

HIGH SPEED TAPE READER UNITS (CX)  
DESCRIPTION AND PRINCIPLES OF OPERATION

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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.

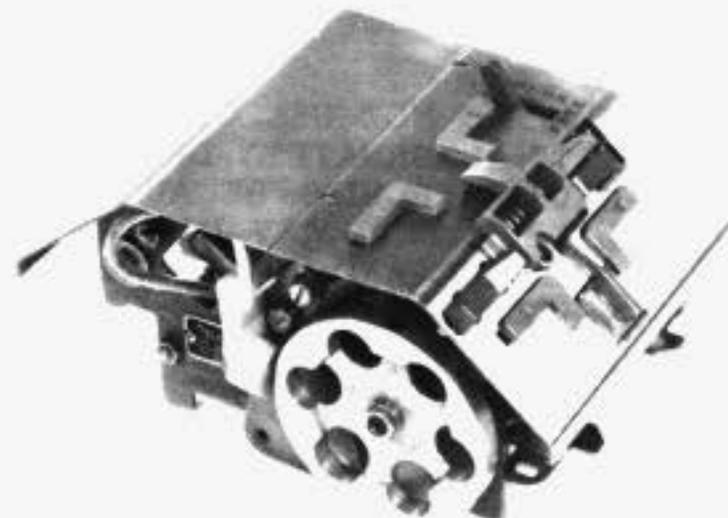


Figure 1 - High Speed Tape Reader Unit

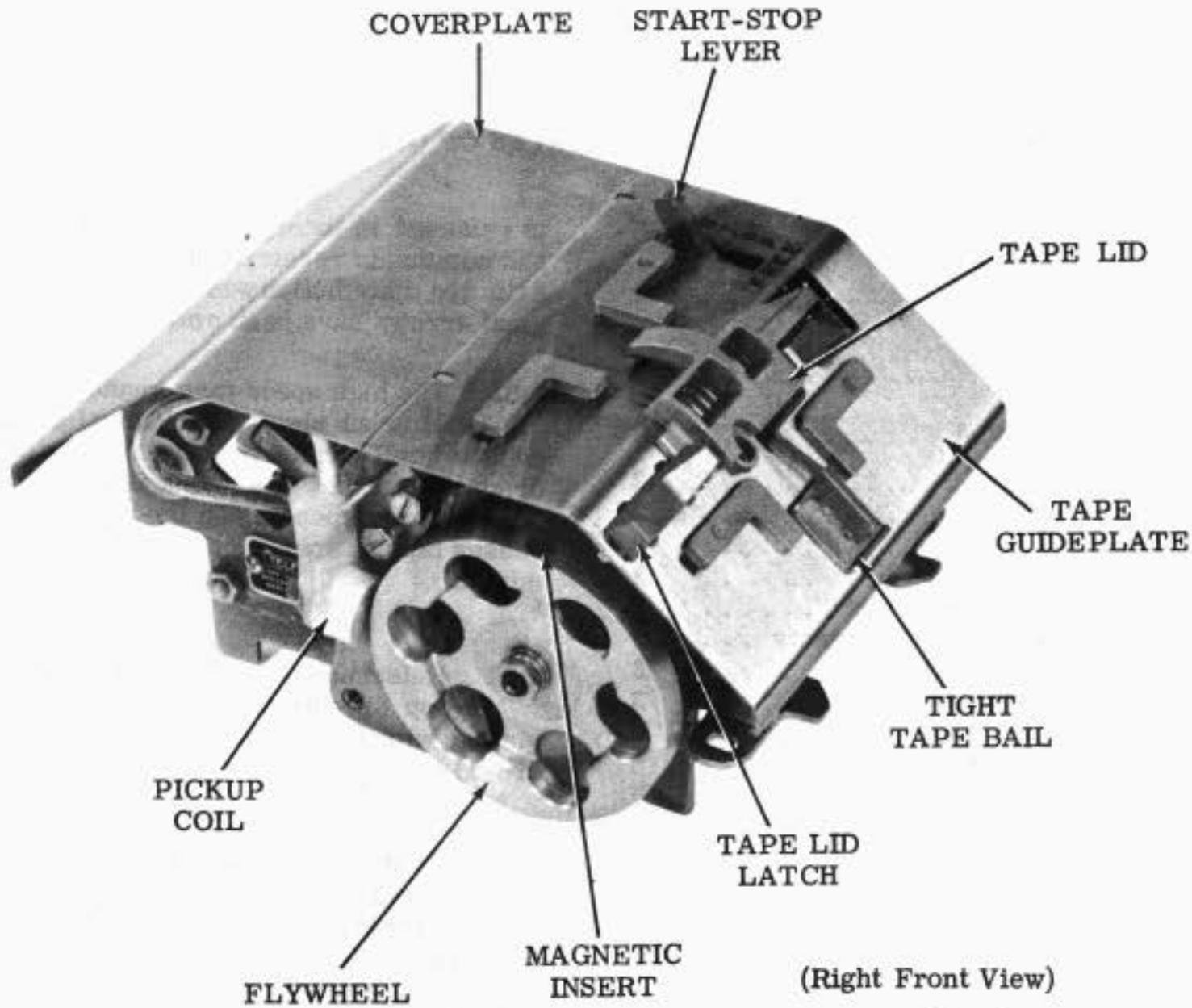


Figure 2 - High Speed Tape Reader Unit

1.05 Use twill jean cloth (KS2423) to clean gold-plated contacts. Do not use bur-nishers, 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 CON-TACTS USED IN LOW-LEVEL CIRCUITS. (SEE 1.04.)**

## 2. DESCRIPTION

### TECHNICAL DATA

#### A. Speed

Gear sets provide several specific speeds start-ing 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 equip-ment 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

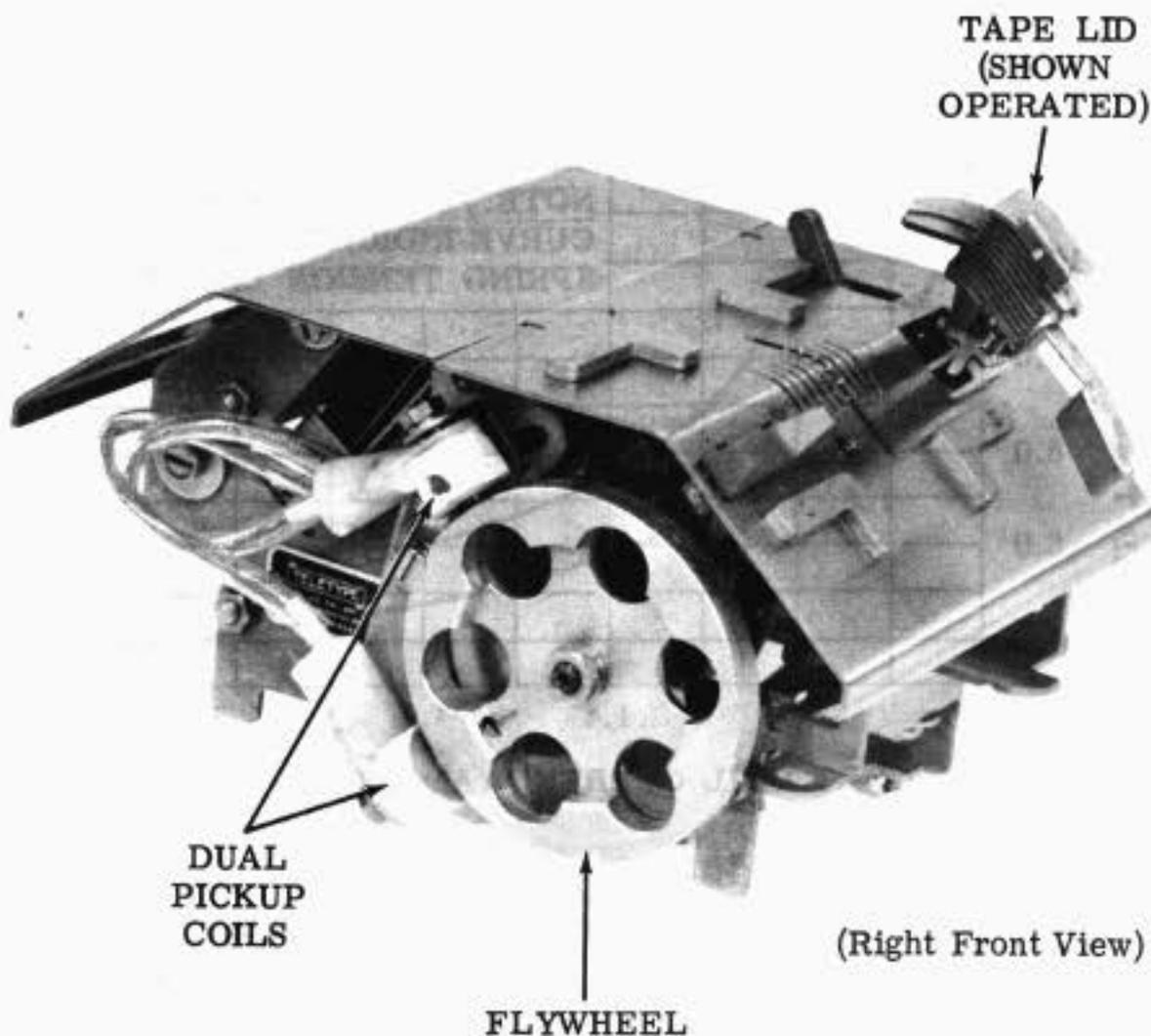


Figure 3 - High Speed Tape Reader Unit (with Dual Pickup Coils)

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

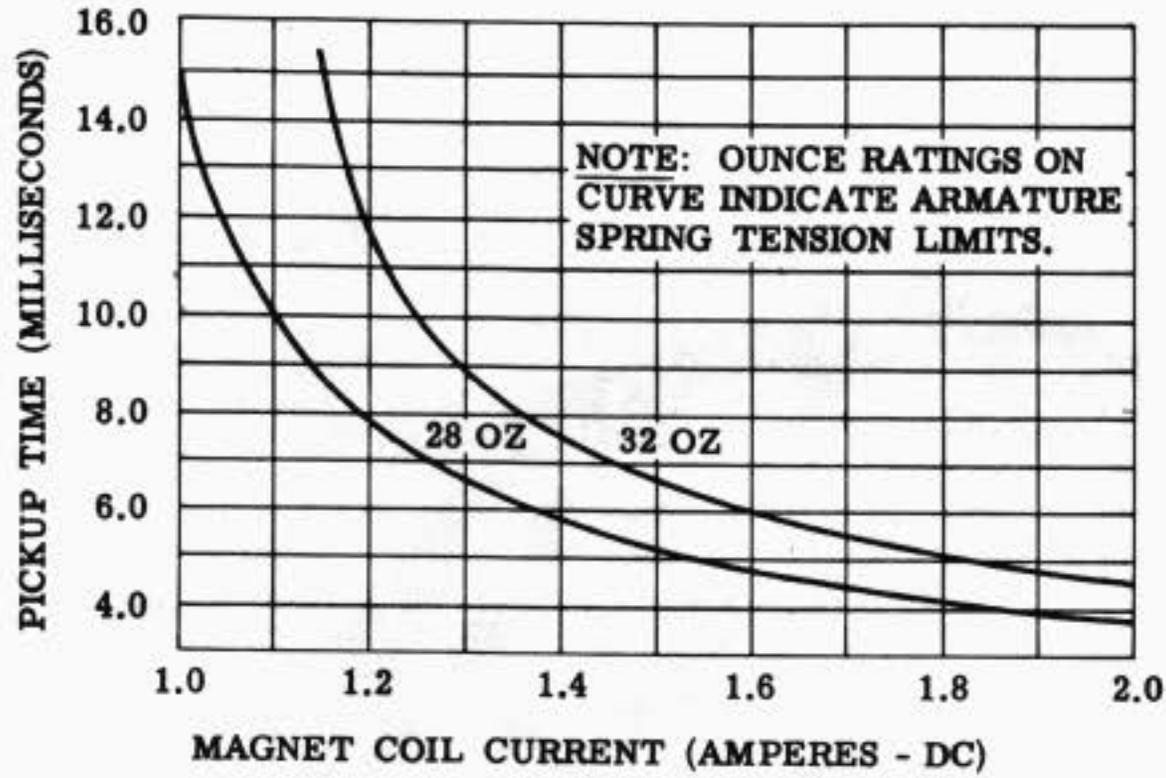


Figure 4 - Operating Magnet Pickup Time

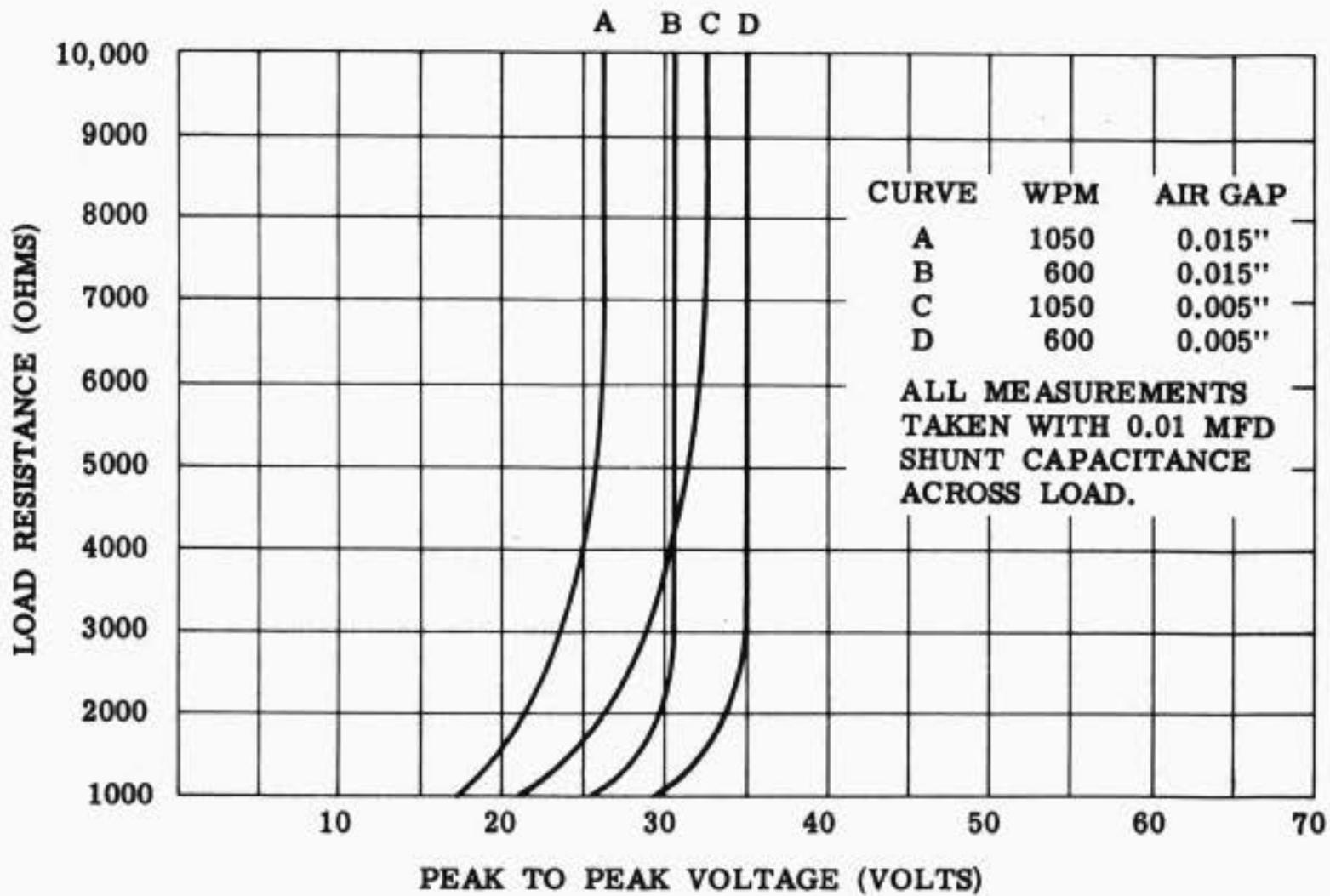


Figure 5 - Magnetic Pickup Characteristics

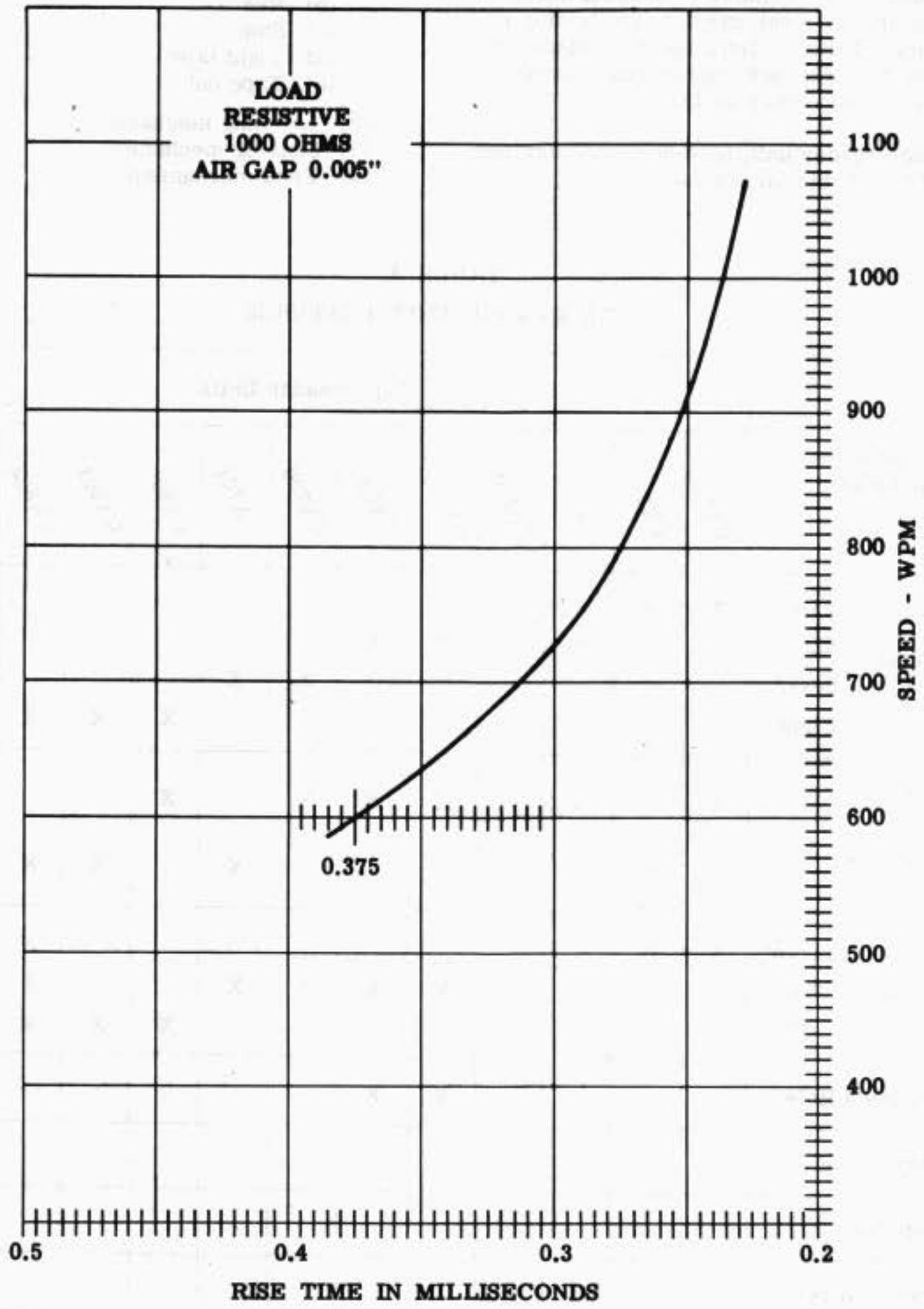


Figure 6 - Magnetic Pickup Characteristics

## 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.

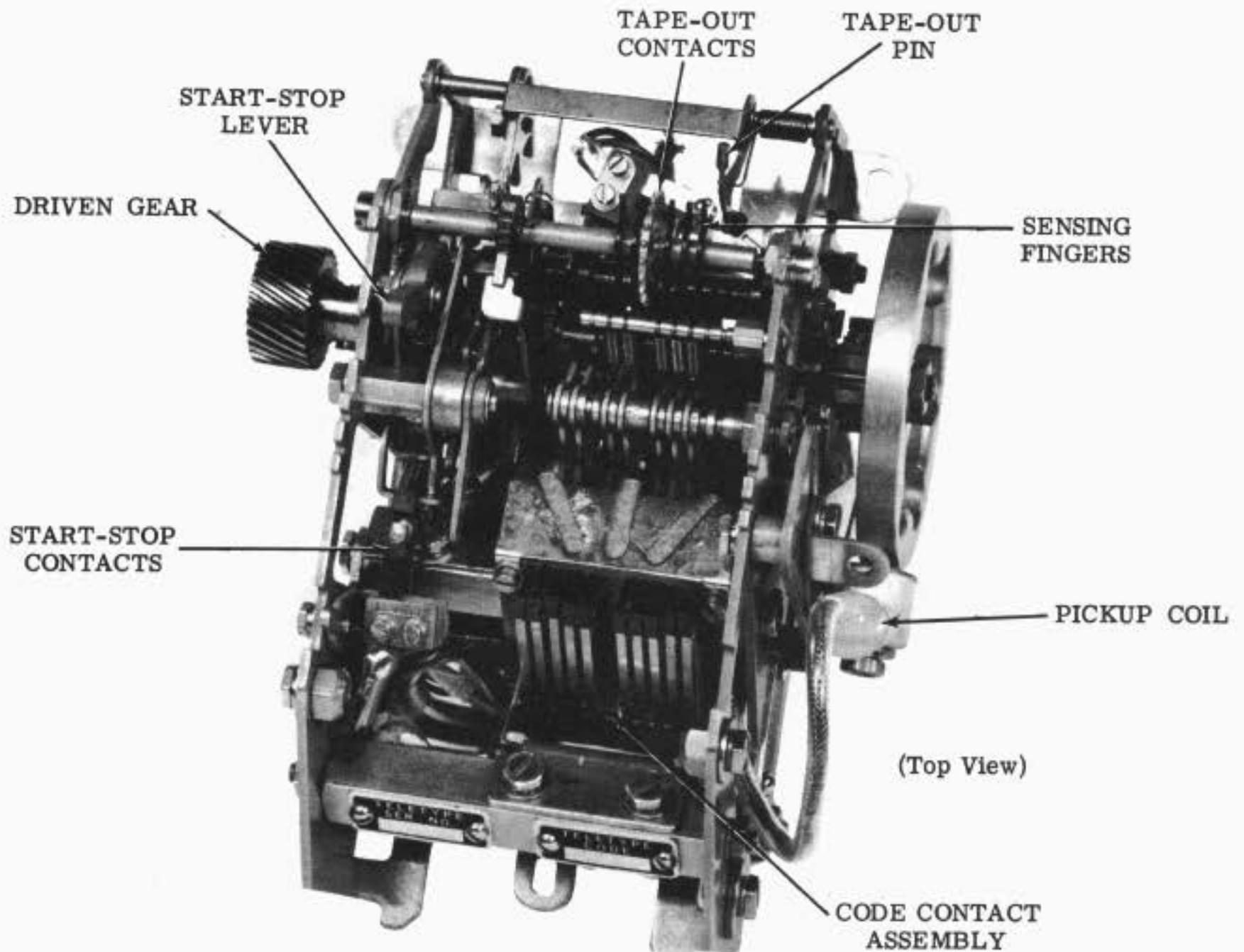


Figure 7 - High Speed Tape Reader Unit (Coverplate Removed)

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.

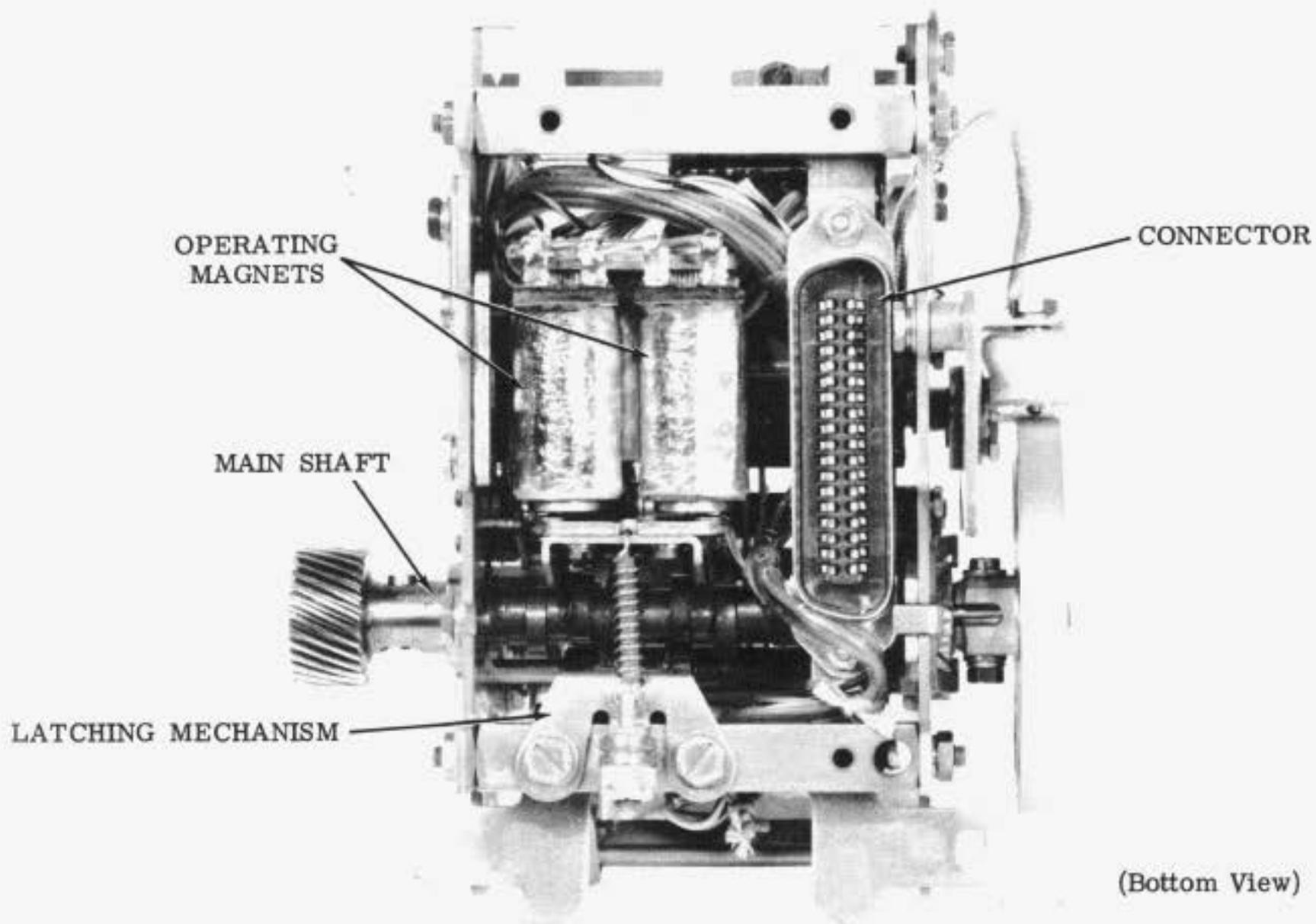


Figure 8 - High Speed Tape Reader Unit

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.

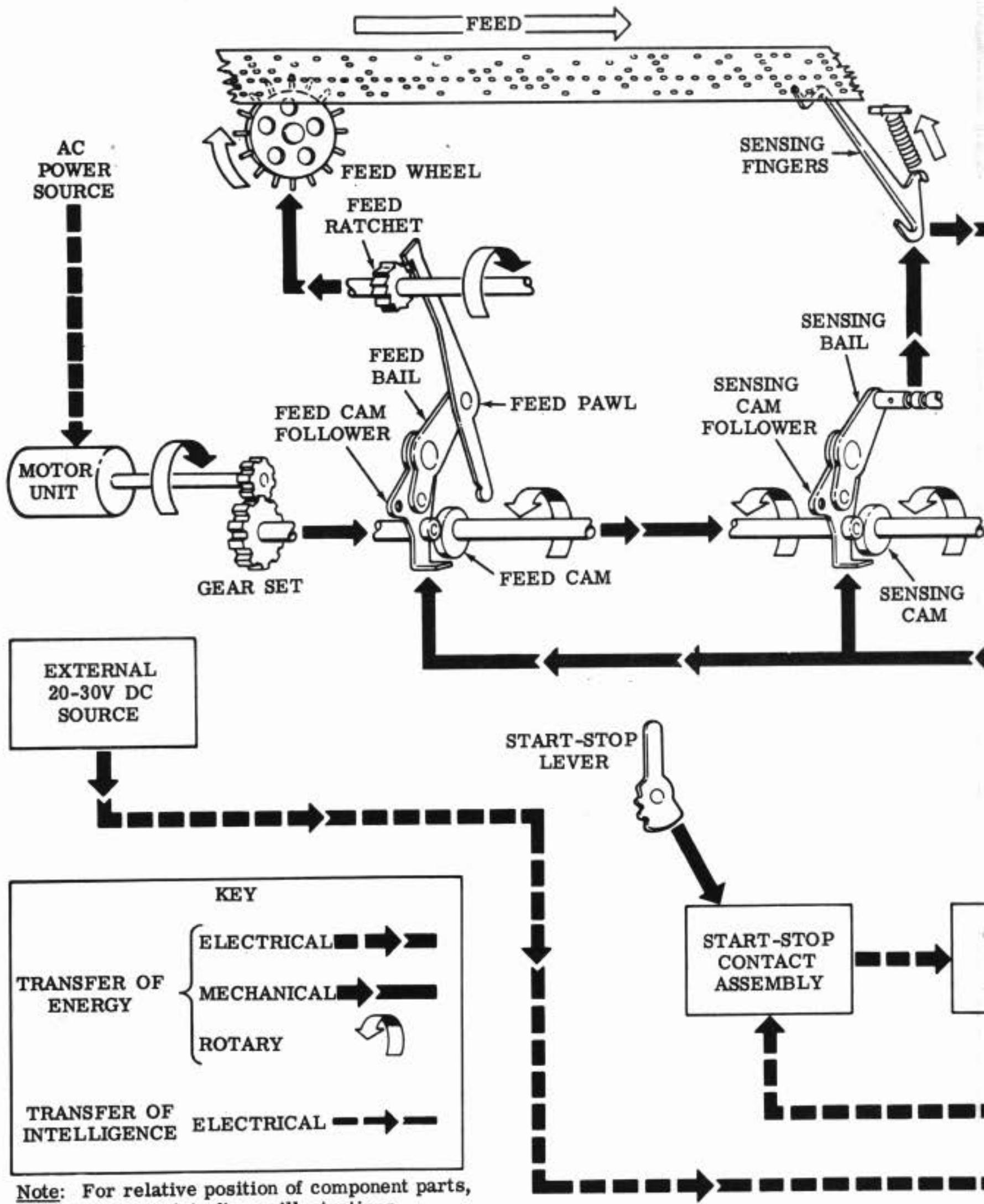
(6) Movement of transfer levers and actuator bars causes code and timing contacts to close.

- (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.

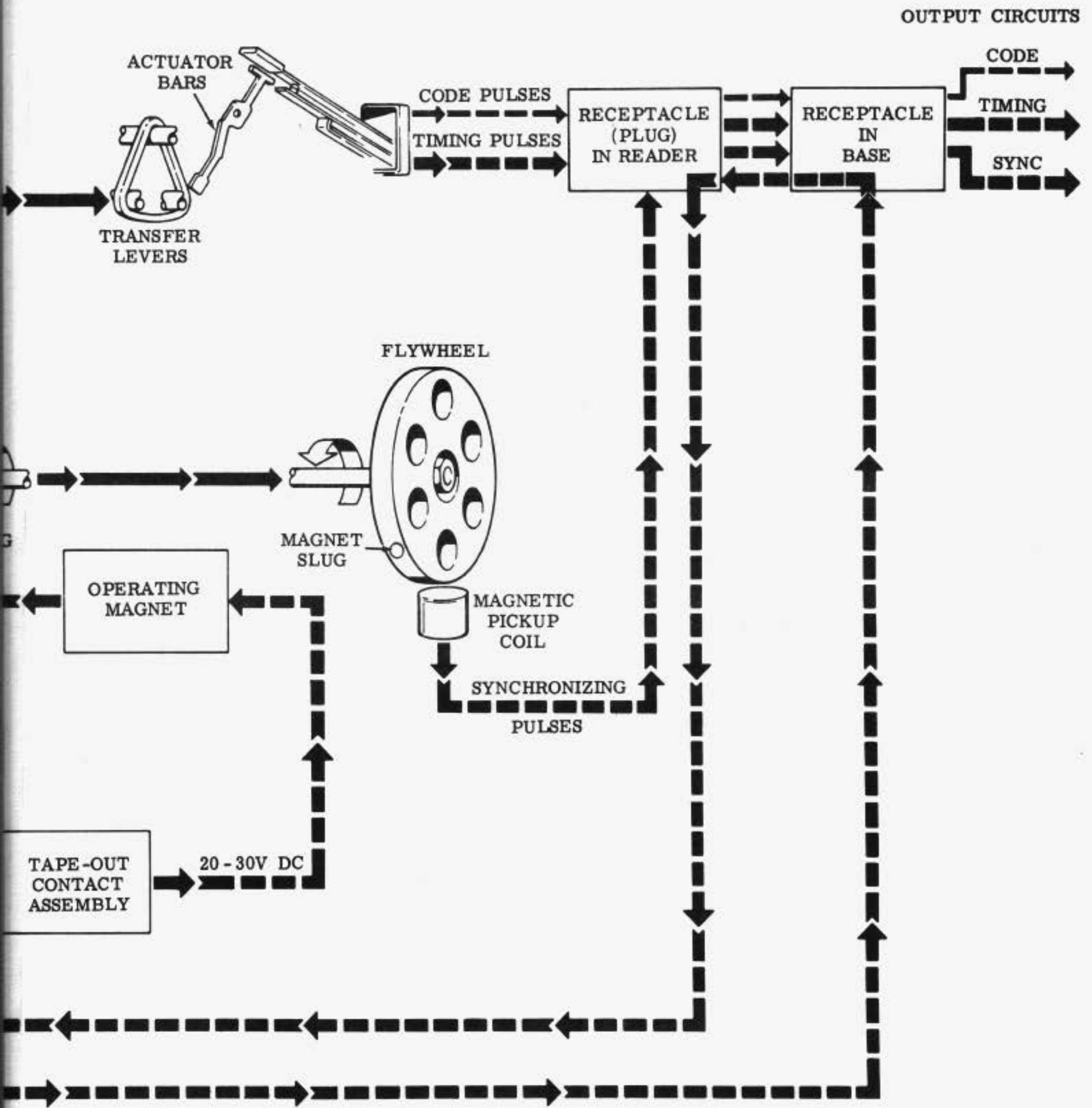
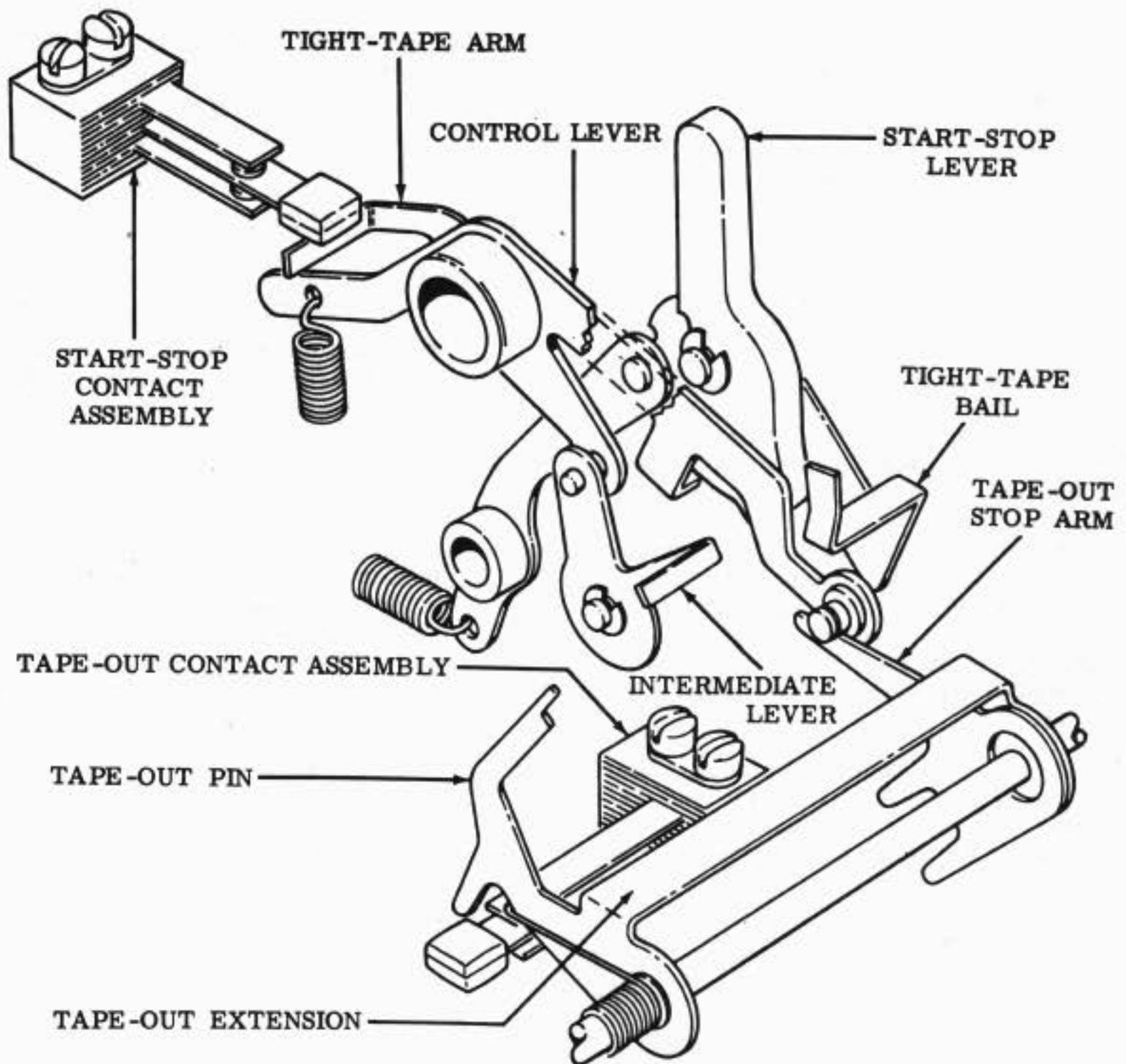


Figure 9 - Typical Tape Reader Unit Pictorial Schematic



(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.

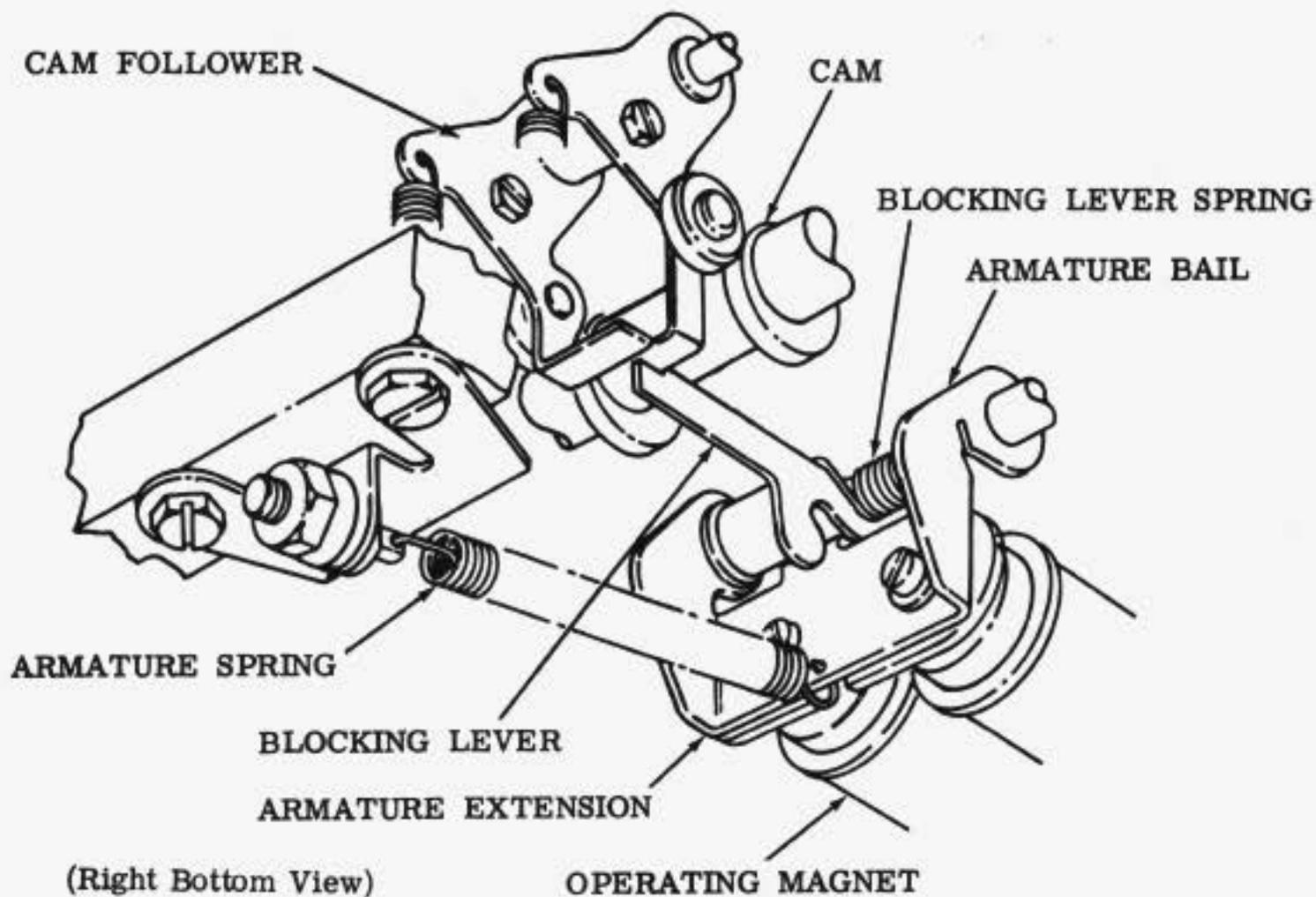


Figure 11 - Latching Mechanism

## 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.

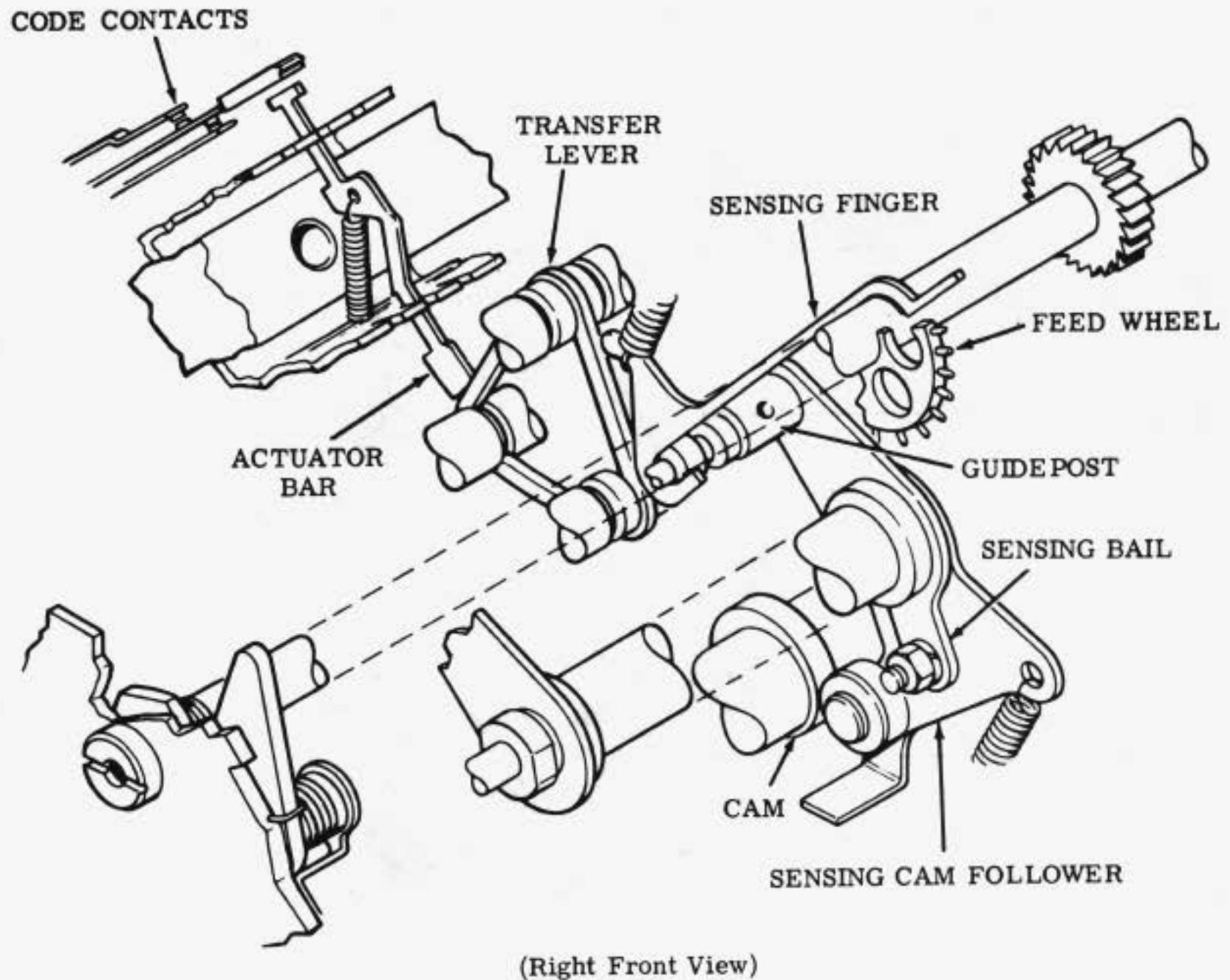


Figure 12 - Sensing Mechanism

- 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 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.

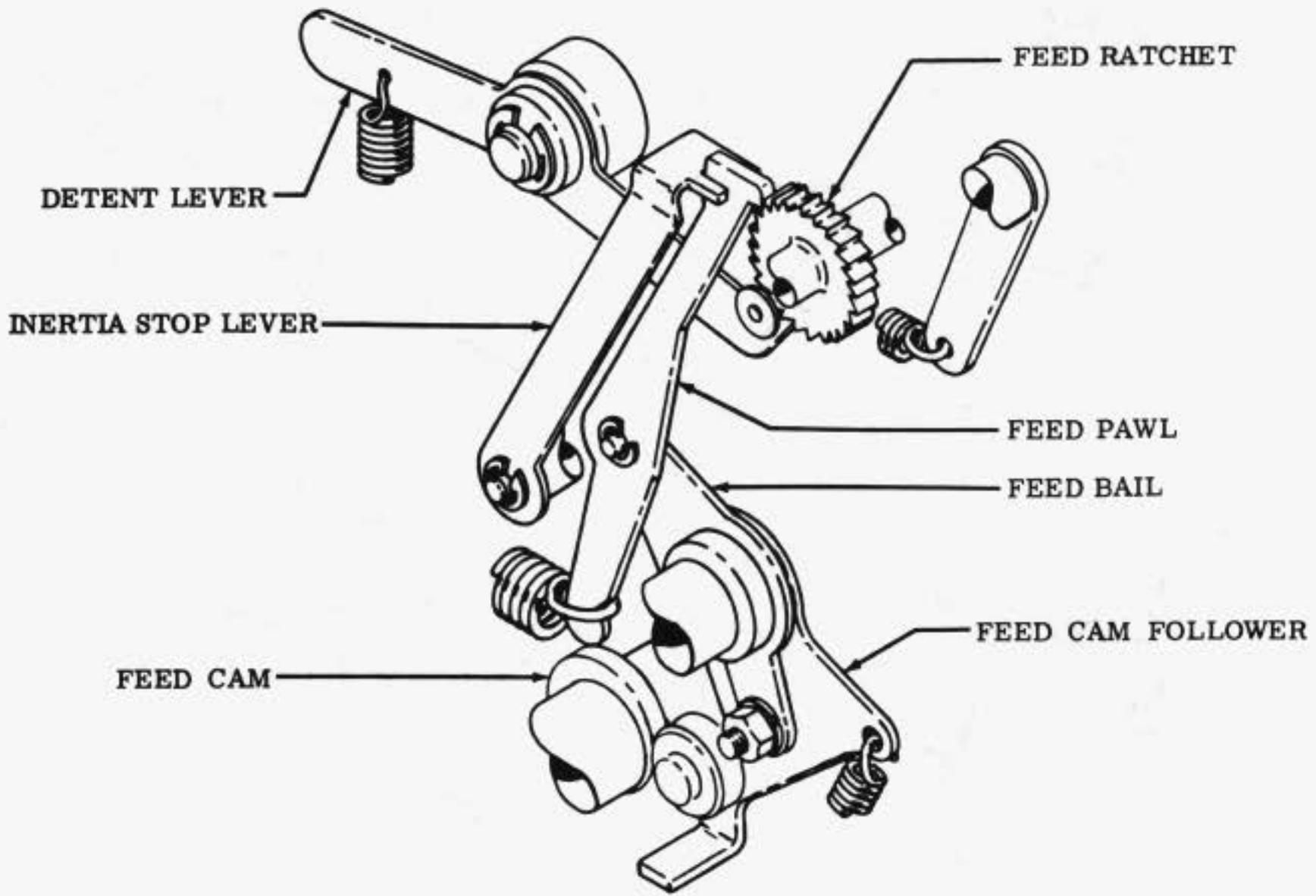
FEED MECHANISM

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.

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

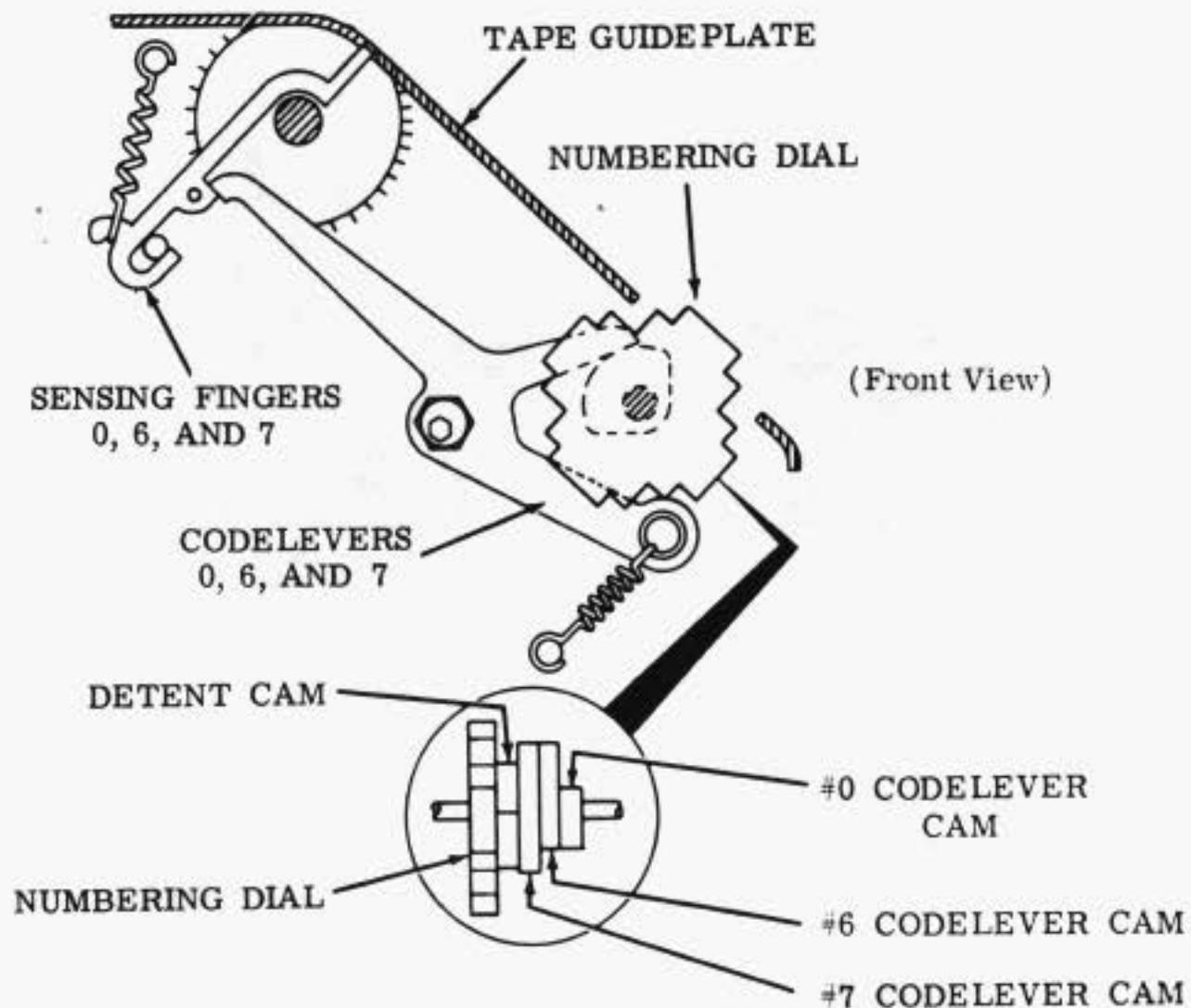


Figure 14 - Universal Tape Reading Mechanism

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.

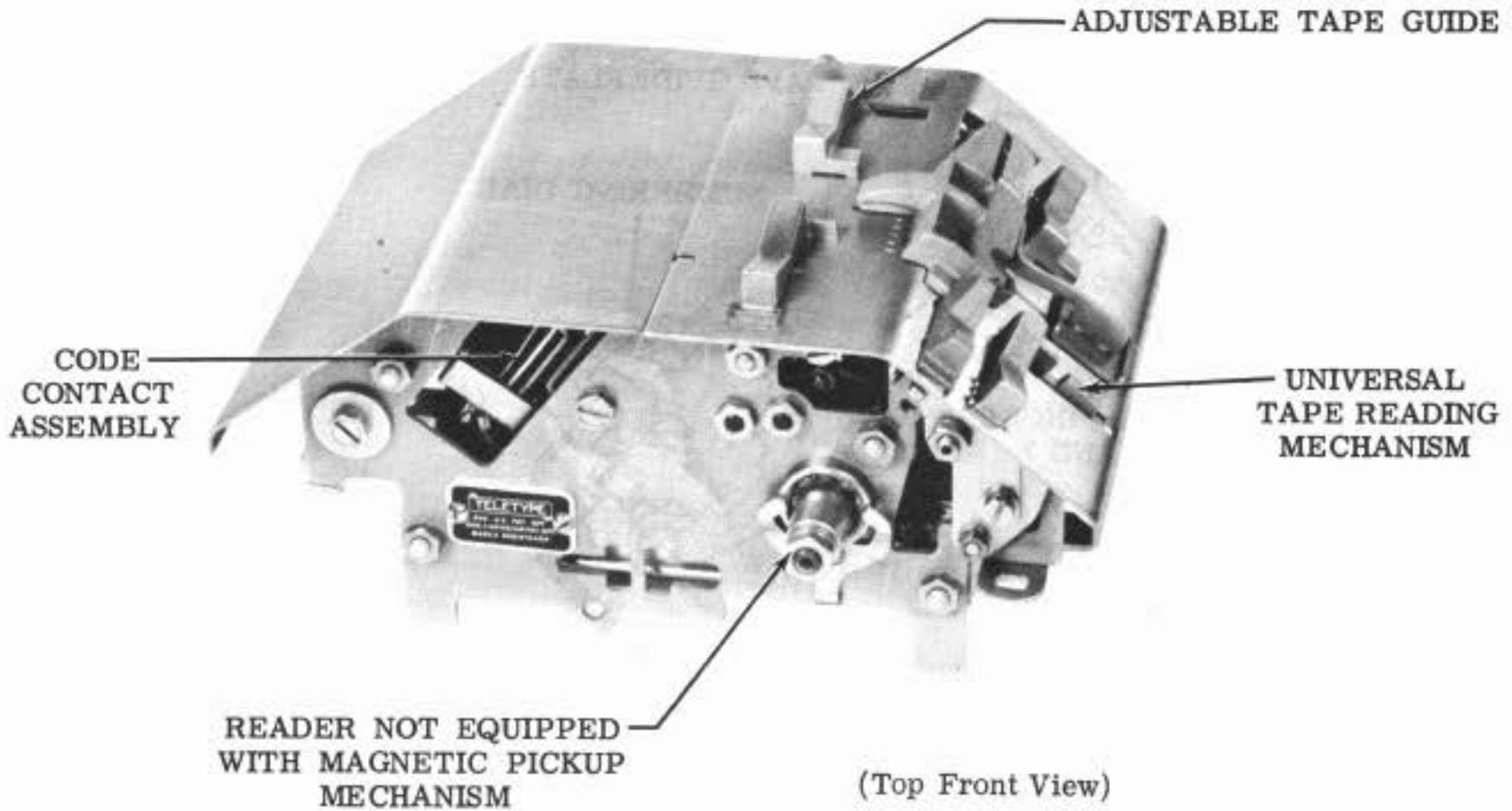


Figure 15 - High Speed Tape Reader Unit (Without Magnetic Pickup Mechanism)

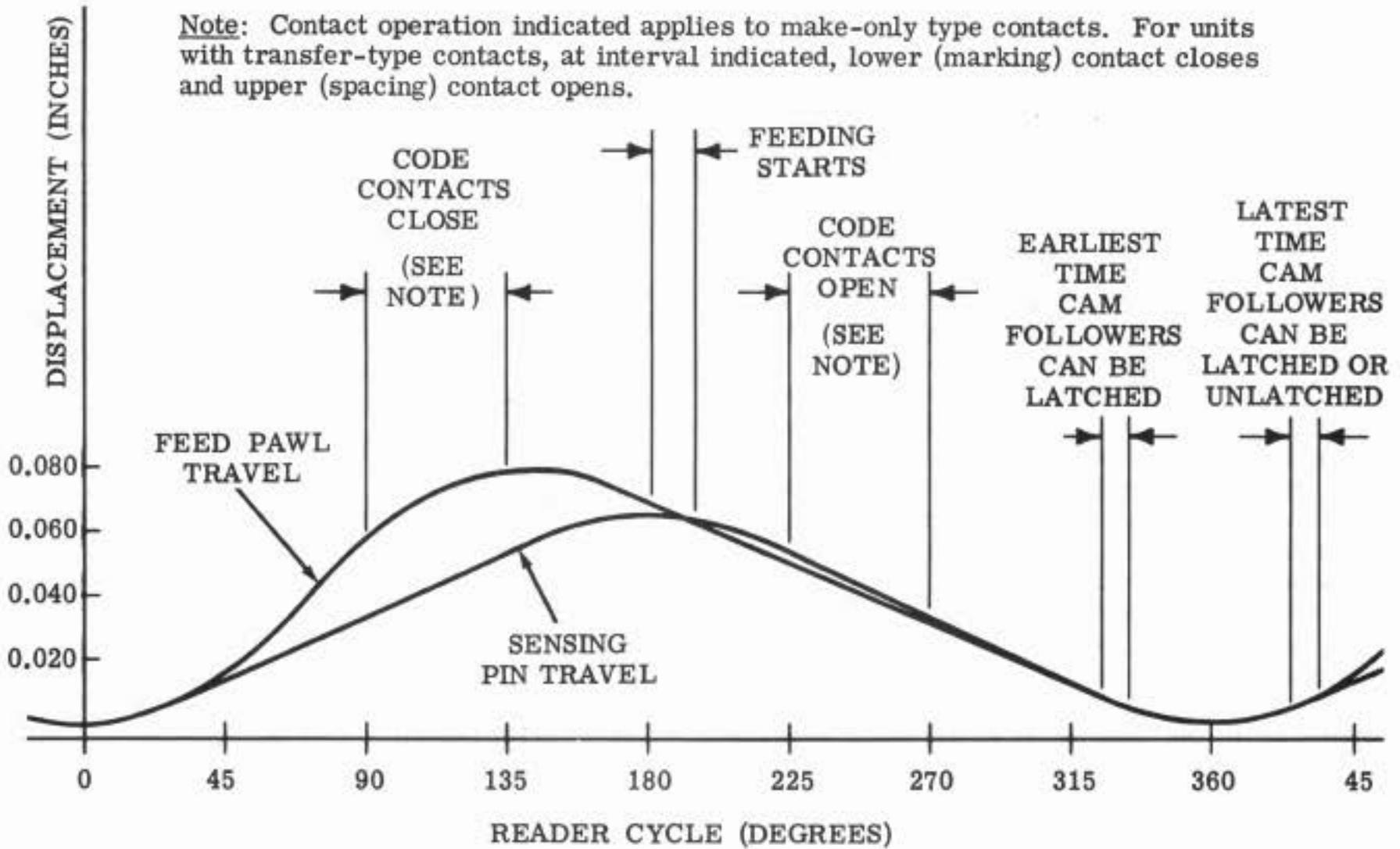


Figure 16 - Timing Diagram