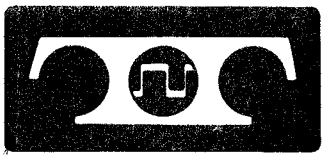
BULLETIN 318B
VOL 1

TECHNICAL MANUAL
MODEL 37
AUTOMATIC SEND-RECEIVE (ASR)
TELETYPEWRITER SET
FOR SWITCHED NETWORK SERVICE

CONTENTS

DESCRIPTION
INSTALLATION
PRINCIPLES OF OPERATION



TELETYPE®
CORPORATION
5555 TOUHY AVENUE, SKOKIE, ILLINOIS

PRINTED IN U.S.A.

TABLE OF CONTENTS

Equipment	Content	Section	Issue
Teletypewriter Set (ASR)	General Description and Operation	574-302-100TC	1
Teletypewriter Set (ASR)	Installation	574-302-200TC	3
Typing Unit	Description and Principles of Operation	574-320-101TC	1**
Keyboard Unit	Description and Principles of Operation	574-321-101TC	2
Electrical Service Unit	Description and Operation	574-322-101TC	1
Teletypewriter Tables	Description and Operation	574-323-101TC	2
Answer-Back Unit Early Design	Description and Principles of Operation	574-325-100TC	2
Typing Unit Cover and Pan	Description and Operation	574-326-101TC	2
Reperforator-Transmitter Cabinet	Description and Operation	574-327-100TC	2
Nontyping Reperforator Unit	Description and Principles of Operation	574-329-100TC	1
Tape Reader Unit	Description and Principles of Operation	592-801-100TC	5

Note: Motor unit information is contained in Bulletin 295B.

37 AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SET

FOR SWITCHED NETWORK SERVICE

GENERAL DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL 2

2. DESCRIPTION 2

STANDARD FEATURES 2

VARIABLE FEATURES 3

KEYBOARD SEND-RECEIVE UNIT COMPONENTS 3

A. Typing Unit 3
B. Keyboard 4
C. Base 5
D. Control Panel 5
E. Motor Unit 5
F. Typing Unit Cover and Pan 5
G. Table 9
H. Electrical Service Unit 9

REPERFORATOR-TRANSMITTER MODULE COMPONENTS 10

A. Reperforator Unit 10
B. Reader Unit 10
C. Electrical Service Unit 10
D. Motor Units 10
E. Tape Module Cabinet 10

ACCESSORIES 12

A. Answer-Back Assembly 12
B. Paper Handling Accessories . . . 13
C. Tape Handling Accessories 13

3. TECHNICAL DATA 13

4. OPERATION 15

GENERAL 15

PERIPHERAL INTERFACE 15

CHANNEL INTERFACE 16

CONTENTS PAGE

LOCAL OPERATION 16

A. Device Selection 16
B. Motor Control 16
C. Message Exchange 16

LINE OPERATION 16

A. Device Selection 16
B. Channel Establishment 19
C. Message Exchange 19

CHANNEL TERMINATION 19

SIMULTANEOUS LOCAL-LINE OPERATION 19

5. REFERENCES 19

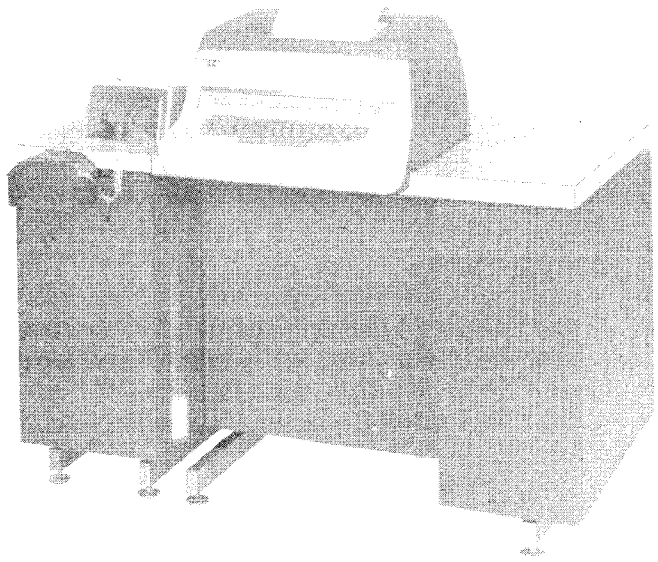


Figure 1 - 37 ASR Teletypewriter Set

1. GENERAL

1.01 This section provides a general description and operation of the 37 Automatic Send-Receive (ASR) Teletypewriter Set. The 37 ASR set generates data from a keyboard or tape reader and can convert received data into a printed copy and perforated tape.

1.02 A 37 ASR set is a heavy-duty terminal that functions with the ASCII (United States of America Standard Code for Information Interchange) and has Electronics Industries Association (EIA) Specification RS-232B interfacing. Sets can optionally be obtained which operate at speeds of either 100 or 150 words per minute (wpm).

1.03 The styling and equipment are designed to complement modern office furnishings. The operator interface including keyboard layout and touch, quality of printed copy and equipment noise is comparable to that of an office typewriter. The equipment has a modular design which permits rapid conversion from one type of set to another.

1.04 References to left or right, front or rear, top or bottom, etc, apply to the set in its normal position as viewed by the operator.

1.05 The 37 ASR set originates data through its keyboard or tape reader in the form of voltage signals, ie, positive (+) voltage for spacing signals and negative (-) voltage for marking signals. These voltages are converted into voice frequency tones by a data set for transmission over communication lines. Received data, in the form of voice frequency tones, is converted into voltage signals by a data set. The voltage signals are used by the 37 ASR set to copy the data on page size copy paper or business forms and/or communications tape.

2. DESCRIPTION

2.01 The ASR set is comprised of a keyboard send-receive unit and a reperforator-transmitter (RT) module. Figure 1 shows a typical set which consists of the following components:

Keyboard Send-Receiver Unit
Typing Unit
Keyboard
Control Panel
Motor Unit
Typing Unit Cover and Pan
Table
Electrical Service Unit
Reperforator-Transmitter (RT) Module
Reperforator Unit
Reader Unit
Electrical Service Unit
Motor Units
Cabinet

STANDARD FEATURES

2.02 The following features are standard on ASR sets:

- Modern modular design.
- Interfacing which conforms with EIA Specification RS-232B.
- Sends on-line through keyboard or tape reader.
- Receives through typing unit or reperforator unit.
- Sends and receives at the speed of 150 wpm (15 characters a second) with a 10-unit code transmission pattern.
- Generates all 128 ASCII characters with even parity.
- Receives all 128 ASCII characters - prints 94 graphics including upper and lower case alphabet.
- Seventy-two characters on a line (10 per inch). Technician adjustable for shorter or longer lengths up to 80 characters.
- End of printed line indication (lamp) which is technician adjustable.
- On-line backspace.
- On-line carriage return and line feed.
- Local reperforator backspace.
- Local carriage return.
- Local paper feed-out.
- Single color printing.
- Operator control of multiple copy.
- Operator control of vertical spacing.
  (a) 3 lines per inch.
  (b) 6 lines per inch.
- Local reader character advance.
- Roll paper (friction feed sets) or flat-folded, form-feed paper with marginal perforations (sprocket feed sets).
- Print position indicator (next character indicator).
- Print position scale.
- Low-tape alarm (lamps).

VARIABLE FEATURES

2.03 In addition to the above standard features, certain options and accessories can be obtained which provide the following variable features:

- Two-color ribbon
- Printed graphics extension.
- Horizontal tabulation stop control.
- Vertical tabulation stop control.
- Half, forward and reverse line feed.
- Nonrepeat form feed.
- Carriage return on receipt of line feed, VT, or FF characters.
- Optional operating speed of 100 wpm (10 characters a second) with an 11-unit code transmission pattern.
- Optional dedicated half-duplex, dedicated full-duplex, or line control of home copy.
- Optional power tape handling winder or winder-unwinders.
- Optional tape storage bin.
- Answer-back triggered either automatically from data set, upon receipt of ENQ character, or manually with HERE IS pushbutton.
- Keyboard transmission blinded on NAK character, unblinded on ACK character.
- Disconnect capability on EOT character.
- Incorrect vertical parity indication.
- Parity sensitive control functions.

  Note: Vertical parity is required on following control functions:

  (a) Carriage Return (CR)
  (b) Backspace (BS)
  (c) End of Transmission (EOT)
  (d) Bell (BEL)
  (e) Answer-Back Start (ENQ)
  (f) Print Suppression on ESCAPE (ESC)
  (g) Keyboard Blind (NAK)
  (h) Keyboard Unblind (ACK)
  (i) Full-Duplex Mode Shift (ESC:)
  (j) Half-Duplex Mode Shift (ESC;)
  (k) Horizontal Tabulation (HT)
  (l) Vertical Tabulation (VT)
  (m) Form Advance (Feed) (FF)

- Character repeat feature — technician adjustable

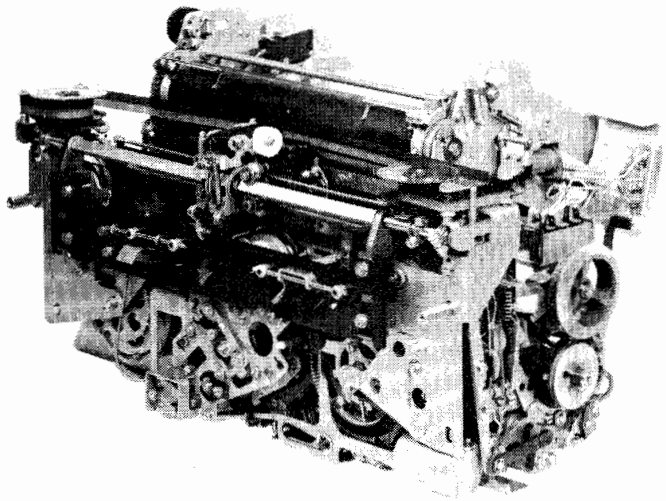


Figure 2 - Typing Unit

Note: This feature is normally disabled on all keys except the following:

Space	Period (.)
NEW LINE	Hyphen (-), Equal (=)
BACKSPACE	Underscore (_)
NULL	Colon (:), Asterisk (*)
DELETE	Character X

- Alarm indication for low-paper (friction feed sets) or paper-out condition (sprocket feed sets).
- Carriage return and line feed on NEW LINE character.
- Form advance (form-out).
- Vertical tabulation (technician adjustable).
- Horizontal tabulation (technician adjustable).
- Eighty-six characters on a line (12 per inch).

KEYBOARD SEND-RECEIVE UNIT COMPONENTS

A. Typing Unit

2.04 The typing unit (Figure 2) receives information serially by means of a single magnet (two coils) type of selector. A function box is provided for character and character sequence recognition.

2.05 Page copy is provided by the typing unit which prints both upper and lower case characters utilizing a typebox positioned by an aggregate motion mechanism. The typebox is moved from character to character and is returned to "home" position when reception stops, thus, making all characters visible when the machine is idle.

2.06 The typing unit is capable of printing symbols for all 128 ASCII characters. Normally, however, it will be arranged to print the 94 graphic, numeric, and alpha characters of the ASCII code.

2.07 Normally the typing unit will print ten characters per inch allowing 72 characters on an 8-1/2 inch platen with normal margins on the paper. Optionally, other typing units may be arranged to print 12 characters per inch allowing 86 characters on an 8-1/2 inch platen with normal margins on the paper. Line feed provides for spacing six lines per vertical inch.

2.08 Two types of paper feed options are available:

(a) A typing unit arranged for friction feed is capable of accommodating roll paper widths of 3 to 8-1/2 inches and capable of providing multiple copies of one original and two carbons.

(b) A typing unit arranged with sprocket feed is capable of handling sprocket feed paper 11 inches long and 9-1/2 inches wide. One-half inch is needed on each side of a page to allow for sprocket holes. The typing unit is capable of providing multiple copies consisting of one original and up to five carbons.

2.09 All typing units are equipped with line feed and carriage return (both on-line and local), on-line backspace, and technician adjustable margins.

2.10 Optional paper positioning controls are provided for either friction feed or sprocket feed typing units:

(a) Form-Feed — When the typing unit detects the form-feed character, it will position the paper for printing on the first line of the next page. Pages up to 15 inches in length, adjustable by a technician, may be accommodated. The typing unit form feeds three lines during one character interval. Two successive form feeds are prevented unless there has been an intervening line feed.

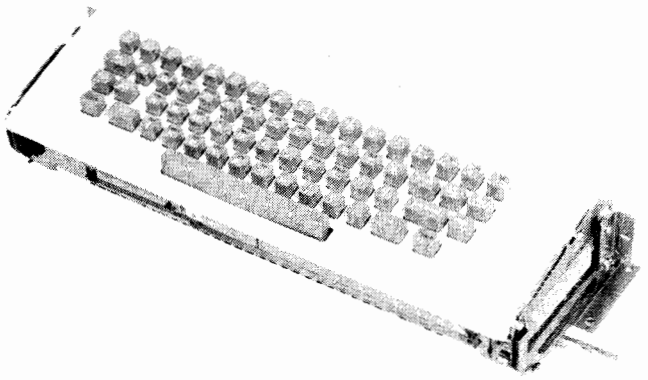


Figure 3 - Keyboard

(b) Horizontal Tabulation — This feature is a fixed tabulator stop type. The fixed stops are set by a technician to customer specifications.

(c) Vertical Tabulation — This feature is a fixed tabulator stop type. The fixed stops are set by a technician to customer specifications.

(d) Horizontal Tabulation Stop Control — This is an on-line feature used to set and clear tabulation stops in the typing unit horizontal tabulation mechanism. The characters ESC 1 are used to set tabulator stops and the characters ESC 2 are used to clear the stops.

(e) Vertical Tabulation Stop Control — This is an on-line feature used to set and clear the tabulation stops in the typing unit vertical tabulation mechanism. The characters ESC 5 are used to set the tabulator stops and the characters ESC 6 are used to clear the stops.

B. Keyboard

2.11 A standard 4-row keyboard configuration (Figure 3) is used. The keytop arrangement is consistent with a standard office typewriter (Figure 4).

2.12 The keyboard is an electromechanical device for generating ASCII code combinations. It converts the mechanical depression

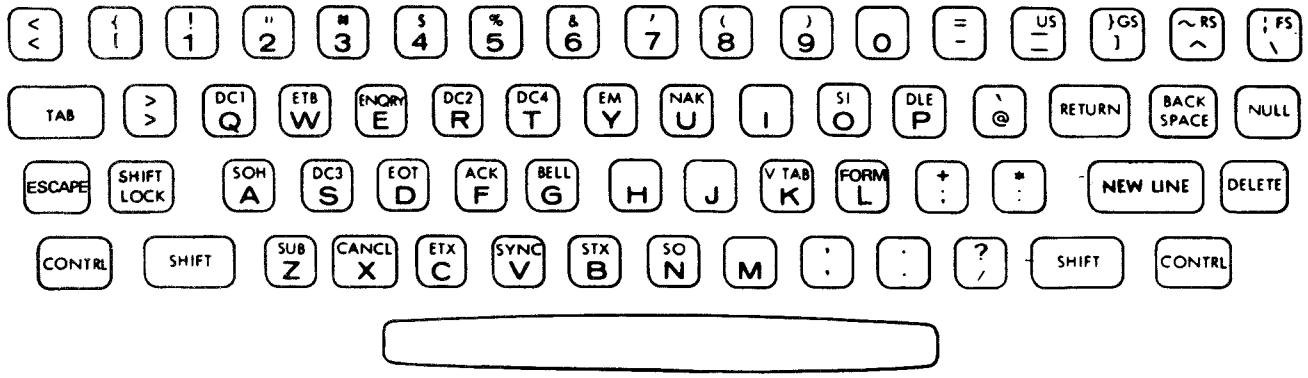


Figure 4 - Keyboard Arrangement

of a key into electrical code paths. Keys move codebars which control electrical contacts. The electrical contacts present an even vertical parity parallel wire output to a keyboard control logic card in the electrical service unit which converts the signals into ASCII.

2.13 It is possible to generate all 128 code combinations of ASCII. Upper and lower case alpha characters, numerics, and special graphic characters are designated on the keytops. Control characters are designated on the keyboard in two ways. The most often used controls appear on separate keys and are active in both the shifted and unshifted modes without use of the CONTRL key. Another group of controls appear on the same keytop with a graphic. To generate these code combinations, it is necessary to depress the CONTRL key while the particular key is struck. All control character designations requiring the depression of the CONTRL key, as well as the individual key, appear on the keyboard in charcoal grey.

2.14 A repeat feature is provided on each key generating a character. Further depression of the key beyond its normal stop position will cause the associated character to be generated repetitively at the maximum character rate. The repeat feature can be enabled or disabled by a technician.

C. Base

2.15 The base provides mounting facilities for the typing unit, motor unit, and intermediate gear assembly. Holes are also provided on the base for mounting the keyboard reset mechanism and margin indicator switch.

D. Control Panel

2.16 The control panel (Figure 5) which is located above the keyboard contains a number of nonlocking pushbuttons (keys). In addition, there are two mechanical pushbuttons (keys) designated PAPER ADVANCE and LOCAL RETURN. The three different arrangements available to meet varying applications are shown in Figure 5. Functional descriptions of the different controls, and the locations of controls within each arrangement, are given in Table A.

E. Motor Unit

2.17 The function of the motor is to provide electromechanical rotating motion for operating the typing unit and keyboard reset mechanism.

2.18 The motor is a synchronous-type, rated at 1/20 horsepower, and is operated from a 117 volt $\pm 10\%$ ac, single phase, 60 hertz $\pm 0.75\%$ source of commercial power. It consists of a 2-pole wound stator with two windings (a main running winding and a start winding), and a ball bearing rotor. The start winding is in series with a start relay, capacitor, and thermal cutout switch which are mounted in a compartment of the motor mounting cradle.

F. Typing Unit Cover and Pan

2.19 The typing unit cover and pan includes copylights and provides the housing for the typing unit, keyboard and base, motor, and control panel. The cover and pan with assembled components normally mounts onto a table.

ARRANGEMENT 1

READER AUTO	KBD LOCAL	PRINTER LOCAL	READER LOCAL	PUNCH LOCAL	PUNCH ON	PAPER ADVANCE

(Left-Side Pushbuttons)

LOCAL RETURN	INTRPT	PROCEED	HERE IS	K8D EOL	ALARM	PTR EOL

(Right-Side Pushbuttons)

ARRANGEMENT 2

INTRPT	PROCEED		HERE IS		READER AUTO	PAPER ADVANCE

(Left-Side Pushbuttons)

LOCAL RETURN		OUT OF SERVICE	ERROR	K8D EOL	PAPER ALARM	PTR EOL

(Right-Side Pushbuttons)

KBD LOCAL	PRINTER LOCAL	READER LOCAL	PUNCH LOCAL	PUNCH ON	

(Center Pushbuttons)

ARRANGEMENT 3

PUNCH ON	PUNCH LOCAL	READER LOCAL	PRINTER LOCAL	KBD LOCAL		PAPER ADVANCE

(Left-Side Pushbuttons)

LOCAL RETURN	INTRPT	HERE IS	PROCEED	K8D EOL	PAPER ALARM	PTR EOL

(Right-Side Pushbuttons)

Note: Center pushbuttons are not used in arrangements 1 and 3.

Figure 5 - Control Panel Arrangements

TABLE A

CONTROLS DESCRIPTION

CONTROL (Figure 5)	ARRANGE-MENT NO.	EQUIPPED WITH		DESCRIPTION
		KEY	LAMP	
READER AUTO	1, 2	YES	YES	When this key is depressed and lamp is on, the reader may be controlled by certain control characters. Reader and typing unit must both be on-line, or off-line when key is depressed and Data Set Ready lead must be turned on. If any of these conditions are not met the lamp extinguishes.
KBD LOCAL	1, 2, 3	YES	YES	When lamp is on, keyboard is in local mode. When lamp is off, keyboard is on-line. Operation of the switch transfers the mode.

TABLE A

CONTROLS DESCRIPTION (continued)

CONTROL (Figure 5)	ARRANGEMENT NO.	EQUIPPED WITH		DESCRIPTION
		KEY	LAMP	
PRINTER LOCAL	1, 2, 3	YES	YES	When lamp is on, typing unit is in local mode. When lamp is off, typing unit is on-line. Depressing the switch transfers the mode.
READER LOCAL	1, 2, 3	YES	YES	When lamp is on, reader is in local mode. When lamp is off, the reader is on-line.
PUNCH LOCAL	1, 2	YES	YES	When this key is depressed the lamp lights and the reperforator is enabled for local operation. When reperforator is on-line, lamp is extinguished. Reperforator can receive signals from transmitting devices which are in the same mode if PUNCH ON lamp is on. Operation of the switch transfers the mode.
PUNCH ON	1, 2, 3	YES	YES	The reperforator is unblinded when this lamp is on. Operation of this switch, or detection of control characters unblind the punch.
PAPER ADVANCE	1, 2, 3	YES	NO	When this key is held depressed the typing unit feeds out paper until the key is released. This key has no effect on line signals.
LOCAL RETURN	1, 2, 3	YES	NO	When this key is momentarily depressed it causes the local typing unit typebox carriage to return for starting a new line. This key has no effect on line signals.
INTRPT	1, 2, 3	YES	NO	When key is momentarily depressed, it causes a timed spacing signal (BREAK) to be sent to the line. It has no effect on sending set.

TABLE A

CONTROLS DESCRIPTION (continued)

CONTROL (Figure 5)	ARRANGEMENT NO.	EQUIPPED WITH		DESCRIPTION
		KEY	LAMP	
PROCEED	1, 2, 3	YES	YES	When this key is depressed, the lamp lights and transmission from the keyboard is enabled. The lamp will light when the Clear to Send (CB) lead is on, or optionally after receipt of ACK character. The lamp will extinguish on receipt of NAK character or interrupt signal. If extinguished by NAK character, ACK or manual operation of the PROCEED key will relight the lamp. If extinguished because an interrupt has been received only operation of the PROCEED key will relight this lamp. The lamp is extinguished at the end of the call.
HERE IS	1, 2, 3	YES	NO	When key is momentarily depressed, it activates the set answer-back causing a stored series of up to 20 characters, such as set identification, to be transmitted.
KBD EOL	1, 2, 3	NO	YES	This lamp lights when the electronic character counter reaches its preselected count. Operation of the return extinguishes the lamp.
ALARM	1	YES	YES	When this lamp is on it indicates a paper-low condition or a parity error. Operation of switch clears a parity error alarm, but only replacing the paper will extinguish the lamp for a low-paper alarm.
PTR EOL	1, 2, 3	NO	YES	This lamp lights when the typing unit typebox reaches a preset position.
PAPER ALARM	2, 3	NO	YES	Lamp lights when paper is out. Replenishing paper moves signal and extinguishes lamp.
OUT OF SERVICE	2	YES	YES	When this lamp is on, the set will not respond to a data call. Operation of the switch extinguishes the lamp.
ERROR	2	YES	YES	Lamp lights when a parity error is received. Operation of the switch extinguishes the lamp.

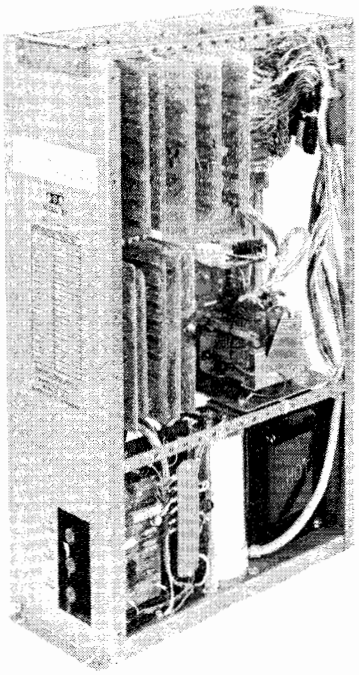


Figure 6 - Electrical Service Unit

2.20 The cover is hinged to the pan and can be easily removed, or it may be raised and extended over interior components while maintenance is being performed.

2.21 Two lids at the top of the cover provide access to the typing unit for ribbon changing, replenishing paper supply, and adjusting print hammer for multiple copy, etc.

G. Table

2.22 The table provides a mounting surface for the typing unit cover and pan and the other components which the cover and pan houses. In addition, a compartment of the table provides facilities for mounting the electrical service unit including the utility strip. The ac power for the set components is obtained from the utility strip when its ac power cord is plugged into a commercial source of power.

2.23 Three optionally available tables may be obtained: A double-compartment table and two single-compartment tables which differ primarily in overall depth dimension (Figure 11).

H. Electrical Service Unit

2.24 The electrical service unit (Figure 6) consists of a chassis assembly and a utility strip which mount into the lower part of the knee well of the table. The chassis assembly has a multivoltage power supply, a wiring field, and is equipped with eleven card connectors. A set of circuit cards selected for a given operable arrangement provides the logical operations for the set (Table B). The cards mount into the card connectors.

2.25 Wiring from the card connectors terminates at the wiring field which provides a centralized wiring location for the set. A cable assembly with several plugs also terminates at the wiring field. The plugs connect to the typing unit, keyboard and base, control panel, and copylights, etc. An interface connector provides a signal interchange point which conforms with the EIA RS-232B standard.

2.26 A power cord from the chassis assembly plugs into one of the six ac power receptacles of the utility strip. The ac power for the set is provided over a single ac power cord which terminates at one of the two utility strip terminal boards, and is controlled by a circuit breaker.

2.27 A bell assembly, copylight transformer, and motor control relay are also a part of the utility strip and derive their power from the multivoltage power supply in the chassis through a second utility strip terminal board.

2.28 The multivoltage power supply converts ac power into appropriate dc power which is used for internal set operation, ie, the solenoids, lamp driver amplifiers, motor control relay, bell, integrated and discrete semiconductor circuits, etc.

TABLE B

CIRCUIT CARD SETS

Cards in Keyboard Send-Receive Unit	Quantity
Mode Control (100 wpm or 150 wpm)	1
Receive Device Control	1
Receive Control	1
Alarms (or alarms and automatic control)	1
Keyboard Control	1
Distributor	2
Character Counter	1
Send Control	1
Channel Control	1
Cards in RT Module	**Quantity**
Receive Device Control	1
Reader Driver	1

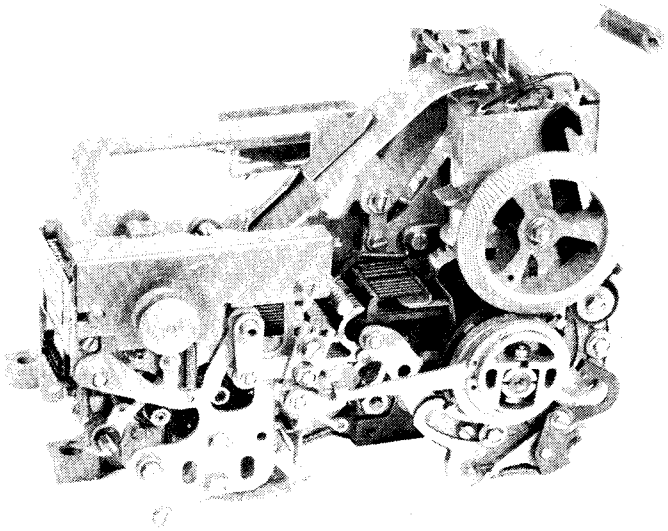


Figure 7 - Reperforator Unit

REPERFORATOR-TRANSMITTER MODULE COMPONENTS

A. Reperforator Unit

2.29 The reperforator unit (Figure 7) is an electromechanical device that converts data received serially into corresponding perforations in tape. It uses a single magnet selector similar to that used in the typing unit (2.04).

2.30 The unit is a nontyping reperforator that provides fully-perforated tape. It is equipped with a manual interfering tape feed-out mechanism to simplify tape loading. The reperforator unit also includes a power backspace mechanism which may be operated locally or on-line. This device permits backspacing tape to eliminate erroneous data by overpunching with delete characters.

B. Reader Unit

2.31 The reader unit (Figure 8) is an electromechanical device used to convert perforations in tape into corresponding parallel electrical data.

2.32 The reader is equipped with a manual control lever, tight-tape and tape-out alarm sensors, and the reader step feature. The control lever has three positions: RUN (operating position); STOP (off position); and FREE (tape threading position).

C. Electrical Service Unit

2.33 The electrical service unit used in the RT module contains a wiring field and circuit cards required to control the reperforator and the reader units (Table B), interconnecting control and power cables, and a control panel.

2.34 The control panel (Figure 9) provides six pushbutton and indicator lamp positions for operating the reperforator and reader units (Table C).

D. Motor Units

2.35 The RT module includes two motor units. One is used to drive the reperforator and is identical to the typing unit motor unit (2.17). The reader unit is driven by a synchronous-type motor developing 1/50 hp and operating at a speed of 1800 rpm.

E. Tape Module Cabinet

2.36 The tape module cabinet provides mounting and operating facilities for the reperforator unit, reader unit, electrical service unit, motor units and bases. It includes a hinged cover with a clear window for access to the reperforator unit and tape supply container. A chad disposal tube is provided for holding punched chad.

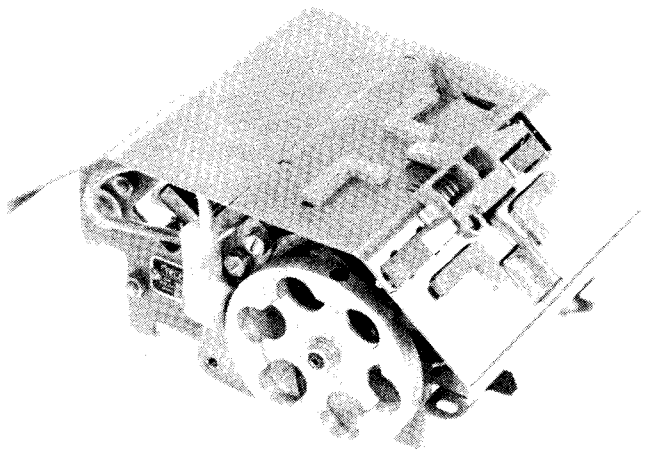


Figure 8 - Reader Unit

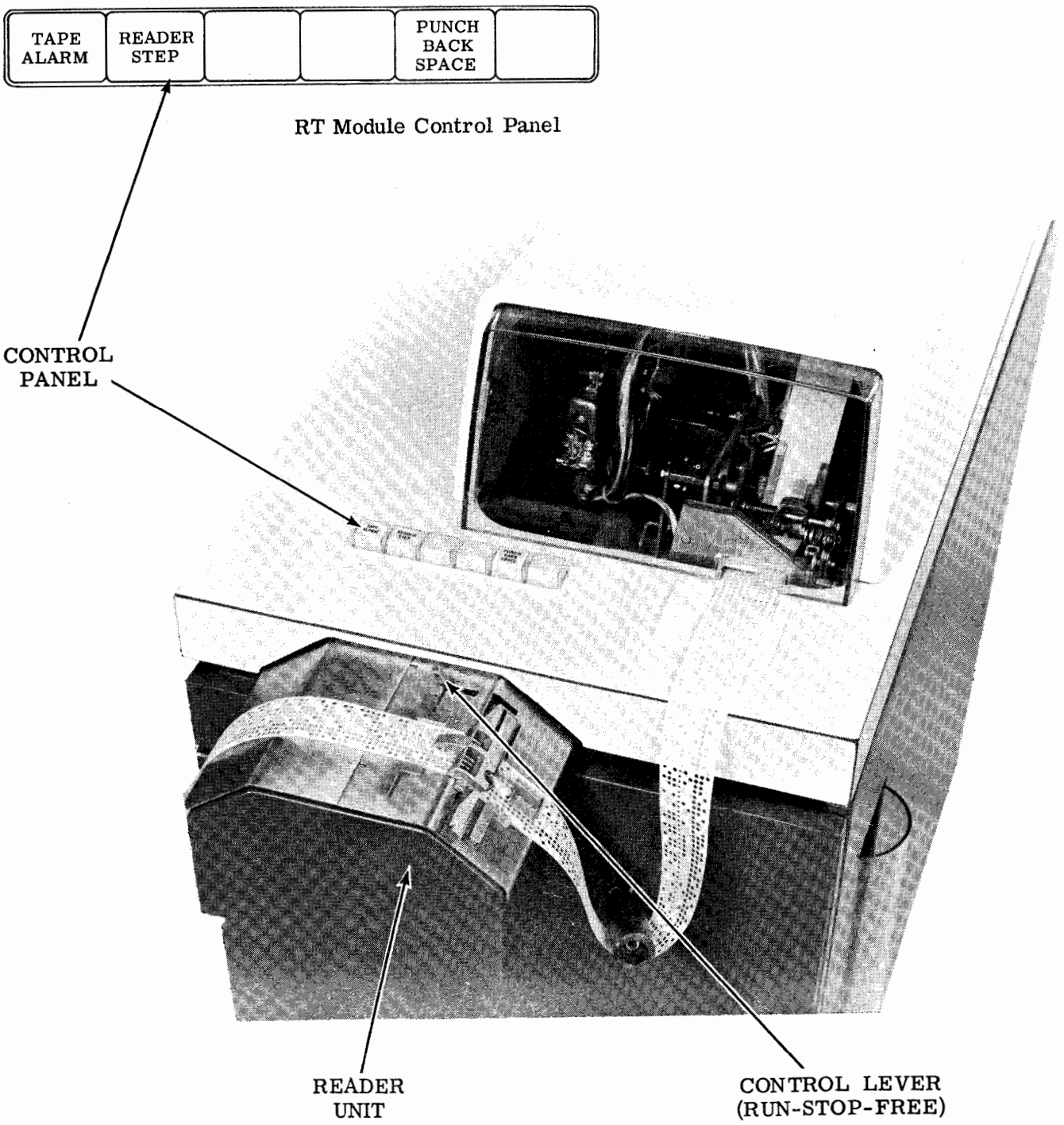


Figure 9 - RT Module Controls

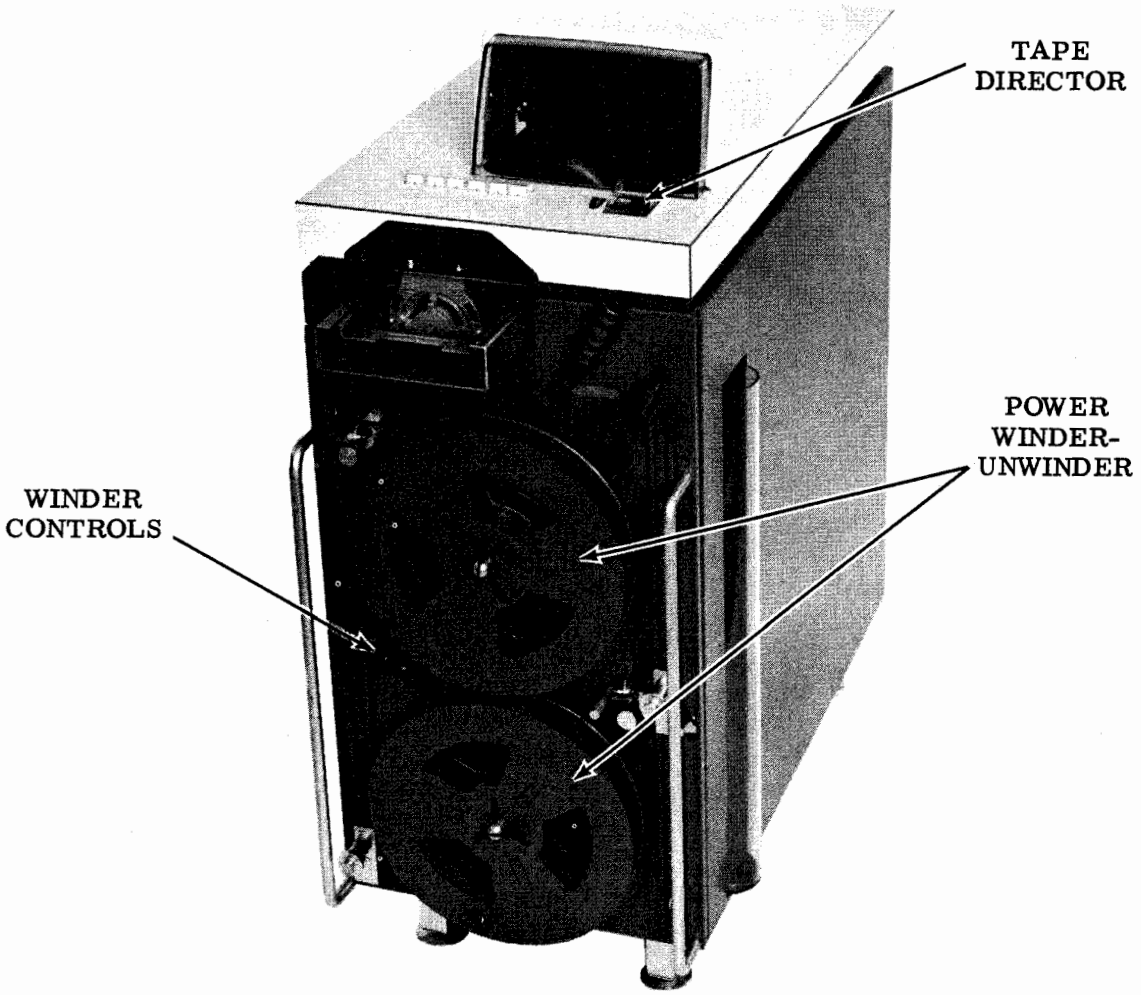


Figure 10 - Tape Handling Accessories

2.37 A reader base is fastened to a mounting bracket in the cabinet with vibration mounts. A toothed belt and pulley are used in conjunction with the motor unit to drive the reader unit.

2.38 The cabinet includes a reperforator base and a mounting plate for installing the reperforator unit and motor unit. A tape supply container with an 8 inch diameter supply reel, a low-tape alarm switch, and connecting cable are included with the reperforator base.

2.39 The cabinet door encloses the electrical service unit compartment. The door may be optionally equipped with either one power tape winder or a combination of a winder and unwinder. A switch is provided on the door to control the tape winders (Figure 10).

ACCESSORIES

A. Answer-Back Assembly

2.40 The answer-back assembly provides for automatically transmitting a maximum of 20 characters for set identification. The assembly consists of a mechanical mechanism, an electronic circuit, and a mounting arrangement.

2.41 The mechanical mechanism (answer-back unit) has a magnet assembly which, each time it is pulsed and released, moves a 20-character codeable drum. Contact wires ride tines of the drum. The electronic circuit (answer-back driver card) drives the magnet and provides read-out for the contacts.

TABLE C

RT MODULE CONTROLS

CONTROL	DESCRIPTION
TAPE ALARM	This indicator lights whenever the tape in the nontyping reperforator is tight, twisted, bunched, or out; it will also light if the reader tape is out or tight.
READER STEP	This key advances the tape through the reader unit one character each time the key is depressed.
PUNCH BACKSPACE	This key backspaces the tape in the reperforator one character each time the key is depressed.
RUN-STOP-FREE	This control lever on the reader unit permits normal operation of the unit in the RUN position and turn-off in the STOP position. In the FREE position, the feed wheel is free and tape may be pulled through the unit without opening the tape lid. When the automatic reader start feature is activated, transmission can occur with the control lever in the RUN or STOP position, but not in the FREE position.

B. Paper Handling Accessories

2.42 A number of paper handling accessories are available for sets with sprocket feed typing units. Modification kits are available for either front or rear loading of a standard box of paper forms. Front loading of forms can be used for forms up to 14 inches in length. Forms 14 to 15 inches long can be loaded from the rear of the table. A form accumulator is also available as an accessory if desired.

C. Tape Handling Accessories

2.43 The tape module may be equipped with a power winder or winder-unwinder combination (Figure 10). These devices operate at speeds of up to 1200 wpm and have a 1000 foot tape capacity. Separate control switches are provided. The single reel winder and the top of the dual winders is used for reader tape winding. The lower winder is used to wind tape from the reperforator. With both winders available, the lower winder can provide fast reel to reel rewinding or power unwinding from a message reel to the reader unit.

2.44 An optional 50 foot capacity tape storage bin and tape director is also available for use with the RT module.

3. TECHNICAL DATA

3.01 Electrical and Environmental Characteristics

(a) Power ..... 117 volts ac + 10%, 60 Hz ± 0.45 Hz, 15 ampere fused circuits, single phase (3-wire)

(b) Ambient temperature .... From 40° F to 110° F

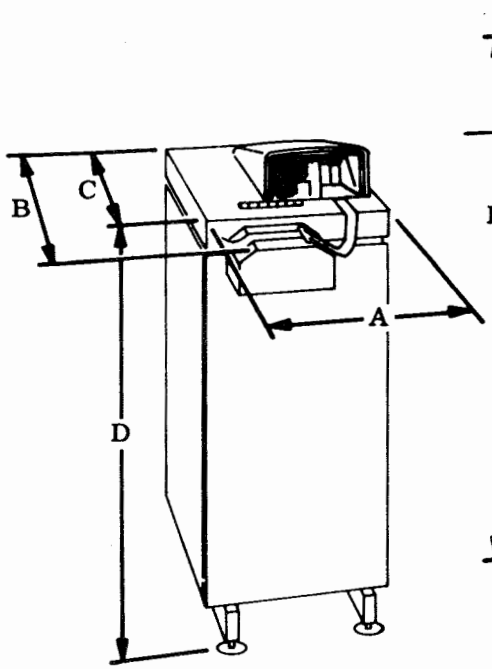
(c) Ambient relative humidity ..... From 0 to 95 percent

(d) Power consumption ..... 550 watts

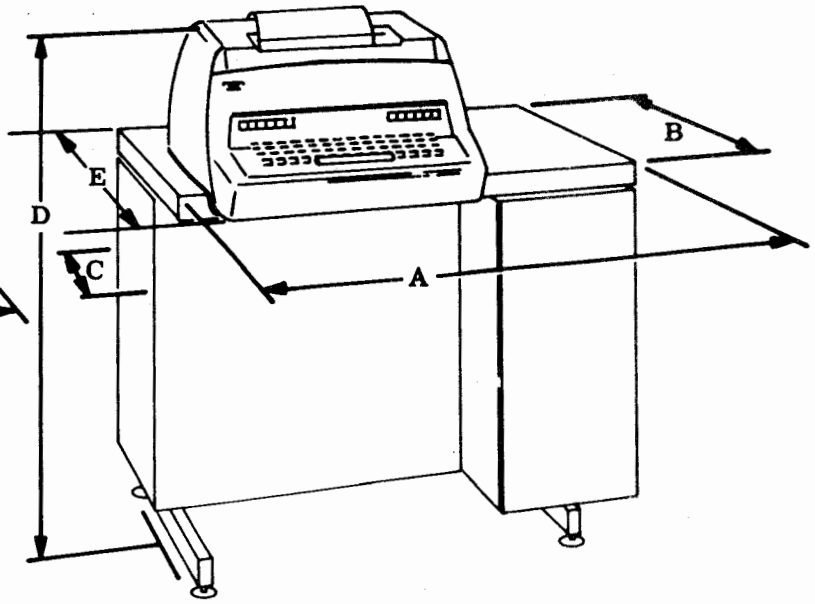
3.02 Physical Characteristics

(a) Dimensions ..... See Figure 11

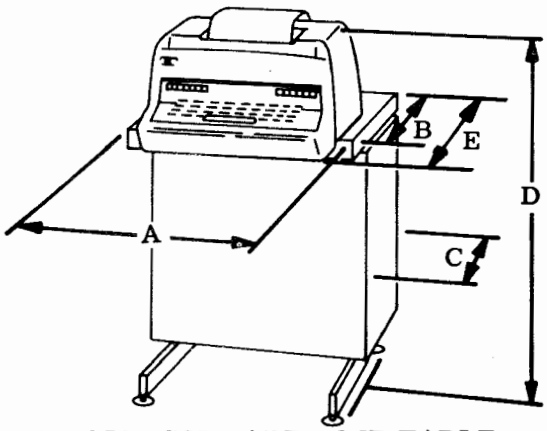
(b) Weight ..... 325 pounds



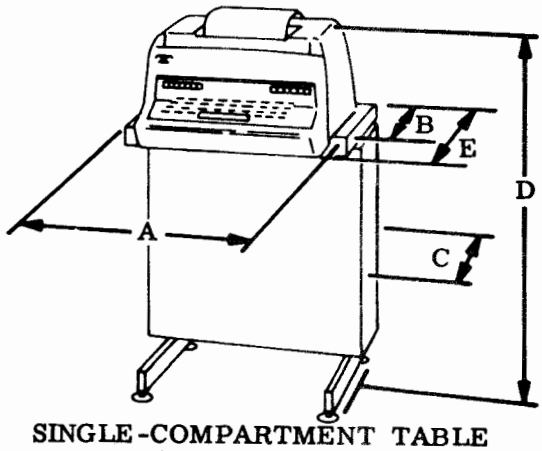
RT MODULE CABINET



TWO-COMPARTMENT TABLE



SINGLE-COMPARTMENT TABLE
(Standard Depth)



SINGLE-COMPARTMENT TABLE
(Narrow Depth)

DIMENSION	RT MODULE (INCHES)	TWO-COMPARTMENT (INCHES)	SINGLE-COMPARTMENT (STD DEPTH) (INCHES)	SINGLE-COMPARTMENT (NARROW DEPTH) (INCHES)
A	22	32-1/2	22-1/2	22-1/2
B	23-25/32	27-3/4	27-3/4	21-1/2
C	19-19/32	14-1/2	14-1/2	8-5/8
D	26-1/2	36	36	36
E	-	31-3/4	31-3/4	24-3/4

Figure 11 - 37 ASR Set Dimensions

(c) Power cord

Purpose . . . . . Provides ac power for entire set

Type . . . . Single 3-pin polarized cord

Length . . . 8 feet from back of cabinet

Note: A similar cable supplies power to the RT module.

(d) Intercabinet cable

Purpose . . . . . Interconnects set logic

Length . . . . . 4 feet

(e) Interface cord

Purpose . . . . . Provides the Electronic Industries Association (EIA) interface

Type . . . . . 25-conductor plug

Length . . . . . 6 feet

3.03 Set Internal Power Supply

(a) Multivoltage power supply

Output voltages . . Nominal + 12.5 volts 7 amperes
Nominal - 12.5 volts 3 amperes
Nominal + 5.25 volts 3 amperes
12 volts ac

(b) Utility Strip

Output voltages . . . . . 115 volts ac
5.5 volts ac (for copylights)

4. OPERATION

GENERAL

4.01 The operation of the set is described in terms of the interface leads controlling both the sending and receiving devices and the communications channel (Figure 12).

4.02 As an example of a switched network application, the description of establishing and terminating a call applies to a set operating with telephone facilities.

PERIPHERAL INTERFACE

4.03 The following four leads (Figure 12) are used by the ASR set logic to prepare the set to receive data.

(1) Receiver Selectable: This is an indication from the typing unit or reperforator to set logic that the receiving device is selectable, ie, there is no condition, such as paper-out, which disqualifies it to receive a message. A receiver not selectable indication is an alarm condition which will cause a call already in progress to be disconnected.

(2) Receive Message: This is a command from set logic to the receiving device to prepare for receiving a message. This would include, for example, starting the typing unit motor.

(3) Receiver Ready: This is an indication by a selectable receiver, in response to Receive Message, that operations preliminary to receiving have been performed. For example, if the typing unit motor was started on receipt of Receive Message, Receiver Ready would be indicated when the motor reached operating speed.

(4) Receiver Serial Data: The serial data on this lead is at set logic voltage and current levels. Logic zero is a space and logic one is a mark.

4.04 The following 13 leads (Figure 12) are used by the ASR set logic to prepare the set to transmit data:

(1) Message Available: This is an indication by the transmitting device to set logic that it is ready to send a message. Once the set logic has responded, this indication is binding on the set.

(2) Send Message: This lead is used by set logic to acknowledge Message Available. It starts any preliminary operations required to prepare the set to transmit data.

(3) Sender Ready: This lead is used by the transmitting device to acknowledge Send Message and to indicate that preliminary transmitting operations have been completed and that the set is ready to produce a character.

(4) Present Character: This signal to the transmitting device acknowledges Sender Ready and directs the transmitter to place a character on the parallel signal buss input to set logic.

(5) Character Available: This signal to set logic acknowledges Present Character and indicates the transmitter is displaying a character on the parallel signal input to set logic. The character output must be sampled within the operation of this lead by the transmitter.

(6) Parallel Data: This is a set of eight leads on which characters are bussed in parallel from the transmitting device to the transmitter distributor for serialization.

CHANNEL INTERFACE

4.05 The channel interface signals conform to EIA Specification RS-232B and are listed, along with the name, purpose, and pin number of each lead, in Table D. The leads which have designations beginning with A are ground leads. Interface leads which have designations beginning with B are data leads. Interface leads which have designations beginning with C are control leads.

4.06 The data leads are positive (+) or high for spacing signals and negative (-) or low for marking signals. A positive (high) voltage on a control lead means it is on, and a negative (low) voltage means it is off.

LOCAL OPERATION

A. Device Selection

4.07 The particular transmitting or receiving device to be used in local operation is selected by depressing the corresponding button on the control panel (Tables A and C). The selected pushbutton lamp will light to indicate the selection of local operation.

4.08 The reperforator unit has two controls: PUNCH LOCAL and PUNCH ON. For local operation, PUNCH ON must be lighted to enable the reperforator to receive data.

B. Motor Control

4.09 The typing unit, reader unit, and reperforator unit motors are started by selection of PRINTER LOCAL, READER LOCAL, and PUNCH LOCAL, respectively.

C. Message Exchange

4.10 The transmitting device selected presents Message Available to the send control logic. If the send control can obtain sending priority, it generates a Send Message response.

4.11 When the transmitting device is properly conditioned, it initiates a Send Ready signal. At this time, provided no tabbing is in process and the local transmitting distributor is conditioned, the send control turns on the Present Character lead.

4.12 The transmitting device responds with Character Available. This results in serialization of the data in the local transmitter distributor.

4.13 At the selected receiving device, no alarm condition exists and Receiver Selectable was initiated. The receive control logic initiates the Receive Message command. When it is ready, the properly conditioned receiving device responds with Receiver Ready. With Receiver Ready on, the selected receiving device can receive the serial data from the local transmitting distributor.

LINE OPERATION

A. Device Selection

4.14 Transmitting and receiving devices to be placed on-line are selected by depressing the corresponding pushbutton on the control panel. A nonlighted pushbutton indication means line operation has been selected.

4.15 The typing unit must be selected (PRINTER LOCAL) for line operation if a call is to be established. Once the call is established, the typing unit can be switched to local operation.

4.16 The PUNCH ON lamp must be on to enable the reperforator unit.

4.17 The READER AUTO pushbutton (lighted when depressed) permits on-line control of the reader unit by a remote station sending DC 1 (reader on) and DC 3 (reader off).

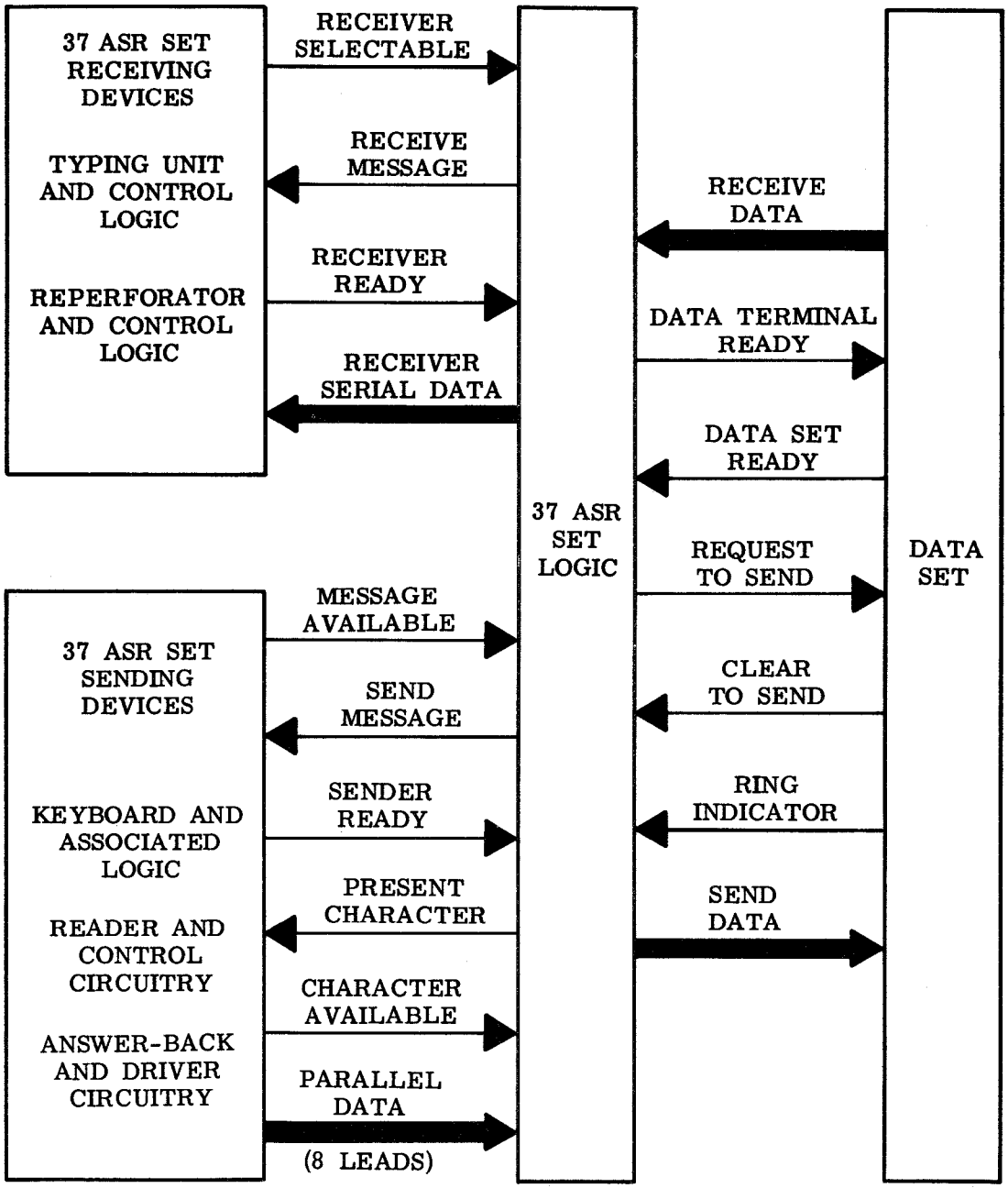


Figure 12 - 37 ASR Set Peripheral and Channel Interface

TABLE D

EIA INTERFACE LEADS

DESIGNATION	NAME	PIN NO.	PURPOSE
AA	Protective Ground	1	To connect ac power service ground to equipment chassis. It is electrically isolated from signal ground.
AB	Signal Ground	7	To provide ground for all signal circuits.
BA	Transmitted Data	2	To carry set output data when the set is in the on-line mode and to remain "marking" when set is in the off-line (local) mode. Note: When equipped with an INTRPT key, this lead will carry a timed "spacing" signal of nominally 500 ms duration each time the key is operated.
BB	Received Data	3	To present incoming data to the set when the set is in the on-line mode. Note: If this lead is grounded at the interface, the set will act as if it were in the "marking" condition.
CA	Request to Send	4	To condition local line interface unit to transmit. This lead is connected permanently on by a strap in the set.
CB	Clear to Send	5	To inform set that local data set is ready to transmit any data presented on BA lead. Note: This lead controls power to the PROCEED lamp and the starting of the answerback if so equipped.
CC	Data Set Ready	6	To inform the set that local data set is connected to the transmission facility. Note: When this lead is on, it causes set motors to start running.
CD	Data Terminal Ready	20	To inform data set that the set is ready to receive data messages. Note: The set is prepared to receive when: (a) No alarms are present. (b) Set is not in "do not answer" mode, ie, OUT OF SERVICE key not operated. (c) Typing unit is on-line.

4.18 Automatic on-line control of the reperforator is provided by a remote station sending DC 2 (reperforator on) and DC 4 (reperforator off).

B. Channel Establishment

4.19 For stations equipped with telephone facilities, a call is placed and a connection between two stations is established before any teletypewriter data is transmitted. To answer the call, the called station must be in service and have no alarm conditions.

4.20 The calling station dials the call station turning on Ring Indicator. This primes the called station answer-back. Since the Data Terminal Ready lead is normally on (no alarms present), Data Set Ready turns on. This results in Clear to Send turning on and an indication that the connection is established.

C. Message Exchange

4.21 With Clear to Send on, messages may be exchanged when the PROCEED lamp lights. This is done automatically on receipt of the ACK character or manually by depressing the PROCEED pushbutton on the control panel.

4.22 Data transmission can be stopped on receipt of the NAK character (on sets equipped with this feature) or by an interrupt signal. The PROCEED pushbutton must be depressed to complete the message.

4.23 Data is exchanged between the transmitting and receiving sets at different stations using the line transmitter distributors for serialization.

4.24 The data exchange is a half-duplex operation, ie, the transmitted data is copied by the sending station. For sets so equipped, the on-line full-duplex mode of operation may be used to permit simultaneous two-way message exchange.

CHANNEL TERMINATION

4.25 A call may be terminated (PROCEED lamp and motors turn off) by either station using one of these methods: sending EOT or turning off either Data Set Ready or Data Terminal Ready.

SIMULTANEOUS LOCAL-LINE OPERATION

4.26 The set can be used in the local and line modes of operation simultaneously. As an example, the reperforator unit and keyboard may be switched to local and messages processed locally (keyboard to reperforator) and on-line (reader and typing unit).

5. REFERENCES

5.01 The following publications pertain to the 37 ASR Set:

TITLE	NUMBER
ASR SET	
General Description and Operation	574-302-100TC
Installation	574-302-200TC
Troubleshooting	574-302-300TC
Removal and Replacement of Components	574-302-702TC
MOTOR UNIT	
Description and Principles of Operation	570-220-100TC
Adjustments	570-220-700TC
Lubrication	570-220-701TC
Disassembly and Reassembly	570-220-702TC
TYPING UNIT	
Description and Principles of Operation	574-320-100TC
Adjustments	574-320-703TC
Lubrication	574-320-704TC
Disassembly and Reassembly	574-320-705TC
KEYBOARD AND BASE ASSEMBLY	
Description and Principles of Operation	574-321-101TC
Adjustments	574-321-703TC
Lubrication	574-321-704TC
Disassembly and Reassembly	574-321-705TC
ELECTRICAL SERVICE UNIT	
Description and Operation	574-322-101TC

TITLE	NUMBER
TABLE	
Description and Operation	574-323-101TC
Adjustments	574-323-703TC
ANSWER-BACK UNIT (Early Design)	
Description and Principles of Operation	574-325-100TC
Adjustments	574-325-700TC
Lubrication	574-325-701TC
ANSWER-BACK UNIT (Late Design)	
Description and Principles of Operation	574-325-101TC
Adjustments	574-325-703TC
Lubrication	574-325-704TC
TYPING UNIT COVER AND PAN	
Description and Operation	574-326-101TC
Adjustments	574-326-703TC
Lubrication	574-326-704TC
NONTYPING REPERFORATOR	
Description and Principles of Operation	574-329-100TC
Adjustments	574-329-700TC
Lubrication	574-329-701TC
Disassembly and Reassembly	574-329-702TC
TAPE READER	
Description and Principles of Operation	592-801-100TC
Adjustments	592-801-700TC
Lubrication	592-801-701TC
Disassembly and Reassembly	592-801-702TC
RT MODULE CABINET	
Description and Operation	574-327-100TC
Adjustments	574-327-700TC
Lubrication	574-327-701TC
Disassembly and Reassembly	574-327-702TC

37 AUTOMATIC SEND-RECEIVE (ASR)

TELETYPEWRITER SET

INSTALLATION

CONTENTS

		PAGE
1.	GENERAL	1
2.	UNPACKING	2
3.	LUBRICATION	3
4.	ASSEMBLY PROCEDURE	7
	REPERFORATOR-TRANSMITTER MODULE	7
	KEYBOARD AND COVER ASSEMBLY	9
	A. Base Mobilization	9
	B. Cable Routing	10
	TYPING UNIT	10
	A. Mounting on Base	10
	B. Interrelated Adjustments	10
	C. Cable Connection	13
	D. Ribbon Routing	17
	E. Cover Replacement	18
	F. Paper Assembly and Routing	18
	ELECTRICAL SERVICE UNIT AND UTILITY STRIP	19
	A. Answer-Back Assembly	21
	B. Encoding Answer-Back Drum	24
5.	CHECKOUT	26
	LOCAL AND ON-LINE TESTS	26
6.	INTERFACE UNITS	26

1. GENERAL

1.01 This section provides the installation procedures for the 37 Automatic Send-Receive (ASR) Set. The 37 ASR Set conforms to EIA standard (RS-233-B) for the interface connections. This issue replaces interim special printing of Issue 2.

1.02 The 37 ASR Set consists of a reperforator-transmitter (RT) module and a 37 keyboard send-receive unit (Figure 1). The set can be installed in a floor space 44-1/2 inches wide and 27 inches deep. Maximum height, with the printed cover and RT cabinet lids open, is 46 inches. Space for the operator must be added to the depth dimension.

1.03 Reference directions are based on the normal position of the operator facing the keyboard. Left or right, up or down, and front or rear are referenced with the keyboard in front.

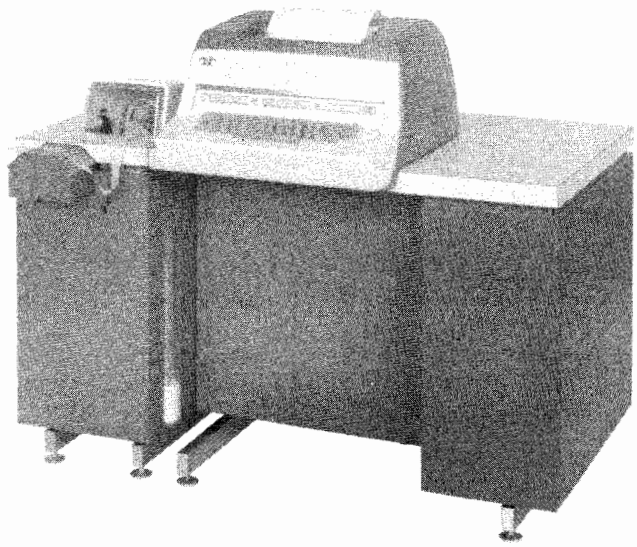


Figure 1 - 37 ASR Teletypewriter Set

1.04 The 37 ASR Set operates under a 3-wire, single-phase 117-volt +10%, 60 Hz ac power source. The ac receptacle must be located within 8 feet of the installation area and be capable of carrying 15 amperes of current.

Note: The ac receptacle should not be under control of a switch.

1.05 Refer to the wiring diagram package packed with the set for information concerning wiring and circuit cards.

2. UNPACKING

2.01 The 37 ASR Set is disassembled and shipped in four separate cartons containing the following major components:

(1) Table with electrical service unit and utility strip.

(2) Reperforator-transmitter module.

(3) Keyboard and cover assembly.

(4) Typing unit.

2.02 Unpack each carton carefully to avoid marring paint finishes or losing small parts. Observe all special unpacking instructions associated with each carton. The table and RT module should be unpacked and prepared first, followed by the components that mount on the table.

2.03 Unpack the table and remove all external packing material. Place the table upright in the assembly area.

Table Access (Figure 2)

2.04 Front panel is removed as follows.

(1) While holding the front panel, push down on the panel latch in the panel slot to unlatch the panel to allow it to move forward.

(2) Release the spring stop safety catch on the underside of the table.

(3) Open the panel and align its top edge with the front edge of the table.

(4) Carefully lift upward and remove panel from its hinges. Place the panel aside until the set is completely assembled.

2.05 To prevent damage to the terminals on the cable connections, do not remove the packing material that protects the connector terminals until the routing is complete as outlined in 4.08.

CAUTION: DO NOT CONNECT AC POWER TO THE SET UNTIL THE INSTALLATION IS COMPLETE AND READY FOR TESTING.

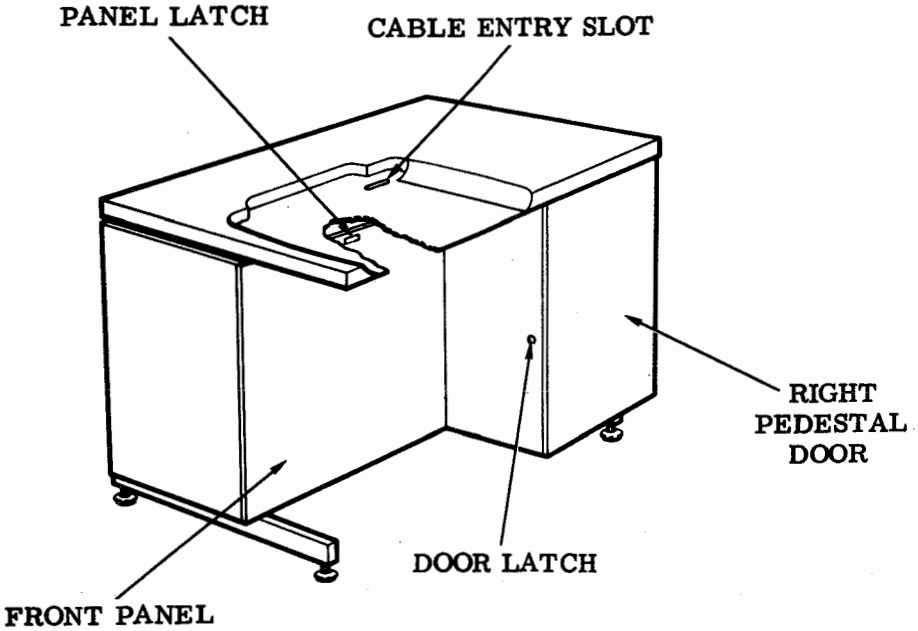


Figure 2 - 37 Teletypewriter Table

Reperforator-Transmitter Module (Figure 3)

2.06 Unpack the RT module by removing the cabinet and all packing material from the carton. Place the RT cabinet in the assembly area. Move the RT cabinet to the left side of the table and route the RT interface plug (P310) and the power cord (Figure 4) through the base of the cabinet and into the opening at the base of the table.

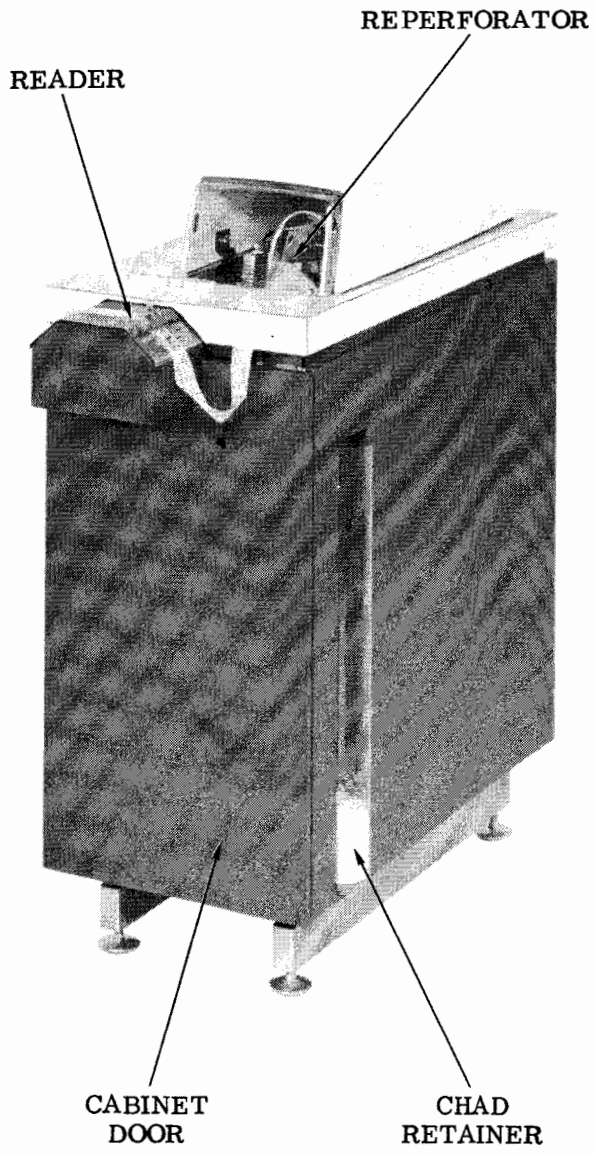


Figure 3 - 37 Reperforator-Transmitter Module

Keyboard and Cover

2.07 Unpack the keyboard and cover assembly which contains the reset mechanism, base, and motor, by opening the top and one side of the carton (Figure 5). Remove all packing materials and slide the assembly out.

CAUTION: DO NOT LIFT ASSEMBLY BY THE KEYBOARD HOUSING.

2.08 Place the assembly in the cutout area on the table top. Open the cover by depressing the two cover latches (one on each side) and lift the front cover upward. Remove the cover from the pan by the following procedure.

(1) Disconnect the cover balancing arm, located on the right side, by sliding the cam to its lowest position and moving the arm to the left.

(2) Pull back on the spring clip located inside lower left corner of the cover and slide the cover to the right until the clip clears the retaining plate.

(3) Slide the cover to the right, disengaging the hinges.

(4) Place the cover aside until the final assembly.

Typing Unit

2.09 Unpack the typing unit (Figure 6) from its carton and remove all packing materials. Remove the shipping pallet from the base. Remove the wire retainer that secures the print hammer assembly. Check the feed pawls and ratchet wheel for packing detail. If detail is present, remove it when moving the print hammer assembly toward the left.

3. LUBRICATION

3.01 Lubricate the typing unit per Section 574-320-701TC and the keyboard unit per Section 574-321-704TC before placing in service. Make visual inspection of the units for general lubrication requirements. Check oil locations on felt washers, oil cups, and in most locations where parts rub or move with respect to each other. Grease should be used on gears, rollers, points of heavy pressure, and some ball bearings.

3.02 General requirements for lubrication areas for the units are as follows.

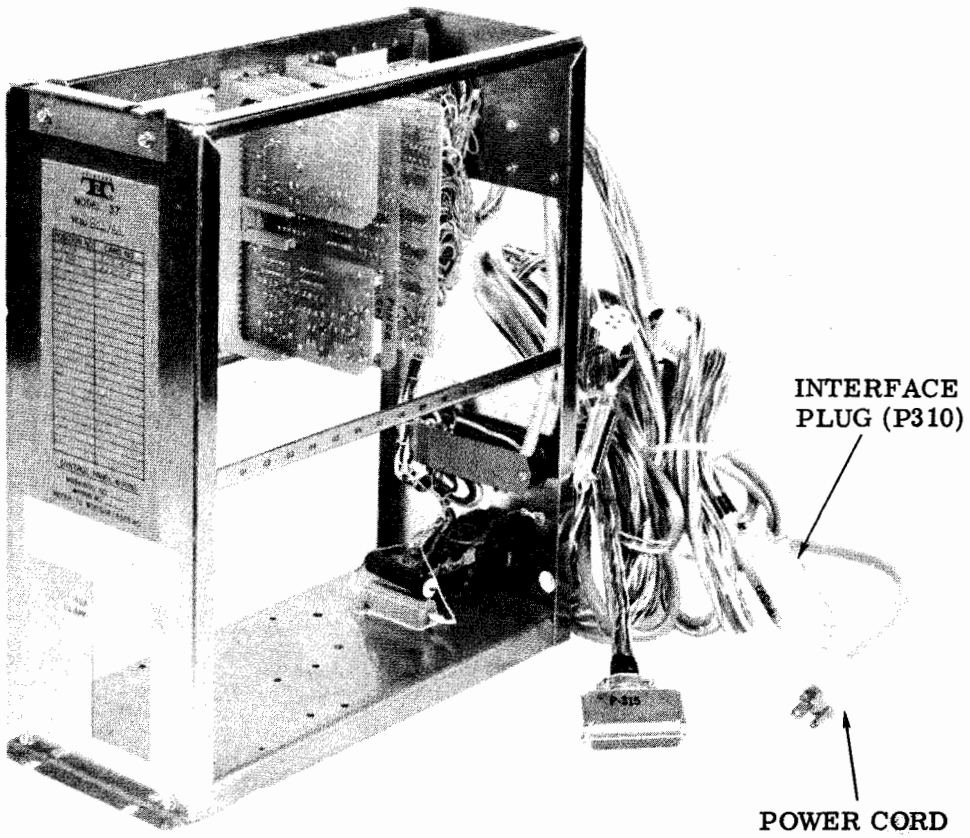


Figure 4 - 37 RT Electrical Service Unit

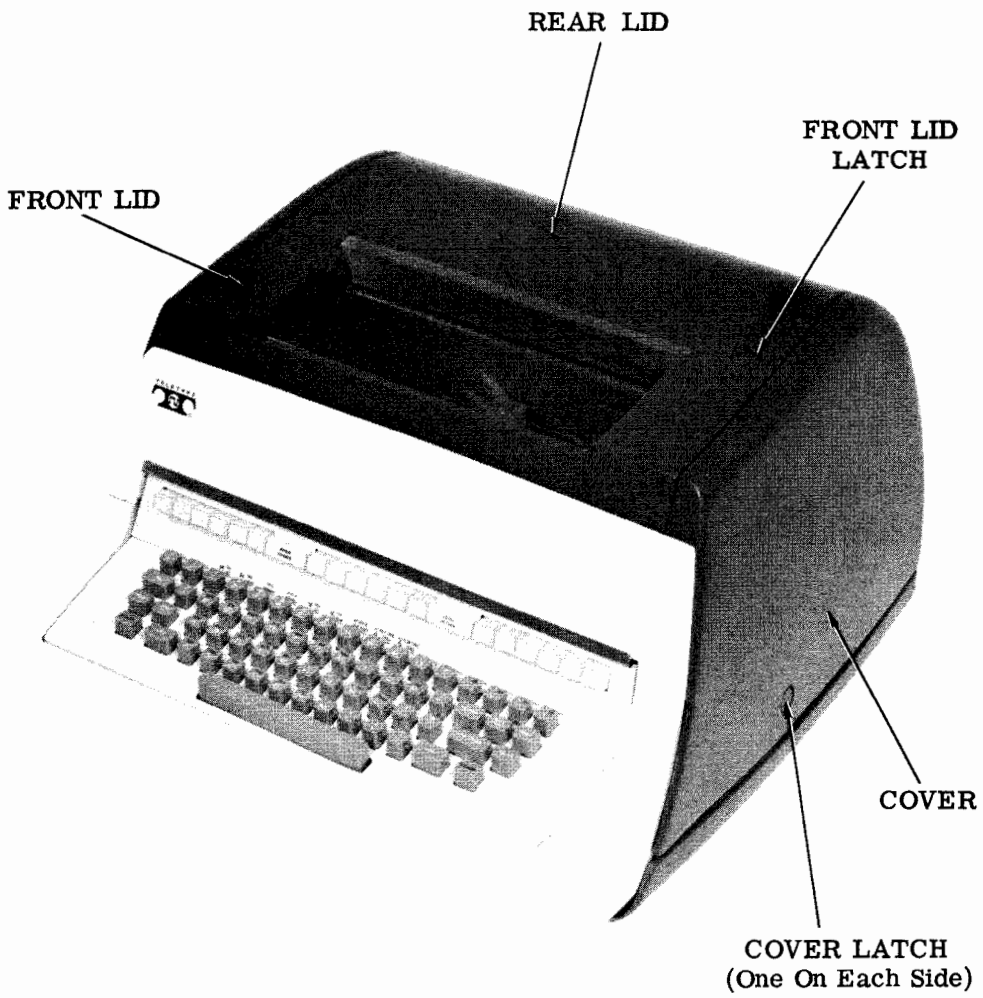


Figure 5 - Keyboard and Cover Assembly

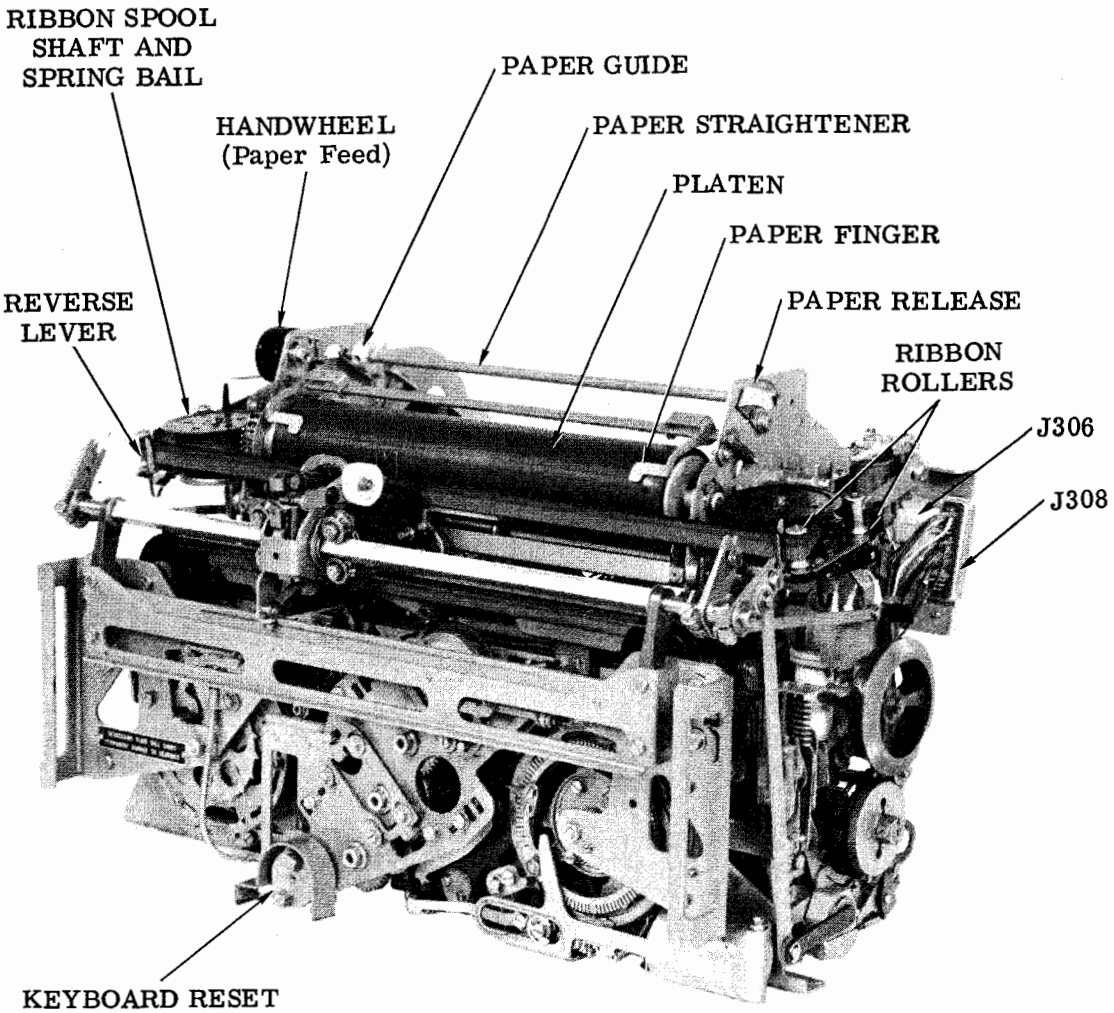


Figure 6 - 37 Typing Unit

(1) Pivot points require two or three drops of oil.

(2) Felt washers are saturated with oil.

(3) Cams and sliding surfaces require a film of oil.

(4) All open roller bearings should be packed with grease TP88973 (KS7471).

Note: Closed roller bearings do not require lubrication.

3.03 Overlubrication which would allow oil to drip or grease to be thrown on other parts should be avoided. Excessive lubricants should be removed with a dry lint-free cloth. Keep all electrical contacts free of oil or grease.

Note: Use maintenance pad TP124828 to protect furniture and floor coverings from oil and grease while lubricating the units.

4. ASSEMBLY PROCEDURE

REPERFORATOR-TRANSMITTER MODULE

4.01 The reperforator-transmitter (RT) module is packaged as a complete unit and consists of cabinet, tape reader, motor unit, reperforator, and an electrical service unit. The components are mounted in place and the installation procedure requires removing the shipping bracket mountings on the reperforator base, and connecting two cables.

4.02 Connect the ac power cord from RT module to an outlet on the utility strip and mate P310 to J310 inside the table (Figures 4 and 7).

4.03 Remove the four shipping brackets from the reperforator base by the following procedure (Figure 8).

(1) Remove and discard the four shipping screws securing the reperforator base to the shipping brackets.

(2) Loosen the four shipping bracket retaining screws.

(3) Drop the shipping brackets out of engagement with the reperforator base.

(4) Slide the shipping brackets down until the top of its stowing slot is resting on the retaining screws.

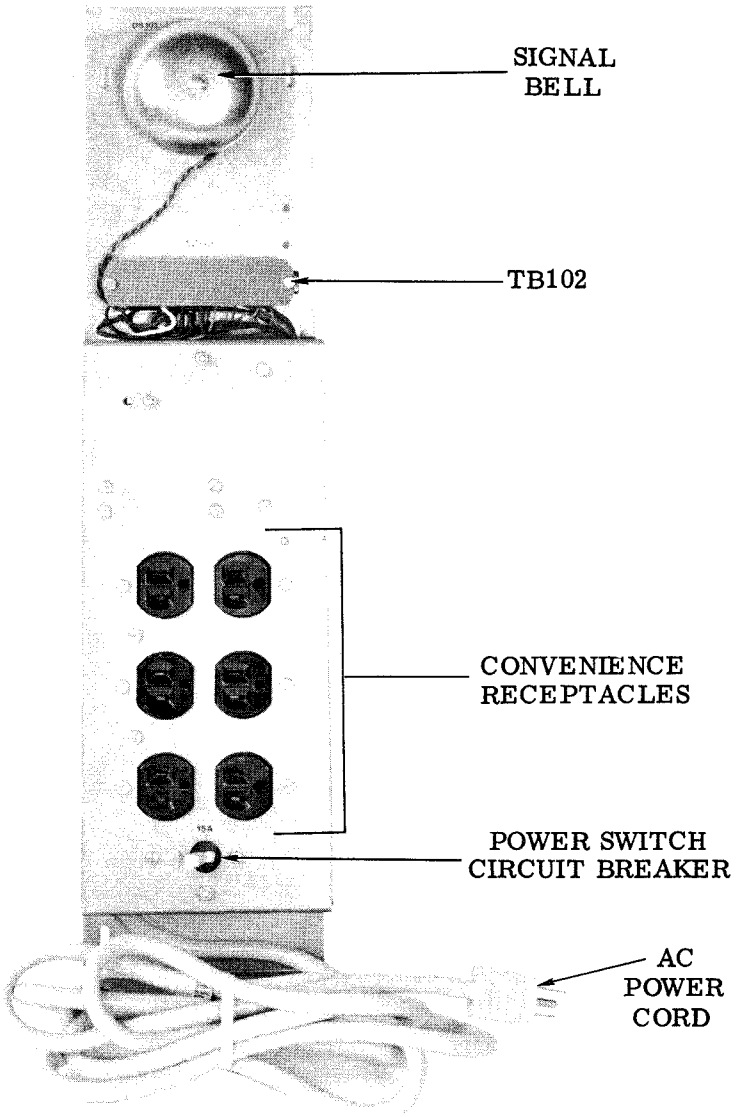


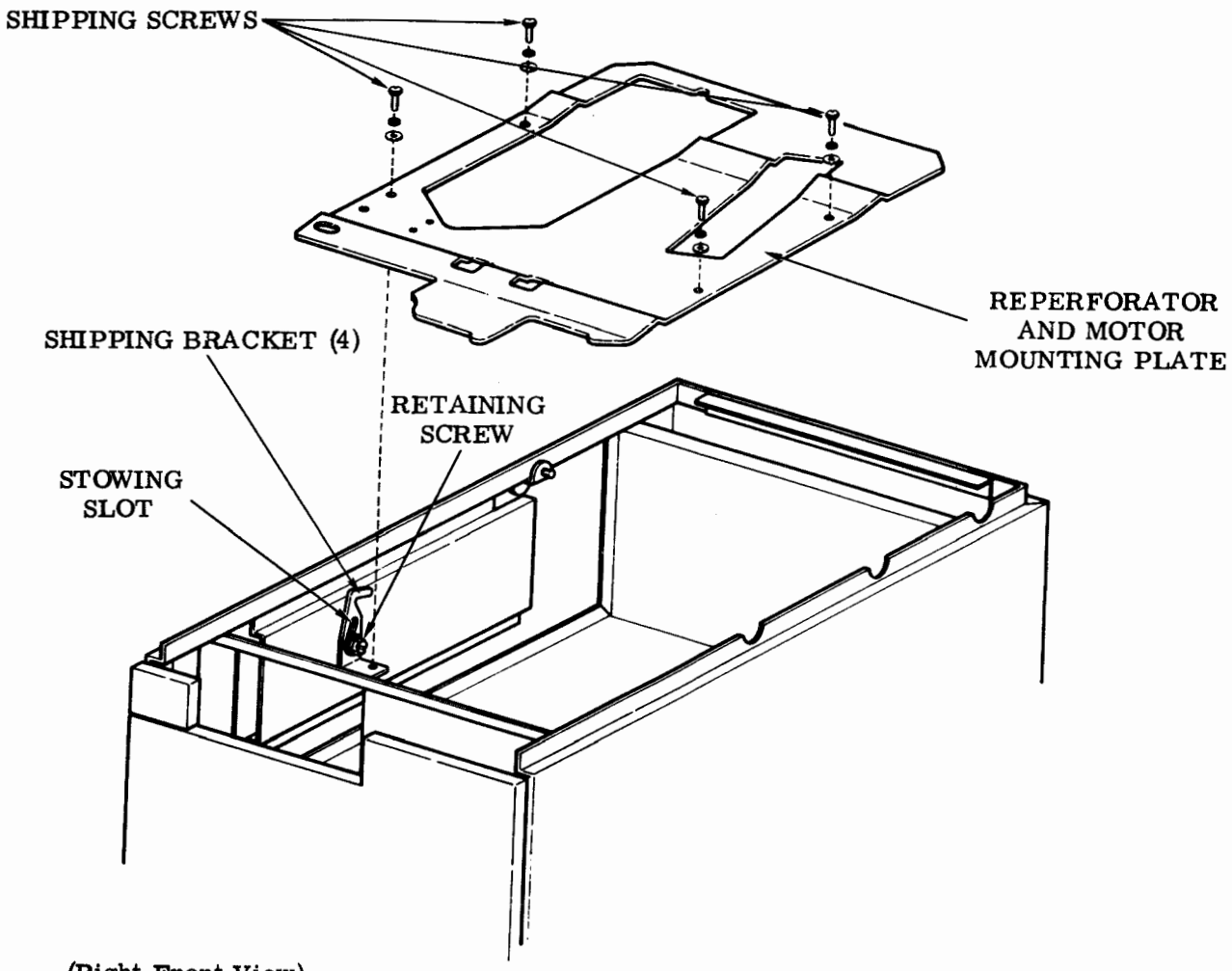
Figure 7 - 37 Utility Strip

(5) Tighten the four shipping bracket retaining screws.

Note: All four (4) shipping brackets must be disengaged from the reperforator and motor mounting plate before operating the unit.

4.04 Refer to Figure 9 and install the reperforator gear and gear guard. The adjustment between the motor pinion and reperforator gear is made during final assembly of the RT cabinet and should not require readjustment. The motor pinion and gear should rotate freely without binding. If adjustment is necessary, refer to the reperforator gear mesh adjustment outlined in Section 574-327-700TC.

4.05 The two muslin bags attached to the base of the keyboard and cover assembly contain the necessary parts to assemble the units.



(Right Front View)

Figure 8 - Disabling Shipping Brackets RT Module

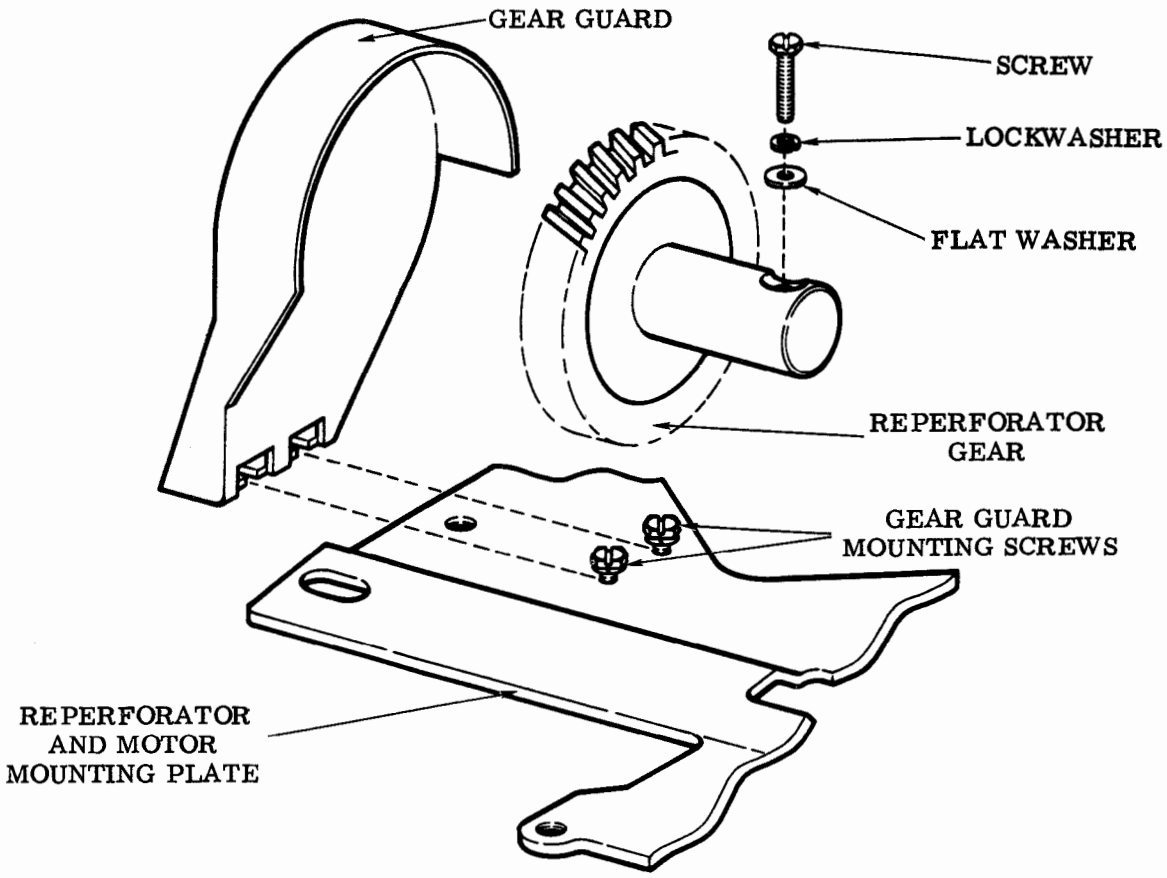


Figure 9 - Gear and Gear Guard Installation

KEYBOARD AND COVER ASSEMBLY

4.06 The keyboard and cover assembly is secured to the table top by four shoulder screws mounted from the under side of the table top. Align the four weld nuts on the bottom of the pan assembly with the four cutouts and rubber grommets in the table top. With the four shoulder screws (TP333169, Figure 10) and associated washers from the muslin bag tied to the pan assembly, secure the pan assembly to the table top.

A. Base Mobilization

4.07 Remove the 6-40 screws (TP151631) from the two base retainers (Figure 11). DO NOT REMOVE THE BASE RETAINERS. Remove the packing detail between the base and the pan. When the packing detail is removed, the vibration mounts will push the base against the base retainers. When installed, the weight of the typing unit will restore the clearance between the base and base retainers.

B. Cable Routing

4.08 Route the cable connectors shown in Figure 12 from the electrical service unit through the cable entry slot in the table and pan (Figures 2 and 11). Use care to prevent bending of the control panel connector pins when routing through the entry slots. If possible, leave the protective covering on the control panel connectors until the routing is complete.

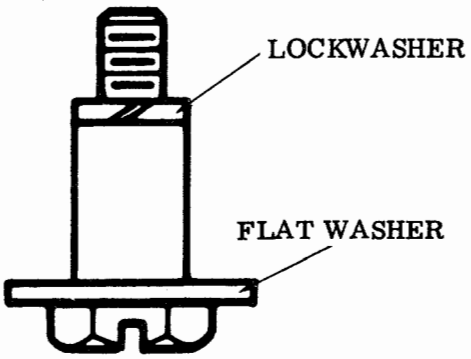


Figure 10 - Shoulder Screw

4.09 Remove the control panel trim strip and loosen the retaining screws, one on each side (Figure 13) Swing the control panel up and connect the control panel connectors making sure connector "A" is to left, "B" is to center and "C" is to the right as viewed from the front of the control panel (Figure 14). Use care when making the control panel connections and check to insure that the pins line up with the mating connector.

4.10 Route and clamp the cables shown in Figures 12 and 14. The center cable should always be routed along the left side of the pan assembly. The plastic cable clamps and associated screws and washers are located in the muslin bags tied to the pan assembly. Use the speed clips located on the inside edge of the pan to secure the cables (Figure 15). Install the cables by prying the spring tang on the speed clip away from lip of pan with a small screwdriver or pull tang away with a spring hook to receive the cables.

Note: The base assembly may be removed to ease the installation of the keyboard and control panel cables. After the base assembly is replaced, mount the base retainers.

TYPING UNIT

A. Mounting on Base

4.11 Locate the selector clutch on the right end of the typing unit main shaft and the keyboard reset coupler (Figure 6) at the lower center front. Facing the right end of the typing unit, rotate the selector clutch drum in a counterclockwise direction until the lugs on the keyboard reset coupler are vertical.

4.12 Viewing the keyboard reset mechanism from the right side of the keyboard, rotate the mechanical reset shaft in a clockwise direction until the open slots, in the plastic universal joint member, are vertical to receive the lugs on the typing unit (Figures 6 and 11) keyboard reset coupler.

4.13 The typing unit may be gripped for lifting by grasping the right vertical handle on the front plate and the rear curve under the left side plate. From a level position, tilt the typing unit slightly forward (toward the keyboard). Mate the reset coupler of the keyboard reset mechanism, and carefully lower the typing unit over the locating studs and intermediate gear assembly. Be sure the main shaft driven gear and intermediate gear mesh properly.

4.14 Install the four typing unit mounting screws, starting with the left rear.

B. Interrelated Adjustments

4.15 Keyboard Trip Arm: Adjust the keyboard trip arm as shown in Figure 16.

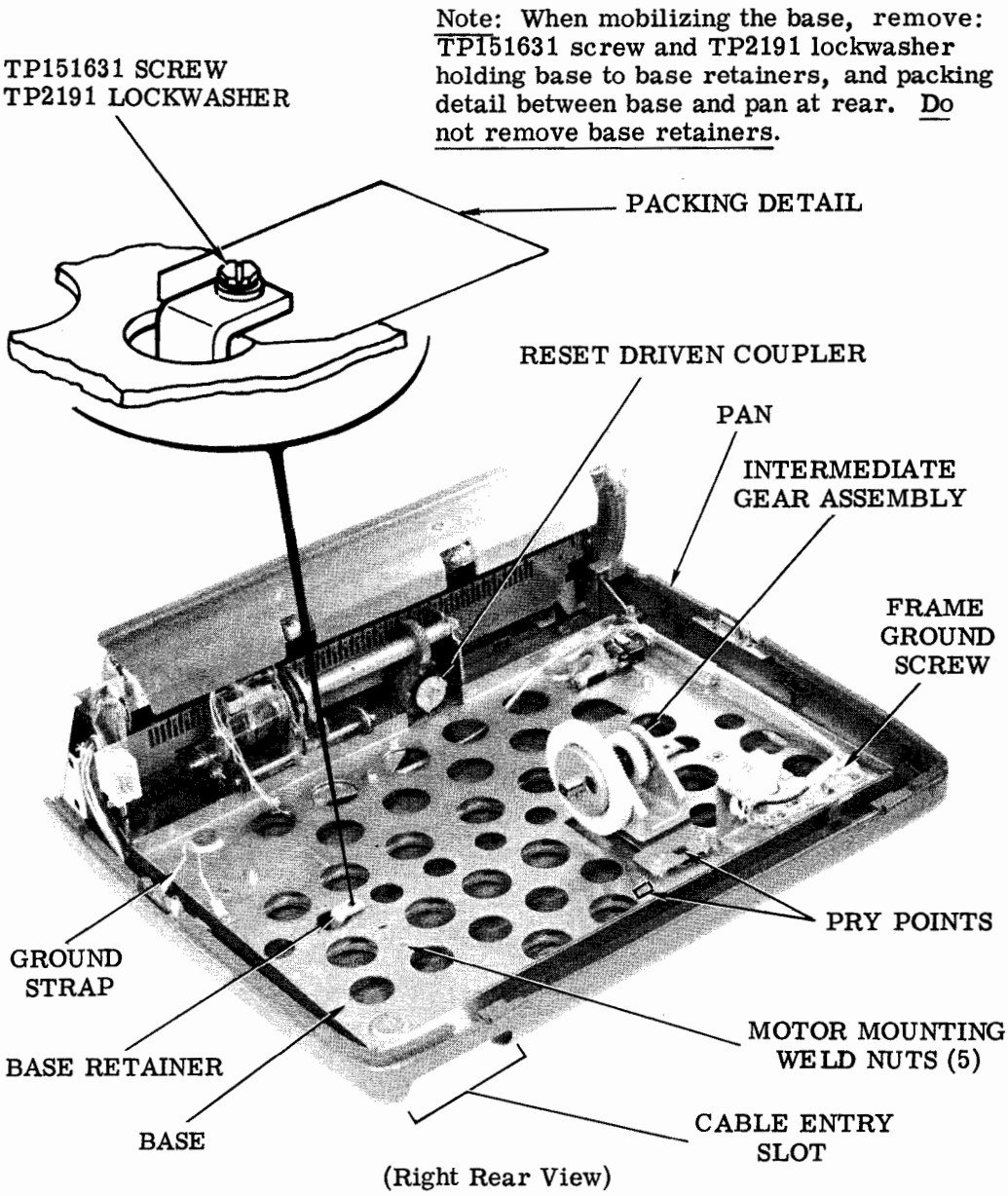


Figure 11 - Keyboard Unit

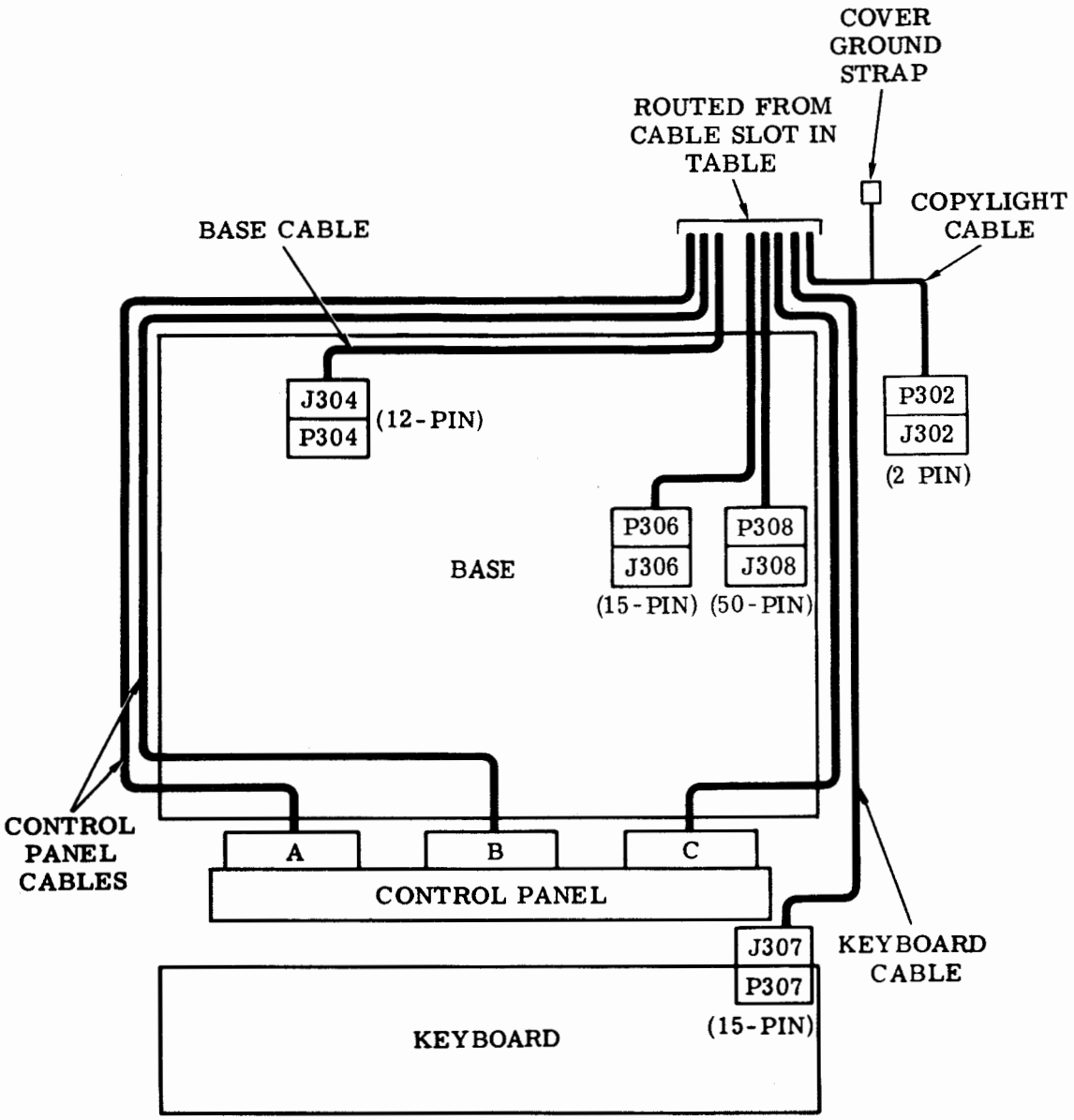
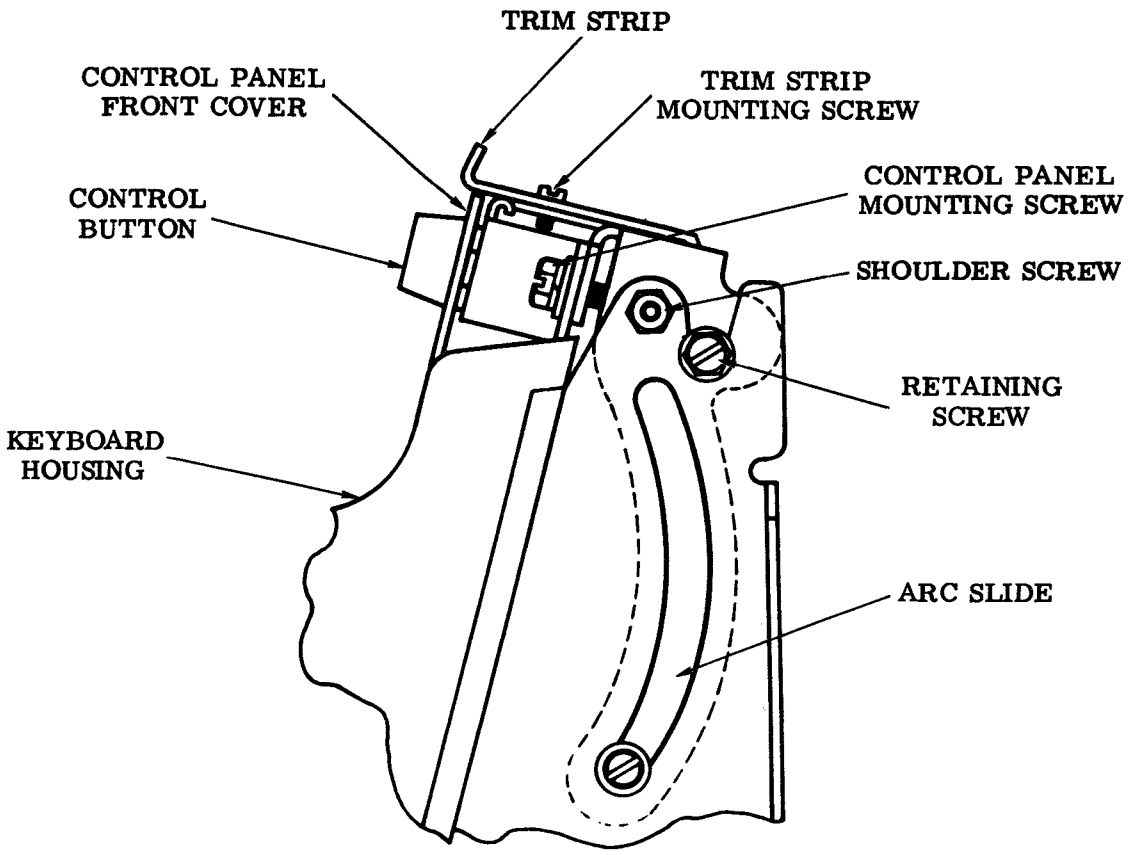


Figure 12 - 37 Typing Unit Cable Routing



(Side View)

Figure 13 - Control Panel

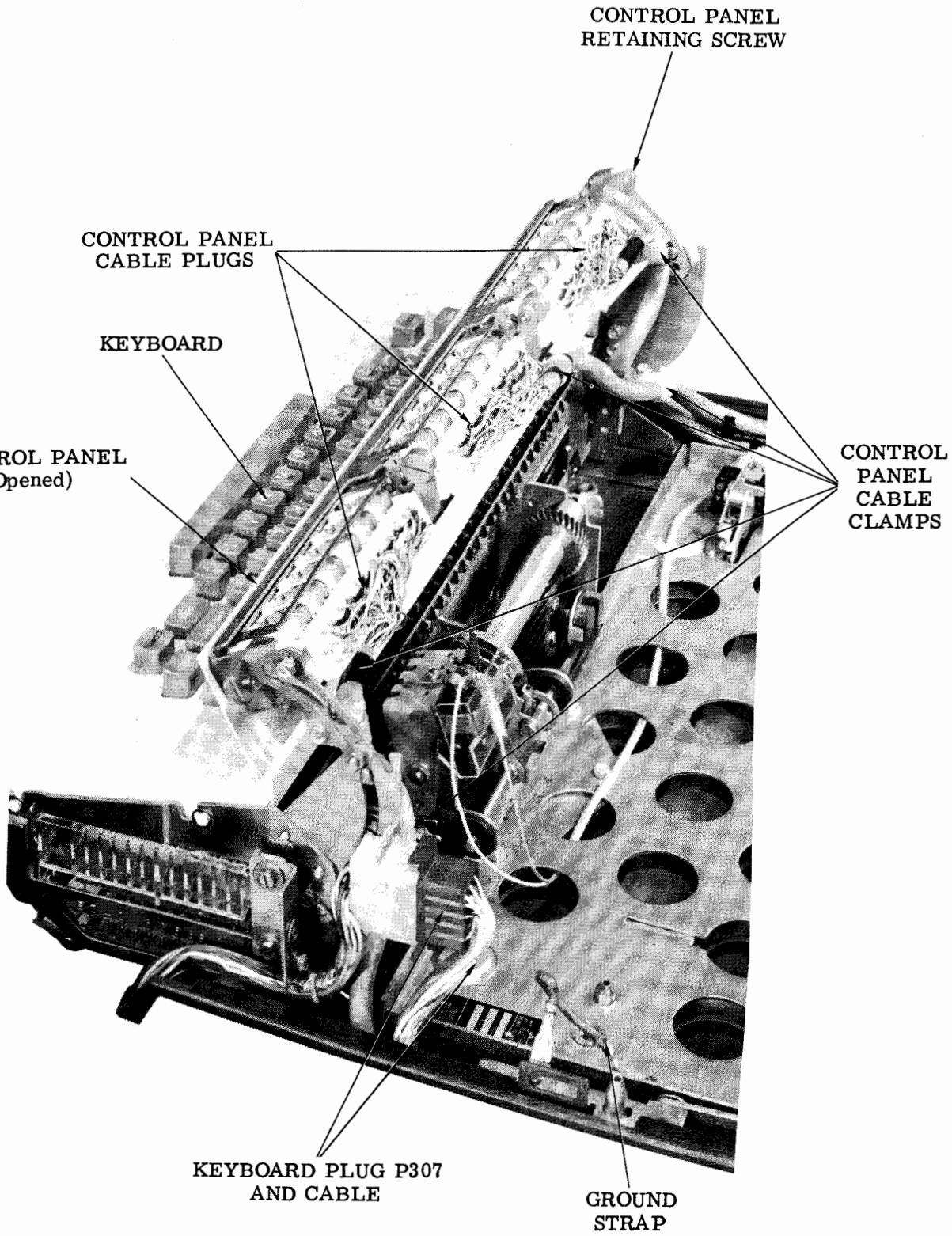
4.16 The motor, intermediate gear assembly (Figures 11 and 17), and the main shaft driven gear should rotate freely without friction between the gears. The backlash should be barely perceptible as outlined in the requirements in the following paragraphs.

4.17 Intermediate Gear Assembly: Remove the gear guard and check for a backlash of 0.004 inch between the main shaft driven gear and the intermediate drive gear. This backlash has a tolerance from 0.004 inch minimum to 0.015 inch maximum. The backlash should move freely and the gears should mesh properly. If adjustment is necessary, loosen the three intermediate gear assembly mounting screws and the five motor mounting screws friction tight. Move the motor to the rear. Use the pry points at the rear of the intermediate gear assembly (Figure 11), adjust the assembly from front to rear until the requirement is met. Tighten the three intermediate gear assembly mounting screws. Proceed with 4.18 to provide backlash between the motor pinion and the intermediate gear assembly.

4.18 Motor Unit: Check for a backlash of 0.004 inch between the motor pinion and intermediate driven gear as outlined in the above paragraph. If adjustment is necessary, loosen the five motor mounting screws friction tight. Use the back edge of the base and the motor cradle as a pry point to move the motor assembly forward. To move the motor back, use the pry point located in front of the left rear mounting screw (Figure 11). Adjust to meet the requirement, tighten the five motor mounting screws, and replace the gear guard.

C. Cable Connection

4.19 Attach the typing unit cable connectors, P306 and P308 to the rear of the typing unit. Position the cables toward the cable exit.



(Right Side View)

Figure 14 - Control and Keyboard

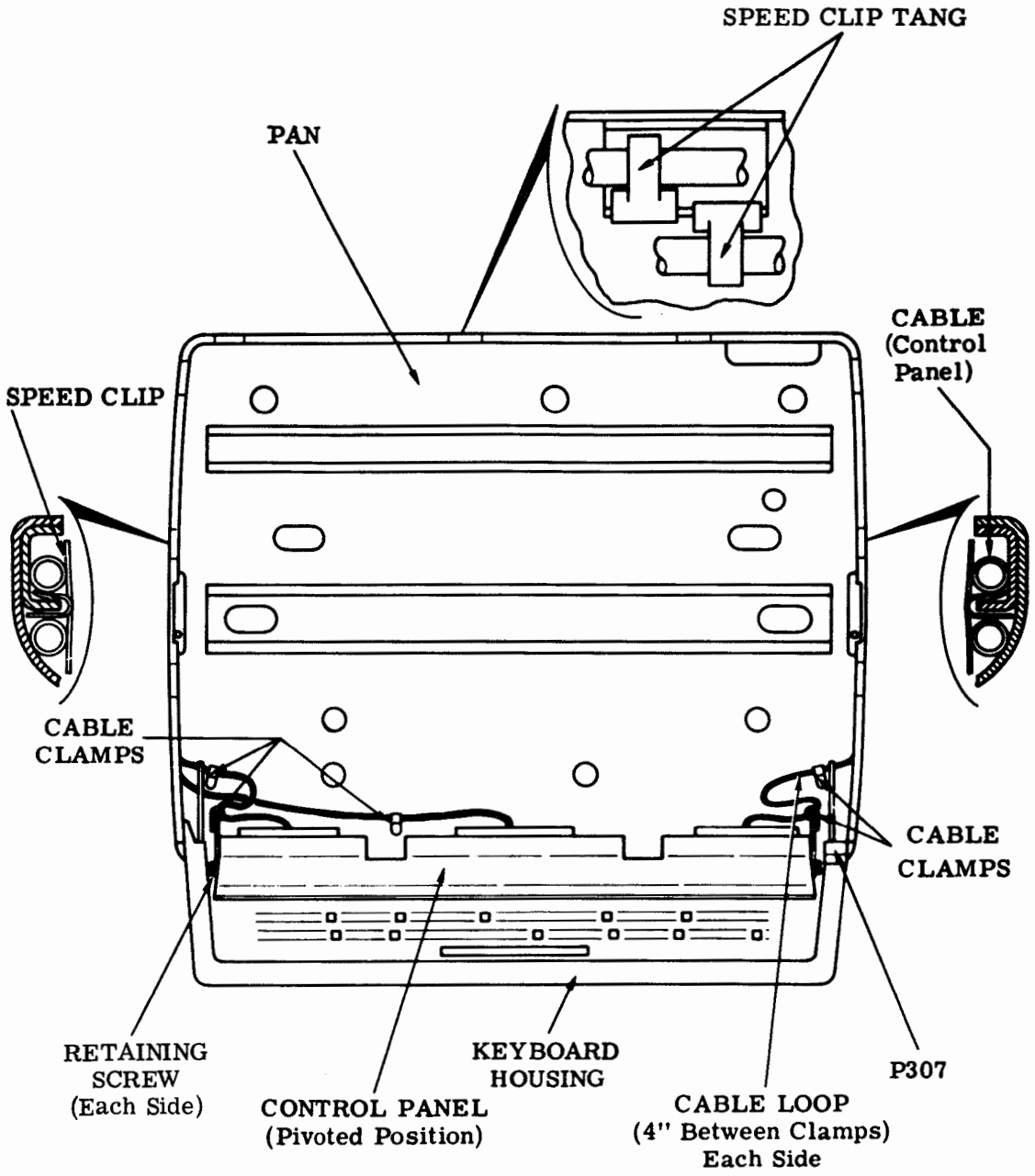


Figure 15 - 37 Control Panel Cable Routing

TRIP ARM

Note: The typing unit must be assembled on the base to make the trip arm adjustment.

To Check

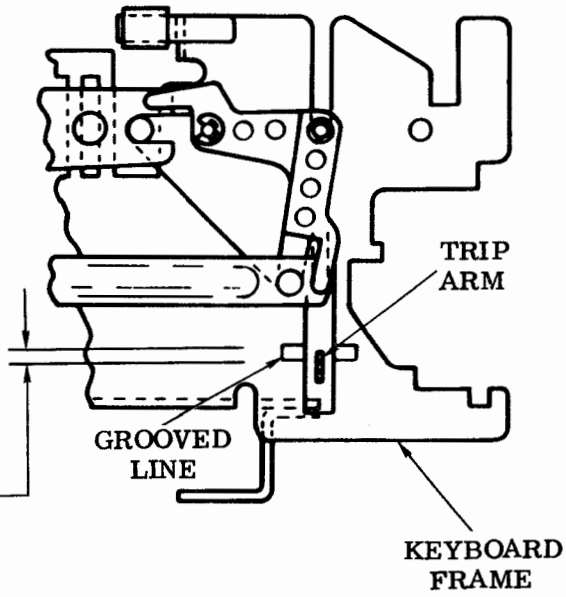
Engage clutch. Rotate shaft until reset bail roller is opposite one of the high parts of reset cam. Note the position of the top edge of trip arm with respect to the grooved line on the front of the keyboard frame. Then rotate the shaft until reset bail roller is on the other high part of the cam, note position of trip arm on keyboard frame.

Requirement

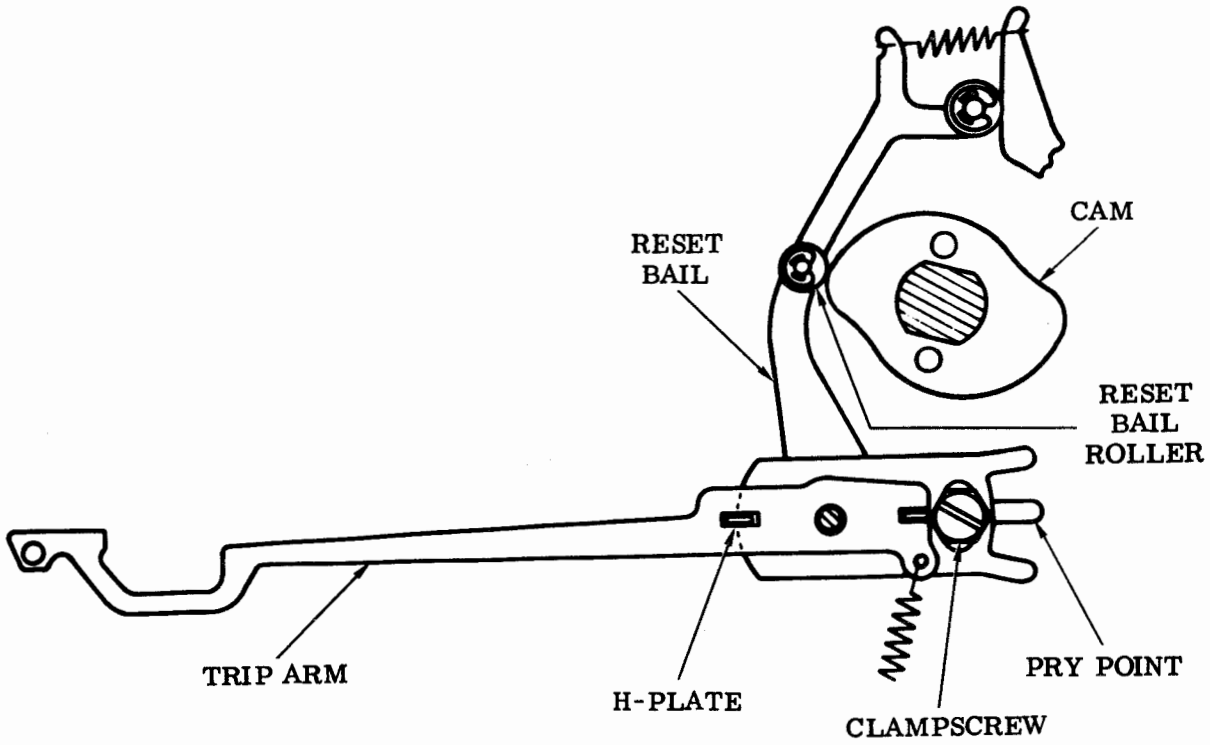
The lowest of the two positions obtained should be within the width of grooved line on front of keyboard frame.

To Adjust

Loosen clampscrew friction tight. Insert screwdriver between pry points and position trip arm to meet requirement. Tighten clamp.



(Front View)



(Right Side View)

Figure 16 - Keyboard Trip Arm

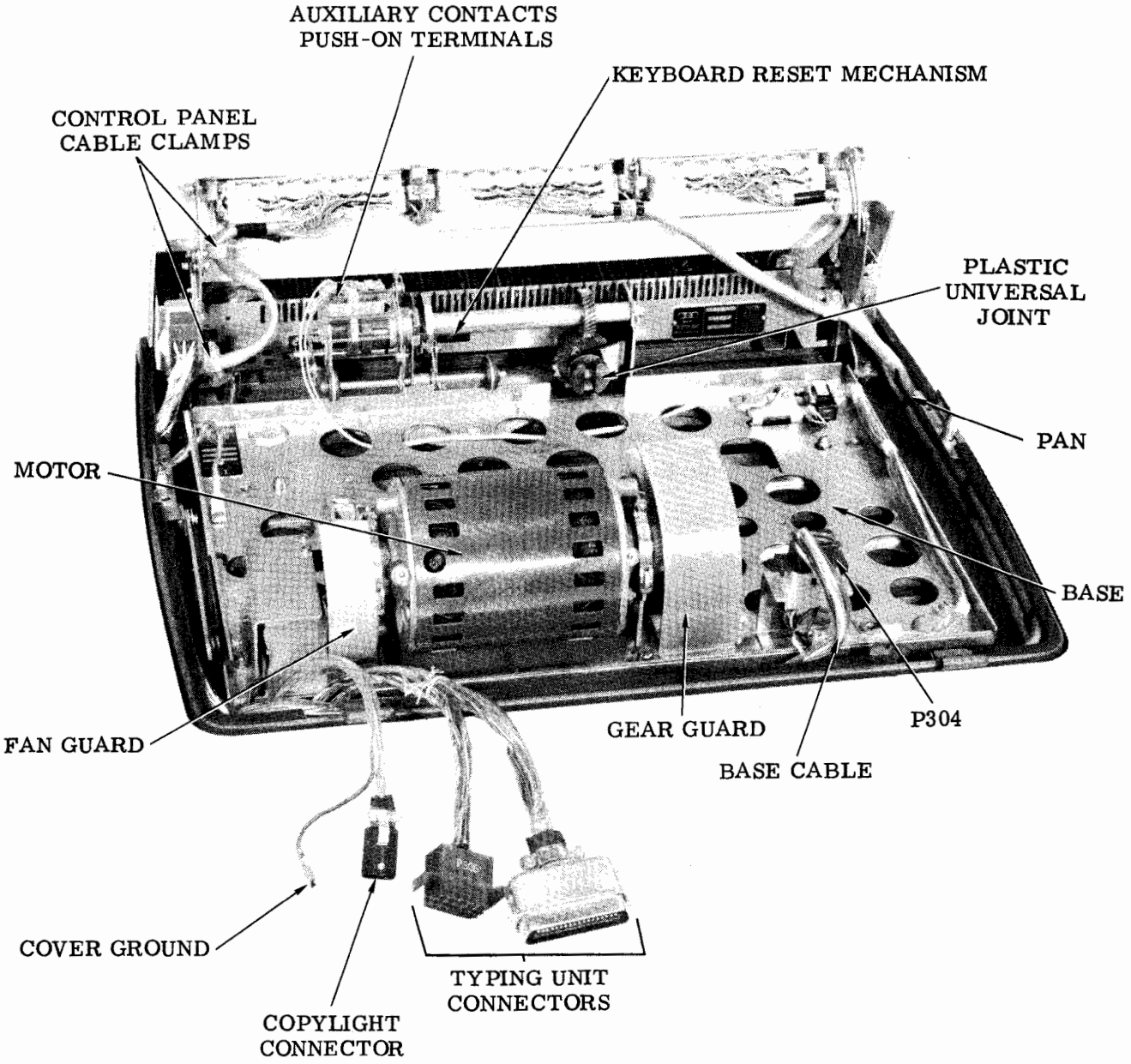


Figure 17 - Keyboard and Motor Units

4.20 Check the cable connections to insure that they are closed and fitted properly. Swing the control panel back and seat the retaining screws, one on each side, and tighten the retaining screws.

4.21 Replace the trim strip with the two mounting screws. Tighten the screws.

D. Ribbon Routing

4.22 To route the new teletypewriter ribbon, straighten the spring bail and lift the spool off the shaft. Remove the packaging, and reel out enough ribbon to reach the empty spool and for three turns on the spool. Refer to Figures 6 and 18 and perform the following routing procedure.

(1) Place the spool on the right shaft, engaging the spool shaft by turning the spool.

(2) Thread the ribbon over the guide rollers and through both ribbon reversing levers. Keep the ribbon free of twists and in-line between the two reversing levers and between the typebox and print indicator.

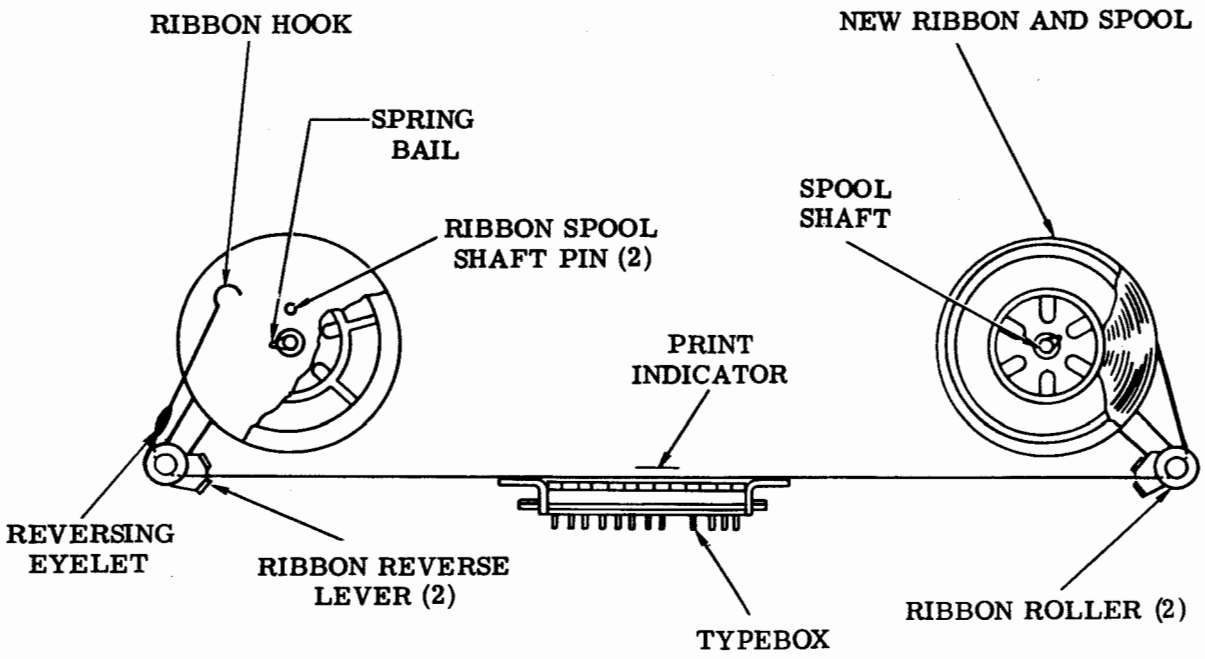


Figure 18 - Ribbon Routing

(3) Position the reversing eyelet, near the ribbon end, between the spool shaft and the ribbon reverse lever.

(4) Attach the ribbon to the empty spool and install the spool on the shaft.

(5) Adjust the ribbon tension by turning the ribbon on the spool until the ribbon is tight and under a spring load.

(6) Engage the spool shaft pin and lower the two spring bails.

E. Cover Replacement

4.23 Install the cover by tilting the cover back towards the right of the hinges and perform the following.

(1) Align the hinge pins on the cover with the hinges on the pan.

(2) Engage the hinges and slide the cover to the left until the spring clip slides off the retaining plate, locking the cover in place.

(3) Attach the 2-pin copylight connectors to the receptacle mounted on the back (right rear corner) of the cover and attach the associated ground tab terminal.

(4) Position the cable toward the cable exit and connect the cover balancing arm.

(5) Close the cover, the latches on the left and right side will snap into place.

F. Paper Assembly and Routing

4.24 Open the front lid on the cover by depressing the two latch releases on top of the cover (Figure 5); pivot the front lid upward and toward the front and pivot the rear lid upward and toward the rear.

4.25 Insert the paper spindle into the paper roll and install the paper roll into the spindle blocks. Route the paper over the paper straightener between the two paper guides, refer to Figure 19. Lift the paper finger on the platen and insert the paper between the platen and pressure rollers. Turning the handwheel, move the paper through the platen assembly leaving 1 foot of loose paper. Lower the paper fingers on the platen assembly and hold the paper toward the front of the typing unit, and close the rear lid. Close the front lid, and position the paper between the window and the paper guide (be sure that the cover and lids are latched).

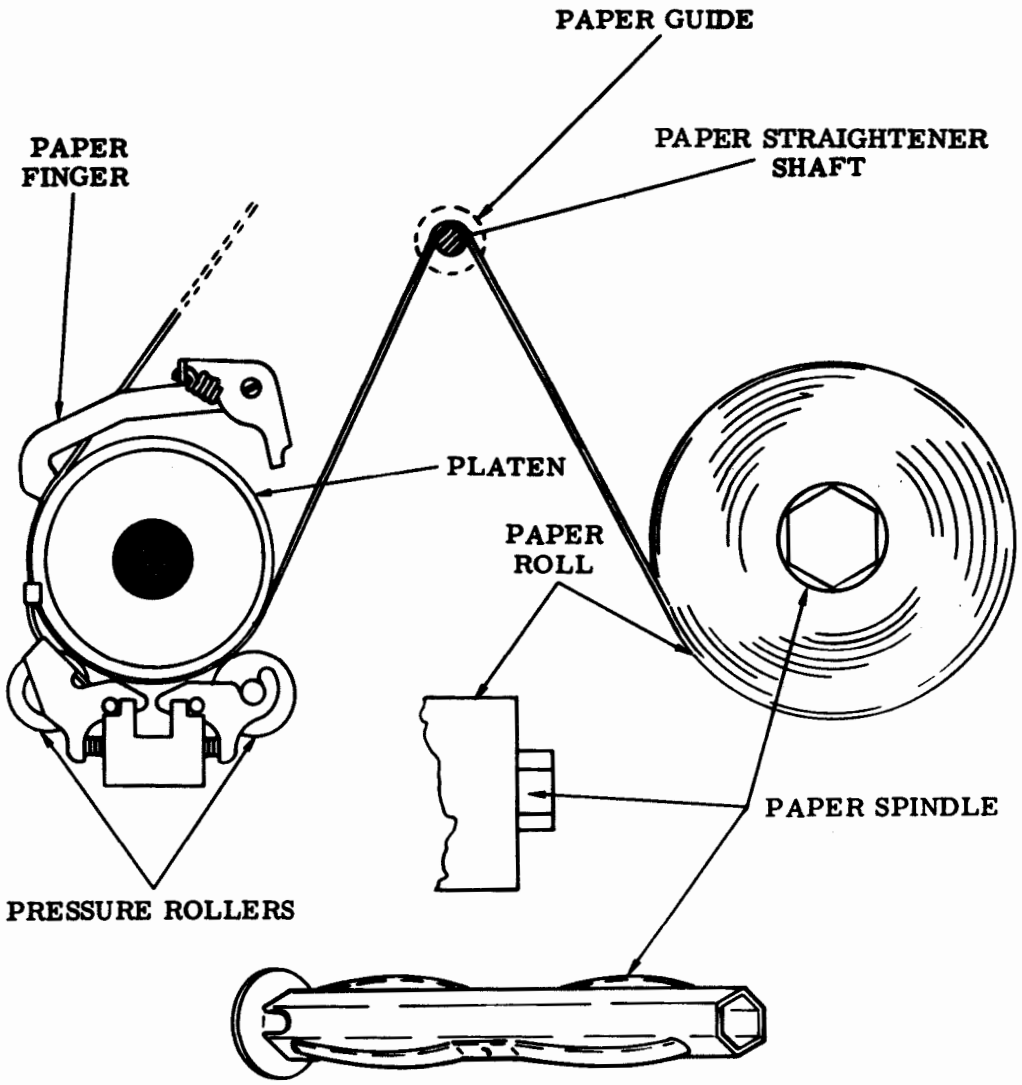


Figure 19 - Paper Routing Assembly

ELECTRICAL SERVICE UNIT AND UTILITY STRIP

4.26 The electrical service unit (ESU) and utility strip (Figures 7 and 20) are exposed when the front panel on the table is removed, refer to 2.04. To gain access to the circuit cards (Table A) and the answer-back unit, the electrical service unit must be removed from the table. To remove the ESU, refer to Figure 21, and proceed as follows.

(1) Remove the three mounting screws on the front panel, one on the top and two on the bottom.

(2) Remove the packing bracket from the bottom panel inside the table.

(3) Unhook the ESU cables from the cable bracket located on the upper back portion of the table.

(4) Slide the ESU to the right, clearing the left edge of the table and pull the unit from the table.

4.27 The electrical service unit for the punch and reader (Figure 4) is located in the RT cabinet. If it is necessary to remove the RT electrical service unit for access to the circuit

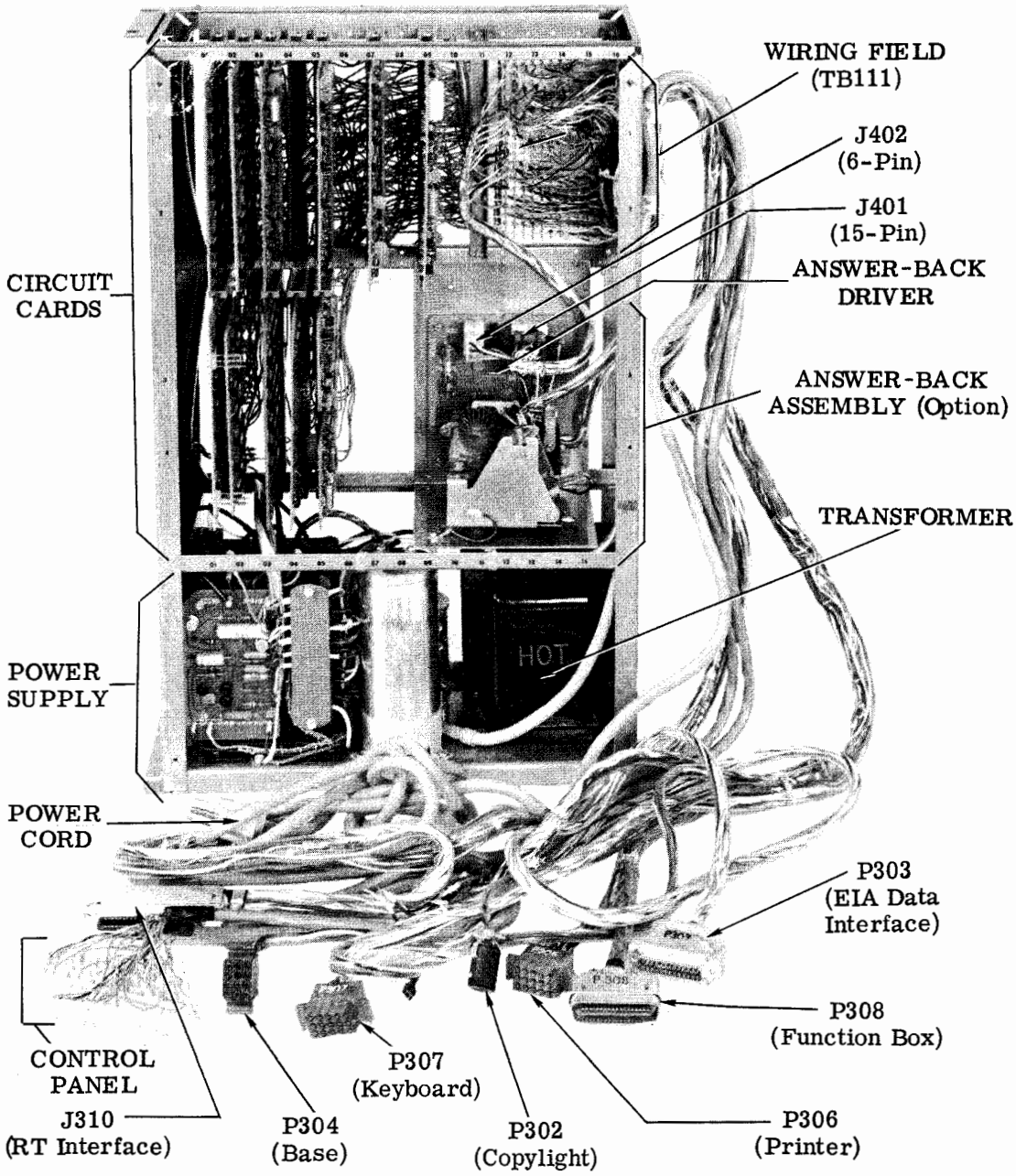


Figure 20 - 37 Electrical Service Unit

cards (Table B) open the cabinet door and remove the three mounting screws on the front panel and pull the unit out.

4.28 Refer to the ordering information to check for the desired circuit cards (options and variable features) that are installed in the electrical service units. Refer to the circuit description (CD) and the wiring diagrams (WD) packed with the set for information concerning the strapping options on the circuit cards.

A. Answer-Back Assembly

4.29 Remove the packing material from the answer-back assembly (Figures 20 and 22) by performing the following procedures.

(1) Cut the plastic strapping with a pair of side cutters.

(2) Pull out the strapping, being careful not to jar the unit.

(3) Remove the packing material.

4.30 Code the answer-back drum as outlined in 4.32 through 4.39. Replace the electrical service unit, install the three mounting screws on the front plate, and route the cables over the bracket on the back panel (Figure 21). Route the power supply cable from the utility strip (Figure 7) through the oblong opening in the base of the table. DO NOT CONNECT THE POWER CABLE AT THIS TIME. Check to insure that the power cable from the electrical service unit is connected to an outlet on the utility strip.

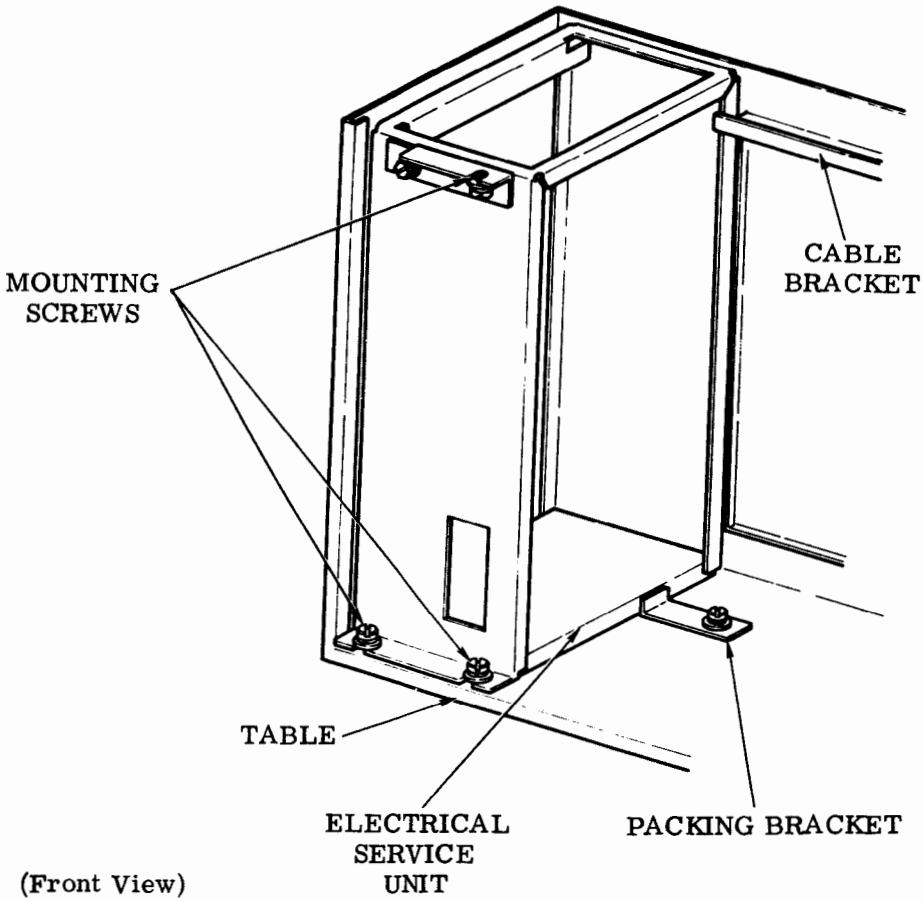


Figure 21- Electrical Service Unit Mounted in the Table

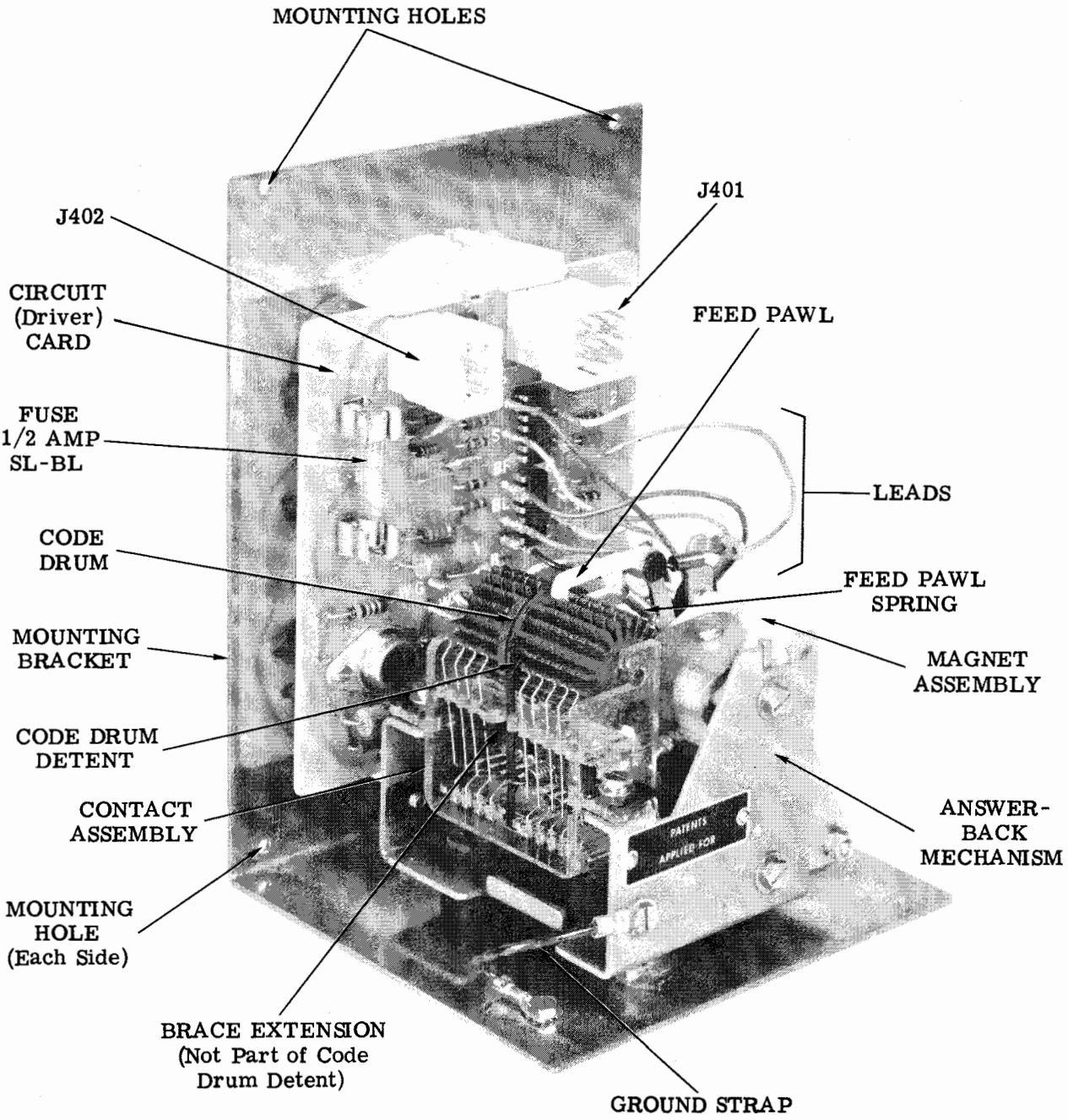
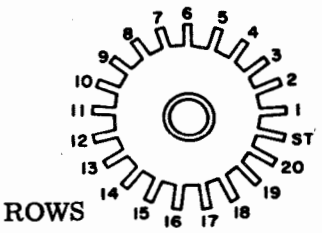


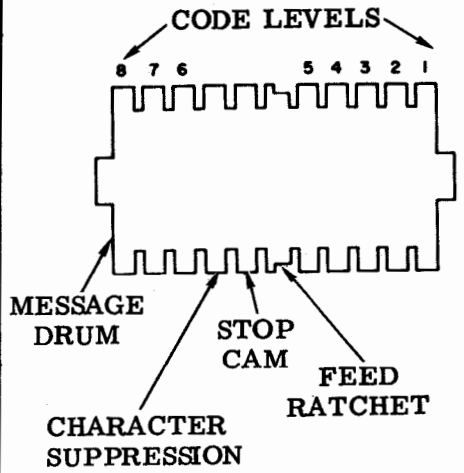
Figure 22 - 37 Answer-Back Assembly

	CODE LEVELS REMOVE TINES
NUL	NONE
SOH	1-8
STX	2-8
ETX	1-2
EOT	3-8
ENQ	1-3
ACK	2-3
BEL	1-2-3-8
BS	4-8
HT	1-4
LF	2-4
VT	1-2-4-8
FF	3-4
CR	1-3-4-8
SO	2-3-4-8
SI	1-2-3-4
DLE	5-8
DC1	1-5
DC2	2-5
DC3	1-2-5-8
DC4	3-5
NAK	1-3-5-8
SYN	2-3-5-8
ETB	1-2-3-5
CAN	4-5
EM	1-4-5-8
SUB	2-4-5-8
ESC	1-2-4-5
FS	3-4-5-8
GS	1-3-4-5
RS	2-3-4-5
US	1-2-3-4-5-8
SPACE	6-8
!	1-6
"	2-6
#	1-2-6-8
$	3-6
%	1-3-6-8
&	2-3-6-8
' (APOS)	1-2-3-6
(	4-6
)	1-4-6-8
*	2-4-6-8
+	1-2-4-6
,	3-4-6-8
-	1-3-4-6
.	2-3-4-6
/	1-2-3-4-6-8
0	5-6
1	1-5-6-8
2	2-5-6-8
3	1-2-5-6
4	3-5-6-8
5	1-3-5-6
6	2-3-5-6
7	1-2-3-5-6-8
8	4-5-6-8
9	1-4-5-6
:	2-4-5-6
;	1-2-4-5-6-8
<	3-4-5-6
=	1-3-4-5-6-8
>	2-3-4-5-6-8
?	1-2-3-4-5-6

	CODE LEVELS REMOVE TINES
@	7-8
A	1-7
B	2-7
C	1-2-7-8
D	3-7
E	1-3-7-8
F	2-3-7-8
G	1-2-3-7
H	4-7
I	1-4-7-8
J	2-4-7-8
K	1-2-4-7
L	3-4-7-8
M	1-3-4-7
N	2-3-4-7
O	1-2-3-4-7-8
P	5-7
Q	1-5-7-8
R	2-5-7-8
S	1-2-5-7
T	3-5-7-8
U	1-3-5-7
V	2-3-5-7
W	1-2-3-5-7-8
X	4-5-7-8
Y	1-4-5-7
Z	2-4-5-7
[	1-2-4-5-7-8
\	3-4-5-7
]	1-3-4-5-7-8
^	2-3-4-5-7-8
_	1-2-3-4-5-7
`	6-7
a	1-6-7-8
b	2-6-7-8
c	1-2-6-7
d	3-6-7-8
e	1-3-6-7
f	2-3-6-7
g	1-2-3-6-7-8
h	4-6-7-8
i	1-4-6-7
j	2-4-6-7
k	1-2-4-6-7-8
l	4-5-6-7
m	1-3-4-6-7-8
n	2-3-4-6-7-8
o	1-2-3-4-6-7
p	5-6-7-8
q	1-5-6-7
r	2-5-6-7
s	1-2-5-6-7-8
t	3-5-6-7
u	1-3-5-6-7-8
v	2-3-5-6-7-8
w	1-2-3-5-6-7
x	4-5-6-7
y	1-4-5-6-7-8
z	2-4-5-6-7-8
{	1-2-4-5-6-7
|	3-4-5-6-7-8
}	1-3-4-5-6-7
~	2-3-4-5-6-7
DEL	1-2-3-4-5-6-7-8

MESSAGE DRUM





Note 1: Remove tine — marking. Leave tine — spacing.

Note 2: The eighth code level must be coded as shown for even parity operation.

Figure 23 - Answer-Back Drum ASCII 67 Code Chart

B. Encoding Answer-Back Drum

4.31 The answer-back code drum is contained within the answer-back unit (Figure 22). If detailed coding instructions are unavailable, the instructions outlined in this part describe the method used to encode the drum.

4.32 Remove the code drum by deflecting the brace extension downward, lifting the feed pawl, and withdrawing code drum.

CAUTION: DO NOT OVEREXTEND FEED PAWL SPRING.

4.33 Encoding the answer-back drum is performed by removing tines on the drum. The rows of tines are numbered and embossed on the right end of the code drum. The elements in each row are identified in Figure 23, which also describes the answer-back drum code chart used for encoding the drum.

4.34 Determine the number of characters in the answer-back message (not to exceed 20). Consider any control functions such as CARRIAGE RETURN and LINE FEED (these codes must be followed by a delete code). The control functions should precede and follow the text of the answer-back message. Refer to Figure 24 and determine number of message cycles per revolution of the code drum. One, two, or three stop cam positions are broken out depending on what operation cycle is desired.

4.35 Encode the code drum, referring to Figures 23, 24, and 25. Character sequence starts on row following home (ST) position. En-

Message Characters	Cycles	Remove Stop Cam Element From
Up to 6	3	Rows 6, 13, & 20
7 thru 9	2	Rows 6 & 17
10 thru 20	1	Row 6

Figure 24 - Message Cycles per Revolution of Code Drum

Cycles	Home Position (Leave all tines in)	Start Message On	Usable Rows	Remove Character Suppression Tine From
3	Row ST	Row 1	1 thru 6	Unused rows
	Row 7	Row 8	8 thru 13	Unused rows
	Row 14	Row 15	15 thru 20	Unused rows
2	Row ST	Row 1	1 thru 9	Row 10 and unused rows
	Row 11	Row 12	12 thru 20	Unused rows
1	Row ST	Row 1	1 thru 20	Unused rows

Figure 25 - General Coding Instructions

code sequence starts with row 1 for the first character or control function and proceeds to higher numbered rows (counterclockwise). Remove tine for a MARK element and leave tine for a SPACE element. Repeat message sequence if more than one cycle is used. To remove tines and stop cam element(s), use a long-nose pliers or a small screwdriver and proceed as follows.

(1) Grasp tine firmly with long-nose pliers, crack, remove tine.

(2) Place the tip of a small screwdriver at the base of tine in adjacent row; lean top of blade against tine to be removed; and break tine off by leaning against it (be sure the base of screwdriver touches the base of the adjacent tine).

4.36 Remove suppression tine from unused rows in any given cycle, see Figure 24. Do not remove any tines in the ST position or other home position.

4.37 With the answer-back drum properly coded, return the drum to the unit as follows.

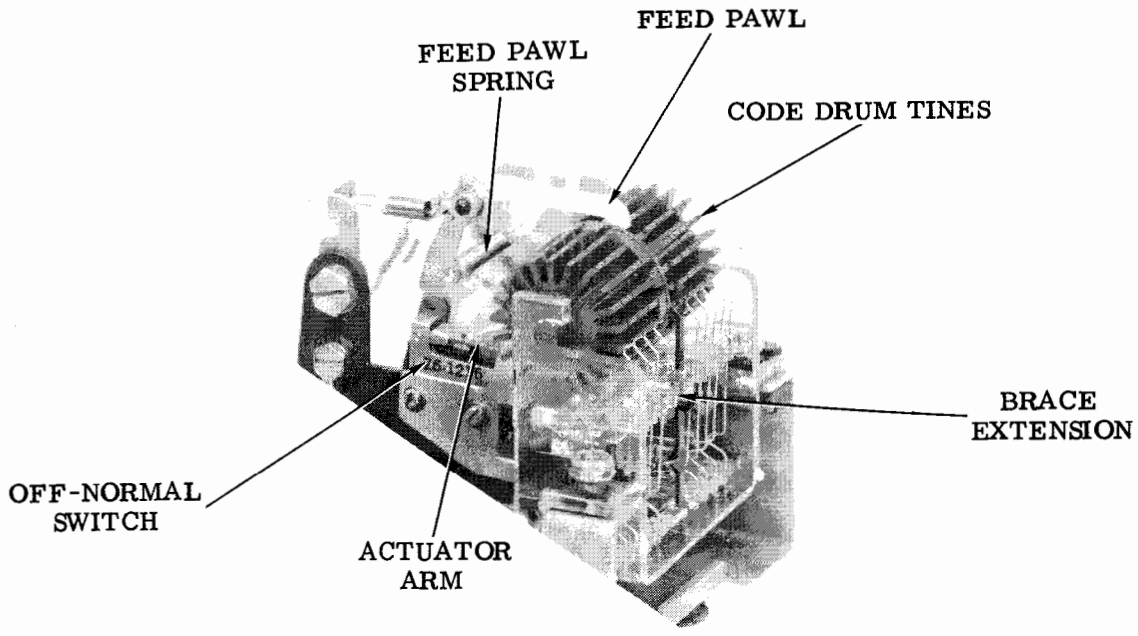
(1) Lift feed pawl while depressing the switch actuator arm (Figure 26) and insert the code drum.

Note: The code drum will not seat properly in the plastic block if installed backwards.

(2) Place the ST position (row with all tines left in) opposite contact wires.

(3) Restore brace extension to normal position.

4.38 The installation of a different code drum in the answer-back unit may cause abnormal operation and require readjusting the answer-back unit. If adjustments are necessary, refer to Section 574-325-700TC for information concerning the following adjustments:



(Left Front View)

Figure 26 - Answer-Back Mechanism

(a) Contact Block

(b) Feed Pawl Advanced

(c) Feed Pawl Relaxed

(d) Off-Normal Switch

(e) Feed Bail Spring

5. CHECKOUT

LOCAL AND ON-LINE TESTS

5.01 The ASR Set can be tested in local and on-line modes by performing designated tests. Local tests can be performed without a data set (6.01). Simulated on-line testing requires wiring connections on the electrical service unit. Refer to the testing information outlined in troubleshooting section, 574-302-300TC.

TABLE A

37 - ASR CIRCUIT CARD ARRANGEMENT

CARD	POSITION
Local Distributor	101
Line Distributor	102
Send Control	103
Bid (option)	104
Mode Control	105
Receive Control	107
Channel Control	109
Receiving Device	305
Keyboard Control Character Counter (option)	401
Counter Control (option)	403
Alarms and Automatic Control	404
Two-Color Control (option)	405

5.02 Connect the power cable from the utility strip to the ac receptacle. Check all the cable connections and proceed with the local and on-line tests.

Note: Check the ordering information to determine the features and options before conducting the checkout. The tests contained in the troubleshooting section cover all available features and options.

TABLE B

CIRCUIT CARD LOCATION — RT MODULE

CARD	POSITION
Receiving Device	107
Punch Feed-out	207
Reader Driver	208
Punch Code Detection	210

6. INTERFACE UNITS

6.01 The output of the electrical service unit terminates with an EIA standard interface connector. The connector extends all related power, control, and signal line circuits to an appropriate data set or line interface units. The data set or line interface units can be installed in the right pedestal of the table.

6.02 As a final check make sure that:

(a) All connections made to facilitate the local and on-line circuit tests have been removed.

(b) The power switch on the utility strip is in the NORMAL ON position.

When the interface units are properly installed and the power cord is connected to a 115-volt source, the automatic send-receive station is ready for operation.

37 TYPING UNIT

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS

		PAGE
1.	GENERAL	1
2.	DESCRIPTION	2
	BASIC UNIT	2
	OPTIONAL FEATURES	7
3.	TECHNICAL DATA	7
4.	PRINCIPLES OF OPERATION	9
	A. Main Shaft	9
	B. Selector Mechanism	10
	C. Codebar Mechanism	17
	D. Codebar Positioning	17
	E. Typebox and Carriage	18
	F. Horizontal Positioning	18
	G. Horizontal Dampener Mechanism	18
	H. Vertical Positioning	20
	I. Vertical Dampening	20
	J. Retraction Mechanism	21
	K. Print Hammer Carriage	24
	L. Ribbon Feeding and Reversing Mechanism	26
	M. Ribbon Positioning Mechanism	27
	N. Spacing Mechanism	28
	O. Function Box and Function Box Drive Mechanism	30
	P. Carriage Return Mechanism	32
	Q. Line Feed Mechanism	32
	R. Print and Space Suppression	32
	S. Backspace Mechanism	33/34
	T. Function Bar Coding	33/34
5.	REFERENCES	

1. GENERAL

1.01 This section is issued to describe the late design 37 typing unit (Figure 1). The purpose of the unit is to translate electrical code signals into printed graphics or functions.

1.02 Other units that support normal operation of the typing unit include a base with intermediate gear assembly, motor unit, and electrical service unit. The support units are described in their appropriate sections.

1.03 The 37 typing unit can be operated at speeds up to 150 words per minute. The selector mechanism of the typing unit can be varied to receive either 10 or 11 unit, 8-level serial code.

1.04 Of the eight levels of code information, four levels are used to position the typebox horizontally, and three levels are used to position the typebox vertically. The eighth level is not used in typebox positioning. The horizontal and vertical positioning mechanisms utilize the aggregate motion principle, and respond immediately to repositioned codebars.

1.05 All eight levels of code information can be sensed by the function mechanism. Seven levels define a character, and the eighth (parity) level verifies accuracy of transmission. When parity is used, a function cannot occur unless parity is correct.

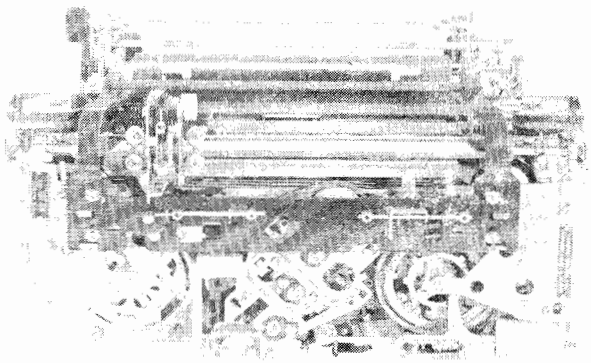


Figure 1 - 37 Typing Unit with Variable Features

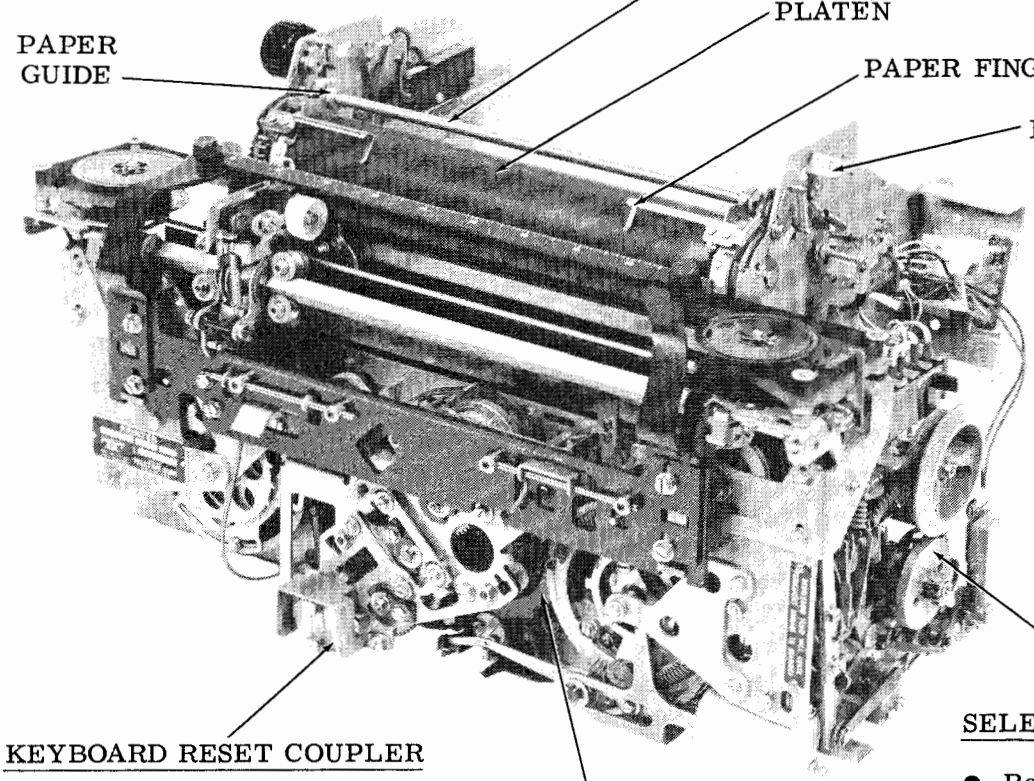
2. DESCRIPTION

BASIC UNIT

2.01 The typing unit contains the basic mechanisms to print a graphic or perform a function. Rotational motion is applied to the main shaft assembly for distribution to all mechanisms within the unit, and is extended to the keyboard reset coupler for driving a separately mounted, keyboard reset mechanism.

2.02 The selector mechanism (Figure 2) translates a serial code input into a corresponding mechanical code output. In 8-level, serial code reception, a combination of eight electrical code bits preceded by a start interval (always spacing) and concluded with a stop pulse (always marking) establishes a character. The nonprinting character (if assigned) is a function, and the printing character is a graphic.

2.03 The major mechanisms and variable features are described in Figures 2 through 6. Variable features are options which may be selected to increase the functions of a basic typing unit.



KEYBOARD RESET COUPLER

- Extends rotational motion to the keyboard reset mechanism mounted on the base unit.

SELECTOR MECHANISM

- Receives and converts electrical code input to mechanical code output.

SPACING MECHANISM

- Advances print hammer and typebox along platen after each graphic is printed.
- Completes spacing cycle in one-sixth revolution of main shaft.

Figure 2 - 37 Typing Unit

TYPEBOX

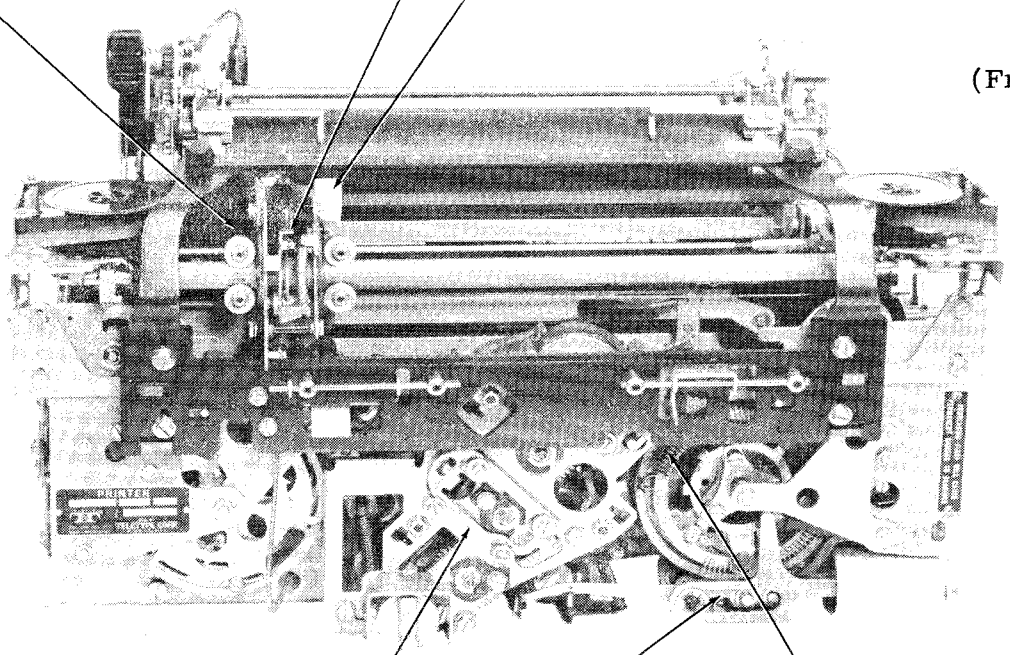
- Can contain up to 128 type pallets. Pallets omitted for nonprinting characters.
- Positioned by vertical and horizontal positioning mechanism.
- Readily removed for cleaning or replacement.

PRINT HAMMER MECHANISM

- If character is graphic, trips print hammer to print graphic.

MULTIPLE COPY KNOB

- Two position adjustable knob. One position for single copy typing. Other position for multiple copy typing.



(Front View)

HORIZONTAL POSITIONING MECHANISM

- Accepts four codebar inputs from codebar mechanism to select vertical row of type pallets.

HORIZONTAL TABULATION MECHANISM (VARIABLE FEATURE)

- Horizontally positions print hammer and typebox. Released by function bar and controlled by adjustable index tabs.

CARRIAGE RETURN MECHANISM

- Returns print hammer and typebox to left margin when CARRIAGE RETURN function character or local control key is depressed.

Figure 3 - 37 Typing Unit

RETRACTION MECHANISM

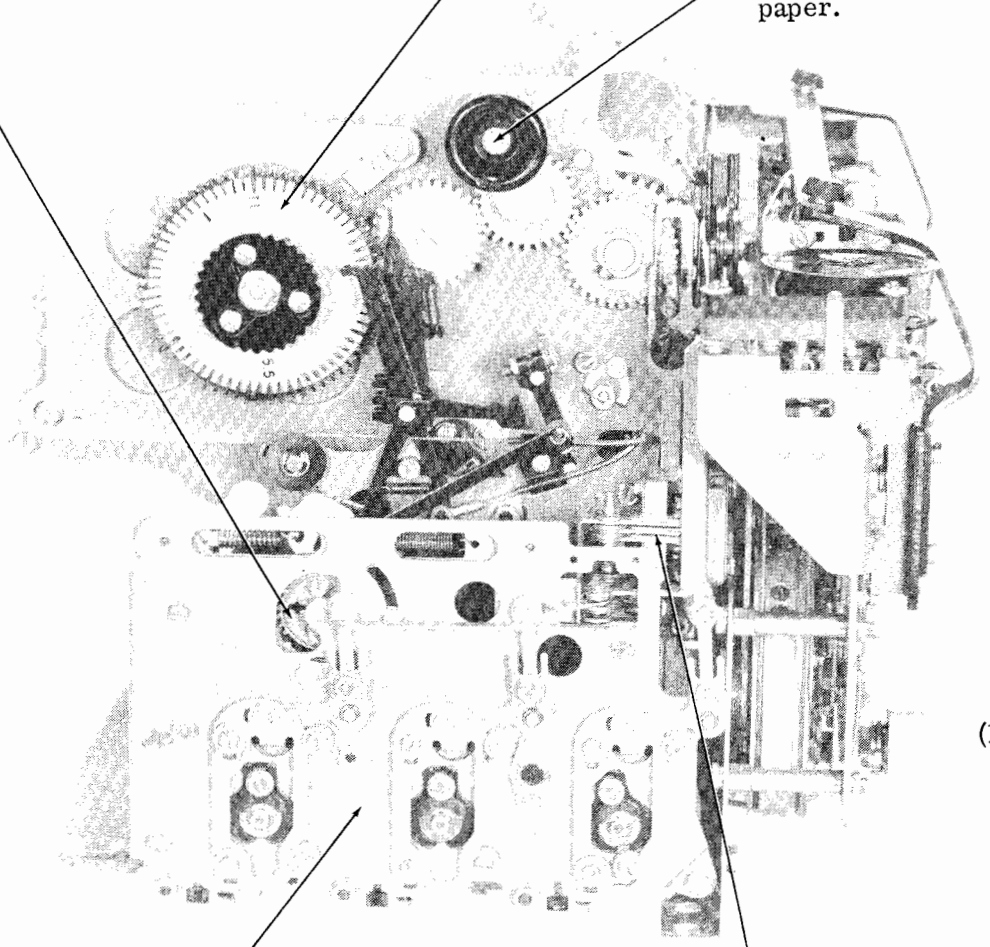
- Lowers typebox to expose printed graphic after brief idle line.
- When operated, repositions codebars.

VERTICAL TABULATION MECHANISM (VARIABLE FEATURE)

- Line feeds page or form when released by function bar. Controlled by adjustable index tabs.

PAPER FEED KNOB

- Manually operate platen to feed paper.



(Left Side View)

CODEBAR MECHANISM

- Receives inputs from either selector mechanism or retraction mechanism. Provides four outputs to horizontal positioning mechanism and three outputs to vertical positioning mechanism. Rear side of codebars provides eight outputs to function mechanism.
- Suppression codebar can be operated by stunt box to inhibit operation of certain function bars.

VERTICAL POSITIONING MECHANISM

- Accepts three codebar inputs from codebar mechanism to select horizontal row of type pallets.

Figure 4 - 37 Typing Unit

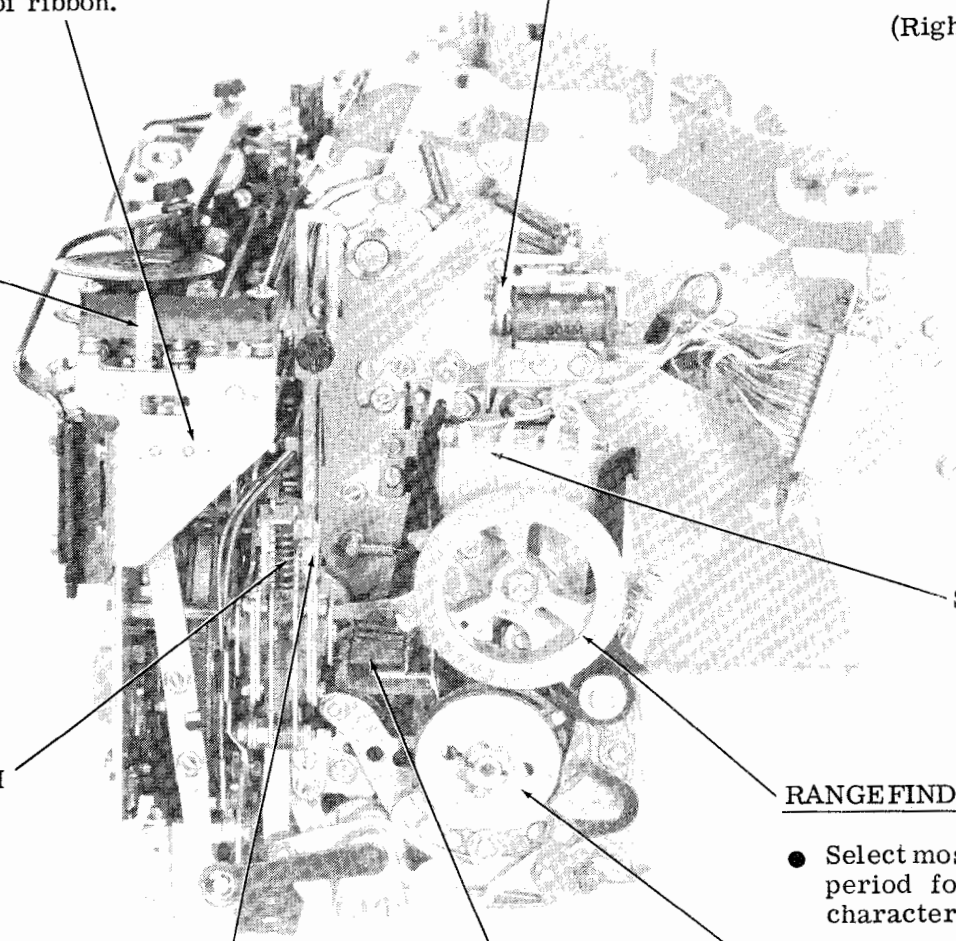
RIBBON MECHANISM

- Provides inked source for impressing graphic on paper.
- Advances ribbon after each graphic is printed.
- Automatically changes direction of ribbon feed at end of ribbon.

TWO COLOR RIBBON MECHANISM (VARIABLE FEATURE)

- Magnet operated through function mechanism to shift vertical position of ribbon so that one of two colors is opposite of graphic to be printed.

(Right Side View)



RANGEFINDER

- Select most favorable period for sampling character bits.

TRANSFER MECHANISM

- Transfers output from selector mechanism to codebar mechanism.

Figure 5 - 37 Typing Unit

50-PIN CONNECTOR

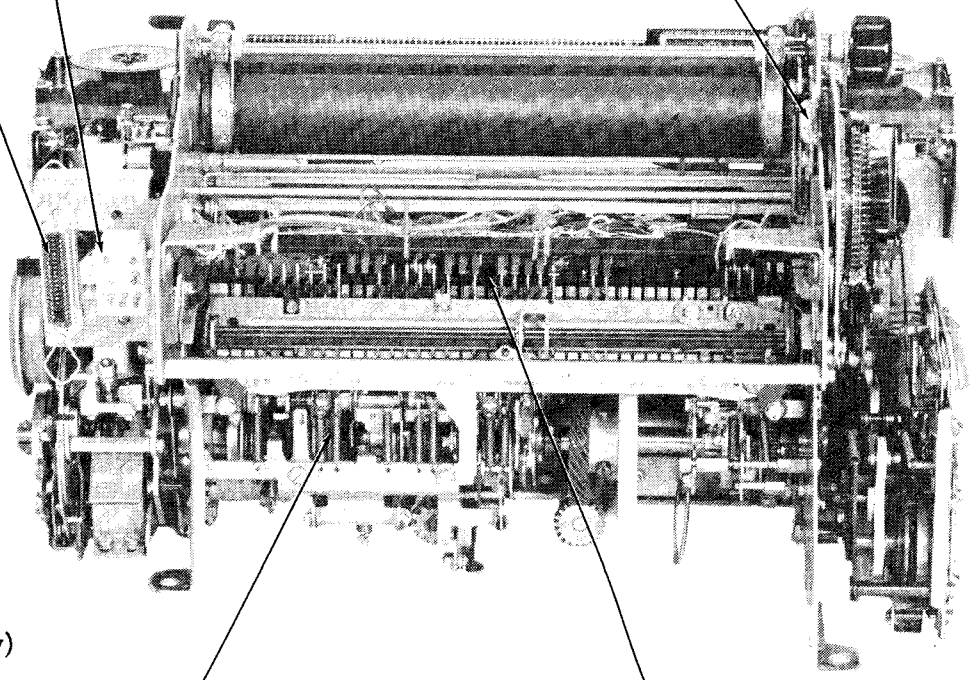
- Electrical interface from the function mechanism to the electrical service unit (transmission of control codes for the function box arrangements).

15-PIN CONNECTOR

- Provides the interface to the selector mechanism from the signal line circuits in the electrical service unit.

LINE FEED MECHANISM

- Advances platen one or two lines when LINE FEED character is received or local control key is depressed.
- Single or double line is preset manually.
- Completes line feed cycle in one-sixth revolution of main shaft.



(Rear View)

TRIP SHAFT MECHANISM

- First operation engages function mechanism.
- Second operation, if not inhibited, operates print hammer and ribbon feed mechanism.

FUNCTION MECHANISM

- Senses each new character received. Detects presence of function character and operates mechanical linkage or electrical contacts to initiate function.
- Can suppress subsequent print hammer, spacing, and ribbon feed mechanisms.
- Can sense parity (eighth) level.
- Function box contains 42 slots for function bars.

Figure 6 - 37 Typing Unit

2.04 The Model 37 can be broken down into five major subassemblies and a main frame assembly. The subassemblies are: main shaft, function box, selector, vertical position and a front plate assembly which contains the horizontal positioning. These major assemblies can be disassembled and assembled to the main frame with little or no adjustment change.

2.05 The typing unit is designed to be used with a base unit which gives the necessary rigidity to the printer frame. The typing unit should not be operated without this or a comparable supporting base plate.

2.06 The base unit supports the motor and gear units which is supported by rubber and spring vibration mounts. This feature isolates vibrations and noise originating in the typing unit, gears, or motor from the supporting pan, table and cover. The typing unit is equipped with a coupling and plastic shock disc that provides power to the keyboard reset mechanism.

OPTIONAL FEATURES

2.07 The typing unit is designed to accept a full range of options that are on-line controllable. These options are furnished in the form of modification kits listed below.

Horizontal Tab
Horizontal Tab Stop Control
Vertical Tab and Form Feed
Vertical Tab Stop Control
Half, Forward and Reverse Line Feed
Two-Color Ribbon
Print (Only) Suppress
Printed Graphics Extension
Low Paper Alarm Switch (Friction Feed)
Paper-Out Alarm Switch (Sprocket Feed)
Auto Carriage Return and Line Feed
To Convert Friction Feed to Sprocket Feed

2.08 In addition to the above features, the function box can be equipped to perform nonrepeat form feed and carriage return upon reception of line feed, vertical tab or form feed.

3. TECHNICAL DATA

Signal Input Data

3.01 By varying the assembly and choice of certain parts in the mechanism during construction of the printer, it can be made to respond to a number of different code arrangements, of which the following are typical:

8 Level	10	Unit	up to	150	Baud
6 Level	8.5	Unit	up to	127.5	Baud
5 Level	7.42	Unit	up to	111.3	Baud

Power Input Data

3.02 Mechanical power is supplied to the printer mechanism by an electric motor operating at 3600 rpm. An intermediate gear unit is used to reduce this speed, and to provide a choice of printer main shaft speeds. Operating speeds considerably lower than 600 operations per minute (100 wpm) may require changes in the printer mechanism.

Unit Code	Levels	Bauds	O.P.M.	Main Shaft Speed
10.00	8	150	900	500 RPM
8.5	6	127.5	900	514 RPM
7.42	5	111	900	514 RPM
11.00	8	110	600	343 RPM

Output Data

3.03 The friction feed typing unit prints the message on a roll of single or multiple copy paper of 8-1/2 inches maximum width, 5 inches maximum diameter.

3.04 The sprocket feed unit prints the message on up to six copies of flat-folded form-feed paper with margin perforations spaced to fit the sprocket teeth on the typing unit platen. Platens are available for the following paper widths 3-5/8, 4, 4-1/4, 4-5/16, 4-1/2, 5, 5-1/2, 5-3/4, 6, 6-1/4, 6-3/8, 6-1/2, 7, 7-1/2, 8, 8-1/2, 9, 9-1/2 inches with the distance between holes being one-half inch less than the paper width.

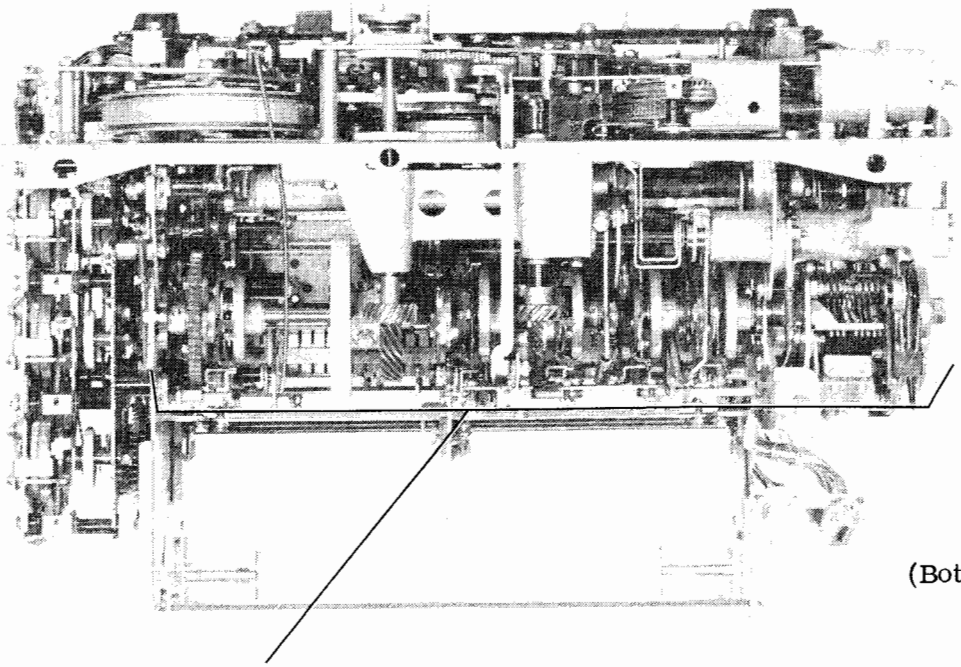
Size, Weight, Mounting

3.05 Overall dimensions of the typing unit exclusive of the base unit are:

Length	15-3/4 inches
Height	9-5/8 inches
Depth	10-7/8 inches

Operational Requirements

3.06 The typing unit is designed to operate with standard lubrication without damage in an ambient temperature between 40°F and



(Bottom View)

MAIN SHAFT ASSEMBLY

- Distributes mechanical rotational motion to various clutch-cam and clutch-gear assemblies, typebox positioning mechanisms, and spacing mechanisms.
- Two-character cycles per revolution of the main shaft.

Figure 7 - 37 Typing Unit

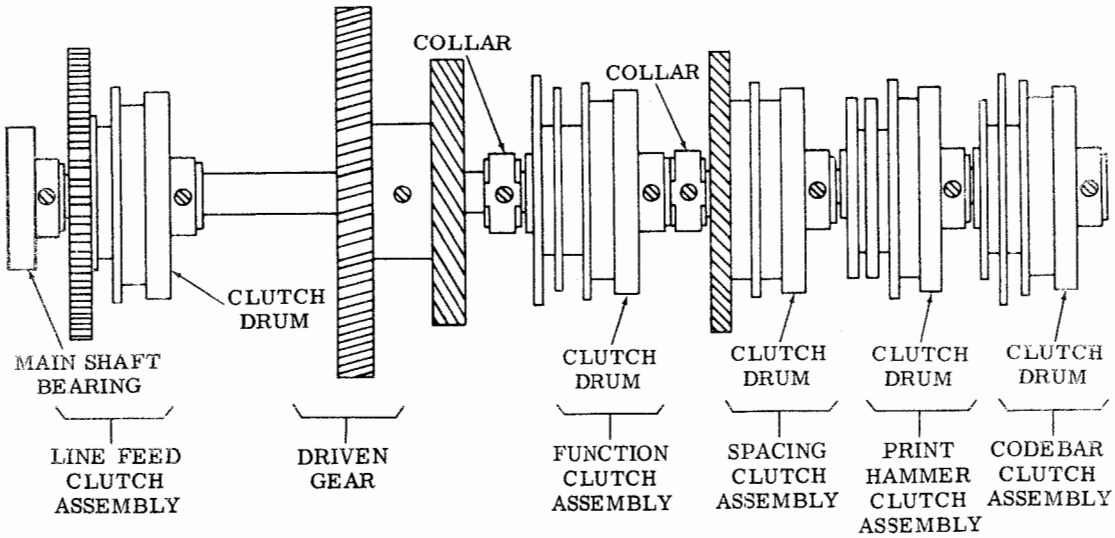


Figure 8 - Main Shaft

(Bottom View)

Note: When the typing unit is mated with the keyboard, refer to Section 574-321-703TC for the required information concerning the adjustment between the main shaft driven gear and the intermediate gear assembly.

140°F measured inside the closed cover.

(a) Operation at temperatures down to -20°F is possible with special lubrication.

(b) Operation is satisfactory in an environment ranging from 1% to 90% relative humidity, in an ambient temperature range of 40°F to 110°F, outside the cover.

(c) Operation is not adversely affected by inclination of up to 45°. The timing of the machine makes possible the suppression of printing and spacing in the same cycle in which a nonprinting code is read by the function box.

(d) Noise and vibration has been kept to a minimum. Noise and vibration isolation shall be provided in the base mounting and cover, or the cabinet where used.

(e) No readily combustible material is used in the construction of the unit.

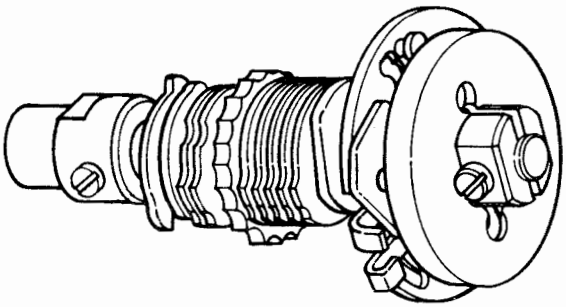
4. PRINCIPLES OF OPERATION

A. Main Shaft

4.01 The main shaft is located in the lower rear portion of the typing unit and extends the full length of the unit. It is supported by ball bearings mounted in each side frame. The main shaft includes six clutches, each when tripped, drives its associated mechanism. These clutches have two shoes which bear against the inside surface of a drum which, in turn, is keyed to the main shaft. Two of the clutches (namely the line feed and the spacing clutches) have six sets of lugs equally spaced about their periphery for controlling the engagement and disengagement of the clutch shoes with the drum. Thus, these clutches will turn only one-sixth of a revolution when tripped, except when the single-double line feed lever is set for double line feed in which case the line feed clutch will turn one-third of a revolution. The remaining clutches have two sets of lugs and will turn half of a complete revolution when tripped.

(Front View)

Figure 9 - Main Shaft



(Right Front View)

Figure 10 - Selector Cam and Clutch

4.02 The six clutches on the main shaft are, from right to left, selector clutch, codebar clutch, print hammer clutch, spacing clutch, function clutch, and line feed clutch. The selector clutch provides power for operating the selector, and also trips the codebar clutch and resets the retraction mechanism. The codebar clutch drives the codebar positioning mechanism, trips the function clutch and print hammer clutch. The print hammer clutch drives the print hammer, ribbon feed, ribbon positioning, dampener detent arms and trips the spacing clutch. The spacing clutch drives the spacing mechanism. The function clutch drives the function bar reset bail and the function pawl stripper blade. The line feed clutch drives the line feed mechanism.

B. Selector Mechanism

4.03 The selector mechanism consists of the magnet coils and armature, a selector cam and clutch, and associated levers, arms and bails necessary to convert the electrical intervals of the start-stop code to the mechanical motions which are transferred to the punch printer or code contacts.

4.04 The selector clutch and cam sleeve assembly is comprised of the two-stop clutch, the start bail and left lever cam, the eighth, seventh, sixth, fifth and fourth selector lever cams, the cam for the spacing and marking locklevers, the third, second, and the first selector lever cams, the push lever reset bail cam, and the function clutch trip cam.

Note: On 5- and 6-level cam sleeves, no cams appear in the 6, 7, and 8th or 7 and 8th positions respectively.

4.05 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.

4.06 At the start of a signal for any character or function, the start (spacing) interval releases the selector armature which under tension of its spring, moves away from the magnet pole piece and thus, unlatches the start lever. The start lever turns clockwise under the tension of its spring to move the start bail into the indent of its cam.

4.07 As the start 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. By this time, the start lever tip has moved into the selector armature extension cut-out and the armature starts moving in correspondence with the signal bits. Between the second and third signal bit, the left lever is pivoted clockwise by the start bail cam and lifts the start lever above the armature extension. At this same time, the start bail rides to the high point of its cam where it remains to hold the start lever away from the selector armature until late in the character cycle. In approximately the middle of the cycle the left lever rides down its cam, thus, lowering the start lever. When the stop impulse at the end of the signal is received, the selector armature is pulled up to block the start lever. Thus, the start bail is prevented from dropping into the low part of its cam (stop position of cam sleeve, and the attached stop arm is held so as to stop the clutch shoe lever).

4.08 The selector cam clutch disc upon which the latchlever rides has an indent at each of its two stop positions. When the clutch shoe lever strikes the stop arm, the inertia of the cam disc assembly causes it to continue to turn until its lug makes contact with the lug on the clutch shoe lever. At this point, the latchlever drops into the indent in the cam disc, and the clutch is held disengaged until the next start interval is received.

4.09 The series of up to eight selecting levers and the marking and spacing locklevers ride their respective cams on the selector clutch and cam sleeve assembly. As the marking and spacing signal intervals are applied to the selector magnet, the selector cam sleeve rotates and actuates the selector levers. When a spacing interval is received, the marking locklever is blocked by the end of the armature and the spacing locklever swings toward the right above the armature and locks it in the spacing position until the next signal transition is due. Extensions on the marking locklever prevent the selector levers from following their cams. When a marking impulse of the signal is received, the spacing locklever is blocked by the end of the armature and the marking locklever swings to the right below the armature to lock it in the marking position until the next signal transition is due. During this marking condition the selector levers are not blocked by the marking locklever 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 momentarily. Each selecting lever has an associated push lever which drops off a shelf on the top of the selecting lever when it rides into its cam indent. As the cam sleeve turns, each selecting lever together with its latched push lever is moved toward the left and held there until all eight code intervals have been received. After all the selected push levers have been positioned to the left and all unselected push levers have been positioned to the right, they are held until the next start interval is received. When the subsequent start interval again causes the cam sleeve to rotate, the push lever reset bail, in following its cam, unlatches the selected push levers. The push levers then return to the unselected (right) position under their spring tension.

4.10 The no. 1 push lever differs in that it uses an auxiliary no. 1 push lever and auxiliary strip bail. When the no. 1 selector lever is permitted to follow its cam (marking condition) the auxiliary no. 1 push lever is selected in the same manner as other push levers. At this time the strip bail is on the high part of its cam, resetting all the selected push levers above the shelves on their associated selector levers. When the no. 1 selector lever returns counter clockwise to the intermediate position on the cam, a tab on the auxiliary no. 1 push lever engages the no. 1 push lever and drives it to the left in a marking condition. At approximately midcycle the auxiliary push lever is stripped by its auxiliary strip bail, thus the auxiliary no. 1 push lever is prepared for the next incoming marking pulse. The auxiliary lever action permits normal strip operation to occur between no. 1 and no. 2 pulse selection.

4.11 The selector cam sleeve clutch has two stop positions and likewise the individual cams have two complete identical contours in 360 degrees, providing for two complete cycles of operation for each revolution of the cam sleeve.

Note: When rotating the main shaft by hand, the clutches will not fully disengage upon reaching the stop position. In order to relieve the drag on the clutch and permit the main shaft to rotate freely, apply pressure on the lug of the clutch disc to cause it to engage its latchlever. This procedure should be followed prior to applying power to the unit.

Manual Operation of the Unit

4.12 While adjustments are being made, apply current to the selector coils, holding the selector magnet armature in the marking position. To manually select an all marking combination, push the armature downward into the spacing position momentarily to permit the selector clutch to engage. Rotate the main shaft slowly through a half revolution. Fully disengage the clutch as prescribed in the preceding note and repeat if desired.

Start-Stop Operation

4.13 Engage-disengage selector cam sleeve with main shaft; responds to start and stop bits of a character.

Operation

Engage selector cam sleeve with main shaft.

(1) Start (spacing) bit of new character de-energizes selector magnets and releases armature.
(2) Armature, under tension of armature spring, falls against downstop bracket.
(3) Absence of armature extension unlatches start lever which, under tension of start lever spring, pivots inward moving the stop arm bail into the indent of its cam. As the stop arm bail pivots inward, the attached stop arm pivots out of path of clutch shoe lever.
(4) Clutch shoe levers expand to engage disc and cam sleeve assembly with rotating clutch drum.

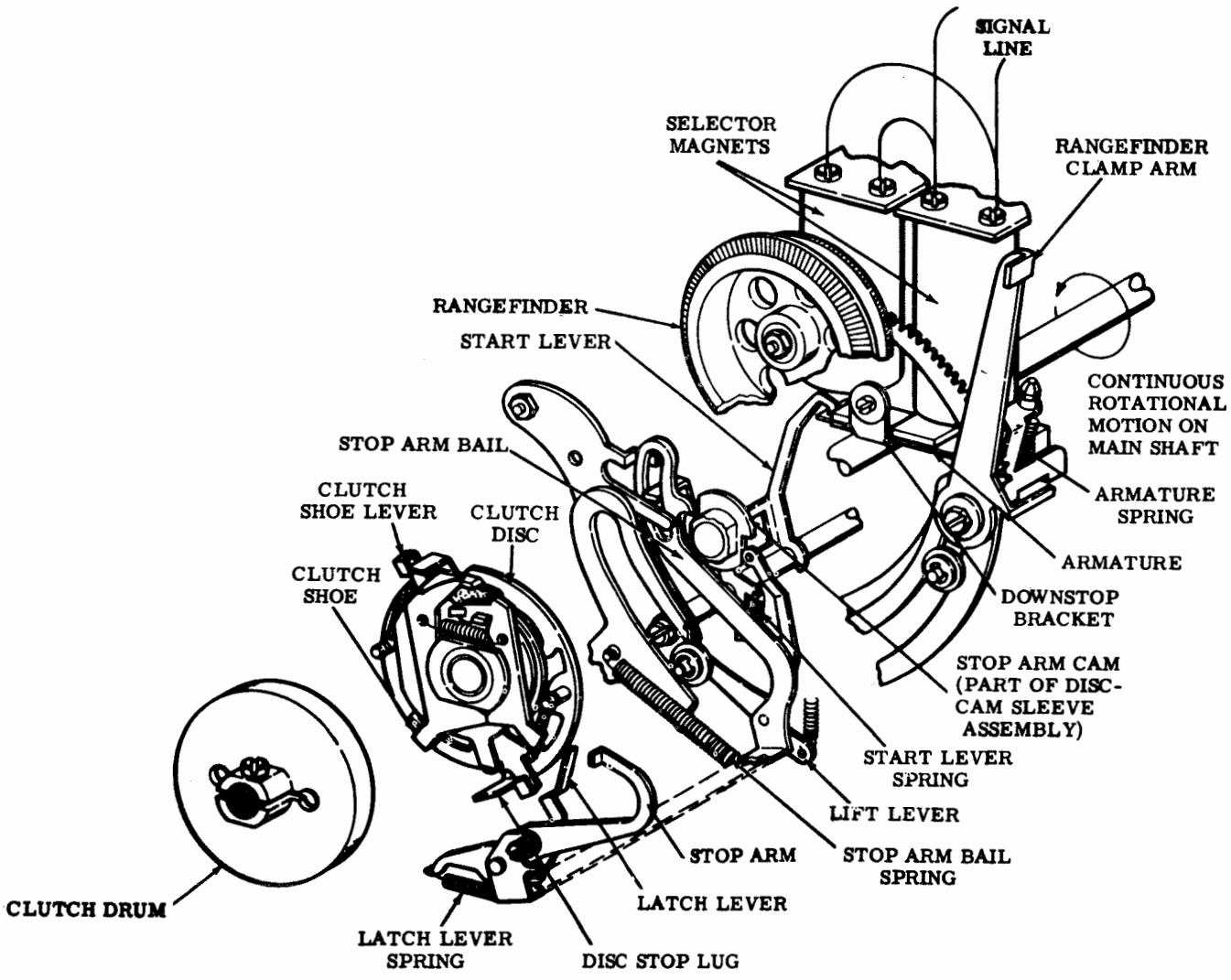
Raise, reset, and lower start lever. Block clutch shoe lever.

(1) Cam sleeve starts rotating. Selector cam sleeve mechanically operates its cam followers in a prearranged sequence as code level signals (marking or spacing) operate the armature (4.15).
(2) Between the second and third character bit, lift lever elevates start lever above opening in armature extension. Stop arm bail rides to high part of stop arm cam forcing start lever away from armature, restoring stop arm to blocking position.

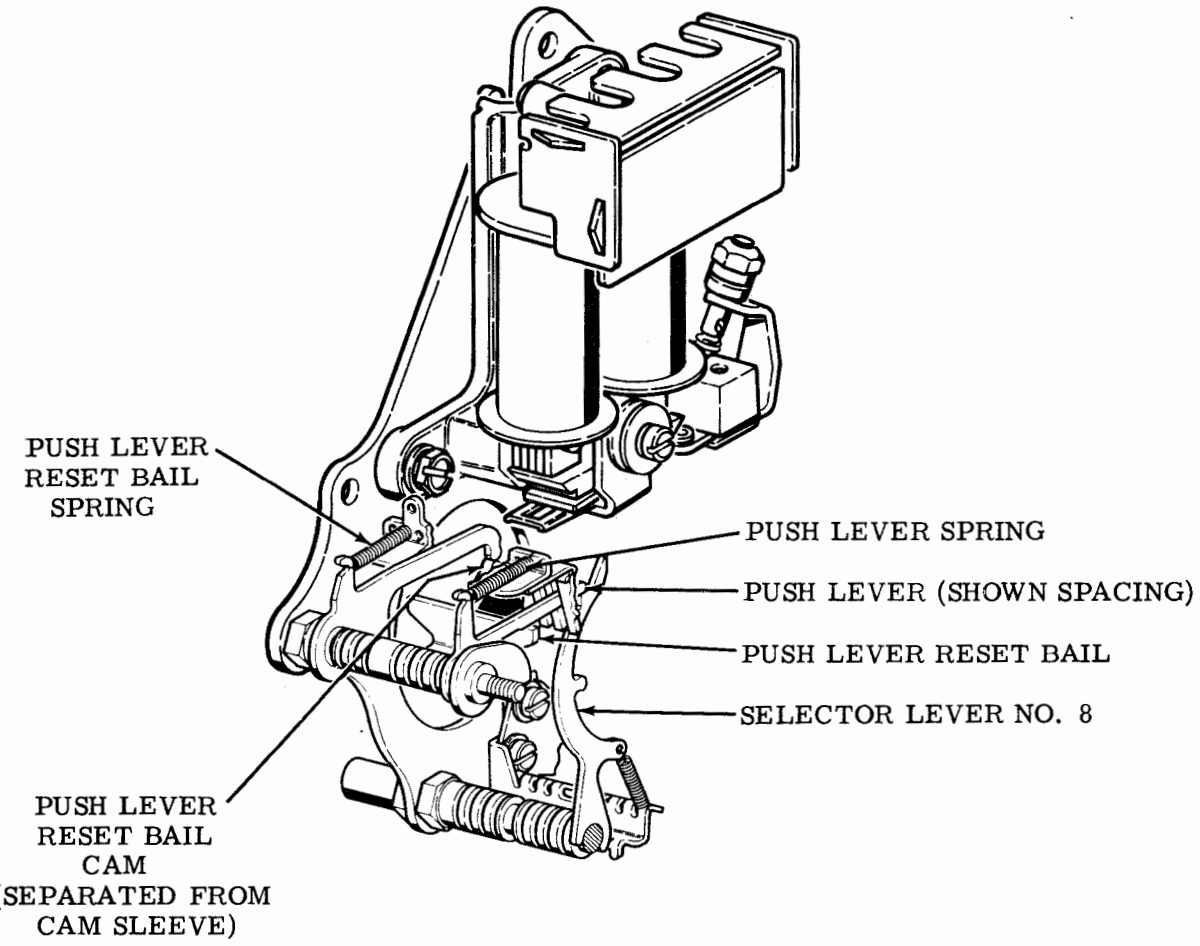
Disengage selector cam sleeve from main shaft.

(1) Lift lever falls into indent of stop arm cam and lowers start lever.

(2) Stop (marking) bit at end of character energizes selector magnets and attracts armature.
(3) Stop arm cam presents indent to stop arm bail.
(4) Stop arm bail begins to enter indent but is prevented from entering fully by start lever whose inward movement is blocked by armature extension. Stop arm engages shoe lever to disengage cam sleeve from rotating clutch drum.
(5) Clutch disc latched by latch lever.
(6) Selector mechanism prepared to receive start (spacing) bit of subsequent character.



Note: Mechanically adjust position of stop arm, stop arm bail, lift lever, and cam sleeve in order to select most favorable period for sampling character bits as received by selector magnets. Range finder clamp arm, when pivoted clockwise, permits range finder scale adjustment.



Push Lever Reset

4.14 Strip the previous character from push levers after a start bit causes the selector cam sleeve to engage the main shaft.

Operation

As cam sleeve begins rotating, high part of push lever reset bail cam lifts push lever reset bail against tension of spring. Bail pivots, lifting and unlatching the marking push levers from behind their selector levers. The bail returns to the unoperated position when the lobe drops from the high part of the cam. All of the push levers, except the auxiliary push lever (Paragraph 3.08) will then be in the spacing condition.

Selection

4.15 Code selections are performed by sequentially positioning push levers as marking and spacing intervals are applied to selector magnets.

Operation

View (A) - Idle Condition

(1) Selector cam sleeve shown before starting selection cycle. Marking lock lever, spacing lock lever, and eight selector levers held against cam sleeve by their individual springs; the lobes of each lever are riding on high part of selector cam sleeve.

(2) As marking and spacing signal intervals are applied to selector magnets, selector cam sleeve rotates and actuates selector levers.

View (B) - Marking Condition

(1) When marking impulse is received, the spacing lock lever is blocked by end of armature. Top of marking lock lever moves under armature, supporting armature in marking position until next signal transition is due.

(2) During marking condition, selector levers are not blocked by armature extensions but are permitted to ride against their respective cams. Only that selector lever which is opposite the indent in its cam, can affect its push lever.

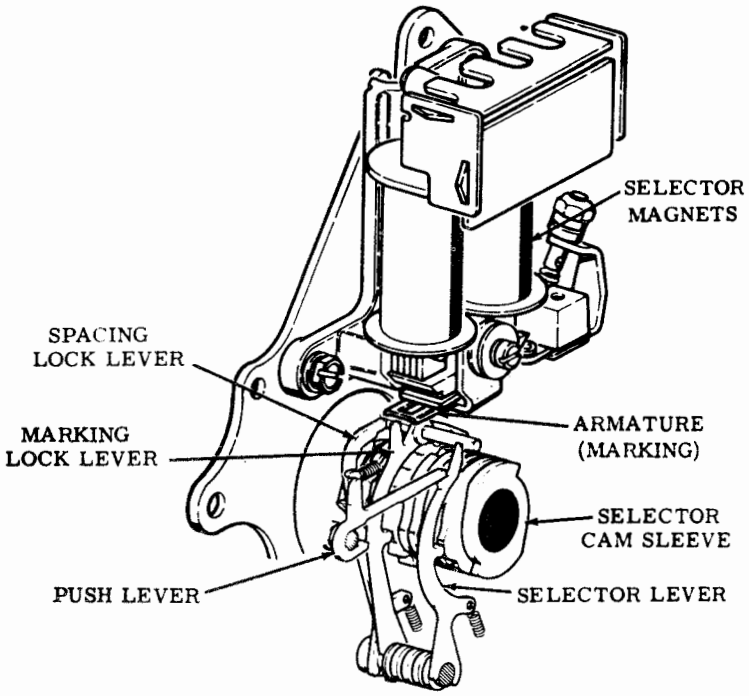
(3) As the lobe of the selector lever is drawn into its cam indent, the push lever drops off the shelf of its selector lever. When the selector lever is forced out of its indent, the selected push lever slides to the marking position.

View (C) - Spacing Condition

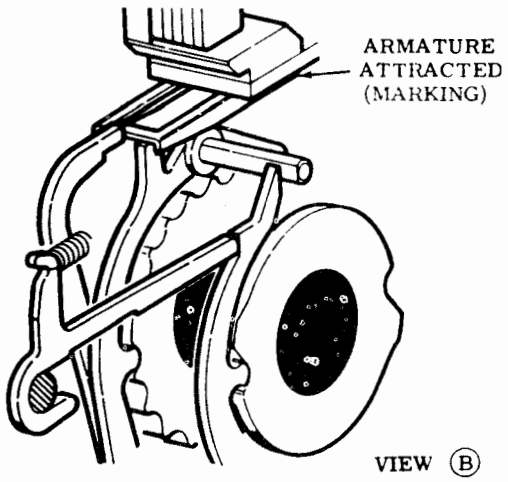
(1) When spacing interval is received, the marking lock lever is blocked by end of armature. Spacing lock lever swings above armature and locks it in the spacing position until next signal transition is due.

(2) During spacing condition, selector levers are prevented from riding their respective cams by extensions on marking lock lever.

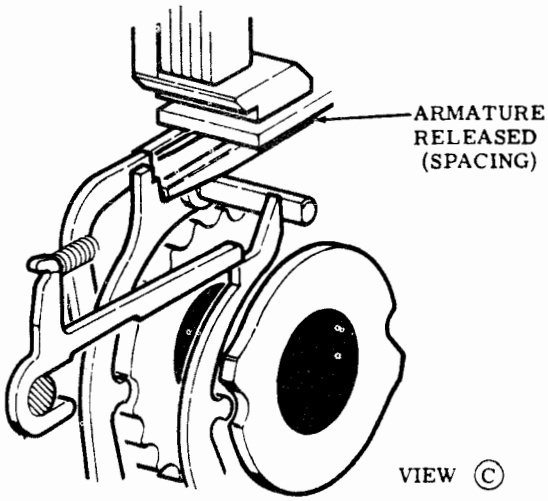
(3) Lobe of selector lever opposite its cam indent cannot enter indent fully. Push lever will not latch behind selector lever but will remain on shelf.



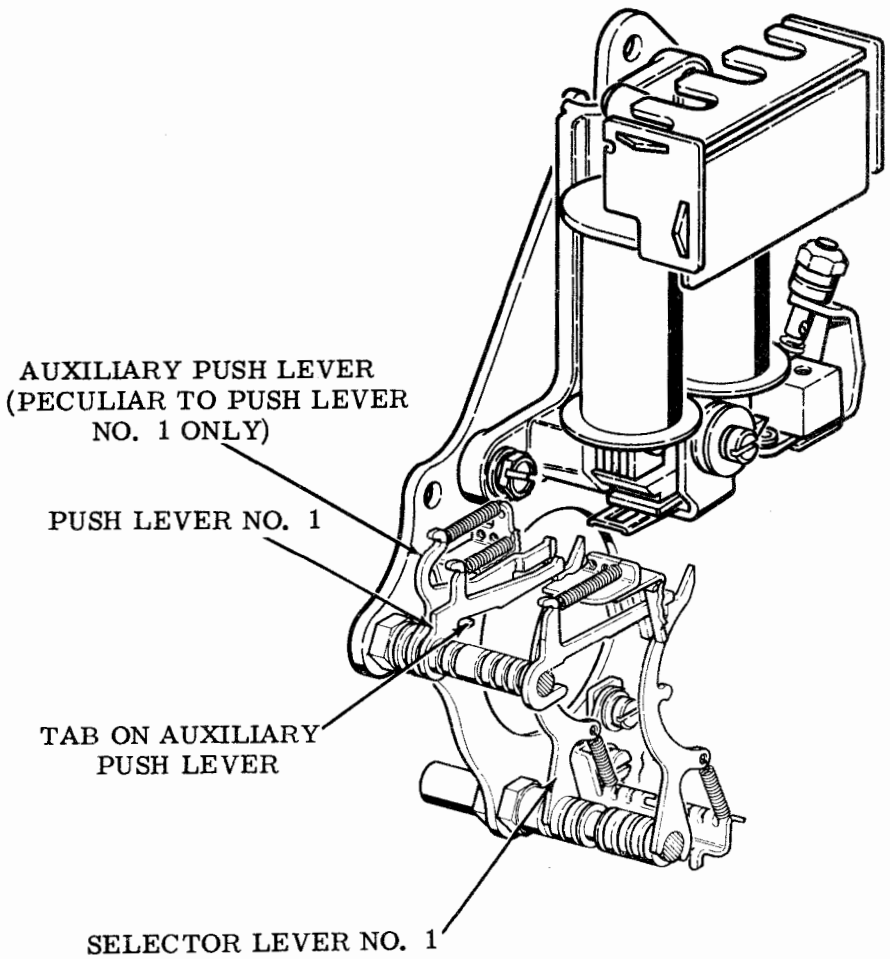
VIEW (A)

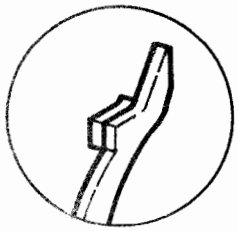


VIEW (B)

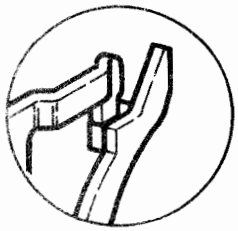


VIEW (C)

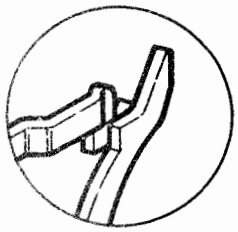




SHOULDER ON SELECTOR LEVER NO. 1 FOR AUXILIARY PUSH LEVER



AUXILIARY PUSH LEVER SHOWN IN STRIPPED OR SPACING CONDITION



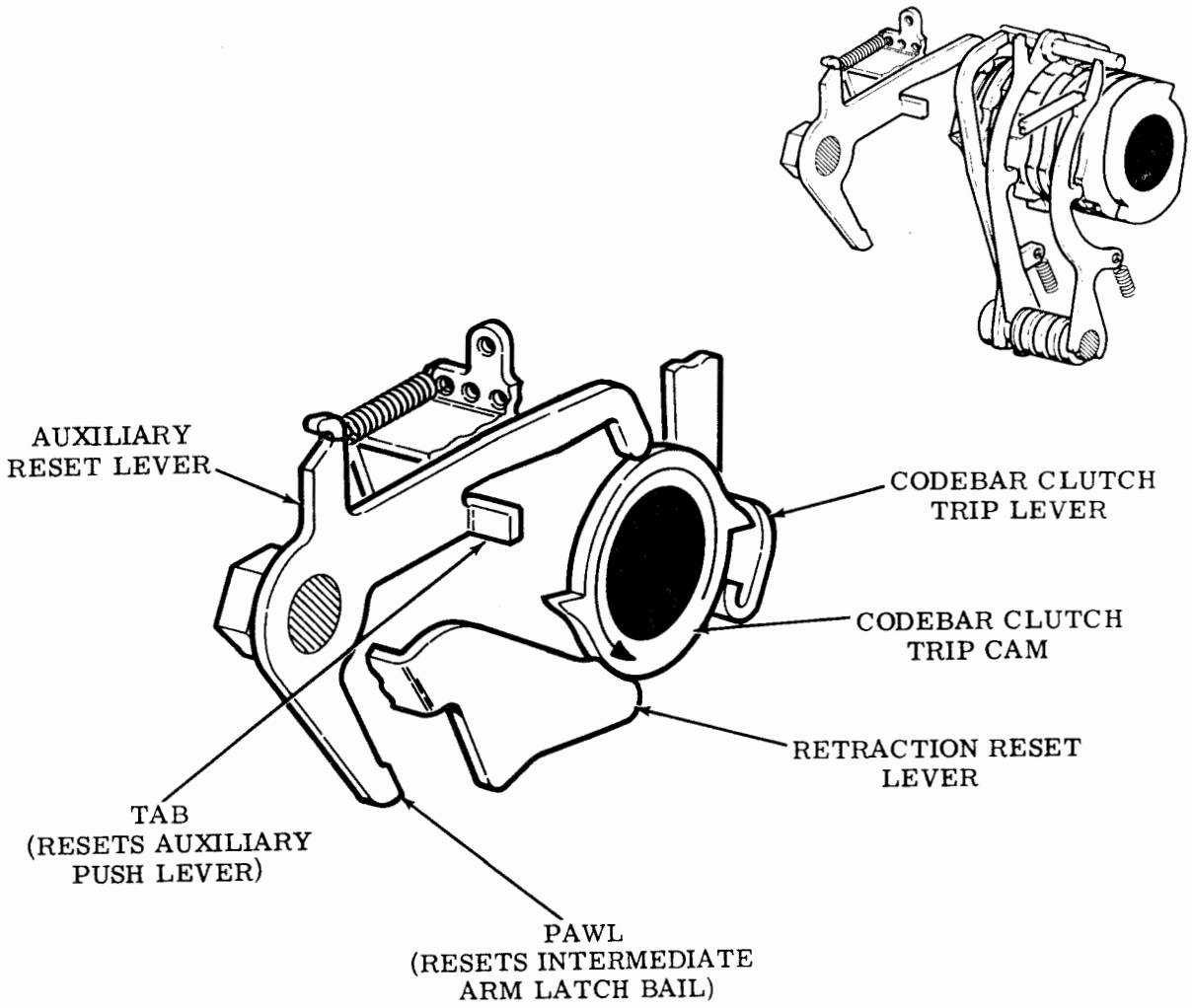
AUXILIARY PUSH LEVER SHOWN MARKING

Auxiliary Push Lever

4.16 Auxiliary push levers sense marking or spacing position of selector lever number 1. Normal strip operation (push lever reset) occurs during reception of code bit number 1 and does not permit push lever number 1 to sense position of its selector lever.

Operation

Auxiliary push lever responds to marking impulse for push lever number 1. When bit number 1 is marking, auxiliary push lever drops behind shoulder of selector lever as push lever number 1 is stripped. Tab on auxiliary push lever carries push lever number 1 to marking position. When push lever reset bail (Paragraph 3.06) returns to unoperated position, push lever number 1 is behind, but not touching, its selector lever. Approximately half way through selection cycle, auxiliary push lever is stripped by auxiliary reset lever (Paragraph 3.09). Push lever number 1 is then latched by selector lever number 1.



Trip and Reset Mechanisms

4.17 The conditions for the trip and reset mechanism are to strip the count on typebox retraction mechanism; reset auxiliary push lever and intermediate arm latch bail, and trip codebar clutch.

Operation

As cam sleeve rotates, high part of cam operates retraction reset lever. Approximately mid cycle, second high part of cam operates auxiliary reset lever. Tab on auxiliary reset lever strips auxiliary push lever, and pawl resets intermediate arm latch bail in transfer mechanism (Paragraph 3.10). About the same time, first high part of codebar clutch trip cam operates codebar clutch trip lever to initiate operation of codebar shift mechanism (Paragraph 3.11).

C. Codebar Mechanism

4.18 In the Model 37 typing unit there are 11 codebars. They are numbered 1 through 11 from the bottom up. The first seven codebars have two basic uses. First, to control the horizontal and vertical positioning clutches, and second along with the other four bars to be read by the function box to perform functions. Bar no. 8 is a parity check by the function box on function codes. Bar no. 9 is used to suppress functions in the function box. Bar no. 10 is used as a gate for "Escape" sequences and may suppress functions if required. Both bars (9 and 10) are moved by shift forks controlled through the function box when so equipped. Bar no. 11 is an auxiliary bar which may serve a variety of purposes. Automatic carriage return is one of the uses for which the no. 11 bar is intended.

D. Codebar Positioning

4.19 As the selector finishes its cycle it positions all selected (marking) push levers towards the front of the machine. As the push levers start to move they impart a motion to the intermediate levers in the codebar positioning mechanism which in turn imparts motion to the bottom of the transfer levers causing the top of the transfer levers to move toward the rear of the machine. The top portion of the selected transfer levers contacts their corresponding codebar shiftbars and move the shiftbars toward the rear of the machine; thereby placing the step in the shiftbars in the path of the shift lever. The shift lever now begins to move under power from the codebar clutch and drives all marking shiftbars and corresponding codebars to the left. A second shift lever drives all spacing (nonselected) shiftbars and corresponding codebars to the right. The codebars have now been fully positioned and the codebar shift levers return to their previous position. The selected intermediate levers are now in a latched condition and therefore are holding the transfer levers and shift levers marking (toward the rear) until midway through the next cycle of the selector where upon they will be stripped allowing the shiftbars to return to the spacing condition (toward the front of the unit). Note that the shiftbars return to spacing in their front to rear direction but retain their positions from left to right. This allows each codebar to remain in position (mark or space) until a change in code for the level occurs.

Escape Sequence

4.20 Escape - Sequences when received in the stunt box can give a mechanical or electrical output on the last character in the sequence. Sequences preferably should be two characters long, however three and more characters each starting with ESC can be implemented. The last character in the sequence should be an ESC terminating character which precludes column 2 of the ASCII code chart. The following is a list of adopted two-character ESC - Sequences:

ESC-1 — Horizontal Tab Set
ESC-2 — Horizontal Tab Clear
ESC-3 — Print Red
ESC-4 — Print Black
ESC-5 — Vertical Tab Set
ESC-6 — Vertical Tab Clear
ESC-7 — Reverse Line Feed
ESC-8 — Half Reverse Line Feed
ESC-9 — Half Line Feed
ESC-: — Full Duplex (FDX)
ESC-; — Half Duplex (HDX)

4.21 Escape sequences are implemented in the unit in the stunt box in conjunction with a no. 10 level blocking bar.

4.22 Escape is received in the stunt box by a function bar in slot 25. Its function lever shifts the no. 10 blocking bar by way of a fork shift mechanism and latches with a stripper blade latch.

4.23 The no. 10 blocking lever is similar to a codebar and positioned above the codebar assembly acts as a gate that opens for the duration of one machine cycle.

4.24 The no. 10 blocking bar, when selected, unblocks the function bar of the second character of the sequence. These function bars are special in that they have a no. 10 blocking tine to be gated by the no. 10 blocking bar.

4.25 After second character of the sequence following escape has been selected, the escape function lever is unlatched by the stunt box stripper blade which closes the gate again for any second character sequence selection.

4.26 The second character in the sequence is always print and space suppressed.

H. Vertical Positioning

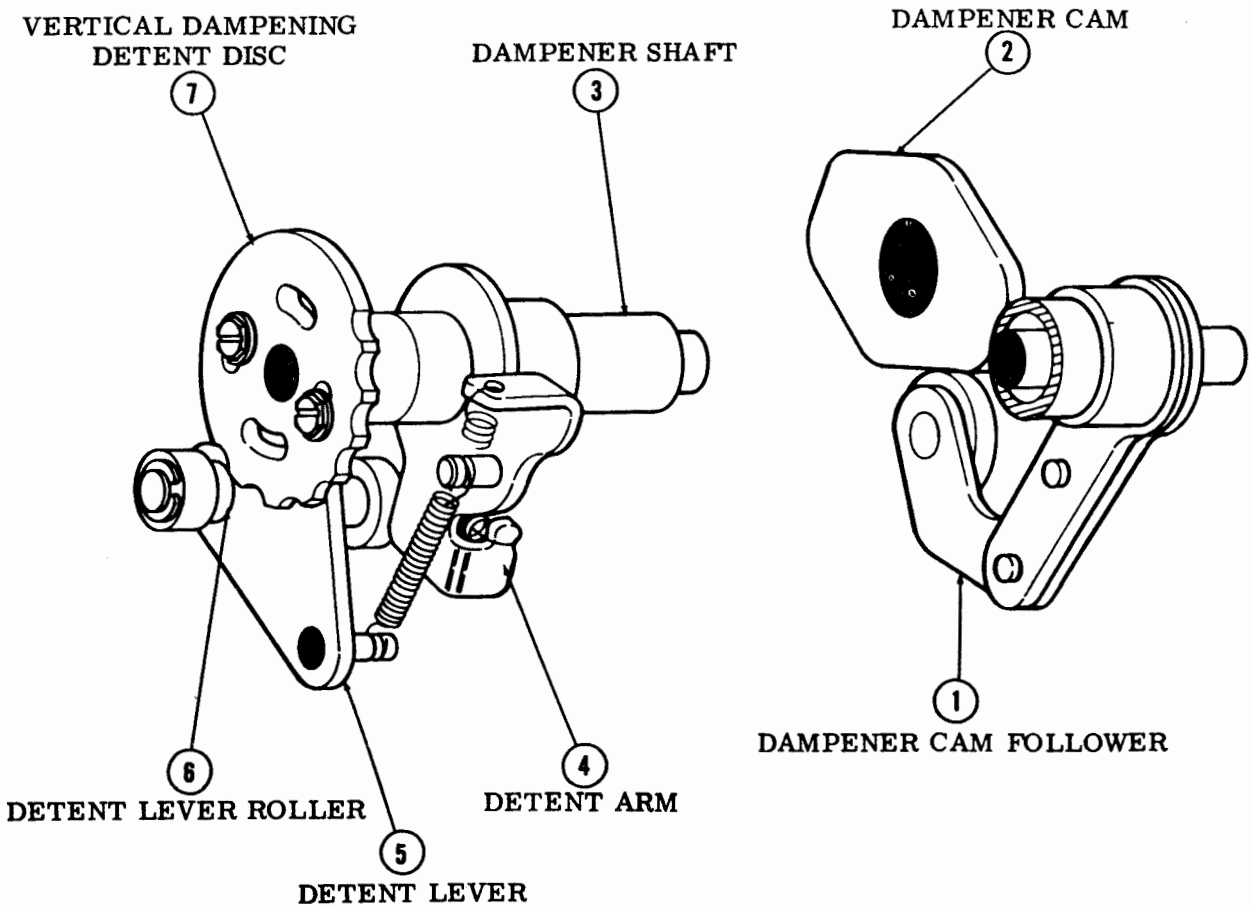
4.33 The vertical positioning (5, 6 and 7) codebars are connected in a manner almost identical to those in the horizontal mechanism. Three clutches in turn cause movement to be applied to an aggregate motion, which gives eight output positions. The output end of this mechanism is made to drive a vertically mounted rack on the left side of the machine. This rack is connected to the rail carrying the typebox and is connected to a similar rack on the right side of the machine through a cross shaft and associated pinions. In this manner the aggregate motion mechanism causes the rail to be set in the selected vertical position, but parallelism is maintained between the rail and the machine center line.

I. Vertical Dampening

4.34 The vertical dampening mechanism is similar in principle to horizontal dampener and is located on the cross shaft mentioned above.

Operation

View as shown is in a stop condition. As printing clutch trips, the DAMPENER CAM FOLLOWER (1) rides high portion of DAMPENER CAM (2) rotating DAMPENER SHAFT (3) counterclockwise. As DAMPENER SHAFT (3) rotates, a spring connected from the DETENT ARM (4) to the DETENT LEVER (5) causes the DETENT LEVER ROLLER (6) to move into the VERTICAL DAMPENING DETENT DISC (7) .

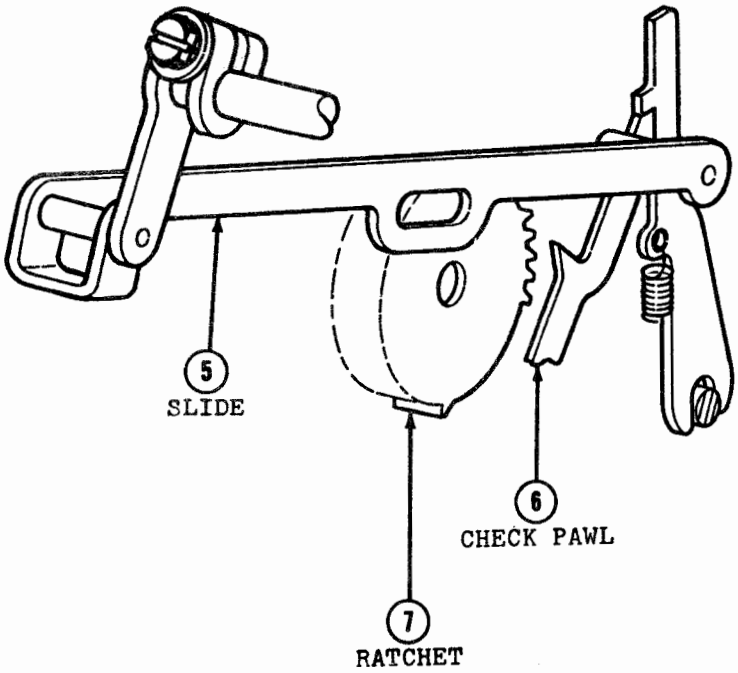


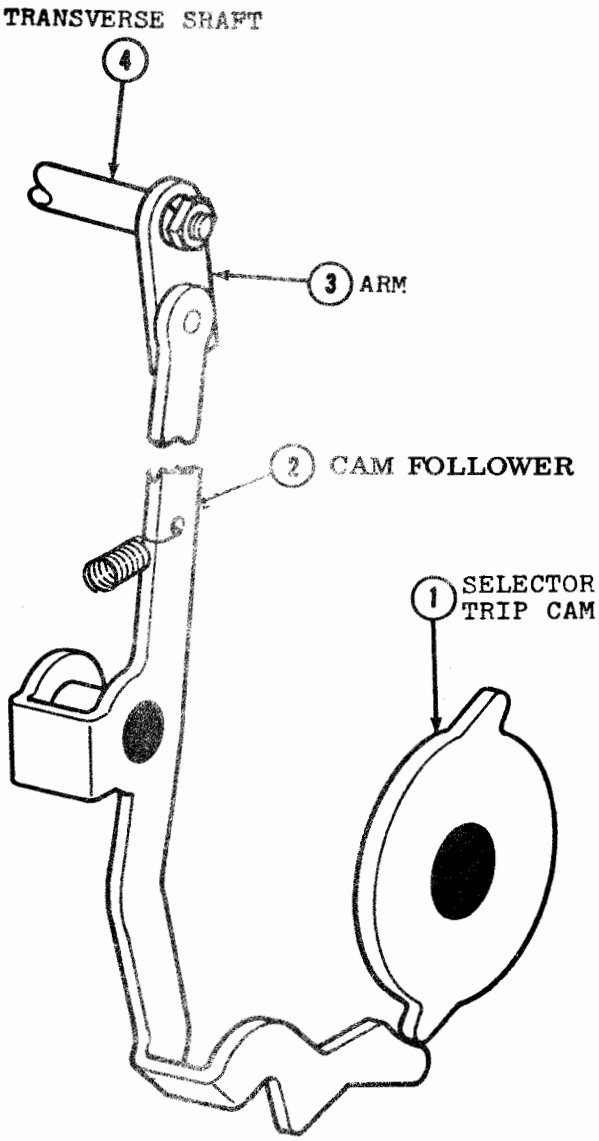
J. Retraction Mechanism

4.35 The purpose of this mechanism is to lower the typebox for viewing of the printed copy. The mechanism is designed to begin lowering the box in a minimum of 10 milliseconds after the character has been printed; but if before this time has elapsed the next character trips the selector clutch the mechanism is reset and retraction will not occur.

4.36 The retract mechanism consists basically of a ratchet driven through a feed pawl by a cam and a blocking pawl controlled by a cam on the selector cam sleeve assembly.

4.37 The ratchet is driven continuously by the feed pawl. Attached to the ratchet is an arm which contacts a slide. If no character is received by the unit in the time mentioned above the slide will have moved into contact with a set of bails in the vertical slide control linkage causing the linkage and slides to go into a spacing condition. This causes all vertical positioning clutches that were marking to go spacing thereby lowering the typebox to its lowest position. Upon the reception of a character by the selector a linkage is operated by a cam on the selector cam sleeve which moves the blocking pawl from engagement with the ratchet causing the ratchet and slide to be reset. The vertical positioning clutch control linkage and clutch remain in a spacing condition thereby leaving the typebox retracted until normal positioning of the typebox takes over.



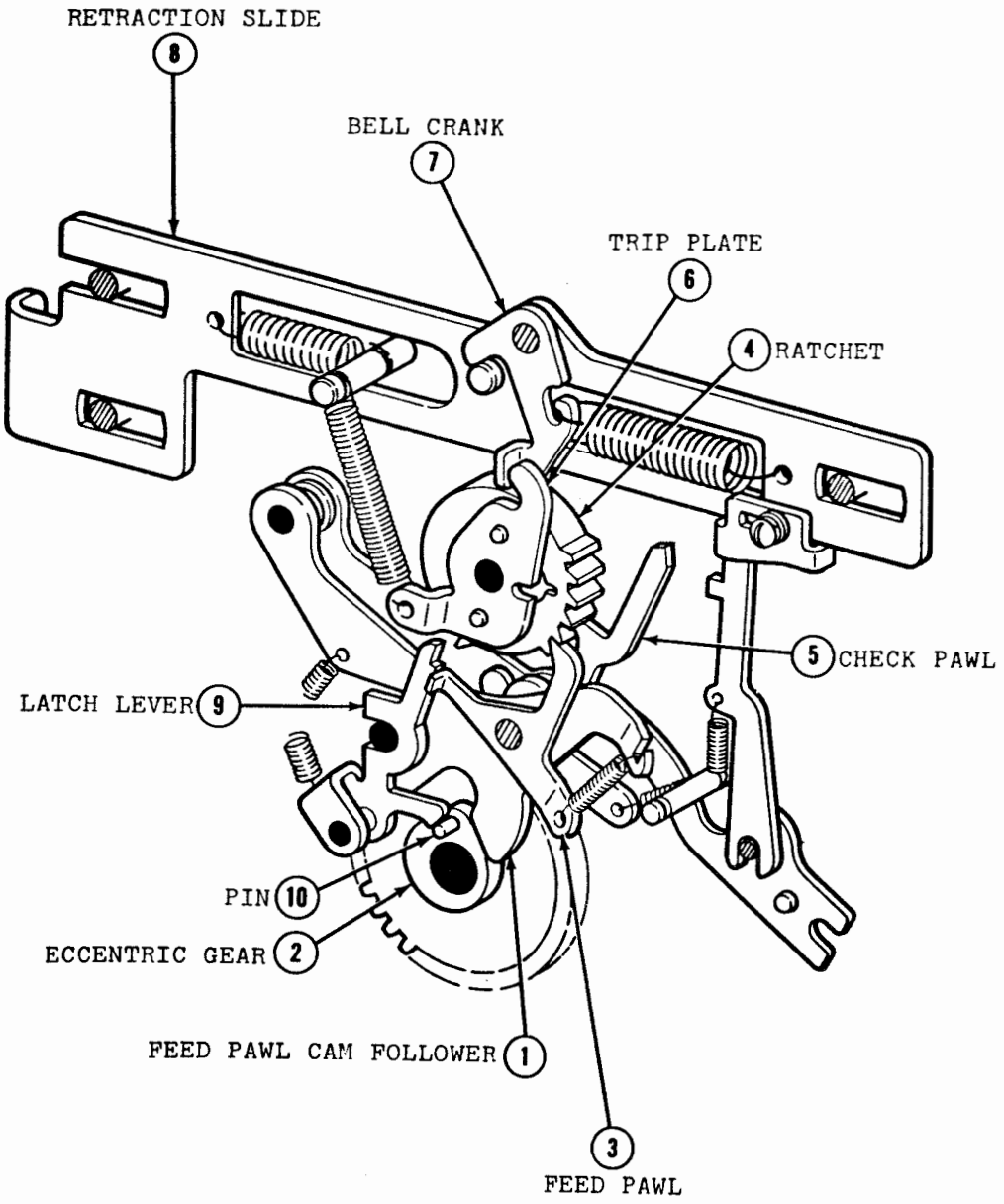


Operation

When the selector clutch is operating its SELECTOR TRIP CAM (1) will drive CAM FOLLOWER (2) clockwise allowing ARM (3) and TRANSVERSE SHAFT (4) to rotate counterclockwise. As TRANSVERSE SHAFT (4) rotates, a SLIDE (5) will be moved towards the rear moving CHECK PAWL (6) away from the RATCHET (7) . This will prevent retraction slide from moving towards the front of the unit.

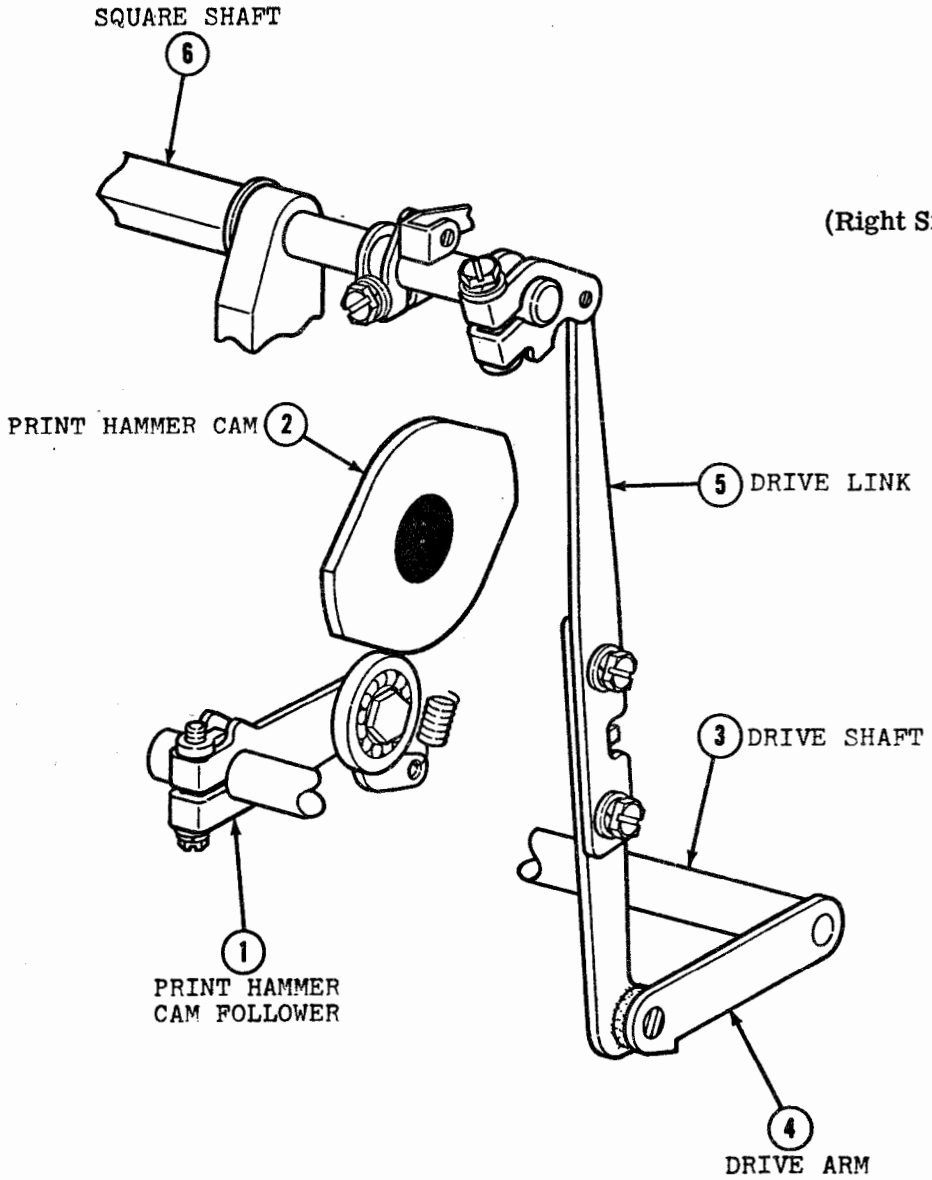
Operation

If unit remains in an idle condition, the FEED PAWL CAM FOLLOWER (1) riding high portion of ECCENTRIC GEAR (2) will cause FEED PAWL (3) to move upward, rotating the RATCHET (4) counterclockwise and allow CHECK PAWL (5) to override one tooth. As RATCHET (4) rotates, its TRIP PLATE (6) will push BELLCRANK (7) and RETRACTION SLIDE (8) forward. As FEED PAWL (3) moves upward the LATCHLEVER (9) latches it. As FEED PAWL CAM FOLLOWER (1) rides low portion of ECCENTRIC GEAR (2) the FEED PAWL (3) will rotate clockwise away from RATCHET (4). As ECCENTRIC GEAR (2) rotates, a PIN (10) attached to it will cause LATCHLEVER (9) to rotate counterclockwise releasing FEED PAWL (3) to come back in engagement with RATCHET (4).



Printing Drive Mechanism

View as shown is in a stop condition. As printing clutch trips, the PRINT HAMMER CAM FOLLOWER (1) will ride high portion of PRINT HAMMER CAM (2). This will cause DRIVE SHAFT (3) to rotate clockwise allowing DRIVE ARM (4) to rotate clockwise. As DRIVE ARM (4) pivots, it causes DRIVE LINK (5) to move upward rotating SQUARE SHAFT (6) counterclockwise. As SQUARE SHAFT (6) pivots counterclockwise, it loads and latches the print hammer mechanism and feeds the ribbon. As PRINT HAMMER CAM FOLLOWER (1) rides low portion of PRINT HAMMER CAM (2), it will cause SQUARE SHAFT (6) to rotate clockwise tripping print hammer mechanism.



K. Print Hammer Carriage

4.38 After the typebox has been moved so that the selected type pallet is in its proper position, it must be struck by a printing hammer in order to print. This is accomplished by the action of the printing carriage located on the printing carriage square shaft.

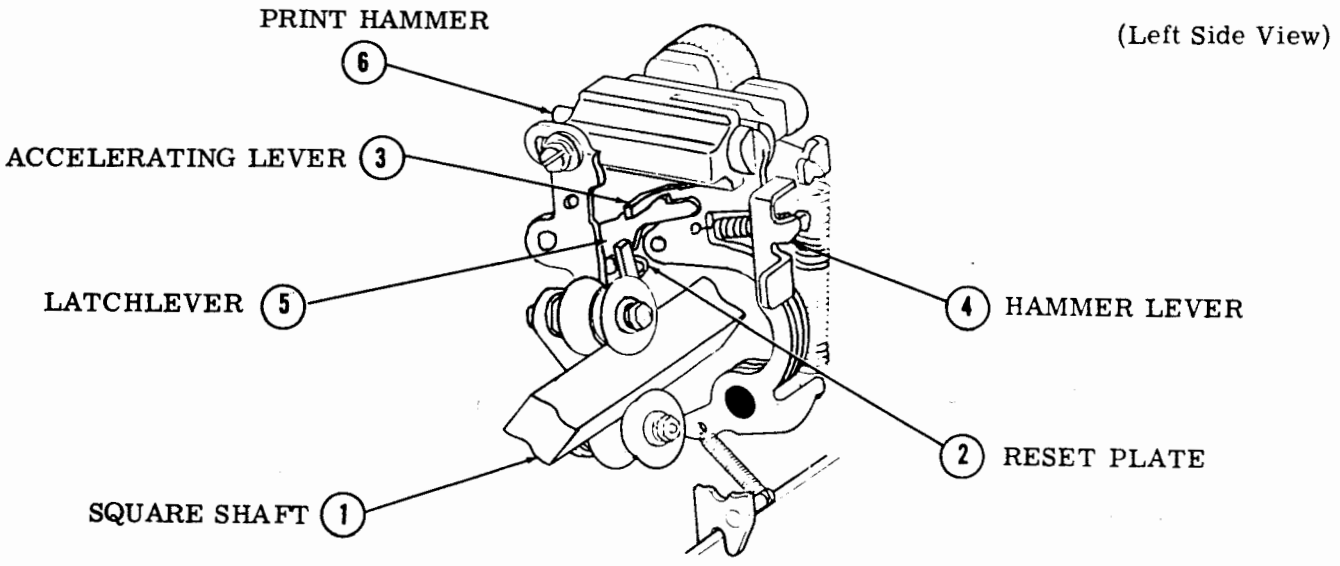
4.39 The printing carriage rides (on rollers) on the square shaft, which is carried in bearings mounted to the printer front plate. Rotation of the complete carriage is prevented by a tracking guide which is part of the carriage frame assembly and is arranged to follow a steel tracking plate attached to the main framework of the front plate assembly. The carriage is clamped to the front spacing cable. This moves the carriage along its track in such a manner that the hammer advances to the next printing position.

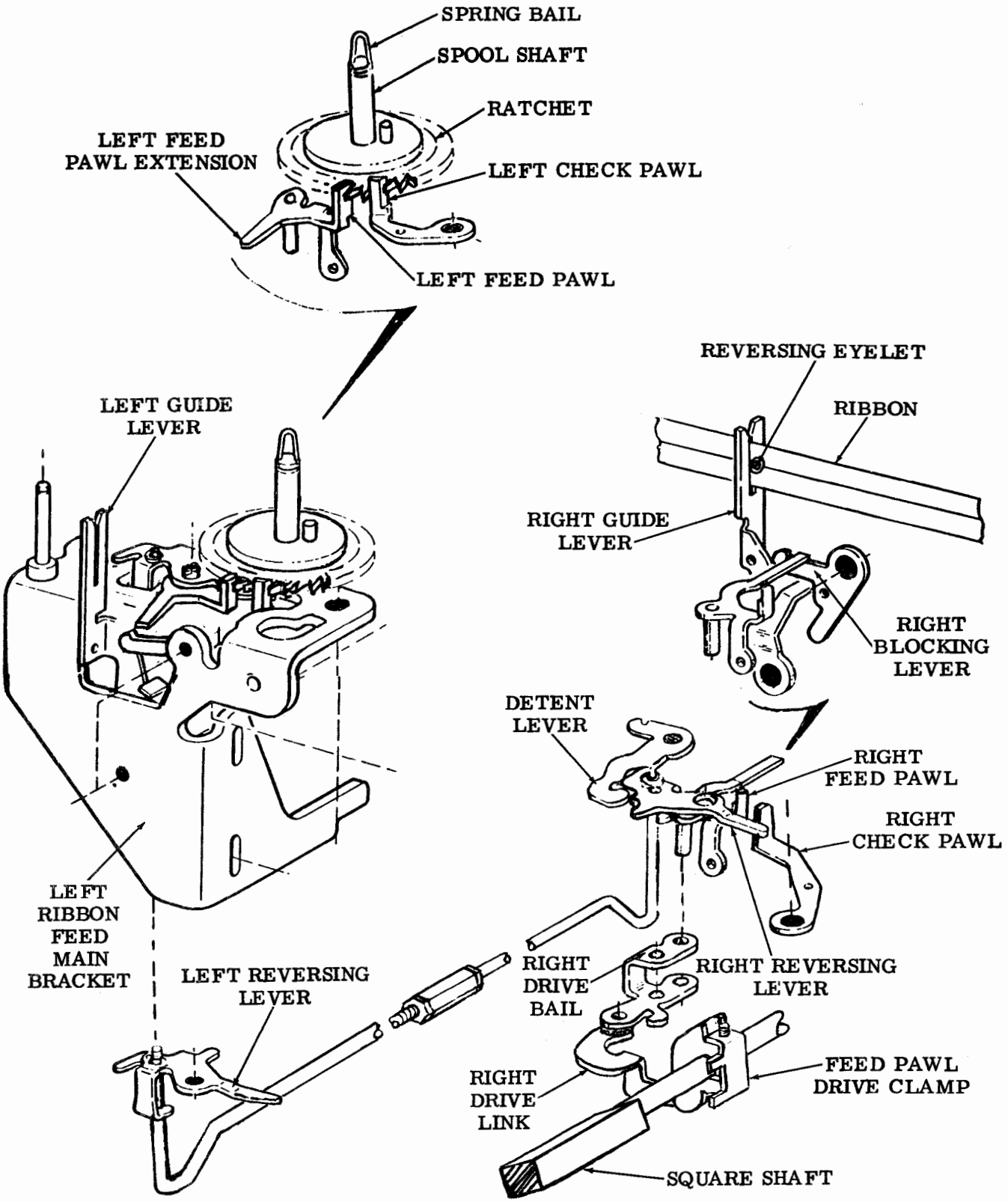
4.40 The printing movement of the hammer is provided by the oscillation of the square shaft, which is driven through a linkage on the right side of the unit by a cam on the print hammer clutch. As the printing cycle begins the square shaft rotates towards the front of the unit transmitting power through the four rollers to the reset plate. The reset plate in turn drives the accelerating lever, print hammer lever and print hammer. In this way the print hammer is driven away from the platen while extending the accelerating lever spring and allows the accelerating lever to be latched. The square shaft now begins to rotate toward the rear of the unit to a predetermined position. At this point the latch is released and the hammer accelerates toward the pallet carrying it into the ribbon and paper. A return spring then pulls it out of the path of the pallets where it is picked up through the accelerating lever and the reset plate by the now forward motion of the square shaft. The print hammer is then latched in a temporary latched position and the cycle is completed.

4.41 The force of the hammer blow may be varied to suit single or multiple copy printing. Clockwise rotation of the knurled knob on the carriage unit to the position where two notches are up, shifts the hammer spring anchor to give the spring higher tension. In this setting the machine will give up to six copies on normal multicopy paper. If single copy is being used, life of the ink ribbon will be prolonged and clearer copy produced by using the lower tension setting with one notch on the knob facing up.

Operation

View as shown is in a stop position. As SQUARE SHAFT (1) rotates clockwise the RESET PLATE (2) will rotate clockwise moving ACCELERATING LEVER (3) and HAMMER LEVER (4) clockwise allowing LATCHLEVER (5) to latch ACCELERATING LEVER (3) . As SQUARE SHAFT (1) rotates counterclockwise the RESET PLATE (2) will rotate counterclockwise pivoting the LATCHLEVER (5) clockwise. This releases ACCELERATING LEVER (3) and HAMMER LEVER (4) to move forward driving PRINT HAMMER (6) forward.



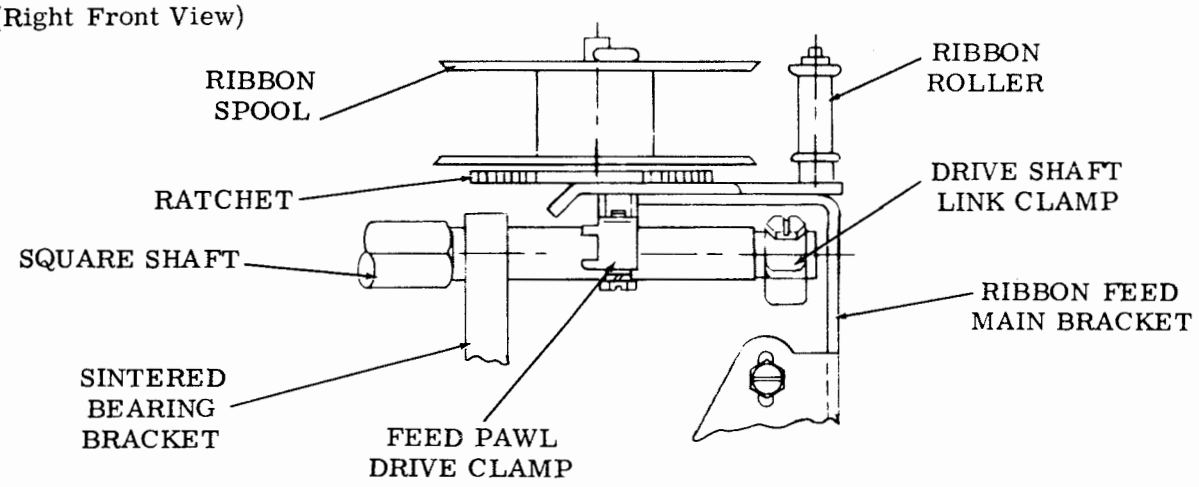

SPRING BAIL
SPOOL SHAFT
RATCHET
LEFT FEED PAWL EXTENSION
LEFT CHECK PAWL
LEFT FEED PAWL
REVERSING EYELET
RIBBON
LEFT GUIDE LEVER
RIGHT GUIDE LEVER
RIGHT BLOCKING LEVER
DETENT LEVER
RIGHT FEED PAWL
RIGHT CHECK PAWL
LEFT RIBBON FEED MAIN BRACKET
LEFT REVERSING LEVER
RIGHT DRIVE BAIL
RIGHT REVERSING LEVER
RIGHT DRIVE LINK
FEED PAWL DRIVE CLAMP
SQUARE SHAFT

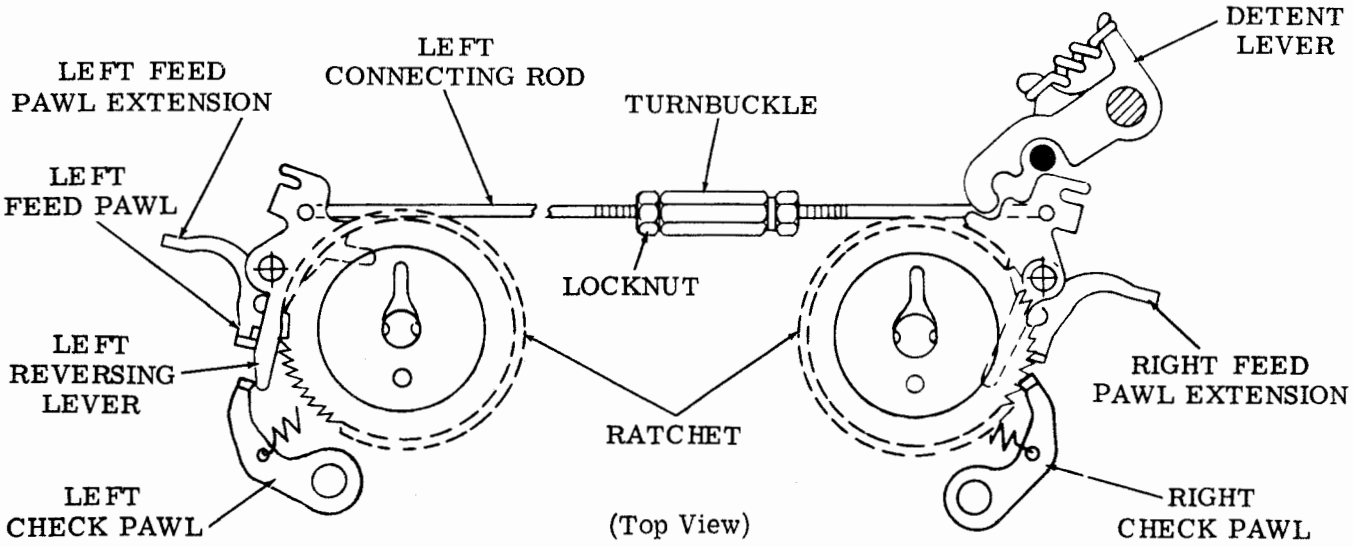
L. Ribbon Feeding and Reversing Mechanism

4.42 At each end of the square shaft on which the print hammer carriage rides is mounted a ribbon feed mechanism and ribbon spool. Each ribbon mechanism consists basically of a ratchet, feed pawl, check pawl and the ribbon reversing mechanism. The ratchet upon which the ribbon spool is mounted is driven by the feed pawl which in turn is powered by the oscillation of the square shaft, through a drive arm, link and bail. While one ribbon mechanism is feeding, the other is in a free running condition. A ribbon reverse mechanism controls which mechanism is feeding.

4.43 On the outside of each ribbon feed mechanism is mounted a guide lever and a blocking lever. The feed pawl and check pawl in the nonfeed condition are held away from the ratchet by a reversing lever, which is detented in one of two positions by a detent lever. The reversing action is initiated by the eyelet at the end of the ribbon as it comes off the spool and moves the guide lever to the rear, which causes the latching surface of the blocking lever to move upwards into the path of the feed pawl extension. As the motion of the feed pawl extension is being blocked during the backstroke, the feed pawl rotates into engagement with the ratchet, and moves the reversing lever over to its other detented position. Through a connecting rod the reversing lever of the other ribbon feed mechanism moves its feed pawl and check pawl out of engagement with the ratchet, and keeps this mechanism in a nonfeed condition. The feed pawl which was previously in a nonfeed condition is now driving the ratchet, and the ribbon is moving in the opposite direction.

(Right Front View)

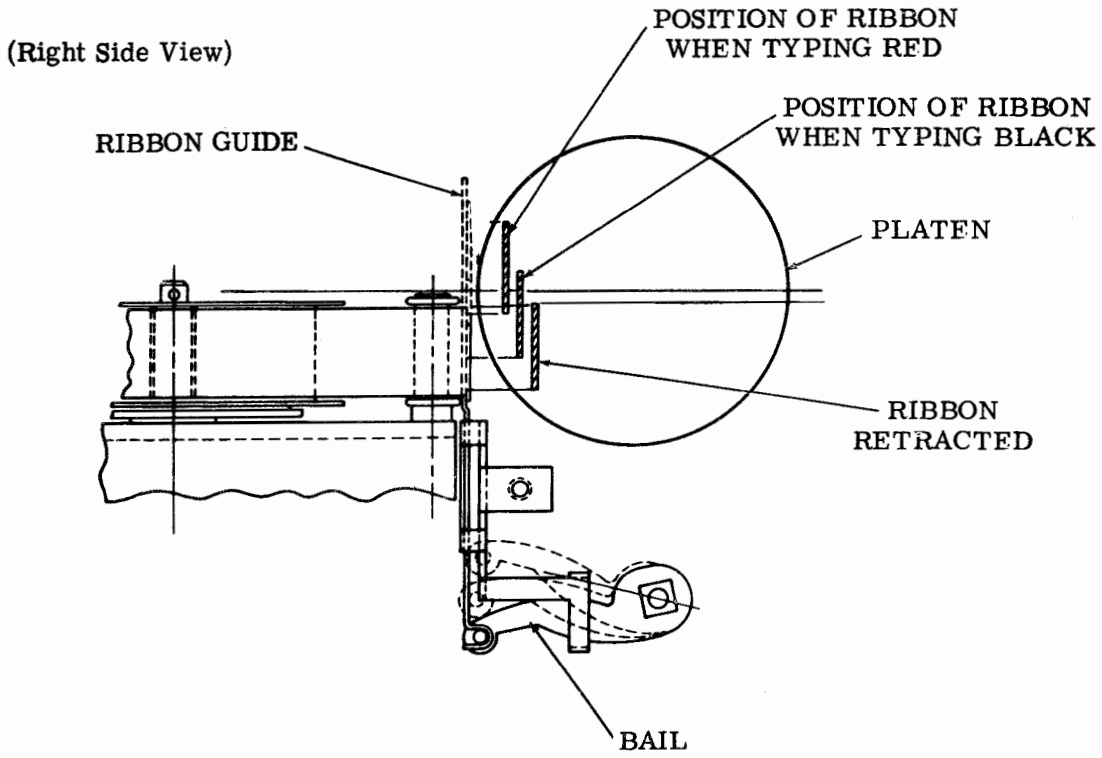


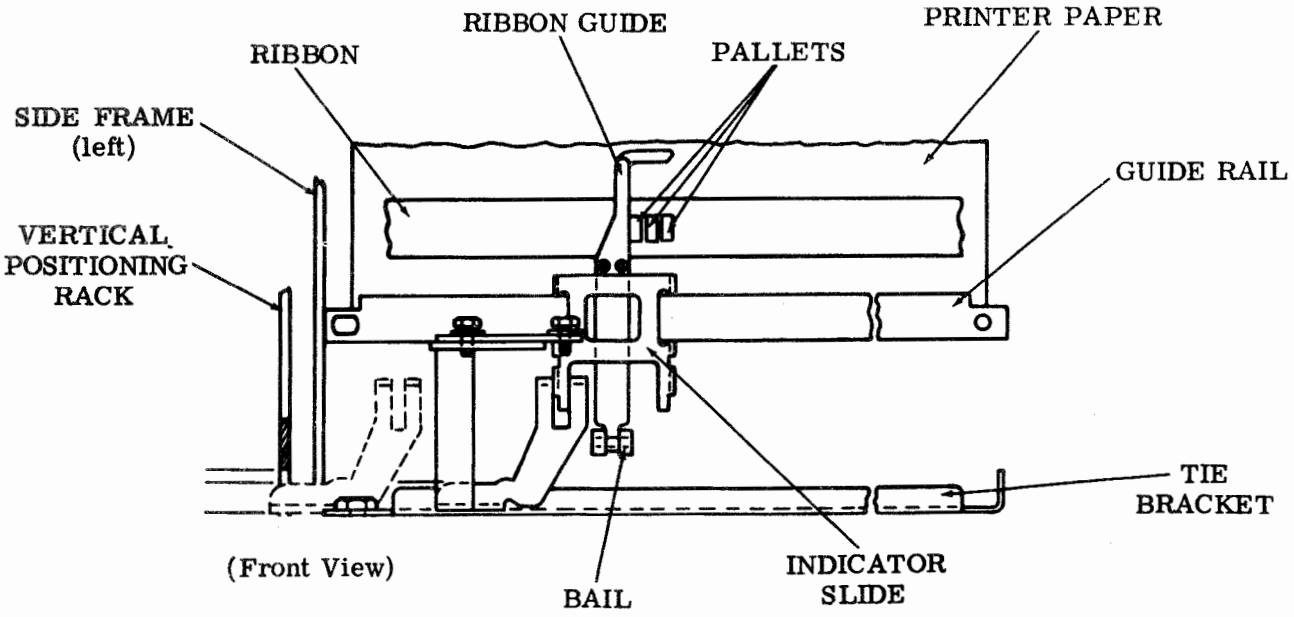


(Top View)

M. Ribbon Positioning Mechanism

4.44 The normal position of the ribbon is below the printing line. That portion of the ribbon which is directly in front of the print hammer is raised by a ribbon guide to allow the pallet to strike the ribbon and print the character. The ribbon guide and guide control arm are moved along separate shafts beneath the platen by a connection to the print hammer carriage. The shaft upon which the guide control arm rides is oscillated by a linkage controlled from the print hammer clutch. Immediately after the character has been printed the ribbon is lowered to allow full view of the entire printed line.





Black Ribbon

When the printing clutch trips the FOLLOWER ARM (1) will ride low portion of CAM (2) allowing FOLLOWER ARM (1) to pivot clockwise. As FOLLOWER ARM (1) rotates it will pull TRANSFER LINK (3) down until it hits against BLOCKING SLIDE (4). TRANSFER LINK (3) moving downward will cause PRINTING SHAFT (5) to rotate clockwise moving RIBBON GUIDE (6) up. RIBBON (7) will only move up far enough to put black field of RIBBON (7) in front of print hammer.

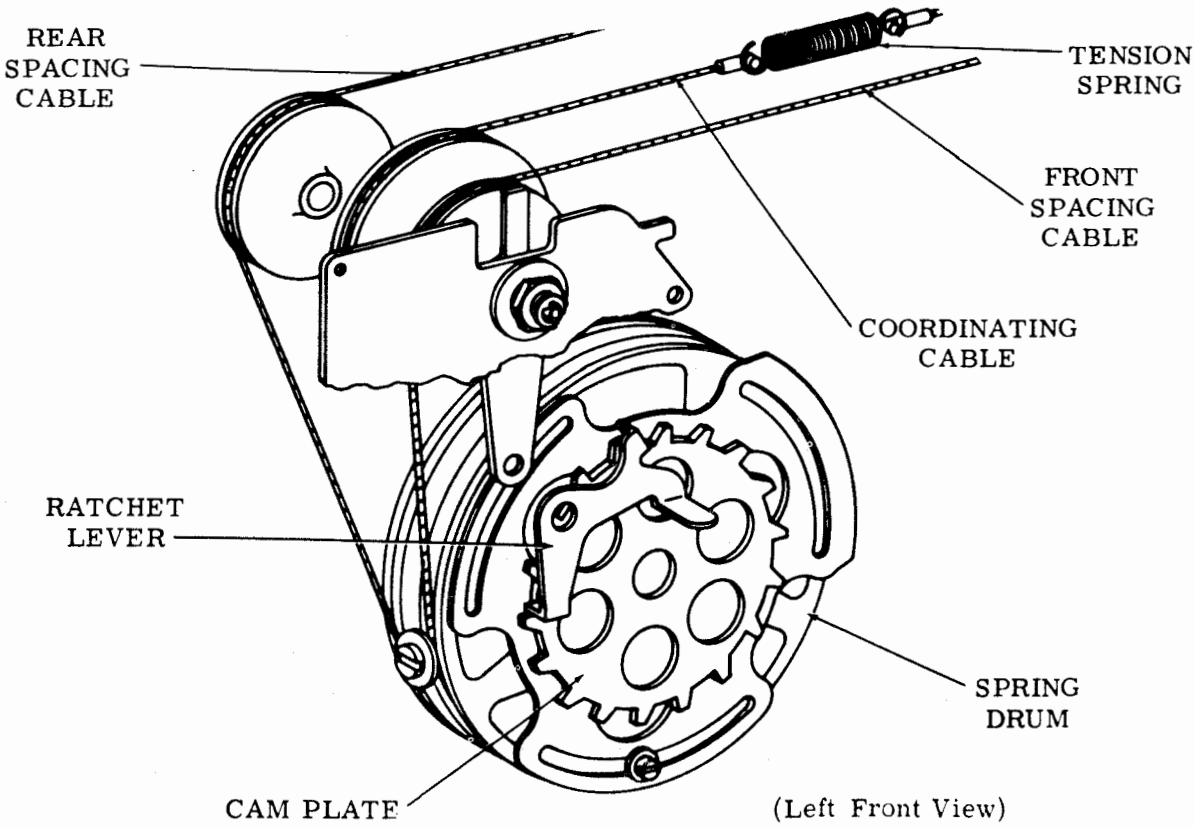
Red Ribbon

MAGNET (8) energizes pulling BLOCK SLIDE (4) to rear. When the printing clutch trips, the FOLLOWER ARM (1) will ride low portion of CAM (2) allowing FOLLOWER ARM (1) to pivot clockwise. As FOLLOWER ARM (1) rotates it will pull TRANSFER LINK (3) down. Since the BLOCKING SLIDE (4) is to the rear it will not block travel of TRANSFER LINK (3), therefore, it will move further down. TRANSFER LINK (3) moving further down will cause PRINTING SHAFT (5) to rotate more in a clockwise direction. PRINTING SHAFT (5) moving further in a clockwise direction will cause RIBBON GUIDE (6) to move further up. This will put red field of RIBBON (7) in front of print hammer.

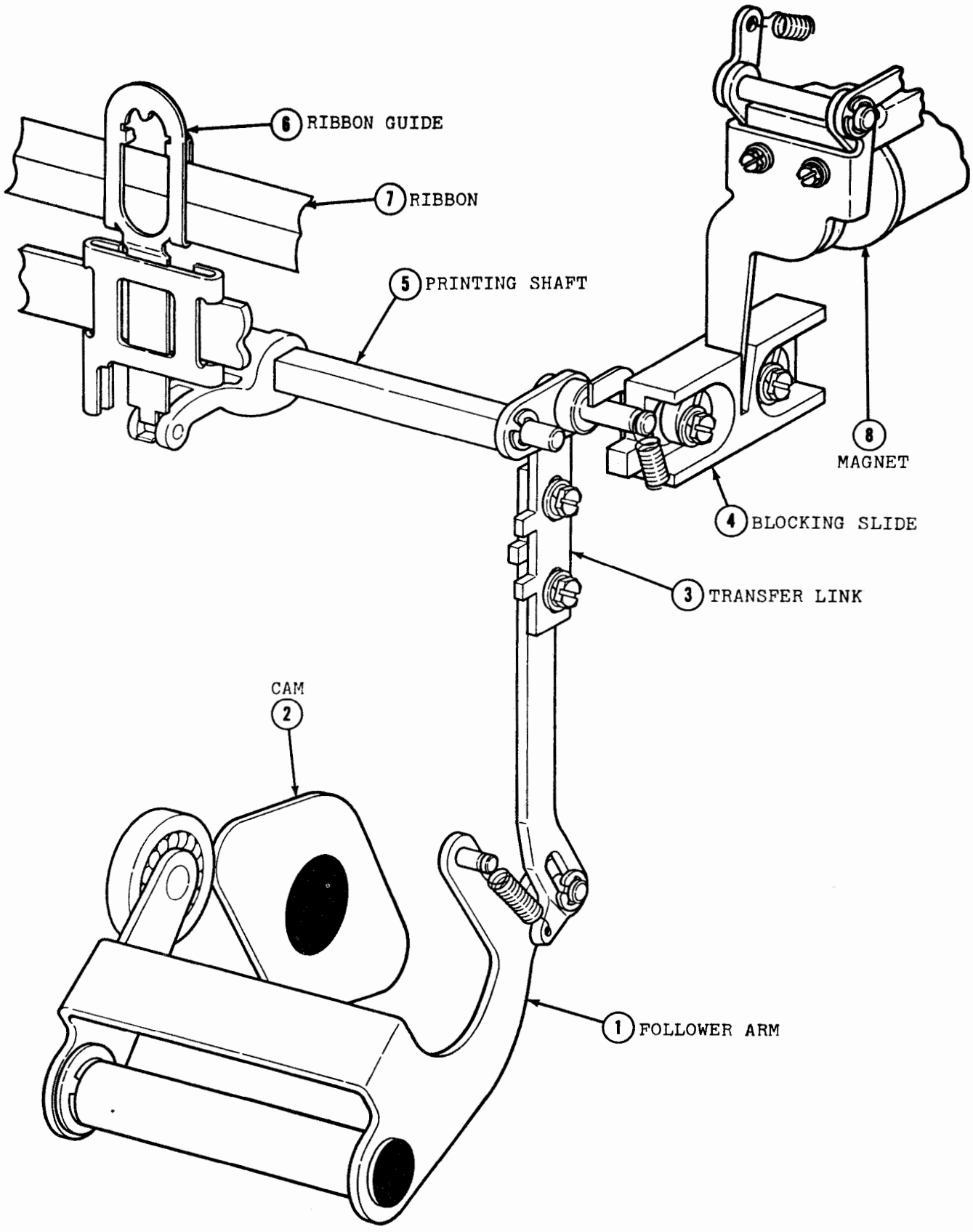
N. Spacing Mechanism

4.45 To properly space the printed characters, the typebox and printing carriage must be advanced with each character printed. The carriages are connected to cables (see 4.31) which, in turn is fastened to the spring drum, which contains a torsion spring. The purpose of the spring drum is to tension the cable rope and the carriage to the left. The spacing drum has ratchet teeth about its periphery, which are engaged by the eccentric driven spacing drum feed pawls. The spacing shaft, on which the spacing eccentrics are mounted, is driven through its helical gear by the helical driving gear attached to the six-stop spacing clutch on the main shaft. The gear ratio of 3 to 1 causes the spacing shaft to turn one-half of a revolution each time the sapcing clutch is tripped. This allows the feed pawls to advance the spacing drum by the amount of the ratchet tooth.

4.46 A cam on the print hammer clutch trips the spacing clutch through a bail which pivots on the trip shaft. This cam is designed so as to allow spacing to occur after the character has been printed.



(Left Front View)


6 RIBBON GUIDE
7 RIBBON
5 PRINTING SHAFT
8 MAGNET
4 BLOCKING SLIDE
3 TRANSFER LINK
CAM
2
1 FOLLOWER ARM

O. Function Box and Function Box Drive Mechanism

4.47 The function box in the Model 37 is very similar to that of other teletypewriter equipment. The major difference is the coding of the function bars. The function bar tines, are numbered 1 through 11 from the bottom to the top. This numbering corresponds to the numbering of the codebars mentioned in 4.18 of this section. Refer to Figure 13 for function bar coding.

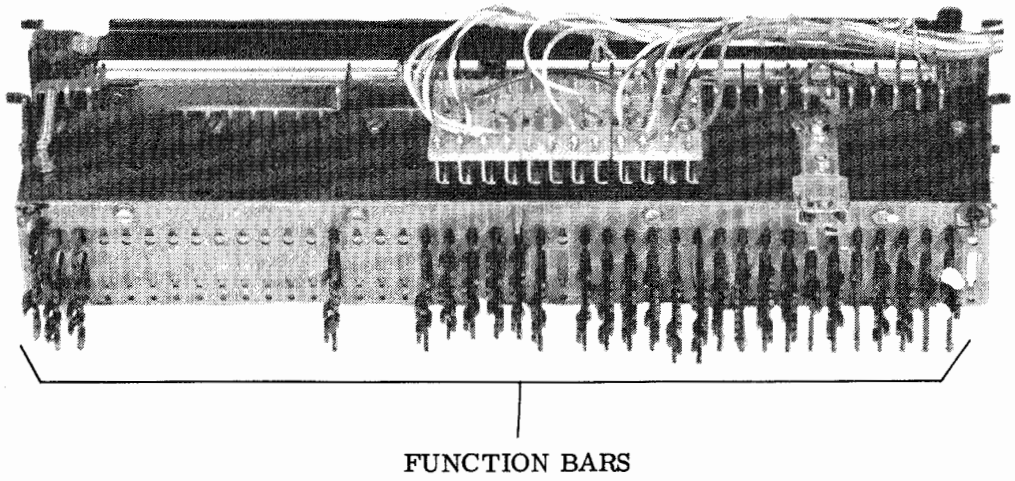


Figure 11 - Function Box

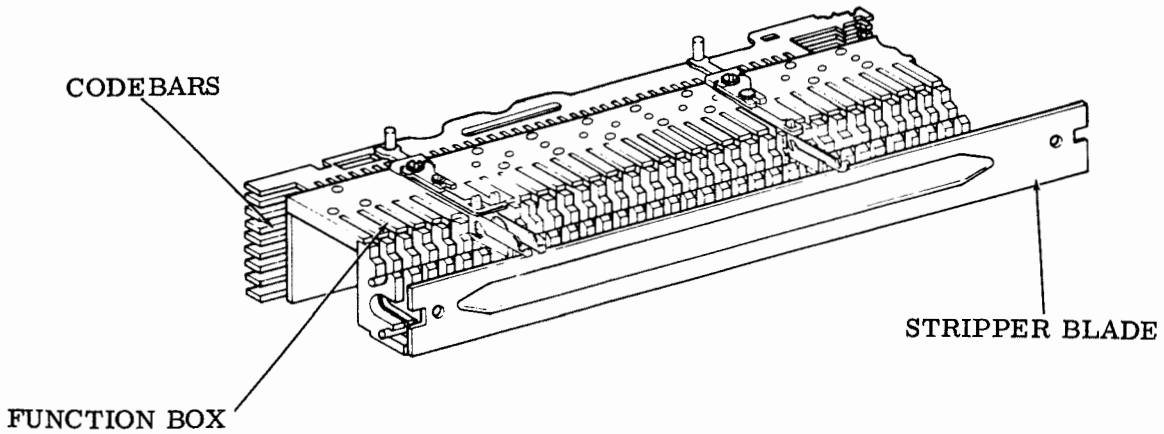
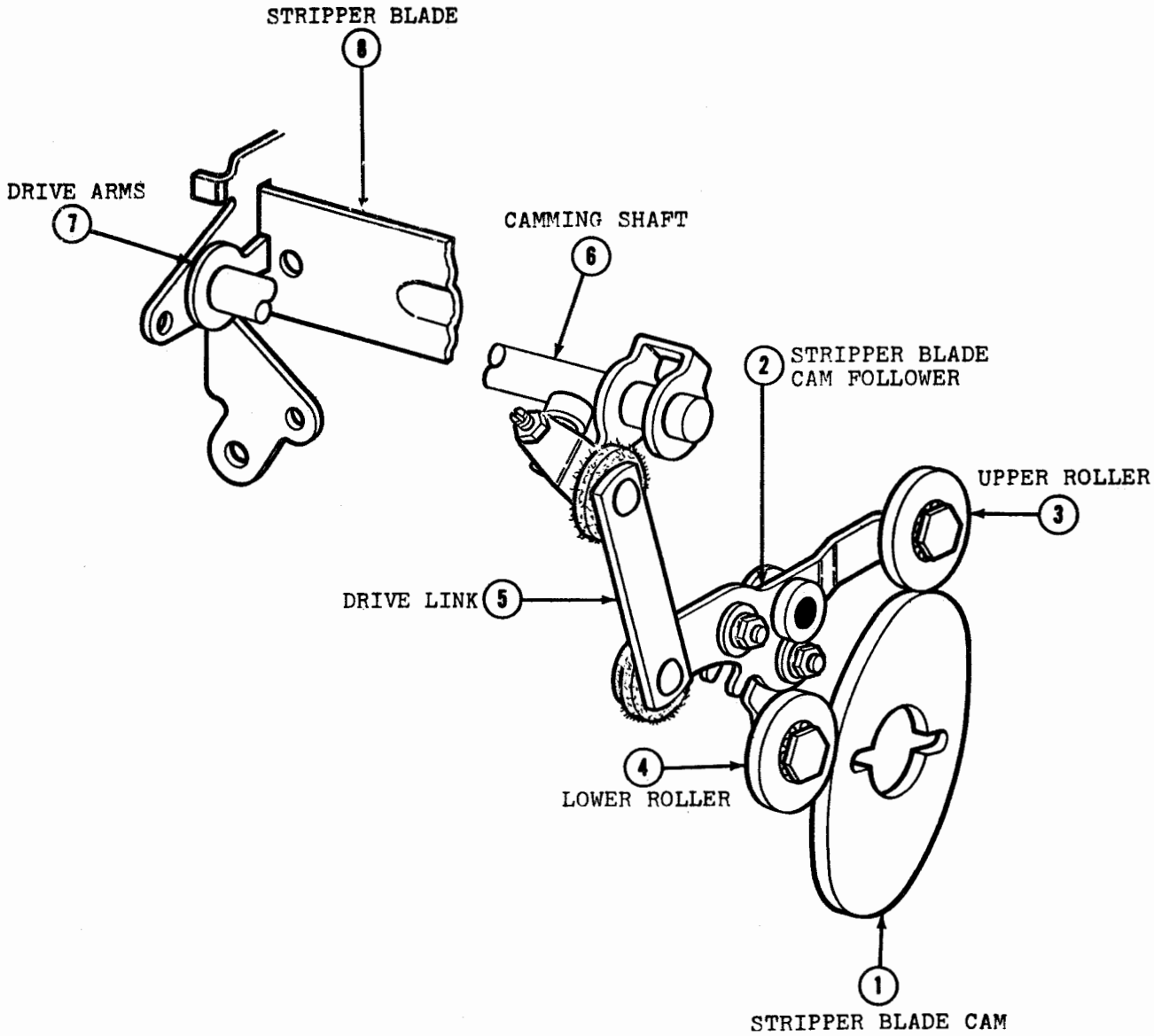


Figure 12 - Stripper Blade and Function Box



Operation

View as shown is in a stop condition. As function clutch trips the STRIPPER BLADE CAM (1) will allow STRIPPER BLADE CAM FOLLOWER (2) to allow its UPPER ROLLER (3) to ride low portion of cam and LOWER ROLLER (4) to ride high portion of cam. The STRIPPER BLADE CAM FOLLOWER (2) will rotate clockwise driving DRIVE LINK (5) upward. As DRIVE LINK (5) moves up the CAMMING SHAFT (6) will rotate clockwise. At this time the DRIVE ARMS (7) will rotate clockwise moving STRIPPER BLADE (8) downward. When STRIPPER BLADE (8) moves up, it will "strip" selected function pawls from function bars.

P. Carriage Return Mechanism

4.48 The carriage return mechanism is located to the right of center of the typing unit. Reception of the carriage return code causes the carriage return function bar, pawl and lever to operate. 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 about its pivot point. As the front portion of the bail 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. When the carriage return bail reaches its 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 typebox carriages toward the left side of the typing unit. As the spacing drum nears the end of its counterclockwise rotation, the roller on its stop arm contacts the transfer slide which, in turn, drives the dashpot piston into the dashpot cylinder.

4.49 A small passageway with an inlet from the inside of the cylinder and two outlets to the outside is incorporated in the end of the cylinder. The size of the outlets are controlled by adjustable members. The lowest outlet is controlled directly by a set screw which opens and closes the passageway. The upper outlet is controlled by a spring loaded ball. These two outlets determine the rate at which the air may escape from the cylinder.

4.50 When the spacing drum reaches its extreme counterclockwise position a post on the transfer slide contacts the carriage return latch bail and thereby allows the carriage return bail to be released permitting the feed pawls to engage the spacing drum.

Q. Line Feed Mechanism

4.51 The line feed mechanism is located at the left side of the typing unit. Upon the receipt of the line feed code, 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 about their pivoted point until the trip lever releases the six-stop line feed clutch. The line feed gearing is such that each one-sixth 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. 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-sixth of a revolution of the clutch has occurred. When a 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-sixth of a revolution. This is accomplished by an auxiliary stripper which is mounted on the stripper blade, and protrudes above the blade thereby causing the function pawl to be stripped earlier in the cycle than would normally occur if stripped by the standard position of the blade. The auxiliary stripper is allowed to slide from left to right under the control of a lever which is pivoted on the side frame. Through this lever the slide can be manually positioned into or out of the path of the line feed function pawl. In this way single or double line feed is achieved by manually positioning the lever in its two-position detent.

4.52 Each one-sixth revolution of the line feed clutch causes its attached spur gear 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, guided by the line feed bar bellcrank, alternately engage the line feed spur gear on the platen and advance the platen one line for each one-half turn of the eccentrics.

4.53 When it is desired to manually position the platen, this may be accomplished by turning the platen handwheel. The platen handwheel spur gear engages the platen idler spur gear which, in turn, is engaged with manual line feed knob causing the line feed bar release lever to bear on the line feed bar bellcrank and causes it to disengage the line feed bars from the line feed spur gear.

R. Print and Space Suppression

4.54 When certain functions are selected it is necessary to suppress printing and spacing. This is accomplished through the function box by the function lever moving the suppression bail which in turn moves the suppression slide forward where it will hold the suppression interposing lever in a position to prevent full movement of the trip shaft cam follower. In this way the trip shaft will not be able to rotate far

enough to trip the printing clutch, and thereby also prevent tripping of the spacing clutch.

S. Backspace Mechanism

4.55 A backspace signal is received by the printer and recognized by the function box. Motion is transferred from the function box through a slide arm and bail which passes through an opening in the front plate. This action depresses the intermediate lever which actuates the backspace bail through a link. As the backspace bail begins to rotate a spring pulls the backspace blocking pawl into engagement with the spacing ratchet on the spacing drum. Continued rotation of the backspace bail causes the spring to stretch, putting pressure on the blocking pawl and also lifting the spacing pawls clear of the spacing ratchet. The spacing drum returns approximately one-half space under carriage return spring tension until its motion is blocked by the blocking pawl. The spacing drum, spacing cables, print hammer carriage and typebox carriage maintain this position until the function pawl in the function box is stripped near the end of the machine cycle. Upon stripping of the function the entire linkage is returned to its previous state, thereby returning the spacing pawl to the ratchet and removing the blocking pawl from the ratchet. This allows the spacing drum to return an additional one-half turn thereby completing a full backspace.

T. Function Bar Coding

4.56 The chart on the last page of this section shows the coding arrangement of function bar tines one through seven for the USASCII X3.4 – 1967 code. The number eight tine is shown for even parity. If odd parity or no parity at all is required the eighth level may be altered to suit. The following are instructions for coding the 9th, 10th and 11th tines.

4.57 The number nine tine senses the condition of the number nine blocking bar. The blocking bar is in a normal mode (print mode of machine) when it is to the right and in the alternate mode (nonprinting mode) when it is to the left (as viewed from the front). The blocking bar is usually positioned in the alternate mode by the reception of an ESC code. For further discussion of the use of ESC codes see escape sequences (4.20).

4.58 When coding a function bar it must be decided if the number nine tine is to respond in the normal mode or alternate mode. If it is to respond in the normal mode the tine on the left (as viewed from the front) should be removed. If it is to respond in the alternate mode the tine on the right should be removed.

4.59 In principle, the number ten and eleven blocking bars operate similar to the number nine. The difference being that when coding a function bar to respond to the normal mode the tine on the right (as viewed from the front) must be removed and in the alternate mode the tine on the left must be removed.

4.60 On machines equipped with automatic carriage return and line feed both tines of the eleventh level must be removed unless they are the automatic carriage return line feed function bars.

4.61 Function bars which are used to control the position of the blocking bars must have both tines removed for the level that they control.

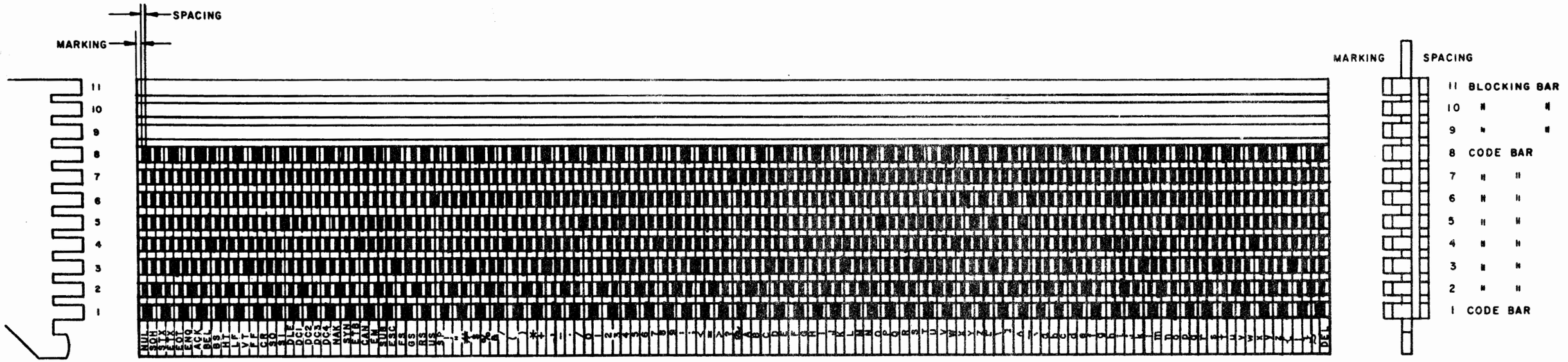
5. REFERENCES

5.01 The following sectionalized literature pertains to the late design Model 37 typing and keyboard units:

TYPING UNIT	NUMBER
Adjustments	574-320-703TC
Lubrication	574-320-704TC
Disassembly and Reassembly	574-320-705TC

KEYBOARD AND BASE ASSEMBLY

Description and Principles of Operation	574-321-101TC
Adjustments	574-321-703TC
Lubrication	574-321-705TC
Disassembly and Reassembly	574-321-705TC



Note: Blank rectangles indicate the tines that should be removed to code the TP326076 function bar.

Figure 13 - Function Bar Coding Chart

37 KEYBOARD UNIT

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS PAGE

1. GENERAL 1

2. DESCRIPTION 2

BASIC UNIT 2

STANDARD FEATURES 2

A. Keylever Interlock 2
B. Code Selection Lock 2
C. Nonrepeat and Repeat 2

VARIABLE FEATURES 2

A. Nonrepeatable Keys 2
B. Auxiliary Contacts 2

TECHNICAL DATA 6

A. Physical Characteristics 6
B. Electrical Characteristics 6
C. Signaling Code 6
D. Keyboard Auxiliary Contacts . . . 6
E. Keylever Spring Tension 6
F. Environment 6
G. Character Arrangement 6
H. Control Characters 6

3. PRINCIPLES OF OPERATION 8

OPERATIONAL INDEX 8

MECHANICAL 9

ELECTRICAL 28

1. GENERAL

1.01 This section provides the description and principles of operation for the late design, 11-unit 37 keyboard unit (Figure 1). It is reissued to incorporate minor engineering changes and comments received on Issue 1. Since only a limited distribution was made on Issue 1, marginal arrows have been omitted. Refer to Section 574-321-100TC for information on early design 28-contact keyboard units.

1.02 The keyboard unit provides mechanical to electrical conversion of an eight-level parallel code as well as mounting facilities for a typing unit and motor unit. The parallel output from the keyboard unit may be converted by external logic into the American Standard Code for Information Interchange (ASCII). The eighth level is for parity. The typing unit and motor unit supporting the operation of the keyboard unit are described in Sections 574-320-100TC and 570-220-100TC respectively.

1.03 Specific information covering adjustments and the lubrication of the keyboard unit can be found in Sections 574-321-703TC and 574-321-704TC respectively.

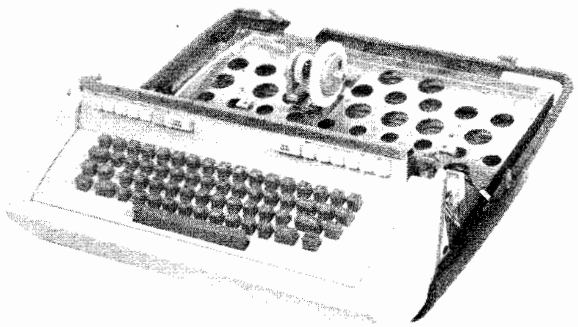


Figure 1 - 37 Keyboard Unit

2. DESCRIPTION

BASIC UNIT

2.01 The keyboard unit contains the major mechanisms to establish the seven-bit code for 128 graphic and function characters and the eighth parity bit. A graphic is a character which is printed and a function causes a mechanical or electrical action to be performed.

2.02 The major mechanisms are described in the upper portions of Figures 2 and 3. The keyboard mechanism is further divided into several basic mechanisms which are identified in Figure 4.

2.03 The passive elements (nonoperating) are described in the lower portions of Figures 2 and 3. Electrical connectors are identified in Figure 5.

STANDARD FEATURES

A. Keylever Interlock

2.04 The keylever interlock prevents depressing of two or more primary keys simultaneously to a point where the keyboard is tripped. This prevents generation of a faulty code. Interlocking is accomplished by complimentary coding of the codebars.

B. Code Selection Lock

2.05 The code selected by depressing a key is locked in place by the trip arm. The trip arm locks the codebars in position during the code sampling period. At the end of the code sampling period the reset mechanism returns the trip arm to its unoperated position thus removing the code selection lock.

C. Nonrepeat and Repeat

2.06 The nonrepeat and repeat features are provided for all keylevers which trip the keyboard mechanism. Depressing a key to its first stop position (normal downstop) trips the keyboard mechanism, and the character is transmitted once. To transmit the same character again, the key must be released and again depressed.

2.07 Further depression of the key, beyond the normal downstop position, places the keyboard mechanism in the repeat condition and the character is transmitted until the key is released.

VARIABLE FEATURES

A. Nonrepeatable Keys

2.08 Any key which trips the keyboard mechanism can be made nonrepeatable by inserting a repeat blocking clip in the front of the unit. The associated key then cannot be depressed beyond the normal downstop position. The repeat blocking clip can be inserted or removed as desired.

B. Auxiliary Contacts

2.09 Additional auxiliary contacts and a cam can be mounted on the reset mechanism for use with associated equipment.

KEYBOARD MECHANISM

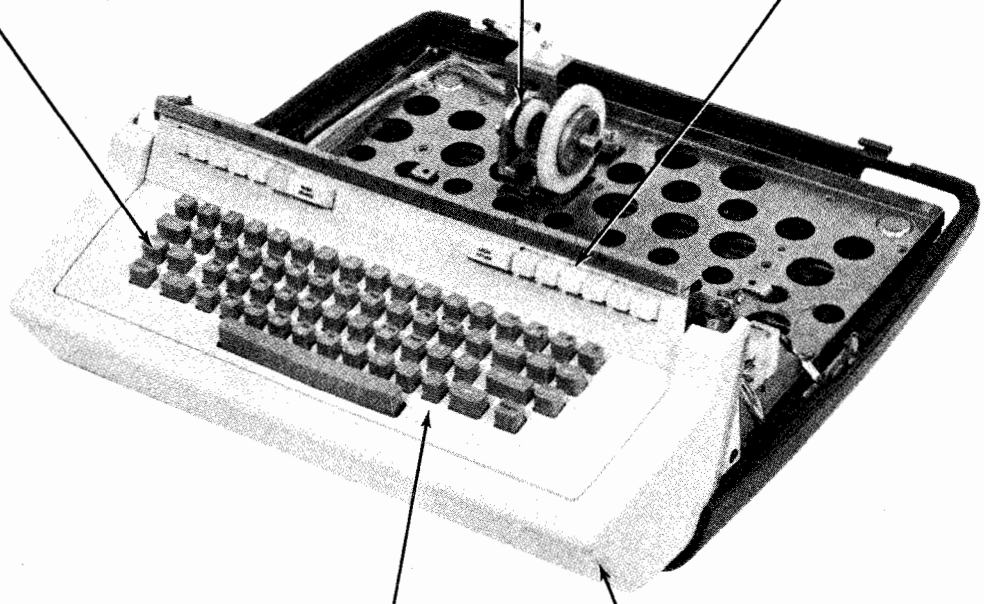
- Contains required keytops, codebars, and contacts to provide electrical paths for parallel code output.
- Upper and lower case characters. Keytop arrangement similar in appearance and operation to standard office typewriter.
- Special primary keys for frequently used control functions.
- Repeat character feature on any key without special repeat key.
- Transmission rate up to 150 words per minute.
- Parity keyboard. Originates 8-level coded characters where level 8 is used for even parity.

INTERMEDIATE GEAR ASSEMBLY

- Transfers rotational motion from motor unit to typing unit.
- Driven gear can be changed (and motor unit pinion gear) to obtain various operating speeds for typing unit.
- Shock-mounted and nylon gears to suppress operating noise level.

CONTROL PANEL

- Local function keys.
- Special control keys and indicators.
- Additional keys and indicators may be added as required.



KEYTOP GUIDE

- Restrains horizontal motion of keytops.
- Protects keyboard mechanism from dust and other hazards.

KEYBOARD HOUSING

- Protects keyboard mechanism from dust and other hazards.
- Modern styling.

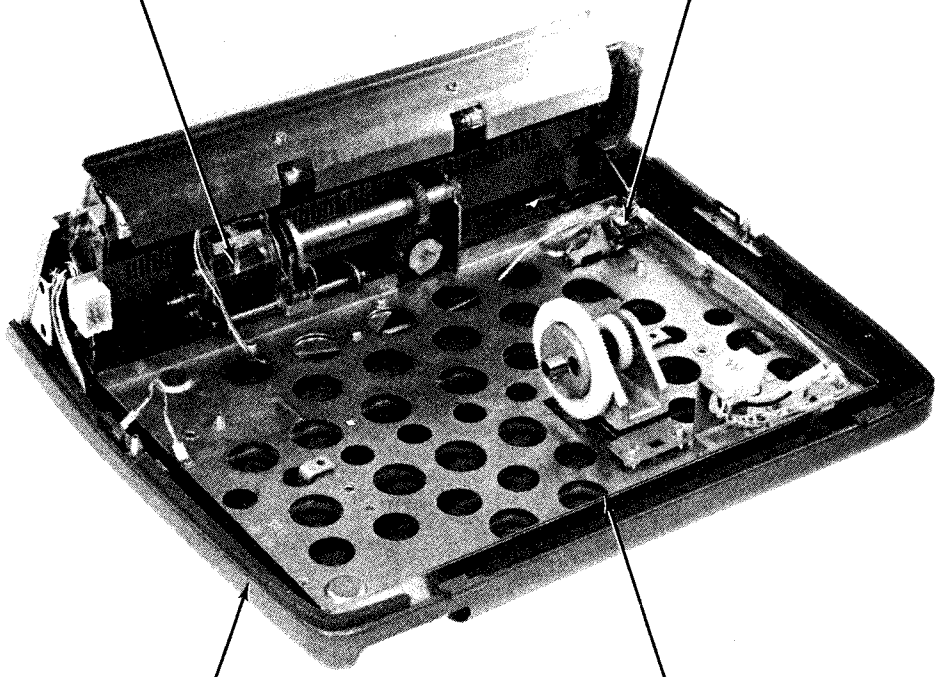
Figure 2 - Keyboard Unit (Right Front View)

RESET MECHANISM

- Mechanically resets keyboard mechanism.
- Auxiliary cam and contacts for code sampling.
- Mechanically driven from typing unit.

MARGIN INDICATOR SWITCH

- Converts mechanical motion from typing unit into electrical signal to control panel.



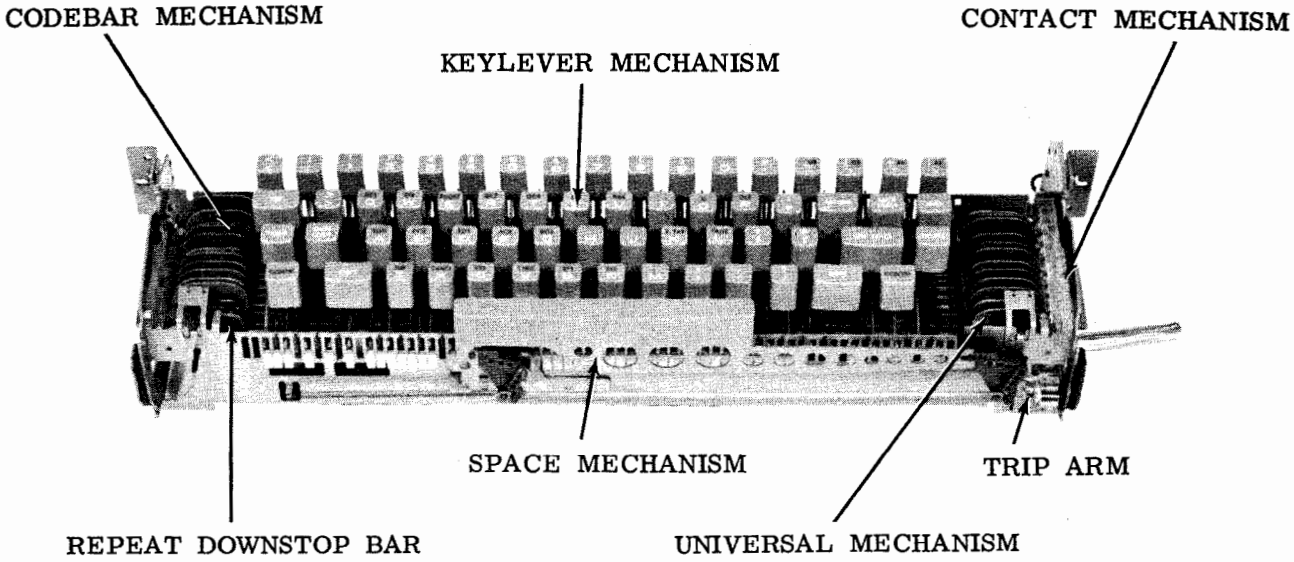
PAN

- Provides mounting facilities for base and keyboard mechanism.
- Provides shock mounting for base.

BASE

- Provides mounting facilities for typing unit and motor unit.
- Contains holes to suppress operating noise level.

Figure 3 - Keyboard Unit (Right Rear View)



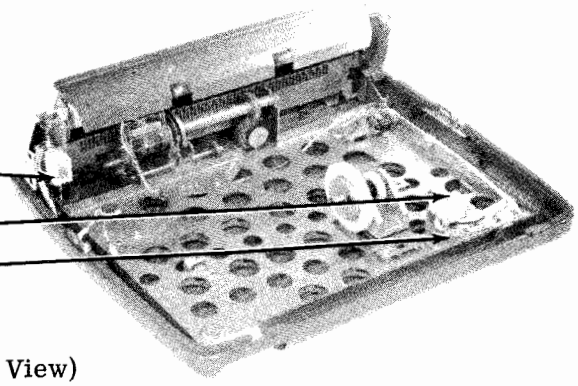
(Front View)

Figure 4 - Basic Mechanisms

CONNECTORS

- Provide electrical interface for power, control, and signal line circuits between keyboard unit and electrical service unit.

(1) Keyboard contact receptacle.
(2) Reset mechanism, margin indicator switch, and motor unit receptacle.
(3) Motor unit connector sockets.



(Right Rear View)

Figure 5 - Electrical Elements

TECHNICAL DATA

A. Physical Characteristics

Weight . . . . . 23 pounds
Height . . . . . 6 inches
Width. . . . . 19-3/8 inches
Depth. . . . . 18-7/8 inches

B. Electrical Characteristics

Keyboard Mechanism
Electrical contacts +5.25 v dc (nominal)

Reset Mechanism
Keyboard auxiliary contact -12.5 v dc (nominal)

Control Panel
Lamps and Switches 25 v dc, 30 ma (nominal)

C. Signaling Code

Levels	Eight
Mark	Closed contact
Space	Open contact
Parity	Even

D. Keyboard Auxiliary Contacts

150 wpm Closes 2.5 to 8.5 msec after reset camshaft begins to rotate and will remain closed 51 to 55 msec.

100 wpm Closes 3.6 to 12.5 msec after reset camshaft begins to rotate and will remain closed 74 to 80 msec.

E. Keylever Spring Tension

Normal	Less than 7 ounces
Repeat	Less than 24 ounces

F. Environment

Ambient Temperature (Outside Cover)
Minimum 40°F
Maximum 120°F

Relative Humidity Range
Minimum 0%
Maximum 95%

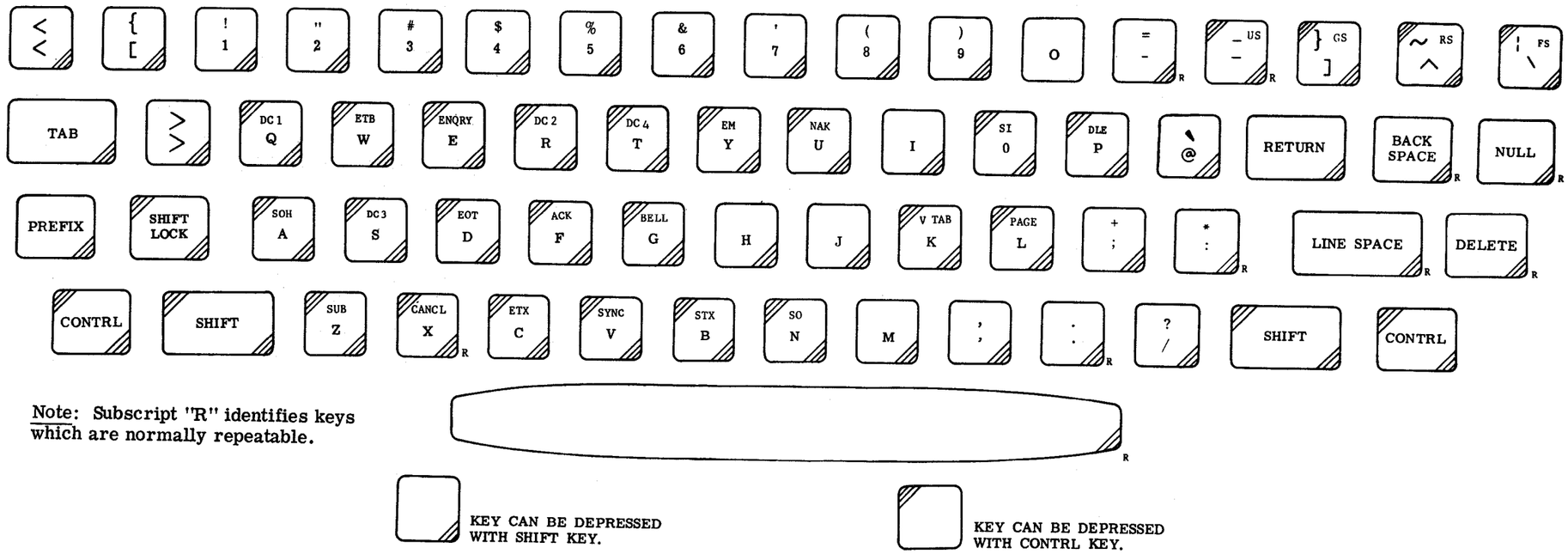
G. Character Arrangement

2.10 The character arrangement of the keytops is as shown in Figure 6. The keytop arrangement is similar to that of a standard office typewriter. In addition, frequently used control functions are provided as primary keys. Designations within keytop are as they appear on the mechanism. Designations shown above the keytop are control function legends. The following chart lists the control character legend and designation. The function as screened on the keytop is listed for those designations where the screening and legend differ.

H. Control Characters

LEGEND		DESIGNATION
ACK	-	Acknowledge
BEL	-	Bell
BS	-	Backspace
CAN	-	Cancel
CR	-	Carriage return (RETURN)
DC1	-	Device control 1
DC2	-	Device control 2
DC3	-	Device control 3
DC4	-	Device control 4
DEL	-	Delete
DLE	-	Data link escape
EM	-	End of medium
ENQ	-	Enquiry
EOT	-	End of transmission
ESC	-	Escape (PREFIX)
ETB	-	End transmission block
ETX	-	End text

LEGEND		DESIGNATION
FF	-	Form feed
FS	-	File separator
GS	-	Group separator
HT	-	Horizontal tabulation (TAB)
LF	-	Line feed (LINE SPACE)
NAK	-	Negative acknowledge
NUL	-	Null
RS	-	Record separator
SI	-	Shift in
SO	-	Shift out
SOH	-	Start of heading
SP	-	Space
STX	-	Start text
SUB	-	Start of special sequence
SYN	-	Synchronize
US	-	Unit separator
VT	-	Vertical tabulation (V TAB)



Note: Subscript "R" identifies keys which are normally repeatable.

Figure 6 - Keytop Arrangement

3. PRINCIPLES OF OPERATION

3.01 The principles of operation are divided into the mechanical operation and the electrical code generating logic of the keyboard unit. The mechanical operation is presented in: (1) a pictorial schematic of the unit; and (2) a series of mechanism drawings. Each illustration is supported with appropriate text to describe the purpose and operation of the mechanism. Where possible, the mechanism drawings are arranged in the order in which the mechanism operates. The electrical operation is limited to the elements which logically generate the eight levels of binary information.

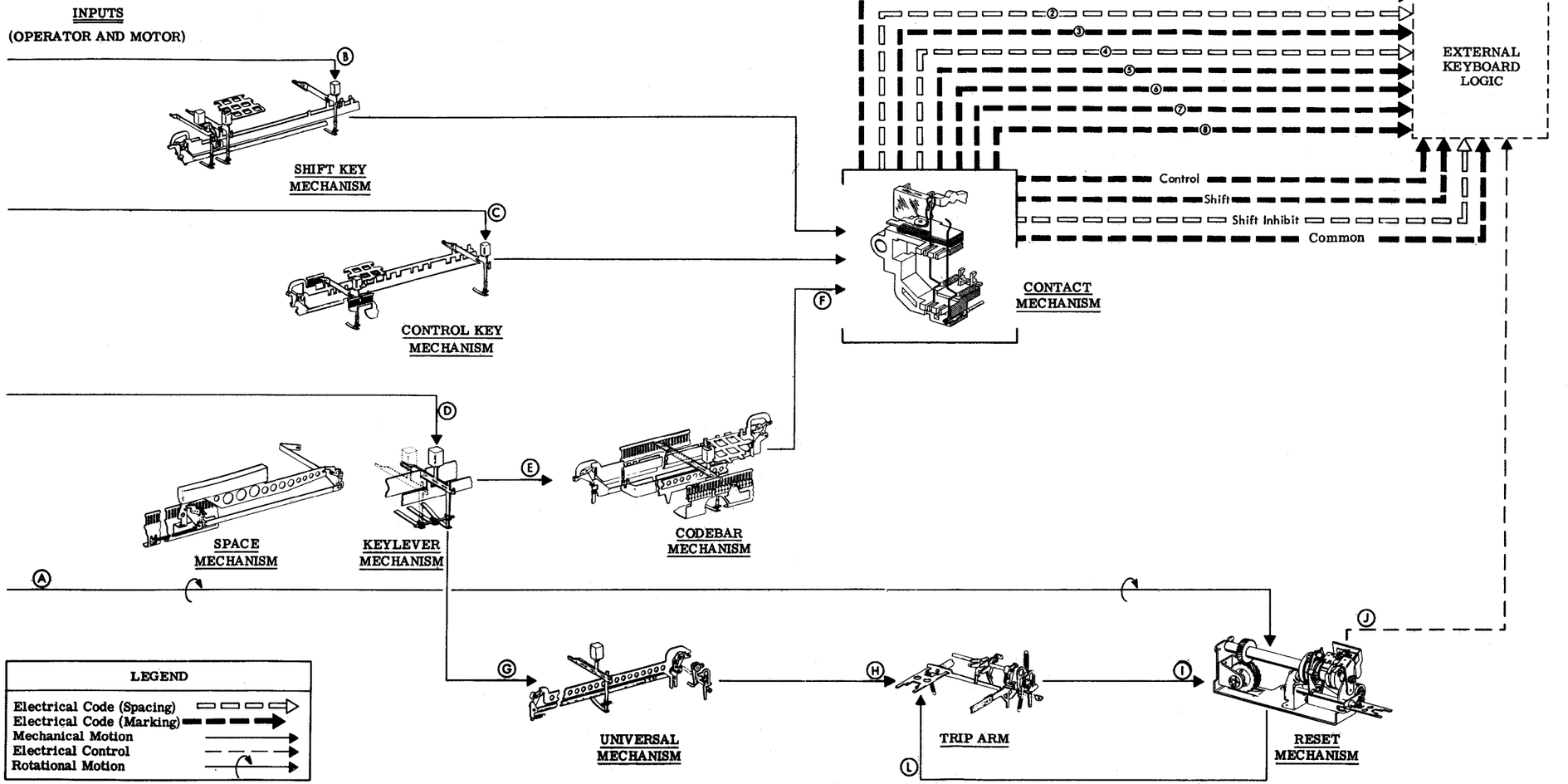
3.02 The contents of this part are listed alphabetically in the operational index.

OPERATIONAL INDEX

ITEM	PAGE
ELECTRICAL	28
American Standard Code for Information Interchange (ASCII)	29
External Keyboard Logic	28
Keyboard Output	28
Keyboard Schematic Diagram	29
MECHANICAL	9
Base Mechanisms	
Intermediate gear assembly	26
Margin indicator switch	26
Control Panel Mechanism	
Control, functions, and indicators	24
Keyboard Mechanism	
Codebar mechanism	15
Contact mechanism	16
Control functions	11
Control key mechanism	11
Keylever mechanism	12
Repeat mechanism	21
Shift key mechanism	10
Shift lock	10
Space mechanism	14
Trip arm mechanism	19/20
Universal mechanism	18
Reset Mechanism	
Trip arm reset and contact sample	22

MECHANICAL

3.03 Unit Operation



OPERATION

- (A) Continuous rotational motion applied to main shaft of reset mechanism.
- (B) Depress SHIFT key to modify output of contact mechanism. Must be depressed before primary key.
- (C) Depress CONTROL key to modify output of contact mechanism. Must be depressed before primary key.
- (D) Depress primary key to select primary shift, or control character.
- (E) Engage and operate codebars other than SHIFT or CONTROL. (SHIFT and/or CONTROL codebars operated when SHIFT and/or CONTROL keys are depressed.)
- (F) Arrange code generating contacts.
- (G) Engage and operate universal codebar.
- (H) Release trip arm.
- (I) Engage cam sleeve with main shaft of reset mechanism.
- (J) Close keyboard auxiliary contacts to initiate sampling period of contact mechanism.
- (K) Keyboard output in form of circuit paths furnished to external logic for processing and character or control generation.
- (L) After sampling contact mechanism, reset trip arm.

3.04 Keyboard Mechanism

SHIFT KEY MECHANISM

Purpose

Changes character output of graphic primary keys from lower case graphics to upper case graphics, and mechanically blocks undesired primary keys.

Operation

The SHIFT key, when depressed, operates the shift codebar set, only. It does not trip the keyboard; ie, a recess in the SHIFT LOCK and both SHIFT keylevers prevent the keylevers from engaging the universal bar. The shift codebar set is spring biased so that the rear codebar is held upward. The rear codebar has two tine extension slots to receive the extensions of the two keylevers. When either SHIFT keytop is depressed, the other SHIFT keytop descends. The keylever is depressed against its leaf spring and the shift codebar spring. When the rear codebar descends, the front codebar ascends to mechanically block undesired primary keys; and the shift contacts are operated to alter the keyboard logic circuit. When released, the codebar set returns to its normal unoperated condition. To generate an upper case graphic, the SHIFT key must first be depressed followed by an unblocked primary key. The primary key trips the keyboard.

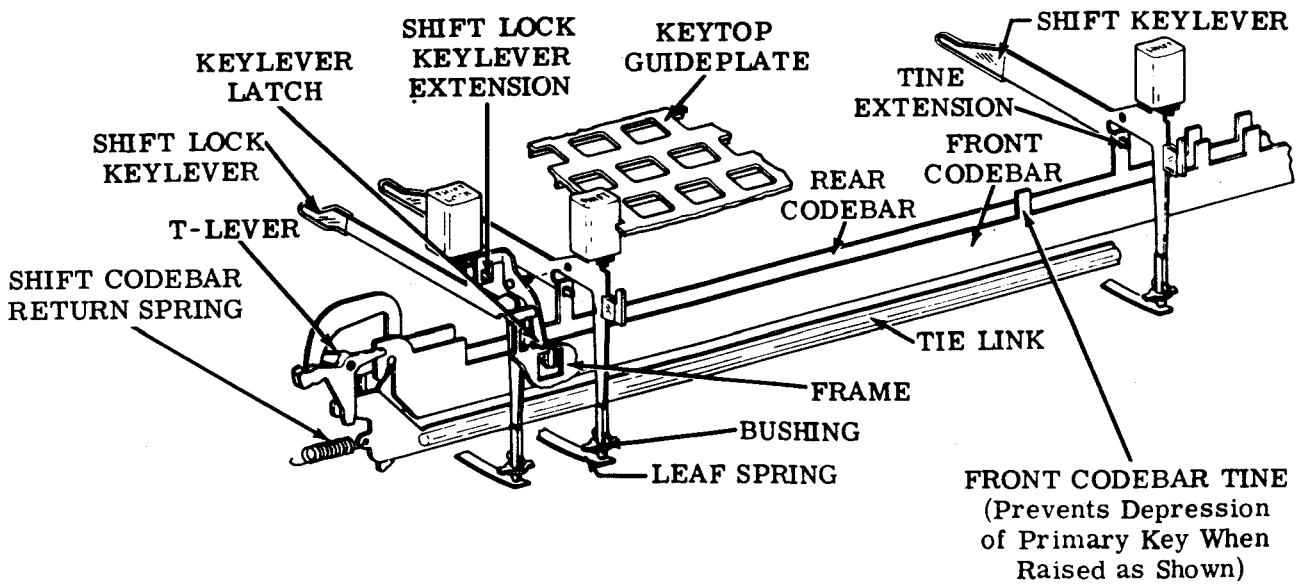
SHIFT LOCK

Purpose

Holds SHIFT key down.

Operation

With SHIFT LOCK key unoperated, the shift keylever latch will pivot toward rear as the SHIFT key is depressed. As SHIFT LOCK key is depressed, the shift lock keylever extension rotates keylever latch which carries the shift keylever downward. When SHIFT LOCK key is near lower end of its travel, the shift keylever latch engages the opening in the basket frame to hold SHIFT LOCK and both SHIFT keys in their depressed positions. To unlock, SHIFT key must be depressed further to unhook the shift keylever latch. Depressing SHIFT key while in lock condition will cause the shift keylever latch to rotate toward the rear and unhook itself from the basket frame. With no pressure on SHIFT LOCK key, the shift lock keylever will lead the shift keylever during upward travel, thereby holding shift keylever latch toward the rear as both keys ascend.



3.05 Keyboard Mechanism (continued)

CONTROL KEY MECHANISM

Purpose

Changes character output of certain primary keys from graphics to their control function equivalents, and mechanically blocks undesired primary keys.

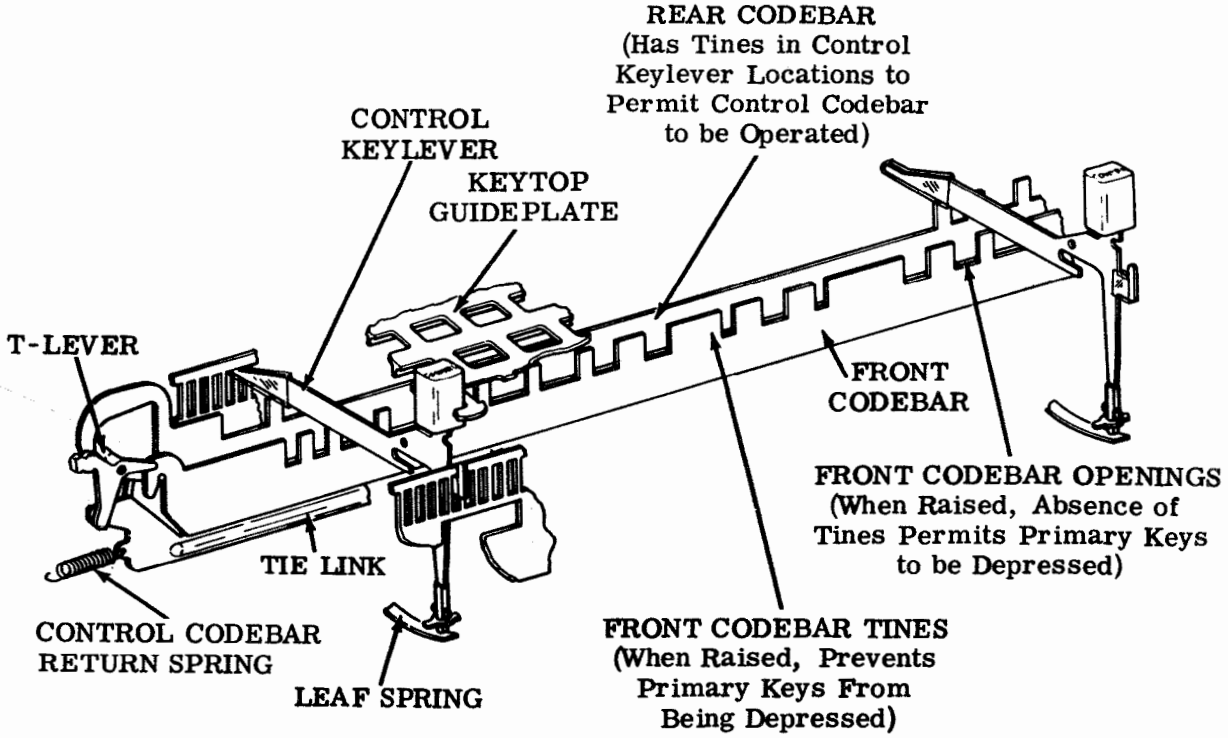
Operation

The CONTRL (control) key, when depressed, operates the control codebar set only. It does not trip the keyboard, ie, a recess in each control keylever prevents the keylever from engaging the universal bar. The control codebar set is spring biased so that the rear codebar is held upward. The rear codebar accepts the CONTRL key input to operate the codebar set. When operated, the rear codebar descends as the front codebar ascends. The control contacts are operated to modify the keyboard logic circuit. The front codebar rises to prevent certain primary keys from being depressed. The presence of a tine in the front codebar prevents the primary key from being depressed; the absence of a tine permits the key to be depressed. The CONTRL key must first be depressed followed by an unblocked primary key in order to generate a function character. When released, the control codebar set, contacts, keylever, and keytop return to their normal unoperated position.

CONTROL FUNCTIONS

Operation

Control functions can be generated from special primary keys or from CONTRL plus graphic primary keys. The same control function cannot be generated by both methods. When a primary key exists for a control function, eg, RETURN, both this primary key and the graphic primary key, M, would be blocked on control. RETURN can be generated in the shift or unshift mode but not in the control mode.



3.06 Keyboard Mechanism (continued)

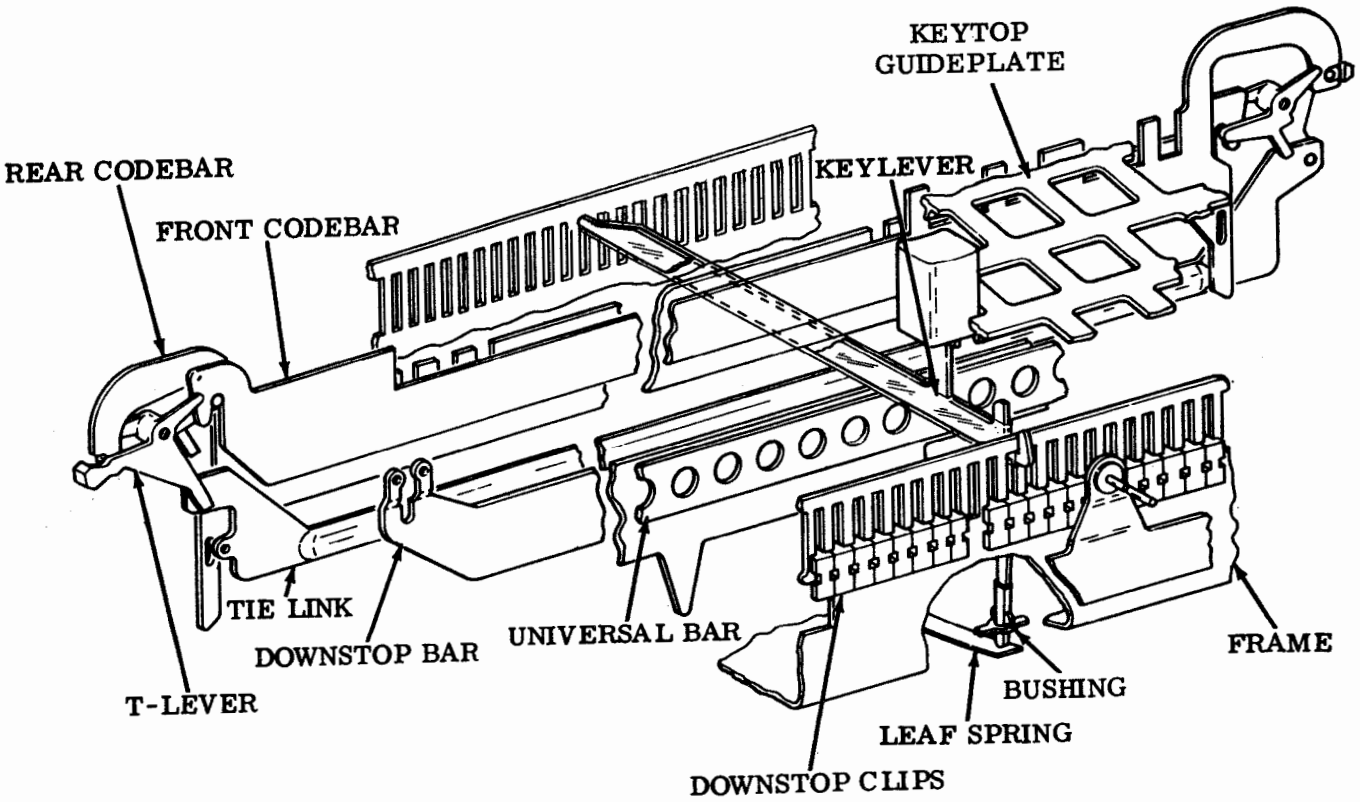
KEYLEVER MECHANISM

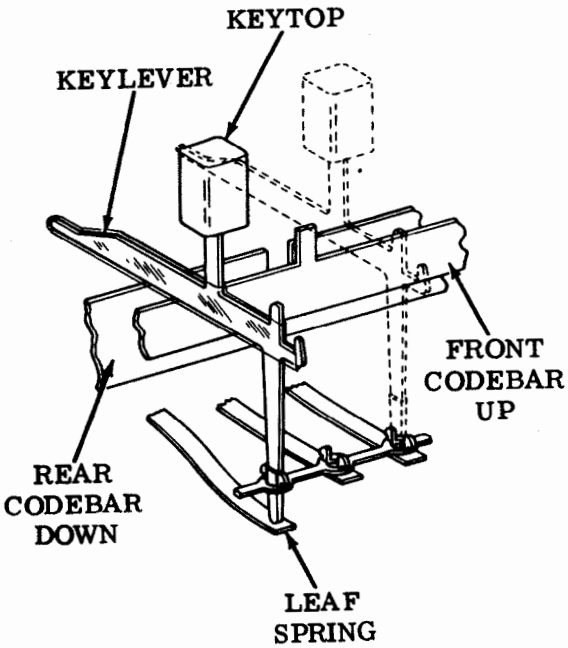
Purpose

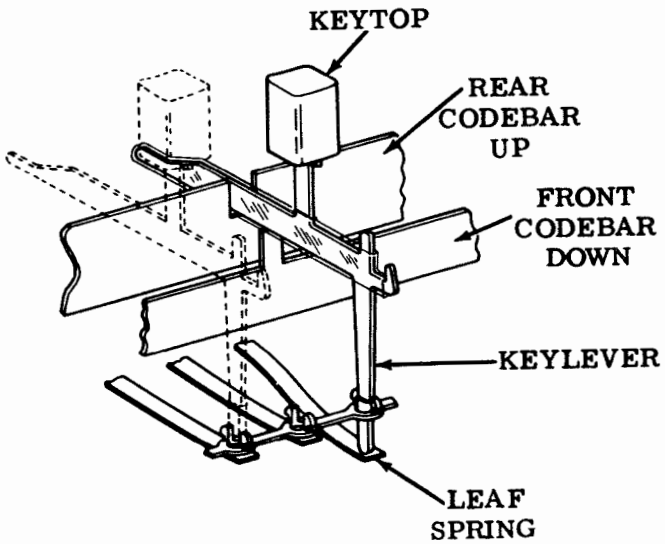
Positions the codebar sets which select the code combination associated with each primary key (other than SHIFT or CONTRL), and trips the keyboard.

Operation

When a primary key is depressed, the bottom surface of the keylever may reposition up to nine of the eleven codebar sets. The other two codebar sets are related to the SHIFT and CONTRL keys which, when depressed, will prevent depression of certain primary keys. A codebar set (operated by a primary keylever) will be repositioned when the solid portion of one codebar is up, and the open portion of the other codebar is down. As the keylever descends against its leaf spring, the codebar sets not previously positioned are repositioned; and the universal bar is engaged to trip the keyboard. (When tripped, the codebar sets are locked by the trip arm holding the code selection in position and preventing another character from being selected before the keyboard is reset.) A plastic bushing provides a guide for the keylever. If not blocked by the downstop clip, the keylever can be depressed against increased spring tension by way of the downstop bar, to repeat the character. When released, the primary key is returned to the upward position by its leaf spring.


KEYTOP
GUIDEPLATE
REAR CODEBAR
FRONT CODEBAR
KEYLEVER
TIE LINK
DOWNSTOP BAR
UNIVERSAL BAR
FRAME
T-LEVER
BUSHING
LEAF SPRING
DOWNSTOP CLIPS


KEYTOP
KEYLEVER
FRONT
CODEBAR
UP
REAR
CODEBAR
DOWN
LEAF
SPRING


KEYTOP
REAR
CODEBAR
UP
FRONT
CODEBAR
DOWN
KEYLEVER
LEAF
SPRING

3.07 Keyboard Mechanism (continued)

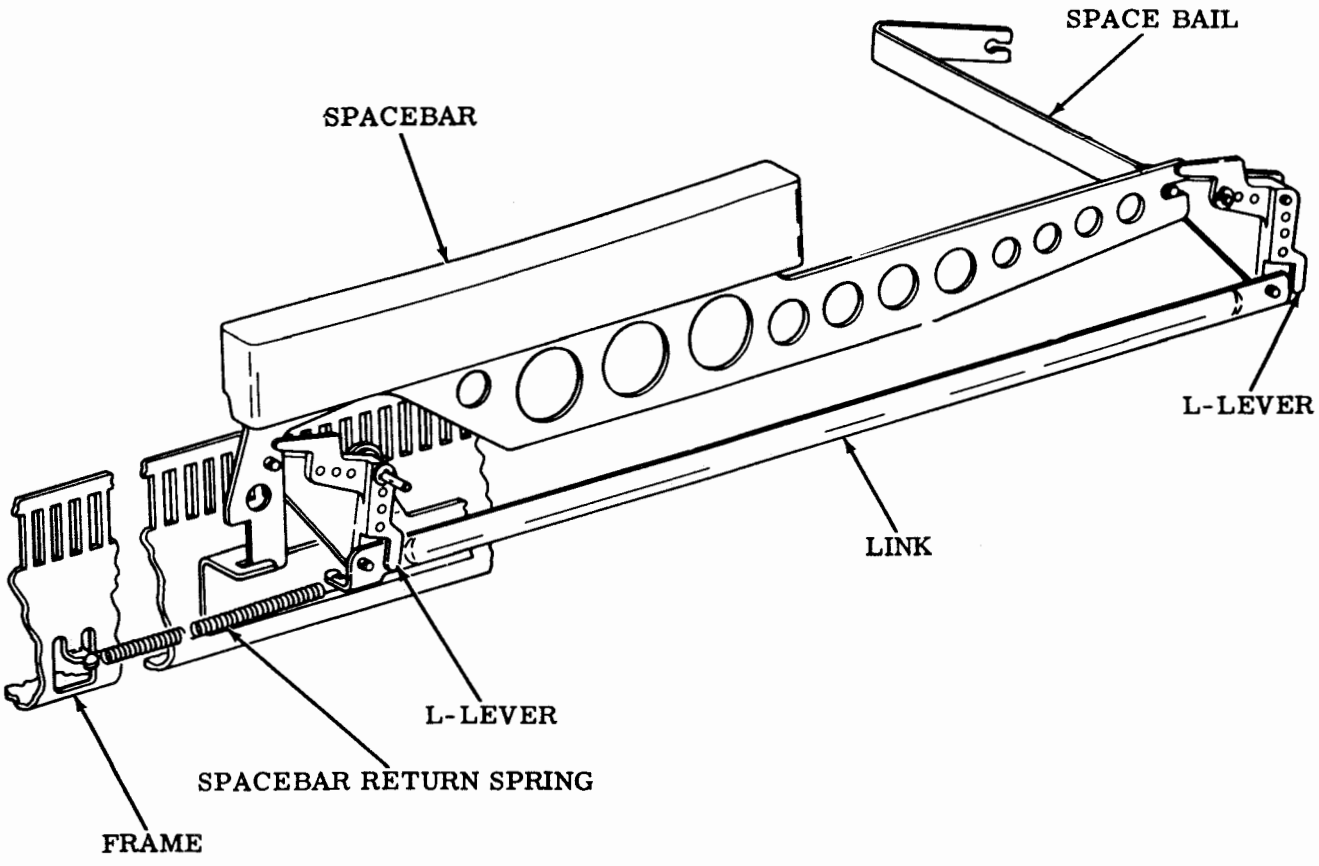
SPACE MECHANISM

Purpose

Provide a means for originating the space character from a bar compatible (both in shape and location) with conventional keyboards. The space character can be generated with the keyboard in the shift or unshift mode but cannot be generated in the control mode.

Operation

Depressing the SPACEBAR (when not blocked by control) will cause the space bail to rotate downward against the codebar sets. Only those codebar sets whose rear or front tines are up (at the space bail position) will be engaged to operate their respective contacts. The space bail, during its downward motion, engages the universal bar to trip the keyboard. When released, the space bail rises against the front and rear upstop bars by means of the spacebar return spring.



3.08 Keyboard Mechanism (continued)

CODEBAR MECHANISM

Purpose

Provides the means for transferring keylever inputs to contact mechanism.

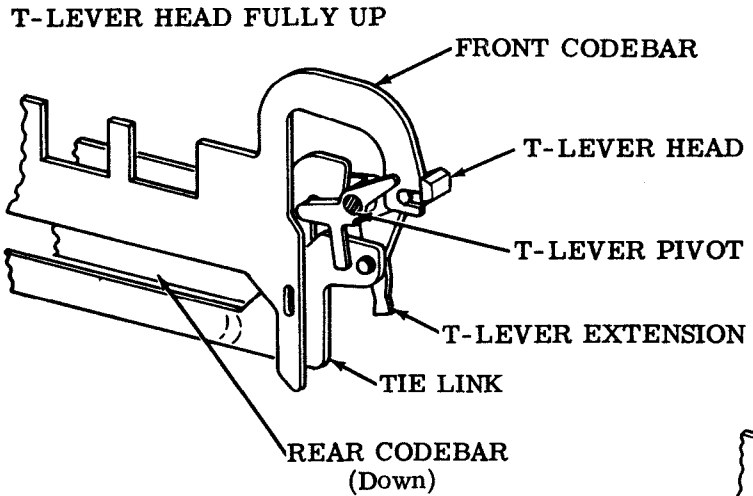
Operation

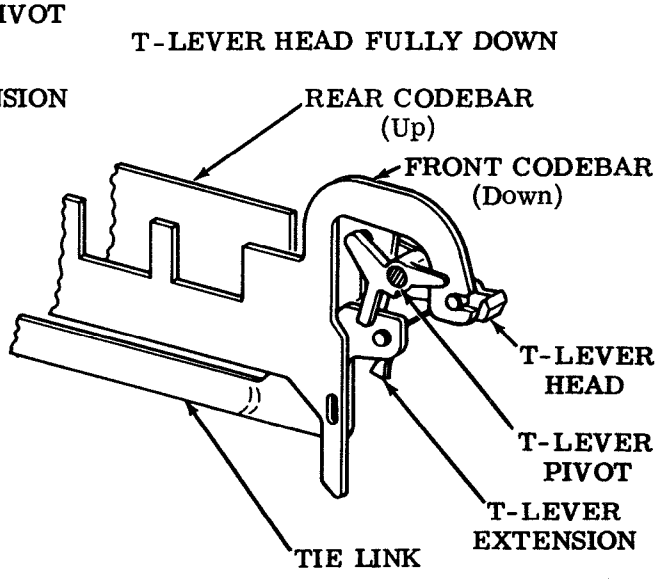
The codebar mechanism consists of the eight code level sets and the shift inhibit codebar set. The other two codebar sets, operated by the individual SHIFT and CONTRL keys, are associated with the shift and control mechanisms. Each codebar set consists of a front codebar, rear codebar, two T-levers, and a tie link.

Each codebar set can be placed in one of two states (binary). For purposes of discussion, the states are defined as follows: rear codebar up and front codebar down is the normal state; rear codebar down and front codebar up is the inverted state. (This state cannot be established by means of a keylever.) (The nine codebar sets are not spring biased as are the shift and control codebar sets. The normal and inverted states are based upon the assigned condition of the associated contacts.)

The nine codebar sets are positioned by a keylever mechanism. At effective keylever locations the front codebar is the compliment of the rear codebar; ie, where the front codebar is solid, the rear codebar is open, and conversely, where the front is open, the rear is solid. At ineffective keylever locations, such as SHIFT, SHIFT LOCK, and CONTRL, keylevers cannot position the codebar sets.

The two T-levers are attached to the codebar set, one at each end and are connected by the tie link. When the front codebar is down, the right end T-lever head is down; when the rear codebar is down, the right T-lever is up. The T-lever head positions the contact wires in the contact mechanism to provide the electrical code path associated with the depressed keylever mechanism.





3.09 Keyboard Mechanism (continued)

CONTACT MECHANISM

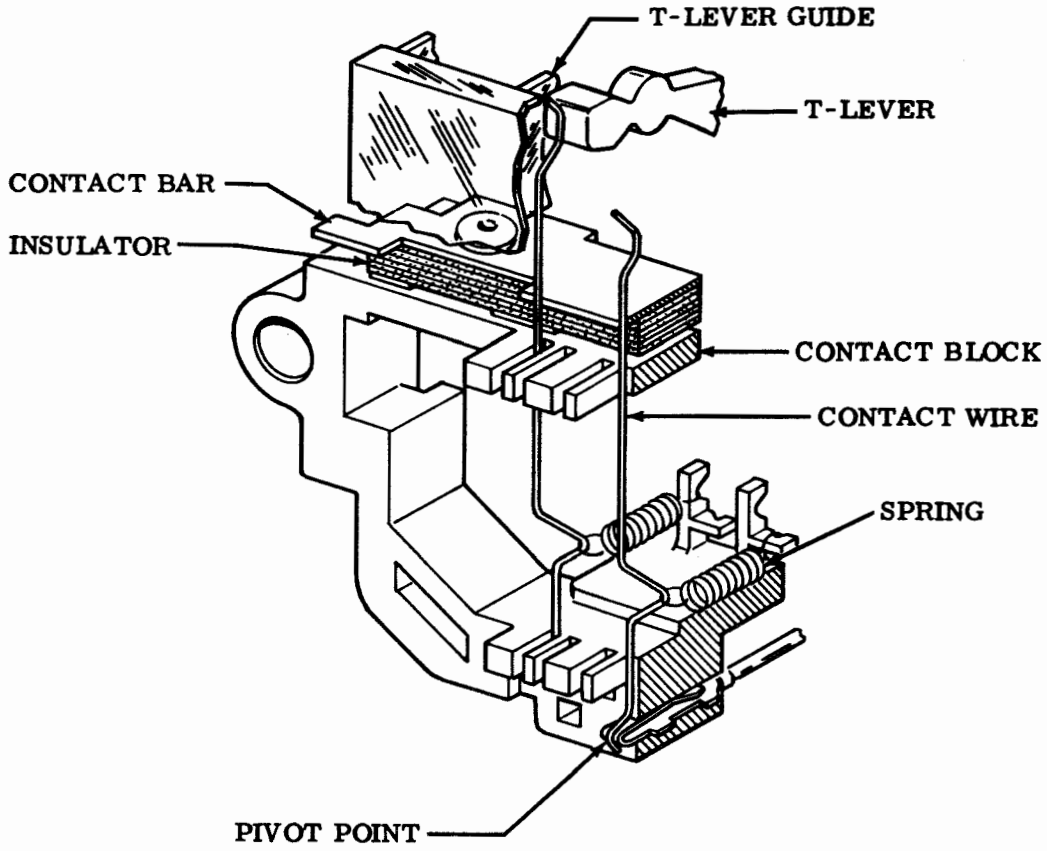
Purpose

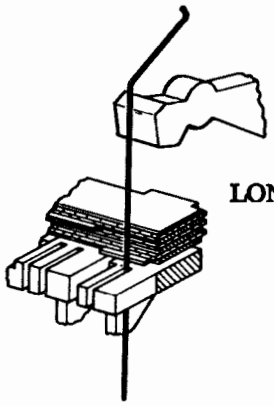
Provides circuit paths to external keyboard logic as determined by the depression of keylevers.

Operation

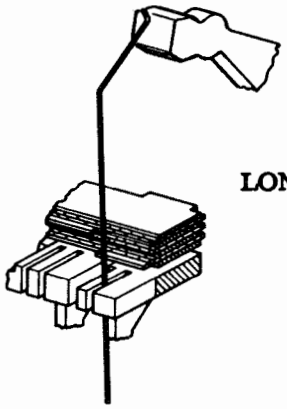
The contact mechanism consists of a contact block, a contact bar, insulators, and eleven contact wires. Two types of contact wires, short and long, are used. Slotted guides in the contact block hold the contact wires in place.

Each contact wire can be placed in one of two binary states. The contact wire is spring biased to a contact bar to provide the electrical connection. Positioning of the T-lever up establishes an electrical connection for the shorter contact wire and opens the electrical connection of the longer contact wire. Conversely, positioning of the T-lever down opens the electrical connection of the shorter contact wire and establishes an electrical connection for the longer contact wire. Refer to Paragraph 3.16 for the electrical description of the contact mechanism.

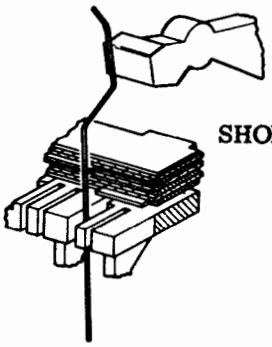




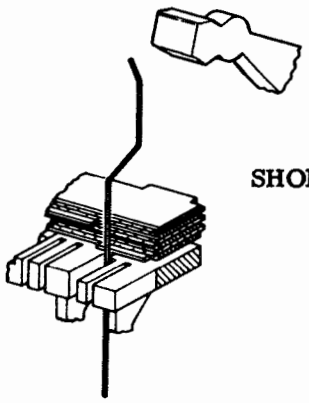
LONG CONTACT WIRE
T-LEVER DOWN



LONG CONTACT WIRE
T-LEVER UP



SHORT CONTACT WIRE
T-LEVER DOWN



SHORT CONTACT WIRE
T-LEVER UP

3. 10 Keyboard Mechanism (continued)

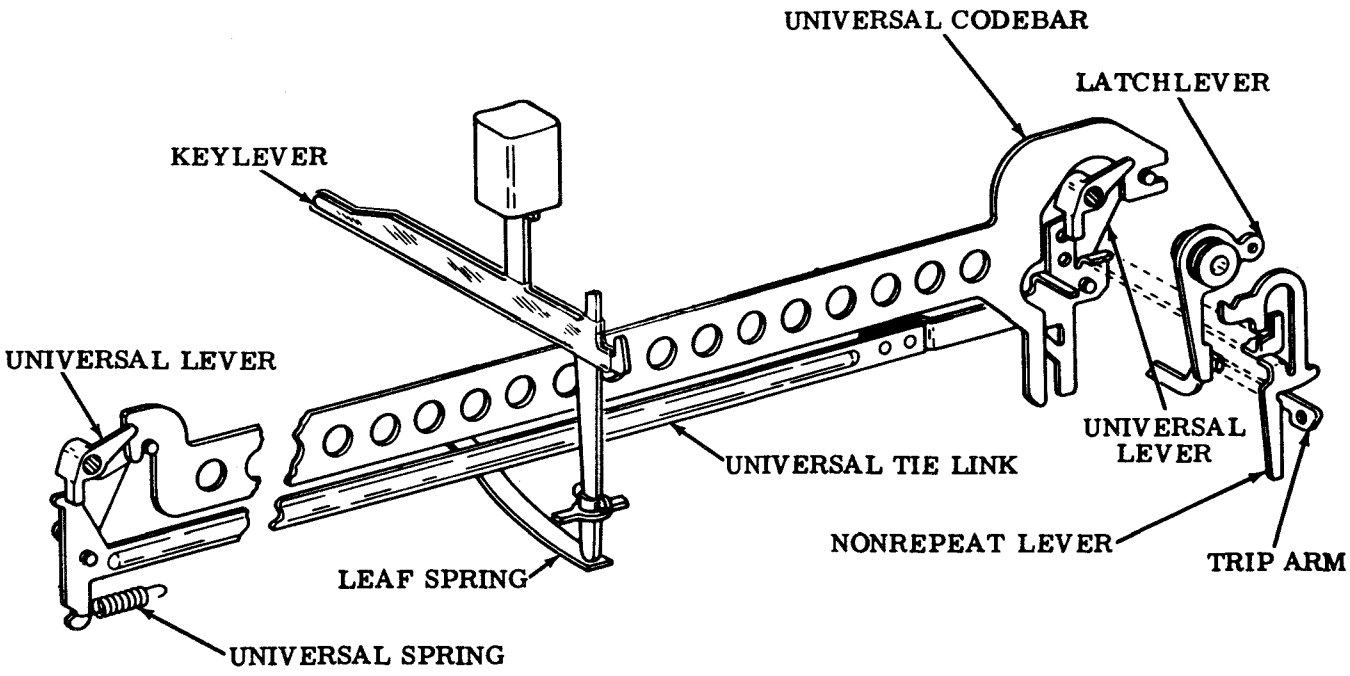
UNIVERSAL MECHANISM

Purpose

Releases the trip arm.

Operation

The universal mechanism consists of a single codebar which is spring biased in the up position and its associated universal tie link is biased to the right. Depressing a primary key places the codebar mechanism in its coded position at which time the keylever engages the universal codebar. Further depressing of the keylever moves the universal codebar downward pivoting the universal levers. This moves the universal tie link to the left. As the universal tie link moves to the left, it engages the nonrepeat lever and latchlever rotating them clockwise, releasing the trip arm. If the primary key is depressed beyond its normal downstop position, the universal tie link rotates the nonrepeat lever further to prevent latching of the trip lever. The character associated with the depressed keylever is thus continuously repeated until the trip lever is latched.



3.11 Keyboard Mechanism (continued)

TRIP ARM

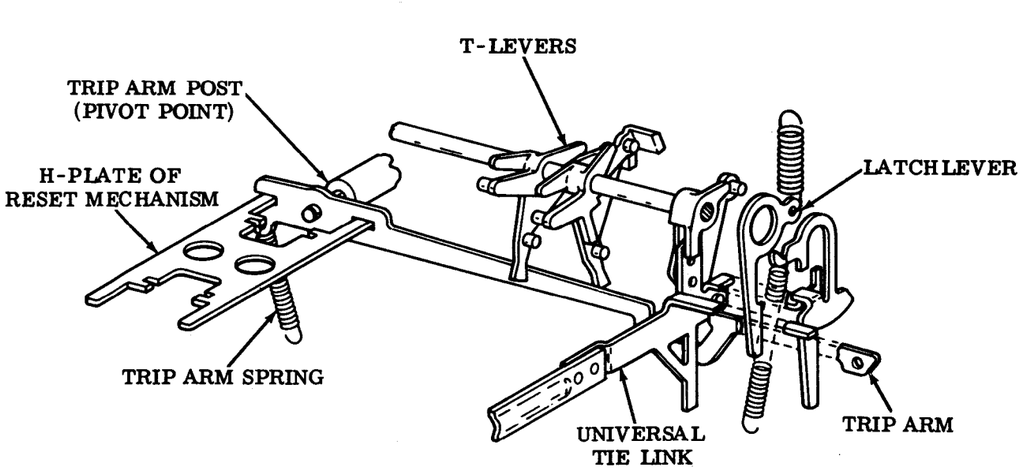
Purpose

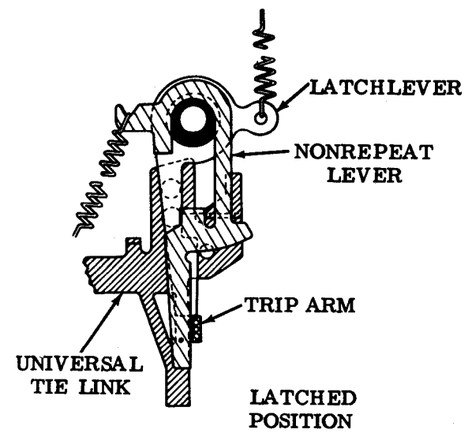
Lock T-levers in selected code position during code sampling period; trip reset mechanism; unlock T-levers at the end of code sampling period; pace operator to keyboard speed.

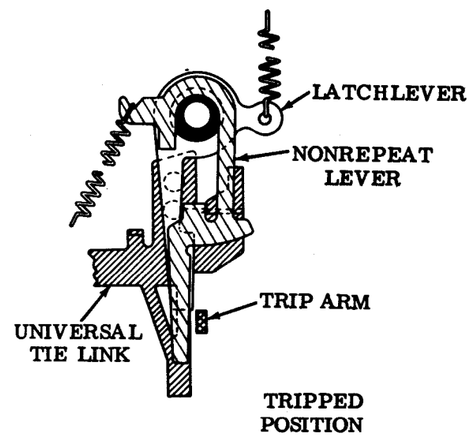
Operation

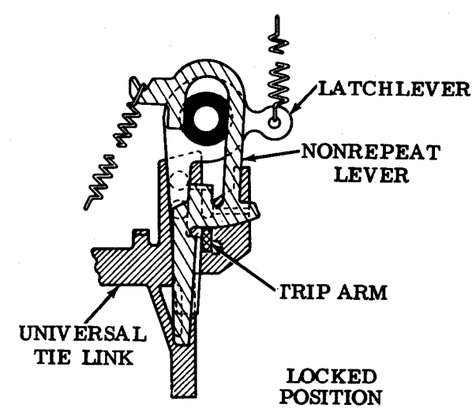
When the keyboard mechanism is in the unoperated condition, the trip arm is latched. When a primary key is depressed, the keylever engages the universal codebar and moves the universal tie link to the left. The universal tie link rotates the nonrepeat lever clockwise. The nonrepeat lever, in turn, rotates the latchlever clockwise releasing the trip arm. When released upward, the trip arm activates the reset mechanism. At the end of the reset mechanism cycle, the reset mechanism returns the trip arm to the latched position.

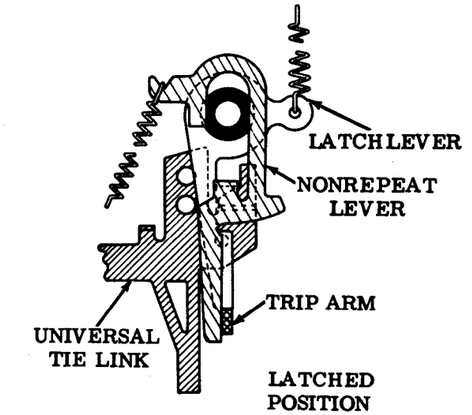
Holding the primary key at the normal downstop position at the end of the reset cycle does not block latching of the trip arm. During the reset cycle the trip arm moves the nonrepeat lever upward into the cutout area of the latchlever. When the trip arm is moved downward at the end of the reset cycle, the latchlever spring rotates the latchlever counterclockwise over the trip arm.











(KEYLEVER DEPRESSED TO NORMAL DOWNSTOP POSITION)

3.12 Keyboard Mechanism (continued)

REPEAT MECHANISM

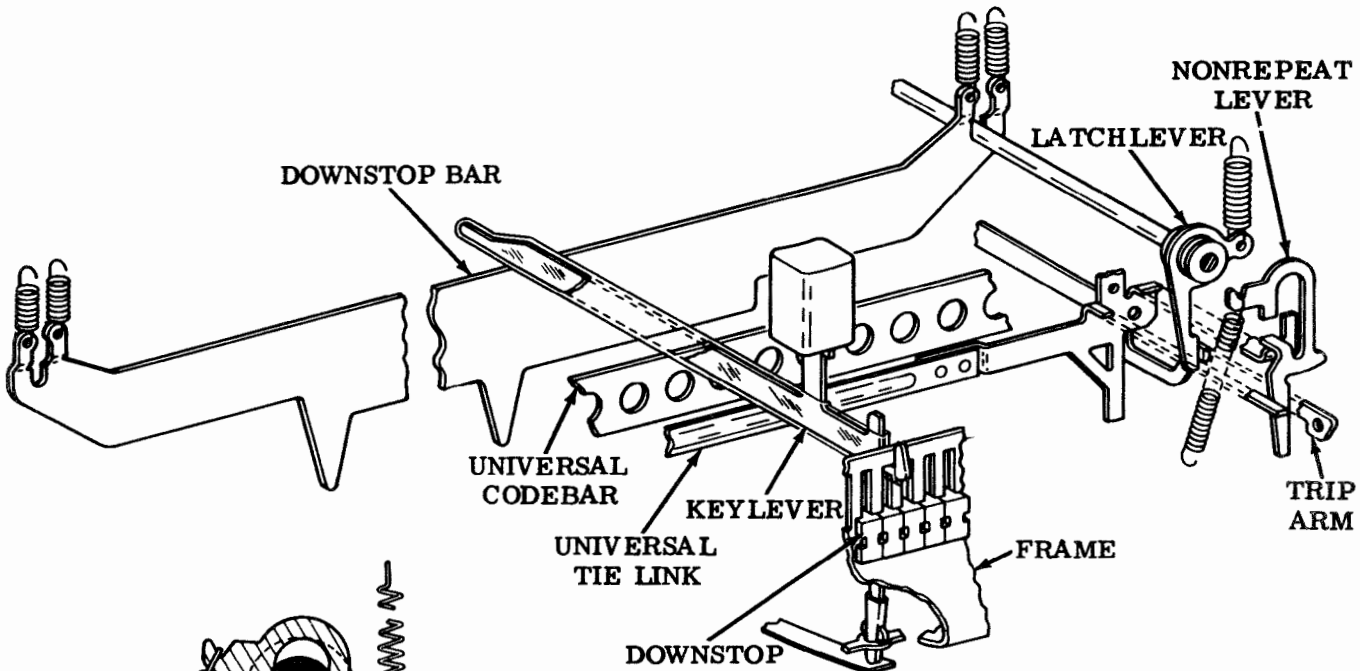
Purpose

Blocks latching of trip arm when primary key is held depressed beyond normal downstop position, permitting repeat of character until primary key is released.

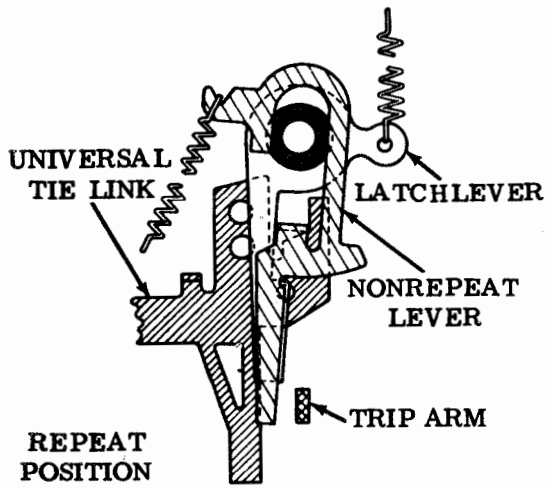
Operation

A keylever, not stopped by a downstop blocking clip, is stopped by the downstop bar when depressed by using normal finger pressure. Depressing the key further downward, on the spring-biased downstop bar, causes the universal codebar to move further downward. This moves the universal tie link further to the left. The nonrepeat lever strikes the vertical tab on the universal tie link and is pressed against the latchlever. This prevents the latchlever from returning to the latched position when the trip arm is reset. The trip arm, not being latched again raises and activates the reset mechanism. This action continues until the keylever is returned to the normal downstop position or released. When the keylever returns to the normal downstop position or is released, the nonrepeat lever does not block the return of the latchlever to its latching position and the repeat action is stopped.

Downstop blocking clips, which attach to the front keylever slots in the frame, block the downward movement of selected keylevers beyond the normal downstop position. Keylevers so blocked become nonrepeatable.



REPEAT MECHANISM



3.13 Reset Mechanism

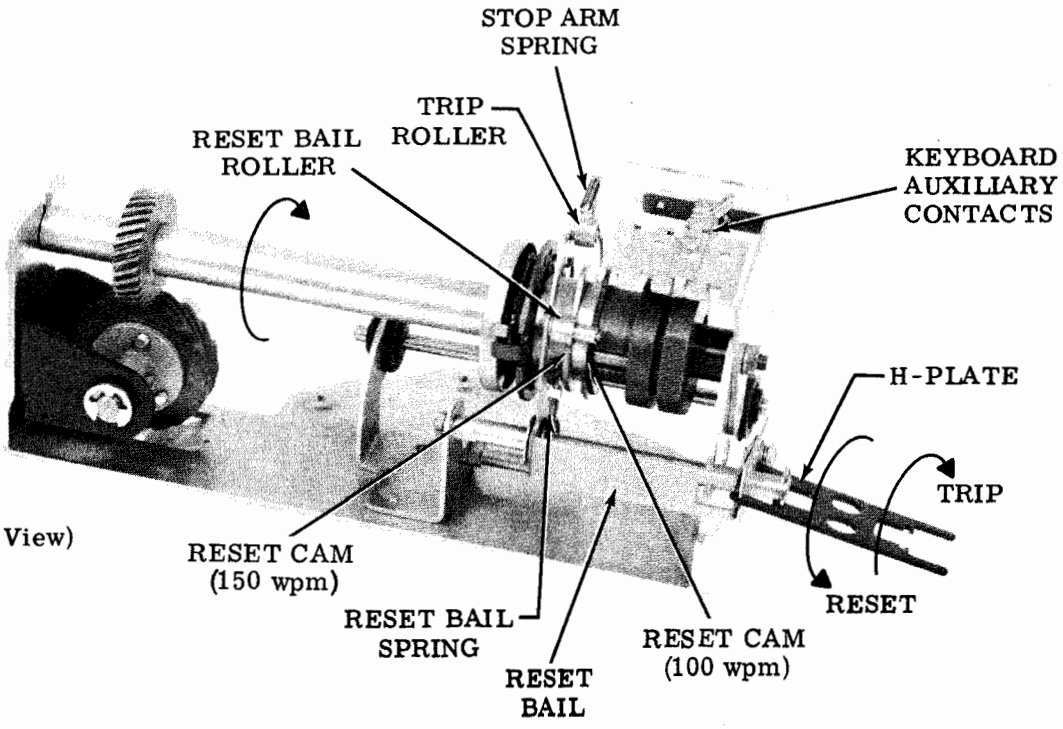
TRIP ARM RESET AND CONTACT SAMPLE

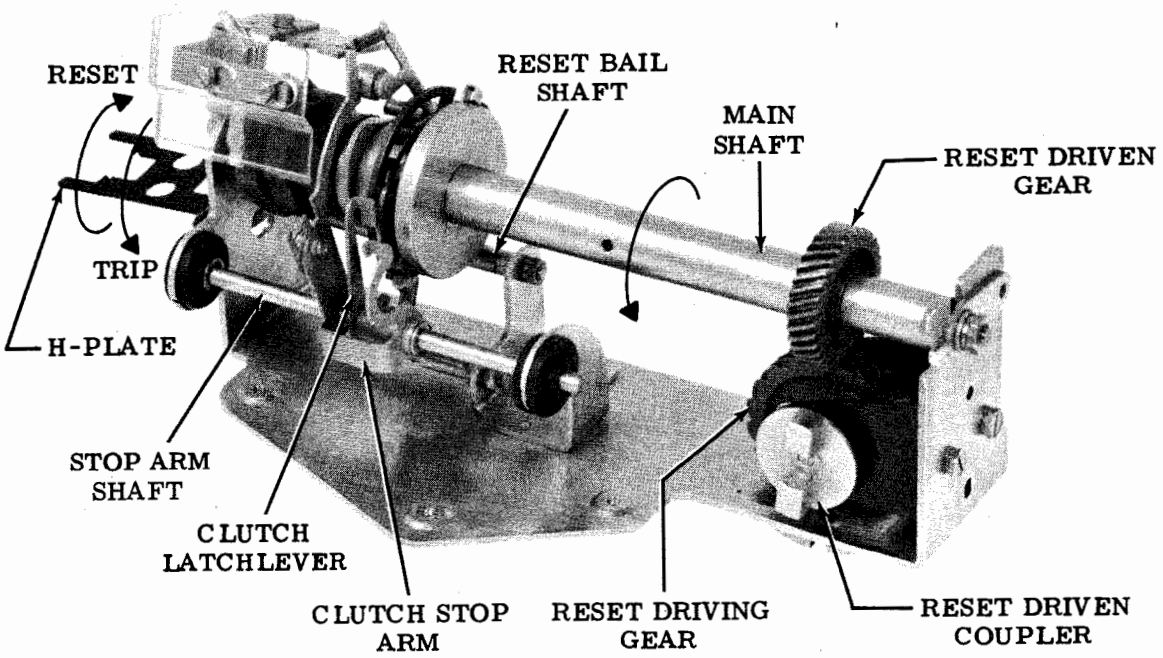
Purpose

Resets trip arm mechanism after a primary key has been depressed to permit subsequent key to be depressed; initiates code sampling period and distribution of selected code.

Operation

When the trip arm is released and travels upward, its extension beyond the pivot point moves downward applying a clockwise rotational motion to the reset mechanism H-plate. The H-plate transfers the rotating motion through the reset bail to the clutch stop arm. The clutch stop arm, which is spring biased inward, is moved outward releasing the clutch shoe lever. The clutch then engages the clutch drum and the main shaft drives the auxiliary cams through one cycle of operation. (As the clutch is a two-stop mechanism, 180 degree rotation of the main shaft provides one cycle of operation.) During the operating cycle, the reset bail roller follows the reset cam causing the reset bail to be rotated counterclockwise and the clutch stop arm to be returned to its blocking position. As the reset bail is rotated, the H-plate drives the trip arm downward returning it to its latched position. The keyboard auxiliary cam, during the operating cycle, closes the keyboard auxiliary contacts which generate a MESSAGE AVAILABLE signal. This signal initiates the movement of keyboard contact information through external logic where conversion to ASCII takes place (3.16). Before the operating cycle is completed, the auxiliary cam reopens the 12.5-volt keyboard auxiliary contact circuit and removes the signal.




RESET
RESET BAIL SHAFT
MAIN SHAFT
RESET DRIVEN GEAR
TRIP
H-PLATE
STOP ARM SHAFT
CLUTCH LATCHLEVER
CLUTCH STOP ARM
RESET DRIVING GEAR
RESET DRIVEN COUPLER

(Rear View)

3.14 Control Panel Mechanism

CONTROL, FUNCTIONS, AND INDICATORS

Purpose

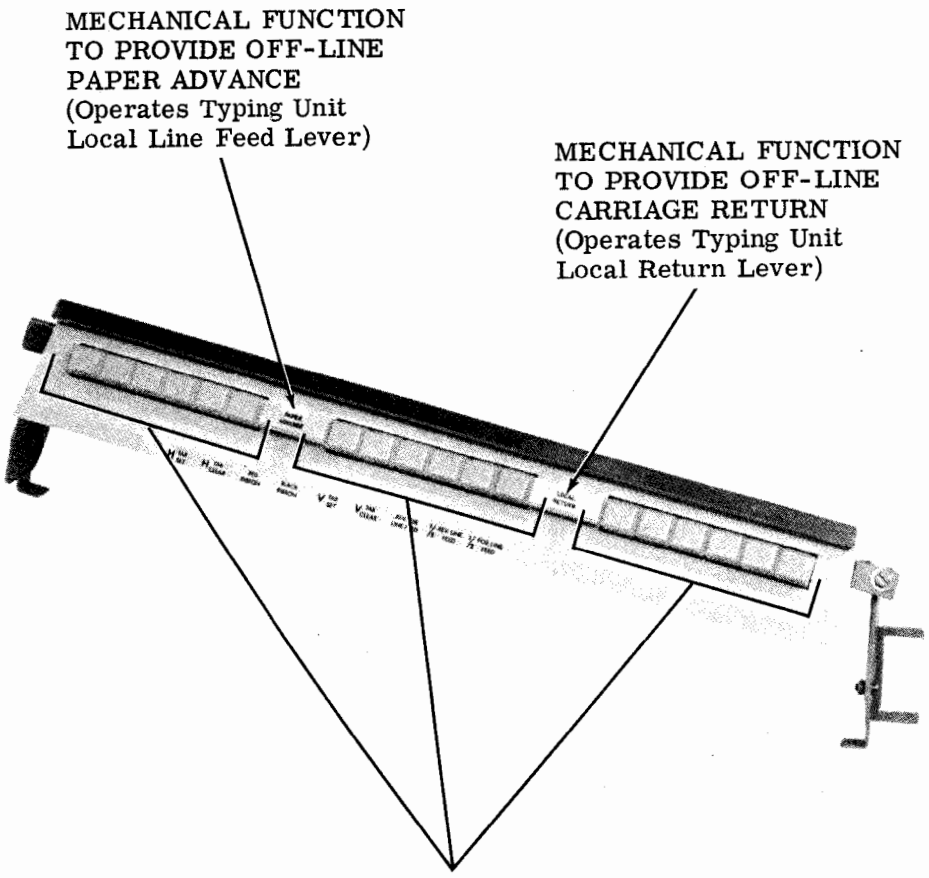
Provides operator control indicators, and off-line paper advance and carriage return controls.

Operation

The control panel provides electrical and mechanical functions for use by the keyboard operator. Three banks of six pushbutton-type indicators are provided to meet specific set applications. The indicator lights are controlled by the set's electrical service unit. Pressing a lighted pushbutton indicator opens the indicator circuit and removes the indication.

The PAPER ADVANCE pushbutton transfers a mechanical motion to the typing unit providing a local line feed which is not transmitted to the signal line.

Depressing the LOCAL RETURN pushbutton transfers a mechanical motion to the typing unit providing a local carriage return which is not transmitted to the signal line.


MECHANICAL FUNCTION
TO PROVIDE OFF-LINE
PAPER ADVANCE
(Operates Typing Unit
Local Line Feed Lever)
MECHANICAL FUNCTION
TO PROVIDE OFF-LINE
CARRIAGE RETURN
(Operates Typing Unit
Local Return Lever)
OPERATOR INDICATOR LAMPS
AND SWITCHES AS DETERMINED
BY SET APPLICATION

3.15 Base Mechanisms

INTERMEDIATE GEAR ASSEMBLY

Purpose

Transfer driving power from motor unit to typing unit; determine operating speed of typing unit; provide overload protection between typing unit and motor unit.

Operation

The driven gear of the intermediate gear assembly consists of a helical gear with an integral overload clutch lever. The motor unit pinion gear drives the driven gear and overload clutch lever. The overload clutch lever, normally engaged with the clutch drum, rotates the intermediate shaft and driving gear.

The gear ratio between the motor pinion gear and the driven gear determines the operating speed of the typing unit.

Overload protection is provided by the overload clutch. Should the typing unit become blocked, the overload clutch arm is disengaged from the clutch drum removing driving torque from the typing unit. To re-engage the clutch, power must be removed from the motor unit and the typing unit main shaft rotated by hand until the clutch arm is latched in the notch of the drum.

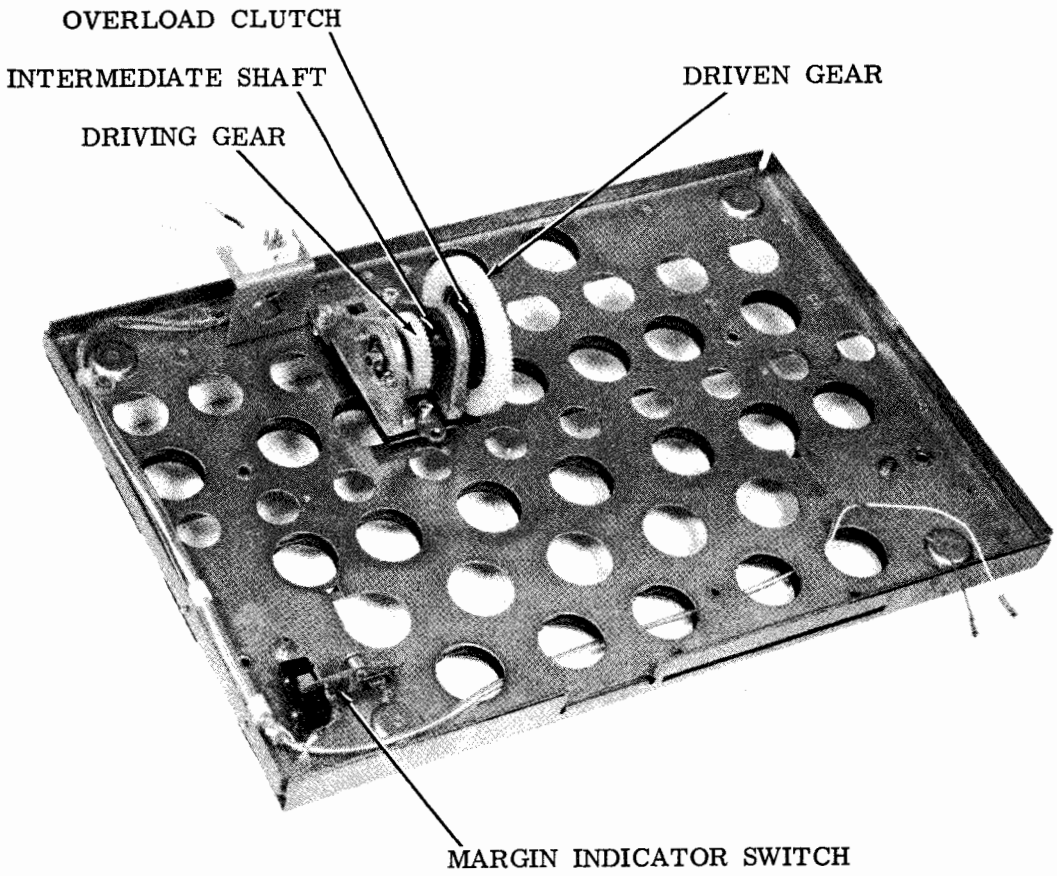
MARGIN INDICATOR SWITCH

Purpose

Lights lamp to indicate carriage at right margin.

Operation

The margin indicator switch contains a normally open contact and switch lever. As carriage approaches right margin, a cam on the carriage return spring drum depresses the switch lever. The switch lever then closes the open contact to complete an electrical circuit.


OVERLOAD CLUTCH
INTERMEDIATE SHAFT
DRIVING GEAR
DRIVEN GEAR
MARGIN INDICATOR SWITCH

ELECTRICAL OPERATION

3.16 Keyboard Output

(1) The output of the keyboard consists of eleven leads or circuit paths through the keyboard contact mechanism. This output is applied to external logic to generate the 128 characters and controls in the American Standard Code for Information Interchange (ASCII).

(2) As shown in the schematic diagram, the outputs are associated with specific codebars. The keys initiating the positioning of the codebars and the resulting contact operations affect the output as follows:

(a) Keyboard outputs 1 through 7 and parity occur when any key with the exception of SHIFT and/or CONTRL is depressed.

(b) The control and shift outputs occur when the CONTRL and SHIFT keys, respectively, are depressed.

(c) The shift inhibit output occurs when a key associated with only one character or control is depressed together with or independent of the SHIFT or CONTRL keys.

(3) When a key is depressed alone or with the SHIFT or CONTRL key, the keyboard output is developed as follows:

(a) Outputs 1 through 7 occur as binary state 1 or 0 according to the ASCII code for the character or control corresponding to the use of that key alone. For example, the binary state for outputs 1 through 7 is the same for the character A whether a lower or upper case A is entered into the keyboard.

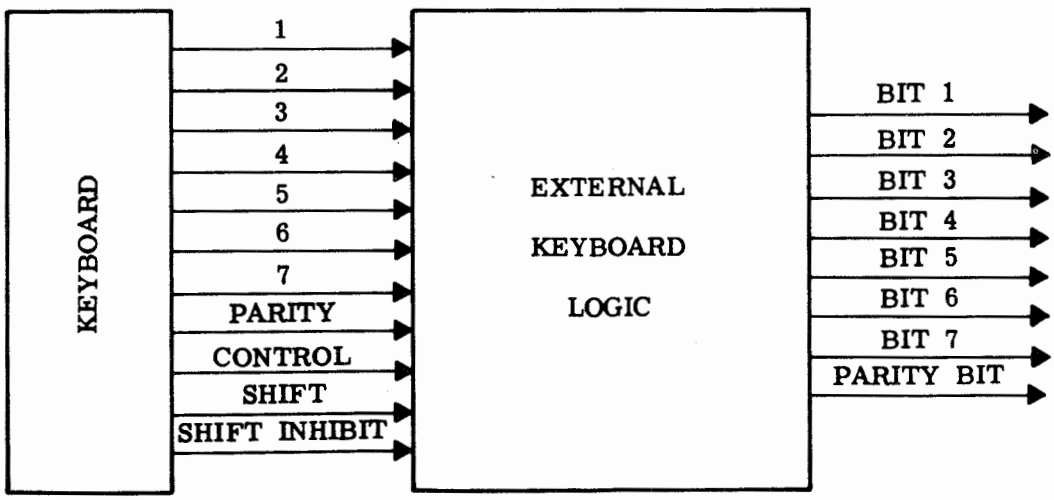
(b) The parity output state is binary 1 or 0 as determined by the total number of 1s in outputs 1 through 7. This output will be 1 or 0 to provide an even number of 1s in outputs 1 through 8.

(c) The control output state is a binary 1 or 0 depending on whether the CONTRL key is depressed.

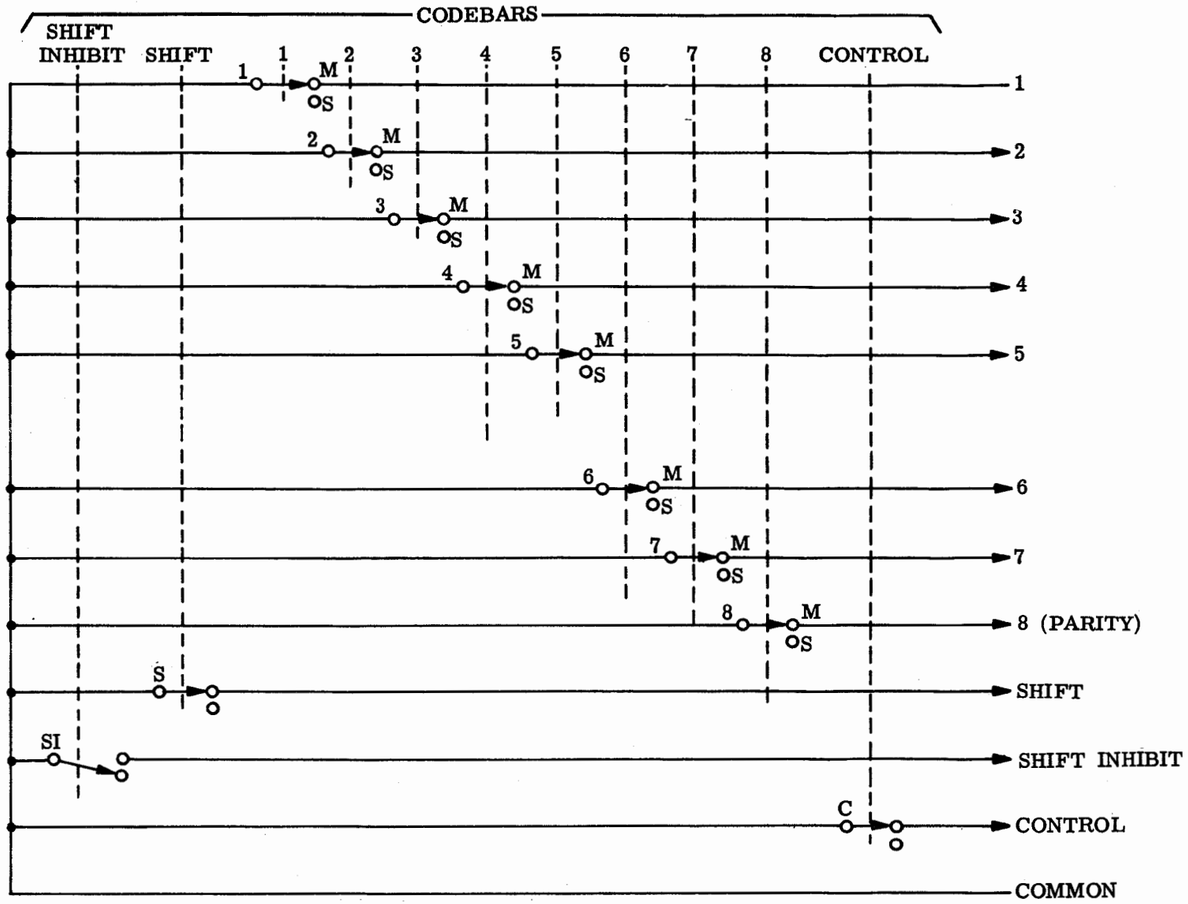
(d) The shift output state is a binary 1 or 0 depending on whether the SHIFT key is depressed.

(e) The shift inhibit output is binary state 1 if the depressed key can be used only to generate one character or one control.

3.17 External Keyboard Logic — The keyboard logic output is in the form of bit permutations. Bits 1 through 7 are binary state 1 or 0 according to the character or control entered into the keyboard, and the parity bit is 1 or 0 to provide even parity.



KEYBOARD SCHEMATIC DIAGRAM



Note: The number 1 - 8 codebars are shown in the marking position.
Shift, control and shift inhibit contacts are shown unoperated.

AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE (ASCII)

BITS 7				0				1			
BITS 6				0		1		0		1	
BITS 5				0	1	0	1	0	1	0	1
4	3	2	1								
0	0	0	0	NUL	DLE	SP	0	@	P	\	p
			1	SOH	DC1	!	1	A	Q	a	q
		1	0	STX	DC2	"	2	B	R	b	r
			1	ETX	DC3	#	3	C	S	c	s
	1	0	0	EOT	DC4	$	4	D	T	d	t
			1	ENQ	NAK	%	5	E	U	e	u
		1	0	ACK	SYN	&	6	F	V	f	v
			1	BEL	ETB	'	7	G	W	g	w
1	0	0	0	BS	CAN	(	8	H	X	h	x
			1	HT	EM	)	9	I	Y	i	y
		1	0	LF	SUB	*	:	J	Z	j	z
			1	VT	ESC	+	;	K	[	k	{
	1	0	0	FF	FS	,	<	L	\	l	|
			1	CR	GS	-	=	M	]	m	}
		1	0	SO	RS	.	>	N	^	n	~
			1	SI	US	/	?	O	—	o	DEL

Characters and controls are generated by use of a key alone ( ), with a SHIFT key ( ), or with a CONTRL key ( ). See Figure 6.

37 ELECTRICAL SERVICE UNIT

DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL 2

2. DESCRIPTION 2

EIA INTERFACE 3

KEYBOARD SEND-RECEIVE UNIT 3

REPERFORATOR TRANSMITTER UNIT 5

RECEIVE-ONLY UNIT 5

UTILITY STRIP 7

POWER SUPPLY AND REGULATOR 7

TECHNICAL DATA 7

A. Code and Signal Characteristics 7
B. Physical Characteristics 8
C. Power Requirements 8
D. Environment 8

CIRCUIT CARDS 8

A. Keyboard Control 8
B. Reader Driver 8
C. Distributor 8
D. Send Control, ASR/KSR 9
E. Mode Control, ASR/KSR 9
F. Channel Control 9
G. Alarms and Control 10
H. Alarms and Automatic Control (ASR) 10
I. Receive Control 10
J. Receiving Device 11

VARIABLE FEATURES 11

A. Answer-Back Control 11
B. Two-Color Ribbon Control 11
C. Counter Control 11
D. Character Counter 12
E. Punch Code Detection 12
F. Punch Feed-Out 12
G. Bid Circuit 12

CONTENTS PAGE

3. OPERATION 13/14

SENDING 13/14

A. On-Line and Local Distributor 13/14
B. Send Control 18

SET CONTROL LOGIC 21

RECEIVING 21

4. REFERENCES 23

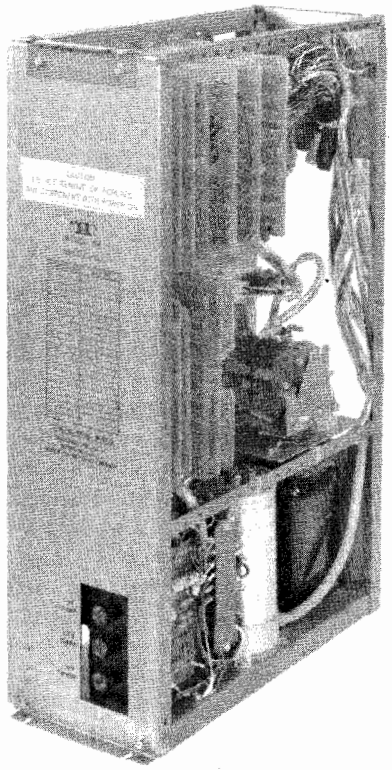


Figure 1 - 37 Electrical Service Unit

1. GENERAL

1.01 This section provides the description and operation for the 37 electrical service units (Figure 1). For a detailed analysis of this unit, refer to the wiring diagram packages associated with each set. Reference material concerning the set is found in the appropriate sectionalized literature.

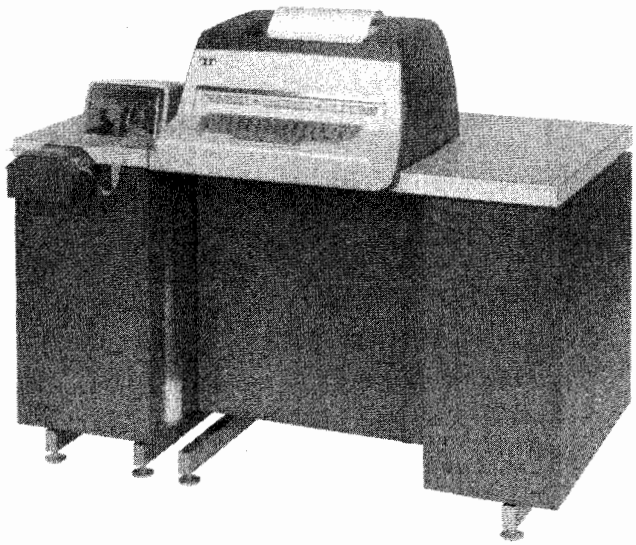


Figure 2 - 37 Automatic Send-Receive (ASR) Set

1.02 The 37 electrical service unit provides the electrical facilities for the 37 Teletypewriter (Figures 2 and 3). The electrical service unit is an assembly that uses the EIA standard interface connections and signal logic. The unit adapts to all classes of data communications, synchronous and asynchronous, which include either 2-wire or 4-wire switched networks. Private line service with multipoint operations is also available with the standard features.

1.03 The electrical service unit is equipped with the necessary mounting, wiring, and cabling facilities for the various circuit card arrangements available on the 37 Teletypewriter. This section also covers a general description and operation for the electrical service unit associated circuit cards (circuit card options, component circuit cards, and circuit cards that provide variable features). Circuit card options are additions to the required circuits for the set.

1.04 Components for the 37 set, keyboard, reader, etc, require circuit cards and these cards may have options available. Variable features provide additional capabilities that may be selected to expand upon the basic set.

2. DESCRIPTION

2.01 The electrical service unit for 37 Automatic Send-Receive (ASR) equipment (Figure 2) consists of two electrical assemblies, one for the Keyboard Send-Receive (KSR) Set and one of smaller size for the Reperforator Transmitter (RT) module. The Receive-Only (RO) Set uses the electrical service unit for the KSR set with a different circuit card arrangement.

2.02 The electrical service unit provides for circuit cards that contain logic for the set controls, component controls, and power supply regulator. Modular design provides a variety of circuit arrangements and the ability to add variable features. The circuit cards mate with connectors mounted on a frame. Each connector is hard wired to a terminal board. Power supply, wiring, cables, and connectors are provided on the frame of the unit.

2.03 The variations for the different set operations are achieved by the selection of plug-in circuit cards. Integrated circuits have been extensively used on the circuit cards. The control logic circuits interact with the control panel located above the keyboard. Six, twelve, or eighteen nonlocking pushbuttons on the control panel may be used depending upon the set and circuit options. Indicator lamps are associated with each pushbutton and various panel configurations are available. The electrical service unit has an associated utility strip that provides 117-volt power distribution, circuit breaker, relays, and signal bell for the 37 sets. The utility strip is located in the KSR table (Figure 3).

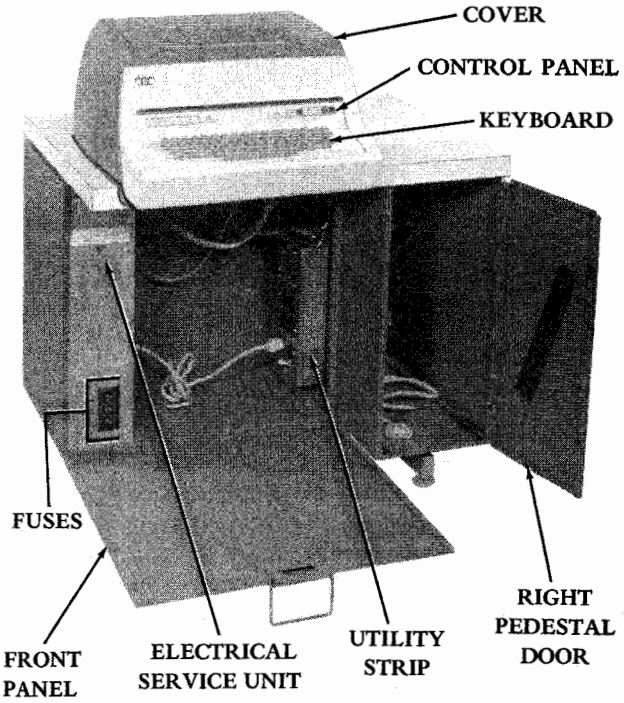


Figure 3 - 37 Keyboard Send-Receive (KSR) Set

EIA INTERFACE

2.04 The 37 electrical service unit (ESU) conforms to the Electronic Industries Association (EIA) Standard RS-232-B for the interface connections with the data set. The EIA standard defines the control signals and binary serialized data signals between an input/output device and the data set or processing terminal (communications equipment).

2.05 This standard also defines the type of connector and the lead designations on the interface cable. Refer to Table A for information concerning the EIA signal logic and Table B for information about the interface connector lead designations.

TABLE A - EIA SIGNAL LOGIC

DESCRIPTION	LOW	HIGH
Binary State	1	0
Signal Condition	Mark	Space
ESU Input Voltages	-3 to -25	+3 to +25
ESU Output Voltages	-12	+12
Paper Tape	Hole	No Hole
Control Function	Off	On

TABLE B - EIA INTERFACE WITH CONTROLLER UNIT PIN ASSIGNMENTS
(P303 Arrangement)

DESCRIPTION	PIN NUMBER	CIRCUIT
Data Set Ready	6	(CC)
Data Terminal Ready	20	CD
Unassigned (See Note 3)	19	-
Request to Send	4	(CA)
Clear to Send	5	(CB)
Ring Indicator	22	(CE)
Transmitted Data	2	(BA) Send Data
Unassigned (See Note 3)	12	-
Data Carrier Detector	8	(CF)
Unassigned (See Note 3)	21	-
Receive Data	3	(BB)
Unassigned (See Note 3)	13	-
Unassigned (See Note 3)	14	-
Protective Ground	1	(AA) Frame Ground
Signal Ground	7	(AB) Circuit Ground

Note 1: Except for the two ground leads, all interface leads use bipolar signal voltages.

Note 2: This 25-pin connector has pin assignments that are not required in the 37 set equipment.

Note 3: Unassigned pin numbers, 11, 12, 13, 14, 16, 18, 19, 21, 23, and 25 may be assigned by mutual agreement. Pin numbers 12, 13, 14, 19, and 21 have tentative assignments of Select to Send, Punch (CDC), Alarm Disconnect, Select to Receive, and Signal Quality Detection.

KEYBOARD SEND-RECEIVE UNIT

2.06 The 37 Keyboard Send-Receive (KSR) electrical service unit is mounted in the lower left portion of the KSR cabinet (Figure 3). The standard components and circuit card arrangements of a typical KSR unit are shown in Figure 4. The electrical service unit is wired to provide a variety of input/output requirements. Set requirements are achieved by the arrangement of circuit cards. This unit provides the necessary facilities, power supply wiring and cabling, to convert the KSR set to an Automatic Send-Receive Set.

2.07 Circuit cards for the ESU provide the set logic and component logic for the KSR set. Options and variable features for the circuit cards are outlined in Table C and Table D.

TABLE C - 37 KSR/ASR FEATURES AND OPTIONS

FEATURE	CARD OR MECHANISM	OPTION
150 wpm operation with 10 or 11 unit code	Mode control	10-unit code
		11-unit code
Full or half-duplex operation or full and half-duplex with line control	Receive control	Dedicated half-duplex
		Dedicated full-duplex
		Line control operation
		Receiver status alarm (ASR only)
Data set control of motor. Disconnect on either EOT or alarm condition	Channel control	Motor control, EOT, and alarm disconnect

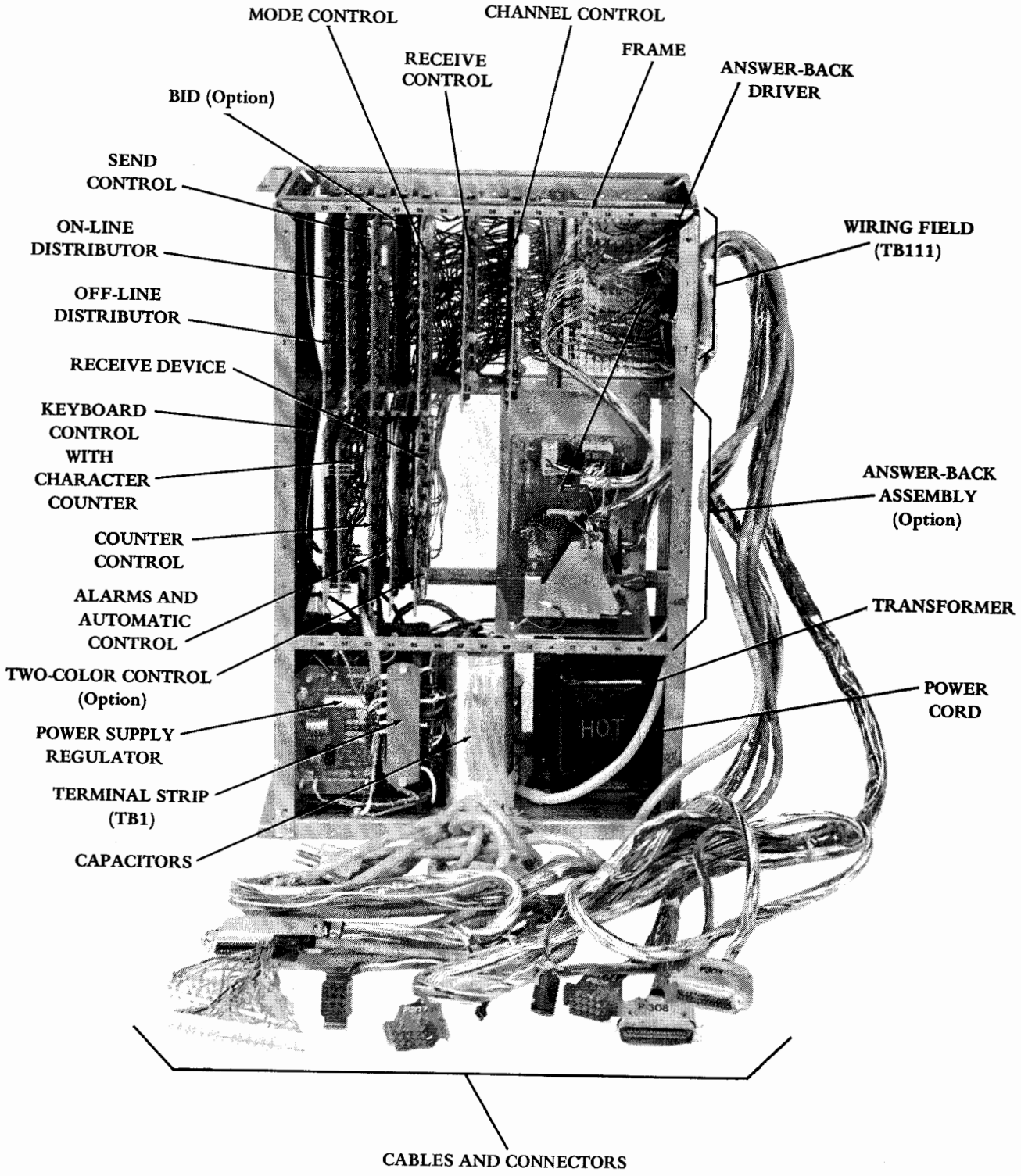


Figure 4 - 37 KSR Electrical Service Unit – Circuit Card Location and Miscellaneous Components

TABLE D - 37 KSR/ASR VARIABLE FEATURES

FEATURE	CARD OR MECHANISM	OPTION
Programmable answer-back message	Answer-back assembly and circuit card	Answer-back at beginning of call or on HERE IS or ENQ
Two-color printing	Two-color ribbon control	Two-color ribbon
Automatic turn-on and turn-off of punch and reader in response to line signals*	Alarms and automatic control	On-line punch and reader control
Counts the number of forward-spacing characters generated by the keyboard*	Keyboard control with character counter and counter control	Character counter and programmable counter control to count up to 255 keyboard generated characters

*Featured on ASR sets only

2.08 The KSR electrical service unit interfaces with a data set or auxiliary set by an EIA interface cable and connector provided with the unit. The EIA connector provides the necessary wiring for the receipt of data signals and on-line control signals for the KSR set.

2.09 The standard EIA connector, P303, on ESU will mate with any data communication equipment or interface equipment that conforms to the EIA Standard RS-232-B. The P303 connector extends all related power, control, and signal line circuits to the appropriate data set or auxiliary set. The location of the data set is in the right pedestal of the KSR table.

REPERFORATOR TRANSMITTER UNIT

2.10 The electrical service unit for the reperforator transmitter (RT) module (Figure 5) provides the control logic circuit cards, motor control relay, and internal wiring for the punch and reader (Figure 6). These electrical facilities for the RT module are contained in a metal frame and mounted into the RT module. This unit contains the necessary interconnecting cabling and power cord to interface with the KSR set to form an Automatic Send-Receive Set (Figure 2).

2.11 The control circuits required for the RT module are the reader driver and control logic and the receiving device logic cards. The reader control circuit contains the reader driver, alarms, and control circuits. The receiving device logic card contains the selector magnet driver for the punch and the motor control circuit for the punch and reader. This circuit is also used in the electrical service unit for the KSR set. (For information concerning the descriptions and operation of the receiving device logic card, refer to 2.41 and 3.32.) Optional circuits for the RT module are punch code detection and punch feed-out circuit cards.

RECEIVE-ONLY UNIT

2.12 The electrical service unit for the Receive-Only (RO) Set has the same basic arrangement as the unit for the KSR electrical service unit. The circuit card requirement for the RO unit contains the standard equipment (circuit cards) to receive data and also contains the frame wiring and power supply required for converting the set to a KSR. Variable features, two-color printing and the answer-back, are available on the RO set with the option of end-of-transmission and alarm disconnect circuits.

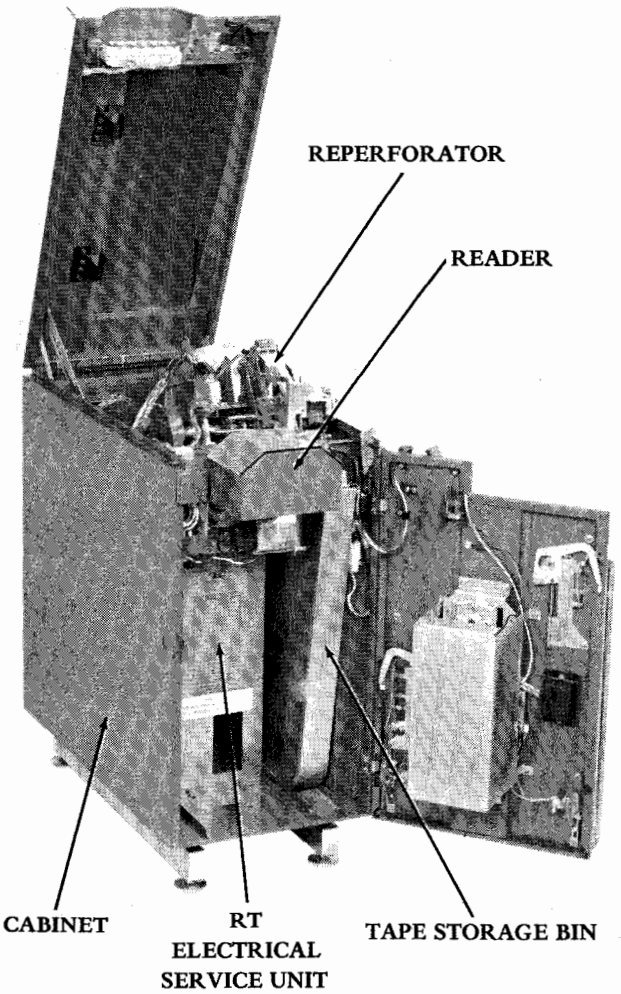
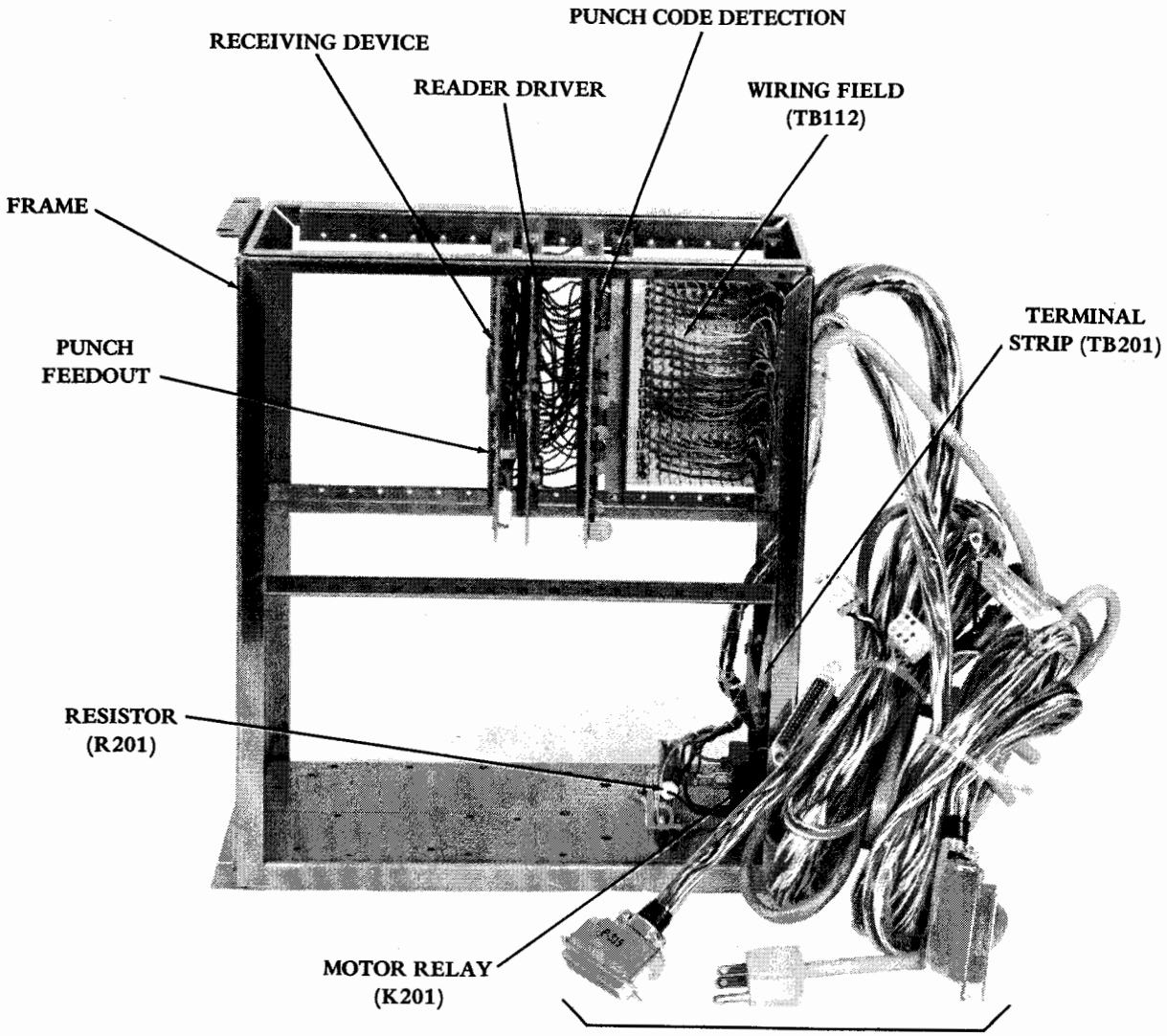


Figure 5 - 37 Reperforator Transmitter (RT) Module



(Right Side View)

Figure 6 - 37 RT Module Electrical Service Unit – Card Location and Miscellaneous

UTILITY STRIP

2.13 The utility strip (Figure 7) provides six convenient outlets, circuit breaker, terminal board, signal bell, and 115 volts ac power cord. The utility strip is equipped with a power supply, 5.5 volts ac transformer, for the copylights. The convenience receptacles supply ac power to the reperforator transmitter electrical service unit and the electrical service unit located in the KSR table (Figure 3). The motor on the base assembly for the page printer and keyboard receives power and is controlled from the utility strip. The motor control function is performed by a motor control relay with a capacitor-resistor suppression network. The motor control relay is connected to and controlled by the receiving device logic card. The motor control enables the receiving device to turn on the set upon receiving a start signal from a remote station. The signal bell mounted on the utility strip is hard wired to the alarms and control logic card through terminal board TB102 mounted below the signal bell. The ac power for the motor on the page printer and motor controls are connected to TB102.

POWER SUPPLY AND REGULATOR

2.14 The power supply for the 37 KSR and ASR sets is contained in the lower portion of the electrical service unit chassis (Figure 4). This power supply and regulator provides power for the electrical service unit, printer and keyboard motor, reperforator and the reader motors, and for the optional tape handling equipment.

2.15 This multivoltage power supply converts ac to dc appropriate for the operation of the solenoids, integrated logic circuits, and discrete semiconductor logic. The power supply includes a ferroresonant transformer, filter capacitors, diode bridge rectifier, power transistors, resistors, and the regulator circuit card. The electrical service unit has three fuses: one 6 amp to the +12 volt line, one 3 amp for the 5 volt line, and a 3 amp fuse to the -12 volt line. These fuses protect the power transistors and the bridge rectifier in the power supply. The regulator circuit card maintains a regulated 5 volts and governs the power supply by keeping the output voltages constant when fluctuations occur in the ac line voltages and dc load. The power supply and regulator provides voltages required for the diode transistor logic (DTL) and the EIA signal circuits. The terminal board (TB1) on the electrical service unit power supply provides the voltages required for the various circuits; refer to 8358WD for information concerning specific voltages and technical data.

TECHNICAL DATA

A. Code and Signal Characteristics

2.16 The 37 electrical service unit is designed to process the 128 ASCII (United States of America Standard Code For Information Interchange) code combinations. The ASCII code is eight level. Seven information bits are transmitted by the Model 37 System plus one parity bit (8 bits total). The code is either 10 or 11 units at 150 or 100 wpm. The transmission speed is 15 characters per second at 150 wpm. The keyboard has parallel 11-wire output with even code parity which is translated to 8-wire output by the system logic for transmission.

2.17 Set interface conforms to the EIA Standard as defined in 2.04 and 2.05. Refer to Table A for the EIA signal logic.

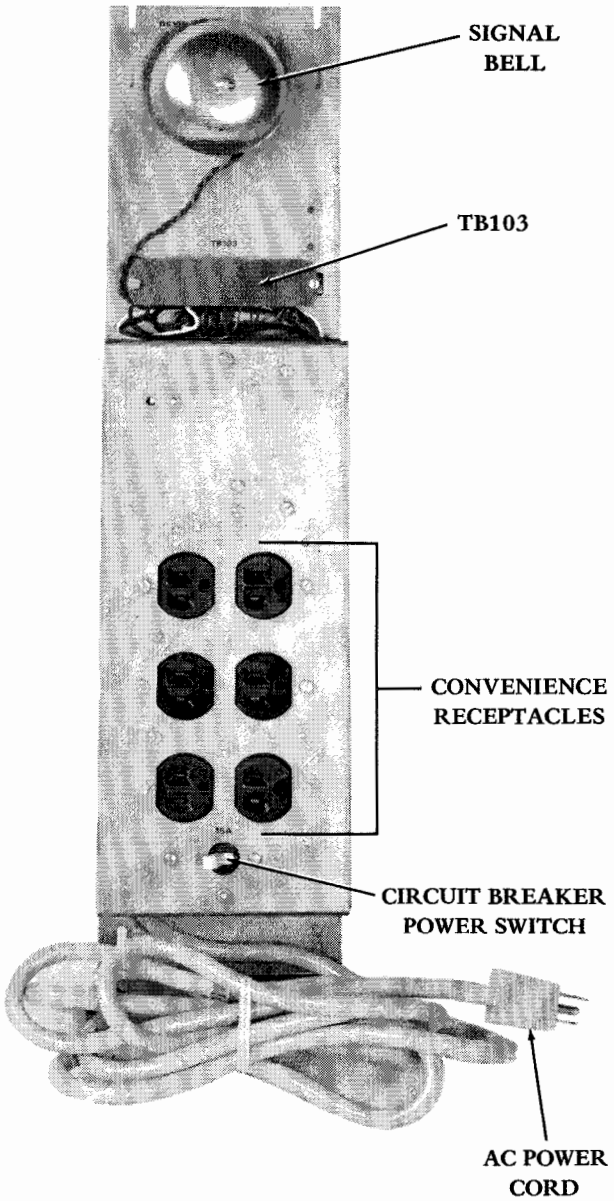


Figure 7 - 37 Utility Strip

B. Physical Characteristics

KSR Unit

Weight . . . . . 37 pounds

Height . . . . . .20 inches

Width . . . . . 5-3/4 inches

Depth . . . . . .13 inches

RT Unit

Weight . . . . . 13 pounds

Height . . . . . .14-1/2 inches

Width . . . . . 5-3/4 inches

Depth . . . . . .13 inches

Utility Strip

Weight . . . . . .9 pounds

Height . . . . . .20-1/2 inches

Width . . . . . 5 inches

Depth . . . . . 2-1/2 inches

C. Power Requirements

117 Volts ± 10%, 60 Hertz ±0.45% Hertz

Single Phase 15 amp, Fused Circuit

Cable - Three Wire, Grounded Plug

RO Set . . . . . 200 Watts

KSR Set . . . . . 300 Watts

ASR (RT and KSR) Set . . . . . 550 Watts

D. Environment

Ambient Temperature

Minimum . . . . . 40° F

Maximum . . . . . .110° F

Relative Humidity

Minimum 1%

Maximum 90%

CIRCUIT CARDS

2.18 The interaction of the circuit cards with the components and the data set are outlined in Figure 8.

2.19 Most circuit card inputs are positive nand type integrated circuits that consist of diode transistor logic (DTL). The DTL inputs are approximately a 1.4 ma load. A logic one (high) draws no current from the input of the logic element.

A. Keyboard Control

2.20 The keyboard control circuit converts the parallel output from the contacts on the keyboard to eight parallel output information levels (bits) representing all 128 ASCII characters (Figure 10). This card is capable of accepting 128 distinct characters; these include 95 graphic characters, 32 control characters and the delete character. Provisions are made for "piggy back" mounting of the character counter logic card for specific ASR applications.

2.21 The keyboard control circuit operates with inputs from the keyboard contacts referenced to circuit ground. These data inputs, bits 1 through 8, consist of marks or spaces. Keyboard control, shift inhibit, and shift inputs are defined by using negative logic. A mark is a logic voltage level between circuit ground and +0.5 volts (low). A space is a logic voltage level between +5.0 volts and +6.6 volts (high). A closed contact is referenced to circuit ground and is considered a logical one. An open contact is referred to the nominal 5.25 volt supply through a pull-up resistor and is considered a logical zero.

B. Reader Driver

2.22 The reader driver circuit adapts the reader to asynchronous operation. The circuit contains control alarm features that monitor the tape-out, tight-tape, and run-stop conditions. Additional circuits provide a single step feature that causes the reader to send one character upon the operation of an externally mounted switch. An automatic reader control portion controls the input and output control signals for the reader through interface leads to the alarms and automatic control card, sends control card, mode control cards, and the control panel. This circuit contains eight shift registers for bit storage. These registers retain a character when the automatic stop condition exists. Manual control of this circuit is provided when the alarms and automatic control card is not used (a strapping option on the card).

C. Distributor

2.23 The electronic transmitting distributor circuit card converts parallel input signals to serial output signals of either 10 or 11 unit code. The parallel input

consists of eight information levels (bits). The serial output consists of a start bit, eight information bits, and one or two stop bits. The telegraphic speed is determined by an external oscillator.

2.24 In addition to the basic functions of conversion and transmission of data bits, the electronic transmitting distributor performs the following functions.

(a) Responds to a character suppress signal (blind) to inhibit transmission of a character.

(b) Recognizes ASCII control characters (6th and 7th level spacing) and electronically delays the transmission of the next character. The delay is a one character interval, plus one to three extra bits, depending upon the character unit code.

(c) Provides an output signal which indicates that a character is stored in the register and can be decoded.

(d) Provides an output signal which is used to sample conditions prior to the parallel data input sample.

(e) Provides an output signal which indicates that another character may be distributed.

D. Send Control, ASR/KSR

2.25 The send control card is designed to coordinate the three sending devices (keyboard, reader, and answer-back) for operation with the line or local transmitting distributor. The send control circuit interacts with the three sending devices by five peripheral interface control leads for each sending device. The five interface leads (Message Available, Send Message, Send Ready, Present Character, and Character Available) and the associated signals control the operation of the on-line and local transmitting distributors. Internal control of the distributors by the send control circuit is governed by Diode Transistor Logic (DTL) signals from the power supply and regulator circuit. The DTL signal logic is described in Table E.

2.26 The data bits are converted to EIA signal voltages by a portion of the send control circuit. Transmission control information is related from the data set via the channel control circuit to the send control.

E. Mode Control, ASR/KSR

2.27 The 37 Teletypewriter mode control circuit has two states, local or on-line. Depending on the set, ASR or KSR, the mode control provides either local or on-line condition for the keyboard, printer, punch, and reader. The mode control circuit contains a set clock for sets operating at 150 wpm with 10 unit code (150 baud), or 100 wpm with 11 unit code (110 baud). The set clock is a crystal controlled, astable multivibrator composed of two transistors operating at 128 times the bit rate.

2.28 The mode control interacts with the control panel located above the keyboard by light indicator switches. When the set is in the local mode the switch is illuminated on the control panel.

2.29 The output of the mode control circuit is a clock pulse of 32 times the bit rate and is capable of driving ten logic loads. The clock pulse is a result of the set clock frequency that is divided by four using a pair of flip-flops. The output of the flip-flop network associated with the mode control circuit is used to control other circuitry in the set. This four mode flip-flop circuit will be low during the Keyboard Local, Printer Local, Punch Local, and Reader Local modes. The RO set is normally in the on-line mode and the motor of the set is under the control of the data set.

TABLE E - DIODE TRANSISTOR LOGIC (DTL)

DESCRIPTION	HIGH	LOW (GROUND)
VCC (Input/Output Voltages)	+5.0 to 6.6	0 to +0.5
Binary State	1 = VCC	0
Signal Condition	Mark	Space
Signal Not Inverted (Keyboard/Reader Output)	Space	Mark

F. Channel Control

2.30 The channel control circuit monitors and responds to line control signals from the data set. The send, receive, and mode control circuits interact with the channel control circuit to govern the on-line mode of the set. The channel control contains the following features:

(a) On-line motor start control for switched or non-switched service

(b) Timed send interrupt generation

(c) Timed receive interrupt detection

(d) On-line transmission control

(e) Out-of-service, "do not answer" signal (option)

G. Alarms and Control

2.31 The alarms and control circuit card is used on the RO and KSR sets to supply power for the signal bell and to provide control logic for the paper alarm. The circuit contains an amplifier to drive the bell magnet and an amplifier for the paper alarm lamp. The controlled paper alarm circuit has the necessary control logic to switch the paper alarm lamp in response to a paper alarm "do not answer" or disconnect signal. Control of the printer is by the control logic circuit that responds to a Printer Ready and Printer Receive message signal.

2.32 The paper alarm is used when a signal from the printer indicates a low paper condition. When this condition exists, the ALARM lamp on the control panel goes on and causes the Printer Selectable lead to go nonselectable after the completed message. The paper alarm signals the remote station that the printer is in the nonselectable state (will not accept an incoming call). The data transmission during this state will not be received until the alarm condition is removed and the printer becomes selectable.

2.33 On an incoming call an alarm in the data set signals the operator. The seizure of the set is performed by the operator who manually switches the set to the desired mode.

H. Alarms and Automatic Control (ASR)

2.34 The alarms and automatic control card contains an automatic reader control, automatic punch control, paper alarm logic, and bell driver that are basic independent logic systems. The alarms and automatic control card provides a circuit to drive the signal bell and a logically controlled paper alarm circuit. This circuit has an automatic control which allows the punch and reader to be turned on or off by a signal pulse from a printer stunt box contact closure. This automatic feature enables a remote station to seize the 37 set and transmit the data.

I. Receive Control

2.35 The receive control card directs and controls line data signals to the appropriate receiving device. The circuit receives EIA serial input signals and provides DTL output signals. The EIA input amplifier receives incoming on-line signals and data signals that are generated locally are received directly from the sending distributors.

2.36 The receive control card functions as a signal regeneration circuit which changes input line data signals that have 40 percent or less distortion to output signals with less than 3 percent distortion. The signal regenerator portion of the receive control circuit maintains a minimum character length of 9.8 units at 150 baud (150 wpm) and 10.6 units of 110 baud (100 wpm).

2.37 The printer is designed to meet the following receiving margins when operating at 150 wpm:

25% Marking Bias

25% Spacing Bias

25% Marking End Distortion

25% Spacing End Distortion

25% Switched Combination Distortion

At 100 wpm (110 baud) the receiving margins are:

35% Marking Bias

35% Spacing Bias

35% Marking End Distortion

35% Spacing End Distortion

35% Switched Combination Distortion

2.38 When equipped with the regenerator, the equipment will meet the following minimum receiving margins:

40% Marking Bias

40% Spacing Bias

40% Marking End Distortion

40% Spacing End Distortion

40% Switched Combination Distortion

2.39 The receive control circuit detects a received signal with improper parity and provides power to an external parity error detection indicator lamp on the control panel. Half or full duplex transmission mode is controlled by the internal logic of the card. The line or local tabulation function of the circuit locks (holds all sending signals) all signals during the tabbing operation. The output indicator of the receiving device in the alarm circuit indicates an alarm condition for the receiver control circuit.

2.40 The receive control circuit contains the following features and subcircuits:

Regenerator

Bit Counter

Data Flip-Flop

Parity Flip-Flop

Timer Control Latch Reset

Parity Count Inhibit Gate

Receive Control

Receive Data Logic

Receive Alarms

Tabbing Control

Full Duplex

Parity Error Display Logic

2.41 Parity errors may be displayed in either of two ways: lamps, located on the control panel, or by a ribbon shift to print the errored character in red. Parity error circuitry is part of the regenerator.

J. Receiving Device

2.42 The receiving device logic card performs the function of a selector magnet and motor control relay driver. The selector magnet driver circuit is a 3-stage amplifier and designed to operate full on or off without intermediate levels. The motor control relay driver is a 2-stage amplifier designed to operate full on or off without intermediate levels. These circuits receive integrated circuit logic levels (DTL signals and serial data) and convert the output to current levels appropriate for operation of the magnets.

VARIABLE FEATURES

A. Answer-Back Control

2.43 The answer-back control card is associated with an electromechanical answer-back unit mounted in the electrical service unit (Figure 4). This unit is an 8-level self-contained transmitting device designed to generate a precoded message of 20 characters or less. The character sequence, usually a station identification sequence, is programmed into and stored in a code drum. For mechanical information about the answer-back unit, refer to the Description and Principles of Operation Section 574-325-100TC.

2.44 The answer-back control circuit consists of a stepping motor driver and an output gating register that provides a parallel read-out for the contacts. The combination of a filter network and a nand gate passes a clock pulse to drive the flip-flop circuit that starts the stepping motor driver. The output register contains eight bits of information and the output is in parallel form. This circuit is designed to send and receive the following signals:

(a) Receives a start command to begin operation.

(b) Sends a Message Available (Sender Selectable) indication when the answer-back moves to the first position and the off/normal switch operates.

(c) Receives a Present Character command that provides a read-out from the output register and initiates the next cycle.

(d) Sends a Character Available indication, informs the send control that a character is present and should be taken.

(e) Data Outputs

Mark - high (+4 v to +6.6 v)

Space - low (0 v to +0.5 v)

Suppress - low (0 v to +0.5 v)

B. Two-Color Ribbon Control

2.45 The two-color ribbon control card is a variable feature that enables the operator to select the red or black portion of the typing ribbon. This circuit has the following features:

(a) Solenoid driver to operate the ribbon magnet.

(b) Lamp driver to operate the indicator lamp on the control panel.

(c) Parity error detection circuit that allows errored characters to be printed in red.

(d) An integrated circuit latch that reads the logic state of the stunt box contacts.

(e) A reset mechanism to select the black ribbon at the end of the message (on-line mode).

2.46 The two-color ribbon control card plugs into a prewired printed circuit card connector and does not require field assembly or adjustment. The ribbon magnet driver converts the integrated circuit logic inputs to current levels appropriate for the operation of the ribbon magnet.

C. Counter Control

2.47 The counter control circuit card assembly is designed to be used in conjunction with the character counter circuit (2.50). This circuit is a variable feature that performs a binary up-down counting function

and indicates the programmed End-of-Line (EOL) character. The EOL condition is indicated by an EOL lamp on the control panel.

2.48 This circuit is capable of counting up to 255 keyboard generated characters. On the 256 character, the counter is reset to zero. Each time a backspace character is generated, the counter down counts by one. The counter control card resets to zero each time a carriage return character is detected and is programmable to any line length up to 256 by strapping on the card. When the counter is at zero, further down counting is prevented by the zero stop control.

2.49 The inputs are obtained from the character counter circuit. These inputs are count-up, count-down, and reset. The output of the counter control is used to drive the EOL lamp.

D. Character Counter

2.50 The character counter is a variable feature used with the 37 ASR set to count the number of forward spacing characters generated by the keyboard or punched by the reperforator. This card is mounted to the keyboard control card and is designed to operate with the counter control card. The character counter controls the binary counting circuit of the counter control card.

2.51 The inputs for the character counter are direct from the keyboard control and consist of eight parallel information levels. The outputs provide count-up, count-down, reset, and control signals for the counter control card. This 3-card arrangement controls a lamp indicator on the control panel to indicate an end-of-line condition. This feature is required when punching tape without a printer monitor, to indicate when a carriage return or new line (carriage return and line feed) signal is required.

2.52 An escape (ESC) sequence recognition (control character code extension) is provided in the character counter card. The code extension enables the operator to deviate from one routine and perform another operation and come back into the original routine. Characters, normally "spacing" characters, when part of an escape sequence, lose their normal sense and therefore are not counted.

2.53 The character counter, counter control, and keyboard circuit card assemblies have the following characteristics in relation to the counting function.

(a) The character counter counts all characters appearing in columns 2 through 7 of the ASCII code, except for the delete character, and except where these characters appear as part of an escape sequence.

(b) Characters appearing in columns 0 and 1 are not counted.

(c) There are no provisions for tabulation.

(d) The counter counts down on backspace unless this is the terminating character of an escape sequence.

(e) The counter is reset upon receipt of a carriage return and optionally on line feed.

(f) The counter can be programmed to display "end-of-line" after any specified character count.

E. Punch Code Detection

2.54 The punch code detection circuit is an option that performs the primary function of detecting a EOT punched on paper tape and to print suppress on a delete character. These features have application in private line systems.

2.55 The punch code detection circuit card is designed to operate in conjunction with the code reading contacts (option) located on the reperforator. This circuit is equipped to detect three discrete character signals: EOT, delete, and the control character. The circuit card can be arranged to print suppress the deleted characters of the reperforator transmitter if the transmitter is equipped for this feature.

F. Punch Feed-Out

2.56 The punch feed-out circuit is an option that performs the function of controlling the length of tape feed-out from the reperforator. This feature requires the addition of a feed-out magnet on the reperforator transmitter which is under control of the punch feed-out circuit.

2.57 There are two methods of feed-out that provide a timed or untimed length of tape feed-out. The timed feed-out has a fixed length of tape feed-out that is under control of an external switch. This fixed length of tape can be programmed by a potentiometer located on the circuit card. The timed feed-out is noninterfering which disables the timed feed-out when line signals are presented to the punch and allows the punch to record data from the line. The untimed feed-out provides the operator with variable lengths of tape feed-out. The operation of this feature interferes with any data bits received by the punch. This feature is controlled by an external switch.

G. Bid Circuit

2.58 The bid circuit is an option used on private line sets. This circuit allows a station to switch from private line to switched network service. The bid option has a switch and lamp on the control panel, and the logic is on a separate card which is wired into the set wiring associated

with the send control. The bid circuit controls the EIA request-to-send signal given to the channel controller. The operation of the BID switch turns the Request-to-Send signal on and a second operation of the BID switch turns off the Request-to-Send signal. The transmission of the end-of-transmission (EOT) character will turn off the Request-to-Send signal; this feature is provided as an option.

2.59 In the torn tape system, the operation of a BID switch places an infinite count into the differential message counter. This provides for continuous operation of the torn tape system. When the BID switch is activated a second time, the message counter will go to zero after a series of EOT signals. When the counter reaches zero, the EIA Request-to-Send signal is off and data transmission will be interrupted.

3. OPERATION

3.01 The electronic service unit operates with the set components and the data set (Figure 9). Each component has an associated logic circuit that interfaces with the set control logic (Figure 10). The set control logic circuits coordinate the operation of the components and variable features (Figure 8). For information concerning the operation of the electrical service unit with the components, refer to Section 574-301-100TC for the KSR set and Section 574-302-100TC for the ASR set.

3.02 Information related to the circuit cards is covered in the wiring diagram package shipped with the equipment. The wiring diagram package includes the circuit descriptions and associate wiring diagrams for the set. The following operations require the associated wiring diagrams when a detailed analysis of the circuits is desired.

SENDING

3.03 The keyboard, reader, and answer-back logic circuits operate through common leads with the distributors (Figure 11). Control of these sending circuits is accomplished by the send control circuit. The condition for the sending is when the set is on and keyboard is idle, bits 1 through 8 are marking. When a character sequence is generated by the keyboard, the data bits are presented to the keyboard logic circuit. A bit sequence and Present Character (PC) signal is generated by the send control card and when the keyboard auxiliary contact closes, the Present Character signal gates bits 1 through 4 to the output pins; the PC input remains low for one bit duration. The result of this action primes the bit latches for a shift control sample (SCS) input.

3.04 The SCS input goes low for a 0.25 bit duration after the PC signal and remains low for 0.25 bit. During this period the keyboard logic card reads the first four characters, the Control Shift Inhibit, and Shift signals and determines if the character is upper or lower case. After the 0.25 bit duration, the latch drivers are enabled and bits 5 through 8 appear at the output pins. At this time, bits 1 through 8 are available to be transmitted to the shift register of the distributor. This cycle is repeated for every data character and control signal.

A. On-Line and Local Distributor

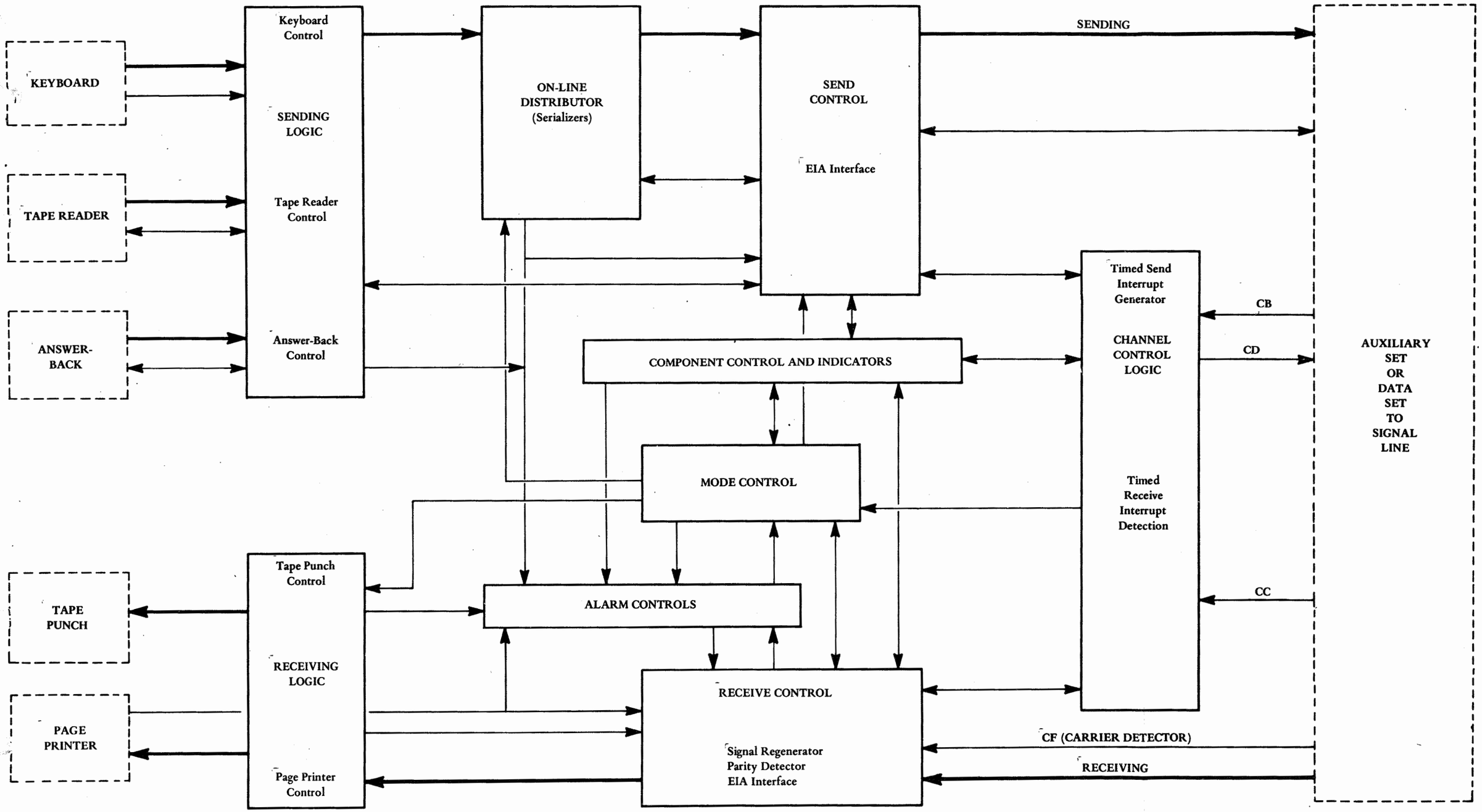
3.05 The operation of the electronic distributor starts when the distributor is idle (no character is being processed) and issues a present next character command (PNC in 0-state). This signal indicates to the set logic (send control) that a character can be presented for distribution. The distribution cycle begins when the take character (TC) signal is presented to the distributor from the send control (TC in 0-state). If the TC signal is in the 1-state, nothing happens. If it is in the 0-state, the output of a nand gate (MLF 2-3 to the timing circuit) goes to the 1-state. This releases the frequency dividers.

3.06 The TC input is now monitored for 0.25 bit duration. If TC goes back high any time prior to 0.25 of a bit, the frequency dividers are recycled to the 0-count. Assuming TC remains low, MLC1-8's output will revert to the 0-state. This sets the character sample latch (CSL), which in turn sets the take character latch (TCL). The distributor will now complete one distribution cycle regardless of the state of TCL. The 0.25 bit time out provides integration that will reject noise pulses at the TC input.

3.07 In addition to setting CSL, MLC1-8 also provides the Shift Control Sample (SCS) signal at pin 5 of the card through two inverters, MLG2-3 and MLG2-6. The inverters are necessary to prevent external noise from triggering CSL. The SCS signal remains low from 0.25 to 0.5 of a bit and is used by the keyboard logic to perform a control function.

3.08 At 0.5 of a bit MLC1-8 reverts to the 1-state. At this time both inputs of MLF1-3 are high, causing the output to change to the 0-state. MLF1-3's output is inverted by MLF1-6 and at this time all data input gates, MLD3 and MLB3, are primed. A 1-state on any Data Input lead during this time causes a mark to be set in the corresponding data flip-flop. When 0.75 of a bit is reached, MLG1-11 reverts to the 0-state, forcing CSL to reset and the character sample period to terminate. MLF1-3 returns to the 1-state, while MLF1-6 returns to the 0-state. After this time the data input leads have no effect on the distributor. A lead originating at MLF2-8 is "wired or" to MLG1-10 so as to terminate the character sample period if the TC condition is removed prematurely. The 0-state at TC should remain for a 1-bit duration.

3.09 The next change that takes place is that the register sample (RS) output MLF1-8 and pin 6 of the card go high. This is an indication that a character stored in the



LEGEND

DATA SIGNALS = ⟶

CONTROL SIGNALS = ⟶

CC - Data Set Ready
CD - Data Terminal Ready
CB - Clear to Send

Figure 8 - Typical 37 ASR Electrical Service Unit, Block Diagram

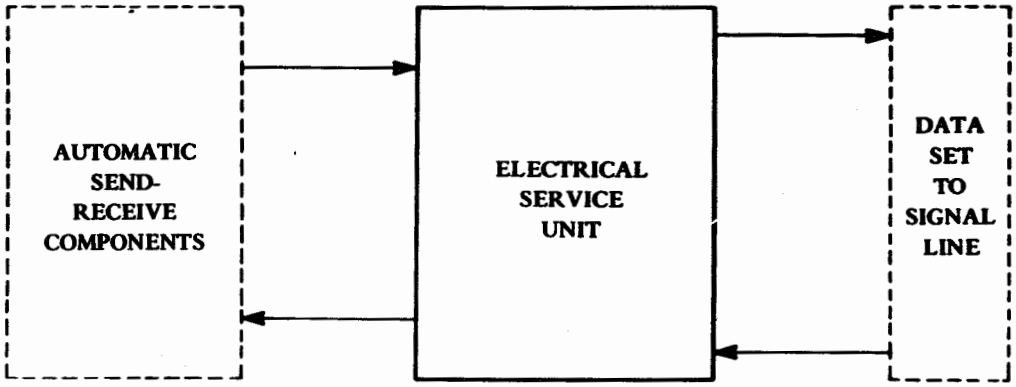


Figure 9 - 37 Automatic Send-Receive Flow Chart

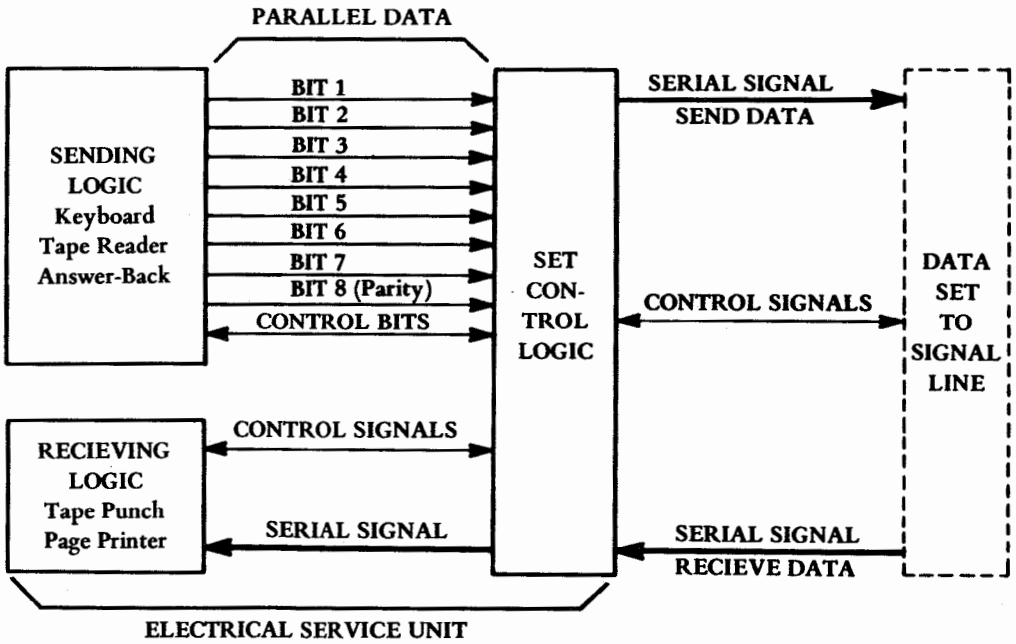


Figure 10 - 37 Electrical Service Unit with Data Set
Flow Chart

register should now be sampled. Internally the signal is used to enable the control character gate MLC1-6 will change states. The result is that the control character latch (CCL) will be set. Control character logic is explained below. The RS pulse remains high from 0.75 of a bit to approximately 0.87 of a bit.

3.10 At approximately 0.87 of a bit, the clock pulse changes to the 1-state. This primes the data flip-flop. At exactly 1-bit time (0.13 bits later) the clock pulse reverts to the 0-state. At this time each data bit stored in the distributor is shifted one position. The data shifted from the line flip-flop becomes the output signal. This will continue for nine more clock pulses (10 for an 11-unit code), at which time the register will have all spaces stored in it. The distribution cycle will be complete at this time.

3.11 When the register positions are all spacing, the output of the register condition, MLE1-6 gate, will revert to the 0-state. (MLC3-4 and MLC3-11 are diode extenders used as a fan-out for MLE1-6.) This results in TCL being reset, along with the output blind latch (OBL), if it had previously been set.

3.12 TCL's inverted output is used to hold the data and start (ST) positions of the register in a spacing condition and to set a mark in the line and stop (SP) positions. The inverted output of the SP position drives the PNC gate. During most of the distribution cycle this output is low, keeping PNC's output high. When a mark is set in SP, PNC output reverts to the 0-state. It will remain in this state until one bit after the start of distribution, at which time a space is shifted into the SP flip-flop.

3.13 When a control character is the character being sent, CCL is set when RS reverts high, priming MLH2-1 and forcing MLF3-3, MLF2-8, and MLF2-11 to the 1-state. As long as CCL is set, a PNC will not be issued. MLF3-3 being in the 1-state has the effect of making the transmission of the control character 11-bits in duration. After the stop bit of the control character has been sent, TCL resets which causes MLH2-3 and MLG1-3 to change to the 0-state since both had been primed earlier. The low output of LMH2-3 causes the output blind latch (OBL) and the extra bit latch (EBL) to set. OBL blinds the signal output MLF3-11. The low output of MLG1-3 causes the same conditions usually presented by TC, ie, keeps the frequency dividers running. When this occurs, the distributor cycles itself for the duration of another character. The EBL set causes an extra stop bit to be generated by shifting another mark rather than a space into the SP flip-flop at the first clock pulse in the blinded character cycle. After the first clock pulse, the ST bit has moved into the line flip-flop which in turn forces EBL to reset. When the first space is shifted from the SP position, CCL is reset by MLG2-11. The remaining distribution cycle continues as described previously. The OBL output also forces MLF3-3 into the 1-state to provide an 11-bit character after EBL has reset. The total time duration of the control character is 23 bits. This time is necessary to insure that the printer function box response has been completed before another character is transmitted. When the register is all spacing, the output of MLE1-6 reverts low, which resets TCL and OBL. At this time PNC reverts low, signaling external logic that another character may be transmitted.

B. Send Control

3.14 The send control interacts with the transmitter for the sending devices directly through (five) interface control leads (Figure 11). Operation of the send control circuit is initiated by a Message Available (MA) signal from the distributor. The MA signal is necessary before a local sending device can transmit character bits to one of the distributors. The send control receives the MA signal from one or more sending devices and assigns a priority to the device that presented an MA first. This condition remains for the entire message and prevents another sending device from seizing the signal line. The send control returns a Send Message signal to the sending device that has established a priority. The condition of a priority is an indication to the sending device that either a line or local distributor has been seized.

3.15 A Send Ready signal informs the send control that the device has performed all necessary internal operations and is ready to start sending a message. The return of a Present Character signal is an indication to the sending device that the distributor's shift register is empty and ready to accept a character for distribution. The sending device returns a Character Available signal to the send control which is relayed to the distributor to indicate that a character has been sent and the distributor can start its cycle. This sequence of five interface signals either remains on or is repeated for each character.

3.16 The Shift Control Sample signal from the distributor enters the send control circuit after the keyboard Present Character lead has gone low (on). The Shift Control Sample (SCS) lead is used to transfer the parallel input data bits 5 through 8 to the output prior to being sampled by the distributor for the bits 1 through 4. (The first four data bits are sampled prior to the last four to determine upper or lower case.) The Local Present Next Character lead remains high until the character has been shifted out of the register; at this time it will revert low and wait for the beginning of the next character.

3.17 When information bits leave the line distributor, the signals are received by the send and receive control card (Figure 11). The mixing of data bits when two devices are transmitting simultaneously is prevented by the Character Available signal from the on-line device. This signal inhibits the local present character and the character available from the local device and inhibits a line Present Character

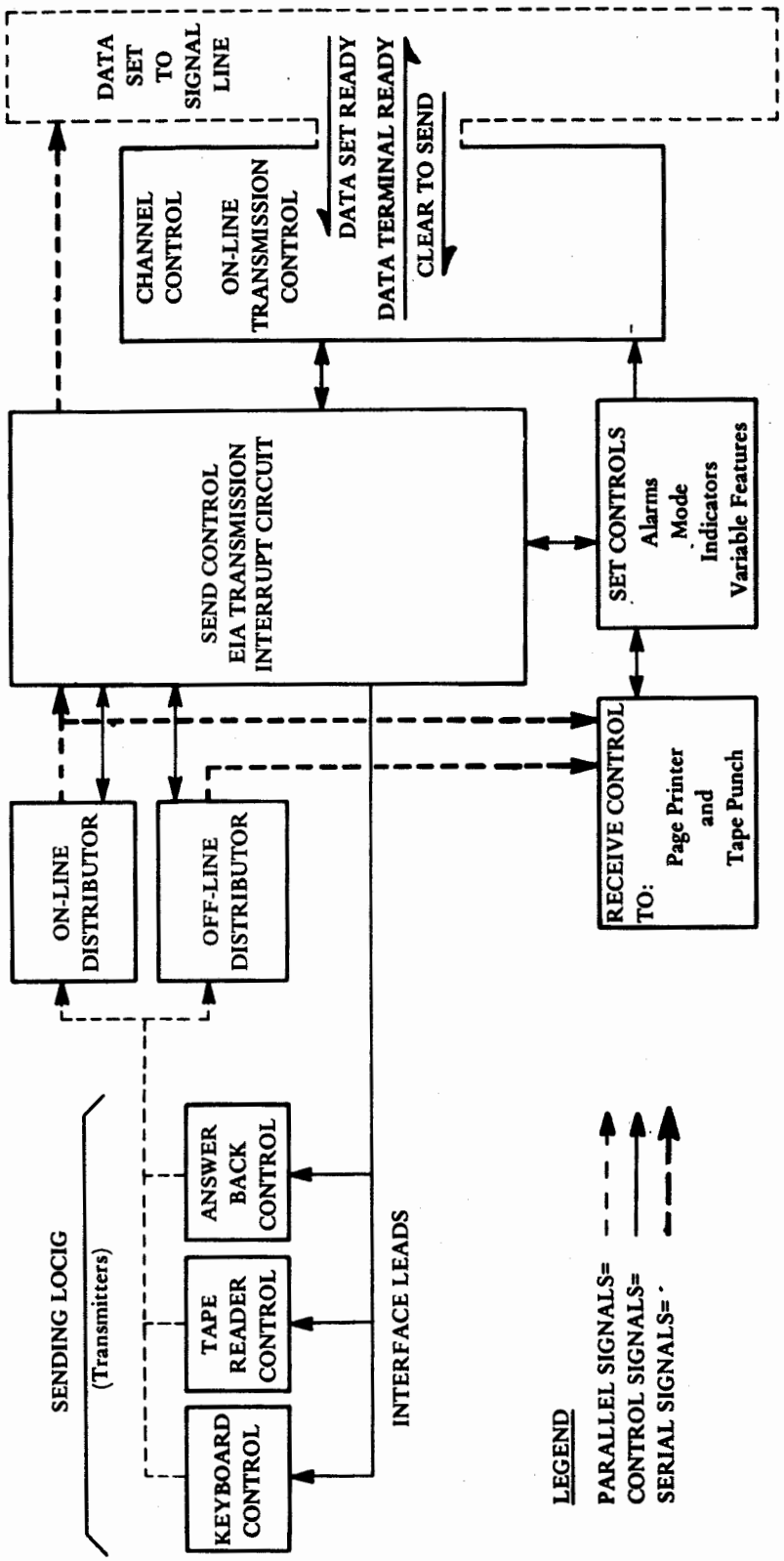


Figure 11 - 37 ASR Sending Signal Flow Chart

signal. The Character Available signal and the inhibited signals prevent the parallel input of the line or local distributors from being sampled at the same time. The data from all sending devices appears on the data leads but are sequentially gated to prevent simultaneous presentation of parallel data on these leads. The contention latch (CNL) for each distributor assigns priority to that device and each sending device presents a message available indication for transmission.

Answer-Back

3.18 The operation of the answer-back is started by a start pulse from the stunt box of a printer through the send control circuit to the answer-back control circuit. This start signal is filtered and gated to provide a clock pulse to drive a flip-flop circuit. The flip-flop circuit starts the stepping motor driver circuit consisting of three transistors and eight resistors. The output of the driver circuit causes the stepping motor to operate, moving the answer-back drum one position. This sequence is repeated for each start command and every preceding present character input. After the code drum has moved to the first position, the off/normal switch operates causing the Message Available signal to register with the send control circuit. The Message Available signal remains on for the entire message sequence and conditions the send control to give priority over a send request from the keyboard or tape reader.

3.19 Reading the coded drum and advancing the drum will occur when a present character command is received from the send control. The eight data bits will be transferred in parallel form from the output register in the answer-back control card to the on-line distributor to be serialized and transmitted to the send control.

3.20 When the coded drum moves to the home position, the end of the message is indicated by the off/normal switch moving to the normal position. The message available indication is removed and the send control circuit does not issue another present character command and the answer-back circuit is in an idle state.

Character Counter

3.21 The operation of the character counter circuit assembly depends upon signals from the keyboard control card. At the beginning of each character distribution cycle, a sample pulse time occurs between 0.5 bit and the end of the distribution cycle. The step forward output is normally high and goes low for a 0.5 bit duration each time a space or printer character is detected. The step reverse output is high at all times except when a backspace is detected. The counter control recognizes these conditions on separate leads from the character counter card. Each time the counter recognizes a low state the counter counts up or down by one depending on the signal lead receiving a low signal.

3.22 The reset output operates on a signal when the carriage return or new line character is generated (depending on the strapping). The escape sequence is generated from the keyboard by the PREFIX key. When an escape sequence is started, the normal functions of the character generating signals are in the inhibiting mode; the Step-Forward signal is inhibited until the final character of the code is generated. At this time the on-line terminal performs the control function and reverts to normal operation.

Counter Control

3.23 The operation of the counter control card depends upon input from the character counter card. The following outline describes a brief operational sequence for the basic functions of the circuit.

(a) Count-Up (Step Forward):

(1) The count-up input is normally high (the off state) when the keyboard is idle.

(2) When a character or space signal is generated by the keyboard, the count-up input goes low (the on state) for a 0.5 bit time duration. This time duration is entered into the character distribution cycle.

(3) The count-up input reverts to a high state at the end of the distribution cycle.

(4) Each high-low-high transition of the count-up input generates a clock pulse which adds a binary one to the contents of the binary counter.

(b) Count-Down (Step Reverse):

(1) The count-down input is normally high while the keyboard is idle.

(2) When a backspace character is generated by the keyboard, the count-down input goes low for a 0.5 bit time duration. This time period is entered into the character distribution cycle.

(3) The count-down input reverts to a high state at the end of the distribution cycle.

(4) Each high-low-high transition generates a clock pulse which subtracts a binary one from the contents of the binary counter.

(c) Reset:

(1) The reset input is high at all times except when a carriage return or line feed character is generated by the keyboard.

(2) When a carriage return or line feed character is generated, the reset input goes low for a 0.5 bit time duration. This time period is entered into the character distribution cycle.

(3) At one bit time period, the reset input reverts to a high state.

(4) Any high-low transition of this input resets all the normal (N) counter outputs to a low state and all the inverted (I) counter outputs to a high state. This sequence resets all the counters to zero.

(5) The 256th clock pulse resets all normal (N) outputs to a logic zero and the counting cycle starts again.

(d) Zero-Stop:

(1) Zero-Stop inputs monitor the eight inverted (I) flip-flop outputs.

(2) With the counter cleared to zero, the inputs are high.

(3) Further down counting is inhibited by the resulting low on the zero-stop control.

SET CONTROL LOGIC

3.24 The set control logic circuits consist of the channel control, mode control, and alarms and controls. The channel control operates the on-line motor start control, send interrupt, and receive interrupt. The Data Terminal Ready lead (EIA lead CD) in the off state stops all the set motors and, if maintained in the off condition, will prevent the set motors from starting. The line interface unit (data set) will recognize a Data Terminal Ready off as a request for disconnect when the Data Set Ready lead is on, and as a request for "do not answer" when the data set is off.

3.25 The send interrupt circuit cycles to produce a positive to negative transition signal for receiving a parity error. The send interrupt, a break-before-make switch, will operate upon receiving a parity error. Depressing the INTRPT pushbutton on the control panel causes a timed interrupt (break) signal of 263 milliseconds to be generated. The interrupt circuit is operated when any alarm condition exists.

3.26 The receive interrupt signal causes the halt signal which inhibits transmission. The interrupt signal is detected on the line receive data input and is defined as a continuous space on the line of more than 308 milliseconds. The line send data pin does not contain the Send Interrupt signal generated by the associated flip-flop and timing circuit.

3.27 The output of a halt, low, will act on the send control circuit to turn off the PROCEED lamp and inhibit transmission from the keyboard on KSR sets or the keyboard and reader on ASR sets. The PROCEED pushbutton is the only means provided to reset its associated flip-flop timing circuit.

Mode Control

3.28 The mode control and its associated switch and lamp on the control panel places the printer and keyboard in off-line or on-line modes. The motor control start indicator from the channel control circuit turns on the set motors upon a signal from the printer Receive Message lead.

3.29 The output of the mode control is a set clock frequency (2.25 and 2.28) used to gate data through the distributors and the receive control signal regenerator. The mode control interfaces with the alarms and control or alarms and Automatic Control circuit by the printer, punch, reader, and receive message leads. These leads control the components when the set is in the local mode, and signals an alarm condition to the operator that one of these components is being used or the set is not in the sending mode. When the set is in the on-line mode and the alarms and automatic control circuit is used, the seizure of the component may be accomplished by remote control.

RECEIVING

3.30 The receive control circuit interfaces with the set control, tape punch control, printer control, channel control, and the data set. (Refer to Figure 11 and 2.34 through 2.40.) Information bits (data) can be received from three sources: receiving data from the data set via the regenerator, sending data from the on-line distributor, and local data from the off-line distributor. The receive control receives half or full duplex signaling and accepts an EIA data signal (pin 20) from the signal line via the data set and regenerator.

3.31 Receiving voltages are marking between 0 volts to -25 volts and spacing between +3 volts to +25 volts. Spacing signals greater than 0.5 bit in length forces the regenerator to cycle and monitor the line for the duration of one character.

Receiving Device

3.32 The selector magnet driver circuit receives one input, serial data, which is amplified to power the selector magnet on the page printer unit and tape reader. This driver circuit is under the control of the set logic (Figure 12) and the input is supplied with mark and space signals corresponding to received data. A logical one signal (mark) will cause the selector magnet to be energized and a logical zero signal (space) will de-energize the selector magnet.

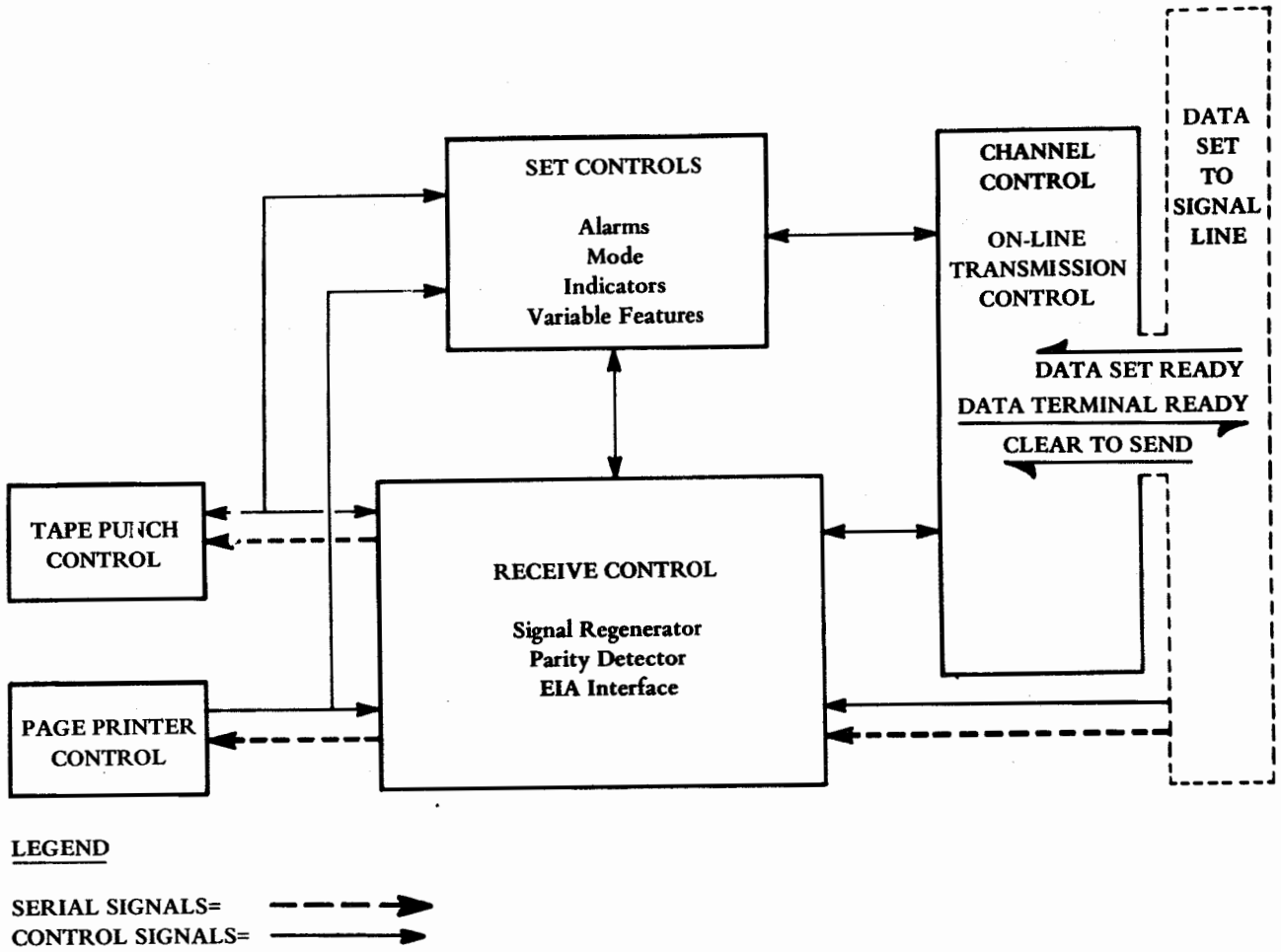


Figure 12 - 37 ASR Receiving Signal Flow Chart

3.33 The motor control relay driver receives two inputs, Receive Message and Motor Start signals. These inputs are connected together in a logical or configuration. A logic zero input will energize the motor control relay and be released on a logic one input.

Two-Color Ribbon

3.34 The operation of the two-color ribbon control depends upon inputs from the keyboard and normalize lead. The typing unit will normally print black (ribbon magnet de-energized). The red ribbon bit sequence is detected by the stunt box when the PREFIX key is depressed followed by the character 3. This results in a low level input to the ribbon magnet driver that causes collector current to flow through two resistors (R4 and R6). The current flow through R4 results in a positive signal at the base of an NPN transistor (Q4). Q4 is now turned on full and the ribbon magnet assembly is energized and the printer prints the data in red.

3.35 The ribbon magnet will remain energized until the end of the transmitted message (EOT signal) at which time a normalize pulse resets the ribbon control latch. The operation of this latch de-energizes the ribbon magnet and the next characters are printed in black. Black printing can be initiated during a message by a black ribbon bit sequence generated from the keyboard. This sequence, PREFIX followed by the character 4, is detected by the stunt box which causes the ribbon control latch to reset. The ribbon amplifier is switched off and the ribbon magnet is de-energized.

3.36 The Parity Error signal results in a shift from black to a red ribbon. The ribbon amplifier and magnet assemblies are capable of switching from black to red and from red to black within one character time period when a Parity Error signal is generated. Parity error indication is functional in the local or on-line modes.

4. REFERENCES

Associated Wiring Diagrams

4.01 The wiring diagram package is packed and shipped with the equipment. The wiring diagram package includes all the associated circuit descriptions and wiring diagrams for the circuit cards.

4.02 The following is a list of Wiring Diagram Package (WDP) numbers for the 37 sets:

WDP 0118 Wiring Diagrams for RO, KSR, ASR Sets

WDP 0125 Circuit Card Set RO

WDP 0126 Circuit Card Set KSR

WDP 0127 Circuit Card Set ASR

WDP 0128 Circuit Card Set RT

WDP 0129 Wiring Diagrams for RT

Private Line Selective Calling:

WDP 0153 Circuit Card Set ASR

WDP 0154 Circuit Card Set RT

WDP 0155 Circuit Card Set RO

4.03 The following is a list of circuit descriptions for the 37 sets:

CD 8358 Power Supply Regulator

CD 8370 Receiving Device

CD 8372 Punch Feed-Out

CD 8373 Distributor

CD 8374 Keyboard Control

CD 8375 Character Counter

CD 8376 Answer-Back Driver

CD 8377 Alarms and Controls

CD 8378 Punch Code Detection

CD 8379 Reader Driver

CD 8380 Counter Control

CD 8381 ASR Send Control

CD 8382 KSR Send Control

CD 8383 Receive Control

CD 8386 ASR Mode Control

CD 8387 KSR Mode Control

CD 8388 Channel Control

CD 8389 Two-Color Ribbon Control

CD 8395 Alarms and Automatic Control

4.04 The following is a list of circuit descriptions for the 37 private line selective calling sets:

CD 8358 Power Supply Regulator

CD 8370 Receiving Device

CD 8371 Distributors

CD 8374 Keyboard Control

CD 8375 Character Counter

CD 8383 Receive Control

CD 8385 Bid

CD 8386 Mode Control

CD 8389 Two-Color Ribbon Control

CD 8775 Channel Control

CD 8778 Reader Driver

CD 8779 Reader Driver Addition

CD 8780 Send Control

CD 8781 Alarms and Control

CD 8782 Counter Control

37 TELETYPEWRITER TABLES

DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL 1
2. DESCRIPTION 1
TECHNICAL DATA 1
A. Double Compartment Table 1
B. Single Compartment Tables 1
3. OPERATION 1
FRONT PANEL 1
FRONT DOOR 1

1. GENERAL

1.01 This section provides description and operation information for late design, front and rear loading 37 teletypewriter tables. The tables, which support a typing unit and enclose its associated equipment, are available in three variations: a double compartment table and two single compartment tables, which differ primarily in the overall depth dimension. This section is reissued to incorporate engineering changes and comments received on Issue 1. Since only a limited distribution was made on Issue 1, marginal arrows have been omitted. Refer to Section 574-323-100TC for information on early design, rear loading tables.

2. DESCRIPTION

TECHNICAL DATA

A. Double Compartment Table

Weight	88 pounds
Height	26-1/4 inches
Width	32-1/2 inches
Depth	23-3/32 inches

B. Single Compartment Tables

	Standard Depth	Narrow Depth
Weight	70 pounds	68 pounds
Height	26-1/2 inches	26-1/2 inches
Width	22-1/2 inches	22-1/2 inches
Depth	23-3/32 inches	17-7/32 inches

2.01 The features of the tables are described in Figures 2, 3, and 4.

3. OPERATION

FRONT PANEL

3.01 The front panel is secured to the table by a latch. Pressing downward on the latch releases the panel. The front panel is removed by opening the panel to just beyond the front edge of the table top and lifting.

FRONT DOOR

3.02 The front door is secured to the table by a latch on the left side of the pedestal. Pressing inward on the latch releases the front door. The door may be removed, when open, by lifting.

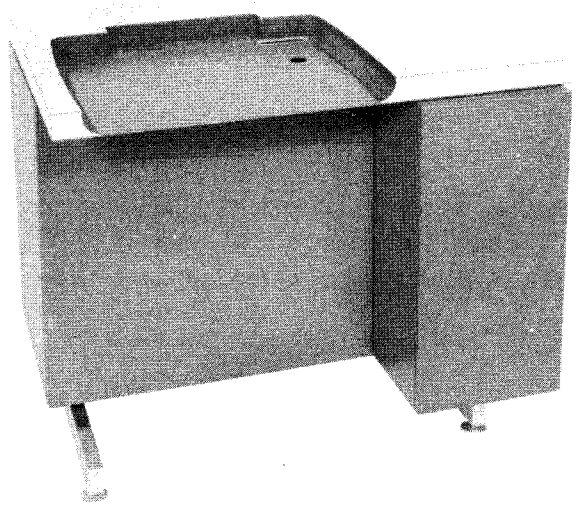


Figure 1 - Double Compartment Table

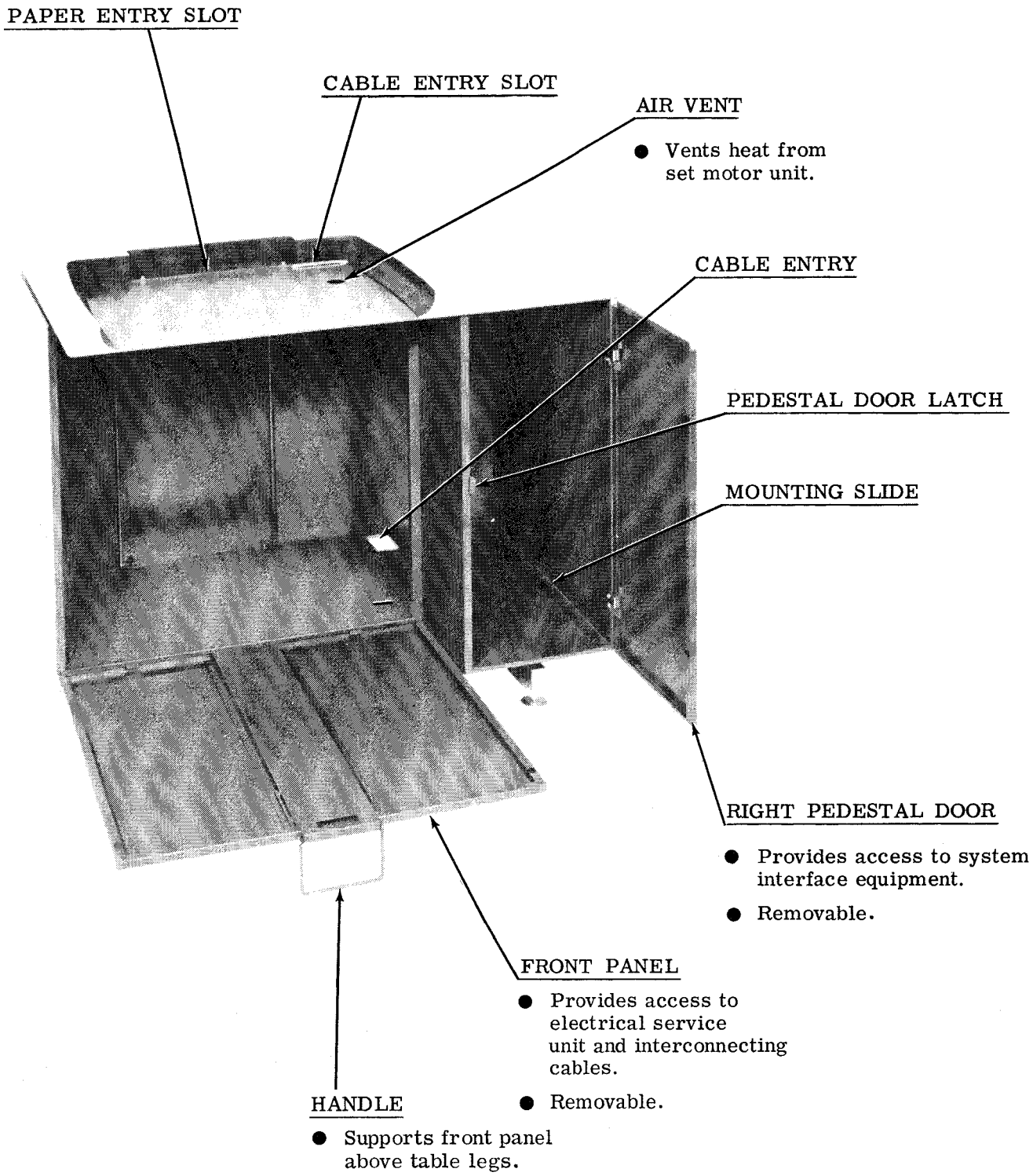


Figure 2 - Double Compartment Table (Front View)

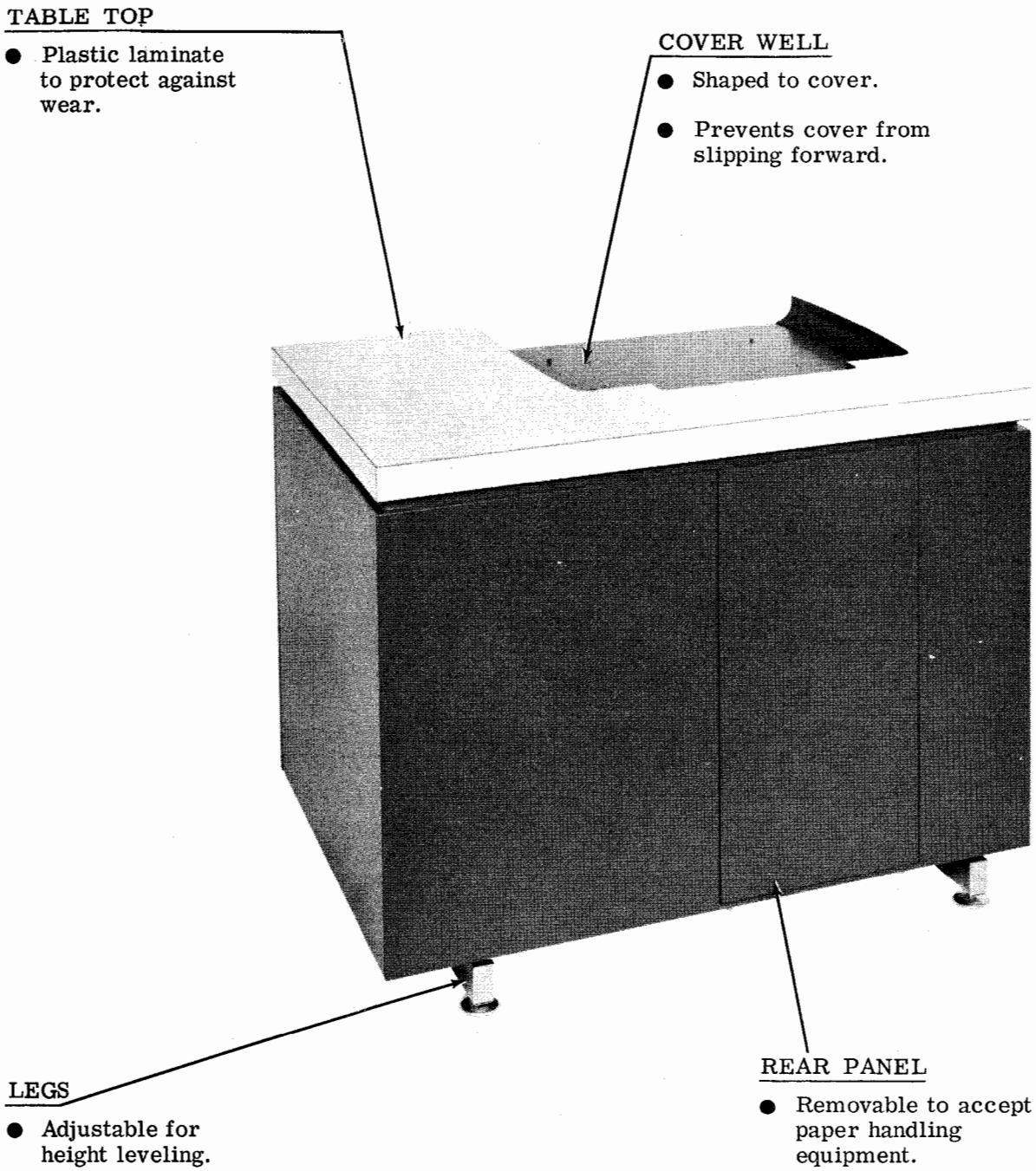
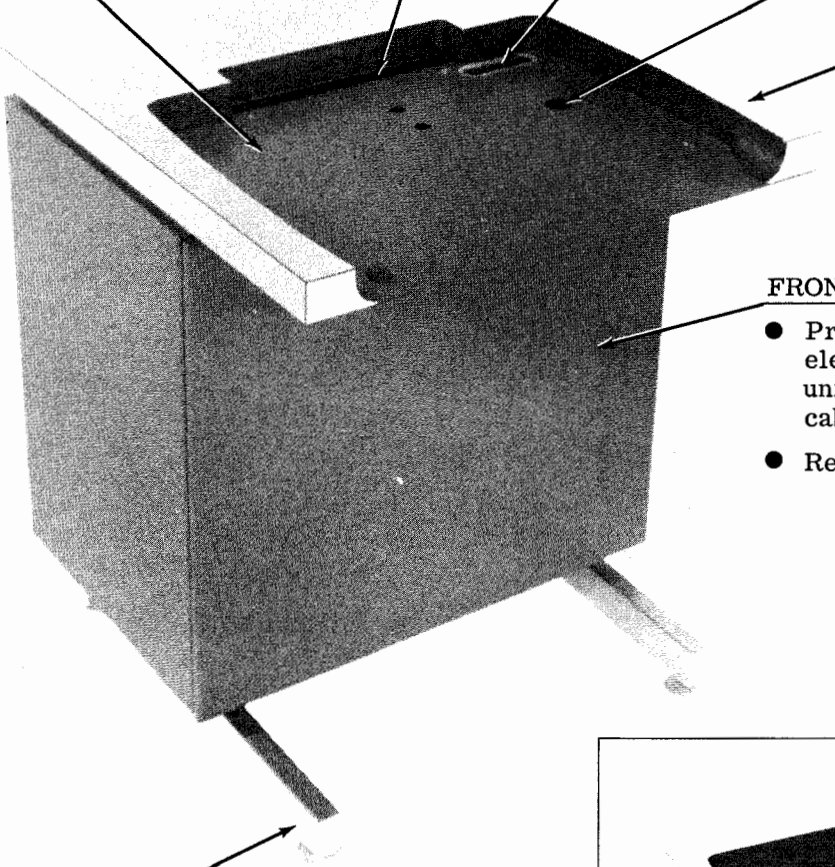


Figure 3 - Double Compartment Table (Rear View)



COVER WELL

- Shaped to accommodate typing unit cover.

PAPER ENTRY SLOT

CABLE ENTRY SLOT

AIR VENT

TABLE TOP

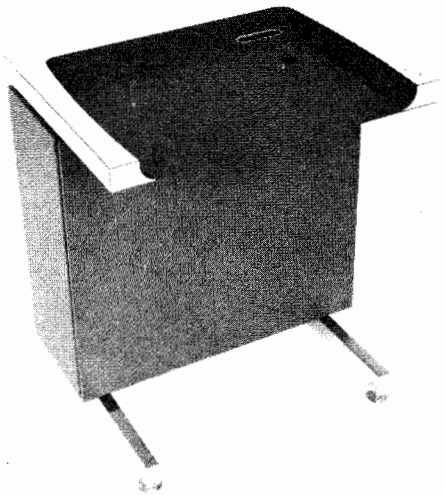
- Plastic laminate to protect against wear.

FRONT PANEL

- Provides access to electrical service unit and interconnecting cables.
- Removable.

LEGS

- Adjustable for height leveling.



SPACE-SAVING TABLE

- Same features as table above except over-all depth is only 17-7/32 inches.

Figure 4 - Single Compartment Tables (Front Views)

37 ANSWER-BACK UNIT

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS

		PAGE
1.	GENERAL	1
2.	DESCRIPTION	4
	CIRCUIT CARD	4
	MECHANICAL ASSEMBLY	4
	CODE DRUM	7
	TECHNICAL DATA	7
	A. Physical Characteristics	7
	B. Message Characteristics	7
	C. Circuits	7
	D. Environment	7
3.	PRINCIPLES OF OPERATION	7
	ANSWER-BACK MECHANISM	7
	CONTACT ASSEMBLY	8
	OFF-NORMAL SWITCH	9
	CIRCUIT CARD	9

1. GENERAL

1.01 This section provides the description and principles of operation for the 37 answer-back unit (Figure 1), and is reissued to incorporate engineering changes. Since this is a general revision, marginal arrows ordinarily used to indicate changes and additions have been omitted. For information concerning adjustments and lubrication, refer to Sections 574-325-700TC and 574-325-701TC.

1.02 The function of the answer-back unit is to generate a precoded message usually a station identification sequence of 20 characters or less. Each character can include up to eight levels of binary information and can accommodate applications using 5-, 6-, or 8-level codes.

1.03 The answer-back unit is provided with a code drum for encoding the desired character sequence. The code drum has frangible tines which can be easily removed for establishing marking bits in required code level positions. Depending upon the length of an answer-back message, the answer-back unit can generate one, two, or three identical messages per revolution of the code drum.

1.04 The answer-back unit is designed to work with an electrical service unit that contains a transmitting distributor and associated send control circuits. For information concerning the circuit description on the answer-back circuit card and the operation with the electrical service unit, refer to the description and operation for the 37 electrical service unit, Section 574-322-101TC and WD-CD (wiring diagram/circuit description) 8376.

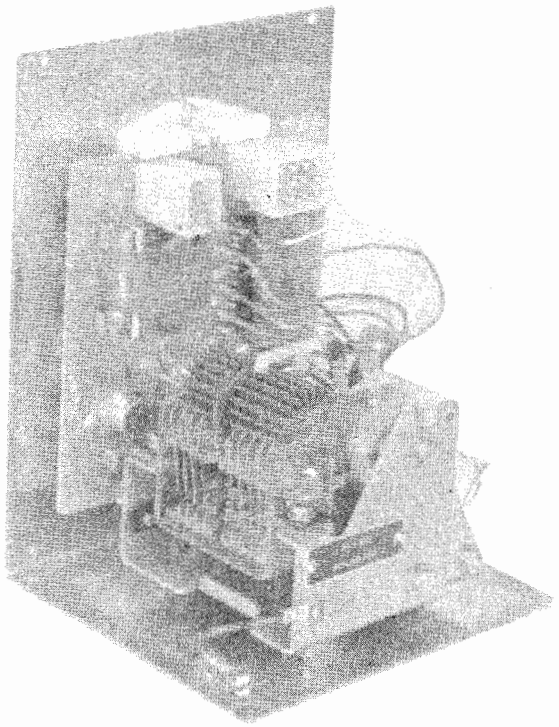
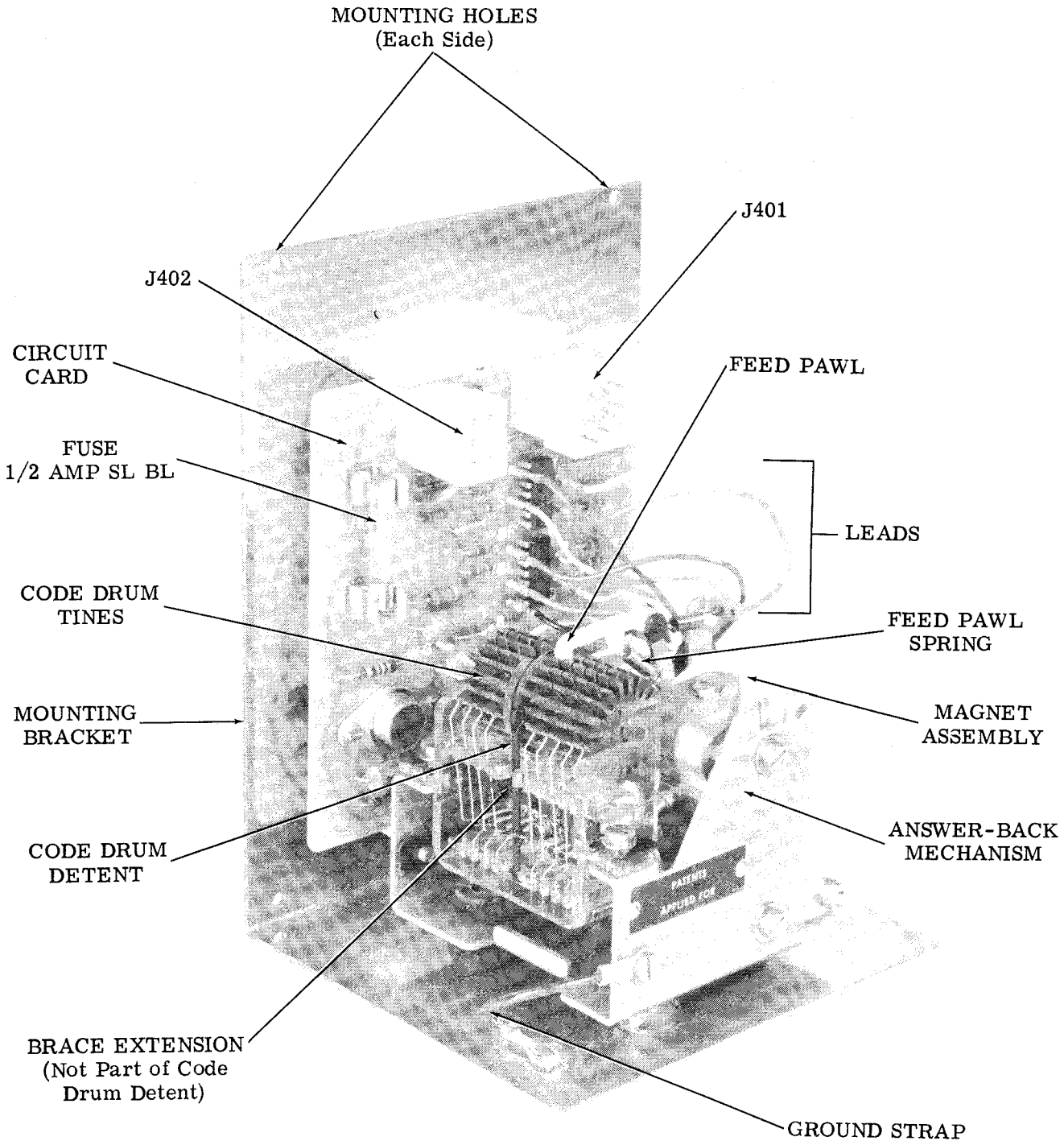


Figure 1 - Answer-Back Unit



(Front Right View)

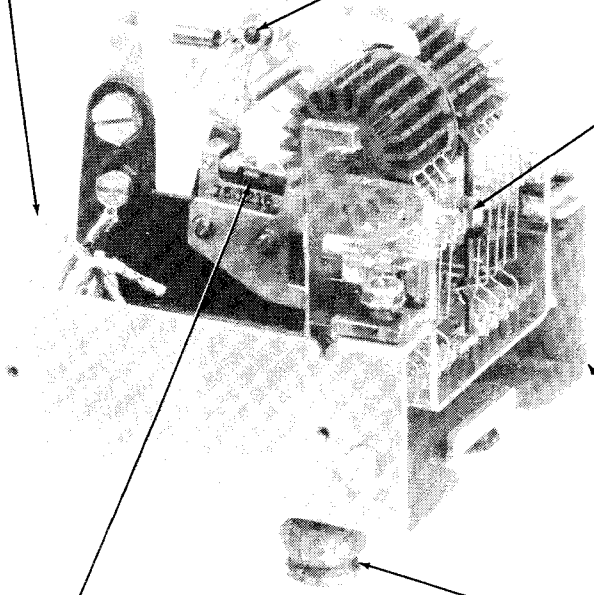
Figure 2 - Answer-Back Unit

LEADS

- Provides electrical interface with the circuit card. Extends circuit to feed magnet, off-normal switch, and contact assembly.

FEED MECHANISM

- Advances code drum one step upon completion of each input pulse.



(Left Front View)

CONTACT ASSEMBLY

- Character generator. Will accommodate up to eight levels of binary information.
- Can be encoded with messages up to 20 characters in length. Depending upon message length, can be encoded with 1, 2, or 3 messages per drum revolution.
- Has brace to hold wire contacts and detent away from code drum to facilitate code drum removal.

MOUNTING BRACKET

- Accepts shock mounts and provides mounting facilities for feed mechanism and contact assembly.

SHOCK MOUNTS

- Isolates mechanism to prevent transmission of vibration to mounting base.

OFF-NORMAL SWITCH

- Operates when code drum is advanced from home position. During answer-back cycle: normally-closed contact is opened to provide a message available indication, blocks the subsequent start pulses and places the stepping magnet under control of present character commands.

Figure 3 - Answer-Back Mechanism

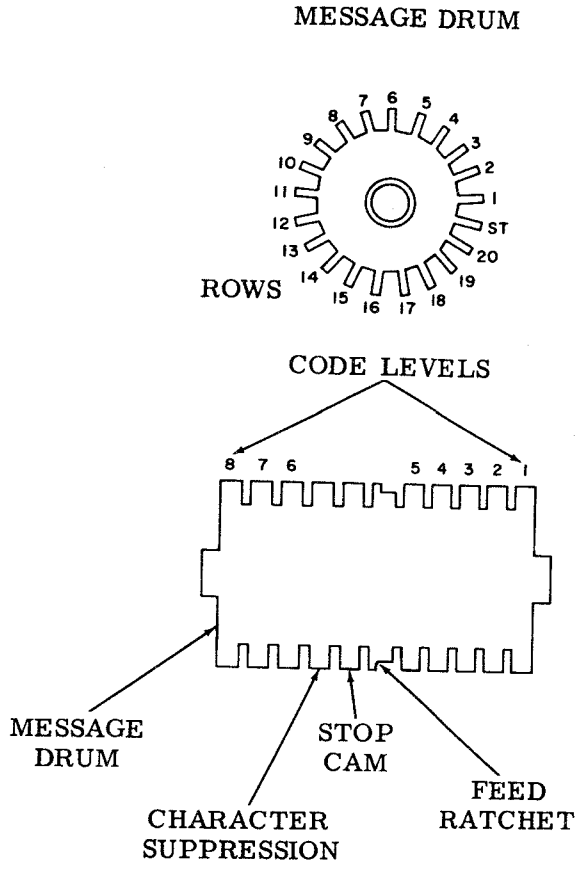


Figure 4 - Answer-Back Code Drum

2. DESCRIPTION

2.01 The answer-back unit is an electromechanical device with an associated control circuit card. The major components are shown in Figure 2 and the mechanisms are described in Figure 3.

CIRCUIT CARD

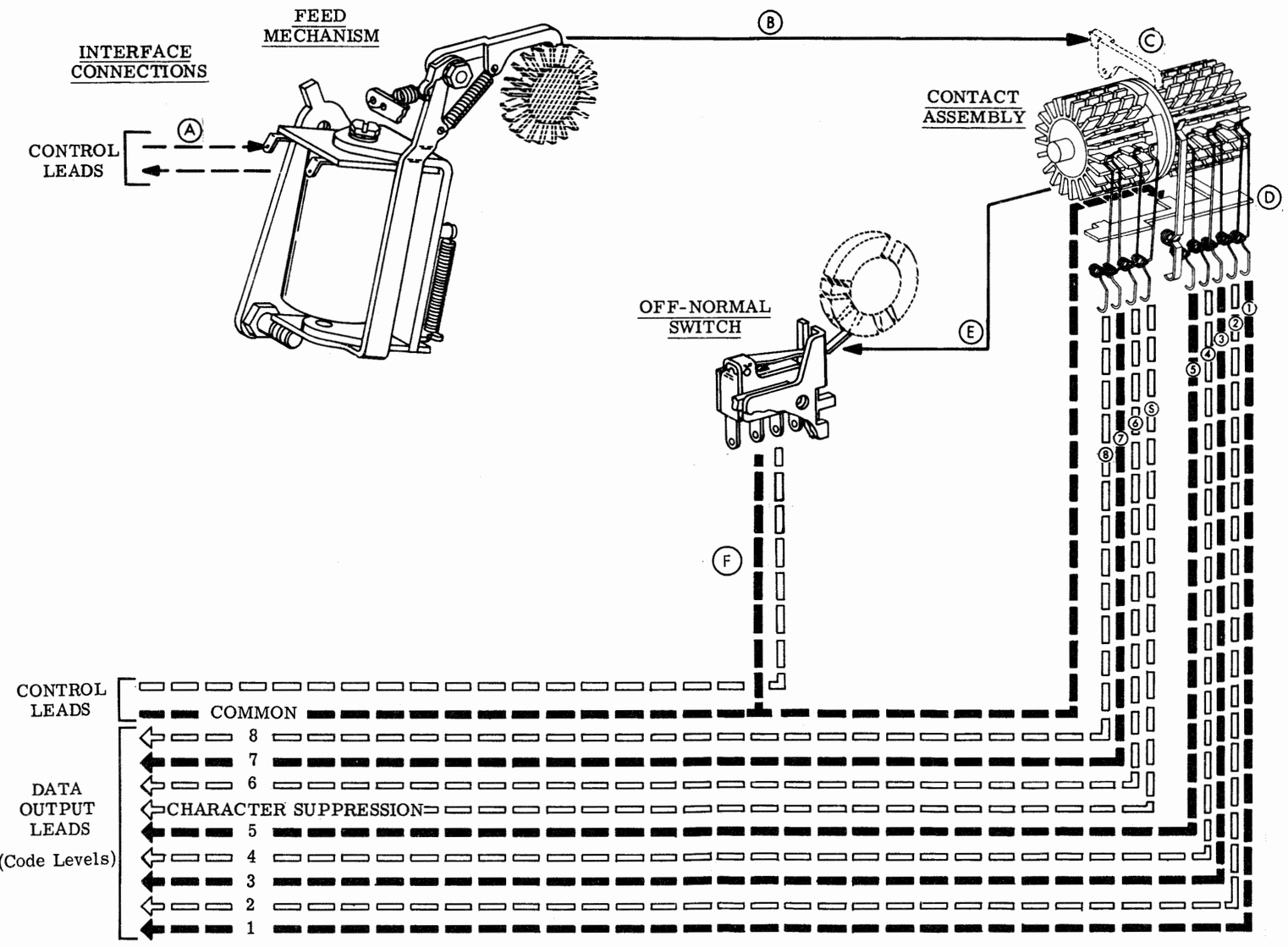
2.02 The circuit card for answer-back unit has a parallel signal output. This circuit card provides control for the mechanical answer-back and contains eight gates, control logic, and a driver for the stepping magnet. The distributor in the electrical service unit converts the parallel signal to serial form.

2.03 The character rate or words per minute is established by the on-line distributor through the send control circuit. The pulse from the send control circuit triggers the driver circuit which causes the stepping magnet to advance the code drum one position for each pulse received.

2.04 The baud rate (bits per second) and the start signals associated with serial transmission are established by the distributor. The send control circuit coordinates the serial transmission for a continuous sequence of characters.

MECHANICAL ASSEMBLY

2.05 The mechanical assembly consists of a stepping magnet, feed mechanism, contact block assembly, and off-normal switch assembly. Associated framing, brackets, springs, and wires comprise the remaining elements for the assembly. The contact block assembly consists of contact block, common bar, brace detent, code drum, and contact wires. The brace is provided on the contact assembly to facilitate the removal and replacement of the code drum. The



LEGEND

Electrical Code (Spacing)
Electrical Code (Marking)
Mechanical Motion
Electrical Control

OPERATION

(A) Pulse magnet momentarily.

(B) Advance feed pawl as magnet energizes. Retract feed pawl as magnet de-energizes.

(C) As feed pawl retracts, detent code drum into next character position.

(D) Arrange wire contacts in spacing or marking positions by means of code drum tines. (Character "U" of ASCII* arranged in code drum.)

(E) Depress arm during answer-back cycle.

(F) The normally-closed contact is open as long as arm is depressed. When open, the off-normal switch provides a Message Available indication to the terminal, disables start pulses and places the stepping magnet under control of the Present Character signal.

*United States of America Standard Code for Information Interchange

Note: Signal line circuits shown during contact sensing period, ie, voltage applied.

Figure 5 - Answer-Back Operation

brace, when deflected downward, will hold the detent and contact wires away from the code drum.

CODE DRUM

2.06 The answer-back drum is coded by removing a tine for a marking signal and leaving a tine for a spacing signal. In addition to eight code levels the code drum contains three control levels (Figure 4): character suppression, stop cam, and feed ratchet. The character suppression tines are removed for unused rows in each message cycle. The stop cam controls the number message cycles desired. When a stop cam tine is removed the off-normal switch contacts return to the normal closed position, which removes the message available and stops the message cycle.

2.07 Coding instructions are found in the adjustment section for the answer-back unit (1.01) or the set installation sections.

TECHNICAL DATA

A. Physical Characteristics

Weight . . . . . 2-1/2 pounds

Height . . . . . 6-5/8 inches

Width . . . . . 4-7/8 inches

Depth . . . . . 4-1/2 inches

B. Message Characteristics

Signal Output . . . . . parallel

Character Rate

Characters per Second 0-15

Words per Minute 0-150

Maximum Bits per Character 8
(will accommodate 5-, 6-, 7-, or 8-level codes)

Messages

Per Revolution of Code Drum . . . 1, 2, or 3

Corresponding Lengths . . . . . 20, 9, or 6 Characters
(each stop or home position is unused, ie, all tines are left in)

C. Circuits

Stepping Magnet

Voltage . . . . . +12 and -12 ±10% volts dc

Maximum Current . . . . . 1.2 milliamperes

Data Outputs

MARK — high (5.0 to +6.6 volts dc)

SPACE — low (0 to +.5 volts dc)

Suppress — low (0 to +.5 volts dc)

Circuit Card

Size — 4 inches by 4-1/2 inches

Code Contacts

Type — Gold-plated wire contacts and common bar

Note: In order to achieve maximum life from contact wires, current should not be switched by code reading contacts.

D. Environment

Ambient Temperature

Minimum . . . . . 32 ° F

Maximum . . . . . 158 ° F

Relative Humidity

Minimum 1%

Maximum 90%

3. PRINCIPLES OF OPERATION

ANSWER-BACK MECHANISM

3.01 The operation of the answer-back unit is started when the stepping magnet receives a pulse from the driver circuit (Figure 5). The current rise energizes stepping magnet which, in turn, attracts armature. The armature and attached feed bail (Figure 6), when pivoted, places feed pawl in position to index code drum. Upon electrical release of stepping

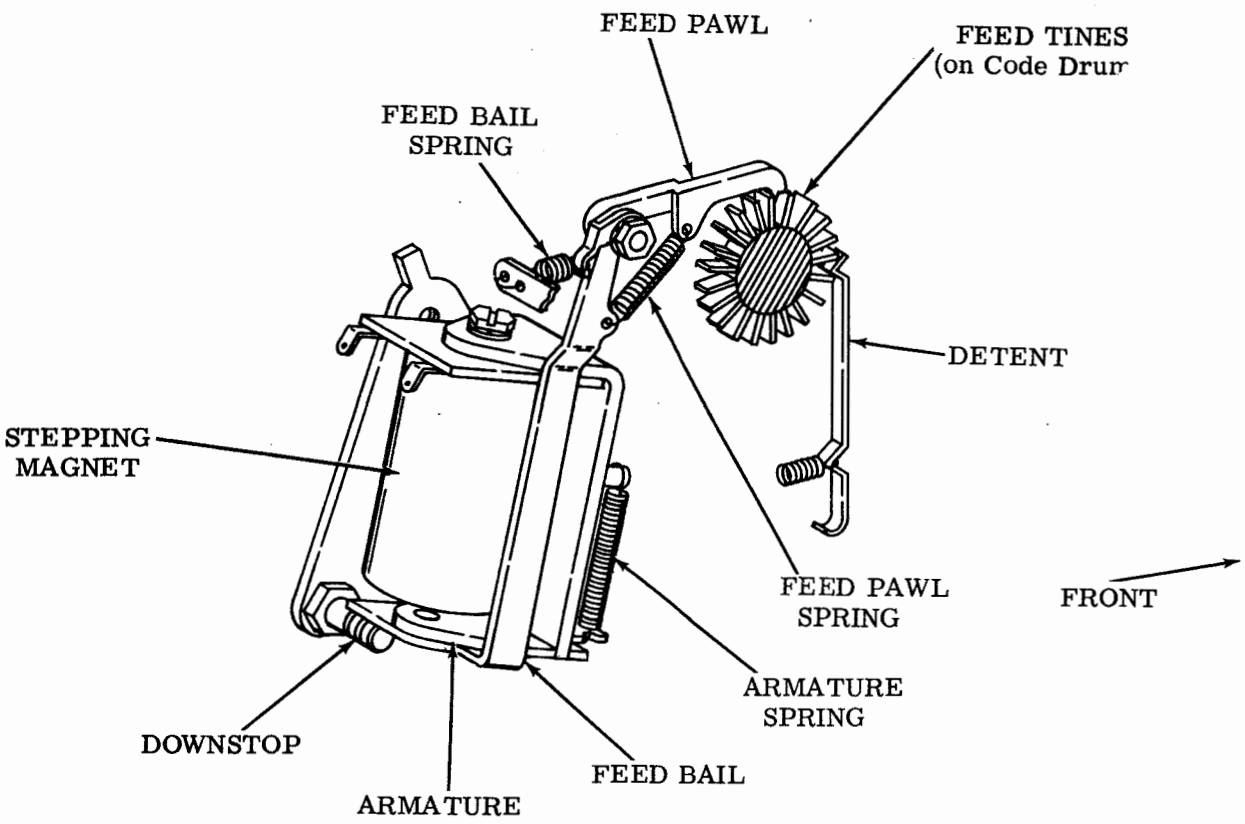


Figure 6 - Feed Mechanism

magnet, the drum is advanced by the rearward movement of feed pawl and is fixed in position by the detent. When the code drum is advanced out of home position the following sequence occurs.

(1) The contact wires of contact assembly (3.04) sense the first character to be transmitted.

(2) The off-normal switch actuator is cammed out of the recess in code drum; opening the normally closed contact of the switch.

3.02 The off-normal switch, when operated, maintains feed pulses from the driver circuit to the stepping magnet. The operational sequence continues until the code drum reaches the home position.

3.03 In the home position, the off-normal switch actuator rises in the recess of stop cam. This action closes the contacts in the off-normal switch and prevents further operation of the answer-back unit.

CONTACT ASSEMBLY

3.04 The contact assembly (Figure 7) requires that the code drum be detented or moved off the home position to send one character per row on the drum. The code drum provides the removable tines to be sensed externally.

3.05 The operation of the contact wires are controlled by each row on the drum and provide parallel signal output. Contact wire springs hold the contact wires toward the code drum. For a spacing bit, the contact wire is held away from the common bar by the code drum tine. When the tine is removed, the contact wire falls against the common bar to provide a marking bit.

3.06 All unused character positions except the first (home position) are suppressed by removing the suppression level tines at these positions.

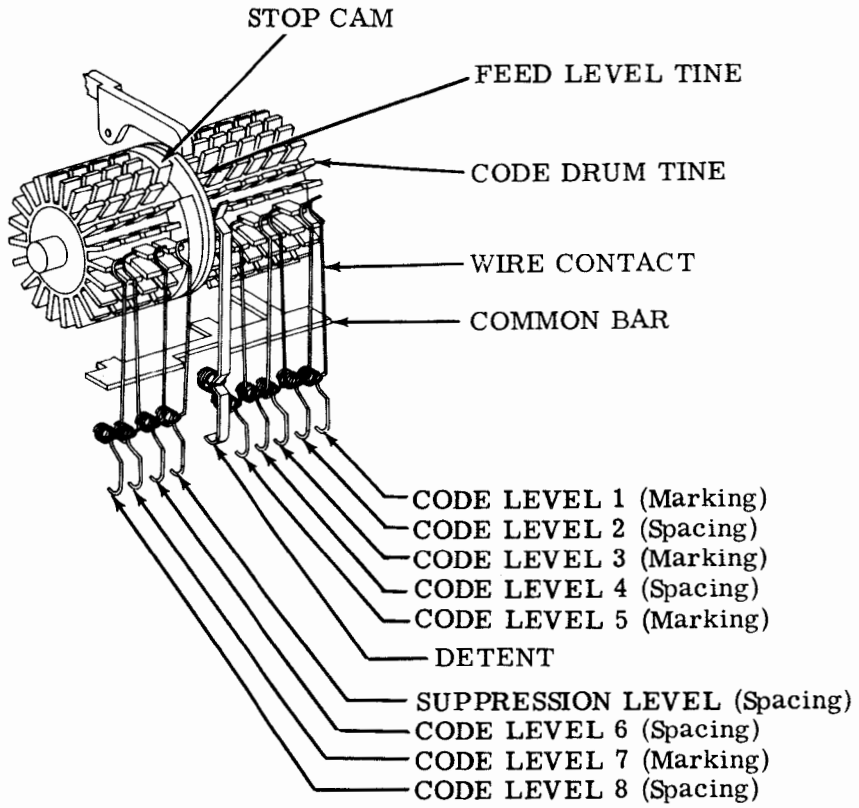


Figure 7 - Contact Assembly

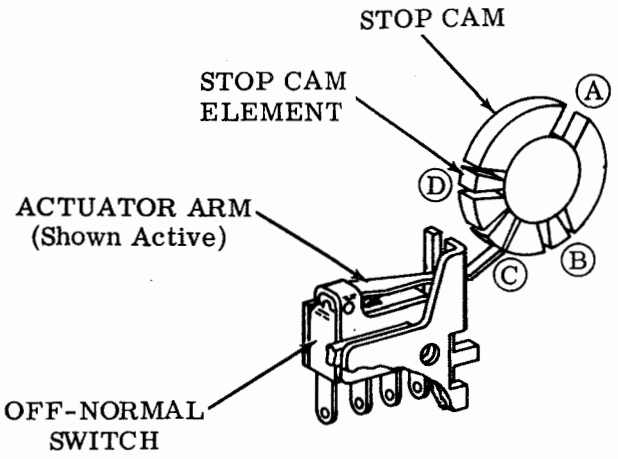
OFF-NORMAL SWITCH

3.07 The off-normal switch (Figure 8) establishes the home (stop) position of the answer-back cycle. By removing the appropriate stop cam elements, the off-normal switch will provide 1-, 2-, or 3-cycle operation.

3.08 The off-normal switch is operated by the stop cam after an initial pulse to the stepping magnet. When open, the normally closed contacts block subsequent start signals and place control of the stepping magnet under the present character signals from the send control card. The line distributor card prevents an additional transmitting device from sending during the answer-back cycle.

CIRCUIT CARD

3.09 The electronic circuit for the answer-back (Figure 2) provides a filter network and a NAND gate. This circuit combination provides a clock pulse to drive a flip-flop circuit that starts the drive circuitry consisting of three



REMOVE STOP CAM ELEMENT	FOR	WITH
Ⓐ	1 Cycle	20 Characters*
Ⓐ Ⓒ	2 Cycles	9 Characters*
Ⓐ Ⓑ Ⓓ	3 Cycles	6 Characters*
*All tines remain at first or home position.		

Figure 8 - Off-Normal Switch

transistors. The output of drive circuit causes the armature of the stepping magnet to be pulled up and then released to move the answer-back drum one position. This sequence occurs for each start command and every present character input. After the code drum has moved one position, an off-normal switch operates, presenting the message available signal to the send control. The message available signal remains on for the entire message and conditions the send control to give priority over a send request from the keyboard or tape reader.

3.10 The answer-back electronic circuit contains eight gates in addition to the stepping magnet driver circuit. After the start signal has advanced the drum one position, the reading and advancing of the drum will occur when a present character command is received from the send control. The eight data bits will be transferred in parallel form to the on-line distributor to be serialized and transmitted to the send control. The data bits are converted to EIA signals and sent to the data set and transmitted on the signal line.

37 TYPING UNIT COVER AND PAN

DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL 1
2. DESCRIPTION 1
TECHNICAL DATA 1
A. Physical Characteristics 1
B. Copylights 1
3. OPERATION 4
LATCHES 4
PAPER EXIT 4

1. GENERAL

1.01 This section provides description and operation information for the late design 37 typing unit cover and pan which has the front cover cut out for WECo 635R2 switches (Figure 1). It is reissued to incorporate engineering changes and comments received on Issue 1. Since only a limited distribution was made on Issue 1, marginal arrows have been omitted. Refer to Section 574-326-100TC for description and operation information on early design units which have the front cover cut out for Licon 76-type switches.

1.02 The typing unit cover and pan encloses, protects and provides mounting and operating facilities for a keyboard unit and typing unit. In addition, the cover and pan reduce the level of noise emanating from the enclosed mechanisms.

2. DESCRIPTION

2.01 The typing unit cover and pan totally enclose a 37 typing unit and motor drive components. The two lids at the top of the cover provide access to the typing unit for replenishing the paper supply, adjusting print hammer pressure, changing the ribbon, cleaning type, and setting tabulation margins.

2.02 The printed copy can be easily read by the operator and standing observers, and emerges through an opening in the top of the cover under power of the typing unit line feed mechanism. A paper tearing edge, provided on the copy view window, facilitates page copy removal.

2.03 To facilitate maintenance, the cover is hinged to the pan and may be raised and extended over the interior components.

2.04 The features of the typing unit cover and pan are described in Figures 2 and 3.

TECHNICAL DATA

A. Physical Characteristics

Weight	12 pounds
Height	11 inches
Width	19-1/4 inches
Depth	15-1/2 inches

B. Copylights

Two, 6-volt lamps

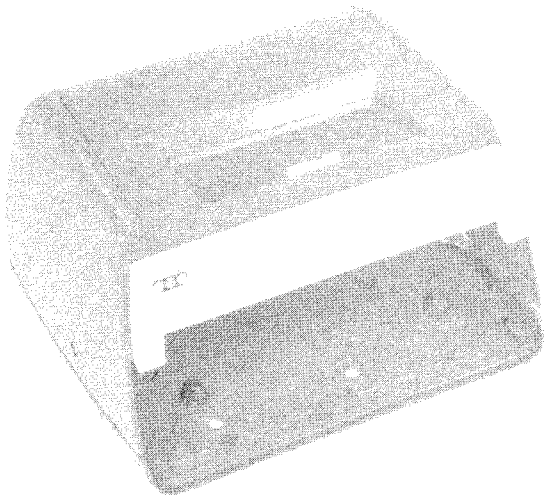


Figure 1 - Typing Unit Cover and Pan

REAR LID

- When front lid is opened, provides full access to top of typing unit for performing operator maintenance tasks.

COPY VIEW WINDOW

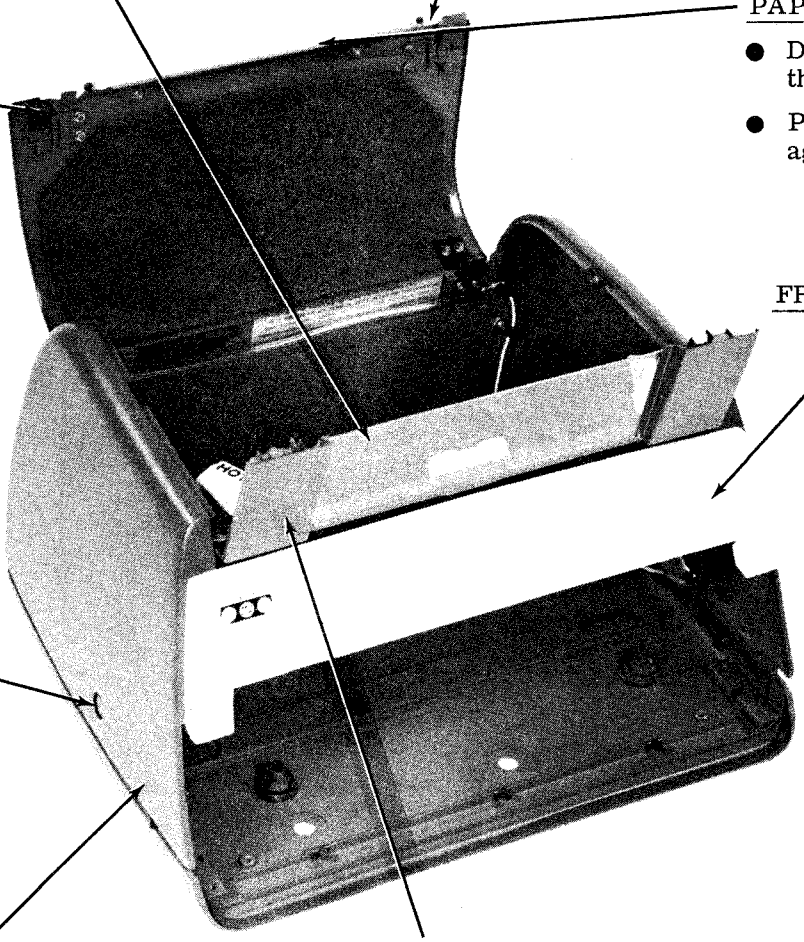
- Flat plastic with minimum distortion for viewing printed copy.
- Tearing edge to facilitate page copy removal.

PAPER GUIDE

- Directs paper through exit.
- Protects cover against wear.

FRONT LID LATCH

FRONT PANEL



COVER LATCH

COVER HOUSING

- Metal construction.
- Padded on inside to absorb noise.

FRONT LID

- Provides access to front of typing unit.
- Easily removable to provide additional work space if necessary.
- Latches rear lid.

Figure 2 - Typing Unit Cover and Pan (Lids Open) (Left Front View)

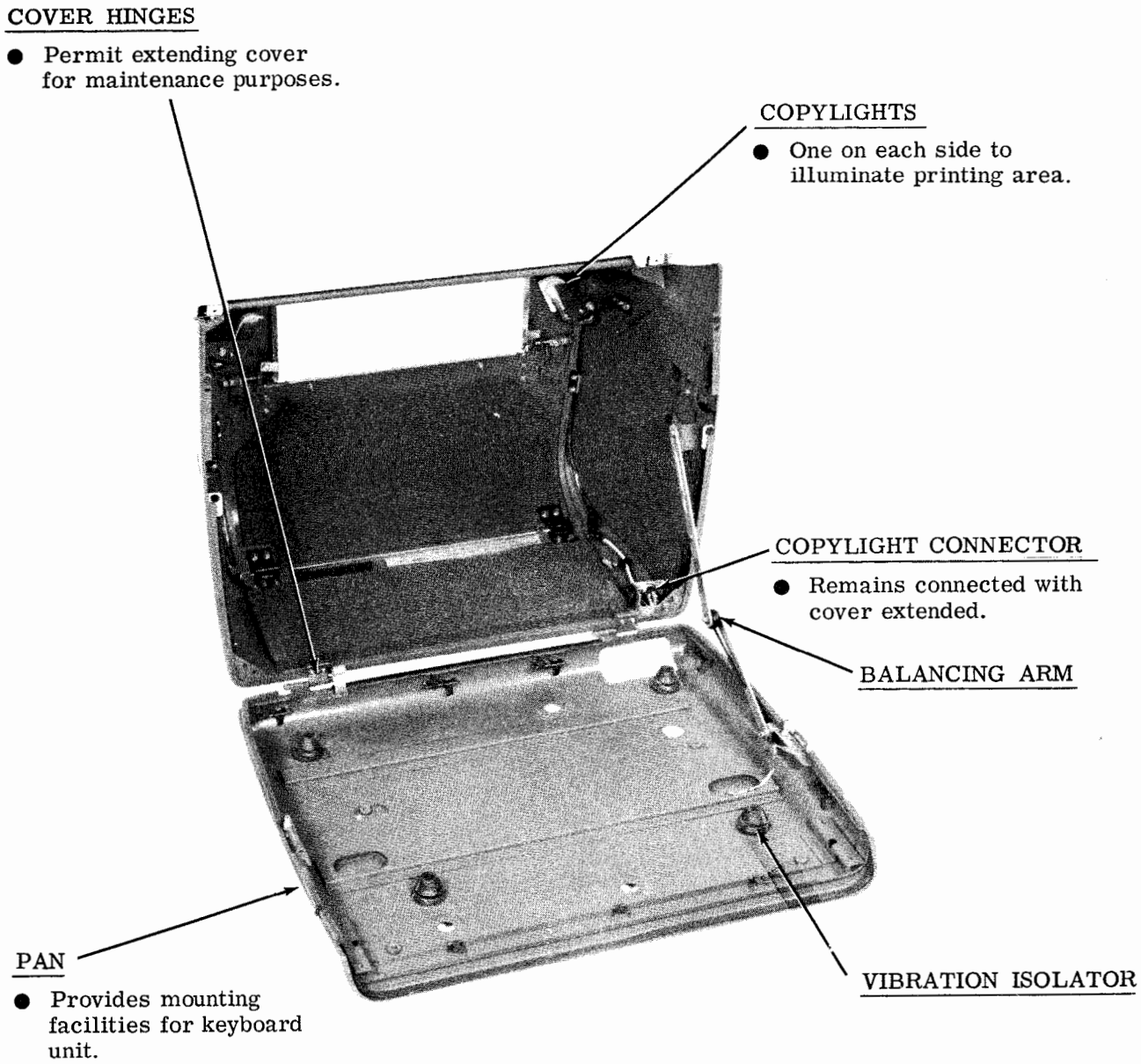


Figure 3 - Typing Unit Cover and Pan (Cover Opened) (Left Front View)

3. OPERATION

LATCHES

3.01 The cover is hinged to the pan at the rear and secured on the left and right sides by two button-operated latches. Depressing both buttons unlatches the cover and permits raising it upward. The opened cover is held in position by a balancing arm.

3.02 Two button-operated latches secure the front and rear lids. Depressing the buttons inward unlatches the lids. To latch the lids, close the rear lid first. Then close and latch the front lid.

PAPER EXIT

3.03 The paper guides, attached to the rear lid, directs the paper through the top opening in the cover. When expended paper is torn at the tearing edge, the free edge will fall against the guide. The free edge will then feed through the opening during subsequent line feed operations.

37 REPERFORATOR-TRANSMITTER (RT) CABINET

DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL 1

2. DESCRIPTION 1
BASIC UNIT 1
TAPE HANDLING DOORS 2
TECHNICAL DATA 2

3. OPERATION 7
MECHANISM INDEX 7
BASIC UNIT 7
TAPE HANDLING DOORS 7

1. GENERAL

1.01 This section describes the features and facilities of the reperforator-transmitter (RT) cabinet and gives the purpose and operation of its various mechanisms (Figure 1). The section is reissued to incorporate engineering changes and comments received on Issue 1. Since only a limited distribution was made on Issue 1, marginal arrows have been omitted.

1.02 The basic purpose or function of the reperforator-transmitter (RT) cabinet is to provide protection and operational facilities for the components which it houses. When the RT cabinet is outfitted with a reperforator (punch), transmitter (reader), reperforator drive motor, electrical service unit, etc, it becomes an RT Module used for tape preparation and transmitting in conjunction with the 37 Automatic Send-Receive (ASR) Set.

1.03 References in this section to left or right, top or bottom, front or rear, etc, refer to the cabinet in its normal operating position as viewed by the operator from the front of the cabinet (Figure 1).

2.01 The basic cabinet (Figure 1) includes these facilities and features.

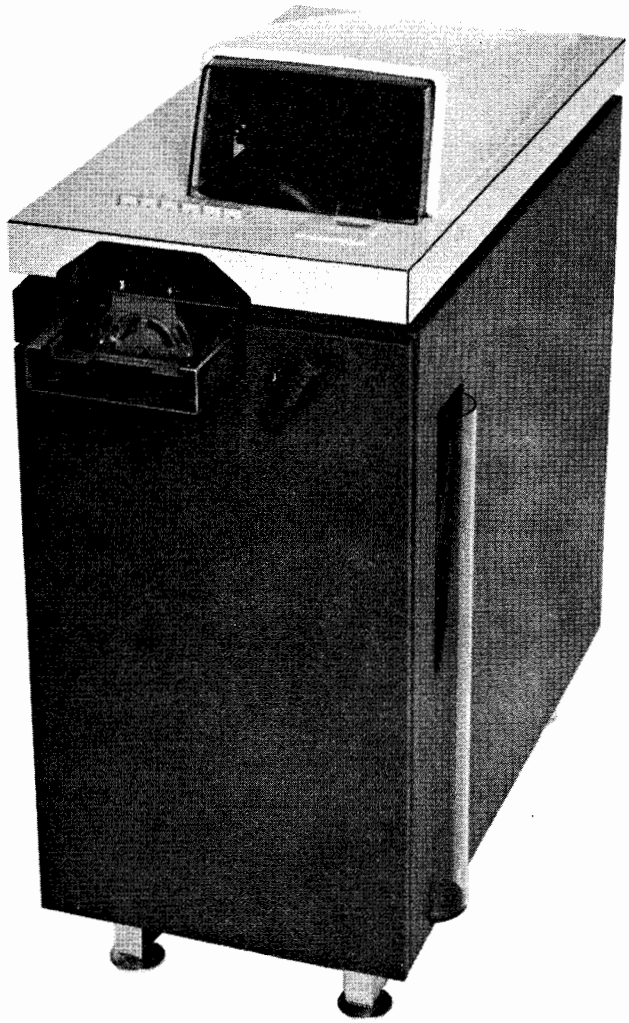


Figure 1 - Reperforator-Transmitter (RT) Cabinet

(a) A base for mounting and operating a CX-type reader unit including a motor unit and drive parts (belt and pulleys). The reader unit base is fastened to its mounting bracket on the cabinet top with vibration dampers.

(b) A base for mounting and operating a reperforator including a motor unit and drive parts, tape supply container and 8-inch diameter tape reel, and low-tape alarm. The reperforator base is mounted on vibration isolators.

(c) A reperforator cover equipped with a clear plastic window and hinged at the left to permit access to the reperforator and tape supply.

(d) A bank of six pushbutton-type switches to control the operating components of the cabinet.

(e) A tight-tape device including a tight-tape switch and guide roller for use with the reader unit.

(f) Mounting facilities for an electrical service unit within the lower portion of the cabinet.

(g) A chad container with the capacity equivalent to the chad produced by two 8-inch diameter rolls of randomly punched tape.

(h) A cabinet door without tape handling facilities.

2.02 The basic cabinet is illustrated and described in Figures 2 and 3.

TAPE HANDLING DOORS

2.03 Two variations of the basic cabinet (Figures 1, 2 and 3) are available to provide tape handling facilities. These facilities are provided by two different tape handling doors which are described below and in Figures 4 and 5.

(a) Door with Single Winder — The single winder occupies the upper position on the cabinet door and is used to wind tape from the reader unit. The tape handling door also includes a winder switch and a tape sensor to control the operation of the winder and a tape tensioner (guide post and pressure pad). Latching the tape sensor permits a free tape path for easy threading. The winder incorporates an antibacklash brake to prevent slack tape between tensioner and reel when the motor is turned off.

(b) Door with Double Winder — The power winders on this door are identical to the winder described above except for the tape sensor associated with the lower winder which is equipped to also operate as a power unwinder. A switch permits selection of winder-unwinder modes. The winders have separate tape sensors, guide posts, and pressure pads. The upper winder is used to wind tape from the reader unit. The lower winder is used to wind tape from the reperforator, for fast reel-to-reel rewinding, and for power unwinding of tape from a message reel to the reader unit.

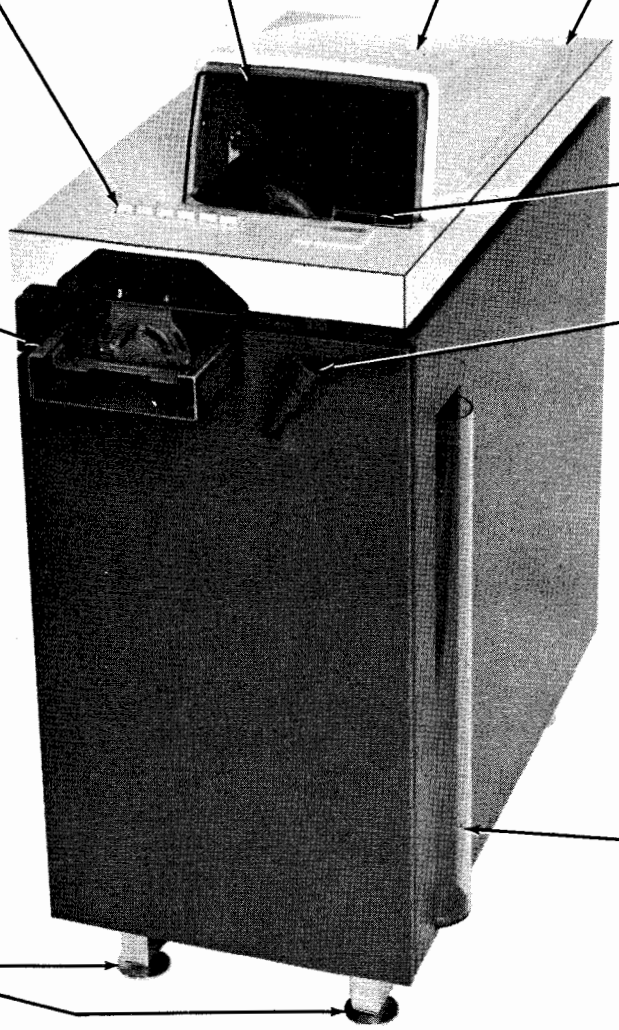
2.04 The tape reel used with either winder has a tape-insertion slot for easy tape threading and an opening that permits the wound message to be removed from the core for use on an inside unwinder. The front flange of the reel may be separated from the rear reel permitting removal of tape with the rear reel remaining on the winder.

2.05 Cabinets with tape handling doors may be equipped with a 75 foot capacity tape storage bin and a tape director which routes reperforator message tape into the bin or out of the cabinet through either of two tape exits.

TECHNICAL DATA

Weight
- Basic unit . . . . . 84 pounds
- With tape handling doors, intermediate tape storage . . . . 103 pounds

Height . . . . . 26-1/2 inches
Width . . . . . 12 inches
Depth (basic unit) . . . . . 23-3/32 inches
Tape winder capacity . . . . . 8-inch dia. roll
Tape winder operating speed . . up to 1200 wpm
Reperforator tape supply . . . . . 8-inch dia. roll
Motor Unit
- Reader Drive Motor
  - Rating . . . . . 1/150 hp
  - Type . . . . capacitor start, synchronous
  - Operating voltage . . . . 115 volts ±10%, single-phase, 60/50 Hz ac
  - Speed
    - 60 Hz . . . . . 1800 rpm
    - 50 Hz . . . . . 1500 rpm
  - Capacitor . . . . . 4 mfd



WINDOW

- Clear plastic with minimum distortion for viewing tape perforation.

REPERFORATOR COVER

- Provides access to reperforator and tape supply container.

CABINET TOP

- Plastic laminate to protect against wear.

MODE CONTROL PUSHBUTTONS

TAPE EXIT

READER BASE

- Provides reader mounting facility.
- Orients reader for right to left tape travel.
- Includes drive motor with pulleys and toothed belt.
- Fastened with vibration dampers.

TIGHT TAPE GUIDE ROLLER

- Guides tape to reader.
- Senses tight-tape condition, and actuates tight-tape switch to stop reader motor.
- Two sensing positions.

CHAD CONTAINER

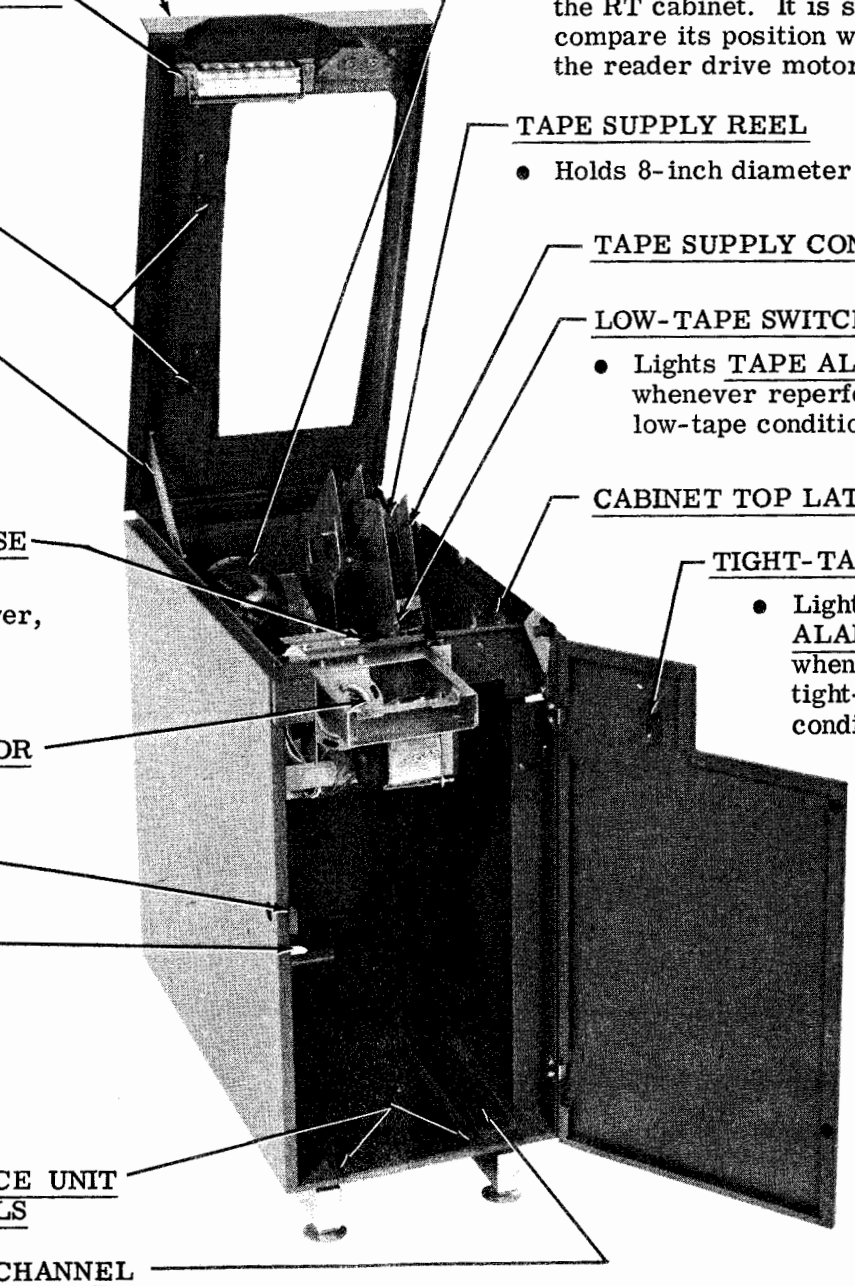
- Transparent to view chad level.
- Removable without opening cabinet.

CABINET FEET

- Adjustable.
- Self-aligning.

(Right Front View)

Figure 2 - Cabinet with Plain Door



CABINET TOP
- Provides full access to reperforator, tape supply, and low-tape switch for servicing.
- Padded on inside to absorb noise.

MODE CONTROL PUSHBUTTON ASSEMBLY
- Provides indicating lamps.

REPERFORATOR COVER HINGES

SLIDE ARM
- Provided with safety latch to hold cabinet top in fully open position.

REPERFORATOR BASE
- Provides mounting facility, motive power, and tape supply for reperforator.

READER DRIVE MOTOR

DOOR LATCH

CABLE ROUTING HOLE
- For routing cables to exterior of cabinet.

ELECTRICAL SERVICE UNIT MOUNTING CHANNELS

TAPE STORAGE BIN CHANNEL

REPERFORATOR DRIVE MOTOR

Note: This motor is not a part of the RT cabinet. It is shown to compare its position with that of the reader drive motor.

TAPE SUPPLY REEL
- Holds 8-inch diameter roll of tape.

TAPE SUPPLY CONTAINER

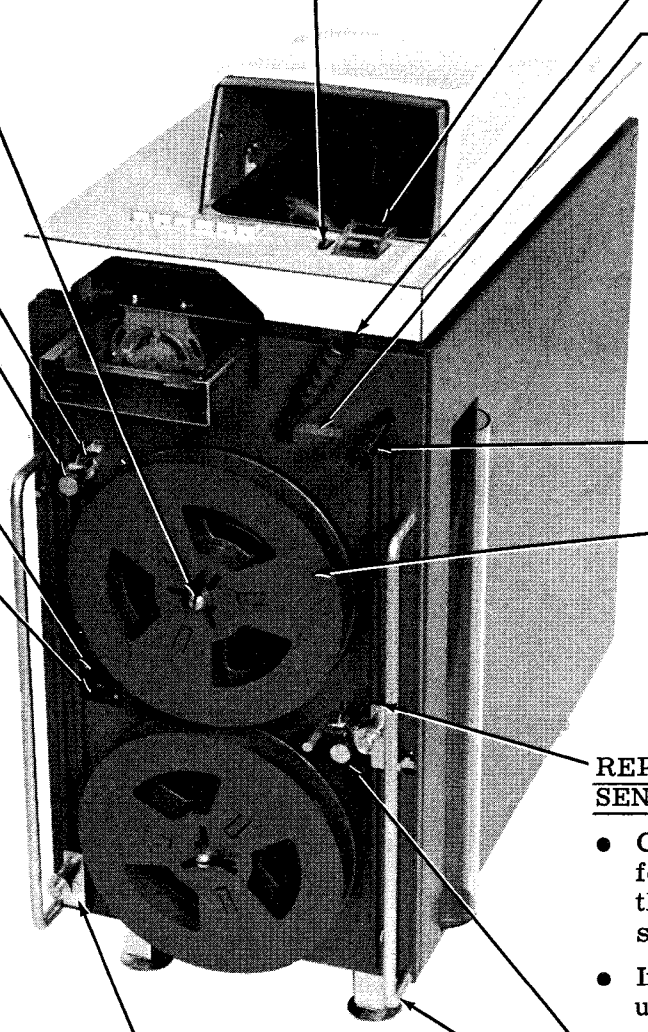
LOW-TAPE SWITCH
- Lights TAPE ALARM lamp whenever reperforator low-tape condition exists.

CABINET TOP LATCH

TIGHT-TAPE SWITCH
- Lights TAPE ALARM lamp whenever reader tight-tape condition exists.

(Left Front View)

Figure 3 - Cabinet with Door and Top Opened



TAPE CHUTE CONTROL BUTTON

DRIVE DETENT

- Engages tape reel when moved into reel drive slot.
- Permits tape reel to free wheel in disengaged position (45° from spindle axis).

TAPE GUIDE

- Directs tape from reperforator over cabinet top, or through tape chute and tape exit, or through tape chute and into intermediate storage bin.
- Position determined by tape chute control button.

TAPE EXIT

TAPE CLIP

- Provides a place to hang leading end of tape awaiting further operation.
- Facilitates keeping tape clean.
- Frees operator from close attendance while tape being reperforated.

PRESSURE PAD

GUIDE POST

READER WINDER SWITCH

- Applies power to motor through reader winder sensing switch.

AUXILIARY TAPE GUIDE ROLLER

REPERFORATOR WINDER MODE SWITCH

- Directs power to reperforator motor through appropriate sensing switch.
- In U position, power is applied through unwind mode sensing switch.
- In OFF position, all power is removed from motor.
- In W position, power is applied through wind mode sensing switch.

TAPE REEL

- Holds 8-inch diameter roll of tape.
- Front flange removable for access to tape.

REPERFORATOR TAPE SENSOR

- Controls power to reperforator winder motor through mode sensing switch energized.
- Includes release button for unlatching tape sensor.

GUIDE POSTS

TAPE REEL GUARD

READER TAPE SENSOR

- Controls power to reader winder motor by actuating reader winder sensing switch.
- Includes release button for unlatching tape sensor.

(Right Front View)

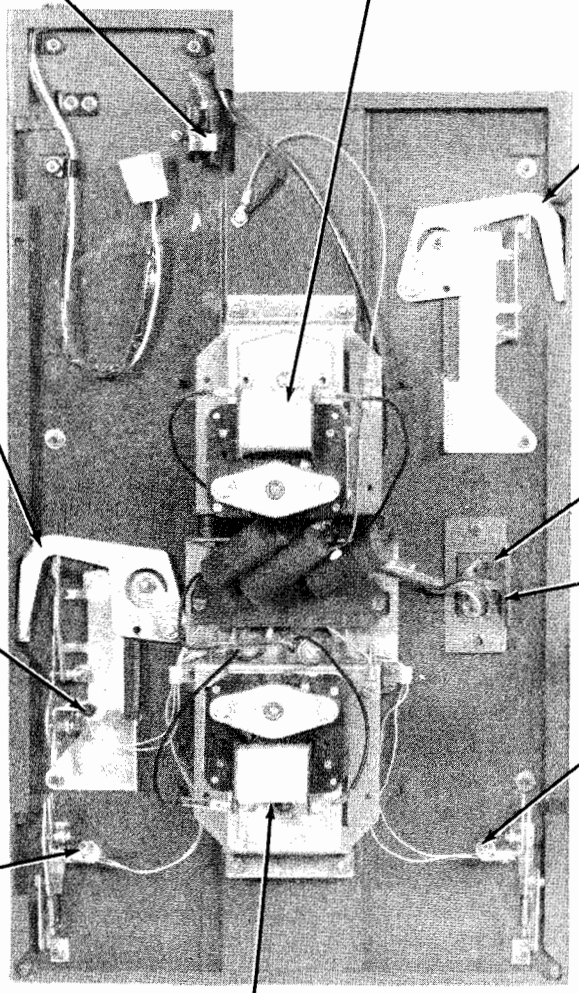
Figure 4 - Cabinet with Power Winders

TIGHT TAPE SWITCH

- Acuated by tight tape guide roller to remove power from reader drive motor.

READER WINDER MOTOR

- Rotates reader winder reel.



TAPE SENSOR LATCHING MECHANISM

- Holds reader, tape sensor in upper-most position.
- Disengaged by release button on tape sensor.

TAPE SENSOR LATCHING MECHANISM

- Holds reperforator tape sensor in upper-most position.
- Disengaged by release button on tape sensor.

READER WINDER SWITCH

UNWIND MODE SENSING SWITCH

- Controls power to reperforator winder motor in accordance with reperforator tape sensor for the un-wind mode.

REPERFORATOR WINDER MODE SWITCH

READER WINDER SENSING SWITCH

- Controls power to reader winder motor in accordance with reader tape sensor position.

WIND MODE SENSING SWITCH

- Controls power to reperforator winder motor in accordance with reperforator tape sensor position for the wind mode.

(Rear View)

REPERFORATOR WINDER MOTOR

- Rotates reperforator winder reel in either direction for power winding or unwinding.

Figure 5 - Cabinet Door with Power Winders

3. OPERATION

3.01 The operation of the cabinet is contained in a series of illustrations which are supported by text to describe the purpose and operation of the various mechanisms.

3.02 The contents of this part are listed alphabetically in the mechanism index.

MECHANISM INDEX

ITEM	PAGE
BASIC UNIT	8
Motor unit	8
Tight-tape guide roller and switch	8
TAPE HANDLING DOORS	9
Fast rewinder	11
Power unwinder	12
Reader tape winder	9
Reperforator tape winder	10
Tape director and storage bin	13

BASIC UNIT

3.03 Tight-Tape Guide Roller and Motor Unit

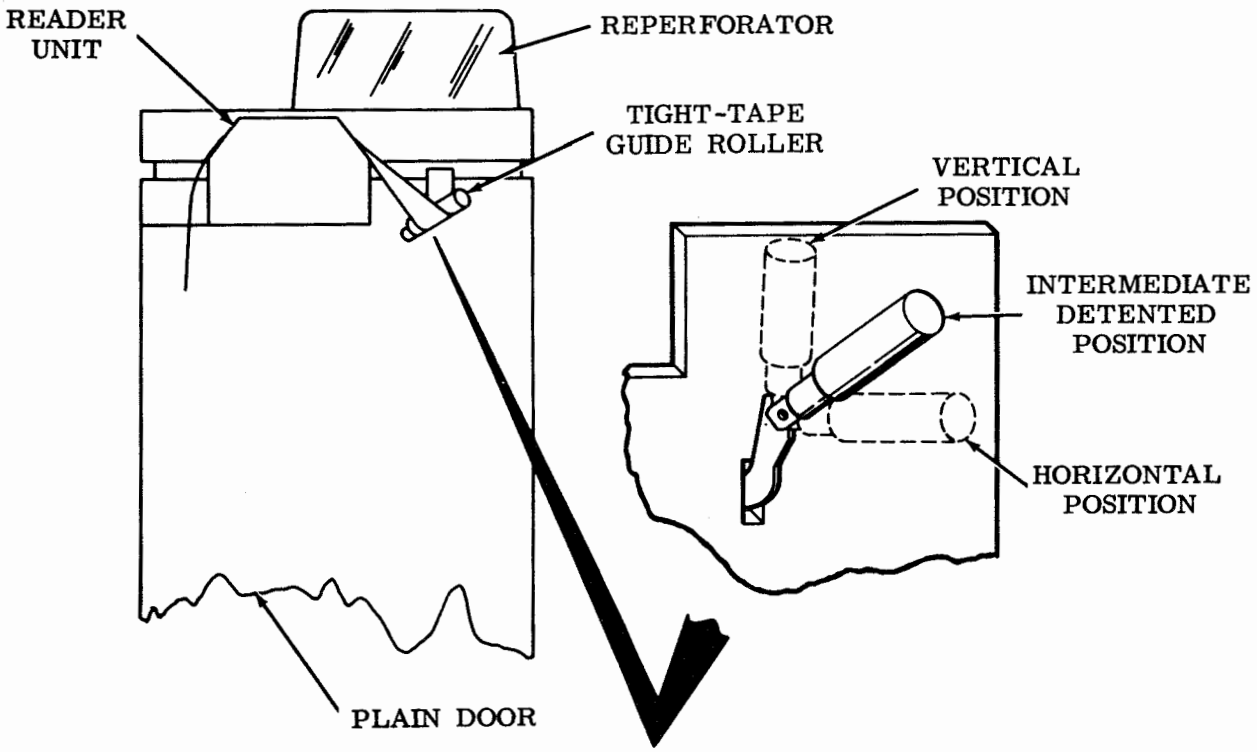
TIGHT-TAPE GUIDE ROLLER AND SWITCH

Purpose

Provides for reader tight-tape sensing when tape is supplied from the reperforator or, on units so equipped, the tape storage bin or lower tape reel.

Operation

When a tight-tape condition occurs, the tight-tape roller operates the tight-tape switch to turn off the reader unit. The tight-tape guide roller is placed in its vertical position when not in use, in the intermediate detented position when tape is supplied from the reperforator or storage bin, and in the horizontal position for tape supplied from the lower tape reel.



MOTOR UNIT

Purpose

Provides mechanical rotating motion for the reader unit.

Operation

The reader drive motor unit is a synchronous type unit, rated at 1/150 hp, single-phase 115 volts ±10%, 60/50 Hz, ac. It operates at 1800 rpm at 60 Hz and is equipped with a starting capacitor and two windings: start and main. Initially, power is applied to the capacitor and start winding. As the rotor approaches its operating speed, the main winding is substituted for the start winding.

TAPE HANDLING DOORS

3.04 Power Winders

READER TAPE WINDER

Purpose

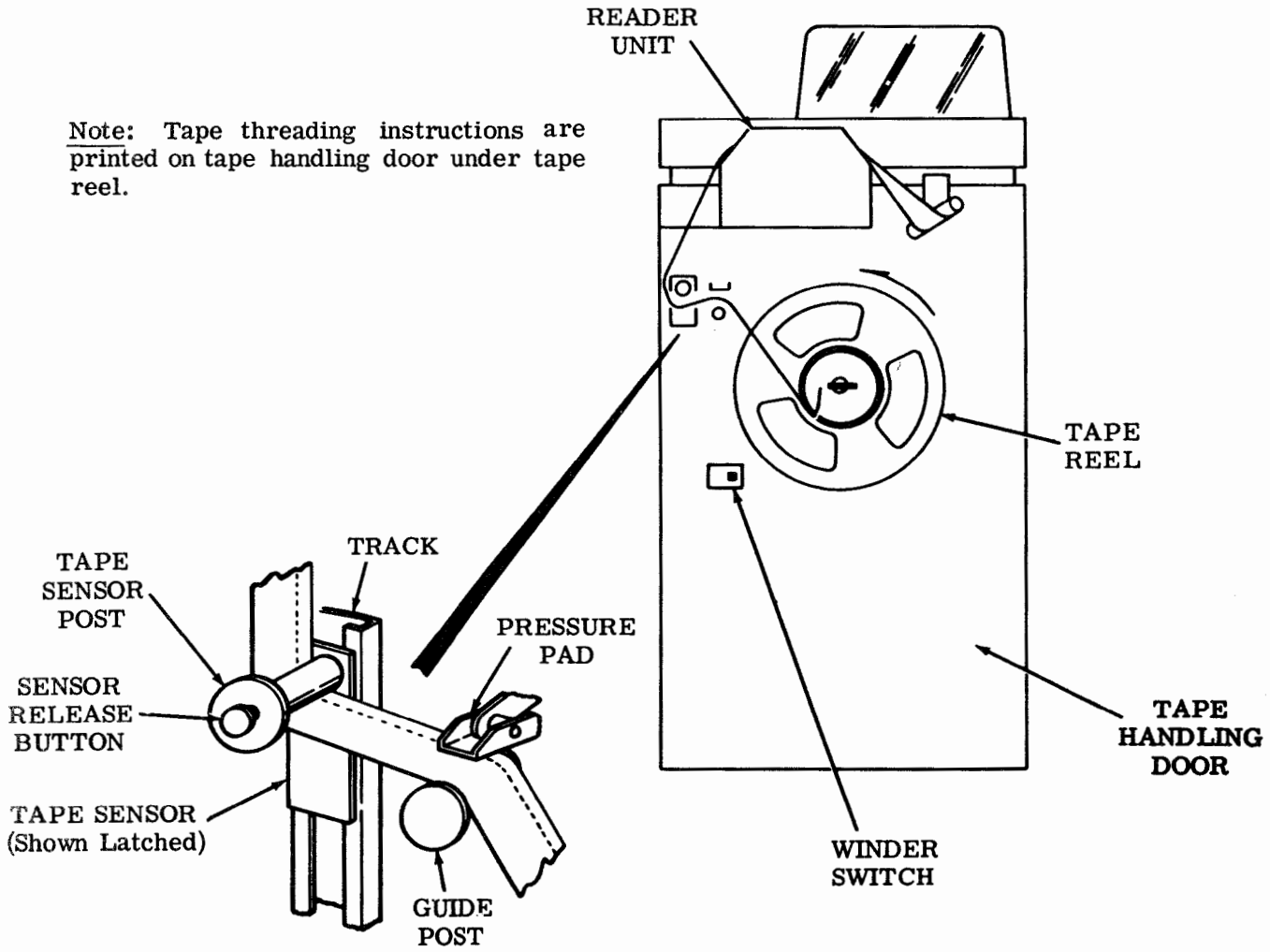
Provide controlled power winding of tape from the reader unit.

Operation

Tape from the reader unit is wound by a motor-driven reel when both the winder switch and the reader winder sensing switch (Figure 5) are closed. Power to the motor is removed when either of these switches is open.

With tape threaded from the reader unit to the winder reel, pushing the sensor release button unlatches the tape sensor and causes a loop of tape to form. As tape is fed from the reader unit the tape loop lengthens allowing the tape sensor to slide downward in its track. As the tape sensor approaches the bottom of the track it operates the reader winder sensing switch (mercury-type) which closes the circuit from the winder switch to the reader winder (shaded-pole) motor, driving the reel. As the reel turns, the tape loop shortens, causing the tape sensor to move upward and open the reader winder sensing switch. This cycle is repeated when tape from the reader unit causes the tape sensor to move downward.

Note: Tape threading instructions are printed on tape handling door under tape reel.



3.05 Power Winders (Continued)

REPERFORATOR TAPE WINDER

Purpose

Provide controlled power winding of tape from the reperforator.

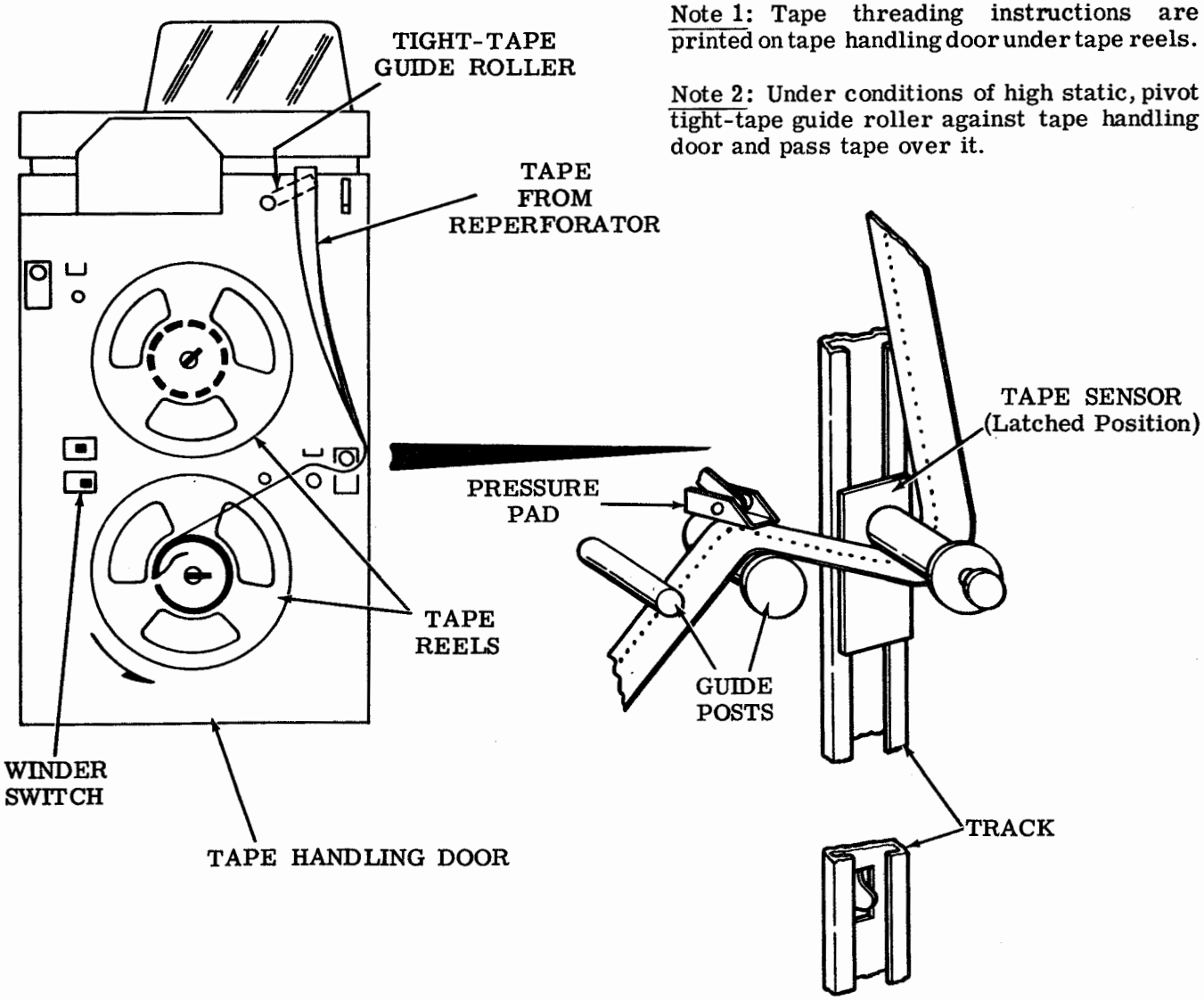
Operation

Tape from the reperforator is wound by a motor-driven reel when both the winder switch and the reperforator winder sensing switch (Figure 5) are closed. Power to the motor is removed when either of these switches is open.

With tape threaded from the reperforator to the winder reel, pushing the sensor release button unlatches the tape sensor and causes a loop of tape to form. As tape is fed from the reperforator the tape loop lengthens allowing the tape sensor to slide downward in its track. As the tape sensor approaches the bottom of the track it operates the reperforator winder sensing switch (mercury-type) which closes the circuit from the winder switch to the reperforator winder (shaded-pole) motor, driving the reel. As the reel turns, the tape loop shortens, causing the tape sensor to move upward and open the reperforator winder sensing switch. This cycle is repeated when tape from the reperforator causes the tape sensor to move downward.

Note 1: Tape threading instructions are printed on tape handling door under tape reels.

Note 2: Under conditions of high static, pivot tight-tape guide roller against tape handling door and pass tape over it.



3.05 Power Winders (Continued)

FAST REWINDER

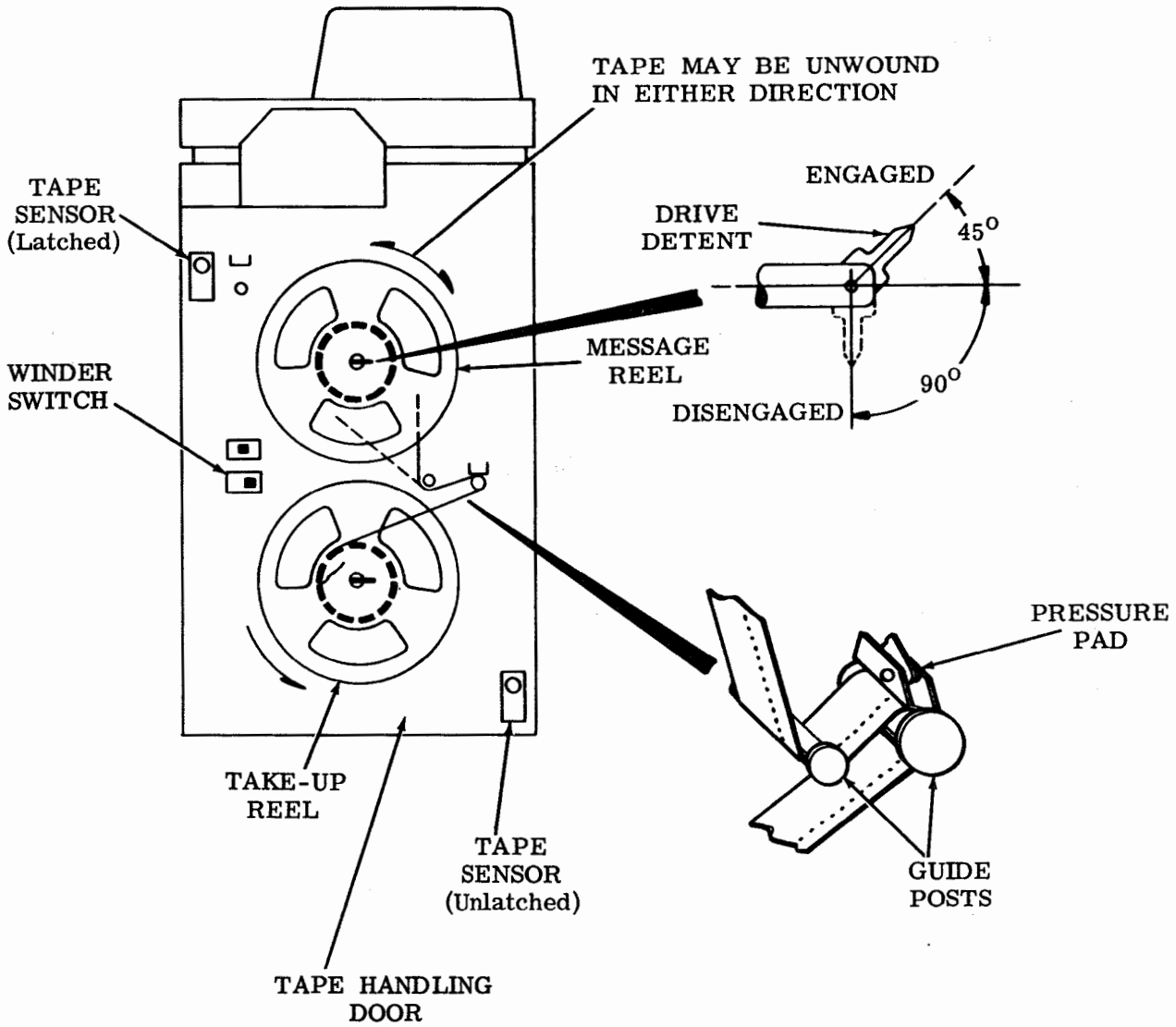
Purpose

Provide fast transfer of tape from upper reel to lower reel.

Operation

With the message reel on the upper winder hub and the reel driving detent disengaged to permit the reel to free wheel on the spindle, the tape is routed to the take-up reel in a path that bypasses the tape sensor. Then, with the reel driving detent fully engaged, the tape sensor is unlatched and moved to its lowest position. This operates the tape sensor switch in series with the lower winder motor. With the drive motor conditioned, the take-up reel is driven when the winder switch is placed in the W (wind) position.

Note: Tape threading instructions are printed on tape handling door under tape reels.



3.06 Power Winders (Continued)

POWER UNWINDER

Purpose

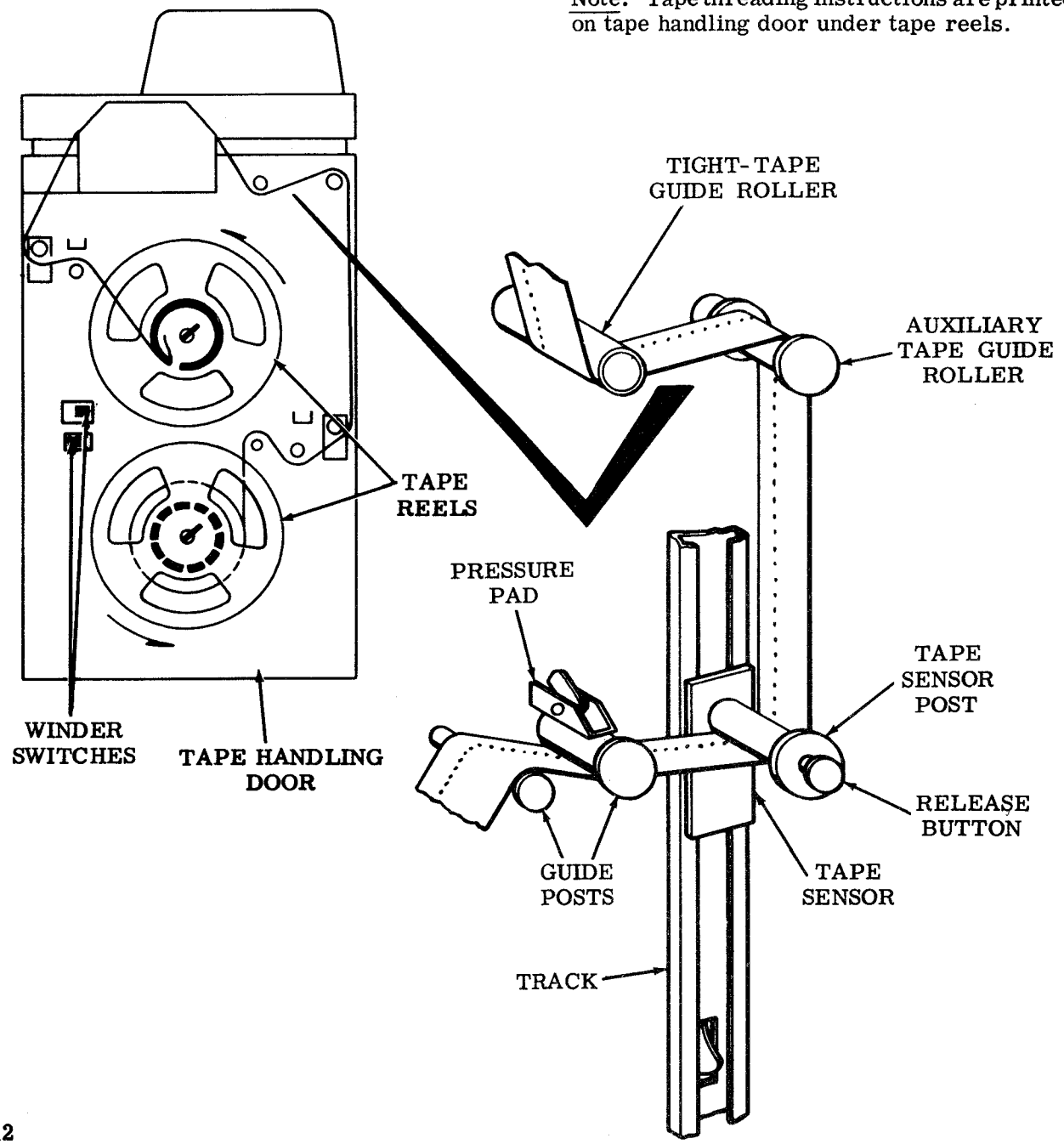
Provide power unwinding from a message reel to the reader unit.

Operation

Tape is routed to unwind in a counterclockwise direction from the lower message reel to the reader unit and then to the upper take-up reel. When the tape sensor associated with the lower reel is released and the winder switch is placed in the U (unwind) position, the reel is driven and the unwinding tape permits the tape sensor to slide down its track.

As the tape sensor moves downward it opens the upper unwinder sensing switch in series with the unwinder drive motor, turning the motor off. When the reader demands additional tape, the tape loop shortens raising the tape sensor and closing the tape sensor switch to repeat the power unwind cycle.

Note: Tape threading instructions are printed on tape handling door under tape reels.



3.07 Tape Director and Intermediate Tape Storage

TAPE DIRECTOR AND STORAGE BIN

Purpose

Provide three paths for routing reperforator message tape including to a 50-foot capacity intermediate tape storage bin.

Operation

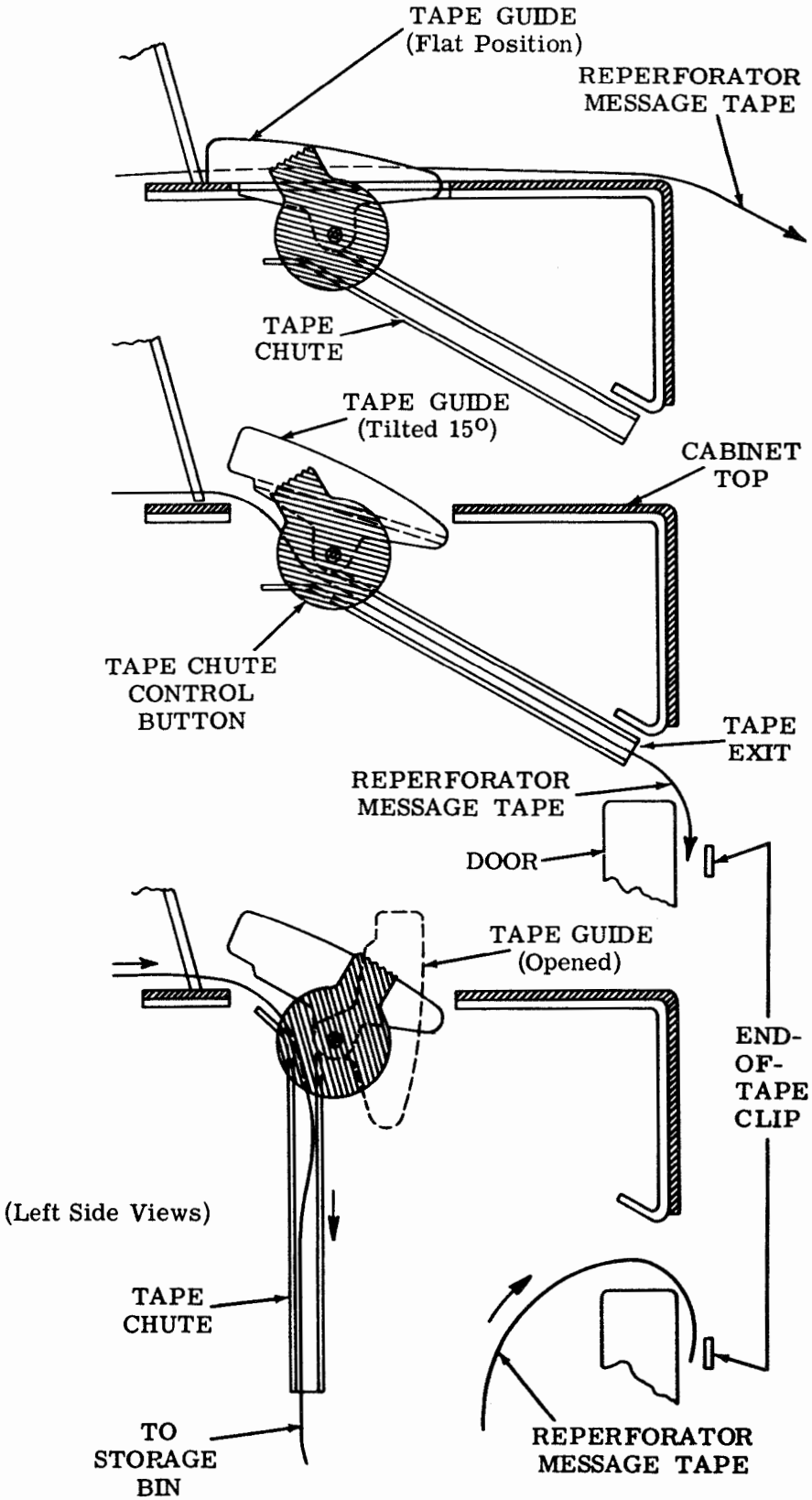
The tape director consists of a three-position tape guide and a two-position tape chute operated by a control button. The tape guide, in its flat position, directs reperforator message tape across the cabinet top, bypassing both the tape chute and the storage bin.

In its tilted position (15°), the tape guide deflects the reperforator tape through the tape chute and the tape exit slot provided in the cabinet for further routing.

In its fully opened position, the tape guide permits pulling the tape back through the tape chute for inspection.

Pushing the tape chute control button to the rear position allows the tape chute to guide the lead end of the tape through the front of the cabinet top so that it may be retained. Pulling the chute control button forward with the tape end retained directs the tape downward through the chute and into the storage bin.

Note: If end of tape falls into storage bin, place tape guide into 15-degree tilted position and scoop tape out with pencil point or other suitable instrument.



37 NON-TYPING REPERFORATOR

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS

		PAGE
1.	GENERAL	1
2.	DESCRIPTION	1
	TECHNICAL DATA	4
3.	PRINCIPLES OF OPERATION	4
	MECHANISM INDEX	4
	BASIC UNIT	5
	VARIABLE FEATURES	20

1. GENERAL

1.01 This section provides description and principles of operation for the 37 non-typing reperforator (Figure 1).

1.02 The reperforator is an electromechanical unit which records information in tape as combinations of perforations representative of the presence or absence of a signal pulse in each of the eight levels of intelligence applied to the unit electrically. The information is received in a form corresponding to the USA Standard Code for Information Interchange (ASCII) and is translated into the necessary mechanical motions to perforate the code holes and feed the tape. Motive power is supplied through an external motor unit and drive mechanism. The reperforator can operate at speeds up to 150 wpm.

1.03 Character representations, or graphics, are the alphabetic, numeral or symbol intelligence representations. Function representations are the coded equivalent of operations auxiliary to transmission or reception of the graphics, such as carriage return, line feed, or signal bell. Both character and function representations are perforated into the tape, so it can be used in conjunction with typing equipment.

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

1.05 References in the text to left or right, front or rear, up or down, etc refer to the perforator in a normal operating position and viewed by an operator facing the punch block.

2. DESCRIPTION

2.01 The basic reperforator consists of the selector, transfer, function, perforator and backspace mechanisms. The selector mechanism includes a 2-coil magnet, selecting cam sleeve and a rangefinder. The rangefinder permits adjusting the selector mechanism in relation to the signal code.

2.02 Information received by the selector mechanism is transferred to the perforator mechanism by the transfer mechanism. The function mechanism, consisting of a trip

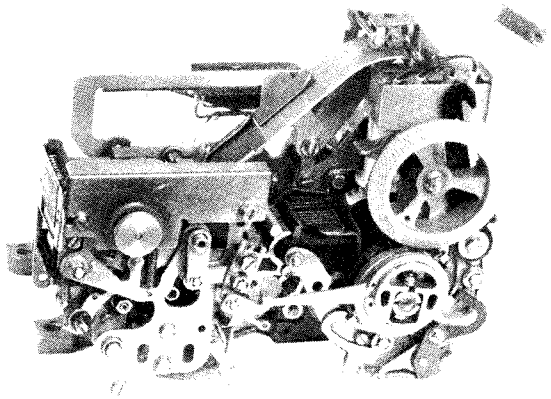


Figure 1 - Non-Typing Reperforator

HANDWHEEL

- Permits normal tape feeding.

TAPE FEED MECHANISM

- Single tape threading procedure.
- Ten characters per inch feeding.

TAPE CHUTE

TAPE DEPRESSOR

- Prevents excess slack in tape.

TAPE ROLLER

SELECTOR MAGNETS

RANGE FINDER

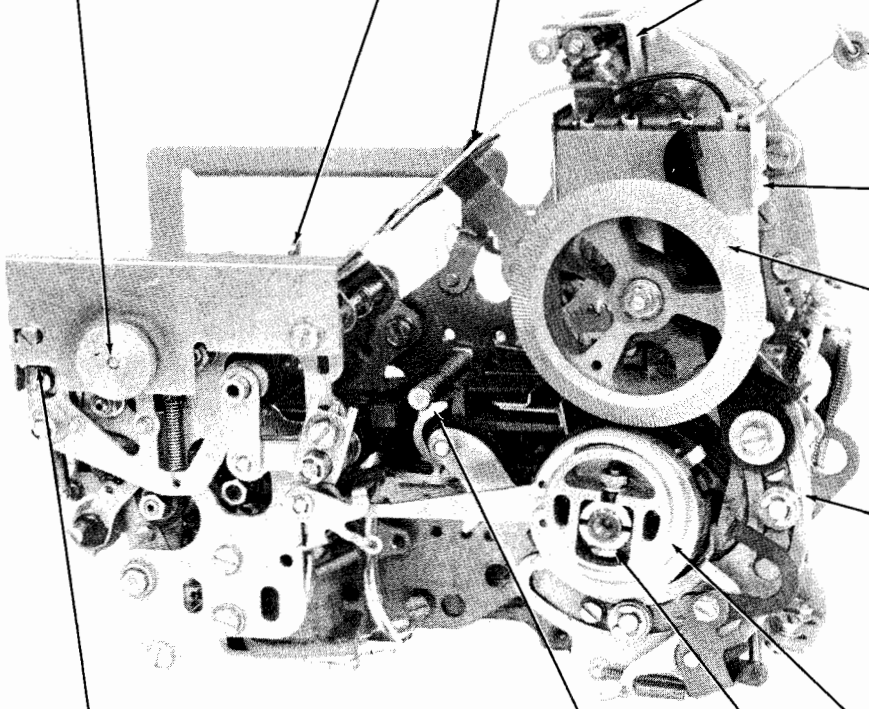
- Selects most favorable period for sampling character bits.

SELECTOR MECHANISM

- Receives and converts electrical code input to mechanical code output.

SELECTOR CLUTCH

(Right Side View)



PERFORATOR MECHANISM

- Produces fully perforated code holes and feed holes.
- Produces advanced feed holes — 0.013 inch ahead of code holes.
- Perforated code holes correspond to marking bits in the signal input. Nonperforated portions of the tape correspond to spacing bits in the original input.

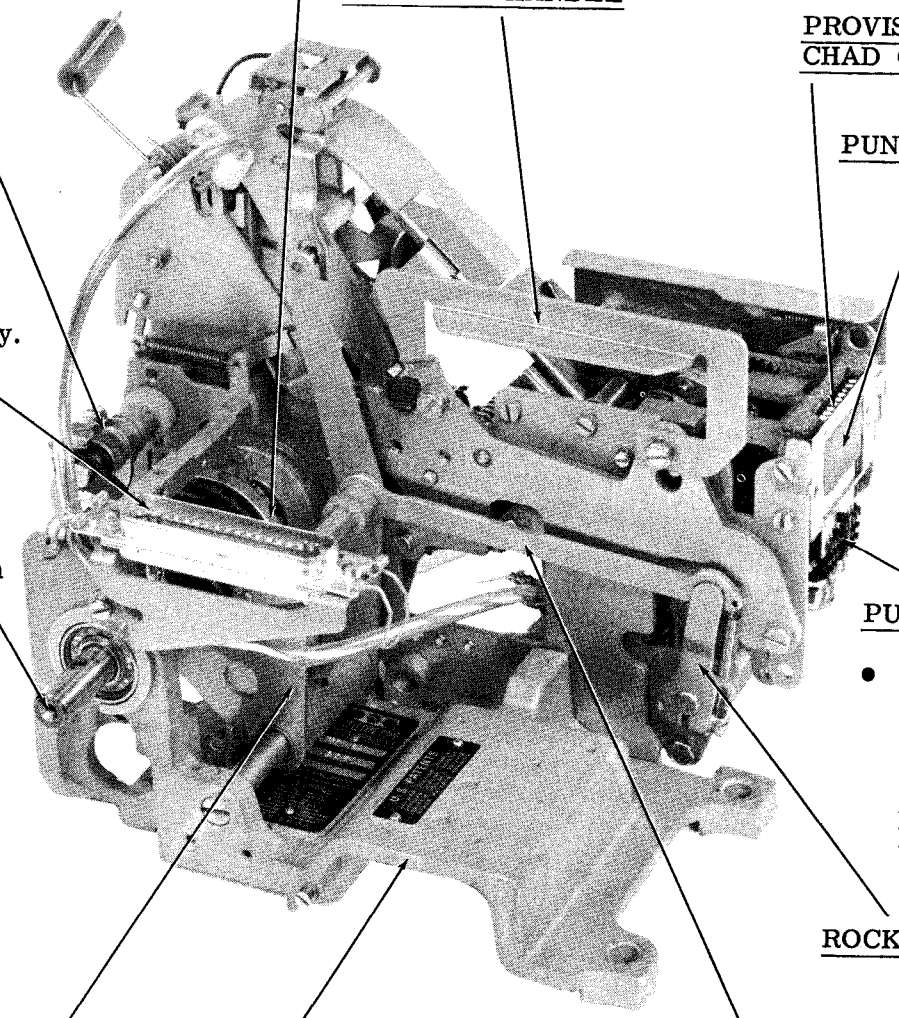
TRANSFER MECHANISM

- Transfers data sensed by selector mechanism to perforator mechanism

BACKSPACE MECHANISM

- Retracts tape one character each time mechanism is actuated.
- Permits eliminating errors in the tape by overpunching.
- Power operated.

Figure 2 - 37 Non-Typing Reperforator (Basic Unit)



FUNCTION CAM-CLUTCH

- Transfers timed motion to rocker bail.

CARRYING HANDLE

TRIP SHAFT

PROVISION FOR CHAD CHUTE

PUNCH BLOCK

ELECTRICAL CONNECTOR

- Interconnects unit with external circuitry.

MAIN SHAFT

- Transfers rotating motion from external source to unit.
- External gears permit unit operation at speeds up to 150 WPM.

PUNCH PINS

- Pins and corresponding holes are from left to right — 1, 2, 3, feed hole, 4, 5, 6, 7, and 8.

ROCKER ARM

CAST FRAME

- Provides mounting facilities for perforator mechanisms and accessories.
- Permits installation on base.

PERFORATOR DRIVE LINK

(Left Front View)

ROCKER BAIL

- Transfers motion from function cam-clutch to perforator mechanism via drive link and rocker arm.

Figure 3 - 37 Non-Typing Reperforator (Basic Unit)

assembly, cam clutch, and rocker bail, transfers timed motion to the perforator mechanism. The function cam clutch is tripped by the selector mechanism. It drives the rocker bail which transmits power to the perforator mechanism through the perforator drive link and rocker arm.

2.03 The perforator mechanism includes punch pins, punch slides and punch slide latches which are positioned according to the signal input by the transfer mechanism. The position of the punch slides determines the operation of the various punch pins.

2.04 The tape is fed by a feed wheel and die wheel which indents but does not perforate the tape. The feed hole is perforated in the punch block.

2.05 The features of the reperforator are illustrated and described in Figures 2 and 3.

2.06 Variable features available with the reperforator include manual interfering tape feedout, which permits preparing a continuous length of delete characters in the tape. Signal inputs are not recorded during the operation of this feature. Other variable features include code reading contacts, operated by the punch slides, for electrical distribution of the perforated information, and auxiliary timing contacts.

TECHNICAL DATA

Dimensions (approximate)

Width	7-1/2 inches
Depth	6-1/2 inches
Height	6 inches
Weight	5-1/2 pounds

Signal

Code	USA Standard Code for Information Interchange (ASCII)
Current	0.500 amperes

Tape

Type	Standard communications
Width	1 inch
Perforations	8-level, fully perforated
Holes/inch	10
Advanced feed hole	0.013 inch

Operating Speed

Up to 150 wpm

3. PRINCIPLES OF OPERATION

3.01 The principles of operation are presented in a block diagram, explanatory text covering the general operation of basic unit, and in a series of mechanism drawings. In each mechanism drawing, the illustrations are supported with text describing the purpose and operation of the mechanism. Where possible, the mechanism drawings are arranged in the order in which the mechanism operates.

3.02 The contents of this part are listed alphabetically in the following mechanism index.

MECHANISM INDEX

ITEM	PAGE
BASIC UNIT	
Backspace mechanism	19
Function mechanism	15
Main shaft mechanism	13
Perforator mechanism	17
Selector mechanism	7
Transfer mechanism	14
VARIABLE FEATURES	
Code reading and auxiliary timing contacts	21
Manual interfering tape feedout mechanism	20

BASIC UNIT

3.03 Unit Operation

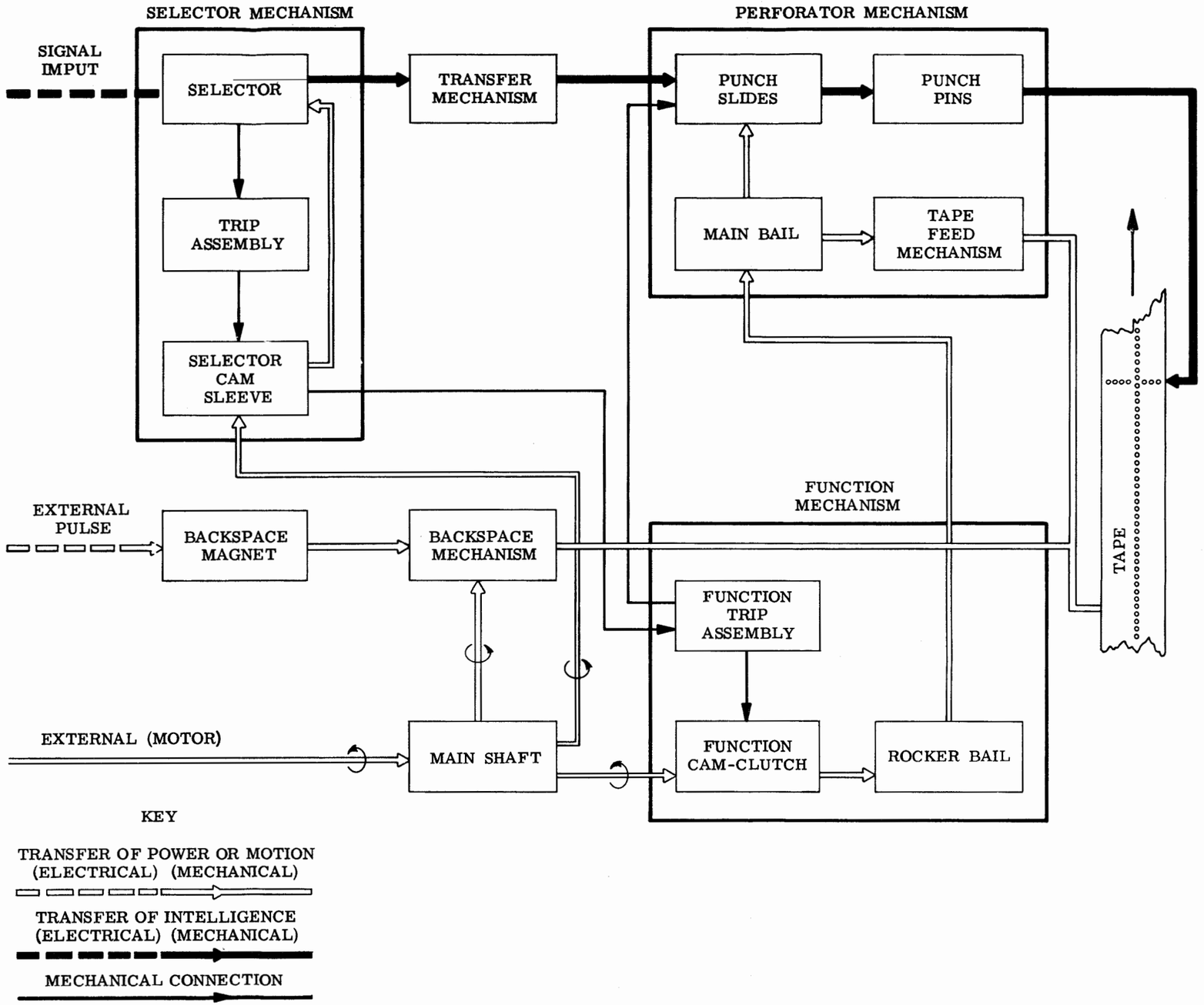
GENERAL OUTLINE OF OPERATION

Rotary motion from an external source is applied to the main shaft which turns constantly as long as the unit is under power.

The serial signal code input is applied electrically to the selector mechanism. The start pulse of each code combination causes the selector, through a trip assembly, to trip the selector cam sleeve. The main shaft then imparts motion to the cam sleeve throughout the selecting cycle. The selector cam sleeve, in turn, transfers timed motion to the selector, which converts the intelligence bits of the code combination into a corresponding mechanical arrangement. Near the end of the selecting cycle, the cam sleeve actuates the function trip assembly which trips the function cam-clutch and releases the punch slides of the perforating mechanism so they can receive the code arrangement from the selector via the transfer mechanism. The selector cam sleeve is then disengaged and remains inoperative until the next code combination is received.

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 perforator main bail which, in turn, distributes it to the punch slides and the tape feed mechanism. The punch slides, having received the arrangement from the selector mechanism, cause the punch pins to perforate code holes in the tape corresponding to the code pulses received by the selector mechanism. Late in the function cycle, the tape feed mechanism advances the tape one character space. The function cam-clutch is then disengaged and remains stationary until again tripped by the selector cam sleeve. 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 and advancing the tape, the selector mechanism may be processing the next code combination.

Pulsing the backspace magnet actuates the backspace mechanism which retracts the tape through the punch block.



3.04 Selector Mechanism

START-STOP

Purpose

Engage-disengage selector cam sleeve with main shaft. Responds to start and stop bits of character.

Operation

Engage selector cam sleeve with main shaft.

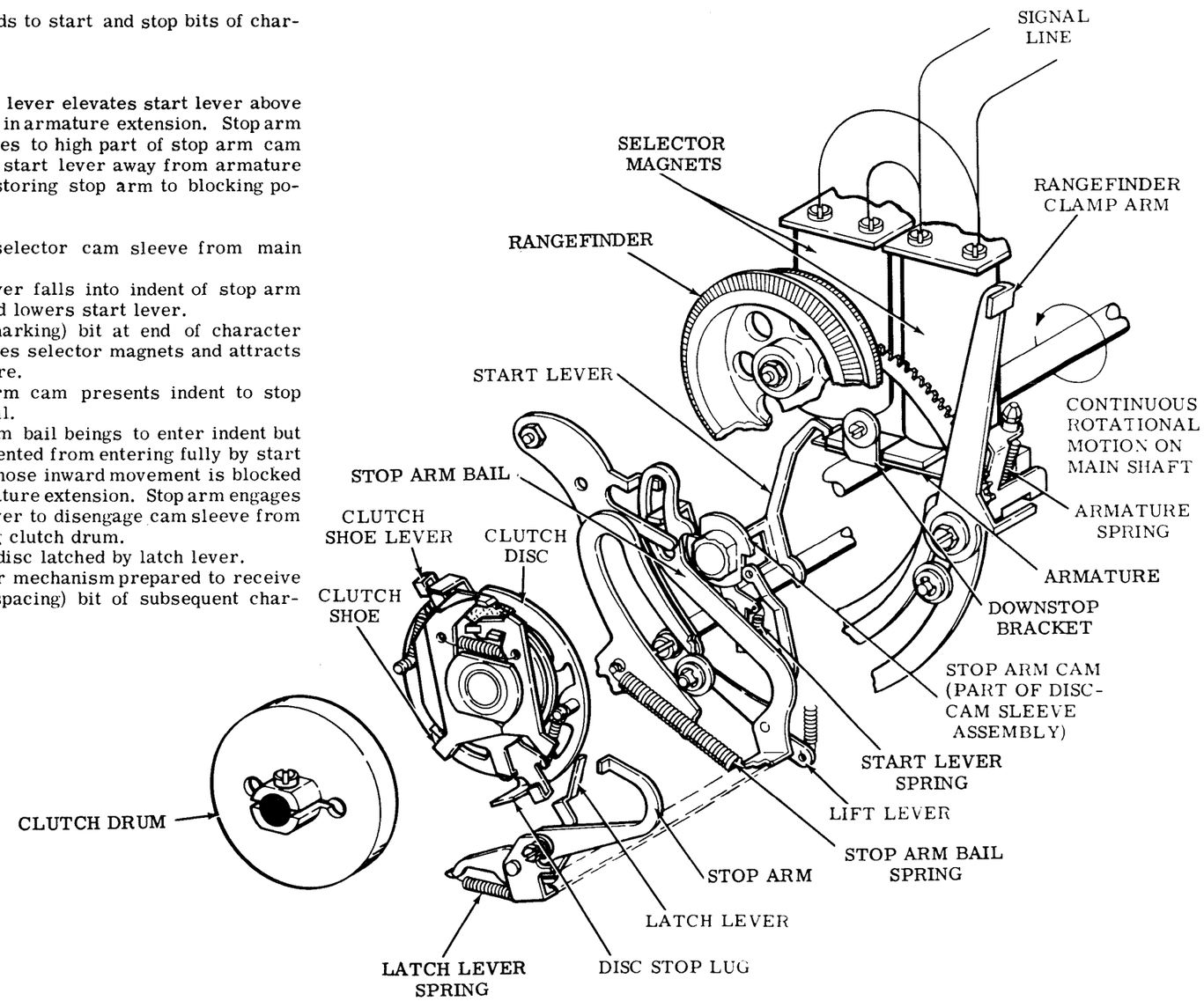
(1) Start (spacing) bit of new character de-energizes selector magnets and releases armature.
(2) Armature, under tension of armature spring, falls against downstop bracket.
(3) Absence of armature extension unlatches start lever which, under tension of start lever spring, pivots inward moving the stop arm bail into the indent of its cam. As the stop arm bail pivots inward, the attached stop arm pivots out of path of clutch shoe lever.
(4) Clutch shoe levers expand to engage disc and cam sleeve assembly with rotating clutch drum.

Raise, reset, and lower start lever. Block clutch shoe lever.

(1) Cam sleeve starts rotating. Selector cam sleeve mechanically operates its cam followers in a prearranged sequence as code level signals (marking or spacing) operate the armature (3.06).
(2) Between the second and third character bit, lift lever elevates start lever above opening in armature extension. Stop arm bail rides to high part of stop arm cam forcing start lever away from armature and restoring stop arm to blocking position.

Disengage selector cam sleeve from main shaft.

(1) Lift lever falls into indent of stop arm cam and lowers start lever.
(2) Stop (marking) bit at end of character energizes selector magnets and attracts armature.
(3) Stop arm cam presents indent to stop arm bail.
(4) Stop arm bail beings to enter indent but is prevented from entering fully by start lever whose inward movement is blocked by armature extension. Stop arm engages shoe lever to disengage cam sleeve from rotating clutch drum.
(5) Clutch disc latched by latch lever.
(6) Selector mechanism prepared to receive start (spacing) bit of subsequent character.

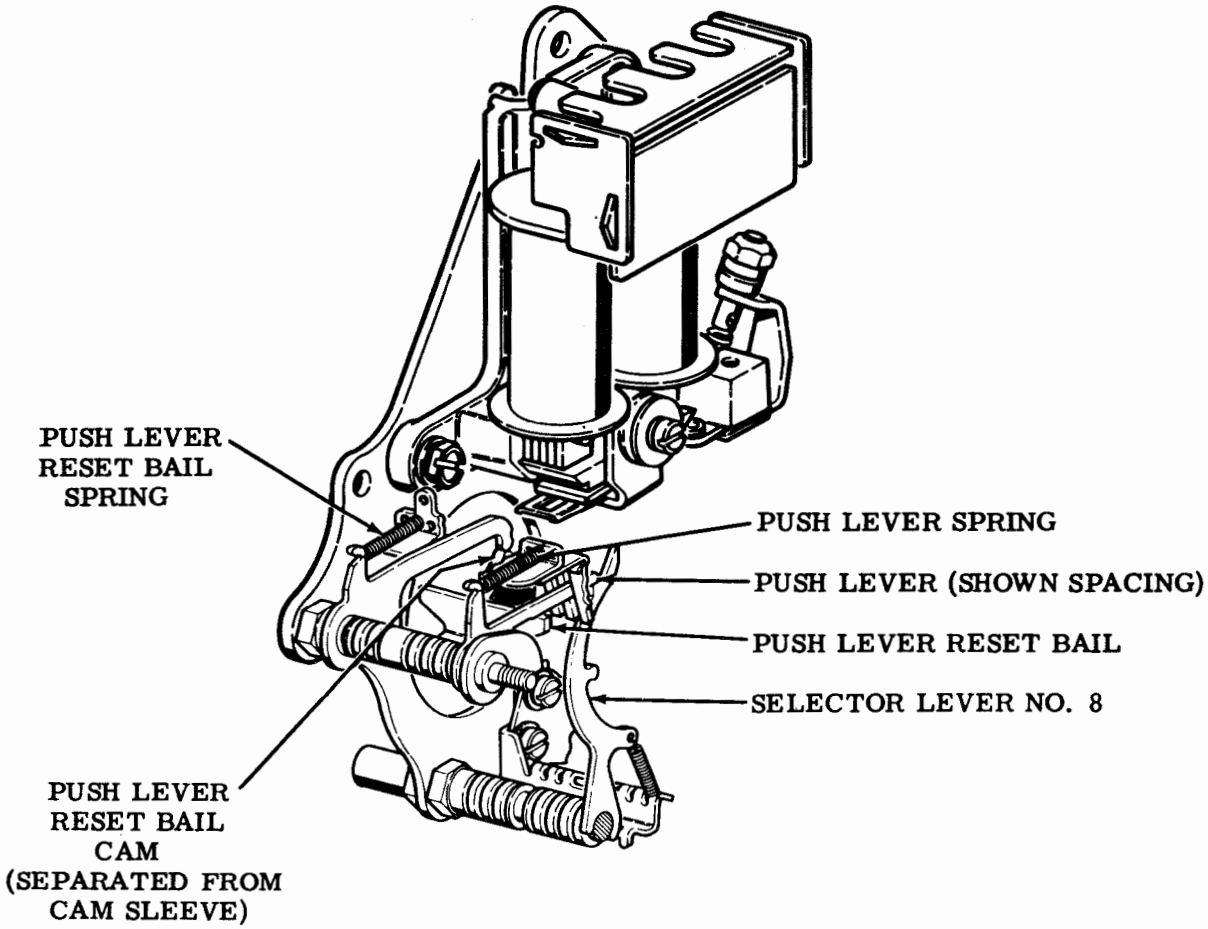


RANGEFINDER

Purpose

Mechanically adjust position of stop arm, stop arm bail, lift lever, and cam sleeve in order to select most favorable period for sampling character bits as received by selector magnets. Rangefinder clamp arm, when pivoted clockwise, permits rangefinder scale adjustment.

3.05 Selector Mechanism (continued)



PUSH LEVER RESET

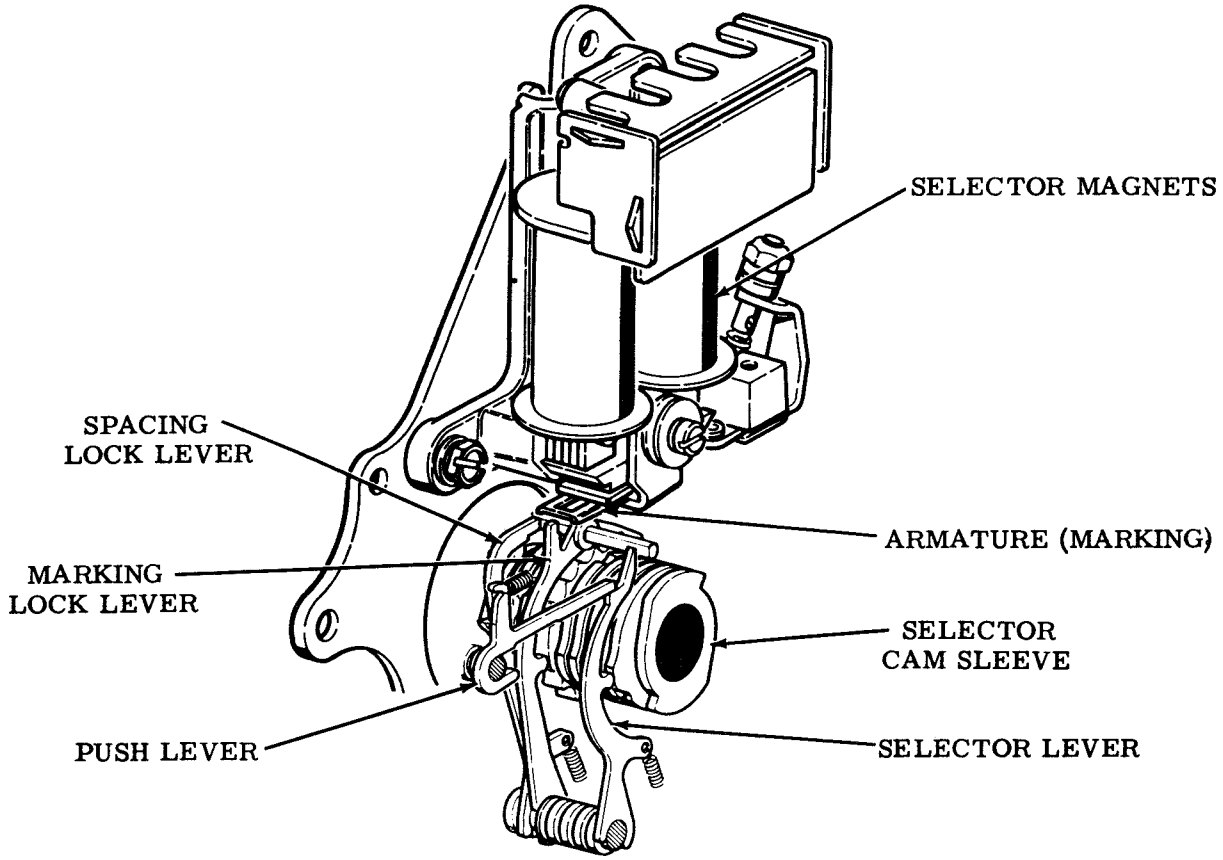
Purpose

Strip previous character from push levers after start bit causes selector cam sleeve to engage main shaft.

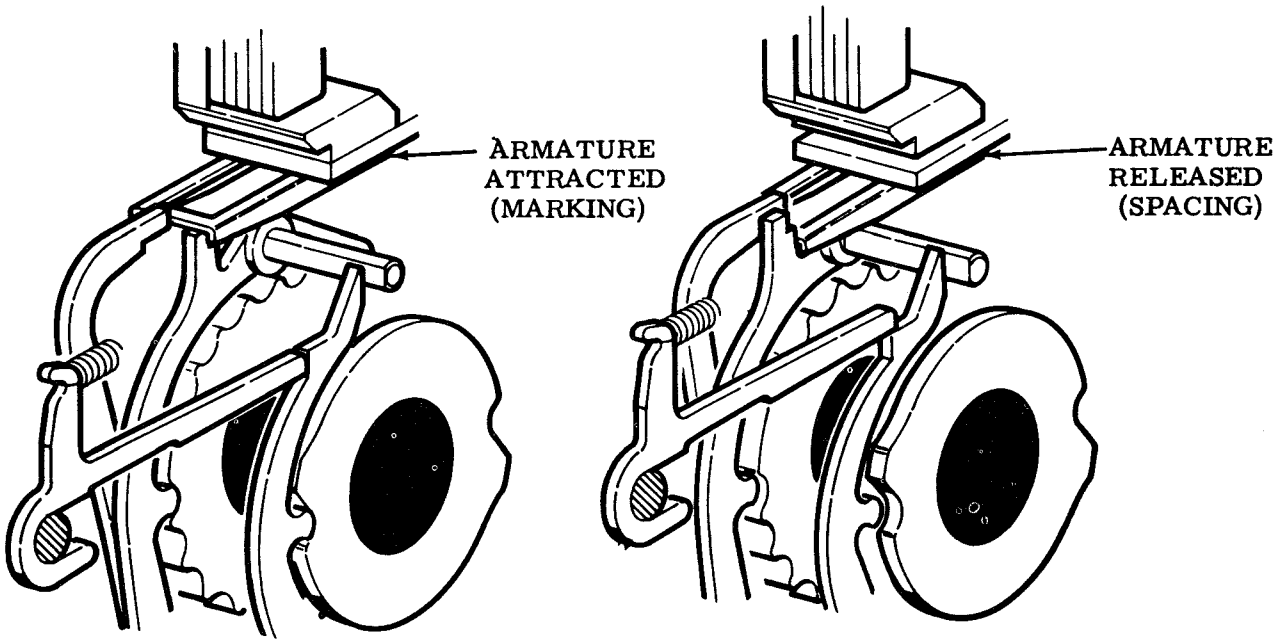
Operation

As cam sleeve begins rotating, high part of push lever reset bail cam lifts push lever reset bail against tension of spring. Bail pivots, lifting and unlatching the marking push levers from behind their selector levers. Bail returns to unoperated position when lobe drops from high part of cam. All push levers, except auxiliary push lever (3.07) will then be in spacing condition.

3.06 Selector Mechanism (continued)



VIEW (A)



VIEW (B) VIEW (C)

SELECTION

Purpose

Sequentially position push levers as marking and spacing intervals are applied to selector magnets.

Operation

View (A) - Idle Condition

(1) Selector cam sleeve shown before starting selection cycle. Marking lock lever, spacing lock lever, and eight selector levers held against cam sleeve by their individual springs; the lobes of each lever are riding on high part of selector cam sleeve.

(2) As marking and spacing signal intervals are applied to selector magnets, selector cam sleeve rotates and actuates selector levers.

View (B) - Marking Condition

(1) When marking impulse is received, the spacing lock lever is blocked by end of armature. Top of marking lock lever moves under armature, supporting armature in marking position until next signal transition is due.

(2) During marking condition, selector levers are not blocked by armature extensions but are permitted to ride against their respective cams. Only that selector lever which is opposite the indent in its cam, can affect its push lever.

(3) As the lobe of the selector lever is drawn into its cam indent, the push lever drops off the shelf of its selector lever. When the selector lever is forced out of its indent, the selected push lever slides to the marking position.

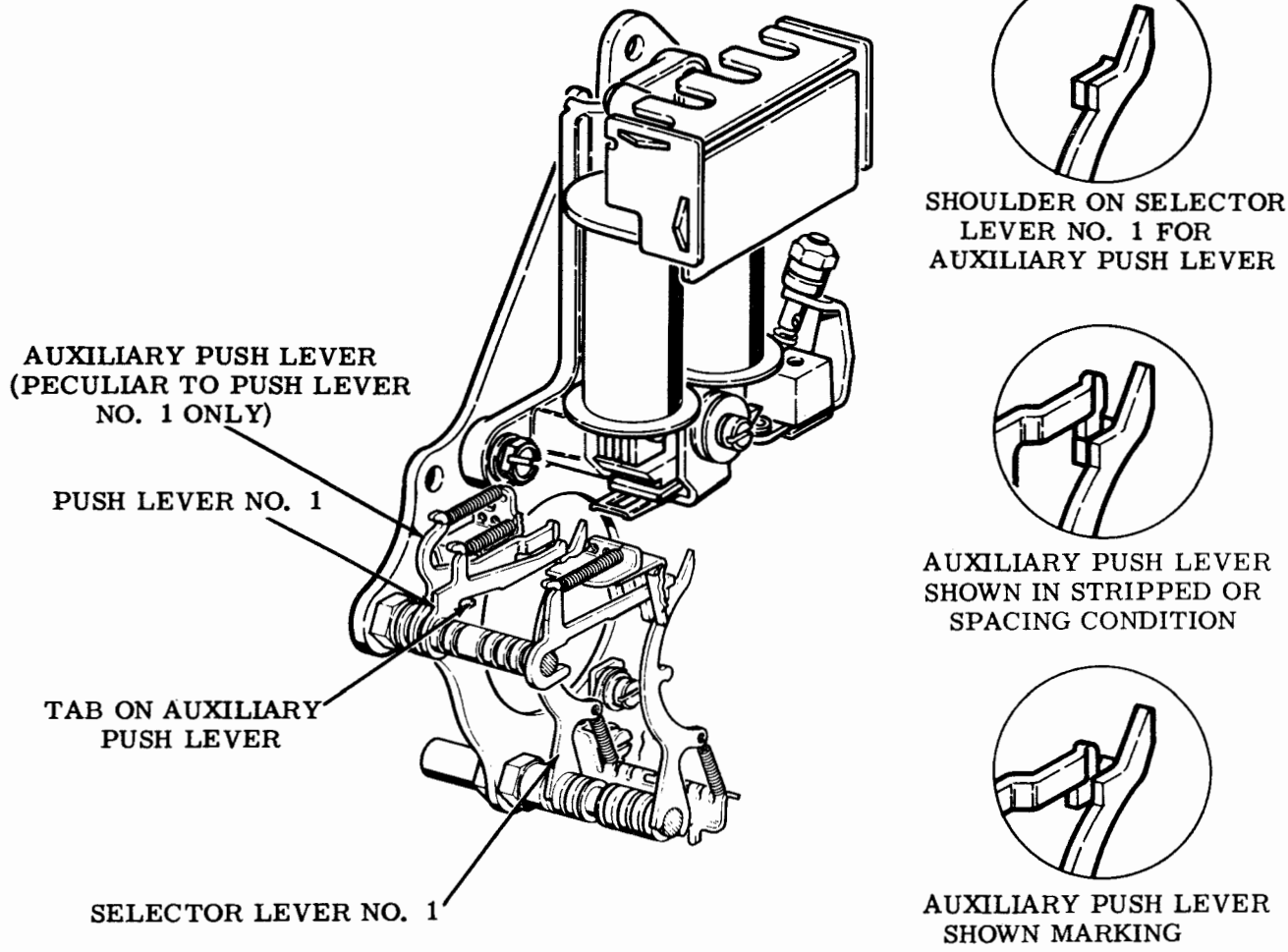
View (C) - Spacing Condition

(1) When spacing interval is received, the marking lock lever is blocked by end of armature. Spacing lock lever swings above armature and locks it in the spacing position until next signal transition is due.

(2) During spacing condition, selector levers are prevented from riding their respective cams by extensions on marking lock lever.

(3) Lobe of selector lever opposite its cam indent cannot enter indent fully. Push lever will not latch behind selector lever but will remain on shelf.

3.07 Selector Mechanism (continued)



AUXILIARY PUSH LEVER

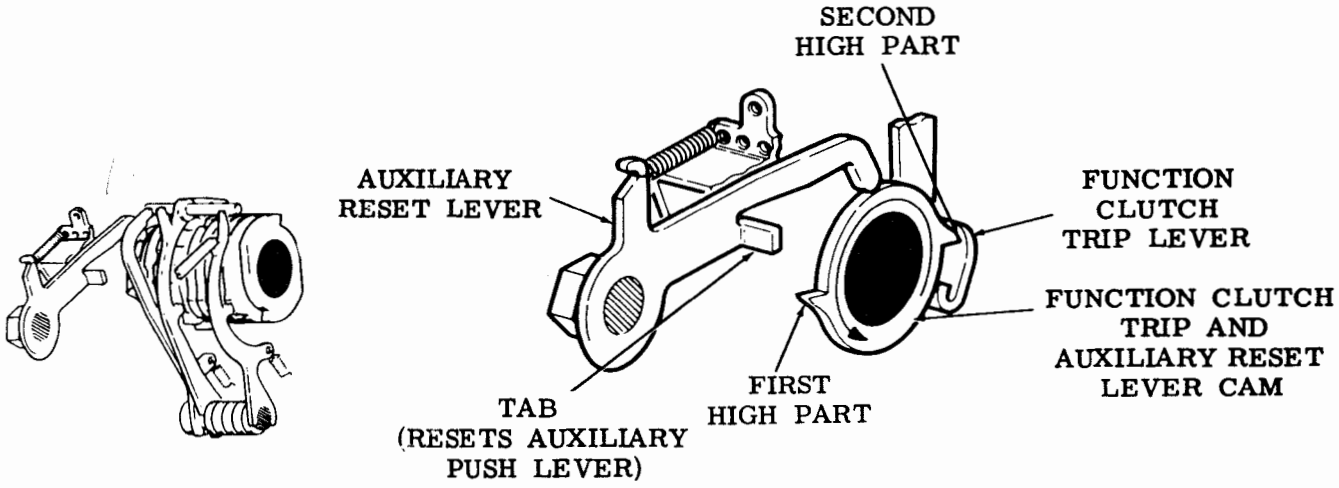
Purpose

Senses marking or spacing position of selector lever number 1. Normal strip operation (push lever reset) occurs during reception of code bit number 1 and does not permit push lever number 1 to sense position of its selector lever.

Operation

Auxiliary push lever responds to marking impulse for push lever number 1. When bit number 1 is marking, auxiliary push lever drops behind shoulder of selector lever as push lever number 1 is stripped. Tab on auxiliary push lever carries push lever number 1 to marking position. When push lever reset bail (3.05) returns to unoperated position, push lever number 1 is behind, but not touching, its selector lever. Approximately half way through selection cycle, auxiliary push lever is stripped by auxiliary reset lever (3.08). Push lever number 1 is then latched by selector lever number 1.

3.08 Selector and Main Shaft Mechanisms (continued)



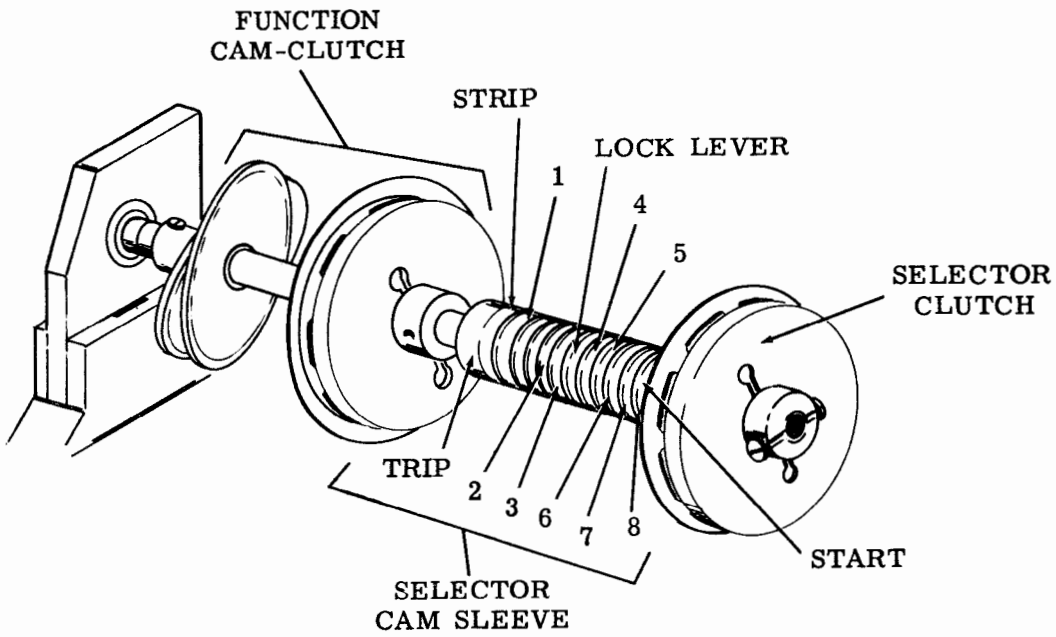
TRIP AND RESET OTHER MECHANISMS

Purpose

Reset auxiliary push lever.

Operation

Consider that selector clutch is engaged and cam sleeve is rotating in direction illustrated. Approximately mid cycle the second high part of cam operates auxiliary reset lever. Tab on auxiliary reset lever strips auxiliary push lever. About the same time, first high part of the cam operates the function clutch trip lever to initiate the function cycle (3.10).



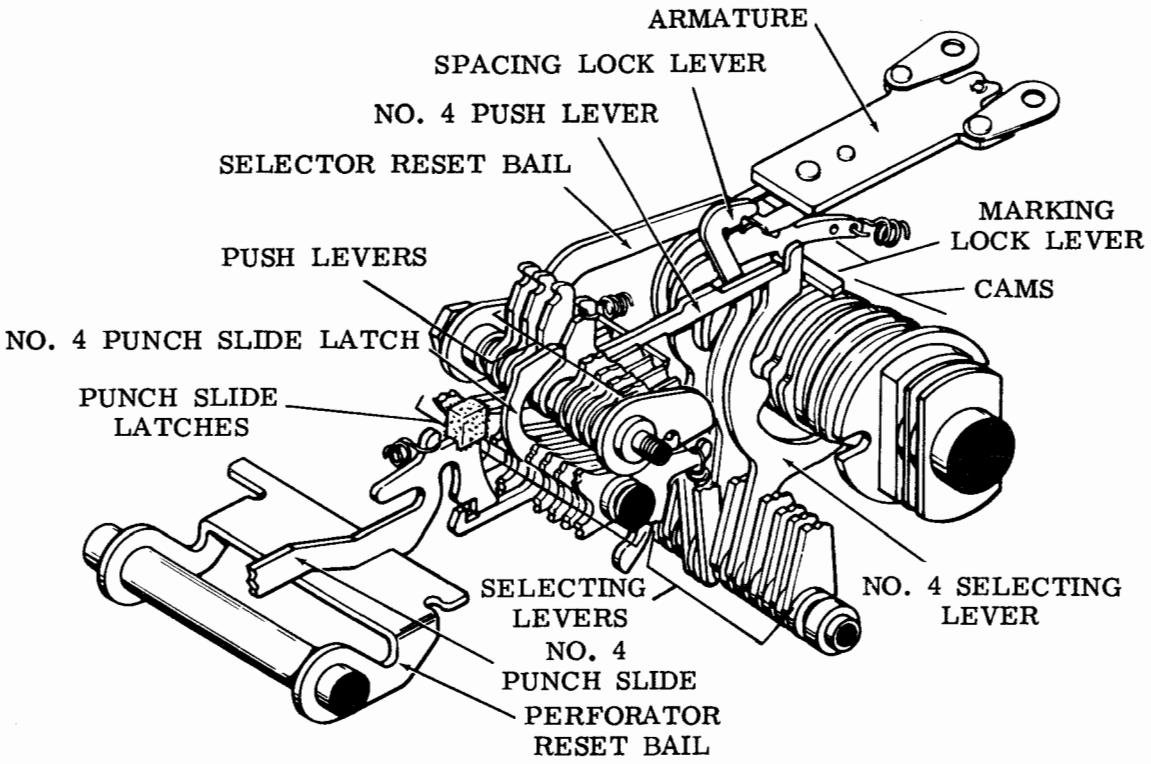
MAIN SHAFT

Purpose

Transfer motor electro-mechanical rotating motion (power) and drive the reperforator mechanisms.

Operation

Rotary motion from an external source is received by the main shaft which rotates continuously as long as the unit is under power. Selecting and function cam-clutches distribute this motion to the selector and function mechanisms.



TRANSFER OF SELECTED DATA

Purpose

To provide a path for transferring the signal intelligence from the selector mechanism to the punch slides in the perforator mechanism.

Operation

Selected push levers, in moving to the left as determined by their respective cams, rotate associated punch slide latches counterclockwise. Just before the eighth push lever is selected, the selecting cam through the function trip assembly carries the perforator reset bail to release the punch slides. 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. The latches return under spring tension to their unselected position when the push levers are repositioned at the start of the next selection cycle.

3.10 Function Mechanism

TRANSFER OF CONTROLLED MOTION FOR PERFORATION

Purpose

To convey timed and controlled motion to the perforator mechanism.

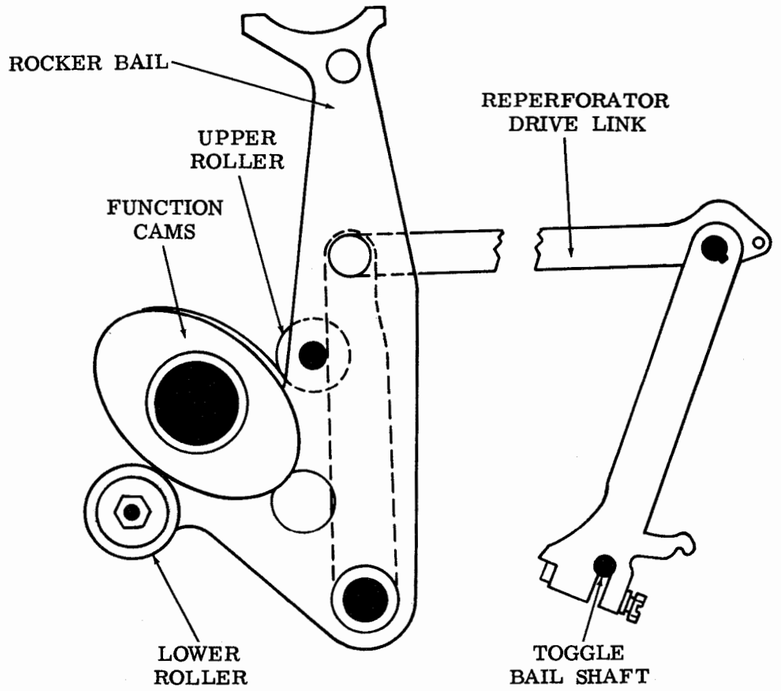
Operation

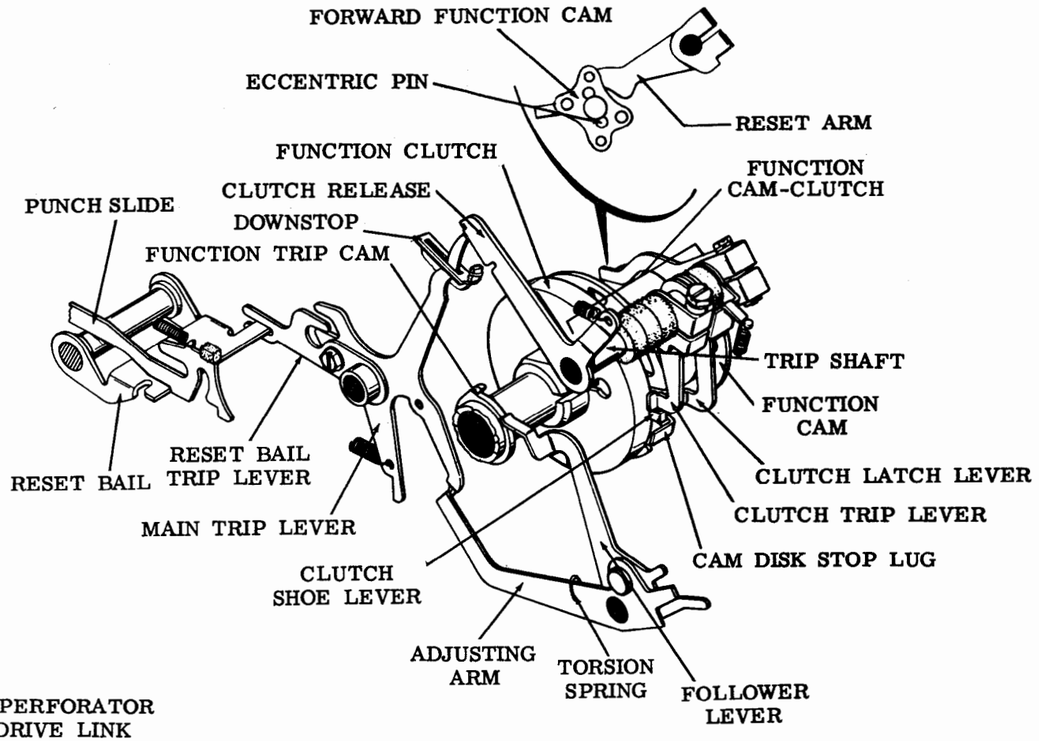
Main shaft motion is conveyed to the perforator mechanism by the function mechanism, comprised of the cam-clutch, rocker bail and a clutch trip assembly. A follower lever rides on the function clutch trip cam which is part of the selector cam sleeve (3.08). Near the end of the selecting cycle, as the main shaft rotates counterclockwise, the high part of the cam pivots the follower lever which, through an attached adjusting arm, rotates the main trip lever counterclockwise. The reset bail trip lever attached to the main trip lever lowers the perforator reset bail and releases the punch slides (3.11), and the upper arm of the main trip lever moves away from the clutch release, which falls against the down-stop and rotates the 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 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 function cam and the rocker bail translate the rotation of the shaft into simple harmonic motion which the rocker bail transfers to the perforator mechanism (3.11).

Each function cycle, the function cams bear against the upper and lower rollers and causes the rocker bail to rock to the left during the first part of the cycle and then back to its home position during the latter part of the cycle.

About midway through the function cycle, an eccentric pin on the function cam lifts the 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.





3.11 Perforator Mechanism

TAPE PERFORATION

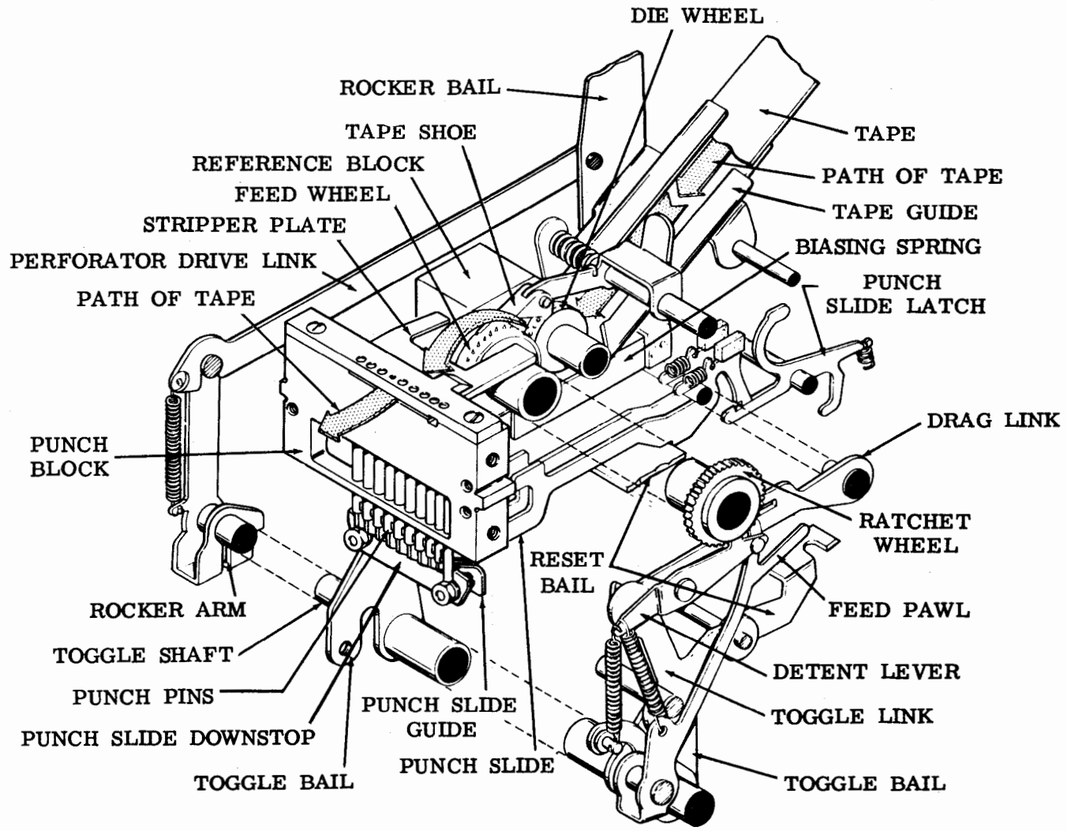
Purpose

To translate the motion received from the function mechanism into feed holes and code holes in the tape.

Operation

The perforator mechanism rolls the tape between a feed wheel and a die wheel which does not perforate the feed hole but merely regulates the amount of tape feed. The punch perforates round holes corresponding to the code combinations received from the signal line and perforates a smaller feed hole positioned between the third and fourth intelligence levels. Intelligence is received from the transfer mechanism by the punch slides, which select the proper punch pins in the punch block assembly. Motion from the rocker bail is distributed to the pins and the tape feed parts by the main bail assembly, which includes the toggle bail, toggle shaft, slide post, toggle links, drag links and the punch slide reset bail. Near the end of the selecting cycle (3.10) the reset bail is lowered and releases the eight punch slides. 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 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.

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, both up and down. The punch pins are positively driven and retracted to produce fully perforated tape.



TAPE FEEDING

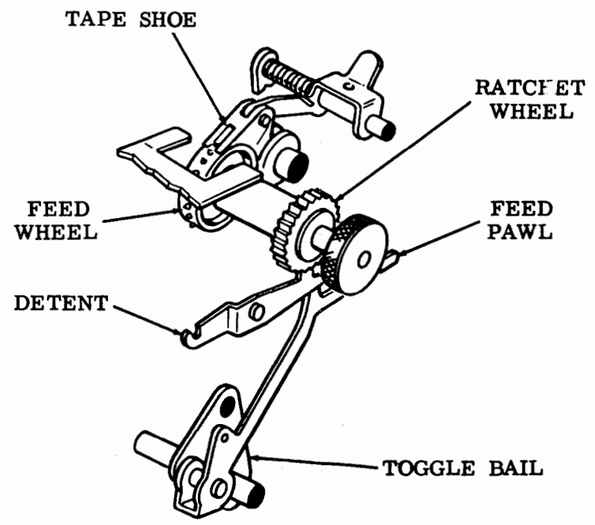
Purpose

To provide regulated feeding of tape for perforation.

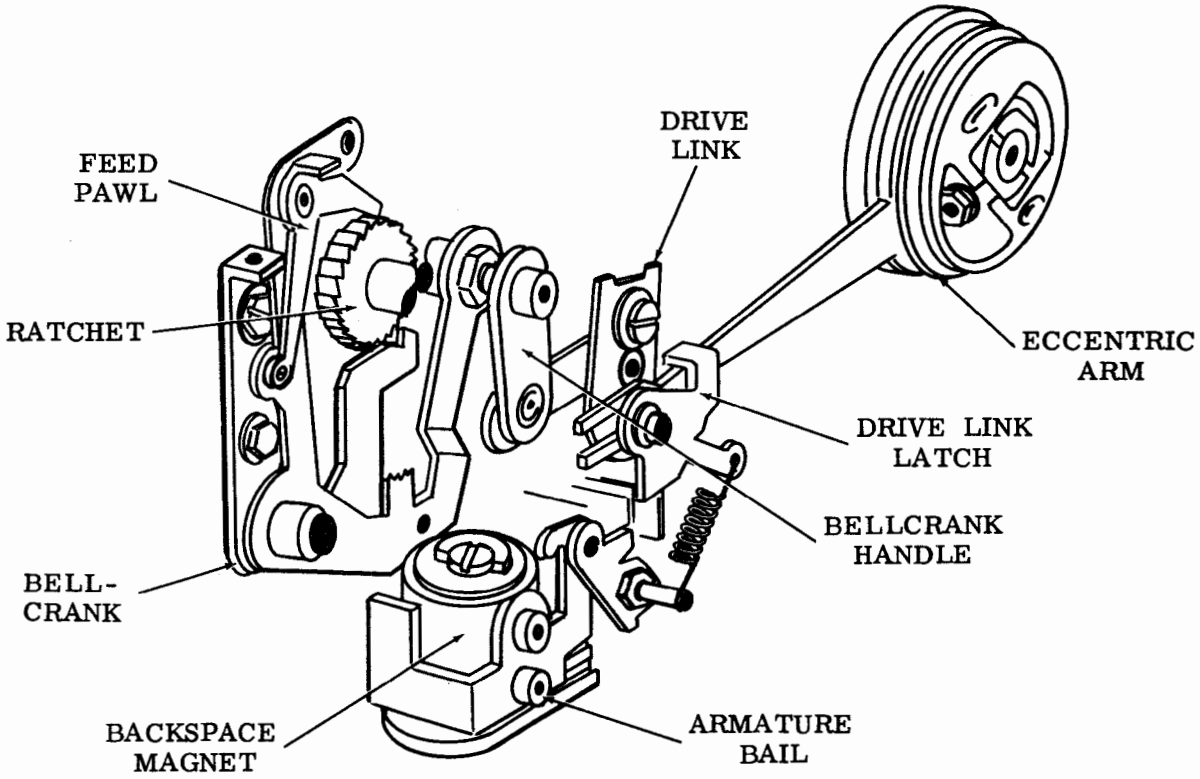
Operation

Tape feeding occurs after perforation during the last half of each function cycle. Tape is threaded down through the tape guide and then up between the feed wheel and die wheel. The feed pawl, driven by the toggle bail, acts upon a ratchet and rotates the feed wheel which, by means of sharp 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 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 biasing spring holds it back against a reference block so that the feed holes are punched a constant distance from the edge. The tape is stripped from the feed wheel by a stripper plate, passes into the punch block where it is perforated, and finally emerges through a slot in the punch block.



3.12 Backspace Mechanism



POWER DRIVE BACKSPACING

Purpose

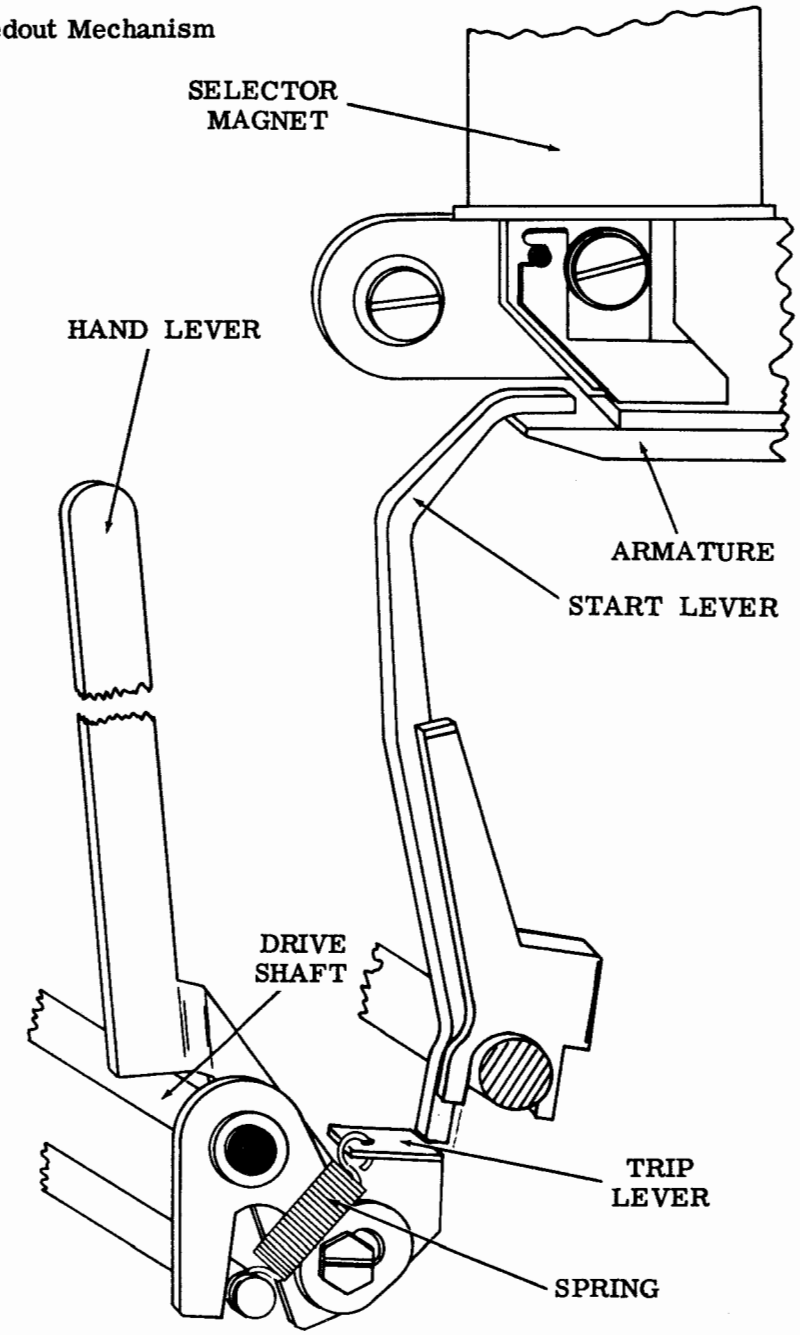
To retract the tape in the punch block so that errors in the tape can be deleted by overpunching.

Operation

The application of an external pulse (initiated by a backspace key on an associated keyboard unit) retracts the perforated tape one code space with each pulse. When the backspace magnet is energized, the armature bail is pulled downward. An extension on the bail disengages a drive link latch, which drops, engaging a notch on the eccentric arm. As the main shaft moves the eccentric arm to the left, the bellcrank is depressed, contacting the perforator feed pawl and disengaging it. The backspace feed pawl engages the feed wheel ratchet and rotates the feed mechanism counterclockwise. When the magnet is de-energized, the drive link is disengaged from the eccentric arm, which slides freely along the pivot post of the drive link.

VARIABLE FEATURES

3.13 Manual Interfering Tape Feedout Mechanism



(Left Front View)

MANUAL INTERFERING TAPE FEEDOUT

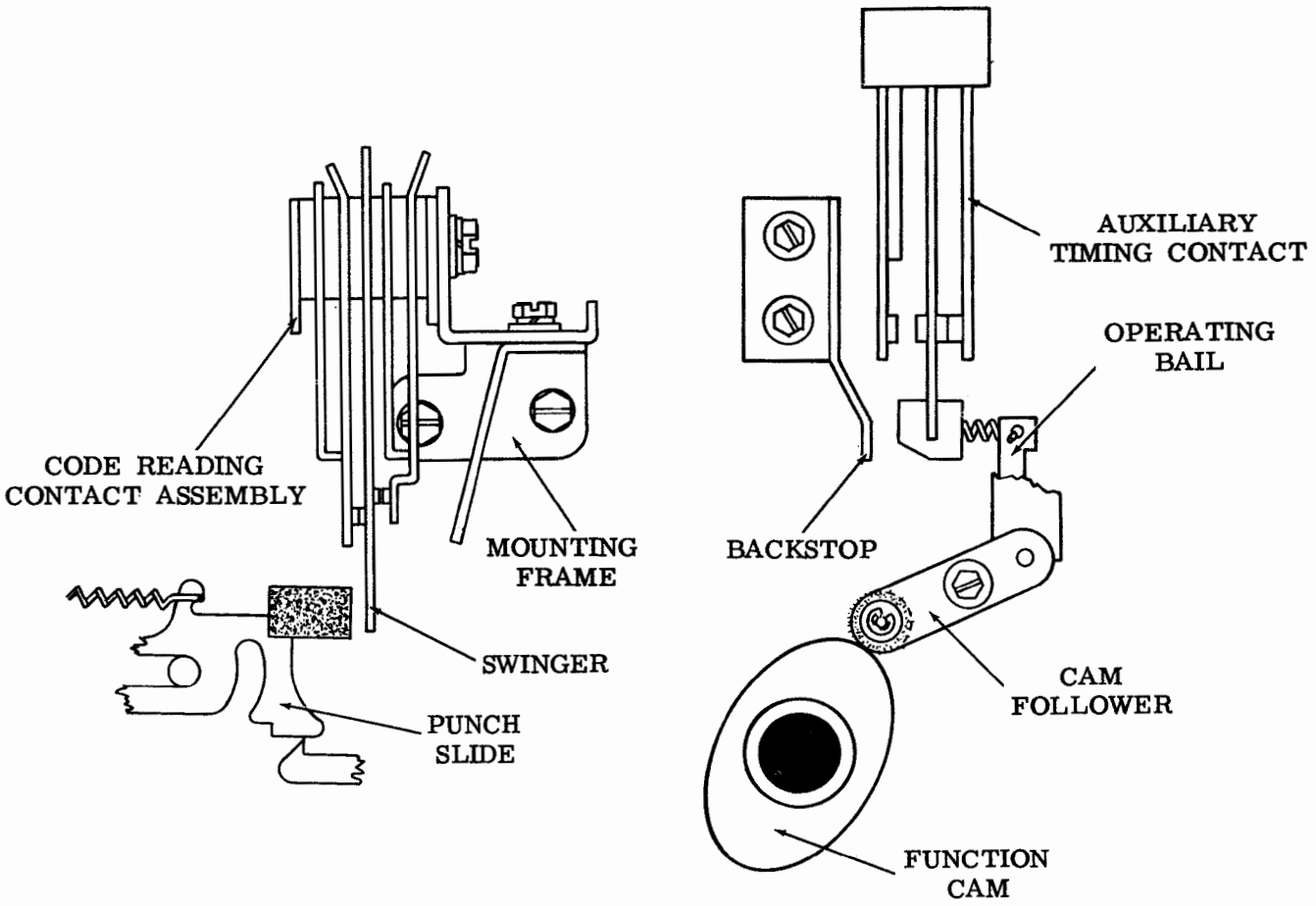
Purpose

To provide means for manually producing delete characters in the tape.

Operation

When the hand lever is operated, the manual interfering tape feedout mechanism causes the reperforator to run open and generate delete characters and, therefore, signal inputs received during this time are not reproduced in the tape (operation interferes with signal input). The projection on the hand lever engages the lower projection on the selector start lever tripping the selector clutch. This causes the reperforator to run open and perforate delete characters in the tape until the hand lever is released.

3.14 Code Reading and Auxiliary Timing Contacts



CODE READING AND TIMING

Purpose

Code reading contacts provide an electrical output corresponding to the information perforated. The auxiliary timing contact provides an electrical output for control of external equipment.

Operation

The code reading contacts are arranged in a bank of eight break-before-make transfer type contacts operated by the corresponding punch slides. The electrical circuit for the code reading contacts is completed externally. When the reperforator is idling, the spacing position of the code reading contacts is held closed by the punch slides and the marking position held open. When the selected punch slides move into their selected position (toward the punch block) near the end of the selection cycle, the punch slides permit the contact positions to reverse. Code reading contacts associated with unselected punch slides remain in the spacing condition. In this way an electrical output is produced corresponding to the perforated information.

The auxiliary timing contact is composed of a break-before-make transfer contact operated by a spring-operated bail in one direction and a function cam in the other direction. When the reperforator is idling, the contact closest to the mounting bracket is closed, the contact swinger is away from the backstop, and the cam follower is resting on the high part of the function cam. As the function cam rotates, the rear contact operating bail engages its swinger and operates the contact. The contact operating bail engages its swinger insulator and operates its associated contact. The swinger insulator comes to rest against its backstop and the cam follower leaves the cam.

During the second half of the function cycle, the function cam engages the cam follower and restores the contact to its idle position. These operations of the auxiliary timing contact produce electrical outputs relative to reperforator timing.

HIGH SPEED TAPE READER UNITS (CX)

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS

		PAGE
1.	GENERAL	1
2.	DESCRIPTION	2
	TECHNICAL DATA	2
	A. Speed	2
	B. Input	2
	C. Output	3
	D. Motive Power	3
	E. Dimensions and Weight	3
	F. Code and Auxiliary Contacts	3
	G. Operating Magnet	3
	H. Pulse Generator Coil	3
	CONFIGURATIONS	6
3.	OPERATION	7
	GENERAL	7
	CONTROL MECHANISM	8
	LATCHING MECHANISM	12
	SENSING MECHANISM	13
	FEED MECHANISM	14
	UNIVERSAL TAPE READING MECHANISM	14
	MAGNETIC PICKUP AND TIMING	15

1. GENERAL

1.01 This section provides description and principles of operation information for the high speed tape reader unit, (Figure 1). It is reissued to incorporate engineering changes and comments received on Issue 4. Since only a limited distribution was made on Issue 4, marginal arrows have been omitted.

1.02 The high speed tape reader unit (Figure 1) is an electromechanical device which senses intelligence recorded in fully perforated or chadless tape. Its output is electrical (from 5 to 8 level, depending on the unit). The reader senses tape at speeds up to 1071.42 words per minute.

1.03 References to left or right, up or down, top or bottom, etc refer to the reader viewed with the flywheel facing the front (Figure 1).

1.04 Gold-plated contacts are used in this equipment. The recommended cleaning interval for gold-plated contacts in special low-level applications (less than 250 microwatts and having an average weekly use of 60 hours) should not exceed 90 days. This interval may be reduced dependent on the signal circuit configuration, usage, and environment.

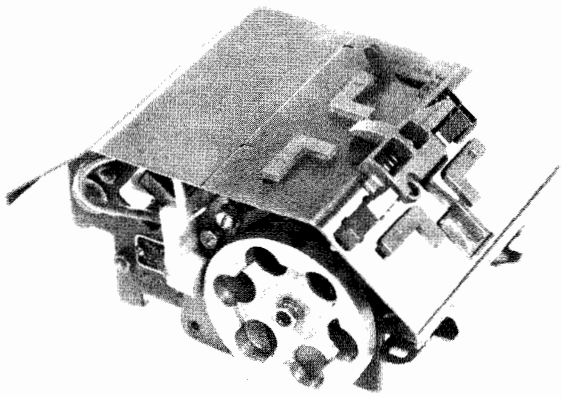


Figure 1 - High Speed Tape Reader Unit

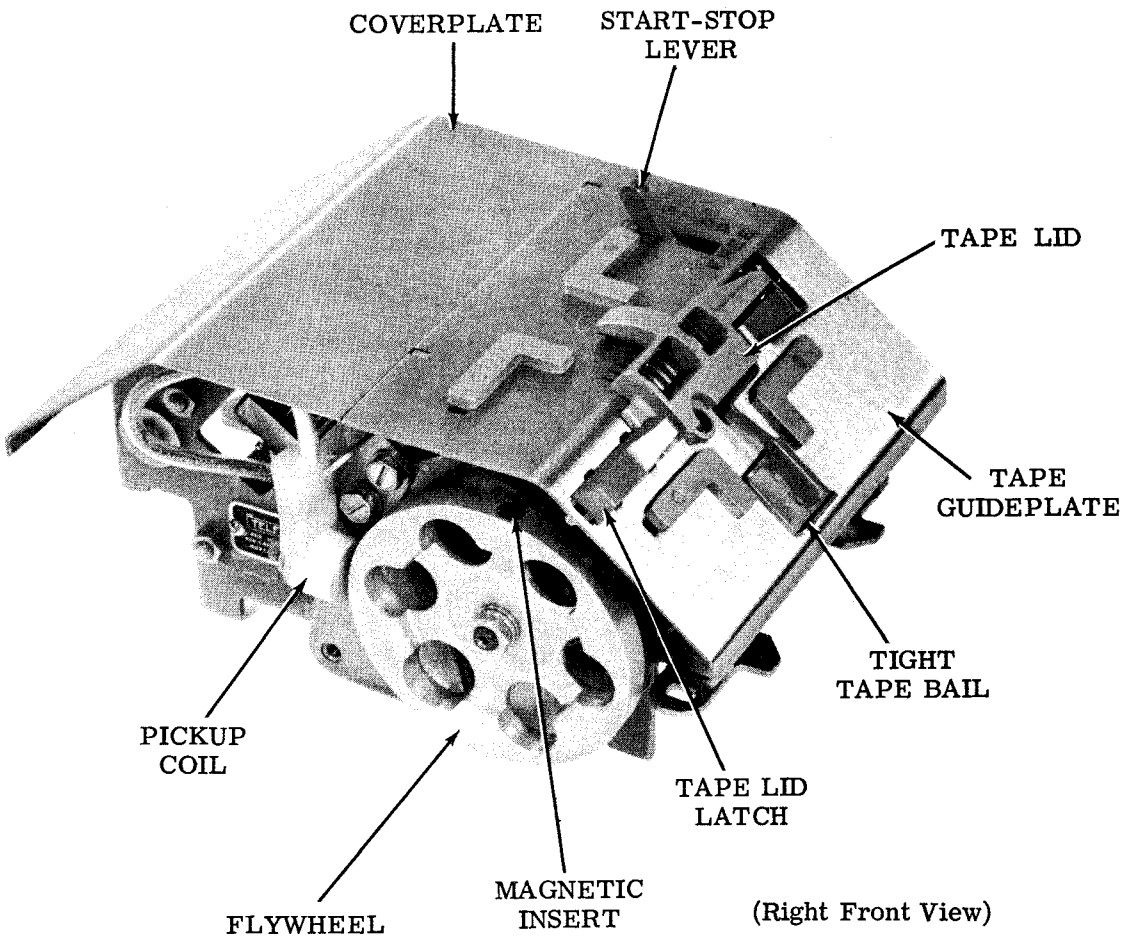


Figure 2 - High Speed Tape Reader Unit

1.05 Use twill jean cloth (KS2423) to clean gold-plated contacts. Do not use burnishers, files, etc which will remove the gold plating.

CAUTION: DO NOT USE GOLD-PLATED CONTACTS ALTERNATELY IN HIGH- AND LOW-LEVEL CIRCUITS BECAUSE HIGH-LEVEL OPERATION MAY DAMAGE THE GOLD PLATING AND IMPAIR THE CONTACTS USED IN LOW-LEVEL CIRCUITS. (SEE 1.04.)

2. DESCRIPTION

TECHNICAL DATA

A. Speed

Gear sets provide several specific speeds starting with 450 words per minute and are available for a maximum speed of 1071.42 words per minute.

Note: Drive sets are used in 37-type equipment to provide speeds of either 100 or 150 words per minute.

B. Input

Punched Tape:

Fully perforated or chadless

Levels: 5, 6, 7, or 8 with inline feed hole
6 with advanced feed hole

Widths: 11/16 inch (5-level)
7/8 inch (6 and 7 levels with inline feed hole)
7/8 inch (6 level with advanced feed hole)
1 inch (8 level)

Characters per inch: 10

Code hole diameter: 0.072 inch

Feed hole diameter: 0.046 inch

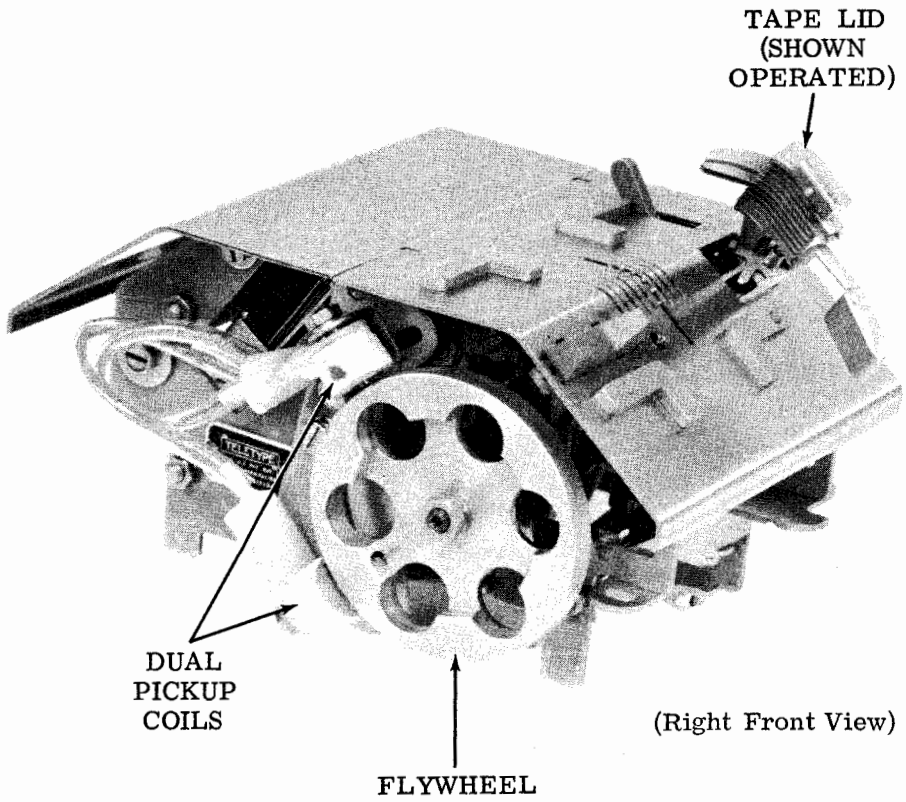


Figure 3 - High Speed Tape Reader Unit (with Dual Pickup Coils)

C. Output

Code Contacts — Parallel Wire

Synchronization (where applicable)

Pulse Generator — Magnetic pickup pulse when main shaft is turning

Auxiliary Contacts — Contact closure when reader is sensing (reading)

D. Motive Power
External Motor Unit

E. Dimensions and Weight

Depth	4 inches
Width	5 inches
Height	3 inches
Weight	2-1/2 pounds

F. Code and Auxiliary Contacts

Rating — Minimum 28 volts dc at 0.15 milliamperes
Maximum 130 volts dc at 100 milliamperes

Contact Resistance — 0.2 to 0.3 ohms

G. Operating Magnet

Type	260M
Connection	Two in parallel
Volts	28 volts
Resistance per coil	4.5 ohms, ±10 percent
Current	1 to 1-1/2 amperes for a circuit using a 25-ohm resistor in series with the power source and with diode shunting of back current.
Pickup Time	See Figure 4
Dropout Time	4.5 milliseconds

Note: For information on 24-volt and 48-volt applications and for data when coils are connected in series, contact the Teletype Corporation Sales Engineering Department.

H. Pulse Generator Coil (where applicable)

Type	261M
Timing	Adjustable 360 degrees
Coil Resistance	85 ohms, ±10 percent
Magnetic Pickup Characteristics	See Figures 5 and 6

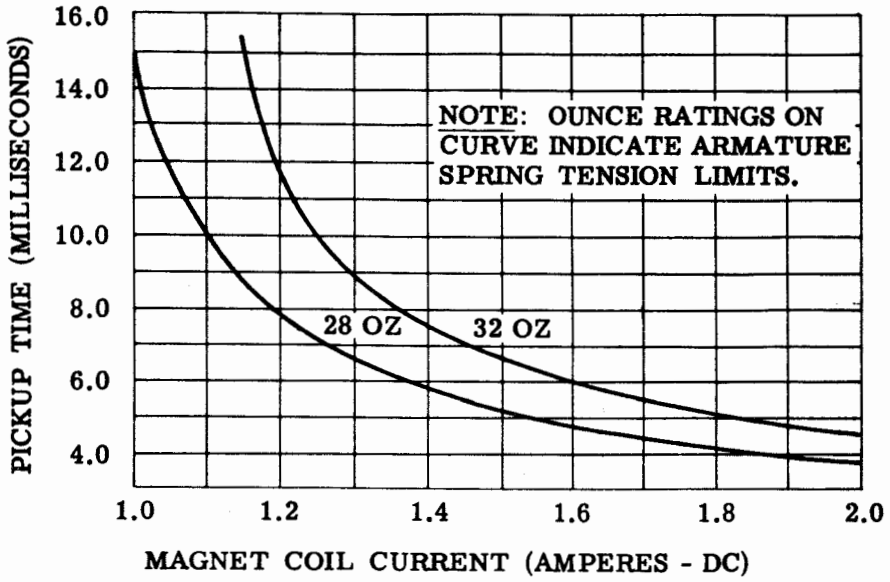


Figure 4 - Operating Magnet Pickup Time

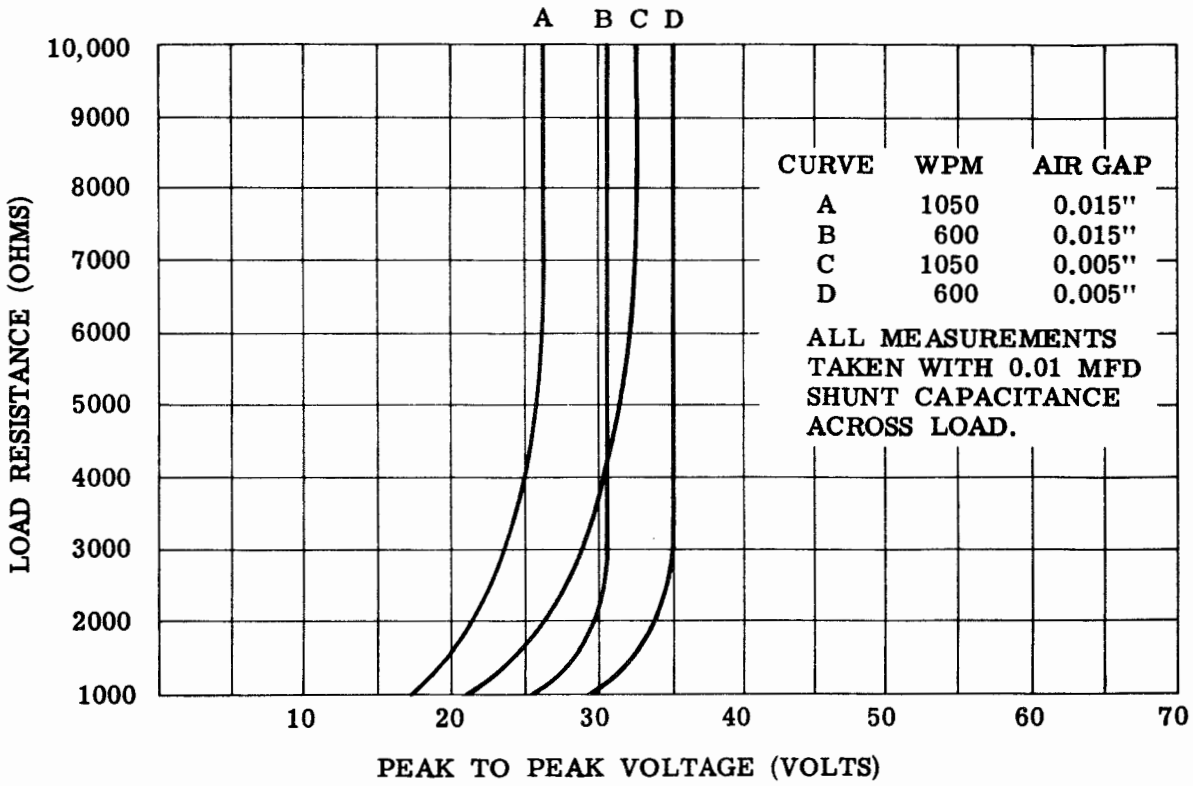


Figure 5 - Magnetic Pickup Characteristics

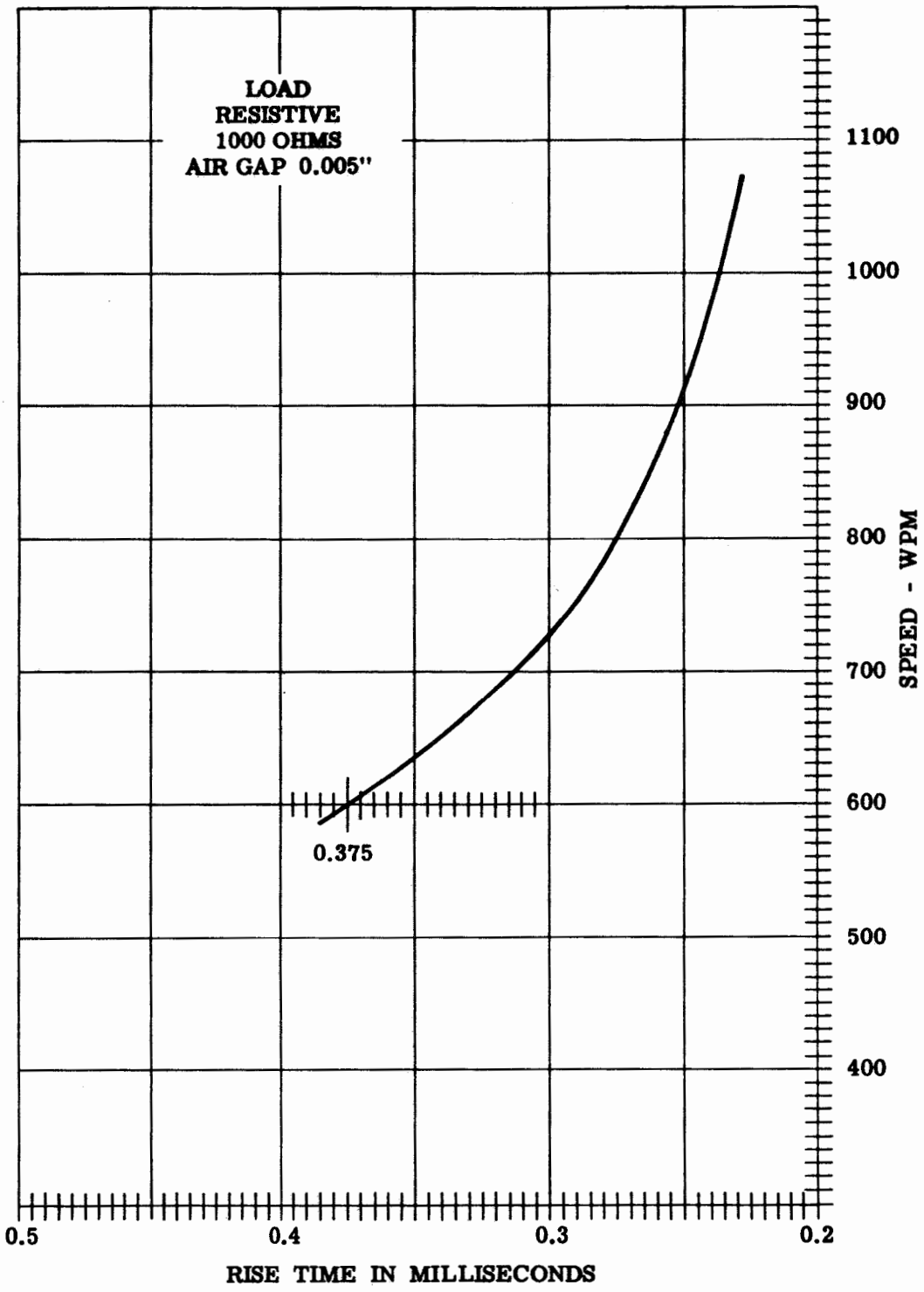


Figure 6 - Magnetic Pickup Characteristics

CONFIGURATIONS

2.01 The tape reader units (Figures 2, 3, 7, 8 and 15) are available in several different configurations to meet varying application requirements. Table A lists the important distinguishing features and operational characteristics of the type reader units.

2.02 Each reader unit, however, is comprised of four basic mechanisms:

(1) Control mechanism which includes components for the following conditions
   (a) Freewheeling
   (b) Run
   (c) Stop
   (d) Tight tape
   (e) Tape out
(2) Latching mechanism
(3) Sensing mechanism
(4) Feed mechanism

TABLE A

TAPE READER UNIT FEATURES

Distinguishing Features		Tape Reader Units												
		CX1	CX2	CX600	CX601	CX602	CX603	CX700	CX701	CX800	CX801	CX802	CX803	CX805
Code Levels	Five	X	X											
	Six			X	X	X	X							
	Seven							X	X					
	Eight									X	X	X	X	X
Make-Only Contacts		X		X		X	X	X		X			X	X
Transfer-Type Contacts			X		X				X		X	X		
Width of Tape	11/16"	X	X									X	X	
	7/8"			X	X	X	X	X	X			X	X	
	1"									X	X	X	X	X
Advanced Feed Hole						X	X							
48 Volt Operation													X	
No Pickup Coil													X	
Dual Pickup Coils														X
Universal Tape Reading												X	X	

Note: CX1 corresponds to Bell 1A, CX802 to Bell 2A, and CX803 to Bell 5A.

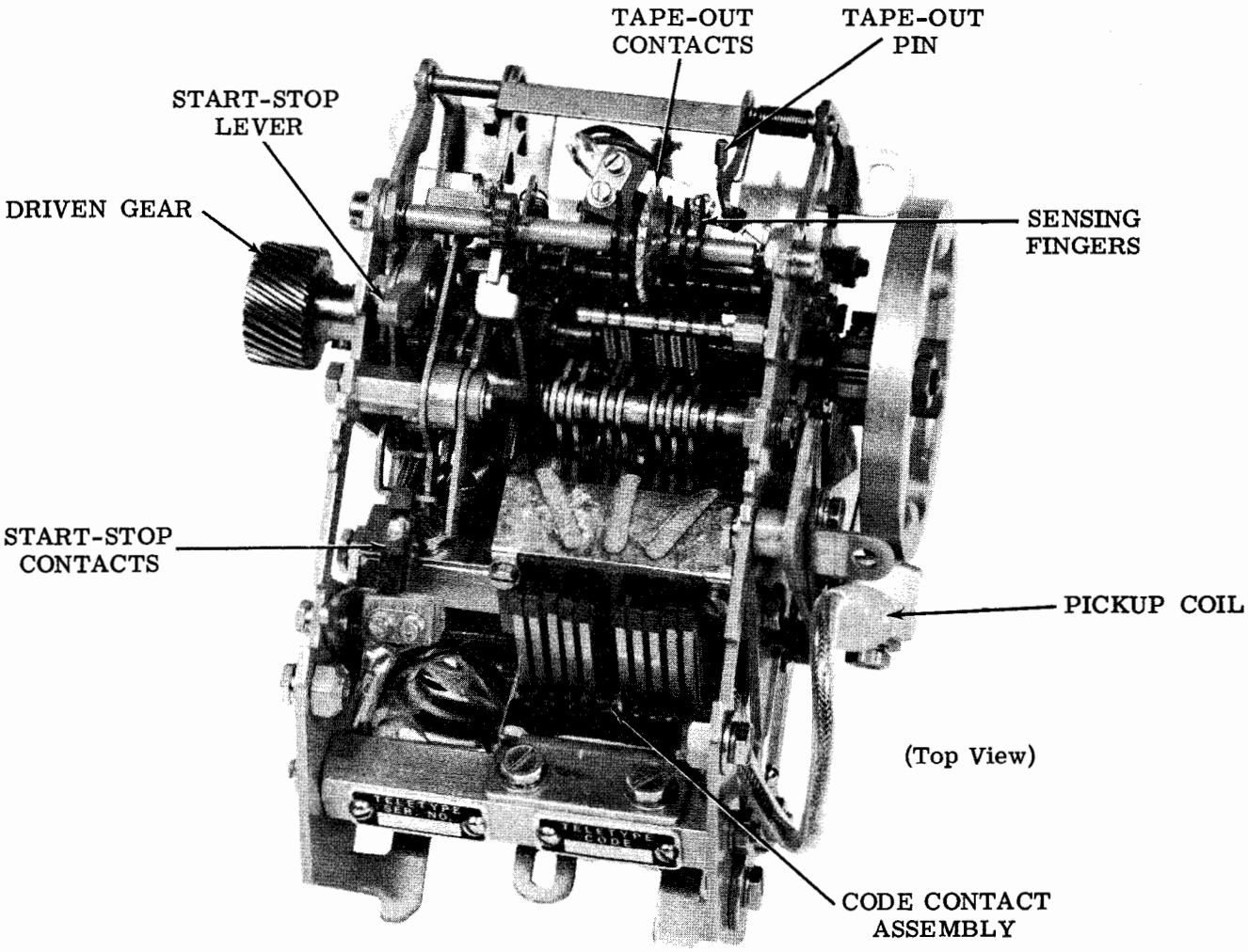


Figure 7 - High Speed Tape Reader Unit (Coverplate Removed)

2.03 The method of control depends on the application and may be either based on electrical timing signals generated by the reader or by external means. Readers not equipped with a magnetic pickup mechanism depend on external circuits for timing (Figure 16).

2.04 A main shaft, with bearings at each end, rotates continuously while the associated motor unit is operating. Sensing and feeding cams are part of the shaft. Both ends of the shaft are threaded for mounting the drive gear and flywheel.

2.05 Either two-unit or three-unit coverplate assemblies enclose the top of the reader. The two-unit coverplate assembly consists of a tape guideplate, secured to the reader by mounting brackets and screws, and a coverplate, held in place by a detent bracket. The three-unit assembly includes a guideplate and top plate, secured to the reader with mounting brackets and screws, and a coverplate, held in place by a detent bracket.

3. OPERATION

GENERAL

3.01 The operation of a typical reader is described below and illustrated in the pictorial schematic diagram, Figure 9.

3.02 When ac power for the motor is applied, rotary motion is transferred to the reader main shaft through the gear and pinion. A synchronizing pulse is generated by the permanent magnet in the flywheel as it passes the pickup coil. This pulse is sent through the output circuits and on to the external equipment.

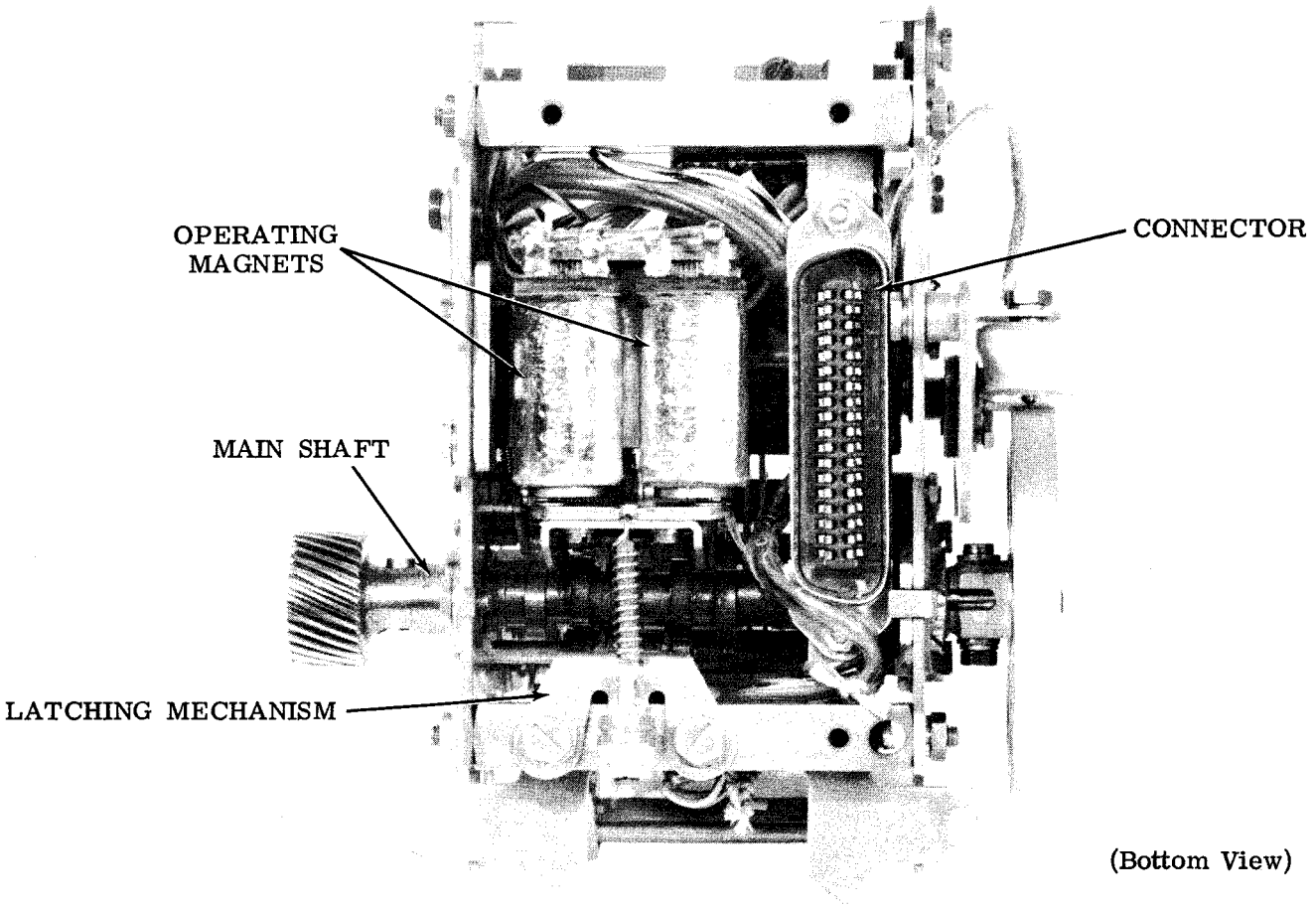


Figure 8 - High Speed Tape Reader Unit

3.03 Operation of the start-stop lever to the RUN position, with tape in the reader, initiates the following actions:

(1) Power is supplied to operating magnet through start-stop and tape-out contacts.

(2) Magnet operates, releasing blocking lever.

(3) Cam on main shaft lifts feed and sensing followers away from blocking lever.

(4) Bail with sensing fingers is driven upward by sensing cam follower.

(5) Sensing fingers under tension of individual springs, pass through code holes in tape.

(6) Movement of transfer levers and actuator bars causes code and timing contacts to close.

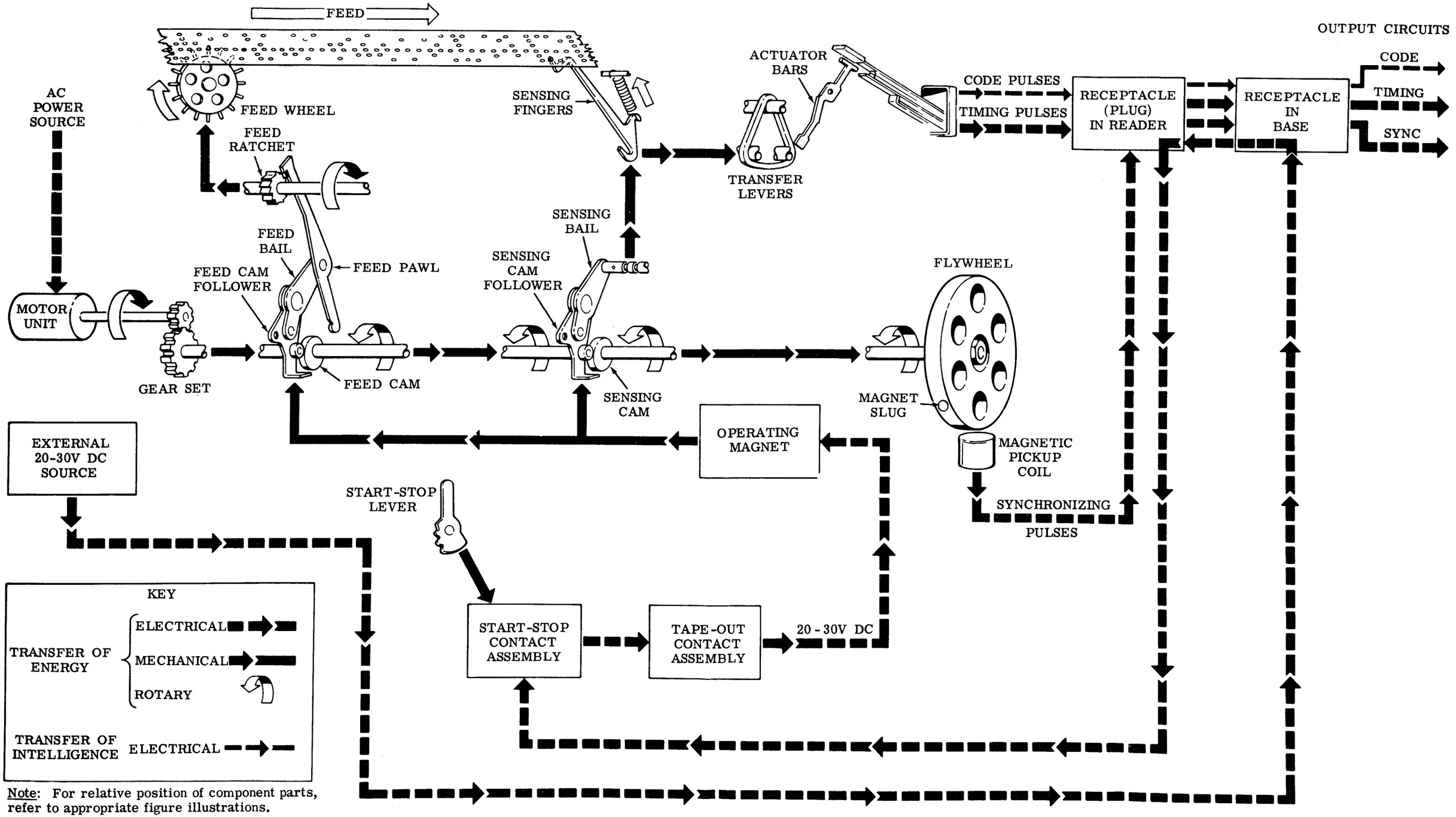
(7) Code and timing signals are sent through output circuits to external equipment.

(8) Feed mechanism advances tape preparatory to sensing next character.

CONTROL MECHANISM

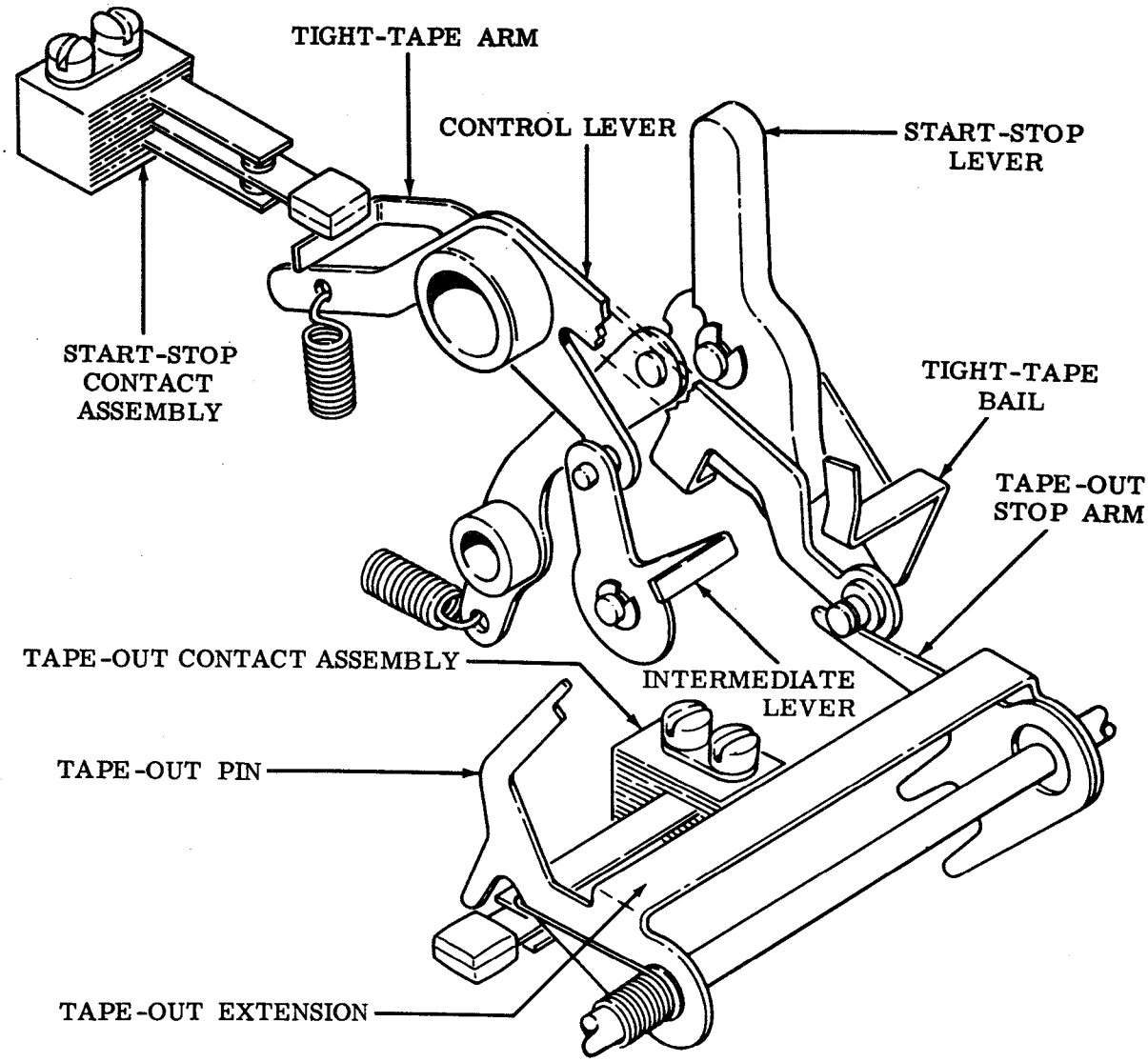
3.04 Moving the start-stop lever to the right (FREE) position results in the following actions (Figure 10):

- Camming surface of the start-stop lever causes the right end of the control lever to move downward.



Note: For relative position of component parts, refer to appropriate figure illustrations.

Figure 9 - Typical Tape Reader Unit Pictorial Schematic



(Right Front View)

Figure 10 - Control Mechanism

- A pin on the control lever bears down on the tape-out stop arm, which is secured to the tape-out extension, causing withdrawal of the tape-out pin.
- Another pin on the control lever operates the intermediate lever and disengages the feed pawl from the feed ratchet.
- The left end of the control lever raises the tight-tape arm which opens the lower contacts and closes the upper contacts of the start-stop contacts.
- Tape can now be inserted without lifting the tape lid, which is held in place by the lid latch mechanism.

3.05 Moving the start-stop lever to the left (RUN) position will initiate the following actions:

- Tape-out pin moves upward through a hole in the tape guide plate. If tape is in gate, tape-out contacts will remain closed.

- Intermediate lever is moved away from the feed pawl, allowing the pawl to engage the feed ratchet.

- Control lever releases the tight-tape arm and closes the lower contacts and opens the upper contacts of the start-stop contacts.

- Tape-out and start-stop contact closure completes the operating magnet circuit.

3.06 The reader is stopped by putting the start-stop lever to the center (STOP) position. This causes control lever to lift tight-tape arm, which opens the lower contacts and closes the upper contacts of the start-stop contacts.

Note: For readers equipped for automatic operation, when the control lever is placed into the STOP position, the tight-tape arm opens both upper and lower contacts of the start-stop contacts. This permits remote (automatic) operation and control of the reader.

3.07 If the tape becomes too tight during reader operation, the left end of the tight-tape bail moves the tight-tape arm upward, causing the start-stop contacts to open. The operating magnet is released and the reader operation is stopped.

3.08 When the end of the tape is reached, absence of tape pressure on tape-out pin opens tape-out contacts and stops the reader.

LATCHING MECHANISM

3.09 When the operating magnet is energized, the following actions occur (Figure 11):

- Armature spring tension is overcome and armature is pulled to a position flush with the coil faces.

- Blocking surface of armature extension is moved from contact with the blocking lever.

- Cams on the main shaft lift feed and sensing cam followers away from the blocking lever.

- Blocking lever is free to rotate out of the path of the cam followers by its spring, completing the unlatching function.

- Latching and unlatching process takes place each cycle of reader operation.

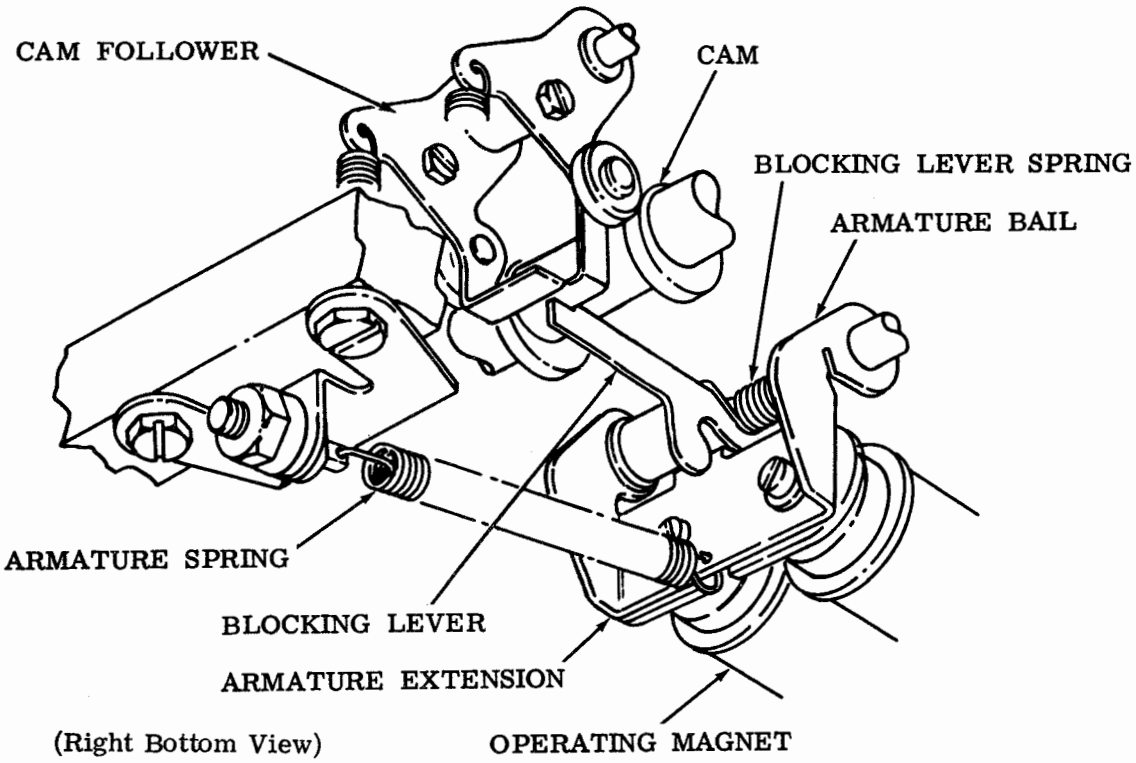


Figure 11 - Latching Mechanism

SENSING MECHANISM

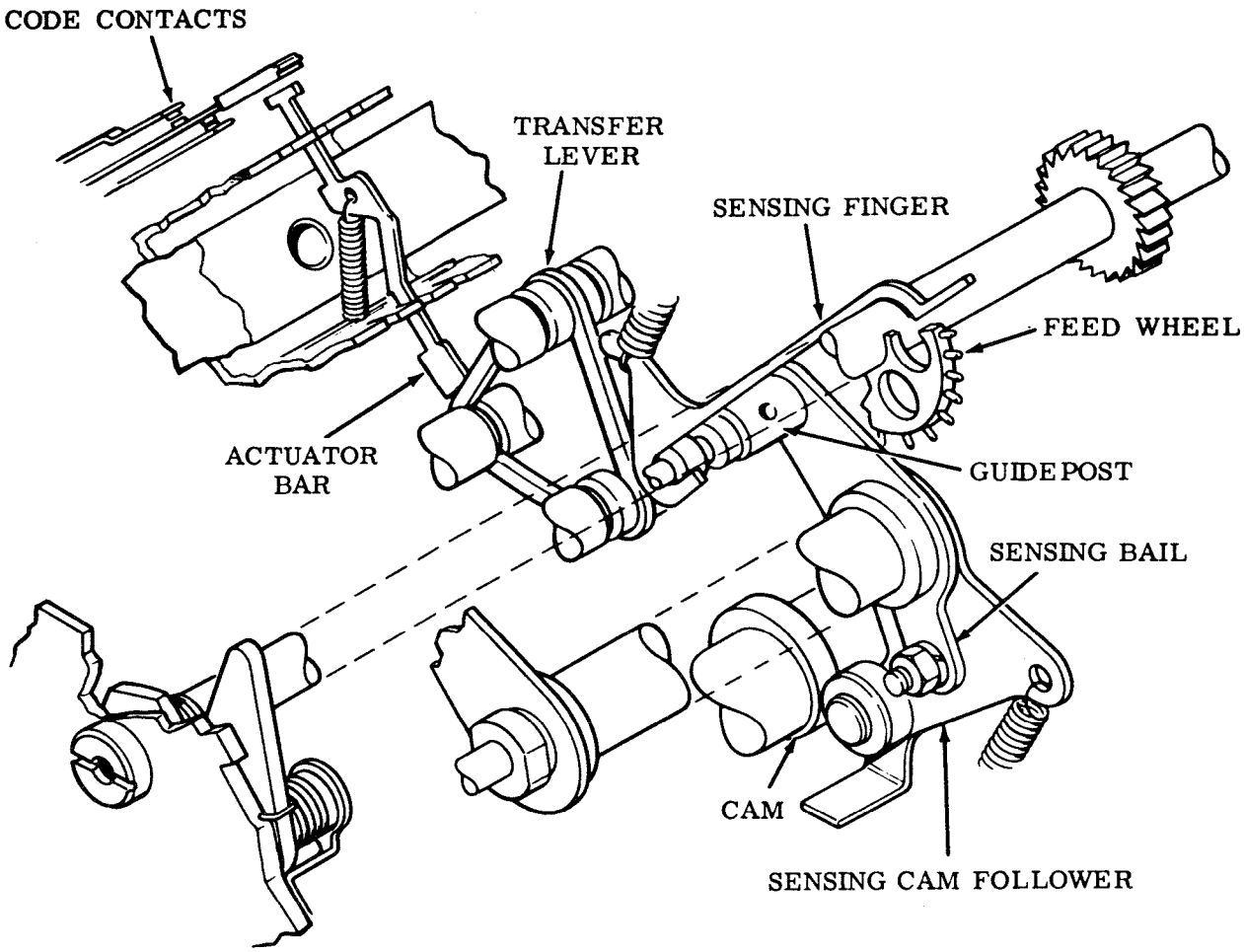
3.10 The following actions occur during operation of the sensing mechanism (Figure 12):

- Sensing fingers, which ride on a slotted guidepost are driven upward by their springs and sense tape as it is advanced.
- Sensing fingers are retracted collectively by the sensing bail. The slotted guidepost with sensing fingers is attached to the upper end of the bail. A cam follower is attached to the lower end of the bail.
- The movement of the sensing fingers is transmitted through the transfer levers to actuator bars which operate code contacts.
- The shoulder on the sensing finger guidepost causes two transfer levers, associated actuator bars and timing contacts to operate.

3.11 Sensing fingers respond to tape conditions as indicated below:

(a) No Hole in Tape

- Upward movement of individual sensing finger is stopped by the tape.



(Right Front View)

Figure 12 - Sensing Mechanism

- Downward movement of associated code contact is stopped and contact remains open.

(b) Hole in Tape

- Sensing finger continues through the tape to its top point of travel, determined by the sensing cam.
- Code contact moves downward and closes when sensing finger travels through tape.

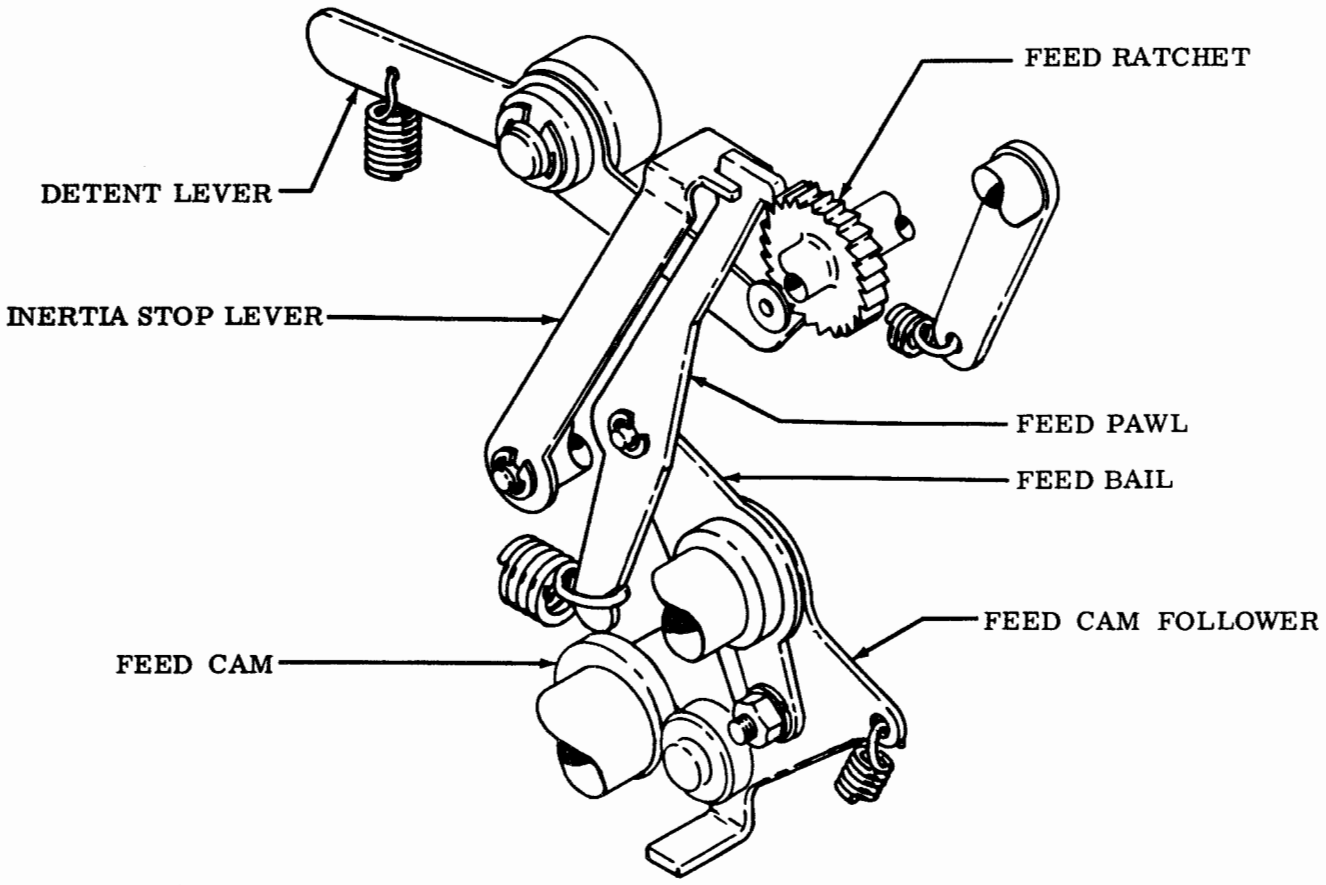
FEED MECHANISM

3.12 Motion for operating the feed mechanism is transferred from the feed cam as follows (Figure 13):

- Feed cam moves its follower which is secured to the lower end of the feed bail.
- Feed pawl is pulled downward by a pin on the upper end of the bail, causing the pawl to rotate the feed ratchet one position.
- Ratchet is then held in place by a detent roller while the pawl moves upward preparatory to the next feeding stroke. The pawl is moved upward by a spring attached to the cam follower.

UNIVERSAL TAPE READING MECHANISM

3.13 The universal tape reading mechanism, allows readers so equipped to alternately sense 5-, 6-, 7-, or 8-level tapes. Changing from one level to another is accomplished by turning the numbered dial located at the lower left corner of the tape guideplate (Figure 14).



(Right Front View)

Figure 13 - Feed Mechanism

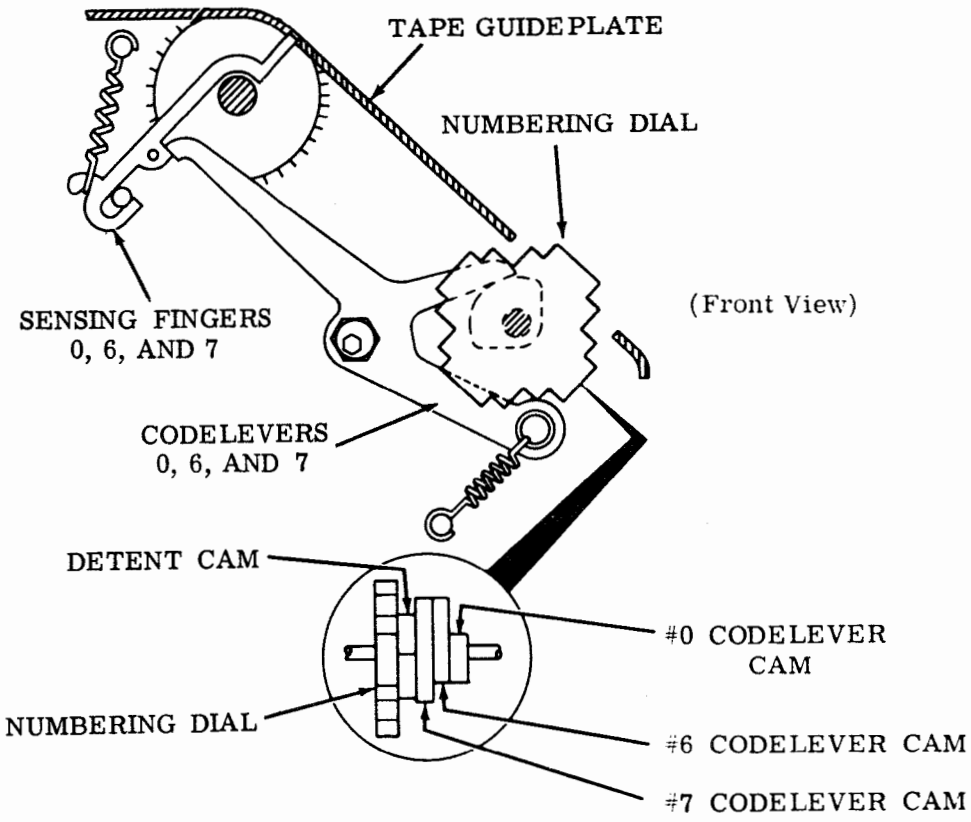


Figure 14 - Universal Tape Reading Mechanism

3.14 When the numbered dial is rotated, the integral cam assembly operates three code levers. These levers, in turn, control the sensing fingers of the 0, 6th, and 7th reading levels. With the dial detented in the number 5 position, each codelever is riding the high part of its respective cam, holding an associated sensing finger from mechanically sensing an unused level (0, 6th, and 7th). As the dial is rotated to the number 6-, 7-, or 8-position, the codelevers release, respectively, the 0, 6th, and 7th level sensing fingers. To change the reading level, therefore, the operator need only rotate the dial until the number corresponding to the tape level to be read appears in view.

3.15 To guide the tape over the sensing fingers, two sets of movable tape guides are used. The guides are designed to accept the three standard tape widths (11/16", 7/8", and 1") associated with 5-, 6-, 7-, and 8-level tape.

MAGNETIC PICKUP AND TIMING

3.16 During each revolution of the main shaft, the permanent magnet imbedded in the flywheel passes the pickup coil core (Figure 8), introducing a rapid change in the coil's flux density. This causes the coil to generate a pulse which is used for triggering electronic circuitry. Instructions for adjusting the magnetic coil are contained in Section 592-801-700TC.

3.17 Feed pawl and sensing pin travel are plotted against degrees of shaft rotation in Figure 16. The lowermost position of the sensing pin is designated as 0 degrees of shaft rotation.

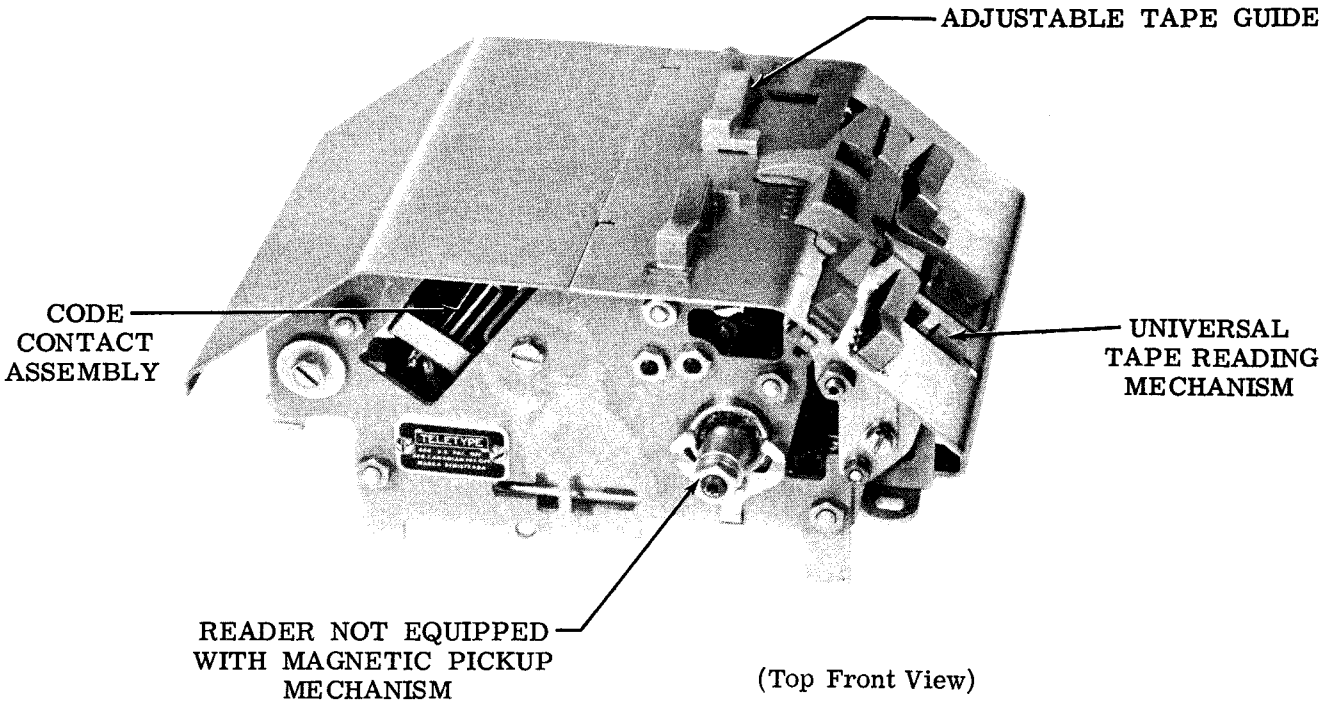


Figure 15 - High Speed Tape Reader Unit (Without Magnetic Pickup Mechanism)

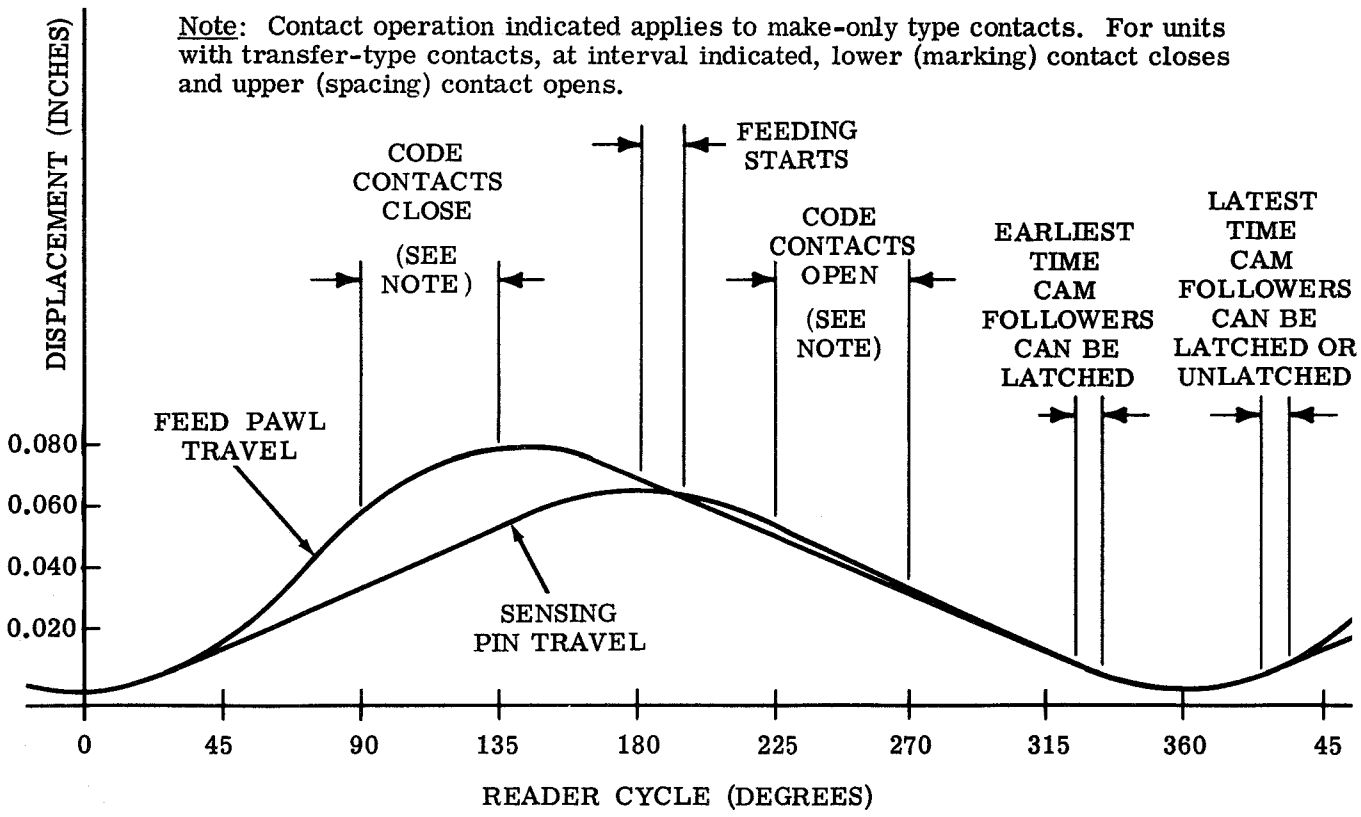


Figure 16 - Timing Diagram