

33 TAPE READER  
 GENERAL DESCRIPTION AND  
 PRINCIPLES OF OPERATION

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1. GENERAL

1.01 This section provides the general description and principles of operation for the 33 tape reader. It is reissued to include a few minor corrections and to distinguish the power pack for 3300 Series Coded Sets and Computer Input/Output Sets from the power pack pertaining to 33 Sets. Marginal arrows indicate the changes.

1.02 The 33 tape reader is an 8-level electro-mechanical device which senses and transmits coded intelligence perforated in tape (Figure 1).

1.03 References to left, right, front, rear, consider the tape reader as viewed by the operator.

1.04 In the illustrations, fixed pivots are solid black, and floating points — those mounted on parts that move — are crosshatched.

2. DESCRIPTION

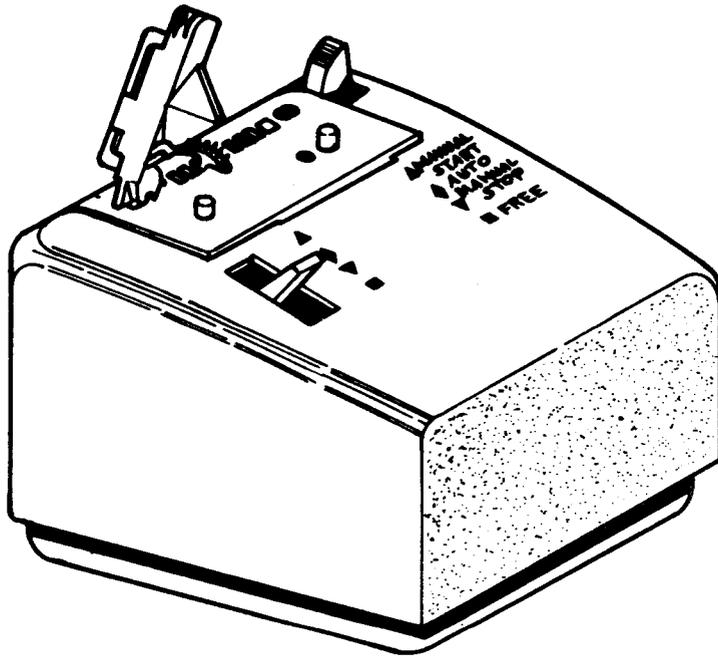
TECHNICAL DATA

Note: This equipment is intended to be operated in a room environment within the temperature range of 40°F to 110°F. Serious damage to it could result if this range is exceeded. In this connection, particular caution should be exercised in using acoustical or other enclosures.

2.01 Dimensions and Weight (Approximate)

Feeding and Sensing Component

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



(Left Front View)

Figure 1 - 33 Automatic Tape Reader

Power Pack Component

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

2.02 Electrical — Power Pack

High Voltage:

Input . . . . .	115 volts ac
Output . . . . .	Min 137 volts dc @ 0.160 ampere

2.03 Feed Magnet

Power dissipation . . . . .	2-1/4 watts
Nominal attraction time . . . . .	8 to 11 milli-seconds at a nominal peak transient current of 0.220 ampere
Nominal release time . . . . .	7 to 10 milli-seconds

**CAUTION: HIGH VOLTAGE PERSISTS 10 SECONDS AFTER POWER IS REMOVED.**

2.04 Speed . . . . . 100 words per minute

2.05 Tape Specifications

Level . . . . .	8-level
Width . . . . .	1 inch
Code combinations per inch . . . . .	10
Feed hole diameter . . . . .	0.0465 inch

2.06 Signal Characteristics

Long telegraph loops . . . . .	0.015 to 0.070 ampere at 48 to 240 volts dc inductive
Short telegraph loops . . . . .	0.058 to 0.072 ampere at 16 to 22 volts dc resistive

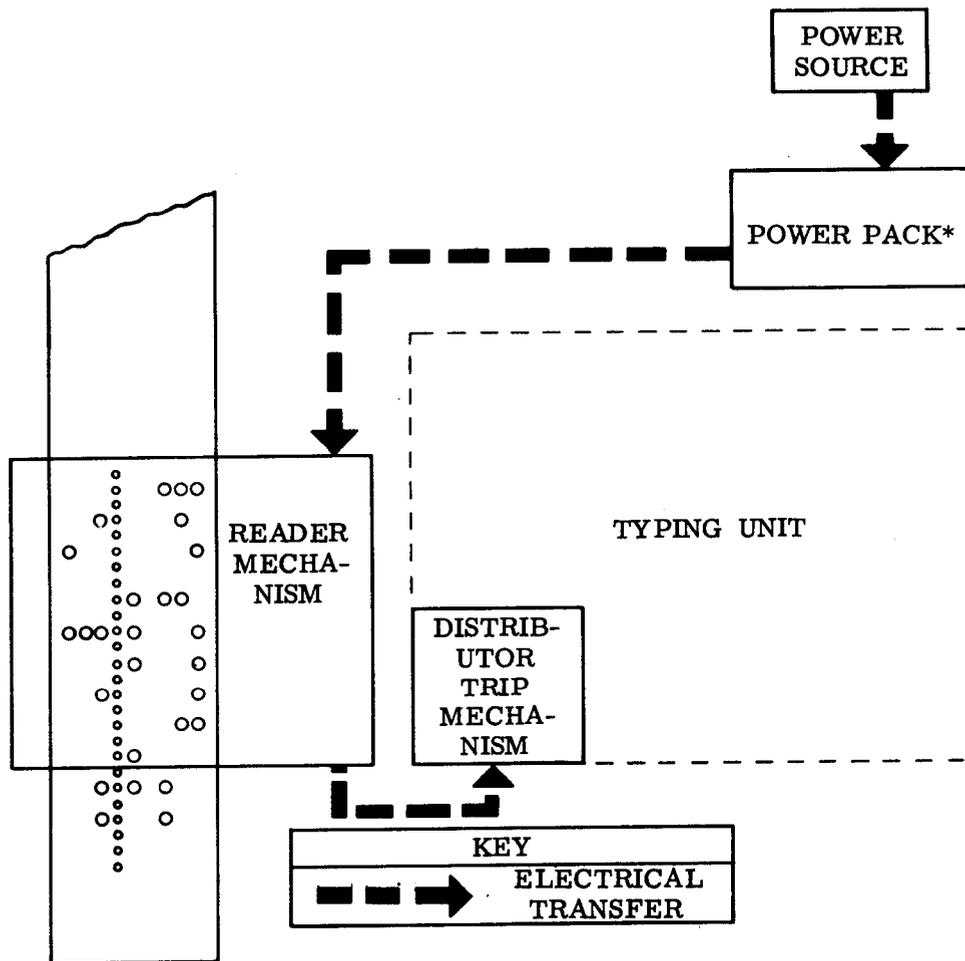
3. PRINCIPLES OF OPERATION

OUTLINE OF OPERATION

3.01 The tape reader senses coded intelligence perforated in tape and transmits this intelligence as a parallel output.

3.02 The tape reader package consists of three mechanisms; the reader mechanism, the power pack, and the distributor trip mechanism (Figure 2).

3.03 The reader mechanism senses and feeds the tape. Other submechanisms within the reader mechanism transmit the intelligence as a parallel output. The reader mechanism mounts on the left side of the typing unit.



\*The power pack for Computer Input/Output Sets and 3300 Series Coded Sets is in the call control unit.

Figure 2 - Tape Reader Package with Major Mechanisms

3.04 The power pack provides current rectification for the reader mechanism. In 33 sets the power pack mounts at the rear of the set underneath the typing unit subbase. In 3300 Series Coded Sets and Computer Input/Output Sets the power pack is a part of the call control unit.

3.05 The distributor trip mechanism receives the reader mechanism output and converts it into serial start-stop signals.

#### DETAILED OPERATION

##### A. Tape Lid Mechanism

3.06 When the tape lid latch handle is moved to the right, the spring biased tape lid swings open. Two locating pins guide the tape as it travels above the top of the plate (Figure 3).

##### B. Control Mechanism

3.07 In the manual reader there are three positions for the control lever: START, STOP, and FREE. In the automatic reader there are four positions for the control lever: MANUAL START, AUTO, MANUAL STOP, and FREE. When the control lever is moved to the START position (MANUAL START position for the automatic reader — Figure 4) the spring biased start contact wires are positioned on the start contact. Since the start contact wires and the start contact are wired in series with the distributor clutch trip coil in the typing unit, the coil energizes and releases the tape reader trip lever (Figure 5).

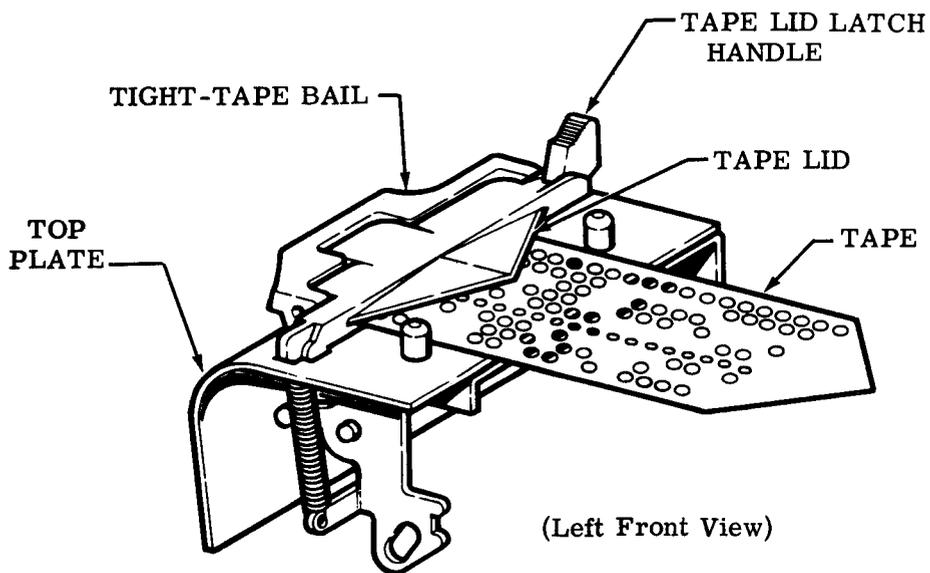


Figure 3 - Tape Lid Mechanism

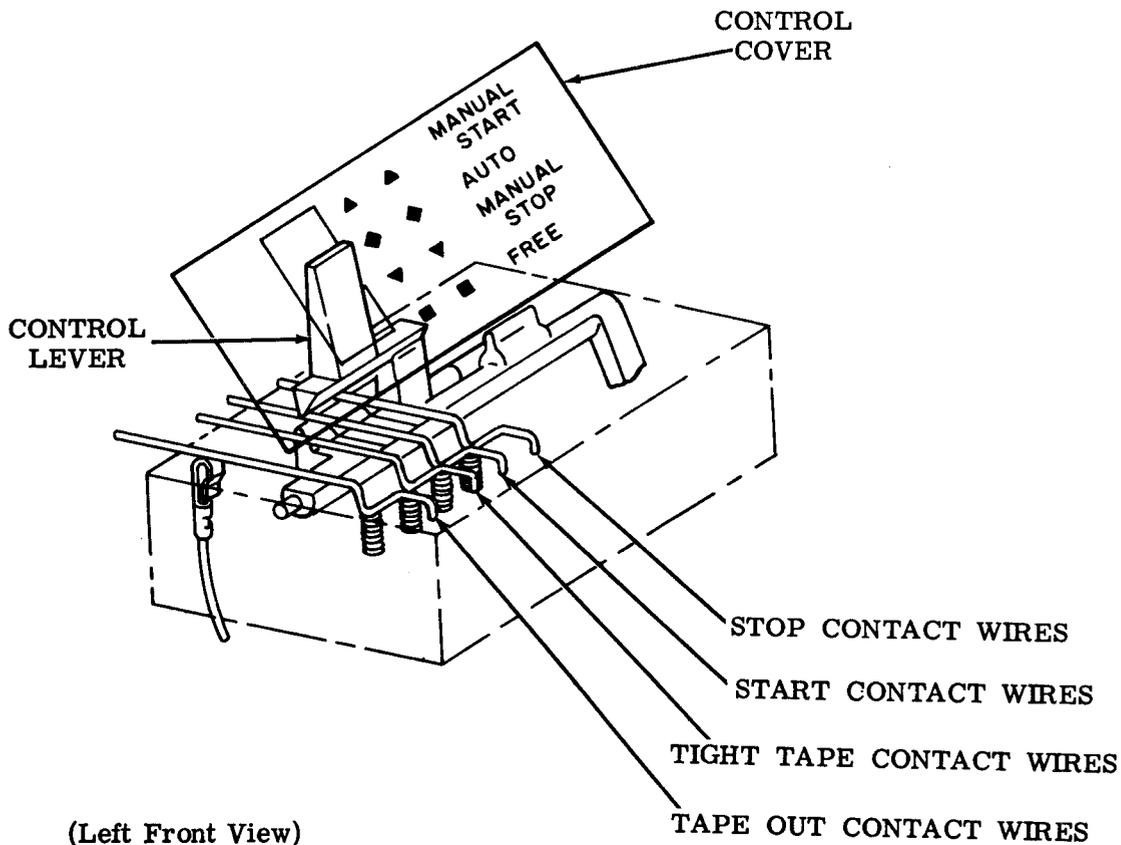


Figure 4 - Control Mechanism

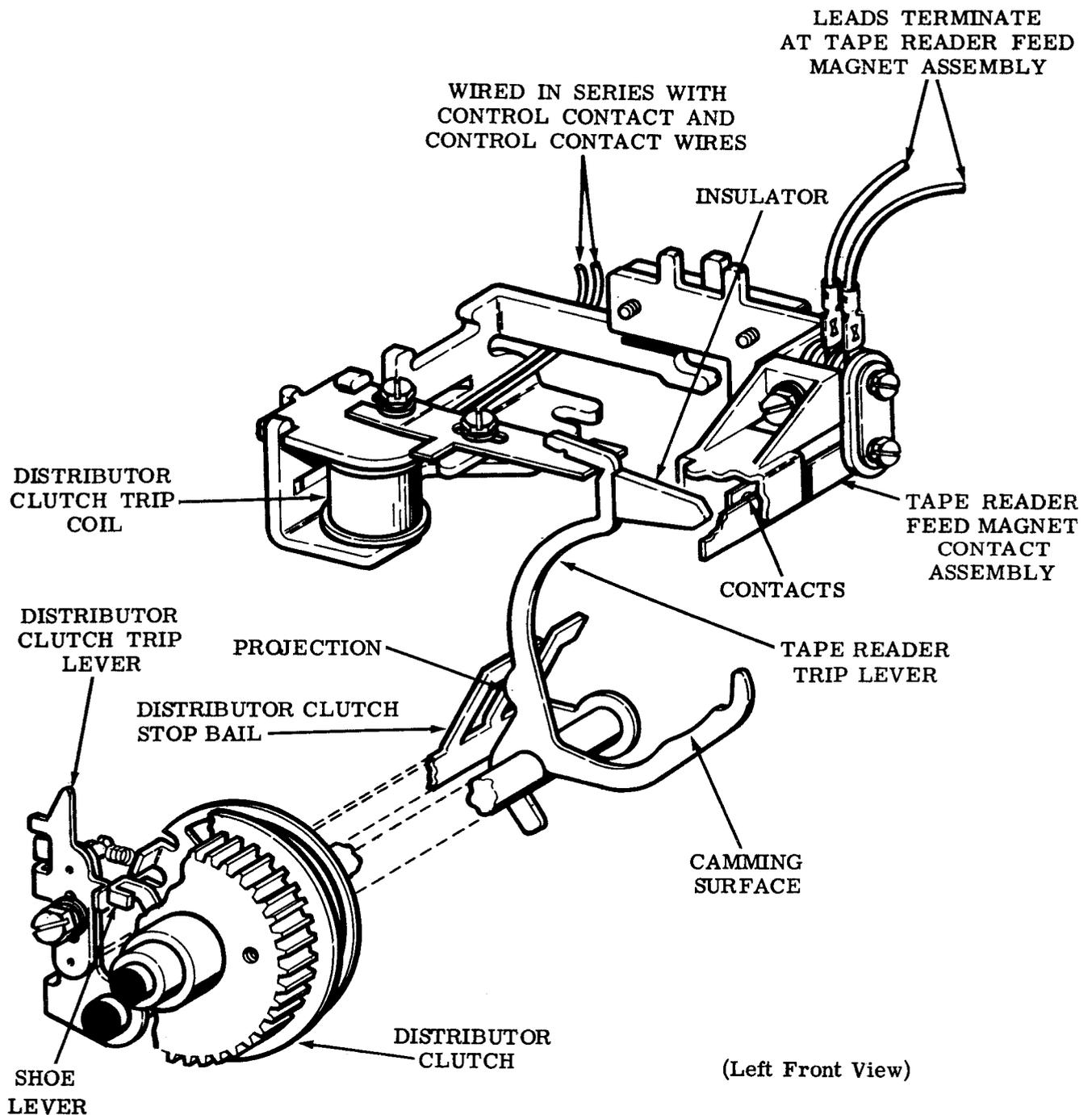


Figure 5 - Distributor Trip Mechanism

### C. Distributor Trip Mechanism

3.08 When released the tape reader trip lever performs two functions; it closes the tape reader feed magnet contact assembly and trips the distributor clutch (Figure 5). The reader feed magnet assembly is closed by an insulator

on the back of the tape reader trip lever. In its travel, the tape reader trip lever rotates the distributor clutch stop bail by means of a projection. This motion is transferred to the distributor clutch trip lever which moves away from the shoe lever. The distributor clutch engages and the distributor cycle begins.

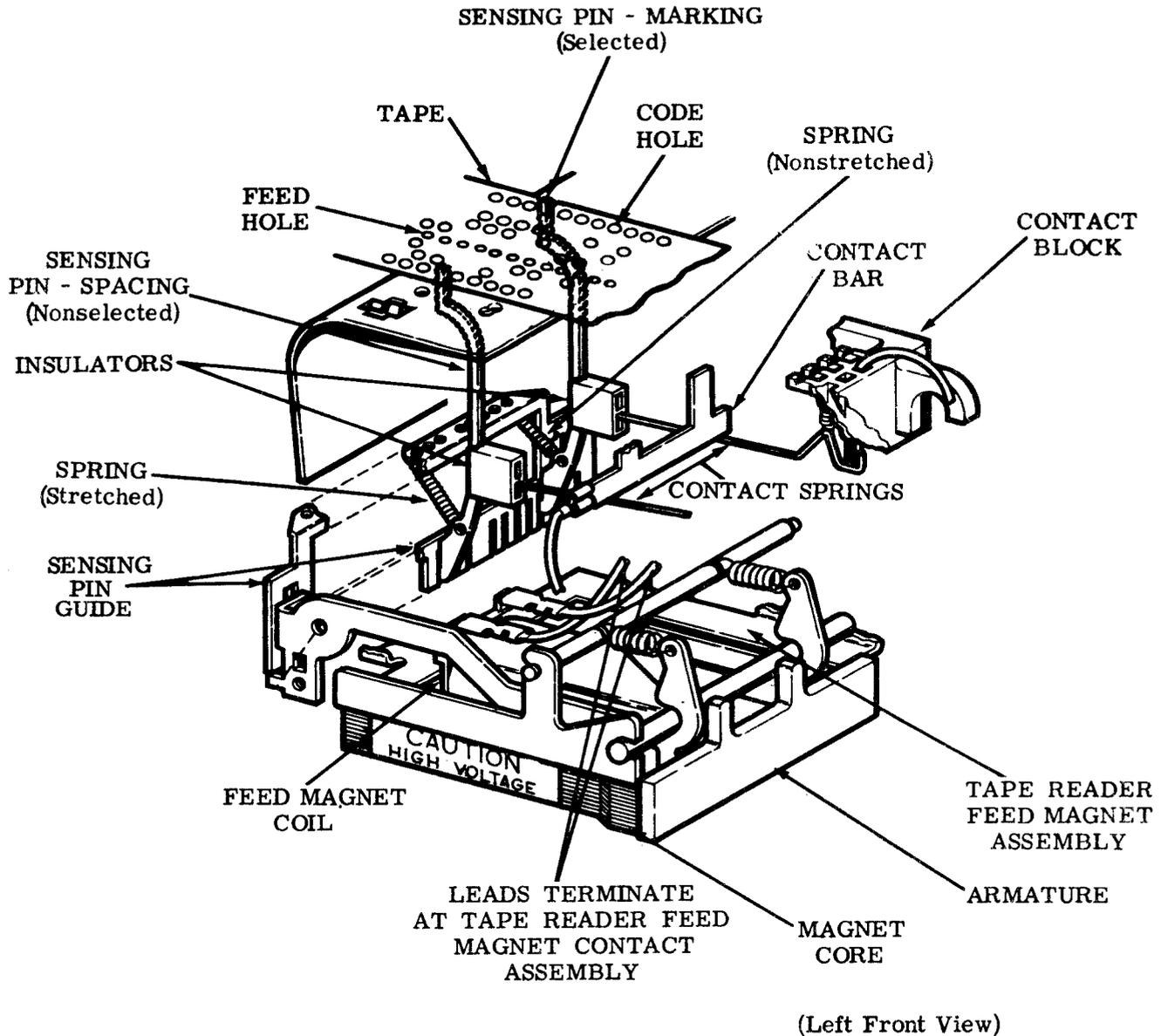


Figure 6 - Feed Magnet and Sensing Mechanism

#### D. Feed Magnet Mechanism

3.09 With the feed magnet contacts closed (Figure 5) the feed magnet in the reader mechanism is activated. The energized feed magnet coil attracts the armature (Figure 6). Rotating about its pivot the armature raises the armature extensions. Fastened to the ends of the armature extensions is a sensing pin guide.

#### E. Sensing Pin Guide Mechanism

3.10 In its upward travel the sensing pin guide carries with it eight spring-biased pins which sense the tape. Where a hole exists in the tape (marking) the sensing pin continues its upward travel and its associated spring remains unstretched. Where no hole exists in the tape (spacing) the sensing pin travel is blocked and its associated spring becomes stretched (Figure 6).

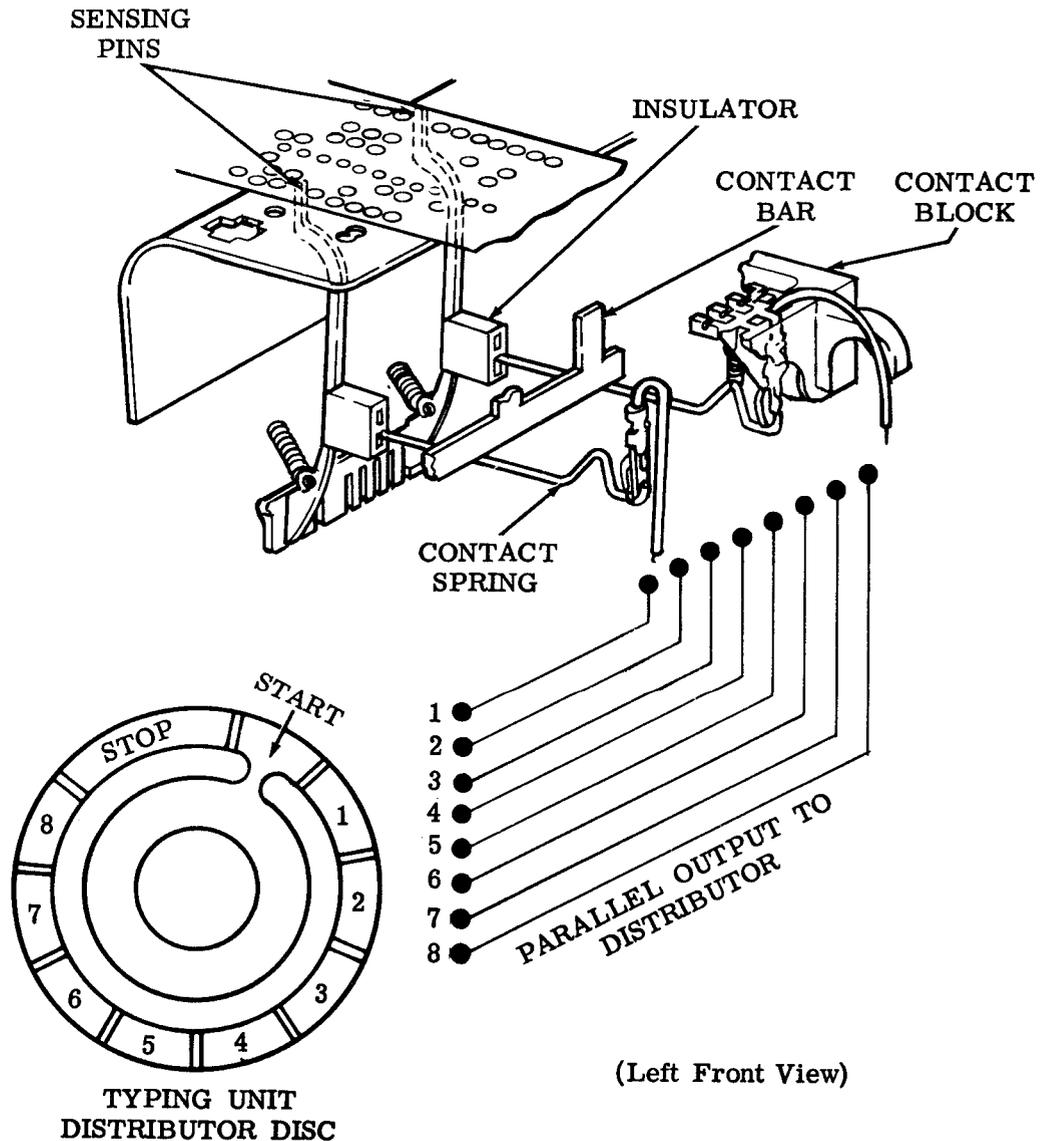
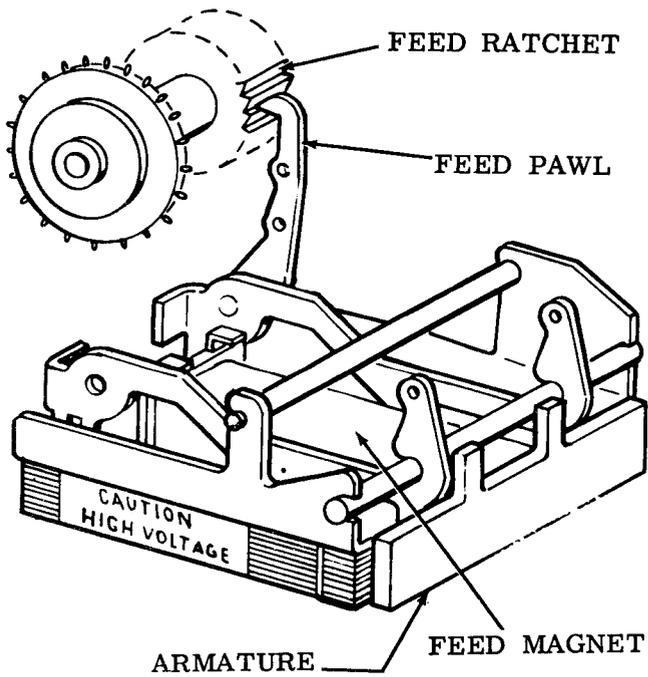


Figure 7 - Contact Block Mechanism

#### F. Contact Block Mechanism

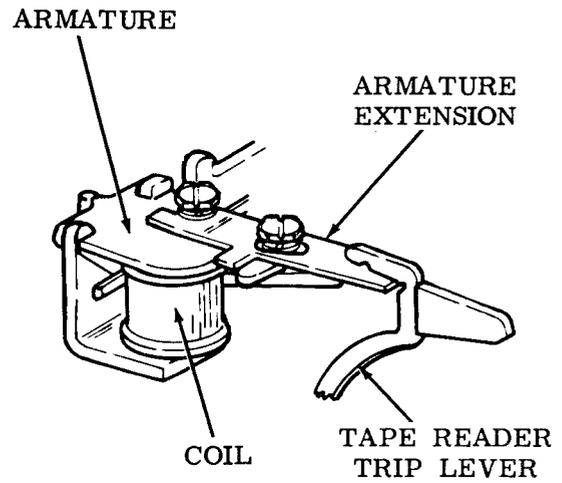
3.11 There is an insulator attached to each sensing pin. The insulators hold eight contact springs in a down position, away from the contact bar (Figure 7). The eight contact springs are connected in parallel to corresponding segments on the distributor disc in the typing unit. If a sensing pin finds a hole in the tape (marking) it continues its upward travel. The

insulator attached to it also rises, allowing the contact spring to make contact with the contact bar (Figure 7). If a sensing pin does not find a hole in the tape (spacing) it remains in the down position, keeping the insulator down. This prevents the contact spring from making contact with the contact bar. Since all eight pins rise up simultaneously, the output going from the contact block to the distributor disc will be a parallel output.



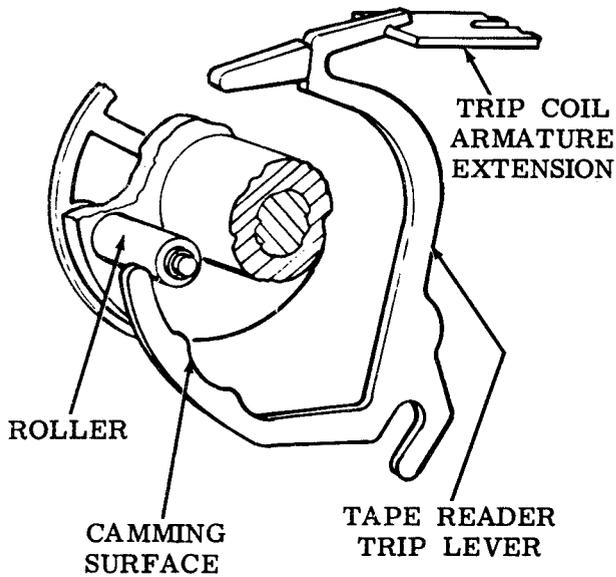
(Left Front View)

Figure 8 - Feed Pawl Engagement



(Left Front View)

Figure 9 - Distributor Clutch Trip Coil



(Right Side View)

Figure 10 - Tape Reader Trip Lever

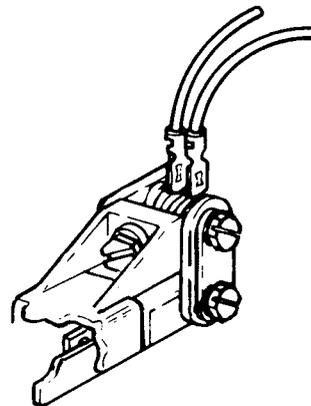


Figure 11 - Feed Magnet Contacts

### G. Tape Feed Mechanism

3.12 The tape feeding cycle begins when the feed magnet attracts the armature as described in 3.09. The right armature extension has a feed pawl attached to it which engages a tooth on the feed ratchet when the armature extensions rise (Figure 8). Before the feed pawl can be pulled down to advance the feed wheel one character a series of steps take place as follows.

3.13 If the control lever is held in the START position, the distributor clutch trip coil will remain energized (Figure 9).

3.14 Near the beginning of the stop pulse the camming surface on the reader trip lever rides the camming roller on the distributor shaft and overtravels the trip coil armature (Figure 10).

3.15 The feed magnet contacts open momentarily causing the feed magnet in the reader mechanism to be de-energized (Figure 11).

3.16 With the feed magnet de-energized the armature extensions drop, withdrawing the sensing pin guide and the sensing pins (Figure 12).

3.17 The tape reader trip lever is reset in sufficient time so that the distributor clutch does not disengage. The tape reader trip lever, once reset, closes the feed magnet contacts by means of the insulator. The projection moves the distributor clutch stop bail which in turn keeps the distributor clutch trip lever away from the shoe lever, allowing the clutch to continue its rotation.

3.18 Tape feeding will occur at the same time that the sensing pins are withdrawn. As the armature extensions drop down the pawl advances the feed ratchet one tooth (Figure 13). Associated with the feed ratchet are also a detent lever and a blocking pawl.

3.19 The detent lever, with its circular surface engaging the feed ratchet teeth, holds the feed ratchet and the feed wheel in their correct position during sensing (Figure 13).

3.20 The blocking pawl, which rides a post on the feed pawl, is lowered into engagement with a feed ratchet tooth during the feed stroke. This is to prevent excessive overthrow of the feed wheel during feeding, without the use of a

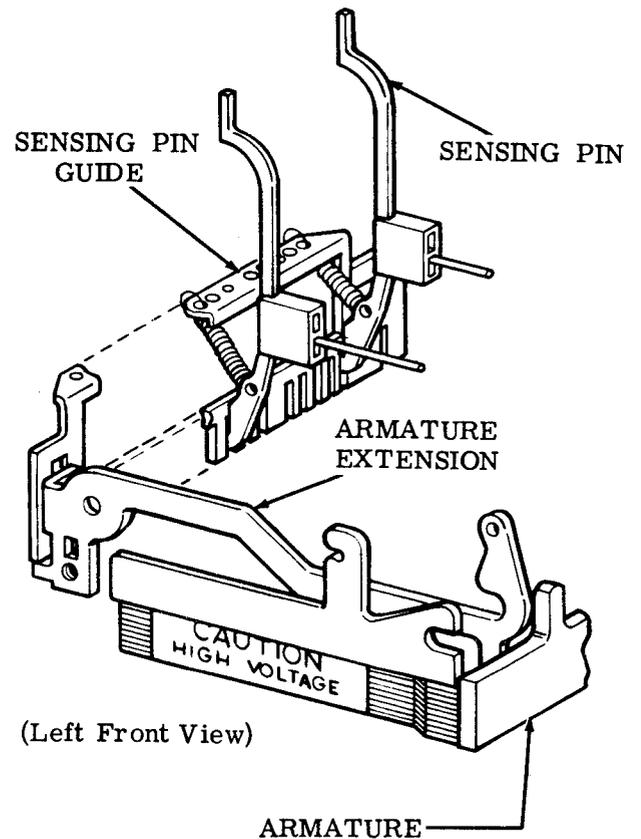


Figure 12 - Sensing Pin Guide

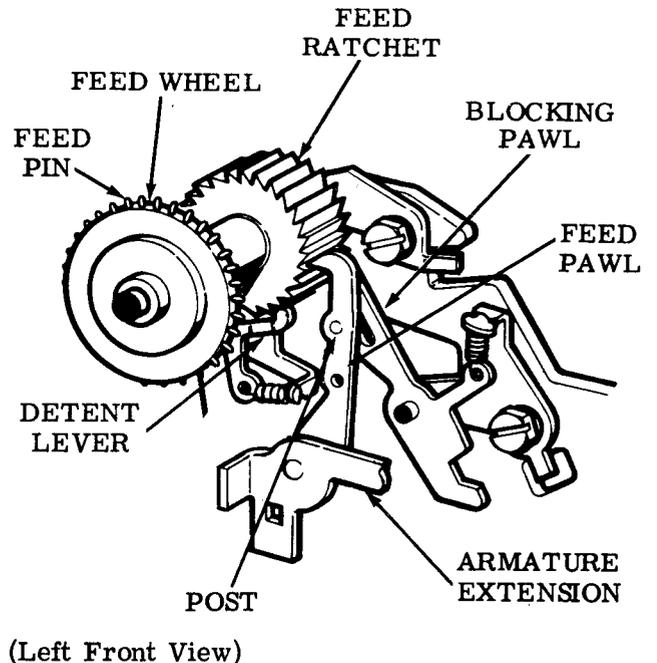


Figure 13 - Tape Feed Mechanism

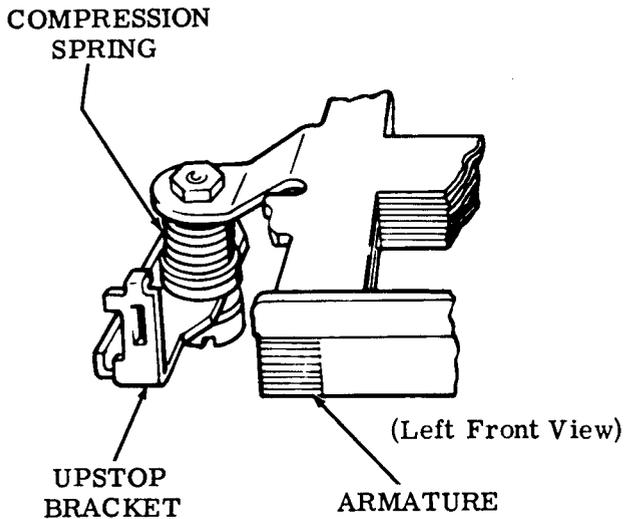


Figure 14 - Upstop Mechanism

heavy detent spring. It also prevents the pulling ahead of the tape, during sensing, by a tape winder, without the use of a heavy detent spring. During the upstroke of the armature extensions, the blocking pawl is rotated out of engagement with the tooth by the post on the feed pawl (Figure 13).

#### H. Upstop Mechanism

3.21 The armature is provided with a spring biased upstop which serves two purposes.

- (a) A portion of the energy during the end of the stroke is stored in a spring and returned to the armature on the downstroke to give a rapid release and acceleration.
- (b) A portion of the energy is dissipated through a resilient buffer to minimize noise and metallic clatter (Figure 14).

### 4. FEATURES

#### → MANUAL READER

##### A. Freewheeling Mechanism (Figure 15)

4.01 The 33 tape reader is provided with a freewheeling feature which allows the feed wheel to rotate freely. When the control lever is moved to the FREE position, the extension on the control lever engages the blocking pawl and pivots it clockwise. Riding in a slot on the underside of the blocking pawl is a stud which connects to the feed pawl. As the blocking pawl

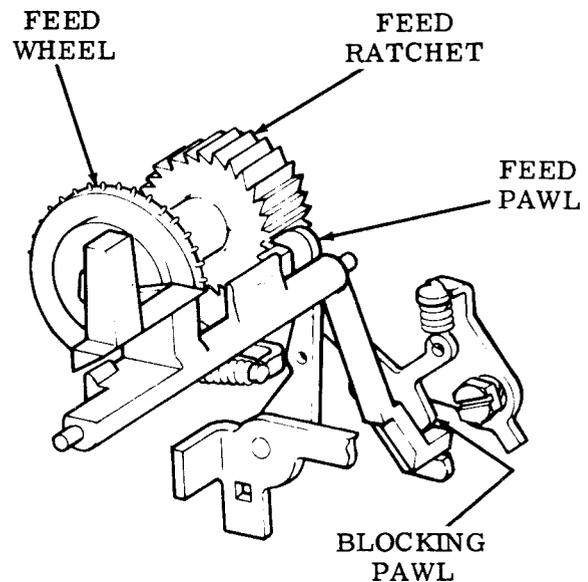
is pivoted clockwise by the control lever extension, the blocking pawl moves the feed pawl away from the feed ratchet. With the feed ratchet free, the feed wheel will also rotate freely.

##### B. Tight-Tape Mechanism (Figure 16)

4.02 This feature consists of a plastic tight-tape bail which snaps into the tape lid. The tight-tape bail serves to turn the tape reader OFF when the moving tape becomes taut. The tight-tape bail has an extension on it which projects through the top plate. This extension rides on a spring biased tight-tape lever. If the tape in the tape reader becomes taut, the bail will be lifted. The bail extension will rotate, causing the tight-tape lever to rotate also. In its pivoting motion the tight-tape lever will lift the tight-tape contact wires away from the contact terminal, breaking the current path. With the circuit broken the tape reader stops.

##### C. Tape-Out Mechanism (Figure 17)

4.03 The tape reader is equipped with a tape-out feature which will stop the tape reader when the tape runs out. A tape-out pin protrudes above the surface of the top plate. During tape sensing the tape-out pin is kept depressed by the moving tape. When the tape runs out, the spring biased tape-out pin moves fully up. An



(Left Front View)

Figure 15 - Freewheeling Mechanism

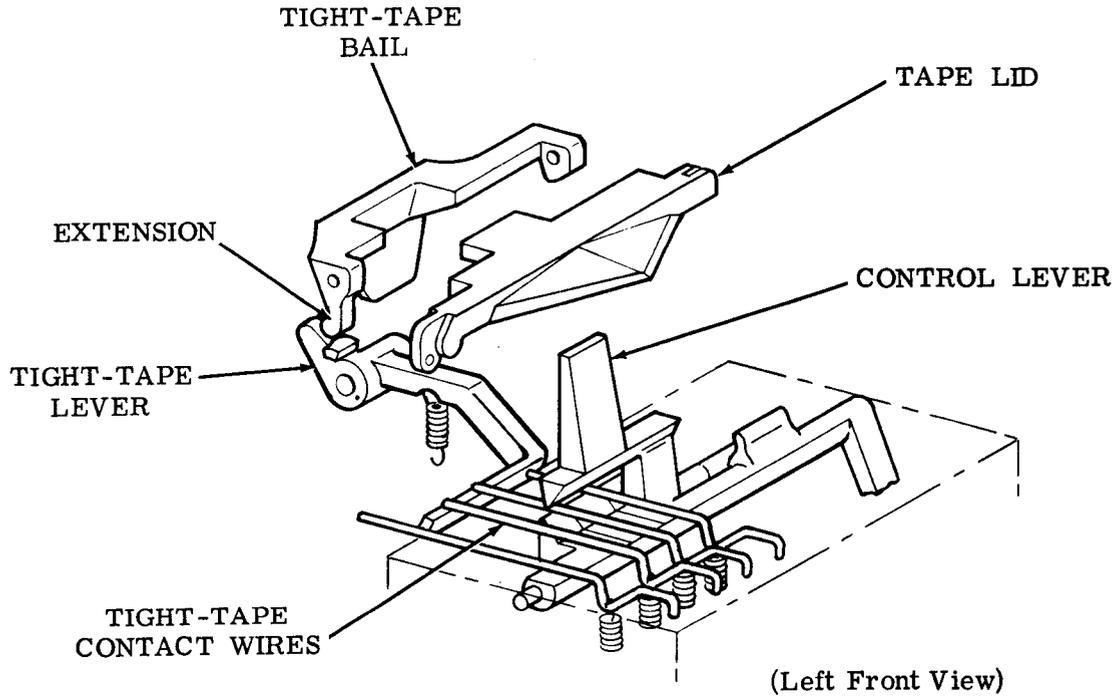


Figure 16 - Tight-Tape Mechanism

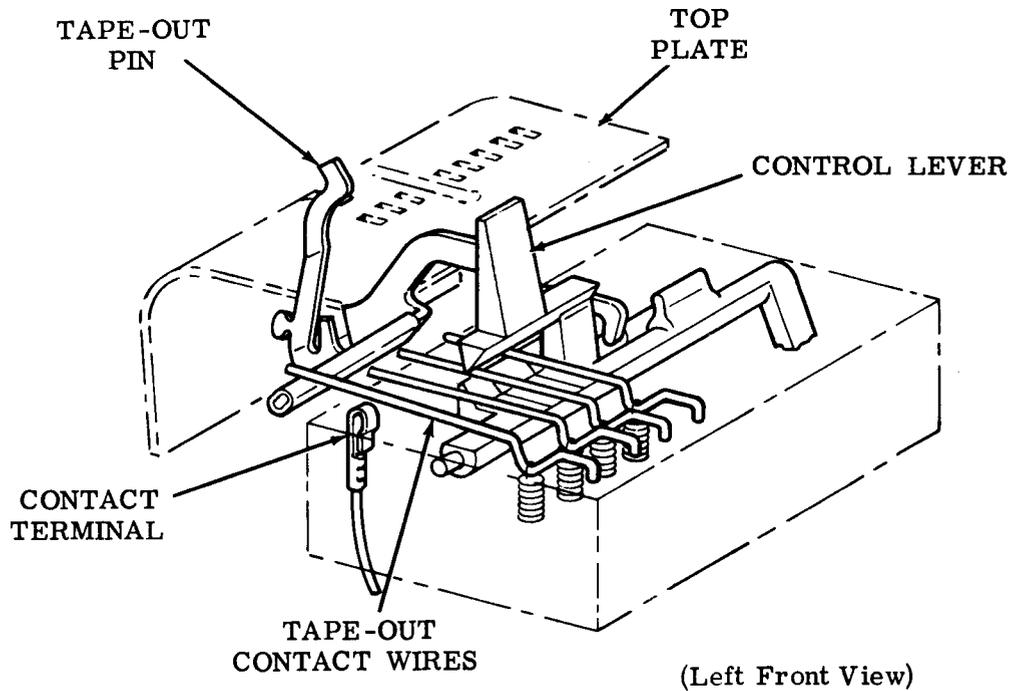


Figure 17 - Tape-Out Mechanism

insulated extension on the tape-out pin lifts the tape-out contact wires away from the contact terminal. This breaks the current path and the tape reader stops.

**AUTOMATIC CONTROL FEATURES**

4.04 The automatic control features allow the tape reader to be started or stopped either manually or automatically. This is accomplished by means of additional contacts, a relay, and wiring. There are other contacts in the typing unit function area and, for sprocket feed typing units, in the form out mechanism, which are related with the tape reader automatic features.

**A. Local Start (Figure 18)**

4.05 When the control lever is placed in the MANUAL START position the following events take place:

- (a) The start contact wires close momentarily.
- (b) After closing momentarily the start contact wires are opened due to the detent action of the control lever.

- (c) The momentary closing of the start contact wires energizes the relay and two normally open contacts associated with the relay.
- (d) The first relay contact closes a holding circuit.
- (e) The second relay contact — if there is tape in the tape reader and the tape-out contact is closed — closes the circuit to the distributor clutch. The distributor clutch will then be tripped as explained in 3.08.

**B. Remote Start (Figure 19)**

4.06 When the control lever is placed in the AUTO position, the start contact is open and the stop contact is closed. The tape reader will respond to a remote reader start signal and turn ON automatically. The remote signal will close a contact in the typing unit function area and complete an electrical path to the distributor area.

**C. Reader Stop**

4.07 When the control lever is placed in the MANUAL STOP position, the stop contact wires are momentarily opened, de-energizing

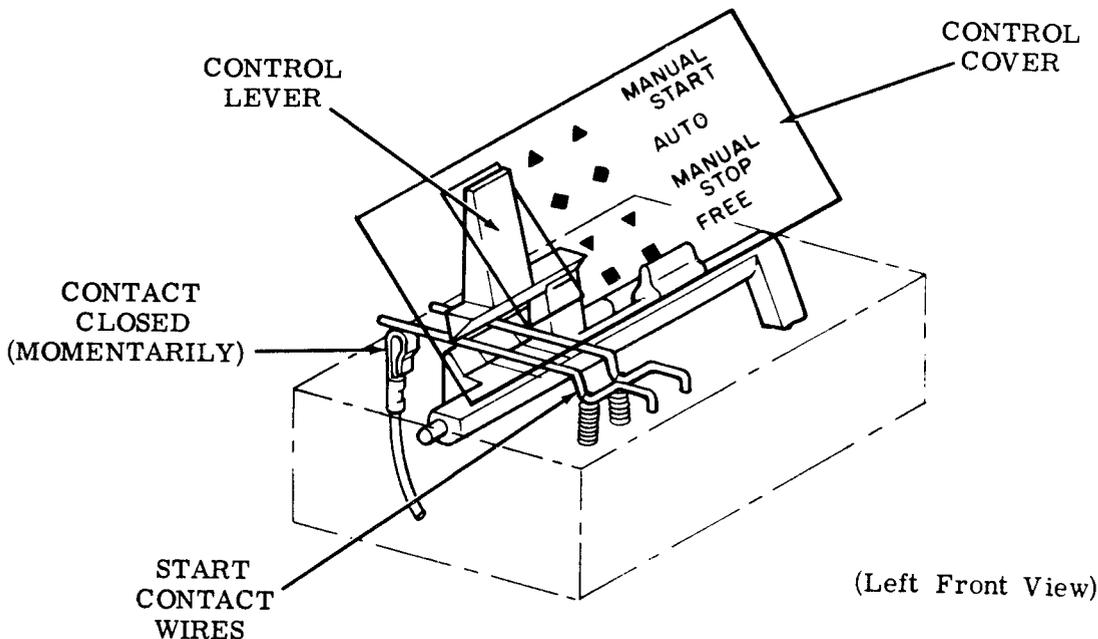


Figure 18 - MANUAL START Position

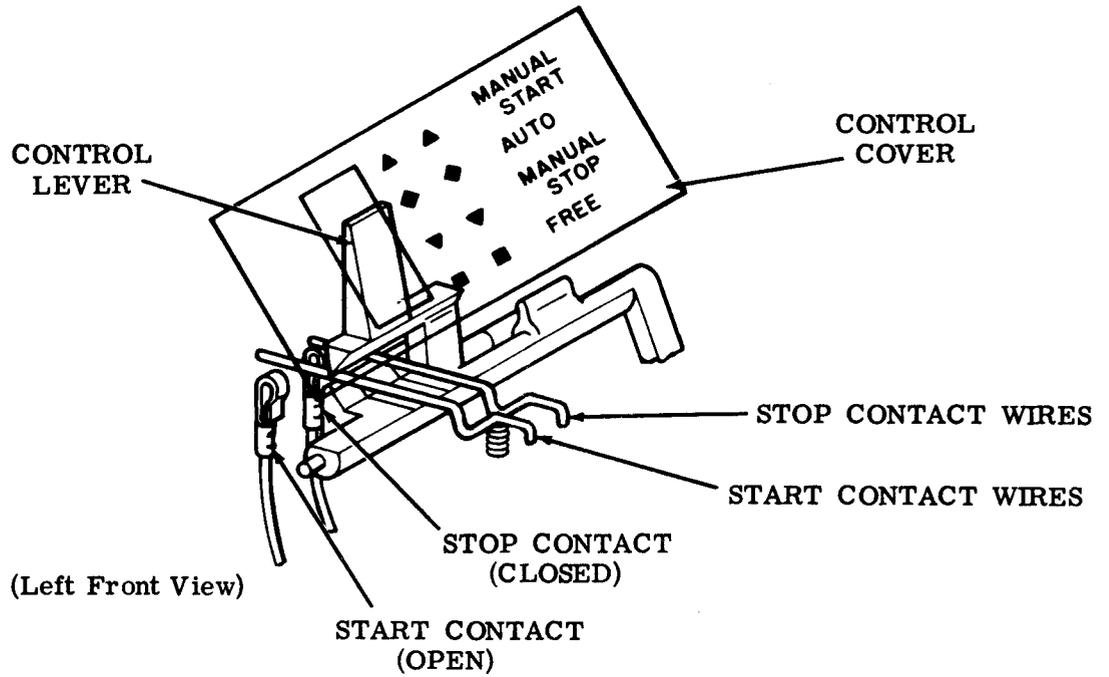


Figure 19 - Automatic Start Position

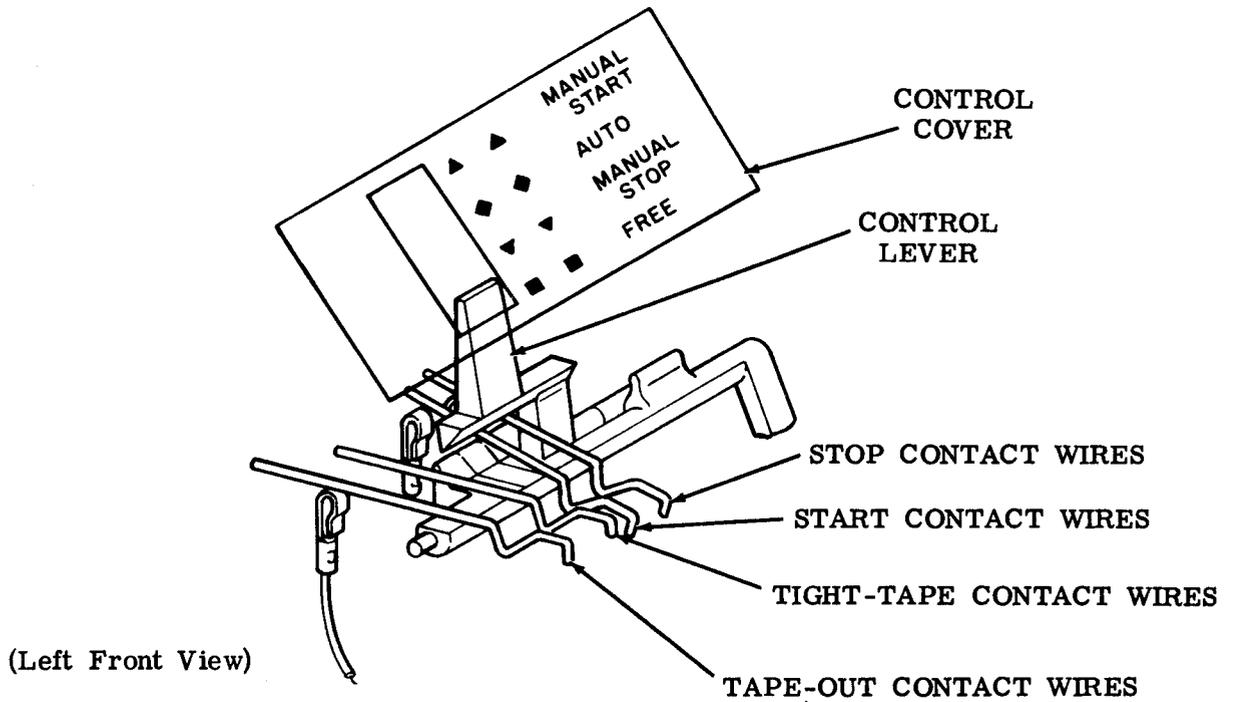


Figure 20 - Control Lever in FREE Position

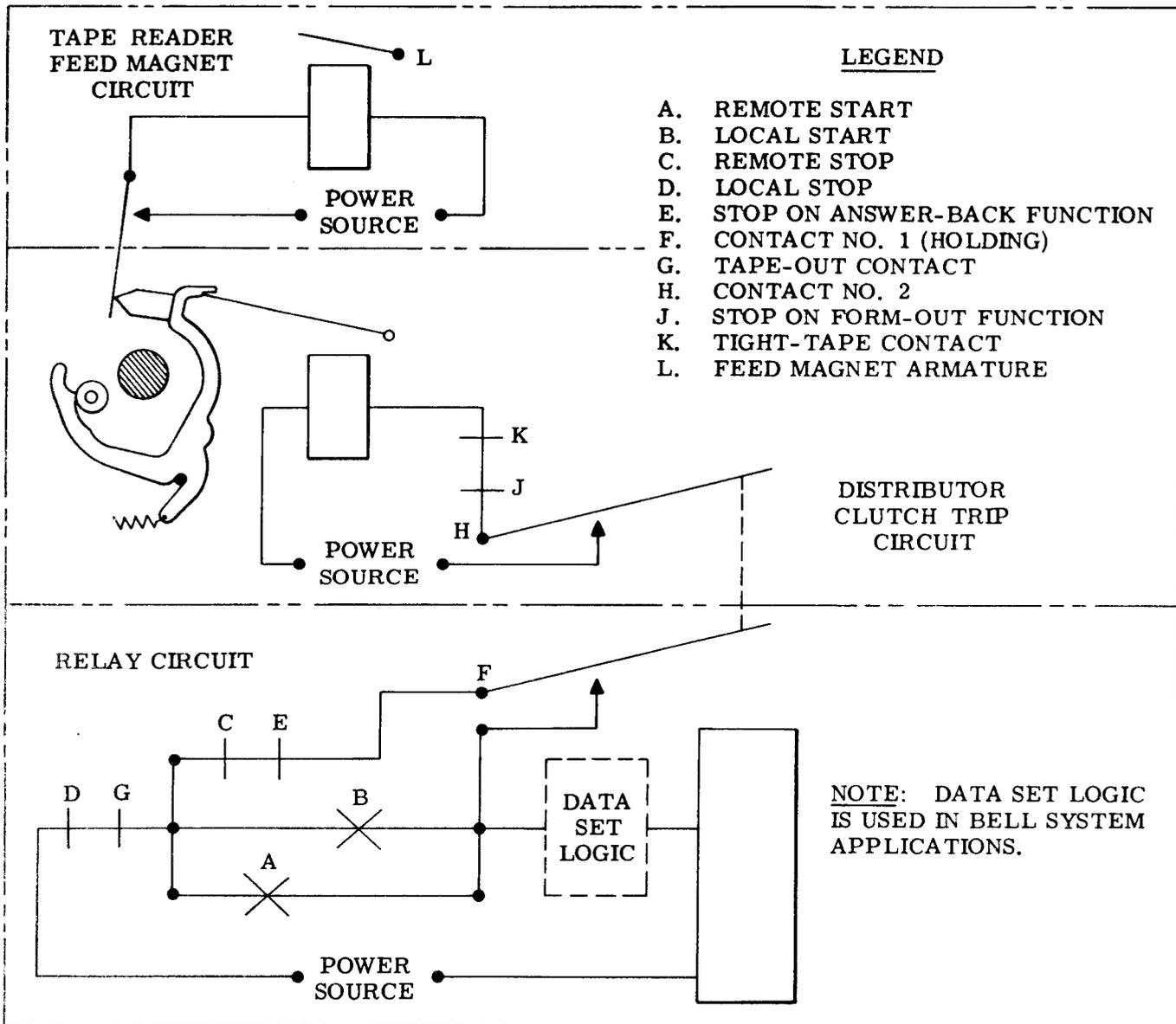


Figure 21 - Automatic Reader Control Schematic

the relay and opening two relay contacts. One of these contacts opens the reader trip magnet circuit. The trip magnet de-energizes causing the tape reader to stop.

**Alternate Reader Stop**

4.08 The automatic tape reader can be stopped either permanently or temporarily. When the reader is stopped permanently it cannot be started again automatically but must be started manually. When temporarily stopped, the reader can be started again either automatically or manually.

**Permanent Stop**

4.09 Besides the stop contact wires mentioned in 4.07, the following are normally closed contacts wired in series with the relay in the power pack:

- (a) Tape-out contact wires
- (b) Tape reader OFF function box contact
- (c) WRU function box contact

When one of these contacts is momentarily opened, the relay is de-energized, opening two relay contacts. One of these relay contacts

opens the reader trip magnet circuit. The trip magnet de-energizes causing the reader to stop permanently.

**Temporary Stop**

4.10 The following normally closed contact wires are wired in series with the reader trip magnet:

- (a) Form-out function box contact
- (b) Tight-tape contact wires

When one of these contacts is opened the trip magnet is de-energized stopping the tape reader temporarily.

**D. FREE Position (Figure 20)**

4.11 When the control lever is placed in the FREE position the start and stop contacts are open. The tape reader will not respond to a remote reader start signal.