14406
S	6-23-61	70255
T	8-8-61	70559
U	10-18-61	71471
V	11-30-61	71805
W	8-24-62	74285
X	9-20-62	74557
Y	11-29-62	75216
Z	4-15-63	76588
AA	4-15-63	76592
AB	5-16-63	76965
AC	5-28-63	76149
AD	8-22-63	77845
AE	1-13-64	79966
AF	1-24-64	79730-1
32	4-13-64	79730-2
33	5-22-64	82008
34	11-4-64	84364
35	3-4-65	82432
36	4-10-65	82432-1
37	9-22-65	82432-3
38	11-8-65	82432-4
39	11-10-65	87664
40	2-22-66	90356
41	4-5-66	90628
42	9-21-66	91790

SEE ISSUE CONTROL RECORD FOR COMPLETE LIST OF SHEETS COMPRISING THIS W.D.

SHEET 1 WDP

ACTUAL WIRING DIAGRAM FOR MODEL 28 & 35 MOTOR UNITS

APPROVALS

D AND R	E OF M
- - - - -	- - - - -

E-NUMBER
PROD. NO. 2900WD
DATE 1-28-55
P.D. FILE NO. 1-30.65.156A
DRAWN E.R. CHKD. RE7
ENGD. B.M.B. APPD.

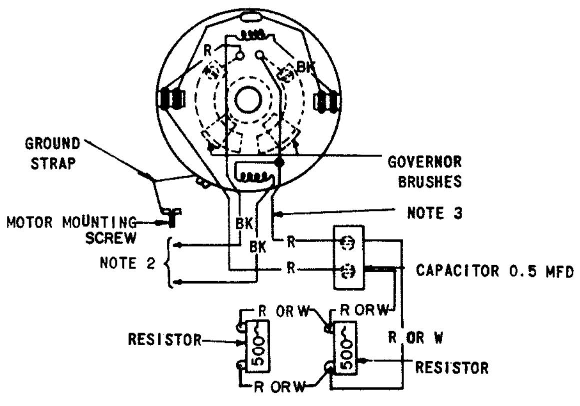
TELETYPE CORPORATION

2900WD

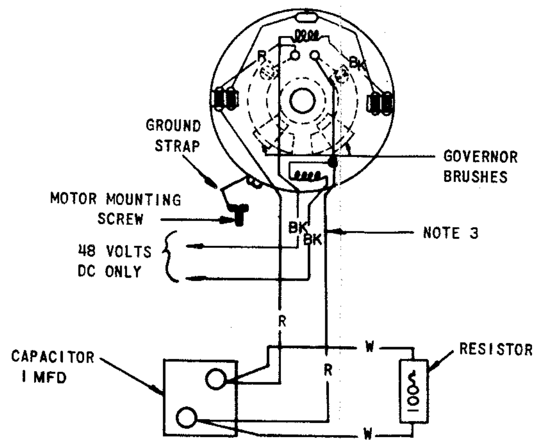
SERIES GOVERNED MOTOR UNITS

NO.	NOTES
1.	A. AC SERIES MOTOR UNITS OPERATE ON UN-REGULATED AC POWER. B. ASSOCIATED LESU MUST BE EQUIPPED WITH CAPACITOR-RESISTOR ASSEMBLY FOR DC OPERATION OF GOVERNED MOTORS.
2.	CONNECT EITHER WIRE TO DESIGNATED TERMINALS OF UNIT TERMINAL BLOCK, PER WIRING DIAGRAM OF ASSOCIATED UNIT.
3.	MOTOR LEADS OF SAME COLOR ARE INTER-CHANGEABLE.
4.	MOTOR LEADS ARE ENCLOSED IN APPROXIMATLY 10" LONG COPPER SHIELDING & FASTENED TO MOTOR AND CONTROL PARTS COMPARTMENT. (FOR LMU28).
5.	LMU4, 10, AND 14 MOTOR UNITS (UNIVERSAL SERIES GOVERNED) CONTAIN TWO 500 OHM RESISTORS WIRED IN PARALLEL EQUIVALENT TO 250 OHMS. LMU4 MOTOR UNIT SUPERSEDED BY LMU41 MOTOR UNIT. LMU10 MOTOR UNIT SUPERSEDED BY LMU47 MOTOR UNIT. LMU14 MOTOR UNIT SUPERSEDED BY LMU39 MOTOR UNIT.
6.	WIRE COLOR CODE: BK - BLACK R - RED BL - BLUE O - ORANGE BR - BROWN Y - YELLOW P - PURPLE S - SLATE W - WHITE G - GREEN

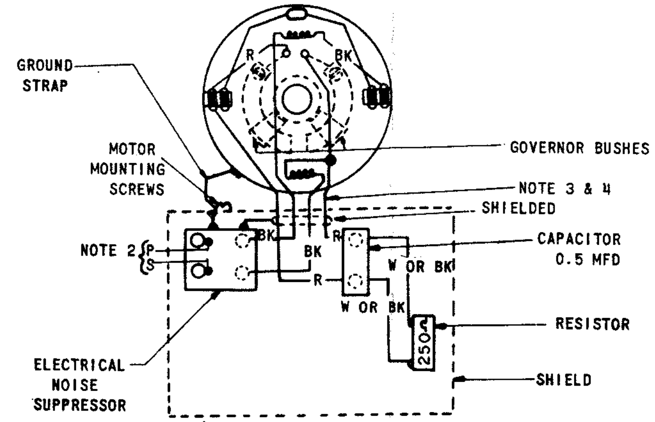
NOTE:
REVISION INFORMATION MUST ALSO BE REFLECTED ON THE ISSUE CONTROL RECORD, WHICH IS A PART OF THIS DRAWING.



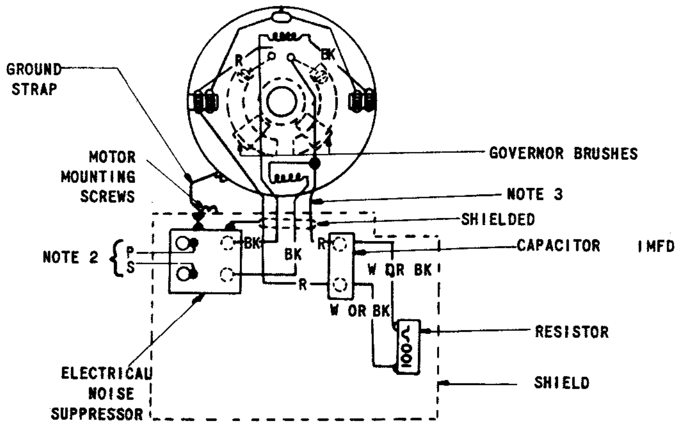
LMU 6,13 **(UNIVERSAL)**
WITHOUT RADIO FREQUENCY SUPPRESSORS
FOR USE WITH EITHER 115V AC 50-60~OR 115V DC POWER SUPPLY (NOTE 1B).



LMU 23 **(48 VOLTS)**
WITHOUT RADIO FREQUENCY SUPPRESSORS
FOR USE ON 48 V.D.C. POWER SUPPLY ONLY.



LMU 28,32,39,41,47 **(UNIVERSAL)**
WITH RADIO FREQUENCY SUPPRESSORS
FOR USE WITH EITHER 115V AC 50-60~115 V DC POWER SUPPLY (NOTE 1B)



LMU 29 **(48 VOLTS)**
WITH RADIO FREQUENCY SUPPRESSORS
FOR USE ON 48 VOLT DC POWER SUPPLY ONLY

2900WD

REVISIONS

ISSUE	DATE	AUTH. NO.
L	2-15-60	28-12447
M	5-17-60	28-13280
N	5-27-60	28-13361
P	7-6-60	28-13494
Q	9-13-60	28-13899
R	12-14-60	28-14406
S	6-23-61	70255
T	8-8-61	70559
U	10-18-61	71471
V	11-30-61	71805
W	8-24-62	74285
X	9-20-62	74557
Y	11-29-62	75216
Z	4-15-63	76588
AA	4-15-63	76592
AB	5-16-63	76965
AC	5-28-63	76149
AD	8-22-63	77845
AE	1-13-64	79966
AF	1-24-64	79730-1
32	4-13-64	79730-2
33	5-22-64	82008
34	11-4-64	84364
35	3-4-65	82432
36	4-10-65	82432-1
37	9-22-65	82432-3
38	11-8-65	82432-4
39	11-10-65	87664
40	2-22-66	90356
41	4-5-66	90628

WDP

SEE ISSUE CONTROL RECORD FOR COMPLETE LIST OF SHEETS COMPRISING THIS W.D.

SHEET 2

ACTUAL WIRING DIAGRAM FOR MODEL 28 & 35 MOTOR UNITS

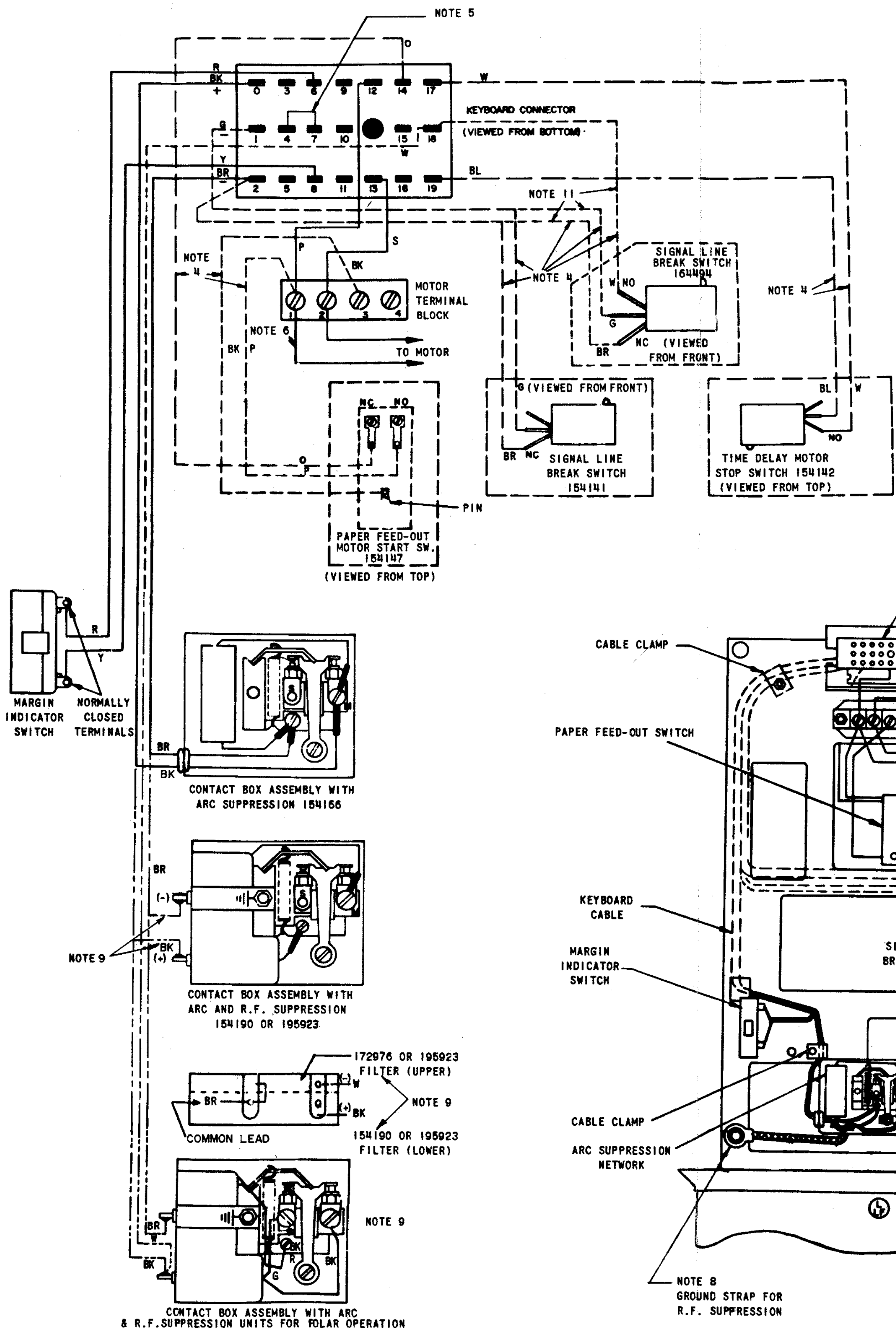
APPROVALS	
D AND R	E OF M
E-NUMBER	
PROD. NO. 2900WD	
DATE 1-28-55	
P.D. FILE NO. 1-30.65.156A	
DRAWN E.R.	CHKD. RETL
ENGD. B.M.B.	APPD.

TELETYPE CORPORATION

41 2900 WD

2928 WD

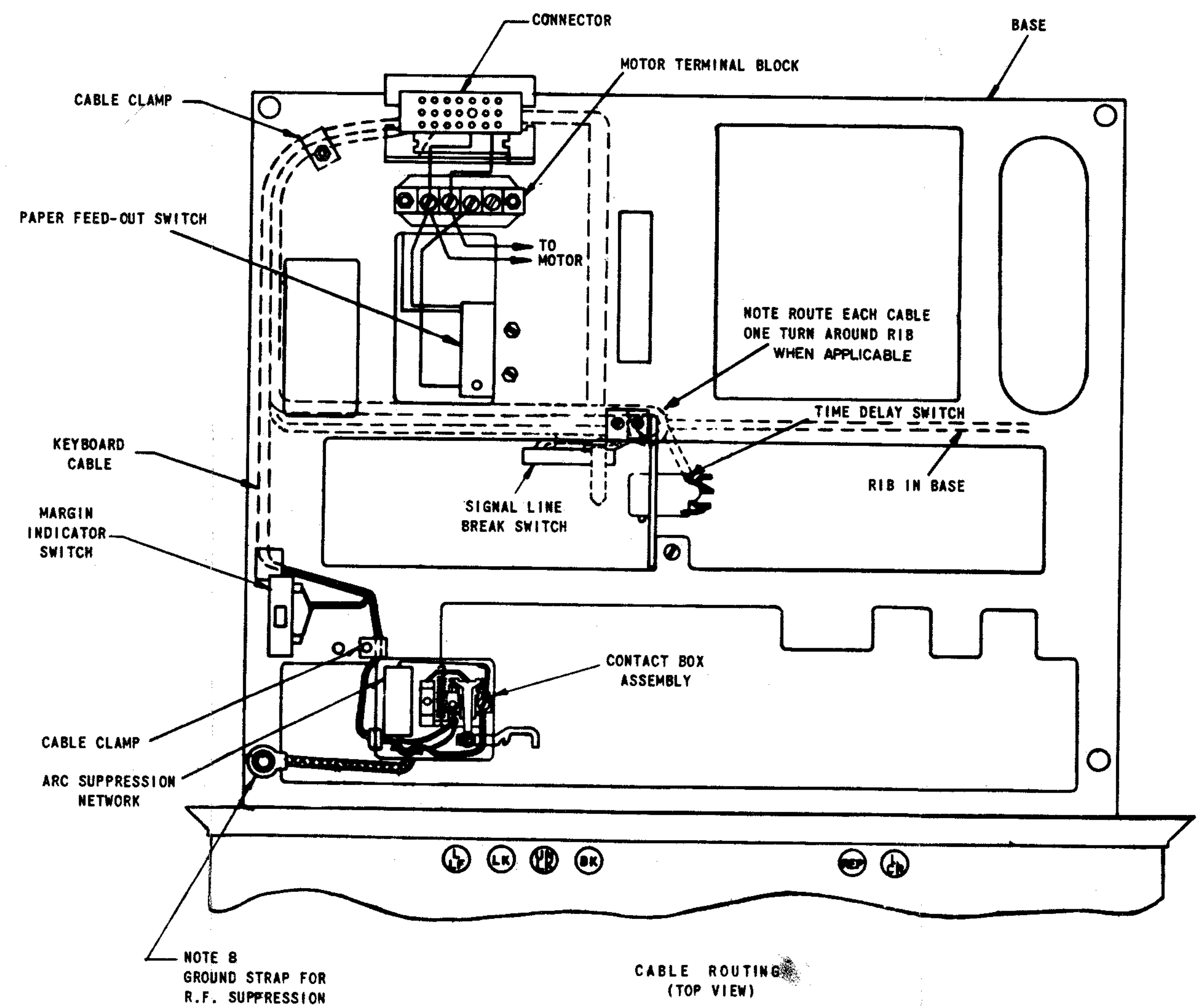
NO.	NOTES
1.	POWER CIRCUITS WIRED FOR 115V AC OR DC OPERATION.
2.	WIRE COLOR CODE: BK - BLACK　Y - YELLOW R - RED　O - ORANGE P - PURPLE　W - WHITE G - GREEN　BR - BROWN BL - BLUE　S - SLATE
3.	CONNECTORS VIEWED FROM SOLDER TERMINAL ENDS.
4.	— — — — DENOTES LEADS FURNISHED WITH OPTIONAL ELECTRICAL COMPONENTS.
5.	STRAP NECESSARY FOR OPERATION WITH LESU7 AND LESU92.
6.	WHEN THE PAPER FEED-OUT MOTOR START SWITCH IS SUPPLIED, NO. 1 MOTOR LEAD CONNECTS TO TERMINAL 3 INSTEAD OF TERMINAL 1 OF MOTOR TERMINAL BLOCK.
7.	_._._._.. DENOTES ALTERNATE BASIC CABLE CONNECTION.
8.	GROUND STRAP TERMINATES AT TOP OF KEYBOARD BASE LOWER PLATE BY MEANS OF LEFT FRONT 151549 KEYBOARD SPECIAL MOUNTING SCREW.
9.	FOR PROPER R.F. FILTERING, POLARITY MUST BE MAINTAINED WHEN 154190 AND 172976 FILTERS ARE USED. UNIT AS FURNISHED IS WIRED FOR "MARKING" CONTACTS POSITIVE (+), "SPACING" CONTACT NEGATIVE (-). TO REVERSE POLARITY ON CONTACTS SO THAT THE "MARKING" CONTACT IS NEGATIVE (-) AND "SPACING" CONTACT IS POSITIVE (+), MAKE THE FOLLOWING CONNECTIONS IN THE CONTACT BOX ASSEMBLY: 1. MOVE BLACK LEAD OF BOTTOM FILTER FROM "MARKING" CONTACT TO "SPACING" CONTACT. 2. MOVE GREEN LEAD OF TOP FILTER FROM "SPACING" CONTACT TO "MARKING" CONTACT. POLARITY MAY BE DISREGARDED WHEN UNITS ARE FURNISHED WITH 195923 FILTERS. COLOR CODING OF FILTER LEADS DOES NOT APPLY TO 195923 FILTERS.
10.	UNITS ARE EQUIPPED WITH 172976 OR 195923 R.F. AND ARC SUPPRESSOR TO FILTER SPACING CONTACT.
11.	ON LK37, ATTACH LEADS FROM LINE BREAK SWITCH TO KEYBOARD CONNECTOR AS FOLLOWS: WHITE LEAD TO F-18 GREEN LEAD TO F-3 BROWN LEAD TO F-1



OPTIONAL ELECTRICAL COMPONENTS							
UNIT CODE	ARC SUPPRESSION ONLY 154166	R.F.& ARC SUPPRESSION 154190 OR 195923	SIGNAL LINE BREAK 154141	TIME DELAY 154142	PAPER FEED-OUT 154147	SIGNAL LINE BREAK 164494	MOD. KIT 178808 WIRE PER 4312WD
LK6	●						
LK8		●	●	●			
LK9		●	●				
LK10		●	●	●			
LK11		●	●				
LK12		●			●		
LK13		●	●				
LK14	●		●				
LK15	●		●	●			
LK16	●		●				
LK18	NOTE	10 ●				●	
LK28	●		●				●
LK32	●		●				
LK37	NOTE 10	●		●		●	
LK39		●	●	●			

● DENOTES ITEM PRESENT

REVISIONS		
ISSUE	DATE	AUTH. NO.
A	6-17-57	28-7718
B	3-20-58	28-8693
C	3-3-59	28-10801
~~D~~ 5	7-8-59	28-11507
~~E~~ 6	9-8-59	28-11692
~~F~~ 7	10-21-59	28-11878
8	11-17-59	28-12042
9	12-22-59	28-12323
10	4-13-60	28-13096
11	9-1-60	28-13832
12	11-11-60	28-14103
13	9-11-61	70895
14	1-5-62	72084
15	8-2-62	74051
16	3-4-63	76174
17	5-2-63	76756
18	3-26-64	79225-1
19	12-22-65	89377
20	2-28-66	89635



CABLE ROUTING
(TOP VIEW)

ACTUAL WIRING DIAGRAM FOR MODEL 28 KEYBOARD LK6, 8 AND UP (MARK III)

APPROVALS	
D AND R	E OF M
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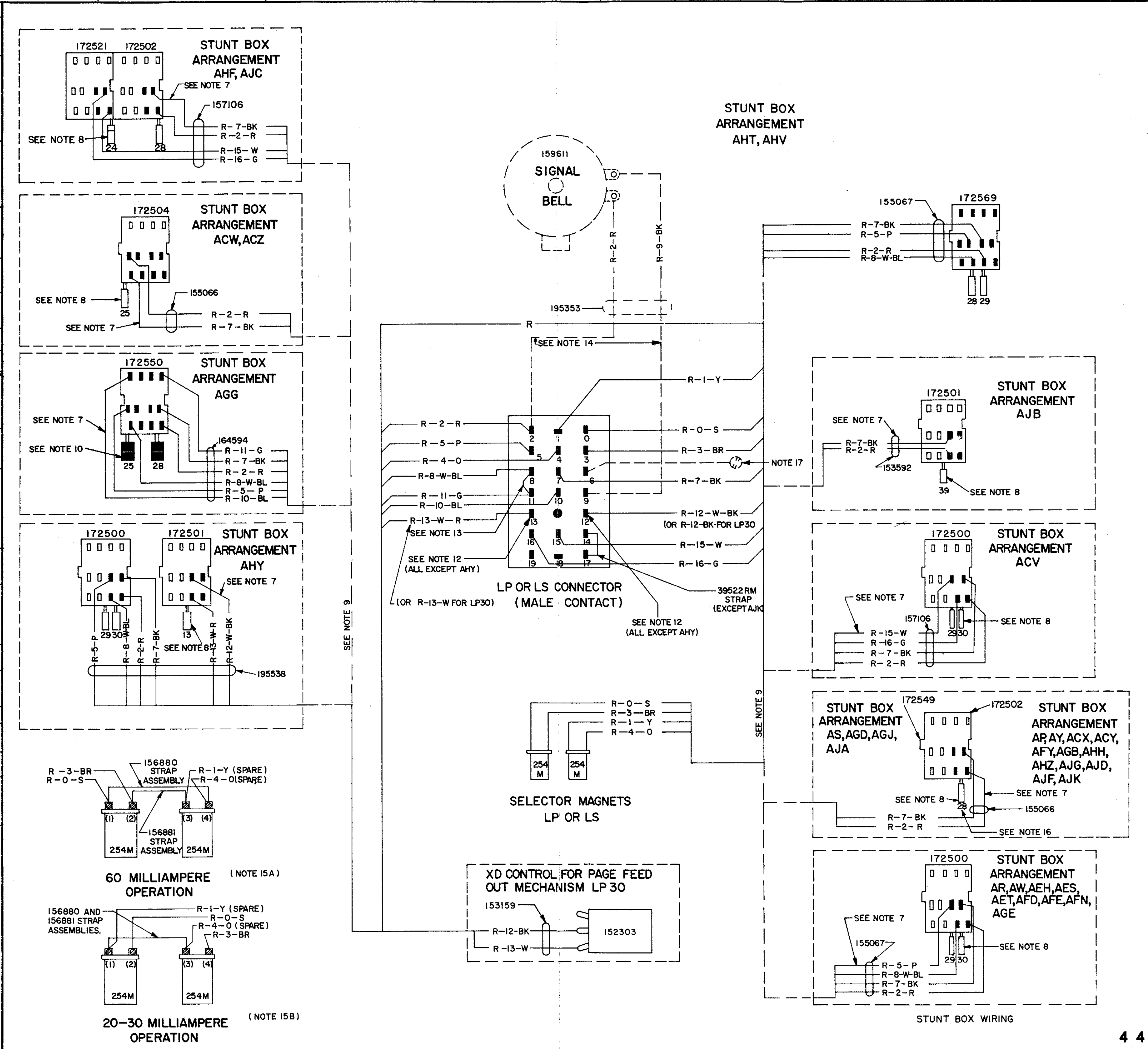
E-NUMBER	
PROD. NO.	2928WD
DATE	9-2-55
P.D. FILE NO.	2-18.65AA
DRAWN I.B.	CHKD. R.D.
ENGD. M.F.M.	APPD. T.I.P.

TELETYPE CORPORATION

2928 WD

NO.	NOTES
1.	WIRING CHANNEL DESIGNATED BY "R" DOES NOT REPRESENT CABLES, BUT ASSISTS IN TRACING CONNECTIONS.
2.	COLOR CODE: BK—BLACK, BL—BLUE, W—WHITE, R—RED, Y—YELLOW, BR—BROWN, P—PURPLE, O—ORANGE, S—SLATE, G—GREEN
3.	COLOR LEGEND: R- 8- W: CHANNEL IDENTIFICATION, CHANNEL WIRE NUMBER, WIRE COLOR CODE
4.	
5.	CONNECTOR VIEWED FROM SOLDERED TERMINAL ENDS.
6.	
7.	THESE LEADS FURNISHED WITH FUNCTION BOX.
8.	NORMALLY OPEN CONTACTS; NORMALLY CLOSED CONTACTS
9.	A COMPLETE LP UNIT USES ONLY ONE STUNT BOX. MAKE APPROXIMATE (----) CONNECTIONS TO COMPLETE CIRCUIT.
10.	TRANSFER CONTACTS: REAR CONTACTS NORMALLY OPEN; REAR CONTACTS NORMALLY CLOSED
11.	THE FOLLOWING STUNT BOXES ARE WITHOUT SWITCH ASSEMBLIES: AX, ADL.
12.	THESE TWO TERMINALS ARE USED WHEN LP IS EQUIPPED WITH XD CONT. PAGE FEED OUT OR XD CONT. HORIZ. TAB. IF BOTH FEATURES ARE USED, THEY ARE WIRED IN SERIES TO THESE TERMINALS.
13.	USE 39522RM STRAP FOR LP 95,96,97,102,122
14.	THE 159611 SIGNAL BELL AND THE 195353 CABLE ASSEMBLY ARE CONTAINED ON THE LPIII ONLY.
15.	A. THE LP III IS FACTORY WIRED FOR 60MA OPER. B. THE LP III MAY BE CONVERTED FOR 20-30MA. OPERATION BY THE CUSTOMER.
16.	FOR AFY STUNT BOX, CONTACT IS OVER SLOT 30.
17.	195269 STRAP CONNECTED FROM TERMINAL 6 TO CONNECTOR BRACKET MOUNTING SCREW FOR 179613 AND 179644 RF SUPPRESSION MODIFICATION KITS.



4 4

3214 WD

REVISIONS		
ISSUE	DATE	AUTH. NO.
41	12-23-63	79185-1
42	1-9-65	85722
43	2-3-65	85959
44	8-25-66	90726

ACTUAL
WIRING DIAGRAM FOR MODEL 28, TYPING UNITS
LP 14,15,16,17,20,21,23,26,27,28,30,31,34,38,39,43,44,55,56,60,65,67,68,70,73,84,96,101,108,111,113,122,72,105,109,115

STUNT BOX
AP,AR,AS,AW,AX,AY,ACV,ACW,ACX,ACY,ACZ,ADL,AEH,AES,AET,AFD,AFE,AFN,AGB,AGD,AGE,AFY,AGJ,AGG,AHF,AHH,AHT,AHV,AHY,AHZ,AJG,AJA,AJC,AJD,AJF,AJG,AJB,AJK

SEQUENTIAL SELECTOR UNIT LS 2,4

APPROVALS	
D AND R	E OF M
H.J.K.	

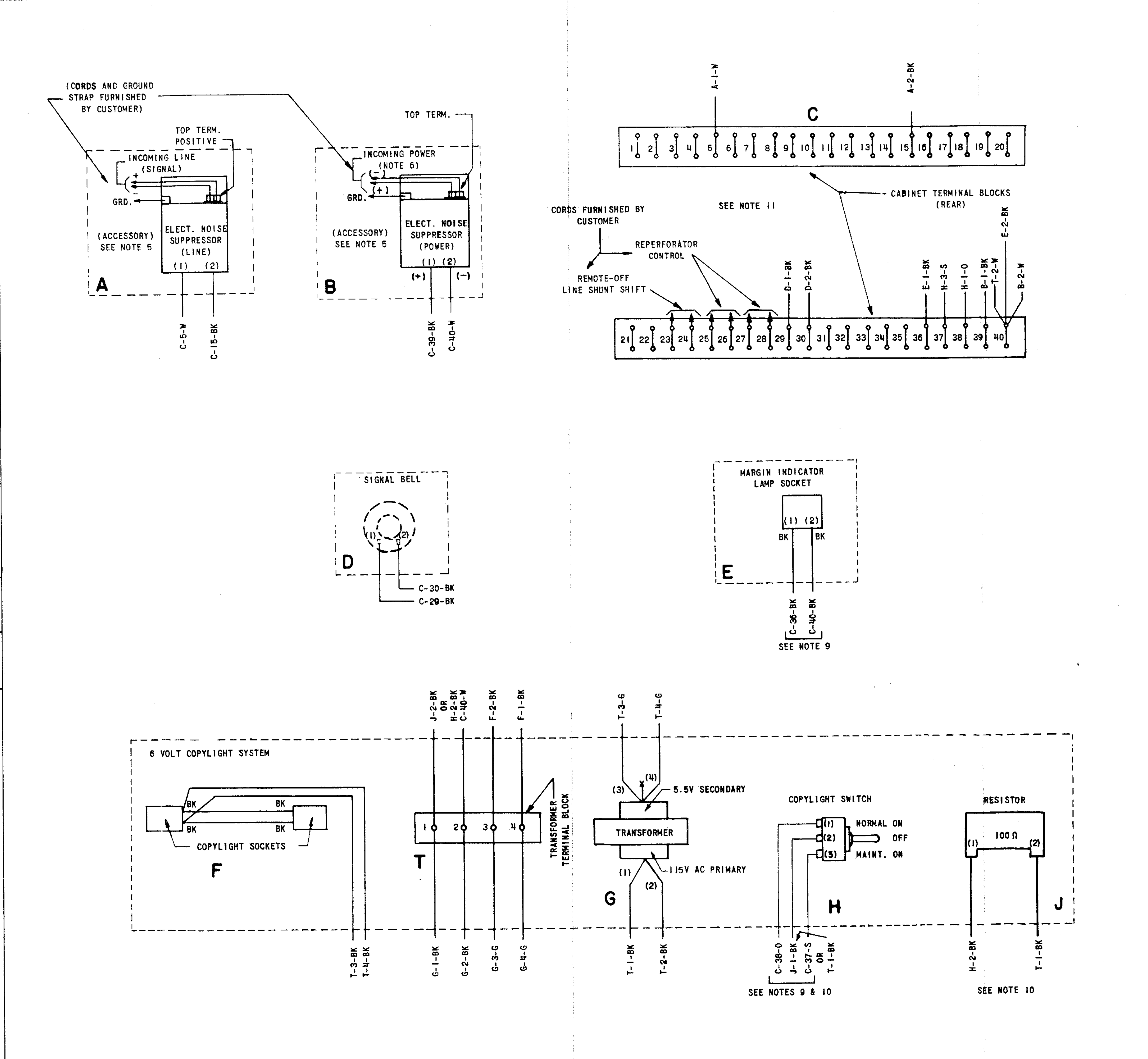
E-NUMBER
PROD. NO. 3214 WD
DATE 12-1-56
P.D. FILE NO. 45-3065AA

DRAWN J.E.R.	CHKD. G.G.
ENGD. V.C.	APPD. O.A.L.

TELETYPE CORPORATION

3214 WD

NO.	NOTES
1.	WIRING LEGEND: A-1-W — DISTANT TERMINATING AREA; DISTANT TERMINATING DESIGNATION; WIRE COLOR CODE
2.	COLOR CODE: BK - BLACK, BL - BLUE, BR - BROWN, G - GREEN, O - ORANGE, P - PURPLE, R - RED, S - SLATE, W - WHITE, Y - YELLOW
3.	—x— DENOTES SPLICED AND TAPED WIRES.
4.	COMPONENTS SHOWN DOTTED ARE ACCESSORIES TO CABINET.
5.	USE POWER AND SIGNAL LINE INTERFERENCE SUPPRESSORS FOR INSTALLATIONS REQUIRING MINIMUM R.F. INTERFERENCE. FOR OTHER INSTALLATIONS, OMIT SUPPRESSORS AND CONNECT INPUTS DIRECTLY TO TERMINALS SHOWN.
6.	CABINET POWER CIRCUIT WIRED FOR 115V 50-60~ A.C. OPERATION ONLY. THE ASSOCIATED ELECTRICAL SERVICE UNIT MUST BE WIRED FOR A.C. OPERATION.
7.	NECESSARY STRAP CONNECTIONS AT THE CABINET TERMINAL BLOCKS ARE SHOWN ON THE ASSOCIATED ELECTRICAL SERVICE UNIT WIRING DIAGRAM. SEE THE LESU7 ACCESSORY GROUP B/M FOR THE DIAGRAM NUMBER.
8.	CONNECTOR VIEWED FROM SOLDER TERMINAL END.
9.	ROUTE MARGIN INDICATOR CABLE ALONG COPYLIGHT CABLE AND COPYLIGHT SWITCH CABLES. FASTEN INDICATOR AND SWITCH CABLES UNDER LOWER LEFT-HAND MOUNTING SCREW FOR THE RIGHT CABINET HINGE WITH CABLE CLAMPS, LOCK WASHERS, AND SCREWS SUPPLIED WITH THE COPYLIGHT KIT.
10.	AREA "J" IS NOT AVAILABLE WHEN USING THE 159357 MOD. KIT, THEREFORE, AREA "H" AND "T" ARE WIRED IN THE ALTERNATE METHOD.
11.	SEE APPROPRIATE ELECTRICAL SERVICE UNIT WIRING DIAGRAM. (AS INDICATED ON THE LESU7 ACCESSORY GROUP B/M). FOR SCHEMATIC, SEE ASSOCIATED LESU WD.



3236WD

REVISIONS

ISSUE	DATE	AUTH. NO.
A	11-26-56	28-7193
B	12-19-56	28-7260
C	7-11-57	28-7723
D 5	8-8-58	28-9690
E 6	10-14-58	28-9997
F 7	11-20-58	28-10197
8	3-11-59	28-10785
9	3-25-59	28-10913
10	9-22-61	71027

ACTUAL WIRING DIAGRAM FOR MODEL 28 PAGE PRINTER CABINETS LAC203, 204, 205, 217 ARRANGED FOR AC APPLICATION ACC GROUPS 137, 148, 149, 194, 195, 221, 222, 236, 237, 238, 239, 250

APPROVALS

D AND R	E OF M
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E-NUMBER

PROD. NO. 3236WD

DATE 7-24-56

P.D. FILE NO. 2-30.65.156A

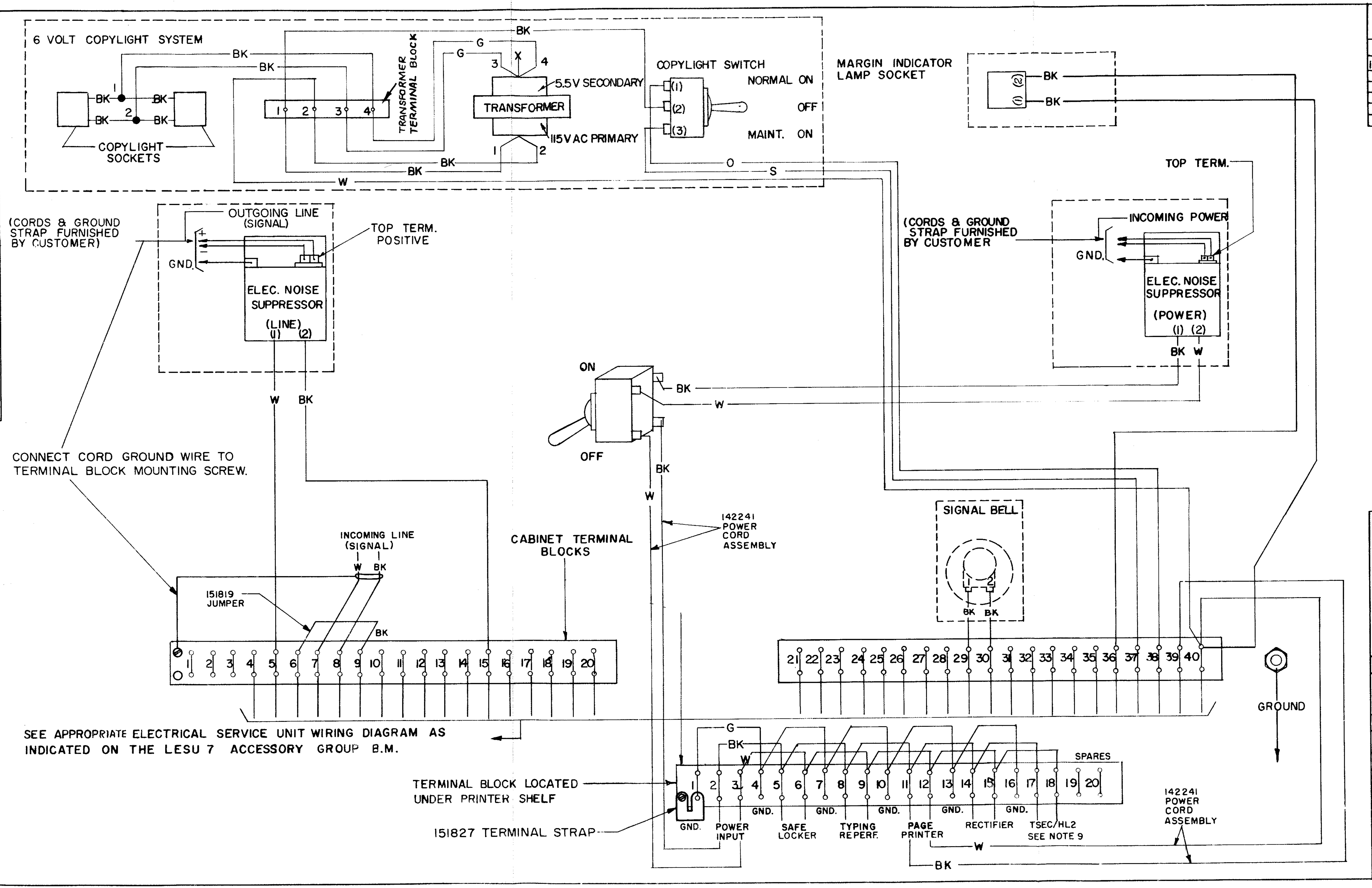
DRAWN J.T.D.	CHKD.
ENGD. T.T.H.	APPD.

TELETYPE CORPORATION

3236WD

10

NO.	NOTES:
1	COLOR CODE: BK-BLACK, W- WHITE, R-RED, G-GREEN, P-PURPLE, S-SLATE, O-ORANGE
2	———X DENOTES SPLICED, SOLDERED & TAPED WIRES.
3	COMPONENTS SHOWN DOTTED ARE ACCESSORIES TO CABINET.
4	USE POWER & SIGNAL LINE INTERFERENCE SUPPRESSORS FOR INSTALLATIONS REQUIRING MINIMUM R.F. INTERFERENCE. FOR OTHER INSTALLATIONS, OMIT SUPPRESSORS & CONNECT IMPUTS DIRECTLY TO TERMINALS SHOWN.
5	COMPONENTS SHOWN DOTTED ARE ACCESSORIES TO CABINET.
6	CABINET POWER CIRCUIT WIRED FOR 115 V. 50-60∿ A.C. OPERATION ONLY. THE ASSOCIATED ELECTRICAL SERVICE UNIT MUST BE WIRED FOR A.C. OPERATION.
7	NECESSARY STRAP CONNECTIONS AT THE CABINET TERMINAL BLOCKS ARE SHOWN ON THE ASSOCIATED ELECTRICAL SERVICE UNIT WIRING DIAGRAM SEE THE LESU 7 ACCESSORY GROUP B.M. FOR THE DIAGRAM NUMBER.
8	CONNECTOR VIEWED FROM SOLDER TERMINAL END.
9.	IT MAY BE NECESSARY TO INTERCHANGE THE INPUT LEADS IF AUTOMATIC TRANSMISSION OF CR LF IS INOPERATIVE.



3490 WD

ISSUE	DATE	AUTH. NO.
1	6-25-58	28-9399
2	8-25-58	28-9789
3	4-1-59	28-9804
4	10-10-61	71220
5	8-10-65	88589

ACTUAL WIRING DIAGRAM FOR MODEL 28 PRINTER CABINET LAC 207 ACCESSORY GROUP 248

APPROVALS
D & R | E OF M
E-NO.
PROD. NO.
DATE 4-18-58
P.D. FILE NO. 1-55.80AA
DRAWN W.A.W. | CHKD.
ENGD. K.S.S. | APPD.

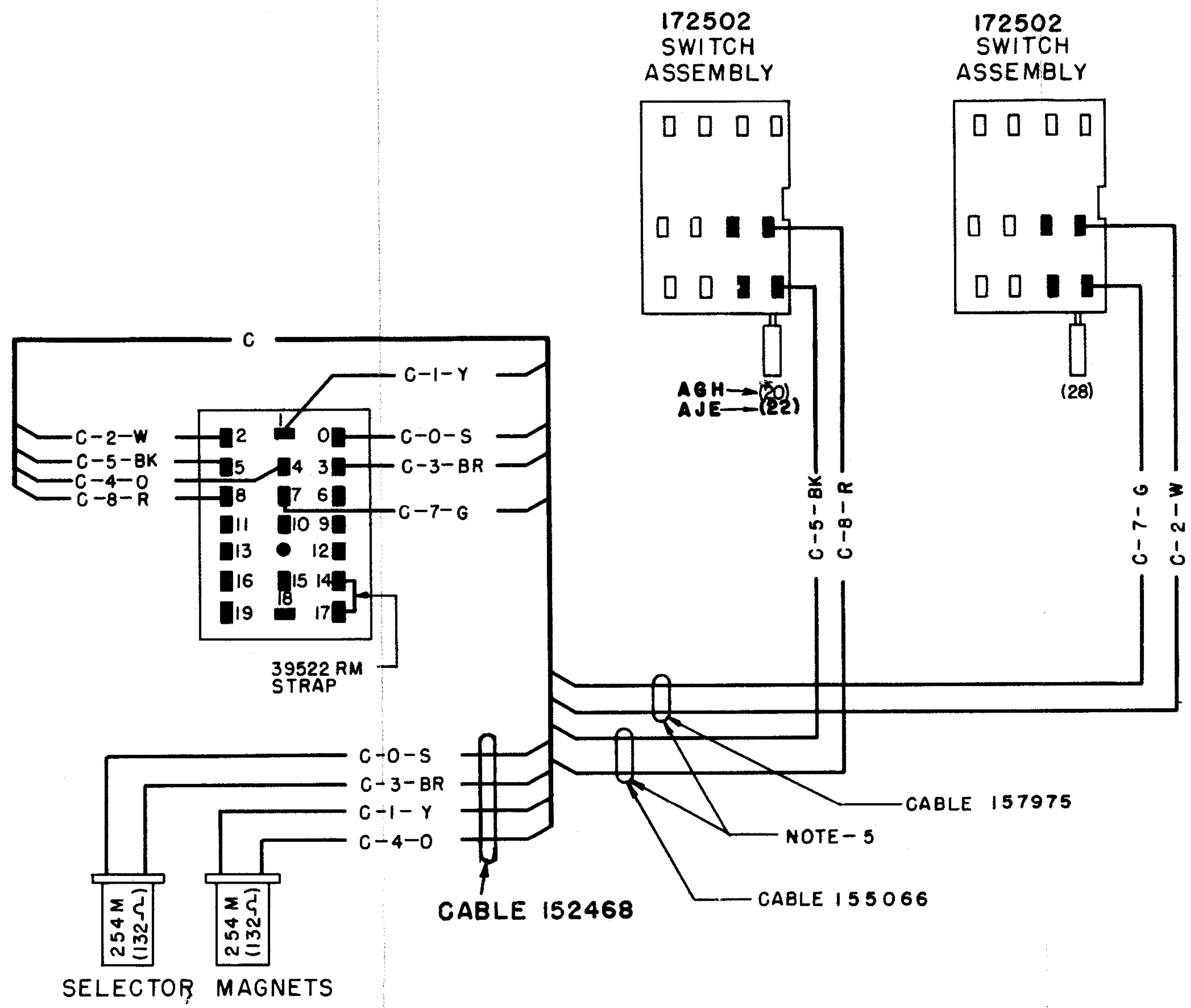
TELETYPE CORPORATION

3490 WD

3813 WD

ISSUE	DATE	AUTH. NO.
A	1/25/60	28-12505
B	10-14-60	28-13541
C	8-20-62	74211
D	5-20-63	76966

NO.	NOTES:
1.	WIRING CHANNEL DESIGNATED BY "C" DOES NOT REPRESENT CABLE BUT ASSISTS IN TRACING CONNECTIONS.
2.	CHANNEL LEGEND C — 8 — W CHANNEL IDENTIFICATION CHANNEL WIRE NUMBER WIRE COLOR CODE
3.	COLOR CODE: BK — BLACK O — ORANGE R — RED Y — YELLOW W — WHITE S — SLATE G — GREEN BR — BROWN
4.	CONNECTORS VIEWED FROM SOLDERED TERMINAL ENDS.
5.	THESE CABLES ARE FURNISHED WITH STUNT BOX.
6.	NORMALLY OPEN CONTACT NORMALLY CLOSED CONTACT



ACTUAL WIRING DIAGRAM
MODEL 28

TYPING UNIT
LP, 14, 108
STUNT BOX
ARRANGT. AGH, AJE

APPROVALS	
D AND R	E OF M

E-NUMBER
PROD. NO. 3813 WD
DATE: 10-10-59
P.D. FILE NO. 5-30.65/120.125A
DRAWN. E. M. CHKD.
ENGD. R.H.L. APPD.

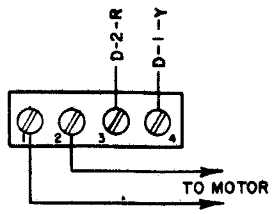
TELETYPE CORPORATION

3813 WD

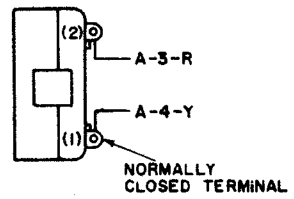
ET-131481

NO.	NOTES
1.	POWER CIRCUITS WIRED FOR 115 V AC OR DC OPERATION.
2.	WIRE COLOR CODE: BK - BLACK P - PURPLE BR - BROWN G - GREEN BL - BLUE Y - YELLOW W - WHITE O - ORANGE R - RED S - SLATE
3.	CONNECTORS VIEWED FROM SOLDER TERMINAL ENDS.
4.	LK53 EMPLOYS NEGATIVE VOLTAGE FOR MARKING CONTACT. UPPER R.F. FILTER IS CONNECTED TO MARKING CONTACT. LOWER R.F. FILTER IS CONNECTED TO SPACING CONTACT.
5.	POLARITY MUST BE MAINTAINED ONLY WHEN 174422 FILTER IS USED. POLARITY MAY BE DISREGARDED WHEN 174421 FILTER IS USED. COLOR CODING OF FILTER LEADS DOES NOT APPLY TO 174421 FILTER.
6.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION WIRE COLOR CODE D-2-R

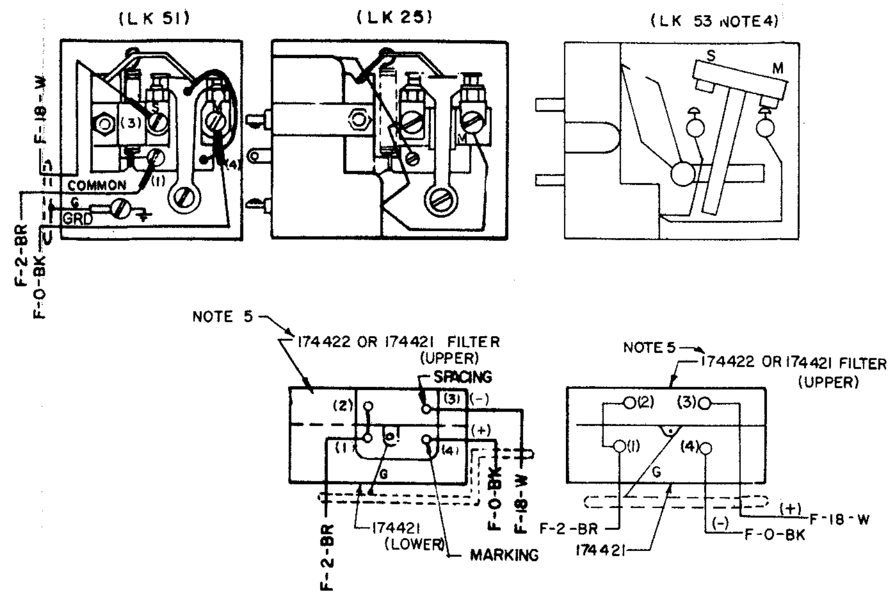
A
MOTOR TERMINAL BLOCK



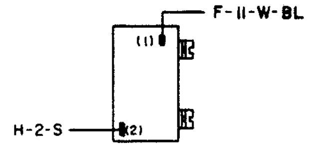
D
MARGIN INDICATOR SWITCH



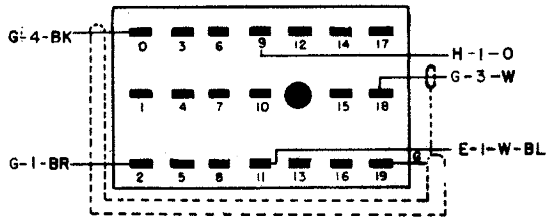
G
CONTACT BOX ASSEMBLIES



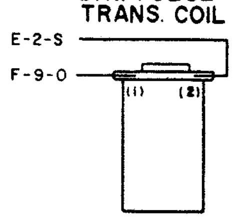
E
SYN. PULSE TRANS. CONTACT

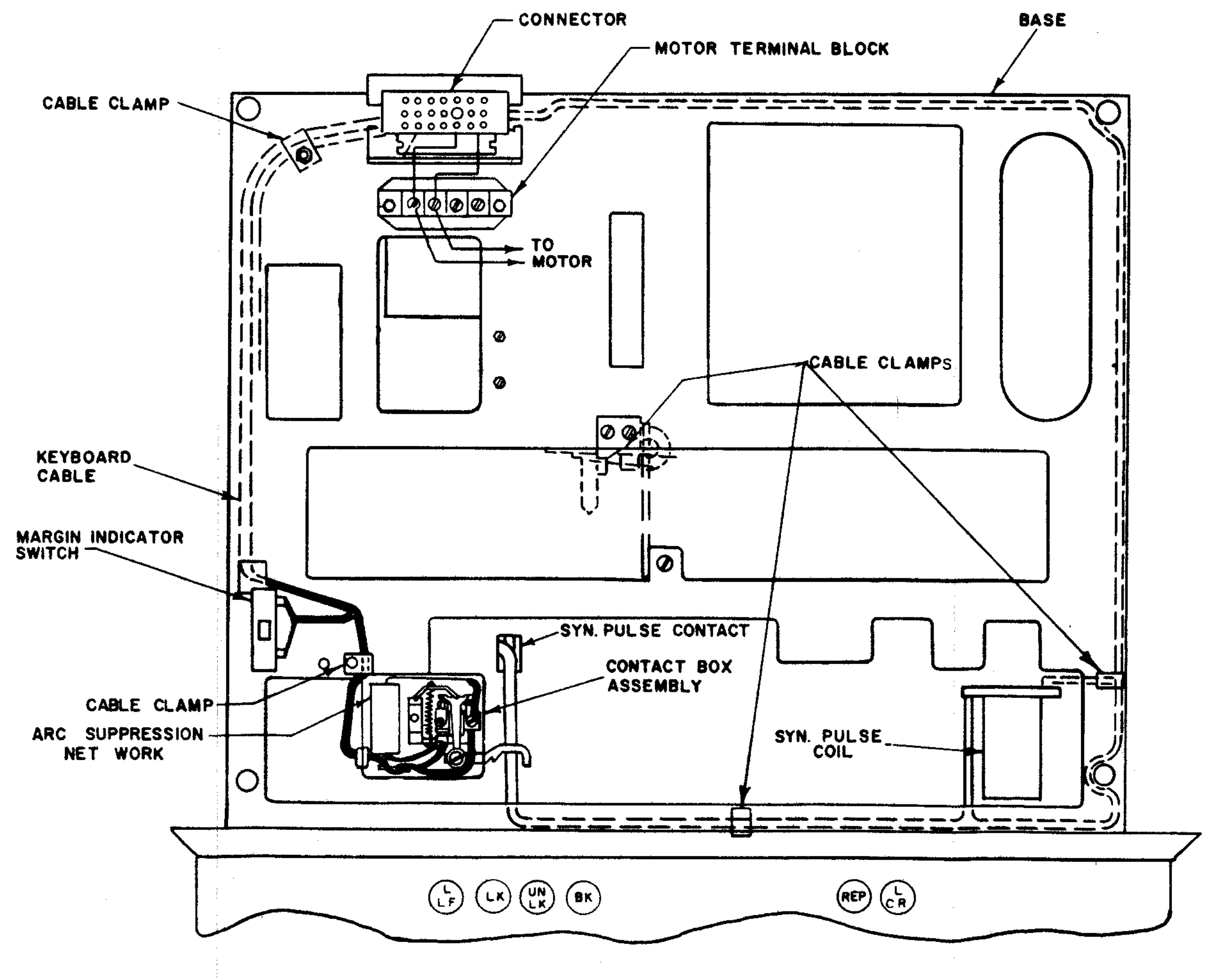


F
KEYBOARD CONNECTOR



H
SYN. PULSE TRANS. COIL





CABLE ROUTING
TOP VIEW

4262 WD

REVISIONS

ISSUE	DATE	AUTH. NO.
2	9-24-60	CC-94
3	11-18-60	CE-182
4	11-23-62	75190
5	4-16-64	79225-7
6	9-8-64	79225-10
7	4-1-65	79225-13
8	9-15-66	91295-RC

ACTUAL WIRING DIAGRAM FOR MODEL 28 KEYBOARD LK25 LK51 LK53

APPROVALS	
D AND R	E OF M
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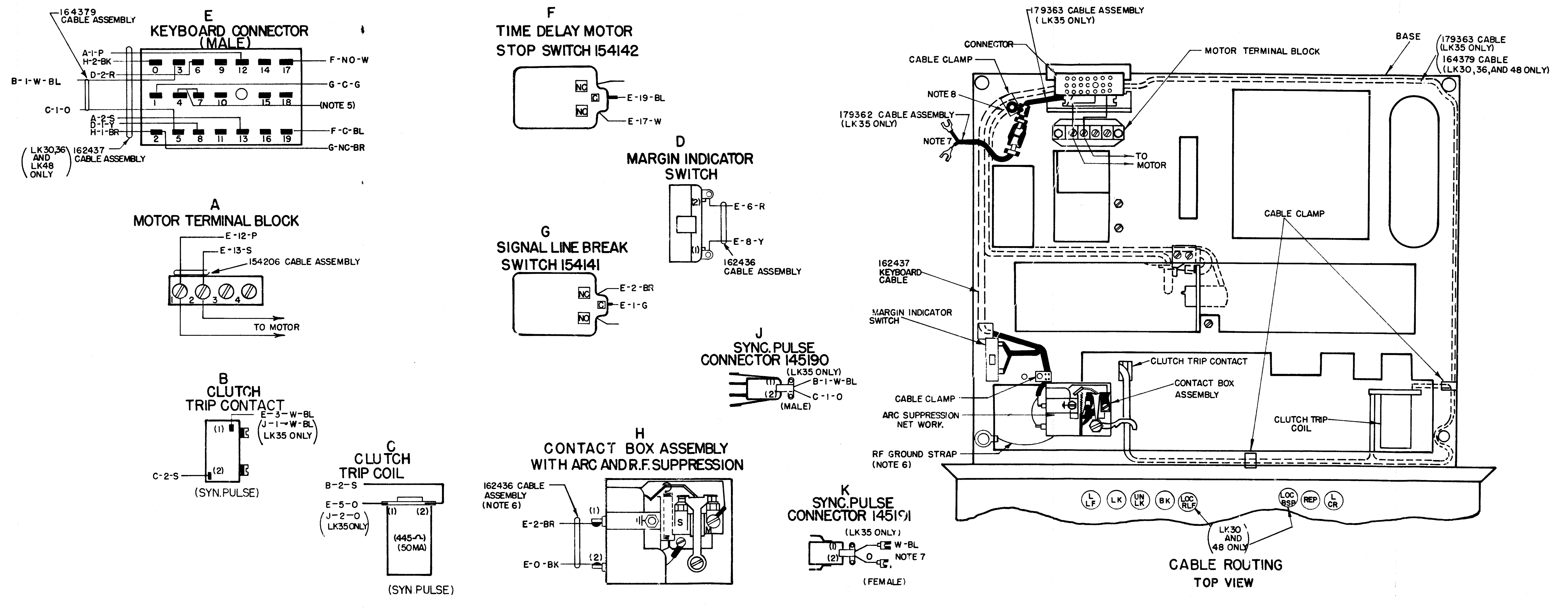
E-NUMBER			
PROD. NO.	4262WD		
DATE	6-8-60		
P.D. FILE NO.	18-A65/2.219A		
DRAWN	P.K.	CHKD.	
ENGD.	D.C.L.	APPD.	

TELETYPE CORPORATION

8

4262 WD

NO	NOTES
1.	POWER CIRCUITS WIRED FOR 115 V. AC OR DC OPERATION.
2.	WIRE COLOR CODE BK BLACK · R RED · P PURPLE · G GREEN BL BLUE · Y YELLOW · O ORANGE · W WHITE BR BROWN · S SLATE · W BL WHITE BLUE
3.	CONNECTORS VIEWED FROM SOLDER TERMINAL ENDS.
4.	WIRING LEGEND C – B – R C — DISTANT TERMINATING AREA B — DISTANT TERMINAL DESIGNATION R — WIRE COLOR CODE
5.	STRAP NECESSARY FOR OPERATION WITH LESU 7.
6.	GROUND STRAP TERMINATES AT TOP OF KEYBOARD BASE LOWER PLATE BY MEANS OF LEFT FRONT 151549 KEYBOARD SPECIAL MOUNTING SCREW.
7.	(LK35 ONLY) UNCOIL ROUTE, AND CONNECT 179362 CABLE TO TWO OPEN CABINET TERMINALS, TYING UP ANY SLACK.
8.	MOUNT THE 179363 CABLE TO THE KEYBOARD WITH 121243 CABLE CLAMP (LK35 ONLY)



4718 WD

REVISIONS

ISSUE	DATE	AUTH. NO.
2	4-10-62	73052
3	8-25-62	74368
4	11-29-62	75189
5	10-17-63	78376
6	12-12-63	79720

ACTUAL WIRING DIAGRAM FOR MODEL-28 KEYBOARD LK30, 35, 36 AND 48

APPROVALS

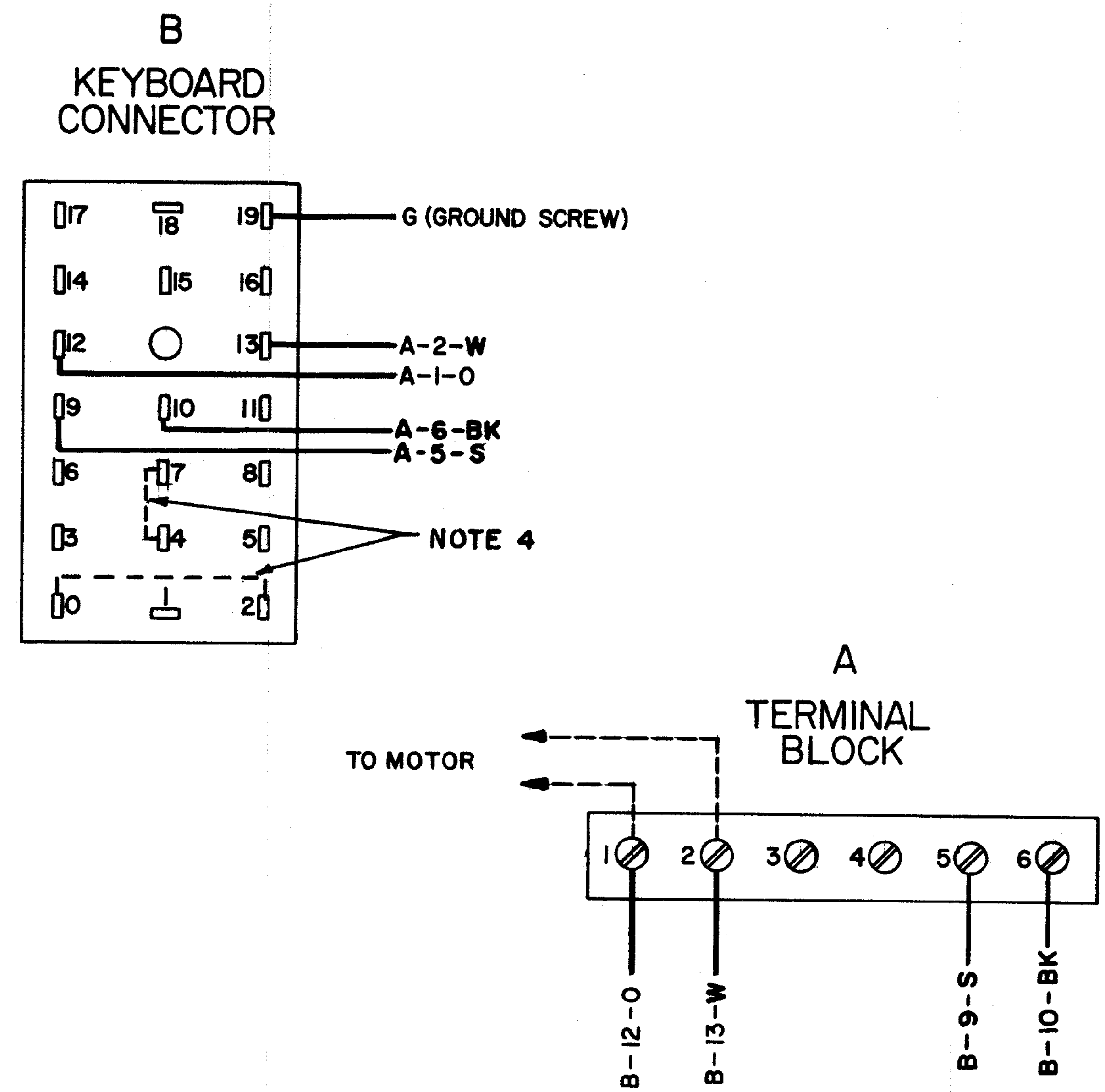
R AND D | E OF M

E-NUMBER
PROD. NO. 4718 WD
DATE: 12-4-61
R. & D. FILE NO. 2-12 65AA
DRAWN R.S. CHKD
ENGD. DAK APPD.

TELETYPE CORPORATION

6 4718 WD

NO.	NOTES
1	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINAL DESIGNATION WIRE COLOR CODE A-1-O
2	COLOR CODE: BK BLACK O ORANGE S SLATE W WHITE G GREEN
3	CONNECTORS VIEWED FROM SOLDER TERMINAL END.
4	ON 194795 BASE, STRAP TERMINALS AS SHOWN. ON 179374 BASE, THESE STRAPS ARE TO BE ADDED WHEN LESU 77 IS USED.



4763 WD

ISSUE	DATE	AUTH. NO.
A	1-6-62	72126
B	2-2-62	72334
C	8-29-63	77884

ACTUAL WIRING DIAGRAM
179374, 193573 & 194795 BASE ASSEMBLIES

APPROVALS

D AND R | E OF M

E-NUMBER

PROD. NO. 4763 WD

DATE: 8-31-61

P.D. FILE NO. 5-55.65.220A

DRAWN. WPH | CHKD.

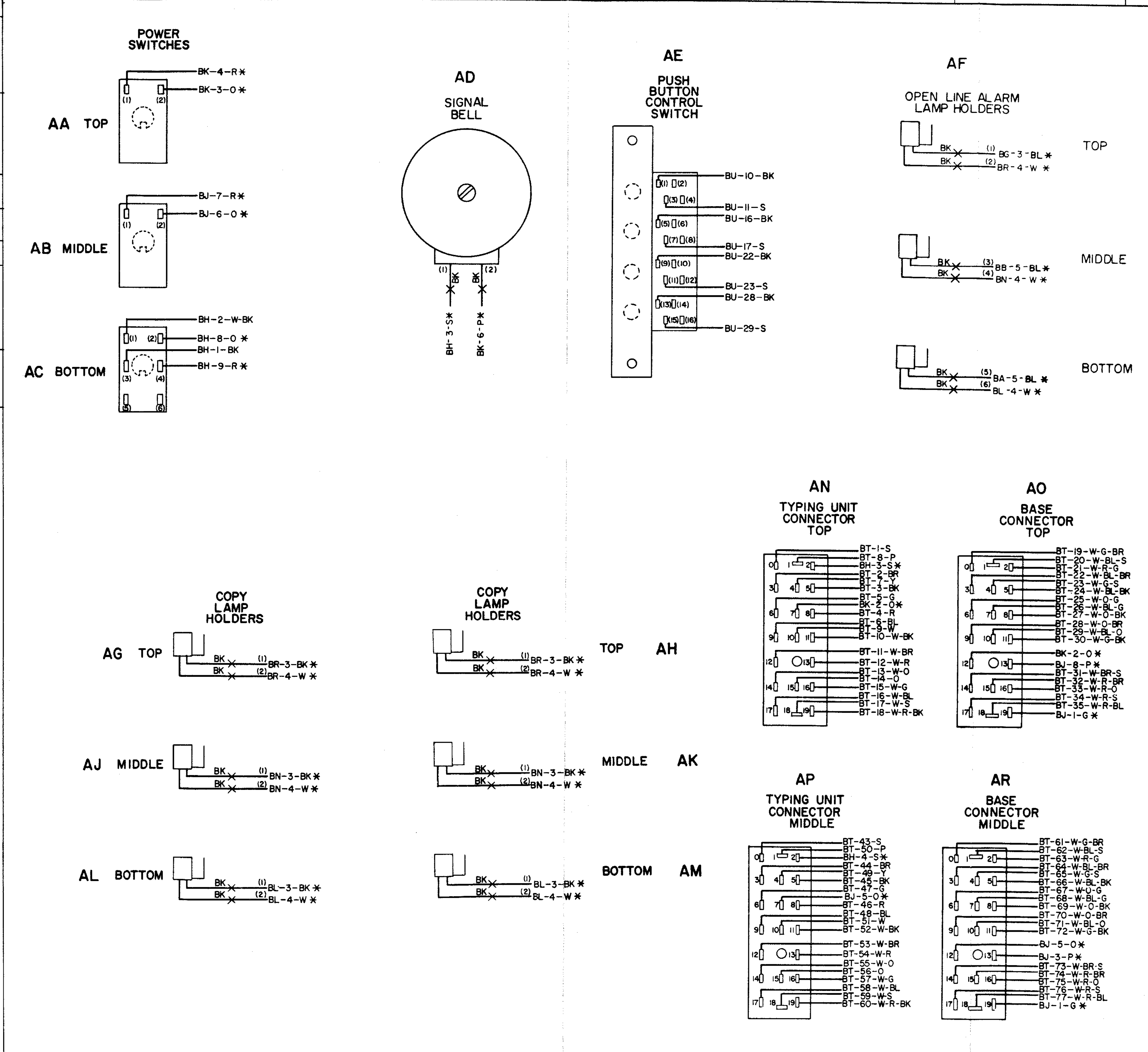
ENGD. D.C.L. | APPD.

TELETYPE CORPORATION

4763 WD

ET-131481

NO.	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION BR-3-BK WIRE COLOR CODE
2.	COLOR CODE: BK - BLACK P - PURPLE BL - BLUE R - RED BR - BROWN S - SLATE G - GREEN W - WHITE O - ORANGE Y - YELLOW
3.	CONNECTORS AND SWITCHES VIEWED FROM SOLDERED TERMINAL ENDS.
4.	* MARKED LEADS ARE 18 GA. WIRE, ALL OTHERS ARE 24 GA.
5.	—x— DESIGNATES SPLICE.
6.	(1) INNER SHELL GROUND SCREW IS THE REAR MOUNTING SCREW OF THE CENTER RIGHT SIDE ADAPTOR PLATE. (2) THE OUTER SHELL GROUND SCREW IS THE LOWER RIGHT MOUNTING SCREW OF THE FIXED PANEL.
7.	LBAC248 ONLY REMOVE STRAPS FROM 75 TO 81, 76 TO 82, 100 TO 106, AND 101 TO 107. ADD A STRAP FROM 81 TO 100.



SHEET 1 OF 2

4946WD

REVISIONS		
ISSUE	DATE	AUTH. NO.
A2	12-10-62	75333
B3	5-14-63	76864
C4	10-15-63	78030

ACTUAL WIRING DIAGRAM FOR LBAC241, 248 UNIVERSAL CABINETS

APPROVALS	
D AND R	E OF M
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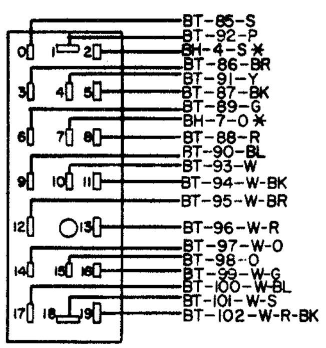
E-NUMBER	
PROD. NO.	4946WD
DATE	3-9-62
P.D. FILE NO.	27-A.65AA
DRAWN W.P.H.	CHKD.
ENGD. D.C.L.	APPD.

TELETYPE CORPORATION

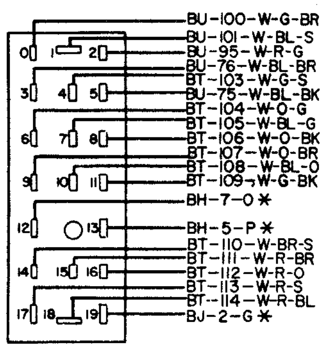
4946WD

SEE SHEET 1 FOR NOTES.

AS
TYPING UNIT CONNECTOR BOTTOM

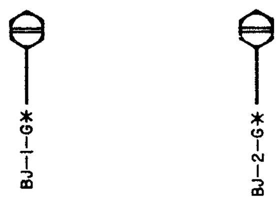


AT
KEYBOARD CONNECTOR BOTTOM

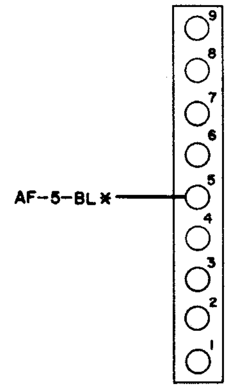


AU AW
CABINET GROUND SCREWS

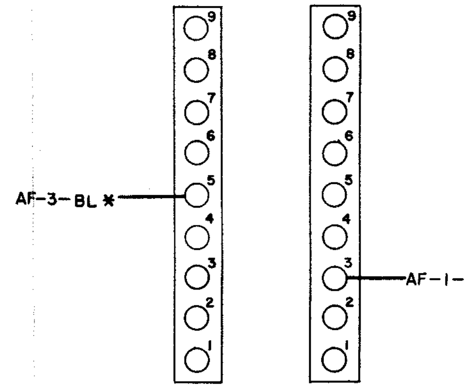
(NOTE 6)

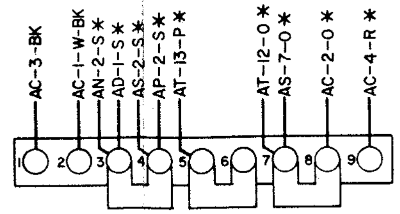


BA
TERMINAL BLOCK

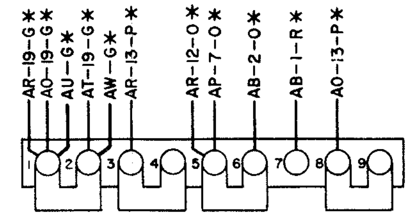


BB BG
TERMINAL BLOCK TERMINAL BLOCK





TERMINAL BLOCK
BH



TERMINAL BLOCK
BJ

BT TERMINAL BOARD LEGEND

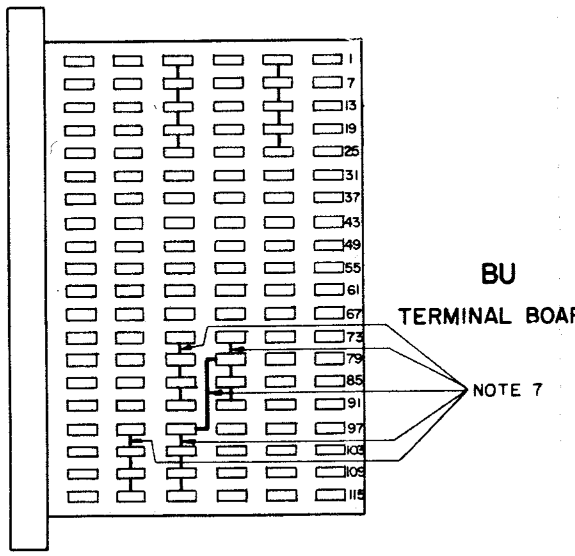
NO.	DESTINATION	NO.	DESTINATION
1	AN-O-S	61	AR-O-W-G-BR
2	AN-3-BR	62	AR-1-W-BL-S
3	AN-5-BK	63	AR-2-W-R-G
4	AN-8-R	64	AR-3-W-BL-BR
5	AN-6-G	65	AR-4-W-G-S
6	AN-9-BL	66	AR-5-W-BL-BK
7	AN-4-Y	67	AR-6-W-O-G
8	AN-1-P	68	AR-7-W-BL-G
9	AN-10-W	69	AR-8-W-O-BK
10	AN-11-W-BK	70	AR-9-W-O-BR
11	AN-12-W-BR	71	AR-10-W-BL-O
12	AN-13-W-R	72	AR-11-W-G-BK
13	AN-14-W-O	73	AR-14-W-BR-S
14	AN-15-O	74	AP-15-W-R-BR
15	AN-16-W-G	75	AR-16-W-R-O
16	AN-17-W-BL	76	AR-17-W-R-S
17	AN-18-W-S	77	AR-18-W-R-BL
18	AN-19-W-R-BK	78	
19	AO-O-W-G-BR	79	
20	AO-1-W-BL-S	80	
21	AO-2-W-R-G	81	
22	AO-3-W-BL-BR	82	
23	AO-4-W-G-S	83	
24	AO-5-W-BL-BK	84	
25	AO-6-W-O-G	85	AS-O-S
26	AO-7-W-BL-G	86	AS-3-BR
27	AO-8-W-O-BK	87	AS-5-BK
28	AO-9-W-O-BR	88	AS-8-R
29	AO-10-W-BL-O	89	AS-6-G
30	AO-11-W-G-BK	90	AS-9-BL
31	AO-14-W-BR-S	91	AS-4-Y
32	AO-15-W-R-BR	92	AS-1-P
33	AO-16-W-R-O	93	AS-10-W
34	AO-17-W-R-S	94	AS-11-W-BK
35	AO-18-W-R-BL	95	AS-12-W-BR
36		96	AS-13-W-R
37		97	AS-14-W-O
38		98	AS-15-O
39		99	AS-16-W-G
40		100	AS-17-W-BL
41		101	AS-18-W-S
42		102	AS-19-W-R-BK
43	AP-O-S	103	AT-4-W-G-S
44	AP-3-BR	104	AT-6-W-O-G
45	AP-5-BK	105	AT-7-W-BL-G
46	AP-8-R	106	AT-8-W-O-BK
47	AP-6-G	107	AT-9-W-O-BR
48	AP-9-BL	108	AT-10-W-BL-O
49	AP-4-Y	109	AT-11-W-G-BK
50	AP-1-P	110	AT-14-W-BR-S
51	AP-10-W	111	AT-15-W-R-BR
52	AP-11-W-BK	112	AT-16-W-R-O
53	AP-12-W-BR	113	AT-17-W-R-S
54	AP-13-W-R	114	AT-18-W-R-BL
55	AP-14-W-O	115	
56	AP-15-O	116	
57	AP-16-W-G	117	
58	AP-17-W-BL	118	
59	AP-18-W-S	119	
60	AP-19-W-R-BK	120	

BU TERMINAL BOARD LEGEND

NO.	DESTINATION	NO.	DESTINATION
1		61	
2		62	
3		63	
4		64	
5		65	
6		66	
7		67	
8		68	
9		69	
10	AE-1-BK	70	
11	AE-3-S	71	
12		72	
13		73	
14		74	
15		75	AT-5-W-BL-BK
16	AE-5-BK	76	AT-3-W-BL-BR
17	AE-7-S	77	
18		78	
19		79	
20		80	
21		81	
22	AE-9-BK	82	J-6-W-O
23	AE-11-S	83	
24		84	
25		85	
26		86	
27		87	
28	AE-13-BK	88	
29	AE-15-S	89	
30		90	
31		91	
32		92	
33		93	
34		94	
35		95	AT-2-W-R-G
36		96	J-7-W
37		97	
38		98	
39		99	J-2-G
40		100	AT-O-W-G-BR
41		101	AT-1-W-BL-S
42		102	
43		103	
44		104	
45		105	
46		106	J-1-W-R
47		107	J-4-W-Y
48		108	J-5-S
49		109	
50		110	
51		111	
52		112	
53		113	
54		114	
55		115	
56		116	
57		117	
58		118	
59		119	
60		120	

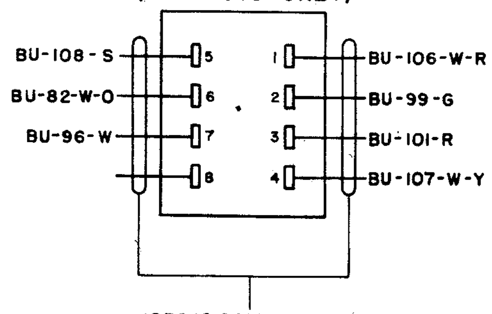
LBAC 248 ONLY

J-3-R

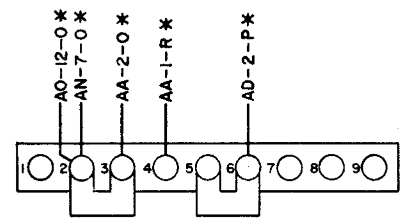


BU
TERMINAL BOARD

J
RELAY MOUNTING
(LBAC 248 ONLY)

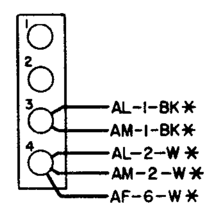


197846 CABLE ASSEMBLY



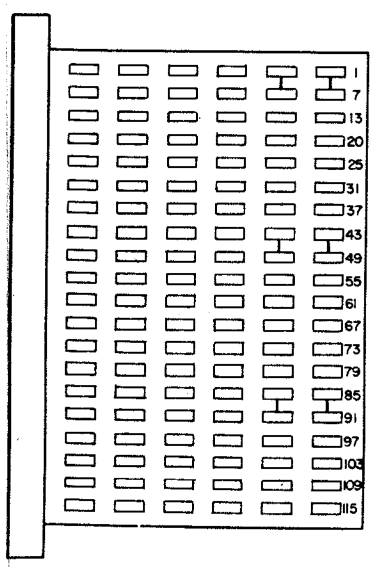
TERMINAL BLOCK
BK

BL



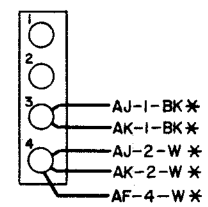
BL
COPY LIGHT TERMINAL BLOCK BOTTOM

(197846 CABLE ASSEMBLY)

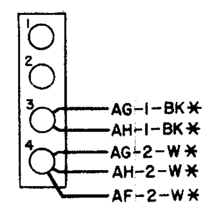


BT
TERMINAL BOARD

BN



BN
COPY LIGHT TERMINAL BLOCK MIDDLE



BR
COPY LIGHT TERMINAL BLOCK TOP

4946WD

REVISIONS

ISSUE	DATE	AUTH. NO.
2	12-10-62	75333
3	5-14-63	76864
4	10-15-63	78030

ACTUAL WIRING DIAGRAM FOR LBAC241, 248 UNIVERSAL CABINETS

APPROVALS	
D AND R	E OF M
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E-NUMBER

PROD. NO. 4946WD

DATE 3-9-62

P.D. FILE NO. 27-A.65.AA

DRAWN W.P.H. CHKD.

ENGD. D.C.L. APPD.

TELETYPE CORPORATION

4946WD

NO.	NOTES
I.	FOR ACTUAL WIRING DIAGRAMS OF INDIVIDUAL UNITS SEE:

WD-NUMBER	UNITS DIRECTLY OPERABLE WITH ELECTRICAL SERVICE UNIT
4946WD	CABINET - LBAC241
4948WD	ELECTRICAL SERVICE ASSEMBLY - 193568
4718WD	KEYBOARD - LK36
2900WD	MOTOR UNIT - LMU3, 21
3214WD	PAGE TYPING UNIT - LP109
4765WD	SELECTOR MAGNET DRIVER - 192669

2. LEGEND:

○ A MOTOR TERMINAL BOARD
○ BB SELECTOR MAGNET DRIVER TERMINAL BOARD
○ BF SELECTOR MAGNET DRIVER TERMINAL BOARD
○ BG SELECTOR MAGNET DRIVER TERMINAL BOARD
○ BH TERMINAL BOARD ON ELECTRICAL SERVICE ASSEMBLY
○ BJ TERMINAL BOARD ON ELECTRICAL SERVICE ASSEMBLY
○ BK TERMINAL BOARD ON ELECTRICAL SERVICE ASSEMBLY
○ BL COPY LIGHT TERMINAL BLOCK
○ BN COPY LIGHT TERMINAL BLOCK
○ BR COPY LIGHT TERMINAL BLOCK
○ BT TERMINAL BOARD
○ BU TERMINAL BOARD

—< AN TYPING UNIT CONNECTOR (TOP)
—< AO BASE CONNECTOR (TOP)
—< AP TYPING UNIT CONNECTOR (MIDDLE)
—< AR BASE CONNECTOR (MIDDLE)
—< AS TYPING UNIT CONNECTOR (BOTTOM)
—< AT KEYBOARD CONNECTOR (BOTTOM)

← B BASE CONNECTOR
← E KEYBOARD CONNECTOR
← R TYPING UNIT CONNECTOR

NORMALLY OPEN CONTACT
NORMALLY CLOSED CONTACT
RELAY DESIGNATION
LEVEL ON RELAY
R2 (3)
RELAYS R1, R2, R3, AND R4 ARE E/W EMB CONTACTS.

3. DOT-DASH (-- ——) LINES INDICATE FILTERING, SHIELDING AND SUPPRESSION NETWORKS.

4. ALL APPARATUS IS SHOWN IN UNOPERATED OR DE-ENERGIZED POSITIONS.

5. a. RESISTANCE IN OHMS (Ω)
b. INDUCTANCE VALUE IN MICROHENRIES (MH)
c. CAPACITANCE VALUE IN MICROFARADS (MFD)

6. USE SYNCHRONOUS MOTOR ON REGULATED 60~ (±1%) AC. POWER ONLY. GOVERNED MOTORS AND OTHER POWER CIRCUITS OPERABLE ON 50 TO 60~ UNREGULATED AC.

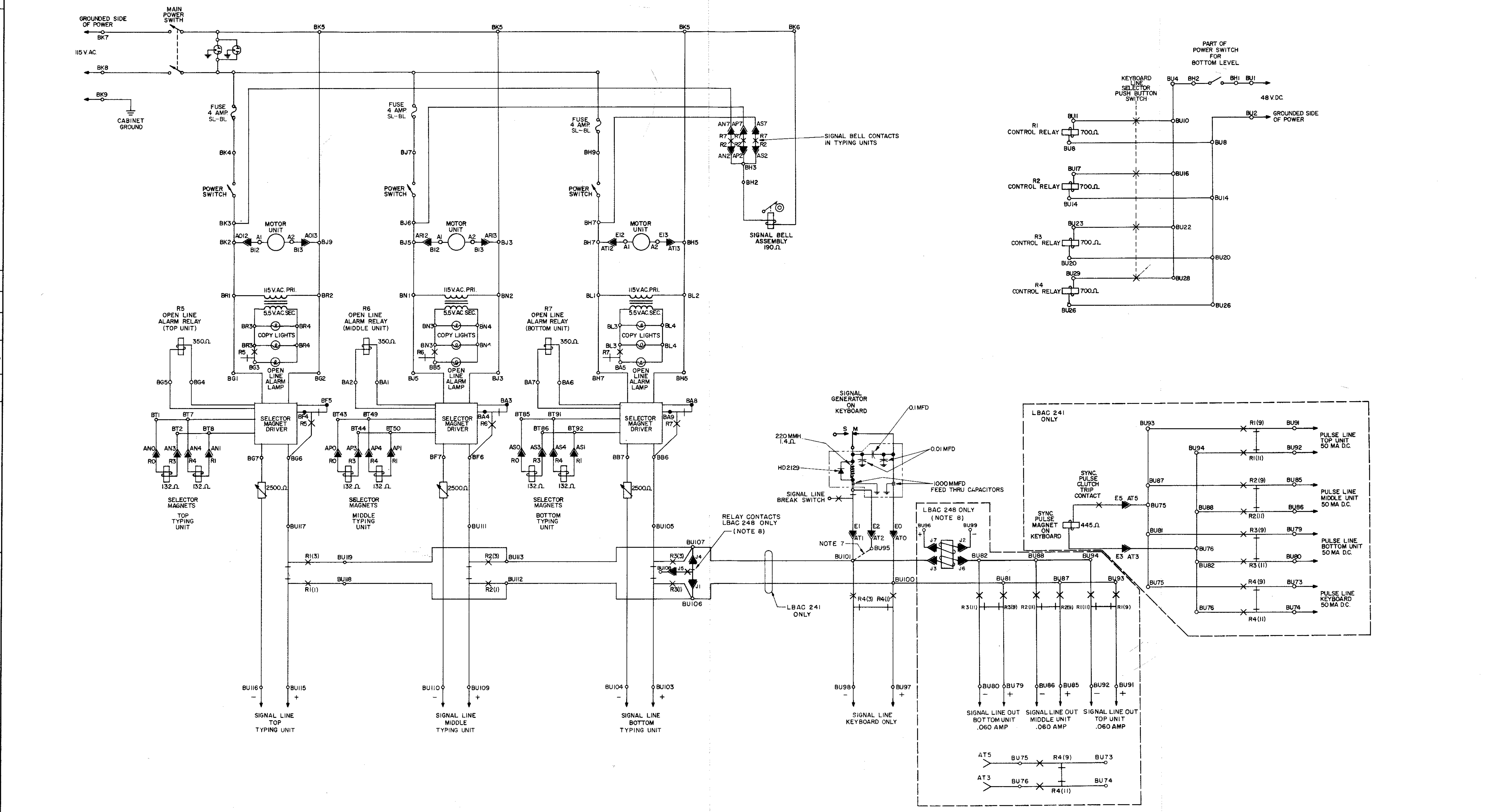
7. UNITS ARE WIRED WITH LINE BREAK SWITCH OPERABLE. IF LINE BREAK IS NOT DESIRED ADD STRAP FROM BU95 TO BU101.

8. LBAC 248 IS EQUIPPED WITH MOUNTING PROVISIONS FOR A CUSTOMER SUPPLIED SPECIAL PULSING CONTROL RELAY (J). R.F. FILTERING AND PROTECTION FOR THE RELAY CONTACTS BETWEEN BU106 AND BU107 WILL BE CUSTOMER-SUPPLIED.

FOR TEST PURPOSES ONLY A LINE RELAY (RY 30 OR 33) IS SHOWN IN THE CIRCUIT.

TO TEST THE CIRCUIT PERFORM THE FOLLOWING:

A.) APPLY .030 AMP BIAS CURRENT TO TERMINALS BU96 AND BU99.
B.) APPLY .060 AMP NEUTRAL SIGNAL LINE CURRENT TO ALL SIGNAL IMPUTS AND OUTPUTS.
C.) TEMPORILY INSTALL EITHER RY30 OR RY 33 TEST RELAY IN RELAY MOUNTING.
D.) REMOVE THE ABOVE CURRENTS AND THE TEST RELAY AFTER TESTS ARE COMPLETED.



4947WD		
REVISIONS		
ISSUE	DATE	AUTH. NO.
A	5-14-63	[illegible]
B	12-17-63	[illegible]

SCHEMATIC WIRING DIAGRAM FOR UNIVERSAL CABINETS LBAC241 LBAC248

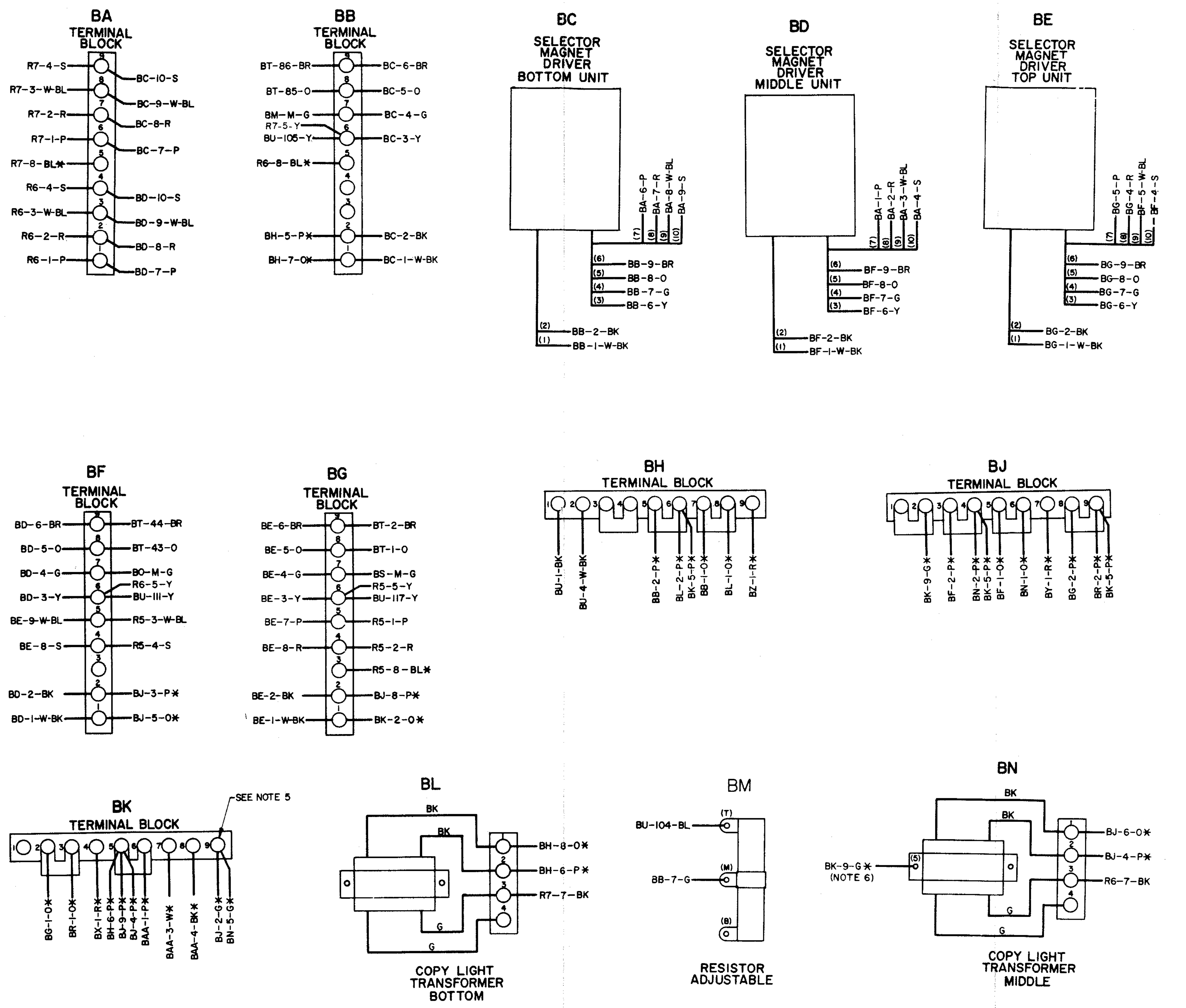
APPROVALS	
D & R	E / M
[illegible]	[illegible]
E-NO.	
PROD. NO. 4947WD	
DATE: 3-2-62	
P.D. FILE NO. 27-A[illegible]AA	
DRAWN WPH	CHKD. [illegible]
ENGD. DCL	APPD. [illegible]

TELETYPE CORPORATION

4947WD

4948WD

NO.	NOTES
1.	WIRING LEGEND: BT-86-BR — DISTANT TERMINATING AREA; DISTANT TERMINATING DESIGNATION; WIRE COLOR CODE
2.	COLOR CODE: BK - BLACK, BL - BLUE, BR - BROWN, G - GREEN, O - ORANGE, P - PURPLE, R - RED, S - SLATE, W - WHITE, Y - YELLOW
3.	SWITCH AND RELAYS VIEWED FROM SOLDER TERMINAL ENDS.
4.	CIRCUITS SHOWN WIRED FOR .060 AMP. NEUTRAL OPERATION. IF ALTERNATE INPUT OPTIONS ARE REQUIRED, STRAPPING OF SELECTOR MAGNET DRIVERS MUST BE CHANGED. REFER TO 4767WD.
5.	CUSTOMER TO INSTALL GROUND WIRE IN THIS POSITION.
6.	ELECTRICAL SERVICE GROUND SCREW IS THE LEFT MOUNTING SCREW OF THE "BN" COPYLIGHT TRANSFORMER.
7.	* INDICATES 18 GA. WIRE.
8.	LBAC248 ONLY: REMOVE STRAPS FROM 75 TO 81, 76 TO 82, 100 TO 106, AND 101 TO 107. ADD A STRAP FROM 81 TO 100.



REVISIONS

ISSUE	DATE	AUTH. NO.
A 2	5-14-63	76864
B 3	10-15-63	78031
C 4	12-16-63	79383

SHEET 1 OF 2

ACTUAL WIRING DIAGRAM FOR 193568 ELECTRICAL SERVICE ASSEMBLY LBAC241, 248

APPROVALS	
D AND R	E OF M
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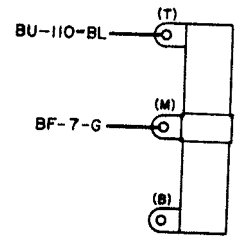
E-NUMBER	
PROD. NO.	4948WD
DATE	3-6-62
P.D. FILE NO.	27-A.65.AA
DRAWN W.P.H.	CHKD.
ENGD. D.C.L.	APPD.

TELETYPE CORPORATION

4948WD

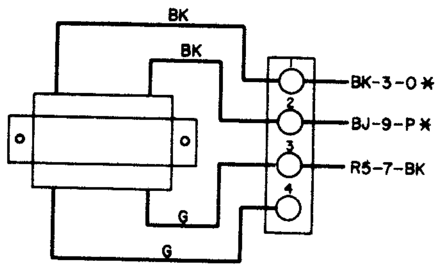
SEE SHEET 1 FOR NOTES.

BO



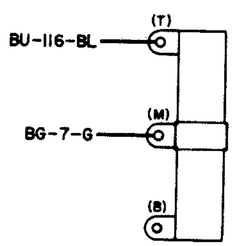
RESISTOR ADJUSTABLE

BR



COPY LIGHT TRANSFORMER TOP

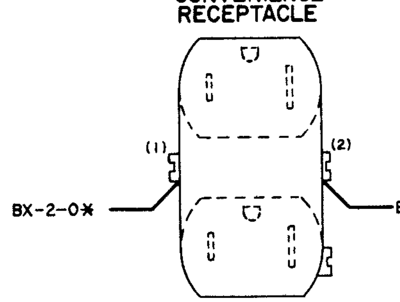
BS



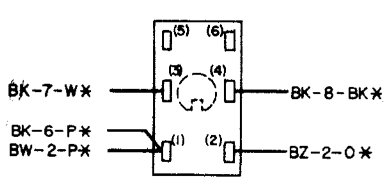
RESISTOR ADJUSTABLE

BW

CONVENIENCE RECEPTACLE



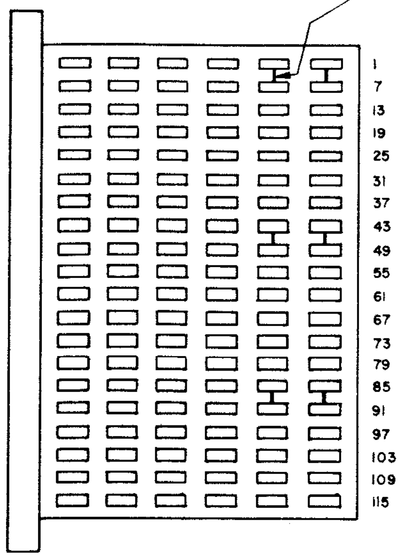
BAA



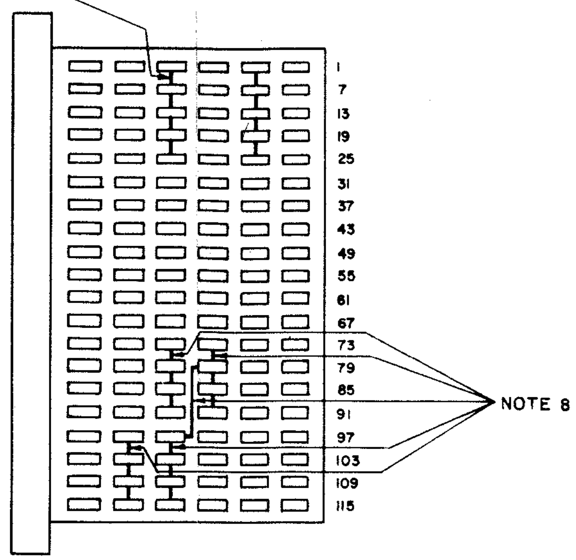
POWER SWITCH

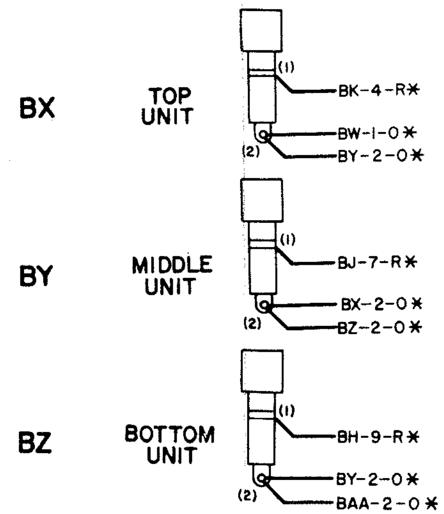
BT TERMINAL BOARD

39522RM BARE WIRE STRAP (26 PLS.)



BU TERMINAL BOARD





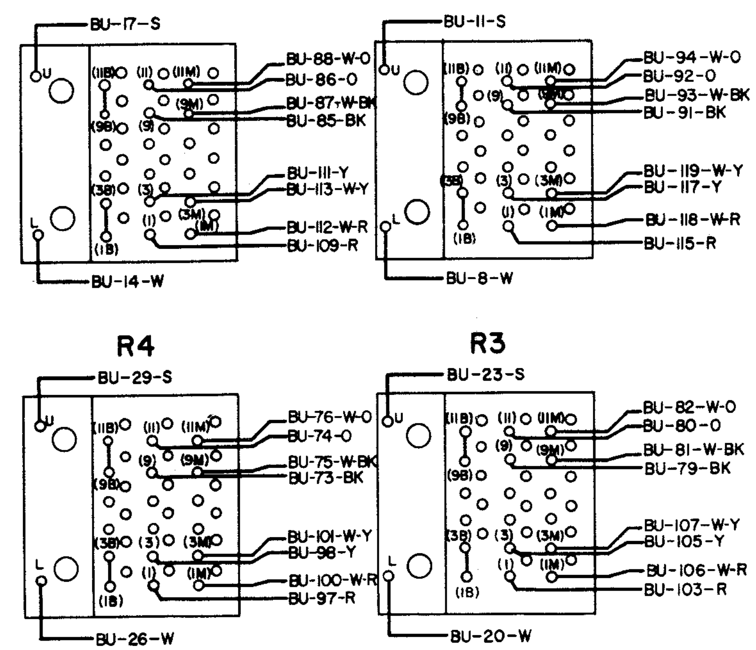
FUSES 4 AMP. SL-BL

BT TERMINAL BOARD LEGEND

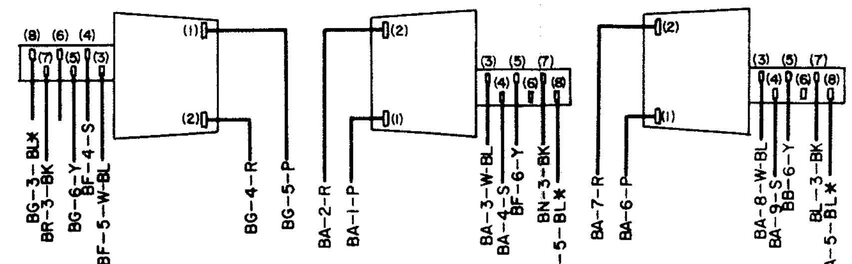
NO.	DESTINATION	NO.	DESTINATION
1	BG-8-O	61	
2	BG-9-BR	62	
3		63	
4		64	
5		65	
6		66	
7		67	
8		68	
9		69	
10		70	
11		71	
12		72	
13		73	
14		74	
15		75	
16		76	
17		77	
18		78	
19		79	
20		80	
21		81	
22		82	
23		83	
24		84	
25		85	BB-8-O
26		86	BB-9-BR
27		87	
28		88	
29		89	
30		90	
31		91	
32		92	
33		93	
34		94	
35		95	
36		96	
37		97	
38		98	
39		99	
40		100	
41		101	
42		102	
43	BF-8-O	103	
44	BF-9-BR	104	
45		105	
46		106	
47		107	
48		108	
49		109	
50		110	
51		111	
52		112	
53		113	
54		114	
55		115	
56		116	
57		117	
58		118	
59		119	
60		120	

BU TERMINAL BOARD LEGEND

NO.	DESTINATION	NO.	DESTINATION
1	BH-1-BK	61	
2		62	
3		63	
4	BH-2-W-BK	64	
5		65	
6		66	
7		67	
8	R1-L-W	68	
9		69	
10		70	
11	R1-U-S	71	
12		72	
13		73	R4-9-BK
14	R2-L-W	74	R4-11-O
15		75	R4-9M-W-BK
16		76	R4-11M-W-O
17	R2-U-S	77	
18		78	
19		79	R3-9-BK
20	R3-L-W	80	R3-11-O
21		81	R3-9M-W-BK
22		82	R3-11M-W-O
23	R3-U-S	83	
24		84	
25		85	R2-9-BK
26	R4-L-W	86	R2-11-O
27		87	R2-9M-W-BK
28		88	R2-11M-W-O
29	R4-U-S	89	
30		90	
31		91	R1-9-BK
32		92	R1-11-O
33		93	R1-9M-W-BK
34		94	R1-11M-W-O
35		95	
36		96	
37		97	R4-1-R
38		98	R4-3-Y
39		99	
40		100	R4-1M-W-R
41		101	R4-3M-W-Y
42		102	
43		103	R3-1-R
44		104	BM-T-BL
45		105	R3-3-Y, BB-6-Y
46		106	R3-1M-W-R
47		107	R3-3M-W-Y
48		108	
49		109	R2-1-R
50		110	BO-T-BL
51		111	R2-3-Y, BF-6-Y
52		112	R2-1M-W-R
53		113	R2-3M-W-Y
54		114	
55		115	R1-1-R
56		116	BS-T-BL
57		117	R1-3-Y, BG-6-Y
58		118	R1-1M-W-R
59		119	R1-3M-W-Y
60		120	



CONTROL RELAYS



4948WD

REVISIONS		
ISSUE	DATE	AUTH. NO.
~~2~~	5-14-63	76864
~~3~~	10-15-63	78031
~~4~~	12-16-63	79383

ACTUAL WIRING DIAGRAM FOR 193568 ELECTRICAL SERVICE ASSEMBLY LBAC241, 248

APPROVALS	
D AND R	E OF M
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E-NUMBER	
PROD. NO.	4948WD
DATE	3-6-62
P.D. FILE NO.	27-A.65.AA
DRAWN W.P.H.	CHKD.
ENGD. D.C.L.	APPD.

TELETYPE CORPORATION

4948WD

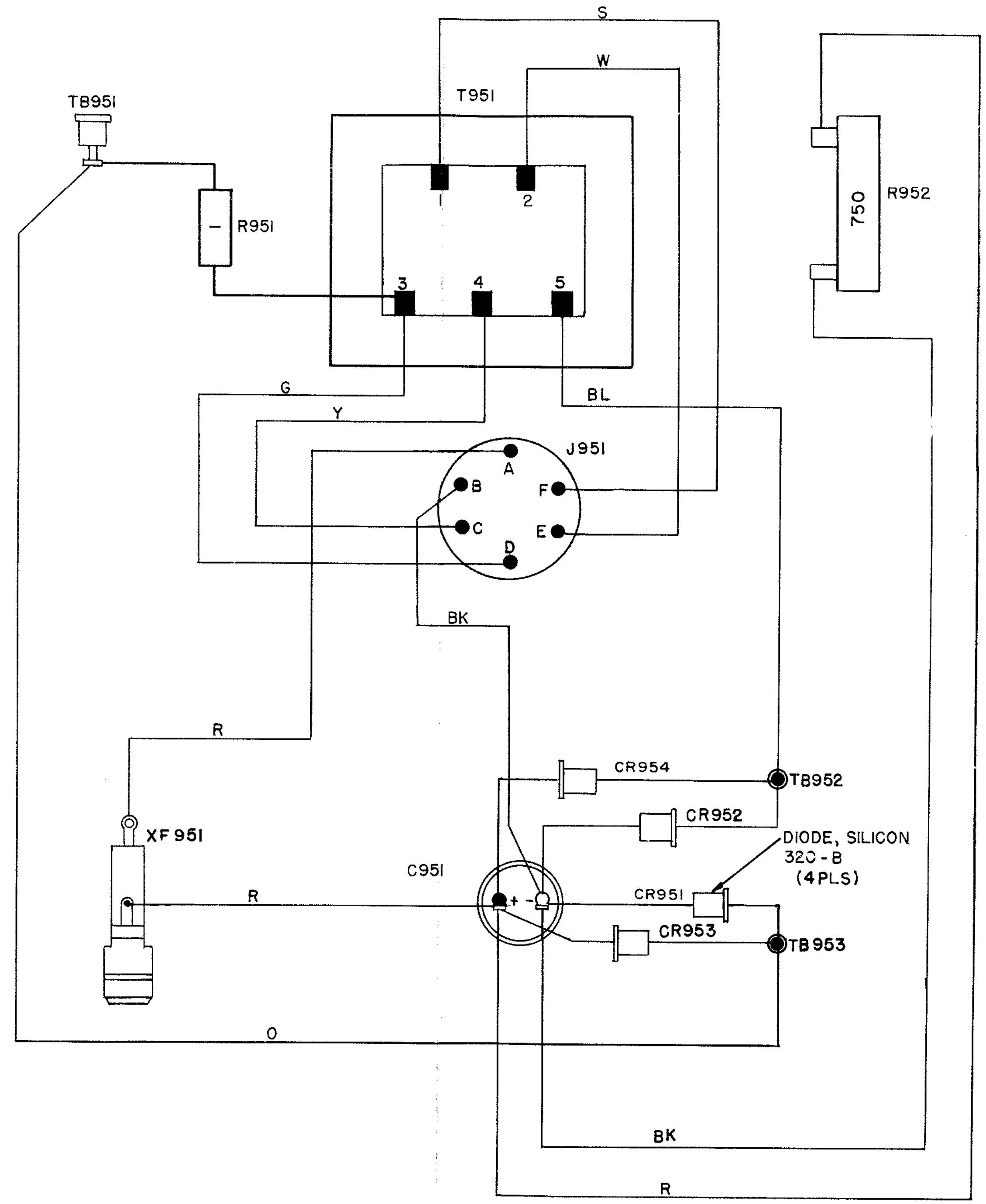
NO.	NOTES
1.	REFER TO 5166WD FOR SCHEMATIC.
2.	ALL WIRES # 20 GA.
3.	USE SLEEVING TO INSULATE WHERE NECESSARY.
4.	FUSE VALUE: XF951 - 1 1/2 A

5167 WD

PARTS REQ.	NO. REQ.	USED ON	NO. REQ.

REVISIONS

ISSUE NO.	DATE	AUTHOR. NO.
A	8-12-59	HS-1091
B	12-16-60	HS-236
C	4-9-63	76572



APPROVALS

R AND D | E OF M

E-NUMBER

PROD. NO. 5167 WD

ACTUAL WIRING DIAGRAM FOR 48V., 1A RECTIFIER

ASSEMBLY NO. 170573

DATE: 6-12-59

P.D. FILE NO. 1-A25.112A

DRAWN S.G. | CHKD.

ENGD. | APPD.

TELETYPE CORPORATION

5167WD

ET 108286
TC 261 (9-54)

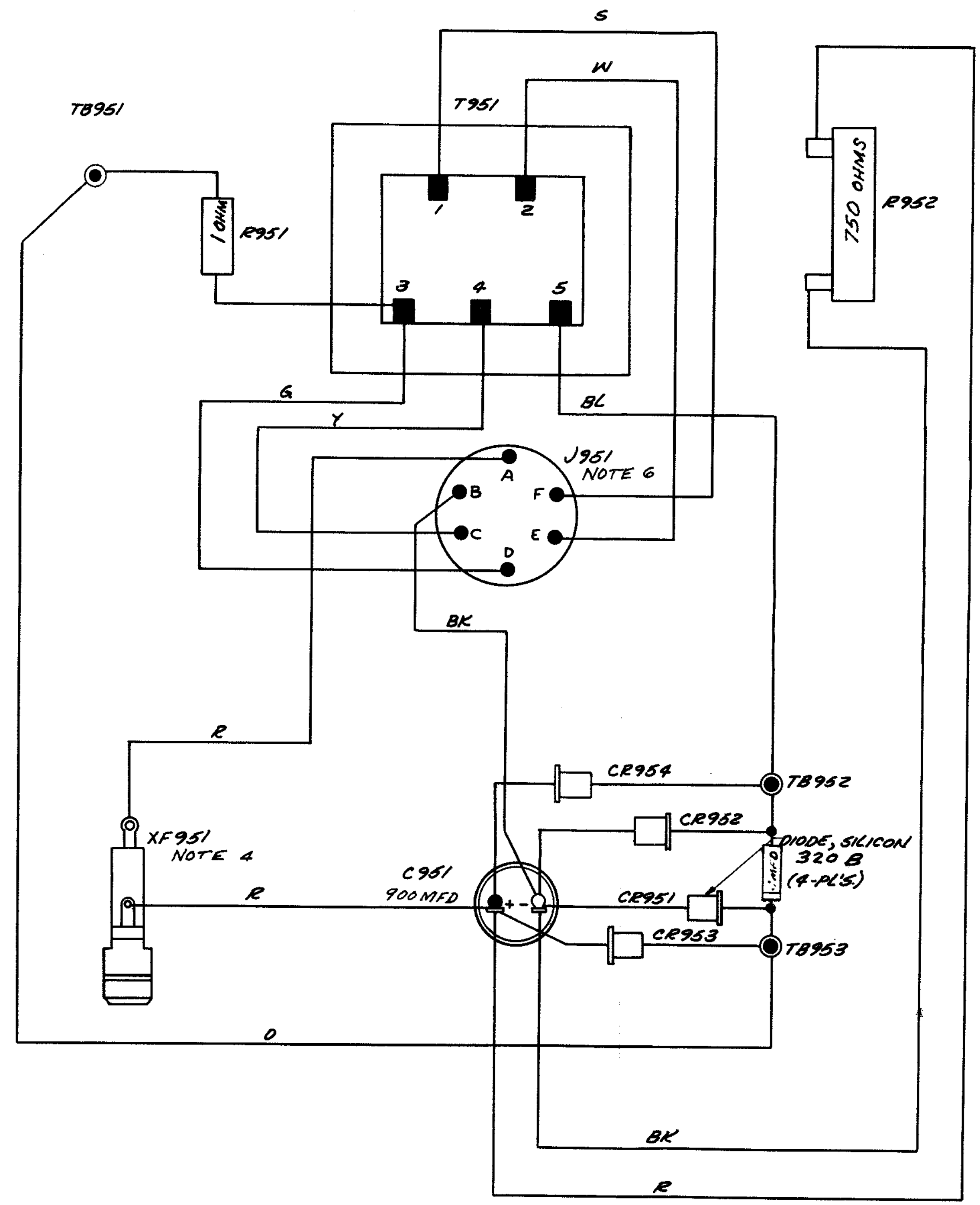
5762 WD

PARTS REQ.	NO. REQ.	USED ON	NO. REQ.

REVISIONS

ISSUE NO.	DATE	AUTHOR. NO.
~~A~~ 2	12-12-62	DCA 6542
~~B~~ 3	4-6-63	DCA6558
~~C~~ 4	1-23-64	79201
5	6-18-64	82766

NO.	NOTES
1.	REFER TO 5763WD FOR SCHEMATIC.
2.	ALL WIRE 20 GA.
3.	USE SLEEVING TO INSULATE WHERE NECESSARY.
4.	FUSE VALUE XF951 - 1½ A
5.	WIRE COLOR CODE WHITE — W SLATE — S BLACK — BK BLUE — BL GREEN — G YELLOW — Y RED — R ORANGE — O
6.	A & B = 48 VDC C & D = 24 VAC E & F = 115 VAC INPUT



ACTUAL
WIRING DIAGRAM
FOR
50/60 CYCLE
48V., 1A
RECTIFIER
ASSEM. NO. 146901

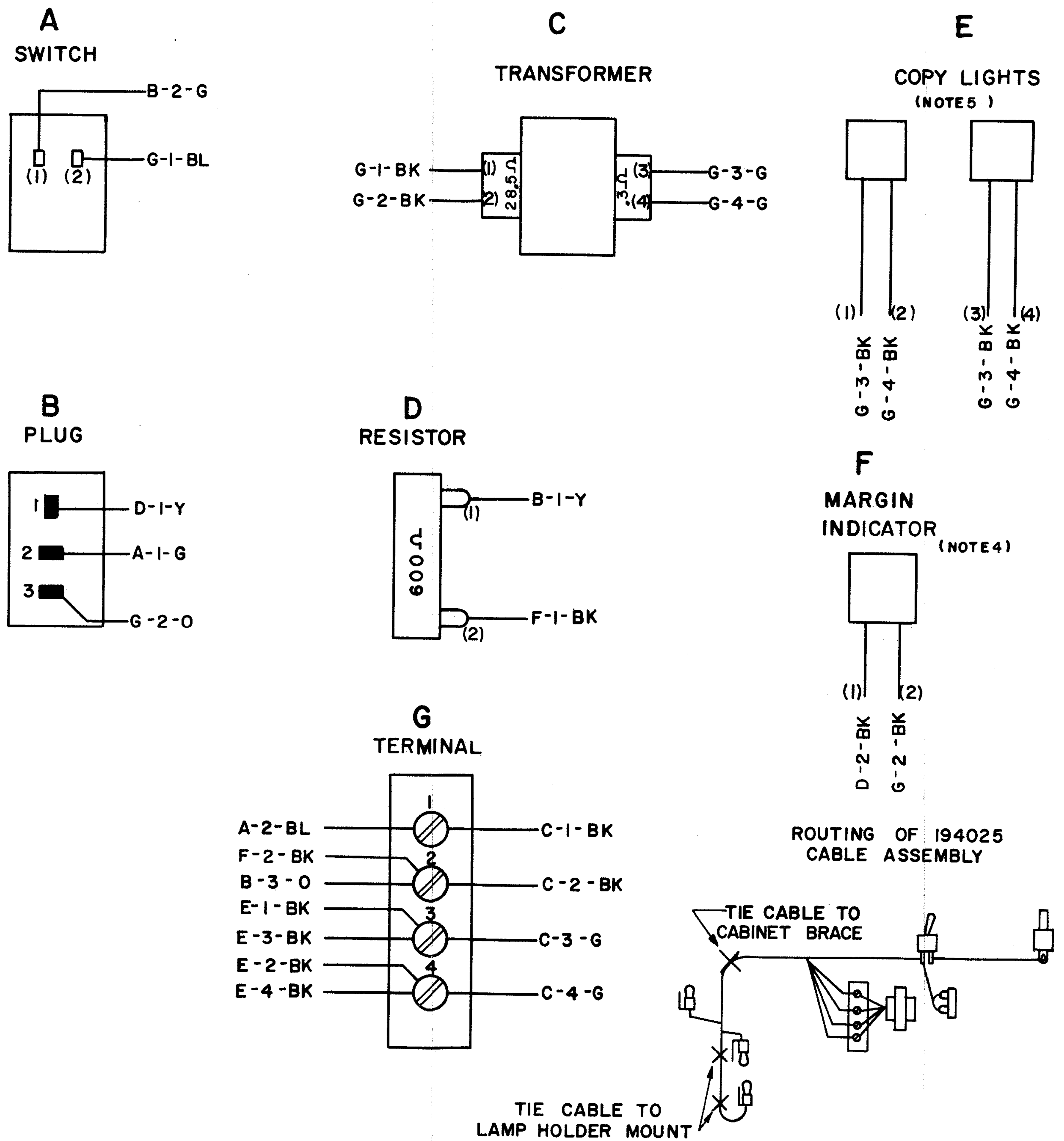
DATE: 8-2-62	
P.D. FILE NO. 35-A25AA	
DRAWN N.A.R.	CHKD.
ENGD. E.J.T.	APPD. R.W.C.
APPROVALS	
D AND R	E OF M
E. NUMBER	
PROD. NO. 5762WD	

TELETYPE
CORPORATION

5762 WD

5831 WD		
ISSUE	DATE	AUTH.NO.
A	1-14-63	75657

NO.	NOTES
1.	WIRING LEGEND: C - 1 - BL DISTANT TERMINATING AREA (C) DISTANT TERMINATING DESIGNATION (1) WIRE COLOR CODE (BL)
2.	—X— DENOTES TAPED OR SPLICED AND TAPED WIRES.
3.	COLOR CODE: BK - BLACK, BR - BROWN, R - RED, O - ORANGE, Y - YELLOW, G - GREEN, BL - BLUE, P - PURPLE, W - WHITE, S - SLATE
4.	USE 60 VOLT LAMP ONLY. TELETYPE PART 153400.
5.	USE 6 VOLT LAMPS ONLY. TELETYPE PART 151982.



ACTUAL WIRING DIAGRAM FOR MODEL 28 PRINTER COVER LPC 202

APPROVALS	
D AND R	E OF M
	10
E-NUMBER	
PROD. NO. 5831WD	
DATE: 4-26-62	
P.D. FILE NO. 25-3065/120AA	
DRAWN. E.E.	CHKD.
ENGD. D.A.K.	APPD.

TELETYPE CORPORATION

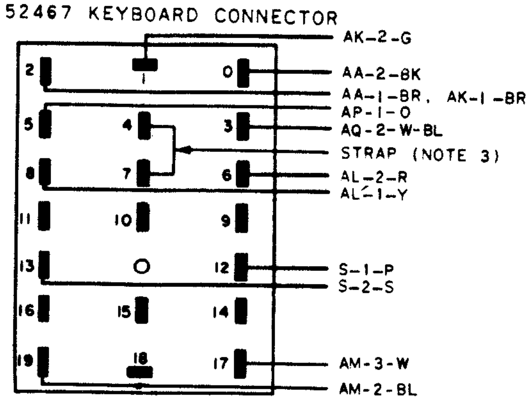
5831 WD

ISSUE	DATE	AUTH. NO.
2	2-6-64	80198
3	4-18-66	90148
4	9-26-66	91294

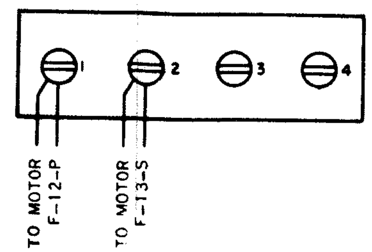
REVISIONS

NO.	NOTES
1.	WIRE COLOR CODE: BK - BLACK BL - BLUE BR - BROWN S - SLATE R - RED W - WHITE O - ORANGE P - PURPLE G - GREEN Y - YELLOW
2.	CONNECTOR VIEWED FROM TERMINAL END.
3.	BARE WIRE STRAP 39522RM
4.	ASSOCIATED CABLES: 162437 KEYBOARD CABLE 164379 SYNC. PULSE CABLE 154149 SIG. LINE BREAK SWITCH CABLE 154144 TIME DELAY MOTOR START CABLE
5.	FOR SCHEMATIC SEE 2893WD.
6.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESIS ARE NOT MARKED ON THE COMPONENT.
7.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION A-1-W-BK WIRE COLOR CODE

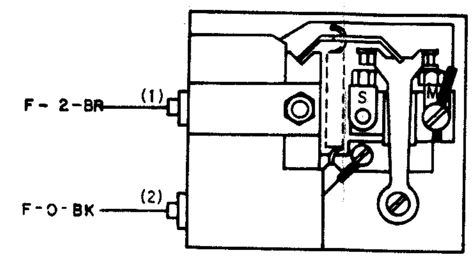
F
152467 KEYBOARD CONNECTOR



S
151415
MOTOR TERMINAL BLOCK

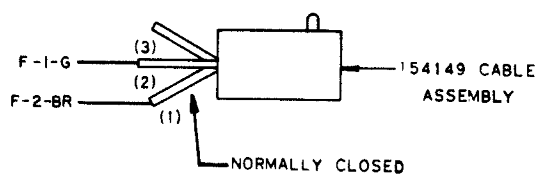


AA
154165
KEYBOARD SIGNAL GENERATOR

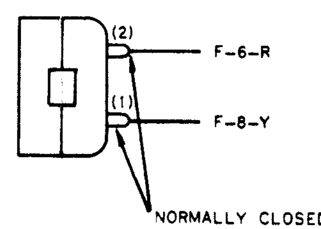


154225 CONTACT BOX ASSEMBLY WITH ARC & R.F. SUPPRESSION

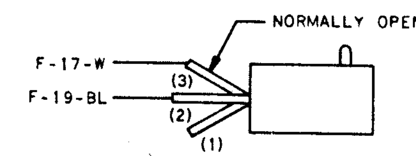
AK
151329
SIGNAL LINE BREAK SWITCH



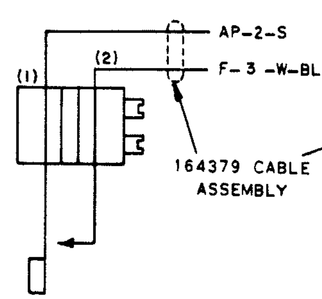
AL
158163
MARGIN INDICATOR SWITCH



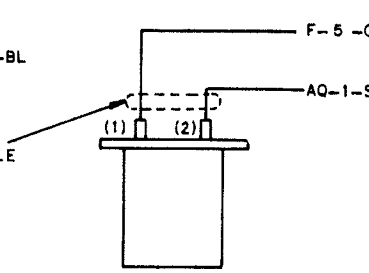
AM
151329
TIME DELAY MOTOR STOP SWITCH



AQ
164650
CLUTCH TRIP SWITCH



AP
263M
CLUTCH TRIP MAGNET



ACTUAL WIRING DIAGRAM
MODEL 28
KEYBOARD
LK49

APPROVALS	
D AND R	E OF M
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E-NUMBER	
PROD. NO. 6462WD	
DATE 5-15-63	
P.D. FILE NO. 49-A65AA	
DRAWN J.D.B.	CHKD.
ENGD.	APPD.

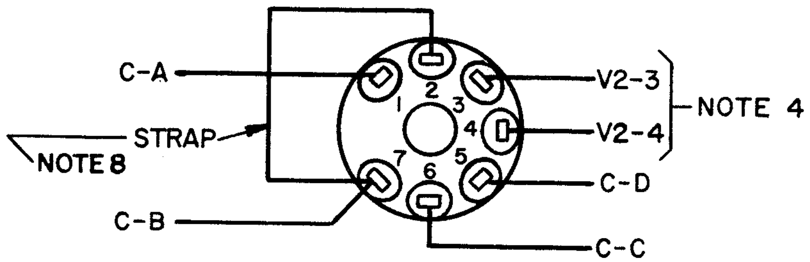
TELETYPE CORPORATION

6462 WD

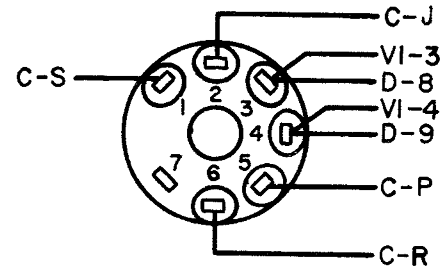
4

NO.	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION D-4
2.	ALL SURFACE WIRE 24 AWG GREEN, 31784RM. DO NOT PULL TAUT BETWEEN TERMINALS. USE 155750 TUBING ON VI AND V2 PINS (13 PLS)
3.	CONNECTOR AND SOCKETS VIEWED FROM SOLDER TERMINAL END.
4.	TWIST WIRES 1-1/2 TURNS PER INCH MIN.
5.	REFER TO 7489WD FOR SCHEMATIC WIRING DIAGRAM.
6.	72597RM TERMINAL ON EACH WIRE TO TERMINAL BLOCK D. (9 PLS.)
7.	ALL WIRES TO BE AS SHORT AS POSSIBLE.
8.	USE 39603 RM 24GA. TINNED WIRE WITH 60340 RM BLACK TUBING.

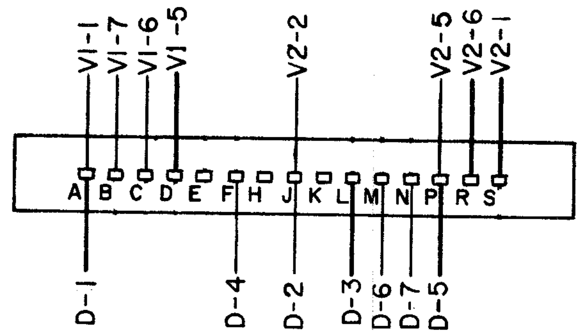
VI
157314 SOCKET
(FOR 6136/6AU6WB TUBE)



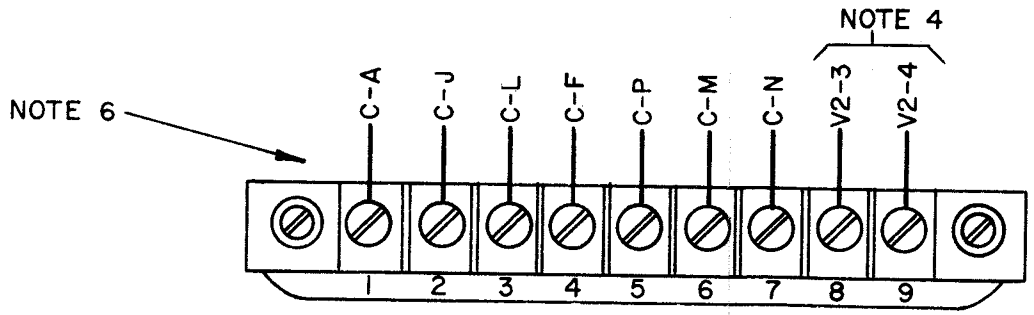
V2
157314 SOCKET
(FOR 6005/6AQ5W TUBE)



C
198649 CONNECTOR
(FOR 309865 CIRCUIT CARD ASSEMBLY)



D
151411 TERMINAL BLOCK



7488 WD

REVISIONS		
ISSUE	DATE	AUTH. NO.
1	12-16-64	16250 R
2	2-9-65	85778

ACTUAL WIRING DIAGRAM FOR VOLTAGE INPUT SMD ASSEMBLY 309863

APPROVALS	
D AND R	E OF M
HK	

E-NUMBER

PROD. NO. 7488WD

DATE: 10-14-64

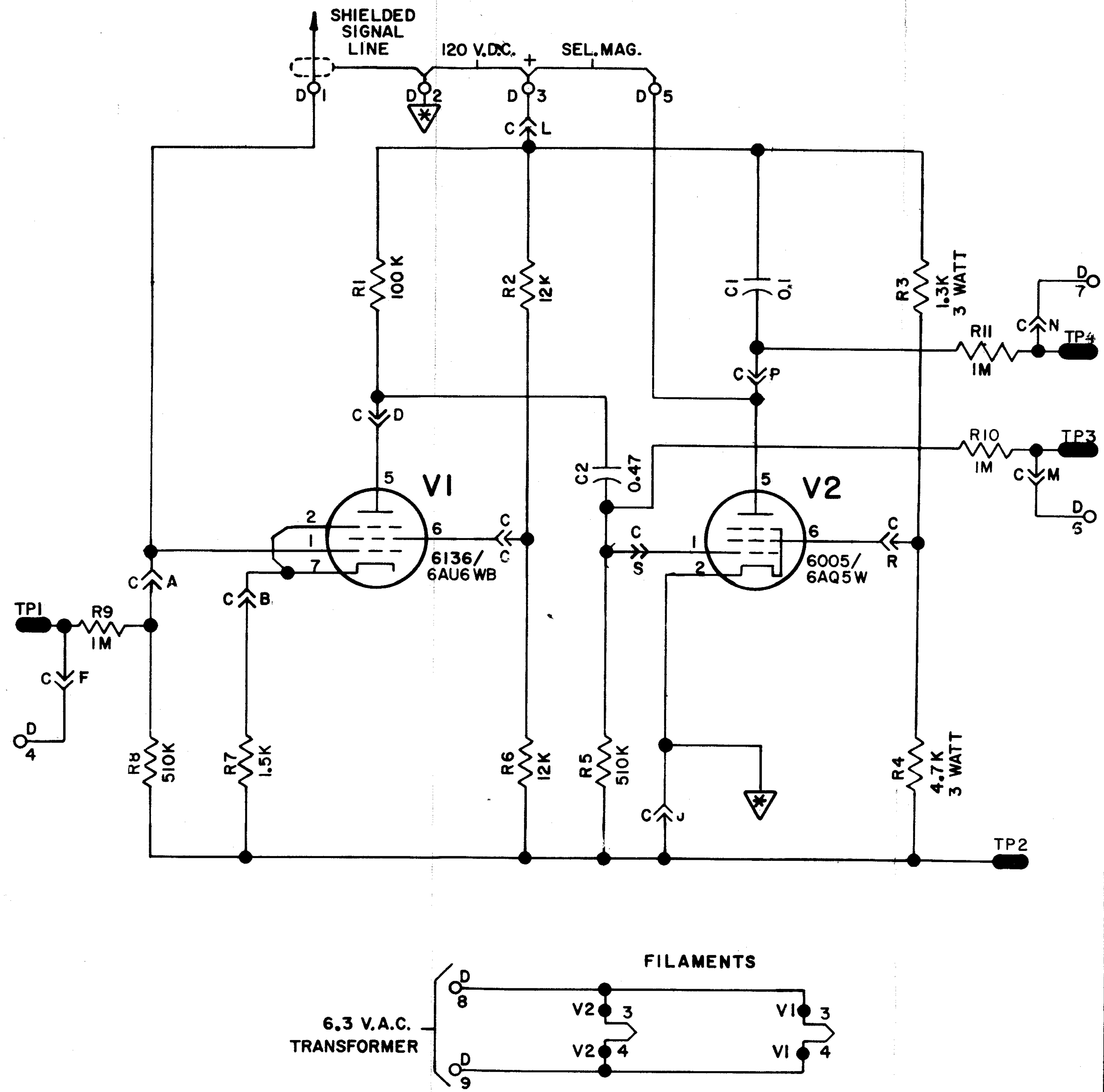
P.D. FILE NO. N-8-G

DRAWN. WPH	CHKD. RDS
ENGD. JRH	APPD. EJC

TELETYPE CORPORATION

7488 WD

NO.	NOTES
1.	FOR ACTUAL WIRING DIAGRAM, SEE 7488 WD.
2.	LEGEND: ● V1 6136/6AU6WB SOCKET, TUBE ● V2 6005/6AQ5W SOCKET, TUBE C 15 PIN CONNECTOR ○ D TERMINAL BLOCK
3.	INDICATES CIRCUIT COMMON.
4.	ALL RESISTORS 1/2 WATT AND RESISTANCE VALUES IN OHMS, UNLESS OTHERWISE SPECIFIED.
5.	ALL CAPACITANCE VALUES IN MICROFARADS
6.	INDICATES FEMALE TERMINAL ON 15 PIN CIRCUIT CARD RECEPTACLE C___. INDICATES MALE TERMINAL ON 309865 CIRCUIT CARD ASSEMBLY.
7.	SELECTOR MAGNETS MUST BE WIRED IN SERIES (30 MA. OPERATION).
8.	
9.	REFER TO 309865 CIRCUIT CARD ASSEMBLY FOR COMPONENT POSITIONS AND DESCRIPTIONS.
10.	SIGNAL INPUT IS 0V. SPACE, -6 V. MARK.



ISSUE	DATE	AUTH. NO.
1	12-16-64	16250 R

7489 WD

SCHEMATIC WIRING DIAGRAM FOR VOLTAGE INPUT SMD ASSEMBLY 309863

APPROVALS

D AND R | E OF M

E-NUMBER

PROD. NO. 7489WD

DATE 9-30-64

P.D. FILE NO. N-8-G

DRAWN J.J.A. CHKD

ENGD D.D. APPD

TELETYPE CORPORATION

7489WD

ET-131481

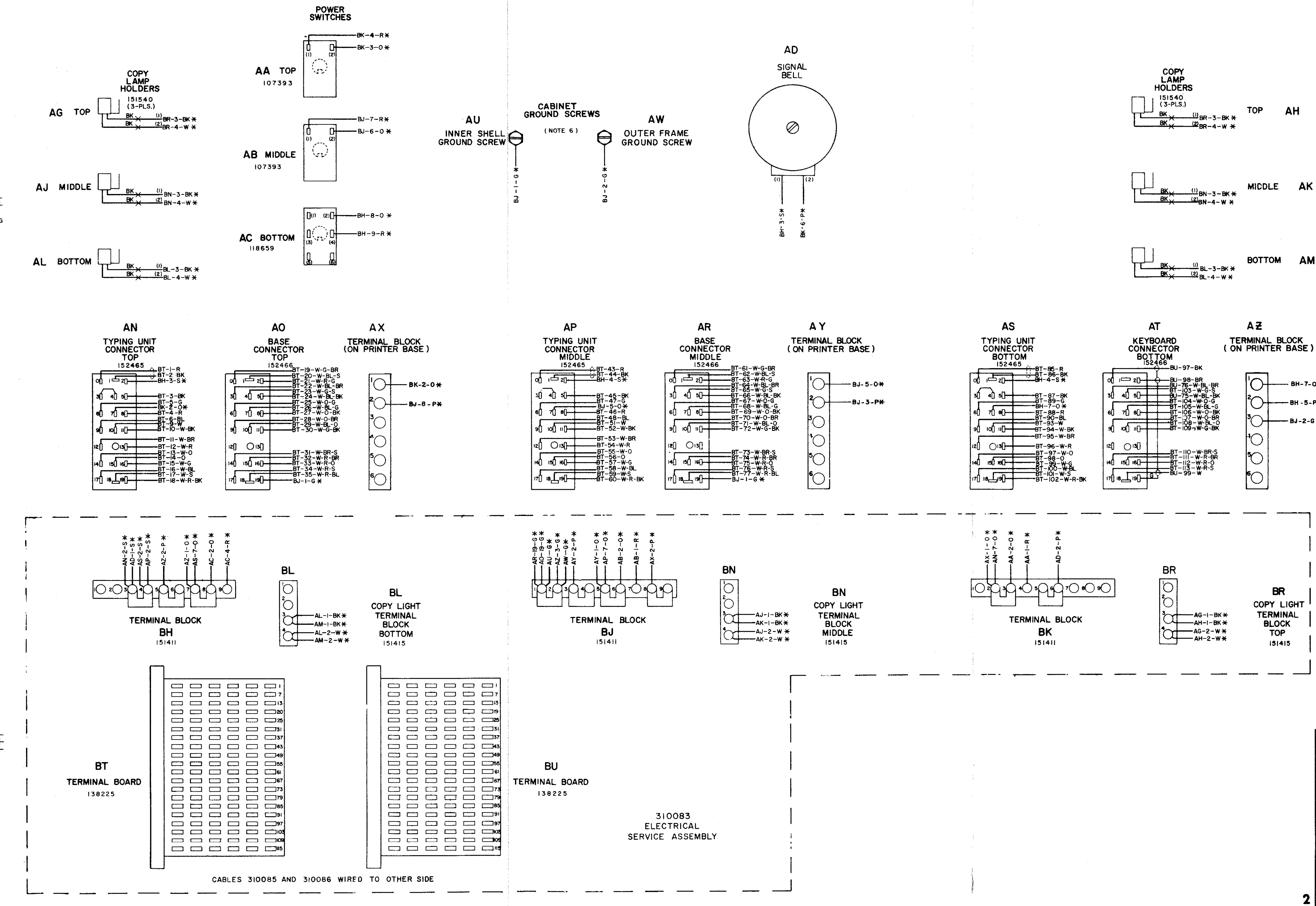
NO.	NOTES
1.	BR-3-BK — DISTANT TERMINATING AREA; DISTANT TERMINATING DESIGNATION; WIRE COLOR CODE
2.	COLOR CODE: BK - BLACK BL - BLUE BR - BROWN G - GREEN O - ORANGE P - PURPLE R - RED S - SLATE W - WHITE Y - YELLOW
3.	CONNECTORS AND SWITCHES VIEWED FROM SOLDERED TERMINAL ENDS.
4.	* MARKED LEADS ARE 18 GA. WIRE, ALL OTHERS 24 GA.
5.	—✕— DESIGNATES SPLICE AND TAPE.
6.	(1) INNER SHELL GROUND SCREW IS THE REAR MOUNTING SCREW OF THE CENTER LEFT SIDE ADAPTOR PLATE. (2) THE OUTER SHELL GROUND SCREW IS THE LOWER LEFT MOUNTING SCREW OF THE FIXED PANEL.
7.	INDICATES 2 LEAD, 22 AWG SHIELDED CABLE. INDICATES 3 LEAD, 22 AWG SHIELDED CABLE.
8.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE FOR REFERENCE ONLY AND ARE NOT MARKED ON COMPONENTS.
9.	REFER TO 7532 WD FOR SCHEMATIC WIRING DIAGRAM.
10.	THIS WIRING DIAGRAM SHOWS CABINET WIRING AND CONNECTIONS TO 310083 ELECTRICAL SERVICE ASSEMBLY. FOR WIRING OF ELECTRICAL SERVICE ASSEMBLY REFER TO 7533 WD.

BT TERMINAL BOARD LEGEND

NO.	DESTINATION	NO.	DESTINATION
1	AN-O-R	61	AR-O-W-G-BR
2	AN-1-BK	62	AR-1-W-BL-S
3	AN-5-BK	63	AR-2-W-R-G
4	AN-8-R	64	AR-3-W-BL-BR
5	AN-6-G	65	AR-4-W-G-S
6	AN-9-BL	66	AR-5-W-BL-BK
7	SHIELD GRD.	67	AR-6-W-O-G
8		68	AR-7-W-BL-G
9	AN-10-W	69	AR-8-W-O-BK
10	AN-11-W-BK	70	AR-9-W-O-BR
11	AN-12-W-BR	71	AR-10-W-BL-O
12	AN-13-W-R	72	AR-11-W-G-BK
13	AN-14-W-O	73	AR-14-W-BR-S
14	AN-15-O	74	AR-15-W-R-BR
15	AN-16-W-G	75	AR-16-W-R-O
16	AN-17-W-BL	76	AR-17-W-R-S
17	AN-18-W-S	77	AR-18-W-R-BL
18	AN-19-W-R-BK	78	
19	AO-O-W-G-BR	79	
20	AO-1-W-BL-S	80	
21	AO-2-W-R-G	81	
22	AO-3-W-BL-BR	82	
23	AO-4-W-G-S	83	
24	AO-5-W-BL-BK	84	
25	AO-6-W-O-G	85	AS-O-R
26	AO-7-W-BL-G	86	AS-1-BK
27	AO-8-W-O-BK	87	AS-5-BK
28	AO-9-W-O-BR	88	AS-8-R
29	AO-10-W-BL-O	89	AS-6-G
30	AO-11-W-G-BK	90	AS-9-BL
31	AO-14-W-BR-S	91	SHIELD GRD.
32	AO-15-W-R-BR	92	
33	AO-16-W-R-O	93	AS-10-W
34	AO-17-W-R-S	94	AS-11-W-BK
35	AO-18-W-R-BL	95	AS-12-W-BR
36		96	AS-13-W-R
37		97	AS-14-W-O
38		98	AS-15-O
39		99	AS-16-W-G
40		100	AS-17-W-BL
41		101	AS-18-W-S
42		102	AS-19-W-R-BK
43	AP-O-R	103	AT-4-W-G-S
44	AP-1-BK	104	AT-6-W-O-G
45	AP-5-BK	105	AT-7-W-BL-G
46	AP-8-R	106	AT-8-W-O-BK
47	AP-6-G	107	AT-9-W-O-BR
48	AP-9-BL	108	AT-10-W-BL-O
49	SHIELD GRD.	109	AT-11-W-G-BK
50		110	AT-14-W-BR-S
51	AP-10-W	111	AT-15-W-R-BR
52	AP-11-W-BK	112	AT-16-W-R-O
53	AP-12-W-BR	113	AT-17-W-R-S
54	AP-13-W-R	114	
55	AP-14-W-O	115	
56	AP-15-O	116	
57	AP-16-W-G	117	
58	AP-17-W-BL	118	
59	AP-18-W-S	119	
60	AP-19-W-R-BK	120	

BU TERMINAL BOARD LEGEND

NO.	DESTINATION	NO.	DESTINATION
1		61	
2		62	
3		63	
4		64	
5		65	
6		66	
7		67	
8		68	
9		69	
10		70	
11		71	
12		72	
13		73	
14		74	
15		75	AT-5-W-BL-BK
16		76	AT-3-W-BL-BR
17		77	
18		78	
19		79	
20		80	
21		81	
22		82	
23		83	
24		84	
25		85	
26		86	
27		87	
28		88	
29		89	
30		90	
31		91	
32		92	
33		93	
34		94	
35		95	
36		96	
37		97	AT-0-BK
38		98	AT-2-BR
39		99	AT-18-W
40		100	SHIELD GRD.
41		101	
42		102	
43		103	
44		104	
45		105	
46		106	
47		107	
48		108	
49		109	
50		110	
51		111	
52		112	
53		113	
54		114	
55		115	
56		116	
57		117	
58		118	
59		119	
60		120	



7531 WD

REVISIONS

ISSUE	DATE	AUTH. NO.
1	1-9-65	16306-R
2	3-11-65	86244

ACTUAL WIRING DIAGRAM

LBAC 261 UNIVERSAL CABINETS

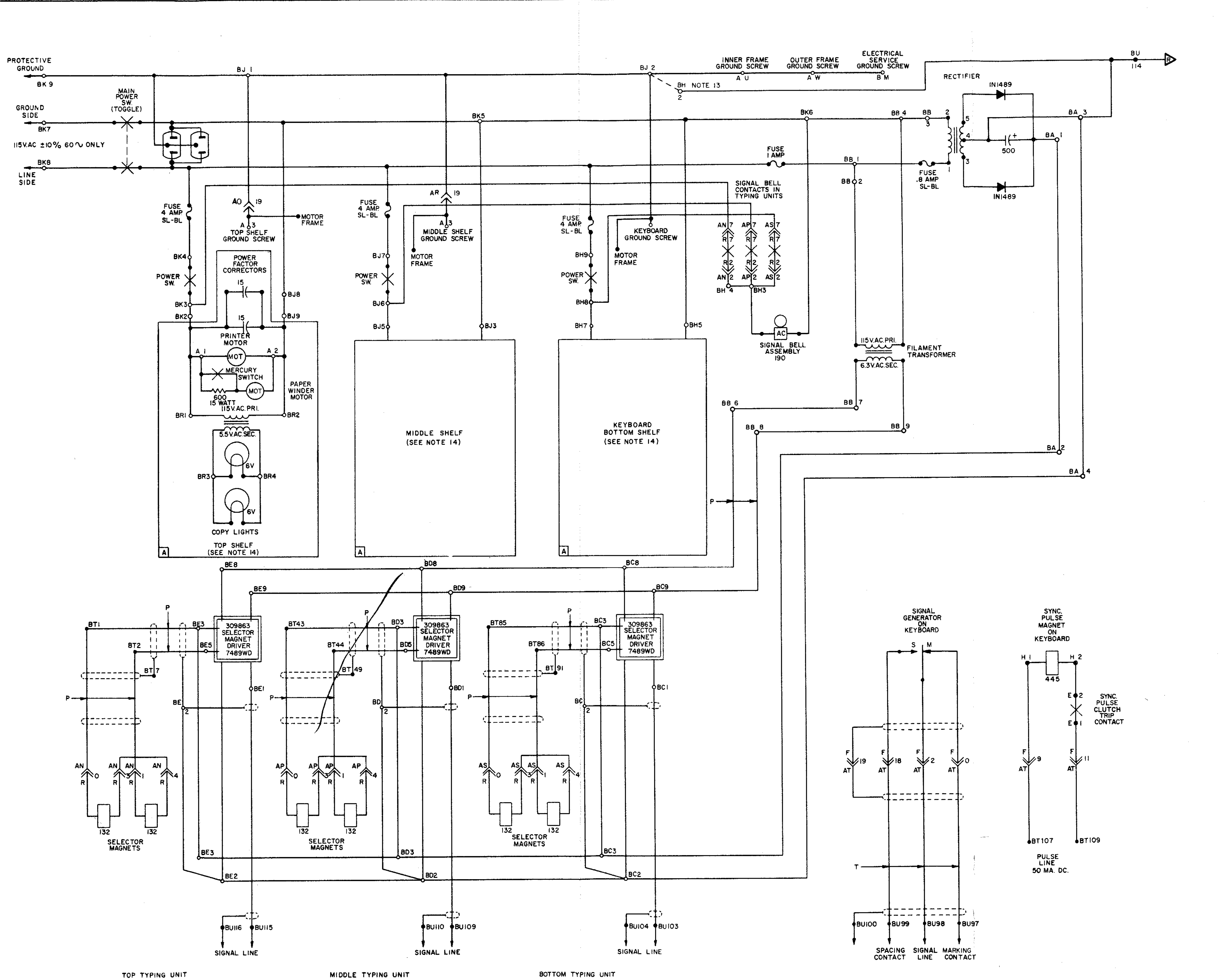
APPROVALS

D&R	E/M
HJK	CJ

E-NO.:
PROD. NO. 7531 WD
DATE: 10-21-64
P.D. FILE NO. N.-8-G
DRAWN J.J.A. CHKD. R.S.I.
ENGD. D.C.L. APPD. EJC

TELETYPE CORPORATION

NO	NOTES
1.	FOR ACTUAL WIRING DIAGRAMS OF INDIVIDUAL UNITS REFER TO: 7556 WD BASE ASSEMBLY 310088 7531 WD CABINET LBAC261 7533 WD ELECTRICAL SERVICE ASSEMBLY 4262 WD KEYBOARD LK51 2900 WD MOTOR UNIT LMU3-21 3214 WD PAGE PRINTER LP109 7488 WD SELECTOR MAGNET DRIVER 309863
2.	LEGEND: O A TERMINAL BLOCK - PRINTER BASE O BA, BB TERMINAL BLOCK - SELECTOR MAGNET DRIVER MTG. ASSEMBLY O BC, BD, BE TERMINAL BLOCK - SELECTOR MAGNET DRIVER O BH, BJ, BK TERMINAL BLOCK - ELECTRICAL SERVICE ASSEMBLY O BL, BM, BN COPY LIGHT TERMINAL BLOCK - ELECTRICAL SERVICE ASSEMBLY ● BT, BU TERMINAL BOARD - ELECTRICAL SERVICE ASSEMBLY —< AN CONNECTOR, RECEPTACLE - TOP TYPING UNIT —< AP CONNECTOR, RECEPTACLE - MIDDLE TYPING UNIT —< AS CONNECTOR, RECEPTACLE - BOTTOM TYPING UNIT —< AT CONNECTOR, RECEPTACLE - KEYBOARD ← E CONNECTOR, PLUG - KEYBOARD ← R CONNECTOR, PLUG - TYPING UNIT
3.	INDICATES SHIELDED LEADS.
4.	RESISTANCE VALUES IN OHMS, UNLESS OTHERWISE SPECIFIED.
5.	CAPACITANCE VALUES IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
6.	POWER INPUT 115 V.A.C. ±10 % 60 CYCLES ONLY.
7.	SL-BL DENOTES SLOW BLOWING
8.	
9	SIGNAL LINE INPUT TOP TYPING UNIT - BU115 MIDDLE TYPING UNIT - BU109 BOTTOM TYPING UNIT - BU103 COMMON CIRCUIT RETURN - BU114
10.	KEYBOARD SIGNAL GENERATOR CONNECTIONS. MARK CONTACT - BU97 SPACE CONTACT - BU99 SWINGER CONTACT - BU98 CABLE SHIELD - BU100
11.	SYNCHRONOUS PULSE TRANSMISSION CONNECTIONS. 120 V.D.C. 50 MILLIAMPERES BT107 BT109
12.	—▷(R) INDICATES COMMON CIRCUIT RETURN.
13.	CUSTOMER MAY CONNECT NEGATIVE SIDE OF POWER SUPPLY AND CIRCUIT COMMON RETURN TO CABINET GROUND BY ADDING A STRAP FROM BH2 TO BJ2.
14.	CORRESPONDING DESIGNATIONS FOR REPEATED CIRCUIT "A". TOP SHOWN: BR MIDDLE SHELF: BN KEYBOARD BOTTOM SHELF: BL
15	P —+—+ INDICATES TWISTED PAIR T —+—+—+ INDICATES TWISTED TRIPLE.



7532 WD		
REVISIONS		
ISSUE	DATE	AUTH. NO
1	2-16-65	16368-R
2	4-27-65	86257

SCHEMATIC WIRING DIAGRAM FOR UNIVERSAL CABINET LBAC261

APPROVALS	
D AND R	E OF M
/i/k	
E-NO.	
PROD. NO. 7532 WD	
DATE: 10-12-64	
P.D. FILE NO. N-8-G	
DRAWN WPH	CHKD.
ENGD. D.C.L.	APPD.

TELETYPE CORPORATION

7532 WD

NO.	NOTES
1.	DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION WIRE COLOR CODE BT - 86 - BR
2.	COLOR CODE: BK - BLACK BL - BLUE BR - BROWN G - GREEN O - ORANGE P - PURPLE R - RED S - SLATE W - WHITE Y - YELLOW
3.	INDICATES SHIELDED LEAD, 22 AWG UNLESS OTHERWISE SPECIFIED.
4.	TERMINALS ENCLOSED IN PARENTHESES ARE FOR REFERENCE ONLY AND ARE NOT MARKED ON COMPONENT.
5.	REFER TO 7532 WD FOR SCHEMATIC WIRING DIAGRAM 3637 WD 7488 WD
6.	SL-BL DENOTES SLOW BLOWING
7.	ELECTRICAL SERVICE GROUND SCREW IS IMMEDIATELY LEFT OF THE "BN" COPYLIGHT TRANSFORMER.
8.	* INDICATES 18 GA. WIRE. ** INDICATE 14 GA. WIRE.
9.	CUSTOMER AC POWER CONNECTIONS (115 V. ±10%, 60∿ ONLY): LINE SIDE OF POWER - TERMINAL BK 8 GROUND SIDE OF POWER - TERMINAL BK 7 PROTECTIVE GROUND - TERMINAL BK 9
10.	CUSTOMER SIGNAL LINE CONNECTIONS TOP TYPING UNIT - TERMINAL BU-115 MIDDLE TYPING UNIT - TERMINAL BU-109 BOTTOM TYPING UNIT - TERMINAL BU-103 CIRCUIT RETURN FOR THE ABOVE SIGNAL LINE CIRCUITS ARE RETURNED THROUGH THE CABLE SHIELDS. CONNECT RETURNS AS FOLLOWS: TOP TYPING UNIT - TERMINAL BU-116 MIDDLE TYPING UNIT - TERMINAL BU-110 BOTTOM TYPING UNIT - TERMINAL BU-104
11.	THIS WIRING DIAGRAM SHOWS WIRING OF 310083 ELECTRICAL SERVICE UNIT ONLY FOR CABINET CONNECTION AND WIRING REFER TO 7531 WD

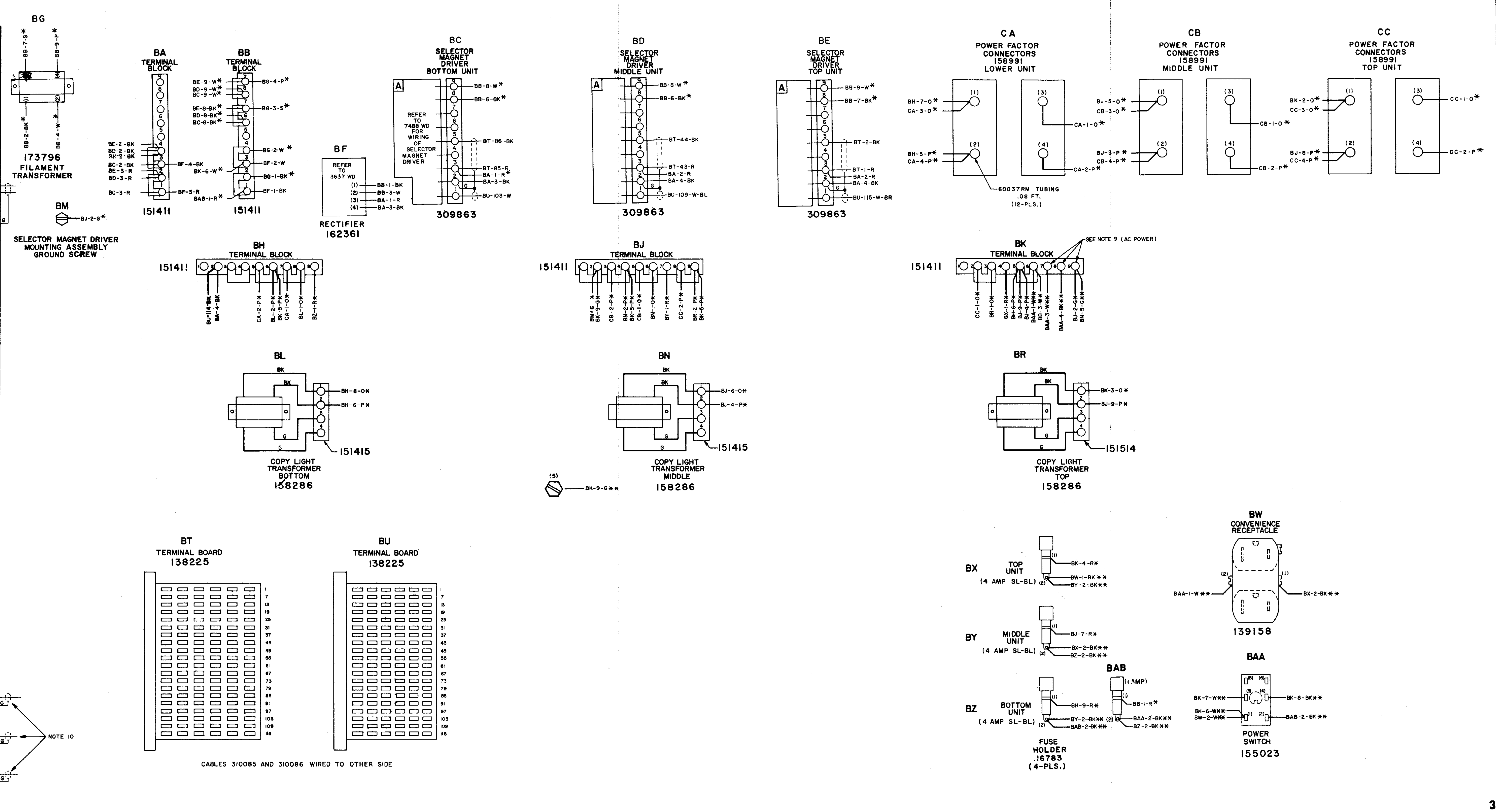
BT TERMINAL BOARD LEGEND

NO.	DESTINATION	NO.	DESTINATION
1	BE-3-R	61	
2	BE-5-BK	62	
3		63	
4		64	
5		65	
6		66	
7	SHIELD GRD.	67	
8		68	
9		69	
10		70	
11		71	
12		72	
13		73	
14		74	
15		75	
16		76	
17		77	
18		78	
19		79	
20		80	
21		81	
22		82	
23		83	
24		84	
25		85	BC-3-R
26		86	BC-5-BK
27		87	
28		88	
29		89	
30		90	
31		91	SHIELD GRD.
32		92	
33		93	
34		94	
35		95	
36		96	
37		97	
38		98	
39		99	
40		100	
41		101	
42		102	
43	BD-3-R	103	
44	BD-5-BK	104	
45		105	
46		106	
47		107	
48		108	
49	SHIELD GRD.	109	
50		110	
51		111	
52		112	
53		113	
54		114	
55		115	
56		116	
57		117	
58		118	
59		119	
60		120	

BU TERMINAL BOARD LEGEND

NO.	DESTINATION	NO.	DESTINATION
1		61	
2		62	
3		63	
4		64	
5		65	
6		66	
7		67	
8		68	
9		69	
10		70	
11		71	
12		72	
13		73	
14		74	
15		75	
16		76	
17		77	
18		78	
19		79	
20		80	
21		81	
22		82	
23		83	
24		84	
25		85	
26		86	
27		87	
28		88	
29		89	
30		90	
31		91	
32		92	
33		93	
34		94	
35		95	
36		96	
37		97	
38		98	
39		99	
40		100	
41		101	
42		102	
43		103	BC-1-W
44		104	SHIELD GRD.
45		105	
46		106	
47		107	
48		108	
49		109	BD-1-W-BL
50		110	SHIELD GRD.
51		111	
52		112	
53		113	
54		114	BH-2-BK
55		115	BE-1-W-BR
56		116	SHIELD GRD.
57		117	
58		118	
59		119	
60		120	

NOTE 10



7533 WD		
REVISIONS		
ISSUE	DATE	AUTH. NO.
1	1-9-64	16308-R
2	3-1-65	862244
3	4-27-65	862257

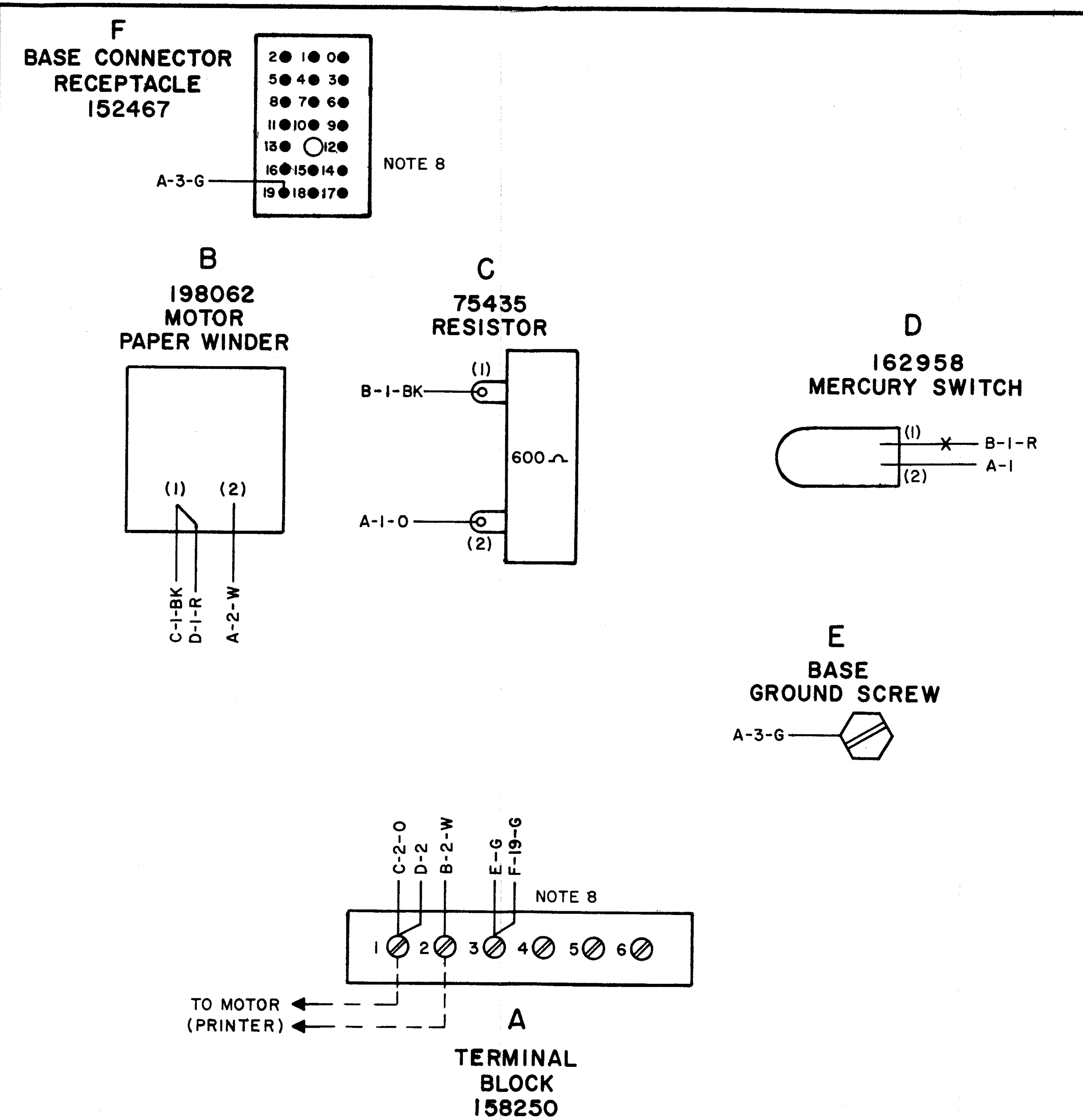
ACTUAL WIRING DIAGRAM
310083
ELECTRICAL SERVICE ASSEMBLY
LBAC 261

APPROVALS	
D & R	E / M
E-NO.	
PROD. NO. 7533WD	
DATE: 10-19-64	
P.D. FILE NO. N-8-G	
DRAWN J.J.A.	CHKD.
ENGD. D.C.L.	APPD.

TELETYPE CORPORATION

7533 WD

NO.	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA; DISTANT TERMINAL DESIGNATION; WIRE COLOR CODE — A-1-O
2.	COLOR CODE: BK - BLACK, O - ORANGE, W - WHITE, G - GREEN, R - RED
3.	NUMBERS ENCLOSED IN PARENTHESES ARE FOR REFERENCE ONLY AND ARE NOT MARKED ON COMPONENT.
4.	—X— DENOTES SPLICE AND TAPE.
5.	PAPER WINDER MOTOR OPERATES ON 115 V.A.C. ± 10% 50 OR 60 CYCLES.
6.	
7.	FOR SCHEMATIC WIRING DIAGRAMS REFER TO 7532 WD FOR 310088 BASE ASSEMBLY AND 7809 WD FOR 317009 BASE ASSEMBLY.
8.	"F" CONNECTOR AND ASSOCIATED WIRING NOT USED ON 317009 BASE ASSEMBLY.



7556 WD

REVISIONS

ISSUE	DATE	AUTH. NO.
1	1-9-65	16358-R
2	10-21-65	89283

ACTUAL WIRING DIAGRAM FOR 310088 AND 317009 BASE ASSEMBLIES

APPROVALS

D AND R	E OF M
O.A.L.	

E-NUMBER
PROD. NO. 7556 WD
DATE: 11-12-64
P.D. FILE NO. N-8-G
DRAWN J.J.A. CHKD.
ENGD. D.C.L. APPD. O.A.L.

TELETYPE CORPORATION

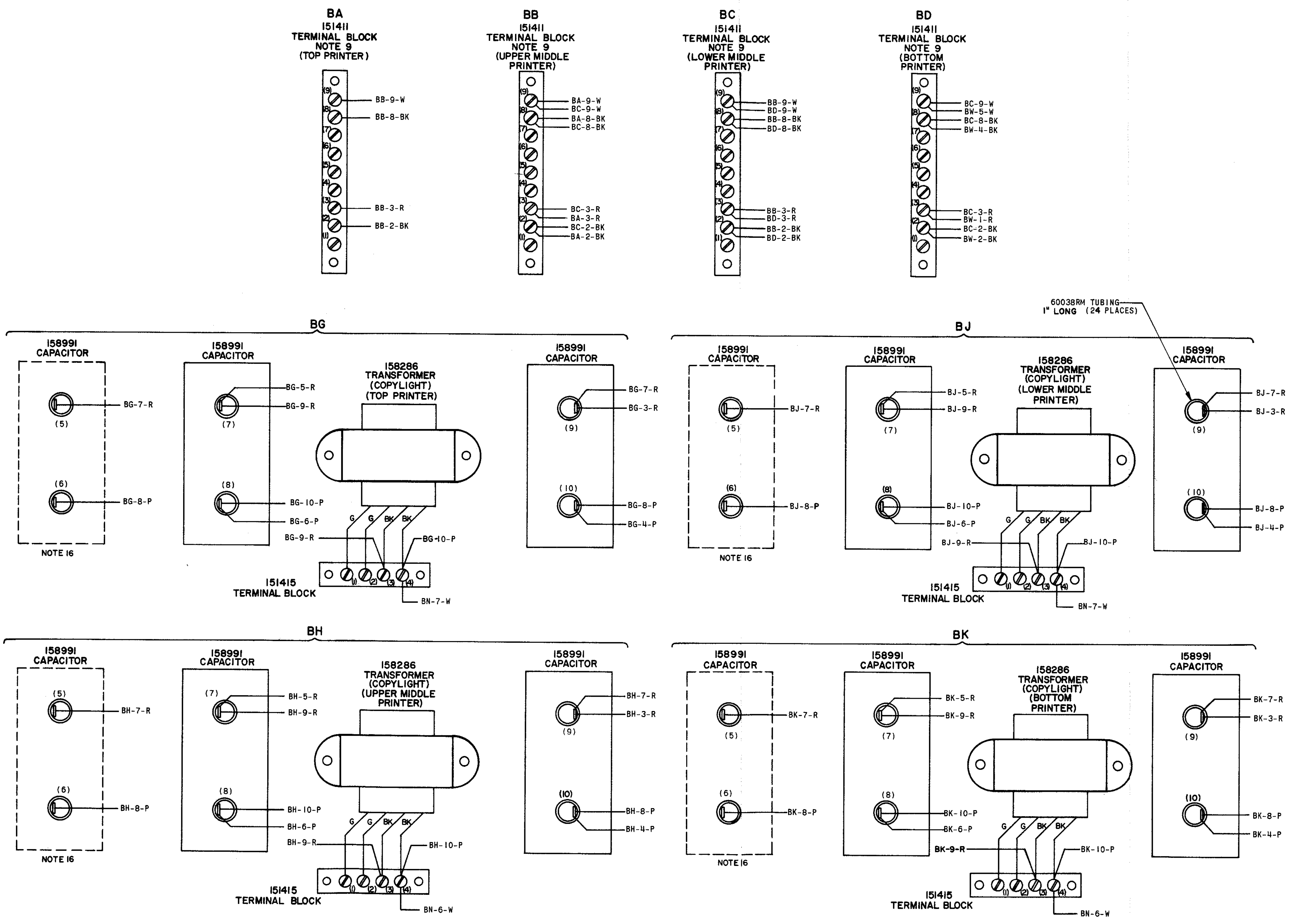
7556 WD

ET-131481

7807WD

REVISIONS

ISSUE	DATE	AUTH. NO.
1	11-29-65	17380-R



ACTUAL
WIRING DIAGRAM
FOR
312696
ELECTRICAL
SERVICE ASSEMBLY

APPROVALS

D AND R	E OF M
HJK	

E-NUMBER

PROD. NO. 7807WD

DATE 5/14/65

P.D. FILE NO. N-8-G

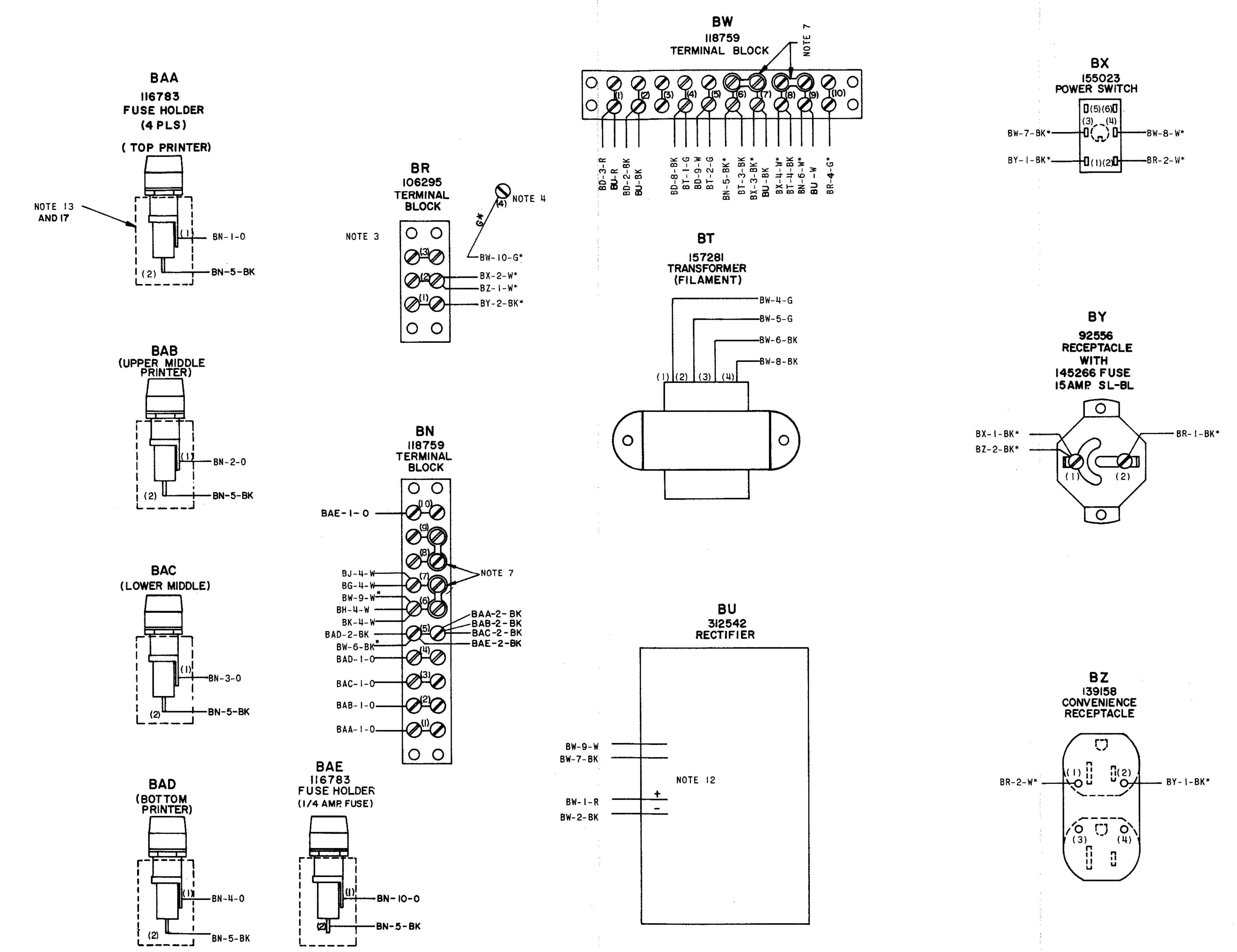
DRAWN	HC	CHKD.	
ENGD.	CFC	APPD.	RRS

REFER TO SHEET 2 FOR NOTES

TELETYPE CORPORATION

7807WD

NO.	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION WIRE COLOR CODE BW-7-BK
2.	COLOR CODE: BK-BLACK P-PURPLE BL-BLUE R-RED BR-BROWN S-SLATE G-GREEN W-WHITE O-ORANGE Y-YELLOW
3.	CUSTOMER TO INSTALL AC INPUT (115V ± 10% 50/60 CYCLE) AS FOLLOWS: AREA BR LIVE SIDE OF LINE - TERMINAL 1 GROUND SIDE OF LINE - TERMINAL 2 PROTECTIVE GROUND - TERMINAL 4
4.	ELECTRICAL SERVICE GROUND SCREW. INSERT GROUND LEAD TERMINAL BETWEEN 92260 LOCK WASHER AND HEAD OF 151630 SCREW.
5.	* INDICATES 14 AWG WIRE ** INDICATES 24 AWG WIRE ALL OTHER WIRE 18 GA.
6.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENT.
7.	312703 TERMINAL STRAP.
8.	COMPONENTS VIEWED FROM SOLDERED TERMINAL ENDS.
9.	COMPONENT OF 309863 SELECTOR MAGNET DRIVER ASSEMBLY ON THE 312698 SMD MOUNTING ASSEMBLY. REFER TO 7488 WD.
10.	REFER TO 7809 WD —— FOR SCHEMATIC WIRING DIAGRAM.
11.	
12.	REFER TO 7810WD FOR ACTUAL WIRING DIAGRAM OF THE 312542 RECTIFIER.
13.	ADD 60040RM TUBING, 1-1/2 INCH 5 PLACES.
14.	SL-BL INDICATES SLOW BLOWING.
15.	ASSOCIATED CABLE ASSEMBLIES: 312693 312694 312695
16.	FOR 60 CYCLE OPERATION USE TWO CAPACITORS. FOR 50 CYCLE OPERATION USE THREE CAPACITORS. CAPACITORS SHOWN WITH DASHED LINES TO BE WIRED BY CUSTOMER IF SET IS TO BE USED FOR 50 CYCLE OPERATION
17.	BAA, BAB, BAC AND BAD USE A 4AMP SL-BL FUSE



7807WD

REVISIONS

ISSUE	DATE	AUTH. NO.
1.	11-29-65	17380-R
2	1-14-66	89150

SHEET 2 OF 2

ACTUAL WIRING DIAGRAM FOR 312696 ELECTRICAL SERVICE ASSEMBLY

APPROVALS

D AND R	E OF M

E-NUMBER

PROD. NO. 7807 WD

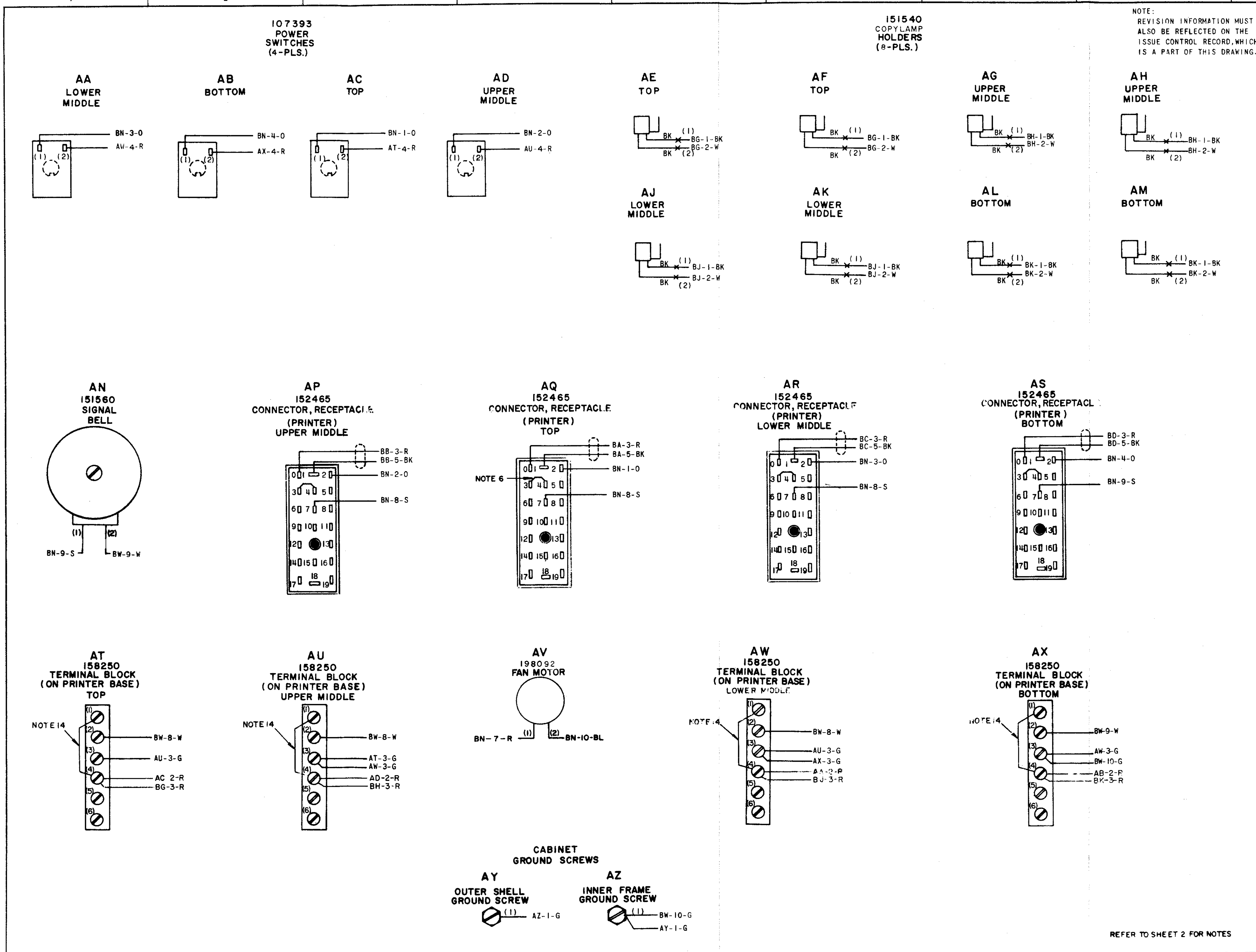
DATE 5-14-65

P.D. FILE NO. N-8-G

DRAWN HC	CHKD.
ENGD. CFC	APPD. RRS

TELETYPE CORPORATION

7807WD



7808WD

REVISIONS

ISSUE	DATE	AUTH. NO.
1	11-29-65	17[illegible]-R
2	3-17-66	90234

SEE ISSUE CONTROL RECORD FOR COMPLETE LIST OF SHEETS COMPRISING THIS W.D.

SHEET 1

ACTUAL
WIRING DIAGRAM
FOR
MODEL 28
CABINET
LBAC 264
(WITH 312696 ELECTRICAL SERVICE ASSEMBLY)

APPROVALS

D AND R	E OF M

E-NUMBER

PROD. NO. 7808 WD

DATE 5-24-65

P.D. FILE NO. N-8-G

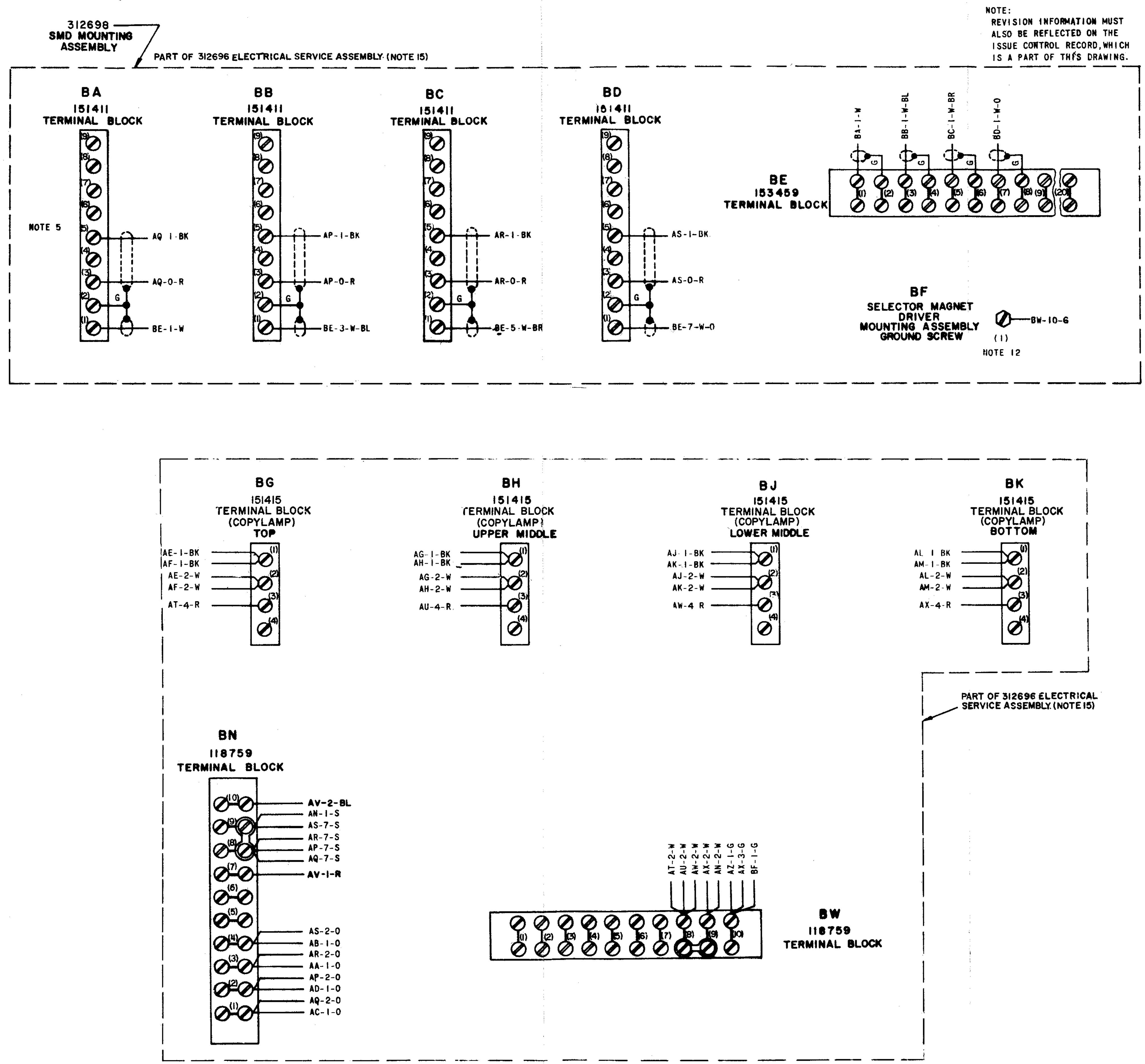
DRAWN HC | CHKD. [illegible]

ENGD. CFC | APPD.

TELETYPE
CORPORATION

7808WD

NO	
1	WIRING LEGEND; DISTANT TERMINATING AREA / DISTANT TERMINATING DESIGNATION / R-12-BL / WIRE COLOR CODE
2	COLOR CODE: BLACK - BK, BROWN - BR, RED - R, ORANGE - O, GREEN - G, YELLOW - Y, WHITE - W, SLATE - S, PURPLE - P, BLUE - BL
3	DESIGNATES SPLICE AND TAPE.
4	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENT.
5	COMPONENT OF 309863 SELECTOR MAGNET DRIVER ASSEMBLY, REFER TO 7488 WD ACTUAL WIRING DIAGRAM.
6	ALL STRAPPING WIRE 22 AWG BARE, 39522RM, USE SLEEVING WHERE REQUIRED. DO NOT PULL TAUT BETWEEN TERMINALS.
7	INDICATES SHIELDED 22 AWG. WIRE.
8	ALL OTHER WIRE 18 AWG.
9	ASSOCIATED CABLE ASSEMBLIES: 312693 312694 312695
10	INSERT GROUND LEAD TERMINAL (S) BETWEEN 92260 LOCKWASHER AND HEAD OF THE SCREW. OUTER SHELL GROUND SCREW IS LOCATED ON SIGNAL BELL MOUNTING BRACKET. INNER FRAME GROUND SCREW IS LOCATED ON THE REAR, LOWER INNER FRAME BRACE.
11	REFER TO 7809 WD — FOR SCHEMATIC WIRING DIAGRAM.
12	INSERT GROUND LEAD TERMINAL BETWEEN 92527 LOCKWASHER AND HEAD OF 1157 SCREW.
13	
14	STRAP 91943 (18 GA.) 4 PLACES
15	FOR ACTUAL WIRING DIAGRAM OF 312696 ELECTRICAL SERVICE ASSEMBLY, SEE 7807 WD.



NOTE: REVISION INFORMATION MUST ALSO BE REFLECTED ON THE ISSUE CONTROL RECORD, WHICH IS A PART OF THIS DRAWING.

7808WD

REVISIONS

ISSUE	DATE	AUTH. NO.
1	11-29-65	16306-R

SEE ISSUE CONTROL RECORD FOR COMPLETE LIST OF SHEETS COMPRISING THIS W.D.

SHEET 2 OF 2

ACTUAL WIRING DIAGRAM FOR MODEL 28 CABINET LBAC 264

APPROVALS	
D AND R	E OF M

E-NUMBER

PROD. NO. 7808 WD

DATE 5-18-65

P.D. FILE NO. H-8-G

DRAWN HC | CHKD.

ENGD. CFC | APPD.

TELETYPE CORPORATION

7808 WD

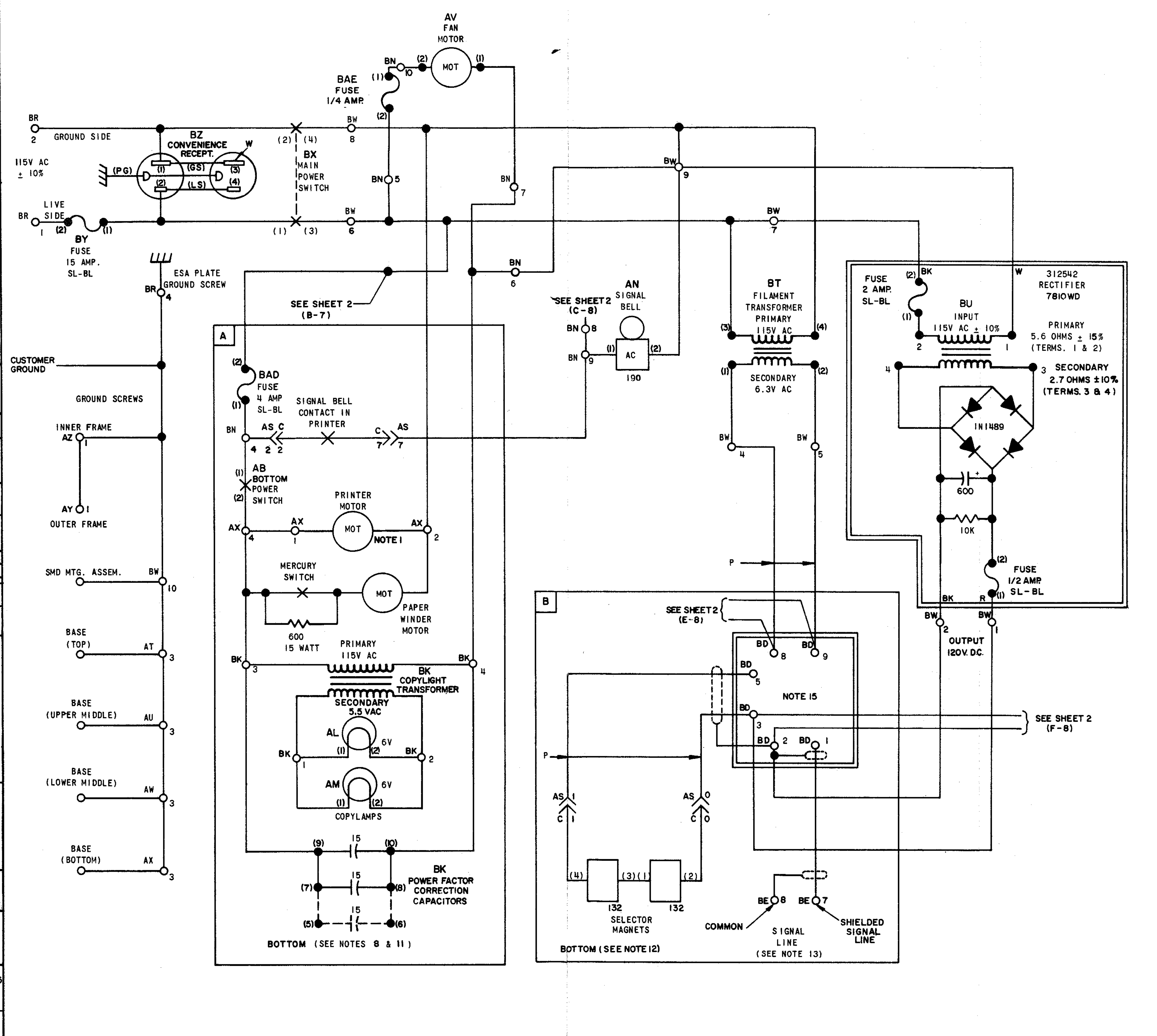
NO	NOTES
1.	FOR ACTUAL WIRING DIAGRAMS OF INDIVIDUAL UNITS SEE: 7808 WD ———— CABINET, LBAC264 7807 WD-ELECTRICAL SERVICE ASSEMBLY TELETYPE NO. 312696. 7810 WD RECTIFIER, TELETYPE NO. 312542. 3214WD PRINTER, LP109RN/AY 7488WD SELECTOR MAGNET DRIVER ASSEMBLY, TELETYPE NO. 309863. 2900WD MOTOR UNIT, LMU21 FOR 60∿±1% LMU52 FOR 50∿±1% 7556WD BASE ASSEMBLY, TELETYPE NO. 317009. FOR SCHEMATIC WIRING DIAGRAM OF TELETYPE NO. 309863 SELECTOR MAGNET DRIVER, SEE 7489 WD.
2.	LEGEND: ○ A TERMINAL BLOCK ON BASE ASSEMBLY. ← C CONNECTOR PLUG (MALE TERMINAL). ≻ AP, AQ, AR, AS CONNECTOR RECEPT. (FEMALE TERM.) ○ AT, AU, AW, AX TERM. BLOCKS "A" ON BASE ASSEM. ○ BA, BB, BC, BD TERM. BLOCKS ON SELECTOR MAGNET DRIVER ASSEMBLY. ○ BE TERMINAL BLOCK ON SMD MOUNTING ASSEMBLY. ○ BG, BH, BJ, BK, BN, BR, BW TERM. BLOCKS ON ELECTRICAL SERVICE ASSEMBLY.
3.	RESISTANCE VALUES IN OHMS, UNLESS OTHERWISE SPECIFIED.
4.	INDICATES SHIELDED WIRE
5.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENTS.
6.	ALL APPARATUS IS SHOWN IN UNOPERATED OR DE-ENERGIZED POSITION.
7.	ALL CAPACITANCE VALUES IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
8.	FOR 60 CYCLE OPERATION-USE TWO CAPACITORS. FOR 50 CYCLE OPERATION-USE THREE CAPACITORS.
9.	SL-BL DENOTES SLOW-BLOWING.
10.	
11.	CORRESPONDING DESIGNATIONS FOR REPEATED CIRCUIT A.
12.	CIRCUIT B
13.	SIGNAL LINE INPUT: MARK -1 TO -6 VOLTS SPACE 0 TO +6 VOLTS
14.	P INDICATES TWISTED PAIR.
15.	312698 SMD MOUNTING ASSEM. PART OF 312696 ELECTRICAL SERVICE ASSEM. FOR REFERENCE SEE 7807WD.
16.	SELECTOR MAGNETS WIRED FOR 30 MILLIAMPERE OPERATION.

Note 11 — Circuit A:

TOP	UPPER MIDDLE	LOWER MIDDLE	BOTTOM (SHOWN)
AQ	AP	AR	AS
BN1	BN2	BN3	BN4
BAA	BAB	BAC	BAD
AT	AU	AW	AX
BG	BH	BJ	BK
AC	AD	AA	AB
AE	AG	AJ	AL
AF	AH	AK	AM

Note 12 — Circuit B:

TOP	UPPER MIDDLE	LOWER MIDDLE	BOTTOM (SHOWN)
BA	BB	BC	BD
BE1	BE3	BE5	BE7
AQ	AP	AR	AS
BE2	BE4	BE6	BE8



7809WD		
REVISIONS		
ISSUE	DATE	AUTH. NO.
1.	11-29-65	17380-R
2	1-14-66	89150

SHEET 1 OF 2

SCHEMATIC WIRING DIAGRAM FOR LBAC 264 CABINET (WITH 312696 ELECTRICAL SERVICE ASSEMBLY)

APPROVALS	
D AND R	E OF M

E-NUMBER

PROD. NO. 7809 WD

DATE 5-25-65

P.D. FILE NO. N-8-G

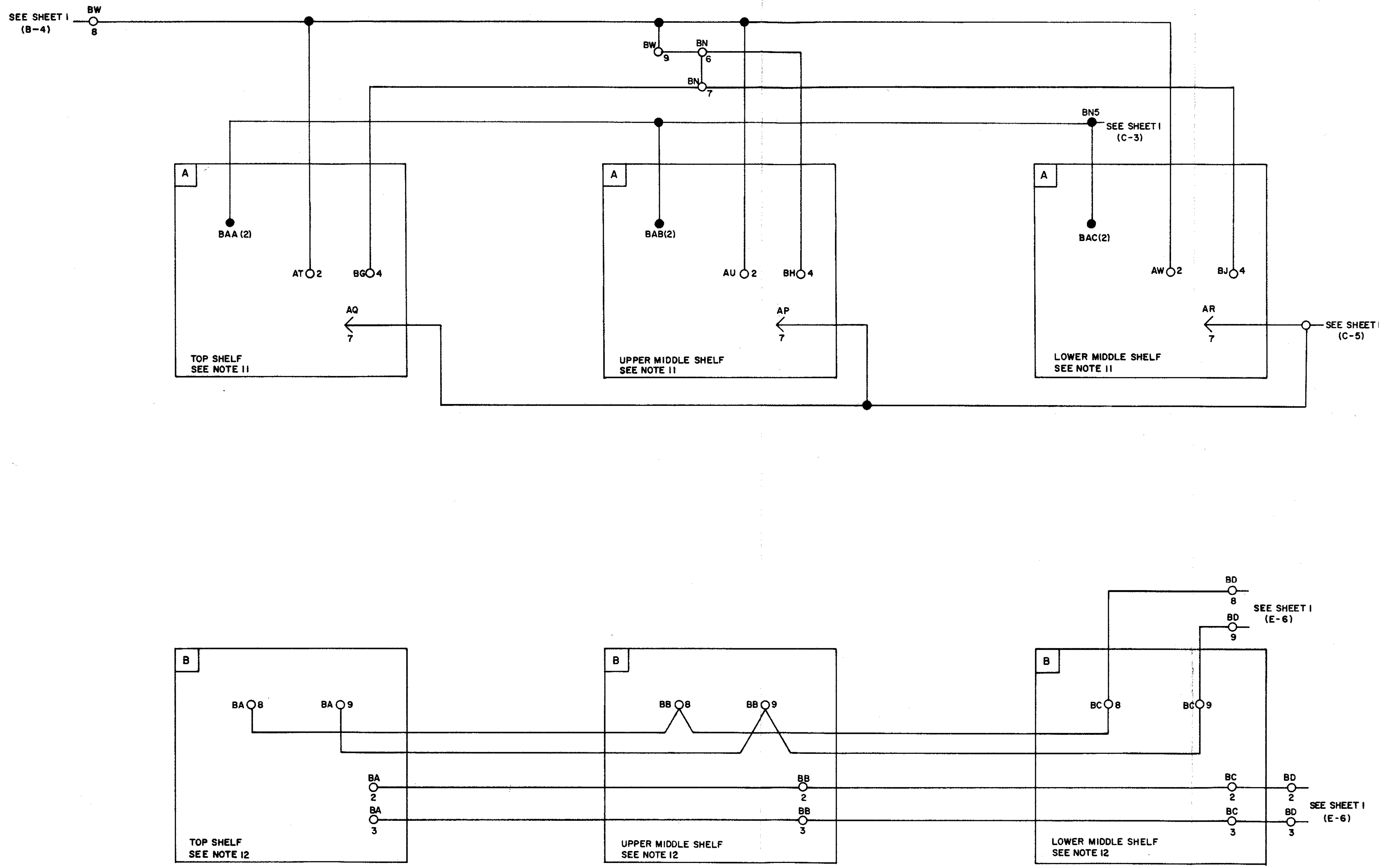
DRAWN HC | CHKD.

ENGD. CFC | APPD.

TELETYPE CORPORATION

7809WD

REFER TO SHEET 1 FOR NOTES.



7809WD

REVISIONS

ISSUE	DATE	AUTH. NO.
1	11-29-65	17380-R
2	1-14-66	89150

SCHEMATIC
WIRING DIAGRAM
FOR
LBAC 264
CABINET

(WITH 312696 ELECTRICAL SERVICE ASSEMBLY.)

APPROVALS

D AND R	E OF M

E-NUMBER

PROD. NO. 7809 WD

DATE 5-25-65

P.D. FILE NO. N-8-G

DRAWN H.C.	CHKD. [signature]
ENGD. C.F.C.	APPD. RRS

TELETYPE
CORPORATION

7809WD

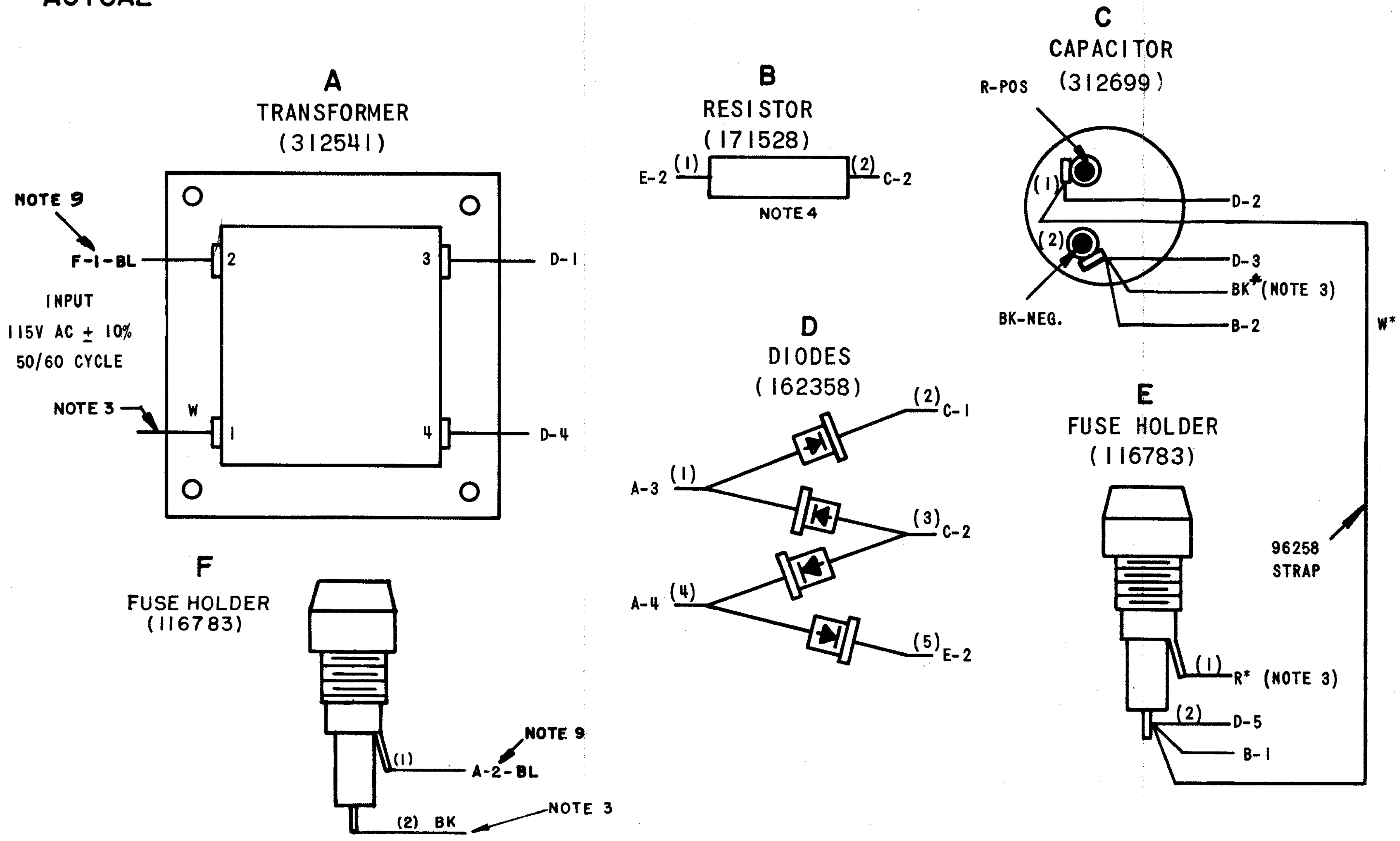
7810 WD

NO.	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION A-3-BL WIRE COLOR CODE
2.	WIRE COLOR CODES: BK - BLACK BL - BLUE R - RED W - WHITE S - SLATE
3.	317219 CABLE ASSEMBLY
4.	RESISTOR 5 WATT RESISTANCE VALUE IN OHMS.
5.	CAPACITANCE VALUE IN MICROFARADS.
6.	DESIGNATIONS SHOWN IN PARENTHESES ARE FOR REFERENCE ONLY, AND DO NOT APPEAR ON COMPONENTS.
7.	* INDICATES 18 AWG. WIRE.
8.	WIRES WITHOUT COLOR CODES ARE LEADS OF RESISTOR & DIODES.
9.	96263BL STRAP (18) GA.

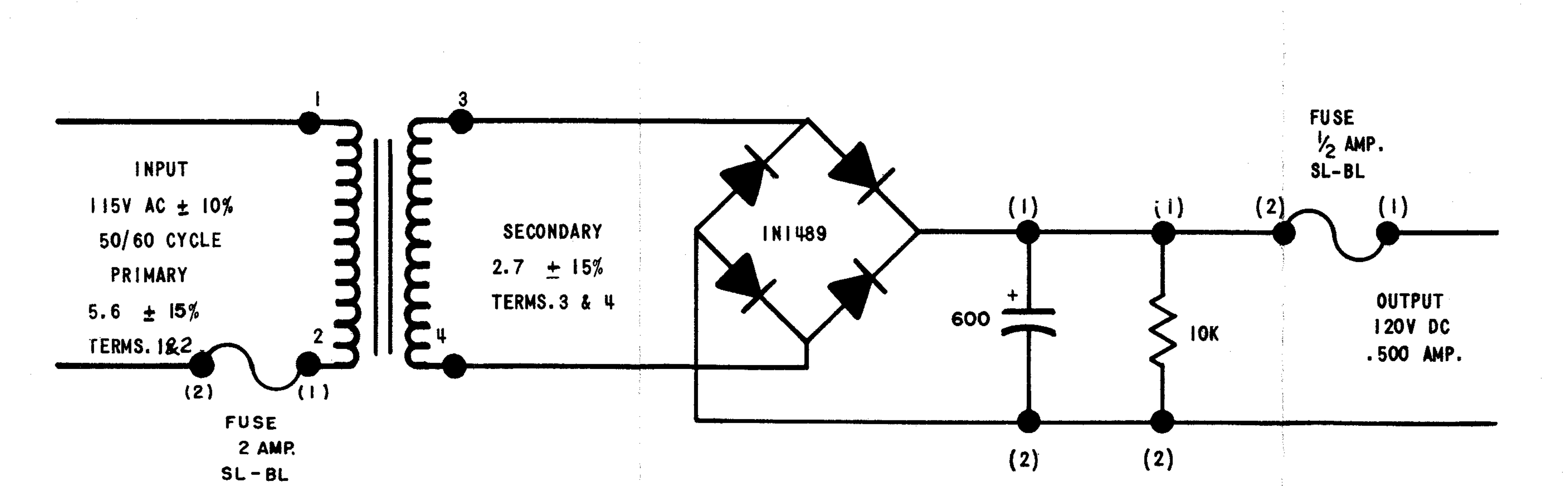
REVISIONS

ISSUE	DATE	AUTH. NO.
1	10-14-65	17299-R
2	11-4-65	89463
3	1-17-67	92241

ACTUAL



SCHEMATIC



ACTUAL AND SCHEMATIC WIRING DIAGRAM FOR 312542 RECTIFIER ASSEMBLY

APPROVALS	
D AND R: HJK	E OF M
E-NUMBER	
PROD. NO. 7810WD	
DATE: 5/26/65	
P.D. FILE NO. N-8-G	
DRAWN H.C.	CHKD.
ENGD. C.F.C.	APPD.

TELETYPE CORPORATION

3

7810 WD