HIGH SPEED TAPE READER

(CX TYPE)

GENERAL DESCRIPTION AND PRINCIPLES OF OPERATION

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1. INTRODUCTION

1.01 This section is reissued to change the title, include photographs of the 2A tape reader, mention the tape reader modified to read tapes with advanced feed holes, and rewrite portions of the text.

1.02 The principles described in this section apply to the 1A, 2A, and 2A special tape readers. The 1A reader is used in tape sender equipment for 5-level operation only; the 2A reader has a set of variable components and may be used for 5-, 6-, 7-, or 8-level operation; and the 2A special reader is a 6-level unit which has been modified to read tapes with advanced feed holes.

1.03 Coded intelligence, recorded in paper tape, is sensed by the tape reader at the transmitting station, converted into a tone modulated serial code, and conveyed to a distant receiving station through existing telephone lines and switching centers. At the receiving station the tone modulated serial code is converted back to a current - no current parallel code for perforating paper tape. Terminal equipment consists of a tape sender set and a tape receiver set. The tape reader is a unit within the tape sender set.

2. GENERAL DESCRIPTION

2.01 The tape reader (Fig. 1) is an electromechanical device which senses intelligence recorded in fully perforated or chadless tape. Its output is fed to the signal converter (within the tape sender set) as parallel pulses. The reader senses tape at a speed of approximately 105 characters per second, (1050 words per minute).

2.02 The tape reader unit consists of the mounting rails, motor unit, and reader unit.

2.03 The mounting rails provide a foundation for the reader. They include the following features:

- Right and left rails with tapped holes for mounting the reader and motor units.
- Power circuitry including a 4-point terminal board for connecting external power to the motor unit.
- A 36-point receptacle which mates with a 36-point plug on the bottom of the reader unit.
- A bracket which serves as a guard over the gear and pinion.
- Vibration mounts.

Prepared for American Telephone and Telegraph Company by Teletype Corporation

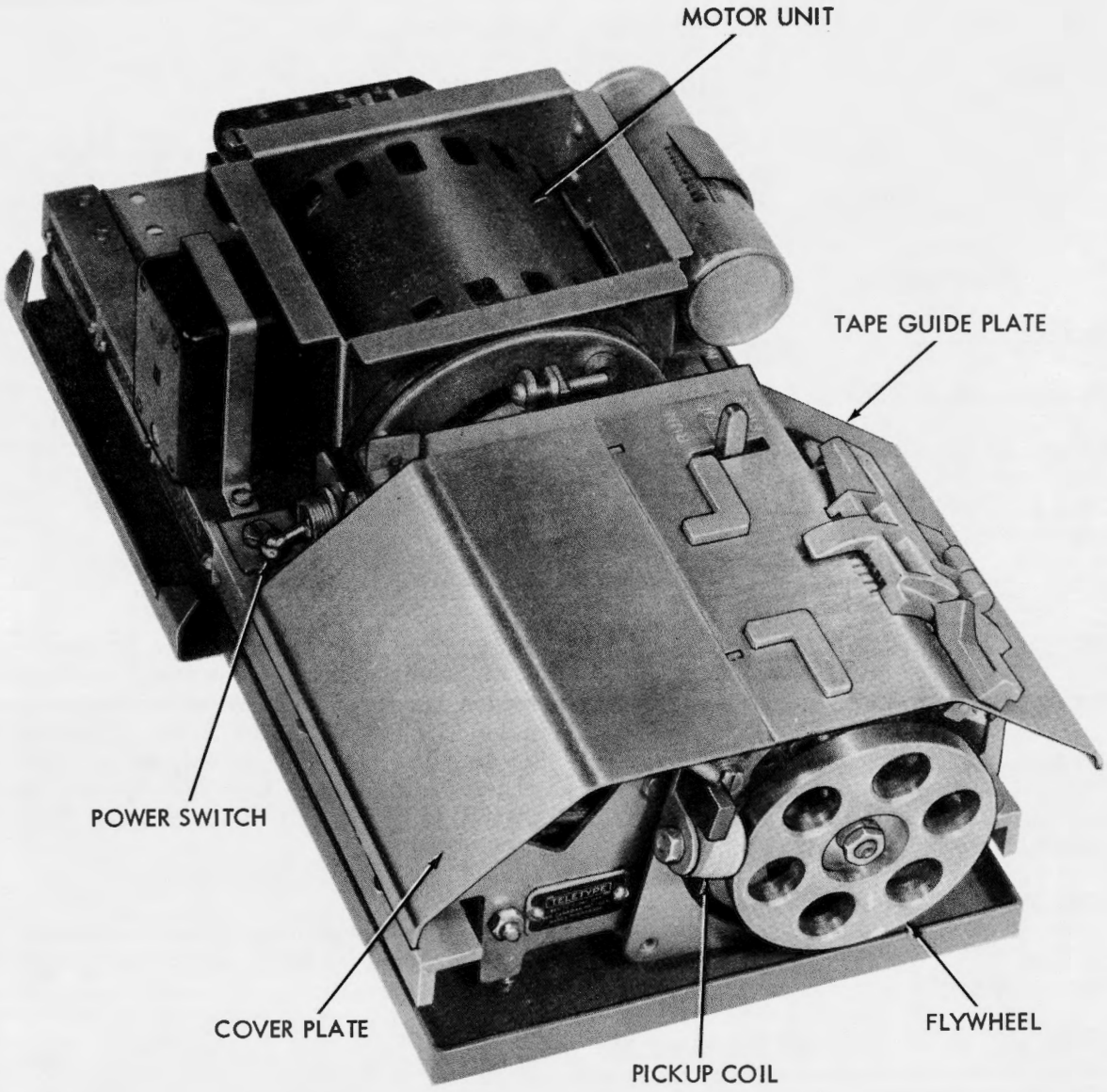


Figure 1 - Tape Reader

2.04 A 2-pole, synchronous motor unit provides mechanical motion to drive the reader. A thermal cutout switch is provided for protection of the motor unit in the event of overload. The switch may be reset by depressing the RESET button.

Note: Allow motor to cool for at least 5 minutes before operating RESET button.

2.05 Either two-unit (Fig. 1) or three-unit cover plate assemblies enclose the top of the reader unit. The two-unit assembly consists of the tape guide plate, secured to the reader by mounting brackets and screws, and the cover plate, held in place by a detent bracket. The three-unit assembly includes the guide plate and the top plate, secured to the unit reader with mounting brackets and screws, and the cover plate, held in place by a detent bracket. Fig. 2 shows the multi-level reader with the new tight tape bail. Fig. 3 shows the 5-level reader with the cover plates removed.

2.06 The main shaft assembly (see Fig. 4) includes the main shaft with a bearing at each end. The shaft rotates continuously while the motor is running. Sensing and feeding cams are part of the shaft. Both ends of

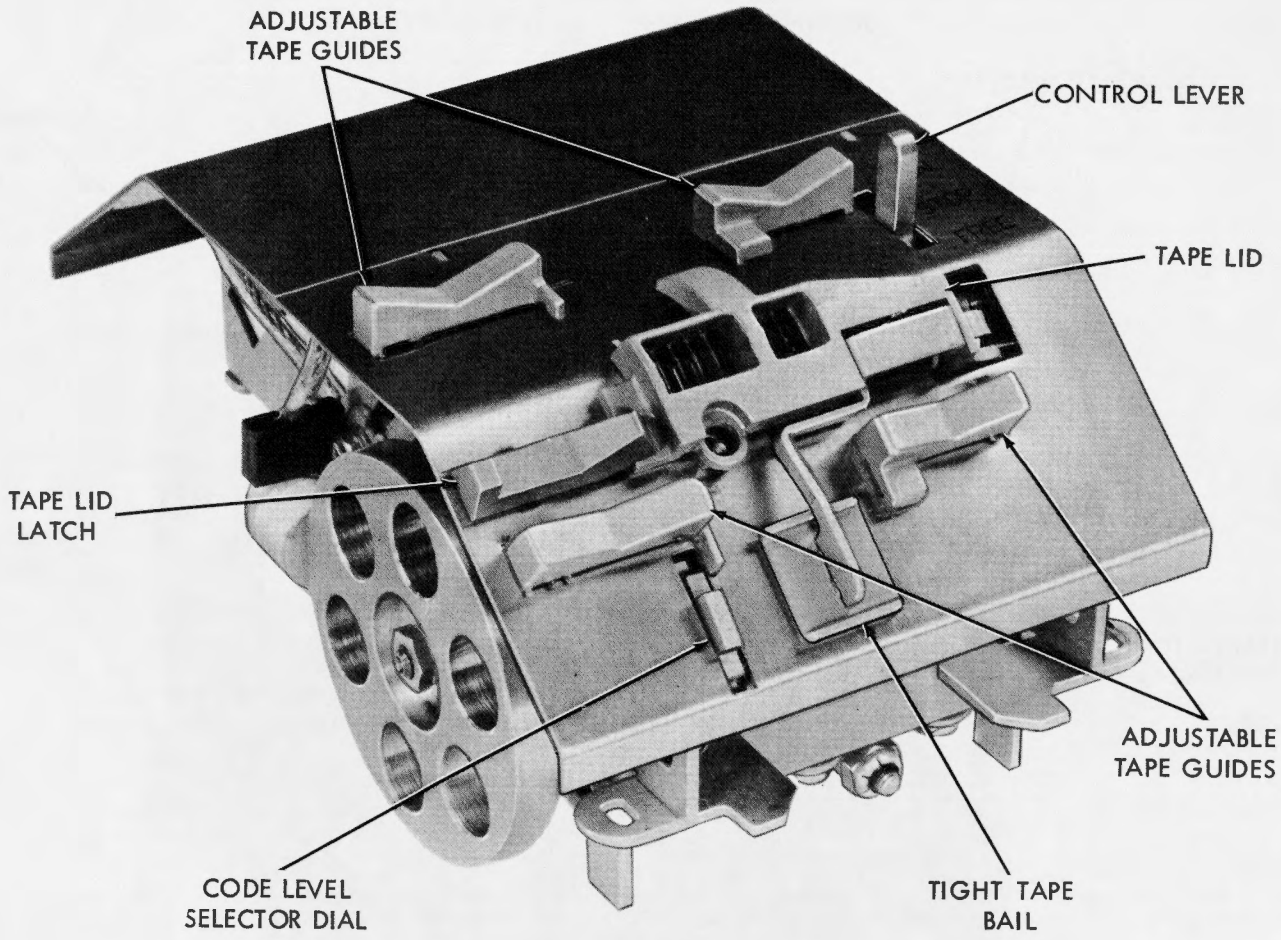


Figure 2 - Reader with Tight Tape Bail

the shaft are threaded for mounting the drive gear and flywheel.

2.07 The reader unit is comprised of four basic mechanisms. These mechanisms and their features are listed below and explained in detail later in this section.

(1) Control mechanism which includes components for the following conditions:

- Free wheeling
- Run
- Stop
- Tight tape
- Tape out

(2) Latching mechanism

(3) Sensing mechanism, which includes code contacts.

(4) Feed mechanism

3. PRINCIPLES OF OPERATION

3.01 The reader operation is described below and illustrated in the pictorial schematic at the end of this section (Fig. 11).

3.02 AC power for the motor is supplied by operation of the READER button on the control panel. 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 signal converter.

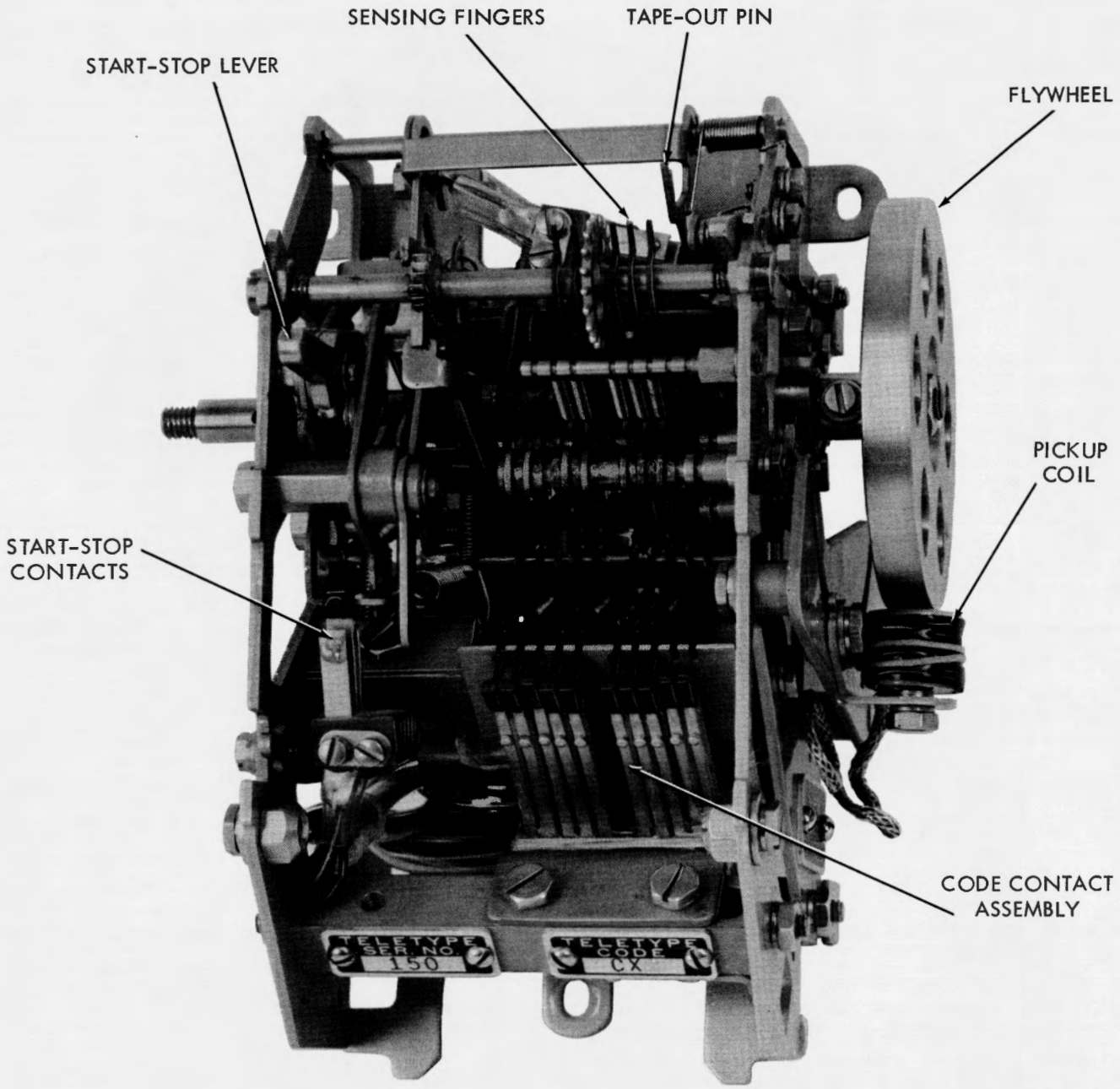


Figure 3 - Reader Unit with Plates Removed

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.

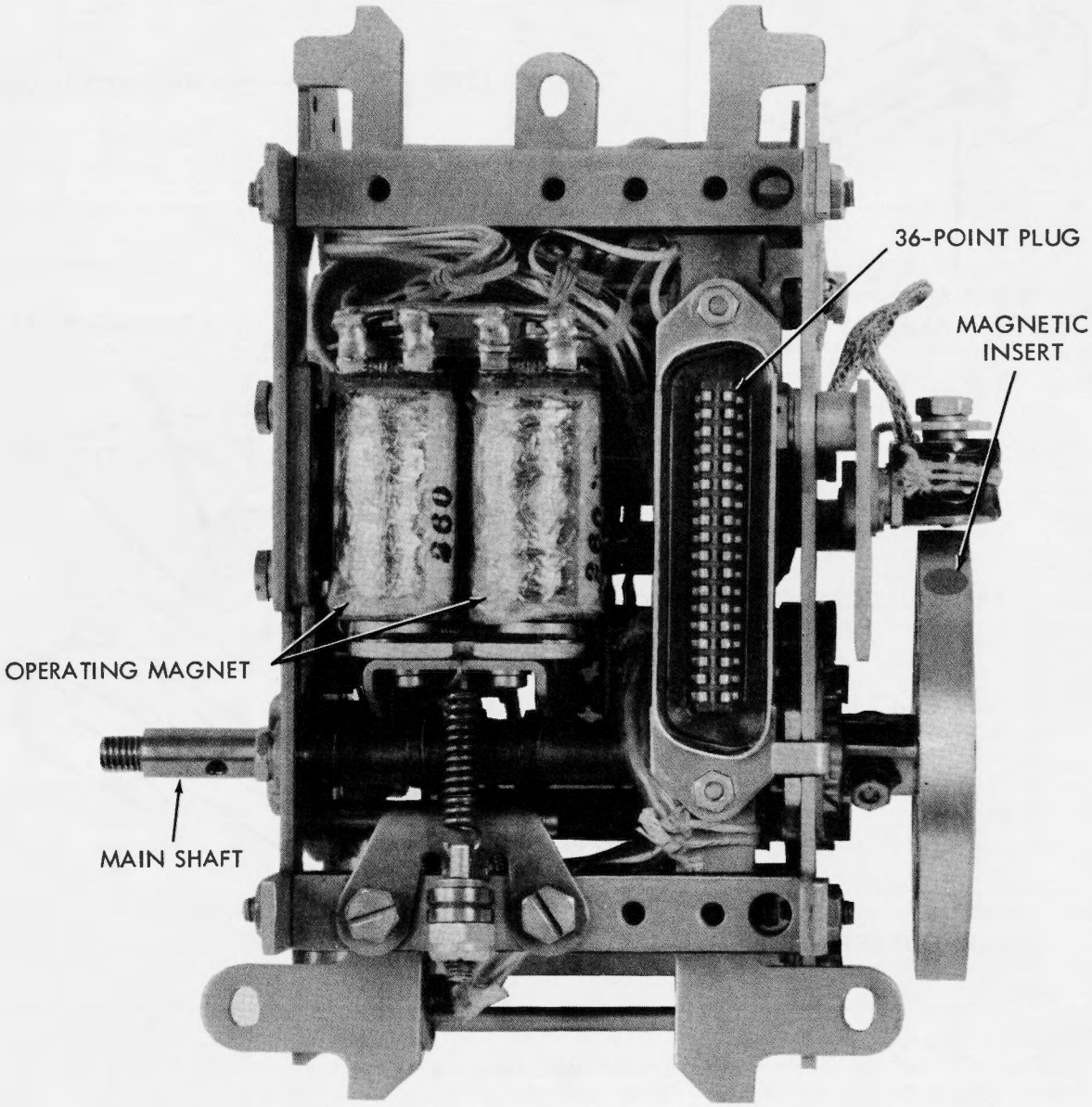


Figure 4 - Reader Unit, Bottom View

(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 signal converter.

(8) Feed mechanism advances tape preparatory to sensing next character.

4. DETAILED DESCRIPTION OF MECHANISMS

CONTROL MECHANISM (FIG. 5)

4.01 Moving the start-stop lever to the right (FREE) position results in the following actions:

- Camming surface of the start-stop lever causes the right end of the control lever to move downward.

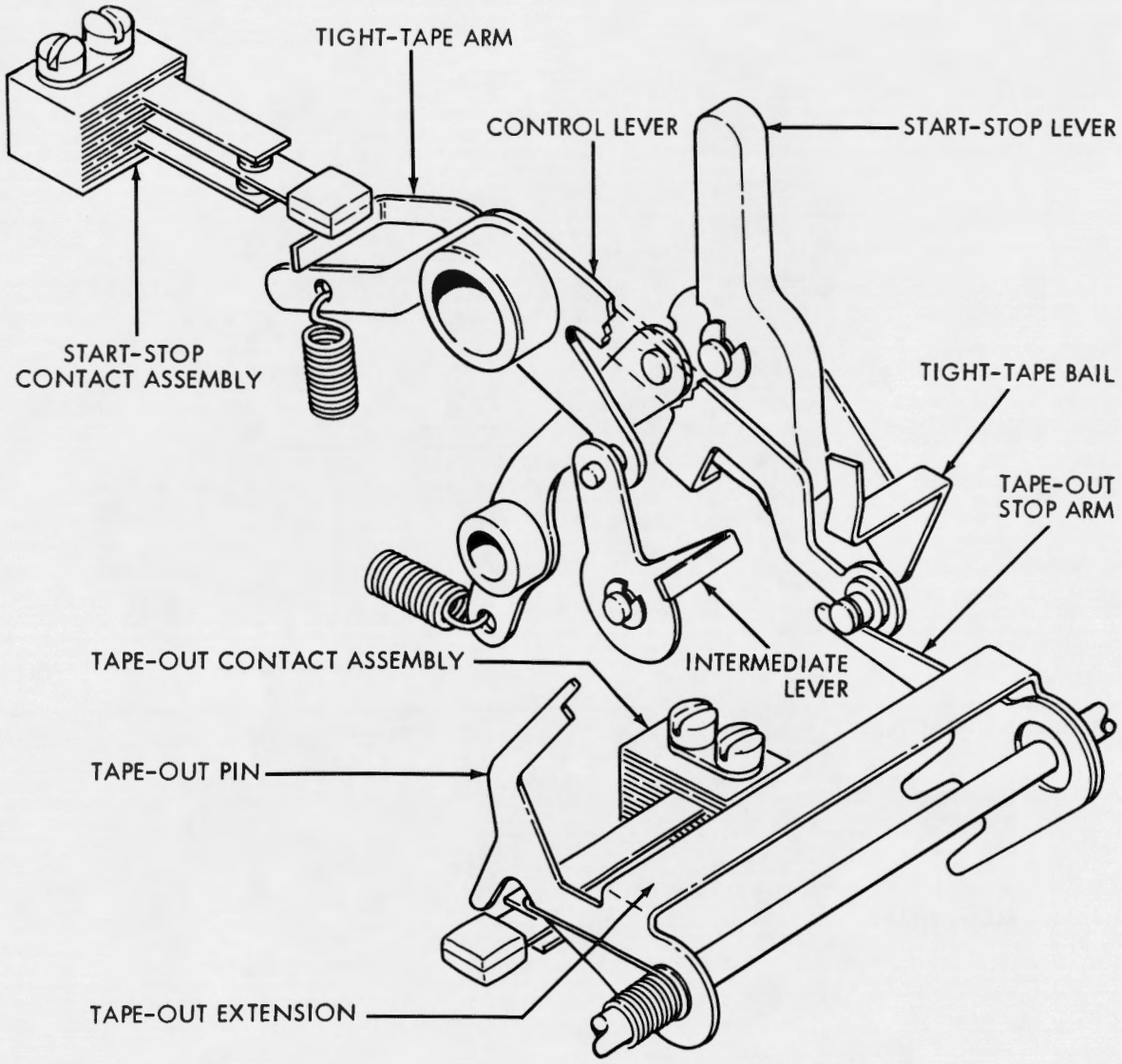


Figure 5 - Control Mechanism

- 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 start-stop contacts.
- Tape can now be inserted without lifting the tape lid, which is held in place by the lid latch mechanism.

4.02 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 start-stop contacts.

- Tape-out and start-stop contact closure completes the operating magnet circuit.

4.03 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 start-stop contacts.

4.04 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.

4.05 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 (FIG. 6)

4.06 When the operating magnet is energized, the following actions occur:

- 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.

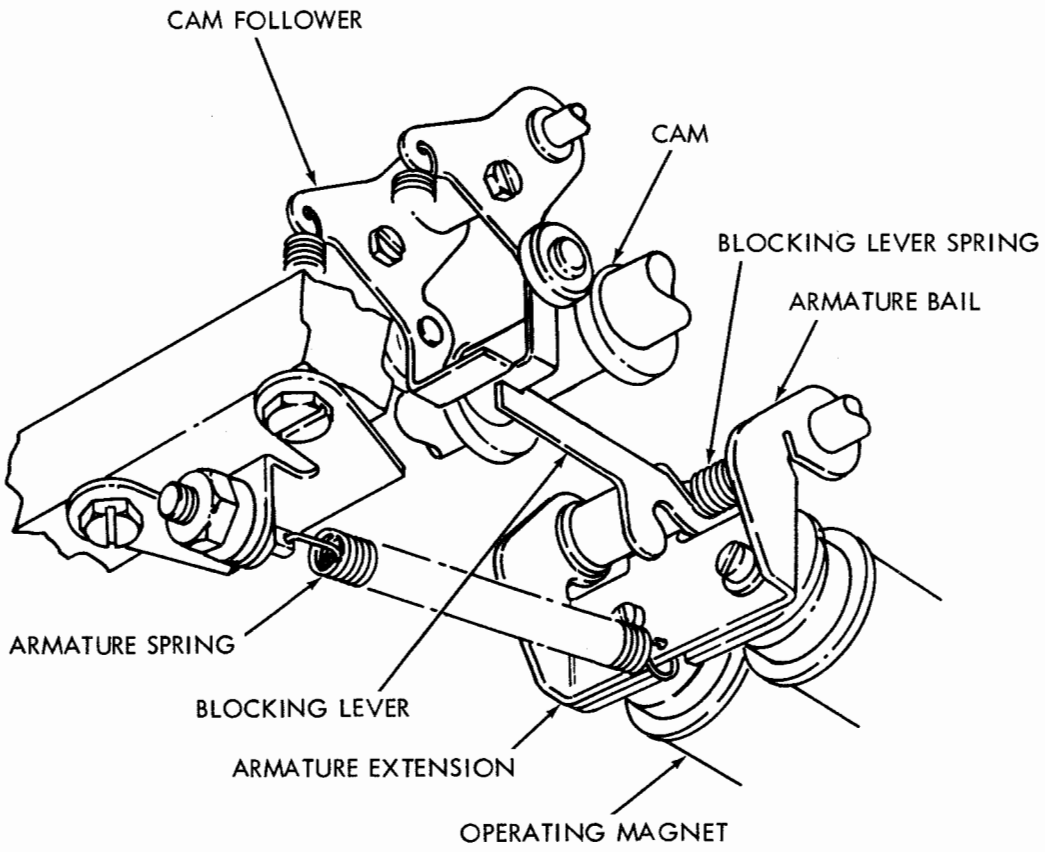


Figure 6 - Latching Mechanism

SENSING MECHANISM (FIG. 7)

4.07 The following actions occur during operation of the sensing mechanism.

- 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.

4.08 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.

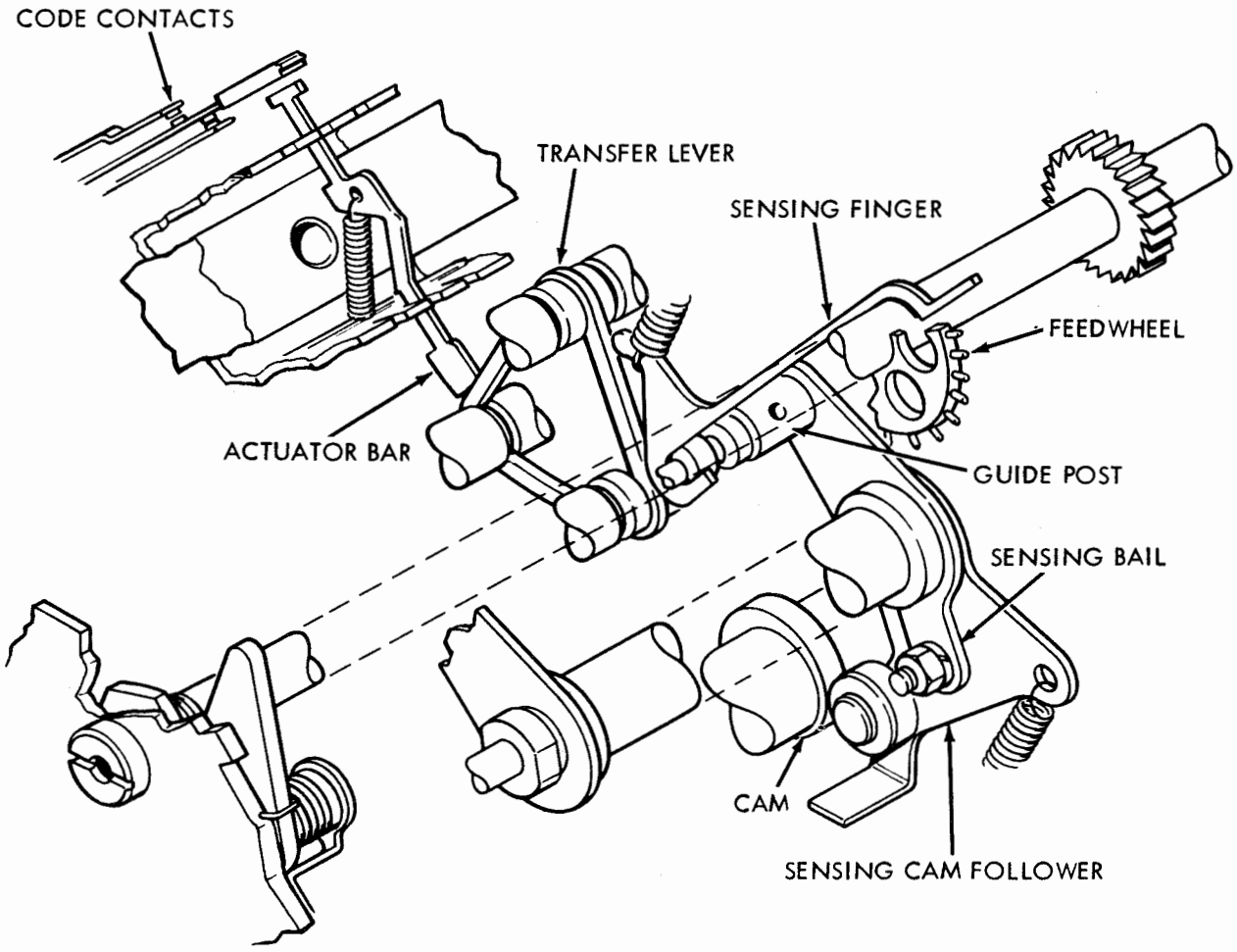


Figure 7 - Sensing Mechanism

- 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 (FIG. 8)

4.09 Motion for operating the feed mechanism is transferred from the feed cam as follows:

- 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 (FIG. 9)

4.10 The universal tape reading mechanism, allows the 2A reader 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 guide plate.

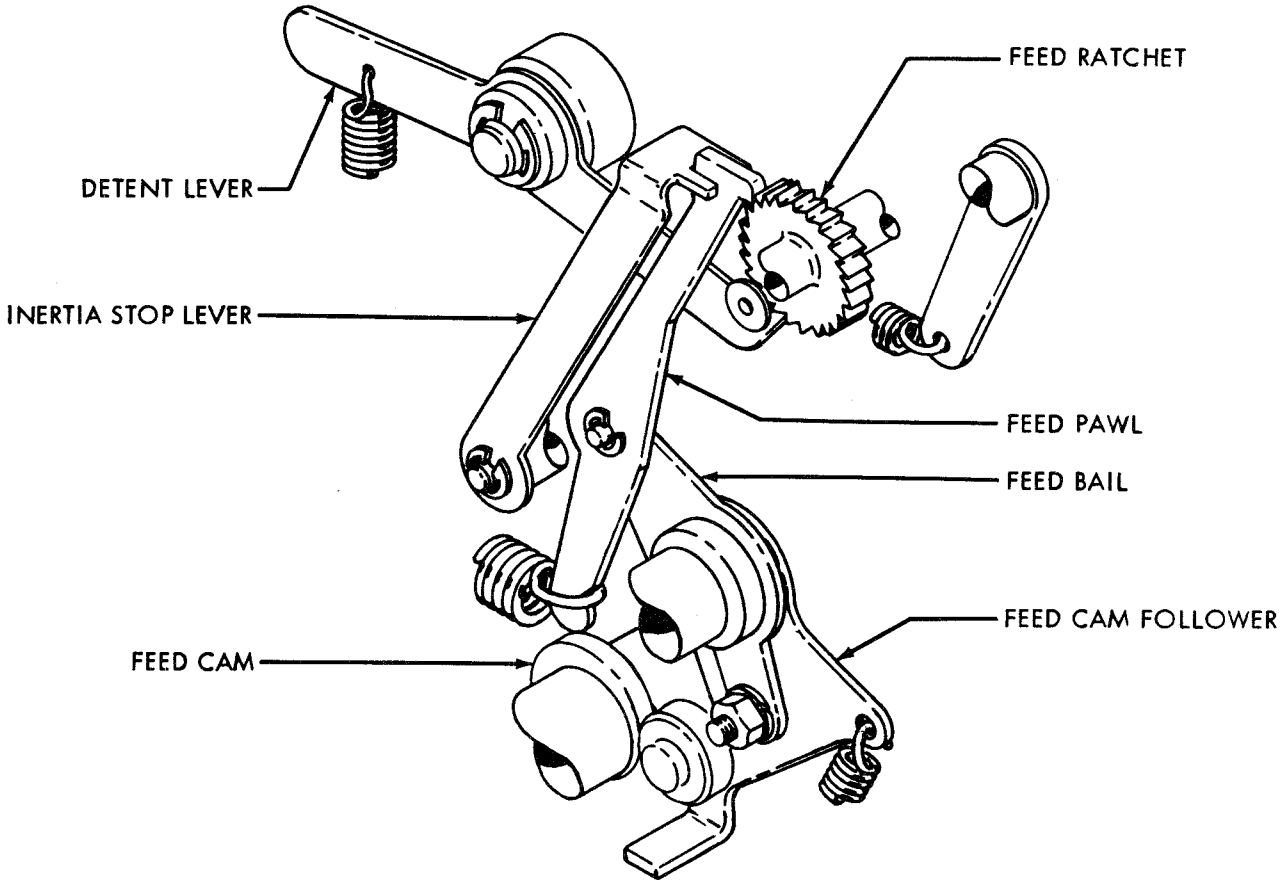


Figure 8 - Feed Mechanism

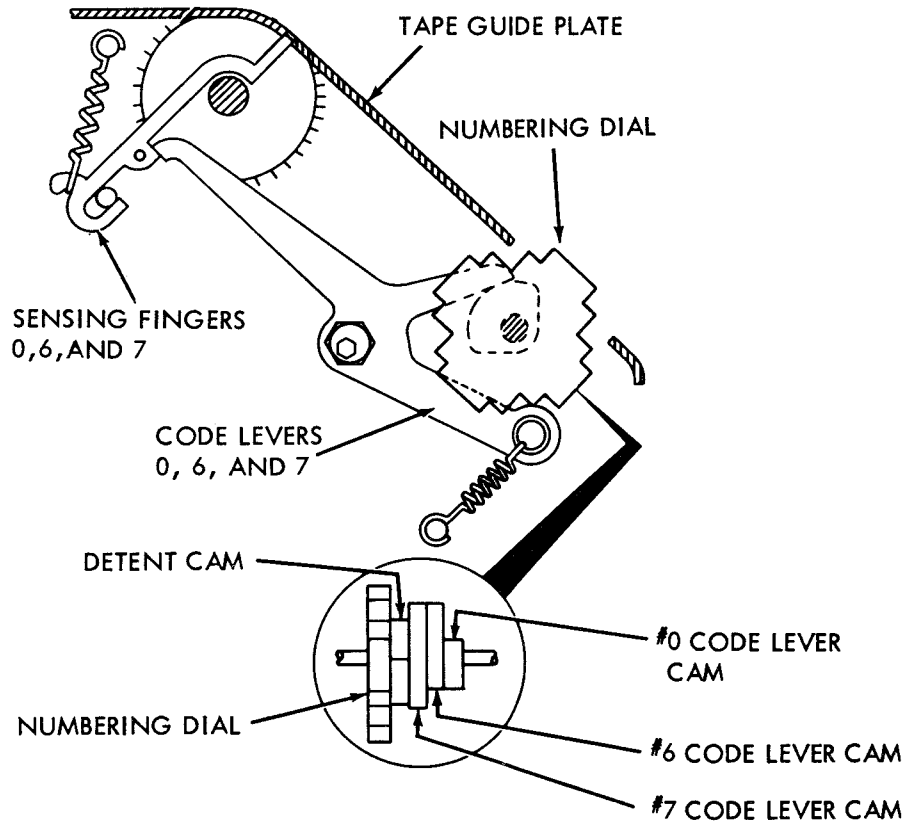


Figure 9 - Universal Tape Reading Mechanism

4.11 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 code lever 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 code levers 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.

4.12 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.

5. MAGNETIC PICKUP AND TIMING

5.01 During each revolution of the main shaft, the permanent magnet imbedded in the flywheel passes the pickup coil core (see Fig. 2 and 3), 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 592-801-700.

5.02 Feed pawl and sensing pin travel are plotted against degrees of shaft rotation in Fig. 10. The lowermost position of the sensing pin is designated as 0 degrees of shaft rotation.

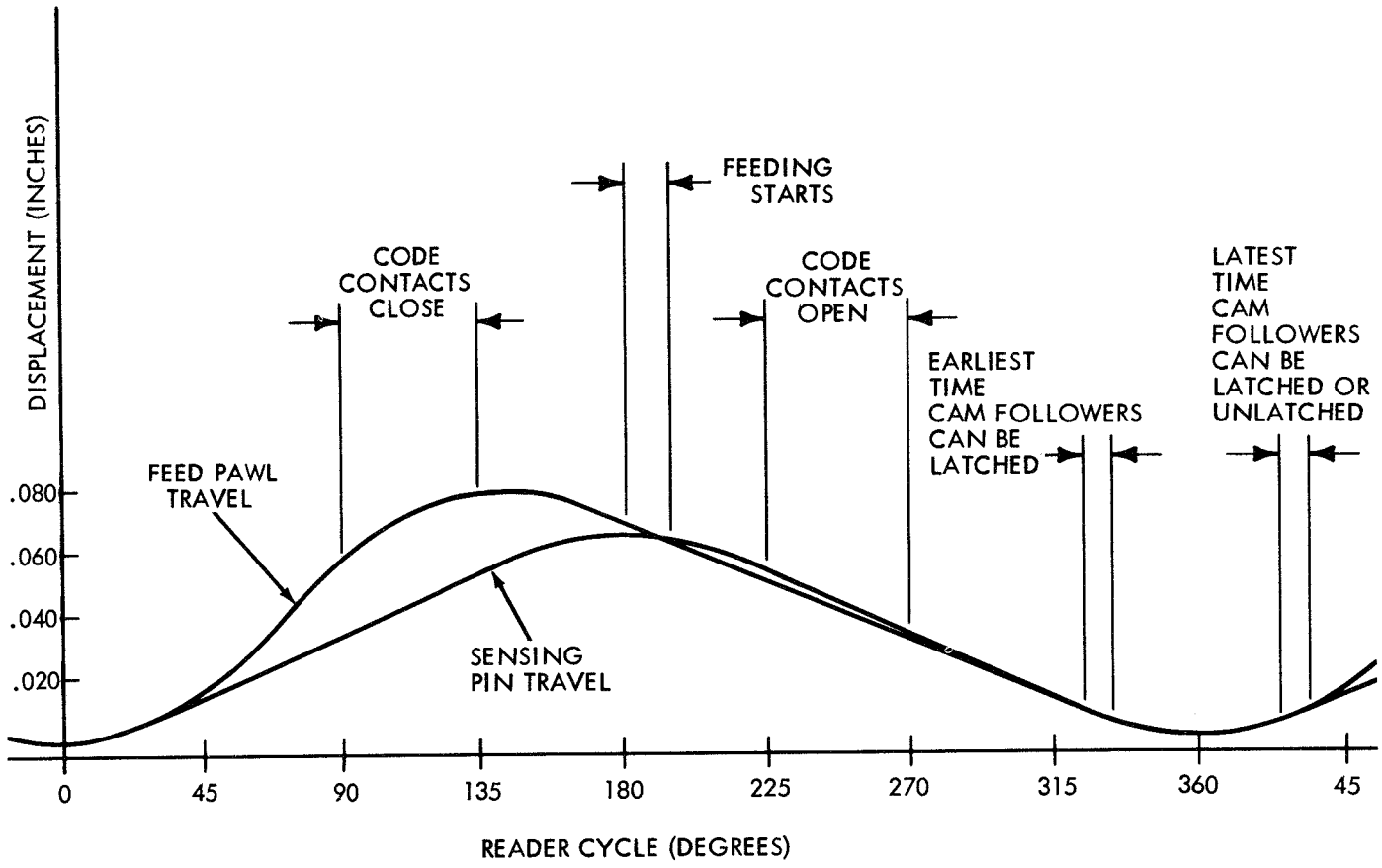
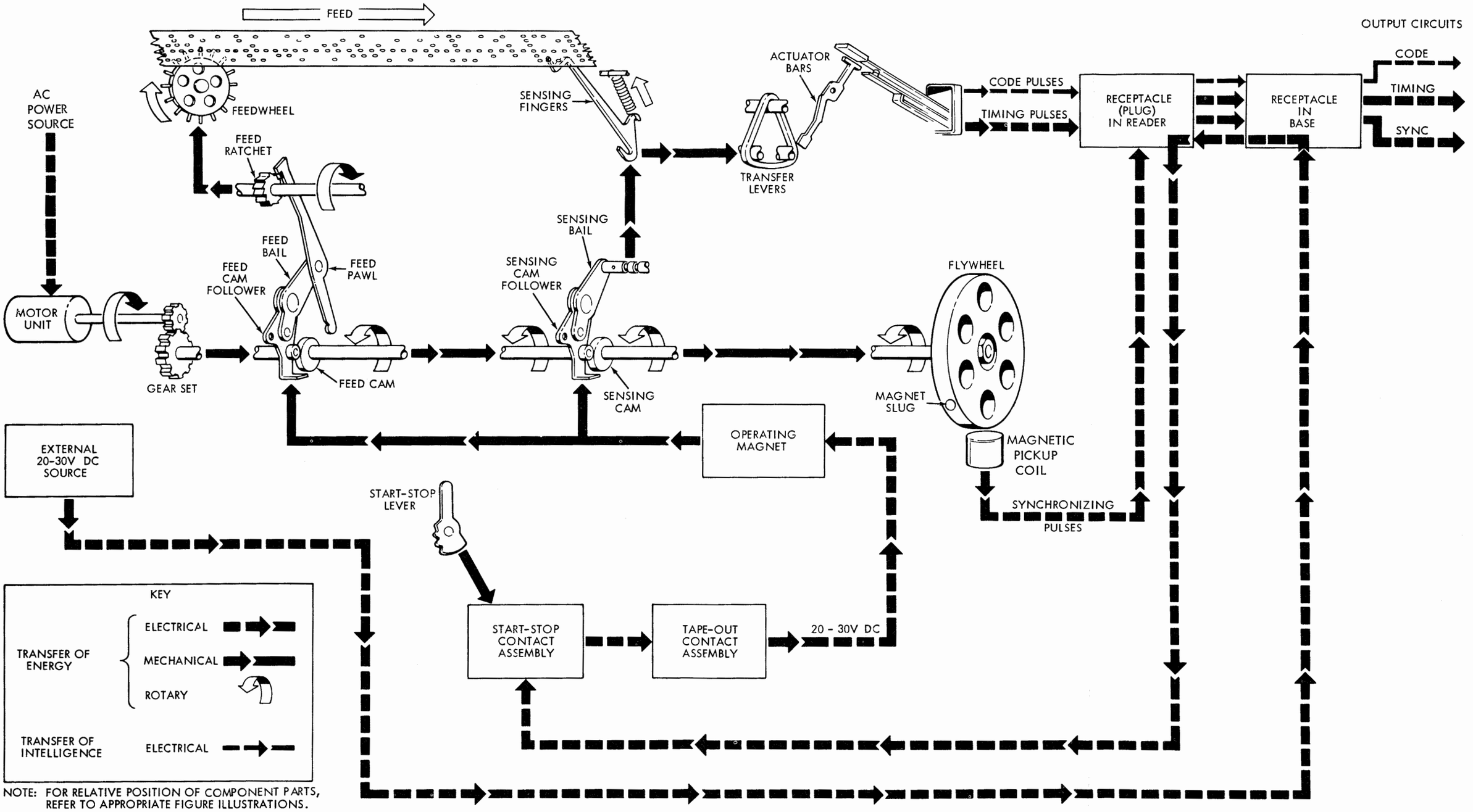


Figure 10 - Timing Diagram



NOTE: FOR RELATIVE POSITION OF COMPONENT PARTS, REFER TO APPROPRIATE FIGURE ILLUSTRATIONS.

Figure 11 - Tape Reader Pictorial Schematic