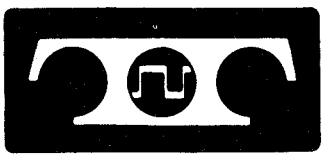
BULLETIN 312B
NAVSHIPS 0967-173-6010
VOLUME 1
(of 3 Volumes)

TECHNICAL MANUAL
28 AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SETS



TELETYPE®
CORPORATION
5555 TOUHY AVENUE, SKOKIE, ILLINOIS

PRINTED IN U.S.A.

VOLUME 1

TABLE OF CONTENTS

28 AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SETS

FOR U. S. NAVY

GENERAL CROSS REFERENCE INFORMATION

1. GENERAL

1.01 This section provides a listing of Automatic Send-Receive 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 chart that follows.

2. ATTACHMENT: ASR COMPONENT CROSS REFERENCE CHART

ASR COMPONENT CROSS REFERENCE CHART

SUBJECT	NAVY DESIGNATION	DESIGNATION OF MANUFACTURER	WIRING DIAGRAM NUMBER	ASR SET NAVY CODE ISSUE	AN/UGC-5	AN/UGC-5X	AN/UGC-5A	AN/UGC-5AX	AN/UGC-5B	AN/UGC-5BX	AN/UGC-5C	AN/UGC-6	AN/UGC-6X	AN/UGC-6A	AN/UGC-6AX	AN/UGC-6B	AN/UGC-6C	AN/UGC-6D	AN/UGC-6E	AN/UGC-6F	AN/UGC-6FX	AN/UGC-6G	AN/UGC-6HX	AN/UGC-6J	AN/UGC-6JX	AN/UGC-6K	AN/UGC-6L	AN/UGC-7	AN/UGC-7X	AN/UGC-8	AN/UGC-8X	AN/UGC-8A	AN/UGC-8AX	AN/UGC-8B	AN/UGC-8C	AN/UGC-8DX	AN/UGC-15	AN/UGC-15X	AN/UGC-16	AN/UGC-16A	AN/UGC-18
CABINETS	CY-2529/UG	LAAC 200	3264WD-A	20	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	X	X	X	X	X					
	CY-3082/UG	LAAC 237	3264WD-A	20																																	X	X	X	X	X
ELECTRICAL SERVICE UNIT	SB-959/UG	LESU 13	3292WD-A, 3294WD-S	19, 24	X	X	X	X				X	X	X	X	X												X	X	X	X	X	X				X	X	X	X	X
	SB-1061/UG	LESU 12	3344WD-A, 3343WD-S	K, P								X	X	X	X		X	X	X	X	X	X								X	X	X	X	X					X	X	X
	SB-1302/UG	LESU 73	4385WD-A, 4386WD-S	B, C												X	X																								
	SB-2611/UG	LESU 96	5930WD-A, 5931WD-S	OR, A																				X	X	X	X														
	SB-2680/UG	LESU 111	7015WD-A, 7016WD-S	5, 3					X	X	X							X	X	X	X	X	X	X	X	X	X								X	X	X				
KEYBOARD BASE	MX-2643/UG	LAK 4 ARN	3302WD-A	17	X	X	X	X				X	X	X	X	X	X											X	X	X	X	X	X					X	X	X	
	MX-2858/UG	LAK 4 ARE	3302WD-A	17																								X	X												
	TT-371/UG	LAK 31 ARN	4927WD-A	K2																																	X	X	X	X	X
	TT-377/UG	LAK 31 ARE	4927WD-A	K2																																					
	TT-433/UG	LAK 42 ARN	6456WD-A	4					X	X	X							X	X	X	X	X		X	X	X	X														
	TT-440/UG	LAK 42 ARE	6456WD-A	4																														X	X	X					
	TT-475/UG	LAK 46 ARN	6456WD-A	4																			X																		
TYPING UNIT	MX-1115B/UG	LP14RN/AY	3214WD-A	44	X	X						X	X					X										X	X	X	X										
	MX-1422A/UG	LP14RE/AY	3214WD-A	44																								X	X												
	MX-2984/UG	LP14RN/AGH	3214WD-A	44			X	X						X	X							X																		
	TT-325/UG	LP14RN/AHF	3214WD-A	44												X	X																								
	TT-372/UG	LP108RN/AY	3214WD-A	44																																	X	X	X		
	TT-374/UG	LP108RN/AGH	3813WD-A	D																																			X		
	TT-378/UG	LP108RE/ACX	3214WD-A	44																																					X
	TT-400/UG	LP14RE/ACX	3214WD-A	44																												X	X							
	TT-436/UG	LP14RN/AJE	3813WD-A	D															X							X														
	TT-437/UG	LP14RN/AJG	3214WD-A	44					X	X	X									X	X		X	X	X	X									X	X	X				
	TT-441/UG	LP14RE/AJG	3214WD-A	44																																					
TYPING REPERFORATOR	TT-266/UG	LPR9/AWA	3628WD-A	21								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X														
	TT-267/UG	LPR9/ARE	3628WD-A	21																										X	X	X	X	X	X	X					
	TT-373/UG	LPR51/BWA	3628WD-A 3567WD-S	21, 13																																	X	X	X	X	
	TT-375/UG	LPR52/BWA	3628WD-A	21																																			X	X	
	TT-379/UG	LPR51/BRH	3628WD-A 3567WD-S	21, 13																																				X
	TT-380/UG	LPR52/BRH	3628WD-A	21																																				X
REPERFORATOR BASE	MT-2234/UG	LRB 6	3590WD-A, 3591WD-S	4, 9								X	X	X	X	X														X	X	X	X							X	X
	MT-2272/UG	LRB 42	3591WD-S	9																																			X	X	X
	MT-2625/UG	LRB 36	3591WD-S	9												X	X	X	X	X	X	X		X	X	X	X									X	X				
	MT-3369/UG	LRB 51	3591WD-S	9																			X														X				
TRANSMITTER DISTRIBUTOR	TT-251/UG	LXD 3	3300WD-A	G	X	X	X	X				X	X	X	X	X	X	X										X	X	X	X	X	X					X	X	X	X
	TT-311/UG	LXD 11	4264WD-A	9																																					
	TT-439/UG	LXD 27	3300WD-A	G					X	X	X							X	X	X	X	X	X	X	X	X	X									X	X	X			
TRANSMITTER DISTRIBUTOR BASE	MT-2099/UG	LCXB1	——		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	X	X	X	X	X					
	MT-2452/UG	LCXB13	4265WD-A	C																																	X	X	X	X	X
MOTOR UNIT	PD-17A/U	LMU 3	2900WD-A	42								X		X		X	X	X	X		X		X	X					X		X		X	X					X	X	X
	PD-18/U	LMU 4	2900WD-A	42									X		X							X									X		X								
	PD-18A/U	LMU 41	2900WD-A	42																					X																
	PD-67/U	LMU 12	2900WD-A	42	X		X		X		X	X		X		X	X	X	X	X		X		X		X	X	X		X		X		X	X		X		X	X	X
	PD-77/U	LMU 14	2900WD-A	42		X		X					X		X								X						X		X		X								
	PD-77A/U	LMU 39	2900WD-A	42					X																X																
	PD-108/U	LMU 38	2900WD-A	42																			X														X				
	PD-111/U	LMU 50	2900WD-A	42																			X														X				
PAPER WINDER	RL235/UG	LPW 300	5830WD-A&S	6							X														X	X															
PERFORATOR TRANSMITTER	TT-252/UG	LTPE1AWA	——		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X														
	TT-265/UG	LTPE1ARE	——																									X	X	X	X	X	X	X	X	X					
GEAR SETS	A-161859, 161860, 161861 B-161859, 161861, 163300 C-164583, 164584, 164585 D-163300, 164583, 164580		E-161859, 161860, 161861, 159660, 159700, 305577, 305579 F-160675, 160676, 160677		A	C	A	C	B	B	B	A	A	A	A	D	D	B	B	B	B	B	E	B	B	B	B	F	F	A	A	A	G	B	B	E	H	H	H	H	H
					G-160677, 161859, 161861 H-163454, 163457, 163499, 163502, 163504, 163505, 173776, 173795, 173992																																						

28 AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SET

DESCRIPTION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the general configuration and capabilities of the 28 Automatic Send-Receive (ASR) Teletypewriter Set. It includes a brief description of the ASR Set components, which are covered in detail in separate sections, the important variable features, a general description of operation, and the appropriate technical data. Because of the many variations possible, the ASR Set described in the text and illustrations is typical.

1.02 The 28 ASR Set is an electromechanical apparatus capable of operating as a self-contained message originating and receiving center. It is used to exchange printed and tape perforated messages between two or more stations connected by appropriate transmission facilities (telegraph lines, telephone networks, and radio channels) (Figures 1 and 2).

1.03 Messages are received electrically via the transmission facility and are printed on page-size copy paper or continuous business forms. With page-printed monitoring, the ASR Set can electrically transmit messages which are originated by either perforated tape or keyboard operation. Messages may be perforated and printed on tape for separate transmission with or without simultaneous transmission and page-printed monitoring.

1.04 Certain ASR Sets are equipped to receive messages in printed and perforated tape form and, at the same time, prepare tape off-line.

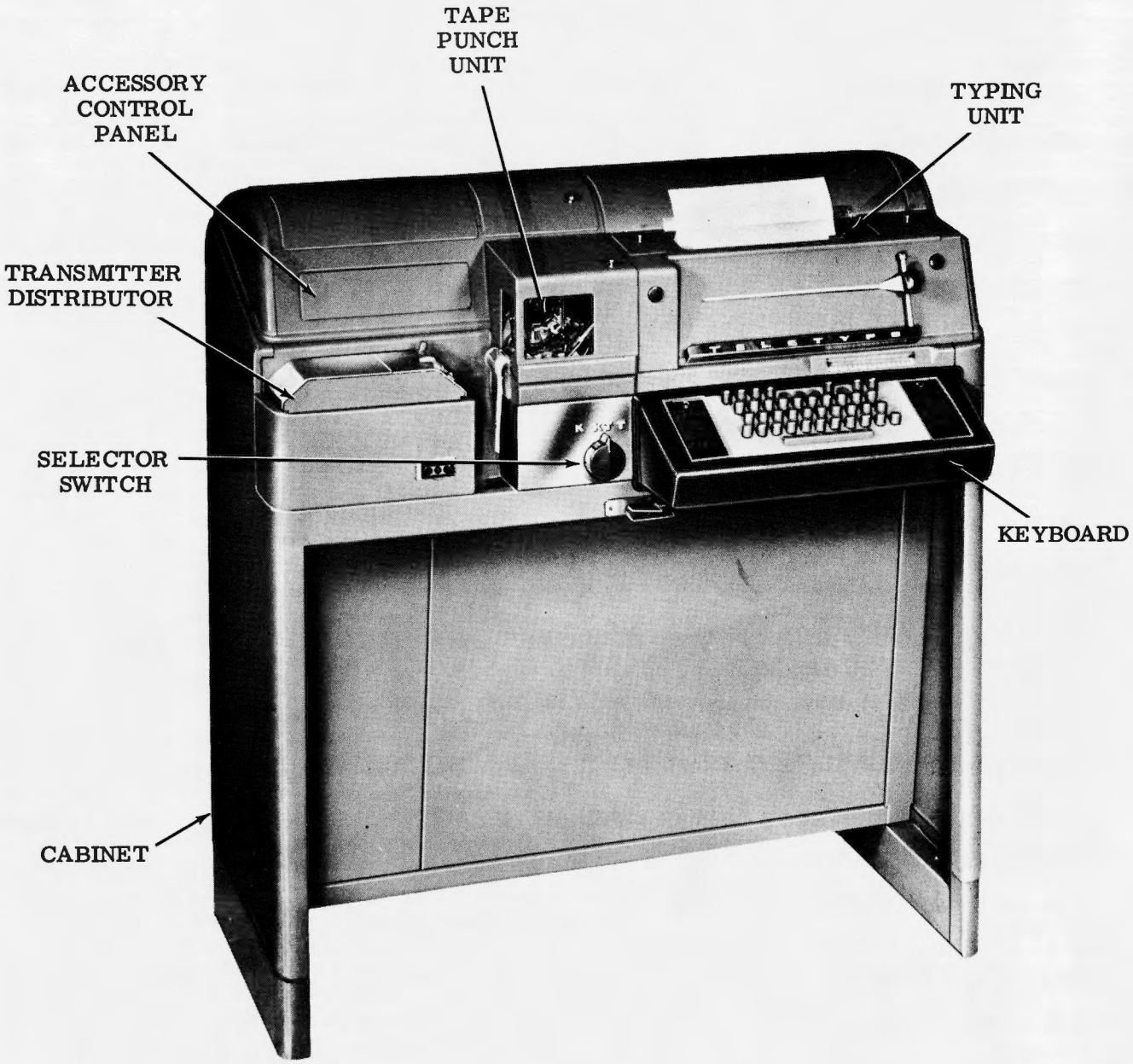


Figure 1 - Typical 28 Automatic Send-Receive (ASR) Teletypewriter Set

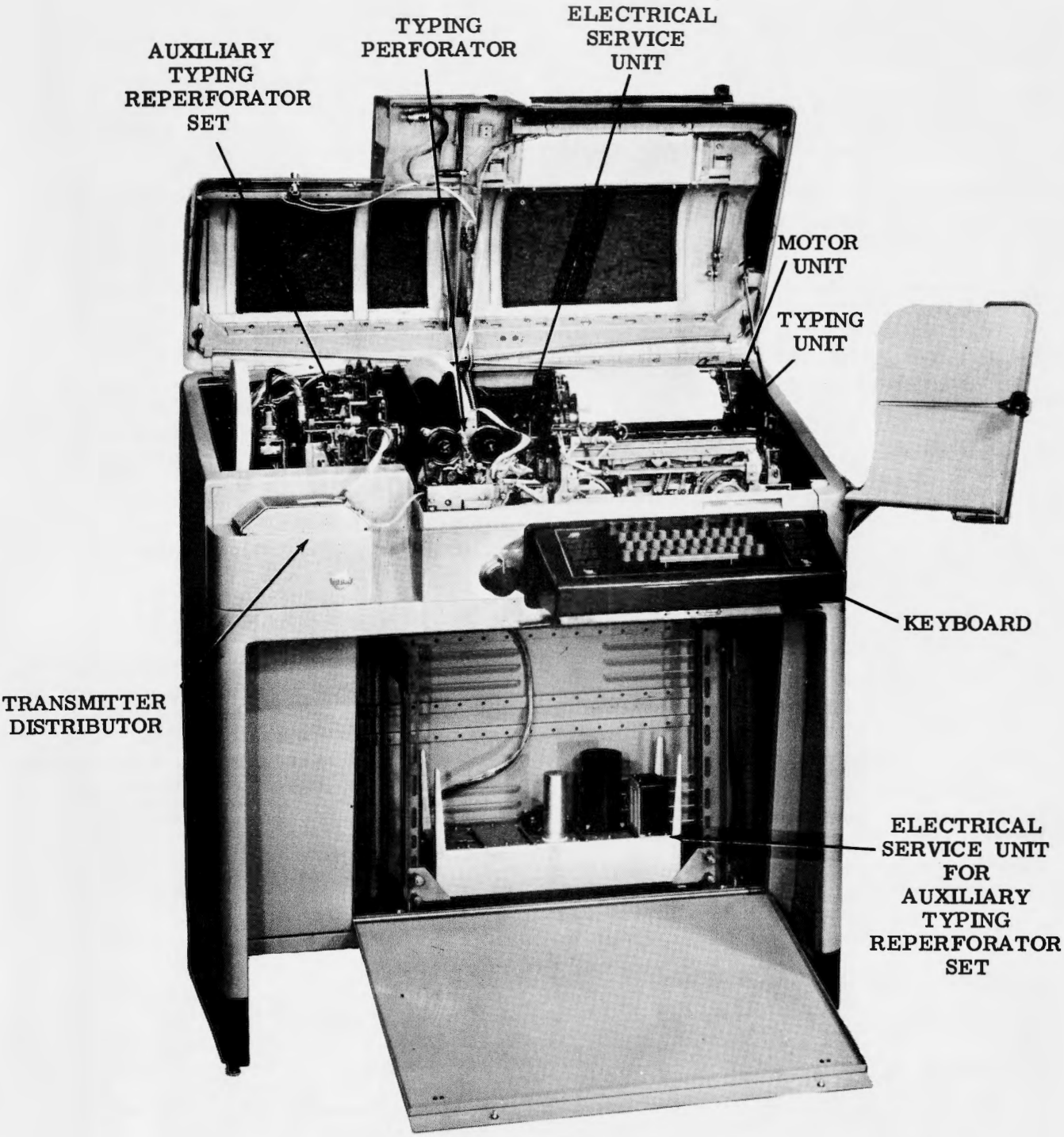


Figure 2 - Typical 28 Automatic Send-Receive (ASR) Teletypewriter Set (Interior View)

1.05 Transmission between stations is accomplished electrically using the Baudot teletypewriter signaling code. The ASR Set operates at speeds up to 100 words per minute.

1.06 Reference should be made to the appropriate sections which describe in detail the various ASR Set components.

1.07 References to left or right and front or rear views are made from a position in front of the ASR Set.

2. CONFIGURATION

2.01 The ASR Set is made up of a group of components using a basic arrangement. These components, described in Part 3, are:

(a) Keyboard

(b) Typing Unit

(c) Perforator (tape punch)

(d) Transmitter-Distributor

(e) Electrical Service Unit

(f) Motor Unit

(g) Cabinet

2.02 To meet varying installation and operational requirements, the selection of the particular kind of component is often varied, but without changing the basic arrangement. The transmitter distributor, for example, may be any one of the following units:

(a) Fixed Head Single Contact

(b) Pivoted Head Multicontact

(c) Fixed Head Multicontact

(d) Pivoted Head and Fixed Head Multicontact

2.03 The perforator (or reperforator) used may be any one of the following four available units:

(a) Nontyping Perforator

(b) Typing Perforator

(c) Nontyping Reperforator

(d) Typing Reperforator

2.04 Variations in typing units include friction feed and sprocket feed units. Motor units are either ac synchronous or dc governed.

2.05 A number of special and optional features are available with the ASR Set. However, these do not affect the basic arrangement of components.

2.06 An addition to the basic component arrangement of the ASR Set is the inclusion of an Auxiliary Typing Reperforator Set. Space is provided in the cabinet for this completely independent receiving unit. Refer to Part 3 for a description of this set.

3. COMPONENTS

3.01 The ASR Set is made up of seven basic components which, because of operational requirements, may vary in features from one installation to another (Part 2). These components are briefly described in the following paragraphs. A complete description including principles of operation appears in the appropriate sections.

TYPING UNIT

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

KEYBOARD

3.03 The keyboard contains the mechanisms for generating and transmitting a teletypewriter signal. It also provides mounting facilities for the typing unit, one of four tape punch units, a motor unit, and the necessary driving gears and cross-shafts. Typing and perforating functions originate from the operation of keytops.

TAPE PUNCH UNITS

3.04 One of four different tape punch units is available with the ASR Set. These receiving-only units contain the mechanisms that translate electrical or mechanical inputs into

perforations in the tape or both perforations and printed characters. The tape prepared by the units may be either fully perforated or partially perforated (chadless).

3.05 Two of the units are perforators and are operated and actuated mechanically by the keyboard. The nontyping perforator prepares only perforations in the tape. The typing perforator, in addition to perforating the tape, types messages on the tape.

3.06 The remaining two units available are reperforators, which are equipped with a selector mechanism to receive inputs electrically. The nontyping reperforator prepares only perforations in the tape. The typing reperforator produces perforations and types on the tape. They may also be actuated mechanically.

3.07 The ASR Set may be equipped with an Auxiliary Typing Reperforator Set. This completely independent set contains the following components:

(a) Typing reperforator unit.

(b) Base (with gears, terminal boards, controls; on some sets controls are on a panel mounted on the front of the cabinet).

(c) Electrical service unit (installed in the lower right side of the cabinet).

(d) Motor unit (a variable speed gear shift mechanism is available with some units. This allows selection of 60, 75, or 100 word per minute speeds).

TRANSMITTER-DISTRIBUTORS

3.08 A transmitter distributor contains the necessary mechanisms to advance the tape, read its perforations, and to convert these into teletypewriter signals. The transmitter distributor is installed on a separate base, but receives motive power from the keyboard-mounted motor unit. The unit is controlled by a three-position start-stop switch which is accessible to the operator. The ASR Set uses one of four available transmitter distributors:

(a) Fixed Head Single Contact: Contains a stationary tape reading head and a single-contact distributor. Output is sequential.

(b) Pivoted Head Multicontact: Tape reading head and signal distributor may be actuated independent of each other by local or remote control. Unit is always used in conjunction with a punching unit because the pivoted reader can move along the tape, read and transmit the last character punched. This unit is used frequently with continuous tape loops. Output from the transmitter distributor is in sequential or parallel form.

(c) Fixed Head Multicontact: Tape reading head and signal distributor may be actuated independent of each other by local or remote control. Output from transmitter distributor is in sequential or parallel form. Signal distributor also accepts external parallel inputs and converts them to serial form.

(d) Pivoted and Fixed Head Multicontact: This consists of two tape reading heads (one stationary, the other pivoted) and a single-contact signal distributor. The pivoted head is mounted in line with and accepts tape directly from the ASR Set punch unit. The stationary tape head is accessible externally for manual insertion of tape from any source. This arrangement permits the combining of inputs, such as standard and variable data. Output from the signal distributor is in sequential form.

ELECTRICAL SERVICE UNIT

3.09 The electrical service unit serves as the area of concentration for the wiring of the ASR Set, and provides mounting facilities for various electrical assemblies and components. It may include such optional assemblies as a line (polar) relay, line shunt relay, and line test key. The set's main power switch, convenience outlet and fuse, terminal blocks, and interconnecting cables may also be included.

MOTOR UNITS

3.10 The motor units that provide mechanical motion for the ASR Set 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 are rated heavy-duty to accommodate the set's load requirements.

CABINET

3.11 The components of the ASR Set are enclosed in a floor mounted cabinet which includes space for an Auxiliary Typing Reperfo-

rator Set and other optional equipment, and for accessories such as paper and tape handling equipment.

4. VARIABLE FEATURES

4.01 A wide variety of optional features are available with the ASR Set. These features, which provide special, nonprinting 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 typing unit 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) Contact Mechanisms: A number of electrical contact mechanisms are available to provide control of external equipment or for other special applications. These include code reading, timing, auxiliary, and letters-figures contact mechanisms.

(f) Tape Feed-Out Mechanism: This mechanism may be installed on the tape punch units. It operates automatically or manually to feed out a length of blank or letters perforated tape for convenience in tape handling. Tape feeding may be either interfering or noninterfering.

(g) Back Space Mechanism: This mechanism, operated manually or with power-drive, retracts tape back through the punch block to allow erroneously perforated data to be obliterated by replacement with the letters code combination.

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

5. OPERATION

GENERAL OPERATION

5.01 The components are interconnected electrically or mechanically to provide a wide range of possibilities for sending, receiving or storing teletypewriter messages. Electrical connections between the components are routed through the electrical service unit. Transmitted signals are initiated through the keyboard or the transmitter distributor (Figure 3).

5.02 Received signals are recorded by the typing unit which also monitors local, off-line transmissions. The tape punch (typing or nontyping perforator or reperforator unit) prepares tape on which received or locally prepared messages may be stored for future transmission by the transmitter distributor.

5.03 The keyboard, tape punch unit, typing unit, and transmitter distributor receive their motive power from a single motor unit.

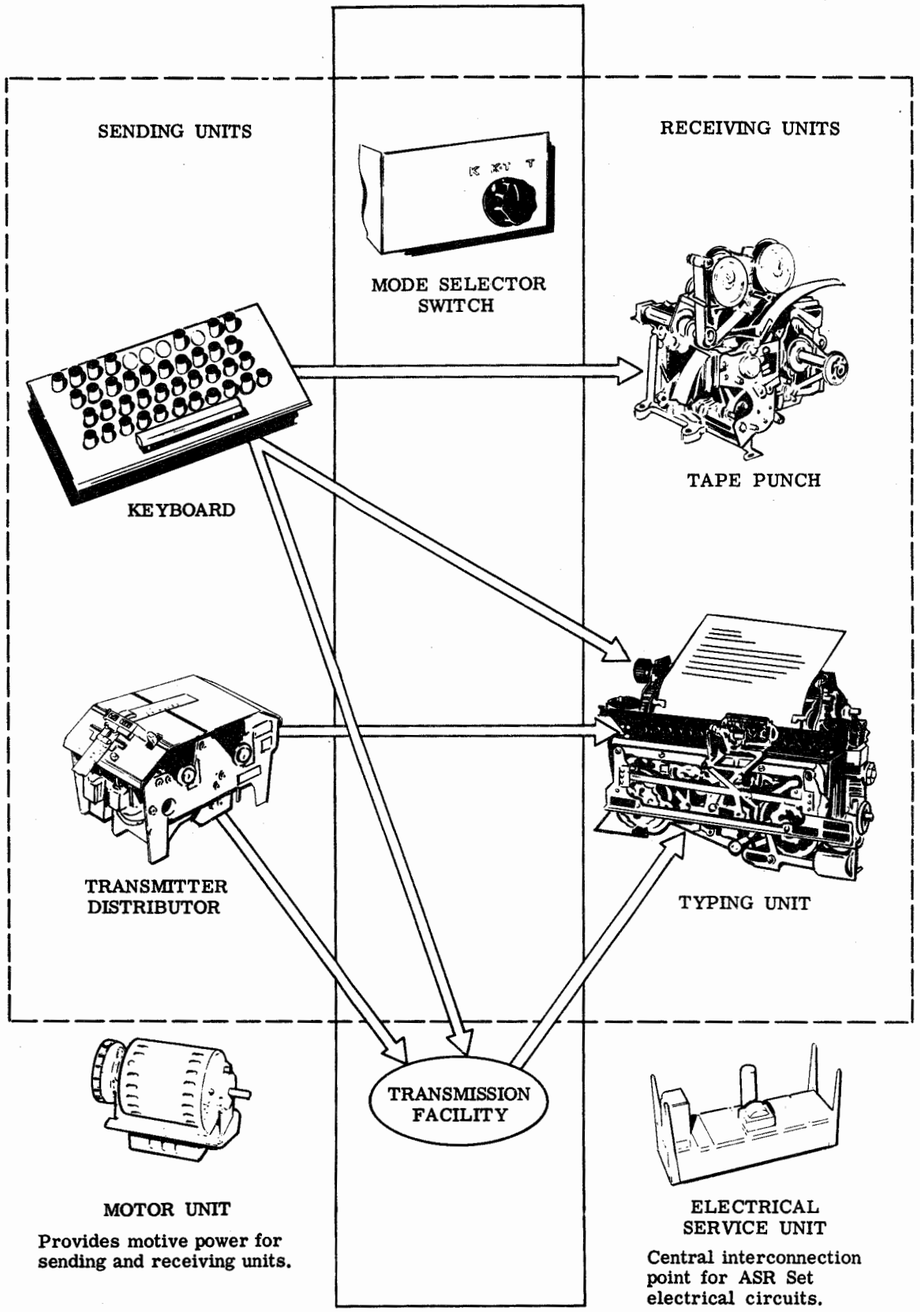
5.04 A three-position mode selector switch, mounted on the front panel of the cabinet, permits the operator to place the ASR Set into one of three operating conditions:

(a) Keyboard (K): Placing the selector switch in the K (keyboard position) conditions the ASR Set so that messages may be transmitted from the keyboard. All messages transmitted are recorded on the typing unit.

(b) Keyboard-Tape (K-T): Placing the selector switch in the K-T (keyboard-tape position) enables the ASR Set to transmit from its keyboard and, at the same time, record all transmission in both punched tape and page-printed form.

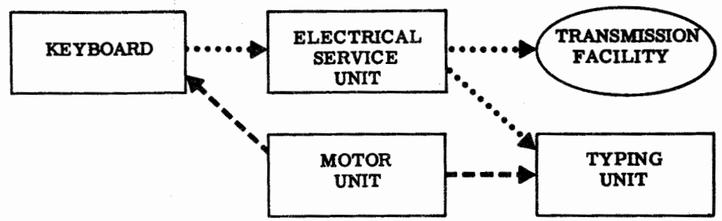
(c) Tape (T): Placing the selector switch in the T (tape position) conditions the ASR Set so that operation of the keyboard produces punched tape only. No external transmissions occur. However, the typing unit is operable and will record all received messages.

5.05 The transmitter distributor is controlled by a start-stop switch which is accessible for operation by the operator. Transmissions are automatically stopped by tight-tape or tape-out devices, which are incorporated in the transmitter distributor, should these tape conditions occur.



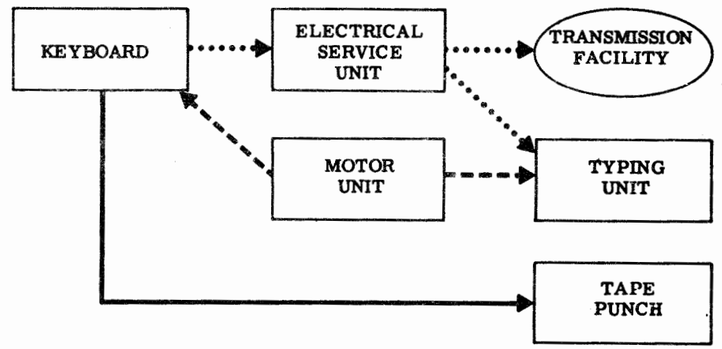
K

Messages are transmitted from the keyboard and recorded on the typing unit. Received messages are recorded on the typing unit.



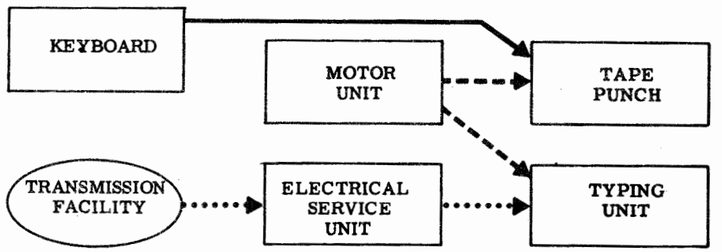
K-T

Messages are transmitted from the keyboard and recorded on both the typing unit and tape punch unit (perforator or reperforator). Perforator (illustrated) is actuated mechanically; reperforator is actuated electrically and may be used, as can the typing unit, to record received messages. Reperforator may also be actuated mechanically.



T

No external transmissions occur. Messages typed on the keyboard are recorded by the tape punch unit. Received messages are recorded on the typing unit, and/or reperforator.



TRANSMITTER DISTRIBUTOR OPERATION

The transmitter distributor, controlled by a start-stop switch, may be operated in place of the keyboard in all operating modes. Transmitted messages are recorded by the typing unit and reperforator-type tape punch unit.

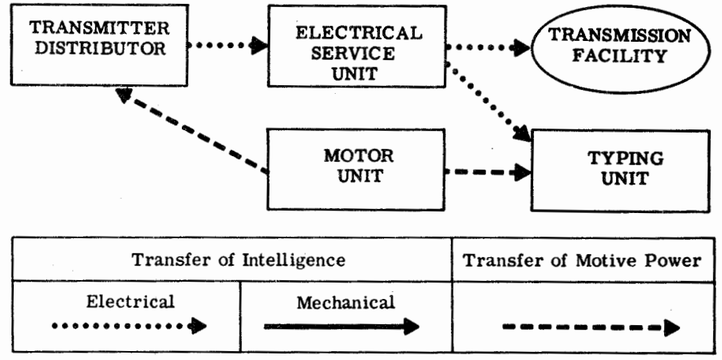


Figure 3 - Typical 28 ASR Set Components and Operating Modes

5.06 Control of the optional Auxiliary Typing Reperforator Set is provided either by controls located on the accessory control panel on the front of the cabinet, or by controls located on the typing reperforator base and accessible through a cabinet access lid. The Auxiliary Typing Reperforator Set is connected to a separate signal line circuit and may therefore receive and record messages simultaneously with but independent of other ASR Set operations.

SELECTIVE CALLING

5.07 ASR Sets may be equipped to operate in a selective calling system. 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-nonprint 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

Code: Baudot (five level start-stop); sequential.

Input:

(1) Neutral - Selector magnets directly connected to signal line, or through line relay.

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

Line Current: 20, 30, or 60 milliamperes.

POWER REQUIREMENTS (TYPICAL)

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

Sets with Governed Motor Units

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

(2) 115 v dc 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)

Height	Width	Depth
39	36	18-1/2 (less keyboard which extends 4-1/2 inches)
(See Figure 4 for dimensional details.)		

APPROXIMATE WEIGHT (POUNDS)

Total Weight	260
Shipping	
Domestic	530
Export	600

PRINTED CHARACTERS (TYPING UNIT)

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.

Type Styles and Spacing (Typical)

Style	Character Height Caps	Fraction	Horizontal Characters Per Inch Single - SPACE - Double		Vertical Lines Per Inch Single - FEED - 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

Physical Characteristics	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 endplay.

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

TAPE SPECIFICATIONS

Type . . . . . Standard communications
Width . . . . . 11/16 inch
Code perforations. Chadless or fully perforated
Characters or feed holes per inch 10

PRINTED CHARACTERS (TAPE)

Height . . . . . Chadless, 0.120 inch; fully perforated, 0.100 inch
Width . . . . . Chadless, 0.075 inch; fully perforated, 0.046 inch
Location of Printing . . . . . Along upper edge of chadless perforated tape; between feed holes on fully perforated tape

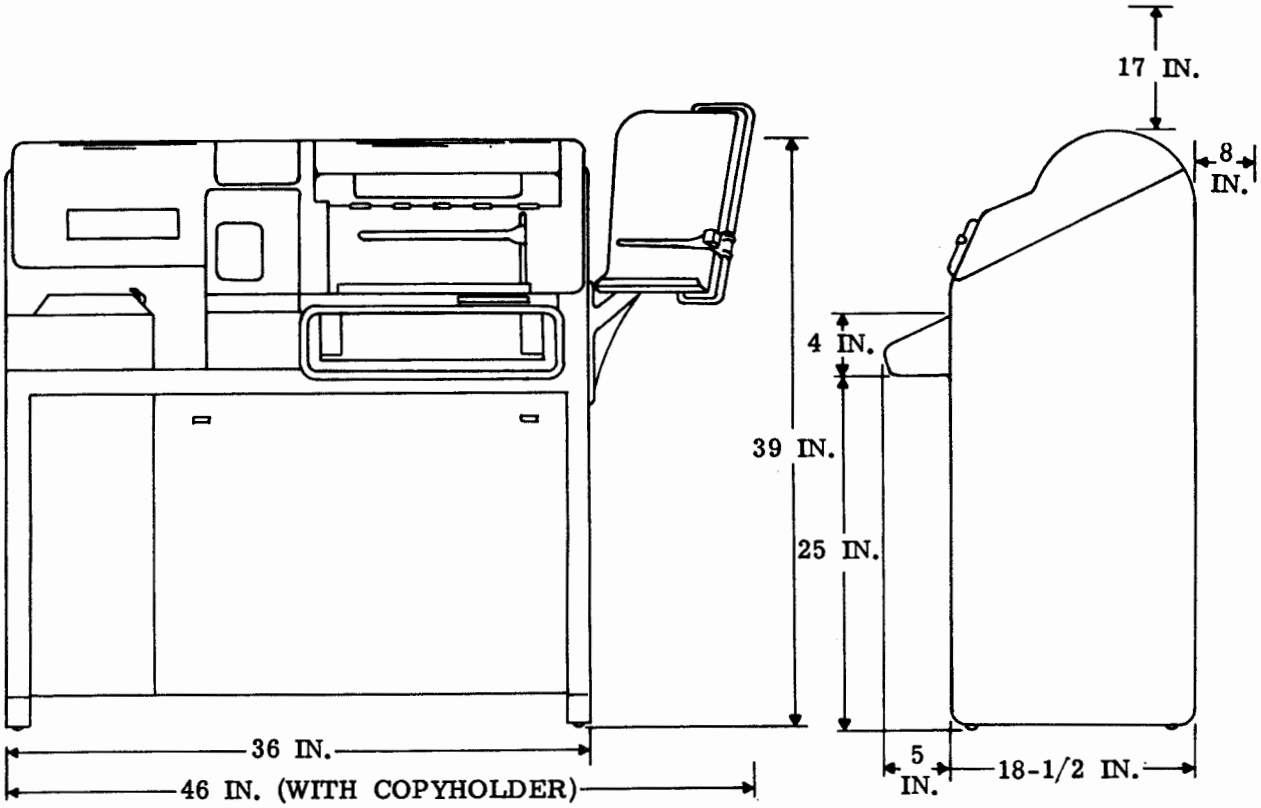


Figure 4 - ASR Set Dimensions

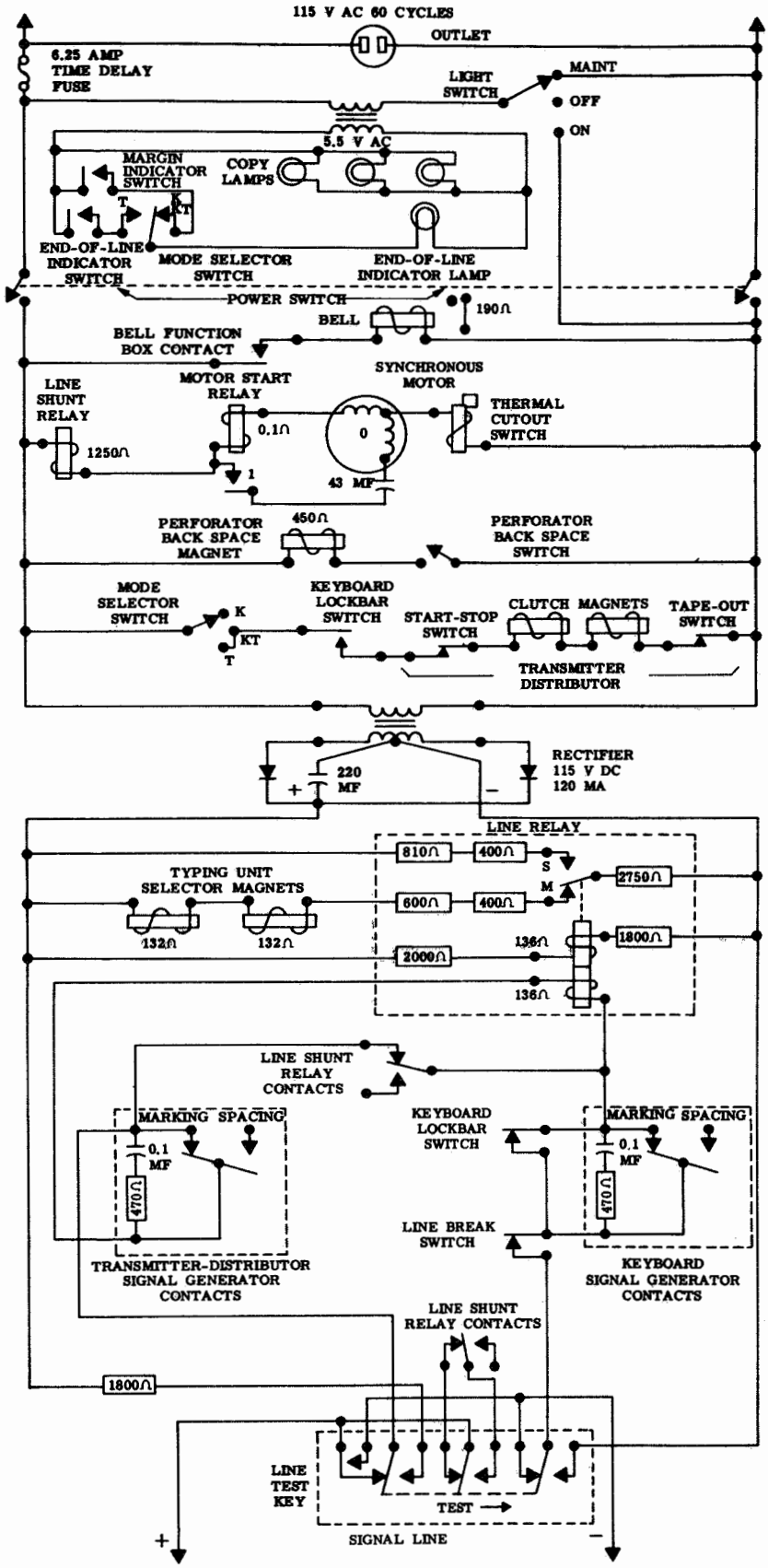


Figure 5 - Typical 28 Automatic Send-Receive (ASR) Teletypewriter Set, Schematic Diagram

28 AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SET

INSTALLATION OF COMPONENT UNITS

CONTENTS

1. GENERAL

1.01 This section is issued to describe the installation of component units and the method of assembling a 28 Automatic Send-

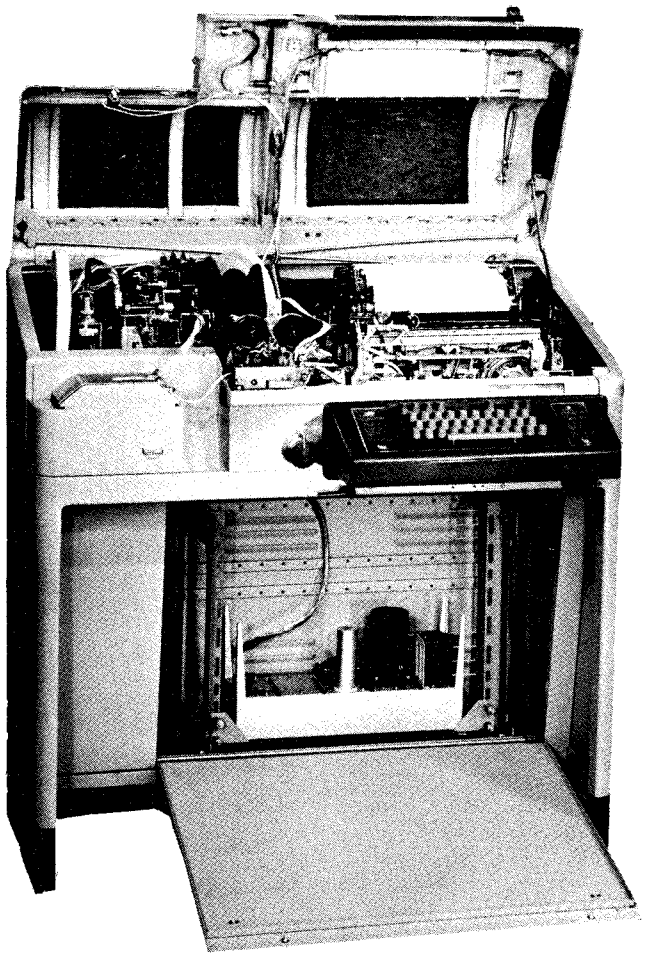


Figure 1 - Typical Automatic Send-Receive (ASR) Set

Receive Set (28 ASR). It also provides the requirements and adjusting procedures needed for proper operation of the set.

1.02 This section includes additional installation and adjustment information for the 28 ASR transmitter distributors.

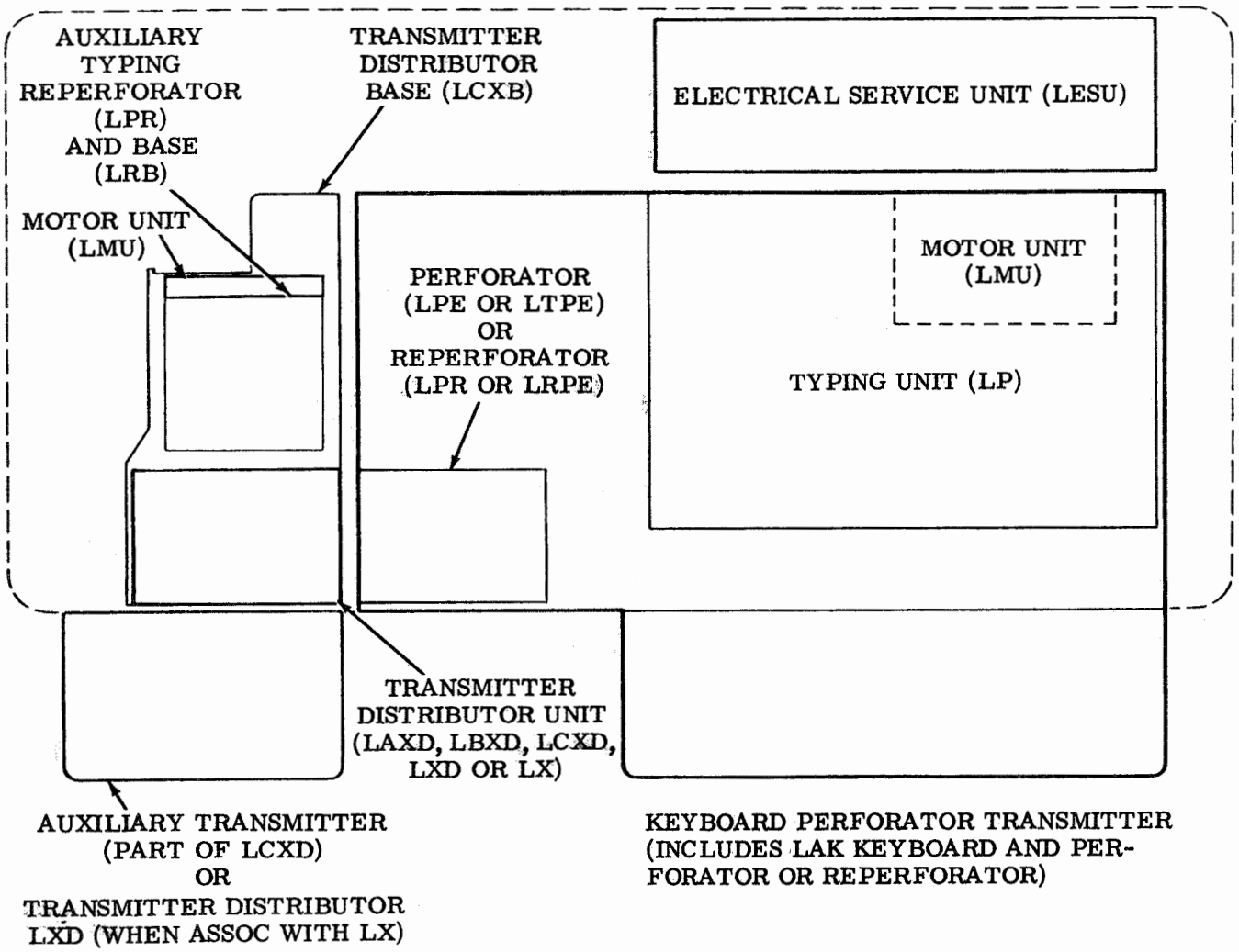
1.03 Instructions for installing an auxiliary typing reperforator in a 28 ASR cabinet are given in the section entitled "Auxiliary Typing Reperforator for 28 Automatic Send-Receive Set — Installation."

1.04 In this section all references to the location of parts are made from the operator's position in front of the set.

1.05 Essentially, a complete 28 ASR Set consists of the following basic Model 28 units, some of which may be provided with various accessories for different service requirements:

(1) Automatic Send-Receive Cabinet — LAAC

Note: This section contains instructions for removing and installing the housing for the TD unit (transmitter distributor unit) when the housing is furnished as part of the cabinet. When the housing for the TD unit is ordered separately, as a modification kit, refer to Teletype Specification 5885S (furnished with each kit) for installation information.



(Top View)

Figure 2 - Location of Units in Automatic Send-Receive Cabinet

(2) Electrical Service Unit — LESU

(3) Keyboard Perforator-Transmitter — LAK/LPE, LTPE, LRPE or LPR

(4) Typing Unit — LP

(5) Motor Unit — LMU

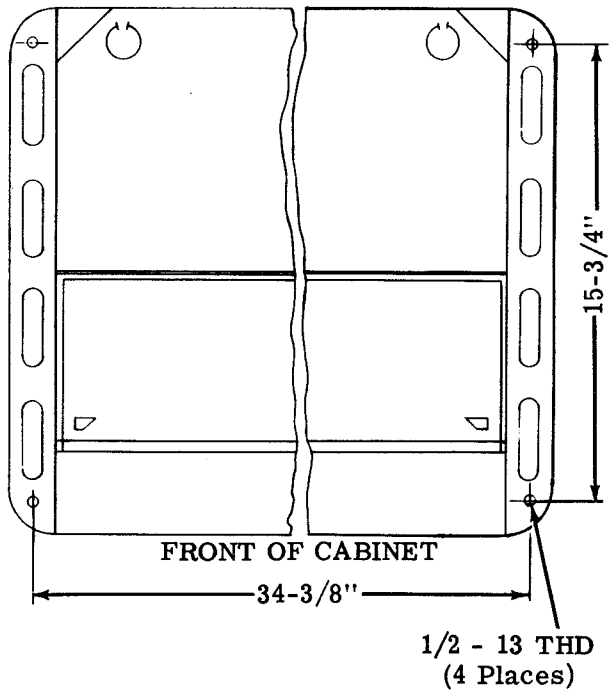
(6) Transmitter Distributor Unit — LAXD, LBXD, LCXD, LXD or LXD and LX

(7) Base for Transmitter Distributor Unit — LCXB

(8) Two (or three) sets of gears (depending on the apparatus to be installed in the cabinet) must be ordered as separate items for desired speed of operation. For part numbers referred to, see the appropriate section covering parts ordering information.

2. INSTALLATION

2.01 When assembling a 28 ASR Set, the components should be installed in the following sequence:



(Bottom View)

Figure 3 - Securing Automatic Send-Receive Cabinet to Mounting Surface

(1) Cabinet

(2) Electrical service unit

(3) Perforator-transmitter base, motor unit, gears for both the typing unit and the punch mechanism

(4) Typing unit

(5) Transmitter distributor unit and base

(6) Auxiliary typing reperforator and base

An illustration of a typical 28 ASR Set is shown in Figure 1. The general arrangement of the components of the 28 ASR Set is shown in diagram form in Figure 2.

Note: If the set is being assembled from new components, observe the following precautions:

Unpack all components with care.

Observe all caution labels and instructions.

All bags and loose parts should be kept with their associated components until used to assemble the set.

3. CABINET ASSEMBLY

A. Installation

3.01 Adjust the four feet of the cabinet using a 3/4-inch open-end wrench, until the cabinet is level. If desired, a maximum of one-inch increase in cabinet height may be obtained by this adjustment. This adjustment may be modified at the time of station installation, if necessary. See Figure 3.

(a) If it is desirable to secure the cabinet directly to a mounting surface, remove and discard the four feet.

(b) In selecting the mounting bolts to be used, make certain that they are of such length as to engage all the threads in the holes from which the feet have been removed.

3.02 Electrical Connections:

B. Electrical Routing Access Holes (Connections)

(a) Remove the cover plate from the right rear corner of the floor in the lower compartment of the cabinet. Remove the two punchouts from the cover plate and reinstall the cover plate in the floor of the cabinet. Install clamp bushings in the two punched-out

holes and feed the line and power cords through them and then up through the hole in the right rear corner of the shelf of the apparatus compartment. If additional cable thickness is required, wind the clamping point of the cord with electrical or friction tape.

(b) Make power and telegraph circuit connections to the cabinet, and attach the various units comprising the printer set, in accordance with the appropriate wiring diagrams furnished with the cabinet.

Note: At the time of station installation, the screw located on the right rear of the cabinet above the C40 terminal should be connected to the common station ground.

3.03 Insert the shaft of the power switch under the right base angle of the cradle so that the control handle protrudes through the hole provided in the right front of the cabinet. The shaft rests on the spring mounted under the right end of the rear base rail. The arm bracket is to the rear of, but just touching, the rear base rail of the cradle. The shaft handle should point to the right.

Note: In order to prevent transmission of vibrations to the cabinet and thereby to aid in reduction of the operating noise level, be sure that all components of the set are mounted in such a way that they do not come in direct contact with the cabinet shell.

C. Separately Ordered Accessories

3.04 Installation instructions for the separately ordered accessories are included with each accessory; for example:

(1) Offset Copyholder — Specification 5736S

(2) Directory Holder (Furnished with LAAC-209*, LAAC210*, LAAC235*, and LAAC236* Cabinets) — Specification 5729S

(3) Apparatus Mounting Rack — Specification 5730S

(4) Relay Rack — Specification 5915S

(5) Mounting of Electrical Service Unit on Relay Rack — Specification 5928S

(6) Subbase to permit Stand-Up Operation of ASR Set — Specification 5846S

(7) Check each accessory package for installation specification.

*Denotes a suffix which indicates the color of paint finish.

4. ELECTRICAL SERVICE UNIT

4.01 Insert the LINE-TEST key shaft under the left side of the cradle in the cabinet so that the control handle protrudes through the hole provided in the center front of the cabinet. The shaft rests on the spring mounted on the left end of the rear base rail. The arm bracket is to the rear of, but just touching, the rear base rail of the cradle. The shaft handle should point to the left.

4.02 Place the electrical service unit in the rear right corner of the cabinet behind the cradle with the legs extending upward and the nameplate facing the front. Install the two mounting studs through the holes in the electrical service unit container and into the threaded holes in the cabinet shelf.

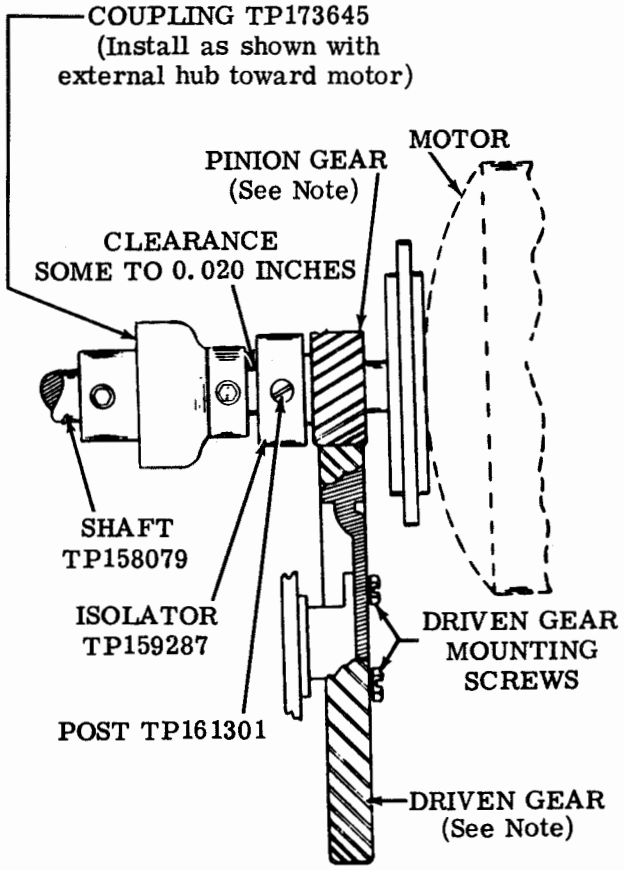
4.03 Connect the cabinet terminal block cables in accordance with the wiring diagram for the particular cabinet and electrical service unit being used.

4.04 Route each of the cables which are to connect to the typing unit, the perforator-transmitter base, and the transmitter distributor, to the approximate location where it will later be connected to its respective component.

4.05 Make the necessary strap connections at the cabinet terminal block as shown in the wiring diagram for the electrical service unit.

4.06 Fasten the power switch fork to the bracket arm of the power switch with the screws, lockwashers, and washers provided. Place this fork end over the power switch on the electrical service unit and locate the end of the power switch shaft in the hole near the right end of the container. The right-angle shaft should point to the right. Make certain that the groove in the end of the shaft engages the hole in the electrical service unit container.

4.07 Repeat 4.06 for the LINE-TEST key on the left side of the electrical service unit, with the exception that the control shaft should point to the left.



Note: Gear sets must be ordered as separate items.

Figure 4 - Installation of Motor Pinion, Gear and Flexible Coupling

5. KEYBOARD, PERFORATOR-TRANSMITTER, MOTOR UNIT, AND TYPING UNIT

A. Initial Assembly before Installation in Cabinet

5.01 Place the motor unit on the right rear portion of the perforator-transmitter base and line up the screw holes of the motor mounting plate with those of the motor mounting strip. Secure the motor unit to the base with three of four mounting screws (with captive lockwashers). At this time omit the screw from the left rear corner of the motor mounting plate.

5.02 Connect the motor leads to terminals 1 and 2 of the terminal block on the perforator-transmitter base just to the left of the motor unit.

5.03 Install the gears for 60, 75, or 100 wpm operation of the 28 ASR Set using the following procedure (see Figure 4):

(a) Remove the screw and lockwasher from the left end of the motor shaft. Place the motor pinion on the motor shaft with the gear end toward the motor. Secure the gear with the screw and lockwasher just removed.

(b) Remove the two screws and lockwashers from the hub on the right end of the intermediate gear shaft. Mount the typing unit 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 just removed. Make certain the motor gear and the typing unit intermediate driven gear are properly meshed.

(c) Slide the end of the motor coupling shaft into the coupling end of the motor gear. Slide the coupling with setscrews over the shaft with bearings and the pinion gear that drives the perforator. Properly seat the shafts in the couplings and tighten the setscrews in both couplings. Place the gear guard over the motor pinion, and match the screw hole in the gear guard with the rear left screw hole of the motor mounting plate. Secure the guard with the remaining motor mounting screw.

(d) Place the typing unit on the keyboard base mechanism with the front feet of the typing unit placed over its locating studs. Rotate the motor shaft by hand until the gear teeth are meshed. Secure the typing unit to the base using the four mounting screws with captive lockwashers.

B. Adjustments before Installation

5.04 Typing Unit to Signal Generator: There should be a barely perceptible amount of backlash between the signal generator gear and the typing unit main shaft gear at their closest point. To adjust, remove the signal generator and add or remove shims beneath the rear of the signal generator frame.

5.05 Typing Unit Intermediate Driving Gear to Typing Unit Main Shaft Gear: There should be a barely perceptible amount of backlash between the typing unit main shaft gear and the typing unit intermediate driving gear at their closest point. To adjust, loosen the three mounting screws on the intermediate gear bracket

until the bracket is held only friction tight. Position the complete intermediate gear assembly by utilizing the adjusting slot at the rear of the bracket. Tighten the mounting screws.

5.06 Motor Pinion to Intermediate Driven Gear: There should be a barely perceptible amount of backlash between the motor pinion and the intermediate driven gear at their closest point. To adjust, loosen the adjusting and clamping screws located on the front end of the intermediate gear bracket and raise or lower the front end of the bracket as required. Refine this adjustment and the typing unit gear adjustment if necessary in order to obtain quiet operation. Tighten the screws (see Figure 4).

5.07 Remove the four mounting screws that secure the typing unit and lift the typing unit off the base.

C. Installation of Units in Cabinet

5.08 Remove the front panel and the transmitter distributor housing including the crossbar from the cabinet in accordance with the Section 573-134-702TC entitled "28 Teletypewriter Cabinet — Disassembly and Reassembly."

Note: Before installing the perforator-transmitter base in the cabinet, check to see whether or not the transmitter distributor base has been equipped with rubber isolation bushings for reduction of noise level. If the transmitter distributor base has been modified in this manner, the perforator-transmitter base must be raised by inserting a washer 0.095 inch thick under each corner in order to maintain proper alignment between the keyboard and the shafting of the transmitter distributor base.

5.09 Fasten the perforator-transmitter base to the cabinet cradle assembly with the four studs provided.

5.10 Typing Unit: Before reinstalling the typing unit, insert a piece of bond paper between the selector magnet pole faces and the armature to soak up any lubricant which may have accumulated. When removing the paper make sure no lint or bits of paper remain on the pole faces. Reinstall the typing unit on the base in accordance with 5.03 (d).

5.11 Electrical Connection: Insert the plug that terminates the keyboard cable coming from the left end of the electrical service unit into the receptacle connector at the middle of the perforator-transmitter base. Push the plug down until it is latched in position in the receptacle. Insert the plug of the typing unit cable in its receptacle on the typing unit.

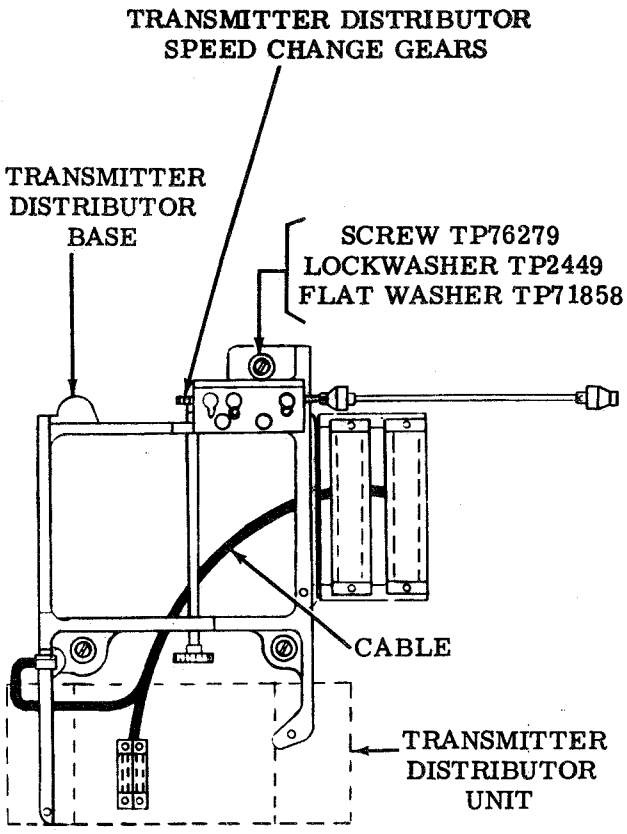


Figure 5 - Typical Transmitter Distributor Unit and Base Arrangement

6. TRANSMITTER DISTRIBUTOR UNIT (LCXD) AND BASE (LCXB)

6.01 Mount the tape chute (supplied with the ASR teletypewriter cabinet) friction tight on the transmitter distributor base using the two screws, two lockwashers, and two washers provided (see Figures 1, 2, and 5).

6.02 Loosen the base locating bracket on the cradle of the cabinet. Install and tighten the two transmitter distributor adjusting studs in the front base rail of the cradle (see Figure 5).

6.03 Loosen the two gear guard mounting screws, slide the gear guard forward and lift it off the transmitter distributor base.

6.04 To install the speed change gear set for 60, 75, or 100 wpm operation on the TD base, install the pinion on the short shaft at the rear of the transmitter distributor base and the larger gear on the long shaft which extends to the TD (see Figure 5).

6.05 Install the transmitter distributor base on the cradle using the screw, three lockwashers, three washers, and two nuts furnished with the base. Fasten friction tight.

6.06 Install the coupling shaft and the two rubber couplings between the driving shaft of the transmitter distributor base and the power shafting of the perforator-transmitter base. The short driving shaft on the TD base and power shafting should be in line. To adjust, move the transmitter distributor base backward or forward until the shafts are lined up. Check with a straightedge (see Figure 5).

6.07 Remount the gear guard on the transmitter distributor base and tighten its mounting screws.

6.08 Mount the plate with studs (part of the LCXD transmitter distributor housing) to the front of the transmitter distributor unit using the two screws, lockwashers, and washers provided. This plate should fit tightly against the cover plate, top plate, and tape guideplate.

6.09 Turn the three mounting bushings of the transmitter distributor unit so that they protrude approximately 7/32 inch beneath the main casting and place the unit on the base. Mount the two receptacles of the transmitter distributor cable assembly on the mounting bracket on the base with the female receptacle next to the base casting. Plug the cabling from the electrical service unit into the receptacles.

6.10 The transmitter distributor unit should be against the two locating studs on the left.

6.11 There should be a barely perceptible amount of backlash between the gears at their closest point. The cover plate and top plate of the fixed-head unit should be parallel within 1/32 inch to the top of the tape winder access door on the cabinet. To adjust, turn the three mounting bushings as required. Tighten the locknuts.

6.12 Fasten the transmitter distributor unit to the base using the three mounting screws, lockwashers, and flat washers. Turn the screws until they are friction tight.

6.13 Check again to be sure the unit is against the two locating studs on the left side of the base. With the pivoted sensing head against the punch, the top plate of the pivoted sensing head (tape lid open) should be flush to 0.010 inch below the bottom surface of the tape slot in the punch block. To adjust, turn each of the two base adjusting studs in the same direction an equal amount at a time until the requirement is met. Loosen the base mounting screws and check to see that the base is resting on all three mounting bushings. The cover and top plates should remain parallel within 1/32 inch to the top of the tape winder access door on the cabinet.

6.14 The tape sensing pins should line up with the punch pins. Gauge by eye. To adjust, move the transmitter distributor unit backward or forward using the play in the mounting holes.

6.15 Tighten the mounting screws for both the unit and the base.

6.16 Position the eccentric on the transmitter distributor base so that it rests against the lower right corner of the rear plate of the unit and tighten its mounting screw.

6.17 Position the base locating bracket on the cabinet cradle assembly so that both locating surfaces rest against the base. Tighten the mounting screws.

6.18 Tighten the setscrews on the rubber couplings.

6.19 The top plate of the pivoted sensing head should meet the punch squarely. To adjust, remake the top plate adjustment given in the section covering adjustments.

6.20 There should be a clearance of 3/16 inch between the tape depressor and the punch. To adjust, position the tape depressor bracket by using the play in the base mounting holes if necessary. Recheck the squareness and the alignment of the shafts. If it was necessary to loosen the base mounting screws in making this adjustment, retighten them.

6.21 The tape chute mounted on the casting of the transmitter distributor unit should clear all moving parts on the transmitter distributor unit and perforator at their closest point to the chute during an operating cycle. To adjust, loosen the tape chute mounting screws to friction tightness and position the chute. Tighten the mounting screws.

6.22 Reinstall the crossbar, the housing that encloses the fixed head of the transmitter distributor unit, and the front panel of the cabinet (removed in 5.08). Avoid damage to the character counter.

6.23 Mount the auxiliary transmitter distributor cover to the rear of the fixed tape sensing unit using the screw, lockwasher, and flat washer provided.

6.24 Install the keyboard tape designation plate with the screws and lockwashers provided.

6.25 Attach the keyboard control switch shaft to its knob using the setscrew in the knob. Then install the shaft with knob by inserting the shaft through the hole in the designation plate. Turn and push the shaft until it snaps in place.

6.26 Secure the tape storage bin to the cabinet by means of the two studs and the thumbscrew. Plug the cord into the receptacle provided on the left side of the cabinet partition.

6.27 Tape Depressor Extension

(a) The tape depressor extension should be 0.040 inch to 0.080 inch from the punch block, and flush to 0.060 inch below the top of the punch block.

(b) The small tip of the tape depressor extension should be centered in the area between the second and third punch-pin slots of the punch block.

(1) To adjust, loosen the locknut and position the depressor extension by moving it angularly and/or horizontally.

(2) If the requirement cannot be met by following the adjustment given in (1), loosen the four mounting screws securing the oil reservoir mounting bar to the unit and turn the bar until the requirement is met. Tighten the four mounting screws. Remake the oil reservoir assembly adjustment and check the tape depressor adjustment given in the section covering adjustments.

(3) Loosen the two horizontal adjusting screws on the depressor extension and position the extension as required to meet (b).

(c) With the tape following in its normal path, and with the pivoted head approximately 15 characters from the punch block, the edge of the tape must not touch the depressor. If necessary, refine the tape depressor adjustment given in the section covering adjustments.

(d) With the pivoted transmitter unit not transmitting, and with the tape following in its normal path and flowing from the punch, the tape depressor should guide the tape to the tape beater to assure positive stuffing of the tape into the tape storage bin. If necessary, readjust the tape depressor extension.

6.28 Last Character Contact Switch Assembly: With the motor running and tape extending from the punch to the pivoted sensing head, and with the sensing head one character away from the punch block, there should be a clearance of 0.010 inch to 0.015 inch between the tape deflector ear and the last character switch insulating button. With the pivoted sensing head against the punch block, there should be a clearance of at least 0.005 inch between the contacts. To adjust, loosen the contact bracket mounting screws and position the bracket as required. Tighten the screws.

7. TRANSMITTER DISTRIBUTOR UNIT (LAXD) AND BASE (LCXB)

7.01 Mount the tape chute (furnished with the appropriate ASR cabinet) friction tight on the transmitter distributor base using the two screws, lockwashers, and flat washers provided.

7.02 Loosen the gear guard mounting screws, slide the gear guard forward and lift it off the transmitter distributor base.

7.03 Install the speed change gear set for 60, 75, or 100 wpm operation on the TD base, as follows: Install the pinion on the short shaft at the rear of the transmitter distributor base, and the larger gear on the long shaft which extends to the TD. The gear set to provide the desired speed of operation must be ordered as a separate item (see Figure 5).

7.04 Adjust the three mounting bushings on the transmitter distributor unit so that they protrude approximately 7/32 inch beneath the main casting and place the unit on the base. Do not tighten the locknuts. There should be a barely perceptible amount of backlash between the gears at their closest point. To adjust, turn the mounting bushings as required.

7.05 Loosen the locating bracket on the cradle assembly. Place the base, together with the transmitter distributor, on the cradle assembly. Mount the connector of the cable assembly to the side mounting bracket on the base using the two screws and lockwashers furnished. Plug the cable from the electrical service unit into the connector.

7.06 Secure the base friction tight with the three screws, lockwashers, and flat washers furnished with the cabinet.

7.07 Install the coupling shaft and the two rubber couplings between the driving shaft of the base and the power shafting of the perforator-transmitter base. The driving shaft and the power shafting should be in line. To adjust, move the transmitter distributor base backward or forward until the shafts are aligned. Check with a straightedge (see Figure 5).

7.08 Remount the gear guard on the transmitter distributor base and tighten its mounting screws.

7.09 Make certain the unit is against the two locating studs on the left side of the base.

7.10 The pivoted sensing head should meet the punch squarely. To adjust, position the base by using the play in the base mounting holes. If necessary, remake the top plate adjustment given in the section covering adjustments.

7.11 There should be a clearance of 3/16 inch between the tape depressor and the punch. To adjust, position the tape depressor bracket by using the play in the base mounting holes. Recheck squareness and shaft lineup. Tighten the base mounting screws.

7.12 Position the base locating bracket on the cradle assembly so that both of its locating surfaces rest against the transmitter distributor base. Tighten the locating bracket mounting screws and the setscrews on the rubber couplings.

7.13 With the pivoted sensing head against the punch, the top plate of the pivoted sensing head (tape lid open) should be flush to 0.010 inch below the bottom surface of the tape slot in the punch block. To adjust, use the gear mesh point as a pivot point and turn the mounting bushings of the transmitter distributor unit as required. Recheck gear backlash.

7.14 The sensing pins of the transmitter distributor unit should line up with the punch pins. Gauge by eye. To adjust, move the transmitter distributor unit backward or forward as required, and fasten it with the three mounting screws, lockwashers, and washers.

7.15 Position the eccentric on the transmitter distributor base so that it rests against the rear plate of the transmitter distributor unit, and tighten its screw.

7.16 Position the tape chute so that it clears all moving parts on the transmitter distributor unit and the perforator at their closest point to the chute during an operating cycle. To adjust, loosen the tape chute mounting screws to friction tightness and position the chute. Tighten the mounting screws.

7.17 Reinstall the crossbar and then the front panel removed in 5.08. Exercise care to avoid damage to the character counter.

7.18 Install the designation plate to the left front of the keyboard with the two screws and lockwashers provided.

7.19 Install the parts and make the adjustments specified in 6.25, 6.26, 6.27, and 6.28.

8. TRANSMITTER DISTRIBUTOR UNIT (LBXD) AND BASE (LCXB)

8.01 Remove the two screws, two lockwashers, and the washer which mount the deflector to the rear plate of the transmitter distributor unit. Replace the right mounting screw and lockwasher. The deflector and the remaining screw, lockwasher, and washer may be discarded.

8.02 Screw in the three bushings which serve as the mounting feet of the transmitter distributor unit until they are tight. (No vertical adjustment of the unit is needed.)

8.03 Loosen the two gear guard mounting screws, slide the gear guard forward and lift it off the transmitter distributor base. The gear set that will provide the desired speed of operation must be ordered as a separate item.

8.04 Install the speed change gear set for 60, 75, or 100 wpm operation on the TD base as follows: Install the pinion on the short shaft at the rear of the transmitter distributor base, and the large gear on the long shaft which extends to the TD (see Figure 5).

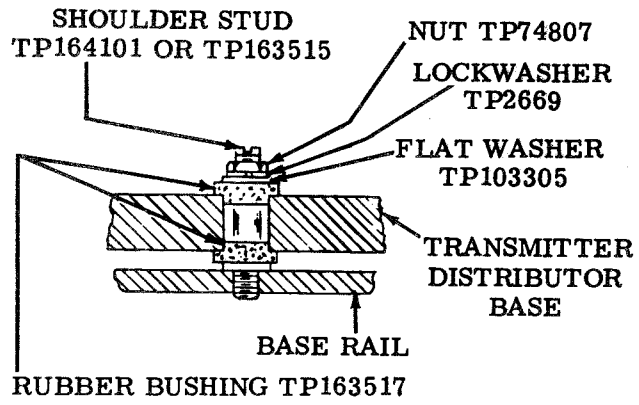


Figure 6 - Isolation Mounting of Transmitter Distributor Base

8.05 Mount the transmitter distributor unit on the transmitter distributor base with the three screws, lockwashers, and washers provided. Tighten the mounting screws friction tight.

8.06 Insert and tighten the three shoulder studs (furnished with TD base) into the TD base mounting holes in the front and rear cradle rails. Place a rubber bushing (furnished with TD base) over each stud (smaller diameter of bushings upward). Position the TD base (with TD unit) over the three studs so that the smaller diameter of the bushings extends into the mounting holes of the base, and the base rests on the shoulders of the bushings. Route the ground strap forward under the base, onto the rear under the rear cradle rail. Route cabling under the cradle rails and plug into connector on the TD unit. Mount the connectors (also resistors if applicable) using the hardware furnished (see Figures 6 and 7).

8.07 Place a rubber bushing (with smaller diameter downward) on the three studs that now extend upward through the mounting holes of the base. The smaller diameter of the bushings must extend into the base mounting holes. Place a washer, lockwasher, and nut (furnished with TD base) on each stud (the terminal of the ground strap should be placed on top of the washer on the right rear stud and followed by the lockwasher and nut); do not tighten the nuts (see Figures 6 and 7).

8.08 Couple the transmitter distributor shaft to the shafting of the perforator-transmitter base. The shafts should be in line. Check

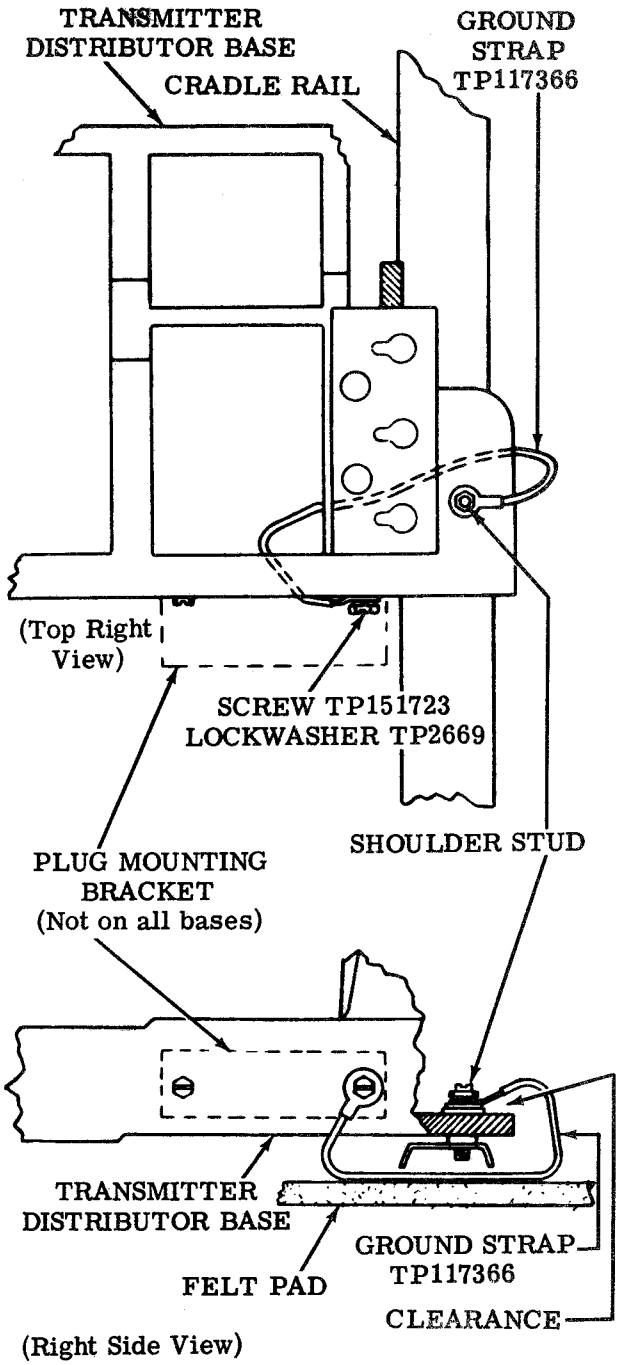


Figure 7 - Installation of Transmitter Distributor Base Ground Strap

with a straightedge. To adjust, use the play in the mounting holes of the transmitter distributor base to line up the driving shaft, the coupling shaft, and the shafting of the perforator-transmitter base. Tighten the transmitter distributor base mounting screws and the setscrews on the rubber coupling (see Figure 5).

8.09 The gears should be aligned and there should be a barely perceptible amount of backlash between the gears at their closest point. To adjust, move the transmitter distributor unit laterally on the base as required. Tighten the mounting screws on the transmitter distributor unit.

8.10 Install the plate with studs on the front of the transmitter distributor unit using the two screws, lockwashers, and washers.

8.11 Remount the gear guard on the transmitter distributor base and tighten its mounting screws.

8.12 Reinstall the crossbar and cover of the transmitter distributor housing and the front panel of the teletypewriter cabinet (in that order). Exercise care to avoid damage to the character counter.

8.13 In order to maintain a low noise level, the transmitter distributor unit should clear its housing and the cabinet by 1/32 inch. To adjust, loosen the mounting screws of the housing detent spring until they are friction tight and move the spring backward or forward as required. Tighten the mounting screws. See 13.01, (a), (b), and (c).

8.14 Install the designation plate to the left front of the keyboard using the screws and lockwashers provided.

8.15 Attach the keyboard control switch shaft to its knob with the setscrew in the knob. Install the shaft with knob by inserting the shaft through the hole in the designation plate. Turn and push the shaft until it snaps in place.

9. TRANSMITTER DISTRIBUTOR UNIT (LXD) AND BASE (LCXB)

Note: No vertical adjustment of the transmitter distributor unit is needed.

9.01 Loosen the two gear guard mounting screws, slide the gear guard forward and lift it off the transmitter distributor base.

9.02 Install the speed change gear set for 60, 75, or 100 wpm operation on the TD base as follows: Install the pinion on the short shaft at the rear of the transmitter distributor base, and the large gear on the shaft that extends to the TD (see Figure 5). The gear set to provide the desired speed of operation must be ordered as a separate item. Mount the TD unit on the base with its three mounting screws friction tight.

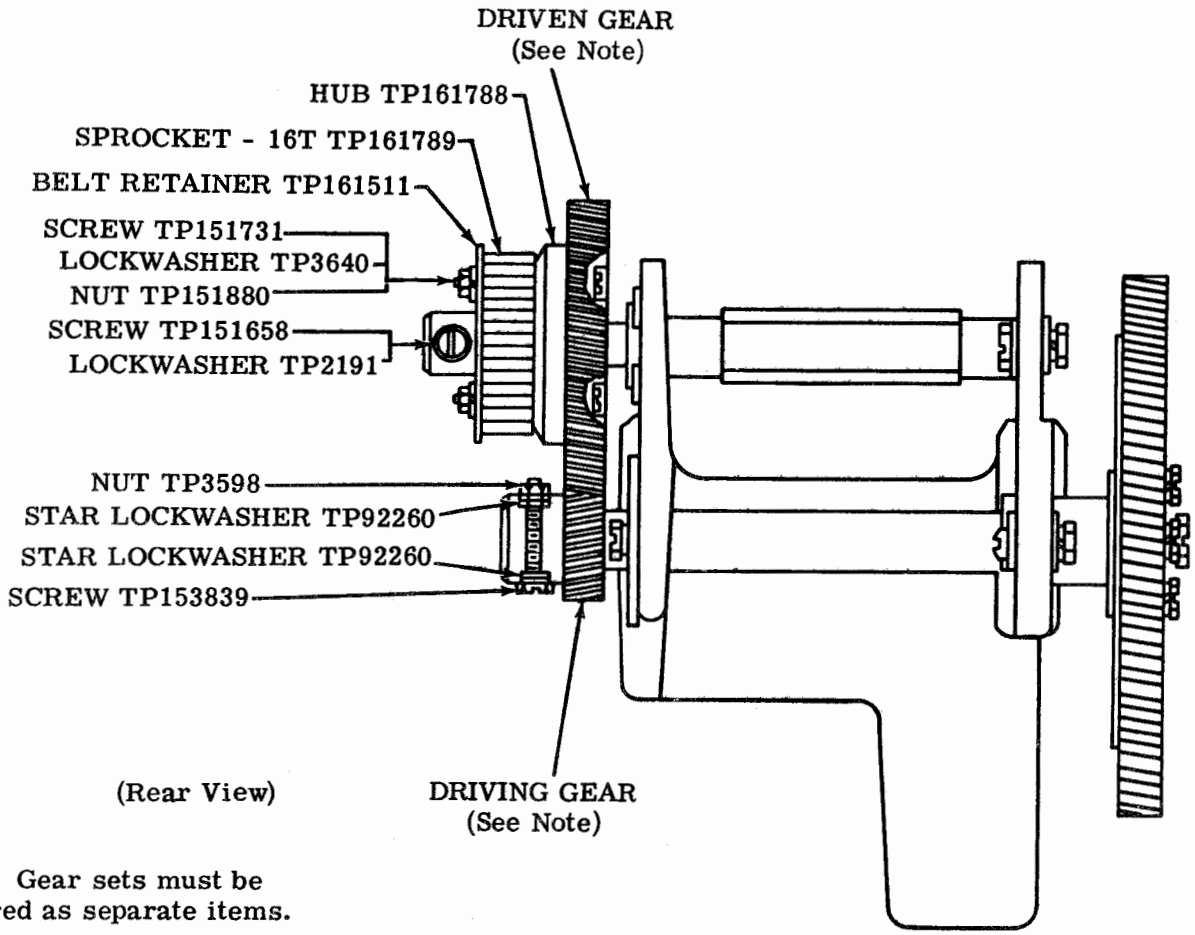
9.03 Insert and tighten the three shoulder studs (furnished with TD base) into the TD base mounting holes in the front and rear cradle rails. Place a rubber bushing (furnished with TD base) over each stud (smaller diameter of bushing upward). Position the TD base (with TD unit) over the studs so that the smaller diameter of the bushing extends into the mounting holes of the base, and the base rests on the shoulders of the bushings. Route the ground strap forward and under the base, then to the rear under the rear cradle rail (see Figure 7). Route cabling along the right side of the base.

9.04 Place a rubber bushing (with smaller diameter downward) on the three studs that now extend up through the mounting holes of the base. The smaller diameter of the bushings must extend down into the base mounting holes. Place a washer, lockwasher, and nut (furnished with TD base) on each stud (the terminal of the ground strap should be placed on top of the washer on the right rear stud followed by the lockwasher and nut); do not tighten the nuts (see Figures 6 and 7). Couple the TD shaft to the keyboard shafting with a flexible coupling. The flexible couplings should be installed with the external hub on the TD base shaft. Utilize the play in the TD base mounting holes to line up the driving shaft, coupling shaft, and keyboard perforator power shafting; check with straightedge rule. Tighten the TD base mounting nuts and the coupling screws. In order to prevent transmission of vibration, neither the terminal nor the wire of the ground strap should touch the TD base. The wire should be slack. If necessary, bend the terminal upward for clearance (see Figure 7).

9.05 The gears should be in alignment and there should be a barely perceptible amount of backlash between the gears at their closest point. To adjust, laterally position the transmitter distributor unit on the base. Tighten the mounting screws.

9.06 Remount the gear guard on the transmitter distributor base and tighten its mounting screws.

9.07 Install the plate with studs on the front of the transmitter distributor unit using the screws, lockwashers, and washers provided.



Note: Gear sets must be ordered as separate items.

Figure 8 - Installation of Gear Set on Gear Bracket Assembly (Auxiliary Reperforator Base)

9.08 Reinstall the crossbar and the auxiliary housing of the transmitter distributor housing, and the front panel of the teletypewriter cabinet (in that order). Avoid damage to the character counter.

9.09 Make the adjustments and install the parts covered in 8.13, 8.14, and 8.15.

10. TRANSMITTER DISTRIBUTOR UNIT COMBINATION (LXD PLUS READER LX) AND BASE (LCXB)

Note: No vertical adjustment of the TD unit is needed.

10.01 Loosen the two gear guard mounting screws, slide the gear guard forward and lift it off the transmitter distributor base. The gear set to provide the desired speed of operation must be ordered as a separate item. Install the speed change gear set for 60, 75, or 100 wpm operation on the TD base as follows: Install the pinion on the short shaft at the rear of the TD base and the large gear on the long shaft that extends to the TD (see Figure 5).

10.02 Insert and tighten the three shoulder studs (furnished with TD base) into the TD base mounting holes in the front and rear cradle rails. Place a rubber bushing (furnished with TD base) over each stud (smaller diameter of bushings upward). Position the TD base over the studs so that the smaller diameter of the bushings extends into the mounting holes of the base, and the base rests on the shoulders of the bushings (see Figure 6).

10.03 Route the ground strap forward and under the base, then to the rear under the rear cradle rail (see Figure 7). Place a rubber bush-

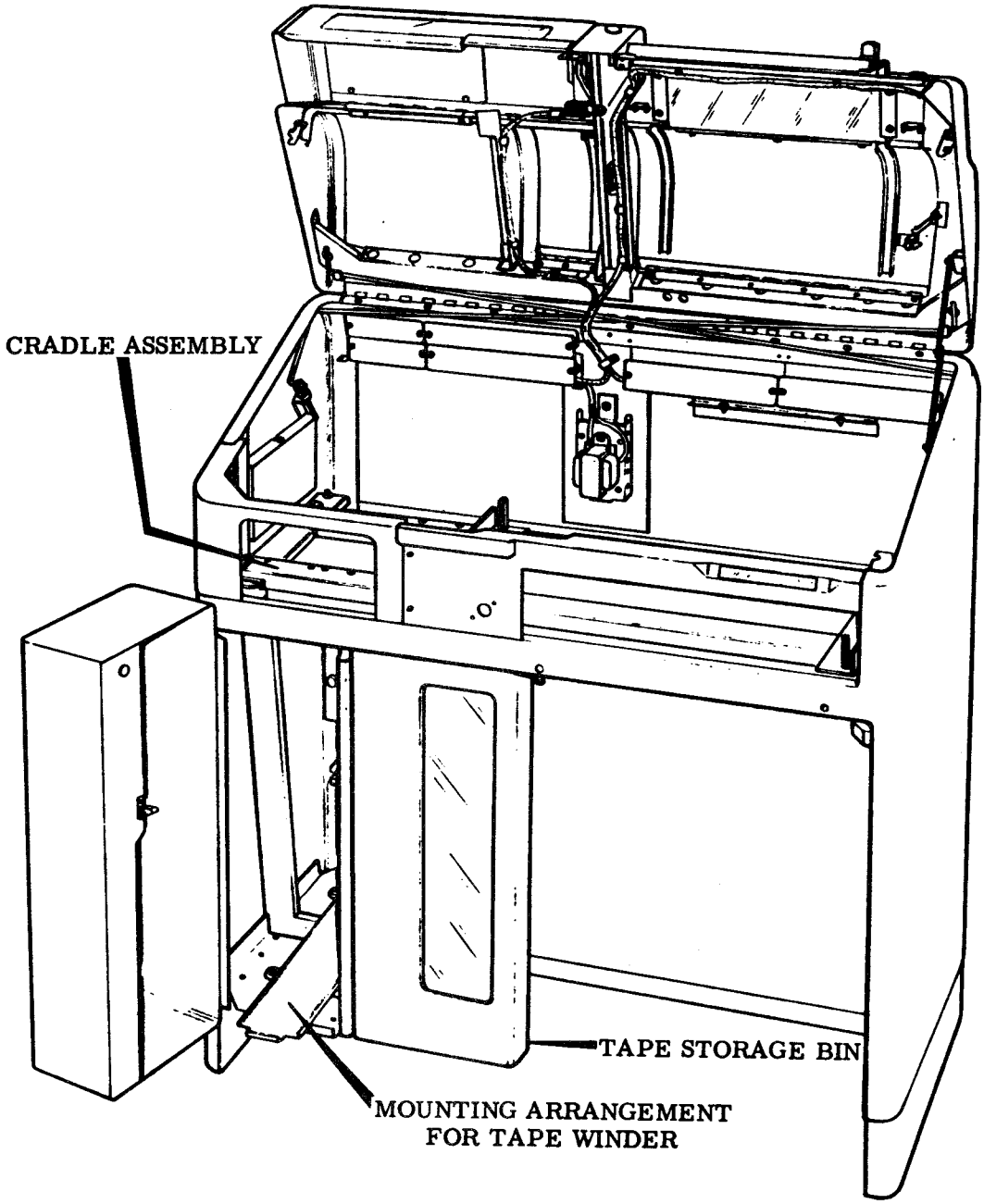


Figure 9 - Typical Automatic Send-Receive Cabinet (LAAC) Shown Open

ing (with smaller diameter downward) on the three studs that now extend up through the mounting holes of the base. The smaller diameter of the bushings must extend into the base mounting holes. Place a washer, lockwasher, and nut (furnished with TD base) on each stud (the terminal of the ground strap should be placed on top of the washer on the right rear stud followed by the lockwasher and nut); do not tighten the nuts (see Figures 6 and 7). Couple the TD shaft to the keyboard shafting with a flexible coupling. The flexible couplings should be installed with the external hub on the TD base shafts. Utilize the play in the TD base mounting holes to line up the driving shaft, coupling shaft, and keyboard perforator power shafting; check with straightedge rule. Tighten the TD base mounting nuts and the coupling screws. In order to prevent transmission of vibration, neither the terminal nor the wire of the ground strap should touch the TD base, and the wire should be slack. If necessary, bend the terminal upward for clearance (see Figure 7).

10.04 Mount the TD units on the base with the six screws, lockwashers, and washers provided in the bag tied to the base. Tighten the mounting screws friction tight.

10.05 Adjust the lateral position of the TD units on the base so that the gears are in alignment with a minimum amount of backlash between the gear teeth at the closest point. Tighten the screws. The TD units should be parallel. Reposition if necessary.

10.06 Install the plate with studs on the front of the TD unit with the screws, lockwashers, and washers provided.

10.07 Reinstall the crossbar, housing, and front panel. Avoid damage to the counter. There should be a minimum of 1/32 inch clearance between the LX unit and the cabinet. A minimum clearance of 1/32 inch is also required between the side and top plates of the TD units and the housing. To obtain these clearances, required for reducing noise level, adjust the housing detent springs and/or reposition the cradle.

CAUTION: TO AID IN THE REDUCTION OF THE NOISE LEVEL, THE UNITS MUST NOT TOUCH THE CABINET AT ANY POINT, THEREBY PREVENTING TRANSMISSION OF VIBRATIONS TO THE CABINET.

10.08 Attach the knob to the shaft using the screw in the knob. These parts are furnished with the appropriate cabinet. Insert the shaft in the hole to the left of the keyboard.

11. TAPE WINDER (TW)

11.01 The backlash and alignment between the motor pinion and the driven gear should meet the requirements of the applicable adjusting information.

11.02 Installation of tape winders in cabinets with provisions at lower left side: With the motor toward the rear, place the tape winder between the two flanges and slide it back until the front part of the tape winder base plate drops into place behind the front retaining flange (see Figure 9). Plug cord into receptacle provided in the cabinet after the tape winder is fully in place, or just before the tape winder is fully in place depending on applicable cabinet and tape winder. Reverse the procedure when removing the tape winder.

12. AUXILIARY TYPING REPERFORATOR UNIT (LPR), BASE (LRB), AND MOTOR UNIT (LMU)

12.01 Install the parts contained in TP161814 or TP161815 modification kit to adapt a TD base (LCXB) to mount an auxiliary typing reperforator base (LRB) and to provide a tape guide. Installation instructions are covered in the specification furnished with the kit (see Figure 1).

Note: A tape (exit) guide is not used on ASR Sets where the tape from the auxiliary typing reperforator is wound on a tape winder in the cabinet.

12.02 Remove and discard the gear guard on the TD base.

12.03 On units not equipped with variable speed drive, install the gears for the desired speed of operation on the shafts of the gear bracket assembly as shown in Figure 8. Mounting hardware is in a bag tied to the base. The set of gears must be ordered as a separate item.

12.04 Remove the gear bracket assembly and the gear guard.

Note: Before installing the motor unit, check to see if the leads on the motor unit, as received, are threaded through the hole in the

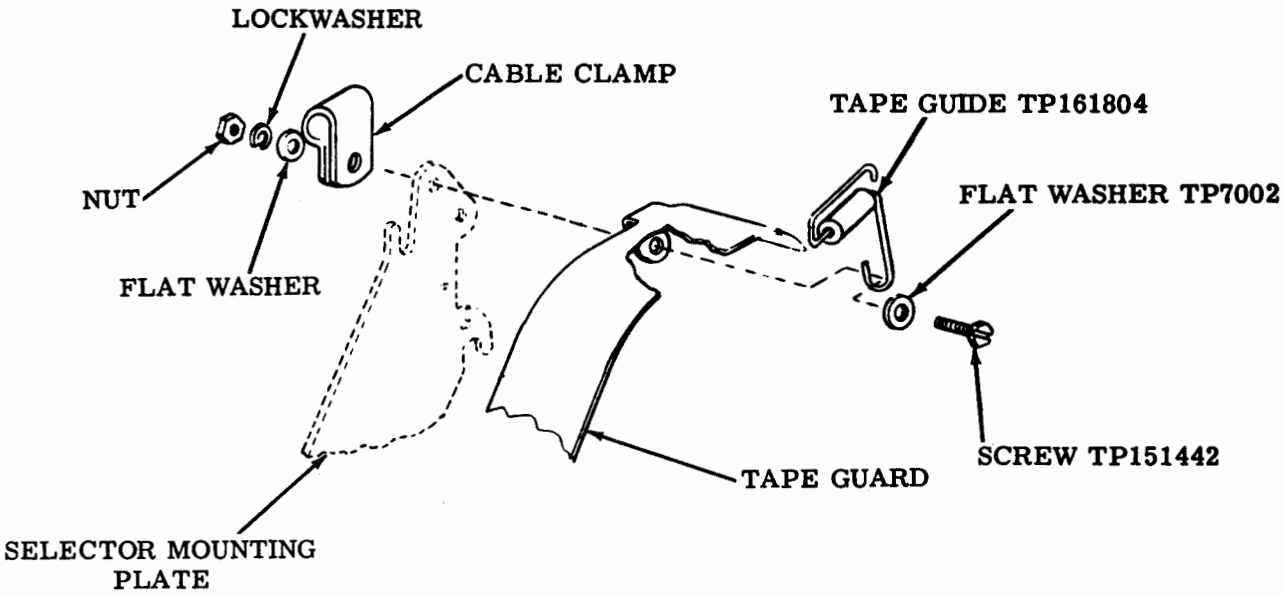


Figure 10 - Installation of Tape Guide TP161804 (Auxiliary Reperforator without Letters-Figures Contact Assembly)

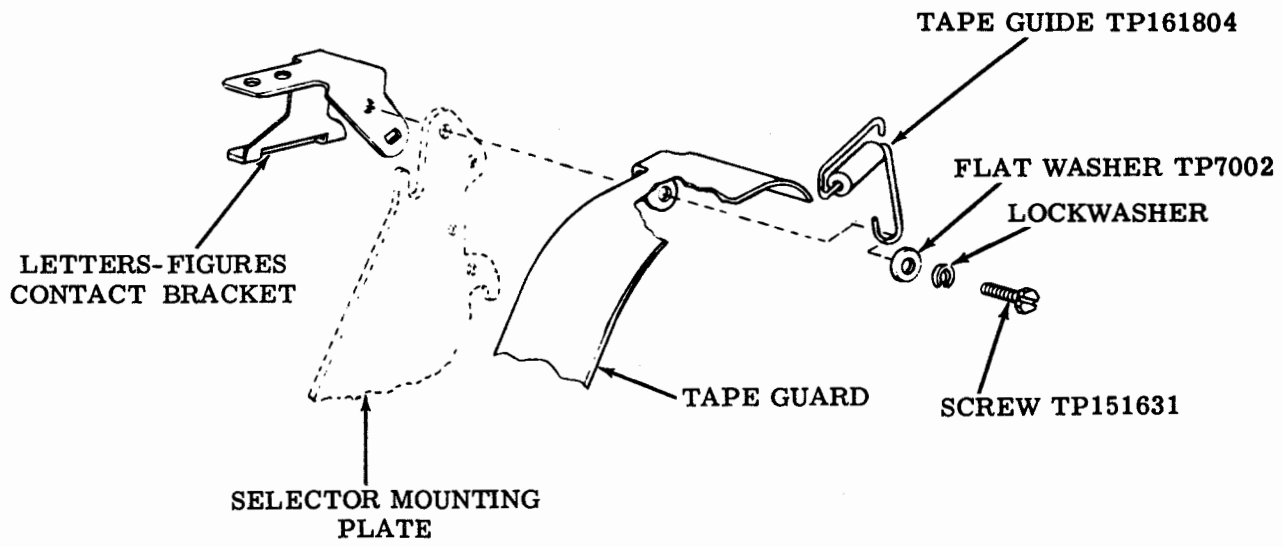


Figure 11 - Installation of Tape Guide TP161804 (Auxiliary Reperforator with Letters-Figures Contact Assembly)

motor mount bracket. If so, pull them out. They should not be routed through the hole when the unit is installed.

12.05 Install the motor unit on the auxiliary reperforator base using the following parts found in a bag tied to the base: four screws, three lockwashers, four washers, four nuts, and two star lockwashers. Place one star lockwasher against the anodized aluminum surface of the motor bracket and one against the painted surface on the bottom of the base so as to ground the motor bracket to the base. Connect the motor leads to the lower terminal block as indicated in the appropriate wiring diagram furnished with the base. It is necessary to remove the tape container to reach these terminals with a screwdriver. Replace the tape container leaving the screws friction tight for later adjustment. Replace the gear bracket assembly and the gear guard.

12.06 Mount the tape guide on the typing reperforator as follows:

(a) On units not equipped with letters-figures contact assembly, remove and discard the screw in the location shown in Figure 10 and mount the tape guide using the screw and washer furnished in a bag tied to the base and the existing mounting parts as shown in Figure 10.

(b) On units equipped with letters-figures contact assembly, remove and discard the screw in the location shown in Figure 11 and mount the tape guide using the screw and washer furnished.

12.07 Mount the sprocket (from the bag tied to the base) on the typing reperforator with the mounting hardware on the hub. The screw heads and lockwashers should be on the side of the deeper inset of the sprocket.

12.08 Mount the gear on the motor shaft with the isolator and two posts. Screw the posts down tight.

12.09 Loosen the three gear bracket assembly mounting screws to friction tightness and position the assembly up or down until there is a barely perceptible amount of backlash between the motor pinion and the driven gear at the closest point. The gears should be parallel to each other. Tighten the screws.

12.10 Mount the auxiliary typing reperforator onto the base as follows:

(a) Remove the following parts from the bag tied to the base: three screws, three washers, four lockwashers, one screw, and one washer.

(b) Position the reperforator over its mounting studs in the base.

(c) Loosen the screw holding the small "L" shaped anchor bracket to the right front of the punch.

(d) Start the screw with lockwasher and washer through the "L" shaped anchor bracket into the proper tapped hole in the base plate. Do not tighten the screw.

(e) To allow for maximum accessibility for a screwdriver to the rear mounting screw, position the pushbar bail of the reperforator to its foremost position. Start the three screws with lockwashers and washers through the holes in the casting and into the proper tapped studs in the "T" shaped plate. Do not tighten the screws.

(f) Remove the timing belt from the bag and place it over the sprockets. Take up the slack in the belt by moving the reperforator away from the motor. The belt should have just enough slack so that a light pressure (8 oz) applied midway between the sprockets will cause the belt to deflect approximately 1/8 inch. Tighten the three mounting screws. Check timing belt deflection.

(g) Hold the anchor bracket so that it rests squarely against the reperforator and base plate and tighten the screw that secures the anchor bracket to the base plate. Tighten the screw that secures the anchor bracket to the reperforator.

12.11 Route and connect the power cable from the bag as follows: Place the receptacle connector over the plug connector and tighten the associated knurled locknut. Route the cable forward and downward, past the right side of the TD unit drive shaft, to the right, under the right side of the TD base casting, left and right, keyboard cradle rails and up to the cabinet terminal block. Connect the black lead to terminal 39, white lead to terminal 40, and the green lead to the cabinet ground screw as indicated in the appropriate wiring diagram furnished with the LRB base.

12.12 Install the cables (if applicable) as indicated in the appropriate wiring diagram furnished with the LRB base.

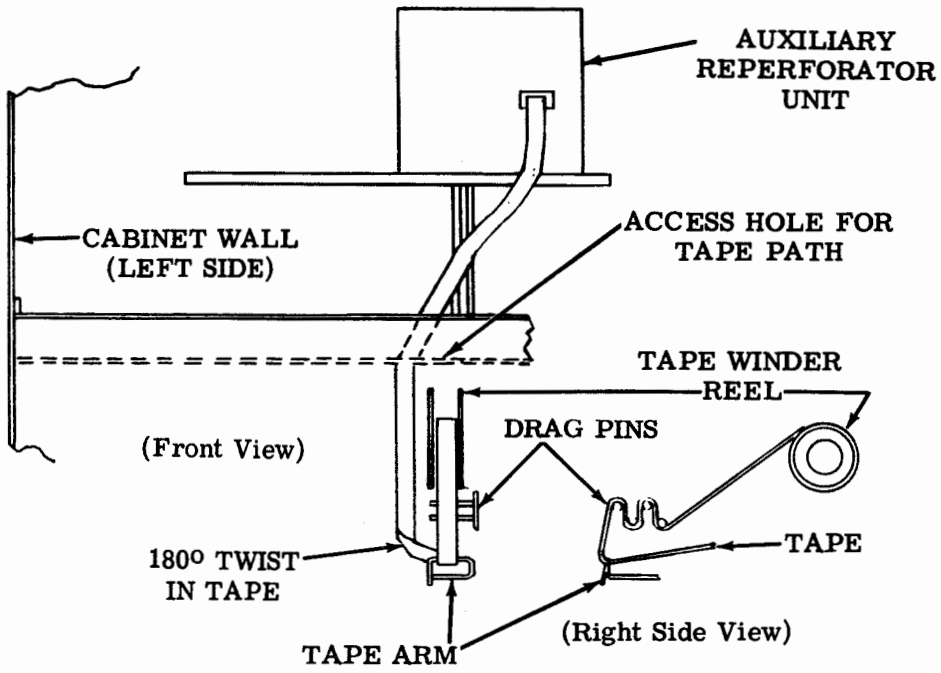


Figure 12 - Tape Path from Auxiliary Reperforator Unit to Tape Winder Reel

12.13 Place the base (with reperforator) on its mounting posts and secure it with the following parts found in the bag attached to the base: three screws, two lockwashers, three washers, and one star lockwasher. Place the star lockwasher next to the upper painted surface of the base under the left front mounting screw.

Note: When an old style LRB base is used (old style mounting bracket and "T" plate), a 13/16 inch diameter flexible coupling must be used on the TD base under the LRB base. Use of larger diameter couplings results in interference when mounting the LRB base. If no 13/16 inch diameter coupling is present, it should be ordered separately. New style LRB bases have a modified mounting bracket and nut plates, and provide clearance for 1-1/16 inch diameter couplings.

12.14 Install the desired control panel in place of the blank panel in the cabinet dome. The control panel must be ordered as a separate item.

(a) When a modification kit (ordered) as a separate item) consisting of a TAPE FEED OUT control panel and a cable w/switch is used, proceed with installation of this kit as follows: Install the control panel in place of the blank panel in the cabinet dome using the existing mounting hardware. Secure the switch, on the cable, to the control panel with the mounting nuts on the switch. Route the cable along the left side of the cabinet through the hole at the rear of the dome. Connect the cable in accordance with applicable wiring diagram furnished with the LRB base. Secure the cable, if necessary, to clear any moving parts.

12.15 Adjust the tape guide included in the modification kit in accordance with instructions contained in Specification 50055S (for TP161814 kit) or 5929S (for TP161815 kit) furnished with the kit.

12.16 Install the TP161829 modification kit (which must be ordered separately) to mount an electrical service unit to a relay rack bracket assembly used with the ASR cabinet. Installation instructions are covered in Specification 5928S furnished with the kit.

12.17 Position the tape container so that a full roll of tape may be inserted through the access door in the dome of the cabinet. Tighten the screws.

13. MISCELLANEOUS INSTRUCTIONS

13.01 Cradle

(a) The cradle in the cabinet is factory adjusted (no load) for nominal squareness and parallelism with respect to the cabinet. Two locating eccentrics are positioned against the rear rail. The cradle may have to be repositioned after the units are installed in order to level the equipment and obtain a flush fit with respect to the cabinet (see Figure 9). Exercise care to avoid damage to the counter.

CAUTION: TO AID IN THE REDUCTION OF THE NOISE LEVEL, THE UNITS MUST NOT TOUCH THE CABINET AT ANY POINT, THEREBY PREVENTING TRANSMISSION OF VIBRATIONS TO THE CABINET.

(b) Should it be necessary to raise or lower the cradle after the units are installed, loosen the locknuts on the right front and the two rear vibration mounts, and the locknut on the lower end of the stud in the left front vibration mount. Raise or lower the cradle by turning the studs. Tighten the locknuts while holding the studs in position.

(c) Should it be necessary to move the cradle forward or backward after the units are installed, loosen the four screws holding the front and rear rails and the two screws securing the eccentrics against the rear rail and tighten their mounting screws.

13.02 Secure all cords and cables where necessary to keep them away from any moving parts.

13.03 Apply a thin film of grease to all newly installed gears. Use standardized lubricant.

13.04 Make a visual check of all fuses, plugs, screw terminal connections, and lamps for loosening or breakage.

CAUTION: ANY TD BASE WHICH IS EQUIPPED WITH RUBBER ISOLATION BUSHINGS MUST BE GROUNDED TO THE CRADLE USING THE GROUND STRAP AS SPECIFIED IN THE FOREGOING TEXT AND FIGURE 7. ALSO, CHECK TO SEE THAT THE CABINET IS CONNECTED TO THE COMMON STATION GROUND AS SPECIFIED IN THE FOREGOING TEXT.

13.05 Make certain that the power switch is in its OFF position before closing the main power to the equipment.

13.06 Refer to standardized instructions for installing paper and ribbon in the page printer.

13.07 A thumb wheel or screwdriver slot is provided on the tape feed wheel shaft for starting or advancing the tape manually. On units with backspace mechanism, a hole is provided in the guard for a screwdriver. Turn the thumb wheel or screwdriver to the left.

13.08 For keyboard tape perforating unit — thread the tape from the top of the roll of tape, over the roller of the tape guide on the tape container and into the tape entry chute. Position and/or reform the tape guide, as necessary, so that the tape flows freely and makes full contact with the roller on the tape guide. Tighten the screws.

13.09 For auxiliary typing reperforator unit — thread the tape from the bottom of the roll of tape, over the roller of the tape guide on the tape container, over the roller of the tape guide on the selector bracket and into the tape entry chute. Position and/or reform the tape guides, as necessary, so that the tape flows freely and makes full contact with the rollers on the tape guides. Tighten the screws.

13.10 To route the tape from the auxiliary typing reperforator unit to the tape winder reel, thread the tape through the access hole provided, twist it 180 degrees, thread it through the tape arm around the drag pins and onto the tape winder reel (see Figure 12).

Note: The Model 28 Automatic Send-Receive Set should be completely assembled with the appropriate units and ready for the following operating tests (Paragraphs 14 and 15 inclusive).

14. LIGHTING FACILITIES

14.01 The incoming power is controlled by a three-position switch located inside of the cover and to the left of the lid opening for the printer.

(a) OFF — Lights are off.

(b) NORMAL ON — Lights are on, excluding end-of-line lamp when printer set is operating.

(c) MAINTENANCE ON — Lights are continuously on, except end-of-line lamp.

15. OPERATING TESTS

Note: Tapes to be run through TD unit LCXD should have at least two blanks at the end so as to clear the unit.

15.01 Keyboard Position (K)

(a) Manually depress each key and determine that the proper character is printed or the proper function is performed.

(b) The LOC LF (local line feed) key, when depressed, should cause paper to be fed out of the machine at approximately three times the speed obtained when the LINE FEED and REPT (repeat) keys are continuously depressed.

(c) The REC (keyboard lock) key, when depressed, should cause the signal generator to be shunted, preventing signal generation. Check this action on the page printer. The key should remain depressed until released by the SEND (keyboard unlock) key.

(d) The SEND (keyboard unlock) key, when depressed, should remove the shunt from the signal generator.

(e) The BREAK key, when depressed, should hold the transmitting line open. If the duration of the open line interval is greater than two character cycles, the electrical keyboard lock should be operated as in Paragraph (c) above.

(f) The REPT (repeat) key, when depressed together with any other key except the local function keys, should cause repeat transmission of the associated code combination.

(g) The LOC CR (local carriage return) key, when depressed, should cause the carriage to be returned.

(h) The bell should ring clearly on single or repeated operation of the BELL key.

(i) The "blank" key, when alternately depressed with any other key except the local function keys, should not lock the keyboard. Depression of the "blank" key twice in succession should operate the keyboard lock making it necessary to depress the SEND key to resume keyboard transmission.

(j) When the LINE-TEST key control shaft is turned to the TEST position, the keyboard should operate the page printer as above. No break in the signal line should occur as the LINE TEST key control shaft is switched.

15.02 Keyboard-Tape Position (K-T)

(a) Manually depress each key and determine that the correct character is printed on the page printer and perforated in the tape.

(b) When the "blank" and REPT (repeat) keys are depressed simultaneously, the tape should feed out without interruption.

(c) When the E and REPT (repeat) keys are depressed simultaneously, the character counter should count without missing. The end-of-line indicator should light at its preset count. When the CAR RET (carriage return) key is depressed, the counter should return to zero. When the E key is again depressed, the counter should count one character.

(d) The electrical keyboard lock should be operative.

(e) The TD unit should be operative. Accuracy of transmission should be tested using a prepared tape and monitoring the transmission on the page printer.

(f) Turning the LINE-TEST key control shaft to the TEST position should result in operation similar to the above except that operation is on a local loop.

15.03 Tape Position T

(a) Depress the "blank" and REPT (repeat) keys simultaneously; the tape should feed out of the punch at high speed without interruption.

(b) Depress the E and REPT (repeat) keys simultaneously; the character counter should count without missing, and the end-of-line indicator should light at its preset count. Depressing the CAR RET (carriage return) key should cause the counter to return to zero and the end-of-line indicator to shut off. When the E key is again depressed, the counter should count one character.

28 AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SET

OPERATING TESTS

CONTENTS PAGE

1. GENERAL

1.01 This section describes the tests to be made to determine if the Automatic Send-Receive (ASR) Set will operate properly. The set provides a means for receiving typewritten page messages and manually originating messages between two or more stations which are similarly equipped.

1.02 The set, in addition, provides facilities for automatic transmission at maximum available line speed through a transmitter distributor, and manual preparation of fully perforated typed tape either at line speed using the LP typing unit as a monitor, or at an unmonitored off-line maximum speed of up to 106 words per minute.

2. KEYBOARD OPERATING TESTS

2.01 The keyboard selector switch determines the mode of operation, which is manipulated by the keyboard control knob located on the left-hand side of the keyboard.

2.02 Turn the main power switch located on the lower right side of keyboard, to its upper position "ON." This conditions the ASR Set for service depending on the LINE-TEST switch and keyboard control knob.

A. K Position

2.03 Turn the keyboard control knob to the K position and LINE-TEST switch to the LINE position. The K mode of operation is confined to sending or receiving messages through the keyboard and typing unit, with transmission monitored by the typing unit.

2.04 With the keyboard control knob in K position, manually depress each character key and determine that the proper character is printed.

2.05 With the keyboard control knob still in the K position, operate the following keys and determine that the proper functions are performed.

(a) Depress the LOC LF (local line feed) key. This should cause 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) Depress the REC (keyboard lock) key. This should cause the signal generator to be shunted, and thereby prevents signal generation. This key should remain depressed until released by depressing the SEND key.

(c) Depress the SEND key (keyboard unlock) to remove the shunt from the signal generator.

(d) Depress the BREAK key and hold it depressed about two seconds. This 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 the local function keys. This should cause repeated transmission of the associated code combination.

(f) Depress the LOC CR (local carriage return) key. The carriage should then return to the left-hand margin.

(g) Depressing the upper-case S key should cause the bell to ring once clearly each time the key is depressed.

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

(i) When depressing the spacebar, located below the bottom row of keys on the keyboard, an electrical signal is initiated for a subsequent mechanical allowance for a space (as between words) in the page-printed message, or a space symbol on tape.

(j) Depressing the FIGS (figure) key conditions 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 equipment on the line for printing characters indicated on the lower part of the keys.

(l) Depressing the TAPE B.SP. key reverses the direction of the tape feed in the perforator for the space required by a single character code. Deletion of a perforated code requires operation of the letters key once for each operation of the backspace key. Except for the tape (T) mode of operation, this deletion is an on-line function.

(m) Operate the LINE-TEST switch to the TEST position. Performing the tests as in 2.04 and 2.05 (a) through (l) should give the same results, except that the operation will be on a local loop. No break in the signal line should occur as the LINE-TEST key is switched. The margin indicator lamp, located at the right of the cabinet dome, is illuminated six characters before the end of a page-printed line.

B. K-T Position

2.06 With the keyboard control knob in the K-T (keyboard-tape) position and the LINE-TEST key (if available) in the LINE position, manually depress each key and determine that the correct character has been printed on the page printer and perforated in the tape. If the perforator-transmitter base includes a typing perforator or reperforator, the correct character should also be printed on the tape.

2.07 With the keyboard control knob still in the K-T position, operate the following keys and determine that the proper functions are performed.

(a) Depress the blank and REPT (repeat) keys simultaneously. This causes the tape to feed out without interruption.

(b) Depress the E and REPT keys simultaneously. This should cause the character counter to count without missing. The end-of-line indicator lamp lights when its preset count is reached. Depressing the CAR RET (carriage return) key should cause the indicator of the character counter to return to zero. Depressing the E key again, should cause the counter to count one character.

(c) Depress the keys indicated in 2.05 (b) through (l). The same functions should be performed as indicated in those tests.

(d) The transmitter distributor should be operative. Check the accuracy of transmission by using a prepared tape and monitoring the transmission on the typing unit.

(e) Operate the LINE-TEST key to the TEST position. Performing the tests given in (a) through (d) should give the same results except that operation should be on a local loop.

C. T Position

2.08 With the keyboard control knob in the T position and the LINE-TEST key (if available) in the LINE position, depress the blank and REPT keys simultaneously. This should cause the tape to be fed out of the punch at high speed without interruption until the depressed keys are released.

2.09 Perform the test covered in 2.07 (b). The margin indicator lamp, located at the right of the cabinet dome, should be illuminated six characters before the counted end-of-line position in the T mode of operation. Care should be taken to avoid overtyping the last character.

2.10 Operate the LINE-TEST key to the TEST position. Performing the tests covered in 2.08 and 2.09 should give the same results.

Note: The left and right margins of the teletypewriter unit are adjusted at time of installation. The operator should not attempt to make these adjustments.

3. TRANSMITTER-DISTRIBUTOR

3.01 Any five-level tape 11/16 inch wide and 10-hole-per-inch feed, chadless or fully perforated, typed or blank, can be fed into the transmitter-distributor. The tape may be fed directly from the typing perforator as the typing is being performed, or it may be fed from a loop of tape previously perforated.

3.02 Make certain that the transmitter switch is in the OFF position. Depress the red button to raise the spring loaded tape lid. Place the tape feed perforations on the teeth of the tape feed wheel with the first code to be transmitted directly over the sensing pins. Two code perforations appear above and three below the tape feed perforations. When the tape is placed in the transmitter, the two code perforations should be toward the back of the transmitter. Hold the tape down flat and close the tape lid. The tape feed will be responsive to the transmitter-distributor switch (GREEN) only when the keyboard selector switch is in T or K-T mode with the SEND key depressed. In either of these modes of operation, a leader of tape with feed holes perforated can be fed into transmitting position manually by raising the switch to its upper, freewheeling, position.

3.03 To interrupt transmission of a message to insert an addition, correction, or new message, raise the transmitter-distributor switch to its intermediate position to stop transmission and tape feed. Note the exact position of the tape with reference to the index line scored in the tape guides. Release the tape lid. Remove the tape, close tape lid, raise the switch to its proper freewheeling position, and insert the new tape. When the inserted addition, correction, or change has been transmitted, replace the original tape either at the point at which it was removed or at the desired point following a deletion.

3.04 Where the typing unit is operated to produce multiple copies, the printing hammer blow should not be heavier than required to produce satisfactory copies. Move the printing spring adjusting bracket to notch "1" for printing one to three copies, to notch "2" for four or five copies, and notch "3" for six or more copies.

4. CABINET LIGHTS

4.01 The cabinet lights are controlled by a 3-position switch located inside the top cover to the left of the top right door. With the set connected to power, the power switch in the ON position, and the light switch in the OFF position, all lights should be off; with the light switch in the NORMAL ON position, all lights should be on except the end-of-line indicator lamp; with the light switch in the MAINTENANCE ON position, all lights should be on continuously except for the end-of-line indicator lamp. With the set connected to power, the power switch in OFF position, the light switch in the MAINTENANCE ON position, all lights should be on except for the end-of-line indicator lamp.

28 AUTOMATIC SEND-RECEIVE (ASR)

TELETYPEWRITER SET

DISASSEMBLY AND REASSEMBLY

CONTENTS PAGE

1. GENERAL

1.01 This section provides the procedure for the disassembly and reassembly of the 28 Automatic Send-Receive (ASR) Teletypewriter Set.

1.02 The sequence outlined herein should be followed when disassembly of a complete set is undertaken.

1.03 References to direction are made as viewed from the front of the set.

CAUTION: REMOVE ELECTRICAL POWER FROM SET BEFORE STARTING DISASSEMBLY.

1.04 For part numbers referred to, see appropriate section covering parts ordering information.

Note: Refer to Section 570-005-800TC for list of tools available.

2. DISASSEMBLY AND REASSEMBLY

2.01 When removing a unit from the set, carefully note the location from which the mounting screws are removed to aid in reassembly. Where no specific instructions are given for reassembly, reverse the procedure used in removing it.

2.02 Unlatch and raise the cabinet dome.

AUXILIARY TYPING REPERFORATOR AND BASE

2.03 Disconnect the cable connector at the rear of the auxiliary typing reperforator. Remove the three screws that mount the reperforator to its base, and the screw that secures the anchor bracket to the base. Lift the reperforator from the base.

2.04 Unscrew the knurled locking ring that secures the auxiliary power cable to the receptacle on the auxiliary reperforator base. Disconnect the cable.

2.05 Remove the three screws, two lockwashers, one lockwasher and three flat washers that secure the base to its mounting studs. Lift the base, motor, and tape container out of the cabinet.

TYPING UNIT

2.06 Disconnect the cable from the right side frame of the typing unit. Remove the four screws that secure the typing unit to its base.

With the right hand under the rear of the right side frame and left hand under the left end of the front plate, lift the typing unit out of the cabinet.

FRONT PANEL

2.07 Remove the keyboard selector switch control knob by loosening its setscrew. Remove the screws that secure the designation plate and slide the plate out from beneath the rubber noise shield.

2.08 Remove the two screws from the front panel. Loosen the thumb screw and slide the front panel to the right and upward to remove it from the cabinet. Exercise care to avoid damage to the character counter scale.

2.09 Loosen, but do not remove, the two screws locking the crossbar to the left side of the cabinet. Remove the TP151723 screw, TP2669 lockwasher, and TP117535 flat washer. Push back on the left end of the crossbar to disengage it from the cabinet, and move the crossbar to the left to disengage it from the slot in the adjusting plate. Lift the crossbar from the cabinet.

2.10 Disconnect the two TP158020 flexible couplings from the TP158013 shaft between the perforator-transmitter base and the transmitter-distributor base.

CAUTION: DO NOT REMOVE THE FACTORY ADJUSTED PLATE (TP154416).

2.11 Cradle mounted components on the cabinet shelf may be moved forward slightly after the front panel and crossbar have been removed. This will provide sufficient room to remove the electrical service unit without removing the perforator-transmitter base and may aid in servicing the cabinet terminal boards.

(a) If it is desirable to move the cradle forward, loosen, but do not remove, the four TP79890 screws and slide the cradle forward on its rails. It will move a maximum of approximately one inch.

(b) To reposition the cradle, slide it back until the rear base rail contacts the detents. Tighten the two screws.

KEYBOARD

2.12 Remove the four screws which mount the perforator-transmitter base to the cradle. Disconnect the cable near the rear of the unit. If a reperforator is used, disconnect the signal line cable from the rear of the reperforator.

2.13 Remove the perforator-transmitter base, with the perforator or reperforator and motor as a unit, from the cabinet.

2.14 Do not remove the perforator or reperforator from the base unless it is necessary for maintenance purposes.

2.15 If it is necessary to remove the perforator or reperforator from the base, proceed as follows. Remove the screw which fastens the anchor bracket to the base in front of the perforating mechanism. Remove the three screws which secure the perforator or reperforator to the base. If the unit is equipped with backspace mechanism, tilt it over and remove the electrical connections from the power drive magnet underneath the perforator mechanism. Lift unit off the base.

2.16 If the motor unit is to be removed from the perforator-transmitter base, disconnect the motor leads from the terminal block and tag the leads. Remove the four motor mounting screws. Lift motor unit off.

ELECTRICAL SERVICE UNIT

2.17 Remove the mounting stud from each end of electrical service unit. Disconnect the power switch shaft near the right end of the unit by applying pressure against the tension of the retaining spring on the shaft and slipping the shaft out of the unit.

2.18 The electrical service unit may now be inverted for servicing. If it is desirable to completely remove the unit from the cabinet, disconnect the cable wires from the terminal boards at the rear of the cabinet. In replacing the cable wires, it may be necessary to refer to the appropriate wiring diagram.

TRANSMITTER DISTRIBUTOR

2.19 Unscrew the three mounting screws until they are withdrawn from the base casting. If the transmitter distributor has cable connec-

tions, unplug the cable from the base connector. Lift unit off.

AUXILIARY ELECTRICAL SERVICE ASSEMBLY

2.20 If the set is equipped with an auxiliary electrical service unit, open the panel underneath the keyboard by turning the 1/4-turn fasteners with a coin or screwdriver and lower the panel. Remove the mounting screw at each end of the electrical service unit and lift unit off the rack for servicing. If it is necessary to completely remove the unit, unfasten the cables at the terminal board of the cabinet.

REASSEMBLY

2.21 To reassemble the units into the set, reverse the procedure used in removing them. If necessary, refer to the section "28 Automatic Send-Receive Teletypewriter Sets (ASR) Installation of Component Units." Also refer to appropriate wiring diagram if necessary for replacement of cable wiring.

28 TELETYPEWRITER CABINET FOR AUTOMATIC SEND-RECEIVE (ASR) SETS

DESCRIPTION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the 28 teletypewriter cabinet for the Automatic Send-Receive (ASR) Set. For information pertaining to the ASR Set or any of its components, refer to the appropriate section.

1.02 The directions — up or down, front or rear, and left or right, as given in this section, are as viewed from an operator's position.

1.03 A cabinet is an enclosure with its cover and all external faceplates. The cabinet protects the enclosed components against dust, possible damage from external sources, and reduces the operating noise level. Figures 1 and 2 show a typical 28 teletypewriter cabinet for the ASR Set.

1.04 The cabinet, of sheet metal construction, is finished internally and externally in baked enamel. The cabinet is 38-1/2 inches high, 46 inches wide with the offset copyholder (36 inches wide without the offset copyholder), 18-1/4 inches deep, and weighs approximately 150 pounds.

2. DESCRIPTION

2.01 The cabinet houses all the basic components, ie, keyboard, typing unit, perforator or reperforator, transmitter distributor, transmitter distributor base, electrical service unit, and motor; plus all required auxiliary equipment. Such auxiliary equipment would be a typing reperforator, a typing reperforator base and a motor, all mounted on the shelf, and an auxiliary electrical service unit mounted on a rack in the lower compartment of the cabinet.

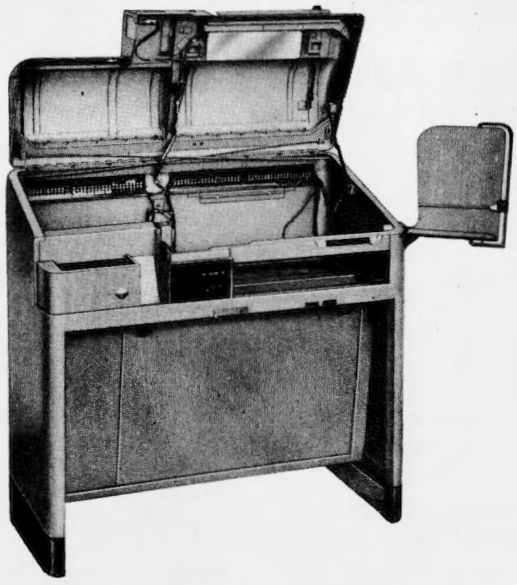


Figure 1 - Typical 28 Teletypewriter Cabinet for Automatic Send-Receive (ASR) Sets (Dome Cover Open)

2.02 A shelf divides the cabinet into an upper compartment and a lower compartment or pedestal. The upper compartment houses the keyboard base, typing unit, electrical service unit, and the auxiliary typing reperforator (if supplied). The lower compartment houses accessory equipment and is used for storage.

2.03 The upper compartment has a dome-shaped cover hinged at the rear. The cover is unlatched by a pushbutton and is counterbalanced by a stop arm mechanism that aids in raising and supporting it in the open position.

2.04 Openings in the dome cover provide access to components without raising the entire cover. The right door on the dome cover (Figure 2) provides access to the rear of the

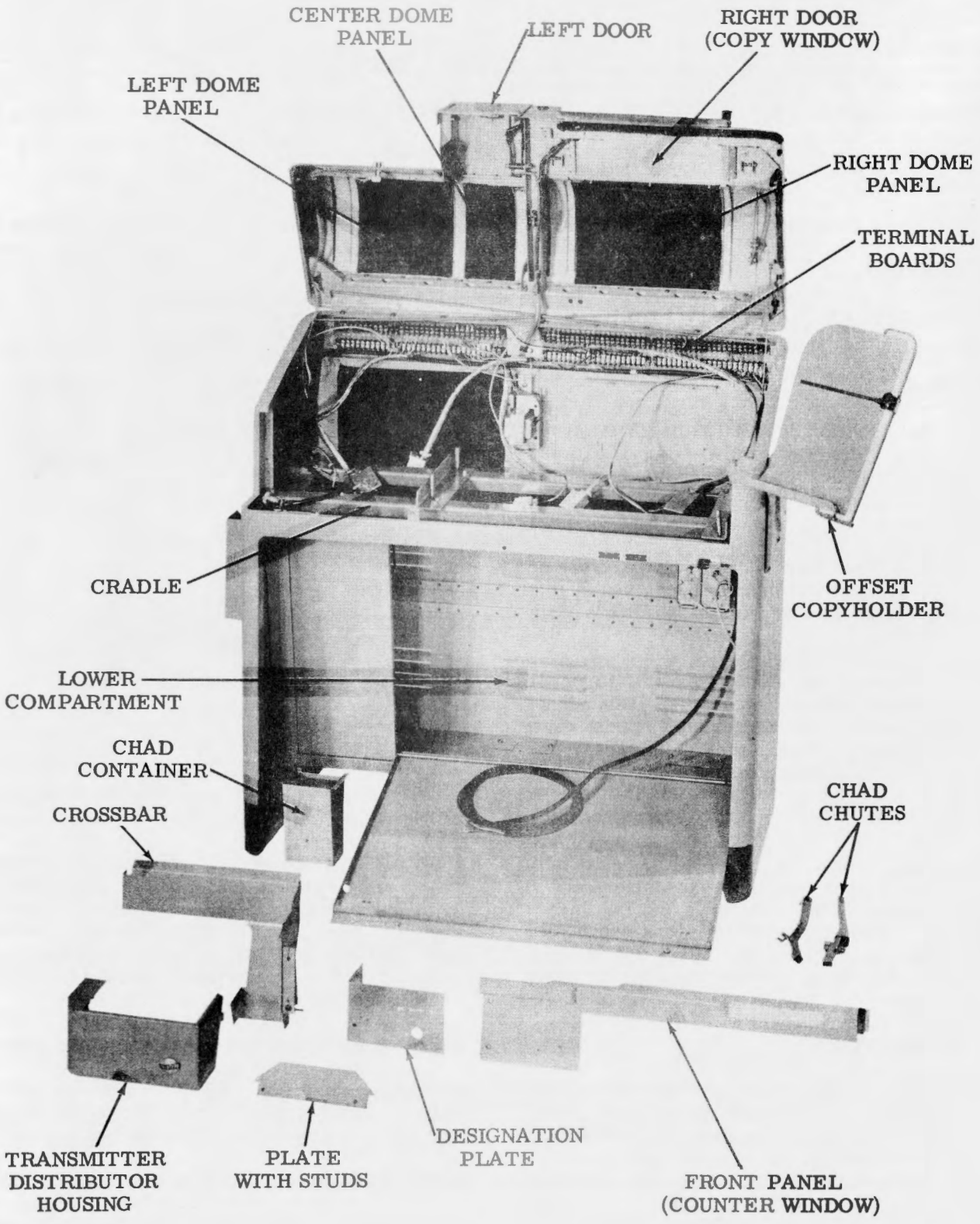


Figure 2 - 28 Teletypewriter Cabinet for Automatic Send-Receive (ASR) Sets (Dome Cover Open)

typing unit for changing the copy paper. A window in this door affords a view of the platen, typebox, and the copy being typed. The rear of the window serves as a straight edge for tearing off printed copy. The hinged left door near the center can be raised to gain access to the perforator. Two windows in the door are provided for viewing the perforated tape, the left window serving as a tape cutoff guide. The hinged left dome panel can be raised to gain access to the auxiliary reperforator, if it is supplied.

2.05 Incandescent indicator and copy lamps, located under the dome cover, illuminate the printed copy. A three-position switch, accessible when the dome cover is raised, controls the copy lamps. The copy lamp switch provides the following operating modes: NORMAL ON, OFF, and MAINT ON (maintenance on).

2.06 A cradle assembly resting on vibration mounts on the floor of the upper compartment accommodates both a keyboard base and a transmitter distributor base.

2.07 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 base. Its power switch is controlled through a lever at the front of the cabinet.

2.08 Rubber sealing strips, applied to the edges of both the dome cover and the lower compartment, help reduce the operating noise level.

2.09 The cabinet may be equipped with many accessories such as:

(a) A signal bell, to make audible those signals that are transmitted for supervisory purposes.

(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 small copyholder and line guide.

(e) An offset copyholder.

(f) An apparatus mounting rack for mounting accessory equipment.

(g) A directory holder.

(h) Four threaded leveling feet to compensate for floor irregularities or to add up to one inch in height to the cabinet.

(i) A tape bin with door.

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.

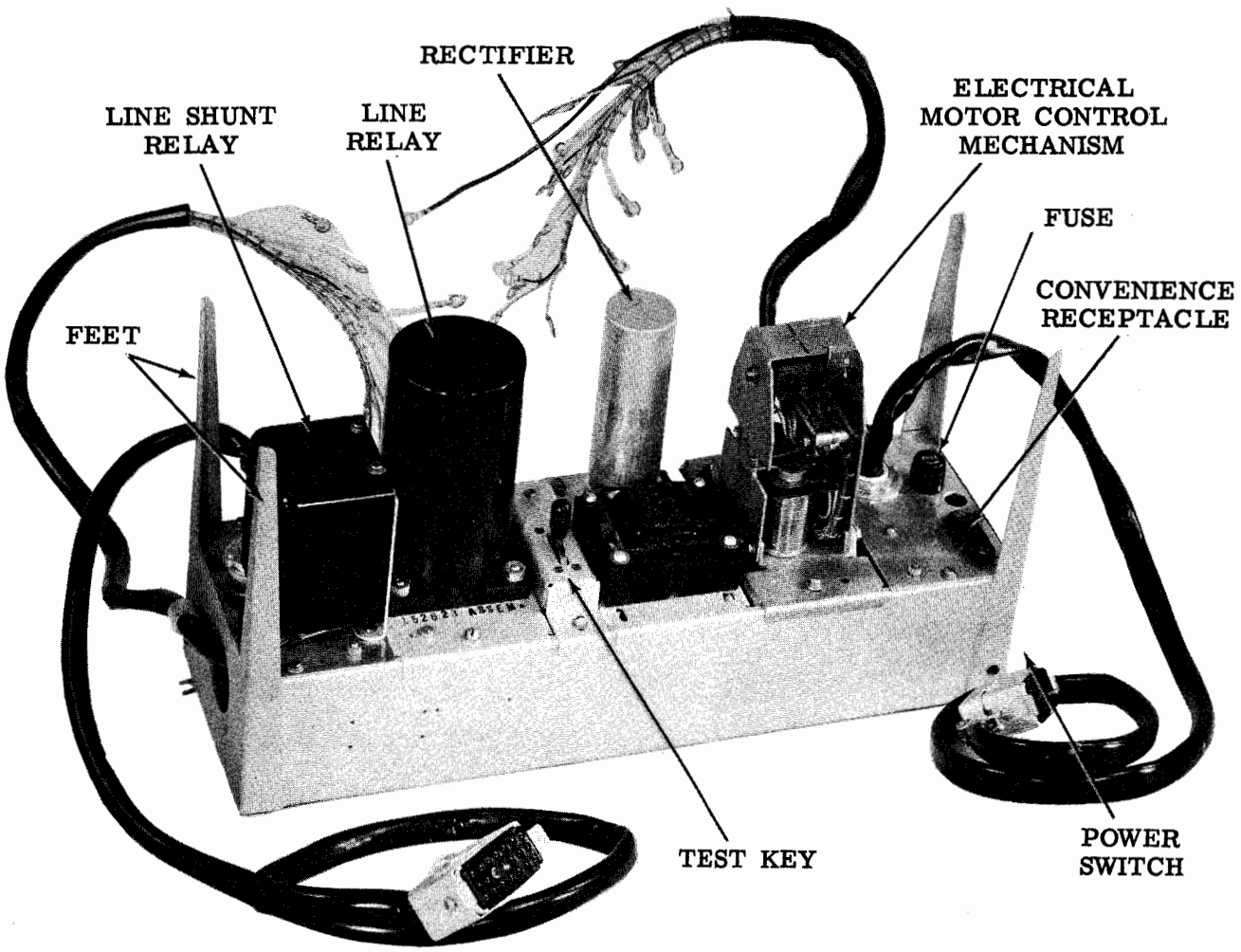


Figure 1 - Typical 28 Electrical Service Unit

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

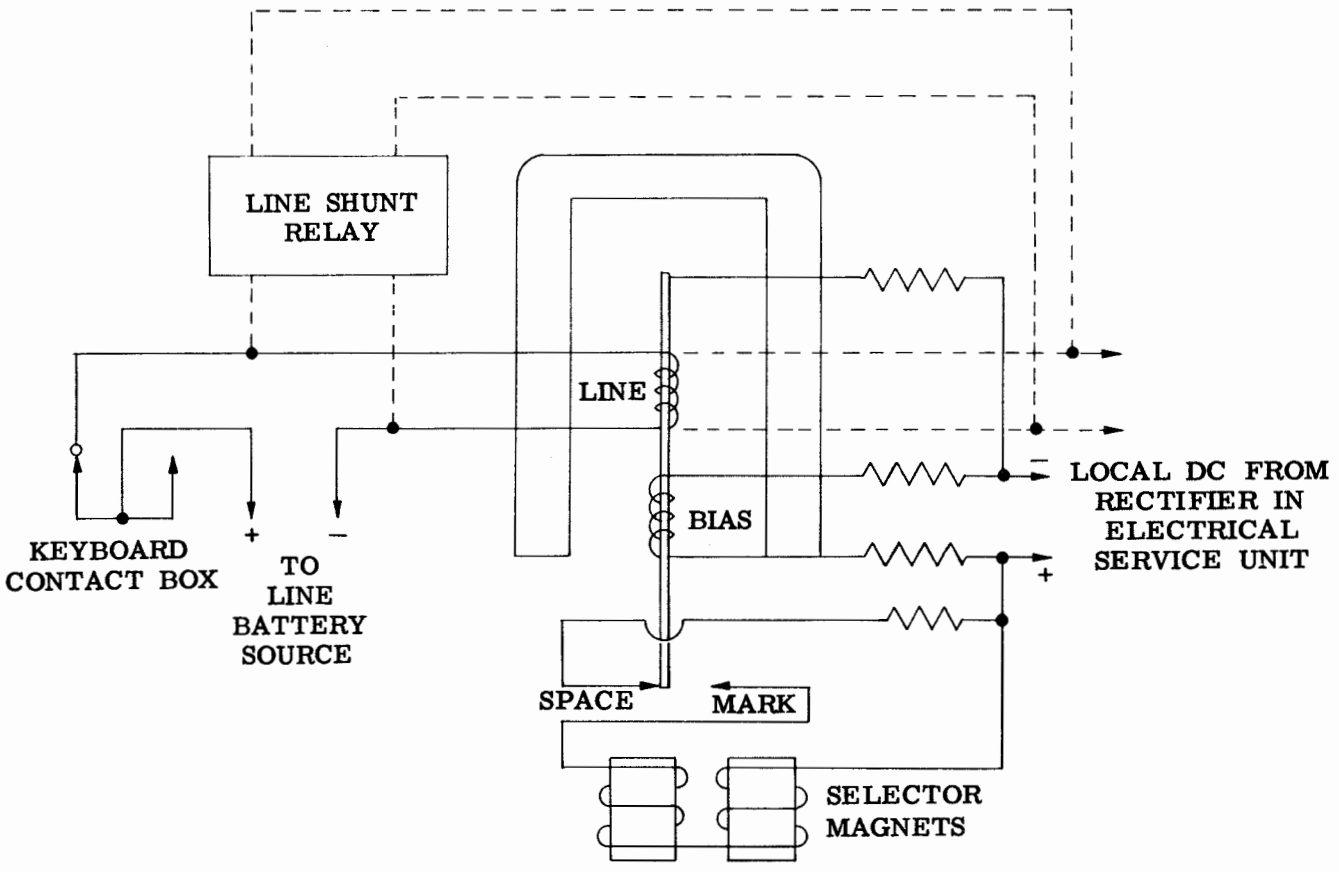


Figure 2 - Line Relay Circuit

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 (± 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

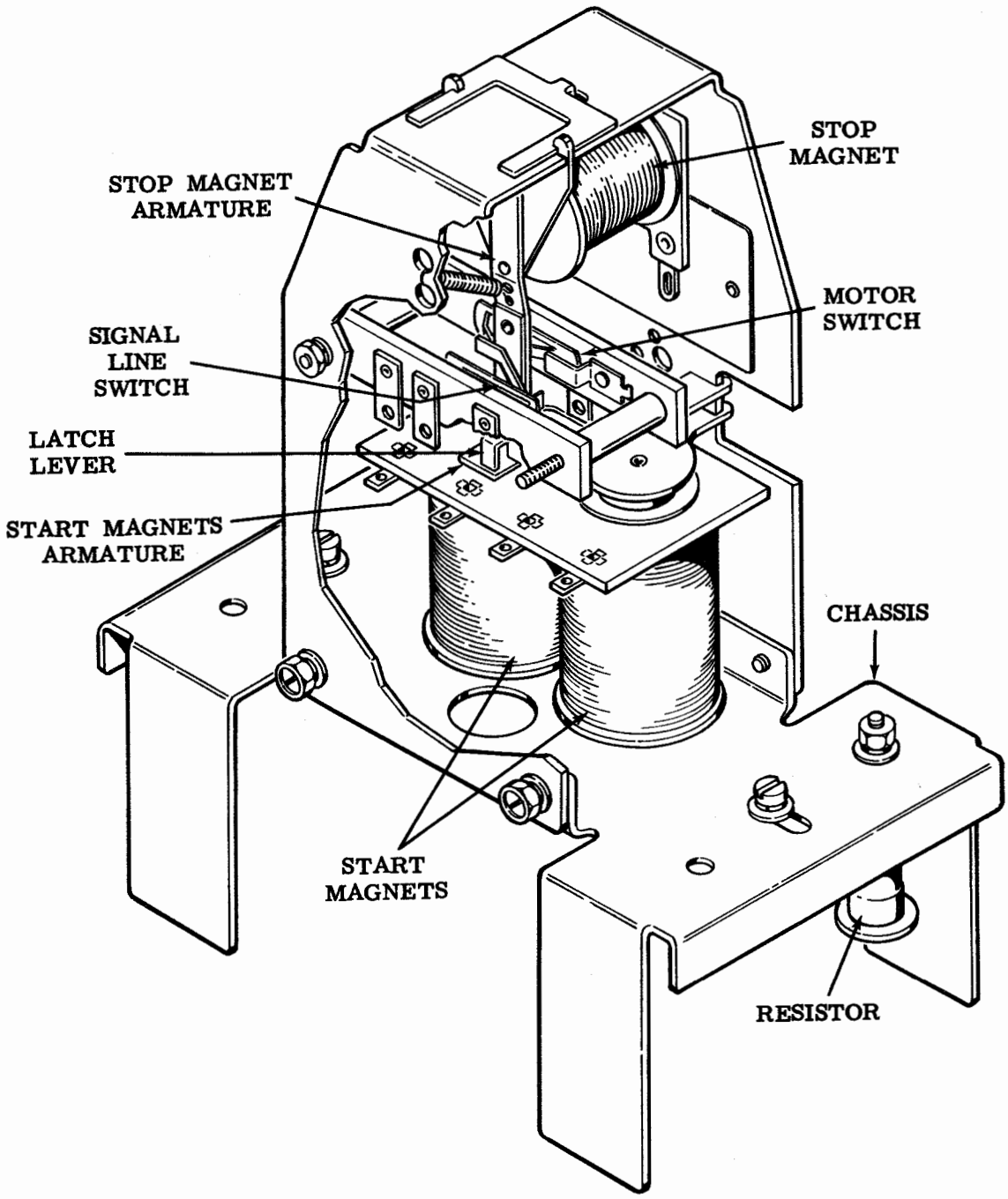


Figure 3 - Electrical Motor Control Mechanism

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 PERFORATOR-TRANSMITTER BASE

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS

1. GENERAL

1.01 This section is issued as a standard publication to cover the description and principles of operation for the 28 perforator-transmitter base.

1.02 The 28 perforator-transmitter base is an electromechanical unit which provides means for transmitting coded electrical impulses to a signal line and/or means for mechanically operating any one of four associated perforators --- a nontyping perforator, a typing perforator, a nontyping reperforator, or a typing reperforator. It also serves as a base mounting for an associated page typing unit for monitoring the message being transmitted from the keyboard.

1.03 A mode selecting mechanism is provided for switching the unit into any one of three positions (K, K-T, and T) to perform the following functions:

(a) Direct keyboard transmission to a signal line with monitoring of the message by a page typing unit (K position).

(b) Direct keyboard transmission and simultaneous operation of a perforator or reperforator with monitoring of a message by a typing unit (K-T position).

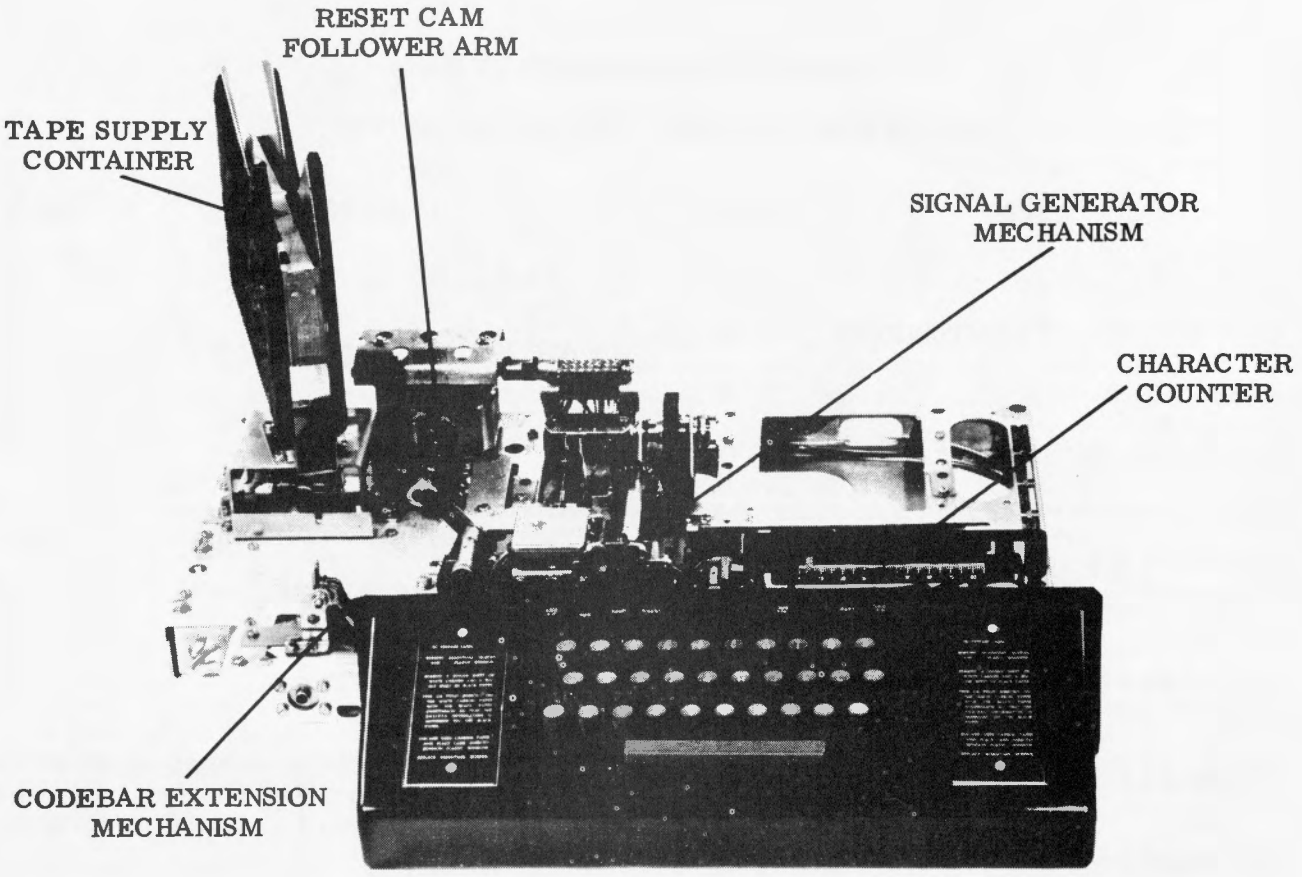


Figure 1 - 28 Perforator-Transmitter Base

(c) Operation of a perforator or reperforator only (T position).

1.04 With direct keyboard transmission, linkage to the perforating mechanism is depressed to disassociate the punching mechanism from the keyboard operation. Under this condition, if a typing or nontyping reperforator is being used, circuitry can be established to permit the reperforator to receive incoming traffic from a second line circuit.

1.05 Several variable features, such as a character counter, electrical keyboard lock, code reading contacts, timing contacts, signal line break, tape backspace, paper feed-out, and motor start are available as optional features.

1.06 Maximum keyboard speeds are 368, 460 and 600 operations per minute (opm) in the K and K-T positions. In the T position, maximum speed is 900 opm. These speeds are for a 5-unit start-stop code (7.42 unit).

Note: In the illustrative drawings, fixed pivot points are indicated as solid black circles. Movable pivot points are indicated as cross-hatched circles.

2. DESCRIPTION OF COMPONENTS

BASE (Figure 1)

2.01 The base is a reinforced aluminum sheet metal box frame on which all other assemblies are mounted.

KEYBOARD ASSEMBLY (Figure 2)

2.02 The keyboard assembly consists of a keylever guide assembly, front frame, guideplate, keylevers, and ball lock assembly.

2.03 The keylever guide assembly accommodates all code and function levers.

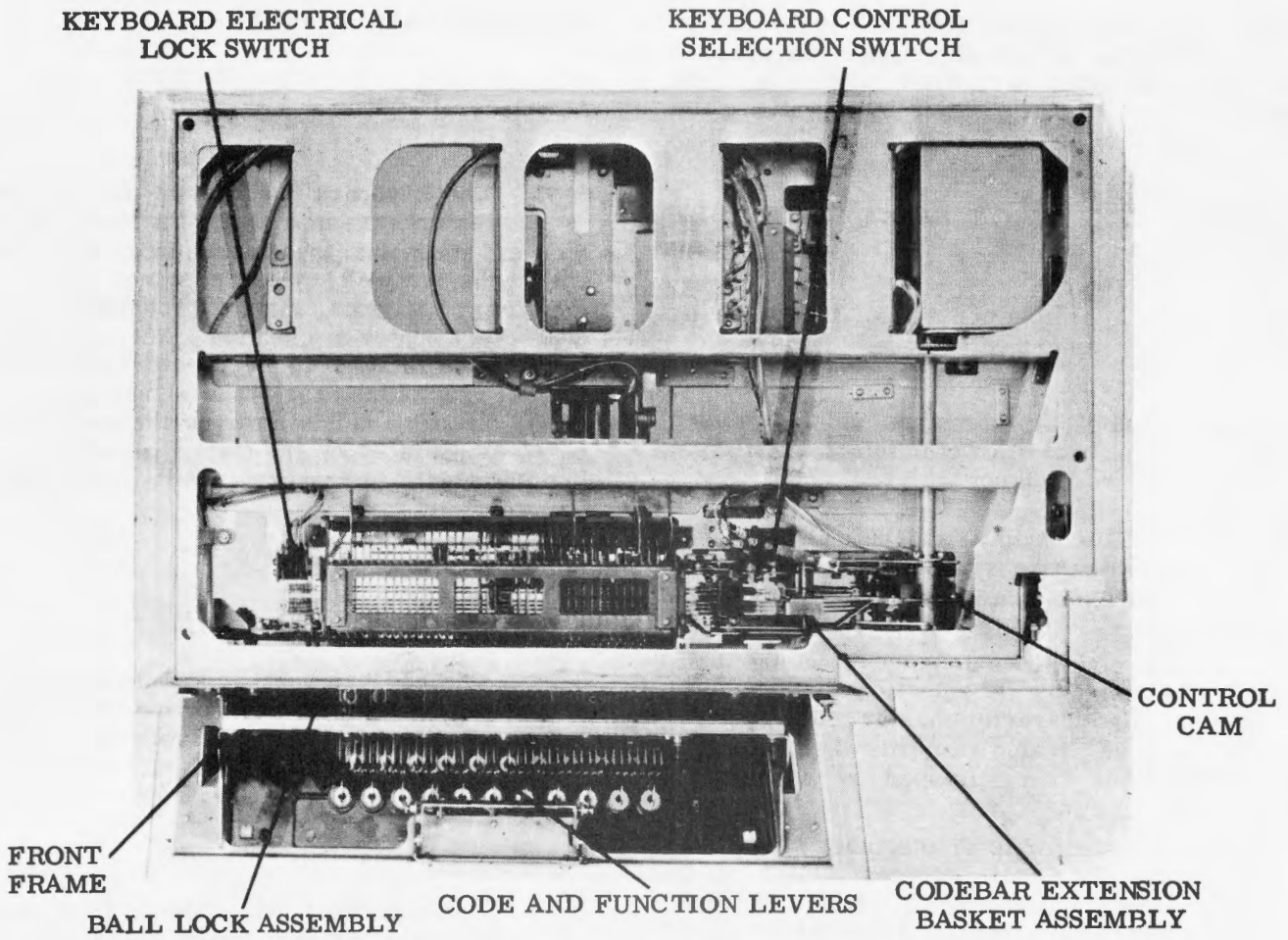


Figure 2 - Perforator-Transmitter Base (Bottom View)

SIGNAL GENERATOR (Figures 2 and 7)

2.04 The signal generator consists of a frame assembly; front and rear plate assemblies; gear, shaft, clutch and cam assembly; and a contact box assembly.

2.05 The clutch stop levers and latchlever are mounted on the frame. The codebar assembly and nonrepeat lever with its guide are mounted on the rear plate. The front plate acts as a mount for the detent plate assembly; transfer bail and stud; transfer levers with their guides springs, and mounting studs; and the locking bail with its stud and spring.

2.06 The cam, clutch, and shaft assembly is mounted between the front and rear plates. The cam is one piece of machined steel with eight lobes. The seven lobes which generate pulse signals, are equal in contour and are positioned at uniform angles with one another. The eighth lobe differs in contour, and is used to actuate the transfer lever locking bail.

2.07 The universal bail latchlever with its eccentric bushing is fastened to the right front of the frame. This latchlever extends to the rear over the codebar bail latch and the nonrepeat lever pawl.

2.08 The contact box assembly is mounted on the front plate. It is composed of a fiber insulating strip, a contact toggle assembly and phenolic base, drive link, and an arc suppressor, or RF filter.

RESET CAM FOLLOWER BRACKET ASSEMBLY (Figure 1)

2.09 This assembly consists of a hollow shaft with internal oilite bearings pivoting on a fixed shaft. A hooked arm on one end of the hollow shaft connects the hollow shaft to the clutch tripbar assembly. An adjustable arm and roller on the other end of the hollow shaft follows the reset cam on the perforator main shaft.

2.10 The entire assembly provides linkage between the clutch tripbar and the cam on the associated perforator when the mode selector is in T position, thereby permitting the the keyboard to be reset at high speeds.

CODEBAR EXTENSION BASKET ASSEMBLY (Figure 2)

2.11 This assembly consists of the following major components:

(a) The codebar extensions which are used to transmit character information from the keyboard to the punch.

(b) The clutch tripbar extension which links the clutch tripbar to the perforator clutch trip lever extension in K-T and T positions.

(c) The codebar extension blocking bail, which blocks the selection of codebar extensions and character counter codebars in the K position. It also prevents the perforator clutch from being tripped in K position.

(d) The selector lever assembly, which permits the signal generator clutch to be tripped in K and K-T positions. It also prevents the signal generator from being tripped in T position.

(e) The control cam, which drives the auxiliary electric switch and provides the K, K-T, and T operations of the perforator transmitter.

2.12 The primary purpose of the codebar extension basket assembly is to transmit character information from the keyboard codebars to a perforator, and to serve as control center for the various functions of the 28 perforator-transmitter base.

3. PRINCIPLES OF OPERATION

Note: Inasmuch as the mechanical operation of the perforator-transmitter and its associated perforator or reperforator are so closely related — one depending on the other functionally — it will be necessary in presenting the principles of operation to overlap certain mechanical actions within the two units for clarity.

KEYBOARD MECHANISMS

A. General

3.01 The keyboard mechanism and optional features are mounted on the base. These mechanisms include the intermediate gear, codebar mechanism with keylevers, signal generator mechanism, various function mechanisms and a character counter mechanism. Necessary circuits are brought out to a connector mounted at the left rear of the base. The signal generator shaft, through a helical gear on the rear of the shaft, is operated by the main shaft of the typing unit which, in turn, derives its power from a motor unit.

B. Codebar

3.02 The codebar mechanism is located on the front underside portion of the keyboard. Each keylever in the lower three rows and the spacebar is connected to a code lever and each keylever in the upper row is connected to a function lever.

3.03 The code and function levers pivot about points near their midportions (Figure 3). Located above the rear half of the code levers and running parallel with the keyboard are, from rear to front, the clutch tripbar, the numbers 1, 2, 3, 4 and 5 codebars, two character counter bars (counter and carriage return), and the lockbar. The rear portion of each code lever or function lever is normally held downward by a spring so that the front end, with its attached keylever, is held upward.

3.04 A wedgelock is mounted on the projection of the lower front portion of all code levers (Figure 4). If one of these levers is operated, its wedgelock moves downward between the lock balls in the lock ball channel and crowds them together. This prevents any other lever with a wedgelock from being operated at the same time.

3.05 With the signal generator shaft in its stop position, the codebars and clutch bar are held toward the left (viewed from the front) against the tension of their springs by the latched-up codebar bail.

3.06 When any keylever in the three lower rows or the spacebar is depressed, the rear end of the associated code lever engages and rotates the code lever universal bail counterclockwise (Figure 3). The extension on the code lever universal bail disengages from the step at the rear of the universal bail latchlever. This lever then moves downward under the tension of its spring. As the lever falls, it strikes the codebar bail latch and carries it downward (Figure 5). When the corner of the codebar bail latch falls beyond the centerline of the needle bearing mounted on the codebar bail, the codebar bail is released and swings to the right.

3.07 Upon being freed, the codebar bail, the clutch tripbar, and the selected codebars are pulled to the right by their springs. Unselected codebars are stopped from moving to the right by the operated keylever or spacebar. For example, if the L lever is depressed, codebars 1, 3 and 4 will be stopped by the code lever engaging teeth on the underside of the codebars. The teeth on codebars 2 and 5 are omitted in this area and the bars are permitted to move to their extreme right-hand position (Figure 6).

3.08 The codebars have vertical extensions that engage a curved part of the signal generator transfer levers (Figure 7). The codebars which are permitted to move to the right carry with them their respective transfer levers.

3.09 Simultaneously with the above operation, the clutch tripbar moves to the right. A keyboard control selection lever (Figure 21) is linked to and moves to the right with the clutch tripbar. When the three-position keyboard control knob is in the K or K-T position (Paragraph 3.42), a projection on the keyboard control selection lever trips the signal generator clutch stop lever. The clutch then engages and rotates the signal generator cam.

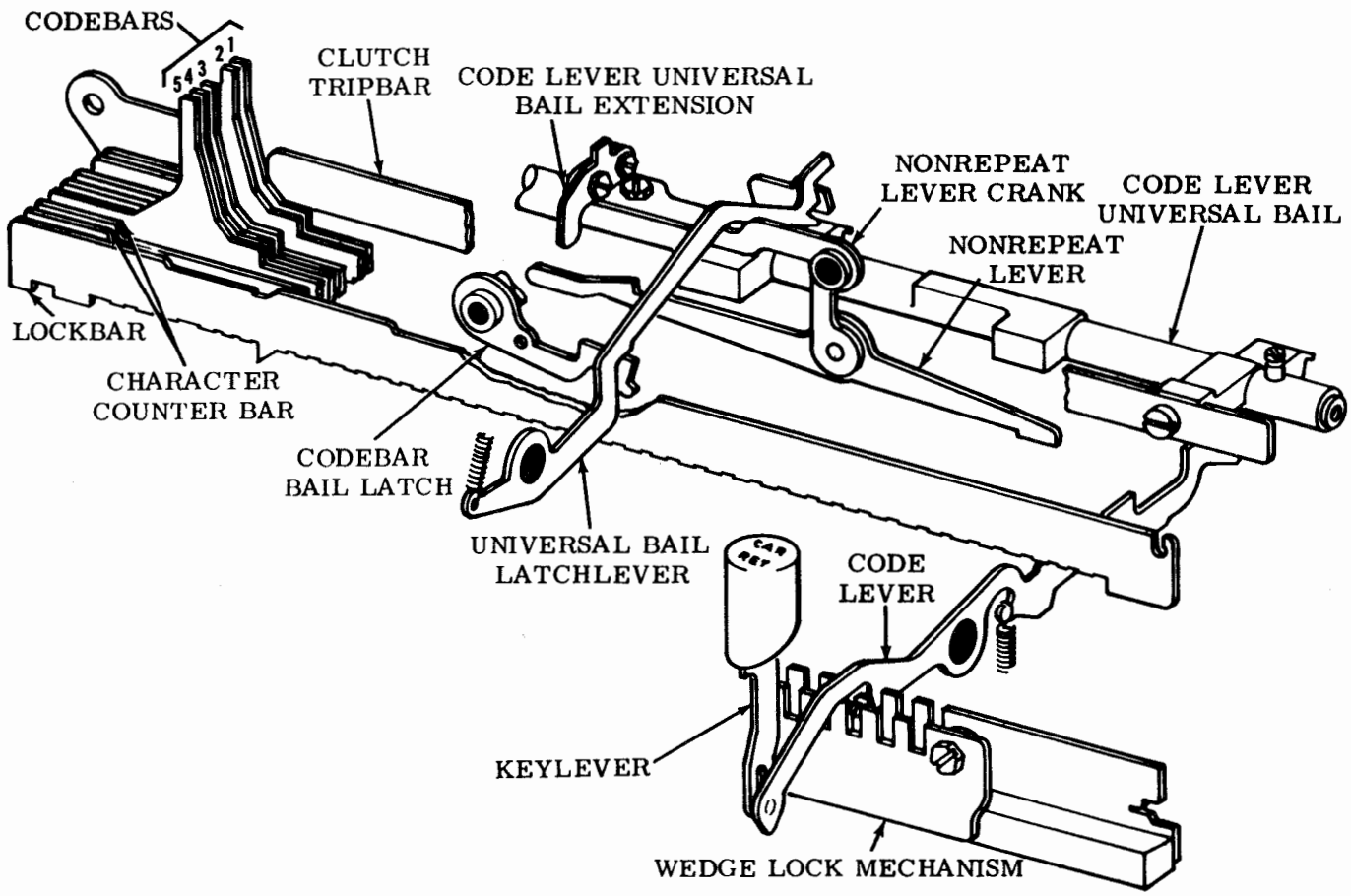


Figure 3 - Codebar and Code Lever Universal Bail Mechanism

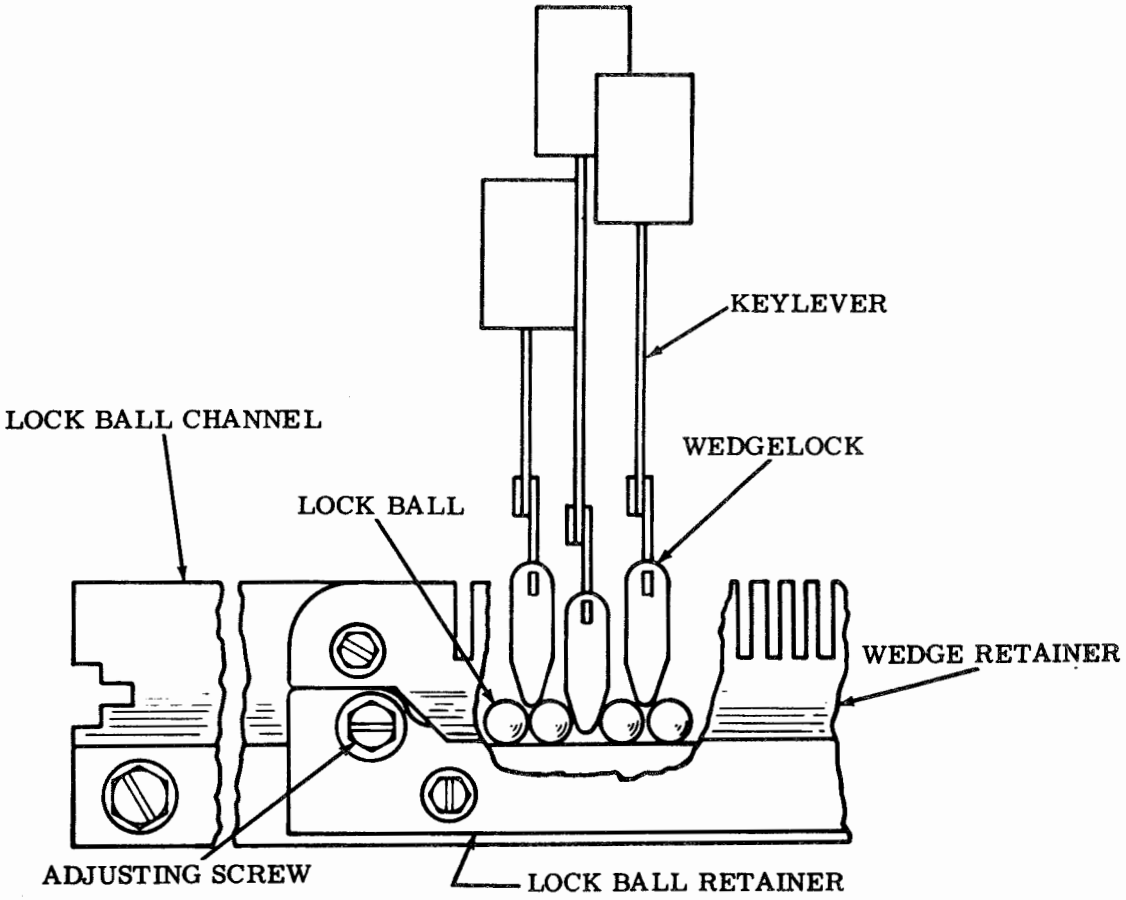


Figure 4 - Wedgelock Mechanism

3.10 Operation to this point is manual, resulting only from depressing a code lever or spacebar. The remainder of the operating cycle is covered in Paragraph C. below.

C. Signal Generator

3.11 When the clutch stop lever is tripped (Paragraph 3.09), the clutch shoes engage a serrated surface on the inside of the clutch drum. When power is on (motor unit operating), the clutch drum rotates continuously in a clockwise direction (viewed from the front) because it is a part of the geared signal generator shaft. Since the clutch shoes are mounted on a plate that is part of the cam assembly, the cam rotates upon engagement of the clutch.

3.12 As was shown in Paragraph 3.08, each of the five codebars operates its own transfer lever (Figure 7). In addition to these five transfer levers, there are two others which are not associated with codebars. These are used to originate the start and stop pulses.

3.13 The cam lobes are numbered from 1 to 8 from rear to front. There are seven signal-pulse lobes on the cam (one for each transfer lever). The eighth cam lobe is used to actuate the locking bail.

3.14 The cam lobes are arranged so that when the cam rotates, lobe 3 engages its transfer lever first and moves it downward. Almost at the same time, the eighth lobe from the rear begins to move the locking bail upward. A blade on the locking bail engages in slots on the selected transfer levers and locks them in position. Unselected transfer levers are locked in the left position as the blade blocks their movement. Thus, in the first few degrees of cam rotation, the permutated position of the transfer lever is locked and the codebars are free to be reset in their normal latched positions.

3.15 Transfer lever 3 is the start pulse transfer lever. There is no codebar to engage this lever, hence it is always held to the left by

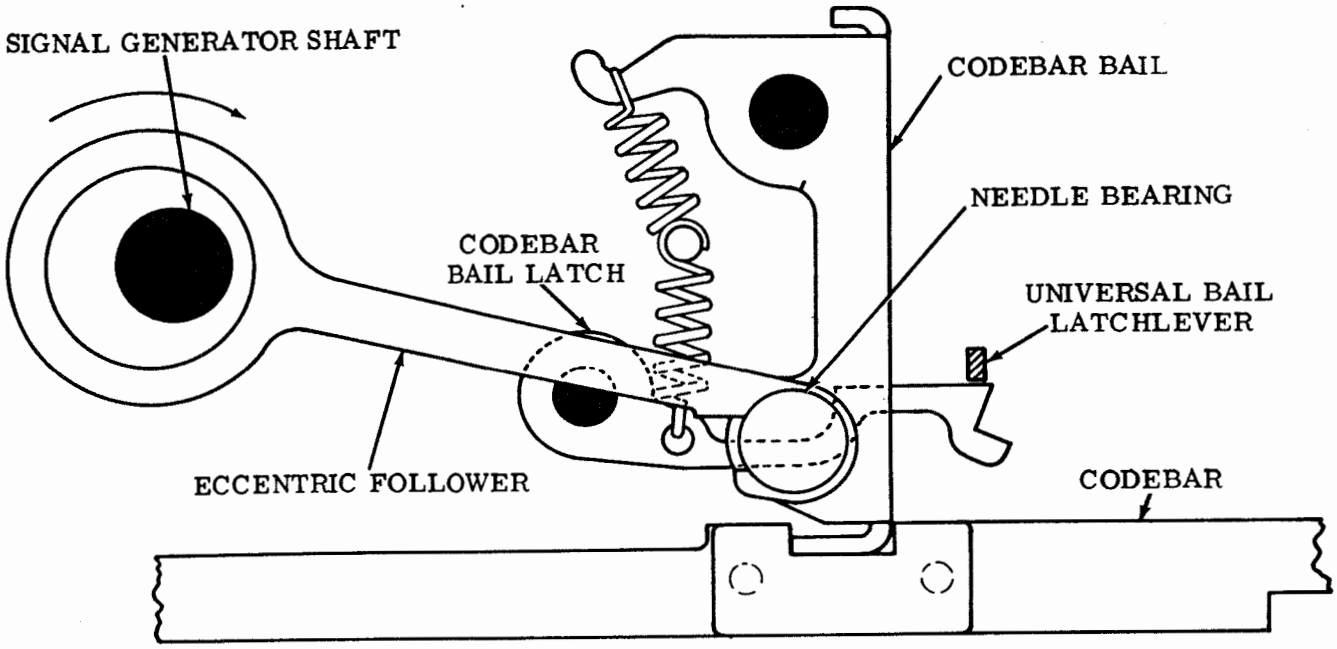


Figure 5 - Codebar Bail Mechanism

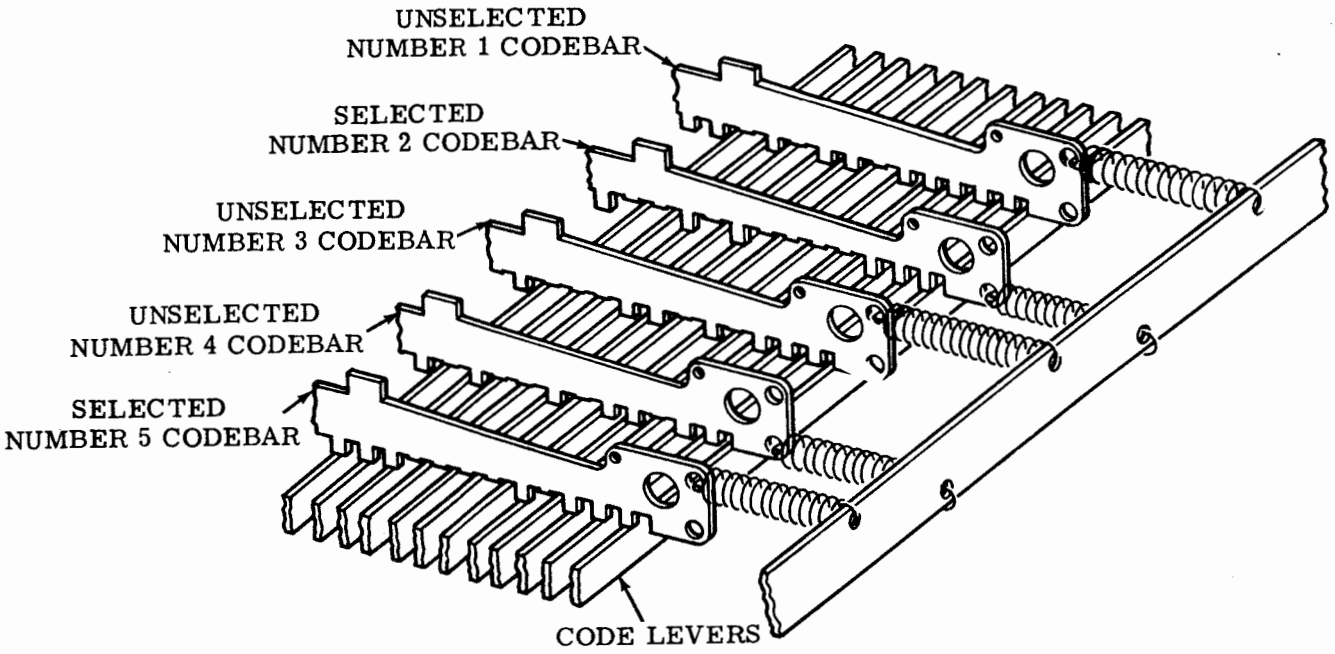


Figure 6 - Codebar Selection

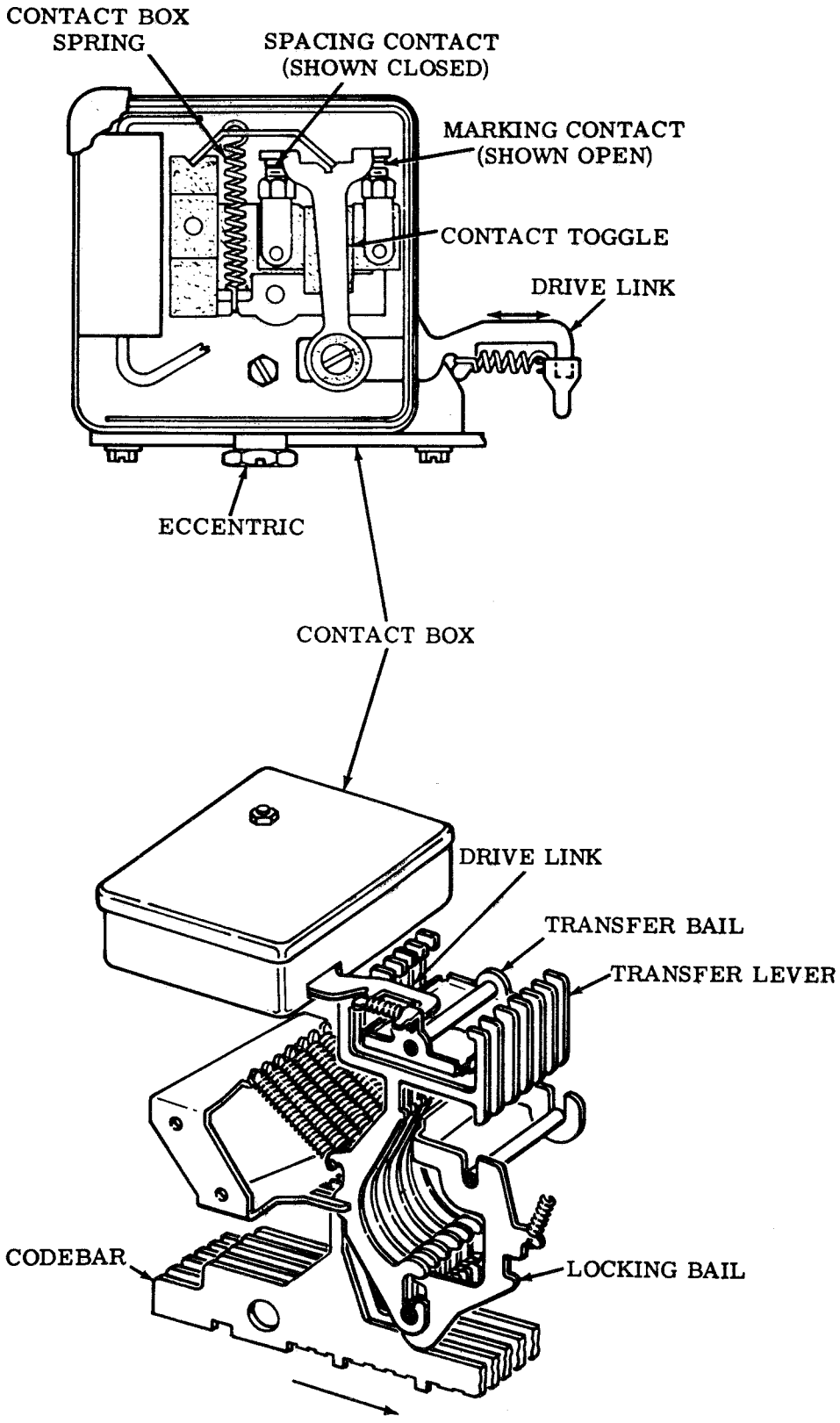


Figure 7 - Transfer Lever and Contact Box Mechanisms

its spring. As cam lobe 3 moves this lever down, the hook on the upper right of the lever engages the right-hand side of the transfer bail. This trips the transfer bail to the right and pulls the contact drive link (Figure 7) to the right. The resulting action of the contact toggle is such that the marking contacts open and the spacing contacts close. Under this condition there is "no current" in the signal circuit. This is known as a spacing pulse. Thus, the first pulse (or start pulse) of any character is a spacing (no current) pulse.

3.16 Lobe 1 and its transfer lever move downward next. For the character L it has been shown (Paragraph 3.07) that transfer lever 1 is positioned to the right. In turn, the upper left hook of this lever pulls downward on the transfer bail, tilting it back to the left. This pushes the drive link to the left, thereby closing the marking contacts and allowing a marking (current on) pulse to be transmitted.

3.17 Similarly, transfer levers 2, 4, 5, and 6 are pulled downward by their respective cam lobes. The resulting pulse will be marking if the transfer lever is to the right, or spacing if it is to the left.

3.18 Transfer lever 7 is the stop pulse transfer lever. This lever is permanently held to the right by a stop pin; therefore, the resulting pulse, the stop pulse, is always marking (current on).

3.19 The locking bail holds the transfer levers in their permutated positions until after the beginning of the fifth pulse. Then cam lobe 8 pulls the bail down out of locking position and all selected transfer levers are free to return to their left position.

3.20 Reset of the codebars is accomplished by means of an eccentric on the front of the cam, which drives an eccentric follower (Figure 5). The follower engages an eccentric stud on the side of the codebar bail and pulls the bail to the left as the cam rotates. As the codebar bail moves to the left, the codebar bail latch clears the needle bearing stud and is pulled upward into locking position under tension of the spring to latch or reset the codebar bail. As the codebar bail is moved into reset position, it engages projections on the permutated codebars, clutch tripbar, and a stop on the nonrepeat lever, thus moving all these elements to the left into latched reset position.

D. Repeat Keylever

3.21 Operation of the REPT keylever simultaneously with one of the keylevers in the three lower rows, or the spacebar, disables the nonrepeat mechanism and causes the character or function selected to be repeated as long as the REPT keylever is held operated. The operated REPT keylever causes its function lever to raise the right end of the nonrepeat lever (Figure 8) and rotates it about its pivot point. In this position, the nonrepeat lever cannot be engaged and operated by the codebar bail, therefore, the nonrepeat lever crank will not reset the operated codebar bail latch. The codebar bail and universal bail latchlever are thus maintained in their operated positions and the codebar bail follows the eccentric arm movement back and forth until the REPT keylever is released.

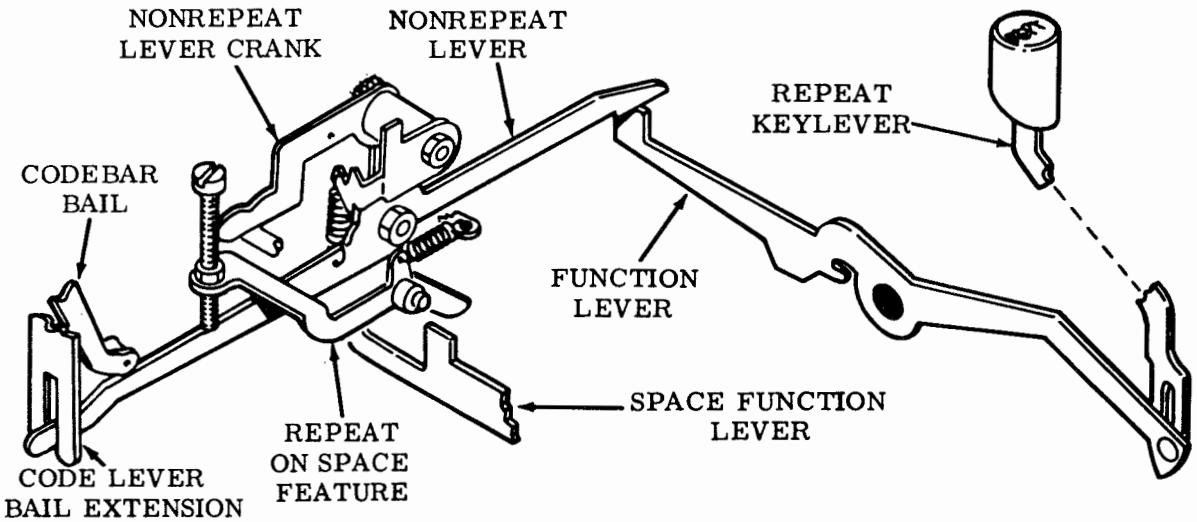


Figure 8 - Repeat Mechanism

E. Electrical Line Break (Figure 9)

3.22 The electrical line break mechanism provides a means of interrupting signal line current for use as a break signal. Interruption of the line current is effected by depressing the BREAK keylever located on the keyboard.

3.23 When the BREAK keylever is depressed, its function lever pivots and raises the front end of the break lever. The rear portion of the break lever depresses the actuator pin of the sensitive switch, which open the normally closed contacts. This action breaks the continuity of the signal line circuit, causing a break signal (no current) to be transmitted.

3.24 When the BREAK keylever is released, the tensions of the switch spring and break lever spring cause the function lever to return the keylever to its normal position and the switch contacts to their normally closed condition.

F. Local Line Feed (Figure 10)

3.25 When the LOC LF keylever on the keyboard is depressed, paper is fed out of the associated typing unit when power is on. The mechanism operates as follows: Depressing the LOC LF keylever raises the forward end of the local line feed bail. This bail pivots and its upper end pushes the attached local line feed trip link toward the rear until the link engages the line feed clutch trip lever on the typing unit. Thus, the line feed mechanism on the local typing unit is made to operate without a signal and other typing units on the same line circuit are not disturbed.

G. Local Paper Feed-Out (Figure 11)

3.26 The local paper feed-out mechanism enables the operator to feed out copy paper by depressing the local line feed keylever, whether the printer set is on or off. The mechanism operates as follows:

(a) Depressing the LOC LF keylever causes the local line feed trip link to move to the rear and unlatch the line feed clutch trip lever, as described in Paragraph F. above. If the set is operating, the result is that copy paper is fed out until the LOC LF keylever is released. If the set is not operating, the line feed clutch of the typing unit is conditioned to operate when the power is supplied.

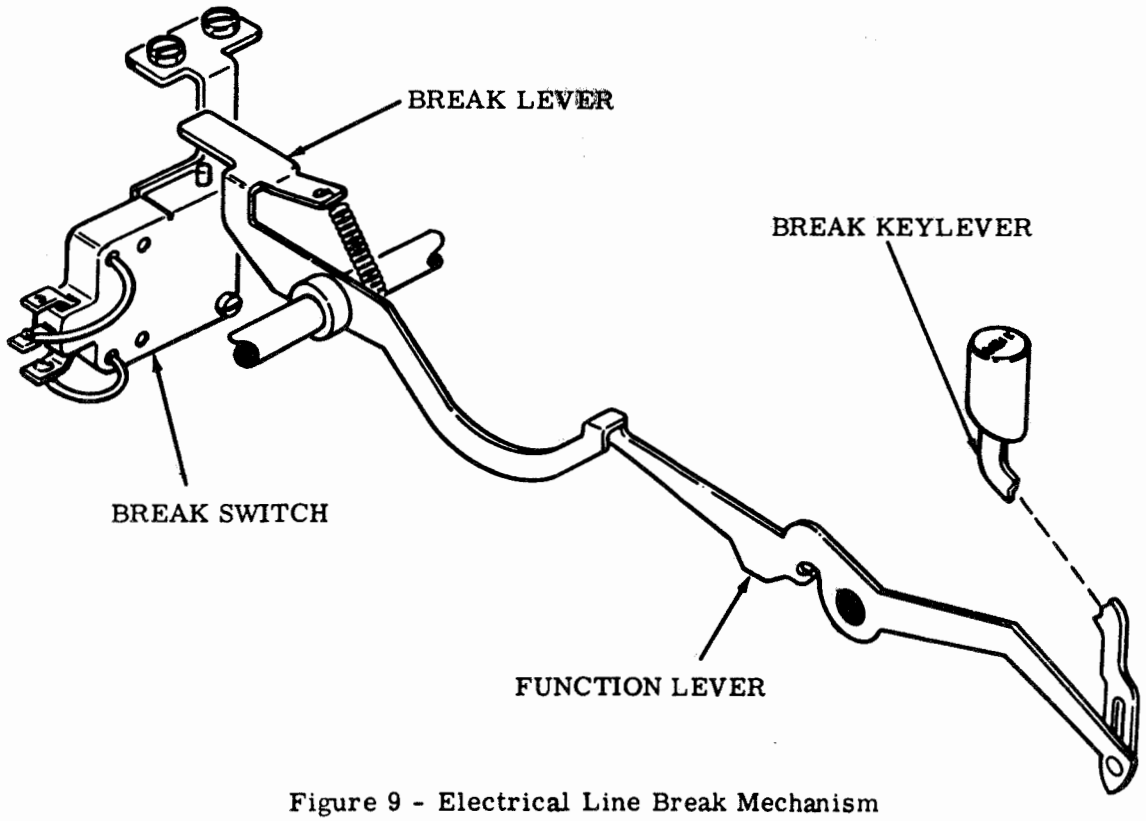


Figure 9 - Electrical Line Break Mechanism

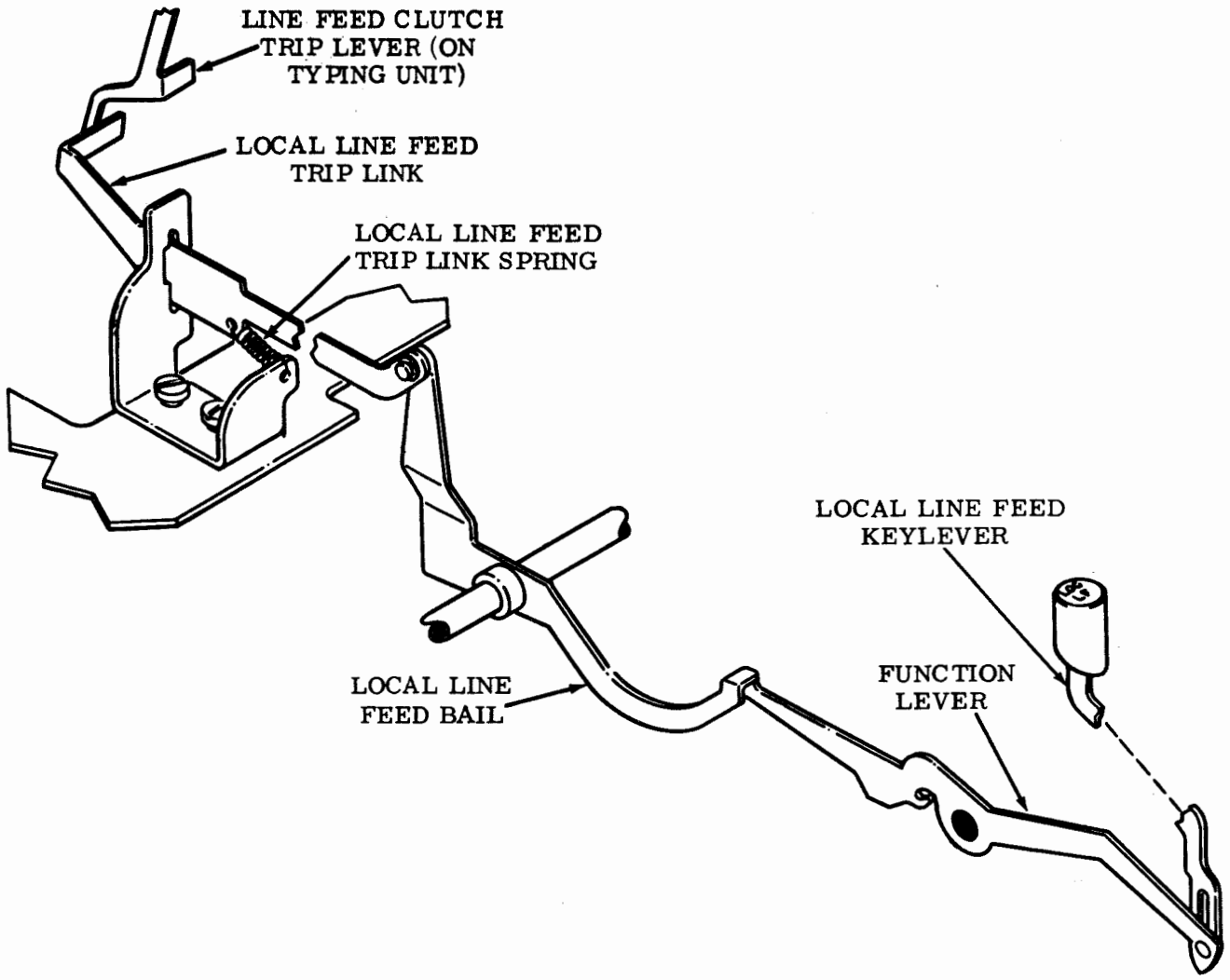


Figure 10 - Local Line Feed Mechanism

(b) When the local line feed trip link is fully actuated, it rotates the local paper feed-out switch lever, releasing the switch plunger and permitting the contacts in the magnetic blow-out switch to close.

(c) This actuates the motor circuit of the printer so that the motor will run and eject copy paper so long as the LOC LF key-lever is depressed (printer normally off).

H. Electrical Keyobard (Figure 12)

3.27 The electrical keyboard lock mechanism permits the signal generator contact to be electrically shunted from the keyboard or from the associated typing unit shunt. This mechanism operates as follows:

(a) To shunt the keyboard locally, depress the REC keylever (Figure 12). This action raises the keyboard lock function lever which, in turn, raises the lockbar latch. With the lockbar latch disengaged, the lockbar is free to move to the right under spring tension of the keyboard lock switch contact on the switch lever. The switch lever then pivots, closing the contacts of the switch. The associated circuits are arranged to shunt the signal generator when the switch is closed. However, since there is no mechanical blocking of the keylevers, the perforator transmitter can still be operated as a tape perforator.

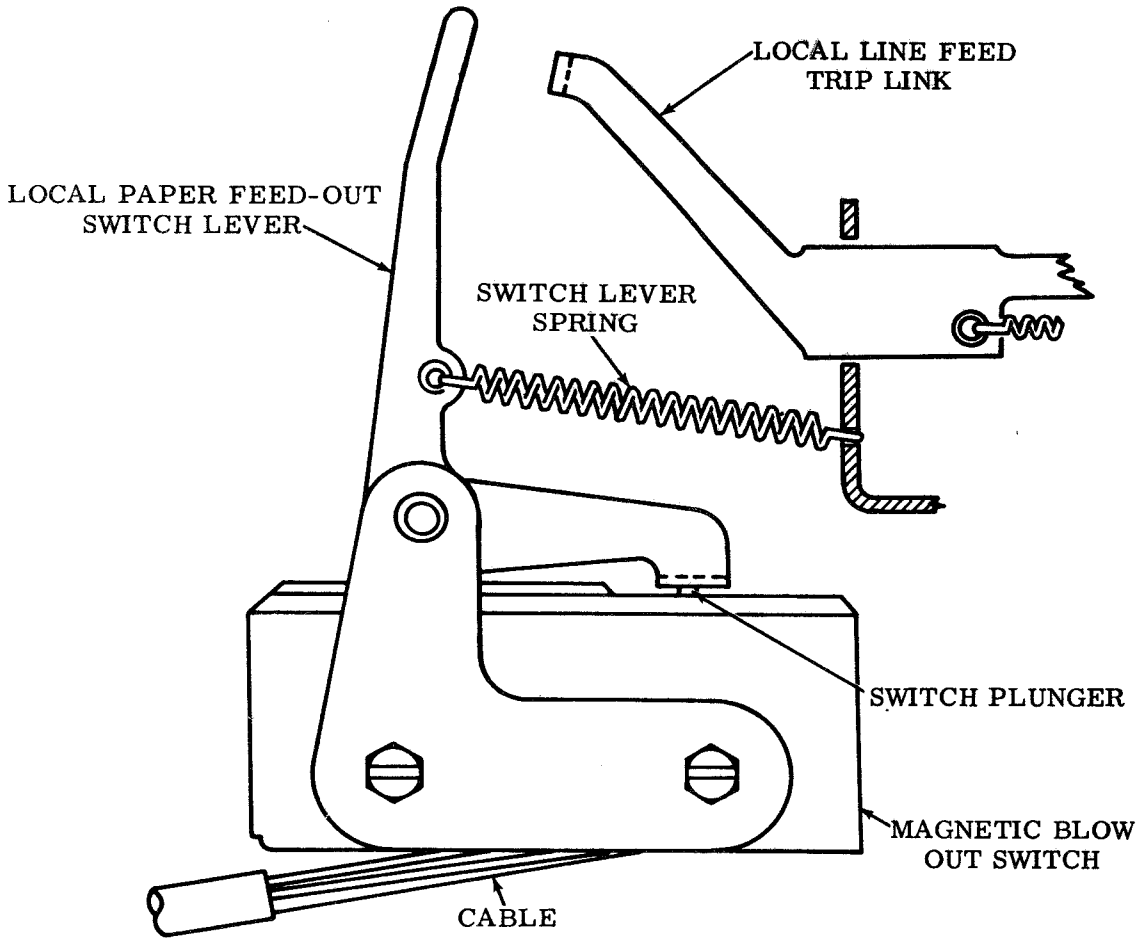


Figure 11 - Local Paper Feed-Out Mechanism

(b) The keyboard can also be shunted when two consecutive blank code signals are received by the associated typing unit. Under this condition, the keyboard locklever on the typing unit (Figure 12) moves downward and depresses the keyboard lock plunger. This movement causes the keyboard lock bail to pivot and raise the keyboard lock function lever. This disengages the lockbar latch and the keyboard is shunted as described in (a).

I. Keyboard Unlock (Send Key)

3.28 The keyboard unlock mechanism permits the keyboard to be unshunted. The operation of the mechanism is as follows:

(a) When the SEND keylever is depressed (Figure 13), the keyboard unlock function lever rises against a diagonal camming surface on the lockbar (Figure 12). This moves the lockbar to the left until the lockbar latch falls into a notch on the lockbar.

(b) As the lockbar moves to the left, the switch lever (Figure 13) pivots and opens the contacts of the keyboard lock switch. The associated circuits are arranged so that, when the switch contacts open, the signal generator is no longer shunted (Paragraph 3.27) and normal signal transmission can take place.

J. Local Carriage Return

3.29 The local carriage return mechanism enables the operator to trip the carriage return mechanism on the associated typing unit, thereby causing the type box carriage to be fully returned to its normal position at the beginning of a line of copy. This mechanism operates as follows: When the LOC CR keylever (Figure 14) is depressed, its function lever rises and, in turn, raises the forward end of the local carriage

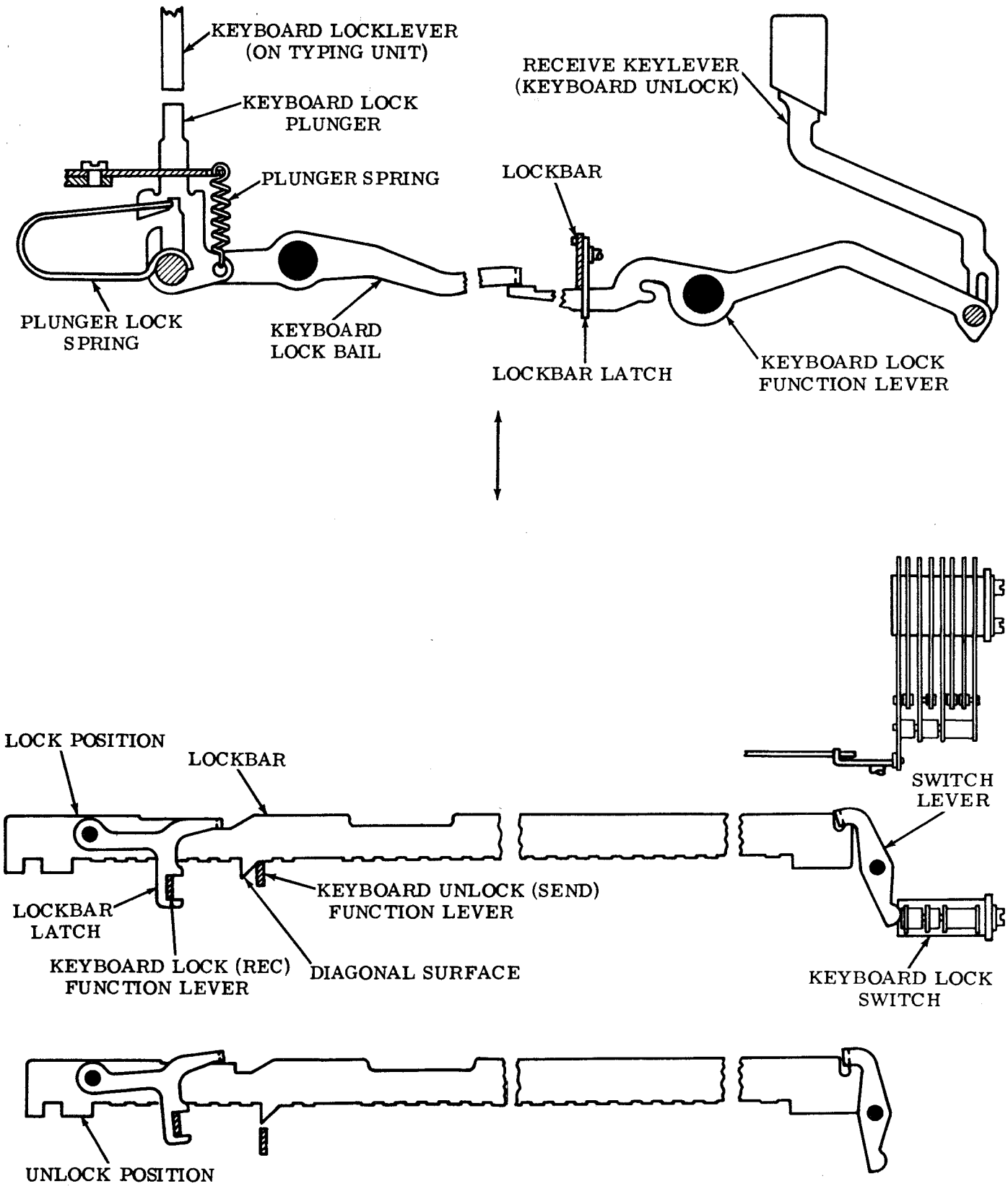


Figure 12 - Electrical Keyboard Lock Mechanism

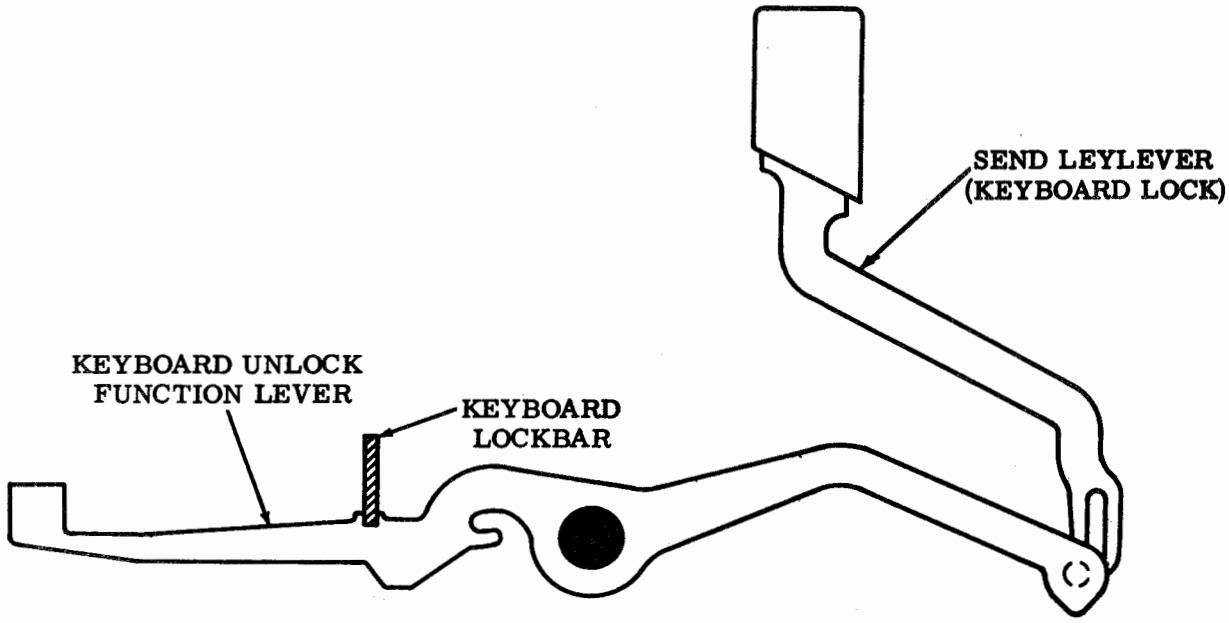


Figure 13 - Keyboard Unlock Mechanism

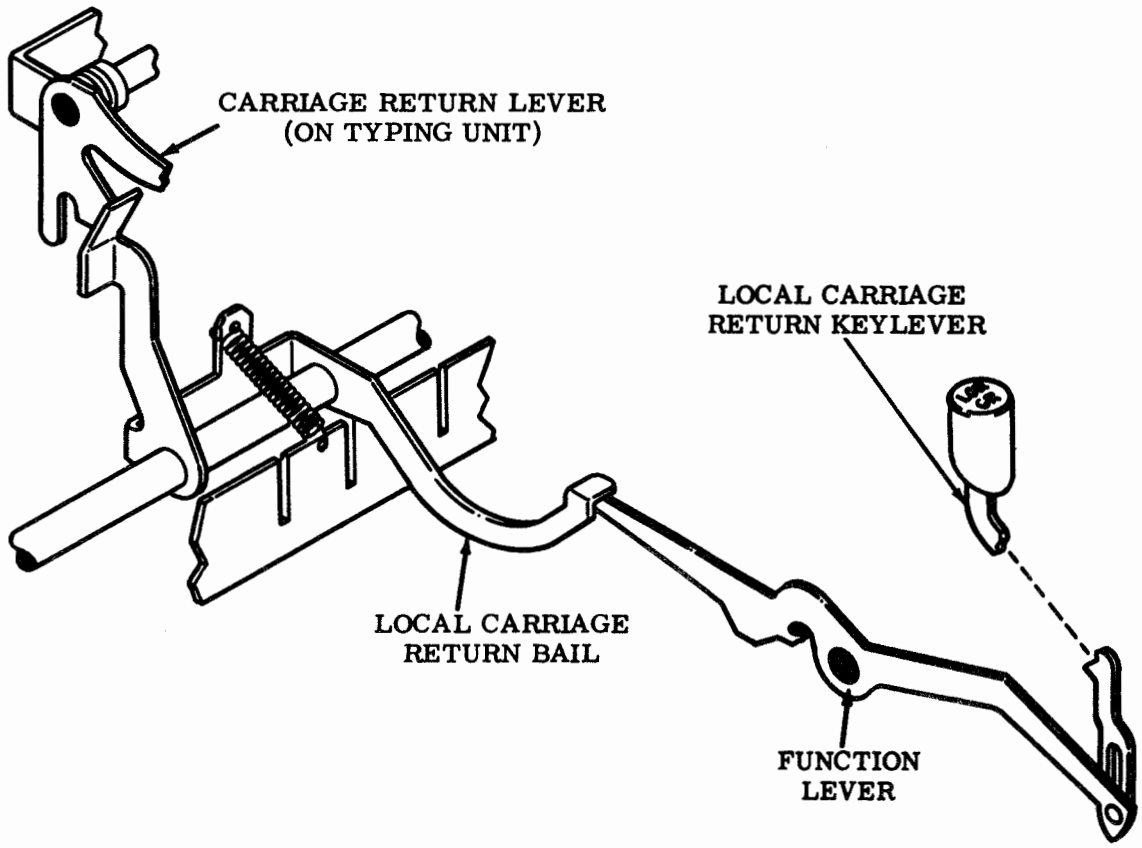


Figure 14 - Local Carriage Return Mechanism

return bail. This bail rotates about its pivot point until the upper end engages the carriage return lever on the typing unit. The carriage return mechanism operates in this manner without a signal that would cause other units in the line circuit to function.

K. Margin Indicator (Figure 15)

3.30 The margin indicator cam disc on the associated typing unit spring drum rotates with the drum as spacing occurs. As the end of each line is approached, the cam surface of the disc makes contact with the margin indicator contact switch lever and rotates it clockwise about its pivot point. When the lever rotates, it releases the margin indicator switch plunger. The normally open contacts are closed, completing the circuit to a margin indicator light in the cabinet. The carriage return cycle returns the cam disc to its starting position and the margin indicator switch opens. The switch is operative only when the keyboard is in the K and K-T positions.

L. Character Counter (Figures 16 and 17)

3.31 The character counter is driven mechanically from the perforator transmitter by the action of the counter and carriage return codebars located in the second and third slots of the codebar basket. These bars provide drive projections which engage the forks of the feed and reset bails of the counter. As the codebars fall to the right when a key on the keyboard is struck, the counter mechanism is tripped. As the keyboard is reset under power, the counter performs its required functions. These functions may be divided into three distinct phases of operation. Figure 18 illustrates these three phases of operation, and also the normal position of the counter mechanism.

Stepping

3.32 Referring to sequence A, Figure 18, as a key is struck the codebars fall to the right, carrying with it feed bail 1. The drive lever, which is linked to the feed bail, moves to the left slightly more than one tooth. As the codebars are reset under power, stepping bail 1 moves clockwise, causing the drive lever to advance the ratchet drum one tooth. The drive pawl prevents the ratchet drum from rotating counterclockwise until it is again tripped for the following character. When this occurs, the ratchet drum rotates slightly counterclockwise, coming to rest against the latchlever.

Counter Reset

3.33 Sequence B, Figure 18, illustrates the tripped position of the counter mechanism for a reset function. Reset bail 2 moves counterclockwise as its codebar falls to the right, causing the reset lever in turn to rotate clockwise.

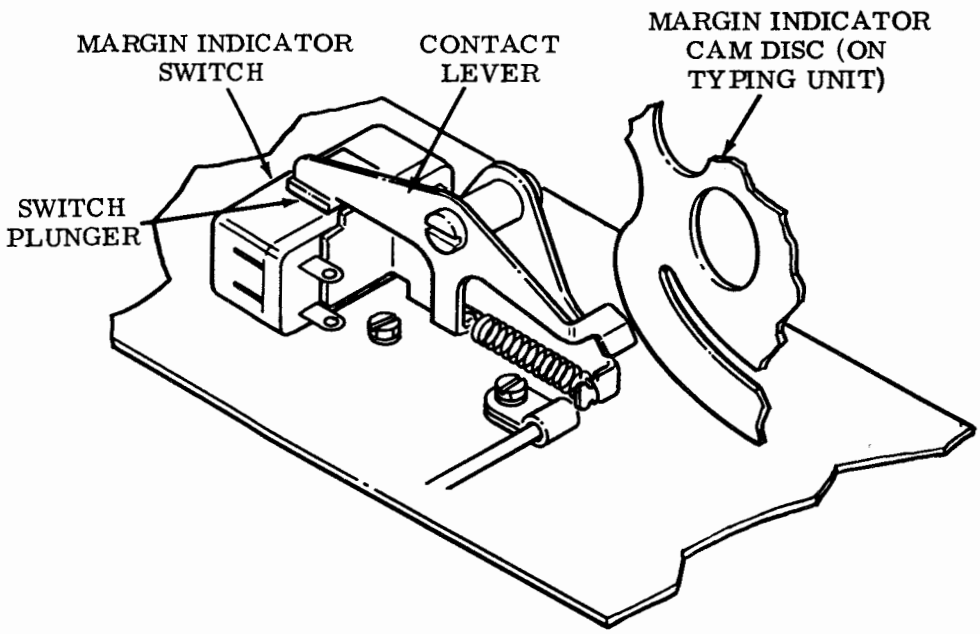


Figure 15 - Margin Indicator Mechanism

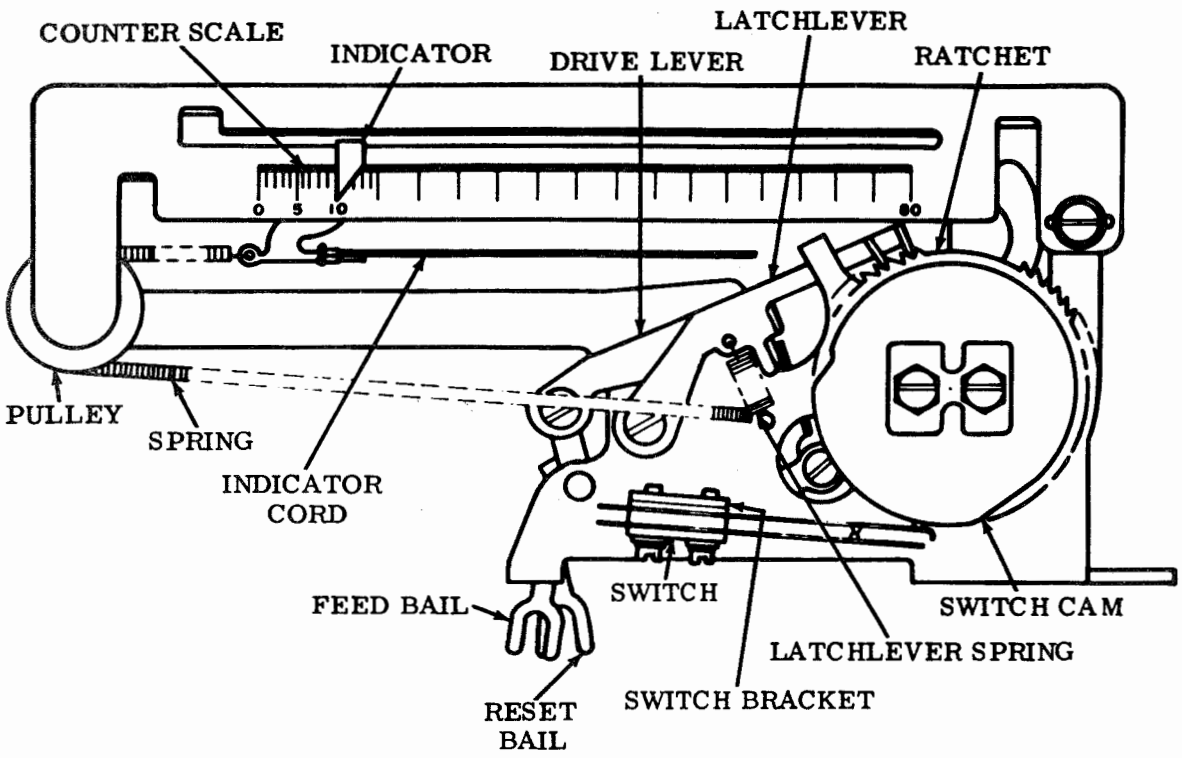


Figure 16 - Character Counter Mechanism (Front View)

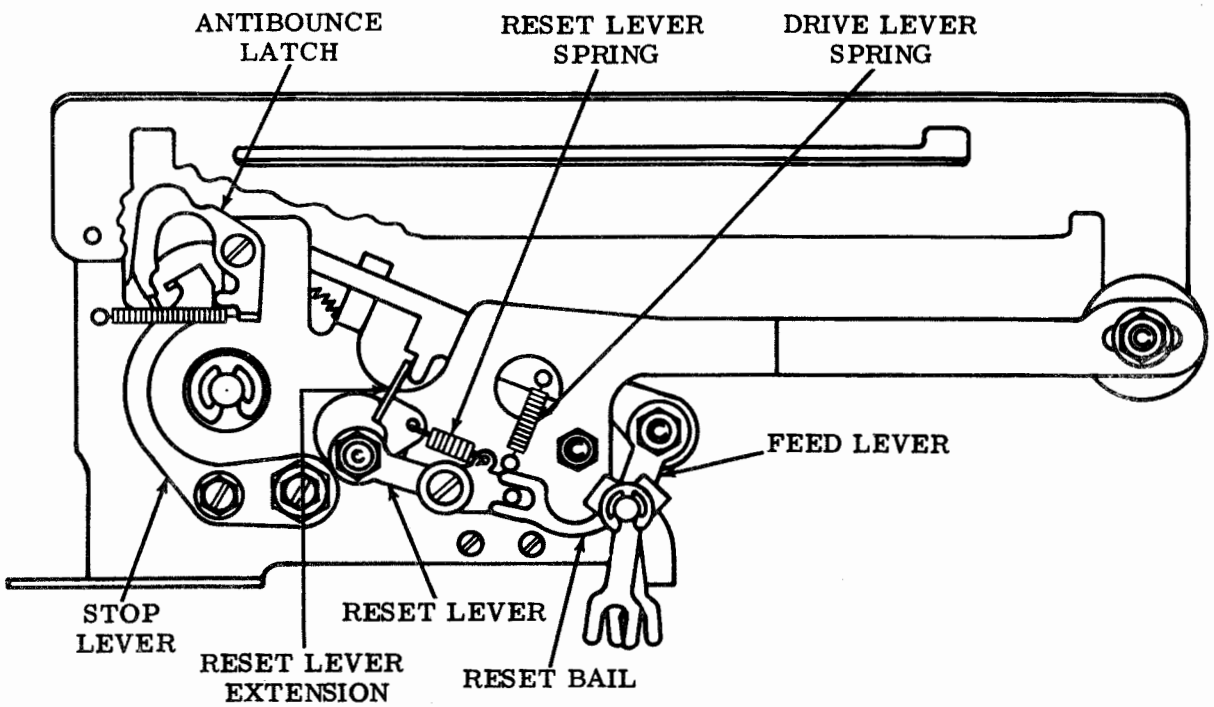


Figure 17 - Character Counter Mechanism (Rear View)

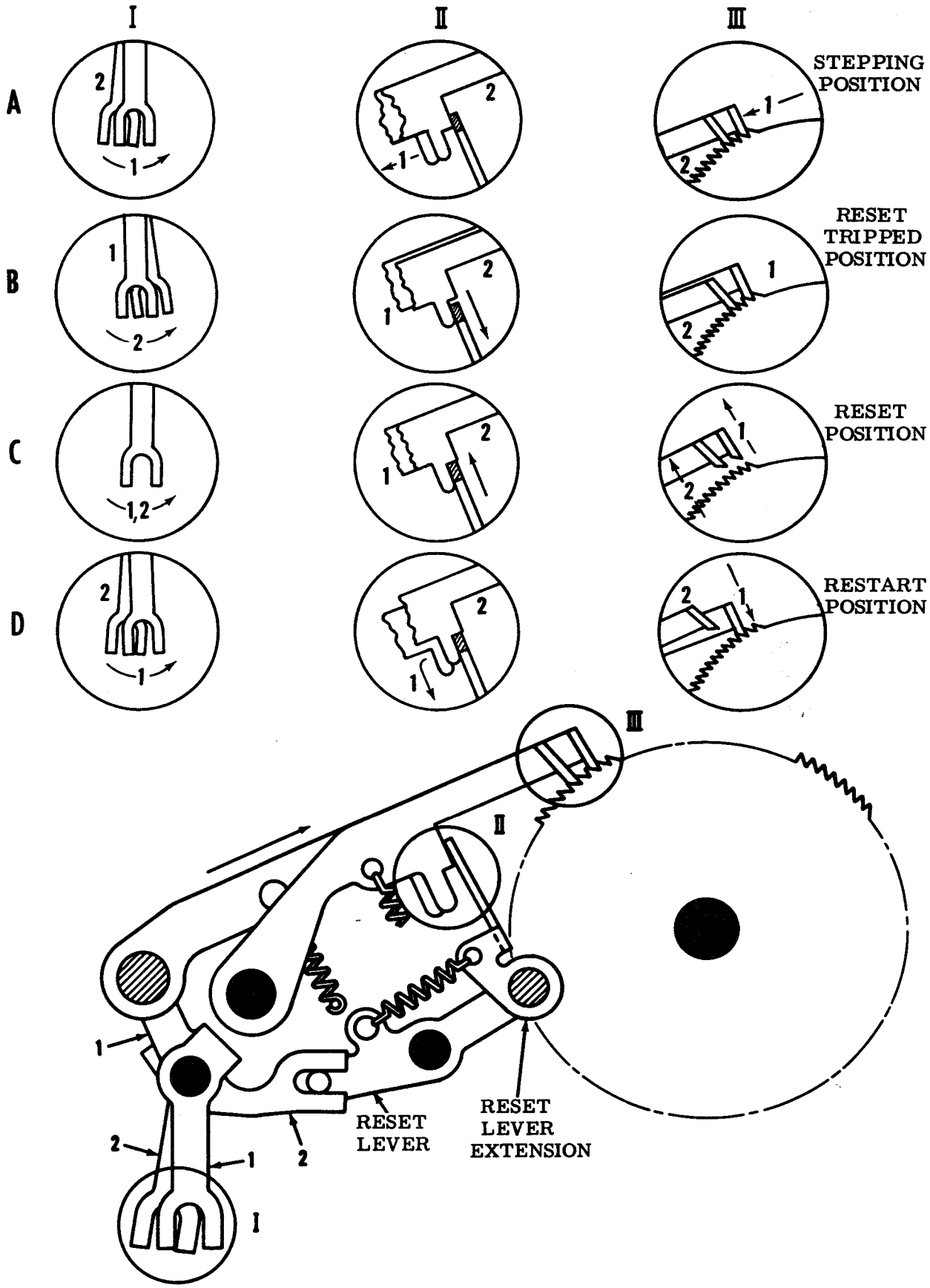


Figure 18 - Operation of Character Counter Mechanism

As the reset lever rotates clockwise, the reset lever extension moves downward until it falls under the shoulder of the projection on the drive and latchlevers under the action of its spring. When the counter bars are reset as in C, Figure 18, the reset bail is rotated clockwise to its original position, causing the reset lever to rotate counterclockwise, carrying the reset lever extension upward, and moving both the drive lever and latchlever out of engagement with the ratchet teeth. The mechanism remains in this condition and the ratchet drum assembly rotates rapidly counterclockwise (under the action of its return spring) until it reaches its zero position.

3.34 As the ratchet drum reaches its zero position, a stop on the ratchet strikes a stop lever fastened to the frame. The elastic impact is transmitted through the stop lever to the antibounce lever whose lower end is normally in contact with the stop lever. The antibounce lever rotates counterclockwise, dropping in behind the ratchet stop. As the ratchet drum rebounds from the stop lever, its stop strikes the antibounce lever, preventing further motion and maintaining the antibounce lever in its actuated position. The ratchet continues to operate between the stop lever and antibounce lever until the energy in the system has been largely dissipated. The ratchet stop then remains in contact with the stop lever, permitting the antibounce lever to return to its normal position.

Restart

3.35 Sequence D, Figure 18, illustrates the restarting action of the counter mechanism for the character following a carriage return. As a key on the keyboard is depressed, the counter codebar falls to the right, the feed bail moves counterclockwise and the drive lever moves to the left. As the drive lever moves to the left it is disengaged from the reset lever extension and falls into engagement with the ratchet tooth. As the codebars are reset under power, the feed bail rotates clockwise and the feed lever begins to move to the right. As it does, its projection pushes the reset lever extension to the right and out of engagement with the latchlever, which falls into engagement with the ratchet drum. As the drive lever completes its stroke, it steps the ratchet one tooth as in the normal stepping operation.

End-of-Line Switch

3.36 The end-of-line switch, Figure 16, operates the end-of-line indicator light located in the cabinet to signal the end of a typed page printer line. The switch circuit is operative only when the keyboard is in the T position. In the K and K-T operating positions, the end-of-line indicator light is operated by the margin indicator switch (Paragraph 3.30). Selection of either the end-of-line indicator switch or margin indicator switch is automatically controlled by a keyboard control selection switch (Figure 21). The selection switch is, in turn, operated by the keyboard control knob.

3.37 Operation of the character counter end-of-line indicator switch is controlled by a switch cam (Figure 16). The switch cam rotates with the ratchet drum and can be adjusted to close the switch at any typed line length of from 10 to 80 characters.

M. Auxiliary Electric Switch (Figure 1)

3.38 This switch is of the multicircuit type. Operation of the switch is controlled by the keyboard control knob through a shaft and gears. The switch is used for various switching requirements not applicable to this section.

N. Tape Supply Container (Figure 1)

3.39 The tape supply container supplies the tape to the punch. The tape is guided from the container so that it traverses the punch from right to left (viewed from the front). A low-tape switch mechanism is available, as an optional feature, with the container to initiate a signal when the supply of tape is low.

O. Keyboard Tape Backspace

3.40 The keyboard tape backspace mechanism controls the operation of the power drive backspace mechanism on the perforator. It consists of a tape backspace (TAPE B. SP.) keylever and a tape backspace switch.

3.41 When the TAPE B. SP. keylever is depressed, it causes its associated lever arm to contact and depress the actuating button on the backspace switch. As this happens, the circuit to the backspace magnet of the power drive backspace mechanism on the perforator is closed, and power is applied to the magnet. The power drive backspace mechanism will then move the perforated tape backward one space each time the TAPE B. SP. keylever is depressed. See appropriate sections of perforator units for operation of power backspace mechanism.

KEYBOARD-PERFORATOR LINKAGE MECHANISM (Figure 19)

A. General

3.42 The keyboard-perforator linkage consists principally of a codebar extension basket mechanism, and a reset cam follower bracket mechanism. The functions of the codebar extension basket mechanism are to transmit character information from the keyboard codebars to the perforator, and to control the operation of the perforator-transmitter in the K, K-T, and T positions. The reset cam follower mechanism provides the linkage between the clutch tripbar and the perforator cam in the T position to permit the keyboard to be reset at high speeds by the tape perforator.

B. Operation in K Position

3.43 In this position, signals are generated by the keyboard as described in Paragraph 2 and the perforator is inoperative. This mode of operation is set up by turning the keyboard control knob to the K position. This conditions the keyboard-perforator linkage as follows:

(a) When the keyboard control knob (Figure 19) is turned to the K position, the blocking bail shown in the illustration is moved to the left to the dotted position by the action of the control cam. When a codebar is selected and falls to the right, the codebar extension is prevented from moving to the right by the blocking bail and, therefore, information is not transmitted to the punch. An extension on the blocking bail also prevents selection of the character counter codebars (Paragraph 3.L.).

(b) As the blocking bail moves to the left, a second extension (Figure 20) engages a bell crank and pivots the bell crank clockwise. This disengages the latch from the clutch tripbar link so that, as the clutch tripbar falls to the right, the clutch tripbar link remains in the position shown and the perforator clutch is not tripped.

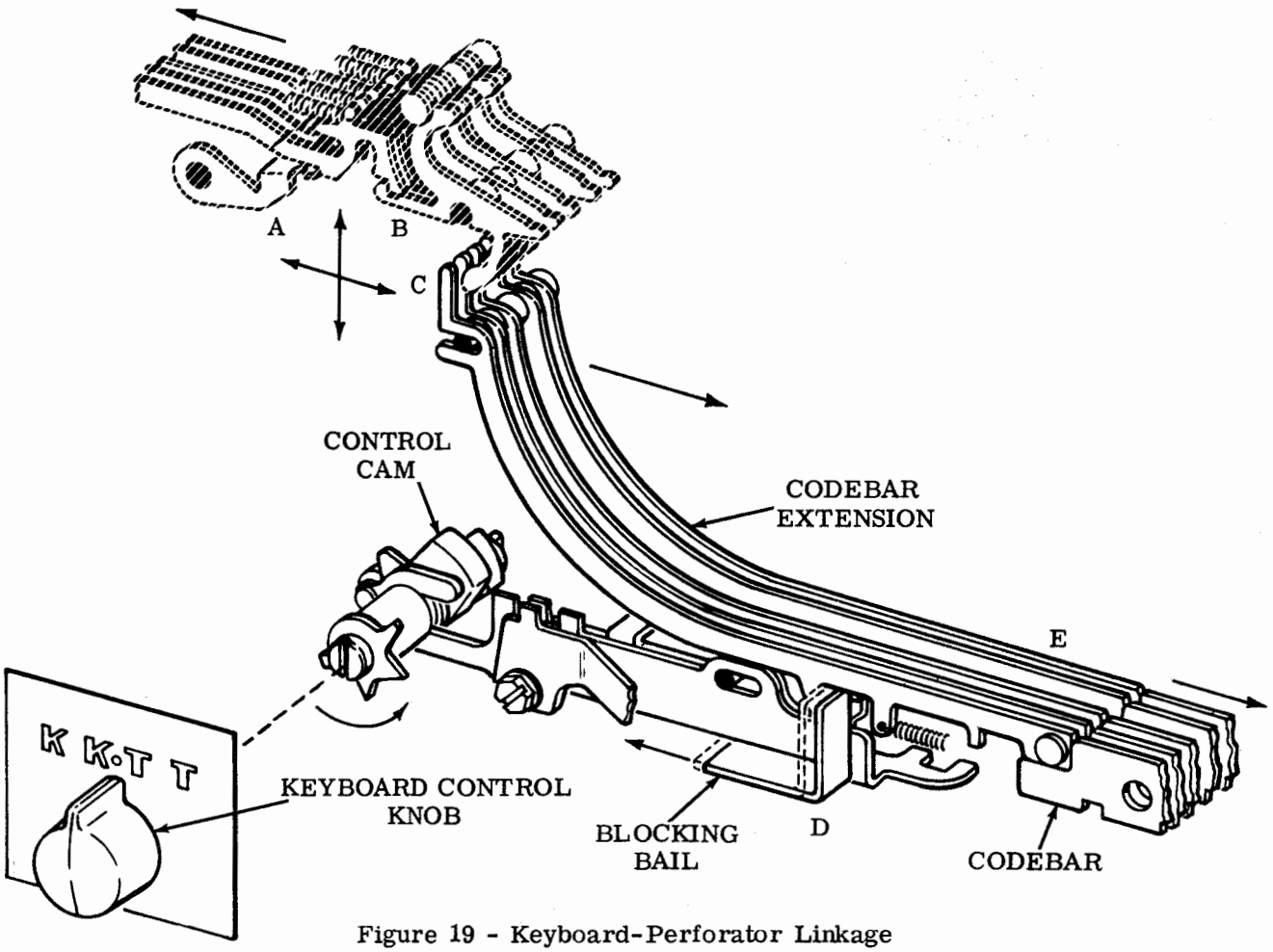


Figure 19 - Keyboard-Perforator Linkage

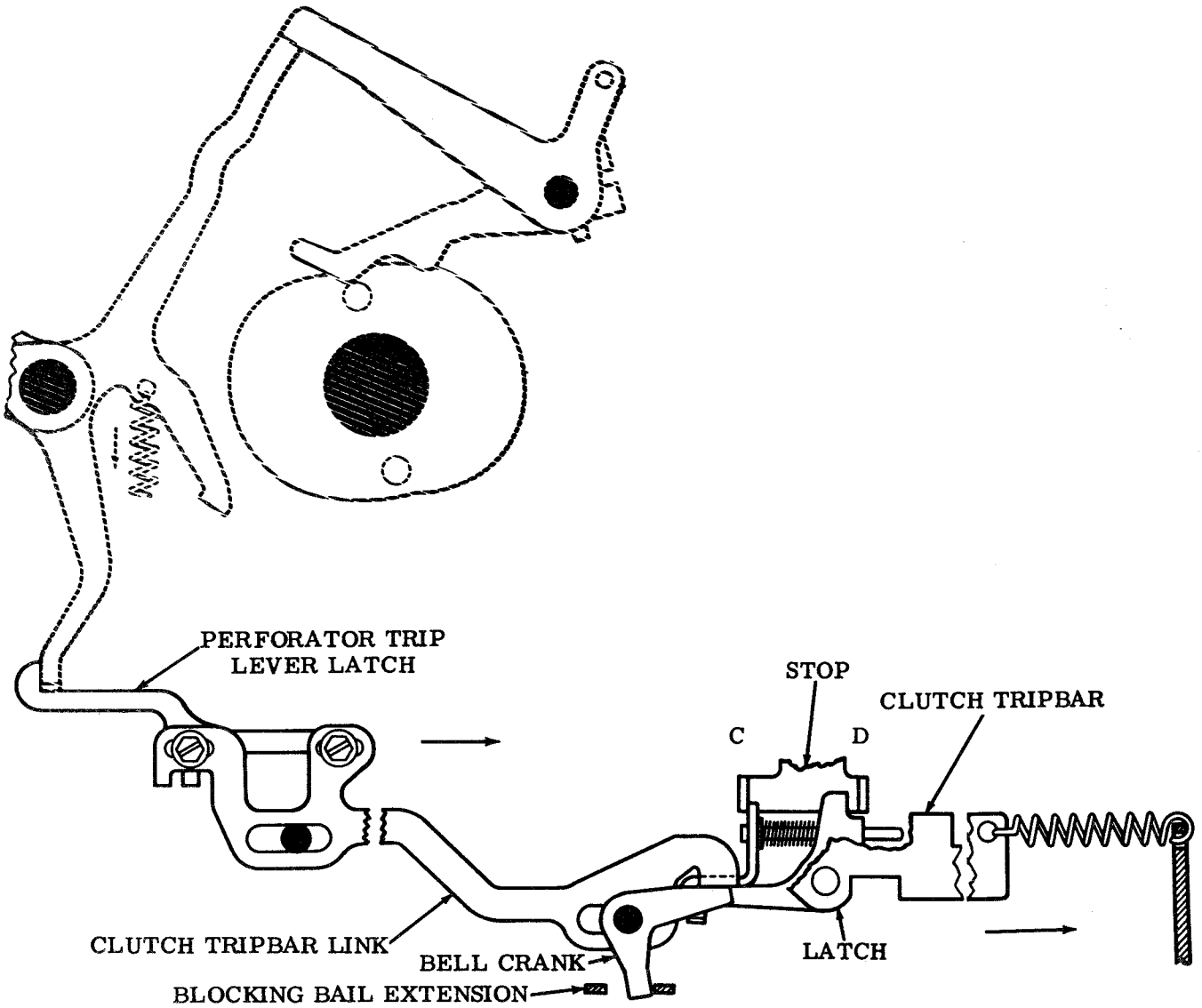


Figure 20 - Perforator Clutch Trip Linkage

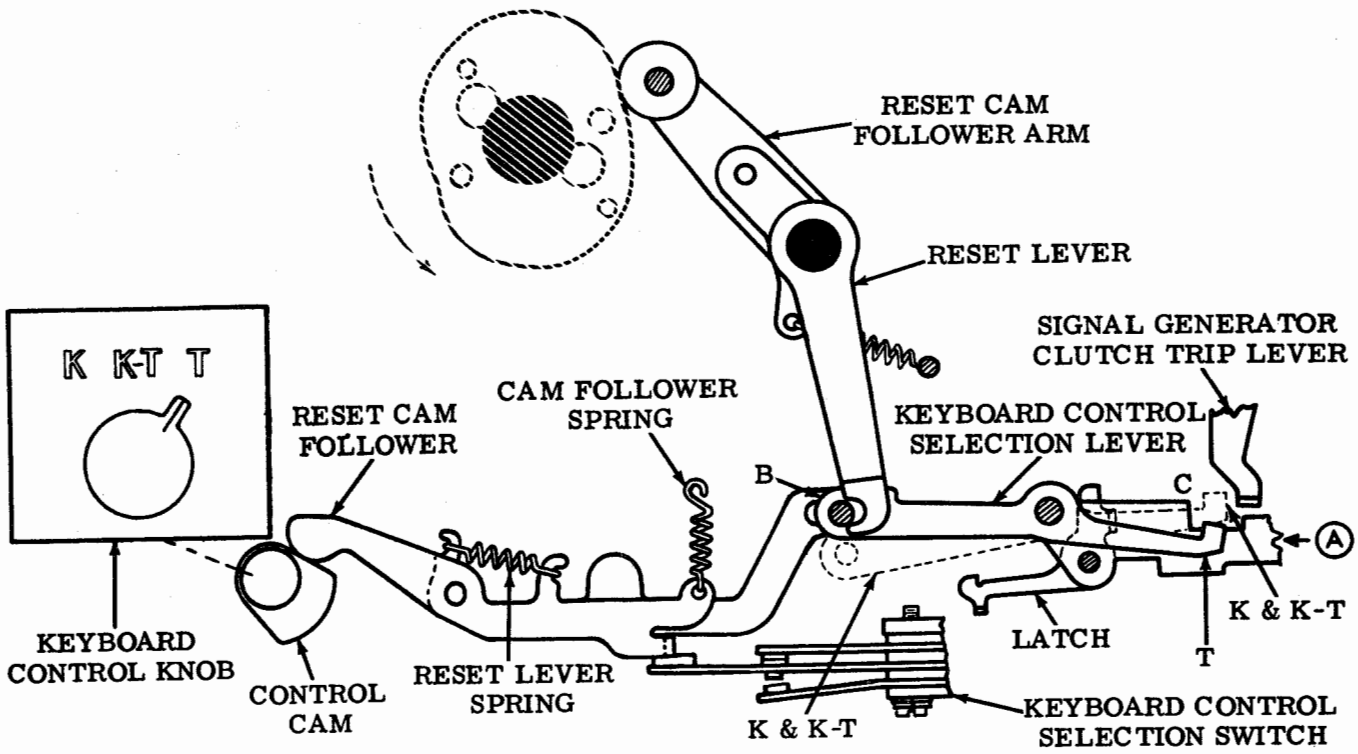
(c) The keyboard control selection lever (Figure 21) is pivoted counterclockwise so that its pin at point B is free of the hook on the reset lever of the reset cam follower mechanism. At the same time, the extension on the right end of the keyboard control selection lever moves up to the dotted position shown at C so that, as the clutch tripbar falls to the right, the extension strikes the signal generator clutch trip lever, operating the signal generator mechanism.

C. Operation in K-T Position

3.44 In this position, signals are generated by the keyboard and tape is simultaneously perforated. This mode of operation is set up by turning the keyboard control knob to the K-T position. This conditions the keyboard-perforator linkage as follows:

(a) When the keyboard control knob is moved to the K-T position, the blocking bail shown in Figure 19 moves to the right, releasing the codebar extensions and character counter codebars. The bell crank (Figure 20) pivots counterclockwise, allowing the latch to engage the clutch tripbar link.

(b) The keyboard control selection lever (Figure 21) remains in its counterclockwise position so that it is not engaged by the reset lever of the reset cam follower, but is still in position to trip the signal generator clutch trip lever.



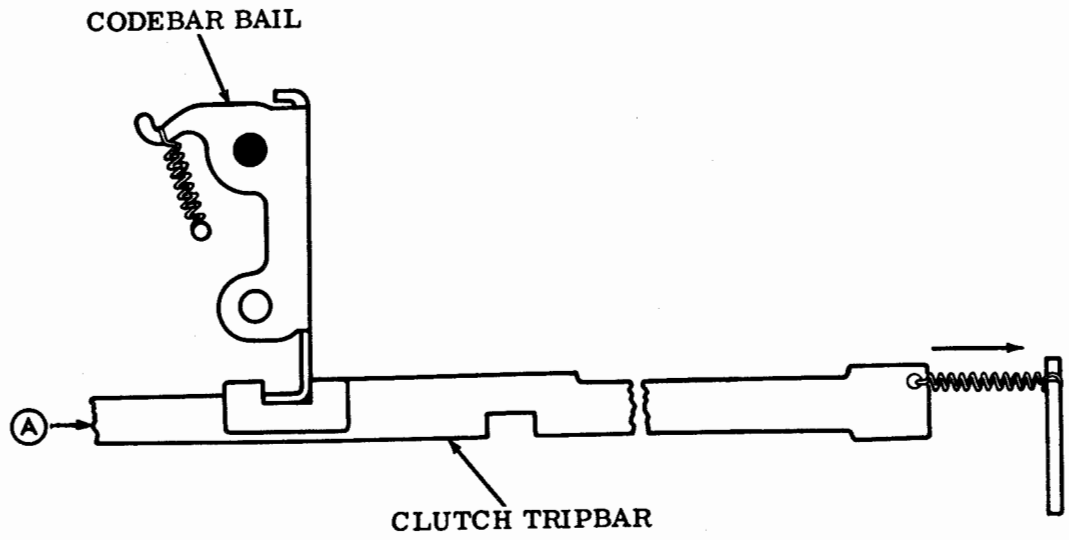


Figure 21 - Mode Selection and Keyboard Reset Mechanism

(c) The character counter codebars are released so that the character will count; however, its end-of-line switch is inoperative due to the position of the keyboard control selection switch (Figure 21). Refer to Paragraph 3.L. for a description of the control switch operation.

(d) When a code keylever is depressed, the clutch tripbar falls and the following sequence takes place:

(1) The codebar bail and clutch tripbar move to the right, thereby releasing the selected codebars. The selected codebars and associated codebar extensions (Figure 19) move to the right. As the codebar extensions move to the right, they engage their associated punch slide latches at C on the perforator, causing the punch slide latches to rotate counterclockwise and unlock the punch slides at B.

(2) The clutch tripbar link (Figure 20) is pulled to the right by the clutch tripbar. The clutch tripbar link is coupled to the perforator trip lever latch. This latch contacts the perforator trip lever at B, causing it to rotate counterclockwise. As it moves counterclockwise, the perforator trip lever is disengaged from the clutch release at A. The clutch release falls under spring tension and releases the perforator clutch trip lever which, in turn, trips the perforator clutch. The signal generator clutch is tripped as previously described.

(3) As the perforator trip lever rotates counterclockwise, the reset bail trip lever linked to it (Figure 20) pulls down an extension on the punch slide reset bail at E. The reset bail moves down, permitting the selected punch slides (Figure 19) to move to the left under action of their bias springs.

(4) As the clutch tripbar nears the end of its stroke to the right, the upper portion of the latch comes in contact with the stop at point D. The latch then pivots counterclockwise, releasing the clutch tripbar link which moves rapidly to the left under the action of the compression spring shown immediately below the stop. The clutch tripbar link is stopped in its movement to the left by its extension striking the stop at point C. The perforator trip lever latch is to the left of and completely free of the perforator trip lever. As the clutch release pivots clockwise under the resulting action of the pin on the reset cam, the perforator trip lever is released from its counterclockwise position and allowed to rotate clockwise to its normal position as shown in Figure 20.

(5) In the meantime, the clutch tripbar (Figure 20) is being reset and is moving to the left. As the latch moves to the left away from the stop at point D, it pivots clockwise to its normal position so that when the clutch tripbar is at the extreme left of its reset travel, the latch is again allowed to hook under the clutch tripbar link. This completes the operating cycle.

D. Operation in T Position

3.45 In this position, tape is perforated by the perforator but no signals are generated by the keyboard. The keyboard is reset by the perforator since the signal generator mechanism is inoperative. This mode of operation is set up by turning the keyboard control knob to the T position. This conditions the keyboard-perforator linkage as follows:

(a) When the keyboard control knob is turned to the T position, the keyboard control selection lever (Figure 21) is pivoted clockwise so that its pin at point B is in position to engage the hook of the reset cam follower reset lever. The right end of the keyboard control selection lever at point C falls so that it will not engage the signal generator clutch trip lever. In the T position, therefore, the signal generator clutch is not tripped and the signal generator is inoperative.

(b) The keyboard perforator linkage and perforator clutch trip system operate as described in Paragraph C. above. The character counter is operative and controls the end-of-line indicator light as described in Paragraph 3.L.

(c) Codebar reset is effected by the reset cam follower mechanism. When a code keylever on the keyboard is depressed, the codebar bail and clutch tripbar (Figure 21) fall to the right so that the reset lever with hook is in position to engage the pin of the keyboard control selection lever at point B. When the perforator clutch is tripped, the reset cam begins to rotate counterclockwise

and, as it does, the reset cam follower arm and associated reset lever rotate clockwise. The hook on the reset lever engages the pin on the keyboard control selection lever and moves the selection lever and clutch tripbar to the left. The configuration of the reset cam is such that, at a later stage of the operating cycle, the reset lever with hook moves away from the pin of the keyboard control selection lever. The clutch tripbar again starts to move to the right. However, the codebar bail latch latches the codebar bail at this point, preventing further movement of the clutch tripbar as the reset cam follower arm returns to its initial position.

4. VARIABLE FEATURES

ANSWER-BACK MECHANISM (Figures 22 and 23)

4.01 The answer-back mechanism is an electromechanical 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 provides manual operation. Transmissions are generated in the normal manner by the keyboard, which, through its codebar mechanism, reads the code combination contained in a message drum.

4.02 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, as required (Figure 22). 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 (carriage return) and LF (line feed). 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.

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

A. Called Station

4.04 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 (noncontention) 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

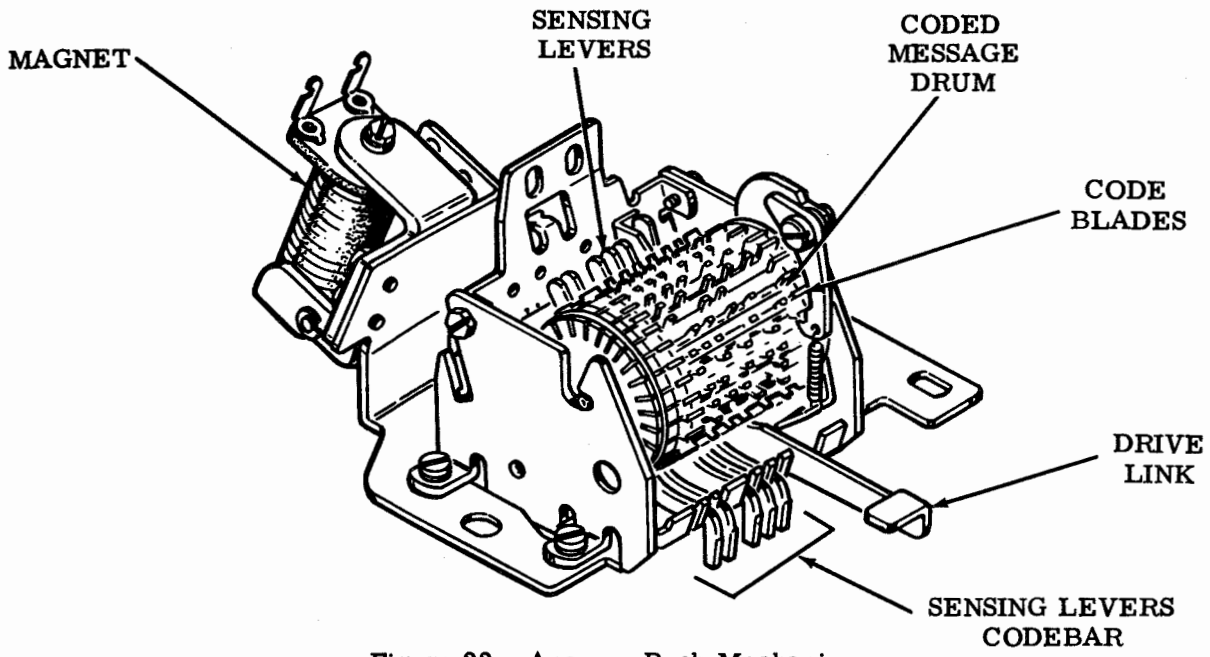


Figure 22 - Answer-Back Mechanism

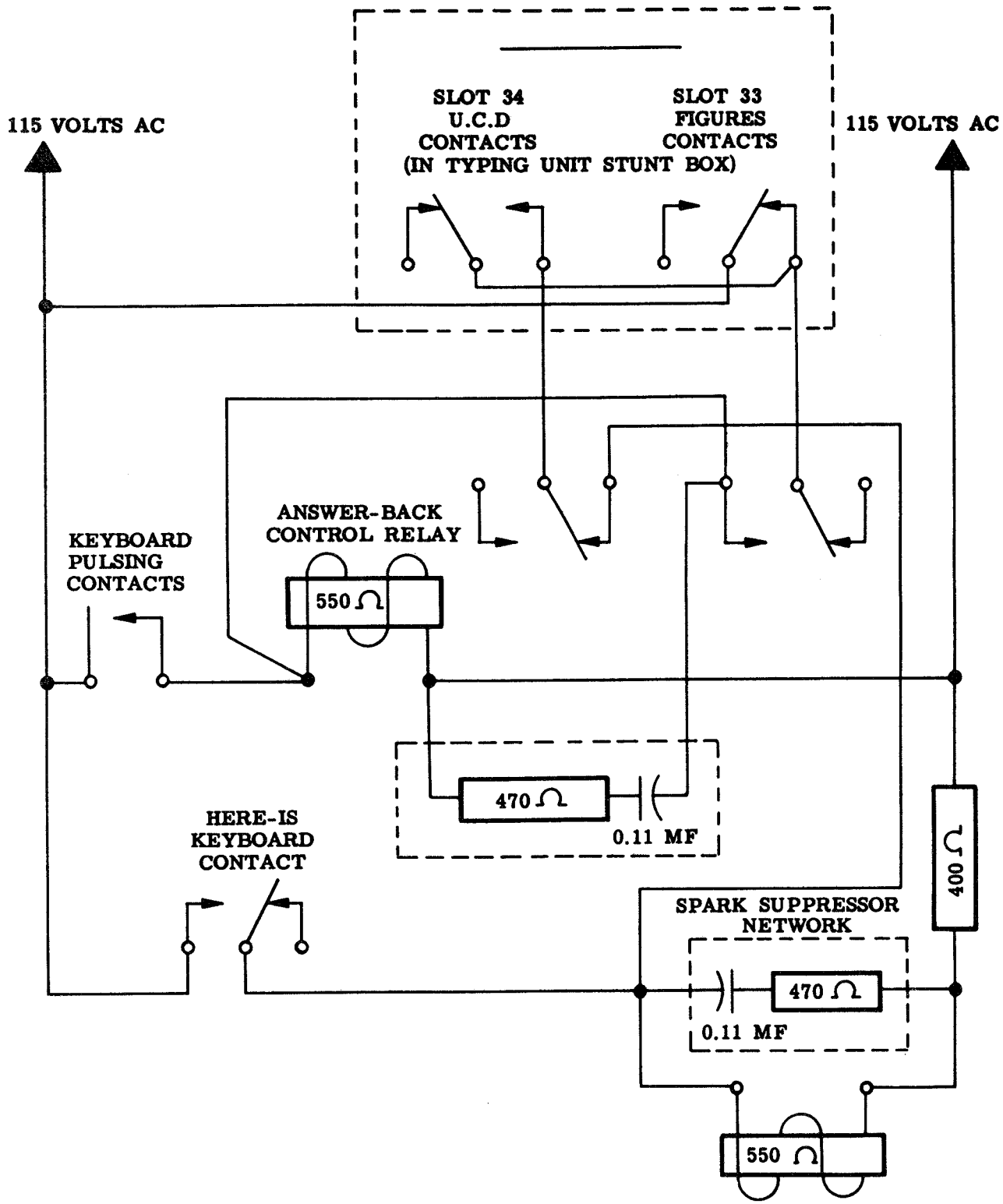


Figure 23 - Typical Answer-Back Circuit

D contact also locks the keyboard through a lever extension to the keyboard locking mechanism, if the set is so equipped. This is accomplished when the blank keylever is depressed twice in succession.

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

4.06 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 codebars. Each code combination is thus transmitted in the normal manner by the keyboard signal generator mechanism. A spacing condition occurs whenever a codebar is prevented from moving to the right by its associated sensing lever; unrestricted movement of a codebar results in a marking condition. Since the sensing levers must be held away from the codebars, 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.

4.07 Once during each rotation of the signal generator cam assembly, the codebar bail is pulled to the left by a cam eccentric, causing it to rotate clockwise. The bail thereby resets the keyboard codebars 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.

4.08 With the stop lever in its released position, the codebar bail latch operating lever also maintains the codebar 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 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 codebar bail latch operating lever counterclockwise, which in turn releases the codebar 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 codebar 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.

4.09 When the codebar bail latch is released to its spring action, it rotates counterclockwise in contact with the codebar bail latch roller until it latches the codebar bail. At this point the blocking lever is also released to its spring action, and it rotates counterclockwise until it rests against a projection on the stop lever. In this position the blocking lever holds the drive plate in its extreme clockwise position and the attached drive link is once more unable to follow the feeding motion from the codebar 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 a keyboard locking mechanism.

B. Originating Station

4.10 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.

4.11 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.

4.12 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 operation is such that the contact does not operate until the selected function bar has first moved forward and then rearward.) This arrangement converts a normally open, momentary-operate FIGS contact to a normally closed, momentary-operate FIGS contact. At the same time, it 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.

4.13 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 (Figures 1 and 24)

4.14 Upon operation of the appropriate key-lever, the reset bail in the keyboard is moved to the right and releases the selected codebars. The universal codebar (a modified clutch tripbar) 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 tripbar to the right. This movement causes the clutch tripbail extension to trip the signal generator clutch. The signal generator camshaft then rotates and transmits the selected signal.

4.15 During the single rotation of the signal generator camshaft, the reset bail is rotated clockwise and latched. The universal codebar, clutch tripbar, and the five codebars are moved and held to the left by the reset bail.

TIME DELAY MECHANISM (Figure 25)

4.16 The time delay mechanism operates in conjunction with the motor control mechanism in the electrical service unit. It provides automatic motor unit stop after a predetermined

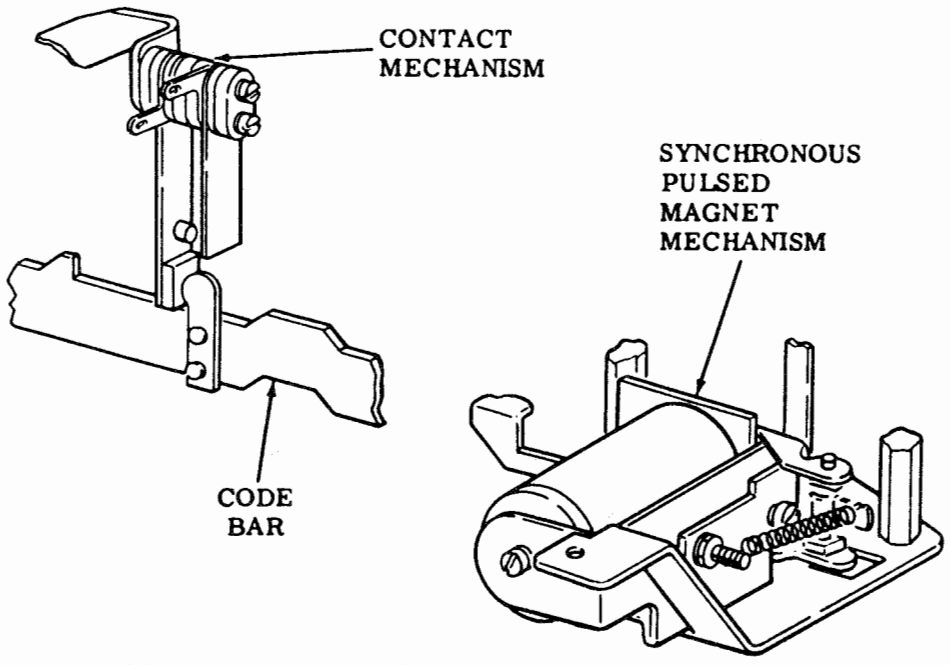


Figure 24 - Synchronous Pulsed Transmission Mechanism

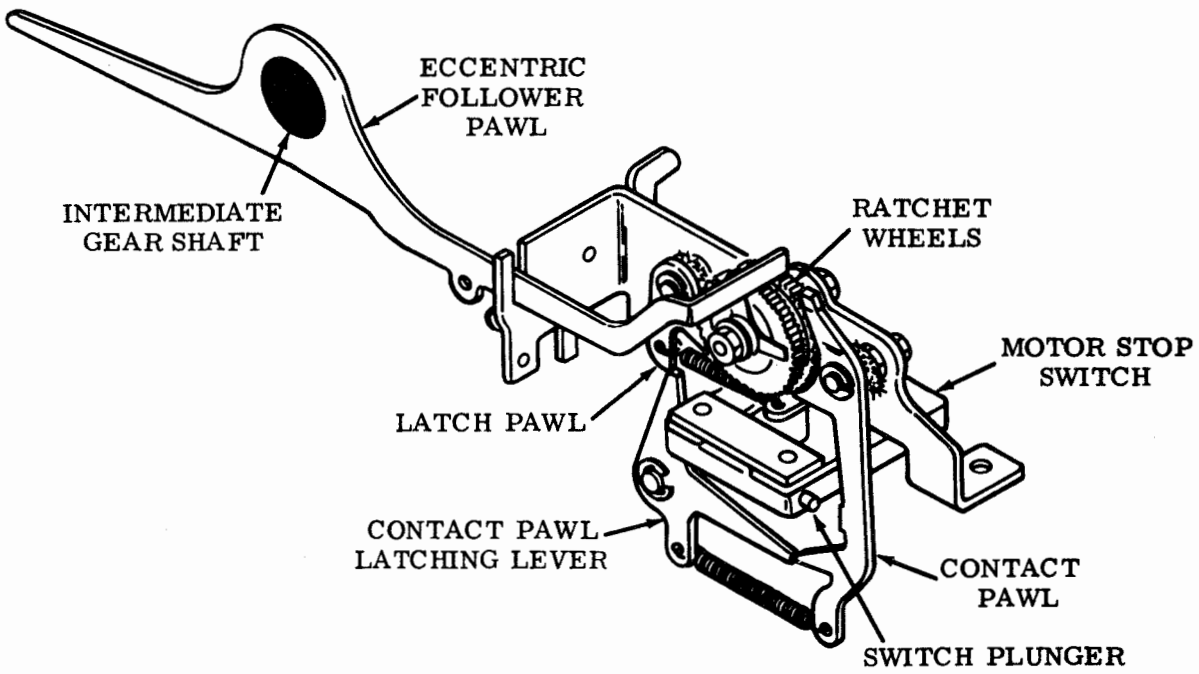


Figure 25 - Time Delay Mechanism

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.

4.17 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.

4.18 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.

4.19 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.

4.20 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).

28 TYPING UNIT

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS PAGE

CONTENTS PAGE

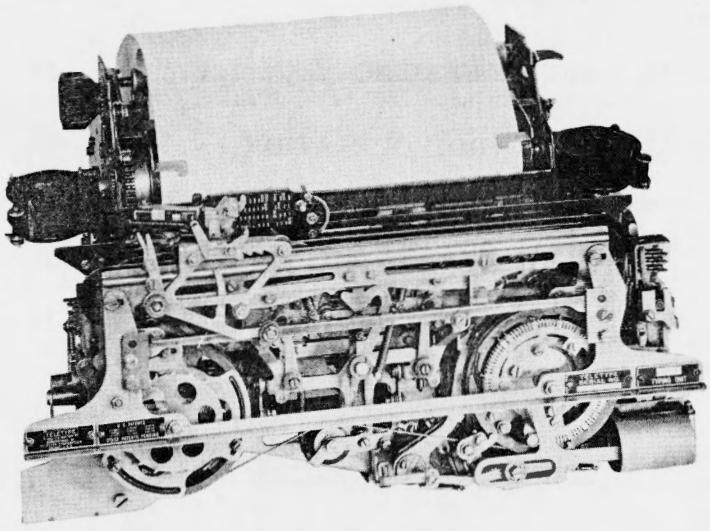


Figure 1 - 28 Typing Unit

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

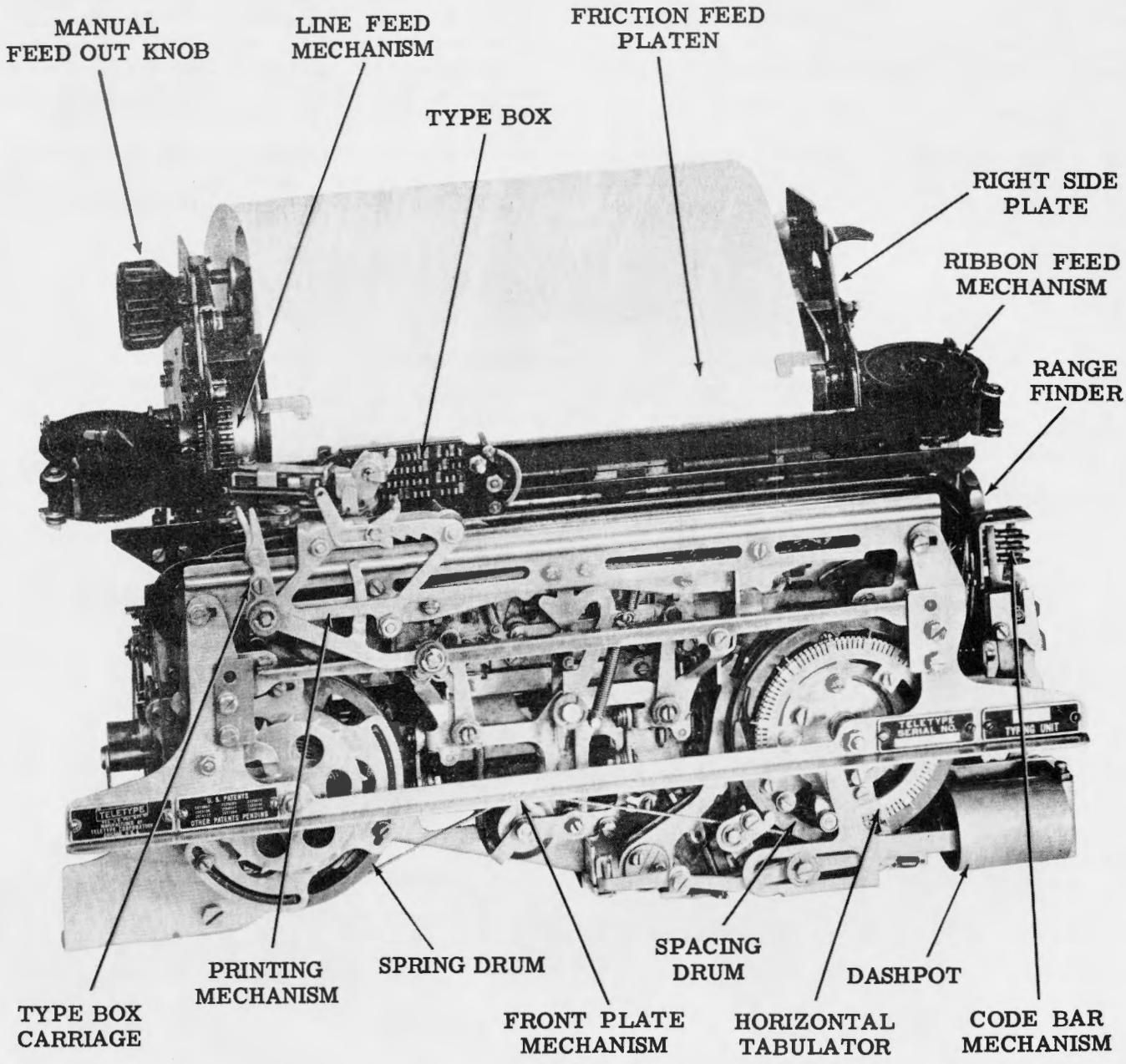


Figure 2 - 28 Typing Unit (Friction Feed) (Front View)

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

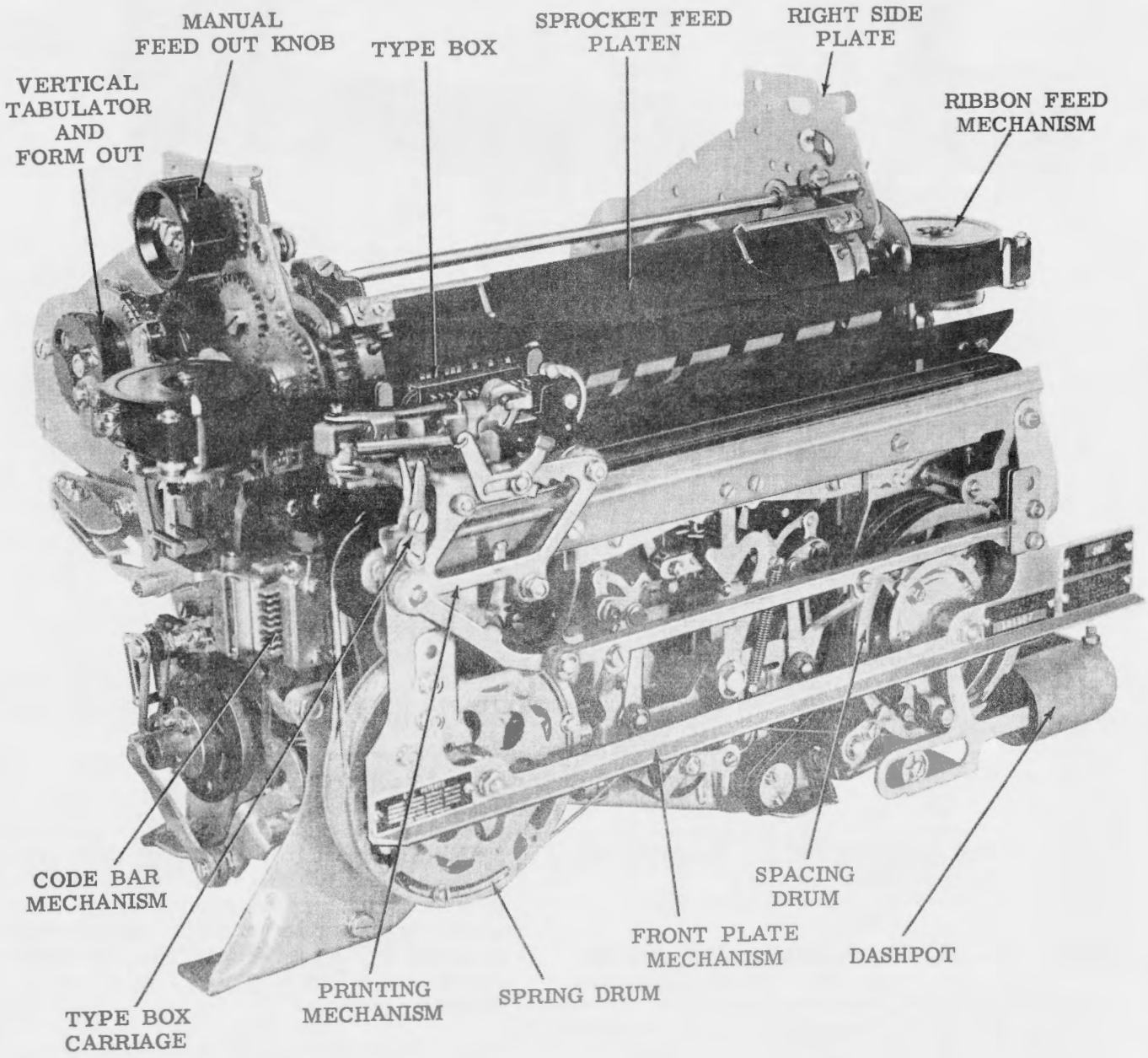


Figure 3 - 28 Typing Unit (Sprocket Feed) (Right Front View)

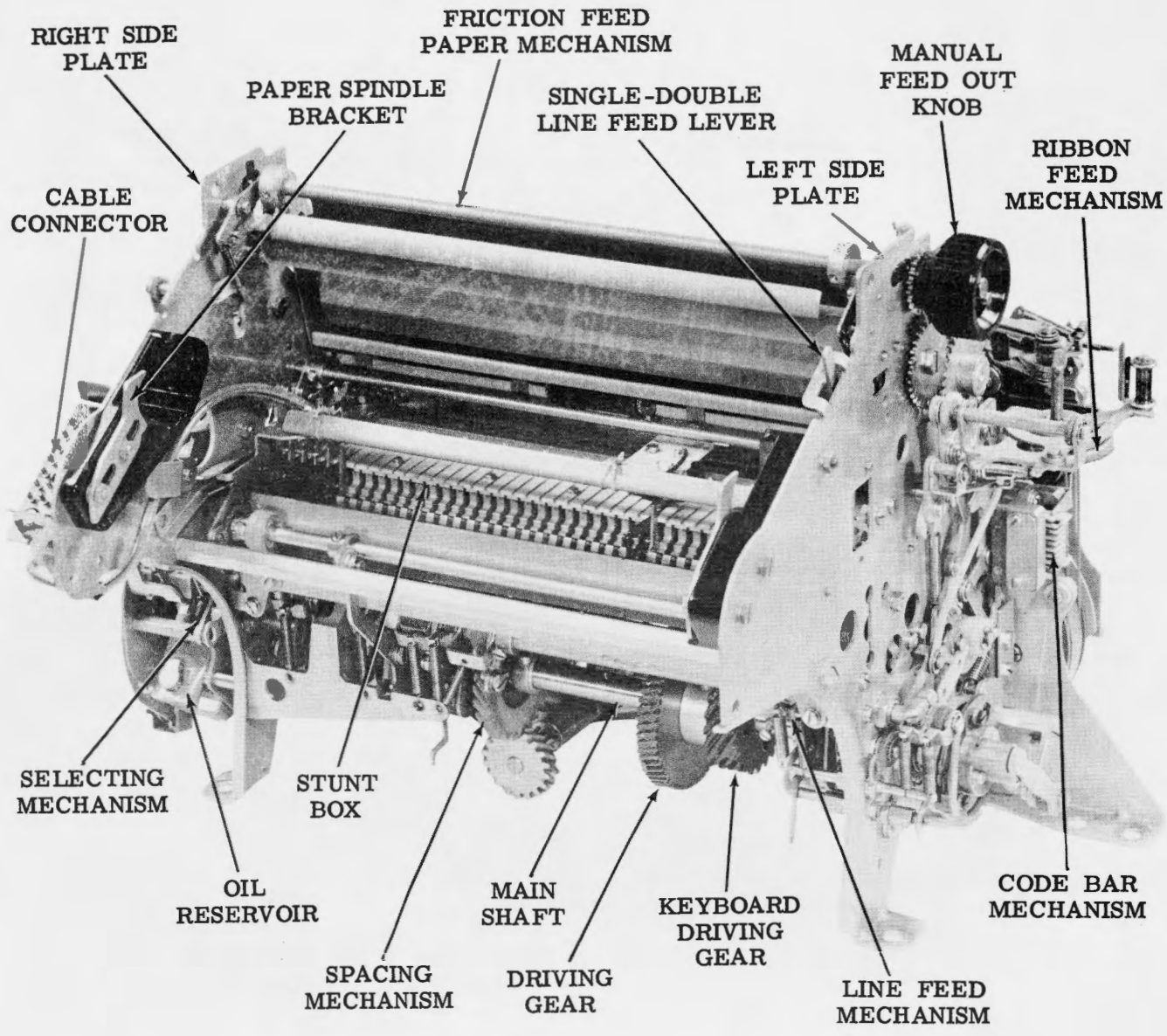


Figure 4 - 28 Typing Unit (Left Rear View)

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

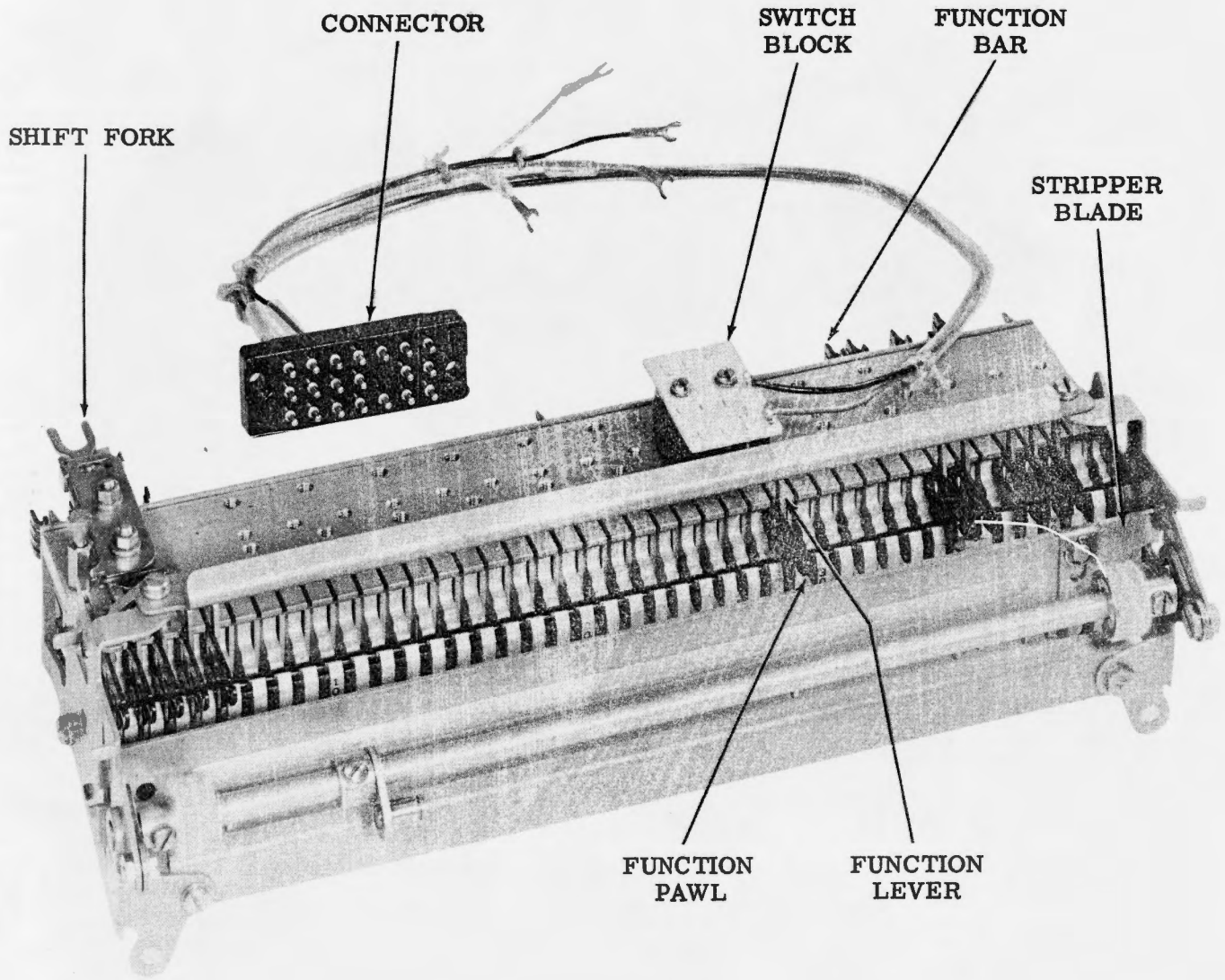


Figure 5 - Stunt Box (Rear View)

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, non-printing operations, without the sacrifice of printed characters. It operates in response to combinations set up in the code bar mechanism with a single character or several characters in sequential combination used to initiate a single function. In general, the stunt box may be programmed to perform three basic types of operation: mechanical initiation of internal functions within the typing unit; electrical control of functions within the Teletypewriter Set; and electrical control of external equipment.

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).

3.02 The selector magnets may be operated with 0.020 ampere (coils in series) or 0.060 ampere (coils in parallel) dc signal line current. Signal-line inputs of the neutral form (non-polar) may be applied directly to the selector magnets. Polar signals require the use of a line relay.

3.03 Electrical contacts for certain variable features, such as the paper out alarm and the form out alarm, horizontal tabulator, 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.

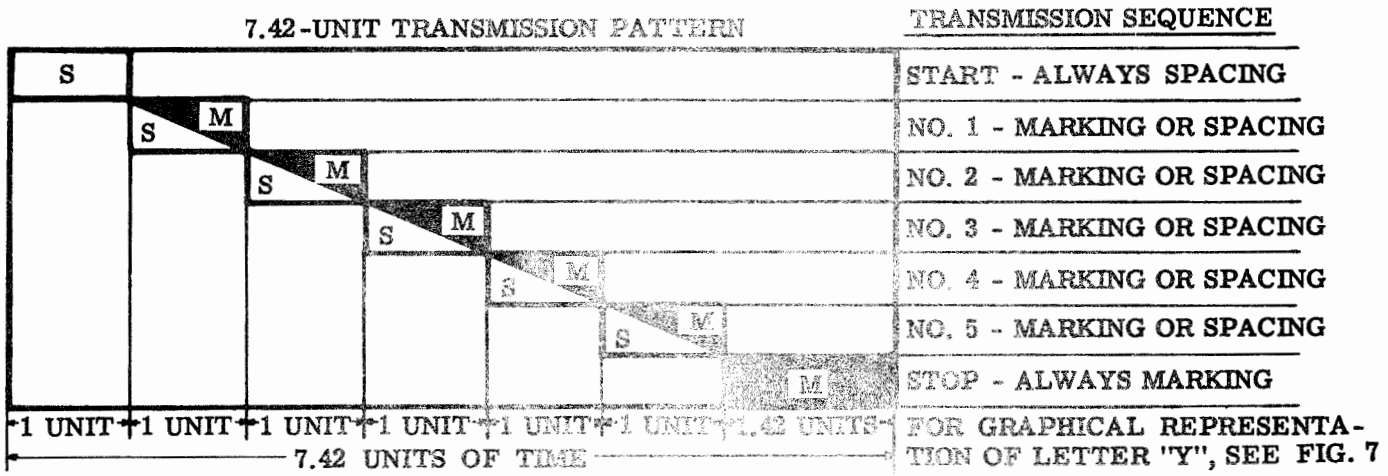
SIGNALING CODE (Fig. 6)

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.

	FIGURES	–	?	:	$	3	!	&	//	8	'	(	)	.	,	9	ø	1	4	Δ	5	7	;	2	/	6	"	ℜ	<	≡	■	W	Λ
	LETTERS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	BLANK	C.R.	L.F.	SPACE	LTR	FIG.
	1	●	●		●	●	●				●	●						●		●		●		●	●	●	●					●	●
	2	●		●				●		●	●	●	●				●	●	●			●	●	●							●		●	●
	FEED HOLES	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	3			●			●		●	●		●		●	●		●	●		●		●	●		●	●					●	●	
	4		●	●	●		●	●			●	●		●	●	●			●			●		●					●			●	●
	5		●					●	●				●	●		●	●	●			●		●	●	●	●	●					●	●

(TYPICAL CHARACTER ARRANGEMENT) b.

Figure 6 - Signaling Code

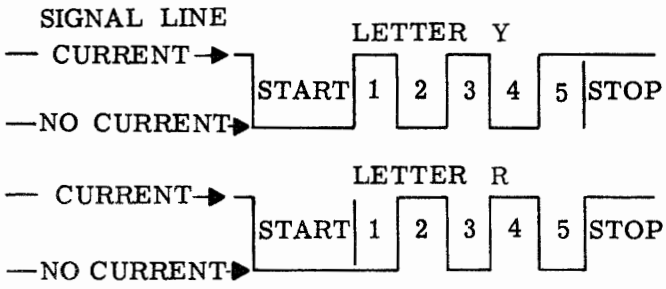


Figure 7 - Code Representation of R and Y

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.

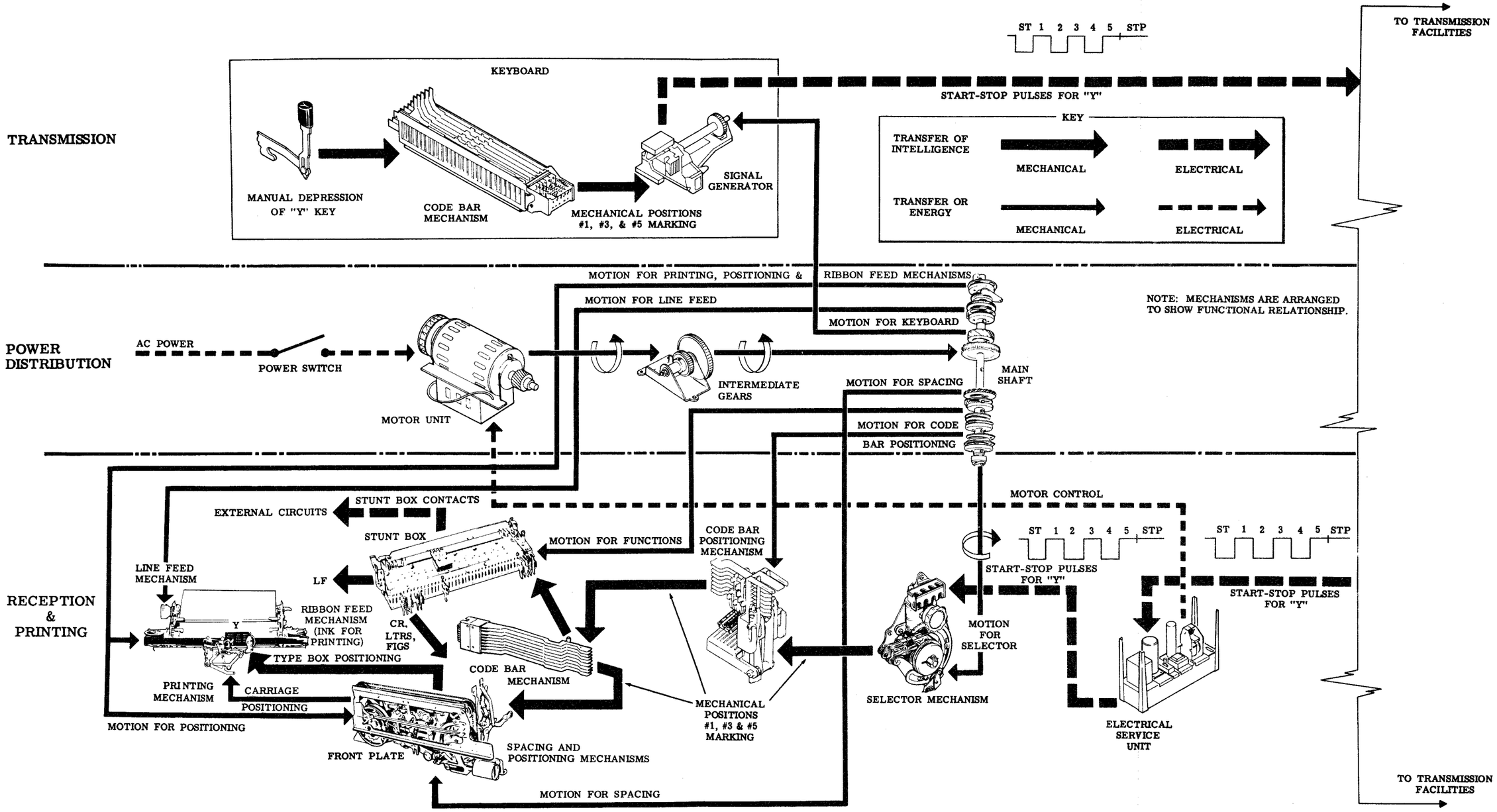


Figure 8 - 28 Typing Unit, Schematic Diagram

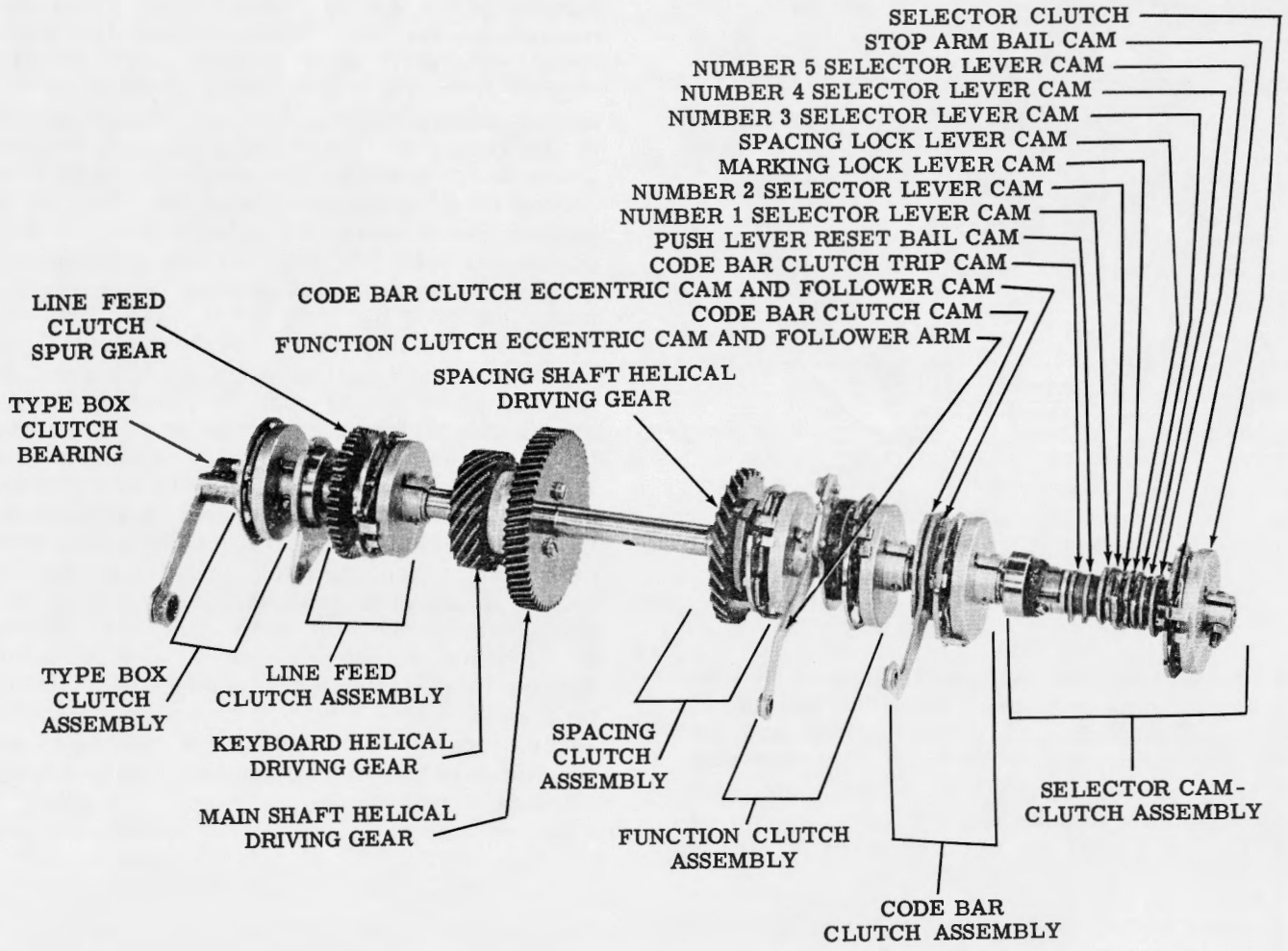


Figure 9 - Main Shaft

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.

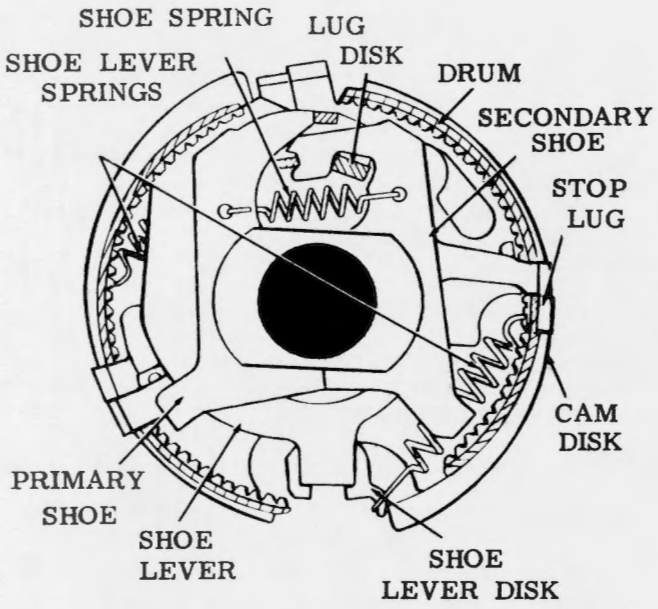


Figure 10 - Three Stop Clutch

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 stop arm bail immediately rides to the high part of its cam, where it remains to hold the start lever away from the selector armature during the reception of the signal code combination. When the stop pulse at the end of the signal code combination is received, the selector armature is pulled up to block the start lever. Thus, the stop arm bail is prevented from dropping into the indent of its cam, and the attached stop arm is held so as to stop the clutch shoe lever. The clutch cam disk upon which the latch lever rides has an indent as its stop position. When the clutch shoe lever strikes the stop arm, the inertia of the cam disk assembly causes it to continue to turn until its lug makes contact with the lug on the clutch shoe lever. At this point, the latch lever drops into the indent in the cam disk, and the clutch is held disengaged until the next start bit is received.

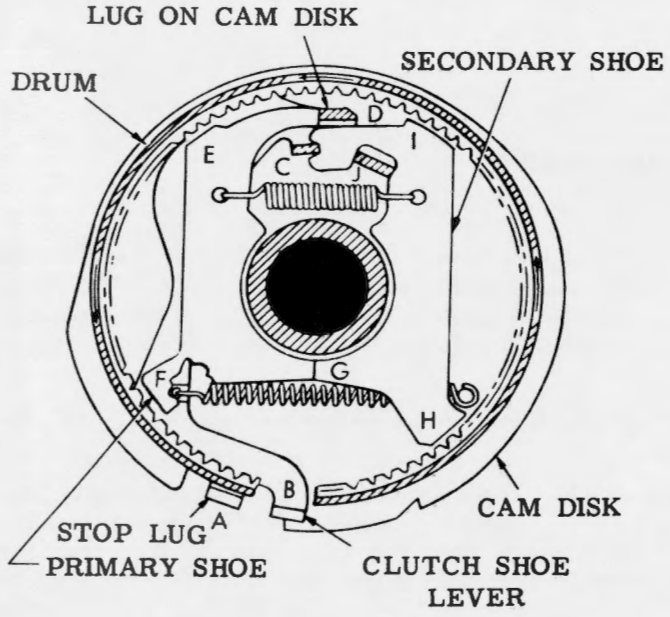


Figure 11 - One Stop Clutch (Disengaged)

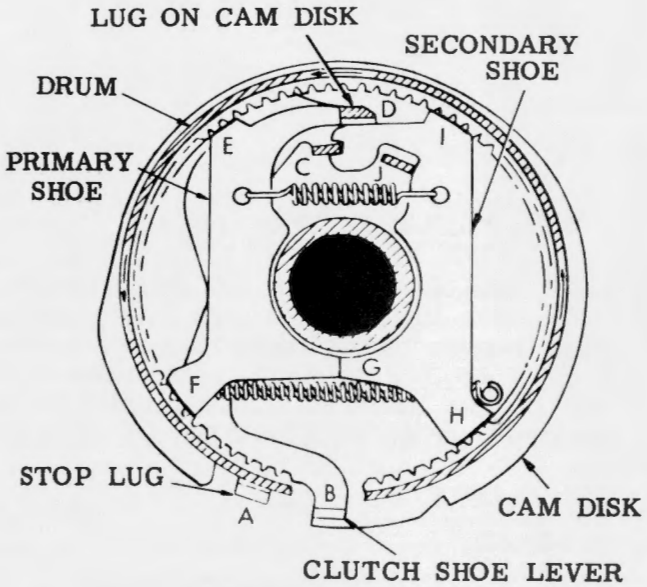


Figure 12 - One Stop Clutch (Engaged)

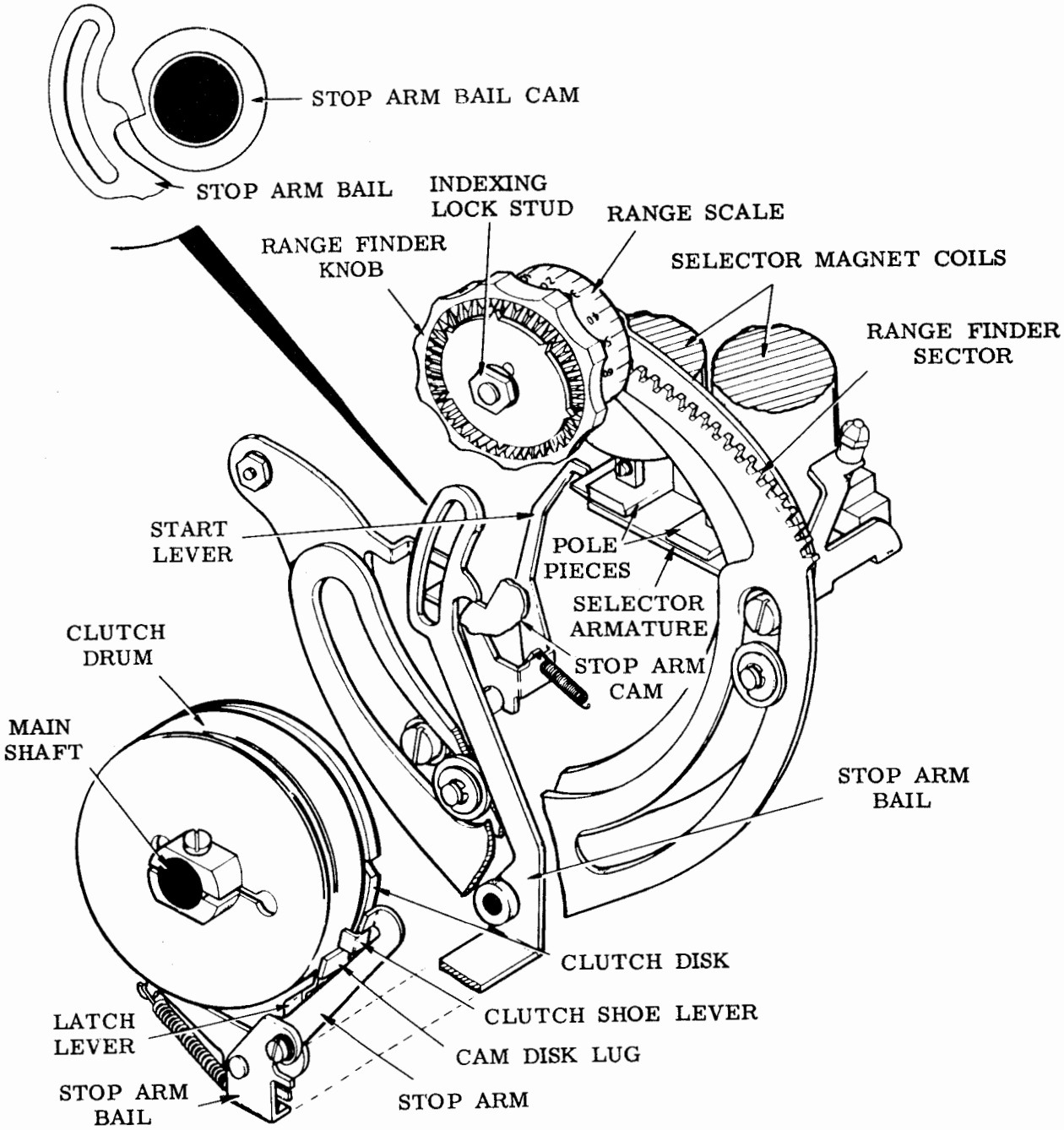


Figure 13 - Selector Clutch and Range Finder

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

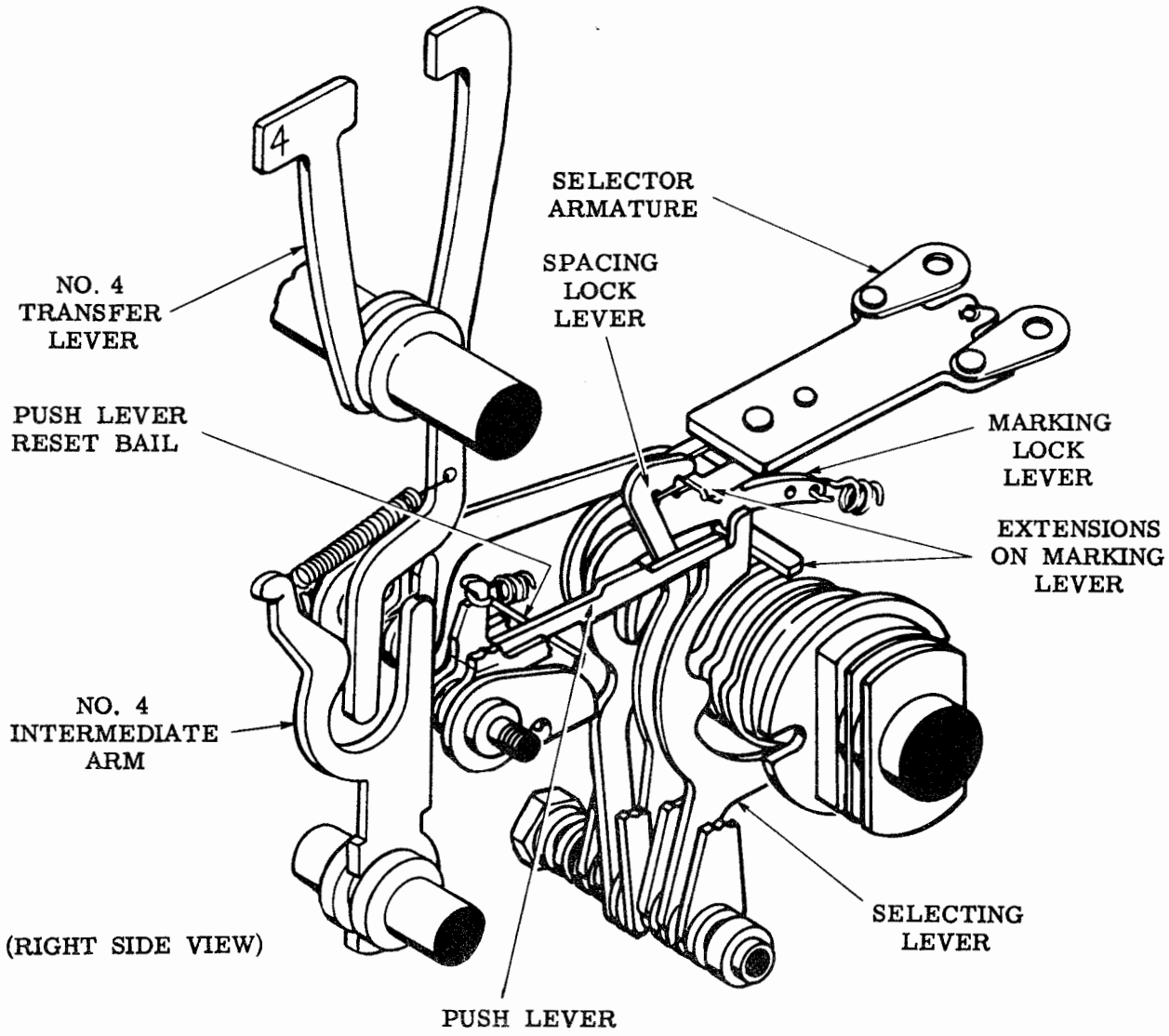


Figure 14 - Selecting Mechanism and Transfer Mechanism

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

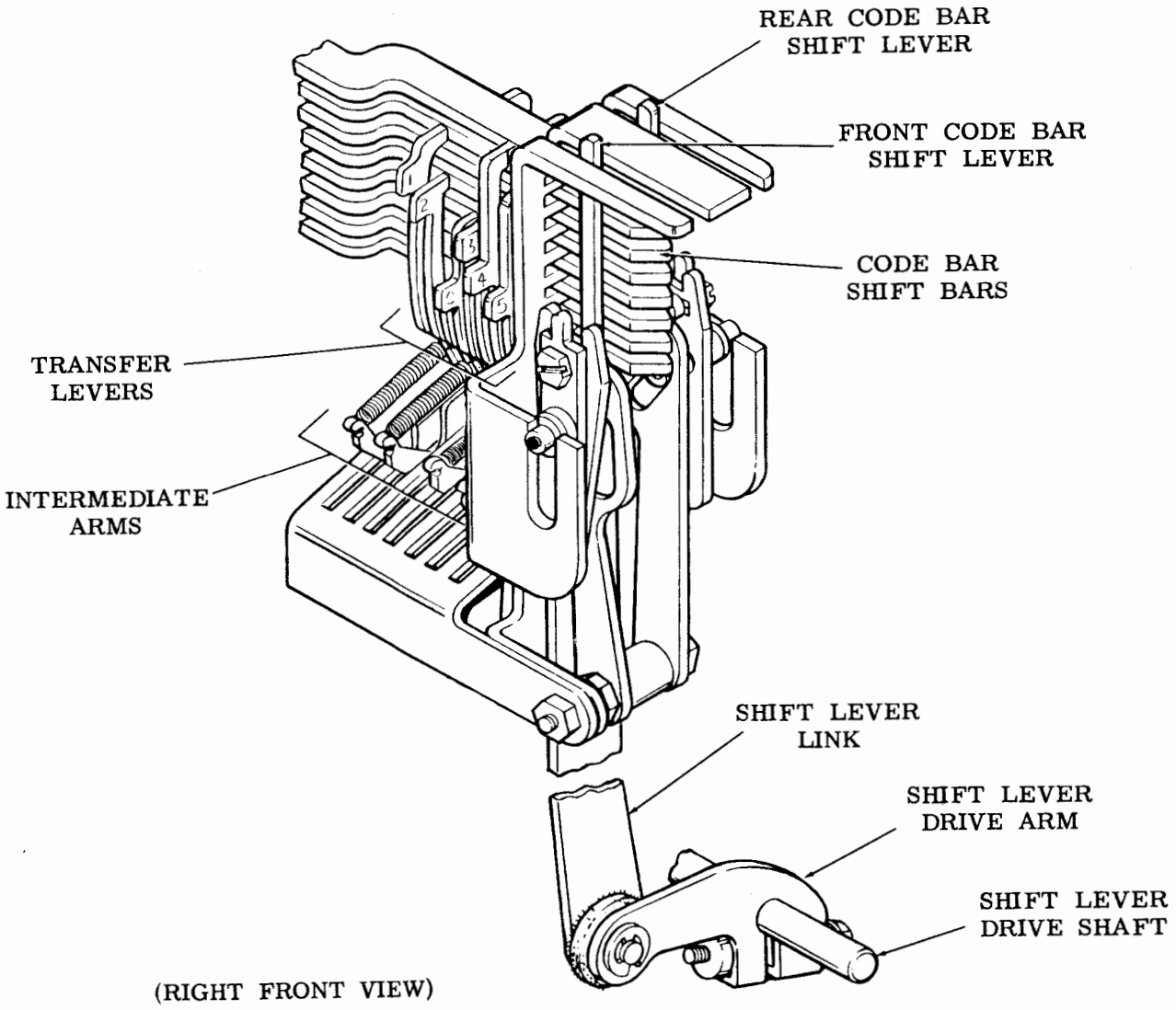


Figure 15 - Code Bar Mechanism

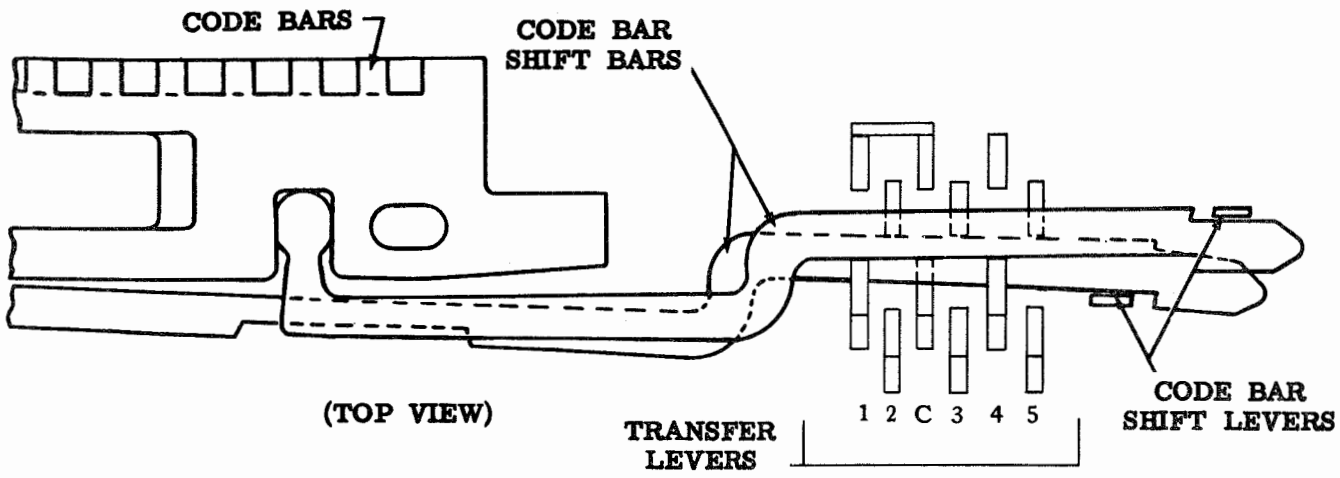


Figure 16 - Code Bar Shift Bar Positioning

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).

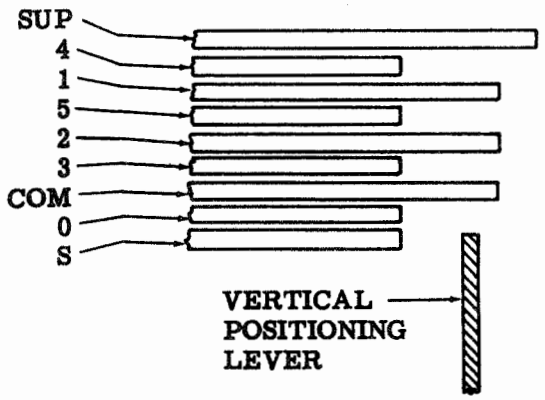


Figure 17 - Vertical Arrangement of Code Bars

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. Rota-

tion of the clutch operates an eccentric and the shift lever drive shaft, shift lever drive arm and shift lever drive link. The drive link moves two code bar shift levers in a scissors like action, the front lever moving to the left, the rear lever moving to the right. Any code bar shift bar in marking position (left) during the previous 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

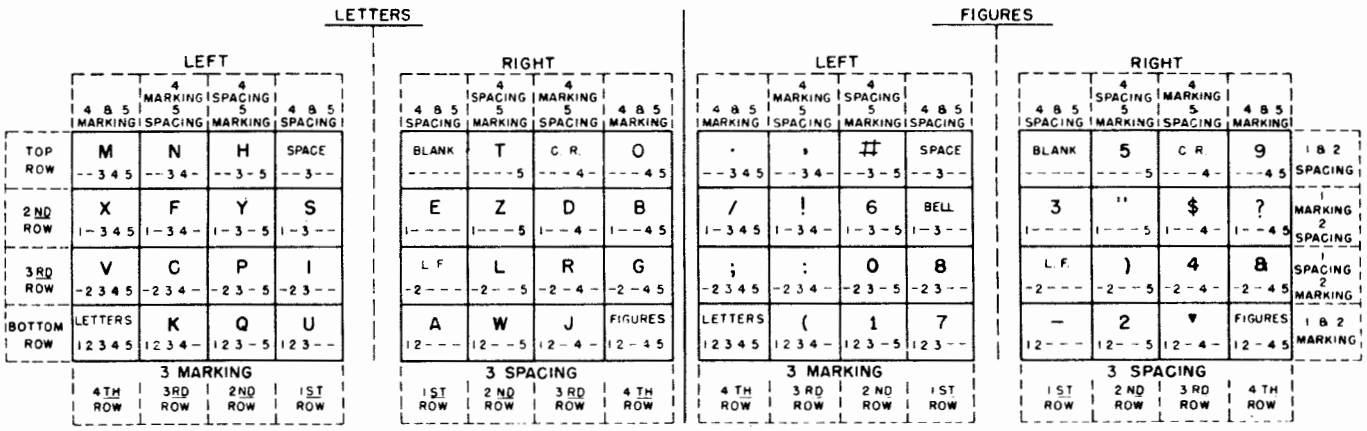


Figure 18 - Typical Type Box Pallet Arrangement

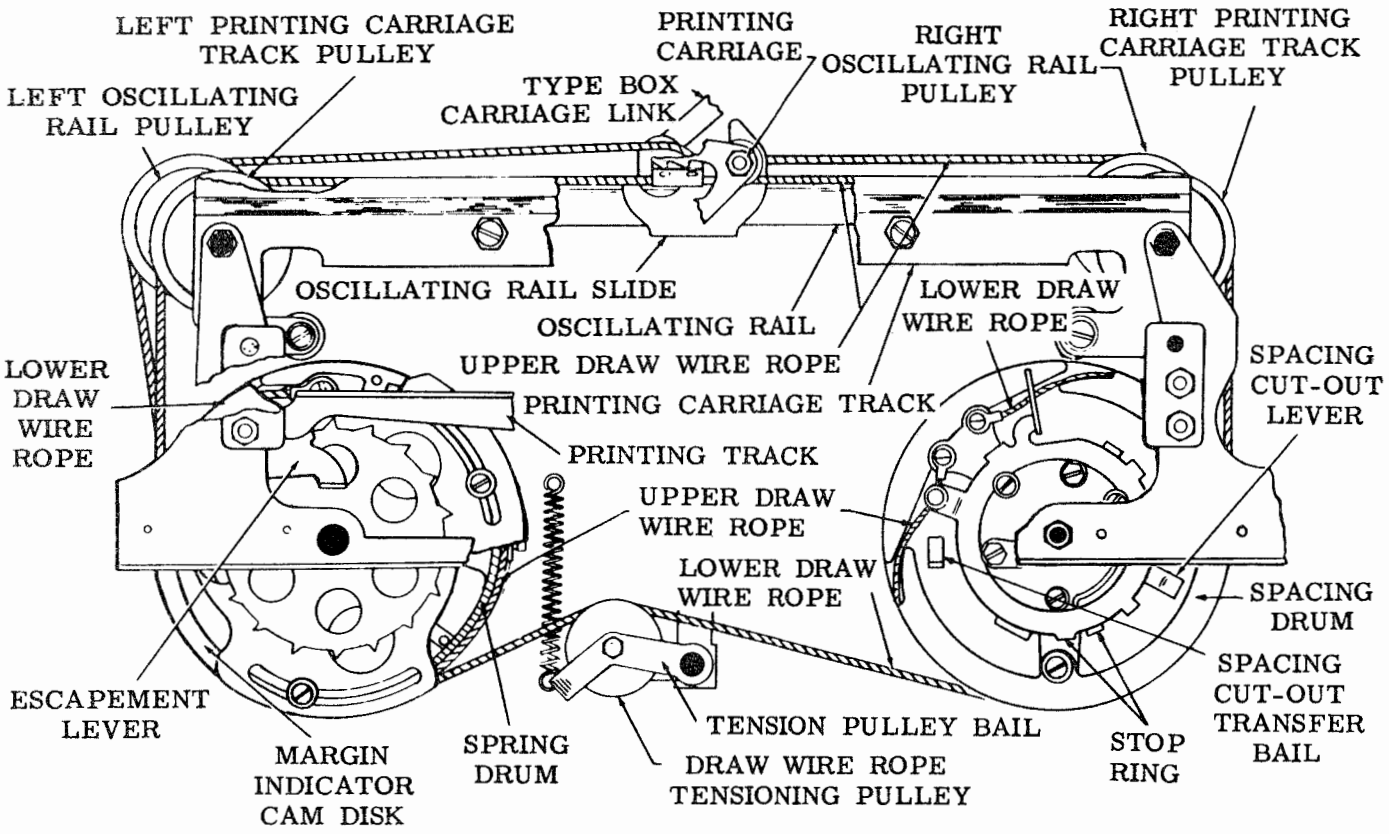


Figure 19 - Draw Wire Rope and Drums

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 to the spacing drum to which it is again fastened. The lower draw wire rope is fastened at its left end to the spring drum and, at its right end, to the spacing drum. It acts in opposition to the upper draw wire rope and holds the two drums in phase (Fig. 19). A tensioning pulley rides the under side of the lower draw wire rope, to take up any slack which may occur due to stretching of the upper and lower draw wire ropes.

8.04 The oscillating rail is supported by pivoted arms at each end. These arms which extend downward are pivoted on the typing unit frame at their lower ends. Thus, the oscillating rail and draw wire rope that it carries with it may be shifted to the left or right with no change in position relative to each other. The oscillating rail shift slide and two oscillating rail shift 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.

LETTERS-FIGURES SHIFT (Fig. 20)

8.05 Mechanical limitations restrict the selection from the type box pallets to four horizontal rows and eight vertical rows. With a total of sixteen vertical rows in the type box, it is necessary to determine which of two fields, letters (left half of type box) or figures (right half of type box) will be presented for printing. To accomplish this, a special non-printing signal combination is used for each shift operation. Upon receipt of the letters or figures shift signal, mechanisms provided in the stunt box initiate the shifting operation. This, as are other non-printing operations, is described under Functions. The operation of the mechanisms that perform the actual shifting of the type box, however, are described below.

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.

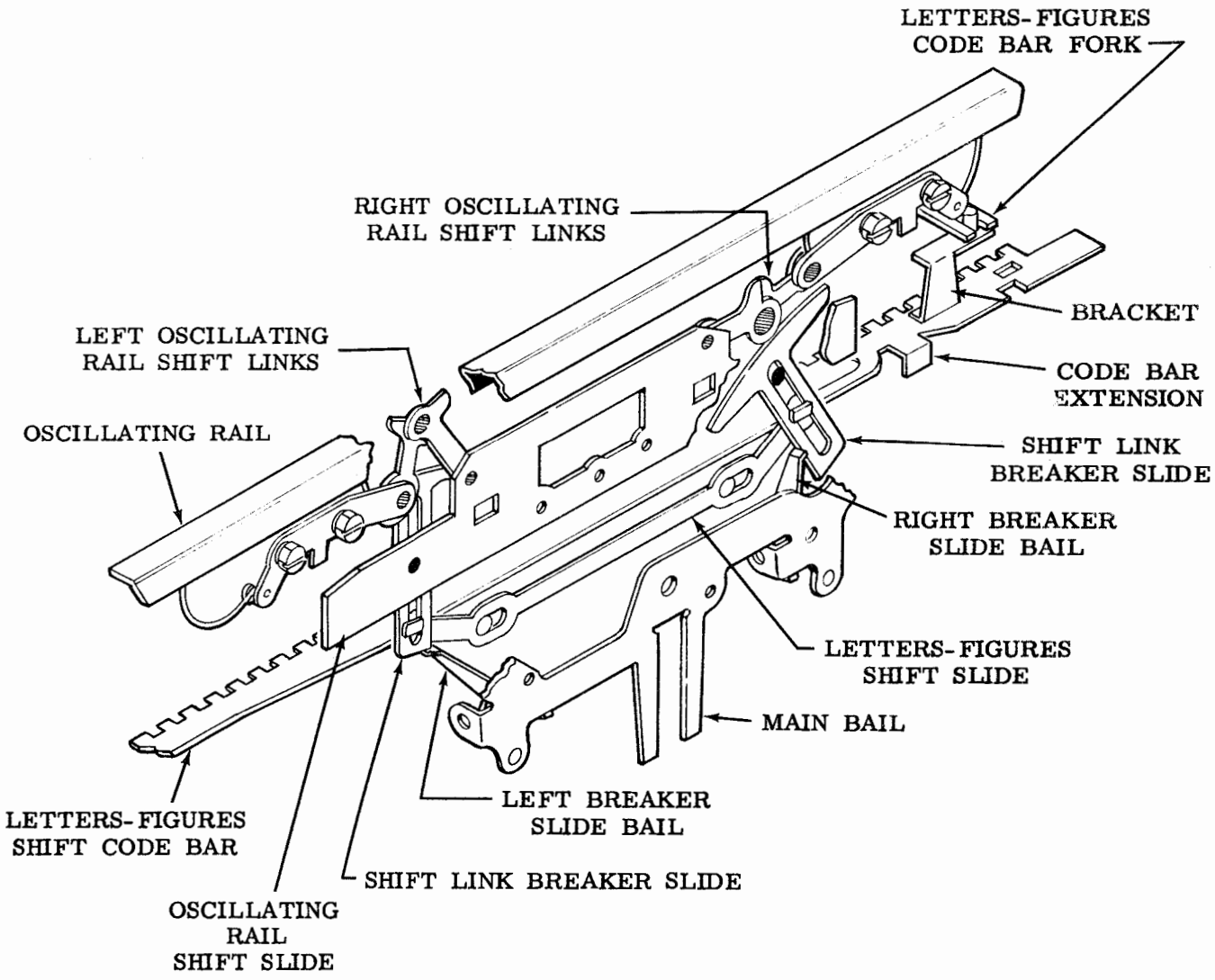


Figure 20 - Letters-Figures Shift Mechanism

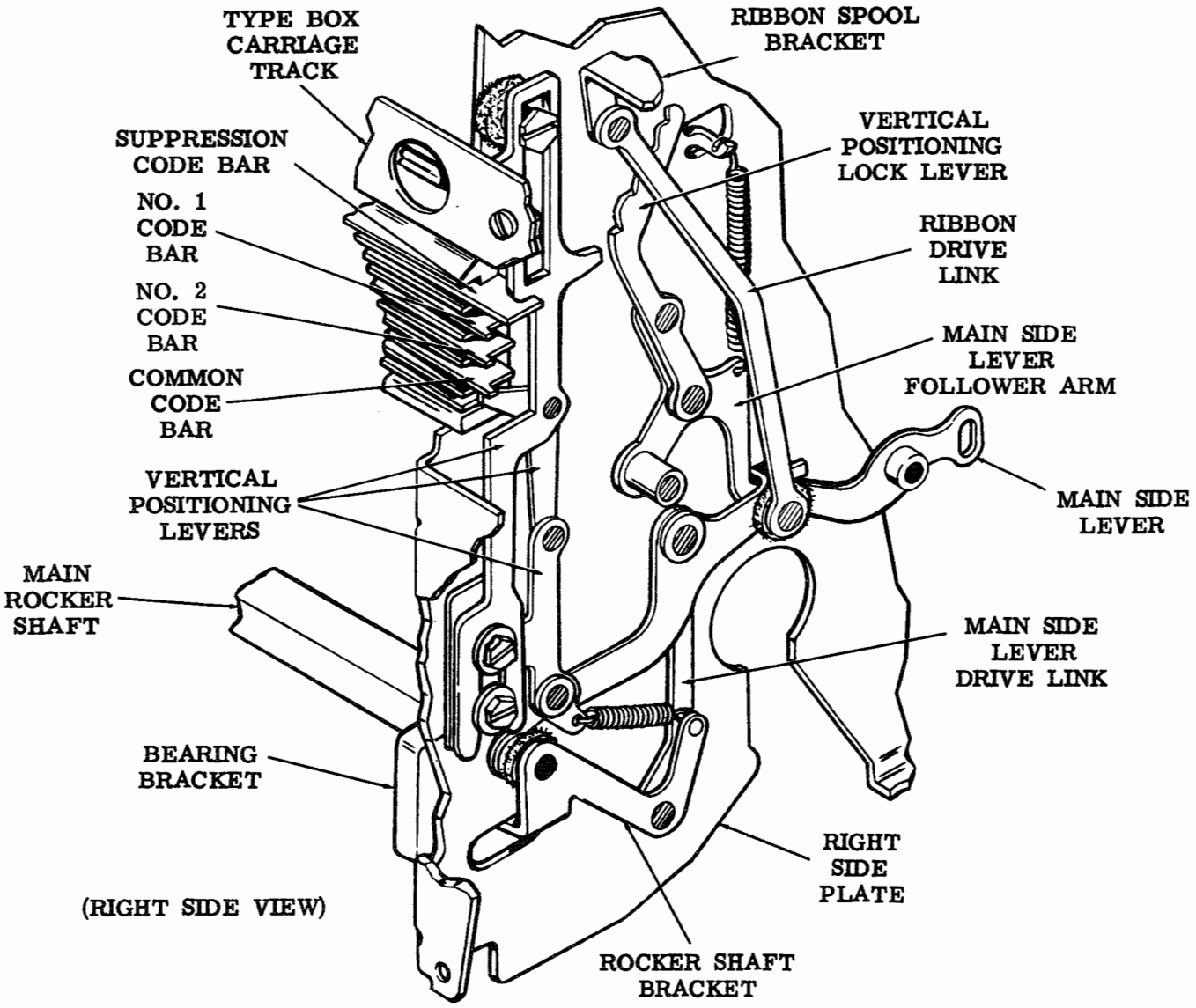


Figure 21 - Right Side Plate Mechanisms

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,

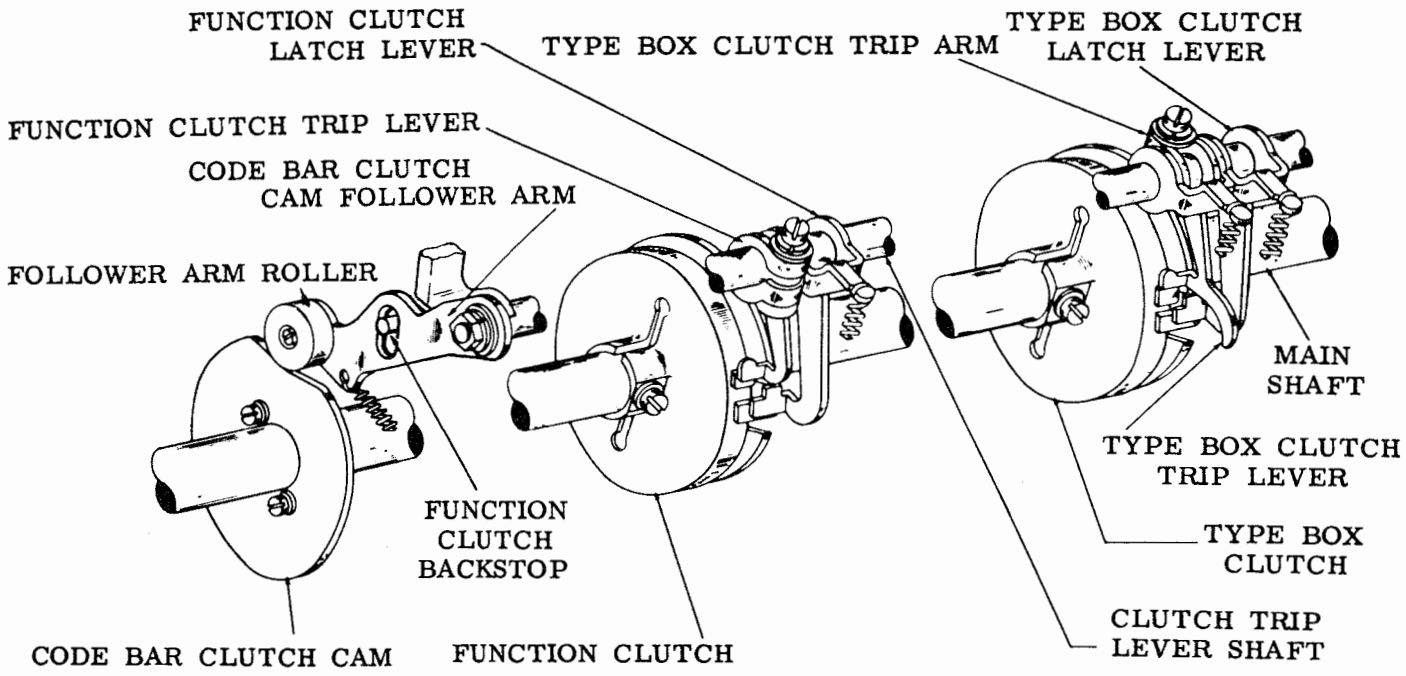


Figure 22 - Clutch Trip Mechanism

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

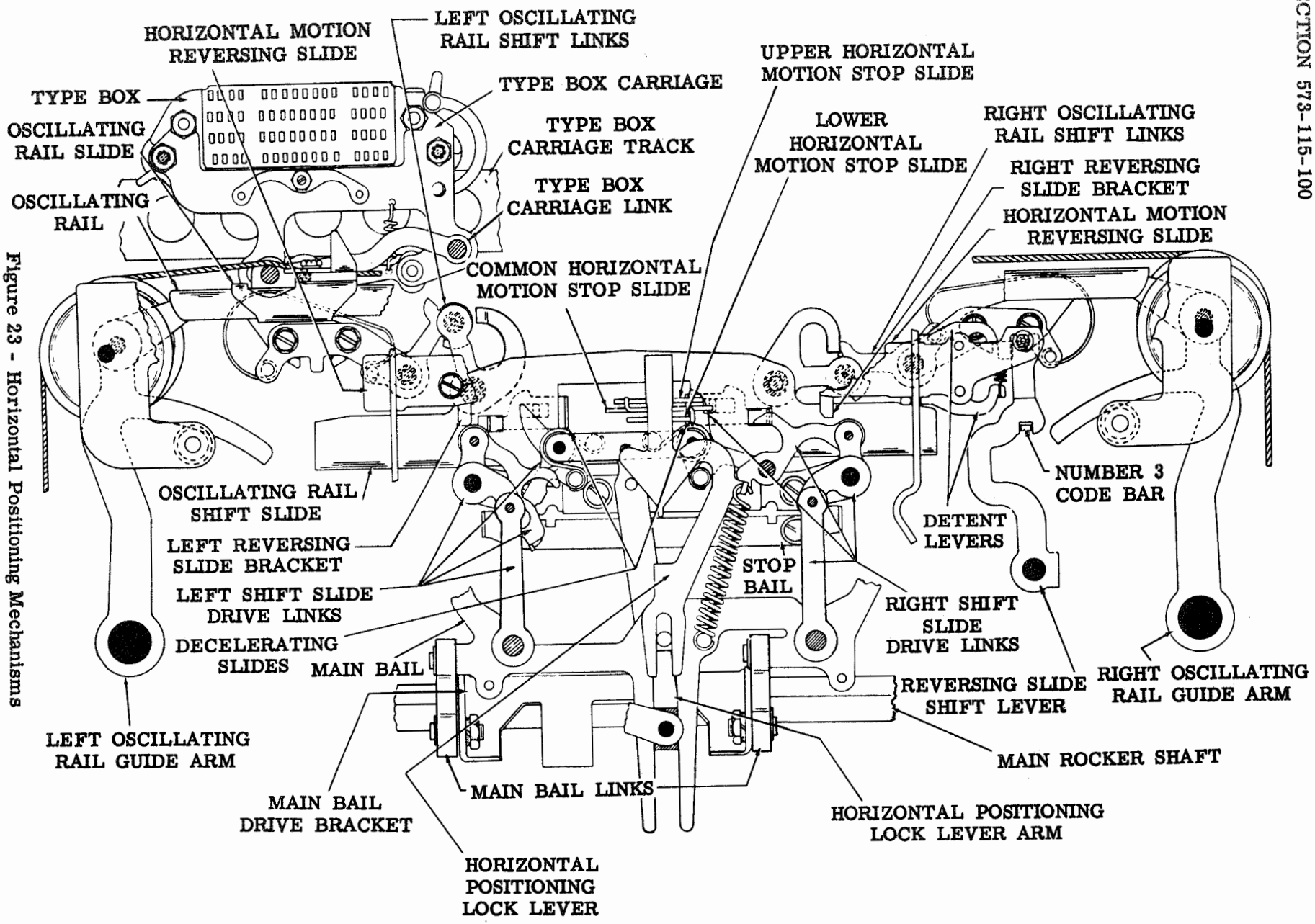


Figure 23 - Horizontal Positioning Mechanisms

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

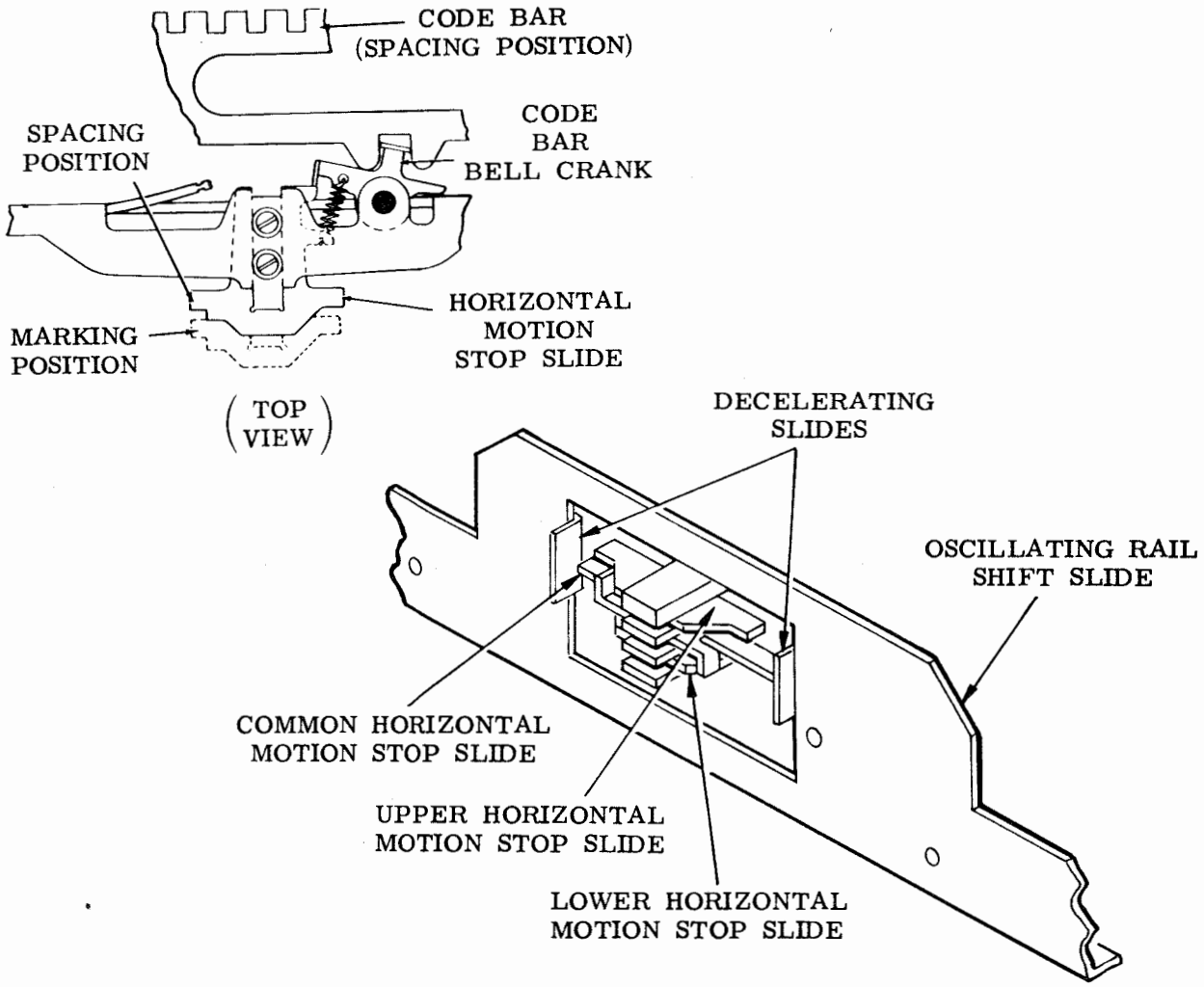


Figure 24 - Horizontal Motion Stop Slides

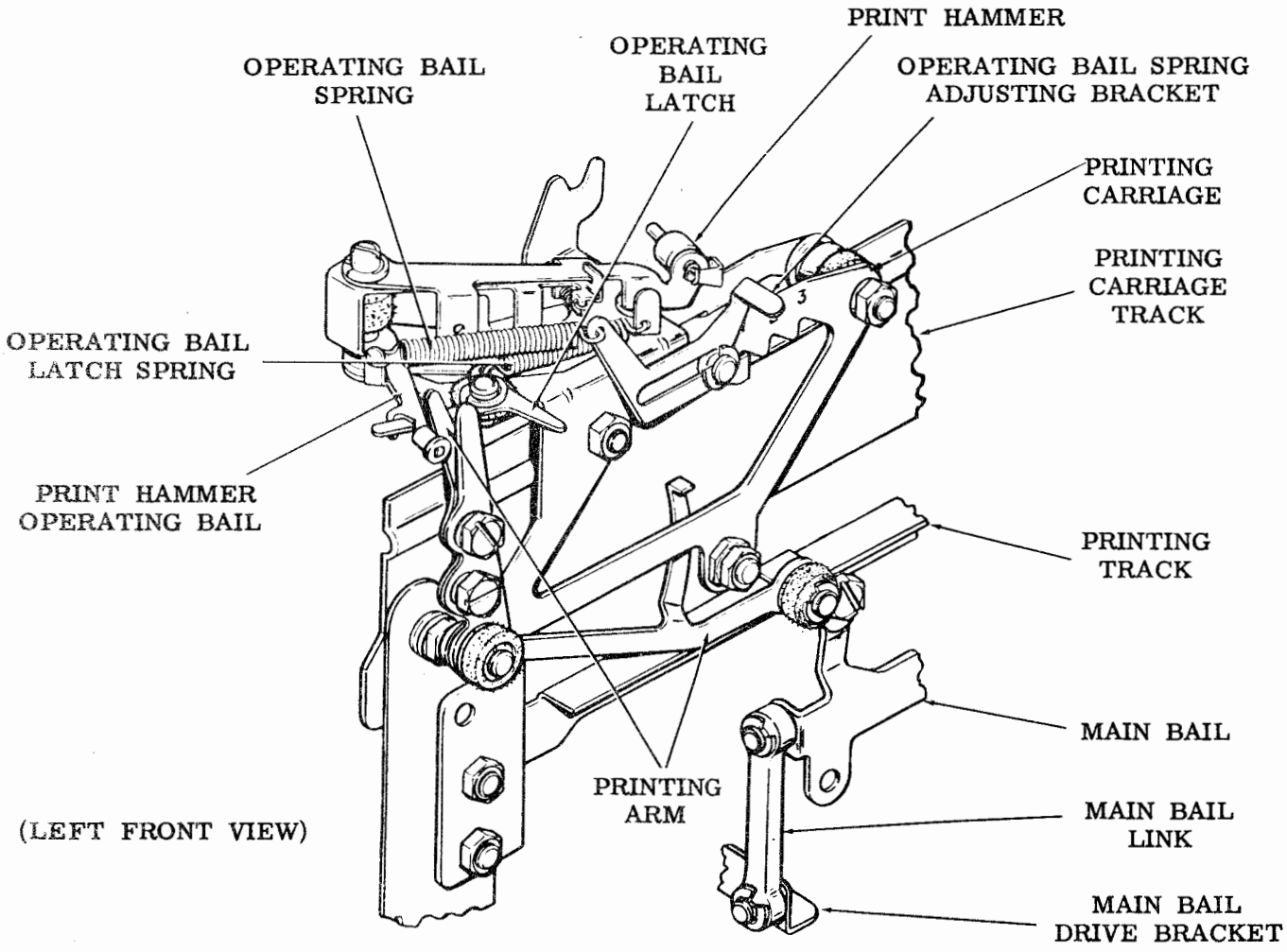


Figure 25 - Print Hammer and Carriage

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

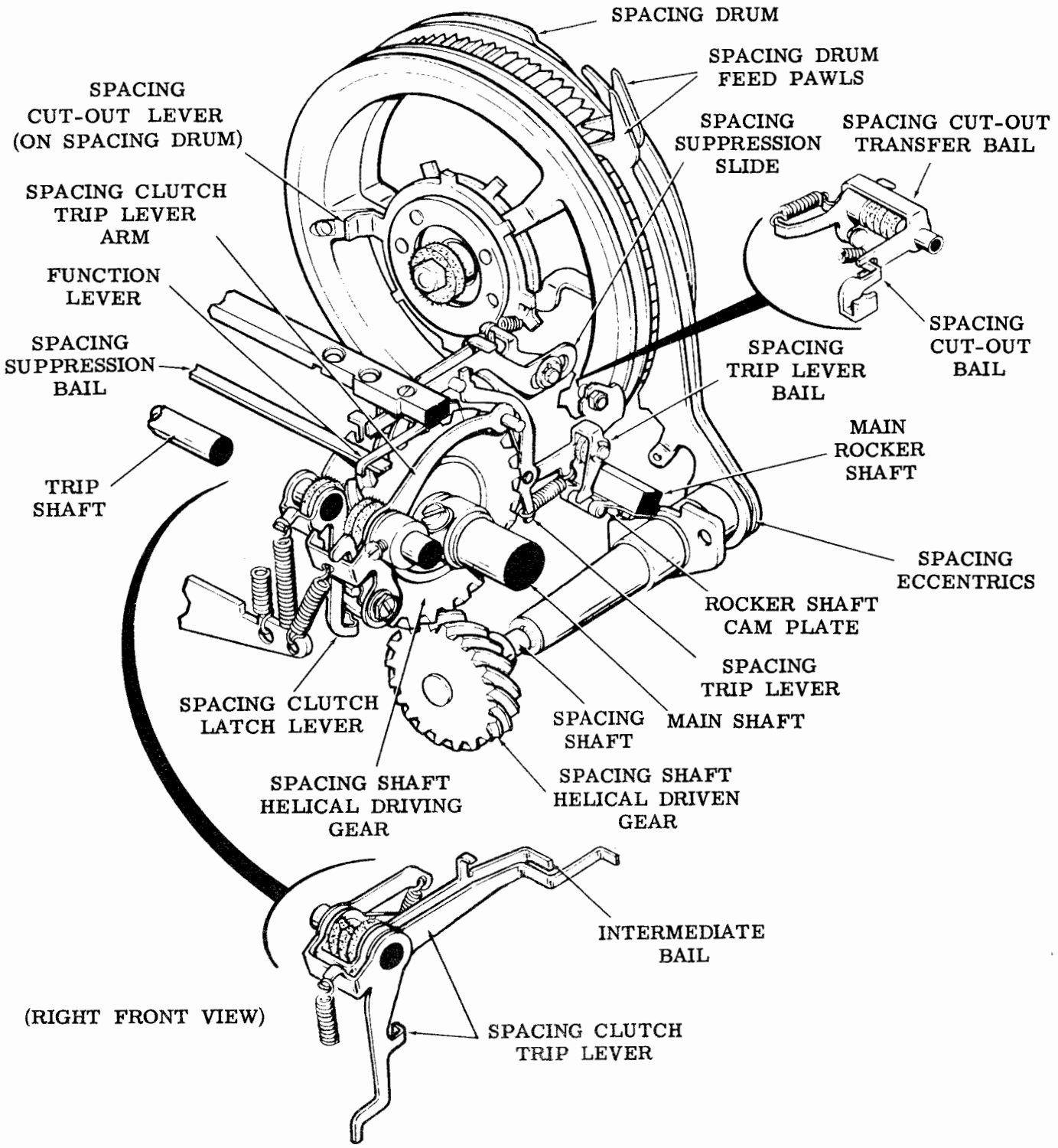


Figure 26 - Spacing Mechanism

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.

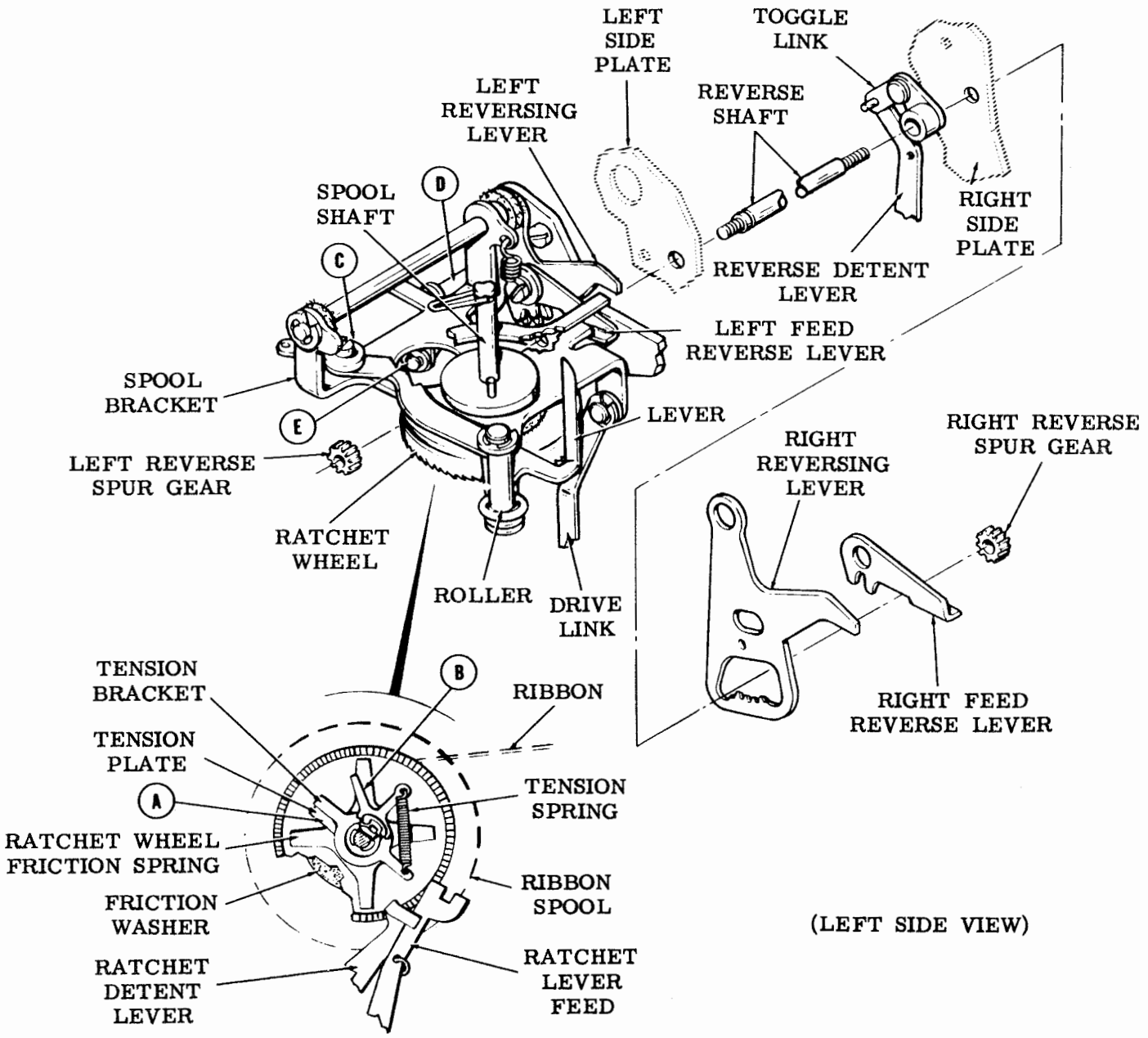


Figure 27 - Ribbon Feeding Mechanism

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

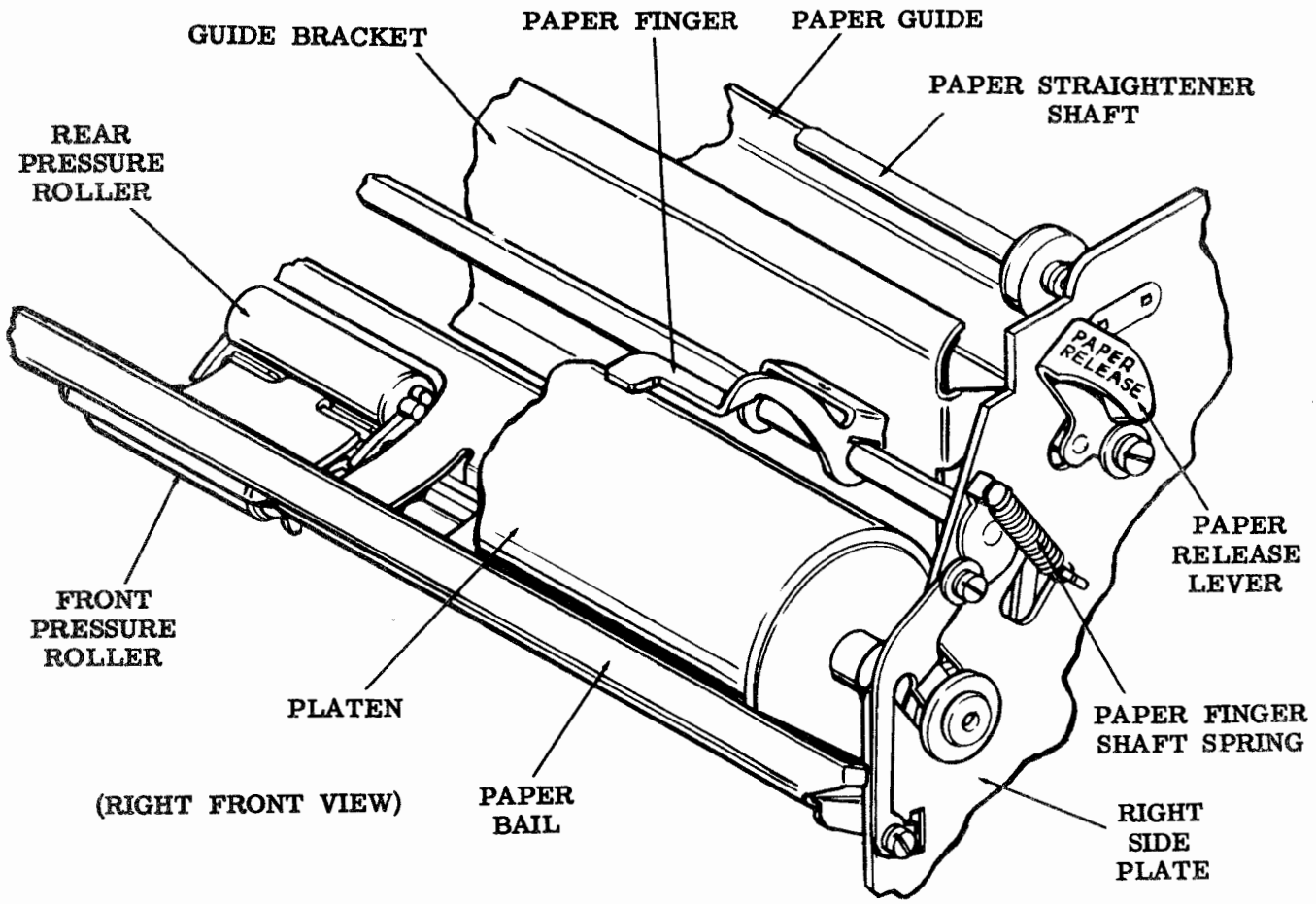


Figure 28 - Friction Feed Platen Mechanism

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

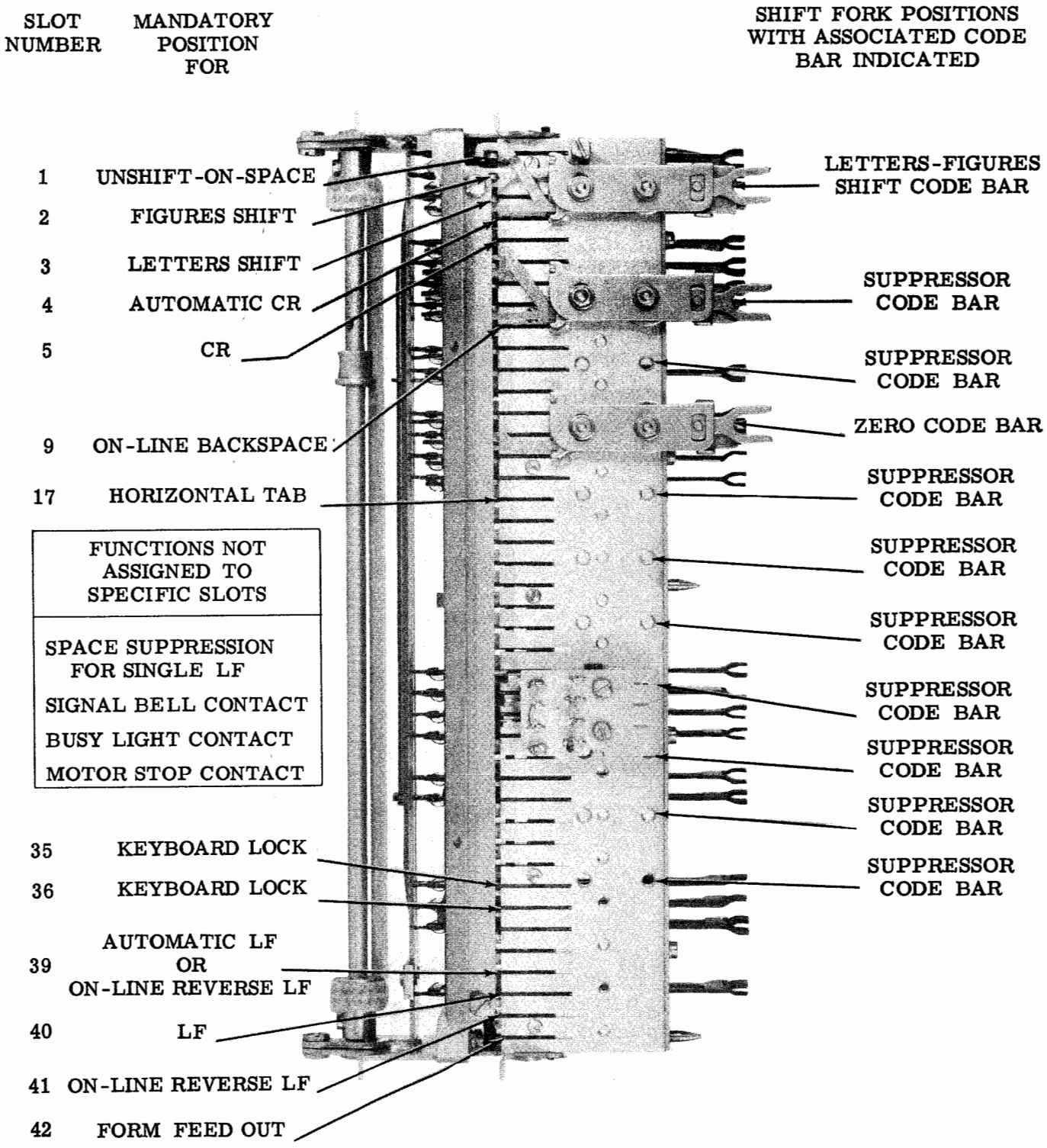


Figure 29 - Stunt Box (Top View)

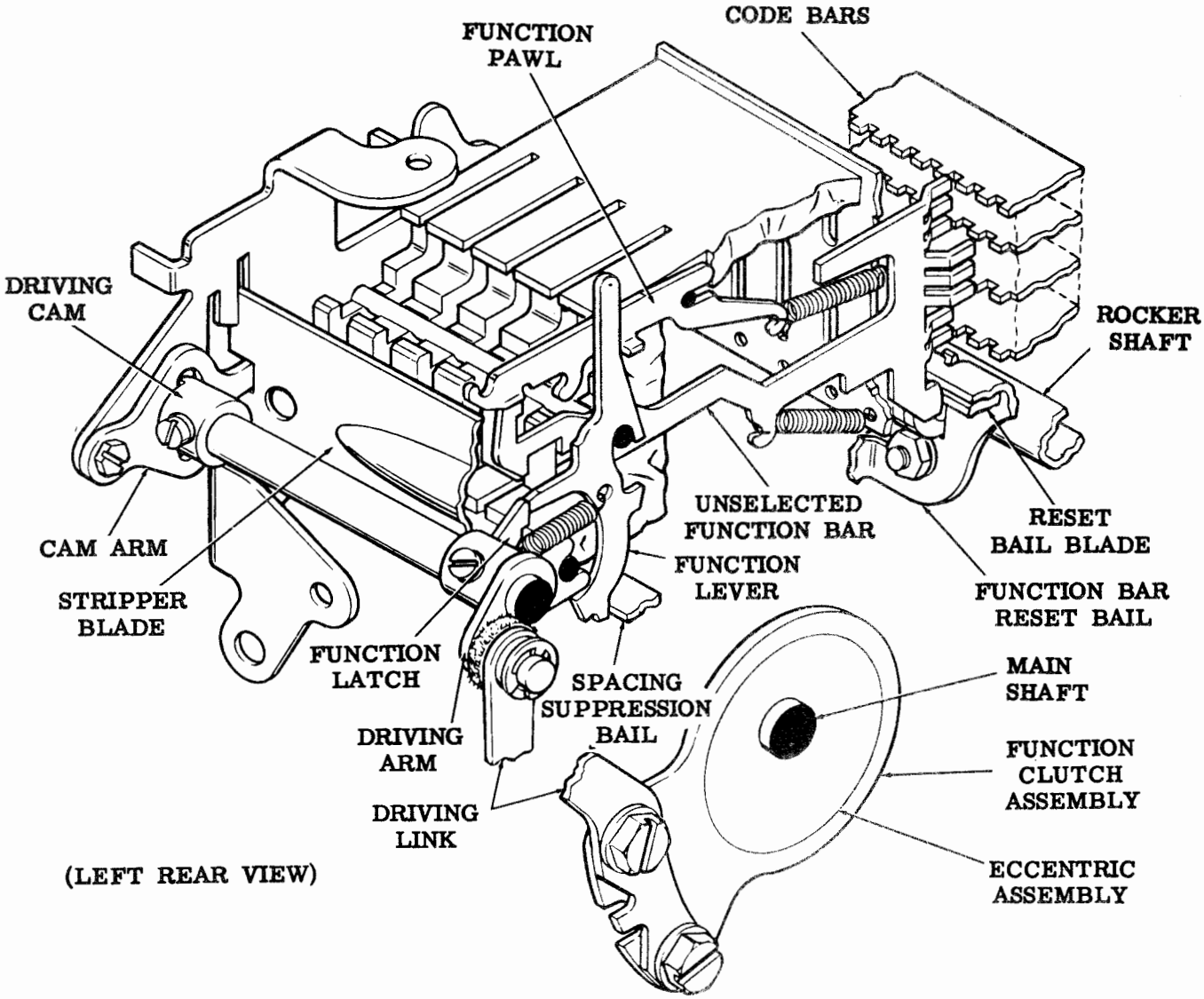


Figure 30 - Stunt Box (Function Linkage unselected)

the code bars 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 code bars, 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.

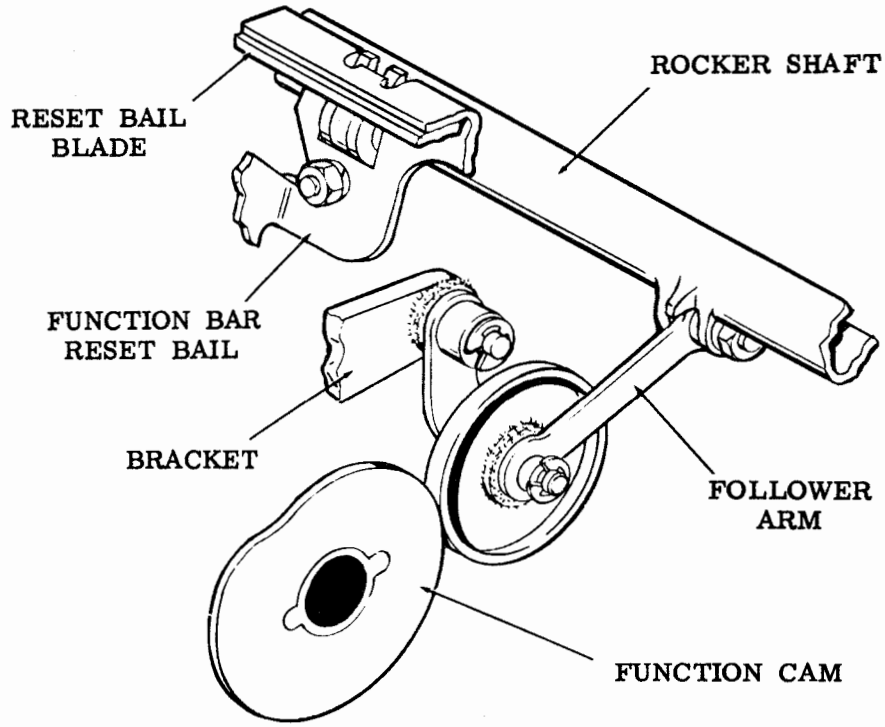


Figure 31 - Reset Bail Mechanism

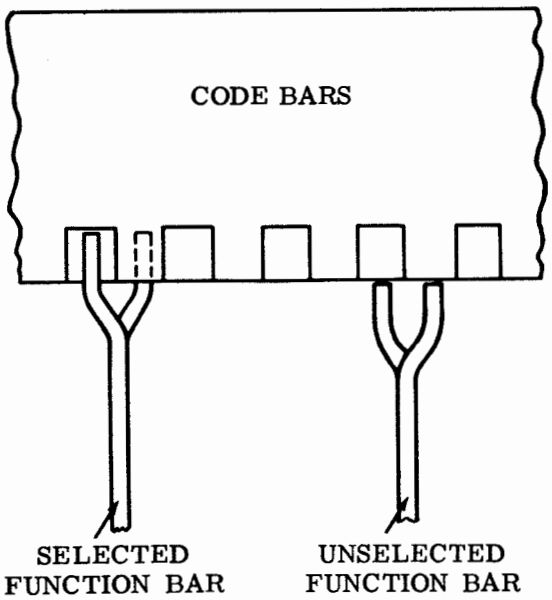


Figure 32 - Function Bar Selection

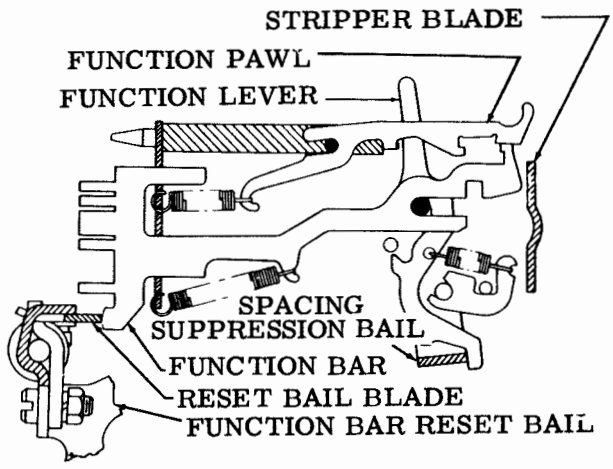


Figure 33 - Typical Function Linkage (Unselected)

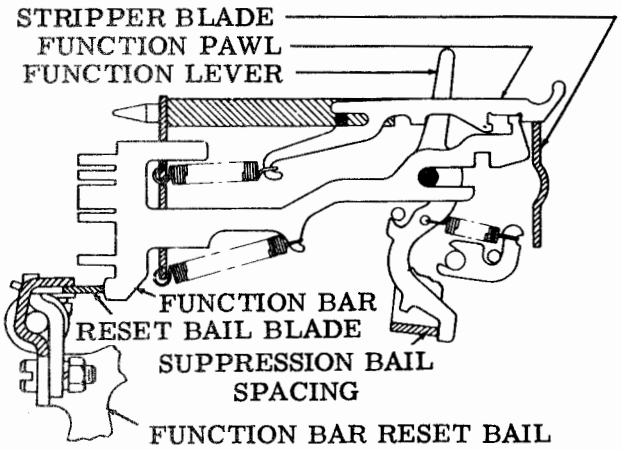


Figure 34 - Typical Function Linkage (Selected)

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

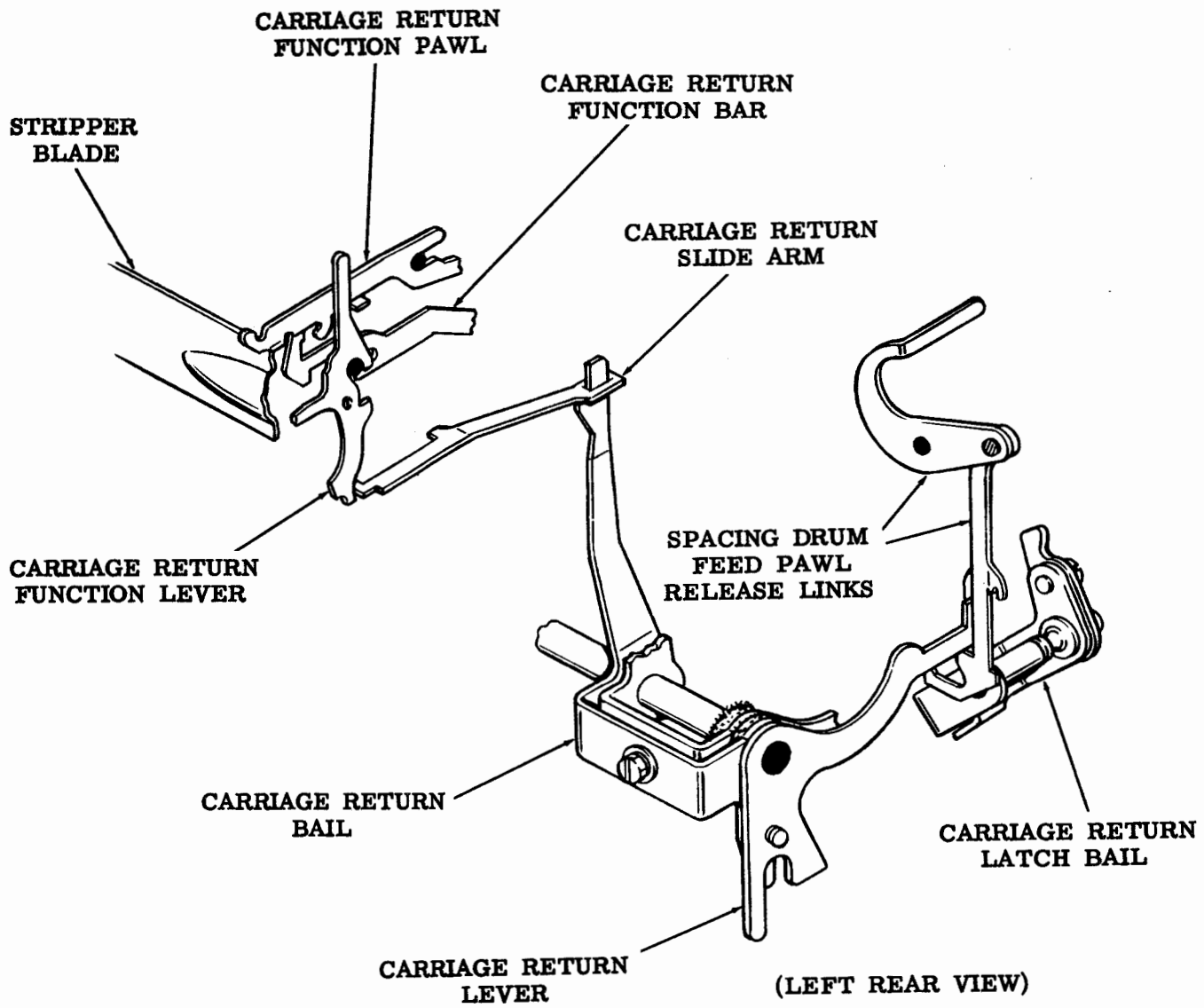


Figure 35 - Carriage Return Function Mechanism

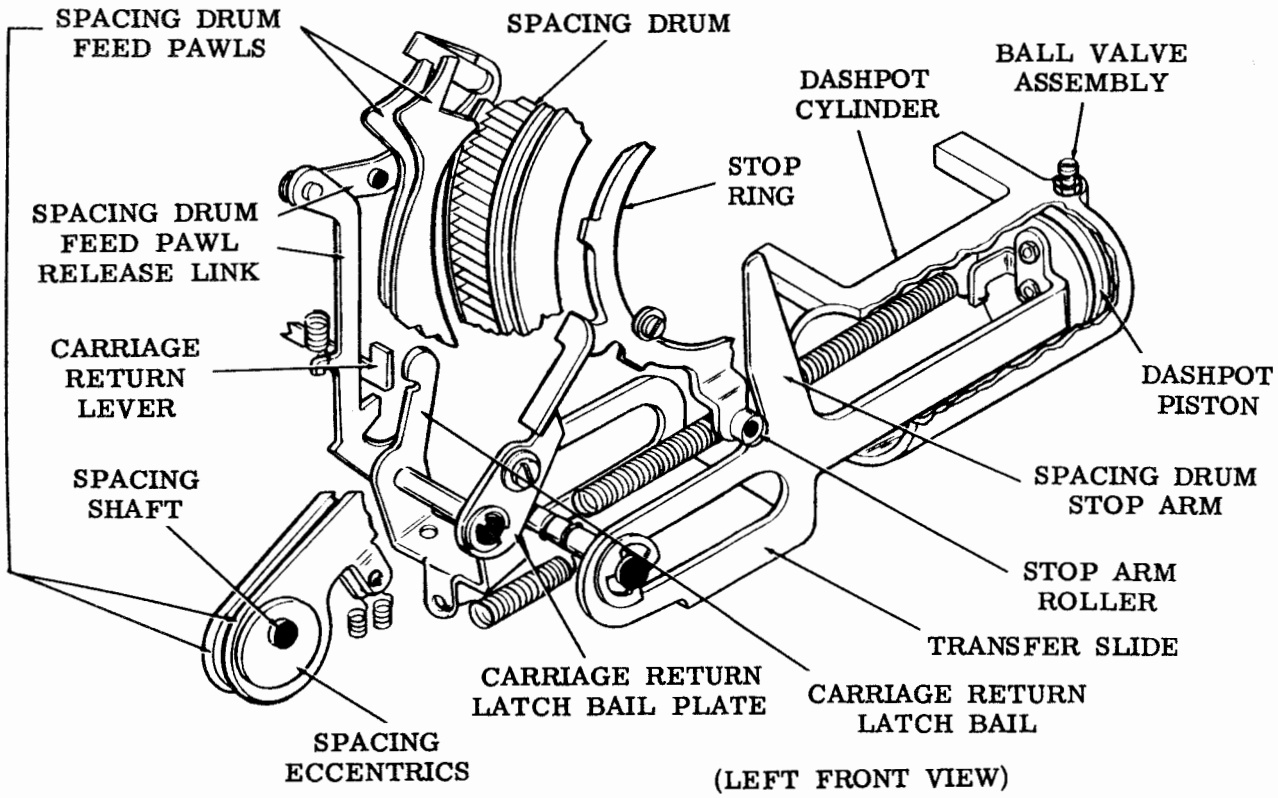


Figure 36 - Carriage Return Mechanism

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

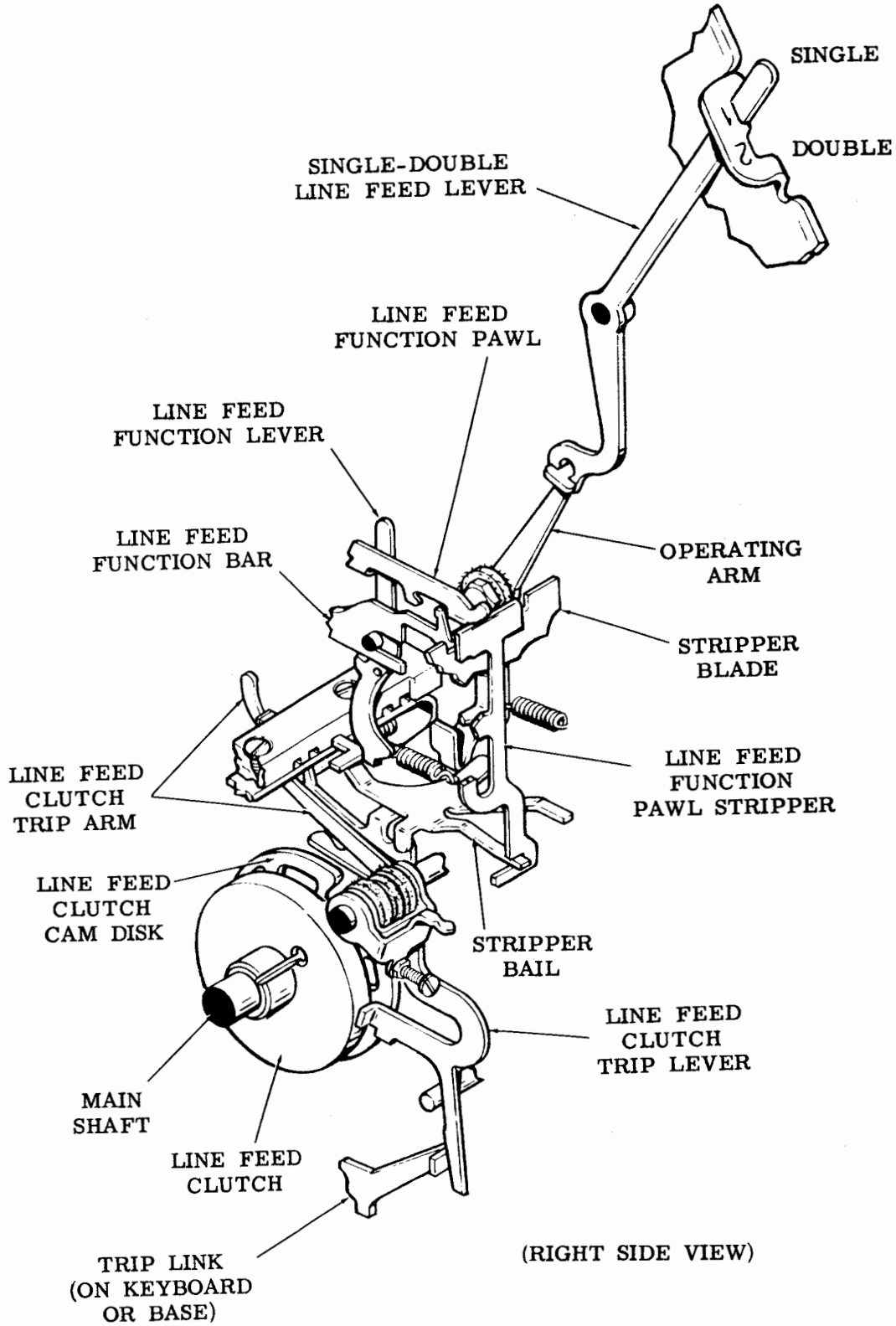


Figure 37 - Line Feed Mechanism

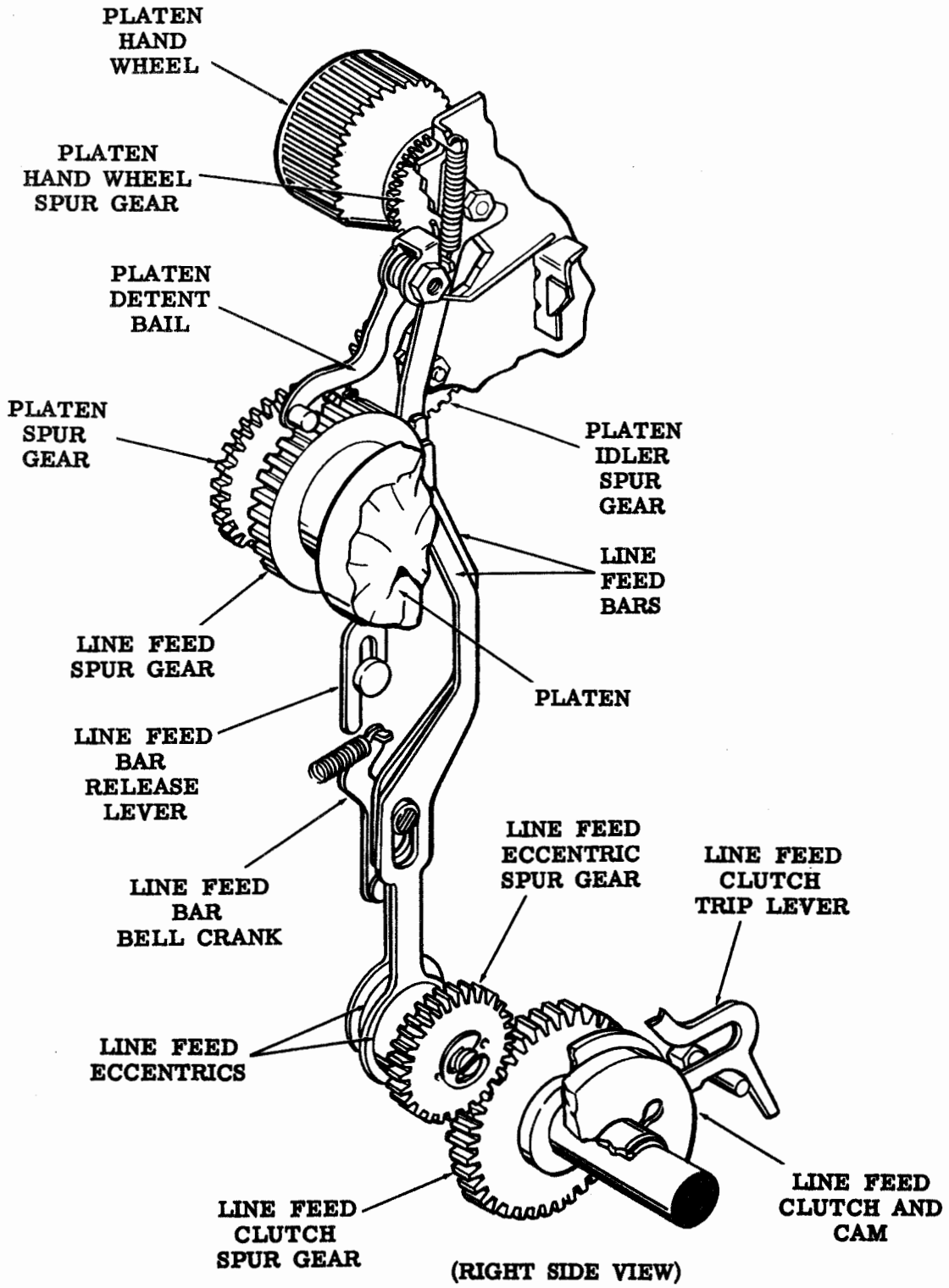


Figure 38 - Line Feed Mechanism

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,

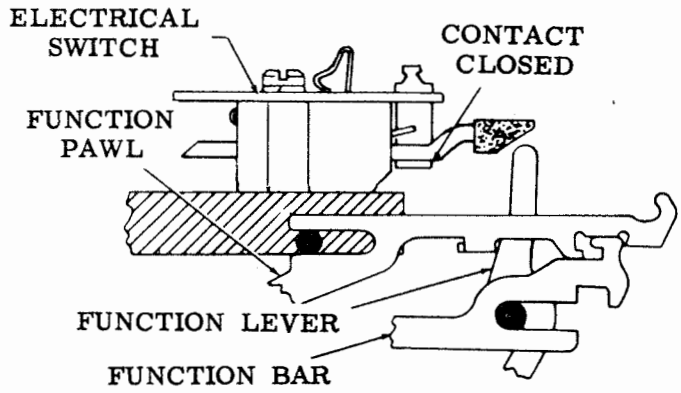


Figure 39 - Typical Stunt Box Contact (Unoperated)

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 type box, 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,

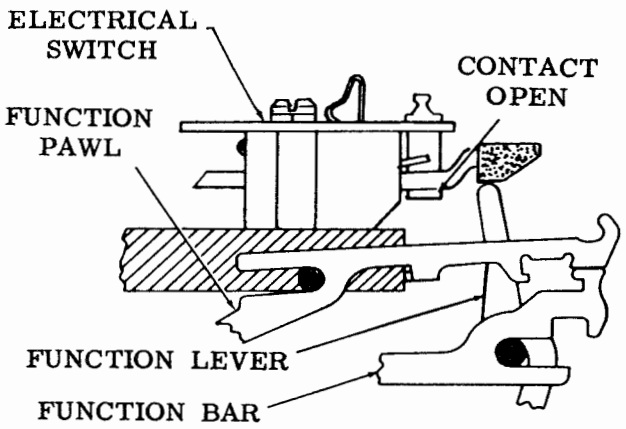


Figure 40 - Typical Stunt Box Contact (Operated)

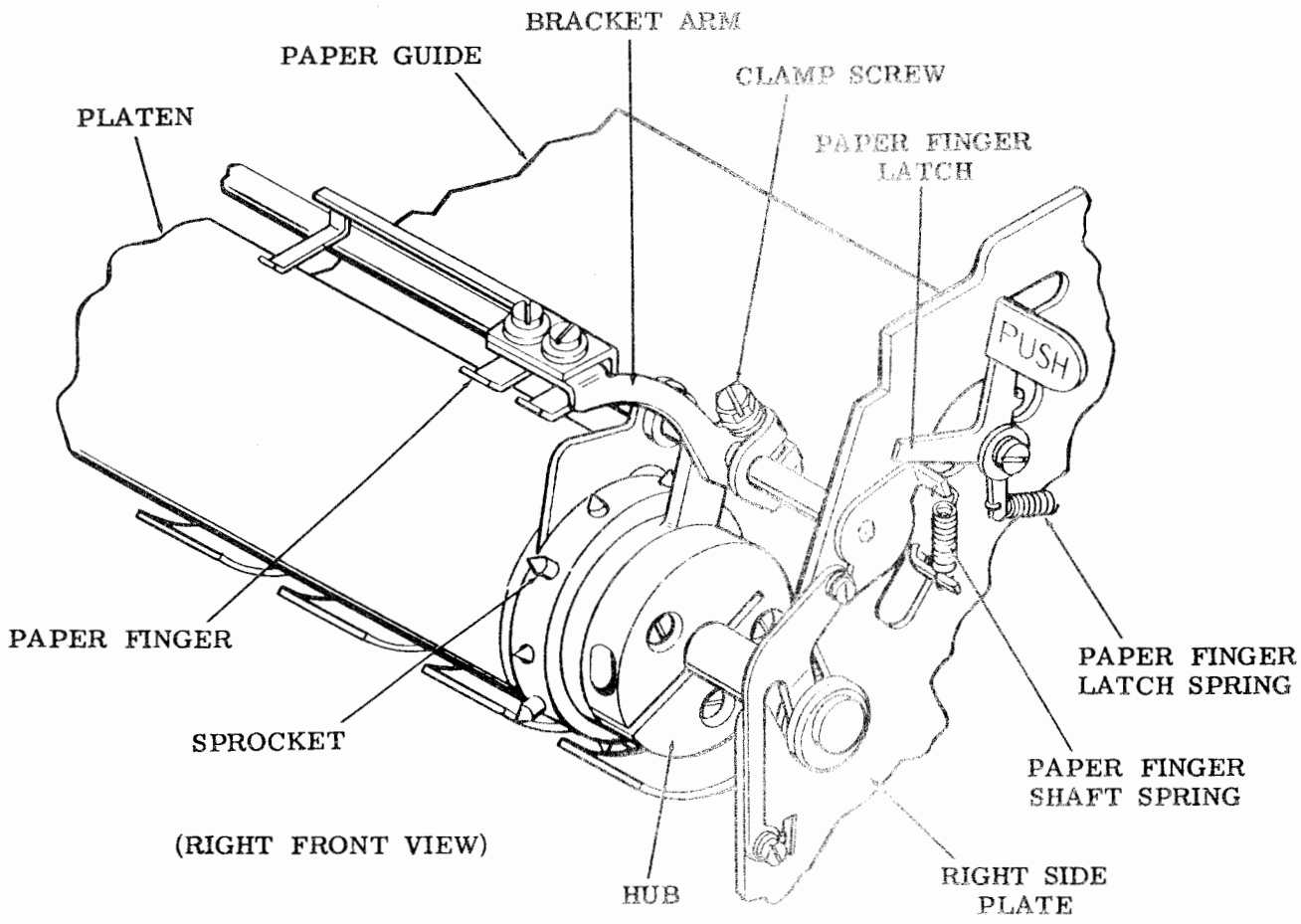


Figure 41 - Sprocket Feed Platen Mechanism

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 fin-

gers are repositioned by depressing them manually until the end of the paper guide shaft latches an indent on the release lever.

15. VARIABLE FEATURES

HORIZONTAL TABULATION (Figs. 42 and 43)

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

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

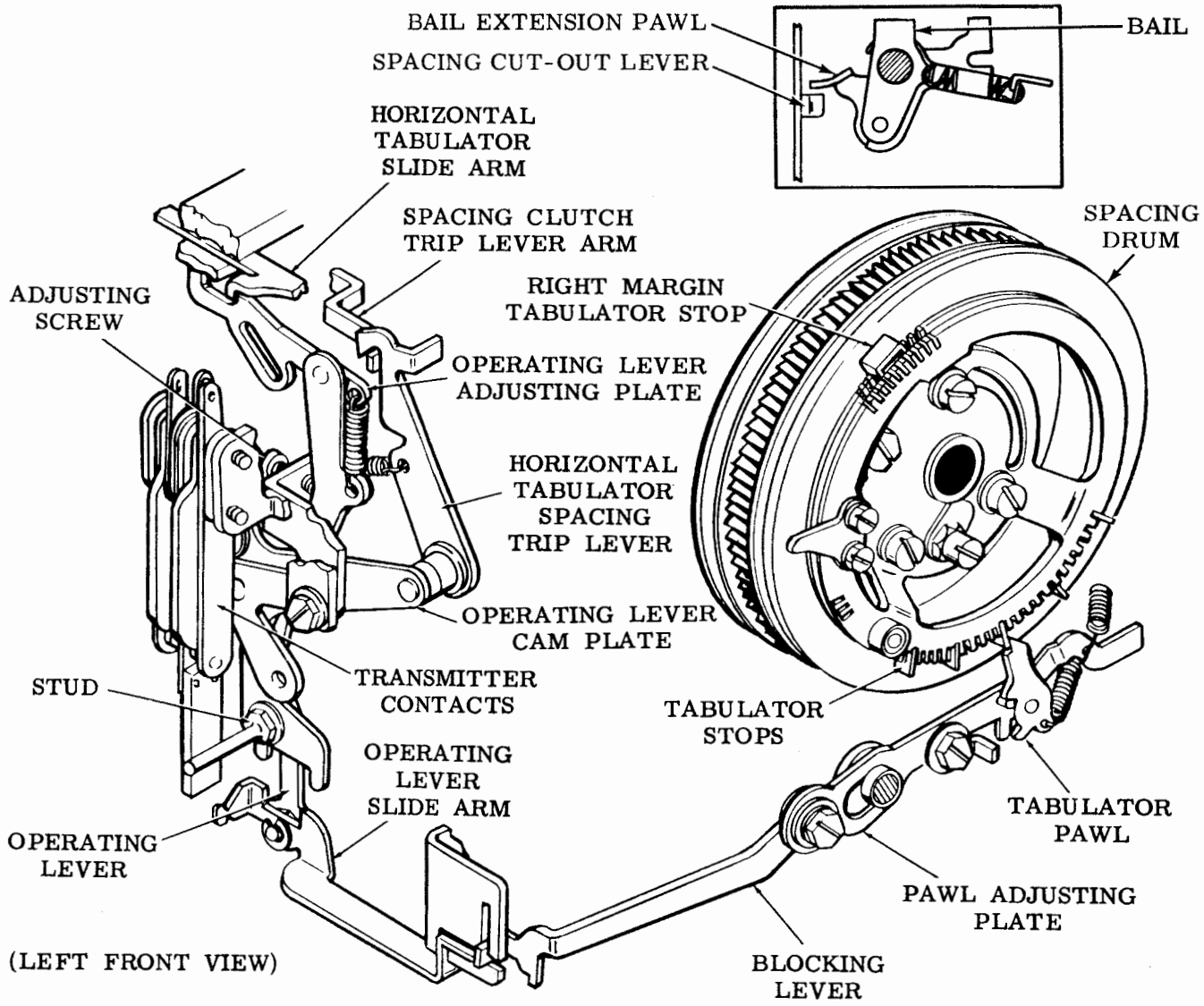


Figure 42 - Horizontal Tabulation Mechanism

15.03 Tripping of the spacing clutch is initiated in the same way as for normal printing (10.01-10.02). As the trip lever moves down, however, it hooks over and pulls down the intermediate trip 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.

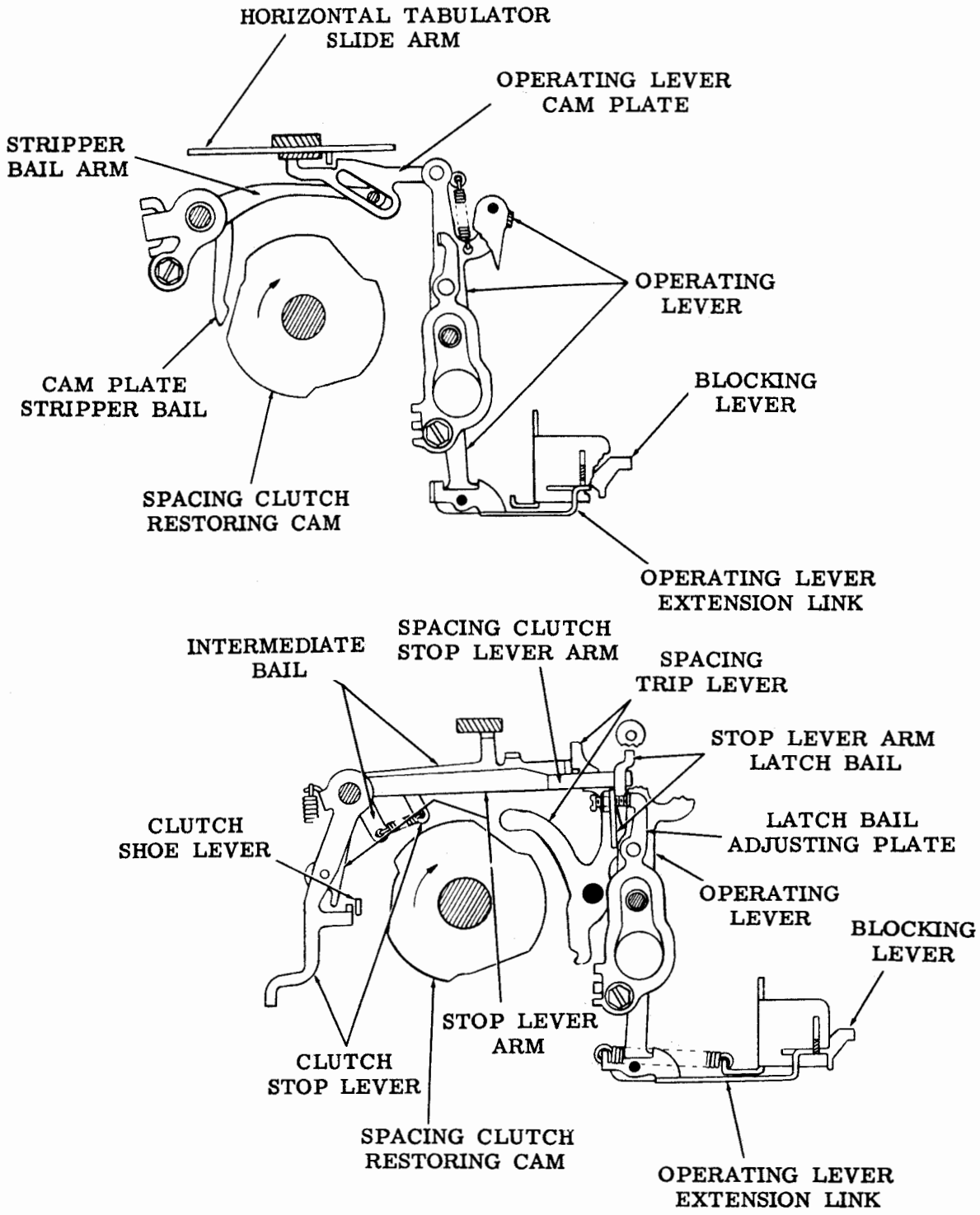


Figure 43 - Horizontal Tabulation

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.

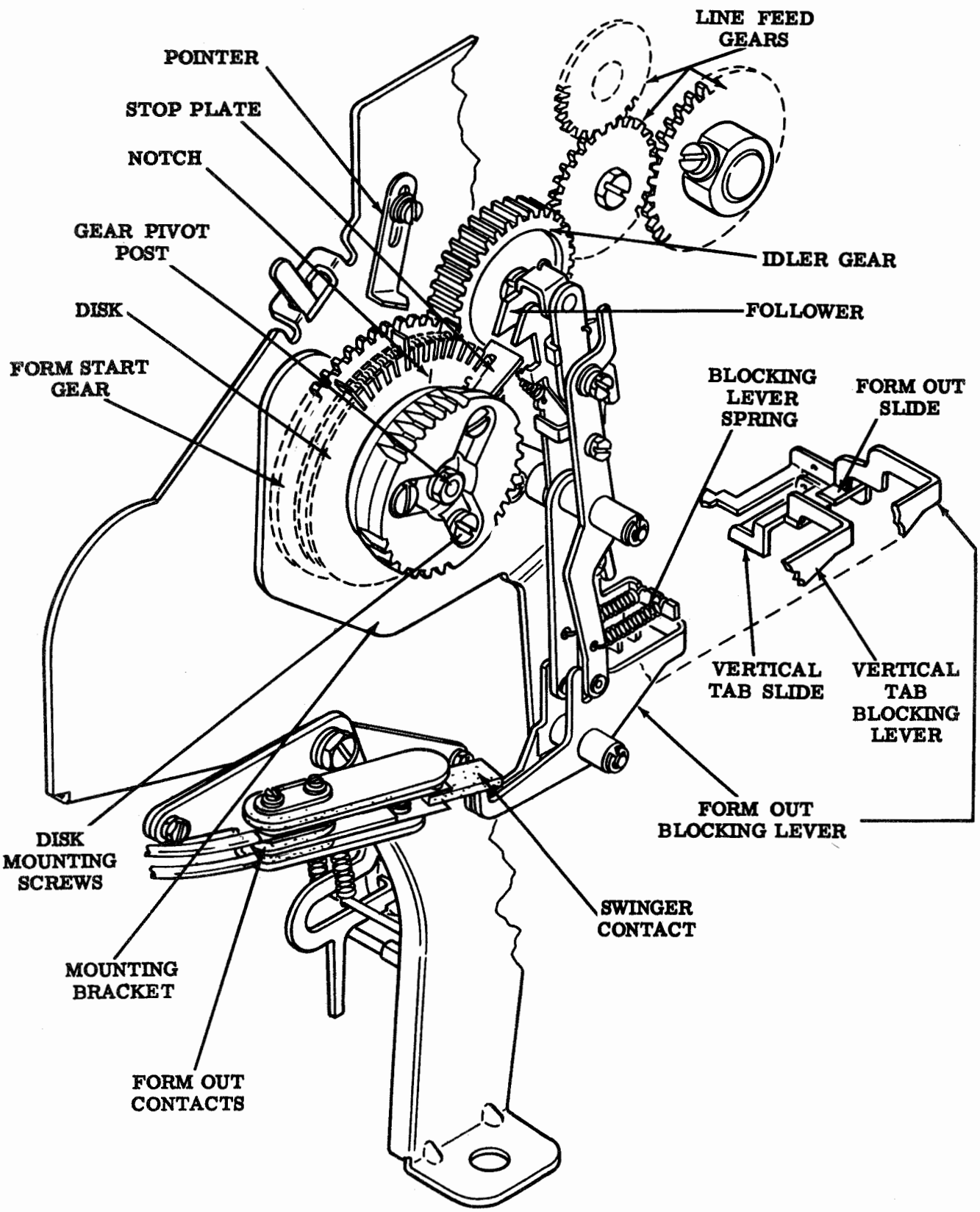


Figure 44 - Vertical Tabulation and Form Out Mechanisms

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.

28 TYPING AND NONTYPING PERFORATORS

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS

1. GENERAL

1.01 This section provides a description and outlines the principles of operation for two types of perforators: one a nontyping perforator and the other a typing perforator.

1.02 The following description and principles of operation will apply to both units except for that portion pertaining to typing mechanism only.

1.03 In this section, reference to left or right indicates the operators left or right facing the front of the unit in its operating position.

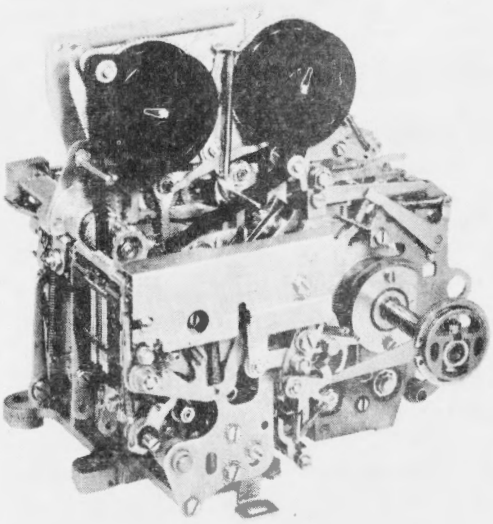


Figure 1 - Typing Perforator

2. GENERAL DESCRIPTION

2.01 The 28 typing and nontyping perforators are mechanical units that are used with an associated keyboard from which code selections are derived and mechanically transferred into the perforator (Figures 1 and 2).

2.02 The perforators produce a coded, perforated tape as dictated by its associated keyboard. Two types of perforators are available: a nontyping perforator and a typing perforator. Each type is capable of producing either chadless tape or fully perforated tape. The typing perforator is capable of producing perforated tape and typing thereon simultaneously. The tape may be chadless with typing on top of the chads which are not completely severed, or it may be fully perforated tape with typing between the feed holes.

2.03 In general the two units have the same function and perforating mechanisms, but the typing perforator has, in addition, the necessary mechanisms to perform typing on tape.

2.04 Each unit receives its driving power from a motor unit through drive shafting on the associated keyboard. Selection is derived mechanically from the keyboard.

2.05 A perforator consists principally of a two-shaft drive mechanism, function mechanism, transfer mechanism, perforating mechanism, and a typing mechanism for the typing perforator only (Figures 3 and 5).

CODE

2.06 The code combinations are set up by simultaneous selection of the punch slides. If a punch slide is released by its latch, it represents a marking condition. If a punch slide is not released by its latch, it represents a spacing condition. Every code combination includes five elements that carry the intelligence, each of which may be either marking or spacing. Marking elements in the intelligence code produce holes in the tape whereas spacing elements do not. The row of smaller holes between the second and third levels are tape feed holes and do not enter into the code permutation.

2.07 The total number of permutations of a five-unit code is two to the fifth power, or 32. In order to produce more than 32 characters and functions, a letters-figures shift operation is designed into the typing equipment. This permits each permutation, excluding those used to shift and unshift the apparatus, to represent two characters or functions. Figure 7 shows the code combinations.

3. DETAILED DESCRIPTION

FUNCTION

3.01 The function mechanism consists of a jack shaft with a gear for driving the main shaft. The main shaft assembly includes a clutch assembly and cams for actuating a rocker bail. The clutches differ in the two types of perforators in that the nontyping perforator has a two-stop clutch which stops twice during each revolution and performs its function in one half of

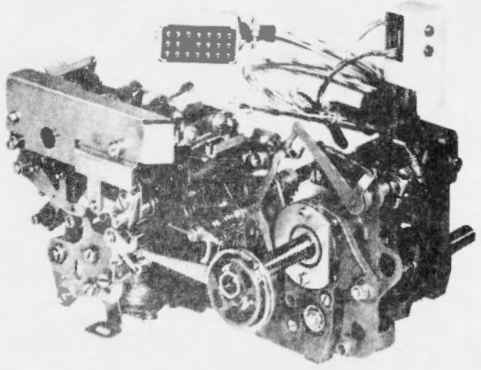


Figure 2 - Nontyping Perforator

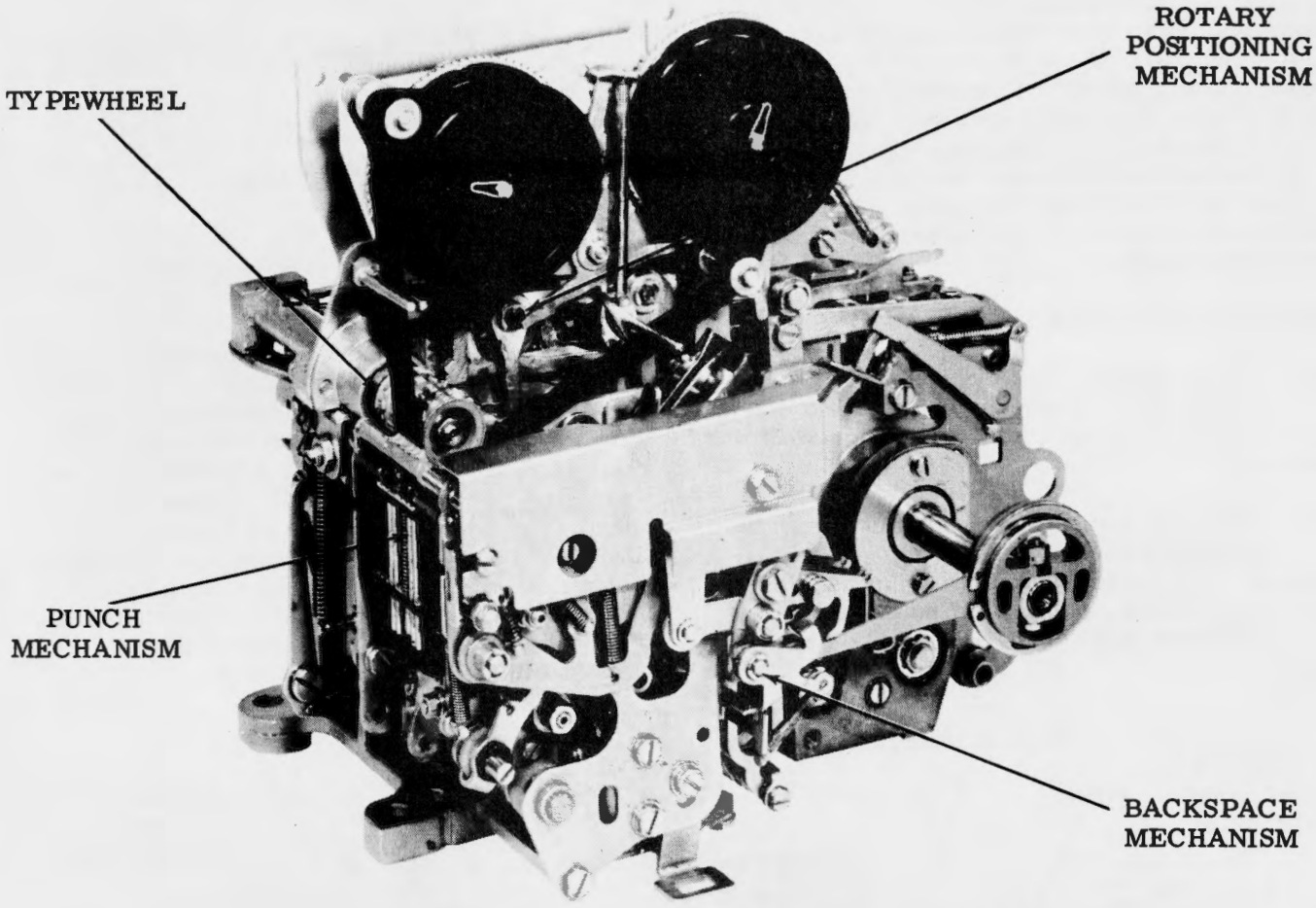


Figure 3 - Typing Perforator (Front View)

a revolution. This makes the nontyping perforator capable of operating twice as fast as a unit with a one-stop clutch. The typing perforator uses a one-stop clutch because the typing mechanism limits its speed of operation. The cams of the function shaft assembly are used to provide motion for the rocker bail, the main source of power for all functions except selection.

SELECTION

3.02 Selection is accomplished mechanically from an associated keyboard through its codebar extensions. An extension is positioned to operate each punch slide latch on the perforating mechanism when selection is made, and a perforator trip lever latch is in position to trip the perforator clutch when selection is applied at the keyboard.

PERFORATING

3.03 The perforator mechanism consists of a set of five punch slides, punch block assembly containing punch pins, toggle bail and reset bail assembly, and a tape feeding assembly. A perforator drive link connects the toggle bail and reset bail assembly to the rocker bail which provides motion for operation of the perforator mechanism.

TYPING

3.04 In addition to the function, selecting, and perforating mechanisms, the typing perforator encompasses other mechanisms necessary for printing on tape. The selection is passed through a transfer mechanism to a func-

tion box and pushbars which control a rotary positioning mechanism and an axial positioning mechanism to position a typewheel for printing. A correcting mechanism further corrects the positioning of the typewheel. A printing mechanism driven directly by the rocker bail actuates a print hammer after the typewheel has reached its correct position, and impels the print hammer upward to drive the tape and inked ribbon against the typewheel. A ribbon feed mechanism, which advances an inked ribbon one space during each operation, is actuated by the rocker bail through a ribbon drive arm.

VARIABLE FEATURES

3.05 Some variable features used with the perforators are: tape backspace mechanism, code reading contacts, and auxiliary contacts.

3.06 The tape backspace mechanism may be manually operated entirely on the perforator, or, with the addition of a magnet assembly on the perforator, it may be power operated from a keylever and switch assembly on a keyboard.

3.07 The code reading contacts are operated by the punch slides to read the code combinations which are being perforated.

3.08 The auxiliary timing contacts provide synchronizing pulses for the code reading contacts.

4. PRINCIPLES OF OPERATION

GENERAL

4.01 The general outline of operation of the two perforators is shown in the block diagram (Figure 6). The broken lines represent the nontyping perforator while the typing perforator is represented by both a broken line and solid line. Selection is applied from the keyboard. The main shaft of the perforator is continuously rotated by power from an associated motor and shafting on an associated keyboard base. The rotary motion is transferred from the main shaft through an all-steel internal expansion clutch to the function cam.

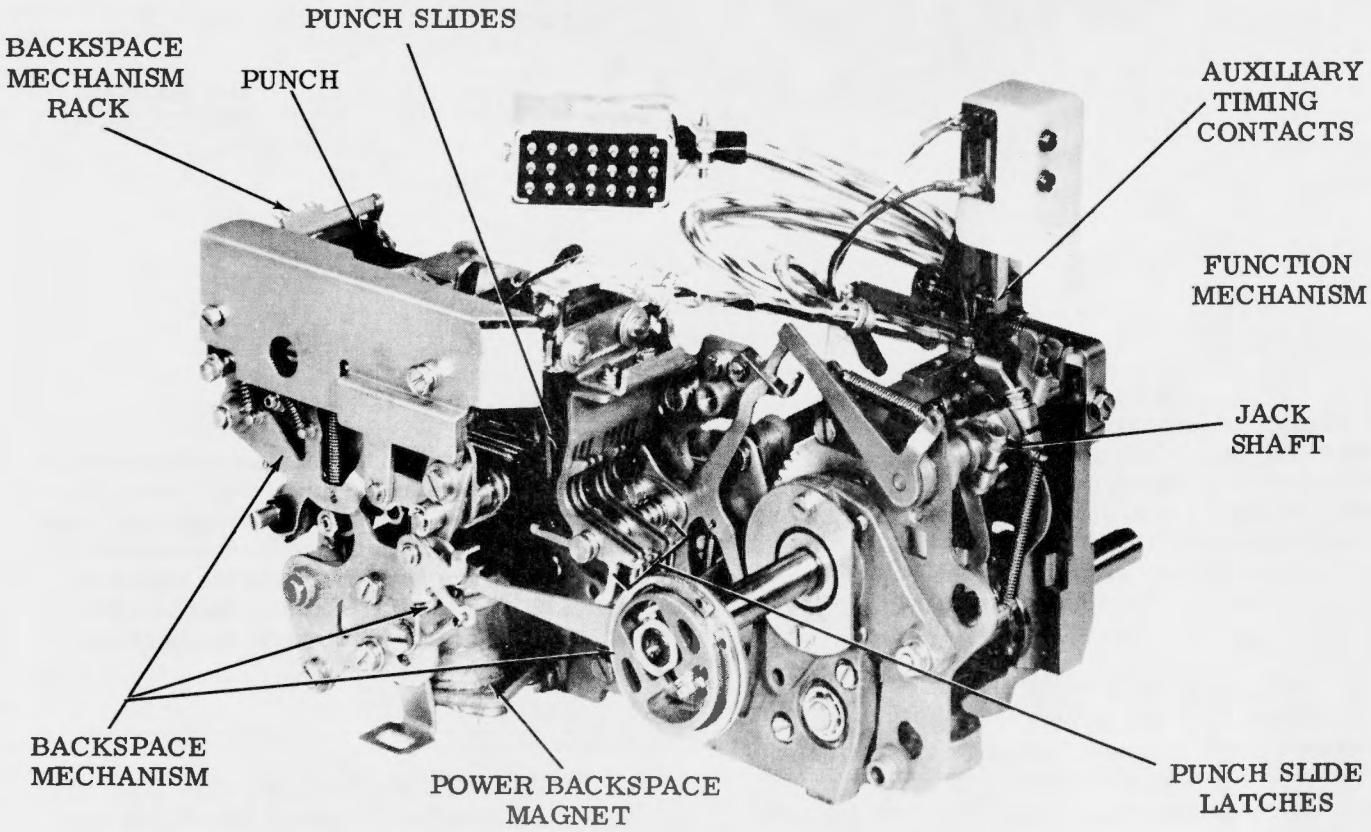


Figure 4 - Nontyping Perforator (Front View)

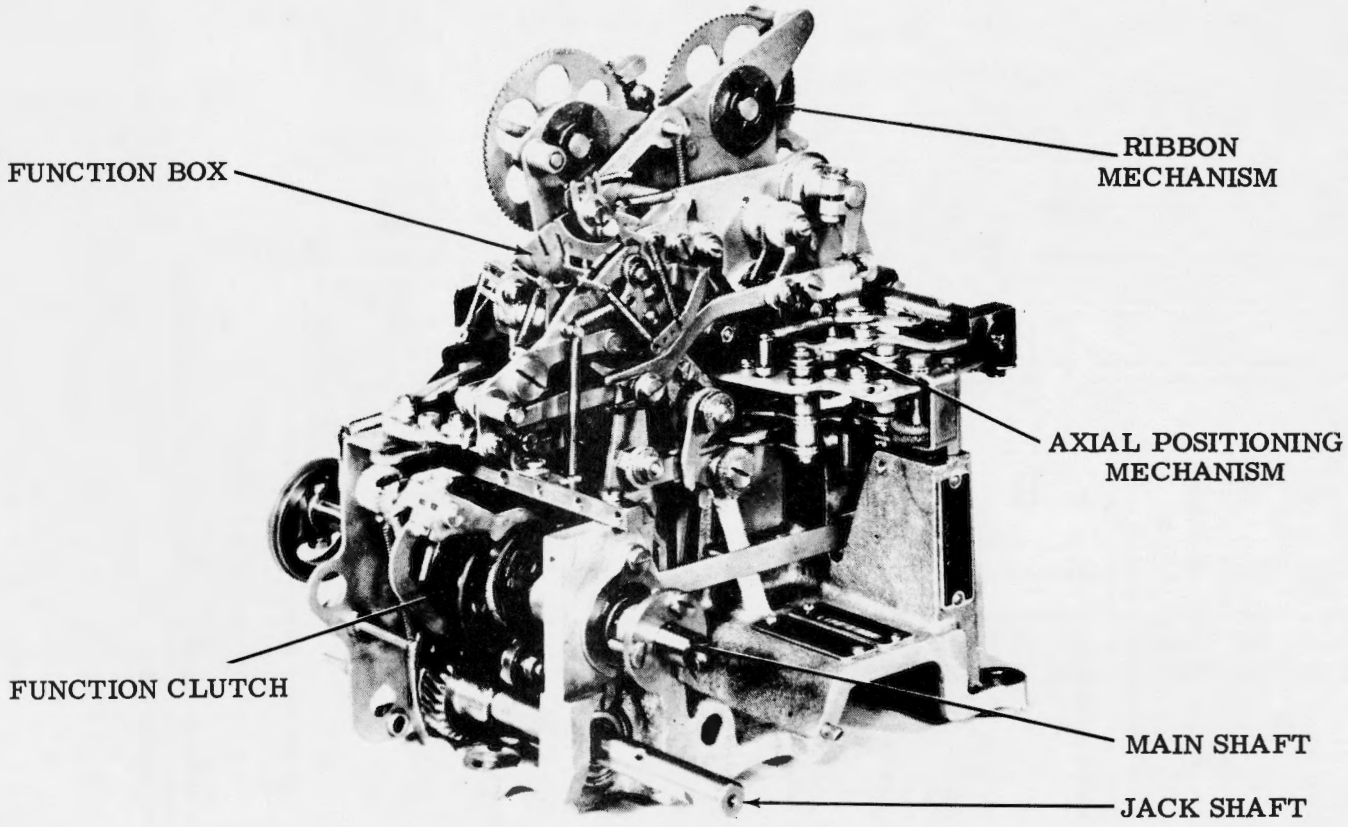


Figure 5 - Typing Perforator (Rear View)

4.02 The function cam drives a rocker bail to transfer the motion derived from the main shaft into simple harmonic motion which drives the other mechanisms of the unit.

SELECTION AND TRANSLATION

4.03 The code combinations set up by keylever on the keyboard are transferred through codebar extensions which move to the right and trip a punch slide latch for each marking condition of the code combination (Figure 7).

A. Clutch Operation

4.04 The typing perforator uses a one-stop function clutch, whereas the nontyping perforator uses a two-stop function clutch. The functions performed are essentially the same except that in the nontyping unit the function is performed during a one-half turn of the main shaft and therefore is capable of operating twice as fast as the typing unit. The typing unit is limited to a slower speed because of the typing operation performed. The operating principle of the internal mechanisms are the same except two shoe levers are used to disengage the clutch twice for each revolution of the clutch in the nontyping perforator.

One-Stop Clutch Operation (Figures 8 and 9)

4.05 The clutch drum is attached to and rotates in unison with the main shaft. In the disengaged position, as shown in Figure 9, the clutch shoes do not contact the drum, and the shoes and cam disc are held stationary. Engagement is accomplished by moving the clutch trip lever, Figure 12, away from the clutch and thus releasing stop lug A and the lower end of shoe lever B (Figure 8). 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

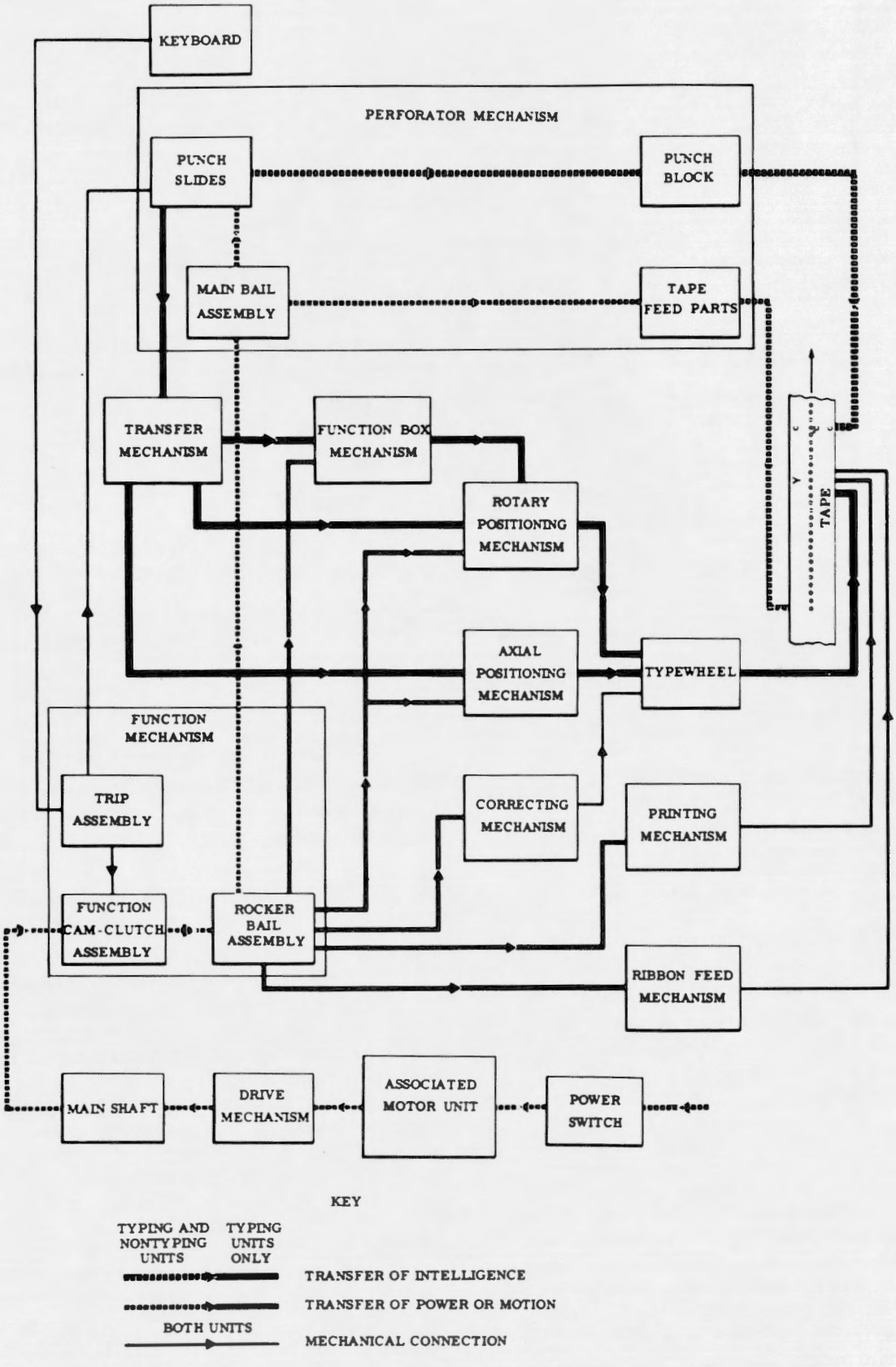


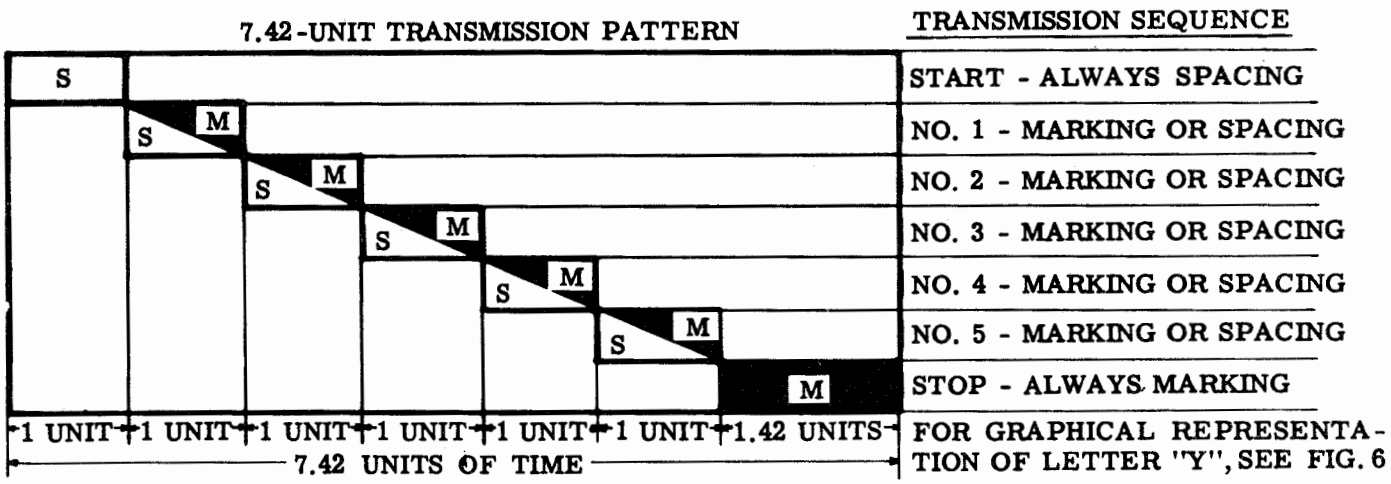
Figure 6 - Block Diagram for Typing and Nontyping Perforators

at point G. The lever end of the secondary shoe then bears against the drum at point H. The drum drives this shoe upward so that it again makes contact with 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 disc, and the disc and attached cam turn in unison with the drum.

4.06 Disengagement is effected when the lower end of shoe lever B strikes the clutch trip lever. Lug A and the lower end of the shoe lever are brought together (Figure 8), 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 latchlever seats in the indent in the cam disc and the cam is held in its stop position until the clutch is again engaged.

Two-Stop Clutch Operation (Figure 10)

4.07 The operation of the two-stop clutch, which is used exclusively on the function cam clutch of the two-shaft unit, is similar to that of the one-stop clutch, the major difference being that it can be stopped after 180 degrees of rotation rather than 360 degrees. The two-stop clutch is shown disengaged in Figure 10. When the stop arm is moved away from A, the shoe lever disc under spring tension pivots counterclockwise and carries with it the shoe lever which engages the shoe lever disc at B. The shoe lever moves the primary shoe to the left and engagement is completed as described in Paragraphs 4.05 and 4.06. After the cam clutch rotates 180 degrees, the shoe lever disc strikes the stop arm at A'. The shoe lever disc and shoe lever are pivoted clockwise and the clutch is disengaged as outlined in Paragraph 4.06.



FIGURES	-	?	:	$	3	!	&	#	8	'	(	)	.	,	9	ø	1	4	Δ	5	7	;	2	/	6	"	≈	<	≡	■	↓	↑
LETTERS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	BLANK	C.R.	L.F.	SPACE	LTR	FIG.
1	●	●		●	●	●				●	●						●		●		●		●	●	●	●					●	●
2	●		●				●		●	●	●	●				●	●	●			●	●	●						●		●	●
FEED HOLES	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
3			●			●		●	●		●		●	●		●	●		●		●	●		●	●						●	●	
4		●	●	●		●	●			●	●		●	●	●			●				●		●				●			●	●
5		●					●	●				●	●		●	●	●			●		●	●	●	●	●					●	●

(TYPICAL CHARACTER ARRANGEMENT)

Figure 7 - Code Chart

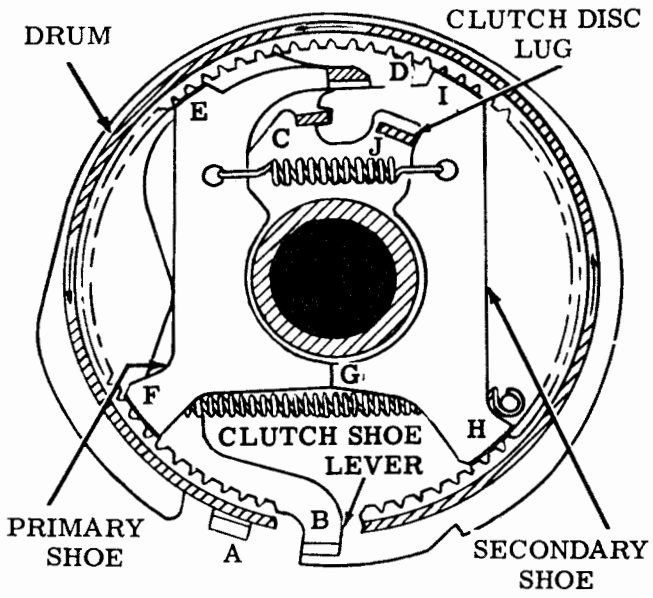


Figure 8 - One-Stop Clutch (Engaged)

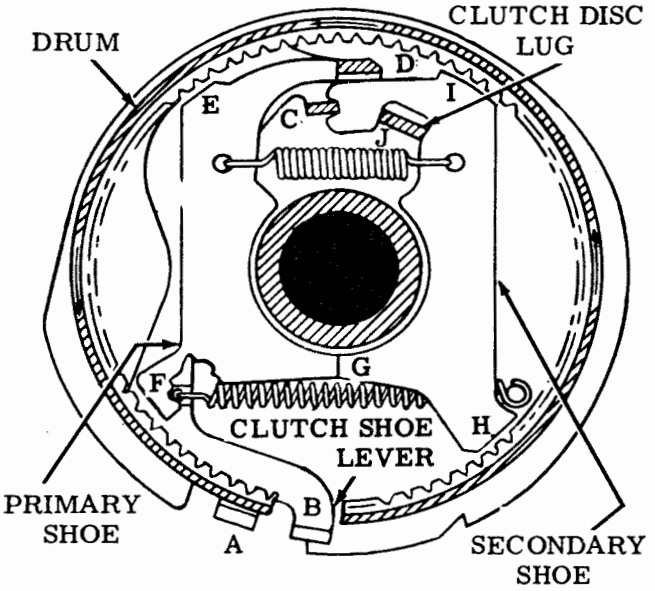


Figure 9 - One-Stop Clutch (Disengaged)

B. Transfer

4.08 Near the end of selection, the transfer mechanism moves the intelligence in the form of a mechanical arrangement from the punch slides to the function box and positioning mechanisms. Included in the mechanism are five linkages, each of which is associated with a punch slide. A linkage consists of a transfer lever, a pulse beam and a bell crank. Since the linkages are similar, only the no. 4 is shown in its entirety in Figure 11.

4.09 The linkages associated with the unselected punch slides remain in their unselected position as in Figures 11 and 12. However, the selected slides in moving to the left, pivot the associated transfer levers which, in turn, move corresponding pulse beams clockwise (as viewed from above). The selected beams allow associated bell cranks under spring tension to pivot counterclockwise and lift attached pushbars. The pushbars, in turn, control the positioning mechanisms. In the period of the last half of the function cycle, the selected slides are moved back to the right (4.46) and return the linkages to their unselected position.

4.10 Slotted upper arms of the bell cranks extend up into the function box and control its operation as described in Paragraph 4.34. An additional bell crank, not associated with a transfer linkage, is specifically concerned with the letters-figures shift.

MOTION FOR TYPING AND PERFORATING

A. General

4.11 The motion of the main shaft is conveyed to the mechanisms concerned with typing and perforation by the function mechanism, which is comprised of a cam clutch, a clutch trip assembly (Figure 12) and a rocker bail (Figures 13 and 14).

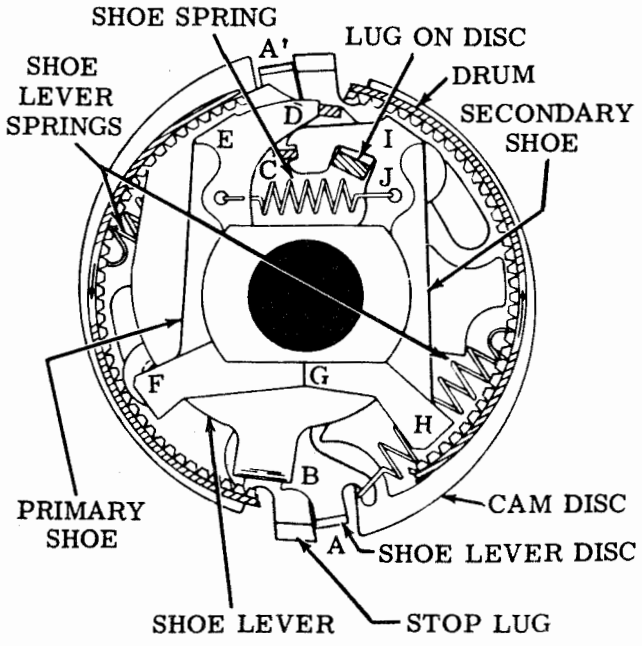


Figure 10 - Two-Stop Clutch

B. Function Cam Clutch and Clutch Trip Assembly

4.12 The trip assembly is shown in its unoperated condition in Figure 12. Through codebar extensions and a clutch trip bar link, Figure 12, operation of a keylever on an associated keyboard releases the punch slide latches and trips the function clutch. A perforator trip lever latch is positioned underneath an extension of the perforator trip lever. When a keylever is operated, the perforator trip lever latch rotates a main trip lever counterclockwise. A reset bail trip lever attached to the main trip lever lowers the perforator reset bail and releases the punch slides (4.43); and an upper arm of the main trip lever moves out of the way of a clutch release, which falls against a down-stop and rotates a trip shaft counterclockwise. Immediately, the perforator trip lever latch returns to its unoperated position, and the upper arm of the main trip lever moves down against the release. When the trip shaft is rotated by the release, it moves an attached clutch trip lever out of engagement with the clutch shoe lever. The clutch engages, and the cam clutch begins its cycle. The internal operation of the clutch is the same as that in Paragraph 4.05.

4.13 About midway through the function cycle, an eccentric pin on the function cam lifts a reset arm, which rotates the trip shaft clockwise. The release is moved up and allows the main trip lever to raise the reset bail as it moves to its downstop. The pin on the reset cam then moves out from under the reset arm, and the release is permitted to return to its unoperated position against the main trip lever. When the clutch completes its cycle, the clutch shoe lever strikes the trip lever, and the clutch disengages.

C. Rocker Bail (Figures 13 and 14)

4.14 The function cams and the rocker bail translate the rotation of the main shaft into simple harmonic motion, which the rocker bail distributes to the operating mechanisms of the unit.

4.15 Since the nontyping perforator operates only the mechanism for perforating tape, a different rocker bail is used to drive the punch mechanism only (Figure 14).

4.16 The rocker bail, used in the typing perforator, includes two upward extensions which transfer the harmonic motion to:

(a) Ribbon feed mechanism

(b) Perforator

(c) Correcting mechanism

(d) Function box

(e) Printing mechanism

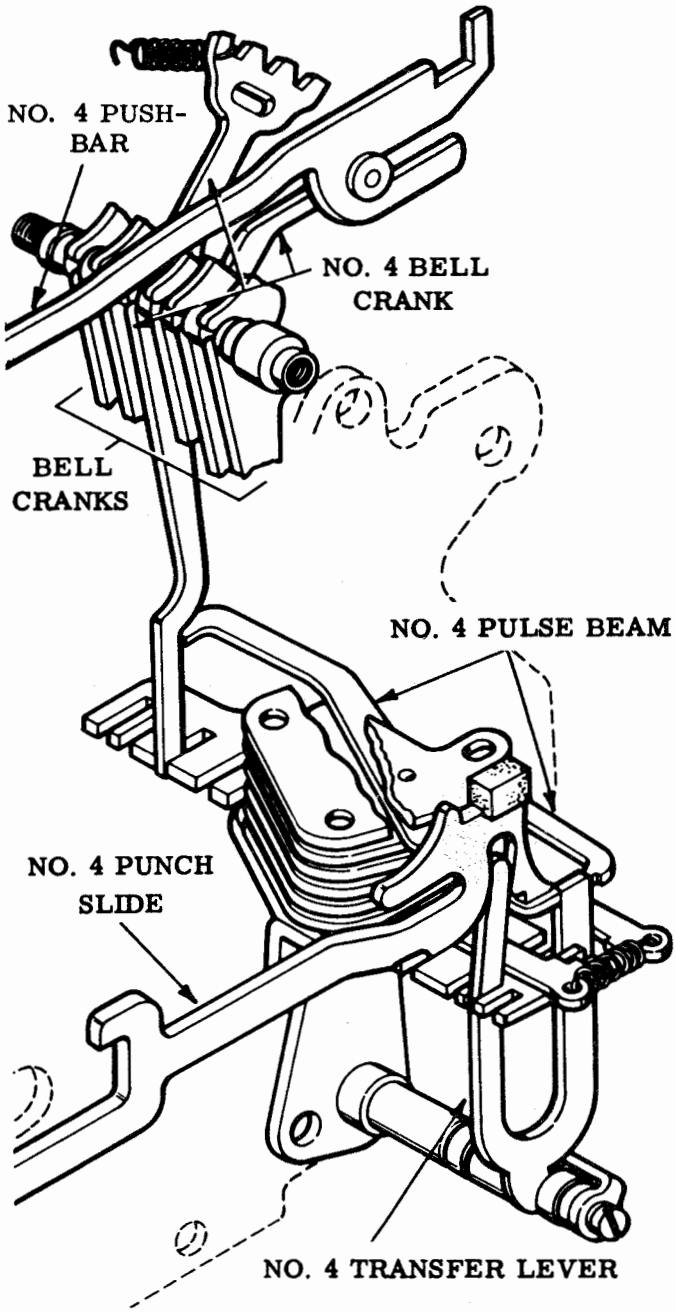


Figure 11 - Transfer Mechanism

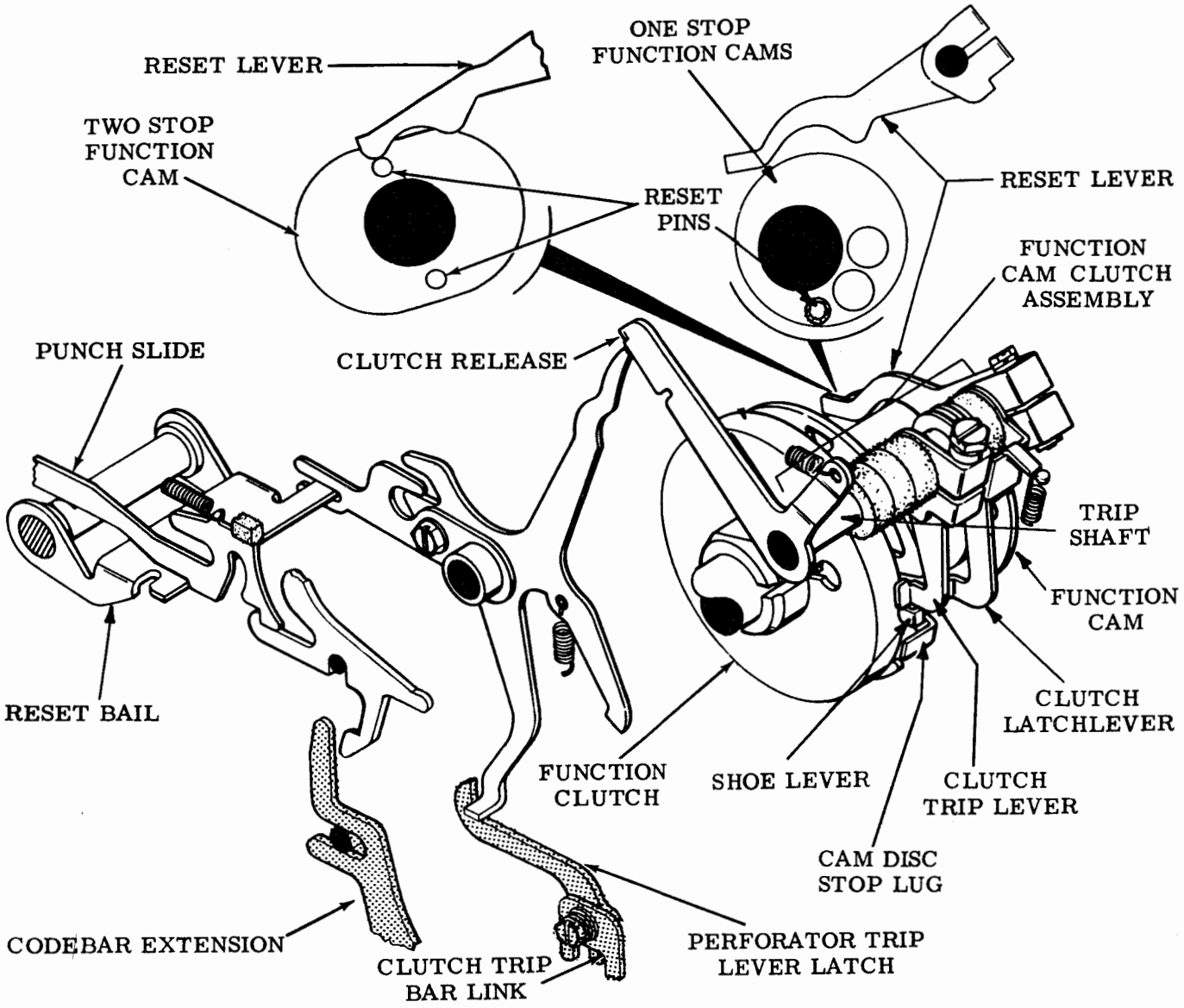


Figure 12 - Function Cam Clutch and Clutch Trip Assembly

(f) Oscillating assembly

(g) Pushbars of the axial and rotary positioning mechanisms

The bail is shown in its home position in Figure 13. Through each function cycle, the function cams bear against the rollers and cause the bail to rock to the right (as viewed from the rear in Figure 14) during the first half of the cycle and then back to the home position during the latter part of the cycle.

TYPING

A. General

4.17 The characters used to type the received intelligence - letters, figures, and symbols representing various functions - are embossed on the cylinderal surface of the metal typewheel (Figure 15). During the function cycle, the axial and rotary positioning mechanisms (Figures 16 and 18), having received the intelli-

gence from the transfer mechanism, position the wheel so that the character represented by the received code combination is selected. Following typewheel positioning the correcting mechanism (Figures 16 and 18) accurately aligns the selected character. Then the printing mechanism (Figure 20), by means of a hammer, drives the tape and inked ribbon against the wheel and imprints the character. A ribbon feed mechanism (Figure 21) advances the ribbon and reverses its direction of feed when one of two ribbon spools is depleted. Near the end of the function cycle the axial positioning mechanism retracts the typewheel and a ribbon guide so that the last printed character is visible. The letters or the figures code combination sets up an arrangement in the transfer mechanism which permits the function box (Figure 19) to operate and cause the rotary positioning mechanism to shift the typewheel through 180 degrees of rotation.

B. Typewheel Positioning

General

4.18 A typical typewheel character arrangement is shown in Figure 15 in which the wheel's cylindrical surface is shown rolled out into a plane. There are 16 longitudinal rows, each of which is made up of four characters numbered 0 to 4 from front to rear. The surface is divided into two sections, a letters and a figures, each containing eight rows. The fifth row counterclockwise from the division line in both sections is numbered 0. There are four rows in one direction from 0 numbered 1 to 4 and designated as counterclockwise rows, and three rows in the other direction numbered 1 to 3, designated as clockwise rows. It should be noted that the clockwise and counterclockwise modifiers refer to the direction of rotation of the wheel to select the rows and not to their position on the wheel.

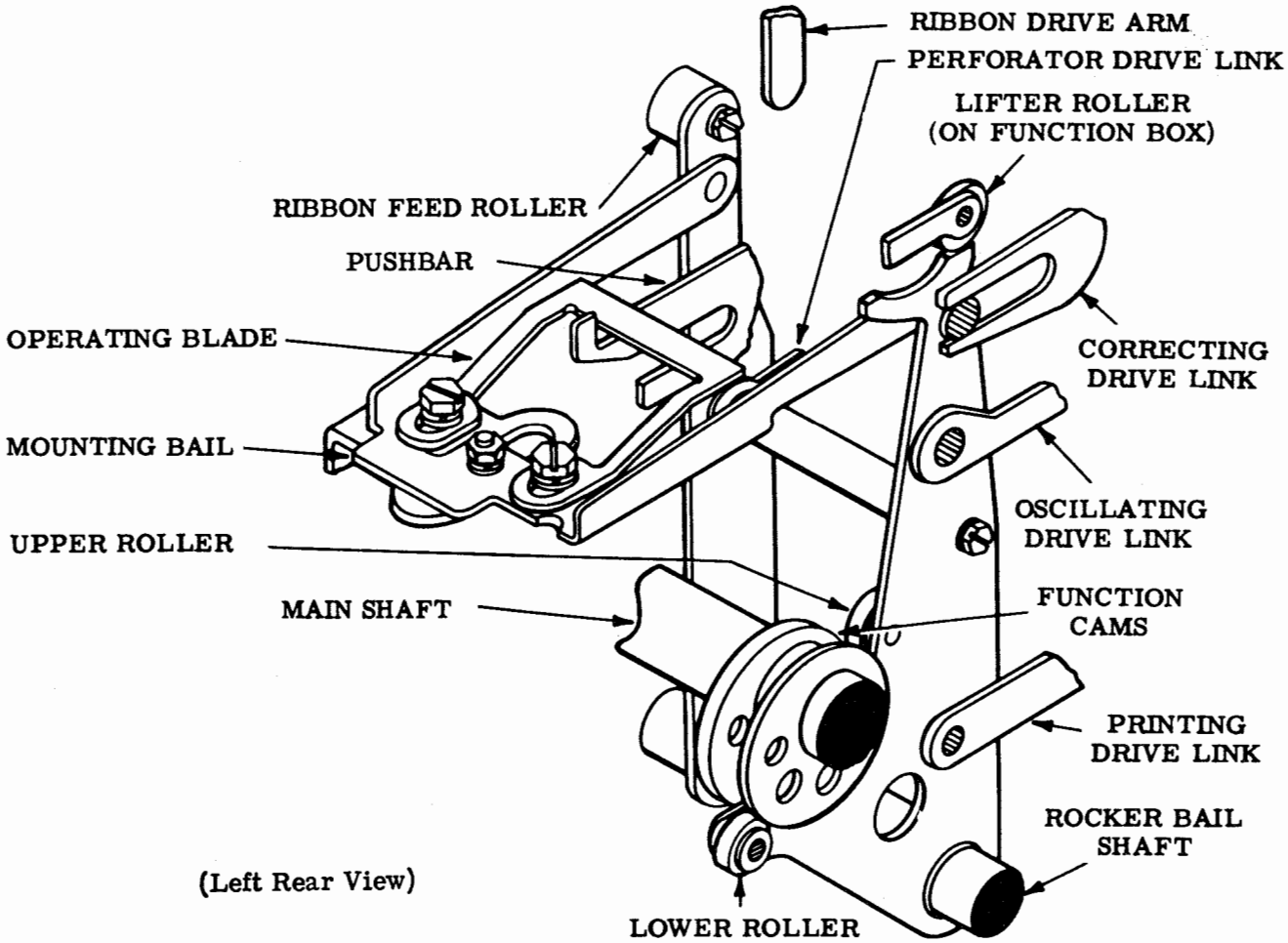


Figure 13 - Typing Perforator Rocker Bail Assembly

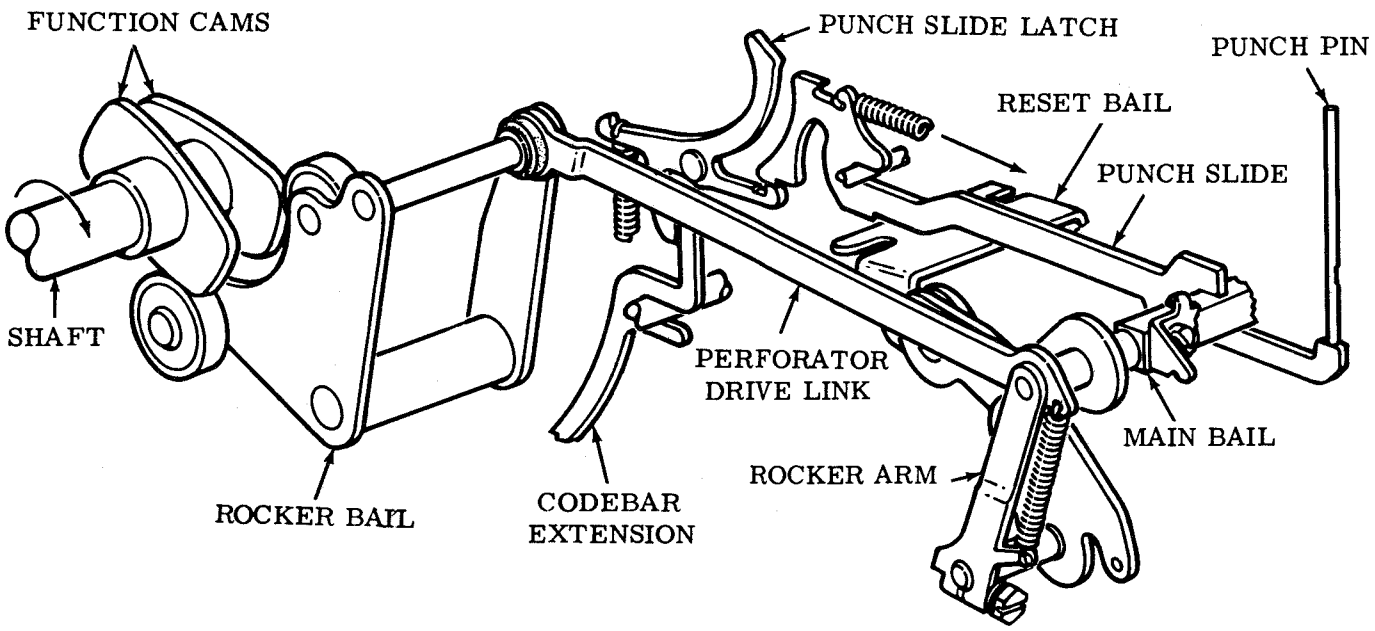


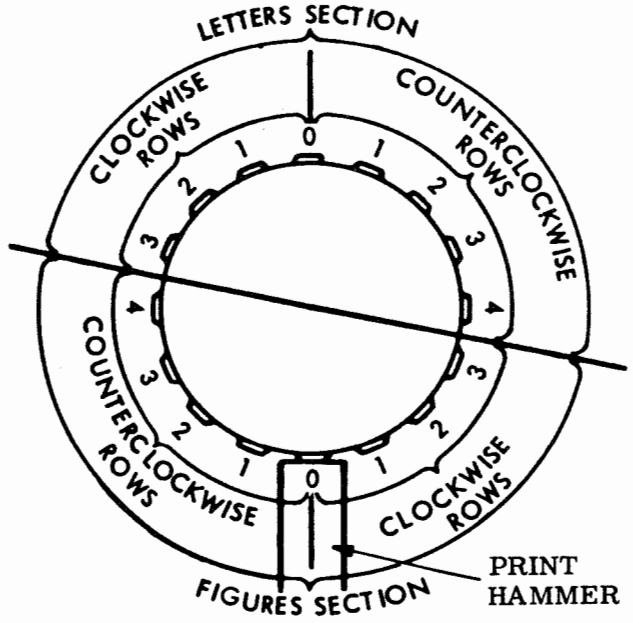
Figure 14 - Nontyping Perforator Rocker Bail

4.19 Each printing operation (excluding those devoted to the letters-figures shift) begins and ends with the typewheel in the home position of the section containing the character to be printed, ie, with the no. 0 character of the no. 0 row at the point of contact of the print hammer. (Actually, inasmuch as the wheel is retracted to show the last printed character (4.27), the no. 0 character is slightly to the rear, but for this discussion it will be assumed that it is at the point of contact.) During the printing operation the axial and rotary positioning mechanisms, transferring separate but simultaneous motions to the wheel, position it so that the character represented by the received code combination is at the point of contact of the hammer at the time of printing. The rotary mechanism, which is controlled by the no. 3, 4 and 5 selecting elements of the code, revolves the wheel so as to select the proper row; and the axial mechanism, which is governed by the no. 1 and 2 elements, moves it forward and rearward along its axis so as to select the proper character in the row. Rotation of the typewheel to print in either the letters or the figures section is controlled by the no. 7 element of the code. The letters-figures shift (4.33), which consists of rotating the wheel eight rows from the home position of one section to that of the other, requires a separate operation of the equipment and results in the printing of the letters or figures symbol.

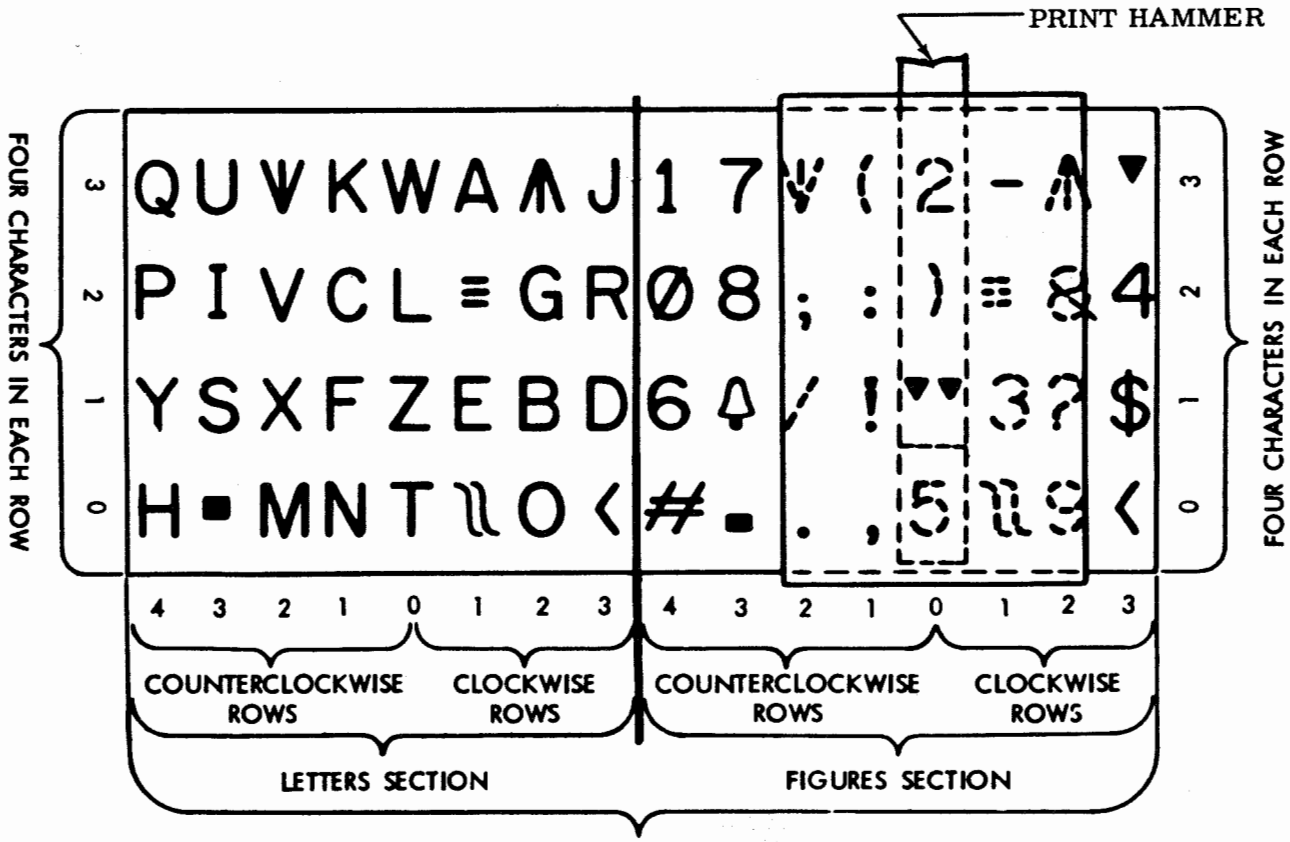
4.20 To illustrate the above, if the wheel is in the figures condition, as shown in Figure 16, and the numeral "5" is to be printed, there is no movement of the wheel during the printing operation, because "5" is already at the point of contact of the hammer. However, if the letter "I" is to be printed, the signaling code for letters must first be viewed to shift the typewheel eight rows to the letters home position. Then during the next operation it is rotated three rows counterclockwise and moved forward two characters so that "I" is at the point of contact of the hammer. Printing takes place, and the wheel is then returned to the letters home position.

Rotary Positioning (Figures 16 and 17)

4.21 The rotary positioning mechanism revolves the typewheel so that the row containing the character to be printed is aligned with the print hammer at the time of printing. Mounted on the front plate, the mechanism includes two eccentric assemblies as shown in Figures 16 and 17. Each assembly includes a primary shaft, a section of which is formed into a pinion. A secondary shaft, mounted in the primary and offset from its center, forms an eccentric, referred to as the rear eccentric. A portion of the secondary shaft is also a pinion, and a crank pin mounted on its disc-like forward surface forms a secondary, or front, eccentric. Each of the four pinions of the two



A. FRONT VIEW SHOWING 16 LONGITUDINAL ROWS



B. TOP VIEW SHOWING CYLINDRICAL SURFACE IN A PLANE

Figure 15 - Typical Typewheel Character Arrangement

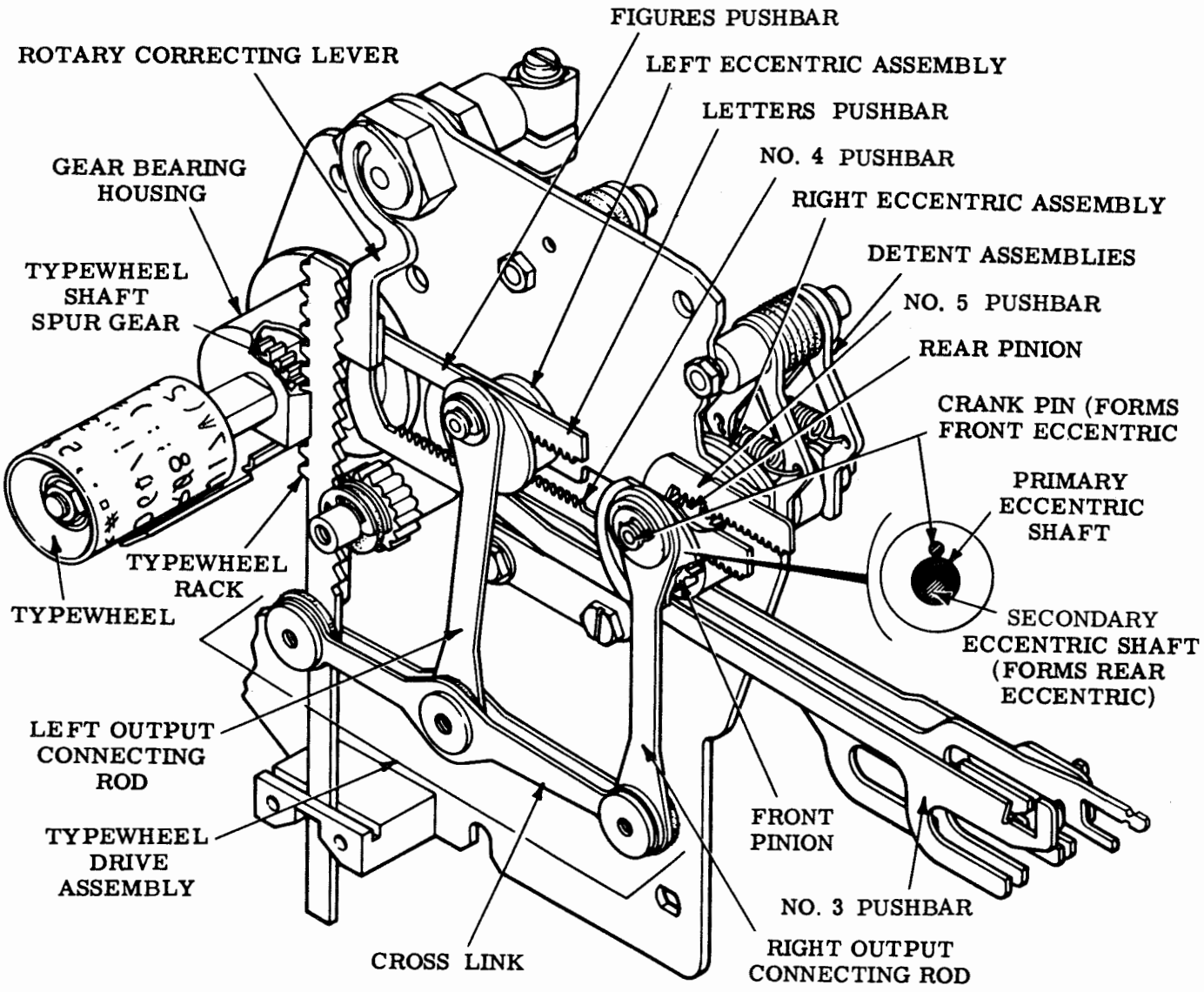


Figure 16 - Rotary Positioning Mechanism

eccentric assemblies is engaged by the rack of a pushbar: the no. 3 bar engages the rear pinion, and the no. 5 engages the right pinion. The left front pinion is engaged by both the letters and the figures pushbar.

4.22 The eccentric assemblies are linked to a typewheel shaft by a drive assembly as shown in Figure 16. The typewheel is secured to the front of the shaft which is supported by a bearing housing mounted at the left rear of the front plate (Figure 18). A spur gear which meshes with a typewheel rack rides on the shaft in a bearing housing. The shaft is free to move axially in the housings and the spur gear, but flats in its circumference which bear against flats in the gear ensure its rotating when the gear rotates.

4.23 When in response to a marking pulse a pushbar is lifted by its bell crank, as described in 4.07, the rocker bail operating blade (see Figures 14 and 17) engages a slot in the bar and moves it to the left during the first part of the function cycle. The bar, by means of its rack and the mating pinion, rotates the associated eccentric one-half revolution where it is locked in position by a detent assembly while printing takes place. When the bail rocks back to the right during the latter part of the cycle, it returns the bar and eccentric to their home positions where the eccentric is again detented. The preceding does not apply to the no. 5 pushbar which is designed so that it is selected - moved to the left - on spacing rather than on marking, nor to the left front eccentric which

affects the letters-figures shift (4.33). In both assemblies one-half revolution of the rear eccentric results in its maximum vertical displacement which is transferred through the front eccentric to a crank pin. Similarly, one-half revolution of the front eccentric results in its maximum displacement being transferred to the crank pin. If both eccentrics are rotated, the displacement of the crank pin is equal to the algebraic sum of the two displacements which may be in either the same or opposite directions. Both assemblies are so designed that, if the displacement of the rear eccentric is taken to be one unit, the displacement of the front eccentric is four units. Four permutations are thus available: zero (neither eccentric displaced), one unit (rear eccentric displaced), four units (front eccentric displaced), and five or three units depending on how the assembly is set up (both eccentrics displaced).

4.24 In the right assembly the home position of the rear eccentric is down and the home position of front eccentric is up (Figure 17). Thus their displacements are in opposite directions - up for the rear and down for the front - and their aggregate displacement is three units downward. Any displacement occurring in the right assembly is imparted to the typewheel rack in equal quantity but opposite direction. For example, if the no. 5 pushbar is selected, it causes the right rear eccentric to be displaced, and one unit of upward motion is transferred through a right output connecting rod to the right end of a cross link (Figure 16). The cross link pivots about a left output connecting rod and at its left end imparts one unit of downward displacement to the typewheel rack. The rack rotates the spur gear, shaft and typewheel one row of characters clockwise from the home position, and the no. 1 clockwise row (Figure 15)

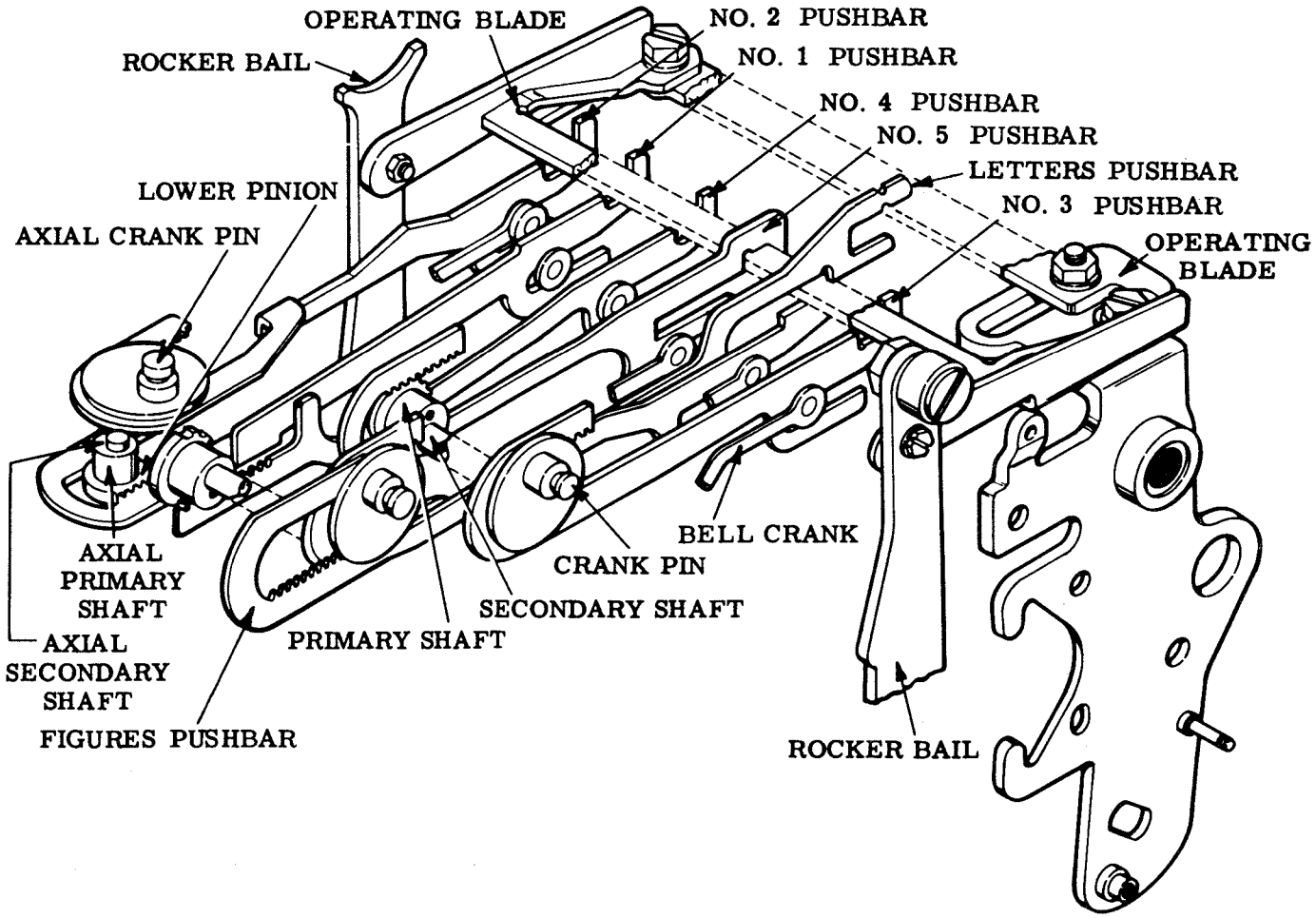


Figure 17 - Pushbars and Eccentric Assemblies

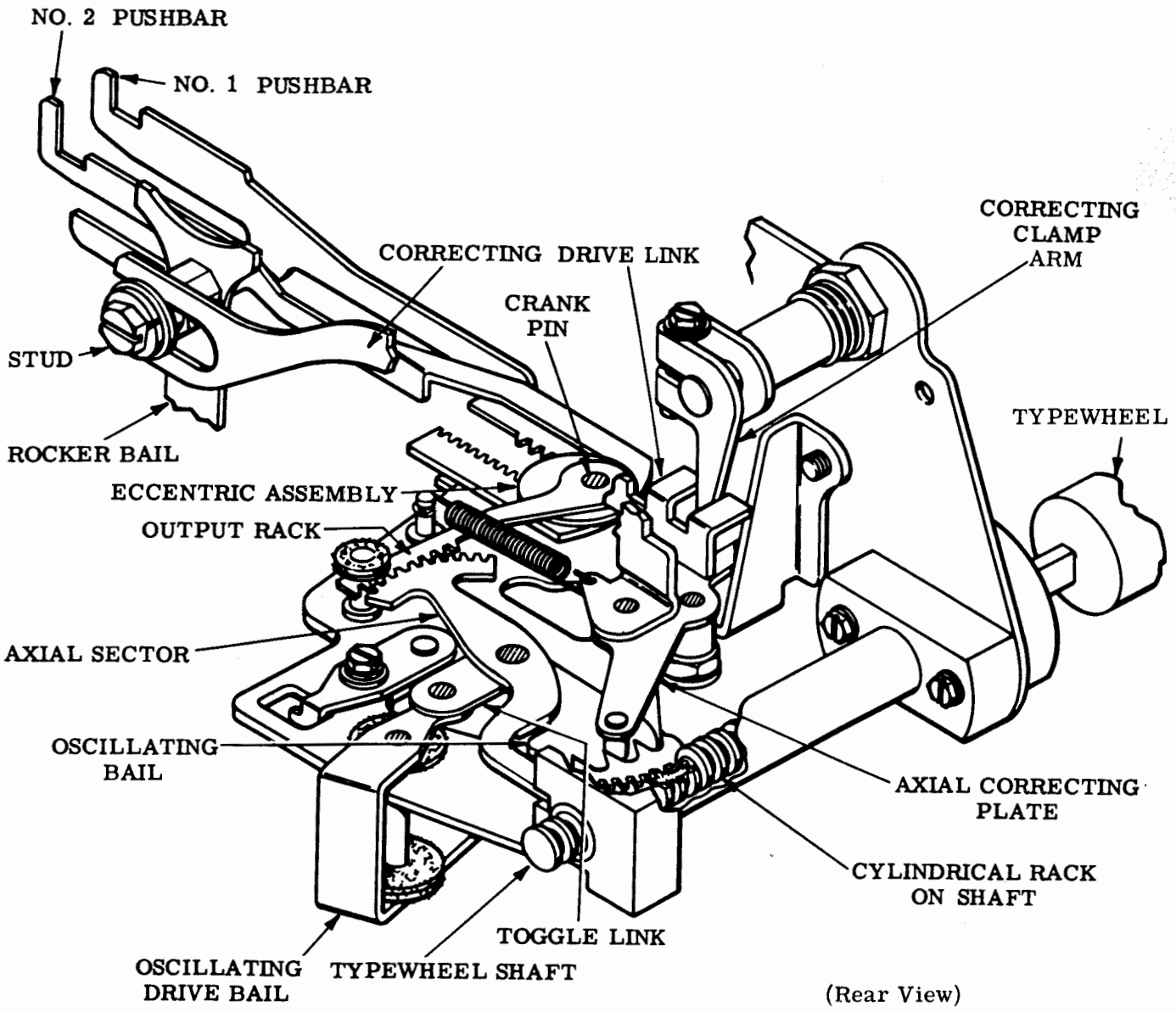
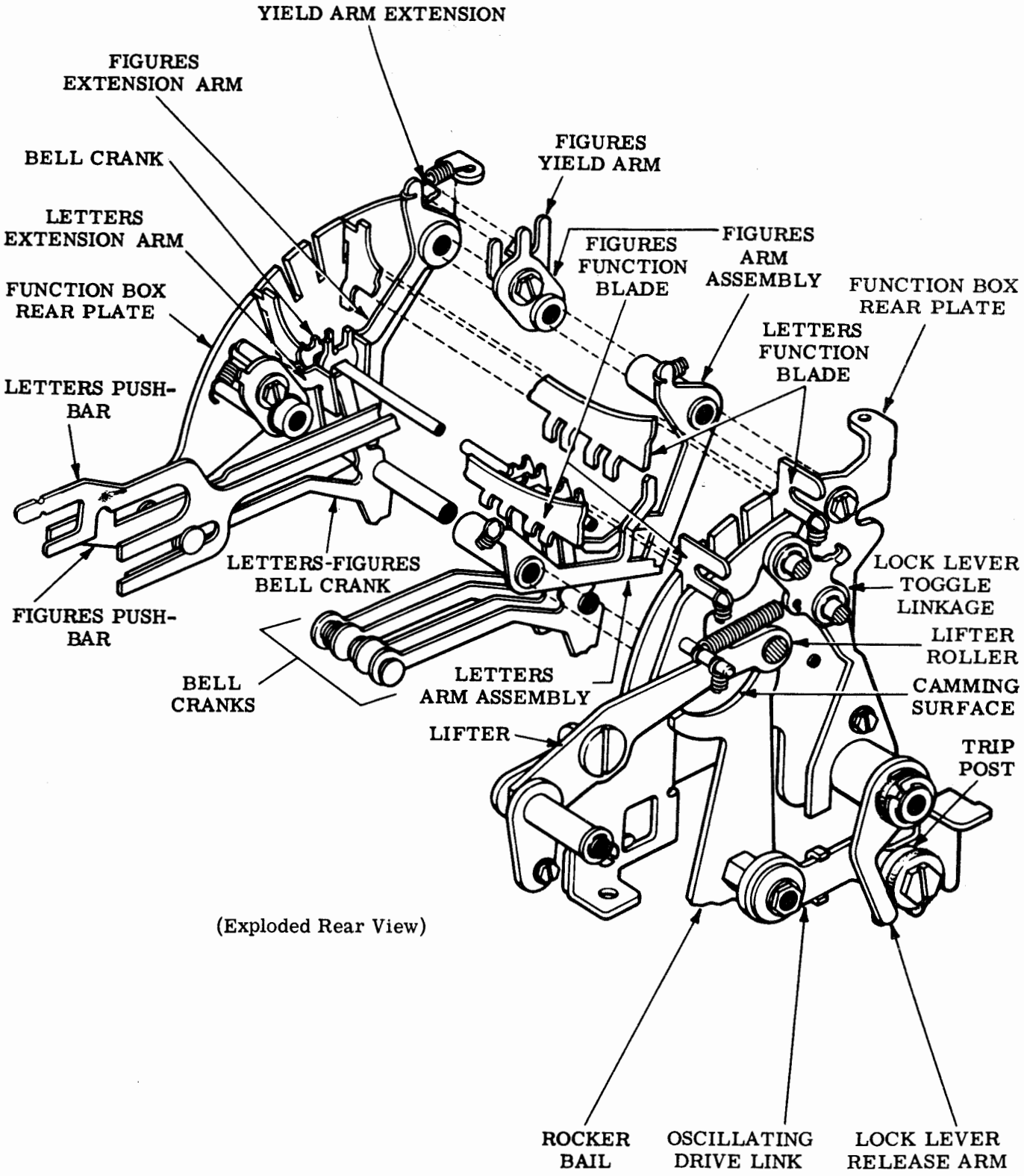


Figure 18 - Axial Positioning Mechanism

is presented to the print hammer at the time of printing. On its right stroke the no. 5 pushbar returns the eccentric and the typewheel to their home positions. In a similar manner, selection of the no. 3 pushbar results in a four unit downward displacement of the right front eccentric and a four-row, counterclockwise rotation of the typewheel. Selection of both the three and five type bars results in a three-row, counterclockwise rotation of the typewheel.

4.25 The home position of the left rear eccentric is up, and any displacement appearing in the left assembly is transferred to the typewheel rack in double quantity in the same direction. When the no. 5 pushbar is selected, the left rear eccentric is displaced one unit downward. This movement is conveyed through the left output connecting rod to the approximate midpoint of the cross link. The cross link pivots about the right output connecting rod and its left end imparts two units of downward movement to the typewheel rack which rotates the typewheel two rows clockwise from its home position.

4.26 When both eccentric assemblies are displaced, the motion occurring in the typewheel rack is equal to the algebraic sum of the motions resulting from each assembly. For ex-



(Exploded Rear View)

Figure 19 - Function Box

ample, if the no. 3, 4 and 5 pushbars are all selected, three units of upward displacement from the right assembly and two units of downward displacement from the left assembly occur as one unit (3-2 = 1) of upward displacement in the rack and a counterclockwise rotation of one row in the typewheel. If neither the no. 3, 4 nor 5 pushbar is selected, the mechanism remains inactive and printing takes place in the no. 0 row. Excluding the left front eccentric, which is only used for the letters-figures shift, there are eight permutations available in the other three eccentrics, making it possible to select any of the eight rows in a given section (Figure 15).

Axial Positioning (Figures 17, 18 and 20)

4.27 The functions of the axial positioning mechanism are to position the typewheel so that the proper character in the selected row is aligned with the hammer at the time of

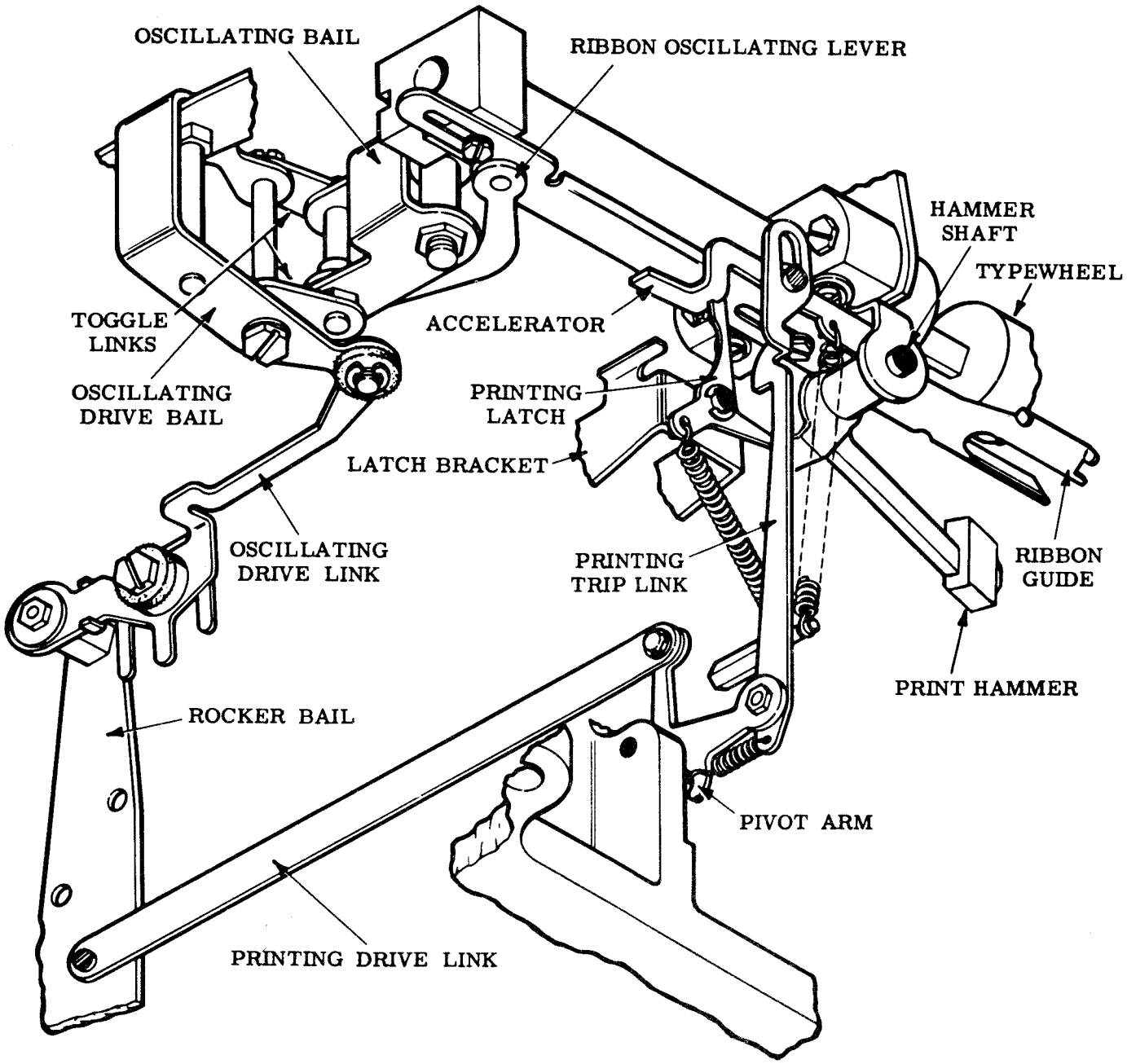


Figure 20 - Printing Mechanism

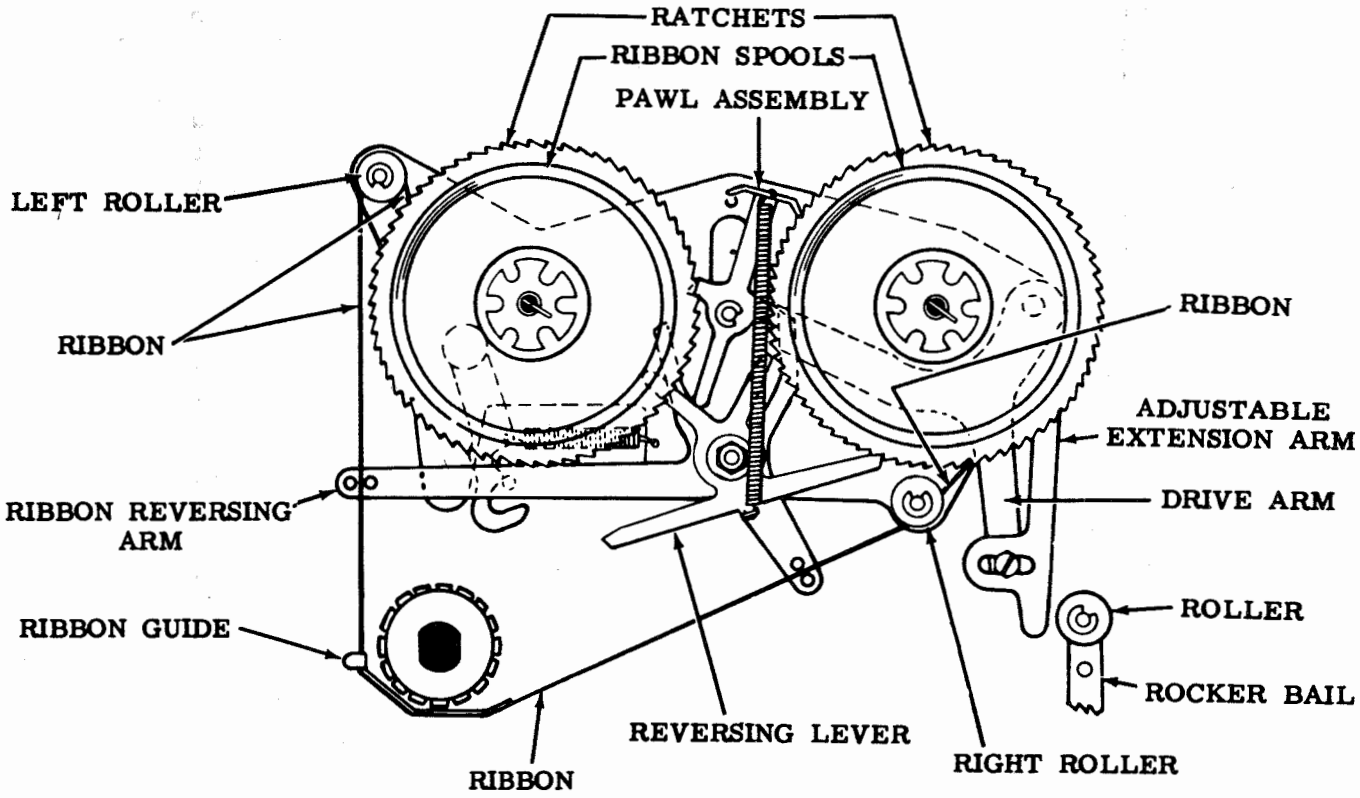


Figure 21 - Ribbon Feed Mechanism

printing, and to retract the typewheel and ribbon guide at the end of the function cycle so that the last typed character is visible. The mechanism mounts on an axial bracket supported by the frame and the front plate and includes an eccentric assembly similar to those of the rotary positioning mechanism (Figures 17 and 18). Two eccentrics, a lower whose pinion is driven by the no. 1 pushbar, and upper whose pinion is driven by the no. 2 pushbar, rotate in a horizontal plane in bearing housings attached to the bracket. The eccentric assembly is linked to the typewheel shaft by an axial output rack and sector as shown in Figure 18.

4.28 The selection of either the no. 1 or no. 2 pushbar results in the maximum displacement toward the rear of the associated eccentric, and the eccentrics are so designed that, if the displacement of the lower is taken to be one unit, that of the upper is two units. Again four permutations are available at the crank pin: zero (neither eccentric displaced), one unit (lower eccentric displaced), two units (upper eccentric displaced), and three units (both eccentrics displaced).

4.29 If during a function cycle neither pushbar is selected, no motion occurs in the axial positioning mechanism with the exception of that resulting from the oscillating assembly (4.30), and the no. 0 character of the selected row is aligned with the hammer at the time of printing (Figure 15). On the other hand, if the no. 1 pushbar is selected, it causes the lower eccentric to revolve and one unit of displacement to be transferred by the crank pin to the axial output rack. The rack moves to the rear and passes the motion to the axial sector which pivots counterclockwise (as viewed from above). The right end of the sector, by means of a cylindrical rack in the typewheel shaft, moves the typewheel one character forward from its home position. The no. 1 character is printed, and when the pushbar reverts to its unselected position it returns the axial linkage and typewheel to their home positions. If the no. 2 pushbar is selected, the no. 2 character is printed, and if both pushbars are selected, the no. 3 character is printed. The cylindrical rack has no lead, and the shaft can thus be rotated while being moved axially.

4.30 With each cycle of the function clutch, an oscillating drive link transfers from the rocker bail an unselected motion to an oscillating drive bail (Figures 18 and 20). This movement is passed by toggle links to an oscillating bail and the sector pivot. The effect of this action is to introduce a separate motion to the sector tending to cause it to pivot about the teeth on the output rack. During the fore part of the function cycle, if no axial pushbar is selected, the right end of the sector is moved forward slightly and positions the no. 0 character for printing. At the end of any cycle the sector retracts the typewheel slightly so that the last printed character is visible. Concurrent with the above operation, a ribbon oscillating lever is made to pivot about its left end and with each cycle projects and retracts the ribbon guide which would obstruct the view of the character (Figure 20).

Correction (Figures 16 and 18)

4.31 After the typewheel has been positioned by the axial and rotary positioning mechanisms, the selected character is more accurately aligned for printing by the correcting mechanism which compensates for any play and backlash in the positioning linkages. Each function cycle the rocker bail transfers motion through a correcting drive link to a correcting clamp and shaft (Figure 18). The shaft pivots a rotary correcting lever (Figure 16) which is equipped with an indentation that engages a tooth in a typewheel rack. There is a tooth in the rack for each row of characters (16 in all), and they are so correlated with the typewheel that when a tooth is engaged by the corrector, its row is accurately aligned with the print hammer. Axial correction, which is accomplished simultaneously, is similar to rotary correction: the drive link rotates an axial correcting plate counterclockwise (as viewed from the above), and a roller mounted on the plate engages a notch in the axial sector (Figure 18). Thus the typewheel is accurately aligned in both fields of motion just before printing takes place. During the latter part of the function cycle, a correcting drive link spring returns the correcting mechanism to its home position.

4.32 Since the rocker bail is the source of motion for both the pushbars and the positioning mechanisms, correction must take place at a point near enough to the extreme travel of the bail that it does not interfere with the movement of the typewheel rack or axial sector. In addition, because the rocker bail controls the tripping of the print hammer, which occurs very late in the bail's stroke, it becomes necessary to utilize the time between the tripping of the hammer and its striking the paper to accomplish correction. The delay in actuating the correcting mechanism is effected by allowing a drive stud on the rocker bail to slide in an elongated slot in the correcting drive link during the early part of the cycle.

Letters-Figures Shift (Figures 16 and 19)

4.33 The purpose of the letters-figures shift is to rotate the typewheel from the home position of one section to that of the other (Figure 15). It is effected by means of the function box mechanism which is made up of a number of assemblies mounted on two plates located at the upper rear of the typing reperforator (Figure 19). When the unit is in the letters condition, as shown in Figures 16 and 19, and the figures code combination (12-45) is received, the transfer mechanism sets up the figures arrangement in the bell cranks during the selecting cycle (4.08). Then, as the rocker bail moves from its home position during the first part of the function cycle, a lifter roller, under spring pressure, follows a camming surface on the rear arm of the bail (Figure 19). The lifter allows letters and figures function blades to move down and, by means of tines on their lower surface, feel for an opening in the slotted upper arms of the bell cranks.

4.34 The slot arrangement of the no. 1, 2, 4 and 5 bell cranks is identical and permits the entry of both function blades when all are selected. However, on receipt of the figures code combination, the no. 3 bell crank permits entry of the figures blade while blocking the letters blade. In moving all the way down, the figures blade encounters a projection of a figures arm assembly and causes the arm assemblies to shift from their letters to figures position. A yield arm extension attached to the figures arm assembly pivots a figures extension arm away from the letters-figures bell crank. A letters extension arm, under spring tension, rotates the bell crank clockwise (Figure 19) and the bell crank lifts the letters and figures pushbars. As the bail reaches its extreme position, the lifter is cammed up and raises the function blades.

4.35 While the letters-figures bell crank is being positioned by the function box, the no. 1, 2 and 4 pushbars are selected, the typewheel is moved two rows clockwise and three

characters forward, and the figures symbol is printed (4.21 - 4.27). On its return stroke, the rocker bail operating blade encounters a shoulder on the figures pushbar (which was lifted as described above) and moves the bar to the right as viewed from the front in Figures 16 and 17. The common pinion moves the letters pushbar to the left, and the left front eccentric shifts from its up to down position. Since the typewheel has been displaced two rows clockwise during the first part of the cycle, it is rotated six more rows to the figures home position. As the bail returns to its home position during the last half of the cycle, a lock lever toggle linkage (Figure 19) prevents the lifter roller from following its camming surface, and the lifter holds the function blades up so they do not drop onto the bell cranks. As the bail nears its home position, a trip post riding on the oscillating drive link strikes a lock release arm, buckling the toggle linkage and permitting the lifter roller to again fall on the bail camming surface.

4.36 In a manner similar to that just described, when the letters code combination (12345) is received, the function box causes the letters-figures bell crank to lower the letters and figures pushbars. The wheel is rotated two rows counterclockwise during the first part of the cycle, and six more rows to the letters home position during the last part of the cycle, and the letters bar is moved to the right. The primary two-row rotation of the typewheel, which is made possible by selecting the no. 5 pushbar on spacing rather than marking, provides less throw and smoother operation than would be possible if the complete eight-row displacement were effected during the latter part of the cycle. In each operation the lifter permits the function blades to move down and feel for an opening, except for the shift operations where they are blocked by slotted arms of the bell cranks.

C. Printing (Figure 20)

4.37 After the typewheel has been positioned and corrected, the printing mechanism supplies the impact which drives the paper and ribbon against the selected character. It effects this operation by means of a print hammer which is mounted on a shaft supported by a bracket attached to the typewheel bearing housing. In its unoperated condition, as illustrated in Figure 20, the hammer is held against an accelerator by a relatively weak spring. The accelerator is mounted on the hammer shaft and is retained by a printing latch in its upper position against the tension of a relatively strong spring.

4.38 The rocker bail, during the fore part of the function cycle, moves a printing drive link to the right (as viewed from the rear in Figure 20) and causes a pivot arm to rotate clockwise. The arm lowers a trip link which slides in an elongated slot. Near the end of the rocker bail's travel, the trip link pivots the latch which releases the accelerator. Under the spring tension, the accelerator snaps down and impels the hammer upward. The face of the hammer drives the tape and inked ribbon up against the typewheel and imprints the selected character on the tape. The accelerator does not follow the hammer through the complete printing stroke. Near the end of its travel, the accelerator encounters a projection on a latch bracket, and inertia carries the hammer the rest of the way. As the rocker bail returns to its home position, it causes the trip link to move up, release the latch, and return the accelerator to its latched position.

D. Ribbon Feeding (Figure 21)

4.39 The characters are typed in ink supplied by an inked ribbon which is held between the tape and the typewheel by a guide and advanced by the ribbon feed mechanism (Figure 21). The path of the ribbon is down to the right off the top of a right spool, under a right roller, through right pins on the reversing arm, through the guide, up through left pins on the reversing arm, over a left roller, and to the right over the top of a left spool.

4.40 During each function cycle, as the rocker bail nears the end of its left travel, a roller mounted on its forward arm pivots a drive arm clockwise. The drive arm lifts a feed pawl which advances the ribbon by rotating a ratchet on one of the ribbon spools one tooth. A retaining pawl under spring tension detents the ratchet while the feed pawl, during the latter part of the function cycle, is lowered so as to engage the next tooth. Each operation, the ribbon is advanced in this manner until the ribbon feed mechanism is reversed.

4.41 When a spool is almost depleted, a rivet in the ribbon encounters pins on the reversing arm, and the stress applied through the ribbon as it is rolled on the other spool pivots the arm. As the pawl assembly is lowered at the end of the next operation, an extension strikes the reversing arm, and the pawl is shifted against the other ribbon spool ratchet. The pawl's rounded lower extension pivots a reversing lever which shifts the retaining pawl so that it engages

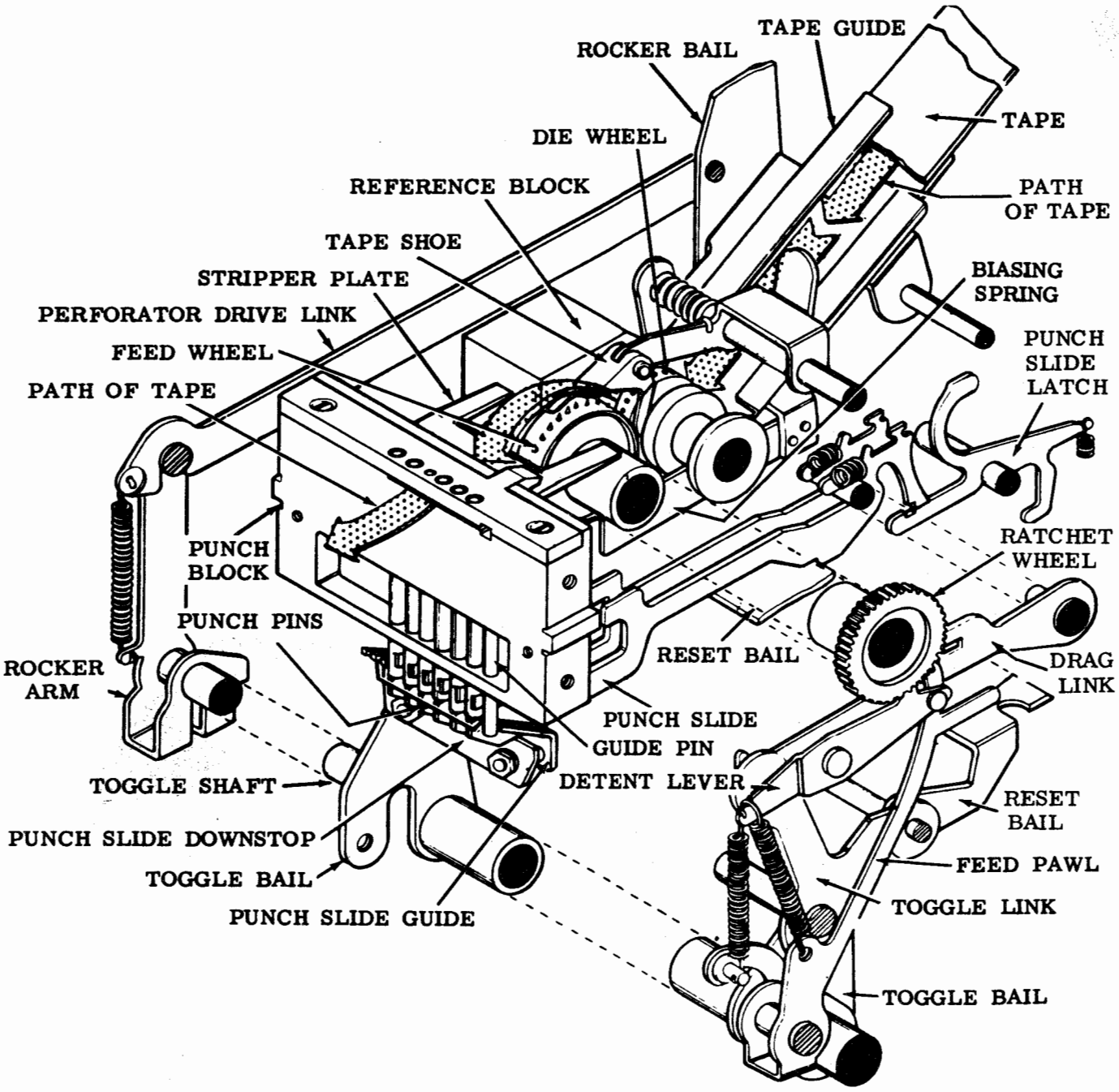


Figure 22 - Perforating Mechanism — Fully-Perforated Unit

the opposite ratchet. The ribbon will then feed in the opposite direction until again reversed. A detent holds the reversing arm in position until its next reversal.

TAPE PERFORATING AND FEEDING

A. General

4.42 The perforating mechanism punches feed holes, advances the tape, and perforates combinations of code holes corresponding to the code combinations received from the keyboard. Intelligence is received from the keyboard by the punch slides, which select proper pins in a punch block assembly (Figures 22 and 23). Motion from the rocker bail is distributed to the pins and the tape feeding parts by a main bail assembly which includes a toggle bail, toggle shaft, slide post, toggle links, drag links, and the punch slide reset bail.

B. Perforating — Fully-Perforated Units (Figure 22)

4.43 After selection, the reset bail is lowered and releases the five punch slides (Figure 22). The selected slides move to the left, and the unselected slides are retained to the right by their latches. In the selected position, a projection of each slide extends over the slide post. Since a feed hole is perforated every operation, the punch slide associated with the feed-hole punch pin is designed so that it is always in a selected position. During the first part of the function cycle, the rocker bail moves to the left and, by means of a drive link and rocker arm, rotates the toggle shaft and bail counterclockwise. Toggle links attached to the front and rear of the bail lift the slide post and move the reset bail to the left. The selected slides are carried upward by the post and force the associated pins through the tape. The slides pivot about the same point as the drag links, and thus become an integral part of the main bail assembly during the perforating stroke. Approximately midway through the function cycle, the function trip assembly lifts the reset bail.

4.44 During the last half of the cycle, the toggle bail is rotated clockwise pulling the slide post down and lowering the selected punch slides. The punch slides, which engage notches in their respective punch pins, pull the punch pins down below the tape. The main bail assembly and the selected punch slides and their associated punch pins move as a unit during the perforating stroke. The openings in the die block above the tape, through which the pins protrude, are circular so that the entire hole is punched.

4.45 A chad chute, mounted on the reperforator punch block, mates with a chute on the base, and carries the chad punched from the tape into a chad container.

C. Perforating — Chadless Units (Figure 23)

4.46 Up to a certain point, the principle of operation of the chadless punch is the same as that for the fully perforated unit. After selection, the reset bail is lowered and releases the five punch slides (Figure 23). The selected slides move to the left, and the unselected slides are retained to the right by their latches. In the selected position, a projection of each slide extends over the slide post. During the first part of the function cycle, the rocker bail moves to the left and, by means of a drive link and rocker arm, rotates the toggle shaft and bail counterclockwise. Toggle links, attached to the front and rear of the bail, lift the slide post and move the reset bail to the left. The selected slides are carried upward by the post and force the associated pins through the tape. The slides pivot about the same point as the drag links, and thus become an integral part of the main bail assembly during the perforating stroke. A retractor bail, which engages notches in the punch pins, is pivoted clockwise as the pins move up through the tape. Approximately midway through the function cycle, the function trip assembly lifts the reset bail.

4.47 During the last half of the cycle, the toggle bail is rotated clockwise and lowers the punch slides. The reset bail, moved to the right by the toggle links, drives the slides back to their unselected positions where it holds them until the next operation. The retractor bail, under spring pressure, holds the punch pins down against the slides until the pins are retracted below the tape. The notches in the pins are long enough to allow the retractor bail to pivot its full amount without lifting the unselected pins against the tape, but are short enough to permit the bail to serve as a downstop for the pins, and thus hold them in the block. A compression spring is mounted on the no. 3 punch pin, and four tension springs are hooked to the slide post and the retractor bail. The main bail assembly, retractor bail, and selected slides and punch pins move as a unit during the perforating stroke, and the retractor bail tension springs are not part of the load on the toggle shaft. The openings in the block above the tape,

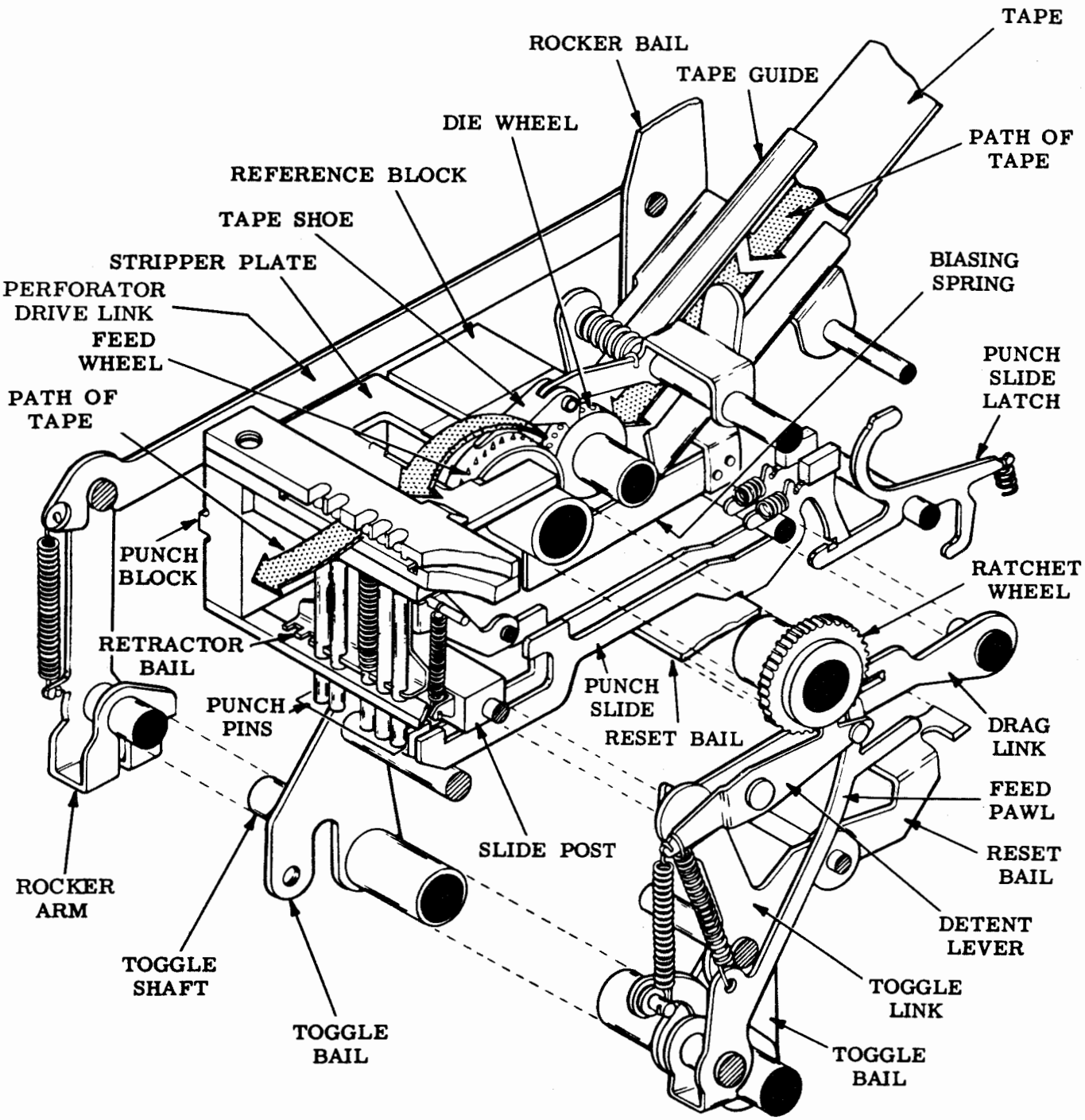


Figure 23 - Perforating Mechanism — Chadless Tape Unit

through which the selected pins protrude, are semicircular, so that only the rear portion of the hole is severed.

D. Feeding — Fully-Perforated and Chadless Units

4.48 Tape feeding is accomplished after perforation during the last half of each function cycle. The tape is threaded down through a tape guide and then up between a feed wheel and die wheel (Figures 22 and 23). A feed pawl driven by the toggle bail acts upon a ratchet and rotates the feed wheel which, by means of pins and a slot in the die wheel, advances the tape one character at a time. A detent, with a roller that rides on the ratchet, holds the feed wheel and tape in position during perforation. The detent and feed pawl springs are so positioned that the pressure of the detent on the ratchet is high during the first half of the cycle (to hold the tape in position during perforation), but is low during idling and the last half of the cycle, to facilitate tape threading and feeding. A tape shoe retains the tape on the feed wheel and a guide spring holds it back against a reference block so that the feed holes are punched a uniform distance from the edge. The tape is stripped from the feed wheel by a stripper plate, passes into the punch block where it is printed and perforated, and finally emerges at the left. A guide spring, by holding the tape back against a reference surface on the block, maintains a uniform relationship between the code perforations and the edge of the tape.

5. VARIABLE FEATURES

BACKSPACE MECHANISMS (Figures 4 and 24)

A. General

5.01 The backspace mechanism steps the tape back through the punch block in order to delete perforated errors. The erroneously perforated code combination in the retracted tape is then obliterated by perforating the letters code combination in its place. The backspace mechanism may be operated manually or it may include power drive. The mechanism used with chadless tape differs from that used with fully perforated tape in that it contains a tape rake for depressing the chad. The mechanisms are shown in Figure 24.

B. Manual Backspace (Fully-Perforated Tape)

5.02 Depressing the handle of the backspacing bell crank disengages the perforator feed pawl from the feed wheel ratchet. The backspacing feed pawl then engages the feed wheel ratchet and rotates the feed wheel clockwise, backspacing the tape to the next row of perforations.

C. Manual Backspace (Chadless Tape)

5.03 Depressing the handle of the backspacing bell crank disengages the perforator feed pawl from the feed wheel ratchet and simultaneously rotates the rack to depress the chads. The backspacing feed pawl then engages the feed wheel ratchet and rotates the feed wheel clockwise, backspacing the tape to the next row of perforations.

D. Power Drive Backspace

5.04 A start magnet in the power drive mechansim is energized by a remote source. When energized, the armature bail is pulled downward. An extension of the bail disengages the drive link latch, which drops and engages a notch in the eccentric arm. The eccentric arm, driven by the perforator main shaft, moves to the right. This action causes the bell crank handle to be depressed through a system of linkages between the drive link latch and the bell crank. The subsequent operation is as described in Paragraphs 5.02 and 5.03.

CODE READING CONTACT MECHANISM (Figure 25)

5.05 These contacts are used to electrically read the code combinations being perforated. The code information is fed to external electrical circuits for end use. The mechanism consists of a bank of five make-type contacts mounted adjacent to the perforator punch slides. Each contact is actuated by its associated punch slide. In the perforator stop position, each code reading contact is held open by engagement with an insulator on its associated punch slide. When the selected punch slides move toward the punch block during the selection cycle, the associated contacts close. The resulting electrical output consists of spacing and marking pulses corresponding to the code combinations being perforated.

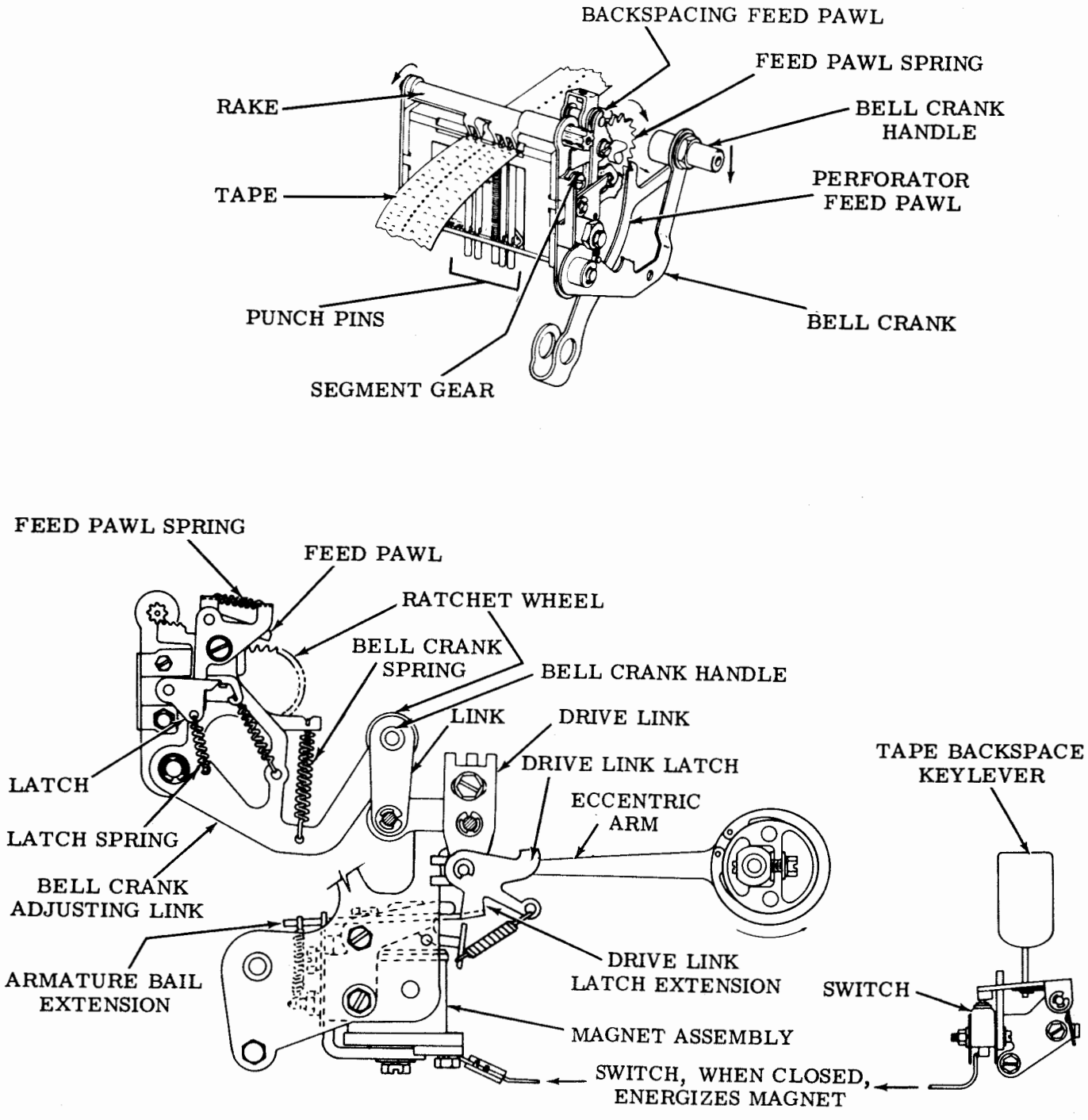


Figure 24 - Backspace Mechanism

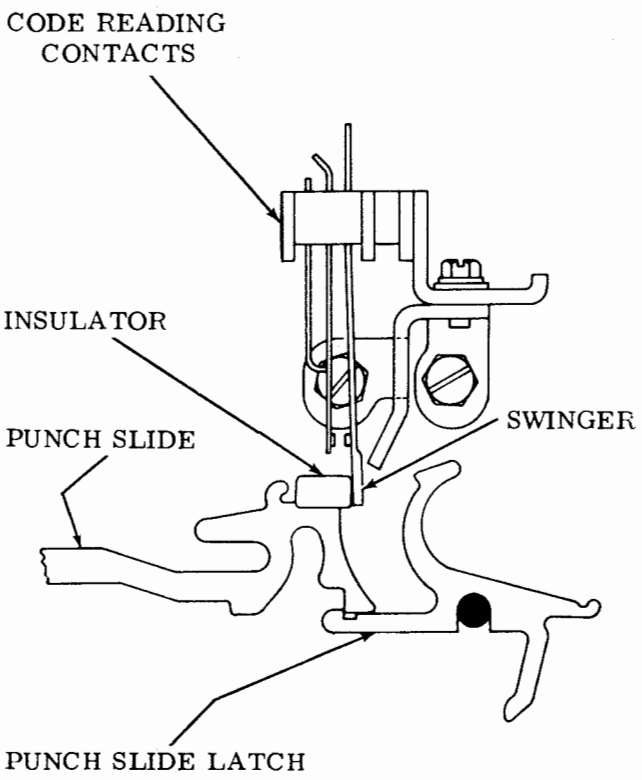


Figure 25 - Code Reading Contact Mechanism

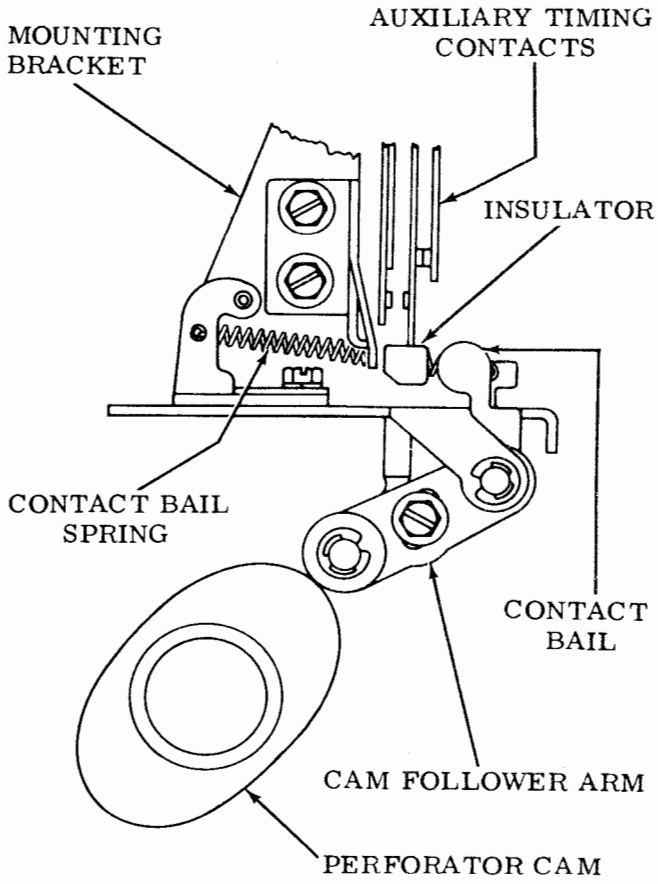


Figure 26 - Auxiliary Timing Contact Mechanism

AUXILIARY TIMING CONTACT MECHANISM (Figure 26)

5.06 This contact provides electrical pulses which are synchronized with the code reading contact pulses for circuitry control purposes. The mechanism consists essentially of a signal contact pile-up of the break-before-make type and a contact bail and cam follower arm. The mechanism is mounted to the frame of the perforator so that the cam follower arm is actuated by the perforator function cam. In the stop position, the contacts, bail, and cam follower arm are positioned as shown in Figure 26. When the cam rotates, the cam follower falls and the contact bail engages the swinger insulator to close the contacts at the left. On the second half of the cam cycle, the cam engages the cam follower roller and restores the contacts to their normal stop positions.

28 TRANSMITTER DISTRIBUTOR BASE FOR THE AUTOMATIC SEND-RECEIVE (ASR) SET

DESCRIPTION

1. GENERAL

1.01 This section describes the transmitter distributor base used in the Automatic Send-Receive (ASR) Set to mount the transmitter distributor unit. The accompanying photograph shows a typical base.

2. PHYSICAL CHARACTERISTICS

2.01 In general, all bases used as mountings for the transmitter distributor in an ASR Set are similar in structure. They consist of an aluminum casting designed to be mounted on the cradle in the left side of the ASR cabinet.

2.02 The transmitter distributor base serves as a mounting for two drive shafts with bearings, and a gear. These shafts are at a right angle to each other and transfer driving motion from the power shaft of the perforator-transmitter base to the transmitter distributor.

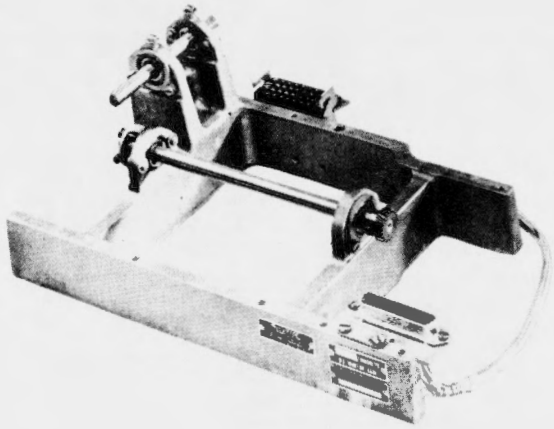
2.03 The speed at which the transmitter distributor runs may be changed by changing the set of gears between the two shafts. These gears are not considered a part of the base.

2.04 Where necessary, adjustable stops are provided to determine the front to rear position of the transmitter distributor.

2.05 A gear guard is provided for the speed gears as a safety measure and for protection of the gears.

3. ELECTRICAL CHARACTERISTICS

3.01 Most of the early designed transmitter distributor bases have no electrical connections. Later designed bases and some early designed bases, however, have a cable with a connector at each end. These connectors are fastened to the base by brackets in a suitable location for connecting electrical circuits from the transmitter distributor to an associated electrical service unit cable.



Typical ASR Transmitter Distributor Base

28 TRANSMITTER DISTRIBUTOR UNIT (LXD)

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS PAGE

1. GENERAL

1.01 This section provides the description and principles of operation for the 5- and 6-level 28 transmitter distributor unit (single contact).

1.02 All references in text to left or right, front or rear, up or down are made from a position in front of, and facing the unit.

1.03 The single contact 28 transmitter distributor unit (Figure 1) is an electromechanical device, which reads code combinations perforated in tape, translates these combinations into electrical impulses, and transmits them in the form of a 5- or 6-level, start-stop permutation code to one or more receiving stations.

1.04 The unit can be used as a component in a self-contained set, in an Automatic Send-Receive Set (ASR), or in a gang-mounted arrangement.

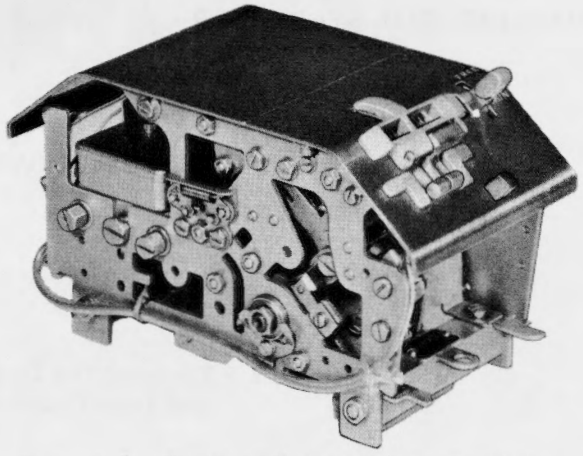


Figure 1 - Typical 5-Level Transmitter Distributor Unit

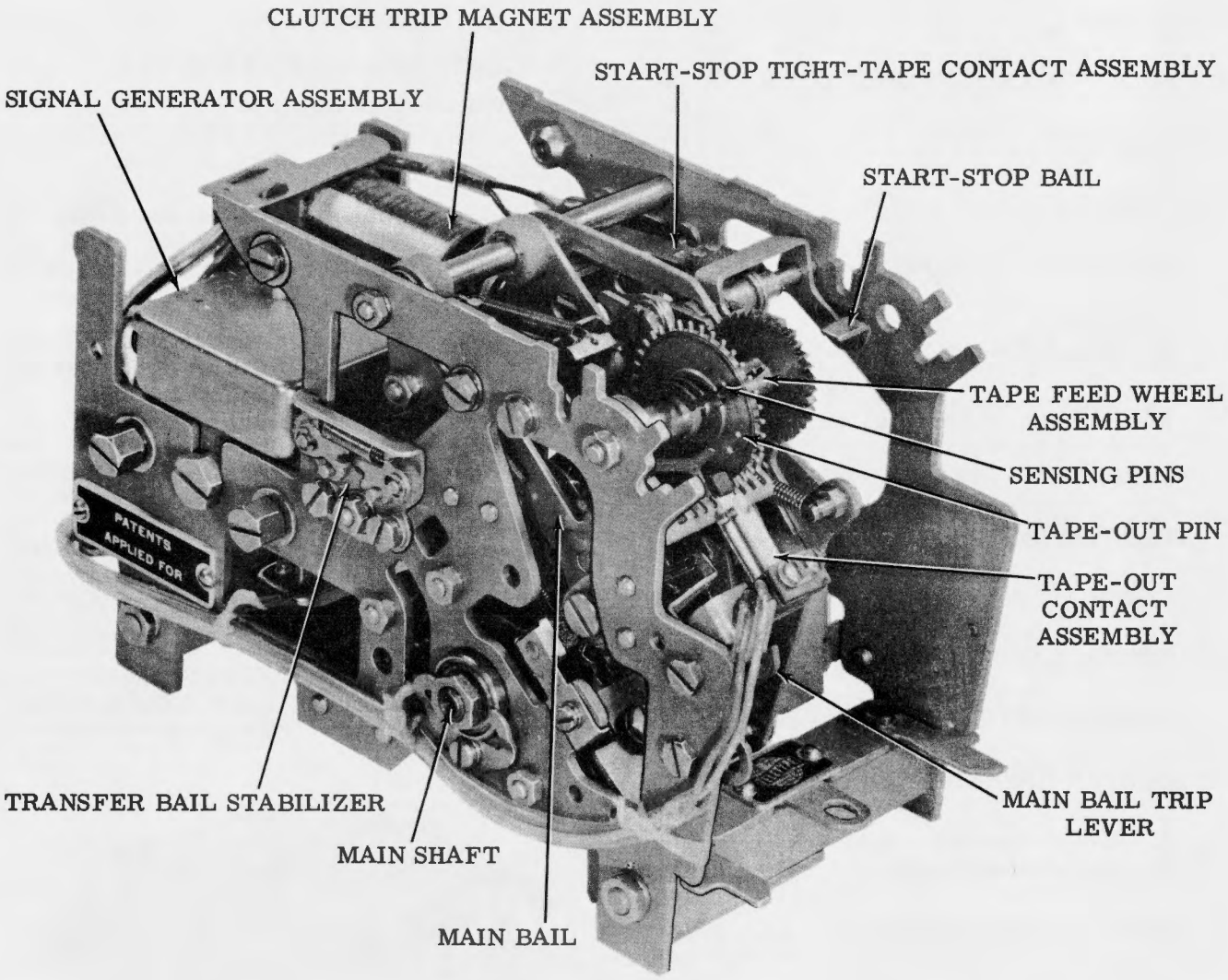


Figure 2 - Transmitter Distributor Unit (Cover Plate, Top Plate and Tape Guideplate Removed)

1.05 The transmitter distributor uses a single camshaft to start, and sequentially perform, the functions of sensing the intelligence stored in a perforated tape. An electrical contact is linked to certain mechanisms to translate the intelligence sensed into pulses of current (marking) and no current (spacing). The unit accepts either chadless or fully perforated tape (Figure 4).

1.06 The signal generator assembly (Figure 12) includes a contact toggle assembly, a drive link, a cover, and an eccentric for adjusting the signal contacts. The signal contacts may be made of either tungsten or gold-plated tungsten.

Note: Gold-plated contacts may be used for both standard applications (including those with data sets) and special low-level applications. However, once used for standard application, they may not be suitable for special low-level application.

2. FUNCTION AND CONFIGURATION

FUNCTION

2.01 The basic operation of the transmitter distributor is to mechanically sense perforated tape and transfer the information to the signal generator, which performs the actual signal transmission (Figure 2).

2.02 The transmitter distributor can be thought of as having two basic functions. The transmitter (tape reader) senses or reads the punched code combinations in the tape and transfers this data mechanically to the distributor. The distributor (signal generator) converts the parallel signal from the transmitter into sequential, start-stop signals for distribution on line.

CONFIGURATION

2.03 The following operating mechanisms of the transmitter distributor are contained between three parallel plates.

(a) The tape sensing mechanism which consists of a bank of sensing pins, (5 or 6 depending on the code level) each with its corresponding transfer lever and latchlever (Figures 2 and 3).

(b) The main shaft assembly, (Figures 2 and 3) which is centrally located in the lower portion of the unit, has the outer race of each ball bearing clamped to the respective front and rear plates. The main shaft assembly consists of multiple cams, eccentrics, and a clutch. Motor power to the shaft is obtained from an external source and is controlled by the clutch and the clutch trip magnet assembly.

(c) A tape feed mechanism that accommodates either chadless or fully perforated tape.

(d) A tape-out pin (Figure 2), located to the right of the sensing pins, stops transmission if there is no tape in the sensing head (Figure 5).

(e) A quick disconnect 36-pin terminal or plug which aligns with its mate on a base, facilitates making electrical connections (Figure 3).

(f) A nylon insulating screw is mounted on the connector bracket and adjusted to align with, and actuate the "Line Shunt Switch" on the associated base (Figure 3).

2.04 The tape lid has the following components:

(a) A three-position control lever for manual control of the unit. The lever positions are FREE, STOP, and RUN.

(b) A pair of adjustable guides (Figure 5) for aligning and locating 11/16- or 7/8-inch wide tape over the feed wheel. An index line is scored in the tape guides 0.600 inch (6 characters) ahead of the sensing pins to aid in aligning the tape.

(c) A tight-tape device on the tape lid stops transmission if the tape becomes taut or tangled.

(d) A spring-loaded tape lid (Figure 5) that snaps open when the red tape lid release plunger is depressed.

ELECTRICAL CIRCUITS

2.05 The transmitter distributor has two electrical circuits, the clutch trip magnet circuit and the signal circuit. The clutch trip magnet circuit consists of the clutch trip magnet coils which are in series with the tape-out, start-stop, and tight-tape contact assemblies. The signal circuit consists of the transmitter signal generator contacts wired to provide neutral operation.

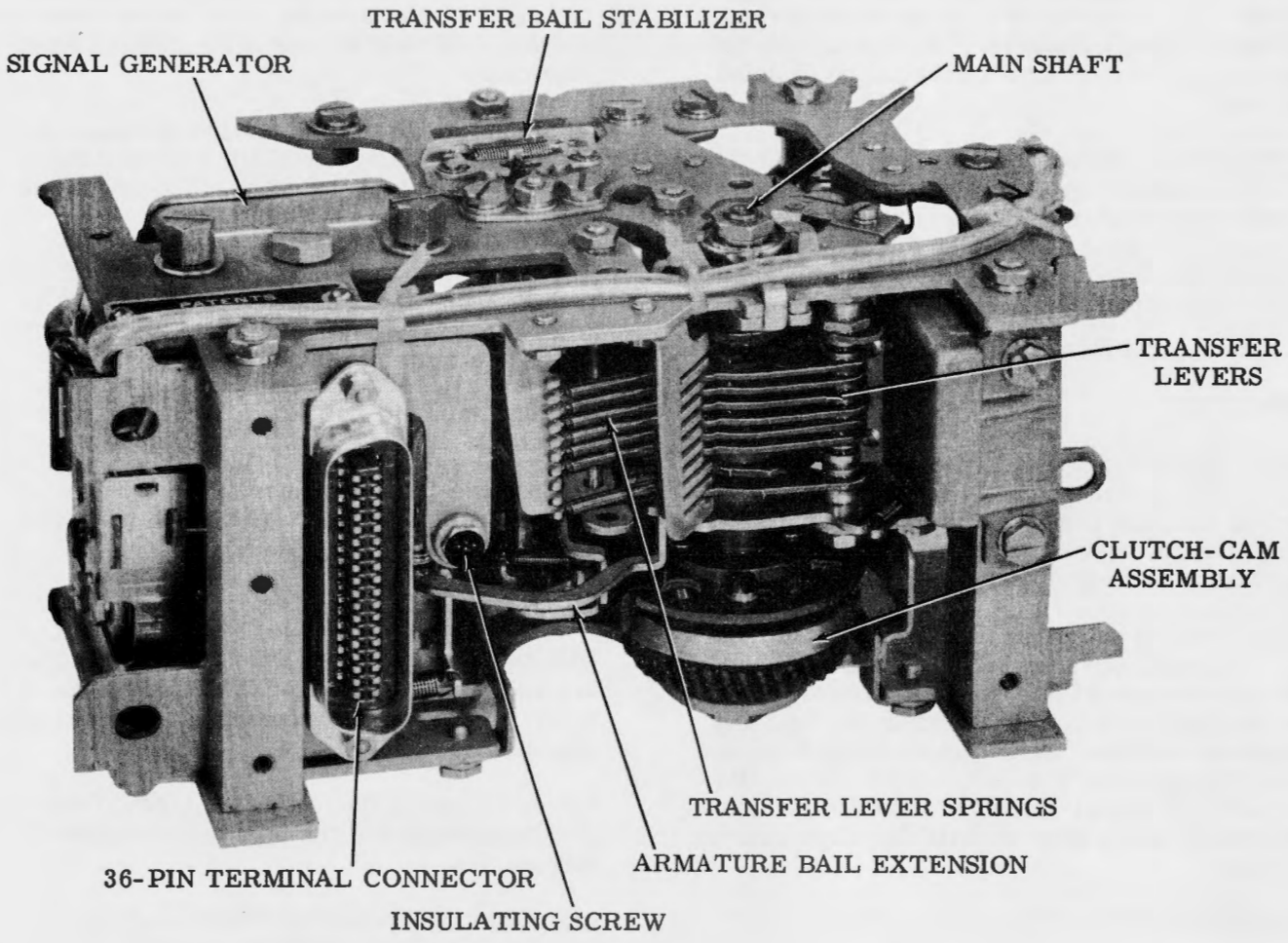


Figure 3 - Transmitter Distributor Unit (Bottom View)

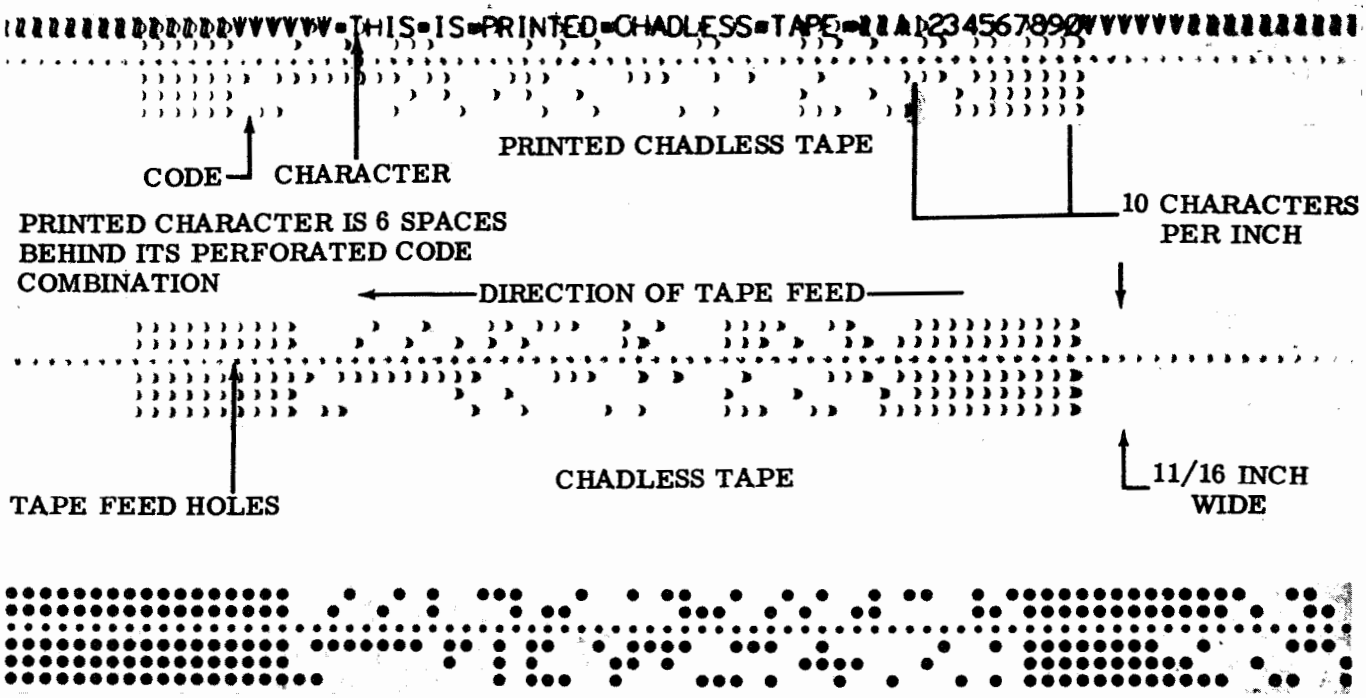


Figure 4 - Standard 5-Level Perforated Tapes

A. Control Circuits

2.06 The control circuit (clutch trip magnet) operates from the following power sources:

(a) 115 v ac ±10% 60 cycles.

(b) 120 v dc ±10% with suitable external resistance.

(c) 50 v dc ±10% with suitable external resistance.

2.07 The tight-tape, tape-out, and manual control mechanisms operate contact assemblies which are in series with the clutch trip magnet assembly. Actuation of any one of these devices opens the clutch trip magnet circuit, causing the clutch to become disengaged, and the transmitter to go into an idle line condition.

Note: Overload protection must be provided externally to the unit.

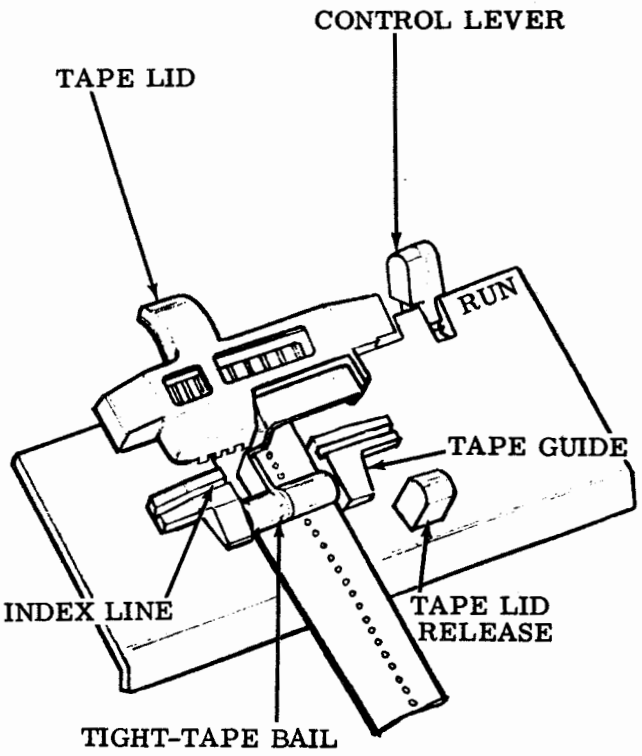
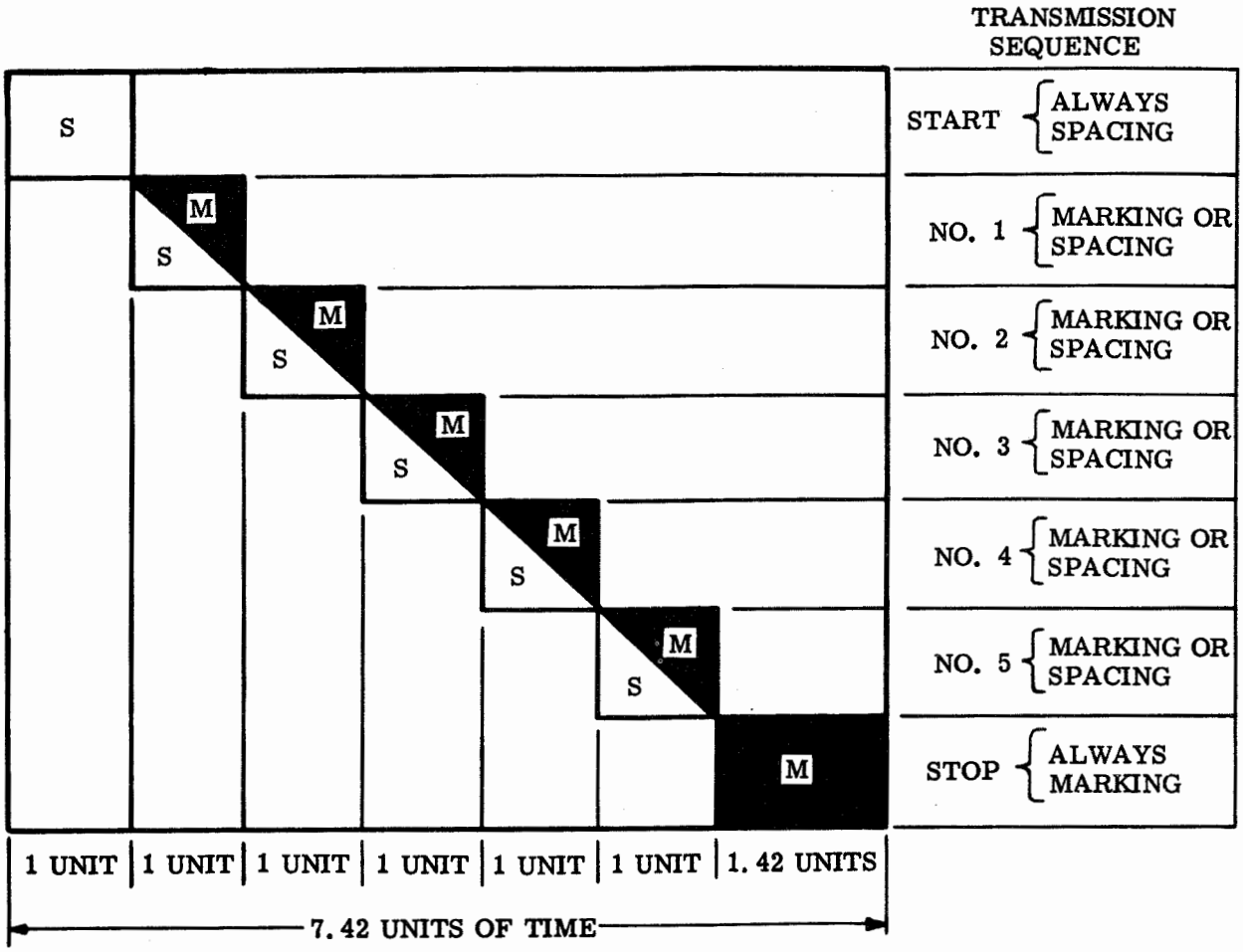
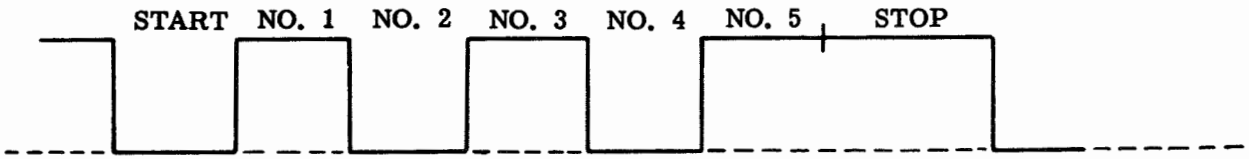


Figure 5 - Tape Guideplate



SIGNALING CODE



GRAPHIC REPRESENTATION OF LETTER "Y"

FIGURES	–	?	:	$	3	!	&	#	8	'	(	)	.	,	9	0	1	4	♁	5	7	;	2	/	6	"	ℓ	<	≡	■	↓	↑
LETTERS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	BLANK	C.R.	L.F	SPACE	LTR.	FIG.
1	○	○		○	○	○				○	○						○		○		○		○	○	○	○					○	○
2	○		○				○		○	○	○	○				○	○	○			○	○	○						○		○	○
FEED HOLES	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3			○			○		○	○		○		○	○		○	○		○		○	○		○	○					○	○	
4		○	○	○		○	○			○	○		○	○	○			○				○		○				○			○	○
5		○					○	○				○	○		○	○	○			○		○	○	○	○	○					○	○

CODE HOLE COMBINATIONS OF TYPICAL CHARACTER ARRANGEMENT

Figure 6 - Start-Stop Signaling Code

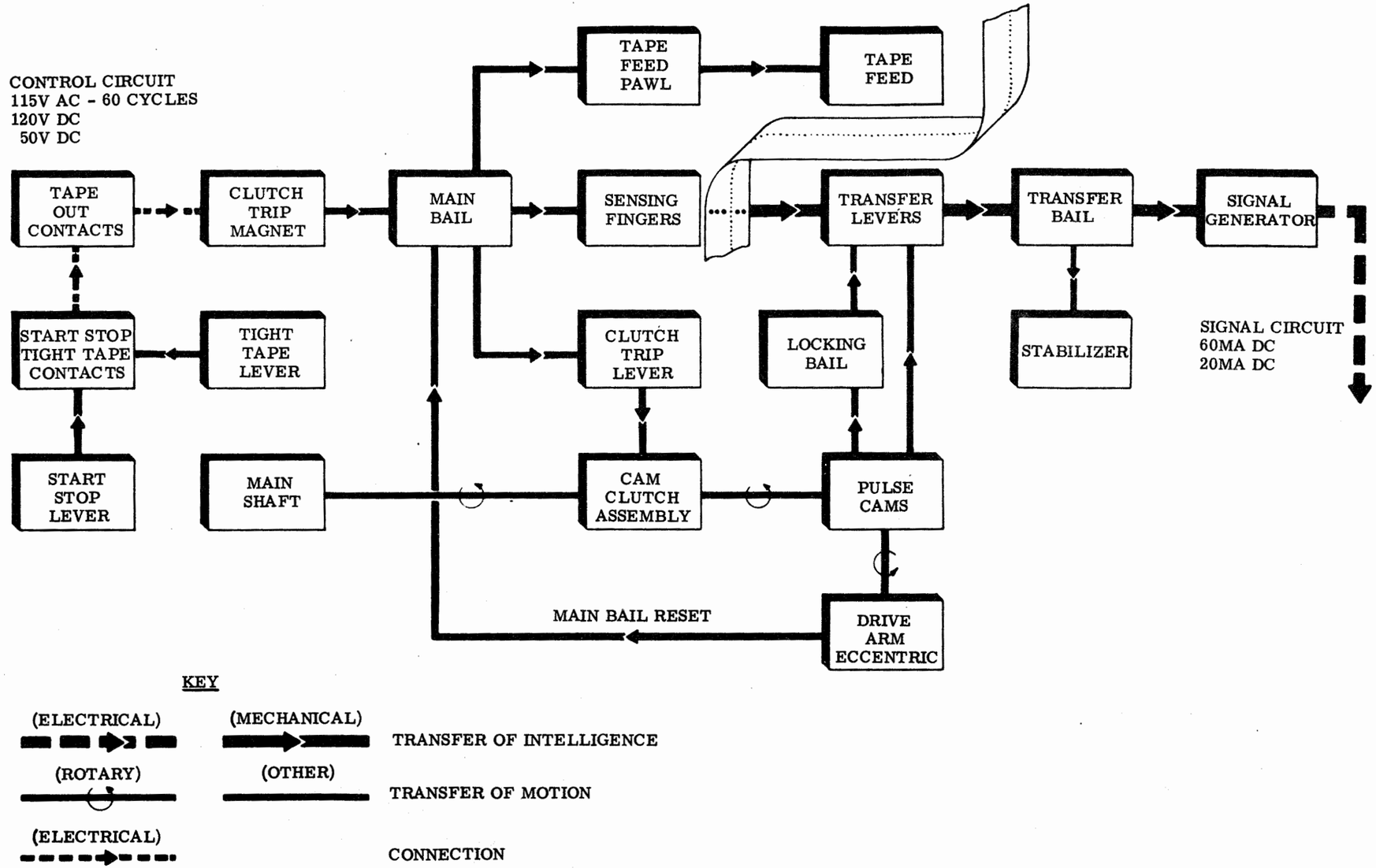


Figure 7 - Functional Block Diagram of Transmitter Distributor Unit

B. Signal Circuit

2.08 The signal contacts in the signal generator operate efficiently at a signal line current of:

60 milliamperes ±10% dc
20 milliamperes ±10% dc

2.09 The signal code transmitted is a 5- or 6-level start-stop neutral code (Figure 6) consisting of current and no-current intervals or pulses. A marking pulse is a measured interval of time during which current flow is permitted through the closure of a contact. A spacing pulse is a measured interval of time during which the current flow is interrupted through the opening of a contact. The start and stop pulses are necessary to keep the receiving apparatus synchronized with the transmitter.

3. TECHNICAL DATA

OPERATING

3.01 Operating data for the unit includes:

Code . . . . . 5- or 6-level.

Operating speeds . . . various speeds up to 100 wpm. Speed is varied by making external gear changes.

Tape . . . . . chadless or fully perforated.

Motor power . . . from external motor unit.

ELECTRICAL

3.02 Electrical requirements for the clutch trip magnets can be summarized as follows with the control circuit operating from the following external sources:

(a) 115 v dc ±10% 60 cycles.

(b) 120 v dc ±10% with suitable external resistance.

(c) 50 v dc ±10% with suitable external resistance.

PHYSICAL

3.03 The approximate physical dimensions for the unit are:

Width	7-1/2 inches
Depth	3-5/8 inches
Height	5 inches
Weight	7 pounds

4. GENERAL OPERATION

4.01 The following paragraphs describe the general operation of the 28 transmitter distributor unit. In conjunction with these paragraphs see Figure 6, Functional Block Diagram of Transmitter Distributor Unit for pertinent information about unit operation.

4.02 The operating cycle starts with the transmitter distributor in the idle signal line condition, the drive motor running, tape in the unit, and the external portions of the transmitter distributor circuits complete. Move the control lever (Figures 5 and 8) to the RUN position. This positioning energizes the clutch trip magnet by completing the circuit through the start-stop and tight-tape contact assembly. Thus, the contact closes to complete the clutch trip magnet circuit, energizes the magnet, and pulls the armature up. The armature bail extension (Figure 9) cams the main bail latchlever about its pivot post to release the main bail.

4.03 The clutch tripbail is reset by an eccentric on the main bail. The eccentric rides in the slot of the clutch tripbail. When the eccentric on the spring biased main bail cams the clutch tripbail, the tripbail, in turn, moves the clutch trip lever (Figure 9) away from its latch. When the main bail is released, the clutch tripbail is also released by the interconnection. The main bail swings up drawn by the main bail spring and causes two actions to occur.

4.04 First, the main bail raises the feed pawl (Figure 10) one tooth on the feed wheel ratchet. Secondly, the main bail permits the sensing pins to rise to read the perforations in the tape. If any of the sensing pins sense a perforation in the tape they extend upward through the perforations until stopped by the spacer on the main bail, and in extending upward rotate their associated transfer levers up.

4.05 In rotating upward, the transfer lever extensions are brought above the line of action of the blade on the locking bail. If any of the sensing pins do not sense a perforation in the tape, the associated transfer levers remain stationary. The extensions on these transfer levers remain below the line of action of the locking blade on the locking bail (Figure 11).

4.06 During the movement of the main bail, the clutch tripbail pivots on its axis and pushes the clutch trip lever away from the shoe release lever to engage the clutch and start the camshaft rotating (Figure 9).

4.07 As the camshaft continues its rotation, the high part of the locking bail cam moves away from the locking bail and permits the locking bail to be pulled up by its spring. In its upward travel, the locking blade of the bail is positioned between the lower extension of the selected transfer levers and locks them into position (Figure 11).

4.08 Further rotation of the main shaft moves the lobe of the start cam into position so it cams its respective transfer lever. Since the start transfer lever has no sensing pin, the lever is always in the spacing position. The start transfer lever upper finger hooks the upper side of the transfer bail and causes it to pivot clockwise. The transfer bail extension (Figure 12) moves the signal generator drive link causing the toggle to open the marking contact and close the spacing contact in the signal generator contact assembly. The extension, in moving to the spacing position, forces the marking latch on the stabilizer (Figure 13) out of its way and continues its travel far enough to let the spacing latch fall into the latching position simulating a detent action.

4.09 The shaft continues its rotation until the cam for the first pulse (Figure 14) cams its transfer lever. Depending on the position of the transfer lever finger, upper or lower, the transfer bail (Figure 15) is rotated if the pulse to be transmitted is not the same as the preceding pulse. If the preceding pulse is the same, no action occurs because the bail has previously been rotated. However, if the preceding is different, the extension on the transfer bail moves the drive link and causes the toggle to open the closed contact and close the open contact. The extension also forces its way past the latch and continues its way until the opposite latch on the stabilizer can fall into position.

4.10 The action of the cams for the second, third, fourth, and fifth pulses follow the action of the first pulse in order and repeat the same action as described for the first pulse (Figure 14).

4.11 The cam for the stop pulse follows that of the fifth pulse and the train of action is the same as that of the first pulse except that the stop pulse has no sensing pin, and its transfer lever is blocked. Thus, its lower finger always hooks the transfer bail causing a marking pulse on the completion of each character.

4.12 The tape feed pawl (Figure 17) advances the tape feed ratchet one tooth against the action of the ratchet detent roller. The tape

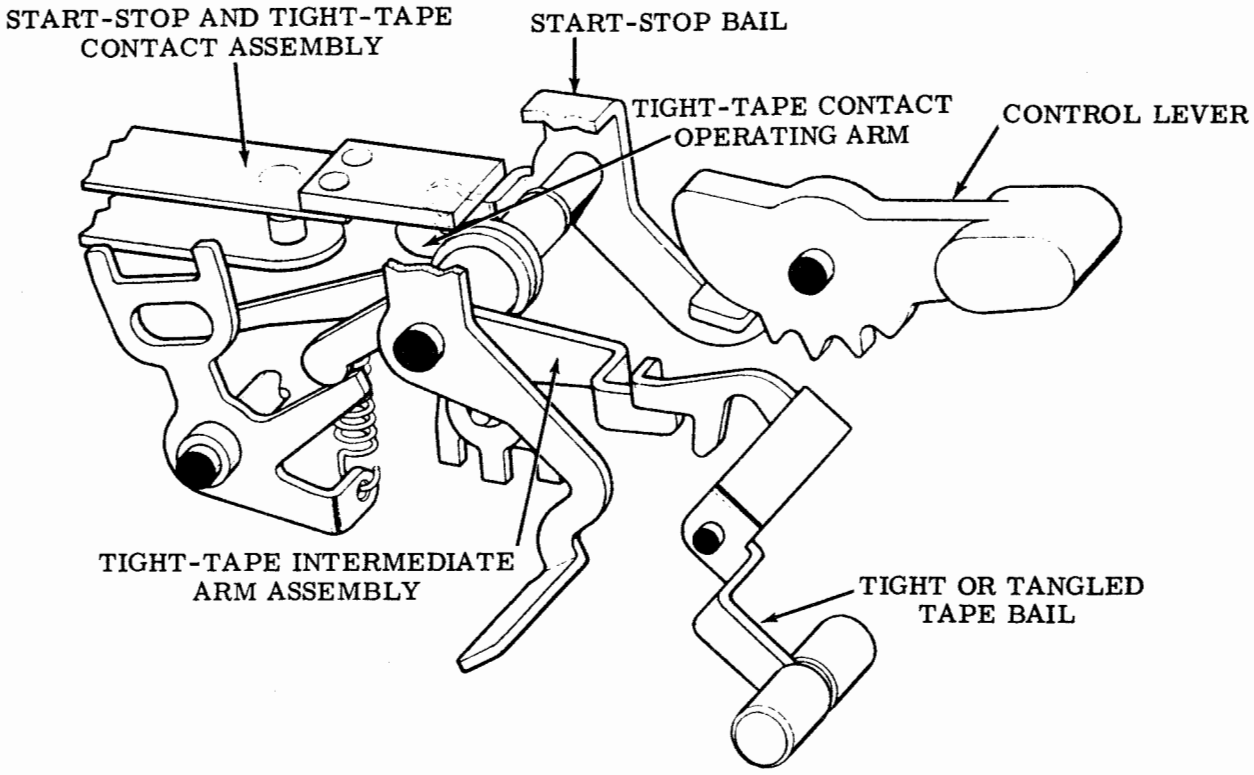


Figure 8 - Start-Stop and Tight-Tape Switch Mechanisms

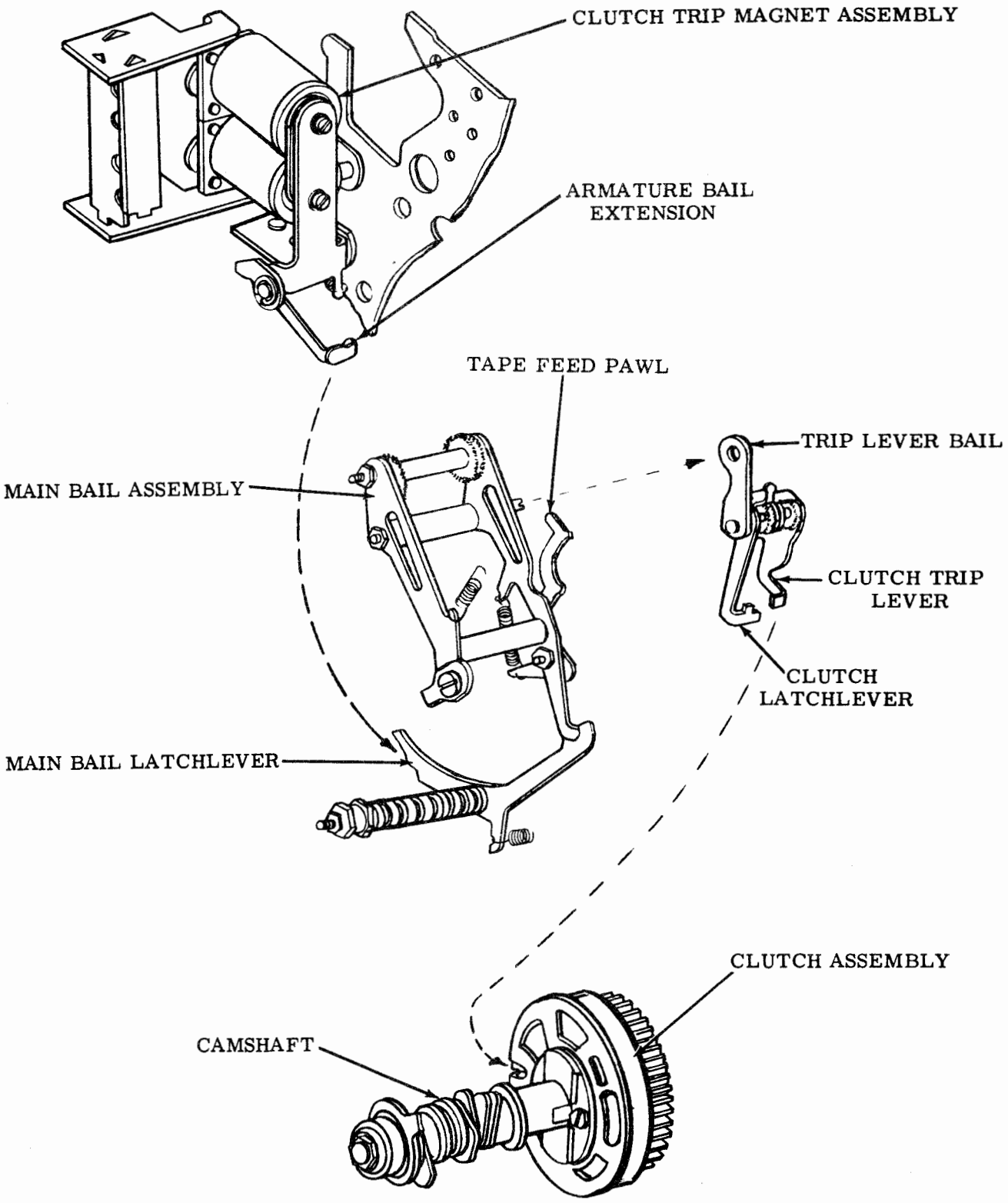


Figure 9 - Function Control Mechanism

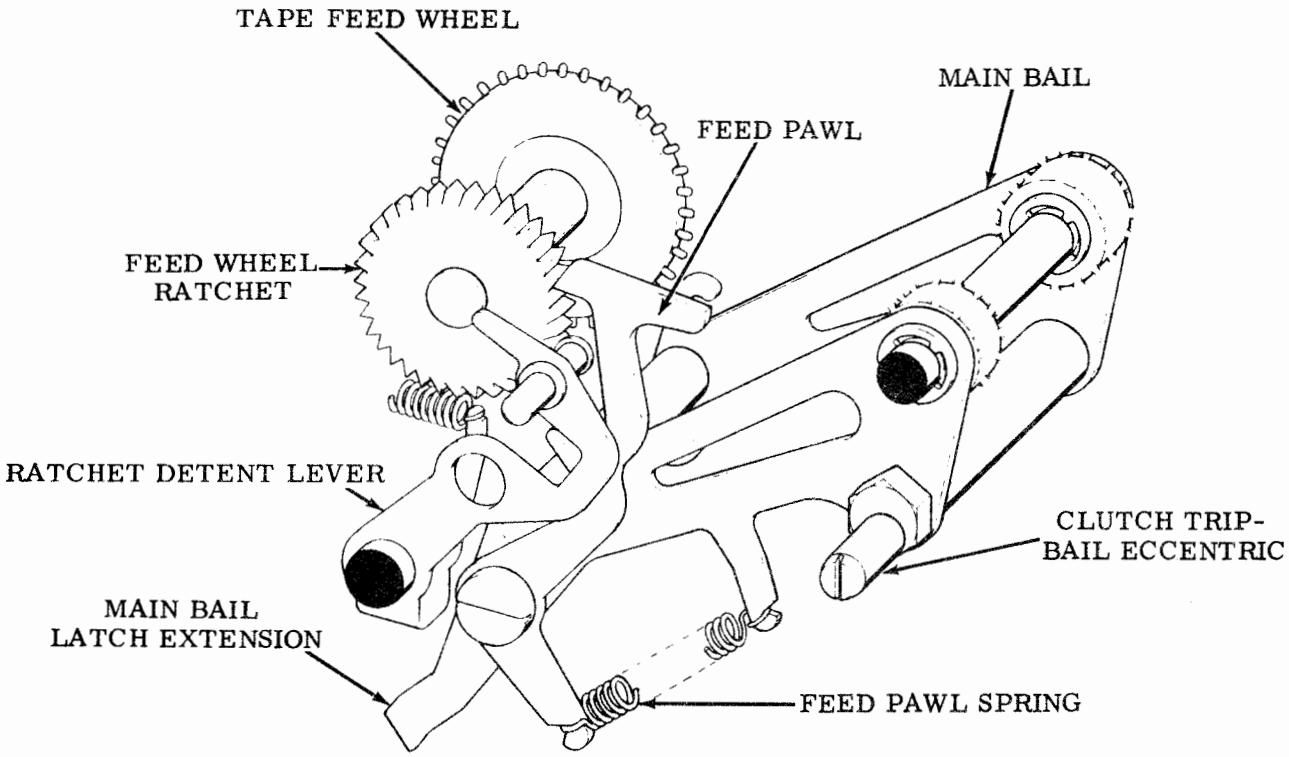


Figure 10 - Tape Feed Mechanism (Rear View)

feed ratchet is part of the tape feed wheel. The tape feed wheel advances the tape one character. The ratchet detent roller bears between two teeth on the ratchet and serves to hold the feed wheel and tape in position during the sensing portion of the operating cycle.

4. 13 Since the clutch tripbail does not latch, the drive arm moves again to its upper position. In so doing, repetition occurs when the main bail swings up, and the main shaft starts to rotate until the unit runs out of tape.

STOPPING THE ACTION

4. 14 The code sensing pins cannot differentiate between a no tape condition and perforations; therefore, the unit operates as if five perforations were sensed and goes through the actions previously described. However, if the tape-out sensing pin senses that there is no tape in the unit, the tape-out pin moves upward, lifting the swinger pad of the tape-out contact assembly and opens the clutch trip magnet circuit.

4. 15 Since the tape out contacts are in series with the start-stop and tight-tape contacts, the clutch trip magnet becomes de-energized and releases its armature. This action permits the armature extension to pivot out of its blocking position and allows the main bail latchlever to be moved by its spring (Figure 9).

4. 16 As the main bail is latched, the clutch trip lever blocks the clutch shoe lever. When the clutch shoe lever is blocked the inertia of the mechanism causes the clutch to rotate far enough to permit the clutch latch to fall into the notch on the clutch cam disc.

5. CLUTCH OPERATION

A. Clutch Engaged

5. 01 The clutch is engaged (Figure 18) by releasing the lower end of lever B. 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 drum at point E. As the drum turns counterclockwise, it drives the primary shoe downward, so that it again makes contact with the drum, this time 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 H. The

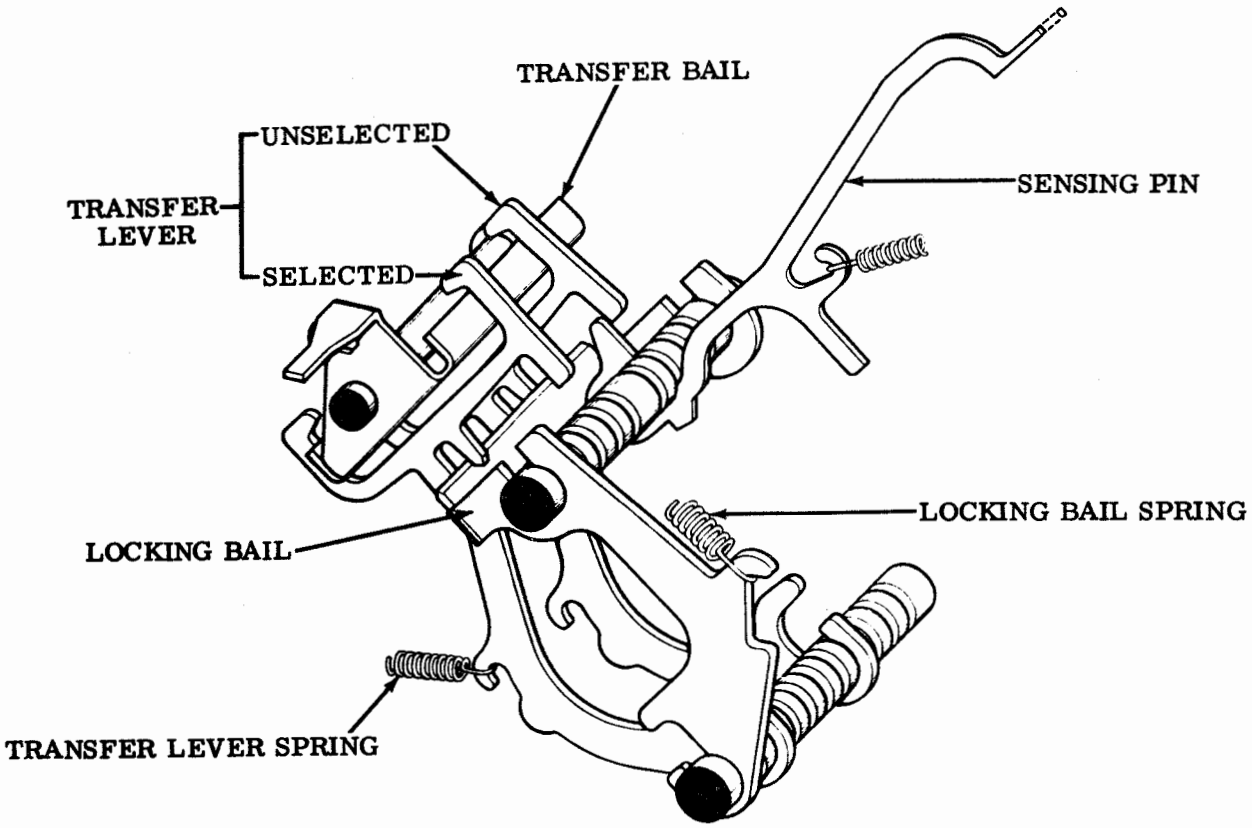


Figure 11 - Locking Bail and Transfer Lever Mechanisms

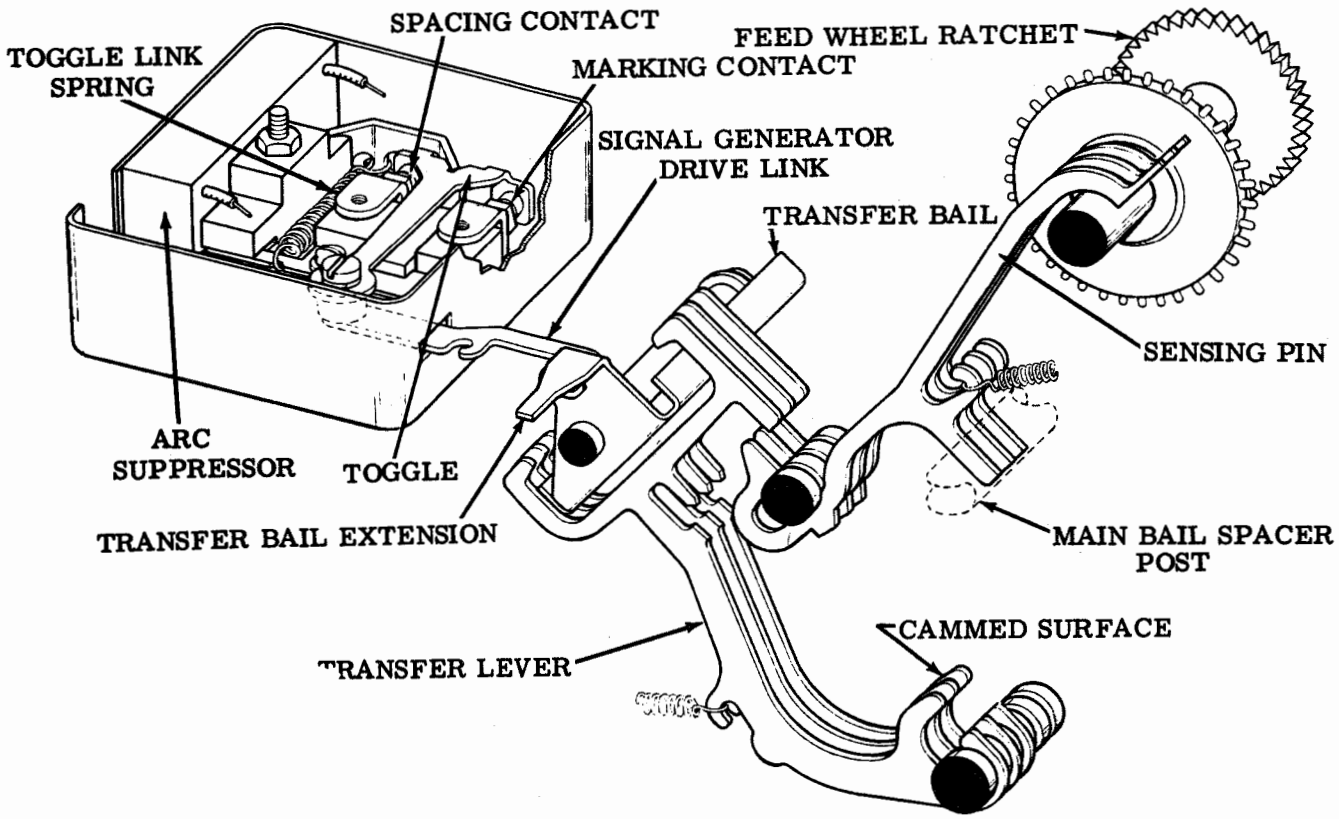


Figure 12 - Transfer Lever and Signal Generator Mechanisms

revolving drum acts to drive this shoe upward so that it again makes contact with the drum at point I. Since the forces involved are multiplied at each succeeding step, the final force developed at point I is very great. This force is applied to the lug J on the clutch cam disc causing it to turn in step with the drum. The cam disc on the clutch, connected to the camshaft, imparts a rotary motion to the cam assembly.

B. Clutch Disengaged

5.02 The clutch is disengaged (Figure 19) by bringing together lug A on the clutch cam disc and the lower end of the clutch shoe lever B. 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.

6. TAPE LID OPERATION

A. Opening

6.01 When the tape lid release plunger (Figure 20) is pressed, the shaft portion of the plunger presses against the tape lid plunger

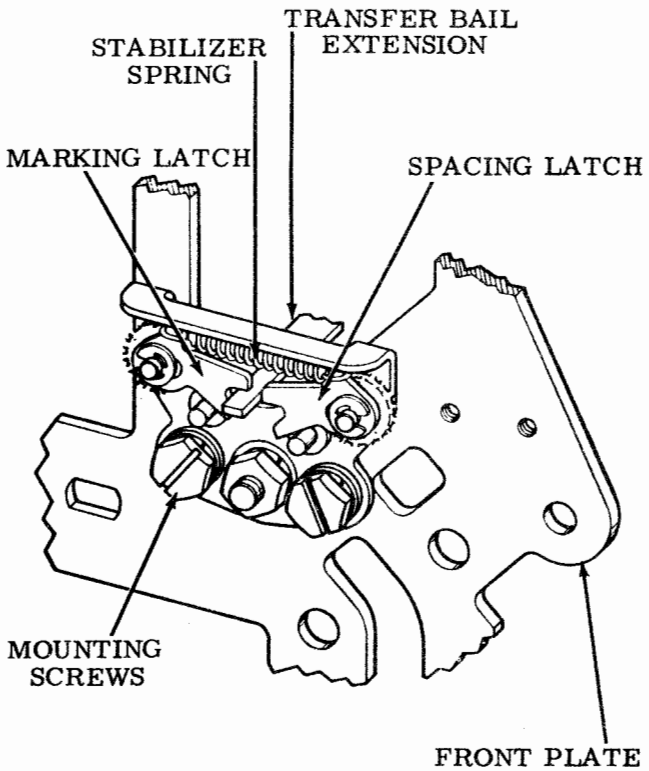


Figure 13 - Transfer Bail Stabilizer

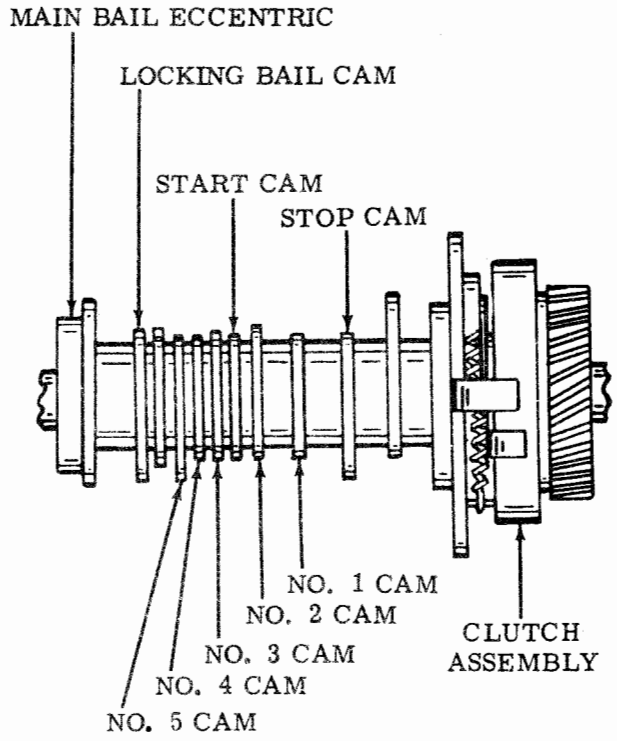


Figure 14 - Clutch Camshaft Assembly

bail extension causing the bail to pivot. The bail, in pivoting, moves its latching extension from under the tape lid latching post to swing down under action of its spring. Since the latching post is mounted on the tape lid behind the pivot point and below the tape guideplate, it causes the main part of the tape lid to swing upward (open) when the post swings downward.

B. Closing

6.02 The tape lid is manually closed by pressing it down against the tape guideplate. As the tape lid is closed, the latching post swings up and cams the latching extension out of its way until it passes the end of the extension which then is pulled under the post, by spring action, latching the post and tape lid.

7. CONTROL LEVER

RUN POSITION

7.01 To start transmission, the transmitter distributor unit must be in an idle signal line condition, the drive motor running, tape in the unit, and the external portions of the transmitter distributor circuits complete. Move the

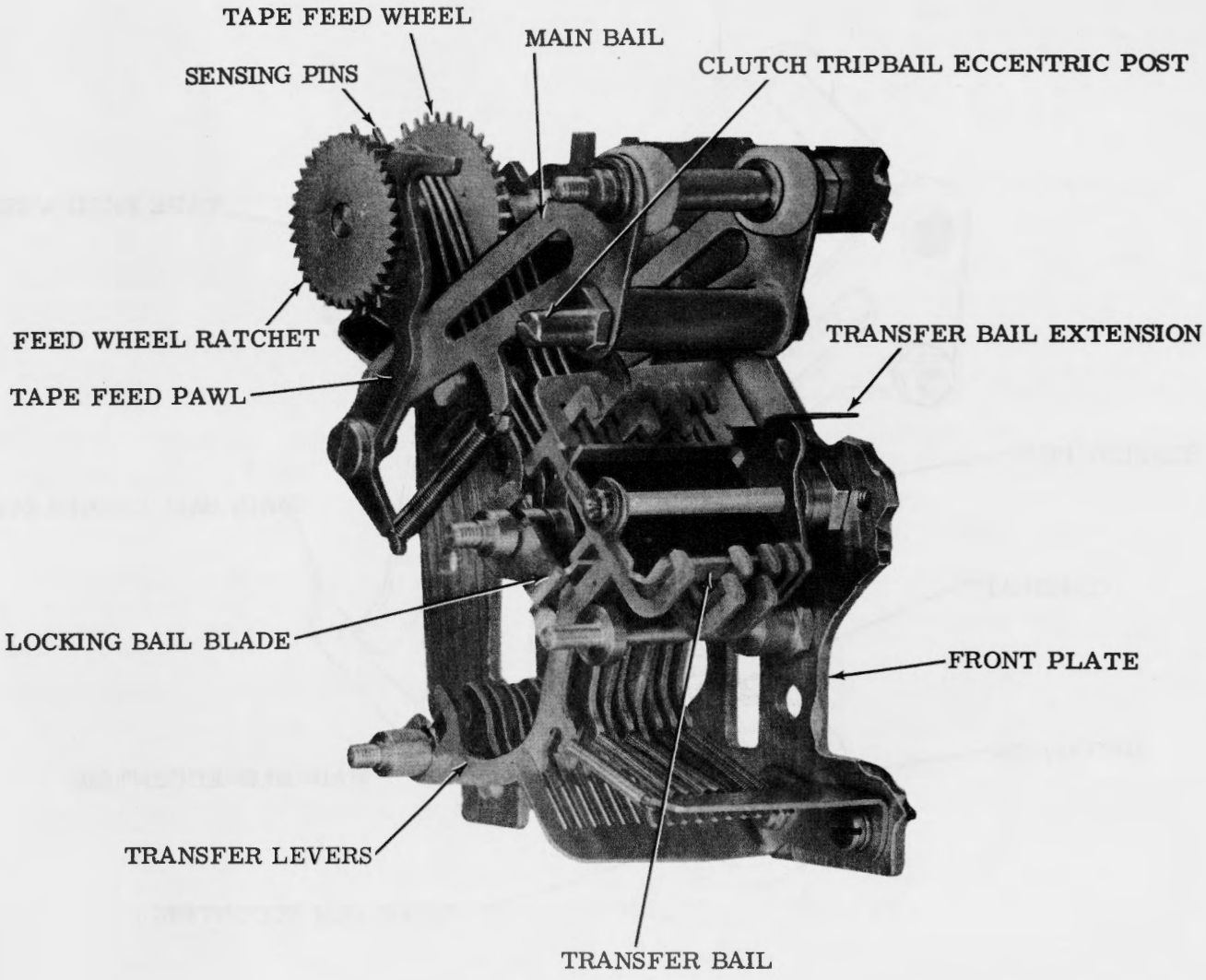


Figure 15 - Front Plate Assembly (Rear View)

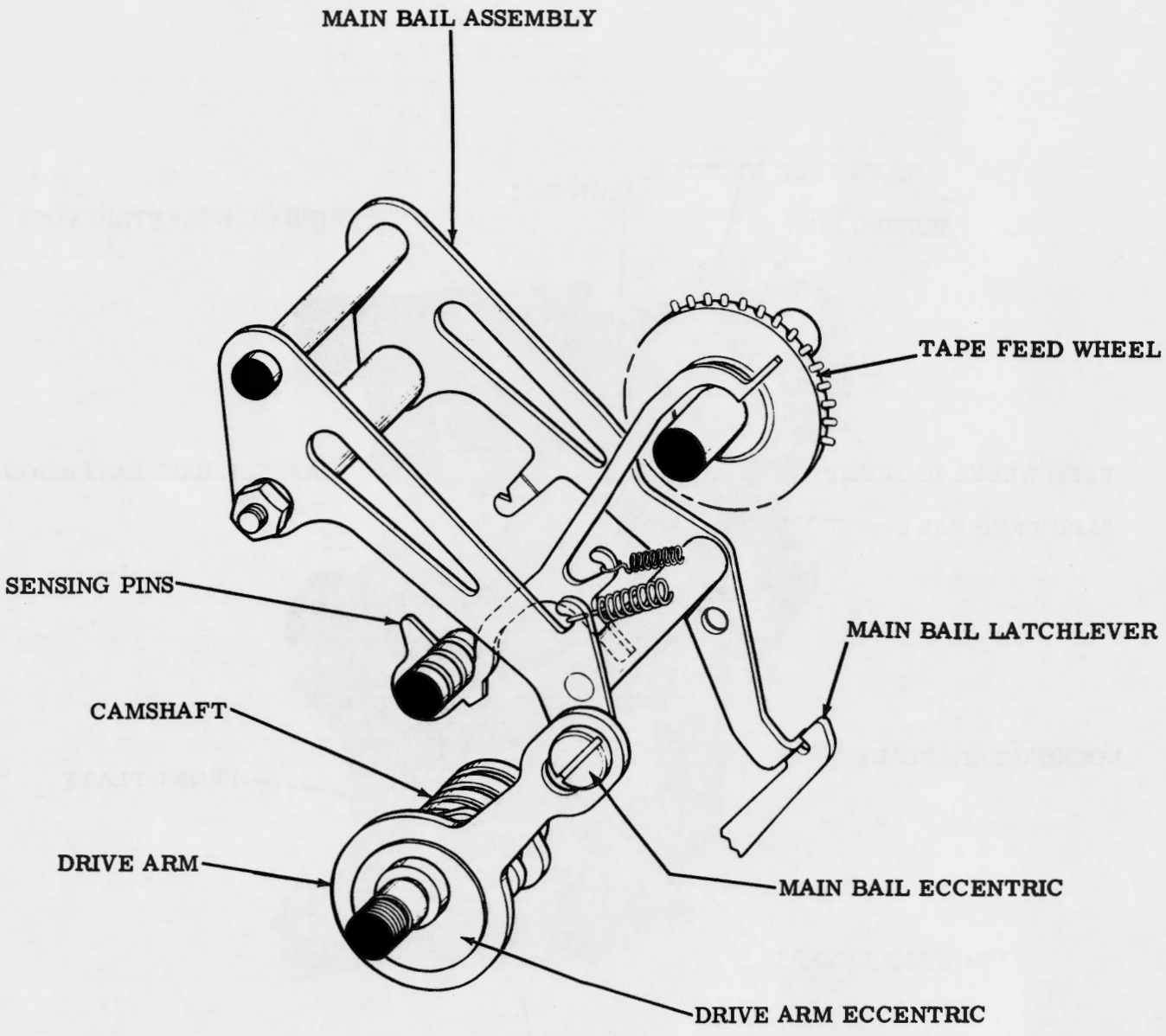


Figure 16 - Main Bail and Drive Arm Mechanism

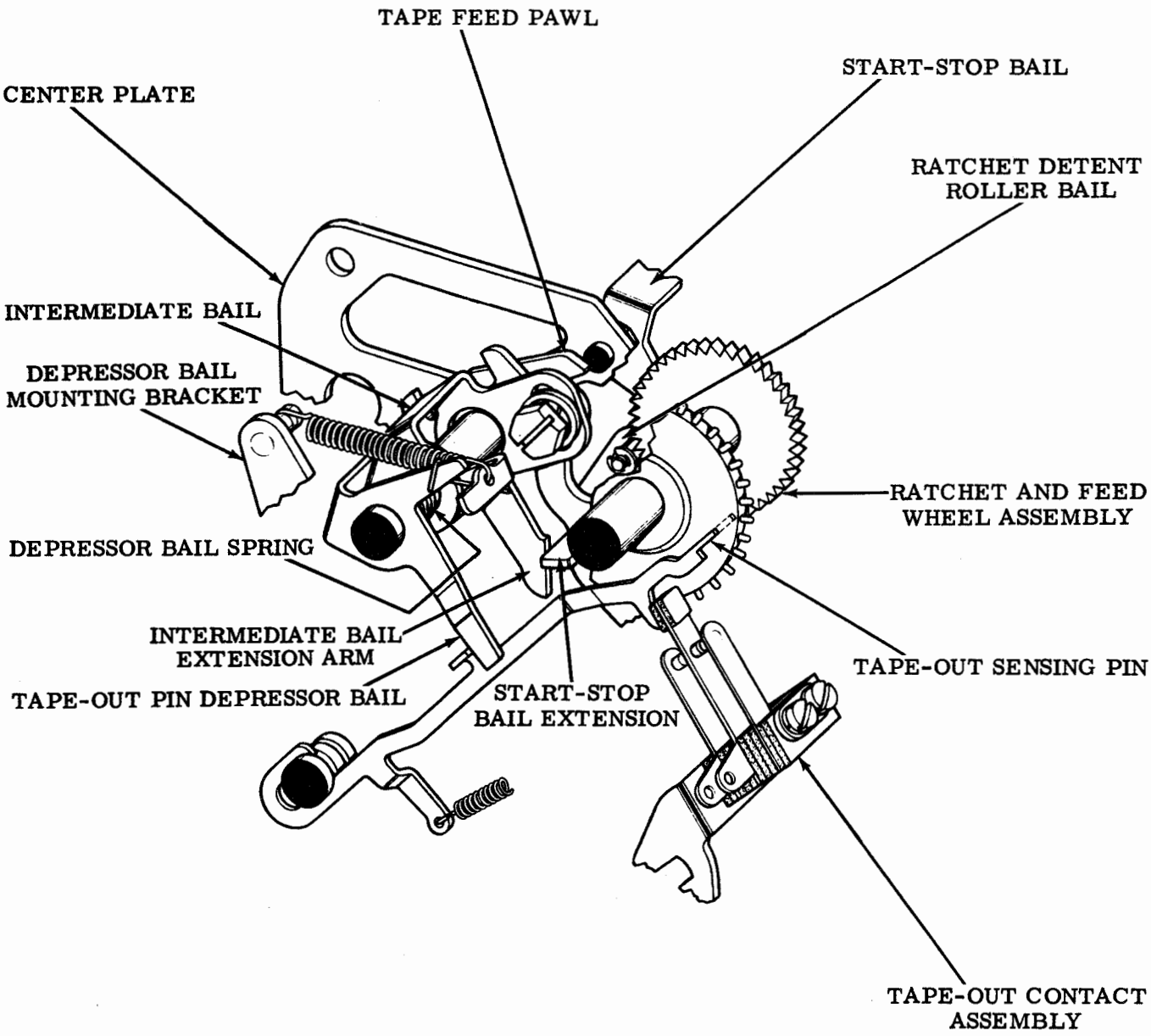


Figure 17 - Freewheeling and Tape-Out Mechanisms

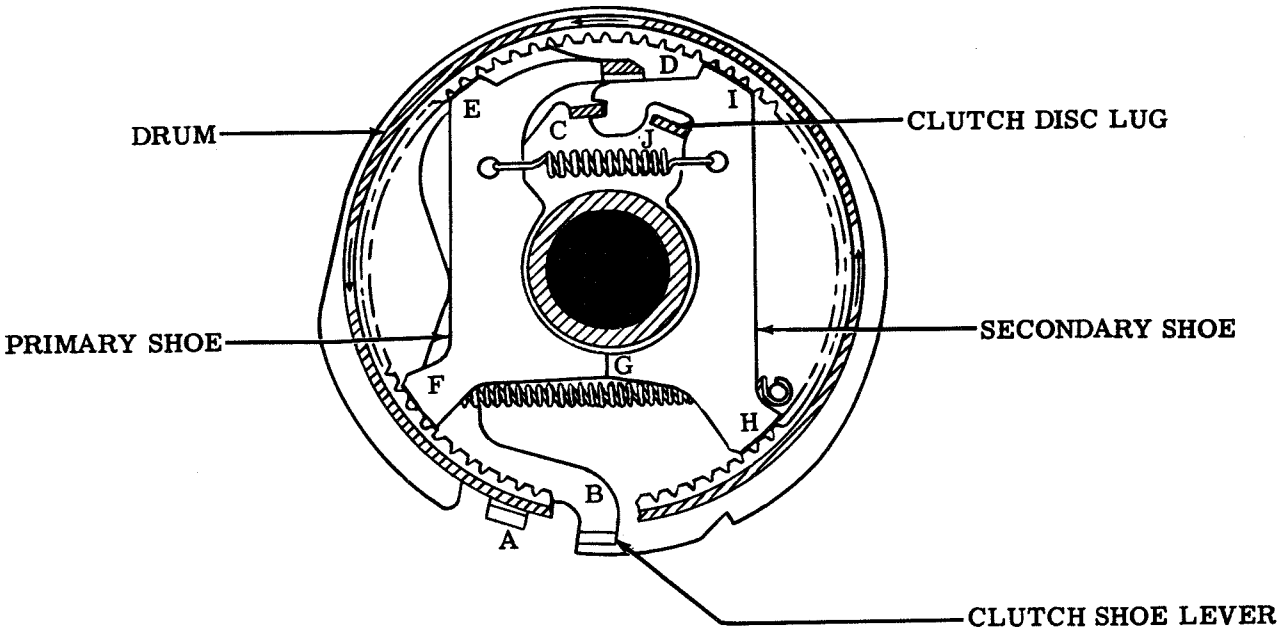


Figure 18 - Clutch — Engaged

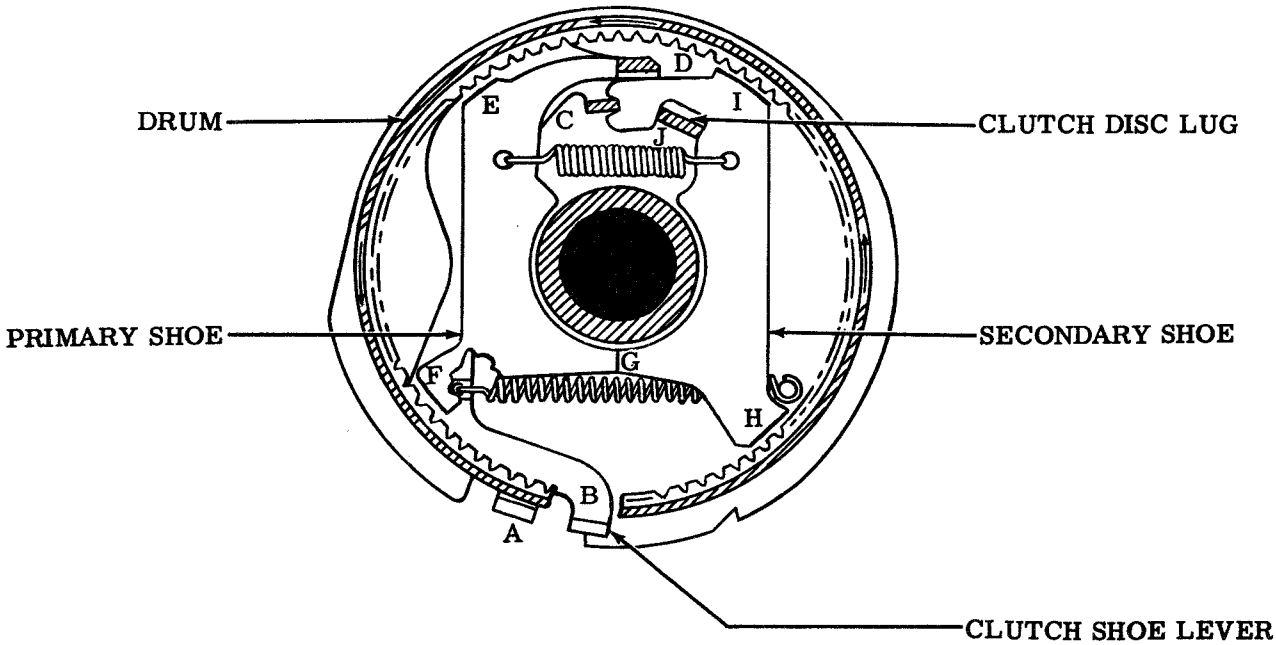


Figure 19 - Clutch — Disengaged

control lever to the RUN position. This positioning energizes the clutch trip magnet by completing the circuit through the start-stop and tight-tape contact assembly. Thus, the contact closes to complete the clutch trip magnet circuit, energizes the magnet, and pulls the armature up. The armature bail extension then cams the main bail latchlever about its pivot post to release the main bail.

STOP POSITION

7.02 When the control lever is pushed to its center or STOP position, the cam surface of the lever cams the start-stop lever bail causing the bail to pivot. As the bail pivots, its extension cams the swinger pad upward on the start-stop contact assembly opening the contacts. This action breaks the circuit to the clutch magnet assembly causing the armature to drop to its unattracted (unenergized) position.

FREE POSITION

7.03 When the CONTROL lever is placed in the FREE position, ie, freewheeling position, the cam surface of the lever cams the start-stop lever bail causing the bail to pivot. As the bail pivots, its extension cams the swinger pad on the start-stop assembly upward opening the contacts, and breaking the circuit to the clutch magnet assembly. The start-stop lever pushes the feed pawl and the ratchet detent roller away from the feed ratchet allowing the feed wheel to rotate freely.

7.04 The start-stop lever extension also cams the intermediate bail extension arm which rotates the intermediate bail. The intermediate bail, in rotating, allows the spring-loaded tape-out pin depressor bail to follow. The depressor bail with its mechanism is mounted on a bracket attached to the front plate. The result of this camming action is the depressing of the tape-out sensing pin to a flush or below flush position relative to the tape guideplate. The position of the tape-out sensing pin allows free passage of the tape under the tape lid (Figure 5).

8. TAPE CONDITIONS

TIGHT OR TANGLED TAPE

8.01 A tight or tangled tape raises the tight tape bail arm (Figure 5). The bail pivots and its extension cams the tight-tape intermediate arm assembly to which the tight tape arm is attached. When the arm assembly is cammed, the associated tight tape arm lifts the swinger on the start-stop, tight-tape contact assembly

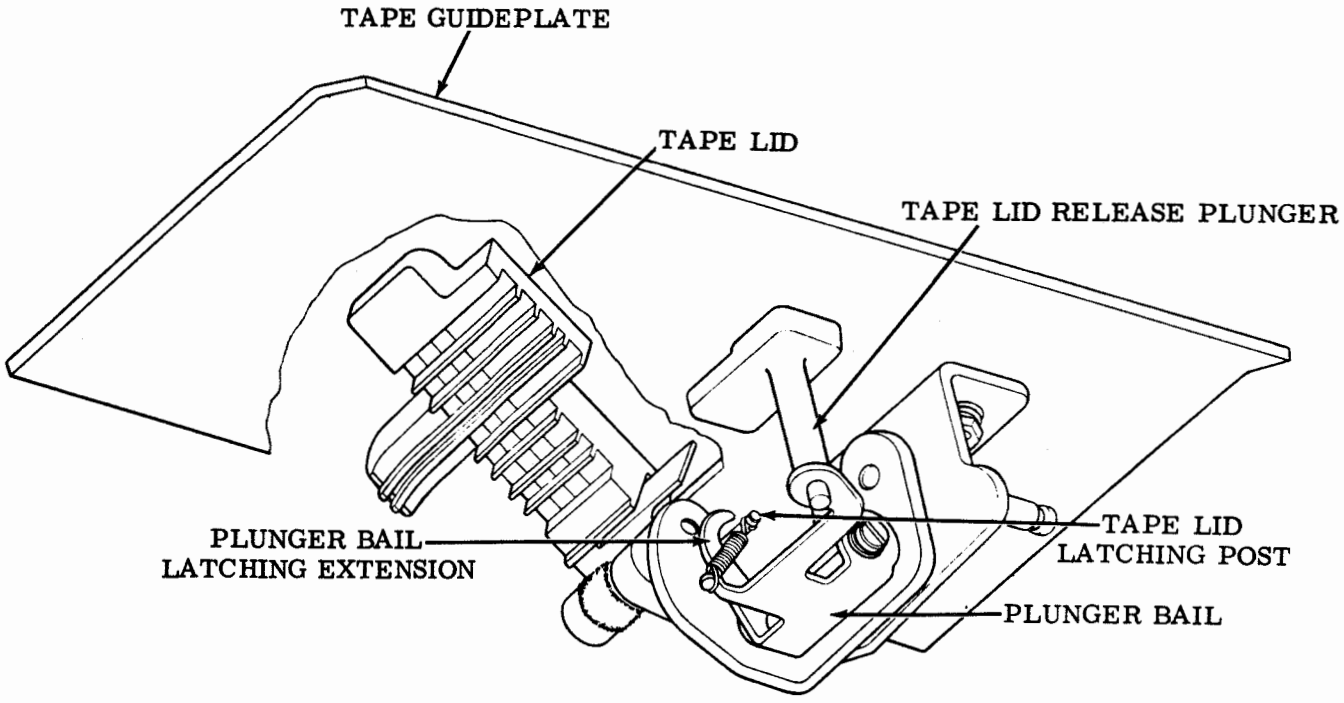


Figure 20 - Tape Lid Mechanism (Bottom View)

up, opening the clutch trip magnet circuit, causing transmission to stop.

TAPE-OUT SENSING PIN

8.02 The tape-out sensing pin (Figure 17) is to the right and slightly forward of the five aligned tape sensing pins. When the tape-out sensing pin is in a depressed position, the circuit is closed, and the unit transmits. Thus, with tape in the unit and the tape lid down, the tape holds the tape-out pin in a depressed position and the circuit is complete.

8.03 When no tape is present, the tape-out sensing pin thrusts up into a hole provided in the tape lid. The rising of the pin opens the tape-out assembly contacts, which opens the clutch magnet circuit, and transmission stops.

TELETYPE CORPORATION
Skokie, Illinois, U. S. A.

SECTION 573-118-100TC
Issue 1, February, 1964

28 TYPING REPERFORATOR

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS PAGE

CONTENTS PAGE

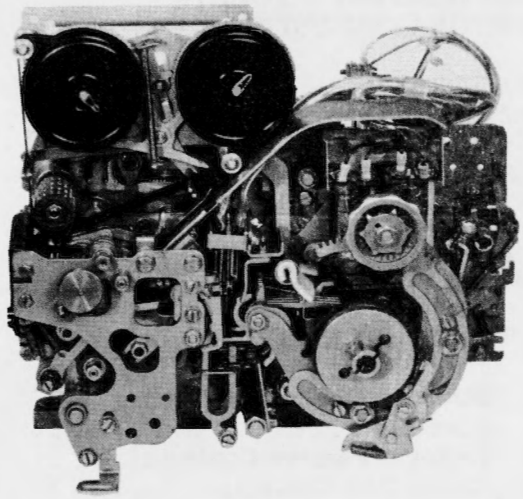


Figure 1 - 28 Typing Reperforator Unit

CONTENTS PAGE

CONTENTS PAGE

1. GENERAL

1.01 The 28 typing reperforator is an electromechanical unit which records information on tape, both as printed characters and as code perforations. The information is received from a signal line in the form of an electrical signaling code (teletypewriter code), which is translated into mechanical motions to type and perforate the tape. The typing reperforator is available in two variations: The fully-perforated tape unit (Fig. 4) and the chadless tape unit (Fig. 2). A number of variable features are also 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 punch mechanism at the left. 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 points and crosshatched to indicate floating points.

1.03 The unit is referred to as being in the idling condition when the main shaft is turning, the signal circuit is closed, so that no message is being received. The unit is referred to as running open when the main shaft is turning and no signal is applied to the selector magnets.

2. DESCRIPTION

GENERAL

2.01 The fully-perforated tape typing reperforator unit prepares fully punched tape and prints between the feed holes (Fig. 4). The chadless-tape typing reperforator prepares partially punched (hinged chad) tape and prints along the upper edge of the tape (Fig. 2). Except for these differences, the units are otherwise identical. The following paragraphs describe the mechanisms that comprise the units. Refer to Figures 2, 3, and 4.

ROTARY MOTION DISTRIBUTION

2.02 Rotary motion from an external source is received by a main shaft and distributed by two cam-clutch assemblies. External changes in speed of the driving power, through a gear shift mechanism or gear changes, permit changes from 60 to 75 or 100 words per minute in the typing reperforator operating speed. A rocker bail further distributes the motion to the mechanisms involved in printing and perforation.

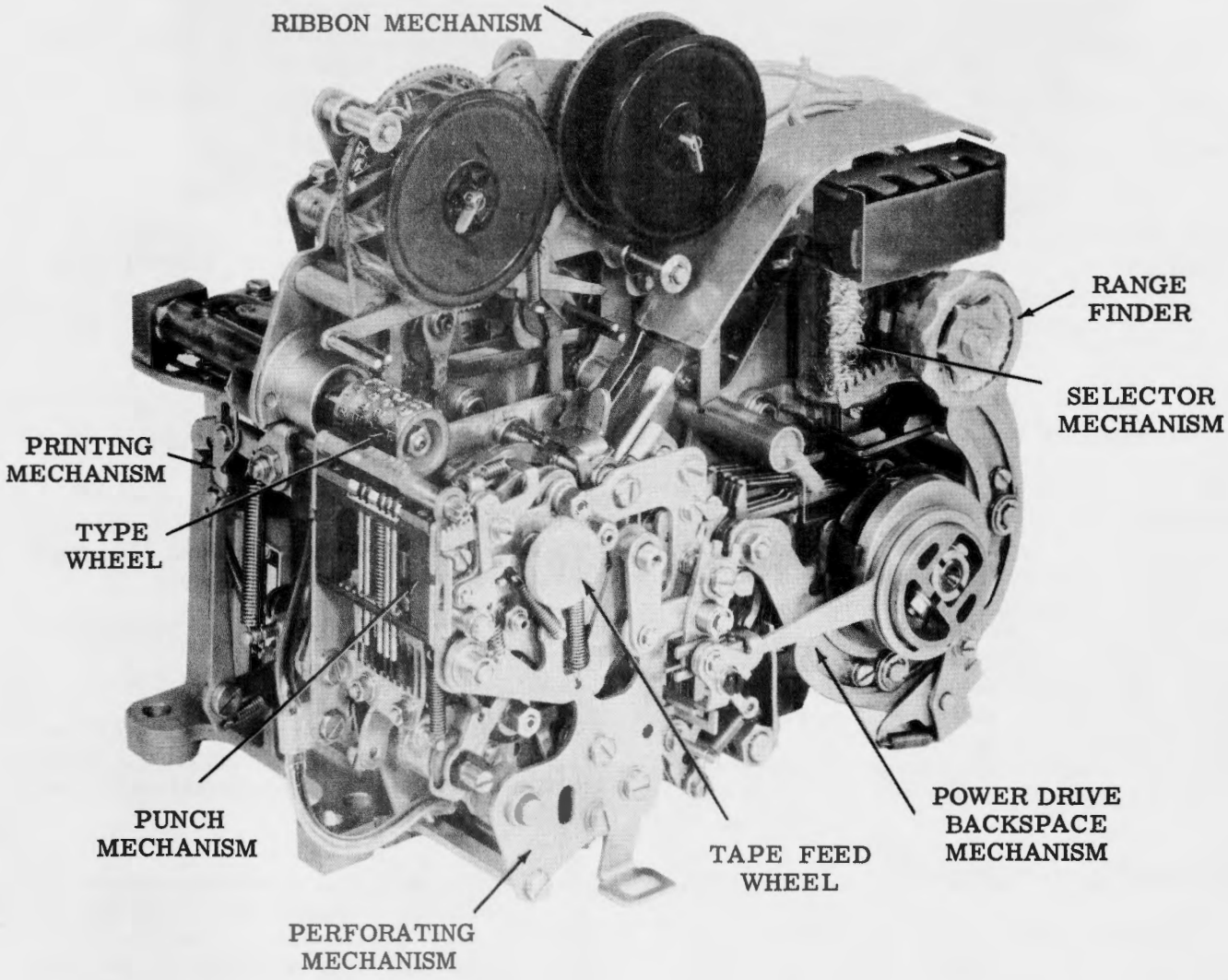


Figure 2 - 28 Typing Reperforator Unit - Chadless Tape (Left Front View)

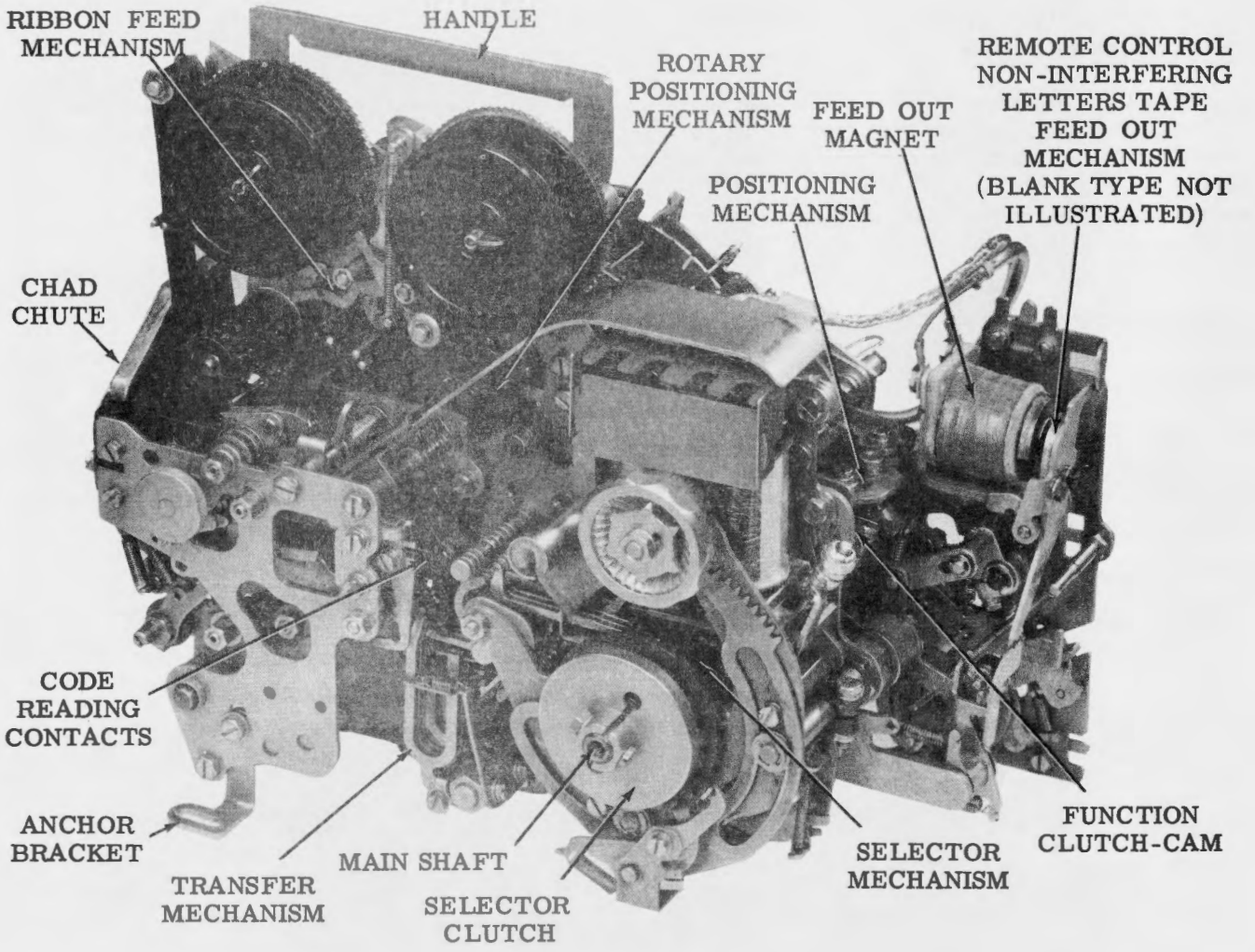


Figure 3 - 28 Typing Reperforator Unit - Fully Perforated Tape (Left Rear View)

SELECTING MECHANISM

2.03 A selecting mechanism, which includes a two-coil magnet wired to the signal line, converts the electrical code combinations into mechanical arrangements which govern the printing and perforation. The magnet may be wired in series for 0.020 ampere operation or in parallel for 0.060 ampere operation. A range finder permits adjustment of the selector in relation to the signaling code.

TYPEWHEEL AND POSITIONING MECHANISMS

2.04 The characters used in printing are embossed on a bakelite typewheel which may be replaced to obtain different type faces and character arrangements. Controlled by the selecting and transfer mechanisms, axial and rotary positioning mechanisms in conjunction with a correcting mechanism select the proper characters by moving the typewheel.

PRINTING, RIBBON FEED, AND PERFORATING MECHANISMS

2.05 A printing mechanism utilizes a hammer to drive the tape and inked ribbon against the typewheel and imprint the selected characters.

2.06 The ribbon is advanced by a ribbon-feed mechanism. A perforating mechanism steps the tape, punches feed holes and perforates chadless (or fully perforated) code holes corresponding to the code pulses received by the selecting mechanism. The tape is threaded by means of a handwheel.

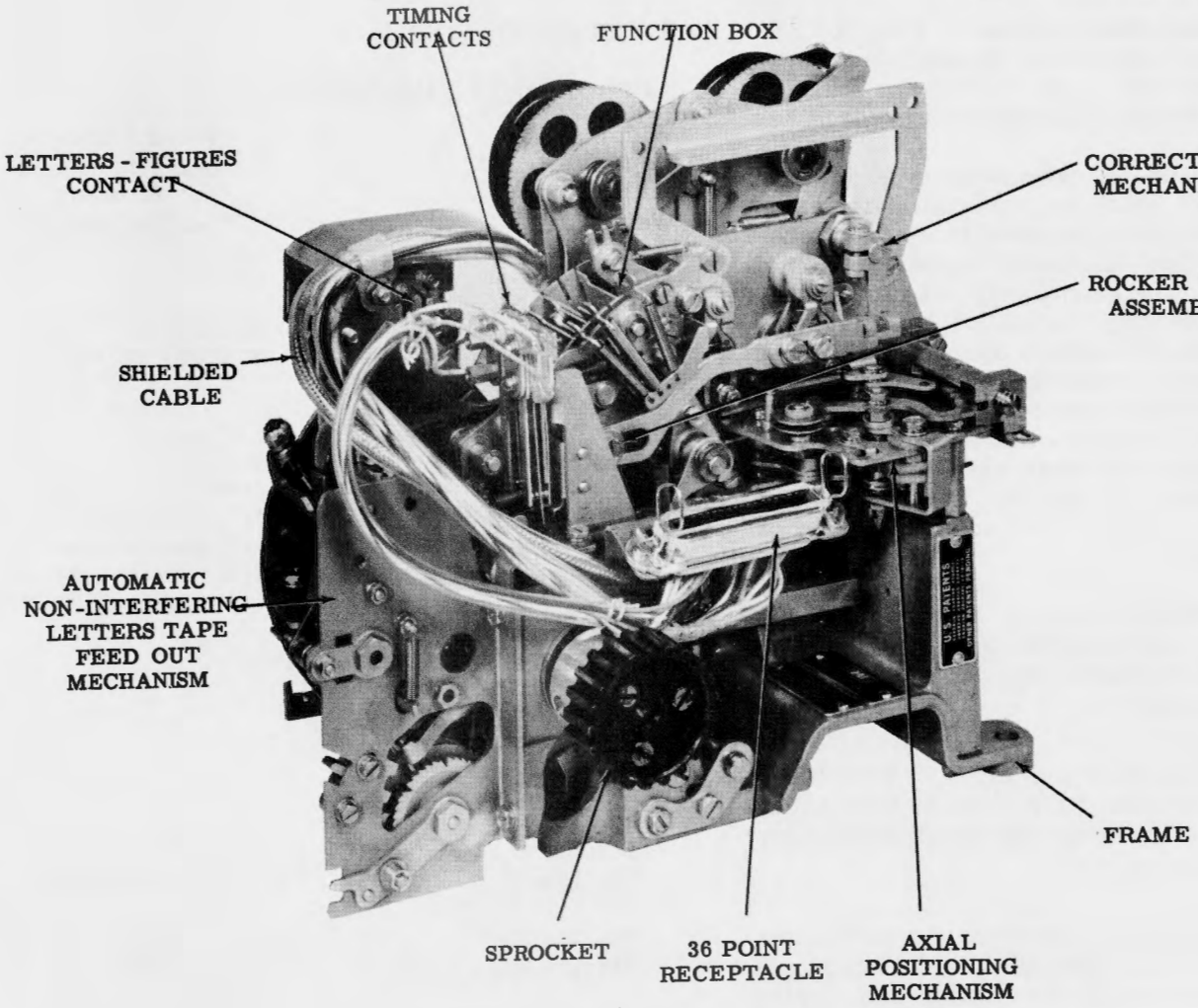


Figure 4 - 28 Typing Reperforator Unit (Front View)
(Fully-Perforated Tape)

2.07 Printing and perforating occur simultaneously at a punch block, but the characters are printed six spaces to the right of the corresponding code combinations. The typewheel is retracted at the end of each operation to make the last printed character visible.

FUNCTION BOX

2.08 A function box enables the unit to perform various auxiliary functions including the letters-figures shift, unshift on space and signal bell.

FRAME ASSEMBLY

2.09 A cast frame provides mounting facilities for the various mechanisms which comprise the typing reperforator. The frame is in turn mounted on associated equipment through which the necessary electrical and motive power connections are made. A 36-point connector for all electrical input requirements is provided.

VARIABLE FEATURES

2.10 A number of variable features are available with the typing reperforator. These features, some of which are described below and in par. 5, enable the unit to perform special operations and may be installed either at the factory or in the field.

(a) Contact Mechanisms - These mechanisms furnish electrical pulses for remote use. They include timing, code reading, and audible and visual indicator actuating contacts.

(b) Backspace Mechanisms - Two basic types are available: manual and power drive. They are used to retract the tape in order to erase (obliterate) an error.

(c) Tape Feed-Out Mechanisms - Several different methods permit the inclusion of a predetermined length of blank or letters-perforated tape following the perforation of a message. The extra length of tape facilitates tape handling. Normally, the interfering tape feed out mechanism operates at the end of a message. A message can not be received during the feed out period. The non-interfering tape feed out mechanisms have provisions for operating messages that are received during the feed-out period. The mechanisms may be operated automatically, manually, or by remote control.

(d) Print Suppression on Function - This feature prevents the printing of a predetermined character when the character or function is selected.

(e) Universal Function Blade - This blade contains removable tines so that it may be coded to accommodate any desired function box requirement.

2.11 A variation of the typing reperforator unit is a unit that contains an additional shaft that enables its perforator and typing mechanisms to be operated at a different speed from that of its selecting mechanism. It is used in applications such as the Automatic Send-Receive Set and is described in another publication.

3. TECHNICAL DATA

APPROXIMATE DIMENSIONS

Width . . . . . 7-1/2 inches
Depth . . . . . 6-1/2 inches
Height . . . . . 8 inches
Weight . . . . . 7-1/2 pounds

SIGNAL

Code . . . . . Sequential, 5-level, start-stop
Current . . . . . 0.020 or 0.060 ampere

TAPE

Type . . . . . Standard communications
Width . . . . . 11/16 inch
Perforations . . . . . Five-level, chadless or fully perforated (determined by unit)
Holes/inch 10
Feed holes and code holes in line

PRINTED CHARACTERS

A. Chadless

Height
Standard . . . . . 0.120 inch
Maximum . . . . . 0.193 inch
Width
Standard . . . . . 0.075 inch
Maximum . . . . . 0.085 inch

B. Fully Perforated

Height . . . . . 0.100 inch
Width . . . . . 0.046 inch

OPERATING SPEEDS

Unit Code	7.00	7.00	7.00	7.00	7.42	7.42	7.42	7.42	7.50	7.50	7.50
O.P.M.	390	428.6	636	643	368	404	460	600	364	400	600
Baud	45.5	50.0	74.2	75.0	45.5	50.0	56.9	74.2	45.5	50.0	75.0
Pulse Lgth	0.022	0.020	0.0135	0.0133	0.022	0.020	0.0175	0.0135	0.022	0.020	0.0133
Freq	22.75	25.0	37.1	37.5	22.75	25.0	28.45	37.1	22.75	25.0	37.5
Char. Per Sec.	6.5	7.1	10.6	10.7	6.0	6.7	7.7	10.0	6.1	6.7	10.0
Words Per Min.	65	71.4	106	107	60	67.3	75	100	60.6	66.6	100

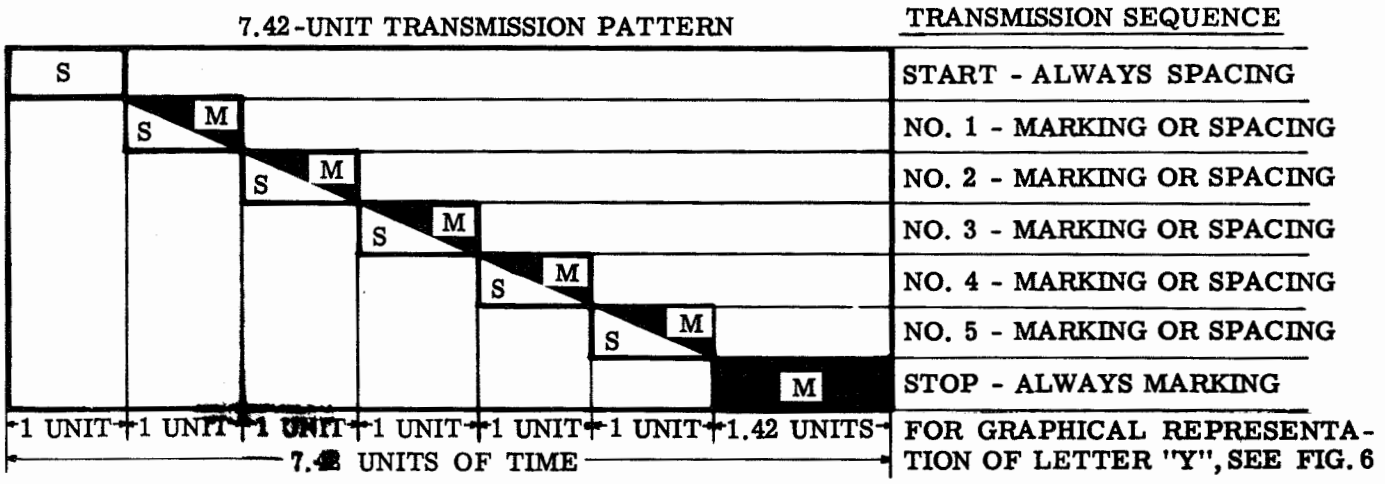
SIGNALING CODE (Fig. 5)

3.01 The typing reperforator operates on the principle of electromechanical conversion of message characters (see Fig. 5) in terms of a signal code. Teletypewriter equipment utilize the Baudot code, a five-unit start-stop signaling code, in which each character or function is represented by a combination of marking current and spacing current time intervals. In a polar signal circuit, intervals during which current flows in a positive direction are referred to as marking elements, and intervals during which current flows in the opposite direction as spacing elements. In a neutral signal circuit, intervals during which current flows in the circuit are referred to as marking elements, and intervals during which no current flows as spacing elements.

3.02 Every code combination includes five elements that carry the intelligence, each of which may be either marking or spacing. The intelligence elements are preceded by a start element (always spacing) and are followed by a stop element (always marking). The start and stop elements provide for mechanical synchronization between the transmitting and receiving equipment. A graphic illustration of the marking and spacing element in each sequence appears in Fig. 5. All five elements are marked in the letters code. The blank code is comprised of five spacing elements.

3.03 The total number of permutations of a five unit code is two to the fifth power, or 32. In order to transmit more than 32 characters and functions, a letters-figures shift operation is designed into the equipment. This permits each permutation, excluding those used to shift and unshift the apparatus, to represent two characters or functions.

3.04 The typing reperforator may operate with a 7.00, 7.42, or 7.50 unit transmission pattern (see Operating Speeds in par. 3). The signaling frequency is expressed in dot cycles per-second, one cycle consisting of a positive



a.

		FIGURES	-	?	:	$	3	!	&	#	8	'	(	)	.	,	9	ø	1	4	Δ	5	7	;	2	/	6	"	ℵ	<	≡	■	Ψ	Λ
		LETTERS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	BLANK	C.R.	L.F.	SPACE	LTR.	FIG.
	1		●	●		●	●	●				●	●						●		●		●		●	●	●	●					●	●
	2		●		●				●		●	●	●	●				●	●	●			●	●	●						●		●	●
	FEED HOLES		o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	3				●			●		●	●		●		●	●		●	●		●		●	●		●	●						●	●	
	4			●	●	●		●	●			●	●		●	●	●			●				●		●				●				●	●
	5			●					●	●				●	●		●	●	●			●		●	●	●	●	●						●	●

(TYPICAL CHARACTER ARRANGEMENT) b.

Figure 5 - Signaling Code

current pulse followed by a negative current pulse. The equipment speed in baud is equal to twice the frequency. Speed in words per minute is roughly equivalent to one-sixth the operations per minute.

3.05 Marking elements in the intelligence code are represented by holes and spacing elements by the absence of holes. The row of smaller holes between the second and third levels are tape feed holes and do not enter into the code permutation.

4. GENERAL OUTLINE OF OPERATION

4.01 The relationship of the operating mechanisms of the 28 typing reperforator are illustrated in the block diagram (Fig. 6). Rotary motion from an external source is applied to the main shaft through a sprocket driven by a timing belt (Fig. 7). The main shaft rotates constantly as long as the unit is under power. An 0.020 or 0.060 ampere signal to the selector magnet is externally supplied. External electrical circuitry is supplied through a 36-point connector at the rear of the unit (see Fig. 3).

4.02 The signaling code combinations, such as the combination representing the graphic Y, plotted at the left of Fig. 6, are applied to the selecting mechanism. The start pulse of each code combination causes the selector, through a trip assembly, to trip the selecting cam-clutch. The main shaft then imparts motion to the cam-clutch throughout the selecting cycle. The cam-clutch mechanism, in turn, transfers timed motion to the selector, which converts the intelligence pulses of the code combination into a corresponding mechanical arrangement. Near the end of the selecting cycle, the cam-clutch actuates the function trip assembly. The latter trips the function cam-clutch to operate the printing and perforating mechanisms. The selecting cam-clutch is then disengaged and remains inoperative until the next code combination is received.

4.03 The function cam-clutch, driven by the main shaft, imparts motion to the rocker bail throughout the function cycle. The rocker bail transfers the motion to the perforating mechanism, the positioning mechanisms, the tape feed mechanism and the printing mechanism.

4.04 The transfer mechanism, having received their arrangement from the selector, causes positioning of the axial and rotary positioning mechanisms, which select the type-wheel character to be printed.

4.05 The punch slides, having received their arrangement from the selector, cause the punch pins to perforate code holes in the tape corresponding to the code pulses received by the selecting mechanism. Late in the function cycle, the tape feed parts advance the tape one character space. The function cam-clutch is then disengaged and remains stationary until again tripped by the selecting cam-clutch or by a tape feed-out mechanism. The operations of the reperforator may overlap if the code combinations are being received fast enough. For example, while the perforating mechanism is punching the code combination, advancing the tape and the printing mechanism is printing, the selecting mechanism may be processing the next code combination.

5. SELECTION

GENERAL

5.01 The selecting mechanism, made up of a selector (5.07), a clutch trip assembly (Fig. 8) and a cam-clutch (Fig. 7), translates the signaling code combinations into mechanical arrangements which govern tape printing and perforation. The electrical pulses comprising each code combination are applied to a magnet of the selector. The magnet, through an armature, controls the clutch trip assembly and the parts associated with translation. The cam-clutch transfers timed motion to the selector and also trips the function cam-clutch. By means of a range finder assembly (Fig. 8), the selecting mechanism can be adjusted to sample the code elements at the most favorable time for optimum operation. The mechanical arrangements produced by the selecting mechanism are passed on through the transfer mechanism to control the positioning and printing mechanisms (5.12) and through the punch slides to control the perforating mechanism (5.09).

RECEPTION AND TRANSLATION

A. Selecting Cam-Clutch and Trip Assembly (Fig. 7 and 8)

5.02 The selecting cam-clutch assembly includes (from right to left in Fig. 7) the clutch, the stop arm bail cam, the fifth, the fourth and the third selector cams, the cams for the spacing and the marking lock levers, the second and the first selector cams, the selector reset bail cam and the function trip cam. The

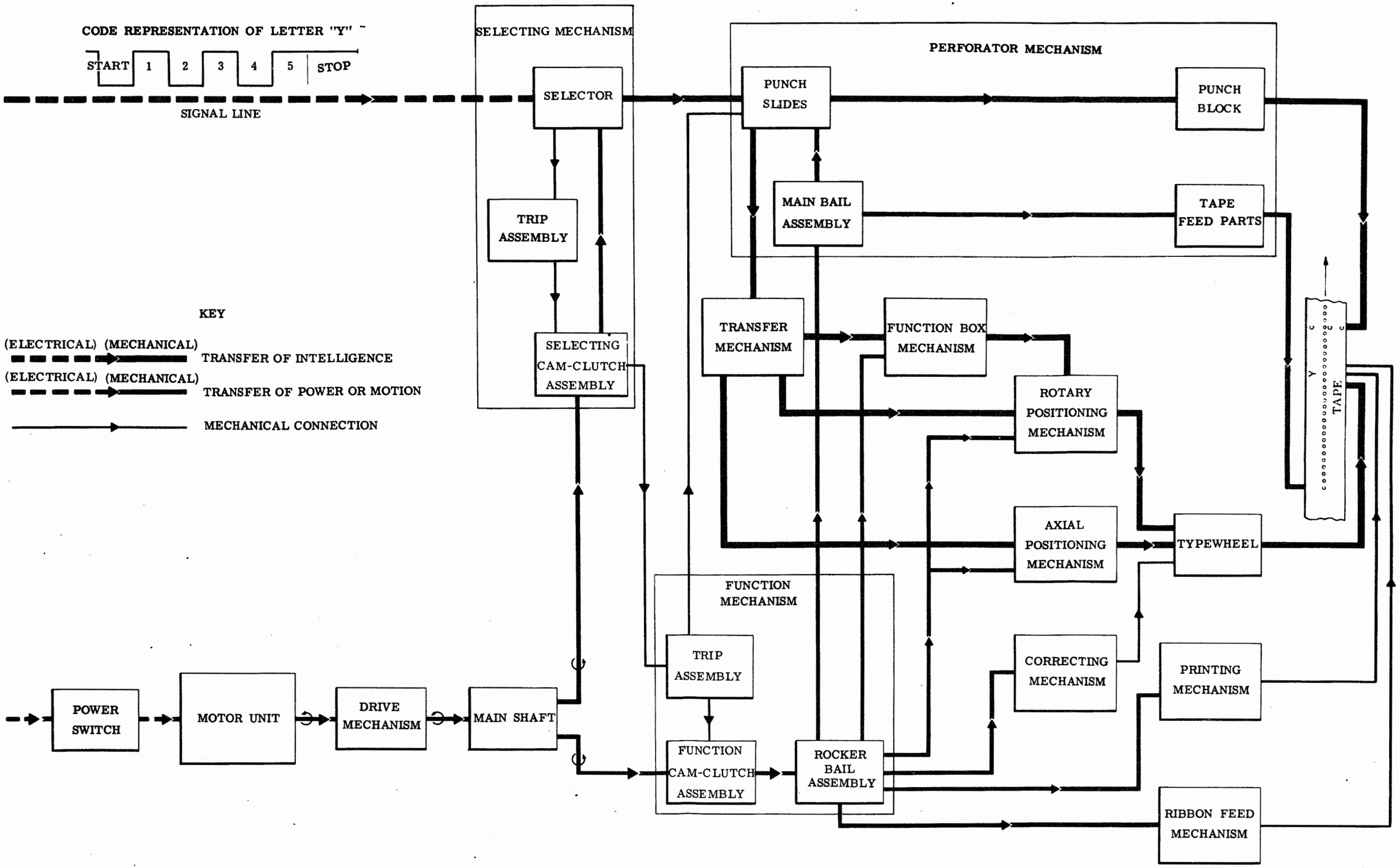


Figure 6 - 28 Typing Reperforator Unit, Block Diagram

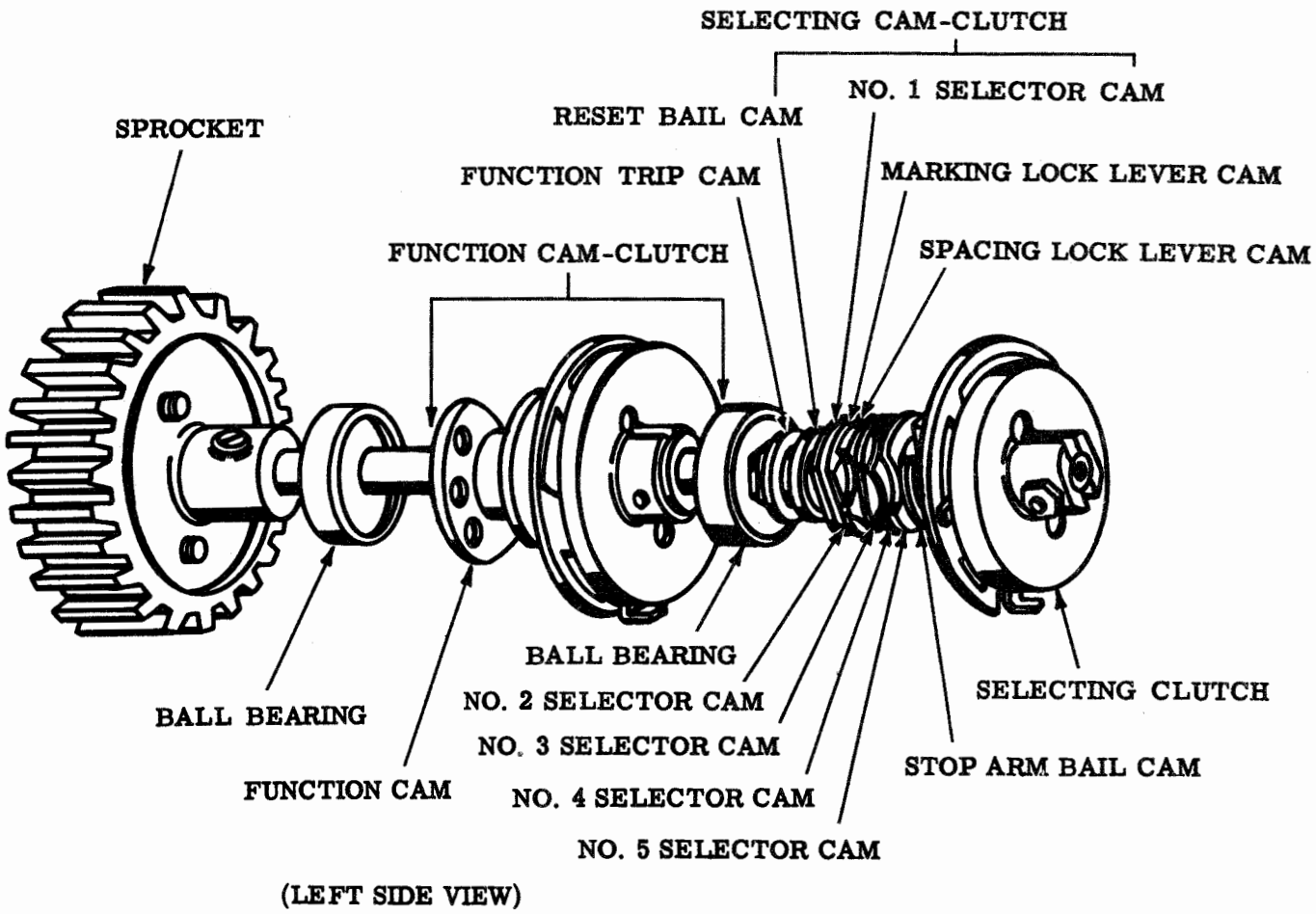


Figure 7 - Main Shaft

cam clutch is controlled by the selector through the clutch trip assembly (Fig. 8). During the time in which the signal circuit is closed (marking), the selector magnet coils are energized and hold the selector armature up against the magnet pole pieces. In this position, the armature blocks the start lever, and the cam-clutch is held stationary between the stop arm and latch lever.

5.03 When a code combination is received, the start element (spacing) de-energizes the magnet, and the selector armature under tension of its spring moves down out of the way of the start lever. The start lever turns clockwise under spring pressure and moves the stop arm bail into the indent of the start cam (Fig. 8). 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 selecting cam-clutch engages and begins to rotate counterclockwise. The stop arm bail immediately rides to the high part of the cam, where it remains to hold the start lever away from the armature while the intelligence pulses of the code are received and processed by the selector (5.07 to 5.09).

5.04 When the stop element at the end of the code combination is received, the armature is pulled up and blocks the start lever. Thus the stop arm bail is prevented from dropping into the low part of its cam, and the attached stop arm is held in position to stop the clutch shoe lever. When the clutch shoe lever strikes the stop arm, the inertia of a cam disk causes it to continue to turn until its lug makes contact with the clutch shoe lever. At this point, a latch lever drops into an indent in the cam disk, and the clutch is held disengaged until the next code combination is received.

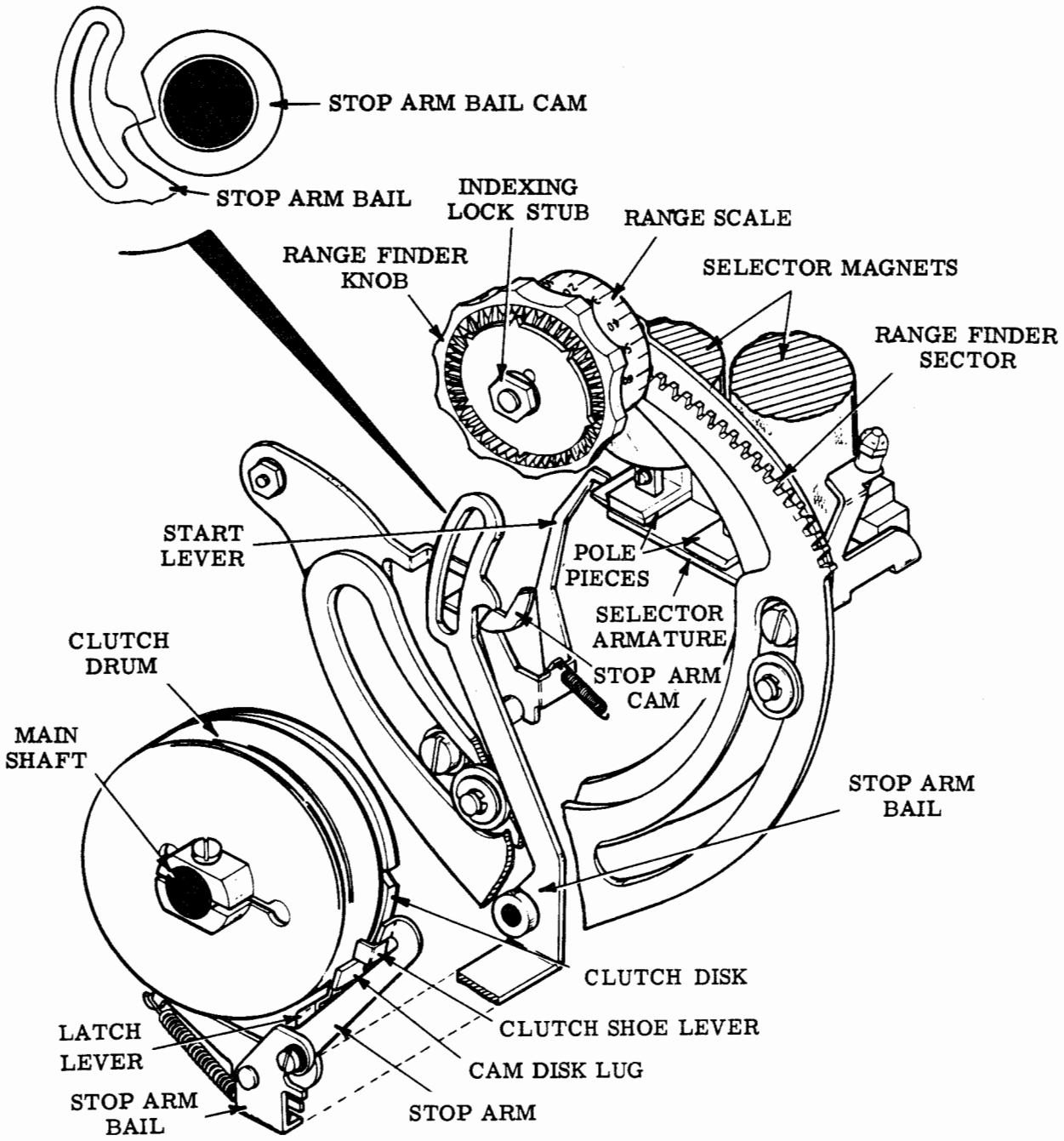


Figure 8 - Range Finder and Selecting Cam-Clutch Assembly

B. Clutch Operation (Fig. 9 and 10)

5.05 The clutch drum is attached to and rotates in unison with the main shaft (Fig. 7). In the disengaged position, as shown in Fig. 10, 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. 8) away from the clutch and thus releasing stop lug A and the lower end of shoe lever B (Fig. 9). 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 down-

ward 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 lever end of the secondary shoe then bears against the drum at point H. The drum drives this shoe upward so that it again makes contact with 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.

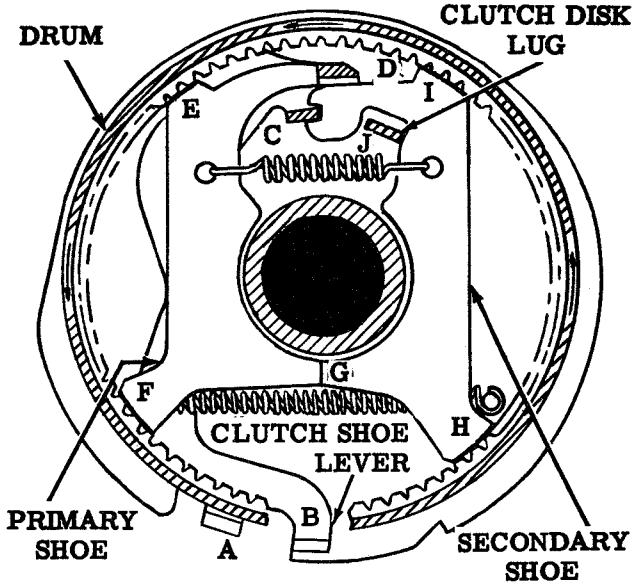


Figure 9 - Clutch, Engaged

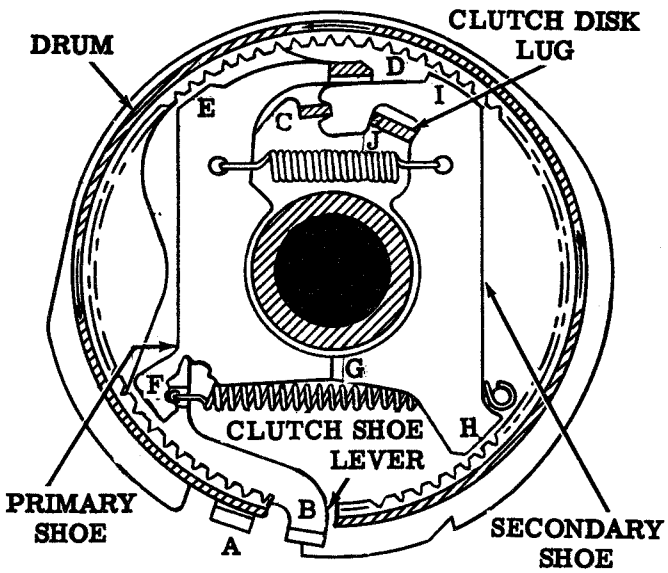


Figure 10 - Clutch, Disengaged

5.06 Disengagement is effected when the lower end of shoe lever B strikes the stop arm (Fig. 8). Lug A and the lower end of the shoe lever are brought together (Fig. 9), 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 (5.04) and the cam is held in its stop position until the clutch is again engaged.

C. Selector Operation (Fig. 7, 8 and 11)

5.07 The selector assembly consists primarily of two magnet coils (Fig. 8), an armature and associated bails, levers and latches (Fig. 11). Five linkages, each of which consists of a selecting lever, a push lever and a punch slide latch, link the selector cam with the punch slides. Since the linkages are identical, only the No. 4 is shown in its entirety in Fig. 11. As the selecting elements of the code combination are applied to the magnet, the cam actuates the selecting levers. When a spacing element is received, a marking lock lever is blocked by the end of the armature, and a spacing lock lever swings to the right above the armature and locks it in the spacing position until the next signal transition occurs. Extensions on the marking lock lever prevent the selecting levers from following their cams. When a marking element is received, the spacing lock lever is blocked by the end of the armature, and the marking lock lever swings to the right below the armature and locks it in the marking position until the next signal transition occurs. During this marking condition, the selecting levers are not blocked by the marking lock lever extensions, but are permitted to move against their respective cams. The selecting lever that is opposite the indent in its cam, while the armature maintains a marking condition, swings to the right, or selected, position, and the end of an associated push lever falls off a step on the selecting lever.

5.08 As the cam rotates, the selecting levers, together with any selected push levers, are moved to the left by the high part of their respective cams, where they remain until the next code combination is received. The unselected push levers remain to the right. When the next code combination is received, a selector reset bail, lifted by its cam (Fig. 11), strips the selected push levers from the selecting levers, and the push levers are returned to the right by their springs.

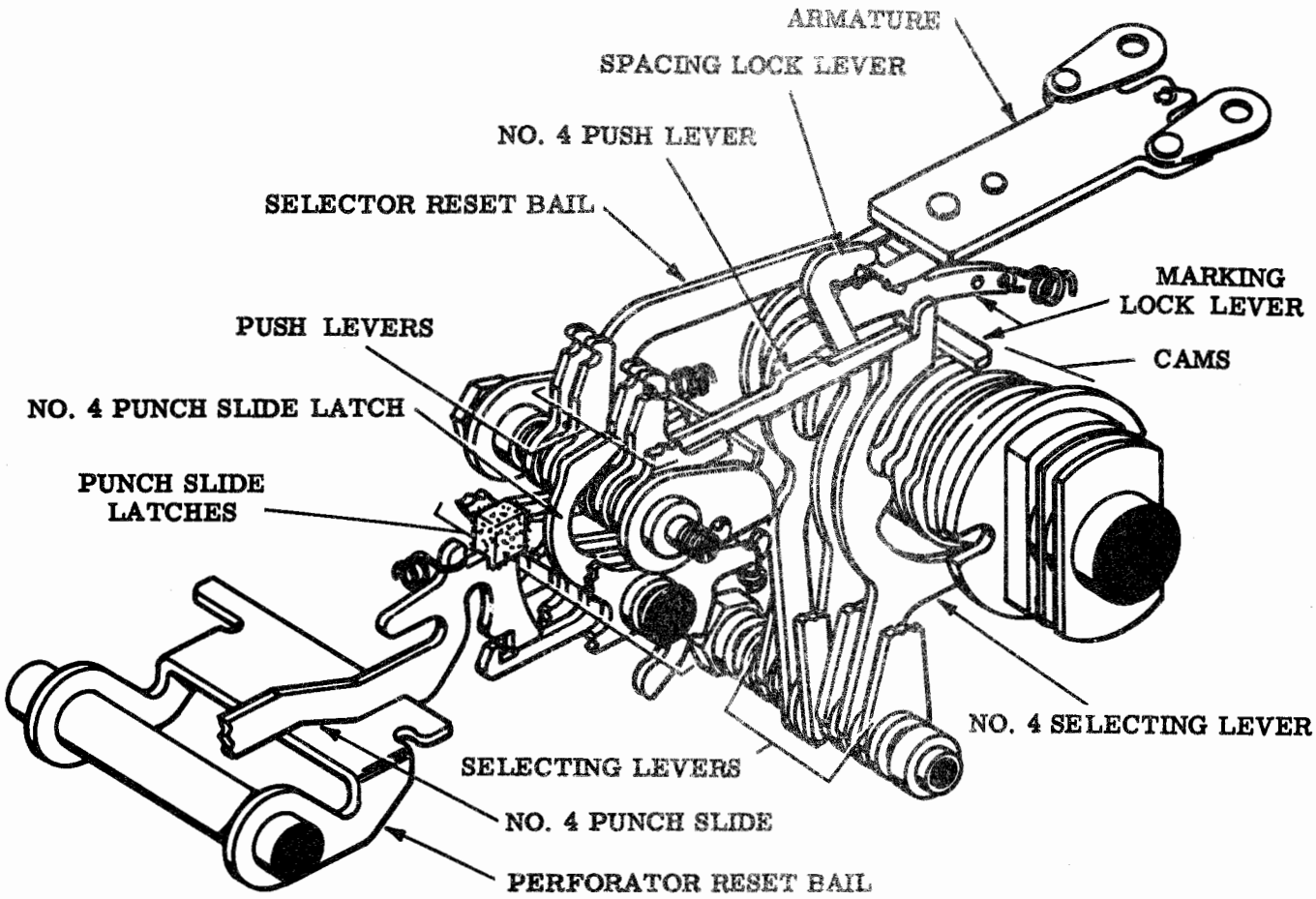


Figure 11 - Selector

5.09 The selected push levers, in moving to the left, rotate associated punch slide latches counterclockwise (Fig. 11). Just before the fifth push lever is selected, the selecting cam through the function trip assembly causes the perforator reset bail to release the punch slides (5.12). The unselected latches retain their associated slides to the right, while the selected latches permit their slides to move to the left under spring tension. During the latter part of the function cycle, the reset bail returns the punch slides to their unselected position (8.05). The latches under spring tension return to their unselected position when the push levers are repositioned at the beginning of the next selecting cycle.

ORIENTATION (Fig. 8)

5.10 For optimum performance, the selecting mechanism should be adjusted to sample the signaling code elements at the most favorable time. To make this adjustment, the operating margins are established through the range finder, which provides a means of varying the time of sampling. The obtaining of this optimum setting is referred to as orientation.

5.11 When the range finder knob (Fig. 8) is pushed inward and rotated, its attached range finder gear moves the range finder sector (which supports 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 marking and spacing lock levers. When an optimum setting is obtained, the range finder knob is released. Its inner teeth engage the teeth of the indexing lock stud and hold the range finder mechanism in position. The setting may be read on the range scale opposite a fixed index mark.

TRANSFER (Fig. 12)

5.12 Near the end of each selecting cycle the transfer mechanism moves the intelligence in the form of a mechanical arrangement from the punch slides to the function box and positioning mechanisms. Included in the mechanism are five linkages, each of which is associated with a punch slide. A linkage consists of a transfer lever, a pulse beam and a bell crank. Since the linkages are similar only the No. 4 is shown in its entirety in Fig. 12.

5.13 The linkages associated with the unselected punch slides (5.09) remain in their unselected position as shown in Fig. 11. However, the selected slides in moving to the left pivot the associated transfer levers which, in turn, move corresponding pulse beams clockwise (as viewed from above). The selected beams allow associated bell cranks under spring tension to pivot counterclockwise and lift attached push bars. The push bars, in turn, control the positioning mechanisms. In the period of the last half of the function cycle, the selected slides are moved back to the right (8.06) and return the linkages to their unselected position.

5.14 Slotted upper arms of the bell cranks extend up into the function box and control its operation as described in (7.18). An additional bell crank, not associated with a transfer linkage, is specifically concerned with the letters-figures shift.

6. MOTION FOR TYPING AND PERFORATING

GENERAL

6.01 The motion of the main shaft is conveyed to the mechanisms concerned with typing and perforation by the function mechanism, which is comprised of a cam-clutch (Fig. 7), a clutch trip assembly (Fig. 13) and a rocker bail (Fig. 14).

FUNCTION CAM-CLUTCH AND CLUTCH TRIP ASSEMBLY (Fig. 13)

6.02 The trip assembly is shown in its unoperated condition in Fig. 13. A follower lever rides on a function trip cam which is part of the selecting cam-clutch (Fig. 7). Near the end of the selecting cycle, as the main shaft rotates counterclockwise, the high part of the cam pivots the follower lever (Fig. 13) which, through an attached adjusting arm, rotates a main trip lever counterclockwise. A reset bail

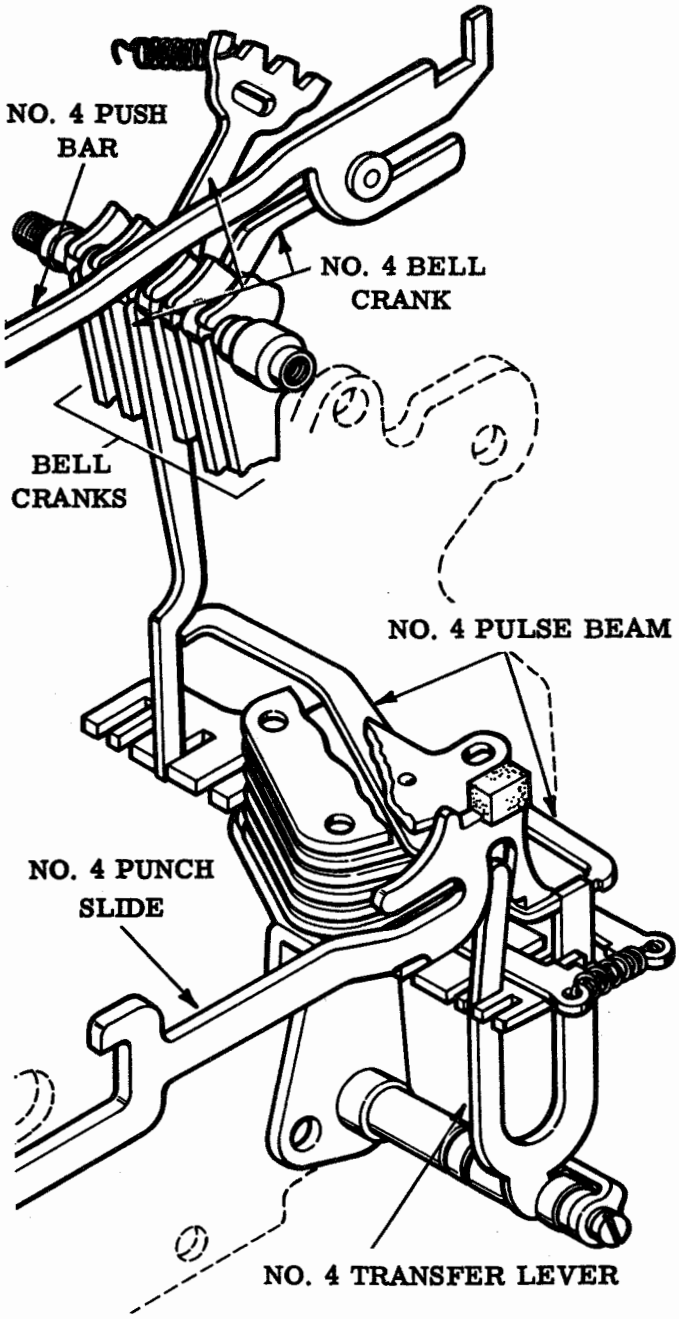


Figure 12 - Transfer Mechanism

trip lever attached to the main trip lever lowers the perforator reset bail and releases the punch slides (8.02); and an upper arm of the main trip lever moves out of the way of a clutch release, which falls against a down-stop and rotates a trip shaft counterclockwise. Immediately, the low part of the trip cam allows the follower lever to return to its unoperated position, and the upper arm of the main trip lever moves down against the release. When the trip shaft

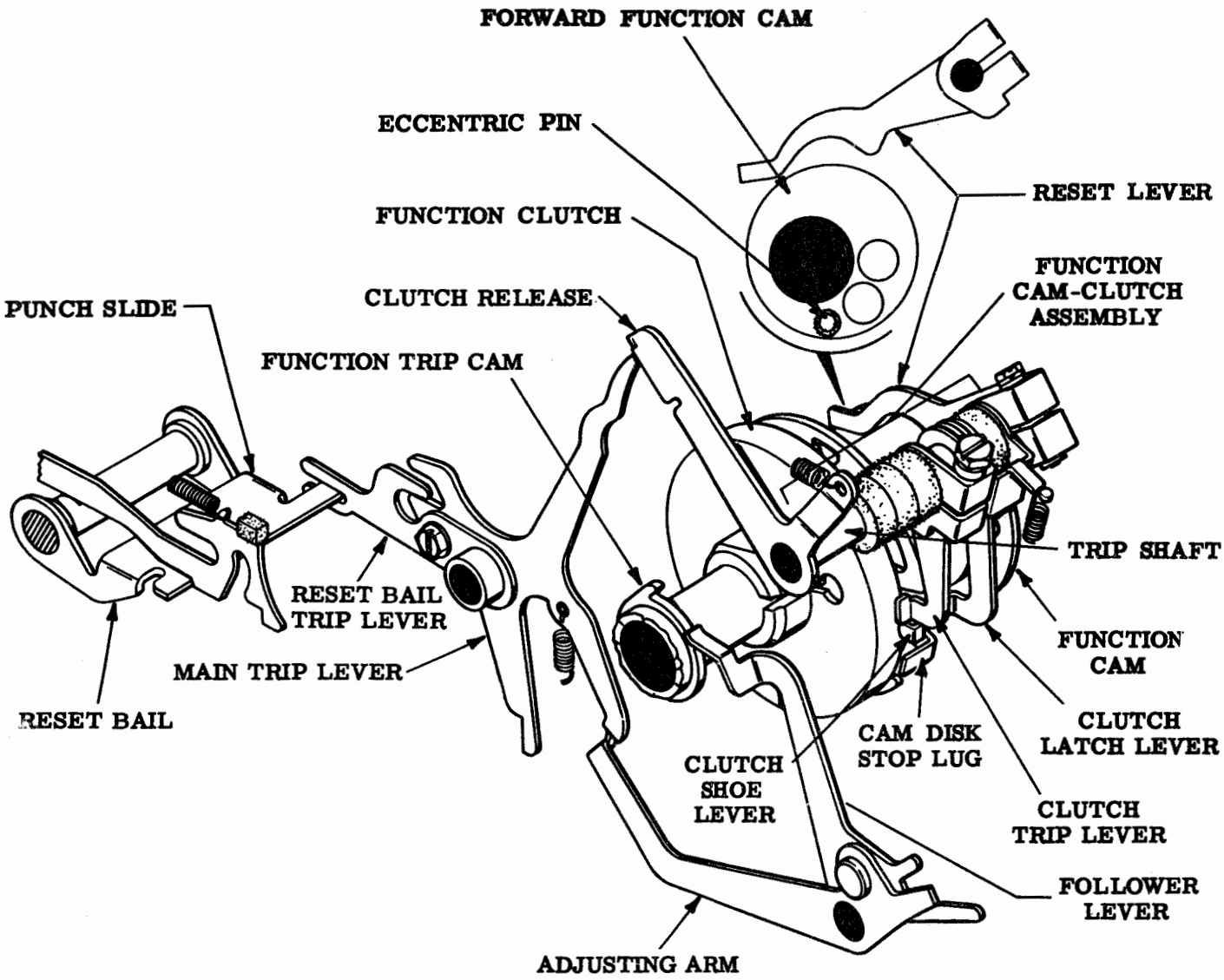


Figure 13 - Function Cam-Clutch and Clutch Trip Assembly

is rotated by the release, it moves an attached clutch trip lever out of engagement with the clutch shoe lever. The clutch engages, and the cam-clutch begins its cycle. The internal operation of the clutch is the same as that of the selector clutch, described in (5.05 and 5.06).

6.03 About midway through the function cycle, an eccentric pin on the function cam lifts a reset arm, which rotates the trip shaft clockwise. The release is moved up and allows the main trip lever to fall against the adjusting arm and raise the reset bail. The eccentric pin then moves out from under the reset arm, and the release is permitted to return to its unoperated position against the main trip lever. When the cam-clutch assembly completes its cycle, the clutch shoe lever strikes the trip lever, and the clutch is disengaged.

ROCKER BAIL (Fig. 14)

6.04 The function cam and the rocker bail translate the rotation of the main shaft into simple harmonic motion, which the bail distributes to the following:

(a) Ribbon feed mechanism

(b) Perforator

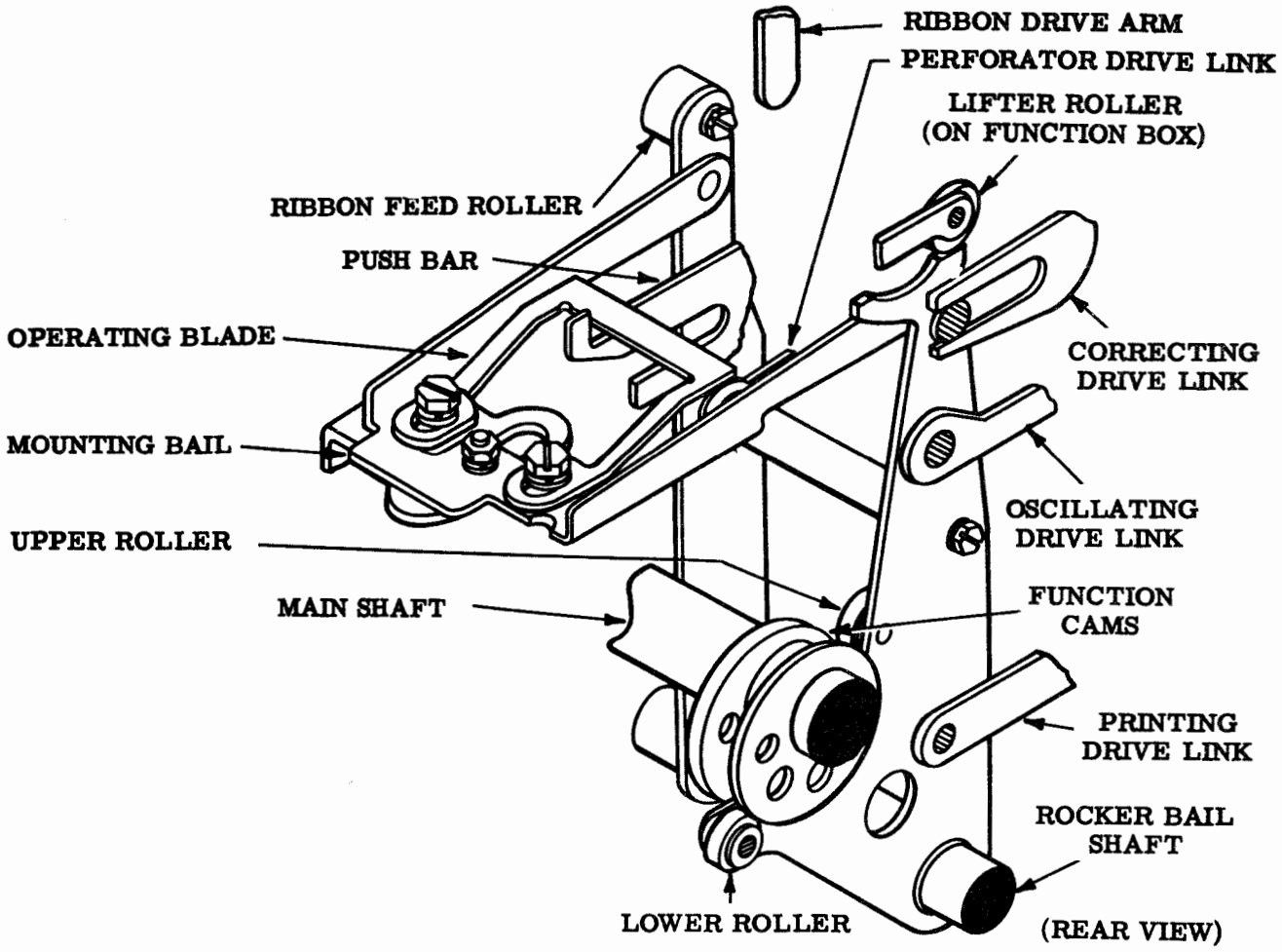


Figure 14 - Rocker Bail Assembly

(c) Correcting mechanism

(d) Function box

(e) Printing mechanism

(f) Oscillating assembly

(g) Push bars of the axial and rotary positioning mechanisms.

The bail is shown in its home position in Fig. 14. Each function cycle, the function cams bear against the rollers and cause the bail to rock to the right (as viewed from the rear in Fig. 14) during the first part of the cycle and then back to the home position during the latter part of the cycle.

7. TYPING

GENERAL

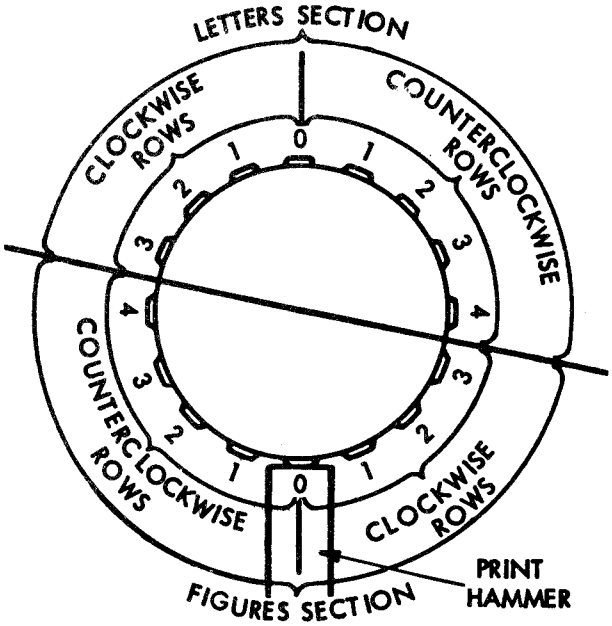
7.01 The characters used to type the received intelligence – letters, figures, and symbols representing various functions – are embossed on the cylindrical surface of the metal typewheel (Fig. 15). During the function cycle, the axial and rotary positioning mechanisms (Fig. 16 and 18), having received the intelligence from the transfer mechanism, position the wheel so that the character represented by the received code combination is selected. Following typewheel positioning the correcting mechanism (Fig. 16 and 18) accurately aligns the selected character. Then the printing mechanism (Fig. 20), by means of a hammer, drives the tape and inked ribbon against the wheel and imprints the character. A ribbon feed mechanism (Fig. 21) advances the ribbon and re-

verses its direction of feed when one of two ribbon spools is depleted. Near the end of the function cycle the axial positioning mechanism retracts the typewheel and a ribbon guide so that the last printed character is visible. The letters or the figures code combination sets up an arrangement in the transfer mechanism which permits the function box (Fig. 19) to operate and cause the rotary positioning mechanism to shift the typewheel through 180 degrees of rotation.

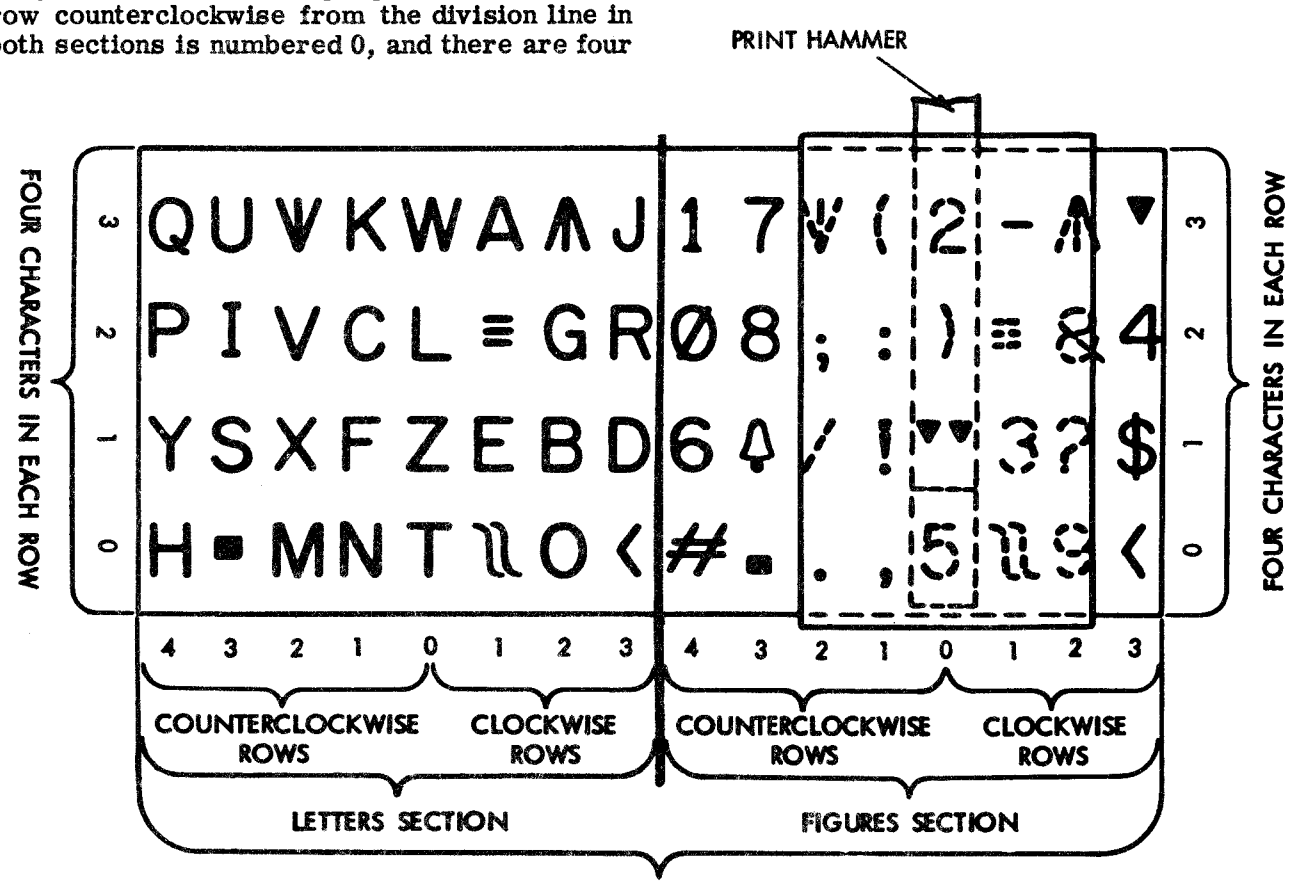
TYPEWHEEL POSITIONING

A. General

7.02 A typical typewheel character arrangement is shown in Fig. 15 in which the wheel's cylindrical surface is shown rolled out into a plane. There are 16 longitudinal rows, each of which is made up of four characters numbered 0 to 4 from front to rear. The surface is divided into two sections, a letters and a figures, each containing eight rows. The fifth row counterclockwise from the division line in both sections is numbered 0, and there are four



a.
FRONT VIEW SHOWING 16 LONGITUDINAL ROWS



b.
TOP VIEW SHOWING CYLINDRICAL SURFACE IN A PLANE

Figure 15 - Typical Typewheel Character Arrangement

rows in one direction from 0 numbered 1 to 4 and designated as counterclockwise rows, and three rows in the other direction numbered 1 to 3 and designated as clockwise rows. It should be noted that the clockwise and counterclockwise modifiers refer to the direction of rotation of the wheel to select the rows and not to their position on the wheel.

7.03 Each printing operation (excluding those devoted to the letters-figures shift) begins and ends with the typewheel in the home position of the section containing the character to be printed, i.e., with the No. 0 character of the No. 0 row at the point of contact of the print hammer. (Actually, inasmuch as the wheel is retracted to show the last printed character (7.11), the No. 0 character is slightly to the rear, but for this discussion it will be assumed that is at the point of contact.) During the printing operation the axial and rotary positioning mechanisms, transferring separate but simultaneous motions to the wheel, position it so that the character represented by the received code combination is at the point of contact of the hammer at the time of printing. The rotary mechanism, which is controlled by the No. 3, 4 and 5 selecting elements of the code, revolves the wheel so as to select the proper row; and the axial mechanism, which is governed by the No. 1 and 2 elements, moves it forward and rearward along its axis so as to select the

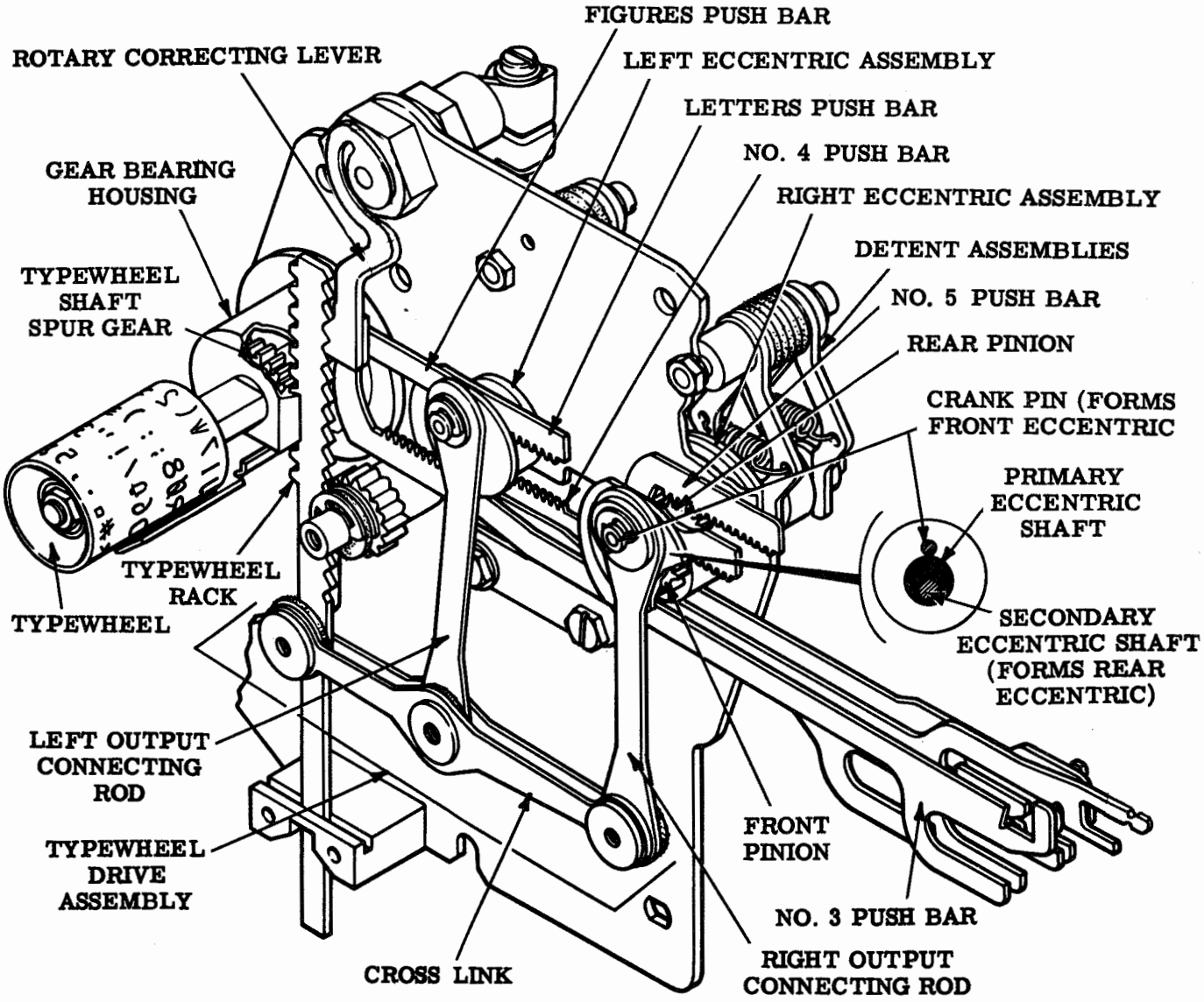


Figure 16 - Rotary Positioning Mechanism

proper character in the row. Rotation of the typewheel to print in either the letters or the figures section is controlled by the No. 7 element of the code. The letters-figures shift (7.17), which consists of rotating the wheel eight rows from the home position of one section to that of the other, requires a separate operation of the equipment and results in the printing of the letters or figures symbol.

7.04 To illustrate the above, if the wheel is in the figures condition, as shown in Fig. 16, and the numeral "5" is to be printed, there is no movement of the wheel during the printing operation, because "5" is already at the point of contact of the hammer. However, if the letter "T" is to be printed, the signaling code for letters must first be viewed to shift the typewheel eight rows to the letters home position. Then during the next operation it is rotated three rows counterclockwise and moved forward two characters so that "T" is at the point of contact of the hammer. Printing takes place, and the wheel is then returned to the letters home position.

B. Rotary Positioning (Figs. 16 and 17)

7.05 The rotary positioning mechanism revolves the typewheel so that the row containing the character to be printed is aligned with the print hammer at the time of printing. Mounted on the front plate, the mechanism includes two eccentric assemblies as shown in Figs. 16 and 17. Each assembly includes a primary shaft, a section of which is formed into a pinion. A secondary shaft, mounted in the primary and offset from its center, forms an eccentric, referred to as the rear eccentric. A portion of the secondary shaft is also a pinion, and a crank pin mounted on its disk-like forward surface forms a secondary, or front, eccentric. Each of the four pinions of the two eccentric assemblies is engaged by the rack of

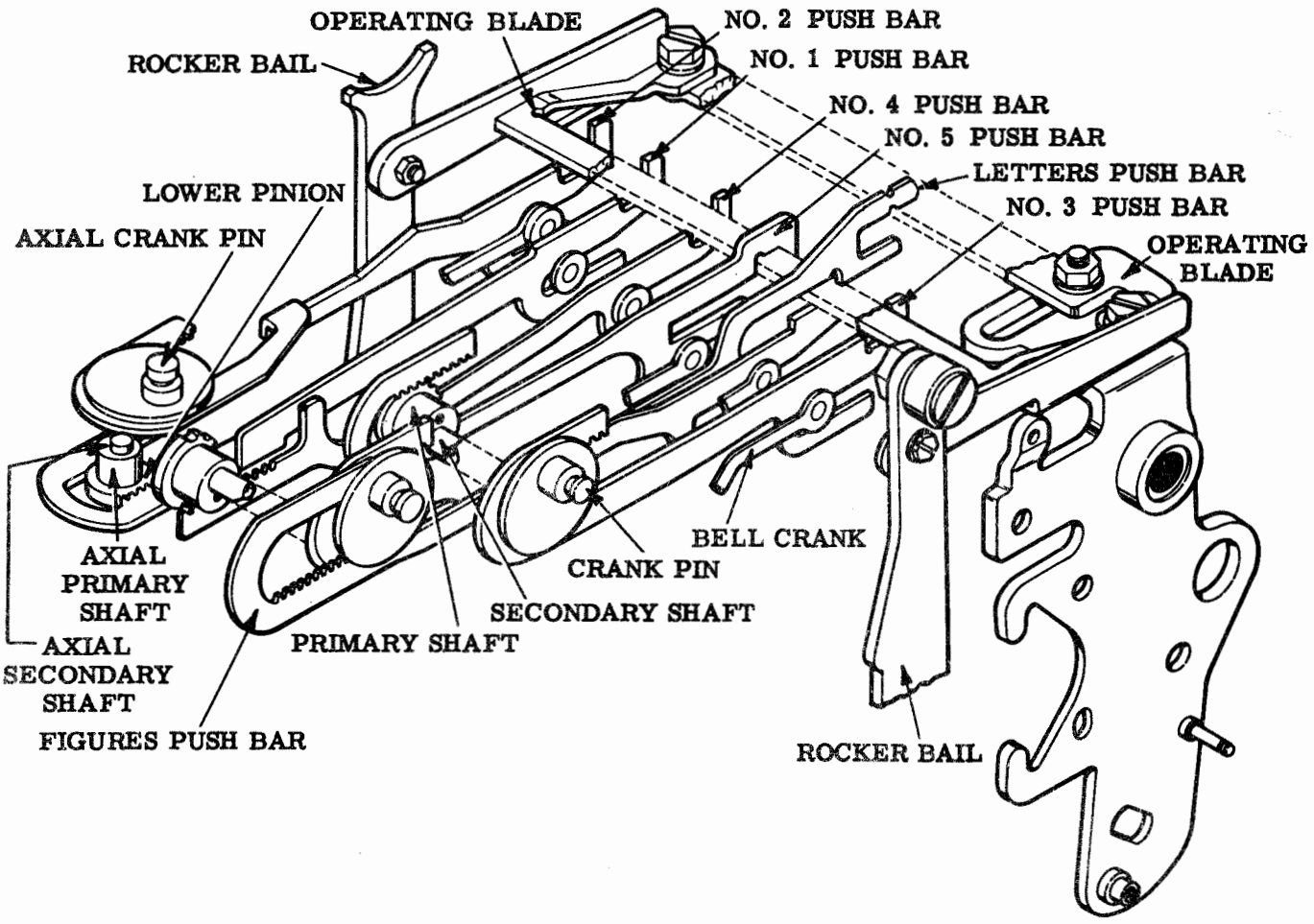


Figure 17 - Pushbars and Eccentric Assemblies

a pushbar: the No. 3 bar engages the rear pinion, and the No. 5 engages the right pinion. The left front pinion is engaged by both the letters and the figures pushbar.

7.06 The eccentric assemblies are linked to a typewheel shaft by a drive assembly as shown in Fig. 16. The typewheel is secured to the front of the shaft which is supported by a bearing housing mounted at the left rear of the front plate (Fig. 18). A spur gear which meshes with a typewheel rack rides on the shaft in a bearing housing. The shaft is free to move axially in the housings and the spur gear, but flats in its circumference which bear against flats in the gear ensure its rotating when the gear rotates.

7.07 When in response to a marking pulse a push bar is lifted by its bell crank, as described in 5.13, the rocker bail operating blade (see Fig. 14 and 17) engages a slot in the bar and moves it to the left during the first part of the function cycle. The bar, by means of its rack and the mating pinion, rotates the associated eccentric one-half revolution where it is locked in position by a detent assembly while printing takes place. When the bail rocks back to the right during the latter part of the cycle, it returns the bar and eccentric to their home position where the eccentric is again detented. The preceding does not apply to the No. 5 push bar which is designed so that it is selected - moved to the left - on spacing rather than on marking, nor to the left - front eccentric which affects the letters-figures shift (7.17). In both assemblies one-half revolution of the rear eccentric results in its maximum vertical displacement which is transferred through the front eccentric to a crank pin. Similarly, one-half revolution of the front eccentric results in its maximum displacement being transferred to the crank pin. If both eccentrics are rotated, the displacement of the crank pin is equal to the algebraic sum of the two displacements which may be in either the same or opposite directions. Both assemblies are so designed that, if the displacement of the rear eccentric is taken to be one unit, the displacement of the front eccentric is four units. Four permutations are thus available: zero (neither eccentric displaced), one unit (rear eccentric displaced), four units (front eccentric displaced) and five or three units depending on how the assembly is set up (both eccentrics displaced).

7.08 In the right assembly the home position of the rear eccentric is down and the home position of front eccentric is up (Fig. 17). Thus their displacements are in opposite directions - up for the rear and down for the front — and their aggregate displacement is three units downward. Any displacement occurring in the right assembly is imparted to the typewheel rack in equal quantity but opposite direction. For example, if the No. 5 pushbar is selected, it causes the right-rear eccentric to be displaced, and one unit of upward motion is transferred through a right output connecting rod to the right end of a cross link (Fig. 16). The cross link pivots about a left output connecting rod and at its left end imparts one unit of downward displacement to the typewheel rack. The rack rotates the spur gear, shaft and typewheel one row of characters clockwise from the home position, and the No. 1 clockwise row (Fig. 15) is presented to the print hammer at the time of printing. On its right stroke the No. 5 pushbar returns the eccentric and the typewheel to their home positions. In a similar manner, selection of the No. 3 pushbar results in a four unit downward displacement of the right front eccentric and a four-row, counterclockwise rotation of the typewheel. Selection of both the three and five type bars results in a three-row, counterclockwise rotation of the typewheel.

7.09 The home position of the left-rear eccentric is up, and any displacement appearing in the left assembly is transferred to the typewheel rack in double quantity in the same direction. When the No. 5 pushbar is selected, the left-rear eccentric is displaced one unit downward. This movement is conveyed through the left-output connecting rod to the approximate mid-point of the cross link. The cross link pivots about the right output connecting rod and its left end imparts two units of downward movement to the typewheel rack which rotates the typewheel two rows clockwise from its home position.

7.10 When both eccentric assemblies are displaced, the motion occurring in the typewheel rack is equal to the algebraic sum of the motions resulting from each assembly. For example, if the No. 3, 4 and 5 pushbars are all selected, three units of upward displacement from the right assembly and two units of downward displacement from the left assembly occur as one unit (3-2 = 1) of upward displacement in the rack and a counterclockwise rotation of one row in the typewheel. If neither the No. 3, 4 nor 5 pushbar is selected, the mechanism remains inactive and printing takes place in the No. 0 row. Excluding the left-front eccentric, which is only used for the letters-figures shift, there are eight permutations available in the other

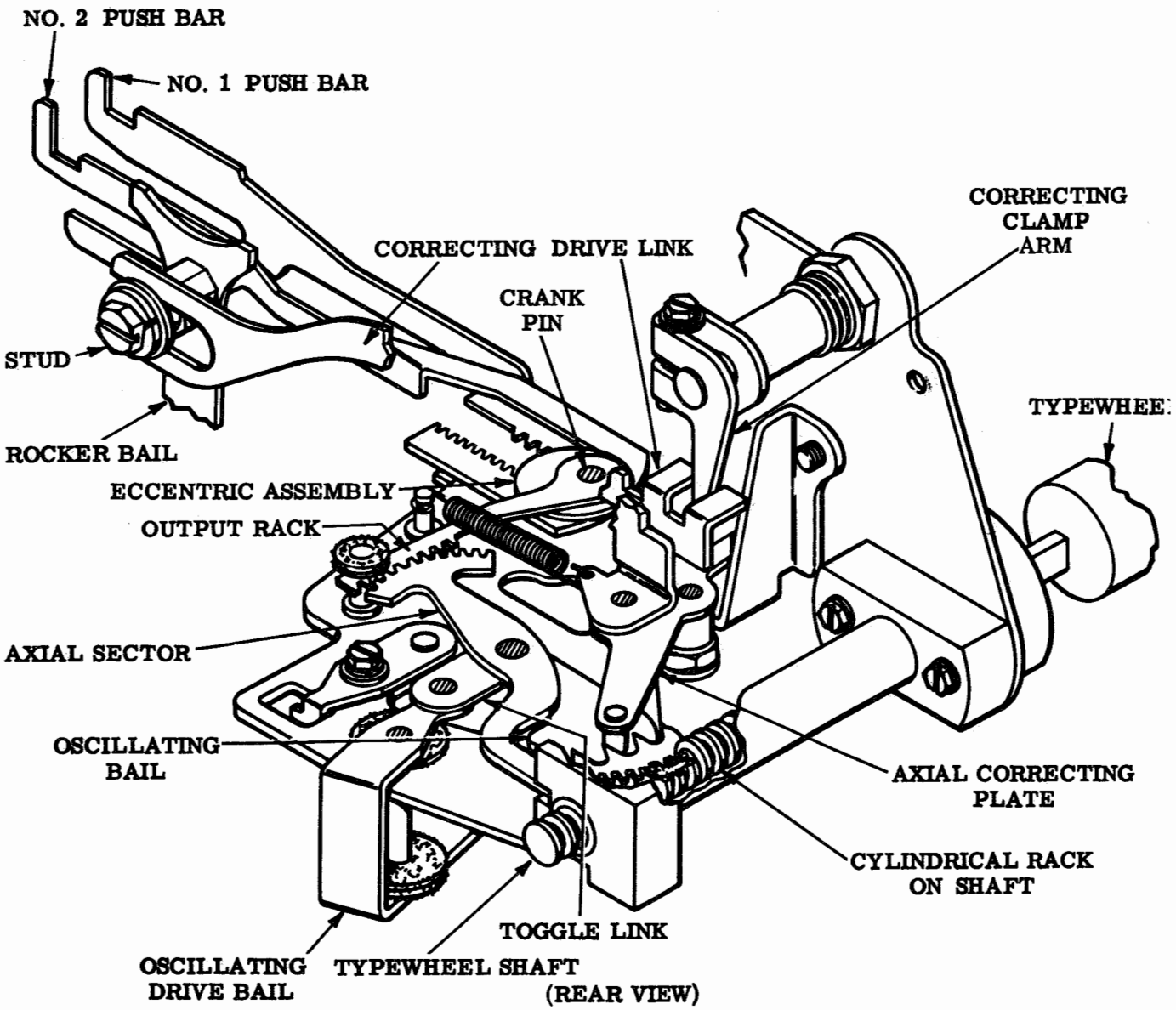


Figure 18 - Axial Positioning Mechanism

three eccentrics, making it possible to select any of the eight rows in a given section (Fig. 15).

C. Axial Positioning (Figs. 17, 18 and 20)

7.11 The functions of the axial positioning mechanism are to position the typewheel so that the proper character in the selected row is aligned with the hammer at the time of printing and to retract the typewheel and ribbon guide at the end of the function cycle so that the last-typed character is visible. The mechanism mounts on an axial bracket supported by the frame and the front plate and includes an eccentric assembly similar to those of the rotary positioning mechanism (Figs. 17 and 18). Two eccentrics, a lower whose pinion is driven by the No. 1 pushbar and upper whose pinion is driven by the No. 2 pushbar, rotate in a horizontal plane in bearing housings attached to the bracket. The eccentric assembly is linked to the typewheel shaft by an axial output rack and sector as shown in Fig. 18.

7.12 The selection of either the No. 1 or No. 2 pushbar results in the maximum displacement toward the rear of the associated eccentric, and the eccentrics are so designed that, if the displacement of the lower is taken

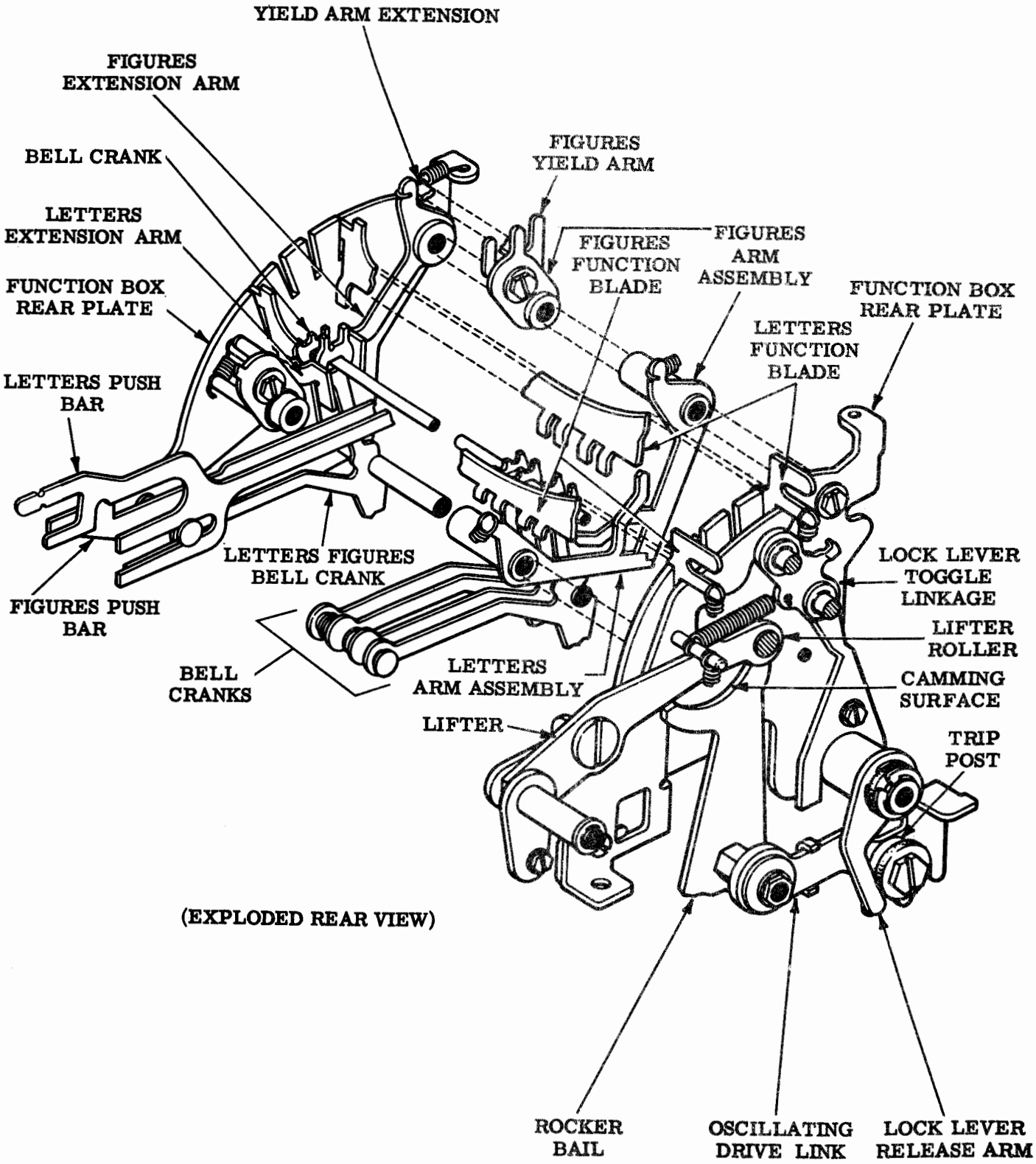


Figure 19 - Function Box

to be one unit, that of the upper is two units. Again four permutations are available at the crank pin: zero (neither eccentric displaced), one unit (lower eccentric displaced), two units (upper eccentric displaced) and three units (both eccentrics displaced).

7.13 If during a function cycle neither pushbar is selected, no motion occurs in the axial positioning mechanism with the exception of that resulting from the oscillating assembly (7.14), and the No. 0 character of the selected row is aligned with the hammer at the time of printing (Fig. 15). On the other hand, if the No. 1 pushbar is selected, it causes the lower eccentric to revolve and one unit of displacement to be transferred by the crank pin to the axial output rack. The rack moves to the rear and passes the motion to the axial sector which pivots counterclockwise (as viewed from above). The right end of the sector, by means of a cylindrical rack in the typewheel shaft, moves the

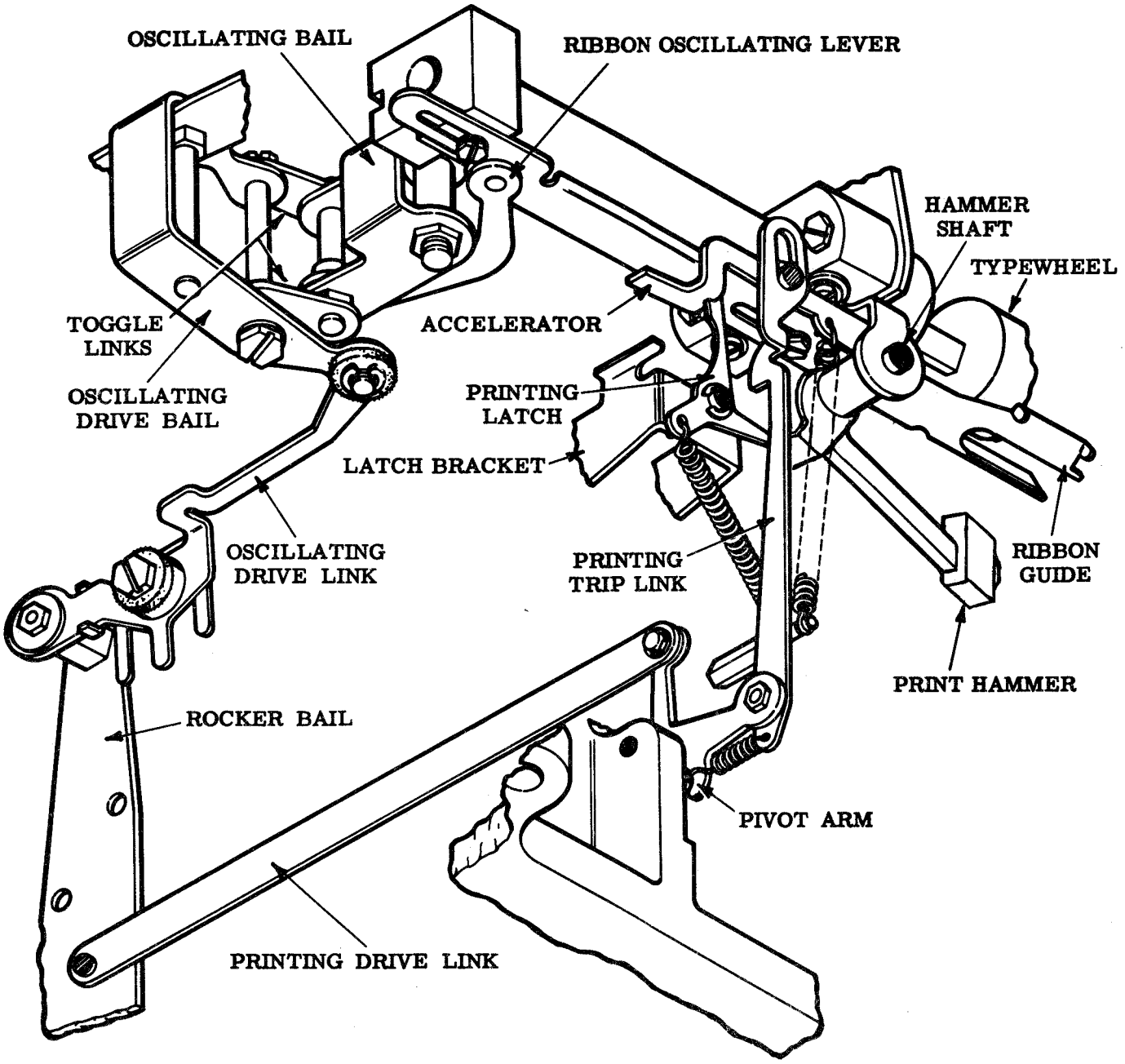


Figure 20 - Printing Mechanism

typewheel one character forward from its home position. The No. 1 character is printed, and when the push bar reverts to its unselected position it returns the axial linkage and typewheel to their home position. If the No. 2 push bar is selected the No. 2 character is printed, and if both push bars are selected, the No. 3 character is printed. The cylindrical rack has no lead, and the shaft can thus be rotated while being moved axially.

7.14 With each cycle of the function clutch, an oscillating drive link transfers from the rocker bail an unselected motion to an oscillating drive bail (Figs. 18 and 20). This movement is passed by toggle links to an oscillating bail and the sector pivot. The effect of this action is to introduce a separate motion to the sector tending to cause it to pivot about the teeth on the output rack. During the fore part of the function cycle, if no axial push bar is selected, the right end of the sector is moved forward slightly and positions the No. 0 character for printing. At the end of any cycle the sector retracts the typewheel slightly so that the last printed character is visible. Concurrent with the above operation, a ribbon oscillating lever is made to pivot about its left end and with each cycle project and retract the ribbon guide which would obstruct the view of the character (Fig. 20).

D. Correction (Figs. 16 and 18).

7.15 After the typewheel has been positioned by the axial and rotary positioning mechanisms, the selected character is more accurately aligned for printing by the correcting mechanism which compensates for any play and backlash in the positioning linkages. Each function cycle the rocker bail transfers motion through a correcting drive link to a correcting clamp and shaft (Fig. 18). The shaft pivots a rotary correcting lever (Fig. 16) which is equipped with an indentation that engages a tooth in a typewheel rack. There is a tooth in the rack for each row of characters (16 in all), and they are so correlated with the typewheel that when a tooth is engaged by the corrector its row is accurately aligned with the print hammer. Axial correction, which is accomplished simultaneously, is similar to rotary correction: the drive link rotates an axial correcting plate counterclockwise (as viewed from the above), and a roller mounted on the plate engages a notch in the axial sector (Fig. 18). Thus the typewheel is accurately aligned in both fields of motion just before printing takes place. During the latter part of the function cycle, a correcting drive link spring returns the correcting mechanism to its home position.

7.16 Since the rocker bail is the source of motion for both the push bars and the positioning mechanisms, correction must take place at a point near enough to the extreme travel of the bail that it does not interfere with the movement of the typewheel rack or axial sector. In addition, because the rocker bail controls the tripping of the print hammer, which occurs very late in the bail's stroke, it becomes necessary to utilize the time between the tripping of the hammer and its striking the paper to accomplish correction. The delay in actuating the correcting mechanism is effected by allowing a drive stud on the rocker bail to slide in an elongated slot in the correcting drive link during the early part of the cycle.

E. Letters-Figures Shift (Figs. 16 and 19)

7.17 The purpose of the letters-figures shift is to rotate the typewheel from the home position of one section to that of the other (Fig. 15). It is effected by means of the function box mechanism which is made up of a number of assemblies mounted on two plates located at the upper rear of the typing reperforator (Fig. 19). When the unit is in the letters condition, as shown in Figures 16 and 19, and the figures code combination (12-45) is received, the transfer mechanism sets up the figures arrangement in the bell cranks during the selecting cycle (5.12). Then, as the rocker bail moves from its home position during the first part of the function cycle, a lifter roller under spring pressure follows a camming surface on the rear arm of the bail (Fig. 19), and the lifter allows letters and figures function blades to move down and, by means of tines on their lower surface, feel for an opening in the slotted upper arms of the bell cranks.

7.18 The slot arrangement of the No. 1, 2, 4 and 5 bell cranks are identical and permit the entry of both function blades when all are selected. However, on receipt of the figures code combination, the No. 3 bell crank permits entry of the figures blade while blocking the letters blade. In moving all the way down, the figures blade encounters a projection of a figures arm assembly and causes the arm assemblies to shift from their letters to figures position. A yield arm extension attached to the figures arm assembly pivots a figures extention arm away from the letters-figures bell crank. A letters extension arm under spring tension rotates the bell crank clockwise (Fig. 19) and the bell crank lifts the letters and figures push bars. As the bail reaches its extreme position, the lifter is cammed up and raises the function blades.

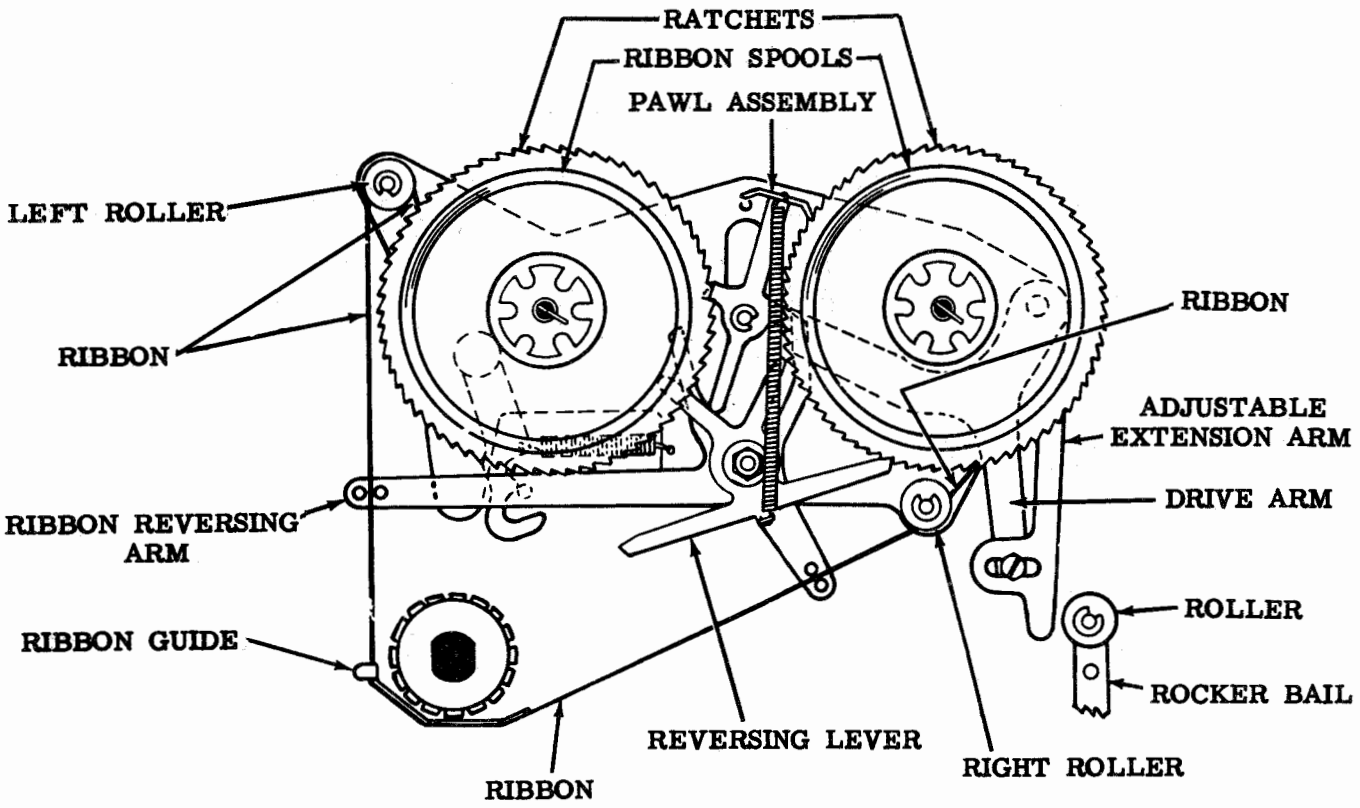


Figure 21 - Ribbon Feed Mechanism

7.19 While the letters-figures bell crank is being positioned by the function box, the No. 1, 2 and 4 push bars are selected, the typewheel is moved two rows clockwise and three characters forward, and the figures symbol is printed (7.05 - 7.11). On its return stroke, the rocker bail operating blade encounters a shoulder on the figures push bar (which was lifted as described above) and moves the bar to the right as viewed from the front in Figures 16 and 17. The common pinion moves the letters push bar to the left, and the left-front eccentric shifts from its up to down position. Since the typewheel has been displaced two rows clockwise during the first part of the cycle, it is rotated six more rows to the figures home position. As the bail returns to its home position during the last half of the cycle, a lock lever toggle linkage (Fig. 19) prevents the lifter roller from following its camming surface, and the lifter holds the function blades up so they do not drop onto the bell cranks. As the bail nears its home position, a trip post riding on the oscillating drive link strikes a lock release arm, buckling the toggle linkage and permitting the lifter roller to again fall on the bail camming surface.

7.20 In a manner similar to that described above, when the letters code combination (12345) is received, the function box causes the letters-figures bell crank to lower the letters and figures push bars. The wheel is rotated two rows counterclockwise during the first part of the cycle and six more rows to the letters home position during the last part of the cycle, and the letters bar is moved to the right. The preliminary two-row rotation of the typewheel, which is made possible by selecting the No. 5 push bar on spacing rather than marking, provides less throw and smoother operation than would be possible if the complete eight-row displacement were effected during the latter part of the cycle. Each operation the lifter permits the function blades to move down and feel for an opening, but except for the shift operations they are blocked by slotted arms of the bell cranks.

PRINTING (Fig. 20)

7.21 After the typewheel has been positioned and corrected, the printing mechanism supplies the impact which drives the paper and ribbon against the selected character. It ef-

fects this operation by means of a print hammer which is mounted on a shaft supported by a bracket attached to the typewheel bearing housing. In its unoperated condition, as illustrated in Fig. 20, the hammer is held against an accelerator by a relatively weak spring. The accelerator is mounted on the hammer shaft and is retained by a printing latch in its upper position against the tension of a relatively strong spring.

7.22 The rocker bail, during the fore part of the function cycle, moves a printing drive link to the right (as viewed from the rear in Fig. 20) and causes a pivot arm to rotate clockwise. The arm lowers a trip link which slides in an elongated slot. Near the end of the rocker bail's travel, the trip link pivots the latch which releases the accelerator. Under the spring tension, the accelerator snaps down and impels the hammer upward. The face of the hammer drives the tape and inked ribbon up against the typewheel and imprints the selected character on the tape. The accelerator does not follow the hammer through the complete printing stroke. Near the end of its travel, the accelerator encounters a projection on a latch bracket, and inertia carries the hammer the rest of the way. As the rocker bail returns to its home position, it causes the trip link to move up, release the latch and return the accelerator to its latched position.

RIBBON FEEDING (Fig. 21)

7.23 The characters are typed in ink supplied by an inked ribbon which is held between the tape and the typewheel by a guide and advanced by the ribbon feed mechanism (Fig. 21). The path of the ribbon is down to the right off the top of a right spool, under a right roller, through right pins on the reversing arm, through the guide, up through left pins on the reversing arm, over a left roller, and to the right over the top of a left spool.

7.24 Each function cycle, as the rocker bail nears the end of its left travel, a roller mounted on its forward arm pivots a drive arm clockwise. The drive arm lifts a feed pawl which advances the ribbon by rotating a ratchet on one of the ribbon spools one tooth. A retaining pawl under spring tension detents the ratchet while the feed pawl, during the latter part of the function cycle, is lowered so as to engage the next tooth. Each operation, the ribbon is advanced in this manner until the ribbon feed mechanism is reversed.

7.25 When a spool is almost depleted, a rivet in the ribbon encounters pins on the reversing arm, and the stress applied through the ribbon as it is rolled on the other spool pivots the arm. As the pawl assembly is lowered at the end of the next operation, an extension strikes the reversing arm, and the pawl is shifted against the other ribbon spool ratchet. The pawl's rounded lower extension pivots a reversing lever which shifts the retaining pawl so that it engages the opposite ratchet. The ribbon will then feed in the opposite direction until again reversed. A detent holds the reversing arm in position until its next reversal.

8. TAPE PERFORATING AND FEEDING

GENERAL

8.01 The perforating mechanism punches feed holes, advances the tape and perforates combinations of code holes corresponding to the code combinations received from the selector. Intelligence is received from the selector by the punch slides, which select proper pins in a punch block assembly (Figs. 22 and 23). Motion from the rocker bail is distributed to the pins and the tape feeding parts by a main bail assembly which includes a toggle bail, a toggle shaft, a slide post, toggle links, drag links, and the punch slide reset bail.

PERFORATING - FULLY-PERFORATED UNITS (Fig. 22)

8.02 As described in 6.02, near the end of the selecting cycle, the reset bail is lowered and releases the five punch slides (Fig. 23). The selected slides move to the left, and the unselected slides are retained to the right by their latches. In the selected position, a projection of each slide extends over the slide post. Since a feed hole is perforated every operation, the punch slide associated with the feed-hole punch pin is designed so that it is always in a selected position. During the first part of the function cycle, the rocker bail moves to the left and, by means of a drive link and rocker arm, rotates the toggle shaft and bail counterclockwise. Toggle links attached to the front and rear of the bail lift the slide post and move the reset bail to the left. The selected slides are carried upward by the post and force the associated pins through the tape. The slides pivot about the same point as the drag links, and thus become an integral part of the main bail assembly during the perforating stroke. Approximately midway through the function cycle, the function trip assembly lifts the reset bail.

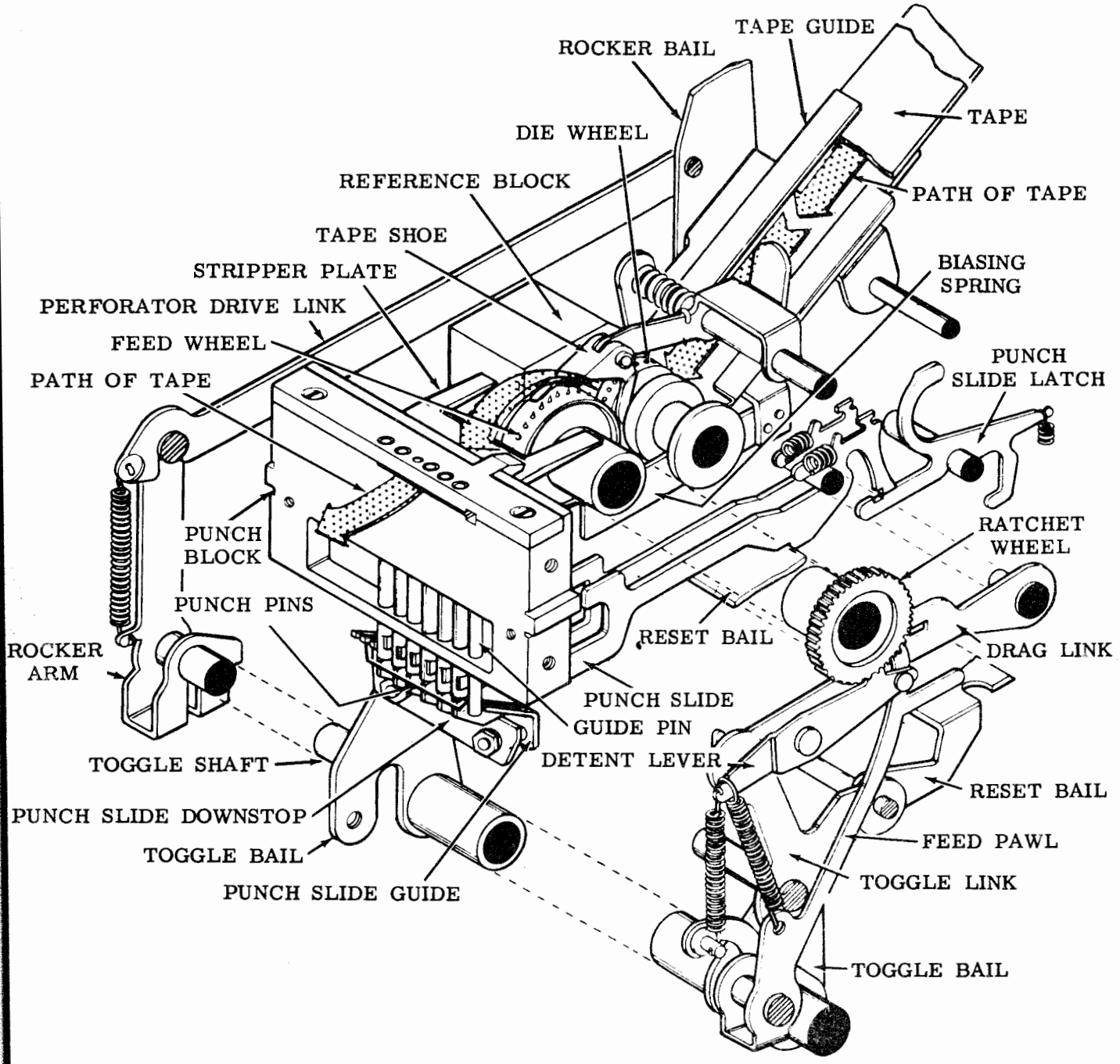


Figure 22 - Perforating Mechanism - Fully Perforated Unit

8.03 During the last half of the cycle, the toggle bail is rotated clockwise pulling the slide post down and lowering the selected punch slides. The punch slides, which engage notches in their respective punch pins, pull the punch pins down below the tape. The main bail assembly and the selected punch slides and their associated punch pins move as a unit during the perforating stroke. The opening in the die block above the tape, through which the pins protrude, are circular so that the entire hole is punched.

8.04 A chad chute, mounted on the reperforator punch block, mates with a chute on the base, and carries the chad punched from the tape into a chad container.

PERFORATING - CHADLESS UNITS (Fig. 23)

8.05 As described in 6.02, near the end of the selecting cycle, the reset bail is lowered and releases the five punch slides (Fig. 23). The selected slides move to the left, and the unselec-

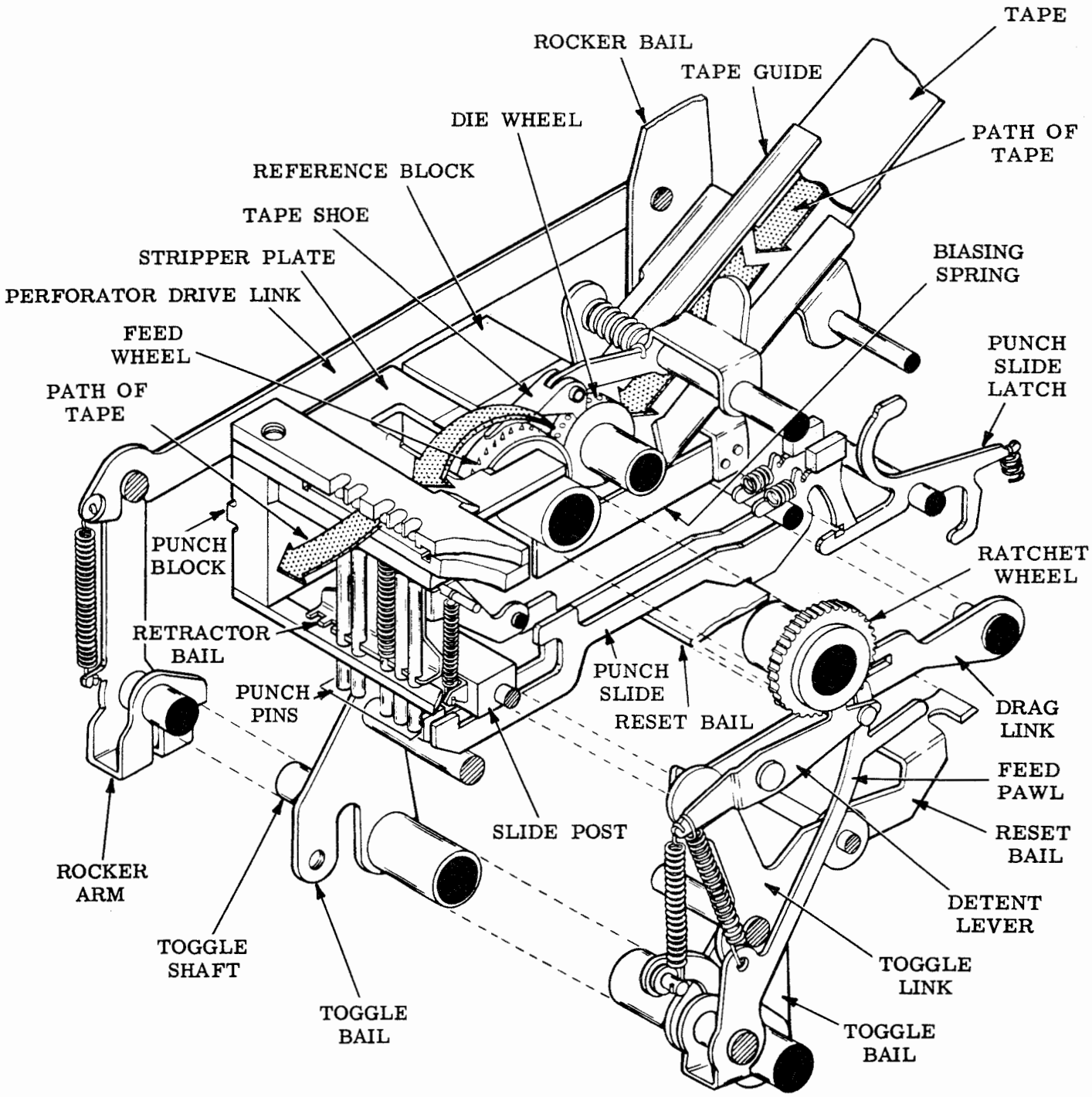


Figure 23 - Perforating Mechanism - Chadless Tape Unit

ted slides are retained to the right by their latches. In the selected position, a projection of each slide extends over the slide post. During the first part of the function cycle, the rocker bail moves to the left and, by means of a drive link and rocker arm, rotates the toggle shaft and bail counterclockwise. Toggle links attached to the front and rear of the bail lift the slide post and move the reset bail to the left. The selected slides are carried upward by the post and force the associated pins through the tape. The slides pivot about the same point as the drag links, and thus become an integral part of the main bail assembly during the perforating stroke. A retractor bail, which engages notches in the punch pins, is pivoted clockwise as the pins move up through the tape. Approximately midway through the function cycle, the function trip assembly lifts the reset bail.

8.06 During the last half of the cycle, the toggle bail is rotated clockwise and lowers the punch slides. The reset bail, moved to the right by the toggle links, drives the slides back to their unselected positions, where it holds them until the next operation. The retractor bail, under spring pressure, holds the punch pins down against the slides until the pins are retracted below the tape. The notches in the pins are long enough to allow the retractor bail to pivot its full amount without lifting the unselected pins against the tape, but are short enough to permit the bail to serve as a downstop for the pins, and thus hold them in the block. A compression spring is mounted on the No. 3 punch pin, and four tension springs are hooked to the slide post and the retractor bail. The main bail assembly, the retractor bail, and the selected slides and punch pins move as a unit during the perforating stroke, and the retractor bail tension springs are not part of the load on the toggle shaft. The openings in the block above the tape, through which the selected pins protrude, are semi-circular, so that only the rear portion of the hole is severed.

FEEDING - FULLY-PERFORATED AND CHADLESS UNITS

8.07 Tape feeding is accomplished after perforation during the last half of each function cycle. The tape is threaded down through a tape guide and then up between a feed wheel and die wheel (Figures 22 and 23). A feed pawl driven by the toggle bail acts upon a ratchet and rotates the feed wheel which, by means of pins and a slot in the die wheel, advances the tape one character at a time. A detent with a roller that rides on the ratchet holds the feed wheel and tape in position during perforation. The detent and feed pawl springs are so positioned that the pressure of the detent on the ratchet is high during the first half of the cycle (to hold the tape in position during perforation), but is low during idling and the last half of the cycle, to facilitate tape threading and feeding. A tape shoe retains the tape on the feed wheel, and a guide spring holds it back against a reference block so that the feed holes are punched a uniform distance from the edge. The tape is stripped from the feed wheel by a stripper plate, passes into the punch block where it is printed and perforated, and finally emerges at the left. A guide spring, by holding the tape back against a reference surface on the block, maintains a uniform relationship between the code perforations and the edge of the tape.

9. VARIABLE FEATURES

CONTACT ASSEMBLIES

A. Selector Mechanism Timing Contacts (Fig. 24)

9.01 Operating in conjunction with an additional cam mounted on the selector cam assembly, this timing contact set (break-make transfer) operates each cycle of selection. The actuating lever maintains a relationship with the rest position of the selector cam, because its pivot point is on the range scale selector rack. Therefore, the contact set is used to signal that the selector cam is in the rest position.

B. Letters-Figures Contacts

9.02 The letters-figures contact assembly is mounted on the rear of the selector mechanism and is operated by the upper extension of the letters push bar. Its purpose is to give a remote signal to indicate whether the typing reperforator is in the letters or the figures condition. When the unit is in the letters condition, the letters push bar is positioned towards the right and in contact with the operating lever. In this position (rotated counterclockwise) the operating lever is not in contact with the center contact spring and the center and upper contact points are made.

9.03 When the figures code combination is received, the letters pushbar is moved to the left and permits the operating lever to rotate clockwise and engage the center contact spring and break the contact between the center and upper contact points. As the operating lever rotates further, contact is made between the center and lower contact points.

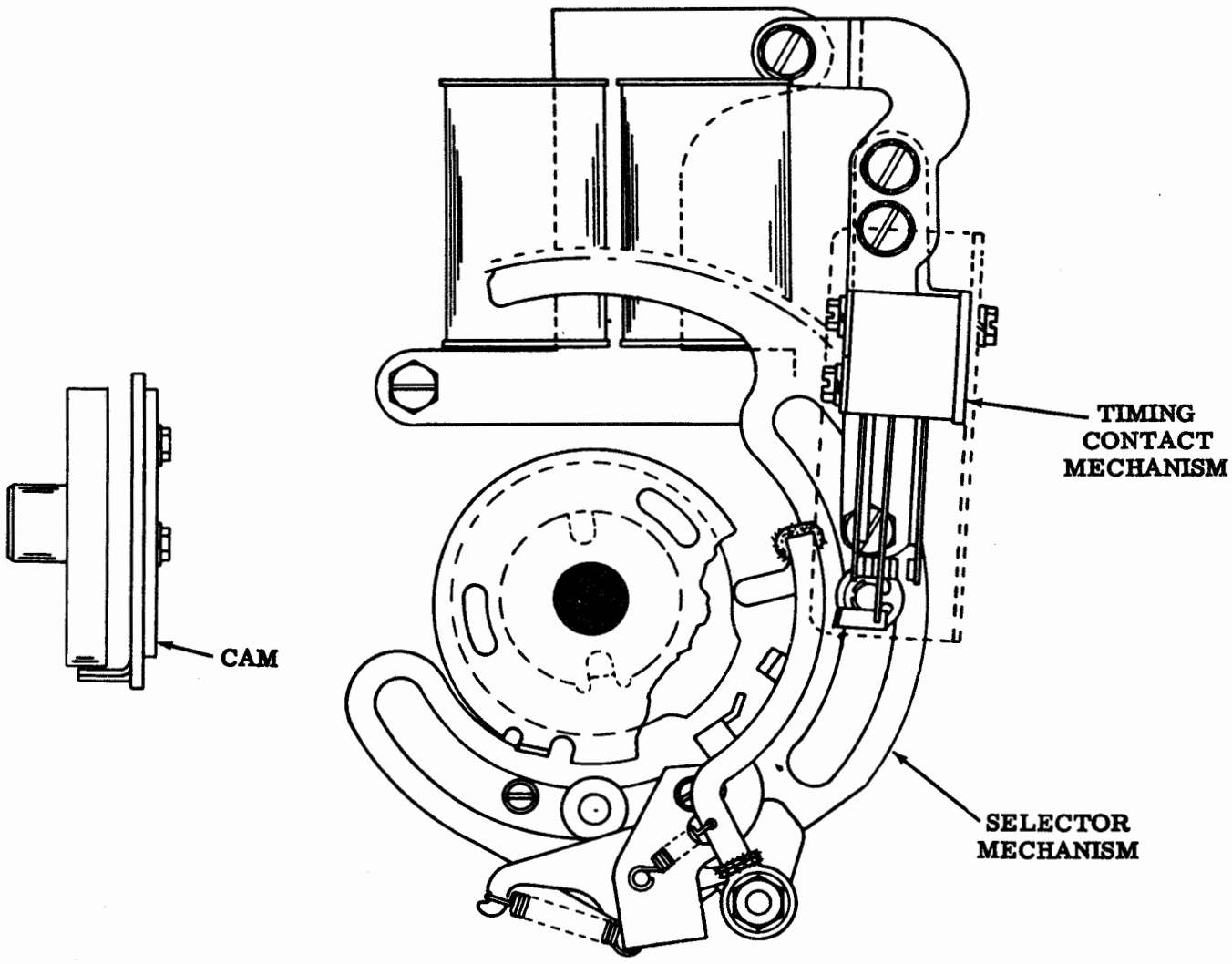


Figure 24 - Selector Magnet Timing Contacts

C. Signal Bell Contacts (Figs. 19 and 25)

9.04 Mounted on and controlled by the function box, these contacts provide an electrical pulse to actuate an audible alarm when the typing reperforator receives the signal bell code combination.

9.05 With the unit in the figures condition and the signal bell code combination (1-3--) received at the selector mechanism, the number 1 and 3 bell cranks rotate in response to the marking pulses, and the number 5 bell crank rotates in response to a spacing pulse. In this position, the slotted arms at the top of the bell crank permit the signal bell function blade to drop under spring tension. The normally-open signal bell contacts, fixed to the function blade drops with the blade, and the contacts close. In the letters condition, the figures bell crank blocks the signal bell function blade.

D. End of Feed Out Timing Contacts

9.06 Used in conjunction with the non-interfering letters (or blank) tape feed out mechanism, this contact assembly furnishes an electrical pulse to indicate the termination of feed out. The contacts are actuated by a bail extension that receives its motion from the tape length adjusting plate (Fig. 28). When the feed out operation terminates, the plate engages and rotates the bail arm, causing the normally-open contact to close and the normally closed contact to open.

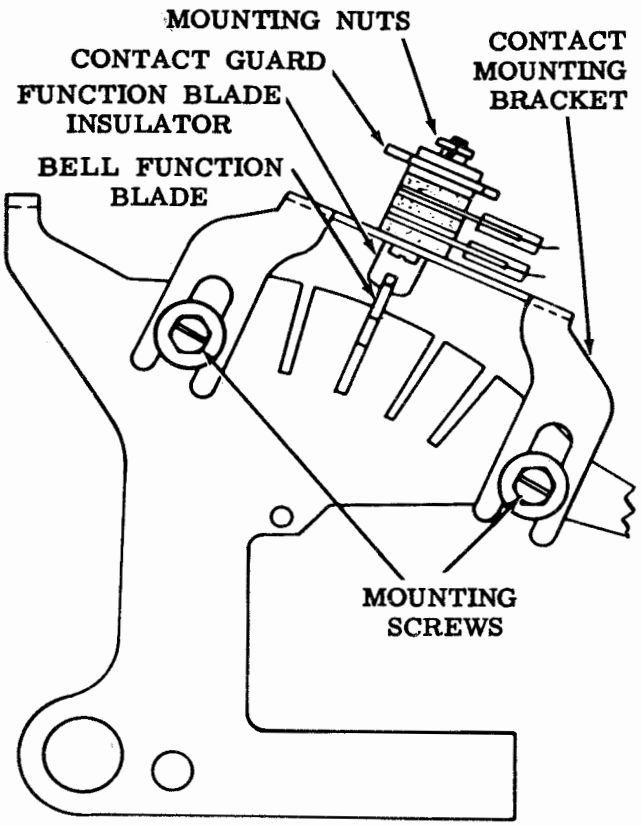


Figure 25 - Signal Bell Contacts

E. Code Reading Contacts

9.07 Consisting of a bank of five contacts, each of which is actuated by a punch slide, the code reading contacts read the code combinations perforated by the typing reperforator and establish circuits corresponding to the five elements. Either transfer or make contacts are available. Applications include error checking and parallel code output.

F. Timing Contacts

9.08 When connected to external circuits, the contacts provide electrical pulses which may be synchronized with the code reading contacts (9.07) for circuitry control purposes. Either single- or double-contact mechanisms are available. The contacts, which are of the transfer type, are actuated by bails which receive motion from the typing reperforator function cam.

UNIVERSAL FUNCTION BLADE (Fig. 26)

9.09 This function blade may be coded for any desired character or shift condition by removing tines. The function blade has removable tines in the marking and spacing positions for all levels.

PRINT SUPPRESSION ON FUNCTION

9.10 This feature utilizes a print hammer stop that permits the hammer to strike the top of the characters on the type wheel but not the base surface. Therefore, if a character or function symbol is relocated in the base surface, printing will not occur when this character or function is selected.

INTERFERING LETTERS TAPE FEED OUT

A. General

9.11 This feature enables the typing reperforator to step out tape containing successive letters code combinations. The feed-out operation may be actuated locally by a hand lever or, with the addition of a separate set of parts, it may be controlled remotely by ener-

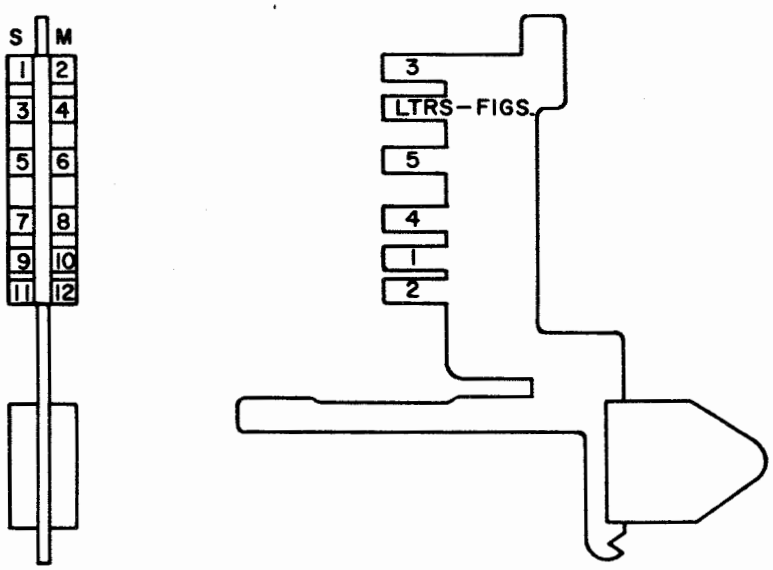


Figure 26 - Universal Function Blade

gizing a solenoid. Letters feed out will continue as long as the hand lever or solenoid is actuated. Since the mechanism's operation involves tripping the selector clutch while retaining the armature in its marking position, a message can not be received during the feed-out period. The mechanism is shown operated in Fig. 27.

B. Initiation

9.12 When the typing reperforator is in the idling condition, the selector magnet is energized and the start lever is blocked as shown in Fig. 8. Feed out is initiated by moving a hand lever to the left (Fig. 27). A drive shaft affixed to the hand lever rotates a trip lever which lifts the start lever. The latter clears the armature and under spring tension rotates clockwise. The selecting cam-clutch engages and the unit undergoes a complete cycle of operation. Since the selector remains energized, it is equivalent to all intelligence elements of the signaling code being marking. As a result, the letters symbols is printed, the letters code combination (12345) is perforated and the tape is advanced one feed hole. As long as the hand lever is retained to the left, the start lever will trip the selecting cam-clutch and feed out will continue.

C. Termination

9.13 Feed out is terminated by releasing the hand lever. The driver shaft and trip lever rotate clockwise under spring tension and lower the start lever. When the stop arm bail and start lever are moved to the left by the stop arm bail cam (5.03), the start lever is blocked by the armature, the selecting cam-clutch is disengaged and the typing reperforator is returned to its idling condition. A message received during feed out will be garbled.

D. Solenoid Operation

9.14 By the use of an additional set of parts, the letters feed out operation can be initiated by an electrical pulse from an external source. When the solenoid (Fig. 27) is energized by the pulse, it pulls a plunger to the left. The plunger through a stop arm and the drive shaft causes the trip lever to lift the start lever, and feed out is effected as described in 9.12. Feed out will continue until the solenoid is de-energized at which time the plunger moves back to the right, the start lever is lowered, and feed out is terminated as described in 9.13.

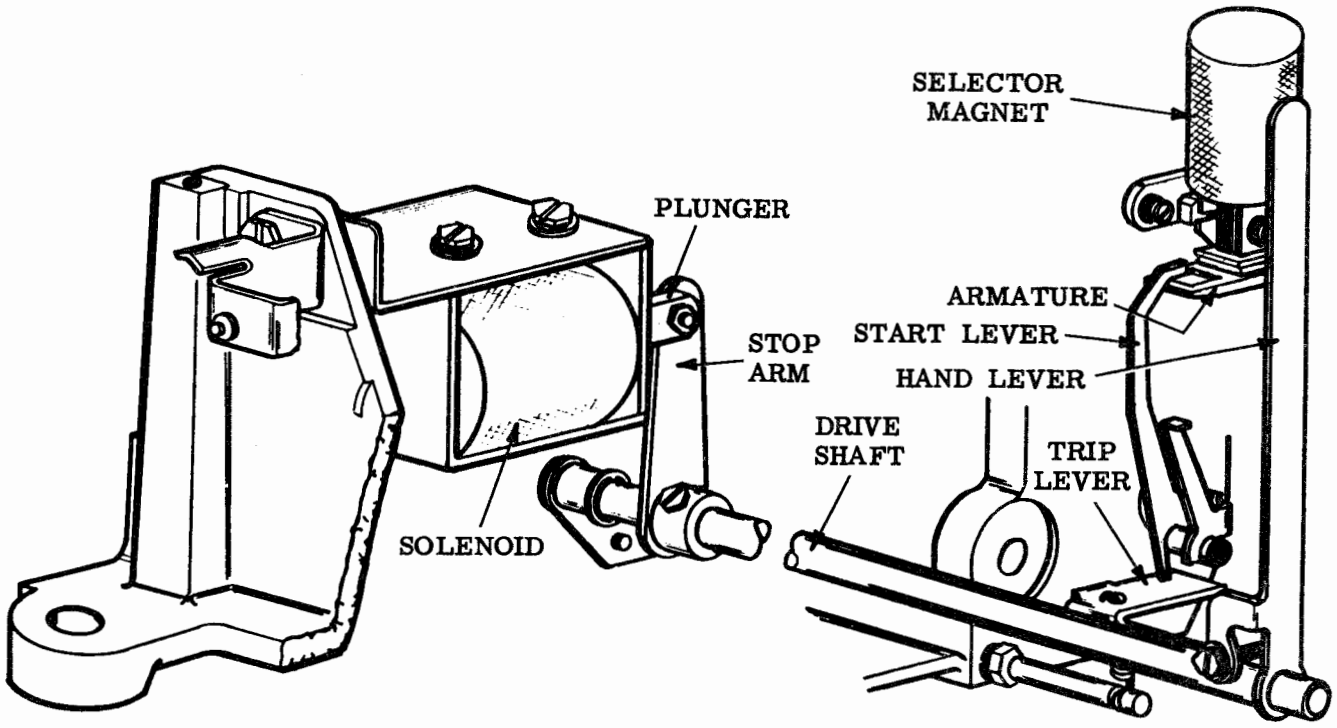


Figure 27 - Manual Interfering Letters Tape Feed Out Mechanism

REMOTE CONTROL NON-INTERFERING BLANK TAPE FEED OUT (Fig. 28)

A. General

9.15 This feature steps out a predetermined length of blank (unperforated) tape at the end of each message by remote control. The operation is initiated by an electrical pulse from a remote source that is applied to a tape feed-out magnet. The feed out is adjustable in steps of 0.6 inch, up to 18 inches. Messages received during any part of the feed out cycle will be processed without interference or loss of content. A non-repeat latch prevents successive tape feed-out operation from being initiated until the first feed-out sequence has been completed. At the end of the feed-out operation the mechanism stops and remains inactive until another cycle is initiated.

B. Initiation

9.16 The feed-out operation is initiated when an electrical pulse is applied to the feed-out magnet with the typing reperforator in the idle condition. With the magnet energized, the armature bail moves the blocking bail out of engagement with the drive bail assembly. The spring loaded drive bail falls into the indent of its cam and the connecting link positions the release lever on the lower step of the latch lever. The non-repeat latch is delayed one cycle by the spring loaded blocking latch on the drive bail. (If the start magnet is held energized longer than one cycle, the non-repeat latch prevents the drive bail from again falling into the indent of its cam.) As the drive bail reaches the indent of its cam, the blocking latch rides over the non-repeat latch. The drive bail then reaches the high part of its cam and the non-repeat latch falls into engagement with the drive bail. When the start magnet is de-energized, the spring loaded blocking bail again engages the drive bail and, simultaneously, disengages the non-repeat latch.

C. Metering

9.17 When the drive bail positions the release levers on the lower step of the latch lever as described above (9.16), metering takes place. The release lever has now permitted the check pawl and feed pawl to engage two adjacent ratchets. One of the ratchets is fed continually by the feed pawl. This ratchet

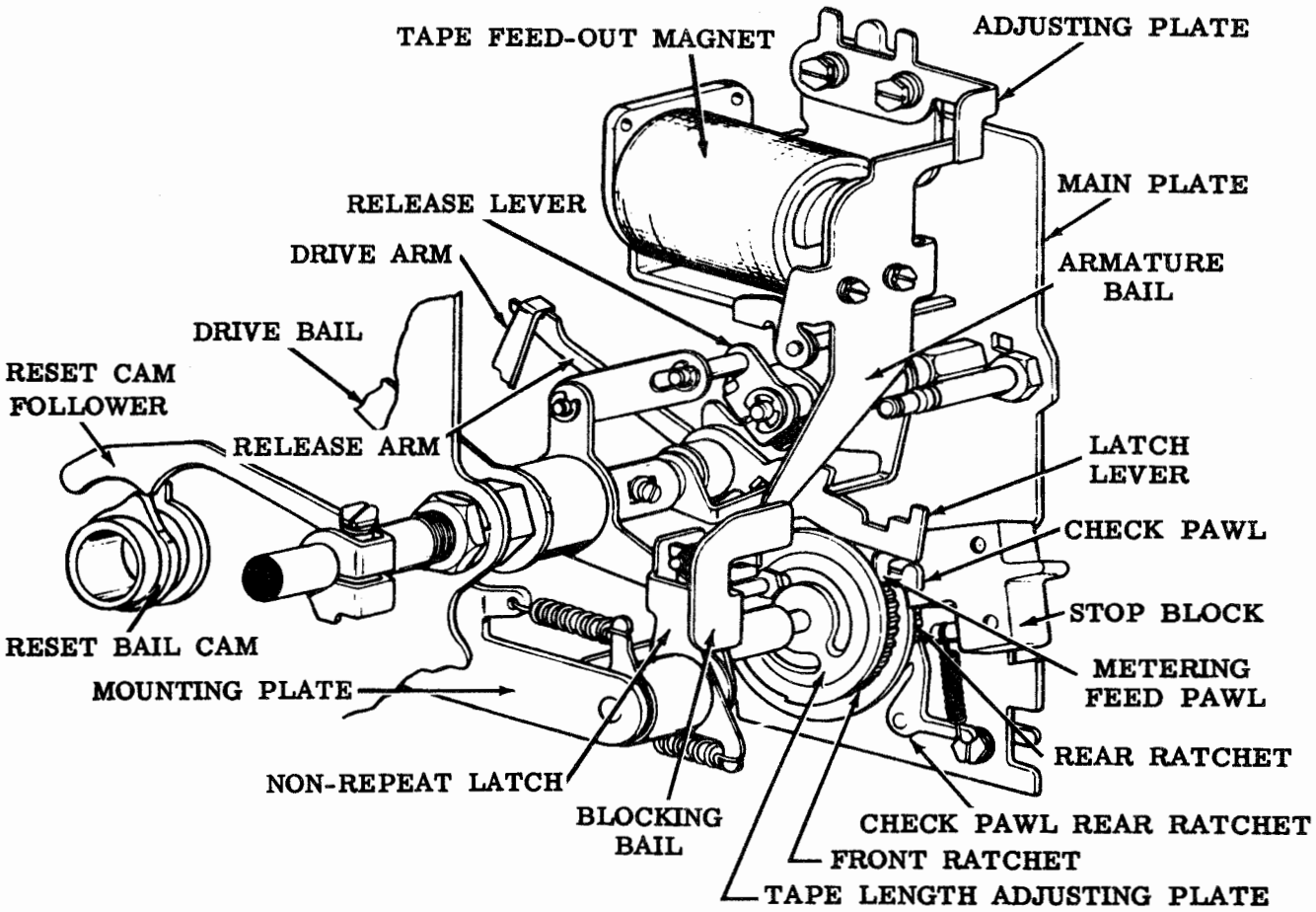


Figure 28 - Remote Control Non-Interfering Letters Tape Feed Out Mechanism

has a deeper notch at every sixth tooth, so that the pawl engages the second ratchet on every sixth cycle. After the second ratchet has rotated an amount equivalent to two teeth, a follower, riding a cam attached to the ratchet, drops off its peak and unblocks the tripping mechanism. After a predetermined length of tape has been fed (as measured by the second ratchet), the latch lever is actuated, as it would be by the selector cam on receipt of a message, and the tripping mechanism is blocked to prevent further feeding. Simultaneously, the feed pawls are lifted off the ratchets, and the ratchets return to their zero position.

D. Tripping and Punch Blocking

9.18 A bail that follows a cam attached to the main shaft engages the function clutch trip lever. When the cam follower enters the indent of its cam, an operating spring causes the bail to operate the clutch trip lever. The perforating and printing mechanisms are then allowed to punch and print the character stored in the selector. However, to insure that only blank tape will be advanced, a blocking link is connected to the selector stripper cam follower shaft. When the magnet is energized and the drive bail positions the release lever on the lower step of the latch lever as described in 9.17, the left end of the blocking link moves to the left and under the punch slide reset bail. Now, when the function clutch is tripped, the marking punch slides are blocked by the punch slide reset bail. The slide post on the front toggle links clears the punch slide projection on its upward movement. The punch slide reset bail then falls off the blocking link, but the punch slides cannot move forward into the marking position because they are blocked by the slide post.

9.19 Each time the main shaft rotates one revolution, a blank tape feed-out cycle is initiated, provided the function clutch trip lever

bail is not blocked by the metering mechanism. Should an incoming message trip the metering mechanism, the tripping mechanism is immediately blocked from any further operation and the blocking link is pulled out of engagement with the punch slide reset bail.

E. Storage

9.20 The purpose of the storage is to hold the reset bail (perforating mechanism) in engagement with the punch slides until the slides are fully reset, so that they may recognize the first character set up in the punch slide latches by the selecting mechanism. This mechanism consists of a latch that is operated by a link attached to the punch slide reset bail toggle. During reception of an incoming message, the toggle mechanism pushes the latch out of the way of the reset bail prior to its being stripped by the clutch trip lever.

REMOTE CONTROL NON-INTERFERING LETTERS TAPE FEED OUT (Fig. 28)

9.21 The operation of this mechanism is essentially the same as that of the remote-control non-interfering blank tape feed out mechanism (9.15). This feature, however, does not contain a blocking link on the stripper cam follower shaft (9.18). The tape output, therefore, is perforated in the letters code combination (1-2-3-4-5).

AUTOMATIC NON-INTERFERING LETTERS FEED OUT (Fig. 29)

A. General

9.22 This feature automatically initiates the feed out of a predetermined length of letters perforated tape at the end of each message, following a fixed period of signal line idle time. The duration of delay between the termination of the message and the initiation of feed out is determined by one of several available cams. (At 100 words per minute operation, for example, delays of approximately 4 seconds and 16 seconds are available.) The length of tape feed out is also variable in increments of .6 inch up to 3.6 inches or 18 inches. The mechanism may be controlled remotely with the addition of a separate set of parts. Messages received during any part of the feed out cycle are processed without interference or loss of content.

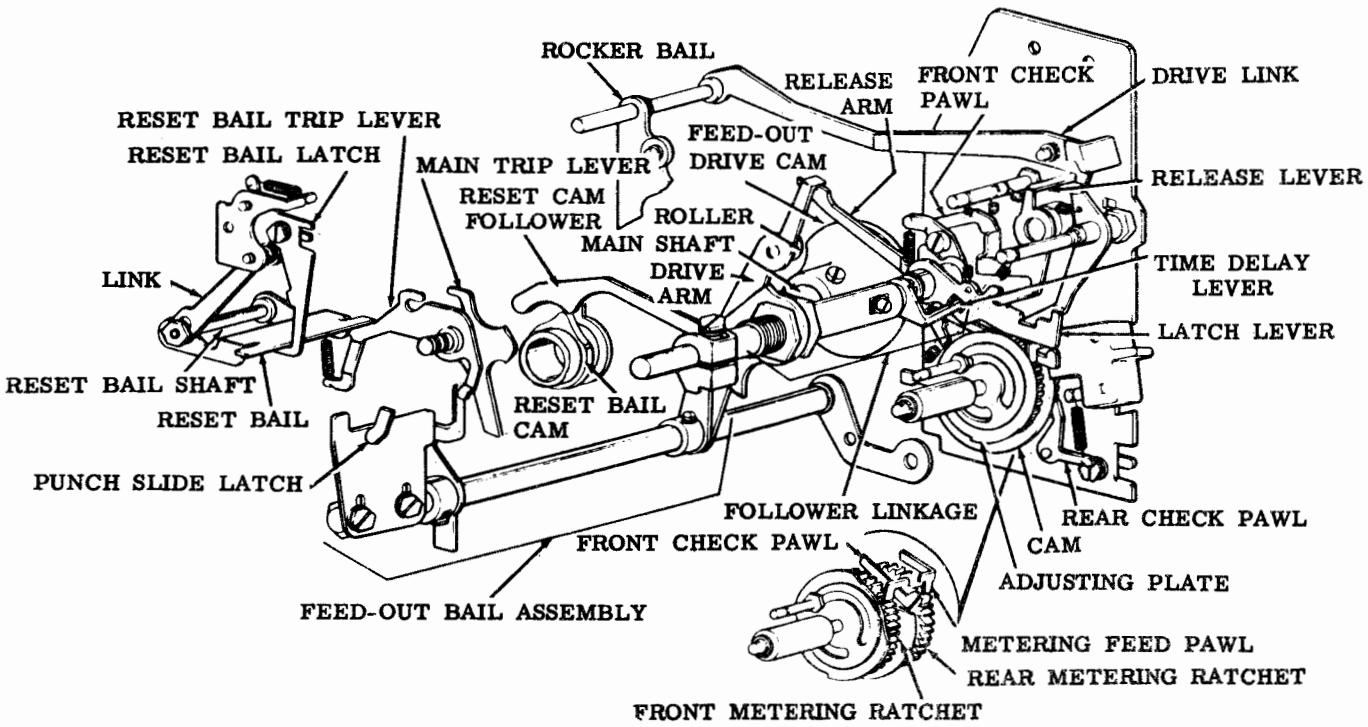


Figure 29 - Automatic Non-Interfering Letters Tape Feed Out Mechanism

B. Initiation

9.23 The feed-out operation is automatically initiated by a fixed period of idle signal line. Through the interaction of a drive link operated by the rocker bail and a follower activated by the reset bail cam in the selector, the mechanism recognizes the end of a message. The timing of the selector while receiving a message is such that the reset bail cam raises its follower during the first part of the selector cycle. The follower, through a linkage, lowers a latch lever which permits a release lever to rotate clockwise. When the release lever is in its clockwise position, the mechanism is in its unoperated condition, as explained below. When the rocker bail goes to its extreme left position during the middle of the function cycle, the attached drive link rotates the release lever counterclockwise and places the mechanism in its operated condition, as explained in 9.27. Each time a new character is received, the above sequence occurs.

9.24 End of message recognition is obtained when the release lever is rotated counterclockwise by the rocker bail and then is not permitted to rotate clockwise by the follower.

C. Metering and Feed Out

9.25 When the release lever rotates counterclockwise, it lowers a front check pawl onto two metering ratchets. These function as described in 9.23 above.

9.26 A time delay lever rides on a cam attached to the front ratchet. When the front ratchet rotates, the time delay lever rides to the low part of the cam and causes a release arm to release the drive arm of a feed out bail assembly. A roller on the drive arm then rides, under spring pressure, on a feed out drive cam on the main shaft. As the shaft rotates, each time the roller rides to the low part of the cam, the feed out bail assembly does two things: 1) rotates the main trip lever counterclockwise and trips the function clutch, and 2) rotates the punch slide latches counterclockwise and sets up a letters code combination. Thus, the reperforator feeds out letters tape in the same manner as if the function clutch and punch slides had been actuated by the selector.

9.27 As the ratchets are rotated as described above, an adjusting plate on the front ratchet reaches the position where it rotates the latch lever clockwise. The latch lever, in turn, performs two actions: 1) through the time delay lever causes the release arm to latch the drive arm and terminate feed out, and 2) permits the release lever to move to its clockwise position and lift the metering feed pawl and front check pawl off the ratchets. A spring returns the front ratchet to its start position. The mechanism remains in its unoperated condition until the next code combination is received. The adjusting plate is adjustable for varying lengths of tape feed out.

D. Non-Interference

9.28 When the first character of an incoming message is received during feed out, the selector clutch is tripped and the reset cam follower causes the release lever to rotate clockwise. Feed-out is terminated, as described in 9.25 . The incoming message is perforated.

9.29 When the first character is received during feed out, the relationship between the selector cam and the function cam could be such that the reset bail would release the punch slides before the slides are fully reset. In this case, the first character of the incoming message would be lost. The purpose of the storage assembly is to prevent this. The storage assembly consists of a reset bail latch that is moved by a link attached to the reset bail shaft. During normal reception of messages, the link pushes the latch out of the way of the reset bail prior to the bail's being lowered by the main trip lever. Whenever the condition described above occurs, the latch holds the bail in engagement with the slides until they are fully reset, so that they may recognize the first character set up in the punch slide latches by the selector.

BACK SPACE MECHANISMS (Fig. 30)

A. General

9.30 The back space mechanism steps the tape back through the punch block in order to delete perforated errors. The erroneously perforated code combination in the retracted tape is then obliterated by perforating the letters code combination in its place. The back space mechanism may be operated manually or it may include power drive. The mechanism used with chadless tape differs from that used with fully perforated tape in that it contains a tape rake for depressing the chad. The mechanisms are shown in Figure 30.

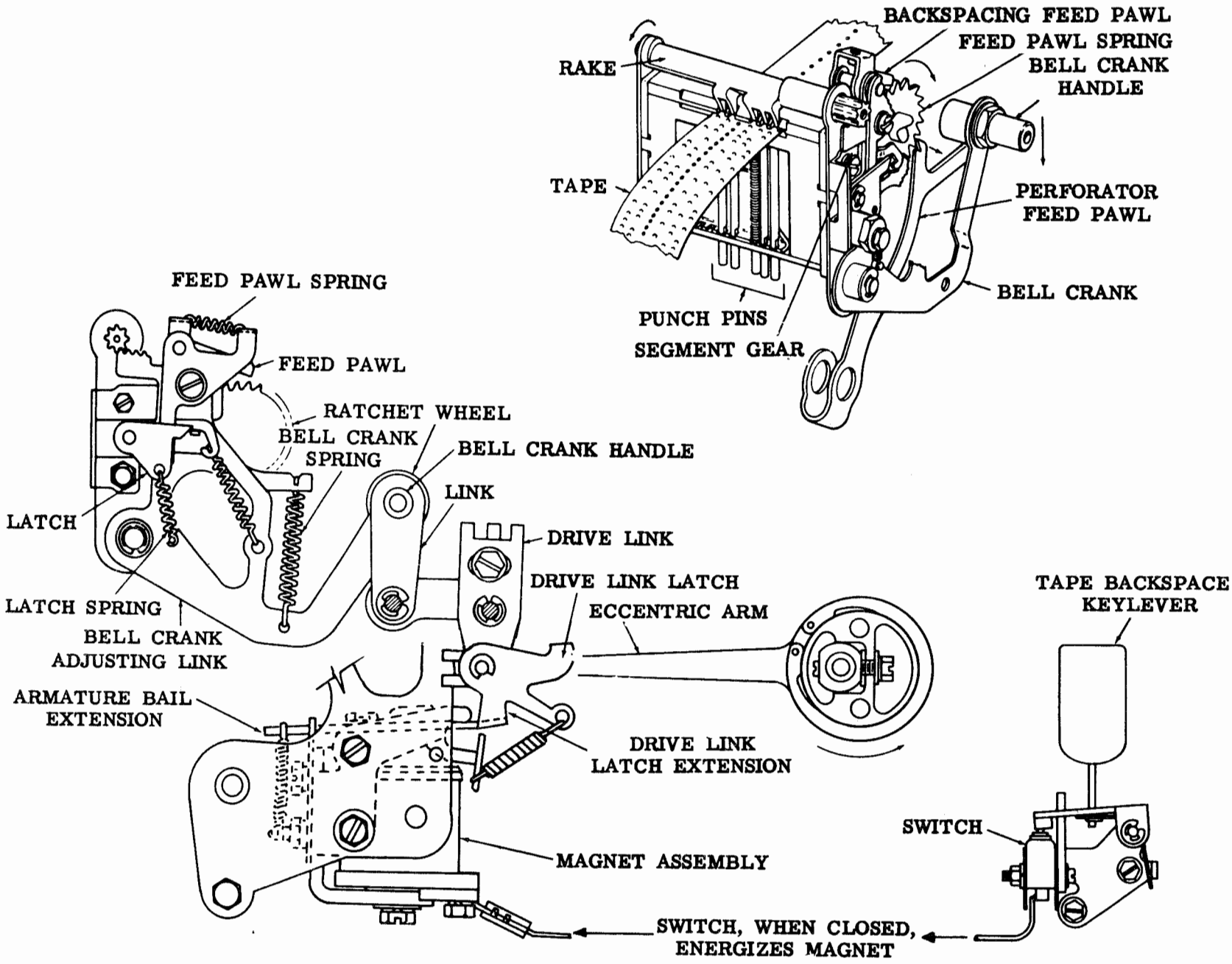


Figure 30 - Back Space Mechanisms

B. Manual Back Space (Fully Perforated Tape)

9.31 Depressing the handle of the back-spacing bell crank disengages the perforator feed pawl from the feed wheel ratchet. The back-spacing feed pawl then engages the feed wheel ratchet and rotates the feed wheel clockwise, back-spacing the tape to the next row of perforations.

C. Manual Back Space (Chadless Tape)

9.32 Depressing the handle of the back-spacing bell crank disengages the perforator feed pawl from the speed wheel ratchet and simultaneously rotates the rake to depress the chads. The back spacing feed pawl then engages the feed wheel ratchet and rotates the feed wheel clockwise, back-spacing the tape to the next row of perforations.

D. Power Drive Back Space

9.33 A start magnet in the power drive mechanism is energized by a remote source. When energized, the armature bail is pulled downward. An extension of the bail disengages the drive link latch, which drops and engages a notch in the eccentric arm. The eccentric arm, driven by the perforator main shaft, moves to the right. This action causes the bell crank handle to be depressed through a system of linkages between the drive link latch and the bell crank. The subsequent operation is as described in paragraphs 9.31 and 9.32 .

28 AUXILIARY TYPING REPERFORATOR BASE

FOR THE AUTOMATIC SEND-RECEIVE (ASR) SET

DESCRIPTION

1. GENERAL

1.01 This section describes the base assembly used only in the Automatic Send-Receive (ASR) Set for mounting an auxiliary typing reperforator unit. The accompanying photograph shows a typical base.

2. PHYSICAL CHARACTERISTICS

2.01 The base is a simple designed structure of steel plates which serve as a mounting for a typing reperforator, a motor unit, tape container, gear bracket assembly, and a bracket on which electrical connections are made.

2.02 The gear bracket assembly, driven directly by a motor, may contain two shafts with interchangeable gears for speed change, or it may be a gear shift assembly by which speed change may be accomplished by moving a lever to any one of three positions. A reperforator driving sprocket is mounted on the gear assembly for driving the reperforator unit by means of a timing belt.

2.03 Motor mounting facilities are provided on the lower level of the base so that the motor is located in position for driving the gear assembly.

2.04 The tape container accommodates a full roll of tape, which is directed out through a tape guide with roller to the typing reperforator. A low tape electrical switch assembly is provided in the tape container. A tape-out switch lever rides the diminishing roll of tape to actuate an electrical switch when a prescribed level is reached.

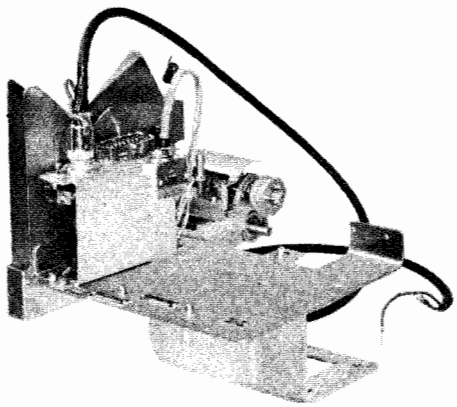
3. ELECTRICAL CHARACTERISTICS

3.01 The electrical connections are made on a bracket assembly adjacent to the tape container. A power cable connector is provided to accept electrical power from the cabinet terminal board.

3.02 A power switch provides means for switching power to and from the auxiliary typing reperforator unit.

3.03 A 36-point connector is provided to accept cable connections from an associated electrical service unit.

3.04 From the 36-point connector a cable emerges to carry electrical connections to a connector on the typing reperforator.



Typical ASR Auxiliary Typing Reperforator Base

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

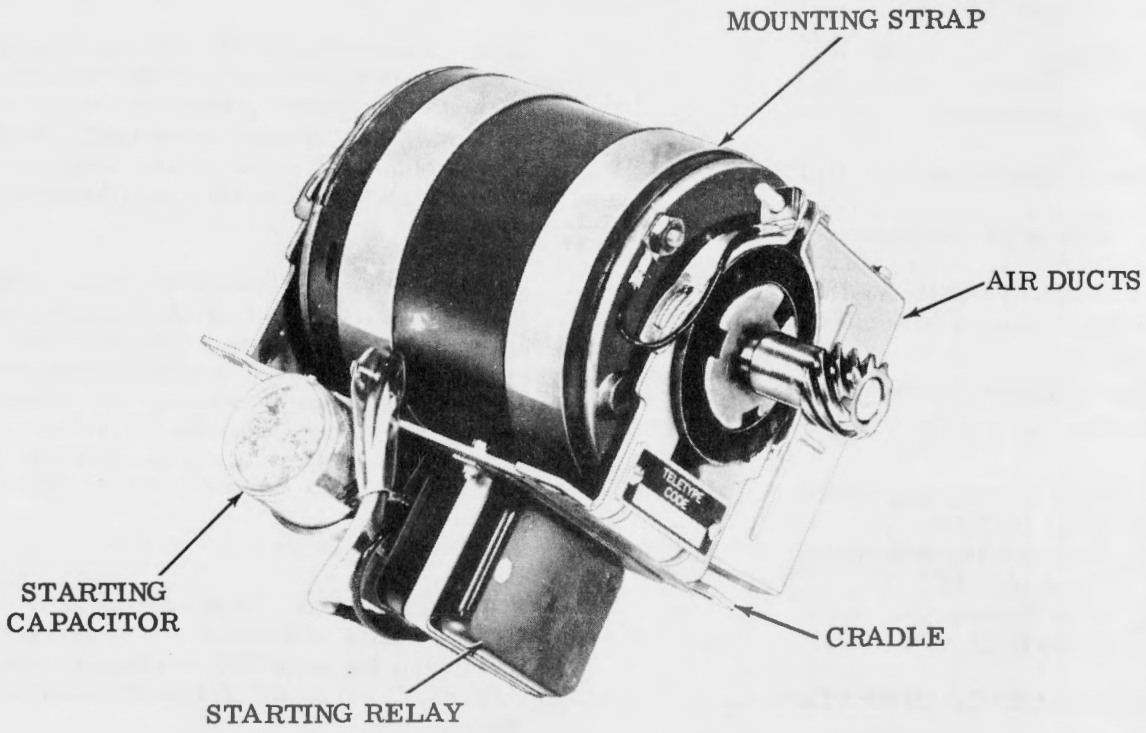


Figure 1 - Typical Miniature Synchronous Motor Unit

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.

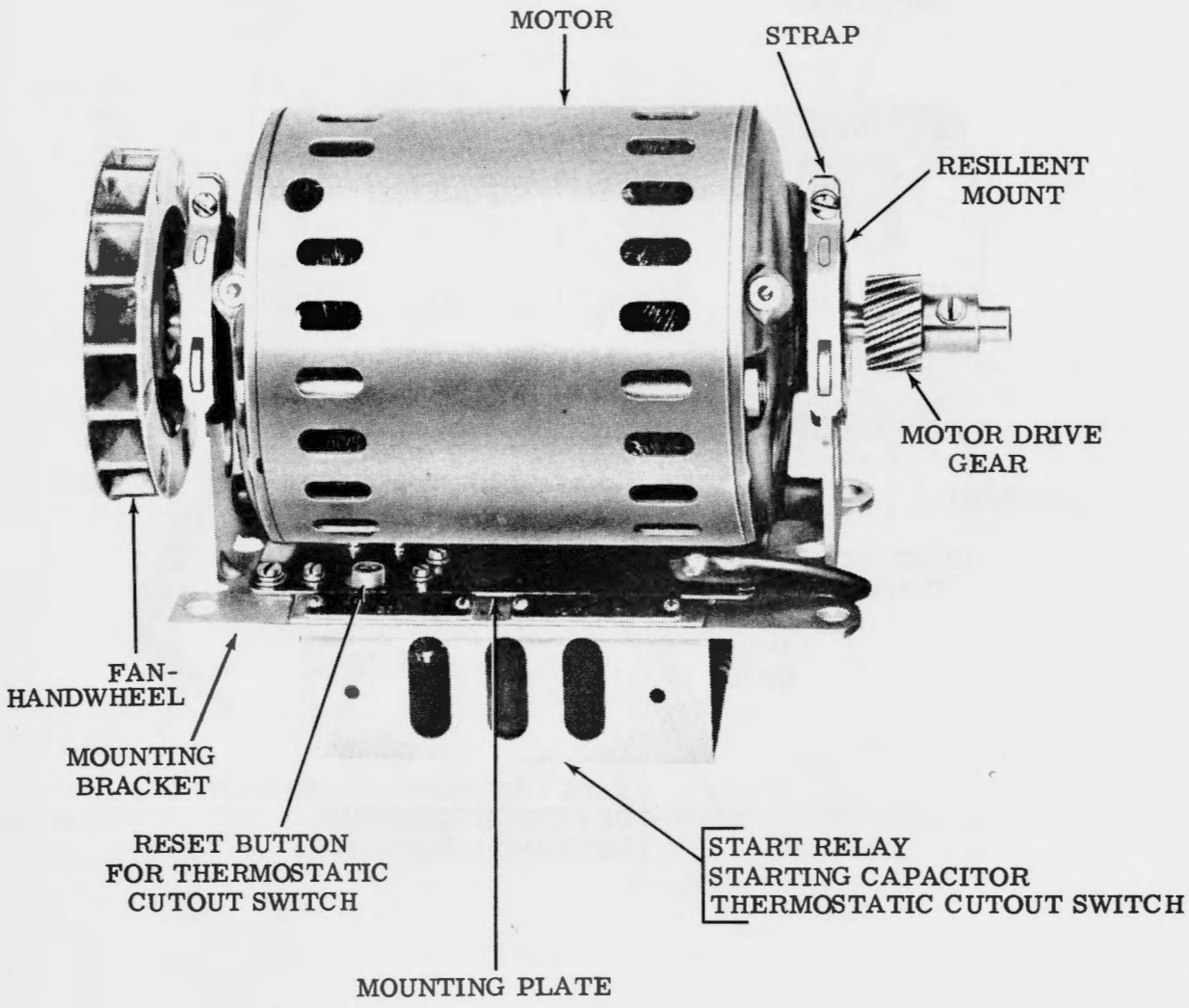


Figure 2 - Typical Standard or Heavy Duty Synchronous Motor Unit

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.

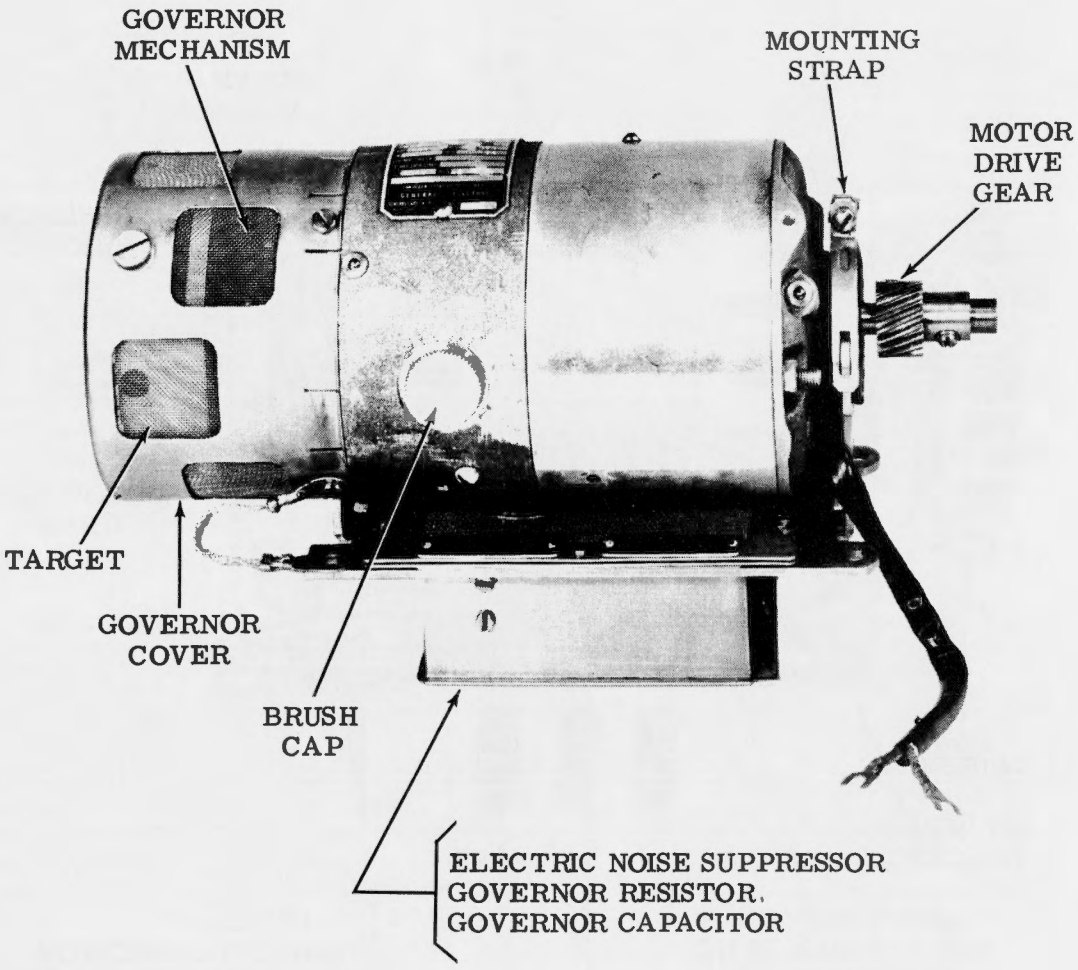


Figure 3 - Typical Series (Governed) Motor Unit

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 de-energizes. Its contacts open and remove the starting winding from the operating circuit. The rotor continues to accelerate until it reaches the synchronous operating speed. Rotation is in the counterclockwise direction, as viewed from the fan or short-shaft end of the motor.

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

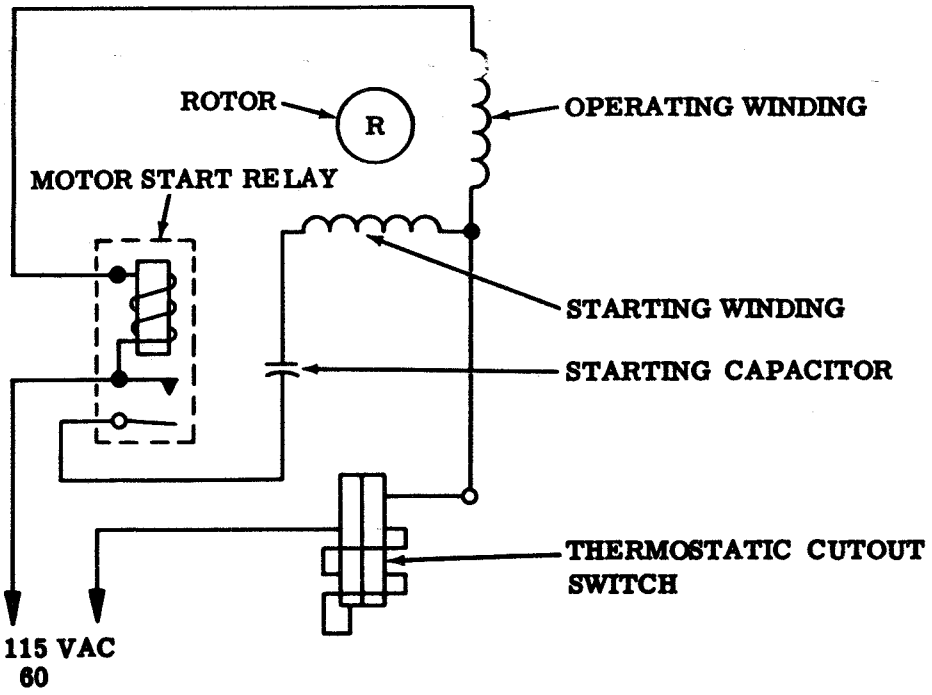


Figure 4 - Typical Synchronous Motor Unit Schematic Diagram

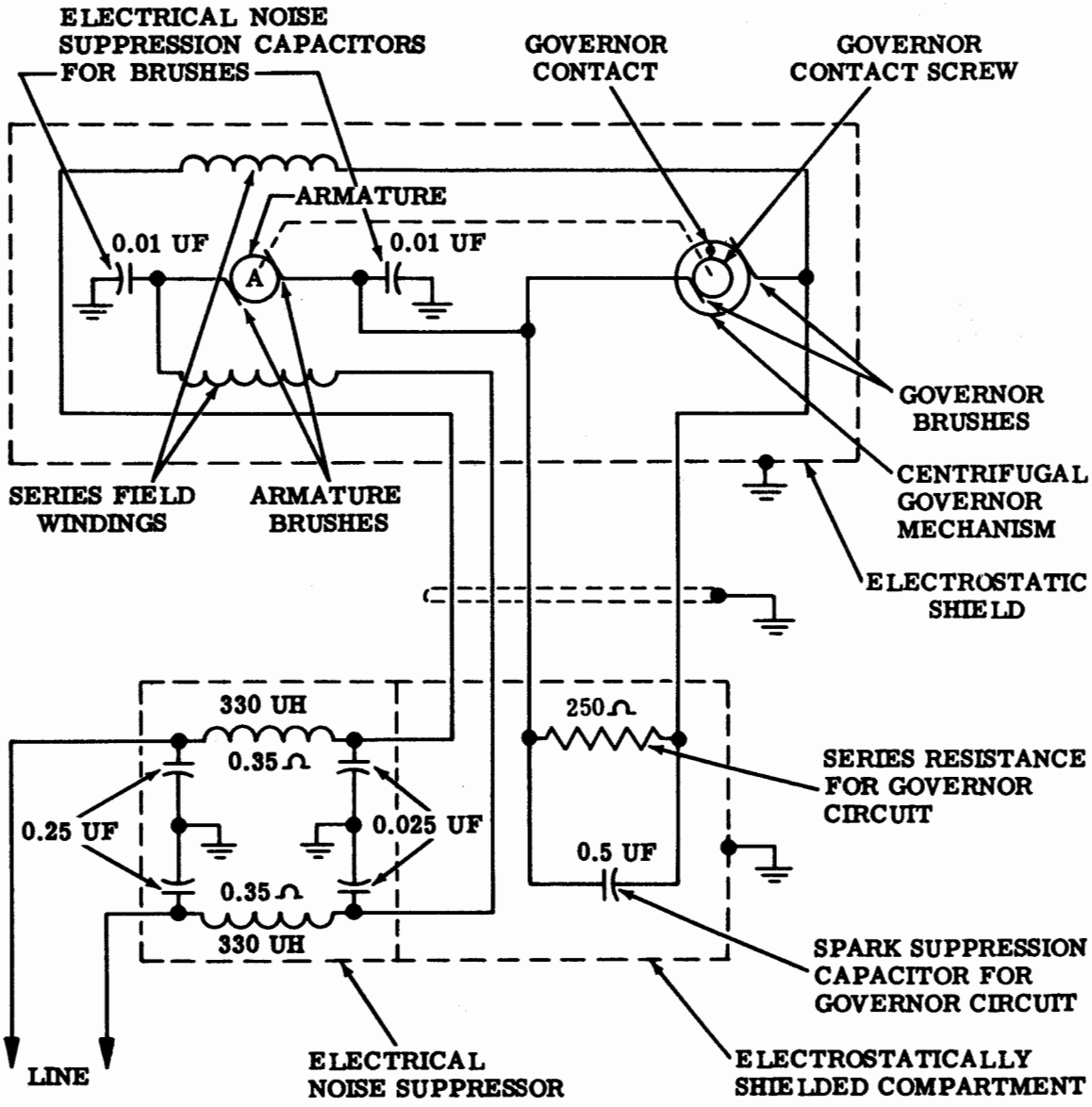


Figure 5 - Typical Series (Governed) Motor Unit Schematic Diagram

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.

28 AUTOMATIC SEND-RECEIVE (ASR) 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 Automatic Send-Receive Teletypewriter Sets listed in Section 573-101-000TC.

1.02 An overall typical schematic wiring diagram of a set is included in the description Section 573-101-100TC.

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
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-67/U	LMU 12	2900WD-A	42
	PD-77/U	LMU 14	2900WD-A	42
	PD-77A/U	LMU 39	2900WD-A	42
	PD-108/U	LMU 38	2900WD-A	42
	PD-111/U	LMU 50	2900WD-A	42
TYPING UNITS	MX-1115B/UG	LP14RN/AY	3214WD-A	44
	MX-1422A/UG	LP14RE/AY	3214WD-A	44
	MX-2984/UG	LP14RN/AGH	3214WD-A	44
	TT-325/UG	LP14RN/AHF	3214WD-A	44
	TT-372/UG	LP108RN/AY	3214WD-A	44
	TT-378/UG	LP108RE/ACX	3214WD-A	44
	TT-400/UG	LP14RE/ACX	3214WD-A	44
	TT-437/UG	LP14RN/AJG	3214WD-A	44
	TT-441/UG	LP14RE/AJG	3214WD-A	44
	TT-374/UG	LP108RN/AGH	3813WD-A	D
	TT-436/UG	LP14RN/AJE	3813WD-A	D
CABINETS	CY-2529/UG	LAAC 200	3264WD-A	20
	CY-3082/UG	LAAC 237	3264WD-A	20
ELECTRICAL SERVICE UNITS	SB-959/UG	LESU 13	3292WD-A	19
			3294WD-S	24
	SB-1061/UG	LESU 12	3344WD-A	K
			3343WD-S	P

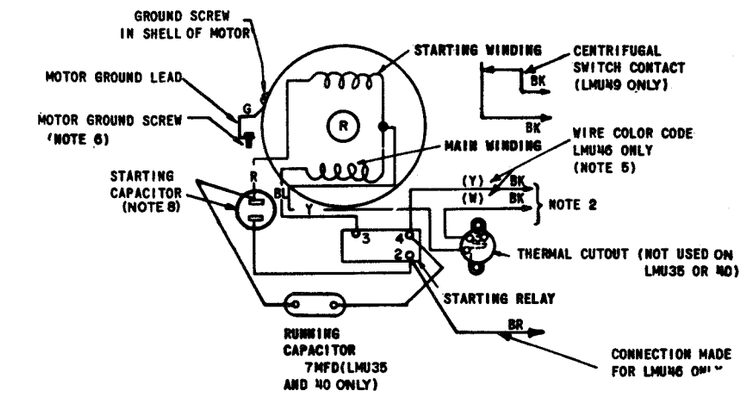
2. WIRING DIAGRAM INDEX continued

SUBJECT	NAVY DESIGNATION	DESIGNATION OF MANUFACTURER	WIRING DIAGRAM NUMBER	ISSUE
ELECTRICAL SERVICE UNITS	SB-1302/UG	LESU 73	4385WD-A	B
			4386WD-S	C
	SB-2611/UG	LESU 96	5930WD-A	ORIG
			5931WD-S	A
	SB-2680/UG	LESU111	7015WD-A	5
			7016WD-S	3
TRANSMITTER DISTRIBUTOR	TT-251/UG	LXD 3	3300WD-A	G
	TT-439/UG	LXD 27	3300WD-A	G
	TT-311/UG	LXD 11	4264WD-A	9
TRANSMITTER DISTRIBUTOR BASE	MT2099/UG	LCXB1	———	
	MT2452/UG	LCXB 13	4265WD-A	C
KEYBOARD BASE	MX-2643/UG	LAK 4ARN	3302WD-A	17
	MX-2858/UG	LAK 4ARE	3302WD-A	17
	TT-371/UG	LAK 31ARN	4927WD-A	K2
	TT-377/UG	LAK 31ARE	4927WD-A	K2
	TT-433/UG	LAK 42ARN	6456WD-A	4
	TT-440/UG	LAK 42ARE	6456WD-A	4
	TT-475/UG	LAK 46ARN	6456WD-A	4
TYPING REPERFORATOR	TT-266/UG	LPR9/AWA	3628WD-A	21
	TT-267/UG	LPR9/ARE	3628WD-A	21
	TT-373/UG	LPR51/BWA	3628WD-A	21
			3567WD-S	13
	TT-375/UG	LPR52/BWA	3628WD-A	21
	TT-379/UG	LPR51/BRH	3628WD-A	21
			3567WD-S	13
	TT-380/UG	LPR52/BRH	3628WD-A	21
REPERFORATOR BASE	MT-2234/UG	LRB 6	3590WD-A	4
			3591WD-S	9
	MT-2272/UG	LRB 42	3591WD-S	9
			4447WD-A	7
	MT-2625/UG	LRB 36	3591WD-S	9
			4447WD-A	7
	MT-3369/UG	LRB 51	3591WD-S	9
			4447WD-A	7
PAPER WINDER	RL235/UG	LPW 300	5830WD-A&S	6

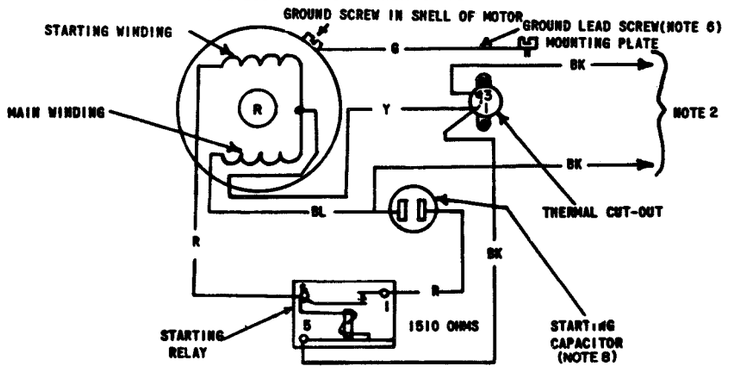
SYNCHRONOUS MOTOR UNITS

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

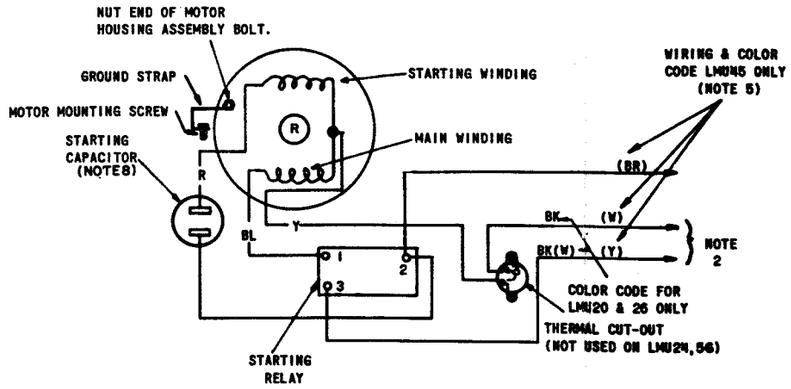
NO.	NOTES
1.	SYNCHRONOUS MOTOR OPERATES ON REGULATED FREQUENCY (± 0.75%) MAXIMUM AC ONLY.
2.	CONNECT EITHER WIRE TO DESIGNATED TERMINALS OF UNIT TERMINAL BLOCK, PER WIRING DIAGRAM OF ASSOCIATED UNIT
3.	MOTOR LEADS OF SAME COLOR ARE INTERCHANGEABLE.
5.	EXTERNAL NOISE SUPPRESSION NETWORK CONSISTING OF 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.	LMU: 3,15,21,30,33,36,37,38,42,46,49,51,52 — STARTING CAPACITOR VALUE: 43–48 MFD LMU: 11,12 — 170–226 MFD LMU: 35,40 — 64–77 MFD LMU: 55 — 15–18 MFD LMU: 19,20,24,26,31,45,56 — 88–108 MFD LMU: 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 50,54
FOR USE WITH 115V AC 50~POWER SUPPLY ONLY



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

2900WD		
REVISIONS		
ISSUE	DATE	AUTH. NO.
L	2-15-60	28-12947
M	5-17-60	28-13280
N	5-27-60	28-13361
P	7-6-60	28-13489N
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	74657
Y	11-29-62	75216
Z	4-15-63	76588
AA	4-15-63	76592
AB	5-16-63	76965
AC	5-28-63	76180
AD	8-22-63	77845
AE	1-13-64	79866
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 NEP

ACTUAL
WIRING DIAGRAM
FOR
MODEL 28 & 36
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

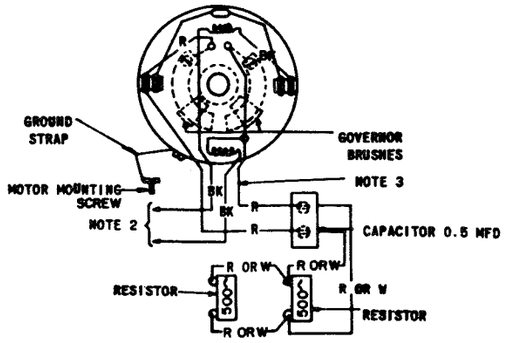
DRAWN E.R.	CHKD. RETT
ENGD. B.H.B.	APPD.

TELETYPE CORPORATION

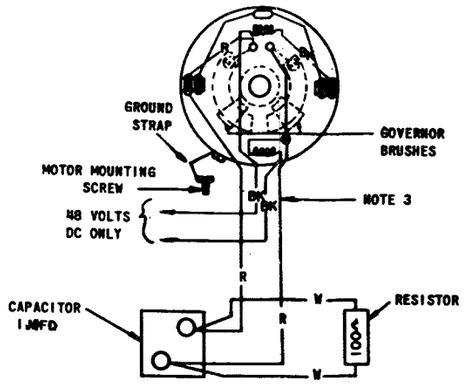
2900WD

SERIES GOVERNED MOTOR UNITS

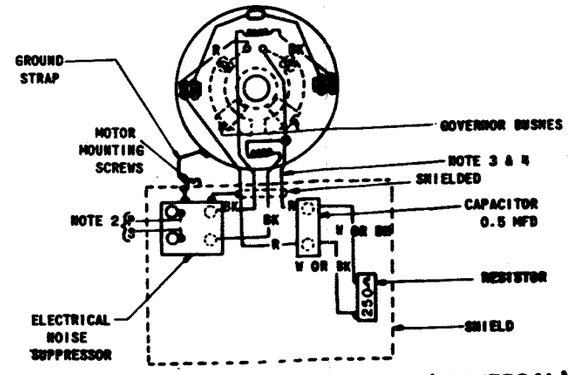
NO.	NOTES
1.	A. AC SERIES MOTOR UNITS OPERATE ON UN-REGULATED AC POWER. B. ASSOCIATED LESU MUST BE EQUIPPED WITH CAPACITOR-RESISTOR ASSEMBLY FOR DC OPERATION OF GOVERNED MOTORS.
2.	CONNECT EITHER WIRE TO DESIGNATED TERMINALS OF UNIT TERMINAL BLOCK, PER WIRING DIAGRAM OF ASSOCIATED UNIT.
3.	MOTOR LEADS OF SAME COLOR ARE INTERCHANGEABLE.
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



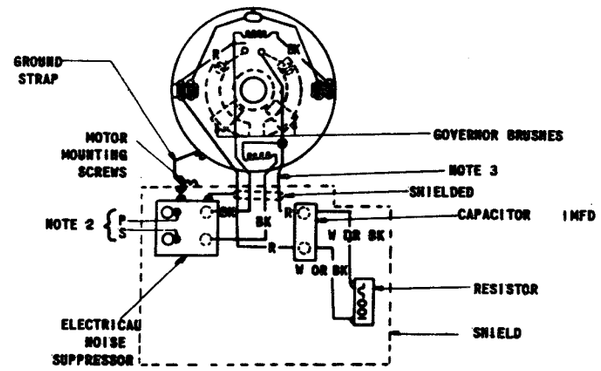
LMU 6,13 **(UNIVERSAL)**
WITHOUT RADIO FREQUENCY SUPPRESSORS
FOR USE WITH EITHER 115V AC 50-60~OR 115V DC POWER SUPPLY (NOTE 1B).



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

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

2900WD

REVISIONS

ISSUE	DATE	AUTH. NO.
L	2-15-60	29-12957
M	5-17-60	29-13000
N	5-27-60	29-13061
P	7-6-60	29-13084
Q	9-13-60	29-13099
R	12-15-60	29-13105
S	6-22-61	70895
T	9-8-61	70929
U	10-18-61	71171
V	11-30-61	71205
W	8-20-62	72685
X	9-20-62	74057
Y	11-29-62	72816
Z	1-18-63	75088
AA	5-16-63	76092
AB	5-16-63	76093
AC	5-20-63	76149
AD	8-22-63	77095
AE	1-13-64	79088
AF	1-20-64	79730-1
32	3-13-64	79730-2
33	5-22-64	80098
34	11-6-64	84304
35	3-5-65	86432
36	5-18-65	86432-1
37	9-20-65	86432-3
38	11-9-65	86532-5
39	11-10-65	87669
40	2-22-66	90454
41	4-5-66	90629

SHEET 2

ACTUAL WIRING DIAGRAM FOR MODEL 28 & 36 MOTOR UNITS

APPROVALS

D AND R	E OF M

E-NUMBER

PROD. NO. 2900WD

DATE 1-28-56

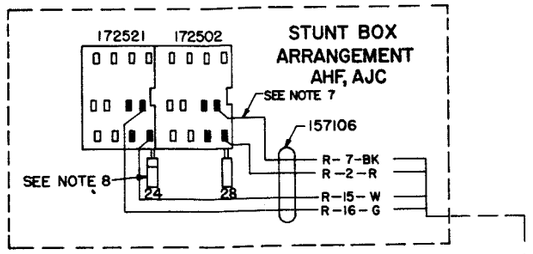
P.D. FILE NO. 1-30.65.166A

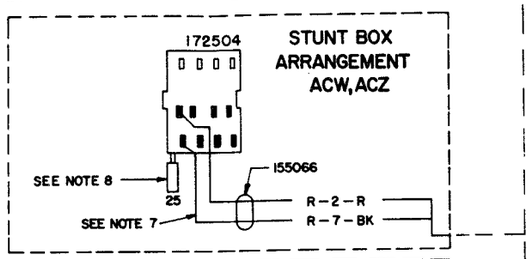
DRAWN E.R.	CHKD. RST
ENGD. B.N.S.	APPD.

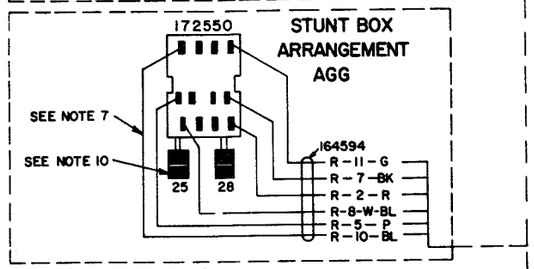
TELETYPE CORPORATION

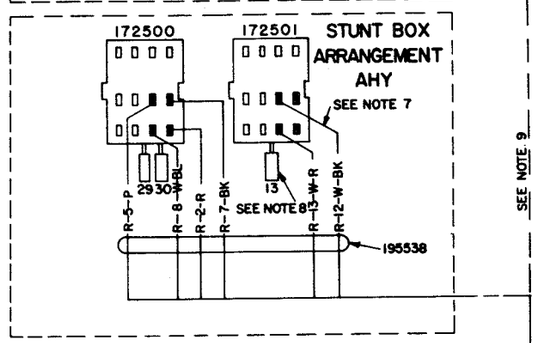
41 **2900WD**

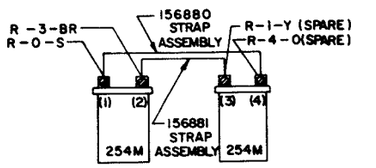
NO.	NOTES
1.	WIRING CHANNEL DESIGNATED BY "R" DOES NOT REPRESENT CABLES, BUT ASSISTS IN TRACING CONNECTIONS.
2.	COLOR CODE: BK—BLACK BL—BLUE W —WHITE R —RED Y —YELLOW BR—BROWN P —PURPLE O —ORANGE S —SLATE G —GREEN
3.	COLOR LEGEND: R- CHANNEL IDENTIFICATION 8- CHANNEL WIRE NUMBER W WIRE COLOR CODE
4.	
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 39522 RM STRAP FOR LP 95,96,97,102,122
14.	THE 159611 SIGNAL BELL AND THE 195353 CABLE ASSEMBLY ARE CONTAINED ON THE LP III 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 R.F. SUPPRESSION MODIFICATION KITS.



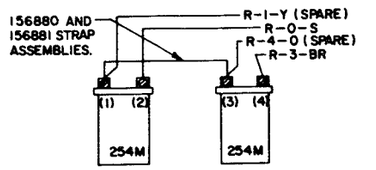






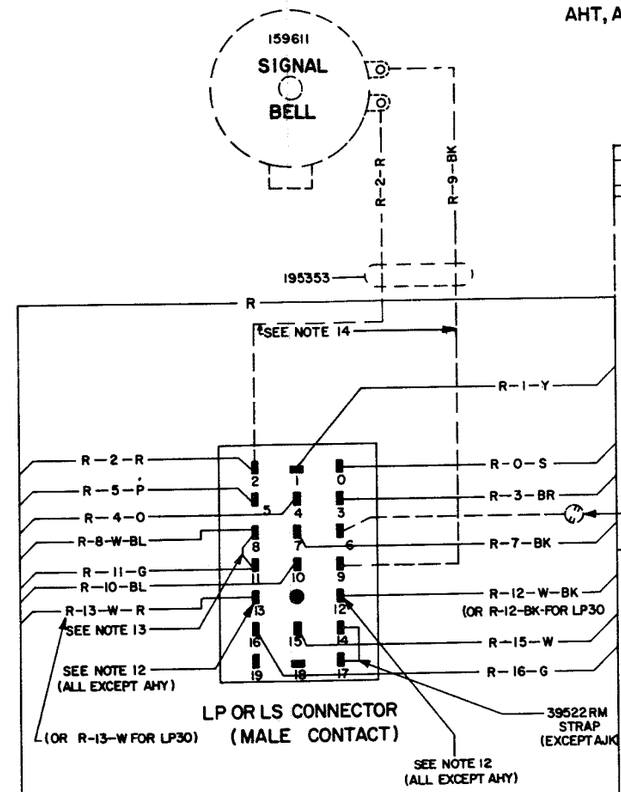


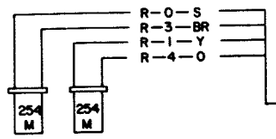
60 MILLIAMPERE OPERATION (NOTE 15A)



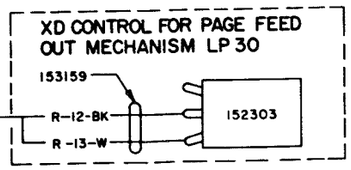
20-30 MILLIAMPERE OPERATION (NOTE 15B)

STUNT BOX ARRANGEMENT AHT, AHV

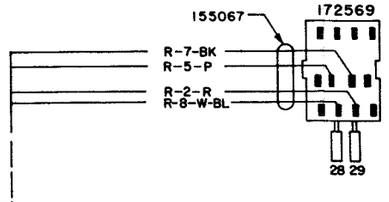


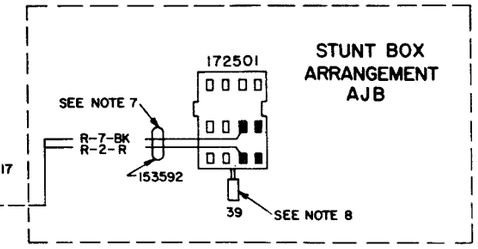


SELECTOR MAGNETS LP OR LS

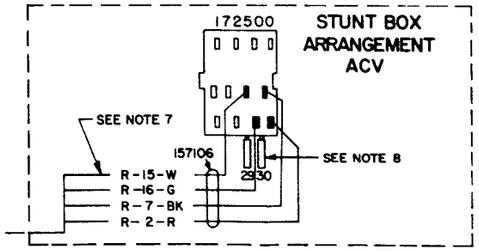


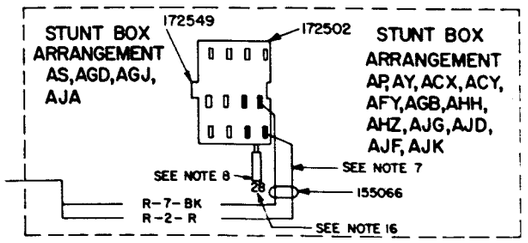
SEE NOTE 9

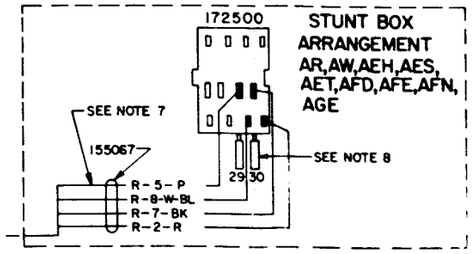




NOTE 17







STUNT BOX WIRING

44

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

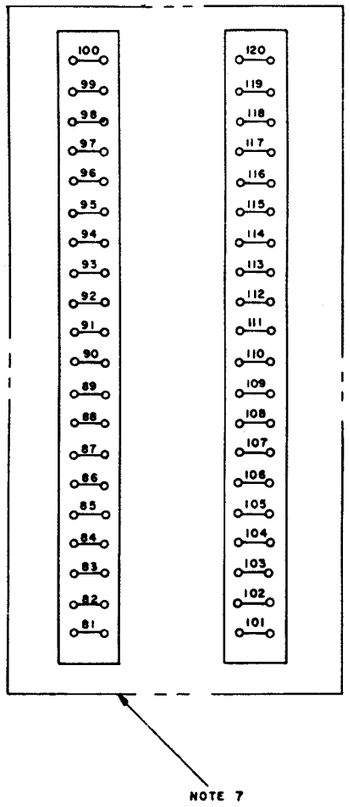
E-NUMBER	
PROD. NO. 3214 WD	
DATE 12-1-56	
P.D. FILE NO. 45-3065AA	
DRAWN JER	CHKD. GG
ENGD. VC	APPD. OAL

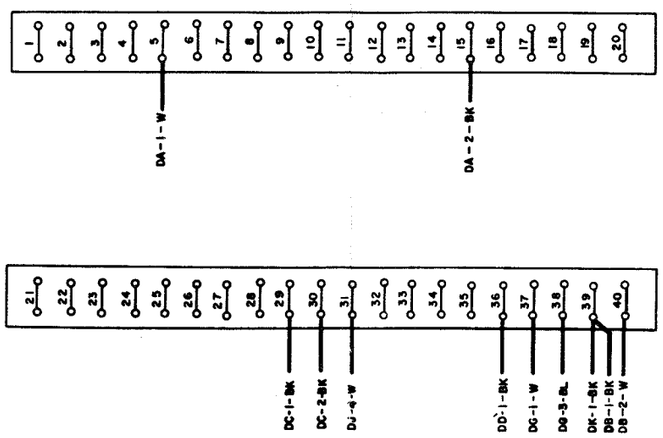
TELETYPE CORPORATION

3214 WD

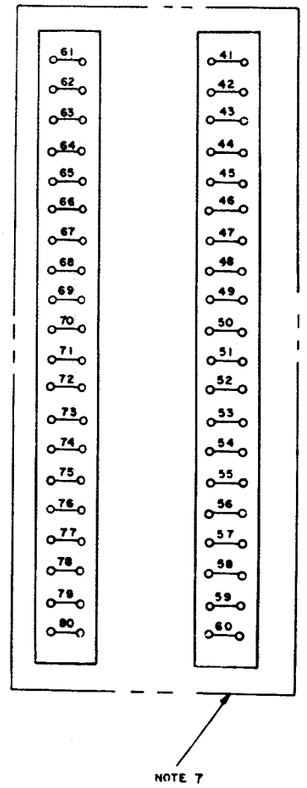
NO	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION A 1 - W WIRE COLOR CODE
2.	COLOR CODE: BK-BLACK BR-BROWN BL-BLUE R-RED P-PURPLE G-GREEN S-SLATE Y-YELLOW W-WHITE O-ORANGE
3.	-*- DENOTES SPLICED AND TAPED WIRES.
4.	USE POWER AND SIGNAL LINE INTERFERENCE SUPPRESSORS FOR INSTALLATIONS REQUIRING MINIMUM R.F. INTERFERENCE. FOR OTHER INSTALLATIONS, OMIT SUPPRESSORS AND CONNECT POSITIVE AND NEGATIVE LEADS OF THE INCOMING SIGNAL LINE TO CABINET TERMINALS C5 & C15 RESPECTIVELY. CONNECT THE INCOMING GROUNDED AND UNGROUNDED POWER LEADS TO CABINET TERMINALS C40 & C39 RESPECTIVELY.
5.	USE PROPER COPYLIGHT SYSTEM FOR THE TYPE OF CURRENT USED.
6.	CABINET RECEPTACLES REQUIRED WHEN TAPE WINDER OR TAPE STUFFER IS USED.
7.	OPTIONAL FEATURES, REFER TO APPLICABLE WD.
8.	CABINET POWER MUST BE 115V, 50-60~AC WHEN THIS ACCESSORY IS USED.
9.	------ FOR DC APPLICATION — — FOR AC APPLICATION ——— NORMAL WIRING
10.	ASSOCIATED CABLES: 158267 TRANSFORMER AND CABLE 159329 TAPE WINDER CABLE 154440 CABINET LIGHTS, SWITCH CABLE 159330 RESISTOR PACK CABLE
11.	GROUND WIRE MAY BE ATTACHED TO THE RIGHT 154412 TERMINAL BLOCK ASSEMBLY MOUNTING STUD BY MEANS OF THE TERMINAL BLOCK COVER MOUNTING SCREW AND LOCK WASHER.

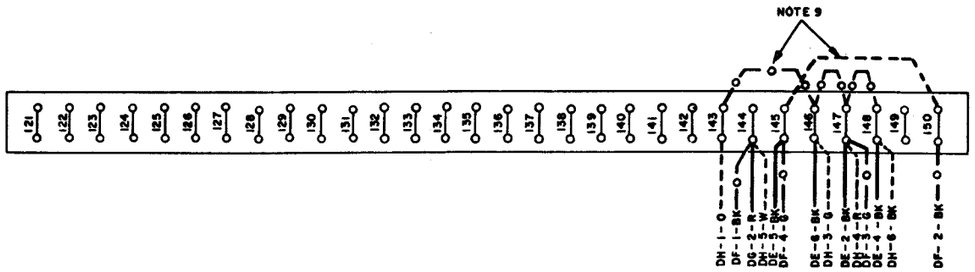
C
CABINET TERMINAL BLOCKS



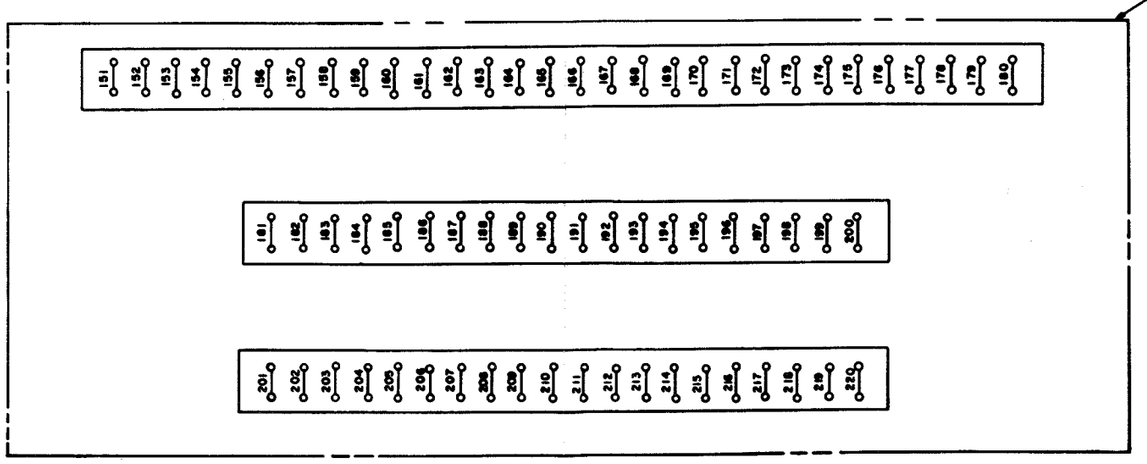


CABINET GRD. SCREW
NOTE 11





C
CABINET TERMINAL BLOCKS



REVISIONS		
ISSUE	DATE	AUTH. NO.
A	7-9-57	TP-2027
B	9-16-57	TP-2399
C	2-24-58	28-8517
D 5	5-27-58	28-9036
E 6	9-17-58	28-9902
F 7	10-7-58	28-9996
8	11-28-58	28-10256
9	4-9-59	28-10928
10	5-22-59	28-11108
11	8-4-59	28-11508
12	9-22-61	71027
13	2-14-62	72426
14	3-23-62	72707
15	4-11-62	73068
16	12-10-62	75290
17	2-19-63	75725
18	3-14-63	75290-1
19	10-3-63	77579
20	10-17-63	78376

SHEET 1 OF 2

ACTUAL
WIRING DIAGRAM FOR
MODEL 28 AUTOMATIC
SEND-RECEIVE
CABINETS
LAAC200, 201, 202,
205, 209, 210, 213,
214, 219, 235, 236
AC-DC APPLICATION
225, 237

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

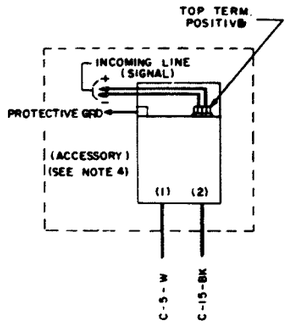
E-NUMBER	
PROD. NO.	3264WD
DATE	4-16-57
P.D. FILE NO.	28-A68AA
DRAWN R.W.D.	CHKD. R.D.
ENGD. J.M.	APPD. J.A.

TELETYPE
CORPORATION

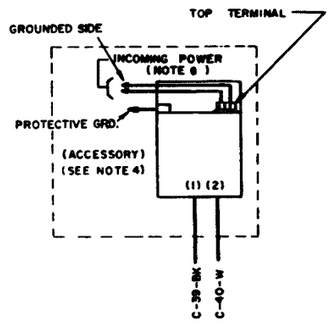
3264 WD

SEE SHEET 1 FOR NOTES.

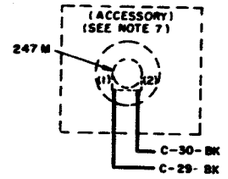
DA
NOISE SUPPRESSOR
(LINE)



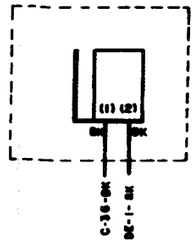
DB
NOISE SUPPRESSOR
(POWER)



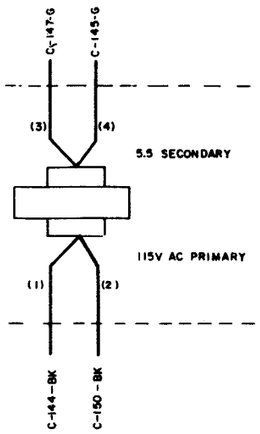
DC
SIGNAL BELL



DD
MARGIN INDICATOR
LAMP SOCKET



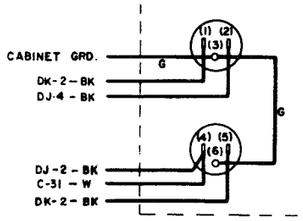
DF
TRANSFORMER



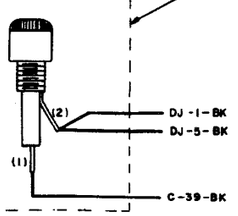
DE
5.5V, 50-60 ~ AC COPYLIGHT SYSTEM

DG
COPYLIGHT SWITCH

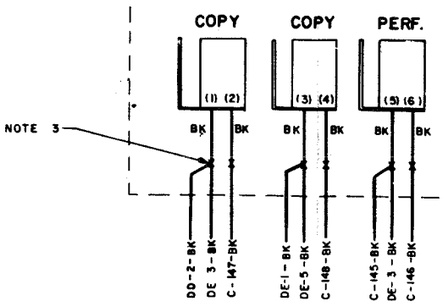
DJ
CABINET RECEPTACLE



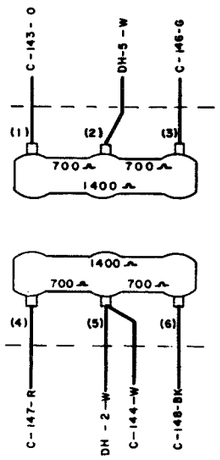
DK
FUSE HOLDER



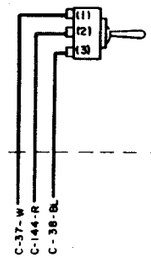
DE
60V DC COPYLIGHT SYSTEM



DH
RESISTOR PACKAGE



DG
COPYLIGHT SWITCH



3264 WD

REVISIONS

ISSUE	DATE	AUTH. NO.
A	7-9-57	TP-2027
B	9-16-57	TP-2299
C	2-24-58	28-8817
D 5	5-27-58	28-9036
E 6	9-17-58	28-9902
F 7	10-7-58	28-9986
8	11-28-58	28-10256
9	4-9-59	28-10928
10	5-22-59	28-11106
11	8-11-59	28-11508
12	9-22-61	71027
13	2-14-62	72426
14	3-23-62	72707
15	4-11-62	73088
16	12-10-62	75290
17	2-19-63	75725
18	3-14-63	75290-1
19	10-3-63	77579
20	10-17-63	78576

SHEET 2 OF 2

ACTUAL
WIRING DIAGRAM FOR
MODEL 28 AUTOMATIC
SEND-RECEIVE
CABINETS
LAAC200, 201, 202,
205, 209, 210, 213,
214, 219, 235, 236
AC-DC APPLICATION
225, 237

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

E-NUMBER	
PROD. NO.	3264WD
DATE	4-16-57
P.D. FILE NO.	2N-A65AA
DRAWN R.W.D.	CHKD. R.D.
ENGD. J.M.	APPD. J.A.

TELETYPE
CORPORATION

3264 WD

20

NO	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION A-1-W-BL WIRE COLOR CODE
2.	COLOR CODE: BK - BLACK G - GREEN BR - BROWN BL - BLUE R - RED P - PURPLE O - ORANGE W - WHITE Y - YELLOW S - SLATE
3	UNIT WIRED FOR 115 VOLTS, 50 TO 60 CYCLE A C POWER INPUT ONLY.
4	CONNECTORS 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: SIGNAL LINE CURRENT: .020 AMP — CONNECTIONS REMOVED: K1-K2, J①1-J①2 — CONNECTIONS ADDED: J①3-J①4
6.	RECTIFIER SHOWN CONTROLLED BY POWER SWITCH. A. FOR CONTINUOUS OPERATION, REMOVE LEAD L-2-BK FROM TERMINAL E-2 AND CONNECT TO TERMINAL E-1. B. FOR OPERATION FROM MOTOR CONTROL, REMOVE LEAD L-2-BK FROM TERMINAL E-2 AND CONNECT TO TERMINAL E-3.
7.	LINE SHUNT RELAY SHOWN CONTROLLED BY POWER SWITCH AND SHUNTING LINE RELAY COIL AND KEYBOARD AND TRANSMITTER DISTRIBUTOR SIGNAL GENERATOR. A. IF KEYBOARD SHUNTING IS NOT DESIRED, OR WHEN SIGNAL LINE BREAK SWITCH IS PRESENT, 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.	THE SPARE LEADS FROM THE KEYBOARD AND TRANSMITTER DISTRIBUTOR UNITS CONNECTORS ARE TERMINATED IN THE RIGHT END OF THE ELECTRICAL SERVICE UNIT. THE SPARE LEADS FROM THE TYPING UNIT CONNECTORS ARE TERMINATED IN THE LEFT END OF THE ELECTRICAL SERVICE UNIT.
9.	ADD STRAP BETWEEN C-10 AND C-11, IF SIGNAL LINE BREAK SWITCH IS NOT USED.
10.	SPARE LEADS FROM F-18 AND U-18 ARE RESERVED FOR POLAR OPERATION OF KEYBOARD AND TRANSMITTER DISTRIBUTOR SIGNAL GENERATORS.
11.	TERMINALS C-143 TO C-148 ARE RESERVED FOR CABINET LAMP OPERATION.
12.	TERMINALS C1-C3 RESERVED FOR CUSTOMER USE.
13.	TERMINALS C-121 - C-122 RESERVED FOR PERFORATOR LOW-TAPE SWITCH.
14.	CONTACTS SHOWN IN UNOPERATED OR DE-ENERGIZED POSITION.
15.	WHEN LBXD IS USED IN PLACE OF LXD, MAKE THE FOLLOWING CHANGES: OMIT CONNECTIONS ADD CONNECTIONS C-142 TO C-150 C-131 TO C-132
16.	WHEN LXD5 IS USED, REMOVE THE STRAP BETWEEN TERMINALS C-135 - C-136. ADD TWO STRAPS, ONE BETWEEN TERMINALS C-23 - C-135 AND ONE BETWEEN C-24 -C-136
17.	WHEN THE LXD 11 IS USED DO NOT INSTALL STRAPS BETWEEN TERMINALS C141 AND C142 OR C131 AND C132. THE INTERNAL CLUTCH MAGNET INPUT SHOULD BE CONNECTED TO TERMINALS C132 & C141. RESISTANCE PER COIL 210 OHMS.

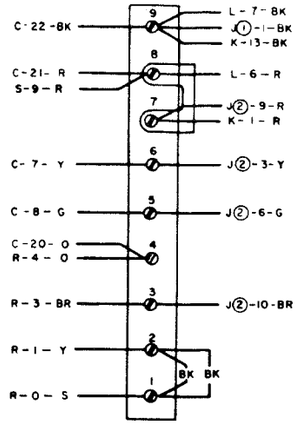
NOTE:
REVISION INFORMATION MUST ALSO BE REFLECTED ON THE ISSUE CONTROL RECORD, WHICH IS A PART OF THIS DRAWING.

3292 WD

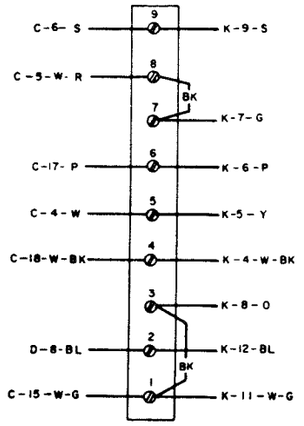
REVISIONS

ISSUE	DATE	AUTH. NO.
14	3-28-62	69762-1
15	2-11-64	79910
16	8-28-64	82637
17	10-26-64	83790
-18	2-26-65	86062
-19	4-7-66	90222

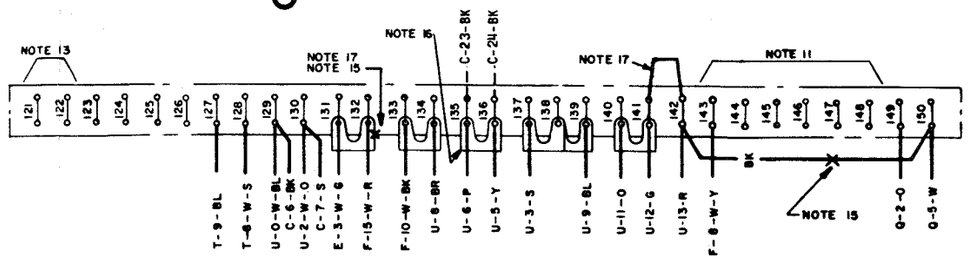
A
SELECTOR MAGNET TERMINAL BLOCK



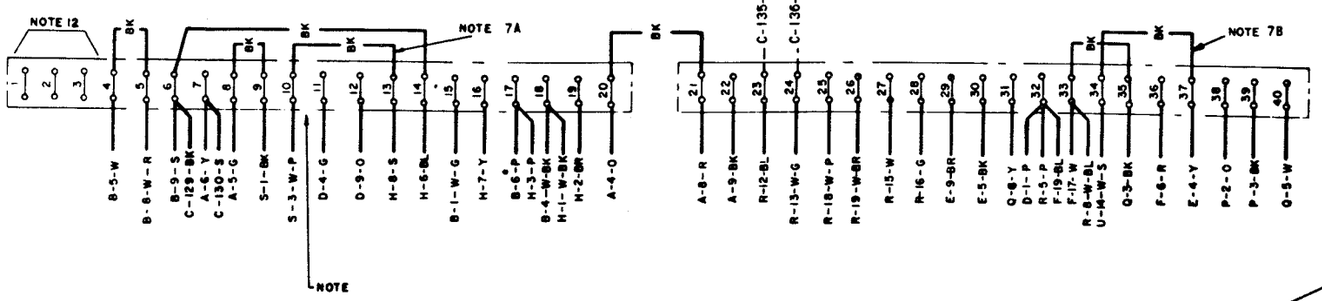
B
LINE TEST KEY TERMINAL BLOCK



C
CABINET TERMINAL BLOCK



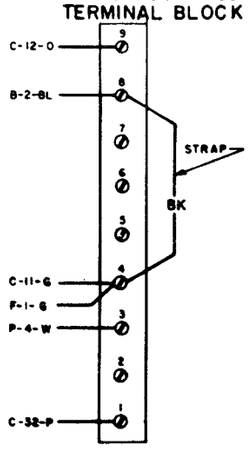
C
CABINET TERMINAL BLOCK



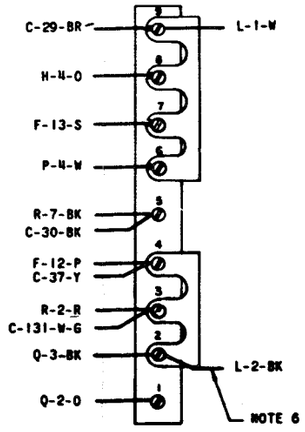
TO CABINET GROUND SCREW

ELECTRICAL SERVICE UNIT GROUND SCREW

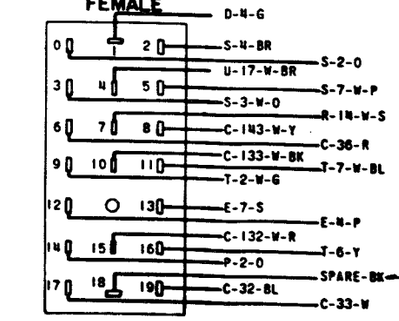
D
MOTOR CONTROL TERMINAL BLOCK



E
POWER TERMINAL BLOCK



F
KEYBOARD CONNECTOR FEMALE



SEE ISSUE CONTROL RECORD FOR COMPLETE LIST OF SHEETS COMPRISING THIS WD

SHEET 1

ACTUAL WIRING DIAGRAM FOR MODEL 28 ELECTRICAL SERVICE UNIT ASR - GP - OPT. IAC

LESUI3

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

E-NUMBER

PROD. NO. 3292WD

DATE 10-10-56

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

DRAWN E.K.S. CHKD. R.D.

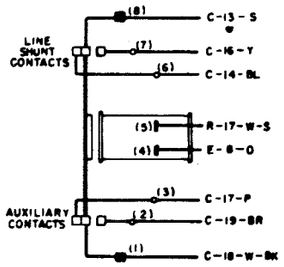
ENGD. N.S.P. APPD.

TELETYPE CORPORATION

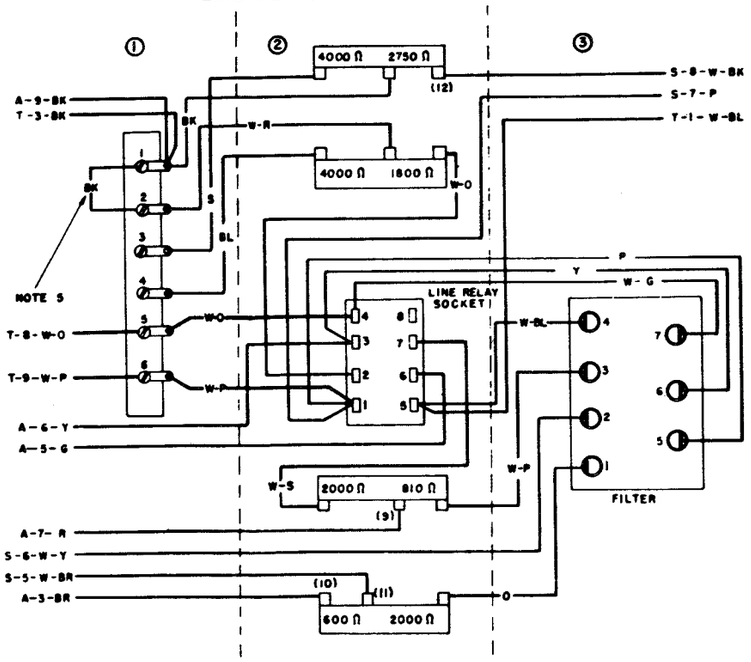
3292WD

SEE SHEET 1 FOR NOTES.

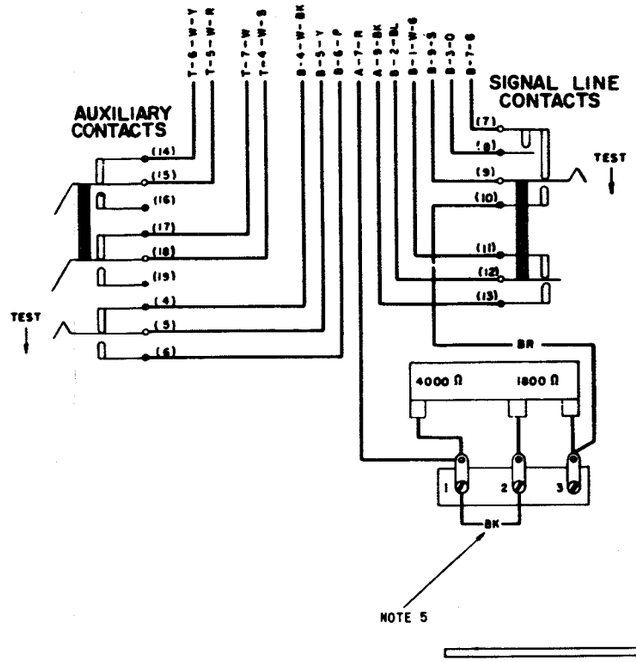
H
LINE SHUNT RELAY



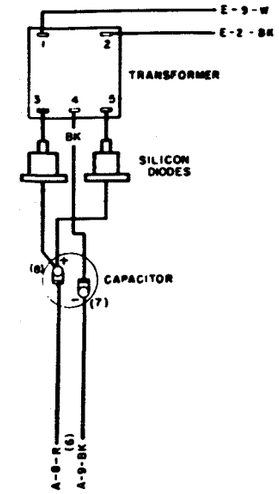
J
LINE RELAY MOUNTING ASSEMBLY



K
LINE TEST KEY ASSEMBLY



L
RECTIFIER ASSEMBLY



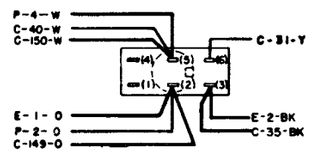
NOTE:
REVISION INFORMATION MUST ALSO BE REFLECTED ON THE ISSUE CONTROL RECORD, WHICH IS A PART OF THIS DRAWING.

3292WD

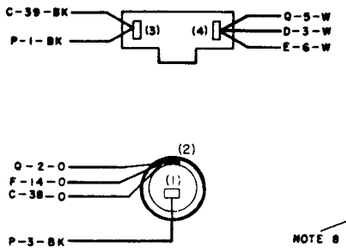
REVISIONS

ISSUE	DATE	AUTH. NO.
14	3-28-62	69762-1
15	2-11-64	79910
16	8-28-64	82637
17	10-26-64	83790
18	2-26-65	86062
19	4-7-66	90222

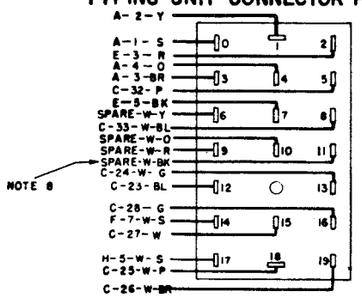
Q
POWER SWITCH



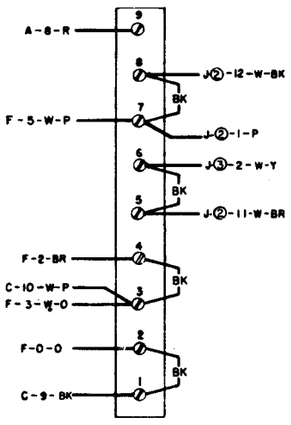
P
CONVENIENCE RECEPTACLE



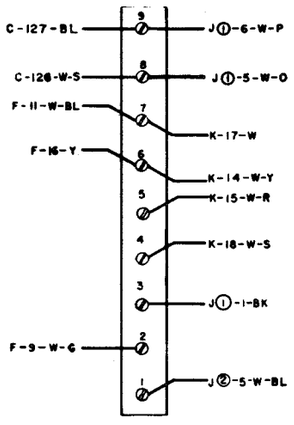
R
TYPING UNIT CONNECTOR FEMALE



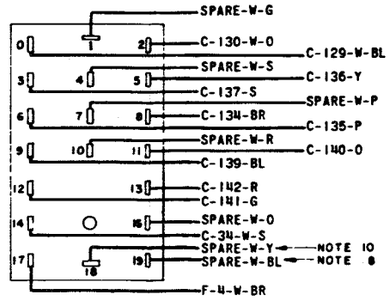
S
SLOW RELEASE RELAY TERMINAL BLOCK

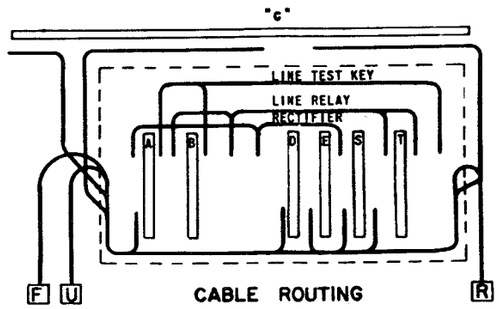


T
SLOW RELEASE TEST KEY TERMINAL BLOCK



U
TRANSMITTER DISTRIBUTOR CONNECTOR FEMALE





CABLE ROUTING
(BOTTOM VIEW)

SEE ISSUE CONTROL RECORD FOR COMPLETE LIST OF SHEETS COMPRISING THIS WD
SHEET 2

ACTUAL WIRING DIAGRAM FOR MODEL 28 ELECTRICAL SERVICE UNIT
ASR - GP - OPT. IAC
LESU13

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

E-NUMBER	
PROD. NO. 3292WD	
DATE 10-10-56	
P.D. FILE NO. 27-A.65.AA	
DRAWN E.K.S.	CHKD. R.D.
ENGD. H.S.P.	APPD.

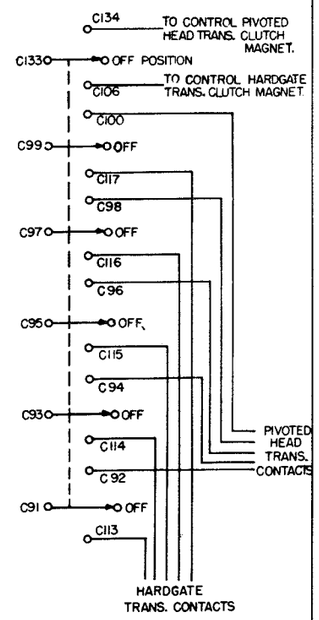
TELETYPE CORPORATION

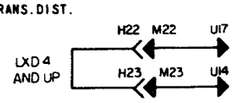
3292WD

NO.	NOTES
1.	FOR ACTUAL WIRING DIAGRAMS OF INDIVIDUAL UNITS SEE: WD NO. — UNITS DIRECTLY OPERABLE WITH LESU 3264WD — CABINETS-LAAC209,210 3292WD — ELECTRICAL SERVICE UNIT LESU13 3302WD — KEYBOARDS-LAK4 2900WD — MOTOR UNITS-LMU12 OR 14. 2864WD — PAGE TYPING UNITS-LP 3300WD — TRANSMITTER DISTRIBUTOR-LXD3 3288WD — TRANSMITTER DISTRIBUTOR-LAXD 3 & LCXD1 3251WD — TRANSMITTER DISTRIBUTOR-LBXD5 3452WD — TRANSMITTER DISTRIBUTOR BASE -LCX87
2.	LEGEND: ○ A SELECTOR MAGNET TERMINAL BLOCK (IN LESU) ○ B LINE TEST KEY TERMINAL BLOCK (IN LESU) ○ C CABINET TERMINAL BLOCK ○ D MOTOR CONTROL TERMINAL BLOCK (IN LESU) ○ E POWER TERMINAL BLOCK (IN LESU) ⋘ F KEYBOARD CONNECTOR ○ J 1 TERMINAL STRIP (ON LINE RELAY ASSEMBLY IN LESU) ⋘ J 2 LINE RELAY CONNECTOR (IN LESU) ● J 3 LINE RELAY FILTER(IN LESU) ○ K TERMINAL STRIP (ON LINE TEST KEY IN LESU) ⋘ R TYPING UNIT CONNECTOR ○ S SLOW RELEASE RELAY TERMINAL BOARD(IN LESU) ○ T TEST SWITCH TERMINAL BOARD (IN LESU) ⋘ U TRANSMITTER DISTRIBUTOR CONNECTOR ○ AG MOTOR TERMINAL BLOCK(ON LAK) ○ AH AUXILIARY SWITCH TERMINAL BLOCK (ON LAK) ⋘ Z TRANSMITTER DISTRIBUTOR CONN (LBXD).
3.	DOT DASH(---) LINES INDICATE FILTERING, SHIELDING AND SUPPRESSION NETWORKS.
4.	ALL APPARATUS IS SHOWN IN UNOPERATED OR DE-ENERGIZED POSITION.
5.	A. RESISTANCE IN OHMS (Ω) B. INDUCTANCE VALUES IN MICROHENRIES(MH) C CAPACITANCE VALUES IN MICROFARADS(MF)
6.	CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION, FOR .020 AMP. LINE CURRENT, ADD DASHED (——) CONNECTIONS AND OMIT CONNECTIONS MARKED (✱) IN LINE TEST KEY, AND LINE RELAY CIRCUITS.
7.	USE POWER & SIGNAL LINE SUPPRESSOR AND SYNC.OR GOV.-FILT. MOTOR FOR INSTALLATIONS REQUIRING MINIMUM R.F. INTERFERENCE. FOR OTHER INSTALLATIONS OMIT SUPPRESSORS AND CONNECT INPUTS AND GOV.MOTOR DIRECTLY TO TERMINALS SHOWN.
8.	USE SYNCHRONOUS MOTOR ON REGULATED 60~ (± 1%) AC POWER ONLY. GOVERNED MOTORS AND OTHER POWER CIRCUITS OPERABLE ON 50 TO 60~ UNREGULATED AC.
9.	RECTIFIER SHOWN CONTROLLED BY POWER SWITCH. FOR CONTINUOUS OPERATION, MOVE RECTIFIER LEAD L2 FROM E2 TO E1.

NO.	NOTES
10.	A. TO OPERATE MOTOR CONTROL, SET MUST BE EQUIPPED WITH EITHER 1. TIME DELAY MECH. OR 2. MOTOR STOP CONTACTS B IF TAPE POSITION IS TO BE USED IN THE ASR SET THE TIME DELAY MECHANISM MUST BE EITHER ELECTRICALLY OR MECHANICALLY DISABLED.
11.	A. LINE SHUNT RELAY SHOWN CONTROLLED BY POWER SWITCH AND SHOWN SHUNTING LINE RELAY COIL, TRANS.DIST.SIG. GENERATOR AND KEYBOARD SIG.GEN. B. IF KEYBOARD SHUNTING IS NOT DESIRED MOVE STRAP FROM C10 TO C9. C. FOR DIRECT CONTROL OF LINE SHUNT RELAY FROM POWER SWITCH, ADD DASHED (——— CONNECTIONS AND OMIT CONN. MARKED (✱) AT CABINET TERMINALS C34, C35. C37. CUSTOMER MAY THEN SELECT PORTION OF SIG.LINE CKT. TO BE SHUNTED BY CONNECTING TERM. C13 TO EITHER C9, C10, C11, C15.
12.	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.
13.	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.
14.	WHEN PAPER FEED OUT SWITCH IS NOT USED DISCONNECT MOTOR LEAD FROM AG3 AND CONNECT TO AG1.
15.	WHEN SIGNAL LINE BREAK SWITCH IS NOT USED IN KEYBOARD ADD DASHED (----) CONNECTION AT CABINET TERMINAL BLOCK BETWEEN C10 AND C11.
16.	IN ALL TRANS.DIST.U14 MUST BE CONNECTED TO U17 EXCEPT FOR LXD4 AND UP. (SEE NOTE 25)
17.	IN ALL KEYBOARDS F4 MUST BE CONNECTED TO F7. IN ALL TYPING UNITS R14 MUST BE CONNECTED TO R17.
18	SPARE LEADS FROM U18 AND F18 ARE RESERVED FOR POLAR OPERATION OF SIGNAL GENERATOR.
19.	CIRCUIT SHOWN FOR 115V DC POWER INPUT TO TRANS.DIST.CLUTCH MAGNETS. FOR 48V DC POWER INPUT MOVE WIRE CONNECTIONS AS FOLLOWS: UNIT — WIRE INVOLVED — MOVE CONN. FROM — TO LAXD — C81 TO V6 — V6 — V5 LCXD — C142 TO V3 — V3 — V2 LBXD — A13 TO V6 — V6 — V5 A6 TO V3 — V3 — V2 POWER SUPPLY MUST DELIVER 300MA @ 48V DC OR 200MA @ 115V DC.
20.	USE APPROPRIATELY LABELED LXD, LAXD, LBXD OR LCXD CIRCUITRY AND MAKE CONN. AS SHOWN.
21.	CUSTOMER MUST SUPPLY EXTERNAL SWITCHING AS FOLLOWS: LXD - NONE LAXD - BETWEEN C133 AND C134 TO CONTROL TRANS.CLUTCH MAGNET LBXD - NONE (CONTINUED)

NO.	NOTES
21.	CONTINUED LCXD AS PER DIAGRAM BELOW LEVER KEY SWITCH 6 NORMAL OPEN CONTACTS ON EACH SIDE





NO.	NOTES
22.	WHEN A SEPARATE TIGHT SWITCH IS USED IN LBXD THIS SWITCH BECOMES A MANUAL ON-OFF SWITCH ONLY.
23.	WHEN LXD5 IS USED, REMOVE THE STRAP BETWEEN TERMINALS C135-C136. ADD TWO 176162 STRAPS, ONE BETWEEN TERMINALS C23-C135 AND ONE BETWEEN C24-C136.
24.	TO CONTROL PIVOTED READER FROM ITS TAPE-OUT CONTACTS, REMOVE THE STRAP FROM TERMINALS 137 TO 141 AND PROVIDE SUITCIRCUITRY. THE TAPE OUT C NTACTS MAY NOT BE USED DIRECTLY SINCE THEY OPEN MOMENTARILY.
25.	U14 IS CONNECTED TO U17 THROUGH THE TRANS.DIST.
26.	CUSTOMER MUST SUPPLY THIS SWITCH WHEN EXTERNAL SWITCHING IS NOT USED.
27.	CUSTOMER MUST SUPPLY THESE STRAPS WHEN EXTERNAL SWITCHING IS NOT USED.
28.	WHEN THE LXD11 IS USED DO NOT INSTALL STRAPS BETWEEN TERMINAL C141 AND C142, OR C131 AND C132. THE INTERNAL CLUTCH MAGNET INPUT SHOULD BE CONNECTED TO TERMINALS C132 AND C141. RESISTANCE PER COIL 210 OHMS.

3294WD

REVISIONS

ISSUE	DATE	AUTH. NO.
Q	3-30-60	28-12924
R	4-21-60	28-12936
S18	10-12-60	28-14077
T19	4-15-61	68761-33
U20	4-26-61	69589
21	3-28-62	69768-33
22	11-26-63	78875
23	2-11-64	79910
24	8-28-64	82637

SHEET 1 OF 6

SCHEMATIC WIRING DIAGRAM FOR MODEL 28 ASR SPCIAL 1 AC WITH FACILITIES PROVIDED BY ELECT SERVICE UNIT LESU13 AND ASSOCIATED UNITS

APPROVALS	
D AND R	E OF M

E-NUMBER

PROD. NO. 3294WD

DATE 11-17-59

P.D. FILE NO. 27 A5544

DRAWN A C — CHK'D.

ENG'D. — APP'D.

TELETYPE CORPORATION

3294WD

24

SEE SHEET 1 FOR NOTES

3294WD

REVISIONS

ISSUE	DATE	AUTH. NO.
Q	3-30-60	28-12929
R	5-21-60	28-12936
S18	10-12-60	28-14077
T19		56781-33
U20		
21	3-28-62	69768-10
22	11-26-63	78875
23	2-11-64	79910
24	6-26-64	82537

LCXD LINE SHUNT CIRCUIT NOTE 20

LCXD TRANS.DIST.CIRCUIT NOTE 20

LCXD SIGNAL GENERATING CIRCUIT NOTE 20

NOTE: REMOVE STRAPS C81-C82, C82-C142, C37-C34, C133-C134

NOTE: REMOVE THESE STRAPS WHEN INSTALLING EXTERNAL SWITCHING C99-C100, C97-C96, C95-C96, C93-C94, C91-C92

SHEET 2 OF 6

SCHEMATIC WIRING DIAGRAM FOR MODEL 28 ASR-GP-OPT 1 AC WITH FACILITIES PROVIDED BY ELECT. SERVICE UNIT LESU13 AND ASSOCIATED UNITS

APPROVALS

D AND R	E OF M
11-9-X	

E-NUMBER

PROD. NO. 3294WD

DATE 11-17-59

P.D. FILE NO. 27-A65AA

DRAWN A.C.	CHKD.
ENGD.	APPD.

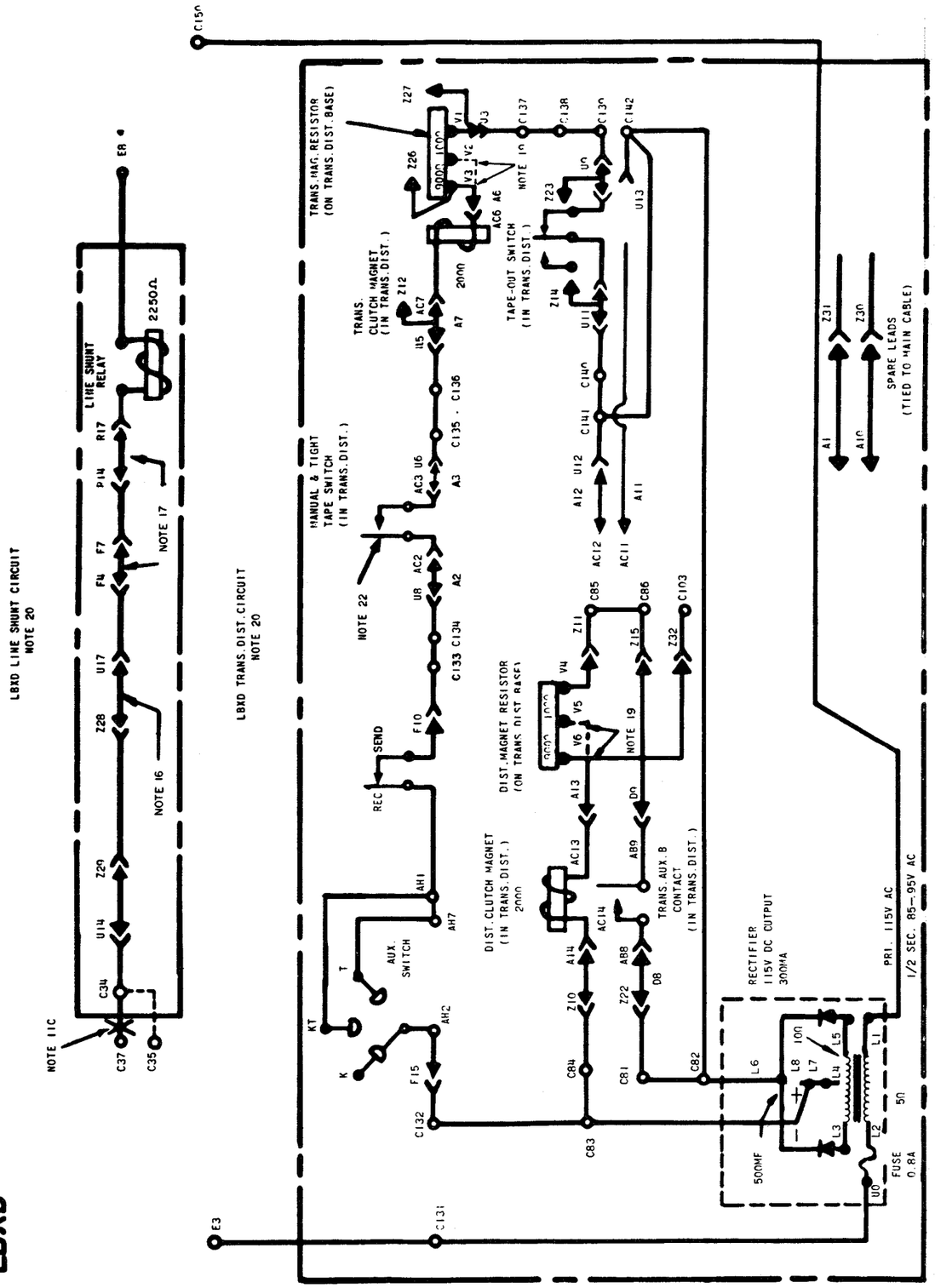
TELETYPE CORPORATION

3294WD

LCXD

24

SEE SHEET 1 FOR NOTES.



LBXD

3294WD

REVISIONS

ISSUE	DATE	AUTH NO

SHEET 1 OF 6

SCHEMATIC WIRING DIAGRAM FOR MODEL 28 ASR OPTION AC WITH FACILITIES PROVIDED BY ELECT SERVICE UNIT LESU13 AND ASSOCIATED UNITS

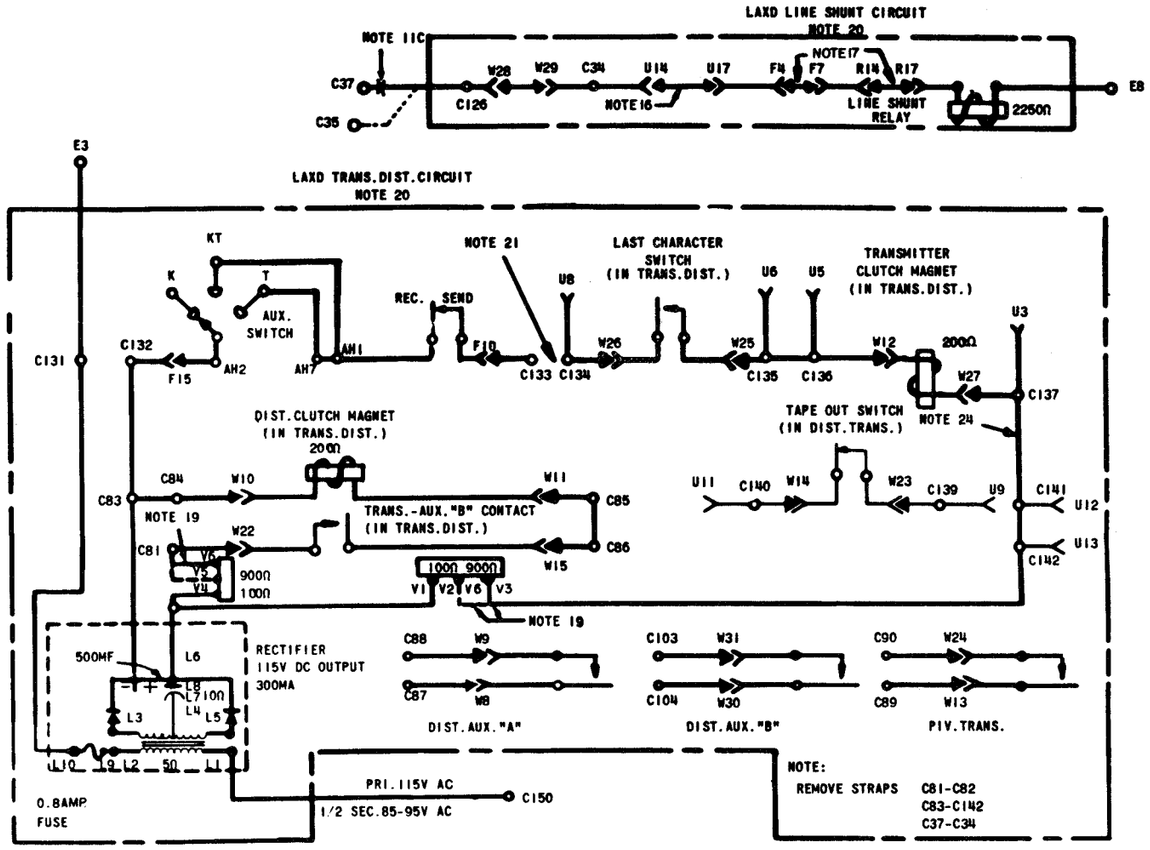
APPROVALS	
D AND R	E OF M

E-NUMBER	
PROD. NO.	3294WD
DATE	11 17 59
P.D. FILE NO.	27-A65AA
DRAWN A C	CHKD.
ENGD.	APPD.

TELETYPE CORPORATION

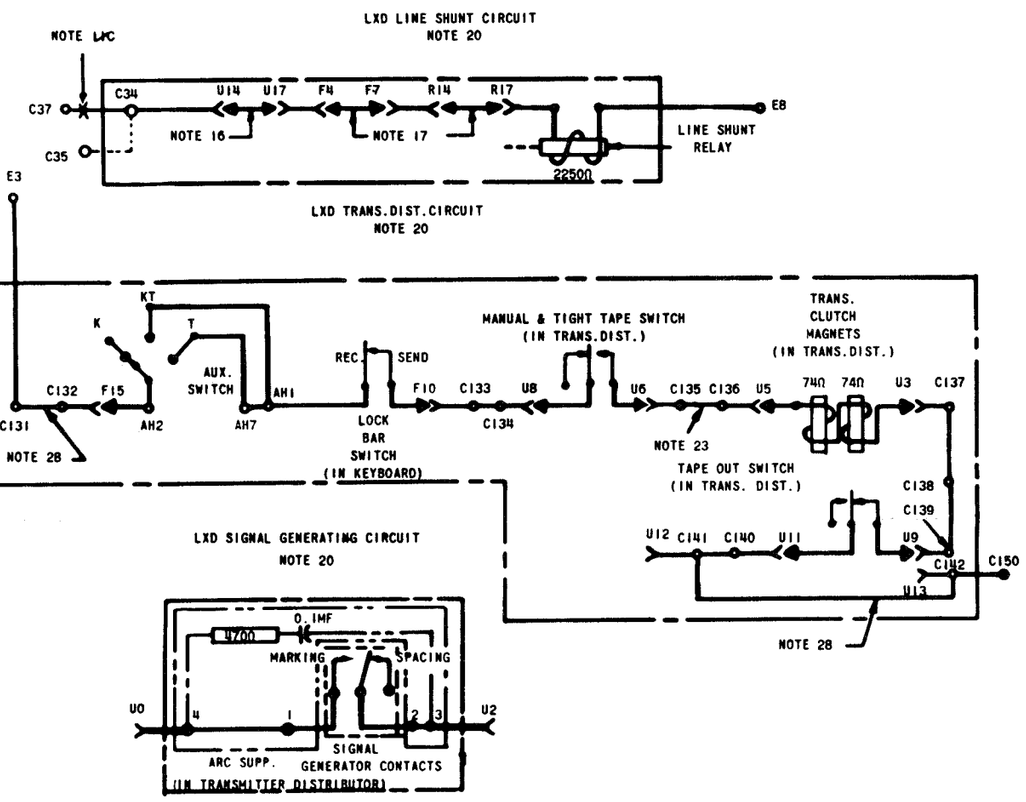
3294WD

LAXD



SEE SHEET 1 FOR NOTES

LXD



REVISIONS		
ISSUE	DATE	AUTH. NO.
0	3-30-60	28-12924
R	4-21-60	28-12936
518	10-12-60	28-14077
719	4-5-61	6876L-33
M20		
21	3-28-62	69768-10
22	11-26-63	78875
23	2-11-64	79910
24	8-28-64	82637

3294WD

SCHEMATIC WIRING DIAGRAM FOR MODEL 28 ASR-GP-OPT I AC WITH FACILITIES PROVIDED BY ELECT. SERVICE UNIT LESU13 AND ASSOCIATED UNITS

SHEET 4 OF 6

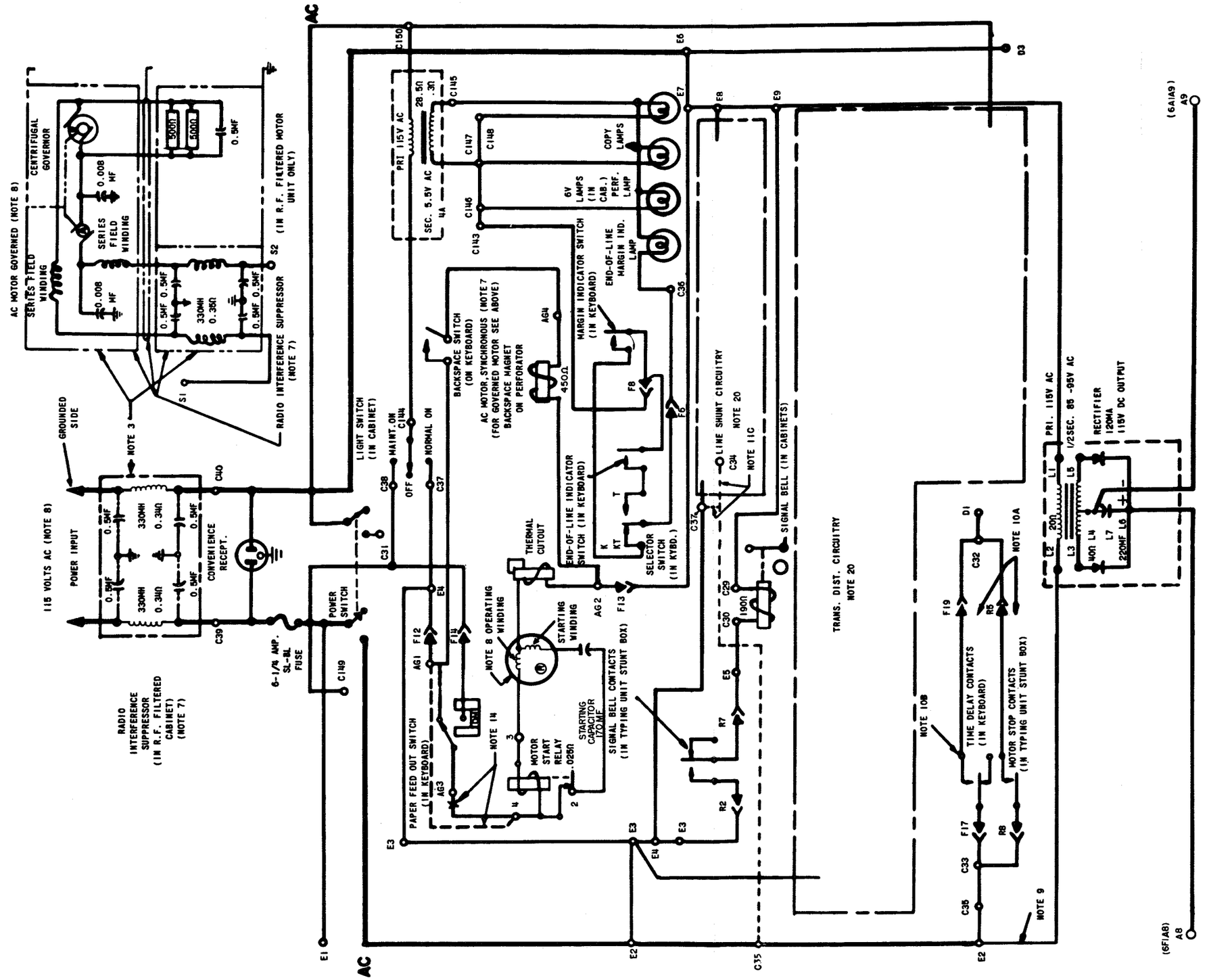
APPROVALS	
D AND R	E OF M
E-NUMBER	
PROD. NO. 3294WD	
DATE 11-17-59	
P.D. FILE NO. 27-48541	
DRAWN A.C.	CHKD.
ENGR.	APPD.

TELETYPE CORPORATION

3294WD

24

SEE SHEET 1 FOR NOTES



3294WD		
REVISIONS		
ISSUE	DATE	AUTH. NO.
0	3-30-60	28-12924
R	4-21-60	28-12936
S18	10-12-60	28-14077
T19	4- -61	68761-33
M20		
21	3-28-62	69768-10
22	11-26-63	78875
23	2-11-64	79910
24	8-28-64	82637

SHEET 5 OF 6

SCHEMATIC WIRING DIAGRAM FOR MODEL 28 ASR-GP-OPT I AC WITH FACILITIES PROVIDED BY ELECT. SERVICE UNIT LESU13 AND ASSOCIATED UNITS

APPROVALS	
D AND R	E OF M
HJK	CT

E-NUMBER	
PROD. NO. 3294WD	
DATE 11-17-59	
P.D. FILE NO. 27-A65AA	
DRAWN A.C.	CHKD.
ENGD.	APPD.

TELETYPE CORPORATION

3294WD

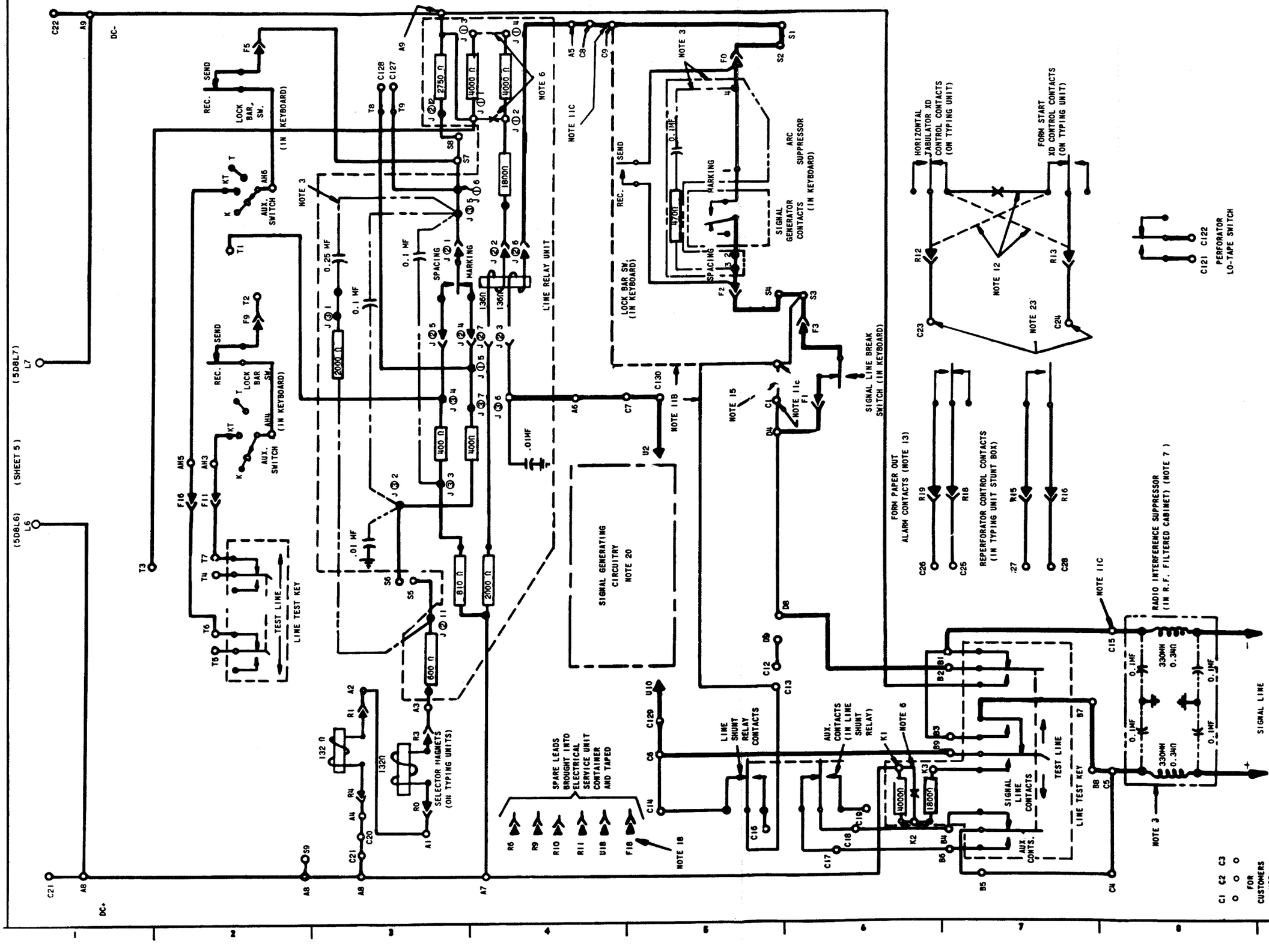
24

SEE SHEET 1 FOR NOTES

3294WD

REVISIONS

ISSUE	DATE	AUTH. NO.
Q	3-30-60	28-12924
R	4-21-60	28-12936
S18	10-12-60	28-14077
T19	4- -61	68761-33
W20		
21	3-28-62	69768-10
22	11-26-63	78875
23	2-11-64	79910
24	8-28-64	82637



SHEET 6 OF 16

SCHEMATIC WIRING DIAGRAM FOR MODEL 28 ASR-GP-OPT I AC WITH FACILITIES PROVIDED BY ELECT. SERVICE UNIT LESU13 AND ASSOCIATED UNITS

APPROVALS	
D AND R	E OF M
RPK	

E-NUMBER

PROD. NO. 3294WD

DATE 11-17-59

W.D. FILE NO. 27-A65AA

DRAWN A.C.	CHKD.
ENGD.	APPD.

TELETYPE CORPORATION

3294WD

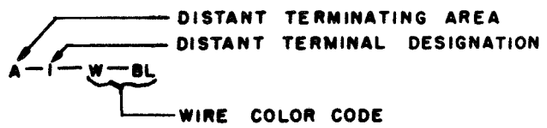
24

3300WD

ISSUE	DATE	AUTH NO
A	8-22-57	TP-2263
B	3-25-58	28-8767
C	6-25-58	28-9401
D	1-6-59	28-10308
E	2-25-59	28-10771
F	7-29-60	28-13548
G	10-17-63	78376

NOTES

1. WIRING LEGEND:



2. COLOR CODE:

BK — BLACK	W — BK — WHITE — BLACK
BR — BROWN	W — BR — WHITE — BROWN
R — RED	W — R — WHITE — RED
O — ORANGE	W — O — WHITE — ORANGE
Y — YELLOW	W — Y — WHITE — YELLOW
G — GREEN	W — G — WHITE — GREEN
BL — BLUE	W — BL — WHITE — BLUE
P — PURPLE	W — P — WHITE — PURPLE
W — WHITE	W — S — WHITE — SLATE
S — SLATE	

4. CONNECTOR VIEWED FROM SOLDER TERMINAL ENDS.

5. ALL CONTACTS SHOWN IN UNOPERATED POSITION.

6. SPARE TERMINAL OF U-18 RESERVED FOR POLAR OPERATION OF TRANSMITTER DISTRIBUTOR SIGNAL GENERATOR.

7. DISCONNECT ONE TERMINAL WHEN TESTING SIGNAL GENERATOR.

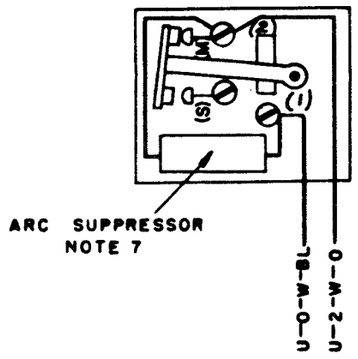
8. *THE NUMBERS ENCASED BY PARENTHESES ARE USED FOR REFERENCE AND ARE NOT NECESSARILY SHOWN ON THE PARTS.*

9. A. 115 V ±10% AC POWER TO BE USED ON CLUTCH TRIP MAGNET ASSEMBLY CIRCUIT. (256M COIL ASSEMBLIES, 74Ω EACH) FOR DC OPERATION ADD SUFFICIENT EXTERNAL RESISTANCE TO LIMIT CURRENT TO 100 M.A.

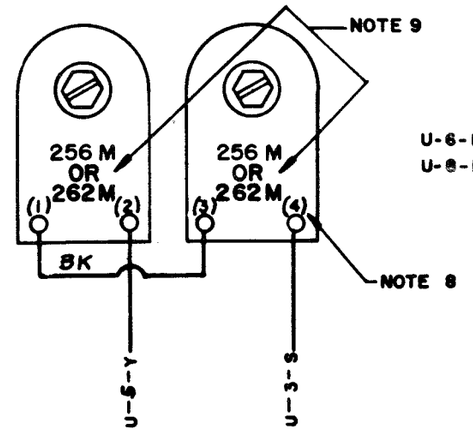
B. LXD27 EQUIPPED WITH 262M COIL ASSEMBLIES (RESISTANCE, 210Ω EACH) THE OPERATING CURRENT MUST BE 50 MA, 115VDC WIRED AS SHOWN. FOR AC OPERATION CONNECT IN PARALLEL.

10. GROUND STRAP 117366 OF LCXB SHOULD BE SECURED TO RIGHT REAR MTG. STUD OF LAAC RAIL (SEE SPEC. 59415).

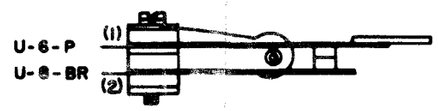
A
TRANSMITTER DISTRIBUTOR SIGNAL GENERATOR



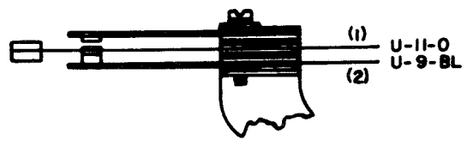
B
TRANSMITTER DISTRIBUTOR CLUTCH MAGNETS

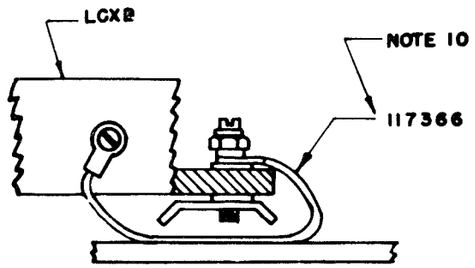


C
CONTROL LEVER CONTACT ASSEMBLY

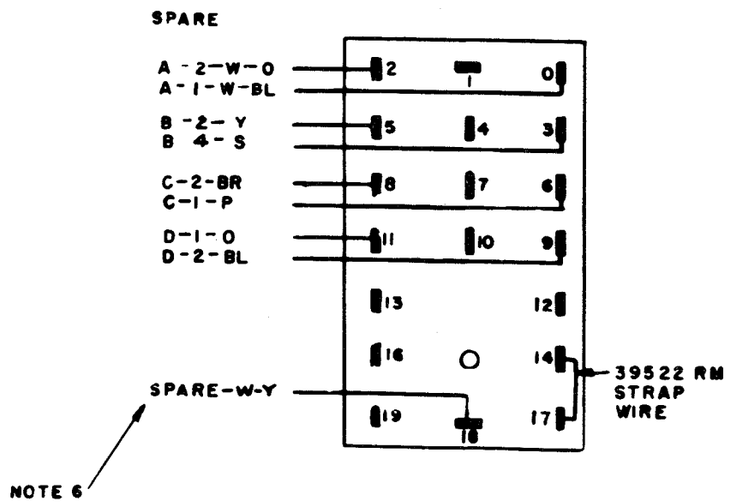


D
TAPE — OUT CONTACT ASSEMBLY (TAPE IN UNIT)





U
TRANSMITTER DISTRIBUTOR CONNECTOR MALE



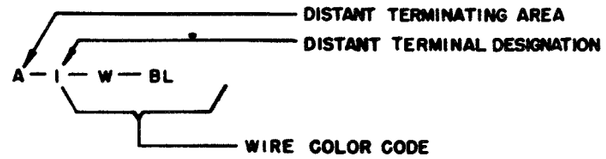
ACTUAL WIRING DIAGRAM MODEL 28 TRANSMITTER DISTRIBUTOR LXD 3,27 ASR-GP

LESU 13, 14, 15, 16, 28, 111

APPROVALS	
D AND R	E OF M
E-NUMBER	
PROD. NO.	
DATE 5-13-57	
PD. FILE NO 2-58.65AA	
DRAWN J.M.K.	CHKD R.O.
ENGD K.S.	APPD

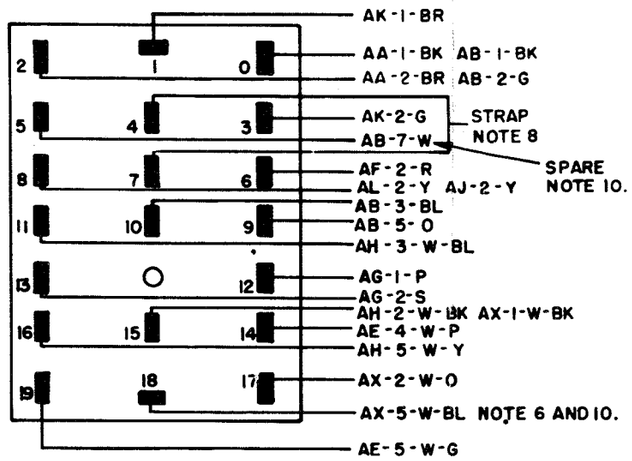
TELETYPE CORPORATION

3300WD

NO	NOTES
1.	WIRING LEGEND 
2.	COLOR CODES. BK — BLACK BR — BROWN R — RED O — ORANGE Y — YELLOW G — GREEN BL — BLUE P — PURPLE W — WHITE S — SLATE W-BK — WHITE - BLACK W-BR — WHITE - BROWN W-R — WHITE - RED W-O — WHITE - ORANGE W-Y — WHITE - YELLOW W-G — WHITE - GREEN W-BL — WHITE - BLUE W-P — WHITE - PURPLE W-S — WHITE - SLATE
3.	UNIT WIRED FOR 115 VOLTS AC OR DC POWER INPUT.
4.	PLUGS VIEWED FROM SOLDER TERMINAL ENDS.
5.	ALL CONTACTS SHOWN IN UNOPERATED POSITION IN KEYBOARD.
6.	SPARE TERMINAL OF F-18 RESERVED FOR POLAR OPERATION OF KEYBOARD SIGNAL GENERATOR AND AL LAMP ON LAK 44.
7.	ASSOCIATED CABLES 158224 CABLE ASSEMBLY, AUXILIARY 158249 CABLE ASSEMBLY, KEYBOARD 155992 CABLE ASSEMBLY, BACK SPACE 159343 CABLE ASSEMBLY, BACK SPACE MAGNET 304613 CABLE ASSEMBLY, LAMP AND SWITCHES (LAK 44)
8.	BARE WIRE STRAP 39522 RM
9.	PART OF ASSOCIATED UNIT (LPE, LPR, LRPE OR LTPE)
10.	ON LAK 44 ONLY. REMOVE WHITE LEAD FROM F5 AND CUT OFF NEAR TUBING OF CABLE 158249.

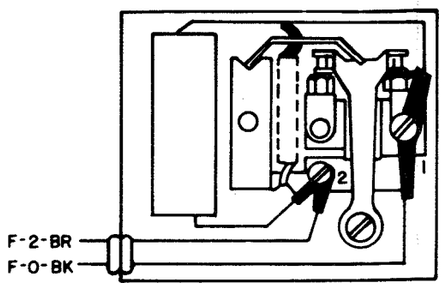
F

KEYBOARD CONNECTOR MALE



AA

KEYBOARD SIGNAL GENERATOR



CONTACT BOX ASSEMBLY WITH ARC SUPPRESSION NETWORK ACCESSORY.

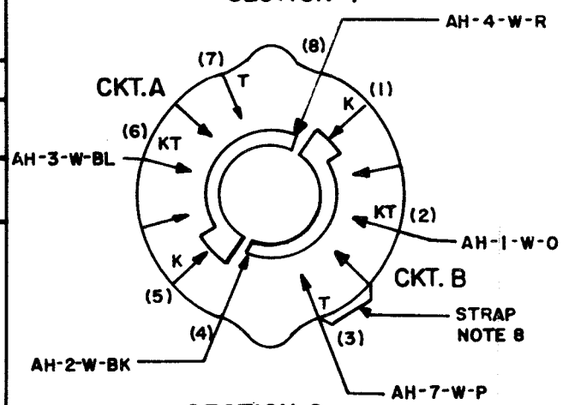
AB

LOCK BAR SWITCH

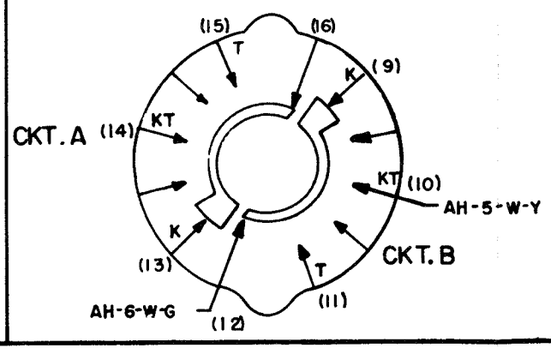
AC

AUXILIARY SWITCH

SECTION 1

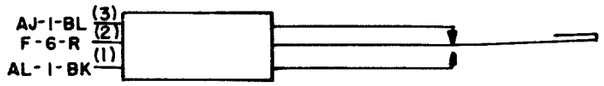


SECTION 2



AF

END-OF-LINE MARGIN INDICATOR SELECTOR SWITCH



3302 WD		
ISSUE	DATE	AUTH NO
5	3-24-59	28-10903
6	4-27-59	28-10983
7	7-10-59	28-11487
8	8-4-59	28-11508
9	3-30-60	28-12924
10	8-24-60	28-13780
11	12-30-60	28-14465
12	8-7-62	74054
13	3-9-64	80416
14	4-3-64	80416-1
15	5-14-64	81758
16	4-14-65	87065
17	9-21-65	89204

ACTUAL WIRING DIAGRAM
MODEL 28
KEYBOARD BASE
LAK 4, 25, 44.
ASR-GP-OPT I
ASR-GP-OPT II
LESU 13, 15, 16, 25, 28, 36, 112.

APPROVALS	
D AND R	E OF M

E-NUMBER
PROD. NO. 3302 WD

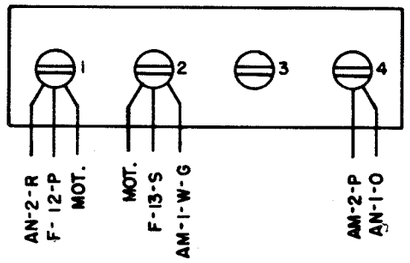
DATE 10-23-56
P.D. FILE NO 27A.65AA
DRAWN R.T.S. | CHKD
ENGD O.P.L. | APPD

TELETYPE CORPORATION

3302 WD

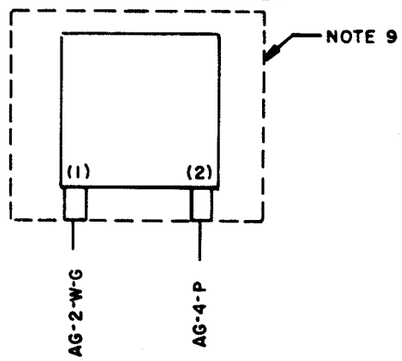
AG

MOTOR TERMINAL BLOCK



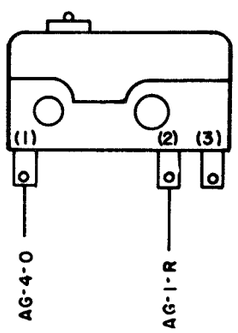
AM

BACK — SPACE MAGNET



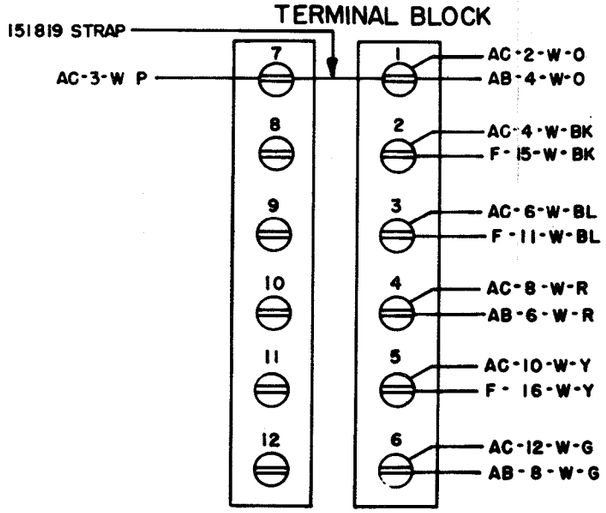
AN

BACK-SPACE SWITCH



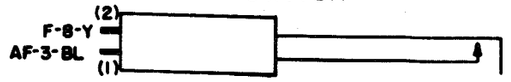
AH

KEYBOARD TERMINAL BLOCK



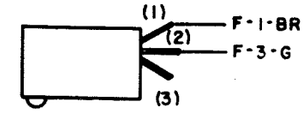
AJ

END-OF-LINE INDICATOR SWITCH



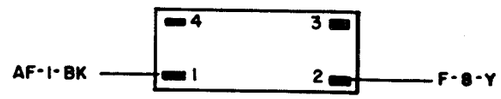
AK

SIGNAL LINE BREAK KEY SWITCH



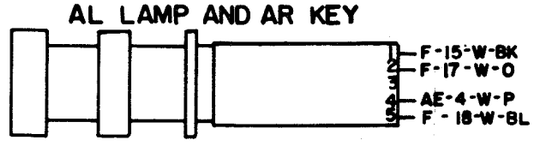
AL

MARGIN INDICATOR SWITCH



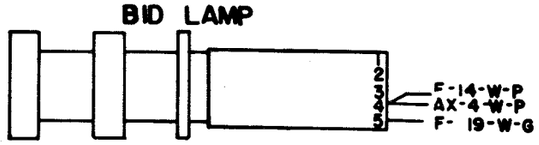
AX

AL LAMP AND AR KEY



AE

BID LAMP



LAK 44 ONLY

3302 WD

ISSUE	DATE	AUTH NO

SHEET 2 OF 2

ACTUAL
WIRING DIAGRAM
MODEL 28
KEYBOARD BASE
LAK 4, 25, 44,
ASR-GP-OPT I
ASR-GP-OPT II
LESU 13, 15, 16, 25, 28, 36, 112.

APPROVALS	
D AND R	E OF M

E-NUMBER
PROD. NO. 3302 WD

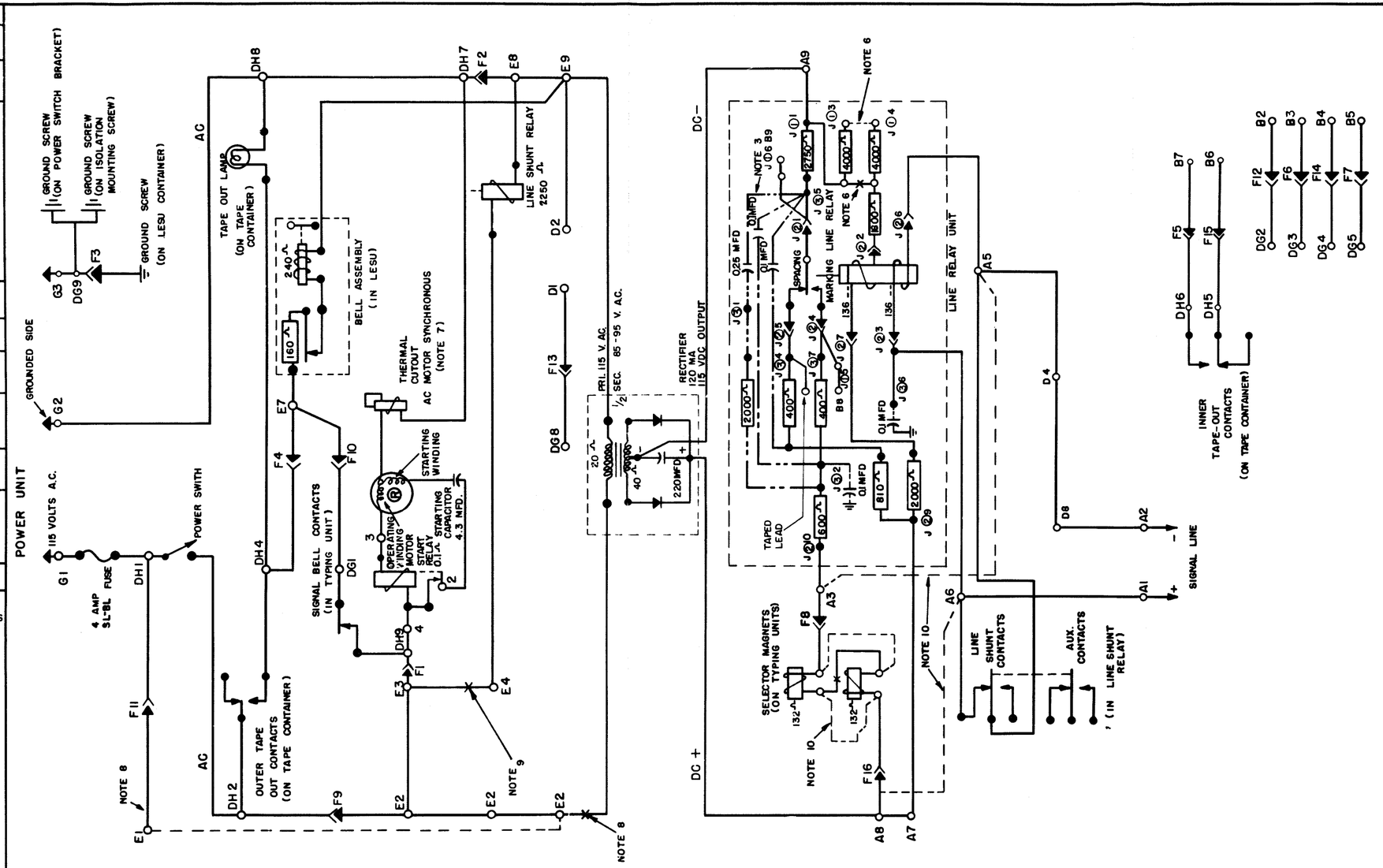
DATE. 10-23-56
P.D. FILE NO. 27A.65AA
DRAWN. R.T.S. | CHKD
ENGD O.P.L. | APPD

TELETYPE CORPORATION

3302 WD

ET-131491

NO.	NOTES
1.	FOR ACTUAL WIRING DIAGRAMS OF INDIVIDUAL UNITS SEE WD NUMBER | UNITS DIRECTLY OPERABLE WITH LESU 12 3344 WD | ELECTRICAL SERVICE UNIT LESU 12 2900 WD | MOTOR UNITS - LMU 3,4,6. 3319 WD | TYPING REPERFORATOR BASE LRB 3,11
2.	LEGEND O G 3-POINT CONNECTOR (ON BASE) O DG TERMINAL BLOCK (ON BASE) O DH TERMINAL BLOCK (ON BASE) ◁ F 16-POINT CONNECTOR O A TERMINAL BLOCK (IN LESU) O B TERMINAL BLOCK (IN LESU) O D TERMINAL BLOCK (IN LESU) O E TERMINAL BLOCK (IN LESU) O J (1) TERMINAL STRIP ON LINE RELAY (IN LESU) ◁ J (2) LINE RELAY CONNECTOR (IN LESU) O J (3) LINE RELAY FILTER (IN LESU)
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 - (~) (B) INDUCTANCE VALUES IN MICROHENRIES (MH) (C) CAPACITANCE VALUES IN MICROFARADS (MFD)
6.	CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION. FOR .020 AMP LINE CURRENT, ADD DASH LINE (- - - -) CONNECTION AND OMIT CONNECTION MARKED (-✕-) IN LINE RELAY.
7.	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.
8.	RECTIFIER SHOWN CONTROLLED BY POWER SWITCH A. FOR CONTINOUS OPERATION MOVE PRIMARY (INPUT) LEAD FROM TERMINAL E2 TO TERMINAL E1.
9.	LINE SHUNT RELAY SHOWN CONTROLLED BY POWER SWITCH AND SHUNTING LINE RELAY COIL.
10.	FOR SPECIAL APPLICATIONS WHEN LESU 12 IS USED WITH LRB 20, THE FOLLOWING NOTE APPLIES; SELECTOR MAGNETS CAN BE OPERATED DIRECTLY IN A NEUTRAL SIGNAL LINE AS FOLLOWS: REMOVE LINE RELAY FOR 20 MILLIAMPERE, 60 AND 75 WPM OPERATION (OR ANY INTERMEDIATE SPEED.) 1. STRAP A5 TO A3 2. MOVE BLUE LEAD FROM TERMINAL A8 TO A6. FOR 60 MILLIAMPERE, 60, 75 & 100 WPM OPERATION (OR ANY INTERMEDIATE SPEED.) 1 AND 2 SAME AS ABOVE 3. ADD DASHED (- - -) LEAD, OMIT ✕ LEAD ON SELECTOR MAGNETS (REFER TO 3342 WD)



3343 WD		
REVISIONS		
ISSUE	DATE	AUTH. NO.
H	4-21-60	28-13089-1
J	11-8-60	28-13473
K	3-24-61	68761-19
L	12-7-61	71660
M	3-28-63	69766-10
P	11-26-63	78675

FOR CUSTOMERS USE

SCHEMATIC WIRING DIAGRAM MODEL 28
REPERFORATOR BASE LRB 3,11
ELECT SERVICE UNIT LESU 12

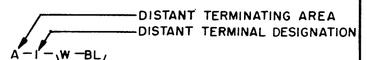
APPROVALS	
D AND R	E OF M
E-NUMBER	104027
PROD. NO.	3343 WD
DATE	6-27-57
P.D. FILE NO.	1-49.65AA
DRAWN E.R.	CHKD G.L.S.
ENGD H.S.P.	APPD

TELETYPE CORPORATION

3343 WD

NOTES

1. WIRING LEGEND:



2. COLOR CODE

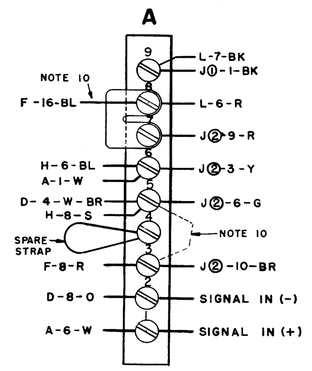
BK - BLACK	W-BK - WHITE - BLACK
BR - BROWN	W-BR - WHITE - BROWN
R - RED	W-R - WHITE - RED
O - ORANGE	W-O - WHITE - ORANGE
Y - YELLOW	W-Y - WHITE - YELLOW
G - GREEN	W-G - WHITE - GREEN
BL - BLUE	W-BL - WHITE - BLUE
P - PURPLE	
W - WHITE	W-S - WHITE - SLATE
S - SLATE	

3. UNIT WIRED FOR 115 VOLTS 50 TO 60 CYCLE A.C. POWER INPUT ONLY.
4. CONNECTOR VIEWED FROM SOLDER TERMINAL END.
5. CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION. FOR .020 AMP OPERATION REMOVE AND ADD CONNECTIONS AS TABULATED BELOW.

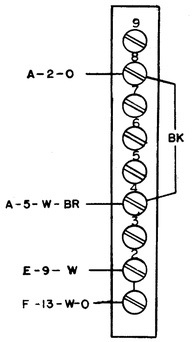
SIGNAL LINE CURRENT	CONNECTION REMOVED	CONNECTION ADDED
.020 AMP.	J①1 - J①2,	J①3 - J①4

6. RECTIFIER SHOWN CONTROLLED BY POWER SWITCH. FOR CONTINUOUS OPERATION REMOVE LEAD L-2-BK FROM TERMINAL E-2 AND CONNECT TO TERMINAL E-1.
7. LINE SHUNT RELAY SHOWN CONTROLLED BY POWER SWITCH AND SHUNTING LINE RELAY COIL.
8. SELECTOR MAGNETS ARE TO BE WIRED AS SHOWN FOR 30 MILLIAMPERE OPERATION WHEN THE LINE RELAY IS USED.
9. ASSOC. CABLE NUMBERS
   - 159939 CABLE ASSEM., LESU 12
   - 153477 CABLE ASSEM., RECTIFIER
   - 164030 CABLE ASSEM., LINE RELAY MTG. ASSEM.
10. SELECTOR MAGNETS CAN BE CONNECTED DIRECTLY IN THE SIGNAL LINE CIRCUIT FOR NEUTRAL OPERATION AS FOLLOWS:
    - REMOVE LINE RELAY
    - 20 MILLIAMPERE, 60 & 75 WPM OPERATION (OR ANY INTERMEDIATE SPEED)
      - A STRAP AS TO A3.
      - B MOVE BLUE LEAD FROM TERMINAL A8 TO TERMINAL A6
    - 60 MILLIAMPERE, 60, 75 & 100 WPM OPERATION (OR ANY INTERMEDIATE SPEED)
      - A & B SAME AS ABOVE
      - C CHANGE WIRING ON SELECTOR MAGNETS FOR 60 MILLIAMPERE OPERATION.

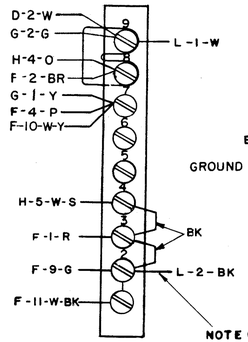
SELECTOR MAGNET TERMINAL BLOCK



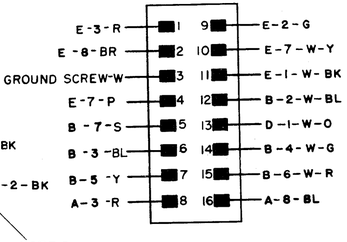
MOTOR CONTROL TERMINAL BLOCK



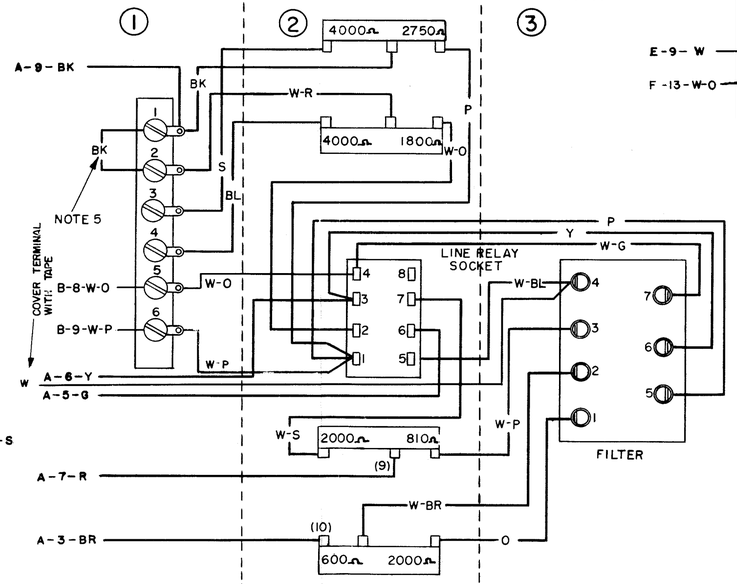
POWER TERMINAL BLOCK



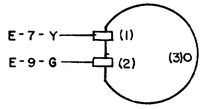
F CONNECTOR PLUG 159541



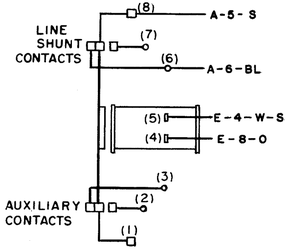
J 152623 LINE RELAY MOUNTING ASSEMBLY



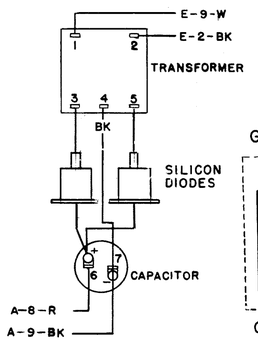
G SIGNAL BELL



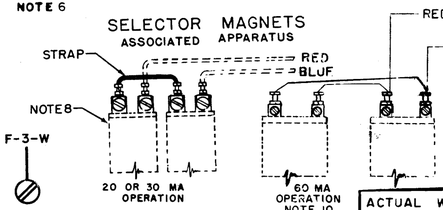
H LINE SHUNT RELAY



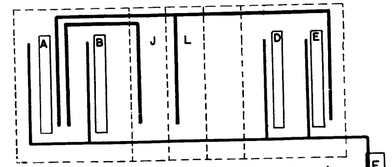
L 152950 RECTIFIER ASSEMBLY



SELECTOR MAGNETS ASSOCIATED APPARATUS



ELECTRICAL SERVICE UNIT GROUND SCREW



CABLE ROUTING (BOTTOM VIEW)

3344 WD

REVISIONS

ISSUE	DATE	AUTH. NO.
A	7-2-58	28-9413
B	8-14-58	28-9413-1
C	9-2-58	28-9413-2
D	10-13-58	28-9413-3
E	12-31-58	28-10443
F	10-8-59	28-11755
G	4-13-60	28-13089
H	11-2-60	28-13873-2
J	3-24-61	68761-1.0
K	12-7-61	71860

ACTUAL WIRING DIAGRAM, MODEL 28 ELECTRICAL SERVICE UNIT, LESU 12

APPROVALS

D AND R	E OF M

E-NUMBER 104207
PROD. NO. 3344 WD
DATE: 7-12-57
P.D. FILE NO. 1-49.65 AA
DRAWN A.D. CHK'D. P.A.
ENG'D H.S.P. APP'D.

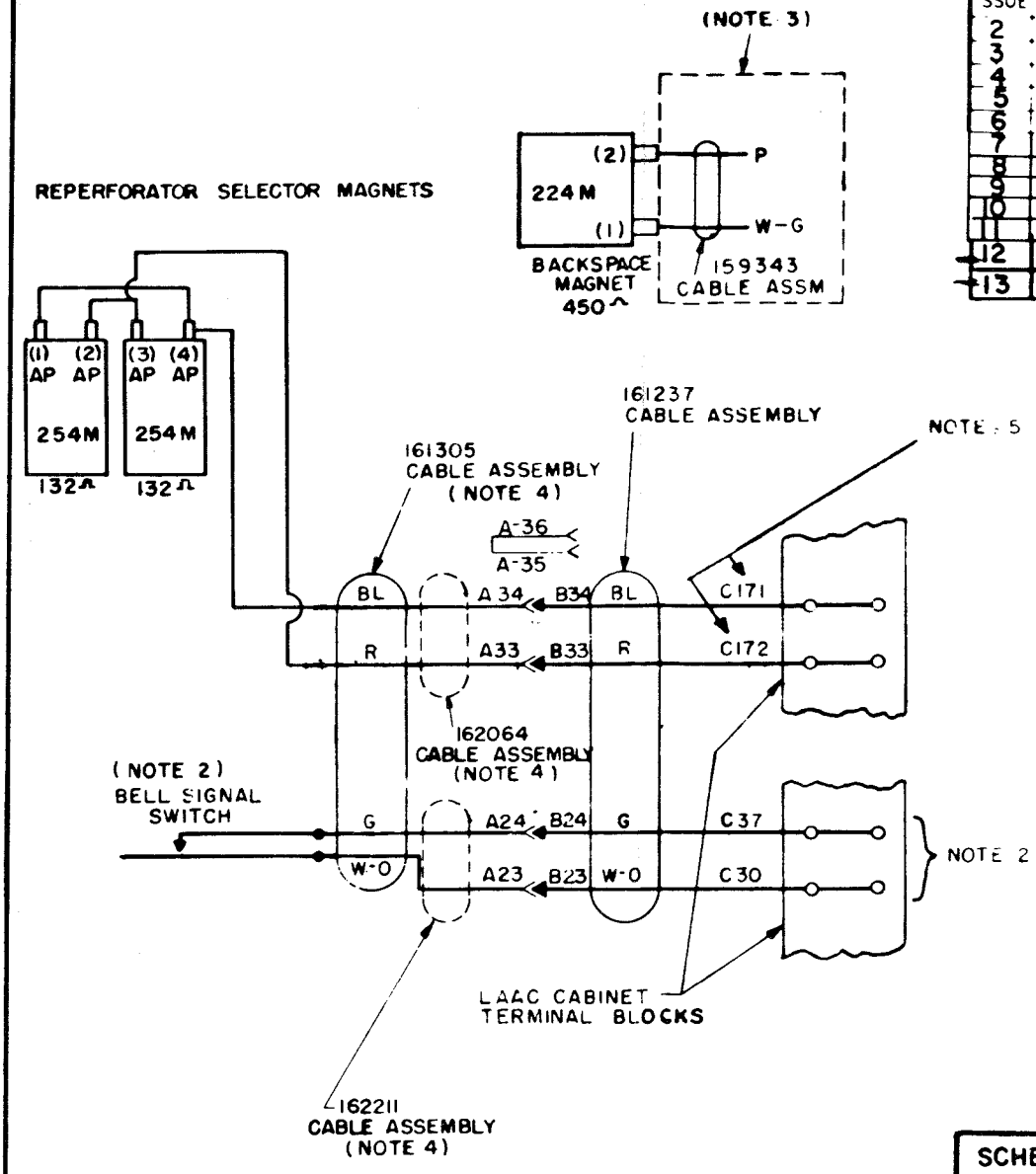
TELETYPE CORPORATION

3344 WD

3567 WD

REVISIONS

ISSUE	DATE	AUTH NO
2	3-6-59	28-10836
3	4-27-59	28-10983
4	5-20-59	28-11062-1
5	1-13-60	28-12424
6	2-10-60	28-12625
7	4-6-60	28-13061
8	5-5-60	28-12266-1
9	4-6-61	69279
10	11-16-62	75121
11	12-20-62	75405
12	3-12-63	76325
13	9-8-66	91153



NOTES:

REPERFORATOR SELECTOR MAGNETS SHOWN FOR .060 AMP OPERATION. FOR .020 AMP OPERATION REMOVE AND ADD CONNECTIONS AS TABULATED BELOW

	CONNECTION REMOVED	CONNECTION ADDED
.020 AMPS.	A33- AP3	A33- AP2
	AP2- AP3	API- AP3
	API- AP4	

2. BELL SIGNAL SWITCH NOT USED ON LRPE6. TIE BACK W-O AND G WIRES ALONG CABLE 161237 WHEN USED WITH LRPE 6

3. PART OF LAK 4. & LAK 18

4. LPR 51 & 56 USE 162064 & 162211 CABLE ASSEMBLIES. LRPE 6 USES 162064 CABLE ASSEMBLY LPR 77 USES 162064 CABLE ASSEMBLY.

5 WHEN THESE TERMINALS ARE NOT AVAILABLE, THE 159396 MODIFICATION KIT TO ADD TERMINALS C-151 TO C-180, MAY BE ORDERED.

SCHEMATIC WIRING DIAGRAM-LPR 10,33 56,51,77 AND LRPE 6

APPROVALS

D AND R	F OF M

E NUMBER

PROD NO 3567

DATE 8-7-58

PD FILE NO 1-76.65AA

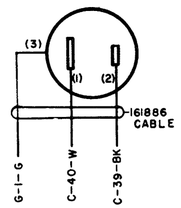
DRAWN JNC	CHKD
ENGD GW	APPD

TELETYPE CORPORATION

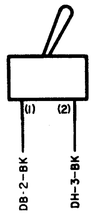
3567 WD

NO.	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION WIRE COLOR CODE AB—2—W
2.	COLOR CODE: BK—BLACK W—BK WHITE—BLACK BR—BROWN W—BR WHITE—BROWN R—RED W—R WHITE—RED O—ORANGE W—O WHITE—ORANGE Y—YELLOW W—Y WHITE—YELLOW G—GREEN W—G WHITE—GREEN BL—BLUE W—BL WHITE—BLUE S—SLATE W—S WHITE—SLATE P—PURPLE W—P WHITE—PURPLE W—WHITE
3.	ASSOCIATED CABLE ASSEMBLIES 161886, 161887 & 161888.
4.	ALL CONNECTORS VIEWED FORM SOLDER END.
5.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESIS ARE NOT MARKED ON COMPONENTS.
6.	FOR SCHEMATIC WIRING DIAGRAM SEE 3591 WD.

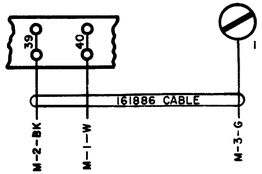
M
CONNECTOR (RECEPTACLE)
161818



DF
POWER SWITCH ASSEMBLY

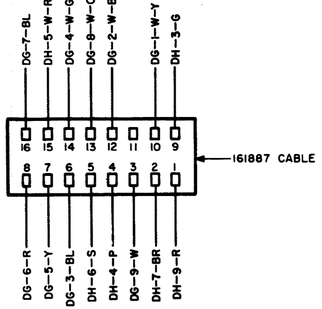


C
CABINET TERMINAL BLOCK

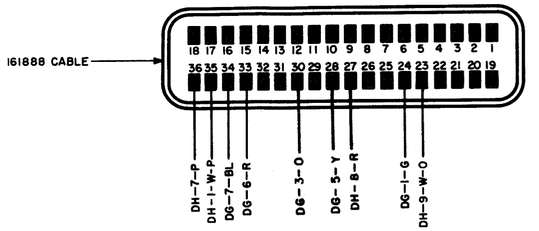


G
CABINET GROUND SCREW

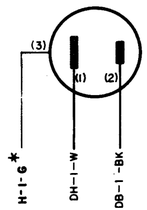
F
CONNECTOR (RECEPTACLE)
159542



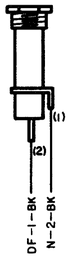
AA
CONNECTOR (PLUG)
161239



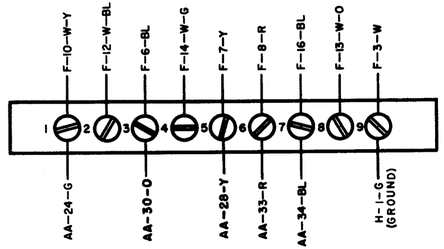
N
CONNECTOR (PLUG)
161817



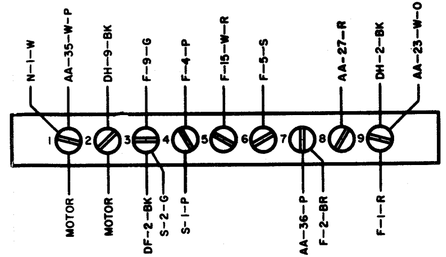
DB
FUSE HOLDER
116783



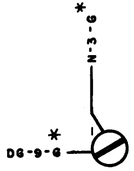
DG
(UPPER)



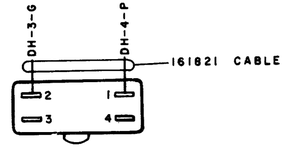
DH
(LOWER)



H
GROUND SCREW



S
LOW TAPE SWITCH
158163



3590 WD

REVISIONS		
ISSUE	DATE	AUTH. NO.
#2	8-28-59	28-11618
#3	8-19-63	77729
4	6-31-66	88621-1

APPROVALS	
D AND B	E OF M
E-NUMBER	
PROD. NO. 3590 WD	

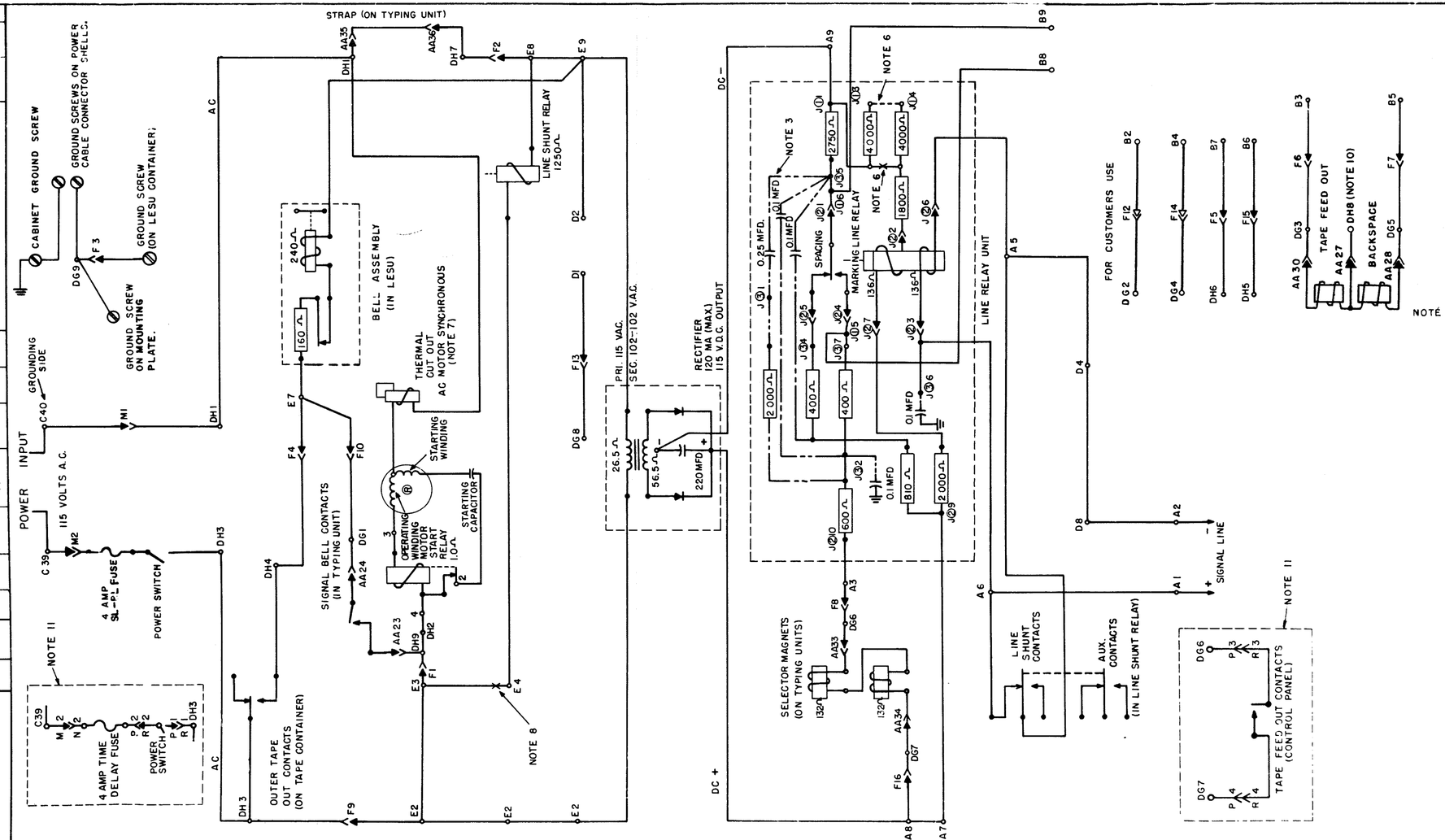
ACTUAL WIRING DIAGRAM
MODEL 28
REPERFORATOR
BASE LRB 5-6

DATE: 9-25-58	
P.D. FILE NO. 8-A65.AA	
DRAWN: K.F.L.	CHKD.
ENGD. G.E.W.	APPD.

TELETYPE CORPORATION

3590 WD

NO.	NOTES
1.	FOR ACTUAL WIRING DIAGRAMS OF INDIVIDUAL UNITS SEE WD NUMBER UNITS DIRECTLY OPERABLE WITH LESU 12 3344 WD ELECTRICAL SERVICE UNIT LESU 12 2900 WD MOTOR UNITS—LMU 3,4,6 3590 WD TYPING REPERFORATOR BASE LRB 5, LRB 6
2.	LEGEND ○ DG TERMINAL BLOCK (ON BASE) ○ DH TERMINAL BLOCK (ON BASE) ◀ F 16-POINT CONNECTOR ○ A TERMINAL BLOCK (IN LESU) ○ B TERMINAL BLOCK (IN LESU) ○ D TERMINAL BLOCK (IN LESU) ○ E TERMINAL BLOCK (IN LESU) ○ J ①TERMINAL STRIP ON LINE RELAY (IN LESU) ◀ J ②LINE RELAY CONNECTOR (IN LESU) ○ J ③LINE RELAY FILTER(IN LESU) ◀ AA 36 POINT CONNECTOR (ON BASE) C CABINET TERMINAL BLOCK ≪ P CONTROL PANEL CONNECTOR ≪ R CONTROL PANEL CONNECTOR
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 (MH) (c) CAPACITANCE VALUES IN MICROFARADS (MFD)
6.	CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION. FOR .020 AMP LINE CURRENT, ADD DASH LINE (----) CONNECTION AND OMIT CONNECTION MARKED (—✕—) IN LINE RELAY.
7.	USE SYNCHRONOUS MOTOR ON REGULATED 60 ~ (±1%) AC POWER ONLY. GOVERNED MOTORS AND OTHER POWER CIRCUITS OPERABLE ON 50 TO 60 ~ UNREGULATED A.C.
8.	LINE SHUNT RELAY SHOWN CONTROLLED BY POWER SWITCH AND SHUNTING LINE RELAY COIL.
9	TAPE FEED OUT AND/OR BACKSPACE MAGNETS ARE AVAILABLE ONLY WITH SPECIFIC CODED LPR UNITS.
10	WHEN COMMON CONNECTION IS USED, D.C. MUST BE PROVIDED FOR MAGNETS OTHER THAN 224M WHICH OPERATES ON A.C. OR D.C.
11.	WIRING FOR LRB6 (EQUIPPED WITH 178838 MOD. KIT) OR LRB36, LRB51



3591 WD

REVISIONS

ISSUE	DATE	AUTH. NO.
2	8-28-59	28-11618
3	5-19-60	69791
4	6-20-61	70239
5	1-9-63	75620
6	11-27-63	78864
7	6-15-64	82627
8	5-25-65	87056
9	8-31-66	88827-1

SCHEMATIC WIRING DIAGRAM MODEL 28

REPERFORATOR BASE LRB 5, 6, 36, 42, 51

ELECT SERVICE UNIT LESU 12

APPROVALS

D AND R	E OF M

E-NUMBER

PROD. NO. 3591 WD

DATE: 9-22-58

P.D. FILE NO.

DRAWN E.M. CHKD.

ENGD. G.W. APPD.

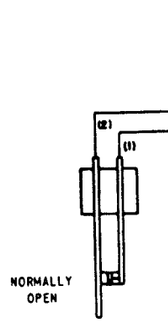
TELETYPE CORPORATION

3591WD

NO.	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION F-4-W-BL WIRE COLOR CODE
2.	COLOR CODE: BK - BLACK G - GREEN BR - BROWN BL - BLUE R - RED P - PURPLE O - ORANGE S - SLATE Y - YELLOW W - WHITE
3.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENTS.
4.	TERMINALS ON CONNECTOR SHOWN AS VIEWED FROM SOLDER END.
5.	NORMALLY OPEN (NO) AND NORMALLY CLOSED (NC) CONTACTS ARE SHOWN WHEN THE REPERFORATOR IS IN THE STOP (IDLE) POSITION.
6.	THE SPACING (S) SIDE ON THE CODE READING CONTACTS ARE NORMALLY CLOSED. THE MARKING (M) SIDE OF THE CODE READING CONTACTS ARE NORMALLY OPEN.
7.	WHEN THE AUXILIARY CONTACTS ARE OPERATED FROM A SINGLE CYCLE FUNCTION CAM, THE CONTACTS NEAREST THE MOUNTING BRACKET ARE NORMALLY CLOSED. WHEN THE AUXILIARY CONTACTS ARE OPERATED FROM A DOUBLE CYCLE FUNCTION CAM, THE CONTACTS FARTHEST FROM THE MOUNTING BRACKET ARE NORMALLY CLOSED.
8.	GENERAL NOTE: WIRING OF INDIVIDUAL COMPONENTS IS DETERMINED BY REFERRING TO THE CABLE ASSEMBLIES SPECIFIED ON THE UNIT B/M.
9.	WHEN USING THE 162306 CABLE ASSEMBLY WITH THE LRPE8, CONNECT THE W-BL WIRE (NORMALLY CONNECTED TO G4) TO G6.
10.	
11.	WHEN COMMON CONNECTION IS USED, D.C. MUST BE PROVIDED FOR MAGNETS OTHER THAN 22MM WHICH OPERATES ON A.C. OR D.C.
12.	FOR WIRING OF BACKSPACE MAGNET ON LAK KEYBOARD MOUNTED PERFORATORS, REFER TO ASSOCIATED LAK WIRING DIAGRAM.
13.	SELECTOR MAGNETS MUST BE STRAPPED FOR 60 MILLIAMPERE OPERATION WHEN 179615 AND 179616 R.F. SUPPRESSION MODIFICATION KITS ARE USED WITH REPERFORATOR SET.
10	ON UNITS EQUIPPED WITH THE 173850 SHIELDED CABLE, THE STRAP BETWEEN TERMINALS C-35 AND C-36 IS OMITTED AND THE "G" WIRE OF THE CABLE IS CONNECTED TO TERMINAL C-35. IF THE UNIT EQUIPPED WITH THE 173850 SHIELDED CABLE IS USED ON A BASE NOT CONTAINING PROVISIONS FOR R F SUPPRESSION (INCLUDING BELL SYSTEM) REMOVE THE "G" WIRE FROM TERMINAL C-35 AND ADD STRAP BETWEEN TERMINALS C-35 AND C-36.
14.	THE LPR 66 SELECTOR MAGNET ASSEMBLY SHALL BE STRAPPED IN PARALLEL FOR 500 MA OPERATION

A

SIGNAL BELL OPERATING CONTACT

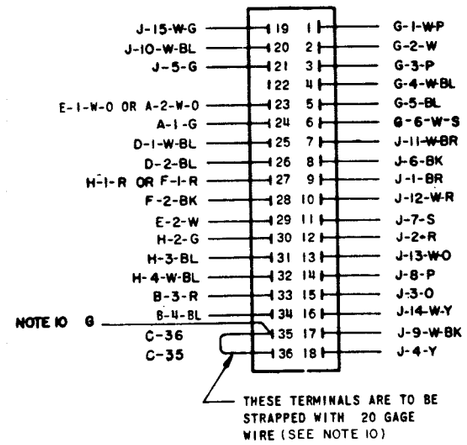


B

SELECTOR MAGNETS

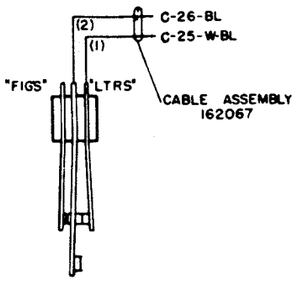
C

36-POINT CONNECTOR



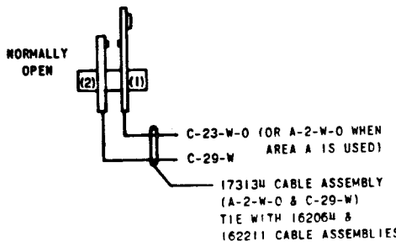
D

"LETTERS" CONTACT



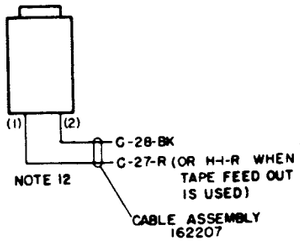
E

MOTOR-STOP CONTACT



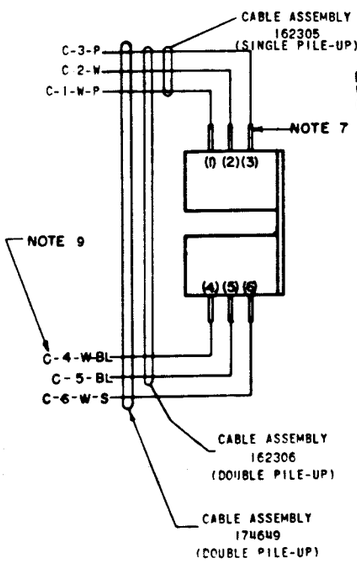
F

BACK SPACE MAGNET



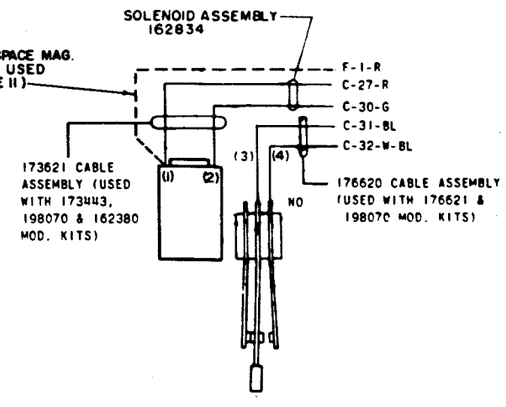
G

AUXILIARY CONTACTS



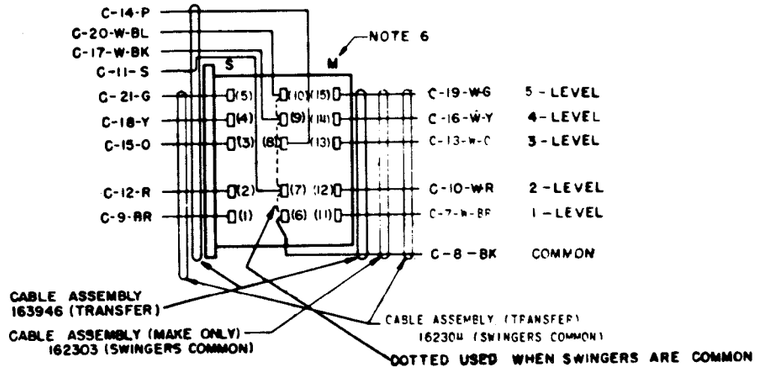
H

TAPE FEED-OUT MAGNET



J

CODE READING CONTACTS



3628WD

REVISIONS

ISSUE	DATE	AUTH. NO.
A 2	4-13-59	28-10974
B 3	5-20-59	28-11062-1
C 4	8-4-59	28-11499
5	4-6-60	28-12999
6	5-3-60	28-13251
7	9-7-60	28-13705
8	10-26-60	28-14088
9	12-19-60	28-14370
10	5-19-61	69691
11	5-19-61	69791
12	11-16-61	71633
13	7-10-62	74013
14	2-9-63	75940
15	2-9-63	75958
16	5-31-63	76926
17	12-30-63	79205
18	10-5-64	83406
19	3-31-65	86803
20	1-6-66	89856
21	5-9-66	90891

WDP

ACTUAL WIRING DIAGRAM FOR TYPING AND NON-TYPING REPERFORATOR LPE LPE LRPE

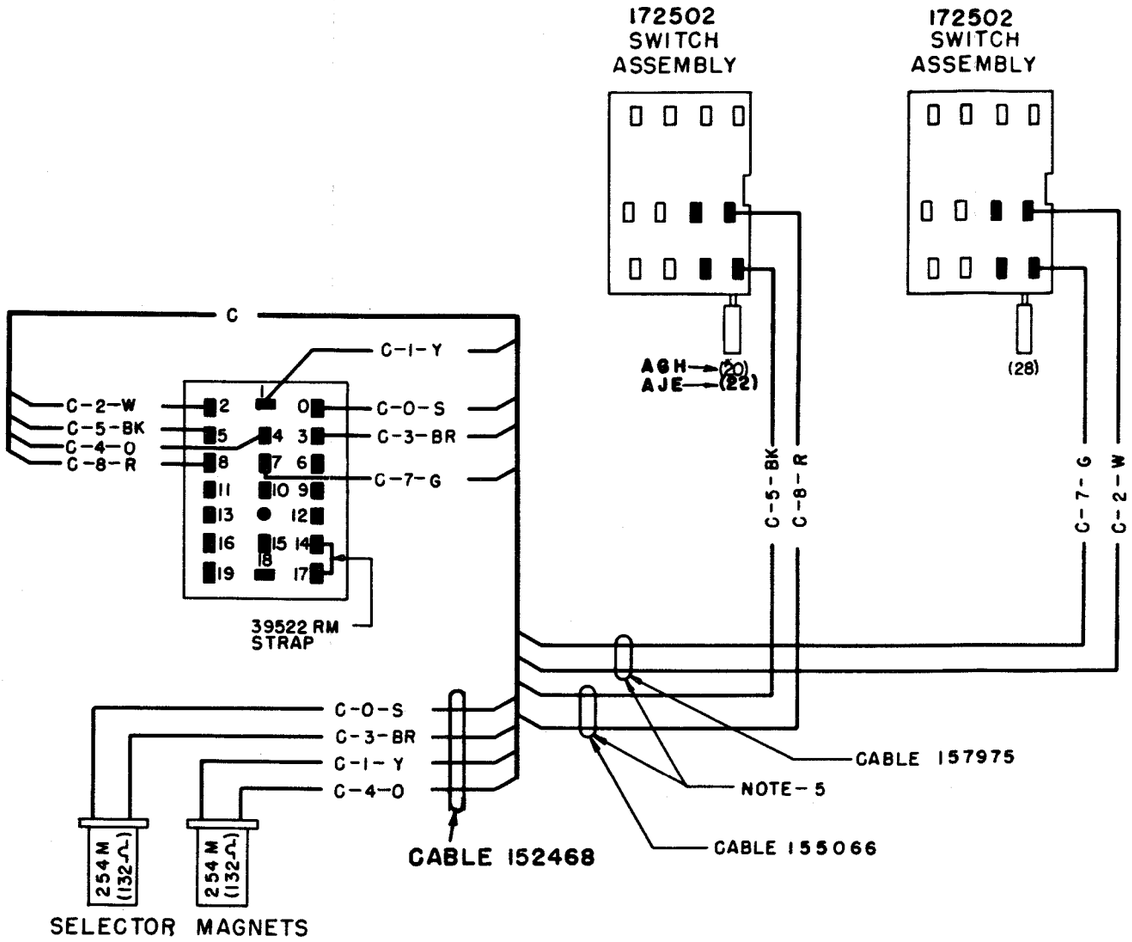
APPROVALS	
D AND R	E OF M
------	-----

E-NUMBER	
PROD. NO.	3628WD
DATE	11-17-58
P.D. FILE NO.	14-49.65AA
DRAWN R.B.B.	CHKD.
ENGD. D.C.L.	APPD.

TELETYPE CORPORATION

3628WD

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 R – RED W – WHITE G – GREEN O – ORANGE Y – YELLOW S – SLATE BR – BROWN
4.	CONNECTORS VIEWED FROM SOLDERED TERMINAL ENDS.
5.	THESE CABLES ARE FURNISHED WITH STUNT BOX.
6.	NORMALLY OPEN CONTACT NORMALLY CLOSED CONTACT



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	76965

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 BG

ENGD. R.H.L. APPD

TELETYPE CORPORATION

3813 WD

ET-131481

4264 WD

ISSUE	DATE	AUTH NO
2	9-24-60	CC 9[illegible]
3	11-18-60	CC-[illegible]
4	5-15-62	73491
5	2-20-64	79225-1
6	3-3-64	79225-9
7	3-16-65	79225-10
8	2-16-66	84706
9	9-28-66	91161

NOTES:

1. WIRING LEGEND:

2. COLOR CODE:

BK - BLACK	W-BK - WHITE-BLACK
BR - BROWN	W-BR - WHITE-BROWN
R - RED	W-R — WHITE-RED
O - ORANGE	W-O — WHITE-ORANGE
Y - YELLOW	W-Y — WHITE-YELLOW
G - GREEN	W-G — WHITE-GREEN
BL - BLUE	W-BL - WHITE-BLUE
P - PURPLE	W-P — WHITE-PURPLE
S - SLATE	W-S — WHITE-SLATE
W - WHITE	

3. CONNECTORS VIEWED FROM SOLDER TERMINAL ENDS

4. ALL CONTACTS SHOWN IN UNOPERATED POSITION.

5. ASSOCIATED CABLES:
   173440 CABLE ASSEMBLY (LXD 11)
   307288 CABLE ASSEMBLY (LXD 29,35)

6. THE NUMBERS ENCLOSED BY PARENTHESES ARE USED FOR REFERENCE AND ARE NOT MARKED ON THE PARTS.

7. UNIT EQUIPPED WITH 262 COIL ASSEMBLY (RESISTANCE 210Ω EACH). THE OPERATING CURRENT MUST BE 50 MA. 120 V DC. FOR EXTERNAL PULSING.
   FOR 110V AC. NON-PULSING OPERATION, RELOCATE STRAP ON TERMINAL (1) TO TERMINAL (2). ADD STRAP BETWEEN TERMINALS (1) AND (4) FOR PARALLEL OPERATION OF MAGNETS.

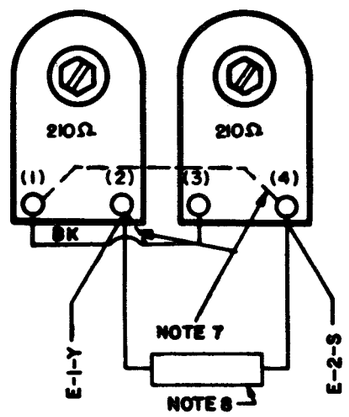
8. 178535 SPARK SUPPRESSOR ASSEMBLY (153631 NETWORK) USED ON LXD 29 ONLY.

9. TERMINAL NO. 21 ON CONNECTOR E IS RESERVED FOR POLAR SIGNAL.

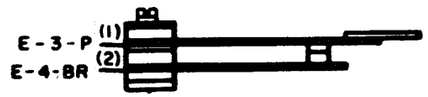
10. STRAP WITH 22 GAUGE WIRE AS INDICATED.

11. FOR PROPER R.F. FILTERING POLARITY OF FILTERS MUST BE MAINTAINED WHEN 174422 FILTER IS USED. UNIT AS FURNISHED IS WIRED FOR "MARKING" CONTACT POSITIVE (+) "SPACING" CONTACT NEGATIVE (-). TO REVERSE POLARITY OF CONTACTS SO THAT THE "MARKING" CONTACT IS NEGATIVE (-) AND "SPACING" POSITIVE (+) MAKE THE FOLLOWING CONNECTIONS IN 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 174421 FILTER. COLOR CODING OF FILTER LEADS DOES NOT APPLY TO 174421 FILTER.

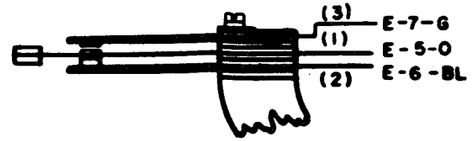
A
TRANSMITTER DISTRIBUTOR CLUTCH MAGNETS — NOTE 7



B
CONTROL LEVER CONTACT ASSEMBLY

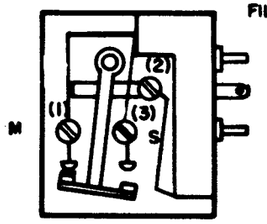


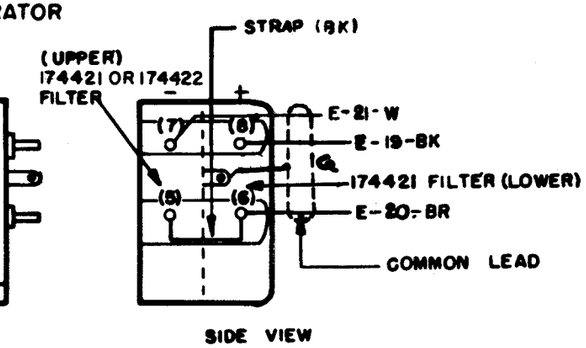
C
TAPE — OUT CONTACT ASSEMBLY



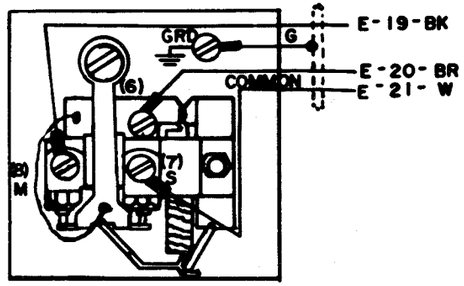
D
TRANSMITTER DISTRIBUTOR SIGNAL GENERATOR

(LXD 11)

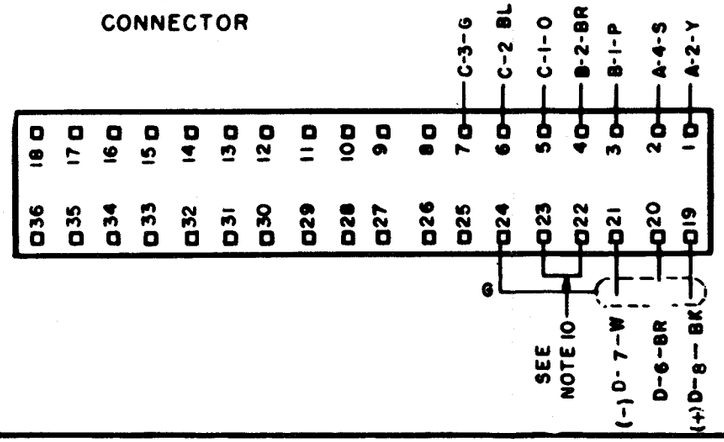




(LXD 29,35)



E
CONNECTOR



ACTUAL WIRING DIAGRAM
MODEL 28 TRANSMITTER DISTRIBUTOR
LXD 11, 29,35

APPROVALS	
D AND R	E OF M
8-18-60	

E-NUMBER

PROD. NO. 4264 WD

DATE 6-8-60

P.D. FILE 18-A.65-2.219 A

DRAWN. WPH	CHK'D.
ENGD. DCL	APPD.

TELETYPE CORPORATION

9 4264 WD

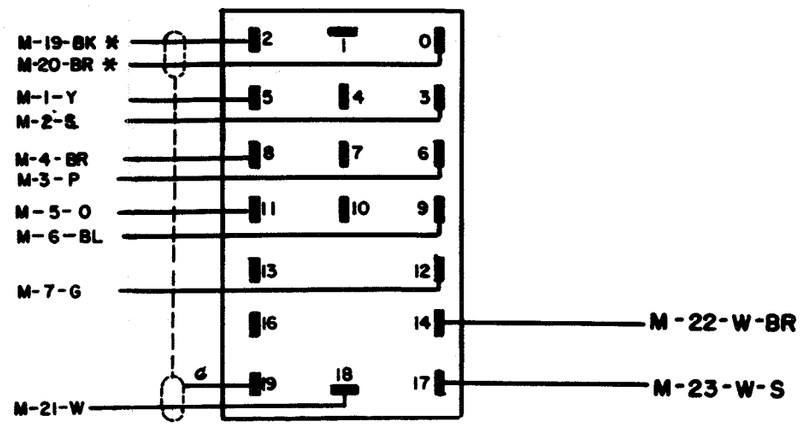
ST-131-001

NO.	NOTES
1.	WIRING LEGEND A-1-W DISTANT TERMINAL AREA DISTANT TERMINAL DESIGNATED WIRE COLOR
2.	COLOR CODE: BK BLACK — BR BROWN Y YELLOW — S SLATE P PURPLE — O ORANGE BL BLUE — W WHITE
3.	CONNECTIONS VIEWED FROM SOLDER TERMINAL ENDS.
4.	ASSOCIATED CABLE 173448
5.	ASSOCIATED SCHEMATIC WIRING DIAGRAM 4275WD
6.	(*) ASTERISK INDICATES 3 WIRE SHIELDED CABLE.

4265 WD		
ISSUE	DATE	AUTH. NO.
A	9-28-60	CC-106
B	11-18-60	CC-182
C	1-2-62	72026

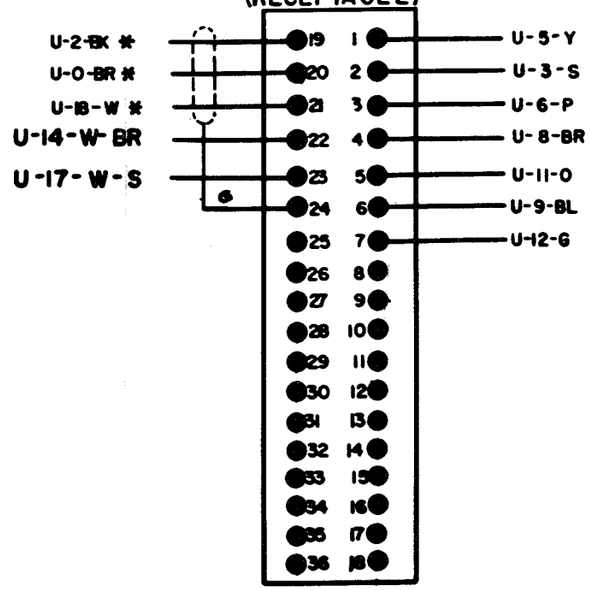
U

TRANSMITTER BASE CONNECTOR (PLUG)



M

TRANSMITTER CONNECTOR (RECEPTACLE)



ACTUAL WIRING DIAGRAM FOR LCXB13

APPROVALS

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

E-NUMBER

PROD. NO. 4265WD

DATE: 6-23-60

P.D. FILE NO. 18-A65/2219A

DRAWN N.K.G. | CHKD

ENGD. D.C.L. | APPD

TELETYPE CORPORATION

4265 WD

ET-131491

NOTES

1. WIRING LEGEND:

   A-1-W-BL
   - A: DISTANT TERMINATING AREA
   - 1: DISTANT TERMINAL DESIGNATION
   - W-BL: WIRE COLOR CODE

2. COLOR CODE

BK - BLACK	W-BK - WHITE-BLACK
BR - BROWN	W-BR - WHITE-BROWN
R - RED	W-R - WHITE-RED
O - ORANGE	W-O - WHITE-ORANGE
Y - YELLOW	W-Y - WHITE-YELLOW
G - GREEN	W-G - WHITE-GREEN
BL - BLUE	W-BL - WHITE-BLUE
P - PURPLE	
W - WHITE	W-S - WHITE-SLATE
S - SLATE	

3. UNIT WIRED FOR 115 VOLTS 50 TO 60 CYCLE A.C. POWER INPUT ONLY.

4. CONNECTOR VIEWED FROM SOLDER TERMINAL END.

5. CIRCUITS SHOWN FOR 060 AMP. NEUTRAL SIGNAL LINE OPERATION. FOR 020 AMP OPERATION REMOVE AND ADD CONNECTIONS AS TABULATED BELOW.

SIGNAL LINE CURRENT	CONNECTION REMOVED	CONNECTION ADDED
.020 AMP.	J①1 - J①2,	J①3 - J①4

6. RECTIFIER SHOWN CONTROLLED BY POWER SWITCH. FOR CONTINUOUS OPERATION REMOVE LEAD L-2-BK FROM TERMINAL E-2 AND CONNECT TO TERMINAL E-1.

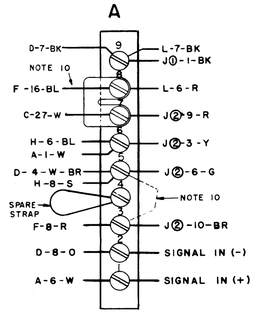
7. LINE SHUNT RELAY SHOWN CONTROLLED BY POWER SWITCH AND MOTOR CONTROL RELAY.

8. SELECTOR MAGNETS ARE TO BE WIRED AS SHOWN FOR 30 MILLIAMPERE OPERATION WHEN THE LINE RELAY IS USED.

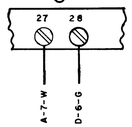
9. ASSOC. CABLE NUMBERS.
   - 176447 CABLE ASSEM., MOTOR CONTROL.
   - 159939 CABLE ASSEM., LESU 7.3
   - 153477 CABLE ASSEM., RECTIFIER
   - 164030 CABLE ASSEM., LINE RELAY MTG. ASSEM.

10. SELECTOR MAGNETS CAN BE CONNECTED DIRECTLY IN THE SIGNAL LINE CIRCUIT FOR NEUTRAL OPERATION AS FOLLOWS:
    - REMOVE LINE RELAY
    - 20 MILLIAMPERE, 60 & 75 WPM OPERATION (OR ANY INTERMEDIATE SPEED)
    - A STRAP A5 TO A3
    - B MOVE BLUE LEAD FROM TERMINAL A8 TO TERMINAL A6.
    - 60 MILLIAMPERE, 60, 75 & 100 WPM OPERATION (OR ANY INTERMEDIATE SPEED)
    - A & B SAME AS ABOVE
    - C CHANGE WIRING ON SELECTOR MAGNETS FOR 60 MILLIAMPERE OPERATION.

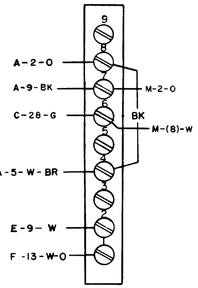
SELECTOR MAGNET TERMINAL BLOCK



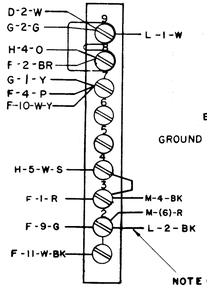
CABINET TERMINAL BLOCK



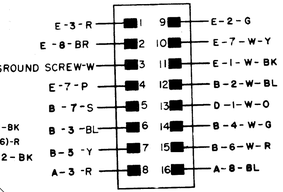
MOTOR CONTROL TERMINAL BLOCK



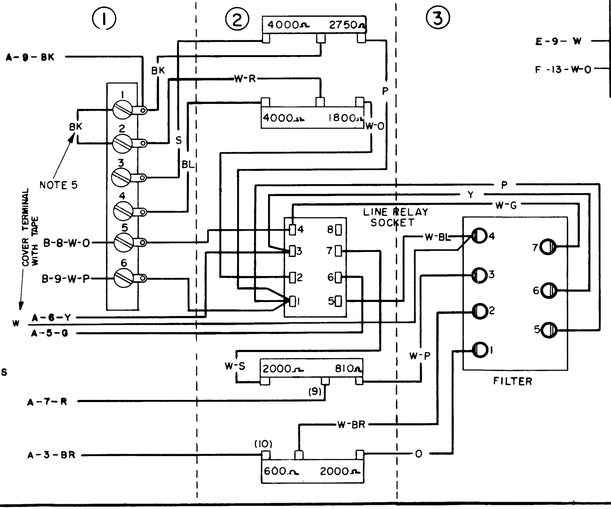
POWER TERMINAL BLOCK



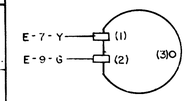
F — CONNECTOR PLUG 159541



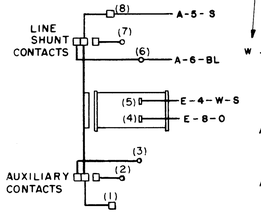
J — 152623 LINE RELAY MOUNTING ASSEMBLY



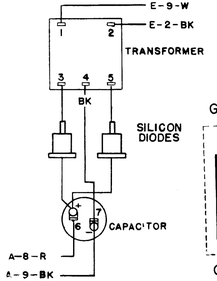
G — SIGNAL BELL



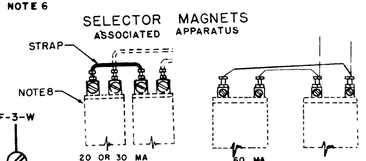
H — LINE SHUNT RELAY



L — 152950 RECTIFIER ASSEMBLY

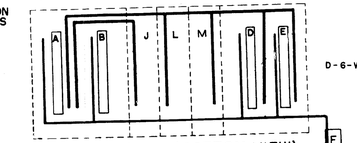


SELECTOR MAGNETS ASSOCIATED APPARATUS

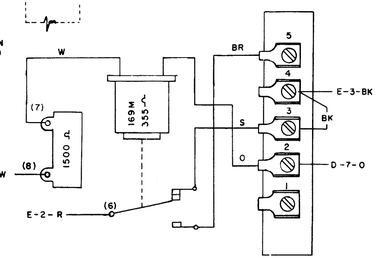


ELECTRICAL SERVICE UNIT GROUND SCREW

CABLE ROUTING (BOTTOM VIEW)



M — 176448 RELAY MOTOR CONTROL ASSEMBLY



4385WD

REVISIONS		
ISSUE	DATE	AUTH. NO.
A	8-3-61	70466
B	12-7-61	71860

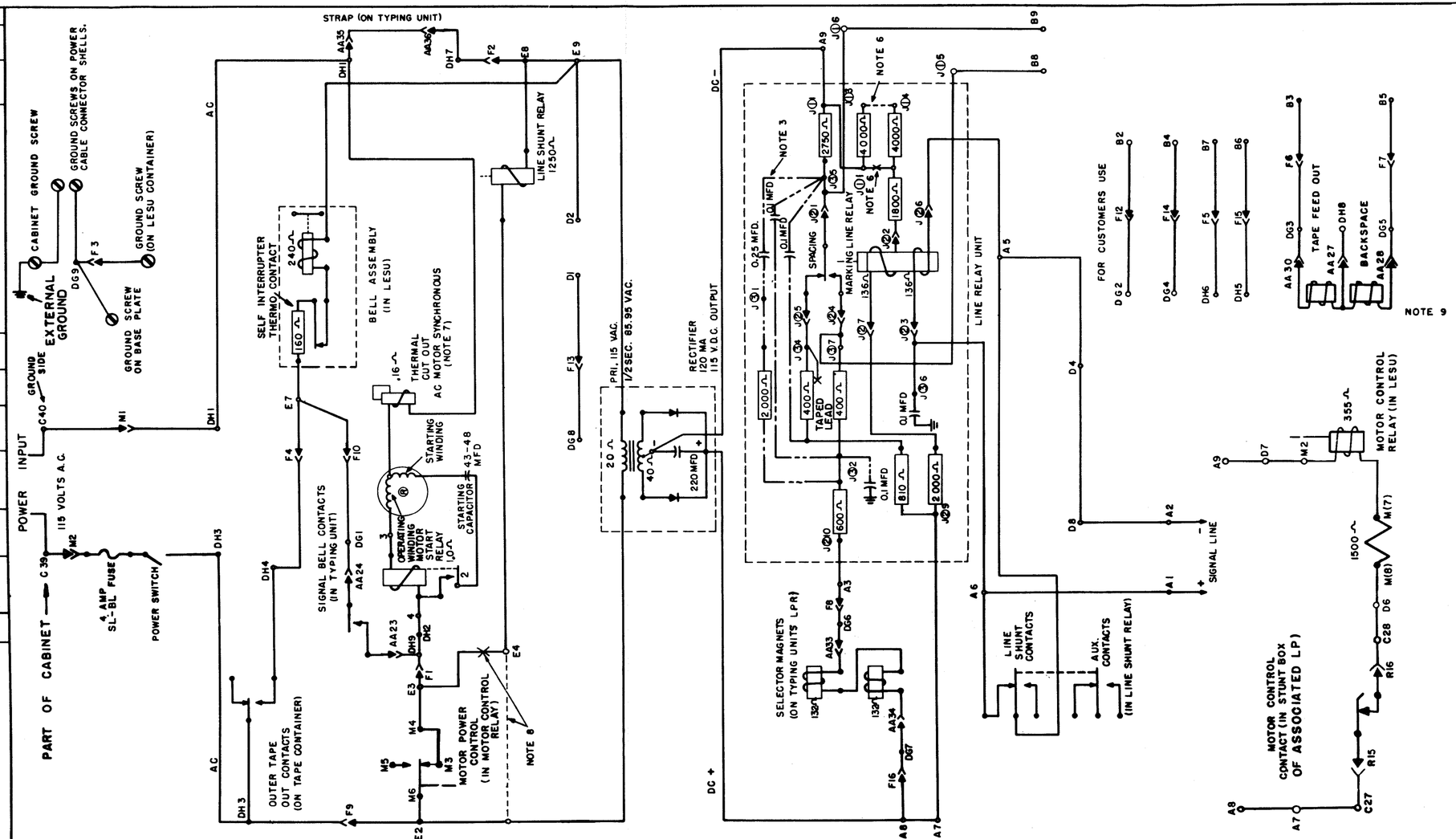
ACTUAL WIRING DIAGRAM MODEL 28 ELECT. SERVICE UNIT 73

D AND B	E OF M
E-NUMBER	
PROD NO. 4385WD	
DATE	
P.D. FILE NO.	
DRAWN D.W.7	CHKD.
ENGD. E.F.D	APPD.

TELETYPE CORPORATION

4385WD

NO.	NOTES
1.	FOR ACTUAL WIRING DIAGRAMS OF INDIVIDUAL UNITS SEE W D NUMBER UNITS DIRECTLY OPERABLE WITH LESU 73 4385 WD ELECTRICAL SERVICE UNIT LESU 73 2900 WD MOTOR UNITS—LMU 3,4,6 3590 WD TYPING REPERFORATOR BASE LRB 5, LRB 6
2.	LEGEND • DG TERMINAL BLOCK (ON BASE) • DH TERMINAL BLOCK (ON BASE) ◁◁ F 16-POINT CONNECTOR • A TERMINAL BLOCK (IN LESU) • B TERMINAL BLOCK (IN LESU) • D TERMINAL BLOCK (IN LESU) • E TERMINAL BLOCK (IN LESU) • J ①TERMINAL STRIP ON LINE RELAY (IN LESU) ◁◁ J ② LINE RELAY CONNECTOR (IN LESU) • J ③ LINE RELAY FILTER(IN LESU) ◁◁ AA 36 POINT CONNECTOR (ON BASE) C CABINET TERMINAL BLOCK • M MOTOR CONTROL RELAY (IN LESU)
3.	DOT-DASH(—•—•—)LINES INDICATE FILTERING SHIELDING AND SUPPRESSION NETWORKS.
4.	ALL APPARATUS IS SHOWN IN UNOPERATED OR DE-ENERGIZED POSITIONS.
5.	(Ω) RESISTANCE VALUES IN OHMS-(Ω) (h) INDUCTANCE VALUES IN MICROHENRIES (M H) (c) CAPACITANCE VALUES IN MICROFARADS (MFD)
6.	CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION. FOR .020 AMP LINE CURRENT, ADD DASH LINE (----) CONNECTION AND OMIT CONNECTION MARKED (—*—)IN LINE RELAY.
7.	USE SYNCHRONOUS MOTOR ON REGULATED 60~ (±1%) AC. POWER ONLY. GOVERNED MOTORS AND OTHER POWER CIRCUITS OPERABLE ON 50 TO 60 ~ UNREGULATED A.C.
8.	LINE SHUNT RELAY SHOWN CONTROLLED BY POWER SWITCH AND MOTOR CONTROL RELAY. FOR CONTROL OF LINE SHUNT BY POWER SWITCH ONLY REMOVE CONNECTION MARKED (—*—) AND ADD DASH LINE (---) CONNECTION.
9.	TAPE FEED OUT AND/OR BACKSPACE MAGNETS ARE AVAILABLE ONLY WITH SPECIFIC CODED LPR UNITS.



4386WD REVISIONS		
ISSUE	DATE	AUTH NO.
A	8-3-61	70466
B	12-7-61	71860
C	11-14-63	78862

SCHEMATIC DIAGRAM FOR MODEL 28 ELECTRICAL SERVICE UNIT LESU 73

ASSOCIATED UNITS
LMU MOTOR UNIT
LP TYPING UNIT
LPR TYPING REPERF.
LRB REPERF. BASE

APPROVALS

E. NUMBER

PROD. NO. 4386 WD

DATE:

P.O. FILE NO

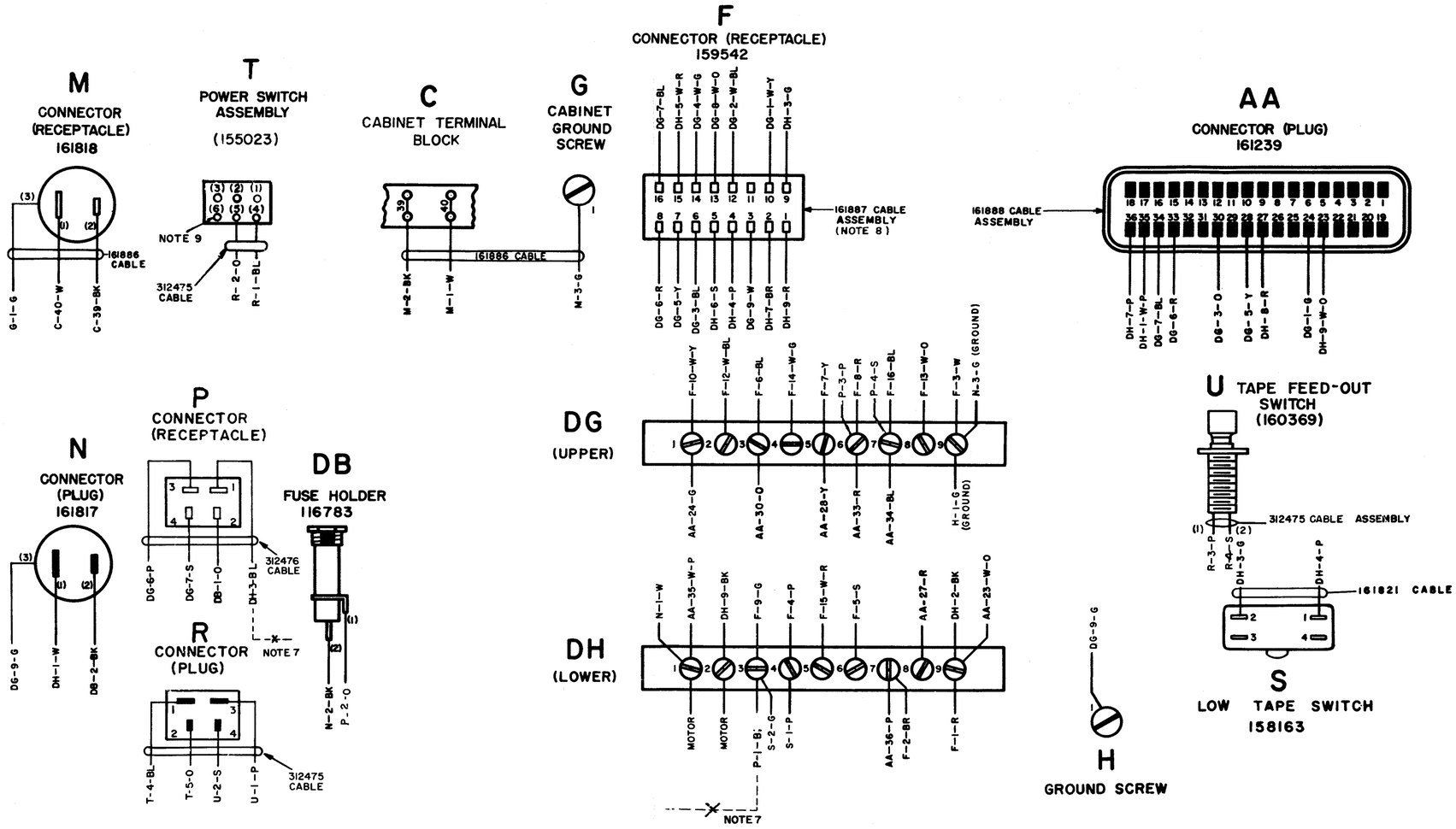
DRAWN D.M.E. CHKD

ENGD. E.F.D. APPD

TELETYPE CORPORATION

4386WD

NO.	NOTES
1.	WIRING LEGEND: AB—2—W AB — DISTANT TERMINATING AREA 2 — DISTANT TERMINATING DESIGNATION W — WIRE COLOR CODE
2.	COLOR CODE: BK—BLACK, W—BK WHITE—BLACK BR—BROWN, W—BR WHITE—BROWN R—RED, W—R WHITE—RED O—ORANGE, W—O WHITE—ORANGE Y—YELLOW, W—Y WHITE—YELLOW G—GREEN, W—G WHITE—GREEN BL—BLUE, W—BL WHITE—BLUE S—SLATE, W—S WHITE—SLATE P—PURPLE, W—P WHITE—PURPLE W—WHITE
3.	ALL CONNECTORS VIEWED FROM SOLDER END.
4.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESIS ARE NOT MARKED ON COMPONENTS.
5.	FOR SCHEMATIC WIRING DIAGRAM SEE 3591WD.
6.	ASSOCIATED CABLE ASSEMBLIES 161886, 161887, 161888, 312475 AND 312476
7.	MAKE THIS CONNECTION BY (SPLICE, SOLDER, AND TAPE) BLACK LEAD FROM 161887 CABLE ASSEMBLY AND BLUE LEAD FROM 312476 CABLE ASSEMBLY.
8.	TIE BLACK JUMPER WIRE BACK IN CABLE.
9.	COVER TERMINAL T-6 WITH A 155753 INSULATING SLEEVE.



4447WD		
REVISIONS		
ISSUE	DATE	AUTH. NO.
#2	11-10-61	71599
#3	1-9-63	75620
4	6-15-64	82627
5	5-25-65	87056
6	10-18-65	89167
7	4-19-66	90365

APPROVALS	
D AND P	E OF M
E-NUMBER	
PROD. NO. 4447WD	

ACTUAL WIRING DIAGRAM MODEL 28 REPERFORATOR BASE, LRB 36, LRB 42 LRB 51

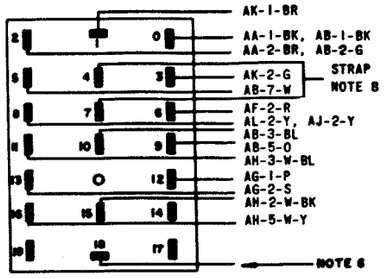
DATE:	
P.D. FILE NO. 8-A65AA	
ORIGIN G F M	CHKD.
ENGR. D.A.K.	APPD.

TELETYPE CORPORATION

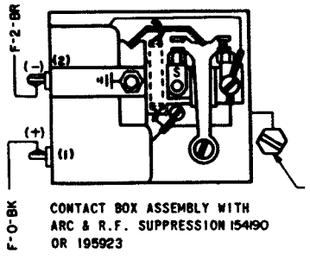
4447WD

NO.	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION A-1-W-BL WIRE COLOR CODE
2.	COLOR CODE BK - BLACK G - GREEN BR - BROWN BL - BLUE R - RED P - PURPLE O - ORANGE W - WHITE Y - YELLOW S - SLATE
3.	UNIT WIRED FOR 115 VOLTS 50-60 CYCLE AC POWER INPUT.
4.	CONNECTORS VIEWED FROM SOLDER TERMINAL ENDS.
5.	ALL CONTACTS SHOWN IN UNOPERATED POSITION IN KEYBOARD.
6.	SPARE TERMINAL OF F-18 RESERVED FOR POLAR OPERATION OF KEYBOARD SIGNAL GENERATOR.
7.	ASSOCIATED CABLES: 158224 CABLE ASSEMBLY, AUXILIARY 158249 CABLE ASSEMBLY, KEYBOARD 155992 CABLE ASSEMBLY, BACKSPACE 159343 CABLE ASSEMBLY, BACKSPACE MAGNET 179362 CABLE ASSEMBLY, SYNC. PULSE
8.	BARE WIRE STRAP 39522RM
9.	PART OF ASSOCIATED UNIT (LPE, LPR, LRPE, OR LTPE)
10.	UNCOIL, ROUTE, AND CONNECT 179362 CABLE TO TWO OPEN CABINET TERMINALS, TYING UP ANY SLACK
11.	POLARITY MUST BE MAINTAINED ONLY WHEN 154190 FILTER IS USED. POLARITY MAY BE DISREGARDED WHEN 195923 FILTER IS USED.

F
KEYBOARD CONNECTOR MALE



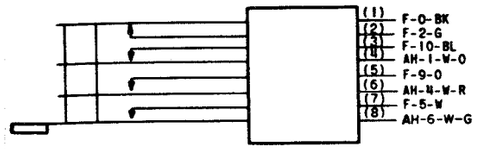
AA
KEYBOARD SIGNAL GENERATOR



CONTACT BOX ASSEMBLY WITH ARC & R.F. SUPPRESSION 154190 OR 195923

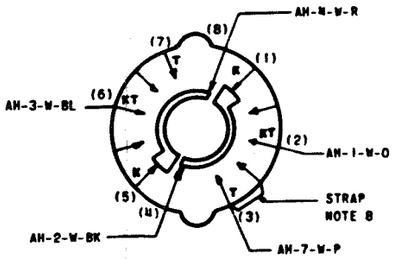
NOTE 11

AB
LOCK BAR SWITCH (SEND-REC. POSITION)

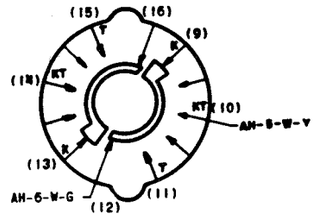


AC
AUXILIARY SWITCH

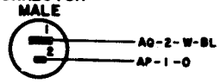
REAR



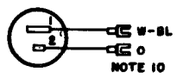
FRONT



AD
SYNC. PULSE CONNECTOR MALE

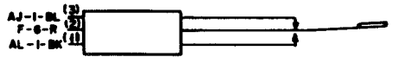


AE
FEMALE

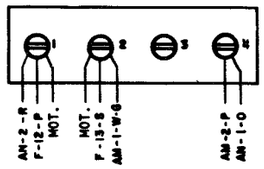


NOTE 10

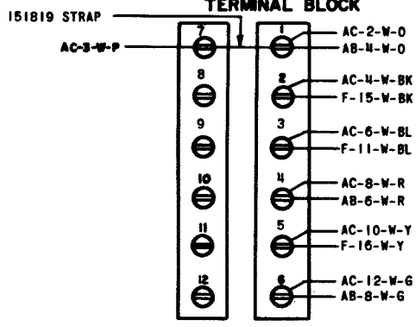
AF
END-OF-LINE OR MARGIN INDICATOR SELECTOR SWITCH



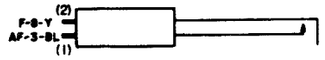
AG
MOTOR TERMINAL BLOCK



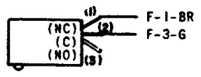
AH
KEY BOARD TERMINAL BLOCK



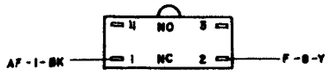
AJ
END-OF-LINE INDICATOR SWITCH



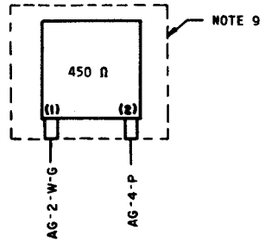
AK
SIGNAL LINE BREAK KEY SWITCH



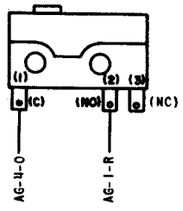
AL
MARGIN INDICATOR SWITCH



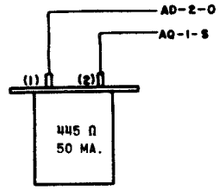
AM
BACK-SPACE MAGNET



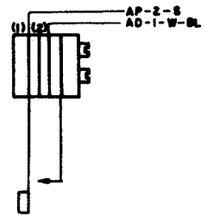
AN
BACK-SPACE SWITCH



AP
CLUTCH TRIP MAGNET



AQ
CLUTCH TRIP SWITCH



4927 WD

REVISIONS		
ISSUE	DATE	AUTH. NO.
# 2	4-9-64	79225-5

ACTUAL
WIRING DIAGRAM
FOR
MODEL 28
KEYBOARD BASE
LAK31

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

E-NUMBER	
PROD. NO.	4927WD
DATE	12-15-61
P.D. FILE NO.	
DRAWN R.L.W.	CHKD. F.G.S.
ENGD. E.F.D.	APPD. E.J.C.

TELETYPE CORPORATION

4927 WD

NOTES

1. WIRING LEGEND
   A–I–R
   A = DISTANT TERM. AREA
   I = DISTANT TERM. DESIG.
   R = WIRE COLOR CODE
2. COLOR CODE:
   R–RED W–WHITE BK–BLACK
3. MATING CONNECTOR 114466 IS FURNISHED WITH UNIT. WIRING BETWEEN A.C. POWER AND 114466 IS TO BE PROVIDED IN FIELD AT INSTALLATION TIME.
4. REMOVE AND TAPE RESISTOR LEADS WHEN LPW300 IS OPERATED WITH MODEL32 AND 33 PAGE PRINTERS.
5. MOTOR OPERATES ON 50-60 CYCLE 110 V.A.C.
6. THE NUMBERS ENCLOSED BY PARENTHESES ARE USED FOR REFERENCE AND ARE NOT SHOWN ON THE PART.

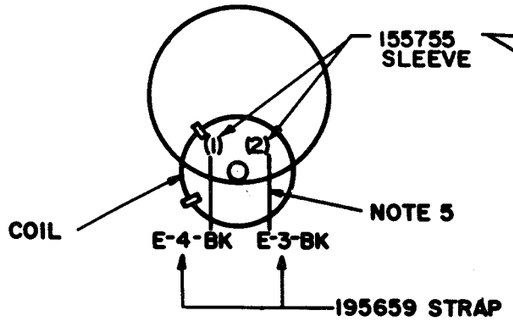
5830 WD

REVISIONS

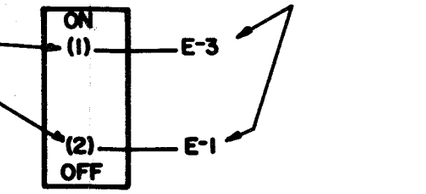
ISSUE	DATE	AUTH NO.
2	11-8-62	75064
3	11-27-62	75207
4	1-10-63	75653
5	4-22-63	76601
6	12-23-63	77313

ACTUAL

A MOTOR (193958)

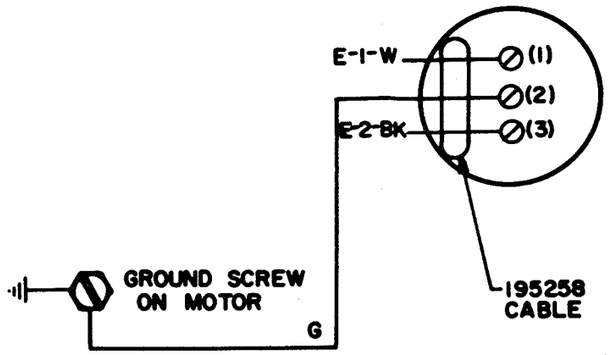


B COVER SWITCH (178714)

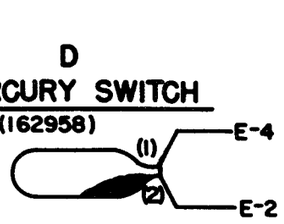


C AC CONNECTOR PLUG

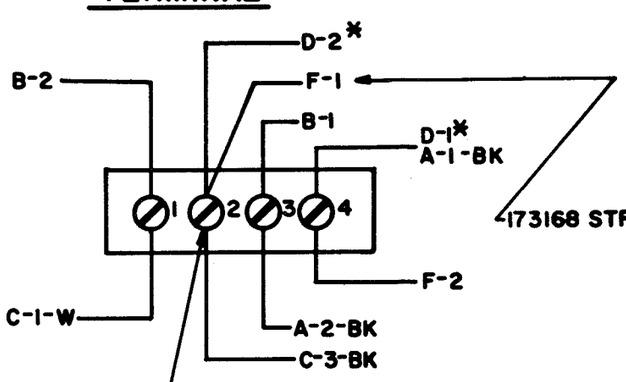
NOTE 3



D MERCURY SWITCH (162958)

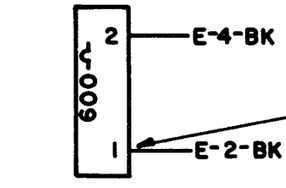


E TERMINAL

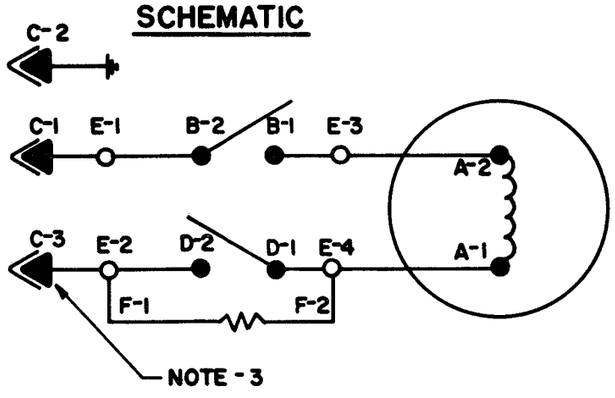


*-72597 RM TERMINAL

F RESISTOR



SCHEMATIC



ACTUAL AND SCHEMATIC WIRING DIAGRAM OF LPW300

APPROVALS

D AND R	E OF M
HJK	

E-NUMBER

PROD. NO. 5830 WD

DATE: 5-22-62

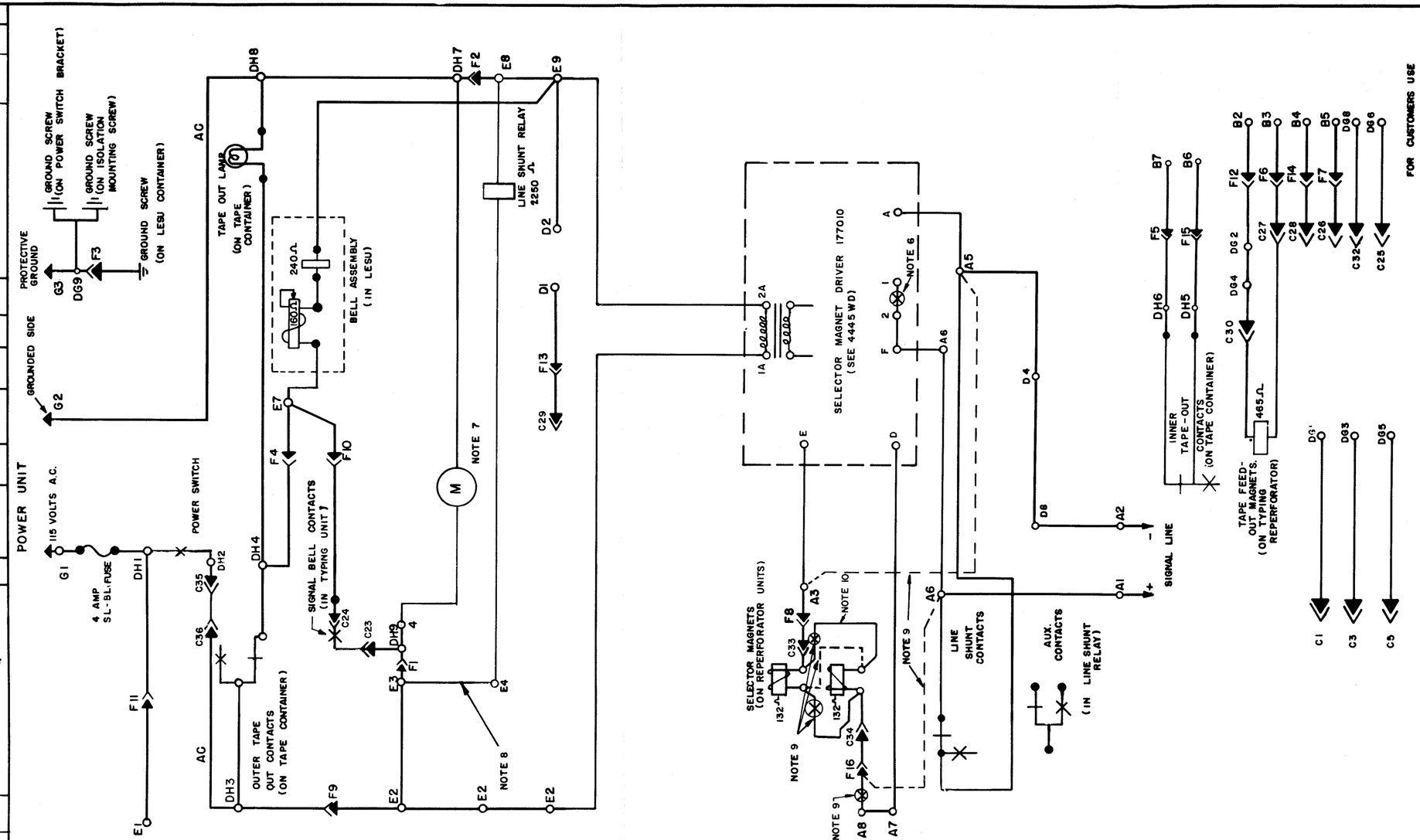
P.D FILE NO. 13-99AAA

DRAWN TJM	CHKD.
ENGD. JCF	APPD T.J.P.

TELETYPE CORPORATION

5830 WD

NO.	NOTES
1.	WIRING DIAGRAMS OF INDIVIDUAL UNITS UNITS DIRECTLY OPERABLE WITH LESU96 4445WD — SELECTOR MAGNET DRIVER-177010 5930WD — ELECTRICAL SERVICE UNIT LESU96 2900WD — MOTOR UNITS - LMU 3,4,6. 3736WD — TYPING REPERFORATOR BASE LRB 21 3628WD — TYPING AND NON-TYPING REPERFORATOR
2.	LEGEND C 36 POINT CONNECTOR G 3-POINT CONNECTOR (ON BASE) DG TERMINAL BLOCK (ON BASE) DH TERMINAL BLOCK (ON BASE) F 16-POINT CONNECTOR A TERMINAL BLOCK (IN LESU) B TERMINAL BLOCK (IN LESU) D TERMINAL BLOCK (IN LESU) E TERMINAL BLOCK (IN LESU) N. C. CONTACT N. O. CONTACT
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 (MH) (C) CAPACITANCE VALUES IN MICROFARADS (MFD)
6.	CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION. FOR .020 AMP LINE CURRENT, OMIT CONNECTION MARKED (⊗) IN SELECTOR MAGNET DRIVER.
7.	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.
8.	LINE SHUNT RELAY WHICH SHUNTS SELECTOR MAGNET DRIVER INPUT IS SHOWN CONTROLLED BY POWER SWITCH.
9.	FOR SPECIAL APPLICATIONS SELECTOR MAGNETS CAN BE OPERATED DIRECTLY IN A NEUTRAL SIGNAL LINE AS FOLLOWS: COMPLETELY DISCONNECT SELECTOR MAGNET DRIVER, FOR 20 MILLIAMPERE, 60 AND 75 WPM OPERATION (OR ANY INTERMEDIATE SPEED.) 1. STRAP A5 TO A3 2. MOVE LEAD FROM TERMINAL A8 TO A6 3. ADD DASHED (---) LEAD, OMIT ⊗ LEADS ON SELECTOR MAGNETS FOR 60 MILLIAMPERE, 60, 75 & 100 WPM OPERATION (OR ANY INTERMEDIATE SPEED.) 1. STRAP A5 TO A3. 2. MOVE LEAD FROM TERMINAL A8 TO A6
10.	FOR OPERATION WITH SELECTOR MAGNET DRIVER, SELECTOR MAGNETS MUST BE CONNECTED IN PARALLEL.



5931 WD		
REVISIONS		
ISSUE	DATE	AUTH. NO.
A	12-10-63	78861

SCHEMATIC WIRING DIAGRAM MODEL 28

REPERFORATOR BASE LRB 21

ELECT SERVICE UNIT LESU 96

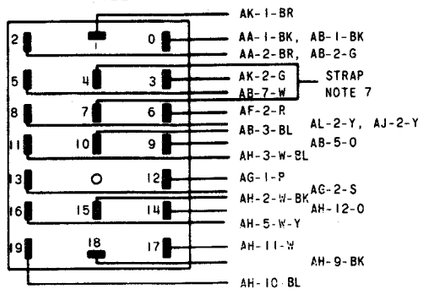
APPROVALS	
D AND R	E OF M
E-NUMBER	
PROD. NO.	5931 WD
DATE	
P.D. FILE NO.	1-49.65AA
DRAWN E.E.	CHKD
ENGD R.S.P.	APPD

TELETYPE CORPORATION

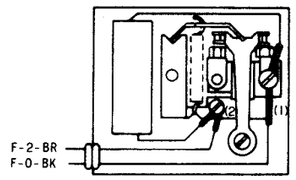
5931 WD

NO.	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION A-1-W BL 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 AC OR DC POWER INPUT.
4.	PLUGS VIEWED FROM SOLDER TERMINAL ENDS.
5.	ALL CONTACTS SHOWN IN UNOPERATED POSITION IN KEYBOARD.
6.	ASSOCIATED CABLES: 198353 CABLE ASSEMBLY, AUXILIARY 198352 CABLE ASSEMBLY, KEYBOARD 155992 CABLE ASSEMBLY, BACKSPACE 159343 CABLE ASSEMBLY, BACKSPACE MAGNET 198351 CABLE ASSEMBLY, SYNC. PULSE TRIP MAGNET
7.	BARE WIRE STRAP 39522RM
8.	PART OF ASSOCIATED UNIT (LPE, LPR, LRPE, OR LTPE)
9.	FOR SCHEMATIC SEE 6460WD AND 7016WD.
10.	TAPE AND TIE BACK BLUE AND WHITE LEADS TO THE OTHER END OF 196353 CABLE ASSEMBLY.

F
KEYBOARD CONNECTOR MALE

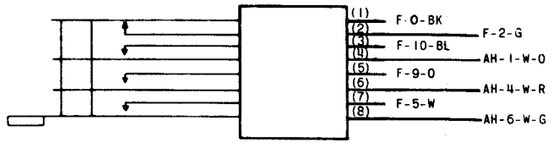


AA
KEYBOARD SIGNAL GENERATOR

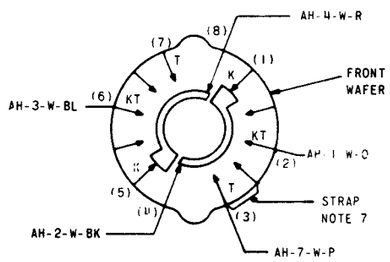


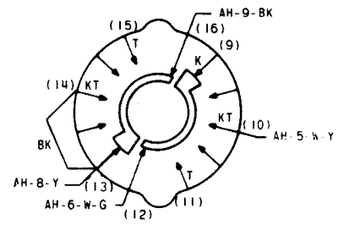
CONTACT BOX ASSEMBLY WITH ARC SUPPRESSION NETWORK ACCESSORY

AB
LOCK BAR SWITCH (REC)

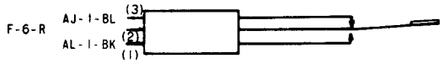


AC
AUXILIARY SWITCH

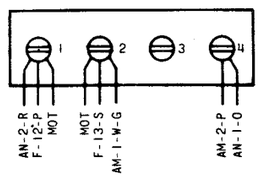




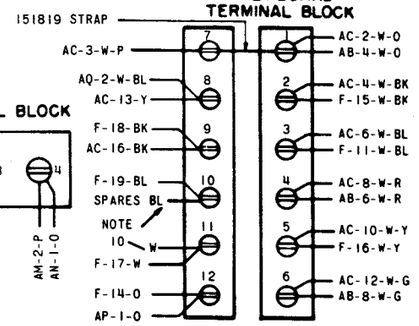
AF
END-OF-LINE MARGIN INDICATOR SELECTOR SWITCH (T SHOWN)



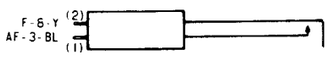
AG
MOTOR TERMINAL BLOCK



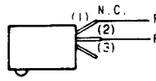
AH
KEY BOARD TERMINAL BLOCK



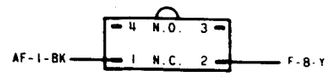
AJ
END-OF-LINE INDICATOR SWITCH



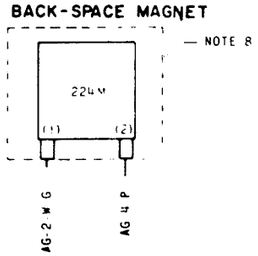
AK
SIGNAL LINE BREAK KEY SWITCH



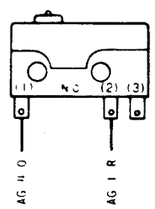
AL
MARGIN INDICATOR SWITCH



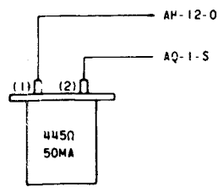
AM
BACK-SPACE MAGNET



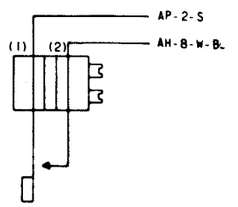
AN
BACK-SPACE SWITCH



AP
SYNC. PULSE MAGNET



AQ
CLUTCH TRIP SWITCH



6456 WD

REVISIONS		
ISSUE	DATE	AUTH. NO.
2	11-27-63	
3	12-12-63	
4	6-15-64	82627

ACTUAL WIRING DIAGRAM FOR MODEL 28 KEYBOARD BASE LAK42 46

APPROVALS

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

E-NUMBER	
PROD. NO.	6456WD
DATE	5-15-63
P.D. FILE NO.	49 A6544
DRAWN J D B	CHKD.
ENGD. R A F	APPD.

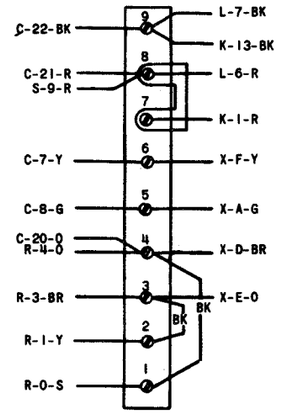
TELETYPE CORPORATION

6456 WD

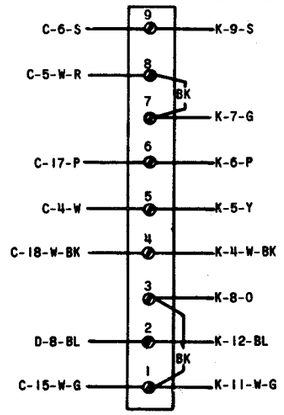
NO.	NOTES
1.	WIRING LEGEND: DISTANT TERMINATING AREA DISTANT TERMINATING DESIGNATION A-I-W-BL WIRE COLOR CODE
2.	COLOR CODE: BK - BLACK BR - BROWN BL - BLUE R - RED Y - YELLOW P - PURPLE W - WHITE S - SLATE O - ORANGE G - GREEN
3.	UNIT WIRED FOR 117 VOLTS. 50 TO 60 CYCLE AC POWER INPUT ONLY.
4.	CONNECTORS VIEWED FROM SOLDERED TERMINAL ENDS.
5.	CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION. FOR .020 AMP. OPERATION REMOVE AND ADD CONNECTIONS AS TABULATED BELOW. SIG. LINE CURRENT: .020 AMP. — CONNECTION REMOVED: K1-K2 — CONNECTIONS ADDED: FOR .020 AMP. OPERATION OF SELECTOR MAGNET DRIVER, REFER TO 4445WD.
6.	RECTIFIER SHOWN CONTROLLED BY POWER SWITCH. FOR CONTINUOUS OPERATION, REMOVE LEAD L-10-BK FROM TERMINAL E-2 AND CONNECT TO TERMINAL E-1.
7.	LINE SHUNT RELAY SHOWN CONTROLLED BY POWER SWITCH AND SHUNTING LINE RELAY COIL AND KEYBOARD AND TRANSMITTER DISTRIBUTOR SIGNAL GENERATOR.
8.	THE SPARE LEADS FROM THE TRANSMITTER DISTRIBUTOR UNIT CONNECTOR PLUG ARE TERMINATED IN THE RIGHT END OF THE ELECTRICAL SERVICE UNIT. THE SPARE LEADS FROM THE TYPING UNIT PLUG ARE TERMINATED IN THE LEFT END OF THE ELECTRICAL SERVICE UNIT.
9.	ADD STRAP BETWEEN C10 & C11 IF SIGNAL LINE BREAK SWITCH IS NOT USED.
10.	SPARE LEAD FROM U18 IS RESERVED FOR POLAR OPERATION OF KEYBOARD AND TRANSMITTER DISTRIBUTOR SIGNAL GENERATORS.
11.	TERMINALS C143 TO C148 RESERVED FOR CABINET LAMP OPERATION.
12.	TERMINALS C1 TO C3 RESERVED FOR CUSTOMER USE.
13.	TERMINALS C121 - C122 RESERVED FOR PERFORATOR LO-TAPE SWITCH.
14.	CONTACTS SHOWN IN UNOPERATED OR DE-ENERGIZED POSITION.
15.	SYNC. PULSE CURRENT SHOWN SUPPLIED FROM SET RECTIFIER, TO PULSE SET EXTERNALLY REMOVE STRAPS AND CONNECT EXTERNAL SOURCE IN ACCORDANCE WITH INSTALLATION REQUIREMENTS: C124 - C131 C21 - C131 C125 - C142 C22 - C142
16.	FOR SCHEMATIC WIRING DIAGRAM SEE 7016WD.

CIRCUITS SHOWN	CONNECTION REMOVED	CONNECTIONS ADDED
.020 AMP.	K1-K2	

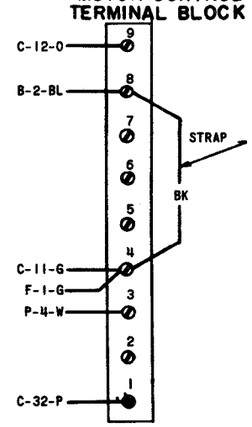
A
SELECTOR MAGNET TERMINAL BLOCK



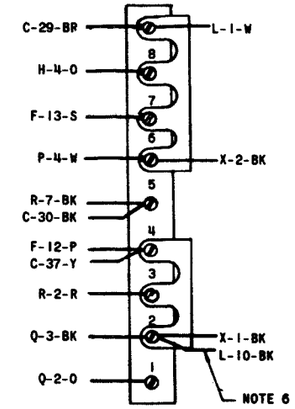
B
LINE TEST KEY TERMINAL BLOCK



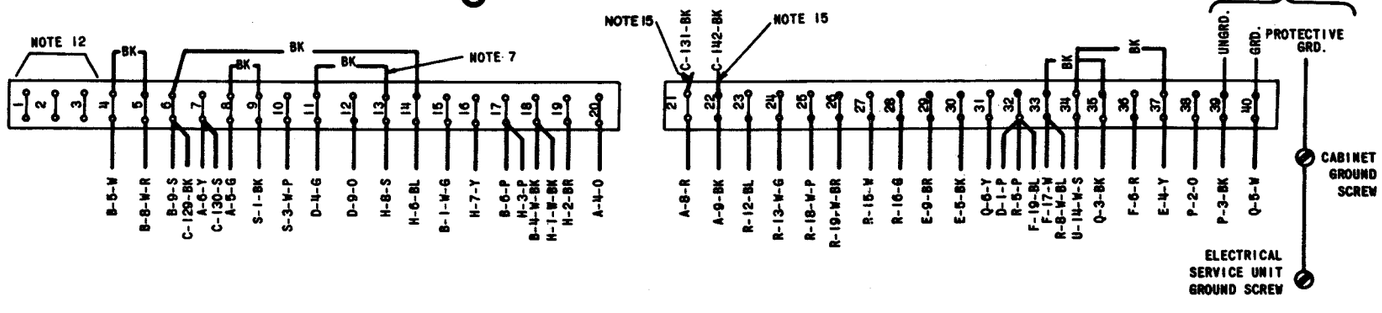
D
MOTOR CONTROL TERMINAL BLOCK



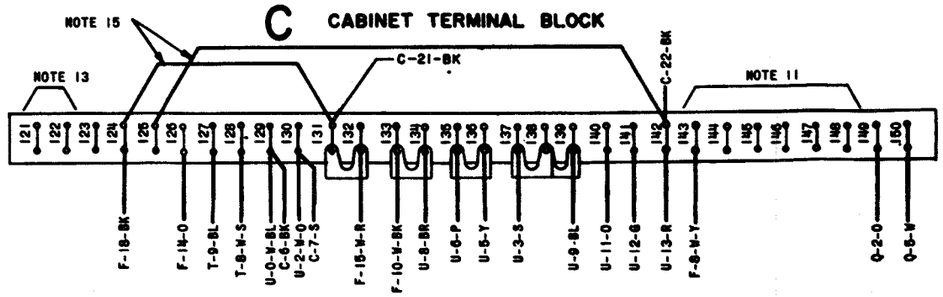
E
POWER TERMINAL BLOCK



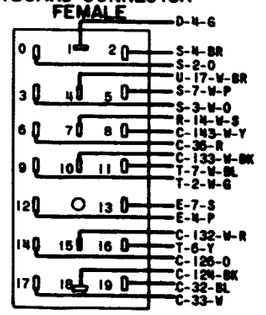
C
CABINET TERMINAL BLOCK



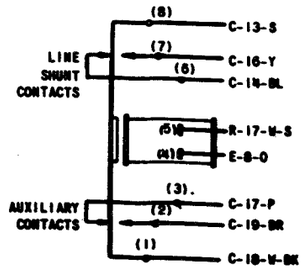
C
CABINET TERMINAL BLOCK



F
KEYBOARD CONNECTOR FEMALE



H
LINE SHUNT RELAY



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

7015 WD

REVISIONS

ISSUE	DATE	AUTH. NO.
A	1-31-64	80196
B3	2-5-64	80198
4	4-20-65	86685
5	7-29-66	88100 RECORD

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

SHEET 1 OF 2

ACTUAL WIRING DIAGRAM FOR MODEL 28 ELECTRICAL SERVICE UNIT LESU111

APPROVALS	
D AND R	E OF M

E-NUMBER

PROD. NO. 7015WD

DATE 8/20/63

P.D. FILE NO. 3-A65.219A

DRAWN	JDB	CHKD.
ENGD.	RAF	APPD.

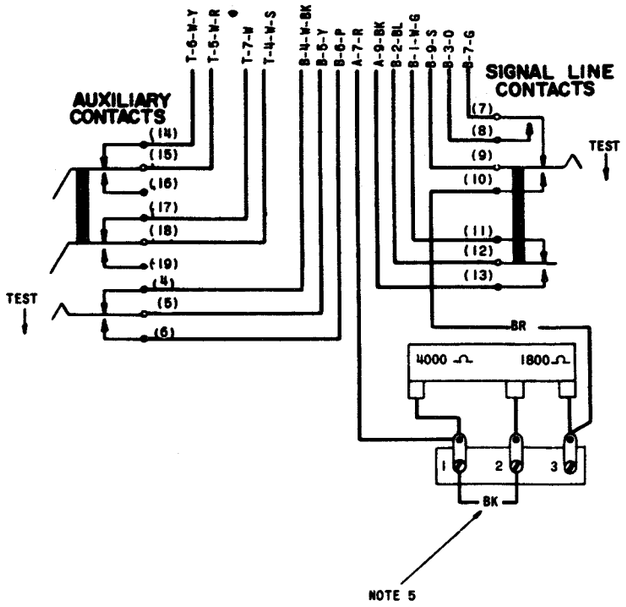
TELETYPE CORPORATION

7015WD

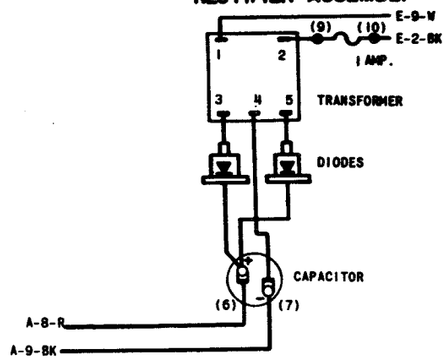
7015 WD

REVISIONS		
ISSUE	DATE	AUTH. NO.
A	1-31-64	80196
B3	2-6-64	80198
4	4-20-65	86885
5	7-29-65	88100
6	4-26-66	90882

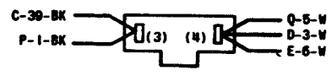
K
LINE TEST KEY ASSEMBLY



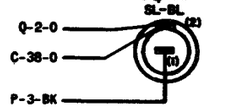
L
RECTIFIER ASSEMBLY



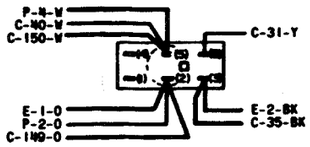
P
CONVENIENCE RECEPTACLE



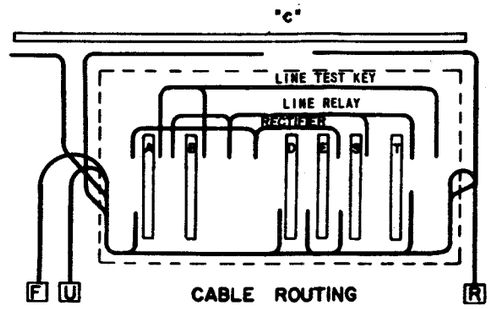
FUSE HOLDER
6¼ AMP
SL-BL



Q
POWER SWITCH



NOTE
REVISION INFORMATION MUST ALSO BE REFLECTED ON THE ISSUE CONTROL RECORD, WHICH IS PART OF THIS W.D.

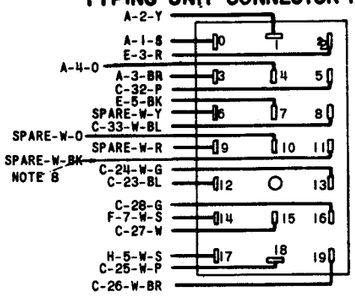


CABLE ROUTING
(BOTTOM VIEW)

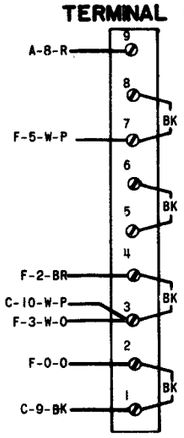
SEE ISSUE CONTROL RECORD FOR COMPLETE LIST OF SHEETS COMPRISING THIS W.D.

SHEET 2

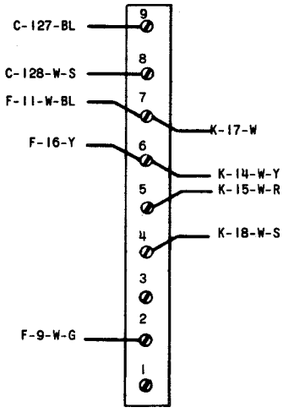
R
TYPING UNIT CONNECTOR FEMALE



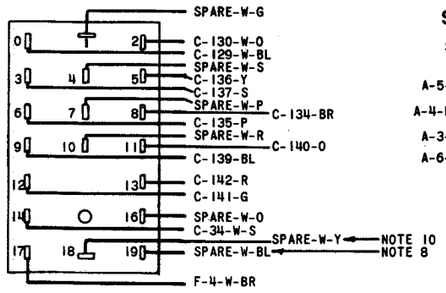
S
SLOW RELEASE RELAY TERMINAL BLOCK



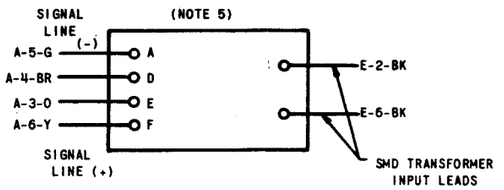
T
SLOW RELEASE TEST KEY TERMINAL BLOCK



U
TRANSMITTER DISTRIBUTOR CONNECTOR FEMALE



X
177010 TYPING UNIT SELECTOR MAGNET DRIVER



ACTUAL WIRING DIAGRAM FOR MODEL 28 ELECTRICAL SERVICE UNIT LESUIII

APPROVALS	
D AND R	E OF M
HJK	

E-NUMBER

PROD. NO. 7015WD

DATE 8 20 63

P.D. FILE NO. 3-A65.219A

DRAWN JDB	CHKD.
ENGD. RAF	APPD.

TELETYPE CORPORATION

7015 WD

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

WD.NO.	UNIT
3264WD	CABINET-LAAC200
7015WD	ELECT. SERVICE UNIT-LESU111
6456WD	KEYBOARD-LAK42
2900WD	MOTOR UNIT-LMU12
3214WD	PAGE TYPING UNIT-LP14
3300WD	TRANS. DIST.-LXD3

2. LEGEND:

- ○ A SEL. MAG. TERM. BLOCK (IN LESU)
- ○ B LINE TEST KEY TERM.BLOCK(IN LESU)
- ○ C CABINET TERMINAL BLOCK
- ○ D MOTOR CONTROL TERM.BLOCK(LESU)
- ○ E POWER TERM. BLOCK (IN LESU)
- ≪ F KEYBOARD CONNECTOR
- ● H LINE SHUNT RELAY (IN LESU)
- ○ X SELECTOR MAGNET DRIVER
- ○ K LINE TEST KEY TERM.STRIP(IN LESU)
- ● K LINE TEST KEY CONTACTS (IN LESU)
- ● L RECTIFIER (IN LESU)
- ● P CONVEN. RECEPT.& FUSE (IN LESU)
- ● Q POWER SWITCH (IN LESU)
- ≪ R TYPING UNIT CONNECTOR
- ○ S SLOW REL.RLY.TERM.BLOCK(IN LESU)
- ○ T TEST SWITCH TERM.BLOCK (IN LESU)
- ≪ U TRANS.DIST.CONNECTOR
- ● AB LOCK BAR SWITCH (IN LAK)
- ● AC AUXILIARY SWITCH (IN LAK)
- ○ AF SELECTOR SWITCH (IN LAK)
- ⊙ AH KEYBOARD TERM.BLOCK (IN LAK)
- ○ AJ E.O.L. INDICATOR SWITCH (IN LAK)
- ○ AL MARGIN INDICATOR SWITCH (IN LAK)
- ● AP SYNC. PULSE MAGNET (IN LAK)
- ● AQ CODE BAR CONTACT (IN LAK)
- —(M)— INDICATES MOTOR UNIT. REFER TO 2900WD.
- —X— INDICATES N.O. CONTACT
- —+— INDICATES N.C. CONTACT
- —[ ]— / - - - - } INDICATES FILTERING, SHIELDING AND SUPPRESSION NETWORKS

-[1]- 470Ω 0.1μF S M

3. ALL APPARATUS SHOWN IN UNOPERATED OR DE-ENERGIZED POSITIONS.(TAPE IN UNIT)

4. A. RESISTANCE IN OHMS (Ω)
B. INDUCTANCE IN MICROHENRIES (μH)
C. CAPACITANCE IN MICROFARADS (μF)

5. CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE. FOR .020 AMP.LINE CURRENT OMIT CONNECTION K1-K2
REFER TO 4445WD FOR SELECTOR MAGNET DRIVER WIRING.

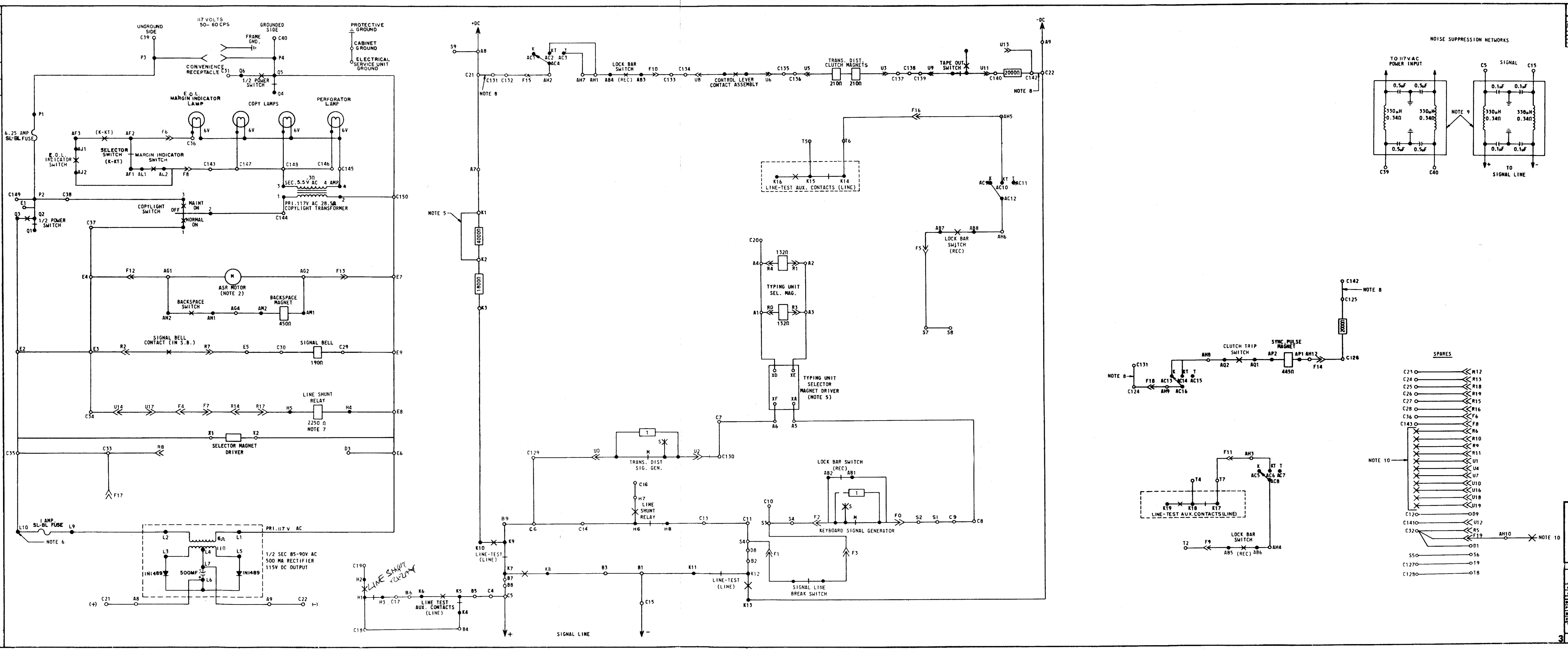
6. RECTIFIER SHOWN CONTROLLED BY POWER SWITCH. FOR CONTINUOUS OPERATION, MOVE L-10 FROM E-2 TO E-1.

7. LINE SHUNT RELAY SHOWN CONTROLLED BY POWER SWITCH AND SHUNTING TRANSMITTER DISTRIBUTOR AND KEYBOARD SIGNAL GENERATORS AND SELECTOR MAGNET DRIVER.

8. SYNC. PULSE CURRENT SHOWN SUPPLIED FROM SET RECTIFIER. TO PULSE SET EXTERNALLY, REMOVE STRAPS AS FOLLOWS AND CONNECT EXTERNAL SOURCE IN ACCORDANCE WITH INSTALLATION REQUIREMENTS:

C142 - C125	C21 - C131
C131 - C124	C22 - C142

NO	NOTES (CONT.)
9.	USE POWER AND SIGNAL LINE SUPPRESSORS AND SYNCHRONOUS OR GOVERNED FILTERED MOTOR UNIT FOR INSTALLATION REQUIRING MINIMUM R.F. INTERFERENCE. FOR OTHER INSTALLATIONS, OMIT SUPPRESSORS AND CONNECT INPUTS AND GOVERNED MOTOR DIRECTLY TO TERMINALS SHOWN.
10	(X) INDICATES SPARE LEADS WHICH ARE TAPED AND TIED BACK TO CABLE.
11	FOR SCHEMATIC OF AUXILIARY REPERFORATOR AND ASSOCIATED APPARATUS, SEE 3343WD.



SCHEMATIC WIRING DIAGRAM MODEL 28 AUTOMATIC SEND-RECEIVE SET LESU111

7016 WD		
REVISIONS		
ISSUE	DATE	AUTH.NO.
2	12-10-63	
3	4-20-65	

APPROVALS

PROD. NO. 7016WD
DATE 9-23-63
PB.FILE NO. 3-A65.219A
DRAWN JDB
ENGD RAF

TELETYPE CORPORATION

3 7016 WD