

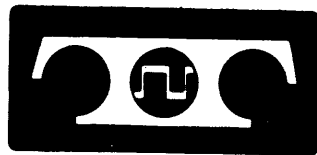
**BULLETIN 215B**  
**TECHNICAL MANUAL**  
**HIGH SPEED RECEIVER SETS**  
**(BRPE TYPE)**



**TELETYPE<sup>®</sup>**  
**CORPORATION**

5555 TOUHY AVENUE, SKOKIE, ILLINOIS

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## INTRODUCTION

Bulletin 215B is a technical manual that provides general and specific technical information for High Speed Receiver Sets (BRPE Type), and their component units.

The bulletin is now made up of a group of appropriate, independent sections covering description and principles of operation, installation, adjustment, lubrication, disassembly and reassembly, and removal and replacement of components. These sections are separately identified by title and section number, and the pages of each section are numbered consecutively, independent of other sections. The identifying number of a section, a 9-digit number, appears on each page of the section, in the upper left corner of left-hand pages and the upper right corner of right-hand pages.

To locate specific information, refer to the table of contents. Find the name of the involved component in column one and the title of the section in column two. The correct 9-digit section will then be found in column three. The sections are arranged in the order shown in the table of contents. Turn to page one of the section indicated where the contents of that section will be found (except where a section is small and does not require a listing of contents).

The sections comprising this bulletin are now stocked separately and may be individually ordered if the entire bulletin is not required.

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FILING INSTRUCTIONS

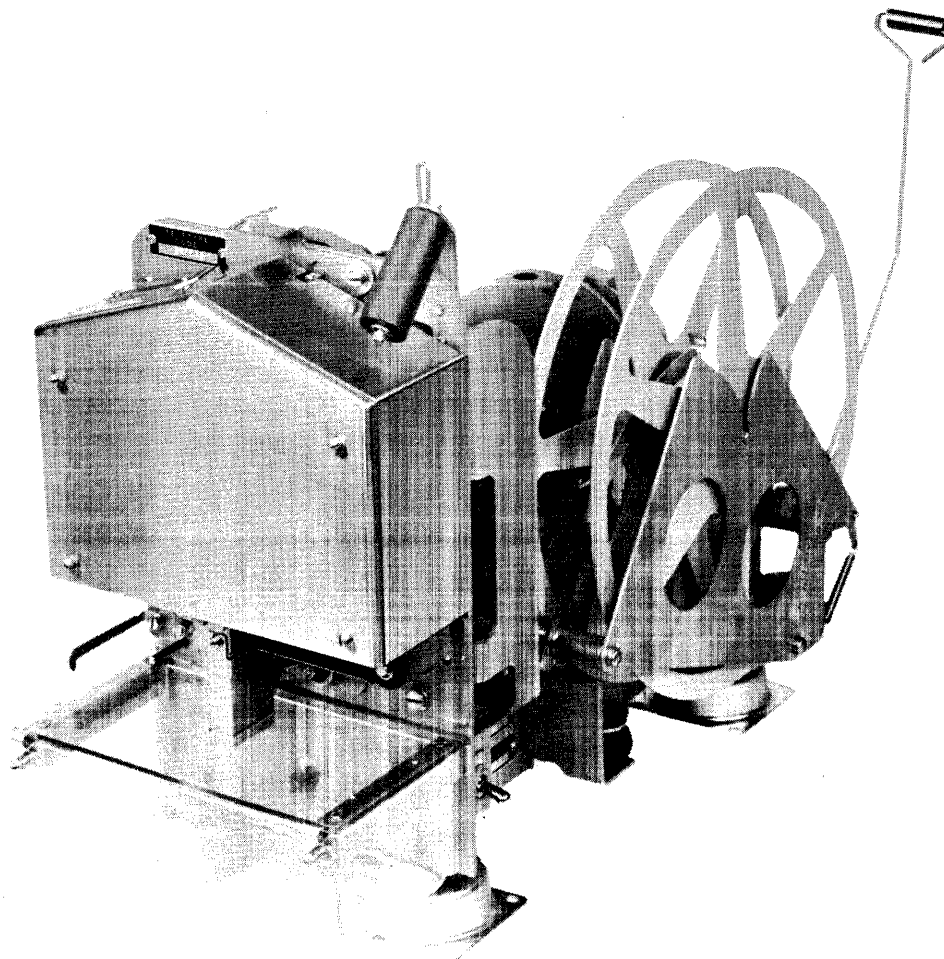
1. The following filing instructions apply to changes sent to the field.
2. Asterisks (\*) in the table of contents indicate changes.
3. When the issue of a section changes, replace the old issue with the attached new one.
4. In the case of addendums, turn to the affected section and follow the instructions on the first page of the attached addendum.
5. Replace the old table of contents with this new one.

<u>Equipment</u>	<u>Contents</u>	<u>Section</u>	<u>Issue</u>
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High Speed Receiver Sets (BRPE Type)	Installation	592-831-200TC	1
High Speed Receiver Sets (BRPE Type)	Adjustment, Lubrication and Removal and Replacement of Components	592-831-700TC	1
High Speed Tape Punch Unit (BRPE Type)	Description and Principles of Operation	592-802-100TC	4
High Speed Tape Punch Base and Cover (BRPEB and BRPEC)	Description	592-802-101TC	1
High Speed Tape Punch Unit (BRPE Type)	Adjustments	592-802-700TC	5*
High Speed Tape Punch Unit (BRPE Type)	Lubrication	592-802-701TC	5*
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Note: For information on motor units, refer to Bulletin 295B. For information on parts, refer to Bulletin 1154B.

HIGH SPEED RECEIVER SETS (BRPE)

		DESCRIPTION
CONTENTS	PAGE	
1. GENERAL . . . . .	1	reel mounted on the side of the base and is fed and punched at the front by the punch unit.
2. COMPONENTS . . . . .	1	
BASE UNIT . . . . .	1	2.02 The tape punch unit is synchronous and has a magnetic pickup that produces clock pulses to trigger the control circuits. Set variations permit operation from either transistorized or vacuum tube circuits. These circuits produce fully-punched, standard teletypewriter, paper tape of five, six, seven, or eight levels. Optional features include drive parts to obtain different speeds, and a protective cover to house the motor unit and part of the base.
MOTOR MOUNTING AND DRIVE PARTS . . . . .	4	
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A. Early Design . . . . .	4	
B. Late Design . . . . .	4	
TAPE . . . . .	5	BASE UNIT
CODE LEVELS . . . . .	5	2.04 The base unit provides a foundation along with certain other accessories for the receiver set. It includes the following:
WEIGHTS AND DIMENSIONS . . . . .	5	(a) Brackets for mounting the tape punch unit.
1. GENERAL		(b) Motor mounting holes.
1.01 The High Speed Receiver Set (BRPE) (Figure 1) is an electromechanical device that rapidly punches information into paper tape at speeds to 110 characters per second (1100 wpm). This information is received from external control circuits in the form of multiwire electrical pulses and transformed into mechanical motions to feed tape, and punch feed and code holes. The set serves mainly as a self-contained unit in a high speed telegraph system, and is adaptable for table top or shelf mounting (with or without shock mounts).		(c) Power circuits that include a four-point terminal board, a motor switch, and mating input connectors.
2. COMPONENTS		(d) Control circuits that include 24-point mating input connectors and a similar connector for interconnecting the base unit and tape punch units.
2.01 The basic set components (Figure 2) include a base unit, a motor unit, and a tape punch unit. The motor unit and tape punch units are mounted on the base and connected by a set of drive parts. The tape unwinds off a		(e) Provisions for mounting electrical components.
		(f) A reel and brake assembly to accommodate the tape roll and to provide smooth acceleration and deceleration during starting and stopping.
		(g) A low-tape mechanism to actuate an external visual or audible alarm.
		(h) Vibration mounts, and rubber grommets to support the cover.



(Right Front View)

Figure 1 - High Speed Receiver Set (BRPE)

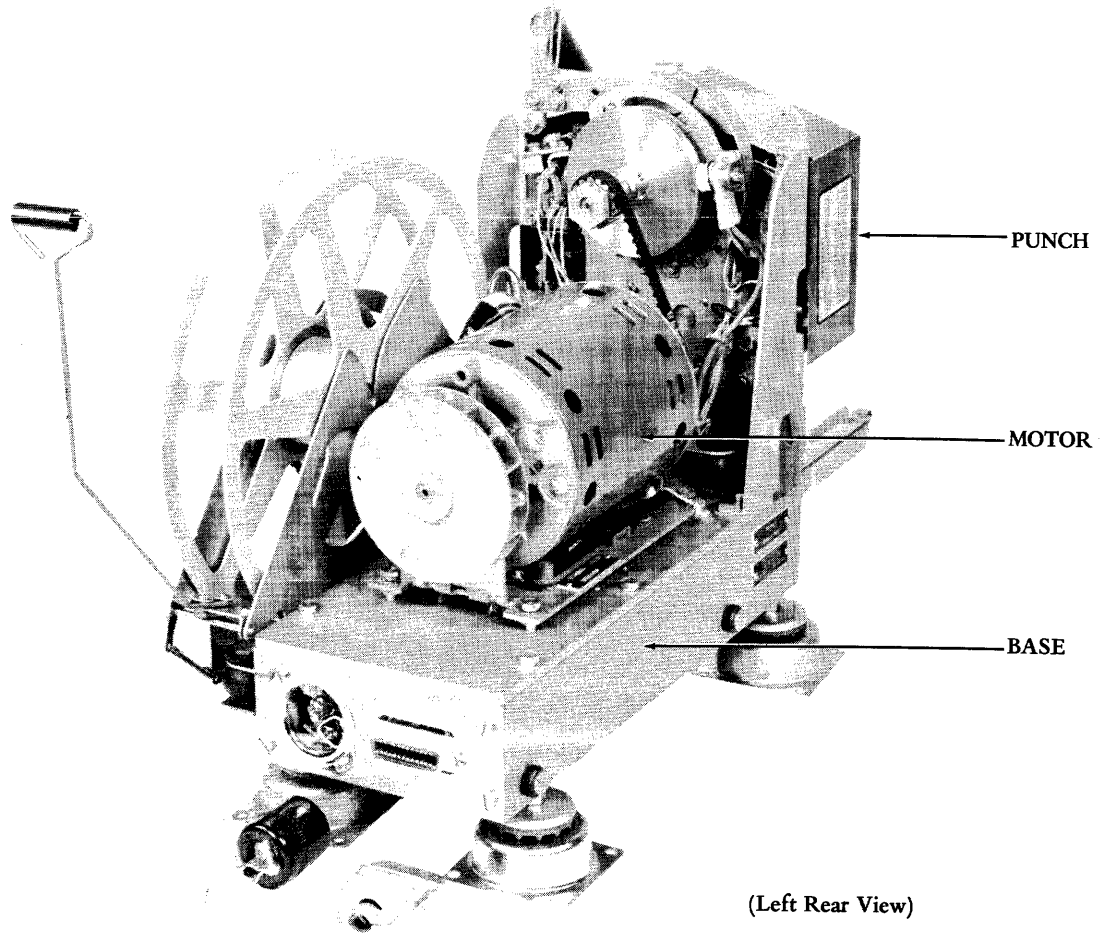


Figure 2 - Basic Set Components (BRPE)

## MOTOR MOUNTING AND DRIVE PARTS

2.05 The high speed tape punch unit can be either belt driven or gear driven. A description of each follows:

## A. Belt Driven

2.06 The drive parts consist of two sprockets and a timing belt. These drive parts transfer motion from the motor unit to the tape punch unit to establish the operating speed. The motor is mounted on four spacers. Timing belt tension is set by adding or removing shims between the spacers and motor mounting bracket (Section 592-802-700TC). Standard motor mounting and drive parts are available for speeds to 633 or 1100 wpm.

## B. Gear Driven

2.07 The drive parts consist of two gears. These gears transfer motion from the motor unit to the tape punch unit to establish the operating speed. The motor mounts on two spacers and an adjustable "T" plate. An adjustment screw, below the "T" plate, is provided to allow adjustments between the gears.

## 3. TECHNICAL DATA

3.01 The data given here is for typical receiver sets and may vary for individual coded units. Standard speeds are 110 characters per second (1100 wpm), 105 characters per second (1050 wpm), and 63.3 characters per second (633 wpm). The following data, Tables A and B, give magnet specifications, and code and feed pulse requirements for transistor and vacuum tube operation.

**CAUTION:** IF CURRENT THROUGH THE 25 OHM RESISTORS ON THE BASE EXCEED 5 MILLI-SECONDS FOR ONE CHARACTER OPERATION, REMOVE THEM AND MOUNT THEM EXTERNALLY OR PROVIDE A BLOWER TO DISSIPATE THE HEAT.

**Note 1:** Because magnet operation is largely dependent on control circuits, these values can be varied experimentally for specific applications.

**Note 2:** Tape punch units are adjusted to a standard optimum input signal of 4.5 milliseconds with an expected operational tolerance requirement of  $\pm 5\%$  margin without readjustment of armature gap and/or spring tension.

TABLE A

MAGNET SPECIFICATIONS

MAGNET	TRANSISTOR OPERATION	VACUUM TUBE OPERATION
Attract Time	3 to 4 ms	4 to 5 ms
Release Time	6 to 8 ms	6 to 8 ms
Coil Resistance	2.9 ohms	74 to 82 ohms
Coil Inductance	8 MH	100 MH
Current Limiting Resistance	25 ohms	6000 ohms

TABLE B

CODE AND FEED PULSE REQUIREMENTS

CODE AND FEED PULSE	TRANSISTOR OPERATION	VACUUM TUBE OPERATION
Current	1 amp	0.15 amp
Voltage	28 v dc	115 v dc
Time	4.5 ms	4.5 ms

## MAGNETIC PICKUP SPECIFICATIONS

## A. Early Design

3.02 The magnetic pickup generates a timing pulse once during each revolution of the flywheel. At 63.3 characters per second, the timing pulse is 4 volts peak-to-peak with a maximum pulse width of 450 microseconds. At 110 characters per second, the timing pulse is 6 volts peak-to-peak with a maximum pulse width of 250 microseconds. The above values are obtained with a clearance of 0.010 inch between the magnetic pickup and the flywheel and the pickup connected across a parallel circuit of 0.01 microfarad and a 1000 ohm resistor.

## B. Late Design

3.03 The magnetic pickup generates a timing pulse once during each revolution of the flywheel. At 63.3 characters per second, the timing pulse is 30 volts peak-to-



peak with a maximum pulse width of 450 microseconds. At a 110 characters per second, the timing pulse is 40 volts peak-to-peak with a maximum pulse width of 250 microseconds. The above values are obtained with a clearance of 0.010 inch between the magnetic pickup and the flywheel and with the pickup connected across a parallel circuit of 0.01 microfarad and a 1000 ohm resistor.

**TAPE**

3.04 After selection and installation of the appropriate punch block assembly and associated parts, the tape punch unit is capable of punching either 11/16 inch, 7/8 inch, or 1 inch tape. Tape guide channels can be provided to align any of these tape widths.

**CODE LEVELS**

3.05 The punch will perforate, depending on the unit and punch block selected, either 5-, 6-, 7-, or 8-level tapes according to the code level arrangement.

**CODE LEVEL ARRANGEMENT**

<u>5 Levels</u>	<u>6 Levels</u>	<u>7 Levels</u>	<u>8 Levels</u>
	0 1	0 1	0 1
0 1	0 2	0 2	0 2
0 2	0 3	0 3	0 3
0 F	*0 0 F	0 F	0 F
0 3	0 4	0 4	0 4
0 4	0 5	0 5	0 5
0 5	0 6	0 6	0 6
		0 7	0 7
			0 8

0 = Code Hole

F = Feed Hole

\*0 = Advance Feed Hole (if so equipped)

**WEIGHTS AND DIMENSIONS**

3.06 Table C contains the approximate overall weights and dimensions for the various components which make up a complete receiver set. These weights and dimensions include drive parts but not those of the variable features, mounting facilities, and covers.

**TABLE C**

**WEIGHTS AND DIMENSIONS**

COMPONENT	DEPTH (Inches)	WIDTH (Inches)	HEIGHT (Inches)	WEIGHT (Pounds)
Tape Punch Unit	6 1/2	6 1/2	10 1/2	8 1/2
Base Unit	13 1/2	8	10	7 1/2
Motor Unit	8	4	4 1/2	8 1/2
Receiver Set	16 1/2	8	12	24 1/2

HIGH SPEED RECEIVER SETS

(BRPE TYPE)

INSTALLATION

	CONTENTS	PAGE
1.	GENERAL .....	1
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	ELECTRICAL CONNECTIONS .....	3
4.	PREPARATION FOR OPERATION .....	3
	ADJUSTMENTS .....	3
	LUBRICATION .....	3
	TAPE ROLL .....	4
	TAPE THREADING .....	4
	TAPE STARTING .....	4

1. GENERAL

1.01 This section contains installation procedures for High Speed Receiver Sets (BRPE type). These sets can be table top or shelf mounted, with or without shock absorbers.

1.02 Certain variations in the following procedures may have to be made for individual coded equipment and specific applications. A set consisting of a base (BRPEB), motor unit (LMU), punch unit (BRPE), and motor mounting and drive parts for 110 operations per second is ordinarily packed assembled in one carton. However, for cases in which the components may be packed separately, 2.04 through 2.08 cover unpacking and assembly. When individual units are obtained, see 2.04 through 2.06 for unpacking instruc-

tions and 3.01 for mounting information. Instructions for installing different motor mounting and drive parts are contained in a specification packed with the set of parts.

2. INSTALLATION

ASSEMBLED SET - UNPACKING

2.01 Cut the seal and open the top flaps of the cardboard carton. Remove the top corrugated detail. Cut the seal and open the top flaps of the inner carton. Remove the corrugated liner. Detach the chad container from the liner and remove the tissue wrapping. Remove the loose connectors from the container and remove the tissue wrapping.

2.02 Grasp the set by the motor housing and carefully lift it out of the carton. Remove the pallet from the set by removing the four mounting clamps. Remove the string and tape holding the tape reel and wire guide in position. Mount the chad container on the front of the set by inserting the plastic post at the rear of the container into the provided hole in the punch unit rear plate and inserting the two studs at the front of the mounting bars into the two holes in front of the container.

2.03 If a cover (BRPEC) is included in the set, cut the seal of its carton and open the top flaps. Lift the cover out of the carton and remove the tissue wrapping. Hold the cover over the set, lower it carefully, and fit the four rubber grommets on the base into the provided slots.

DISASSEMBLED SET - UNPACKING

2.04 Base - Cut the seal and open the top flaps of the cardboard carton. Remove the cardboard detail on top of the equipment. Grasp the base by the mounting plate and carefully lift it from the carton. Remove the string holding the tape reel and wire guide in position. Remove the two male connectors from the muslin bag attached to the base.

**2.05 Punch Unit** - Cut the seal and open the top flaps of the cardboard carton. Remove any tissue at the top of the carton. Remove the chad container, which is wrapped in tissue, from the small cardboard liner and lay it aside. Remove the detail that fits around the unit. Remove the large liner. Grasp the unit by the cover and the wooden tape roller and carefully lift it from the carton. Remove the string and tissue paper from the cable. When ready to mount the unit, take it off the wooden pallet by removing the two mounting screws.

**2.06 Motor Unit** - Cut the seal and open the top flaps of the cardboard carton. If the unit is packed in plastic end caps, hold it in place and turn the carton upside down. Lift the carton off the unit and remove the end caps. If the unit is not packed in plastic, remove the cardboard detail from the top of the carton. Grasp the unit by the housing and lift it out of the carton.

**ASSEMBLY**

**2.07** Remove the punch unit from the wooden pallet. Mount it on the base with mounting hardware provided in a muslin bag attached to the punch unit. Six screws (TP156768) and lockwashers (TP93985) should pass from the rear through mounting brackets (TP142955 and TP142956) on the base into the upper part of rear plate TP142800 of the punch unit (Figure 1). Four screws (TP151724) and lockwashers (TP2669) should pass from the front through the lower part of the rear plate into side bars (TP142950 and TP142951) of the base. Connect the male receptacle of the punch unit cable to the female receptacle on the base. Mount the chad container as instructed in 2.02.

**2.08** Mount the motor unit and drive parts as instructed in the specification packed with the motor mounting and drive parts. If a cover is included with the set, unpack and mount it as instructed in 2.03.

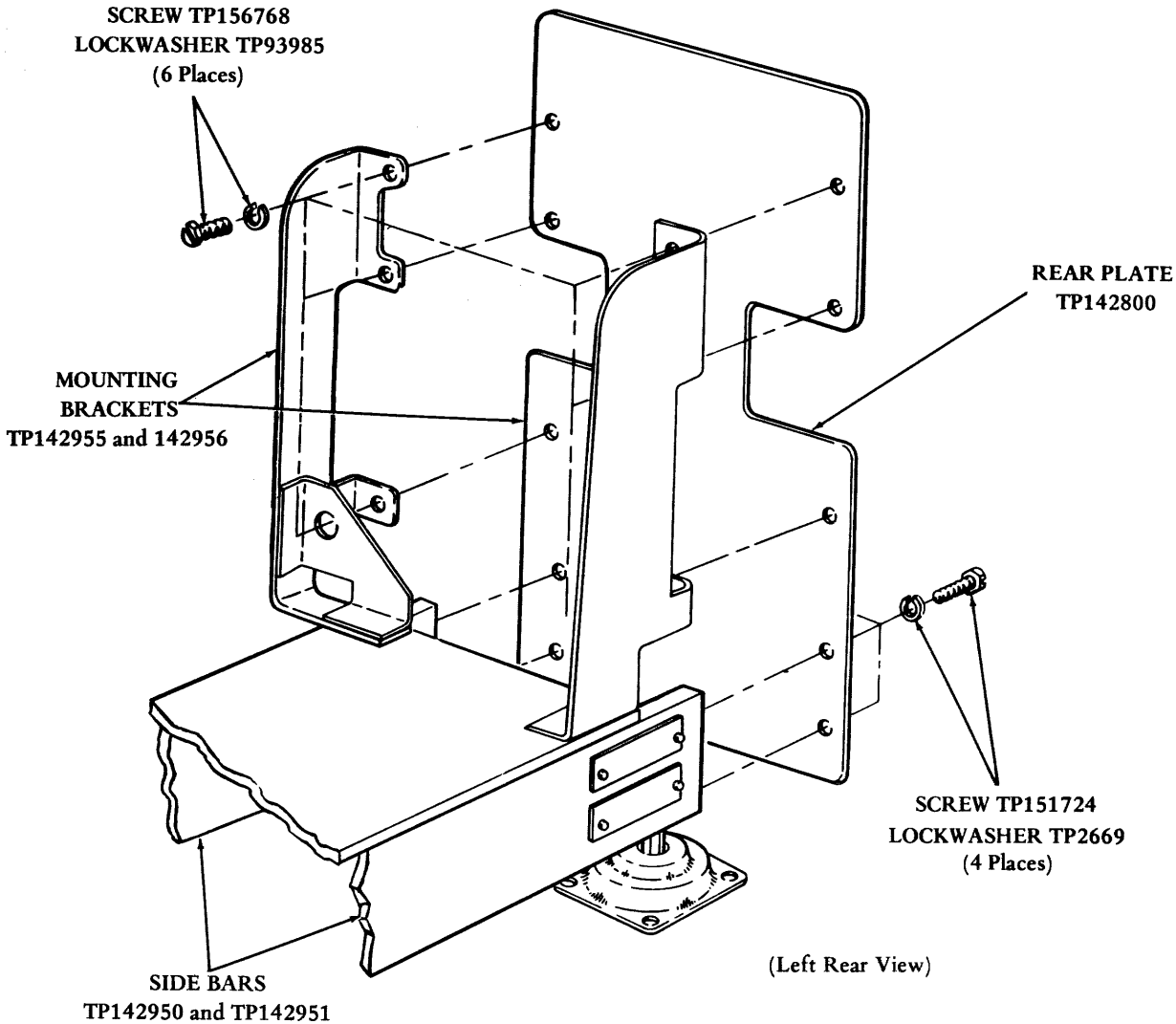


Figure 1 - Punch Unit Rear Plate Mounting

### 3. MOUNTING

3.01 The High Speed Receiver Set is designed for mounting with or without the provided shock mounts. There are four screw holes in each mount for securing the set to the customers table, shelf, cabinet track or other equipment. For pertinent dimensions, see Figure 2. If the shock mounts are not to be used, they can be taken off by removing their mounting screws. Provisions must then be made by the customer for mounting the set on specific equipment. Mounting dimensions for the punch unit are shown in Figure 3.

#### ELECTRICAL CONNECTIONS

3.02 Refer to Section 592-831-100TC for pertinent electrical data. Wiring from the power supply and control circuits should be connected to the two loose connectors stated in 2.01 and 2.04. For specific connections, refer to the wiring diagrams shipped with the equipment.

### 4. PREPARATION FOR OPERATION

#### ADJUSTMENTS

4.01 Five-level punch units are adjusted at the factory for 11/16-inch tape and should need no further adjustment. Six-, seven-, and eight-level equipment is adjusted for one inch tape. If 7/8-inch tape (6- and 7-level) is to be used, see Section 592-802-700TC, TAPE BIAS SPRING adjustment.

4.02 Orientation of the flywheel for synchronization purposes is preset at the factory. If reorientation is needed, see Section 592-802-700TC, TIMING adjustment.

#### LUBRICATION

4.03 For lubrication procedures concerning the punch unit, see Section 592-802-701TC.

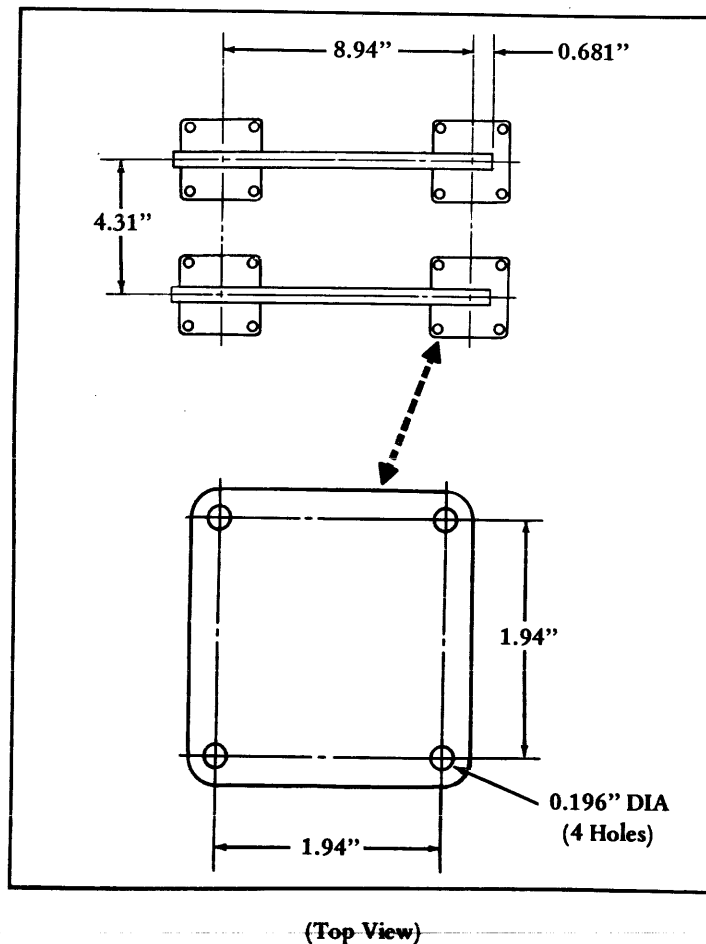


Figure 2 - High Speed Receiver Set Mounting Dimensions

**TAPE ROLL**

4.04 Remove the tape reel from the tape container. Unscrew the tape retainer and remove it from the reel. Place the tape roll on the reel so that the tape will feed off the bottom rear. Replace the retainer and place the reel back in the container.

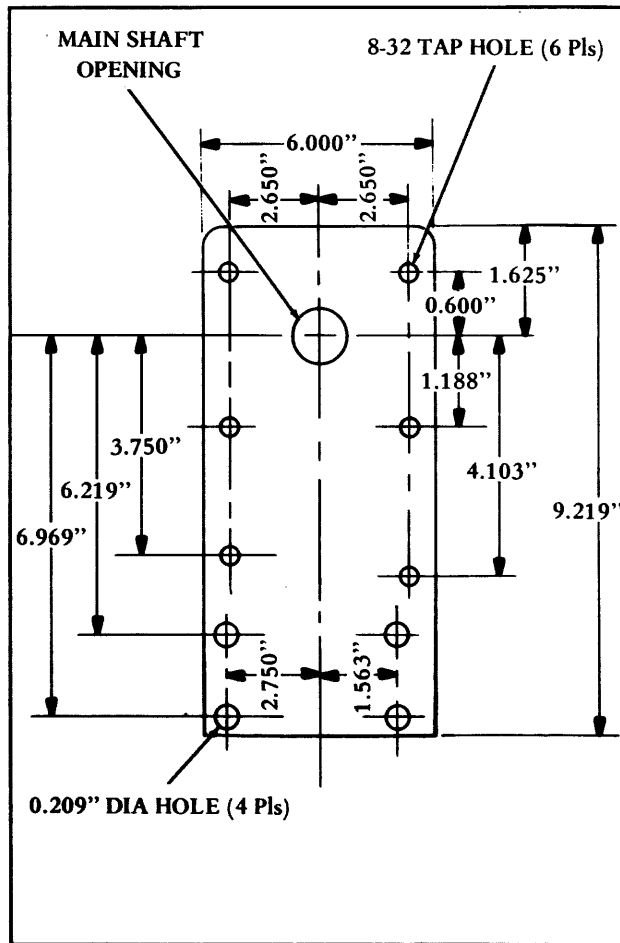
**TAPE THREADING**

4.05 The tape threading for the receiver sets is as follows: Thread the tape off the bottom rear of the roll, up through the wire guide on the container, forward

through the wire guide on the punch unit to the left of the upper roller, over and down to the right of the upper roller, to the right of and down under the lower roller, and to the left through the tape guide and punch block. Lift the tape lid and lead the tape between the lid and the feed wheel and then out to the left under the tape cutter.

**TAPE STARTING**

4.06 Turn on the motor switch. Depress the feed-out lever, pull the tape to the left until it begins to feed and release the feed-out lever. If the receiver set has been properly oriented with its control circuits, it should be ready for operation.



(Rear View)

Figure 3 - High Speed Punch Unit Mounting Dimensions

HIGH SPEED RECEIVER SETS

ADJUSTMENTS

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1.	GENERAL .....	1
2.	BASIC UNIT .....	2
	Drive Belt	
	Timing .....	2
	Flywheel Selection Interval	
	Flywheel orientation .....	4
	Tape Width Selection	
	Tape bias spring .....	2

1. GENERAL

1.01 This section contains adjustment procedures and illustrations for the High Speed Receiver Sets (BRPE). The illustrations are typical of most receiver sets.

1.02 For information concerning adjustments, lubrication, and disassembly and reassembly of the punch unit, see Sections 592-802-700TC, 592-802-701TC, and 592-802-702TC.

**CAUTION:** DISCONNECT POWER FROM SET BEFORE MAKING ADJUSTMENTS UNLESS STATED OTHERWISE.

1.03 Adjustments are arranged in a sequence that is followed when a complete readjustment of the set is undertaken. Read the entire adjustment procedure carefully before making the adjustment. When directed, loosen nuts and screws friction tight; tighten when adjustment is complete.

1.04 Check that all moving parts are free from binds before applying power to set.

1.05 Parts or assemblies that are removed to simplify a particular series of adjustments should not be replaced until that particular series of adjustments is complete.

1.06 Unless stated otherwise, references to left or right, front or rear, and up or down apply to the receiver set in its normal operating position as viewed from the operator position in front of the unit.

1.07 For tools needed to make adjustments in this section, see Section 570-005-800TC. For parts ordering information, see Sections 592-802-800TC and 592-802-802TC.

2. BASIC UNIT

2.01 Drive Belt

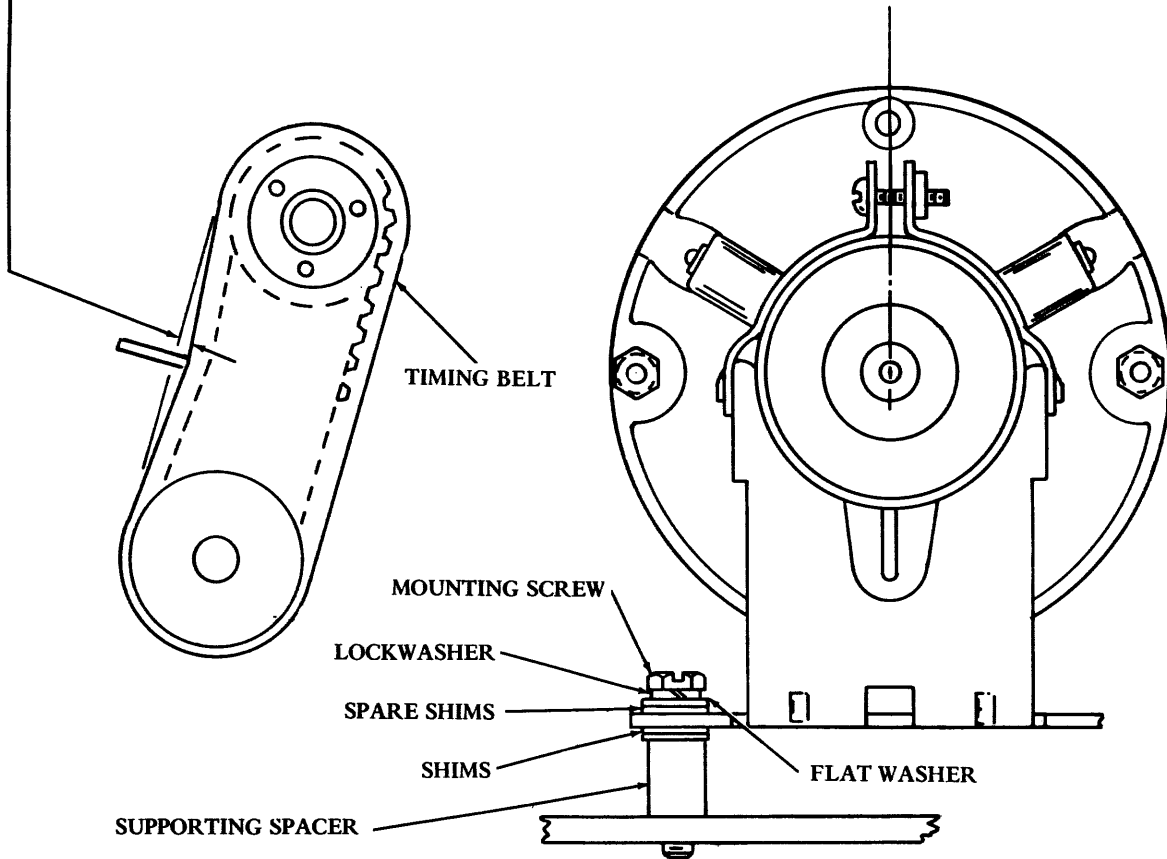
TIMING

Requirement

Apply 1 pound of pressure at center of timing belt. Timing belt should deflect about 1/16 inch for 1100 wpm and 3/16 inch for 633.3 wpm.

To Adjust

Remove four motor mounting screws. Lift motor unit from supporting spacers. Add shims to, or remove them from supporting spacers. Replace motor unit and mounting screws. Shift motor unit horizontally to meet requirement.

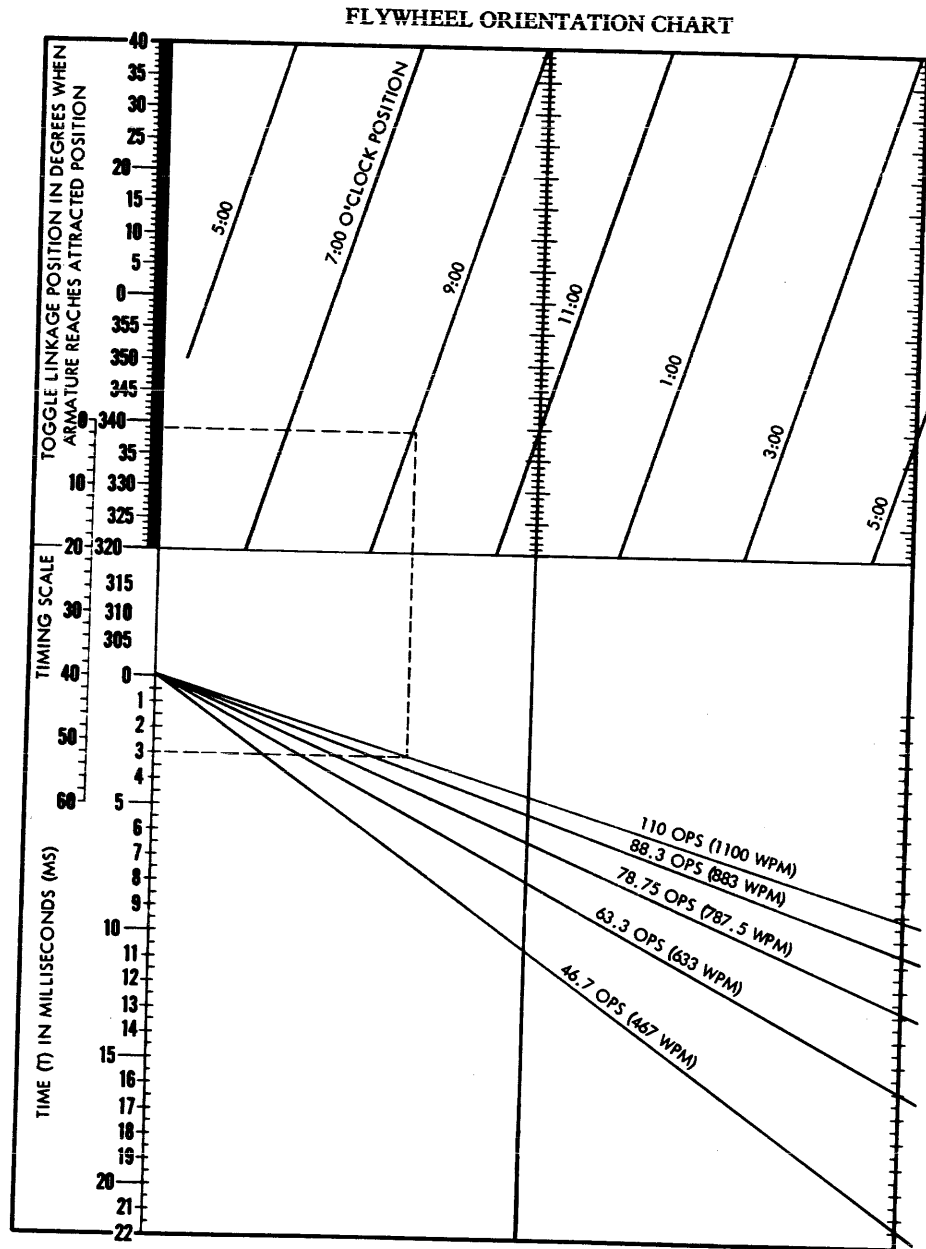


2.02 Tape Width Selection

TAPE BIAS SPRING

For this adjustment, refer to Section 592-802-700TC.

## 2.03 Flywheel Selection Interval



**Note:** The flywheel can be oriented in 60-degree steps for various combinations of operating speeds, magnets, and control circuit delays. The following example (see chart) outlines the procedure for obtaining the desired selection interval.

- (1) Combine attract time of magnets and delay time of control circuits with clock pulse set to range 30. For this example, assume 3 milliseconds and an operating speed of 1100 wpm.
- (2) Using chart, locate 3 millisecond point on timing scale. Extend a line horizontally to the right until it intersects line indicating 1100 wpm. From this point extend a line upward until it intersects one of the o'clock lines.
- (3) At this point extend a line horizontally to the left until it intersects scale at upper left of chart. This point is read in degrees and is the desired selection interval. The particular o'clock position determined (9:00 o'clock in this example) is to be used when making the flywheel orientation adjustment.

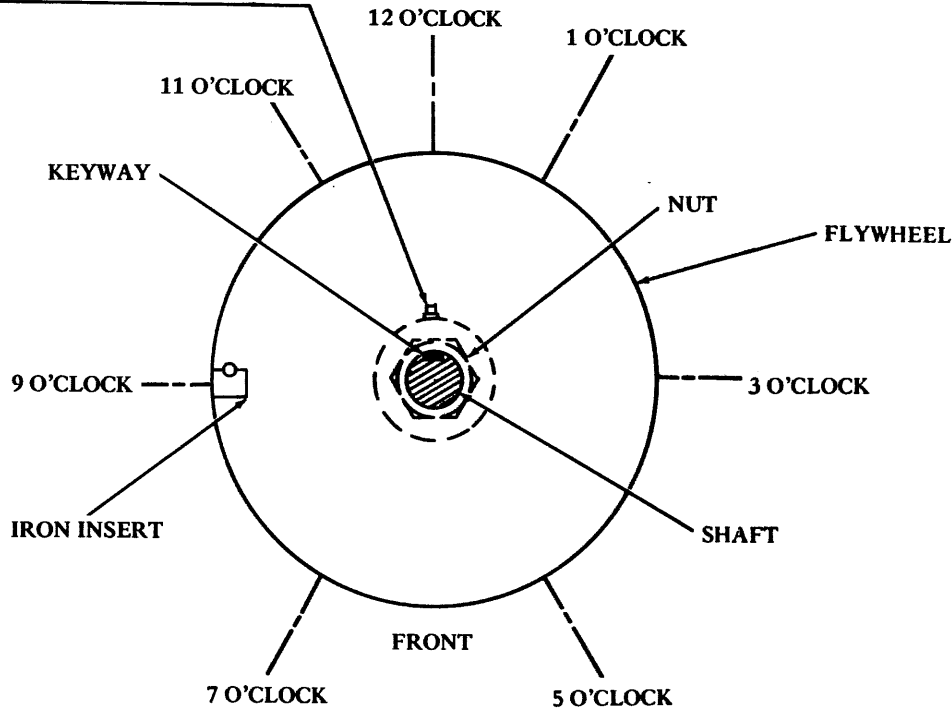


2.04 Flywheel Selection Interval (continued)

FLYWHEEL ORIENTATION

**Requirement**

Flywheel setscrew should be at the 12 o'clock position. Flywheel iron insert should be in the desired position as determined from chart.



**To Adjust**

Loosen nut and remove setscrew. Position shaft so that keyway is at the 12 o'clock position. Hold shaft in this position and rotate flywheel so that the iron insert is set to the desired o'clock position. Insert setscrew in hub at the 12 o'clock position and tighten setscrew just enough to hold flywheel in position. Tighten nut; tighten setscrew securely.

HIGH SPEED TAPE PUNCH UNIT

(BRPE TYPE)

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS	PAGE	1. GENERAL
1. GENERAL . . . . .	1	1.01 This section contains description and principles of operation for the high speed tape punch unit (BRPE type). It is reissued to include information for all BRPE tape punch units, and to change the title. The photographs and drawings are typical of most models.
2. DESCRIPTION . . . . .	1	
USES . . . . .	1	
ASSOCIATED EQUIPMENT . . . . .	1	1.02 The punch unit uses a magnet controlled punch mechanism to produce perforated tape. The magnets may be controlled either by an electronic control unit or equivalent circuits furnished by the customer. Tape feeding is done with a spring driven escapement type feed mechanism. Timing for the electronic and equivalent circuits is provided by a magnetic pickup mounted on the punch unit.
SIGNAL INPUT . . . . .	2	
TAPE . . . . .	2	
CODE LEVELS . . . . .	2	
TIMING . . . . .	2	
OPERATING POWER AND TEMPERATURE . . . . .	3	1.03 The tape punch is used as a self-contained unit when mounted on a high speed reperforator base. Provisions are made for mounting the punch unit on any one of several bases with facilities to install electrical components that are used in the magnet circuits.
WEIGHTS AND DIMENSIONS . . . . .	3	
3. PRINCIPLES OF OPERATION . . . . .	4	2. DESCRIPTION
4. DETAILED DESCRIPTION OF MECHANISMS . . . . .	4	2.01 The tape punch unit (Figure 1) records information at speeds to 110 characters per second. This information is received from control circuits as combinations of electrical code pulses, then converted to mechanical motions to punch corresponding combinations of code holes. Each combination of code pulses includes a feed pulse to advance the tape.
DRIVE MECHANISM . . . . .	4	USES
PUNCH MECHANISM . . . . .	4	2.02 The high speed tape punch unit is intended for use in receive-transmit sets and high speed tape-to-tape receiving terminals. It is also compatible with computer type applications or wherever its high speed capability may be required.
FEED MECHANISM . . . . .	9	ASSOCIATED EQUIPMENT
UNIVERSAL PUNCH MECHANISM . . . . .	9	2.03 An electronic control unit provides the circuits that convert low-level signals to usable power signals capable of operating the punch magnets at varying
ELECTRICAL TIMING CHARACTERISTICS . . . . .	12	
SYNCHRONIZATION . . . . .	14	
A. Early Design Magnet Pickup . . . . .	14	
B. Latest Design Magnet Pickup . . . . .	14	

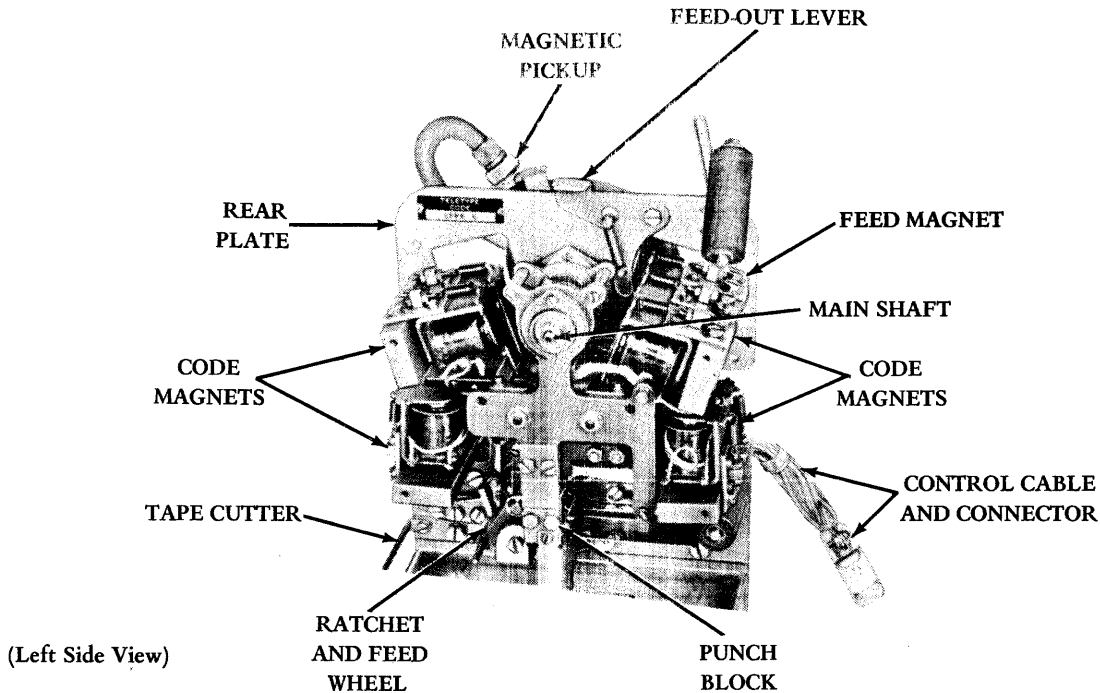


Figure 1 - Tape Punch Unit

speeds. Connecting cables should be provided in the base or cabinet mounting facility. The chad chute, output tape guide and tape handling vary from one application to another, and therefore should also be provided as part of the mounting facility.

**SIGNAL INPUT**

2.04 Signal code input to the punch is binary and parallel. It receives the intelligence in the form of electrical code pulses on a multiple wire basis from the control circuits. These control circuits are triggered by a synchronization pulse which originates in the punch itself.

**TAPE**

2.05 With the appropriate punch block assembly and associated parts selected and installed, the punch unit is capable of punching either 11/16 inch, 7/8 inch, or 1 inch tape (Figure 2). Tape guide channels can be provided to align any of these tape widths.

**CODE LEVELS**

2.06 The punch will perforate, depending on the unit and punch block selected, either 5-, 6-, 7-, or 8-level tapes according to the following arrangement:

<u>5 Levels</u>	<u>6 Levels</u>	<u>7 Levels</u>	<u>8 Levels</u>
	01	01	01
01	02	02	02
02	03	03	03
0F	*00F	0F	0F
03	04	04	04
04	05	05	05
05	06	06	06
		07	07
			08

0 = Code Hole

F = Feed Hole

\*0 = Advance Feed Hole (if so equipped)

**TIMING**

2.07 The high speed tape punch mechanism operates continuously. However, punching and feeding of tape occurs under the control of input signals received from electronic storage circuits. A magnetic pickup, mounted on the punch unit, controls the information in the storage circuits. In addition, the magnetic pickup and its associated

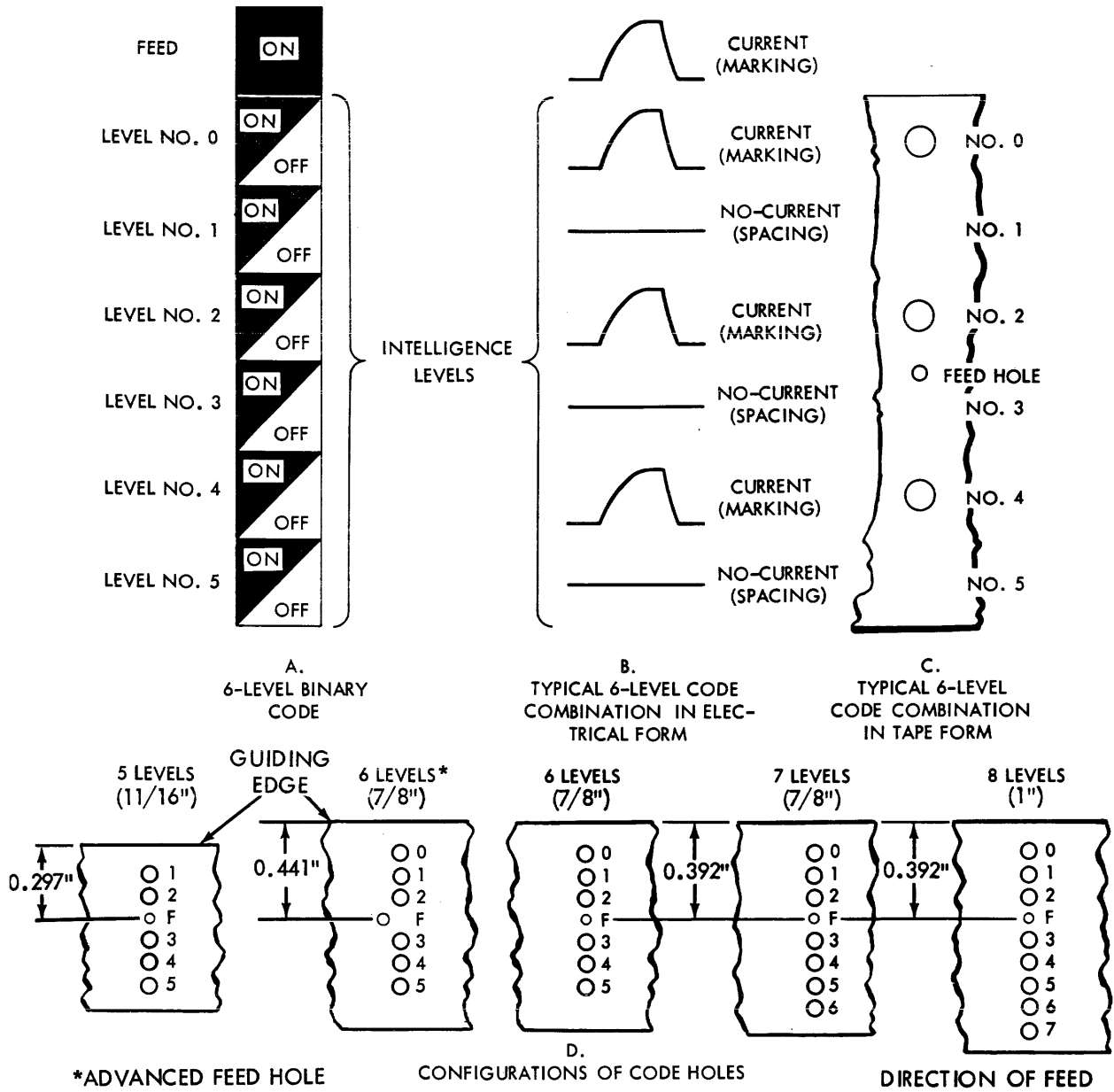


Figure 2 - Code Illustrations

iron insert can be adjusted to allow the full operation or release of the magnet armatures prior to the end of the mechanical selection interval of the operating cycle.

**OPERATING POWER AND TEMPERATURE**

2.08 Mechanical motion to operate the punch unit is produced by a two-pole single-phase synchronous motor which develops 1/20 horsepower at 3600 revolutions per minute. The punch unit may be operated in an

environment ranging from 0 to 90 relative humidity and at an ambient temperature of +40°F to +110°F. The input to the motor is 115 v ac, +10%, 60 Hz, 65 watts at nominal voltage.

**WEIGHTS AND DIMENSIONS**

2.09 The tape punch unit weighs 8-1/2 pounds. The overall dimensions less variable features, mounting facilities, and covers are 7-3/8 inches high, 9-3/8 inches wide, and 9-1/2 inches deep.

### 3. PRINCIPLES OF OPERATION

3.01 Figure 3 shows the related operations of a tape punch unit receiving a 5-level code with levels 1, 3, and 5 marking. The electrical, mechanical, and timing relationships shown are described in the following paragraphs.

3.02 Placing the toggle switch, on right side of punch unit, to the ON position applies ac power to the motor. The motor motion is rotary and is transmitted through a pinion and gear set to the drive mechanism. The drive mechanism converts the rotary motion to oscillating motion and then sends it to the punch and feed mechanisms.

3.03 Figure 4 shows the vertical motion of the punch and feed mechanism being plotted against the rotation of the main shaft. Top dead center (TDC) of the punch mechanism has been designated as the zero degree point. The drive mechanism is so designed that the feed mechanism reaches TDC 45 degrees after the punch mechanism.

3.04 A tape punch operation is the period from TDC of the punch mechanism to TDC of the feed mechanism (405 degrees). This is the time needed by the equipment to punch a character and advance the tape when an electrical code combination has been received. As shown in Figure 4, the operations overlap by 45 degrees.

3.05 The magnetic pickup (Figure 5) generates a sync pulse with each revolution of the flywheel. This pulse starts the transfer of the code combination from the signal converter storage register in the receiver set to the reperforator magnets.

3.06 If intelligence is present in the storage register, a combination of code and feed pulses is applied to the code and feed magnets. The punch mechanism punches code holes in the tape corresponding to the marking pulses received. A feed hole is automatically punched with each code combination. Punching occurs about midway through the operation as shown in Figure 4.

3.07 If intelligence is not present in the storage register, the tape punch undergoes an operation without punching or feeding tape.

3.08 The feed pulse energizes the feed magnet and causes the feed mechanism to advance the tape. This occurs late in the operation, after punching has been completed. Figure 6 shows the position and location of the feed magnet as well as the code level magnets.

### 4. DETAILED DESCRIPTION OF MECHANISMS

#### DRIVE MECHANISM

4.01 The drive mechanism (Figure 7) converts rotary motion to oscillating motion; then applies it to the punch and feed mechanisms. The conversion takes place on the main shaft at points specifically designed to form two cams. The forward cam, through a set of bearings and drive links, causes the transfer surface of the punch bail to oscillate. This motion is represented by the heavy solid line in Figure 4, and is directly imparted to the punch mechanism. A second cam on the main shaft causes the feed drive lever of the feed mechanism to oscillate. This motion is represented by the light solid line in Figure 4. The angular displacement of the two cams are so related that the feed drive link reaches TDC 45 degrees after the punch bail does. As long as the motor switch is on, the drive mechanism will run continuously and transfer motion to the punch and feed mechanisms.

4.02 Because the tape punch cycle is continuous, the feed and code pulses must be presented at specific times. A magnetic pickup is used to synchronize the delivery of the code pulses with the mechanical timing of the punch unit. The magnetic pickup consists of a coil with an iron core. With each shaft rotation, a permanent magnet inserted at the edge of the flywheel passes by the coil and induces a voltage in the coil. This voltage triggers the storage register circuit and starts the transfer of intelligence.

#### PUNCH MECHANISM

4.03 Figure 8 shows the punch mechanism. For each code level there is a code magnet, armature, blocking pawl, toggle linkage, drag link, and punch pin. When idle (motor running and no intelligence), the armatures are held away from the magnet pole faces by their springs. The armature is now in the spacing position, which in turn holds associated blocking pawls in their spacing position. As the drive mechanism cycles, it causes the punch bail and toggle linkages to oscillate.

4.04 When the toggle linkages move down at the beginning of each idling condition, toggle extensions engage the blocking pawls and cause the linkages to buckle at 51 degrees of shaft rotation. Vertical motion is imparted to the punch pins through the drag links. Since the toggle linkages are buckled, the vertical displacement of the pins is not enough to pass through the tape. Thus, the code holes are not punched. The travel of the pins for spacing is represented by the heavy dotted lines in Figure 4. Each operation of the drive mechanism causes a feed hole toggle arm and drag link (having no associated magnet or buckling knee) to drive a feed hole punch pin through the tape. In the idle condition, this pin moves up and down in the same hole.

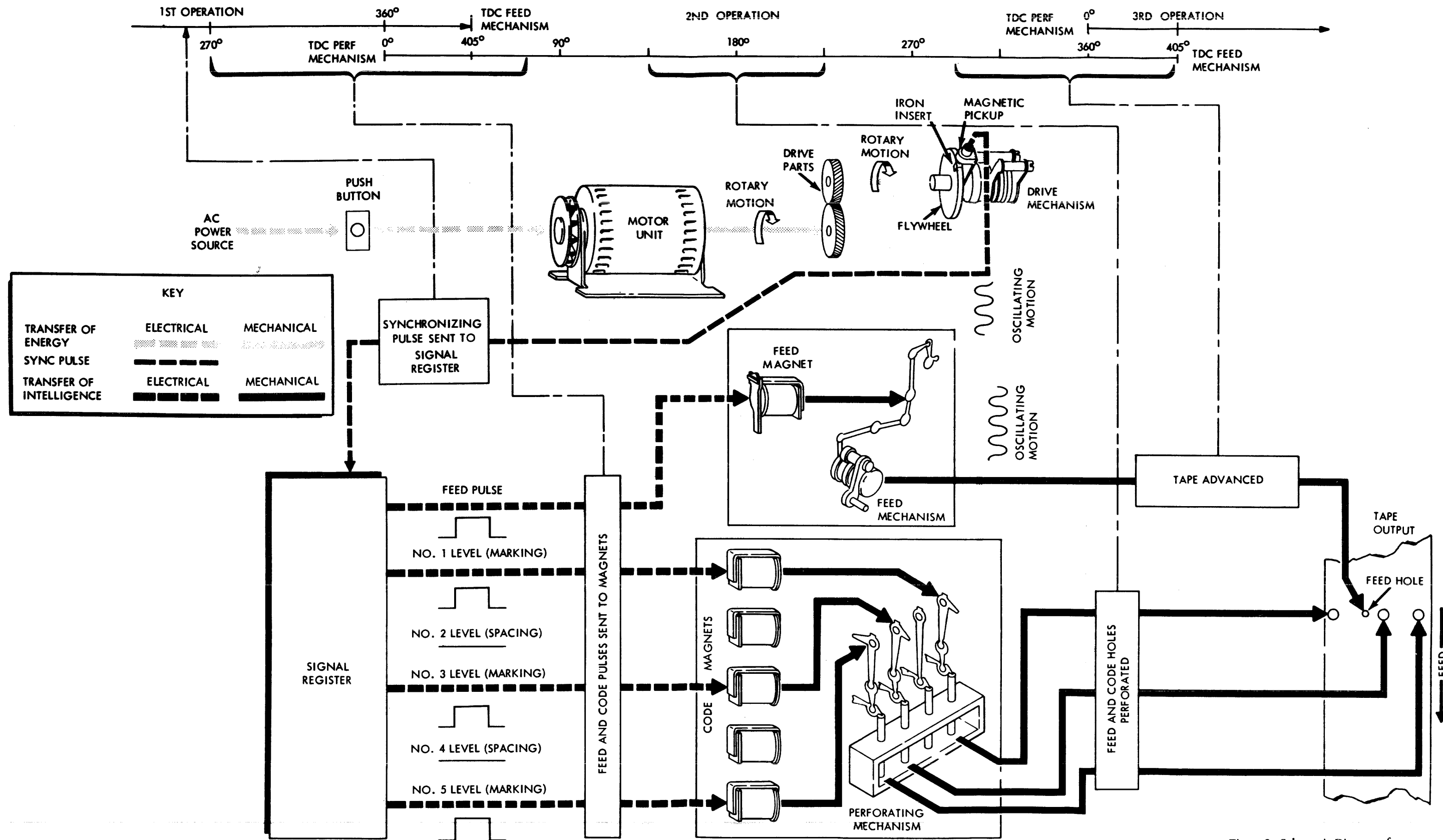


Figure 3 - Schematic Diagram of Reperforator Description



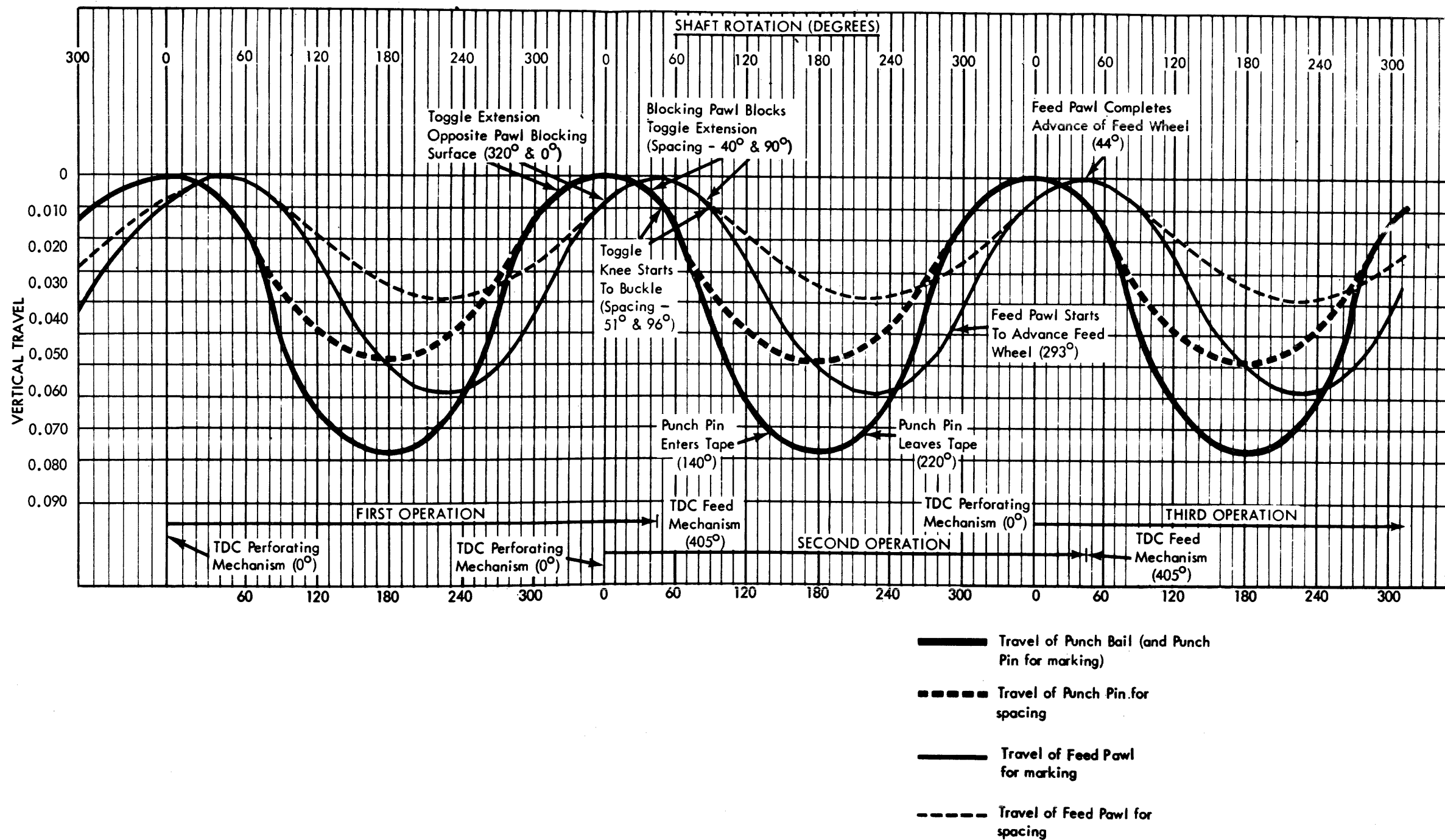


Figure 4 - Timing Diagram





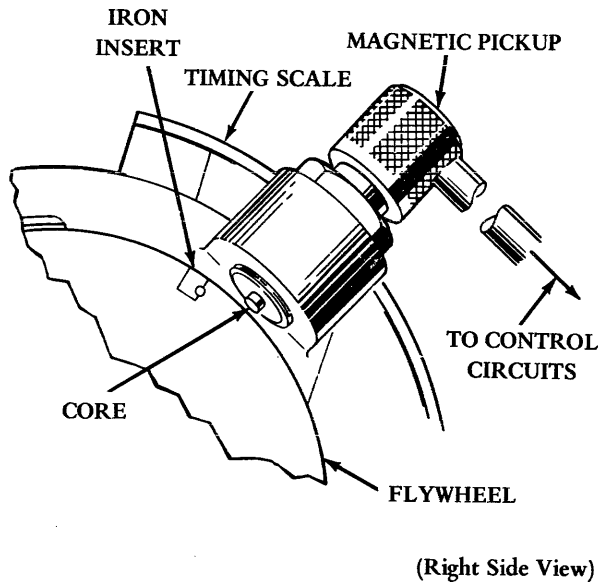


Figure 5 - Magnetic Pickup

4.05 When a code combination is received, the magnets and associated parts corresponding to spacing levels operate as described in the two previous paragraphs. For marking levels in the code combination, the magnets are energized and pull their armatures to their operated (or marking) position. The armatures, in turn, hold the blocking pawls in their marking position. The timing is such that the armatures reach their marking position before the end of the selection interval (320 degrees to 40 degrees of shaft rotation) illustrated in Figure 4.

4.06 As the toggle linkages move down, the toggle extensions associated with marking levels clear their blocking pawls, and the unbuckled linkages drive their pins through the tape and punch code holes. The motion of the pins for marking is represented by the solid black line in Figure 4. As can be seen, perforation occurs about midway through the operation between 140 degrees and 220 degrees of shaft rotation. Each time tape is advanced, the feed hole punch pin perforates a feed hole.

#### FEED MECHANISM

4.07 The tape feed mechanism is shown in Figure 9. It includes a magnet and toggle linkage similar to those of the punching mechanism. In the idle condition the magnet is de-energized, and the armature and blocking pawl are held under spring tension in their spacing position. The drive mechanism, through the feed drive lever, causes the toggle linkage to oscillate. As the linkage moves down during the early part of each idling operation, it is buckled by the blocking pawl at 85 degrees of shaft rotation (Figure 4). The

linkage rotates a pivot arm which lifts the feed pawl, but not enough to raise it above the next tooth on the feed wheel. The motion of the feed pawl for idling (or spacing) is represented by the light dotted line shown in Figure 4. In this condition the feed wheel is not rotated nor is tape advanced.

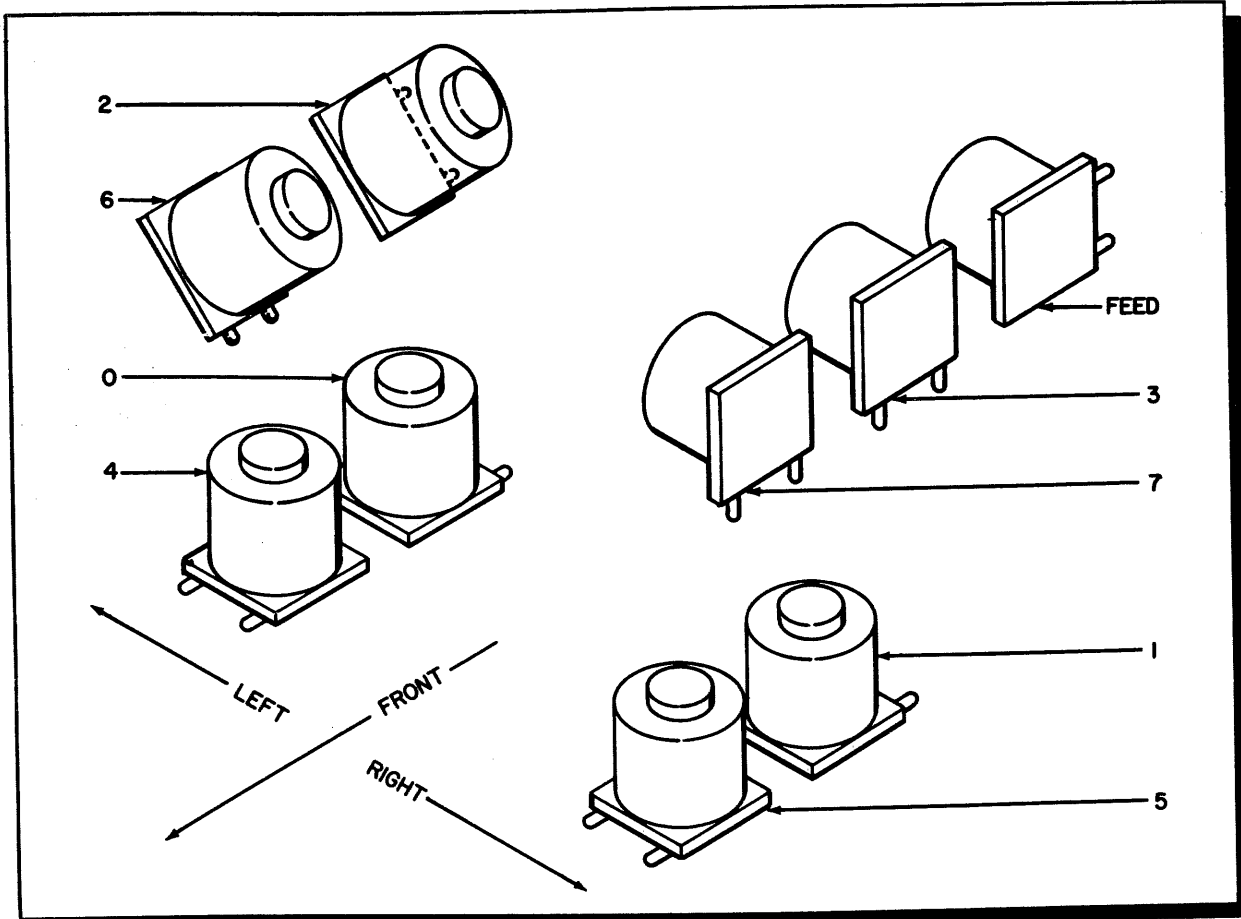
4.08 When a code combination is received, a feed pulse is applied to the feed magnet which pulls the armature and blocking pawl into their marking position. The timing is such that the armature does not reach its fully released position before the end of the feed selection interval (Figure 4). As the toggle linkage moves down during the early part of the operation, the toggle extension clears the blocking pawl; the linkage remains in its unbuckled condition, and the feed pawl is lifted above the next tooth on the ratchet. When the linkage moves up during the latter part of the operation, it causes the pawl to act on the ratchet and rotate the feed wheel one tooth. Pins on the periphery of the wheel engage the feed holes and advance the tape one character. As shown in Figure 4, feeding occurs between 293 degrees and 44 degrees of shaft rotation.

4.09 Near the end of its downward travel, the pawl is engaged by a wedge block which prevents over-travel. Consistent spacing of code perforations is ensured by a detent with a roller that is held under spring pressure against the ratchet. The detent secures the feed wheel and tape in position between feeding operations. Consistent spacing of the perforations in relation to the edge of the tape is maintained by a biasing spring which holds the tape against a reference surface on the block. The tape is fed into the punch block through a tape guide and is held on the feed wheel by a spring-biased tape lid which may be raised to initially insert the tape.

#### UNIVERSAL PUNCH MECHANISM

4.10 The punch units with the universal tape punch (Figure 10) are capable of perforating 11/16-inch tape with 5-level code, or 1 inch tape with 5-, 6-, 7-, or 8-level codes. To accomplish this, a manually operated mechanism is provided to mechanically vary the size of the punch block tape path to accept either 11/16 inch or 1 inch tapes. Associated with this mechanism is a variable tape guide mechanism and three switches which electrically control the 0, 6, and 7 code levels.

4.11 The production of 5-level, 11/16 inch tape is accomplished by lifting up on the control lever (on the right side of punch block), and allowing it to move forward under its own spring tension. This permits the rear edge of the punch block tape path to move forward, and simultaneously lowers a tape guide bias spring to form the front edge of the tape path. The switches for the 0, 6, and 7 levels should be operated to their OFF position, and the tape guideplate should be moved to its forward detented position.



MAGNET	POSITION	TERMINAL POSITION
FEED	UPPER RIGHT REAR	REAR
0 - PULSE	LOWER LEFT REAR	REAR
1 - PULSE	LOWER RIGHT REAR	REAR
2 - PULSE	UPPER LEFT REAR	REAR
3 - PULSE	UPPER RIGHT MIDDLE	DOWN ON 8 LVL, FRONT ON 5 LVL.
4 - PULSE	LOWER LEFT FRONT	FRONT
5 - PULSE	LOWER RIGHT FRONT	FRONT
6 - PULSE	UPPER LEFT FRONT	DOWN
7 - PULSE	UPPER RIGHT FRONT	DOWN

Figure 6 - Magnet Positions

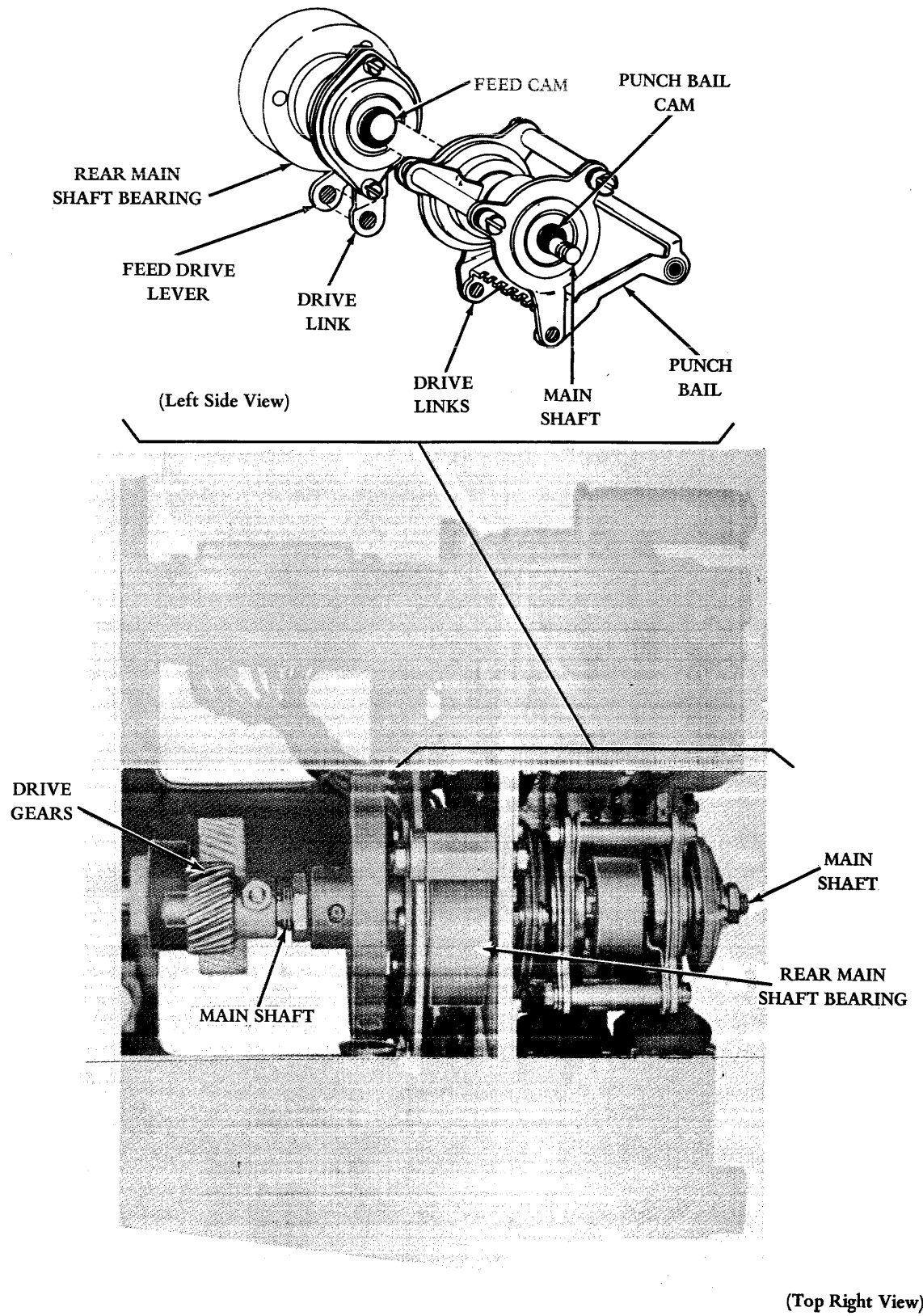


Figure 7 - Drive Mechanism

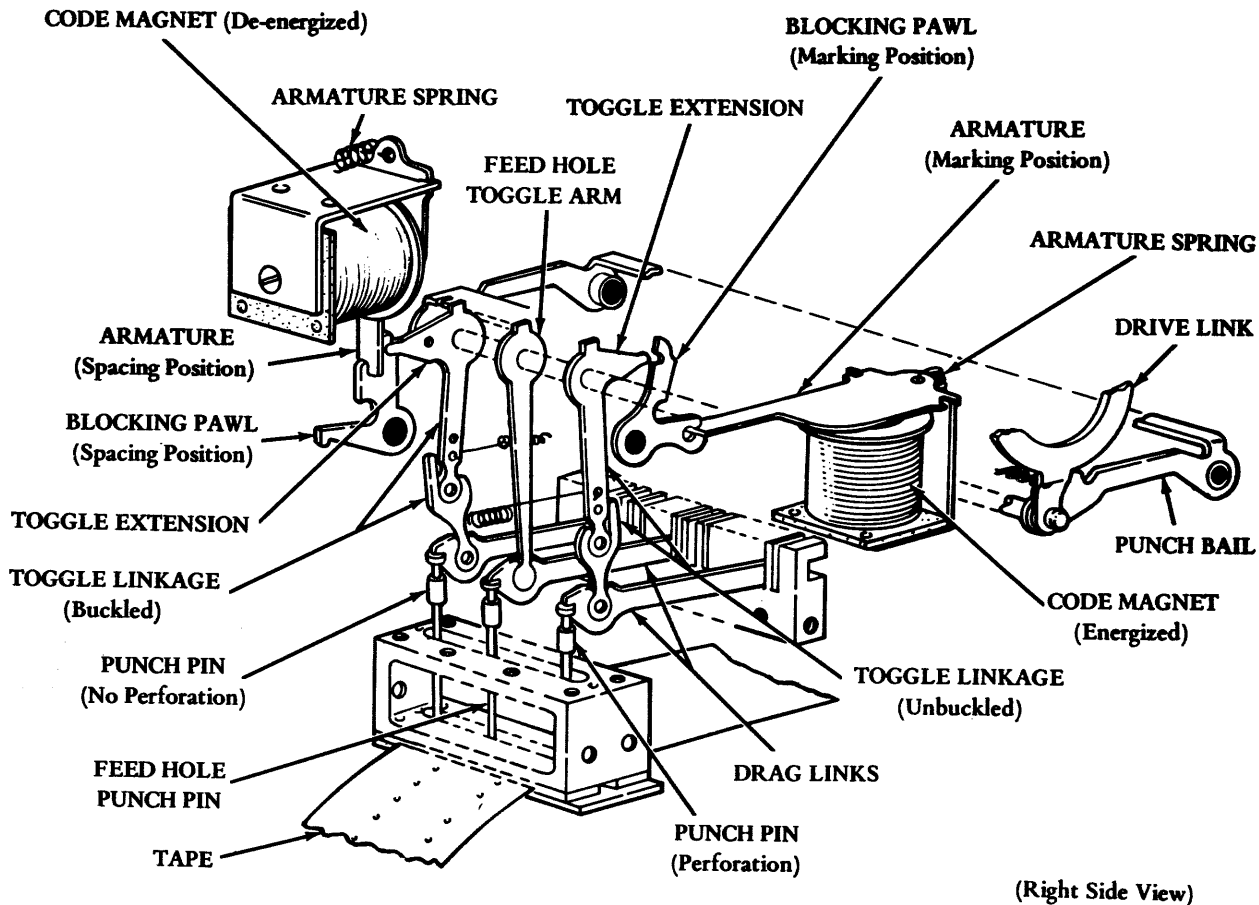


Figure 8 - Punch Mechanism

4.12 The production of 5-, 6-, 7-, or 8-level 1 inch tape is accomplished by pushing the control lever to the rear, while applying a slight downward pressure, until the control lever reaches its rear detent position. In this position, the rear edge of the tape path is moved back and the tape guide bias spring is retracted to clear the tape path for 1 inch tape. The switch for the 0-, 6-, or 7-level codes should be operated to their respective ON positions, depending upon the level of operation desired, and the tape guideplate should be operated to its rear detented position.

#### ELECTRICAL TIMING CHARACTERISTICS

4.13 The following data is for typical tape punch units:

- (a) Punch and feed magnets fully attract their armatures about 3 milliseconds after being energized; they are fully released about 8 milliseconds after opening the circuit.
- (b) Punch units that are pulsed from transistorized control units have magnets that operate on 28 v dc and require a 25 ohm resistor in series with each magnet to limit the operating current.

**CAUTION:** IF THE 25 OHM RESISTORS EXCEED 5 MILLISECONDS FOR ONE CHARACTER OPERATION, REMOVE THEM FROM THE BASE AND MOUNT EXTERNALLY, OR SUPPLY A BLOWER TO DISSIPATE THE HEAT.

- (c) Punch units that are pulsed from tube type control units have magnets that operate on 115 v dc and require a 600 ohm resistor in series with each magnet to limit the operating current.

**Note:** Since magnet operation depends on the control circuits, the above values may be varied experimentally for specific applications.

- (d) The punch and feed magnets should be provided with a square wave pulse of 4.5 milliseconds.

**Note:** Production tape punch units are adjusted to a standard optimum input signal of 4.5 milliseconds  $\pm 5\%$ , without readjustment of the armature gap and/or spring tension. Field applications having control equipment generating signals other than 4.5 ms may need readjustment.

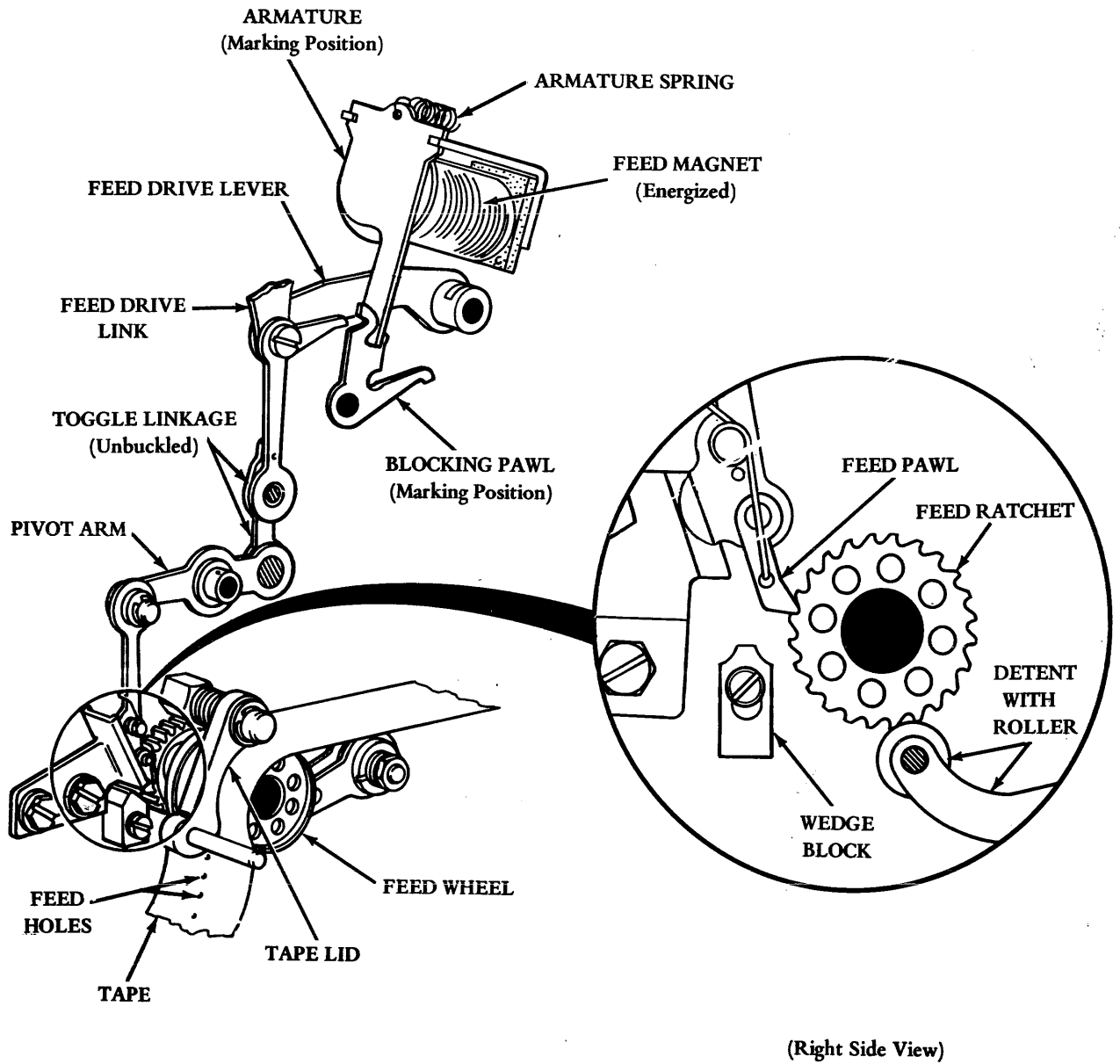


Figure 9 - Tape Feed Mechanism

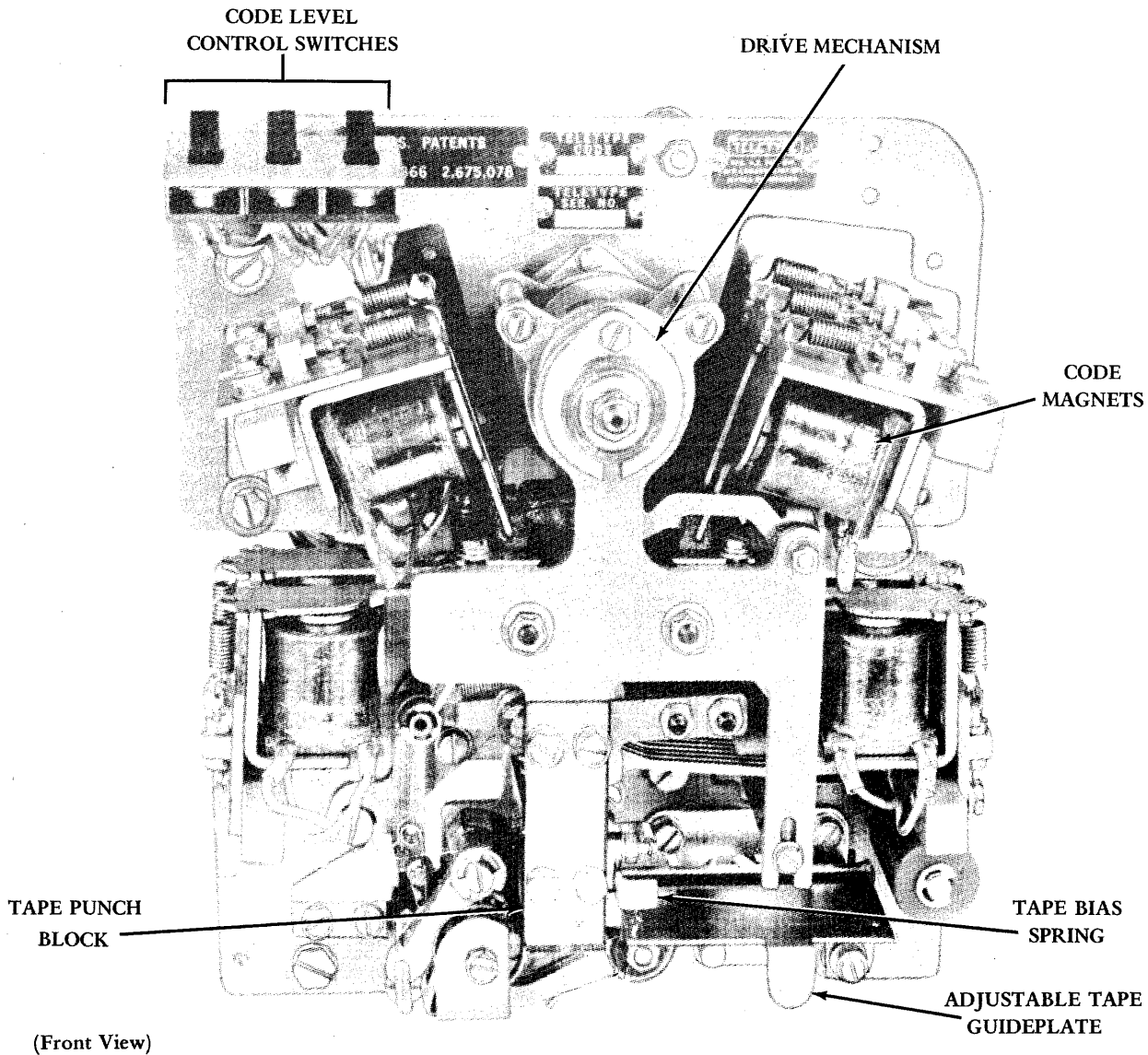


Figure 10 - Universal Tape Punch Unit

**SYNCHRONIZATION**

**A. Early Design Magnet Pickup**

4.14 The early design magnetic pickup generates a timing pulse for every revolution of the flywheel. At 63.3 operations per second it produces a 4 volt (peak-to-peak), 450 microsecond timing pulse. At 110 operations per second it produces a 6 volt (peak-to-peak), 250 microsecond timing pulse.

Note: The above values are obtained with a clearance of 0.010 inch between the magnet pickup and the flywheel when the pickup is connected to an equivalent circuit of a 0.01 mf capacitor and a 1000 ohm resistor in parallel.

**B. Latest Design Magnet Pickup**

4.15 The latest design magnetic pickup generates a timing pulse for every revolution of the flywheel. At 63.3 operations per second it produces a 30 volt (peak-to-peak), 450 microsecond timing pulse. At 110 operations per second it produces a 40 volt (peak-to-peak), 250 microsecond timing pulse.

Note: The above values are obtained with a clearance of 0.010 inch between the magnet pickup and the flywheel when the pickup is connected to an equivalent circuit of a 0.01 mf capacitor and a 1000 ohm resistor in parallel.

HIGH SPEED TAPE PUNCH BASE AND COVER

(BRPEB AND BRPEC)

DESCRIPTION

CONTENTS	PAGE
1. GENERAL . . . . .	1
2. BASE . . . . .	1
3. COVER . . . . .	2

1. GENERAL

1.01 This section describes a tape punch base and a tape punch cover as separate units of a high speed tape punch system. The tape punch base unit (Figure 1) is designed for either table top or shelf mounting, with or without shock mounts. The tape punch unit cover (Figure 2) is a simple slip-on design mounted in place by four screws. Although there are several available tape punch base models as well as tape punch cover models, the information contained herein is typical and can be generally applied to all models. Refer to Section 592-802-100TC for a description of the tape punch unit.

2. BASE

2.01 The tape punch base unit consists of two vertical support brackets and a flat plate with provisions for mounting various components of a high speed tape punch set. The principal component mounts for the base unit include a tape punch unit, a motor unit, and a tape container. The following paragraphs briefly describe additional items generally mounted on the tape punch base unit.

2.02 Power circuits including a four point terminal board, a motor switch, and mating input connectors are provided. Also, there are mounting provisions for

control input connectors, a tape punch base and tape punch unit connector, and power input connectors.

2.03 An electrical component mounting board containing resistors, diodes, and capacitors is installed underneath the flat plate area of the tape punch base unit. These electrical components supply the needed high current and low voltage for the tape punch magnet circuits. A low tape switch is included to actuate an external visual, or audible alarm whenever the tape supply falls below a predetermined level.

2.04 A reel and brake assembly regulates the tape roll tension to provide smooth acceleration and deceleration during starting and stopping of the tape punch unit. Also, vibration mounts (supplied with the tape punch base unit) can be removed at the customers discretion. Rubber grommets (four) mounted on the sides of the tape punch base unit are used to support the motor unit cover shown in Figure 2.

3. COVER

3.01 The tape punch unit is housed in a small removable cover. The cover is designed to provide protection from dust, oil, and paper particles that may otherwise impair proper operation of the tape punch unit. Also, it provides protection from a safety standpoint. A glass window in the cover permits visual access to the tape punch unit.

3.02 For disassembly and reassembly information concerning the tape punch cover unit, refer to Section 592-802-702TC.



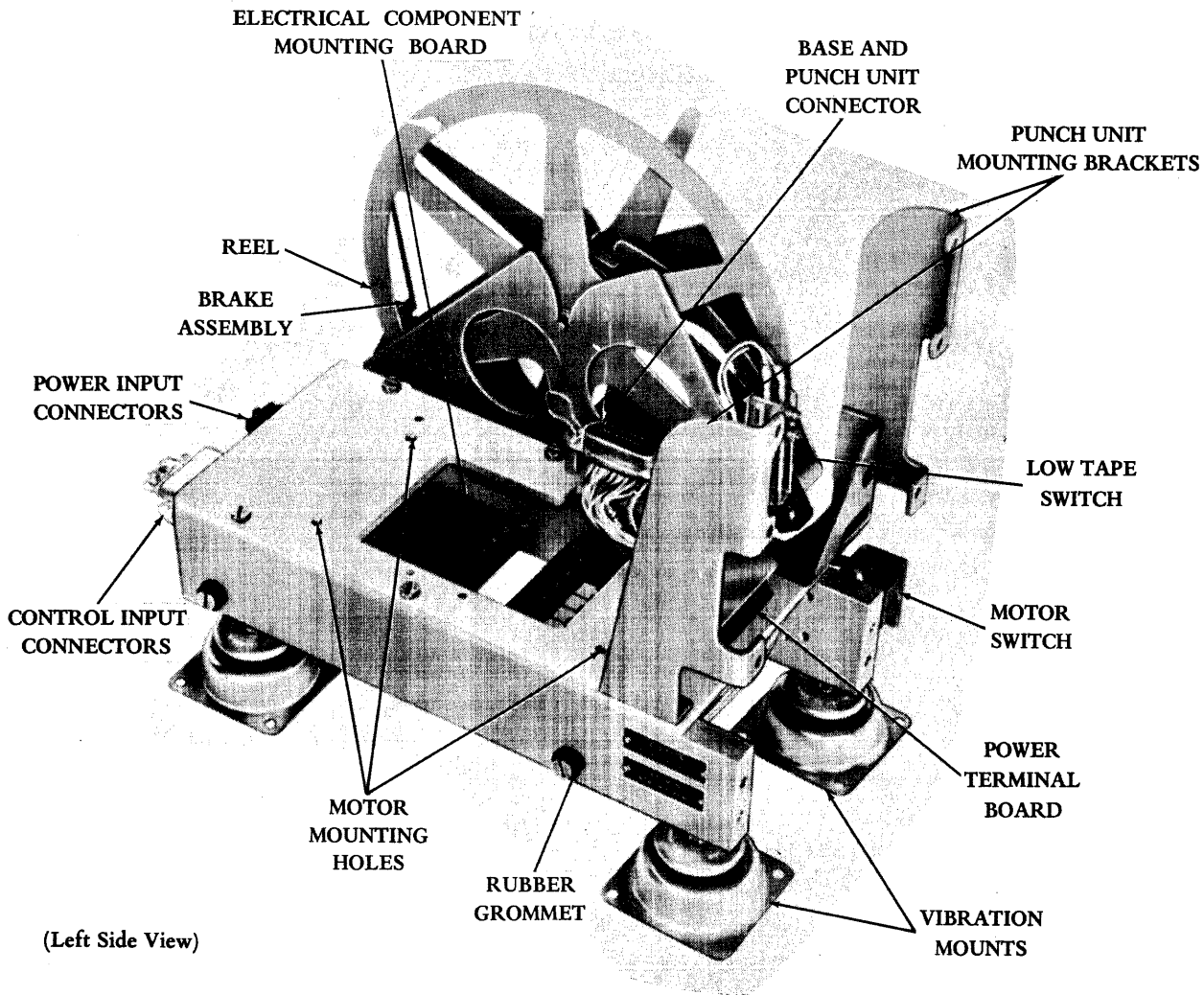


Figure 1 - Tape Punch Base Unit

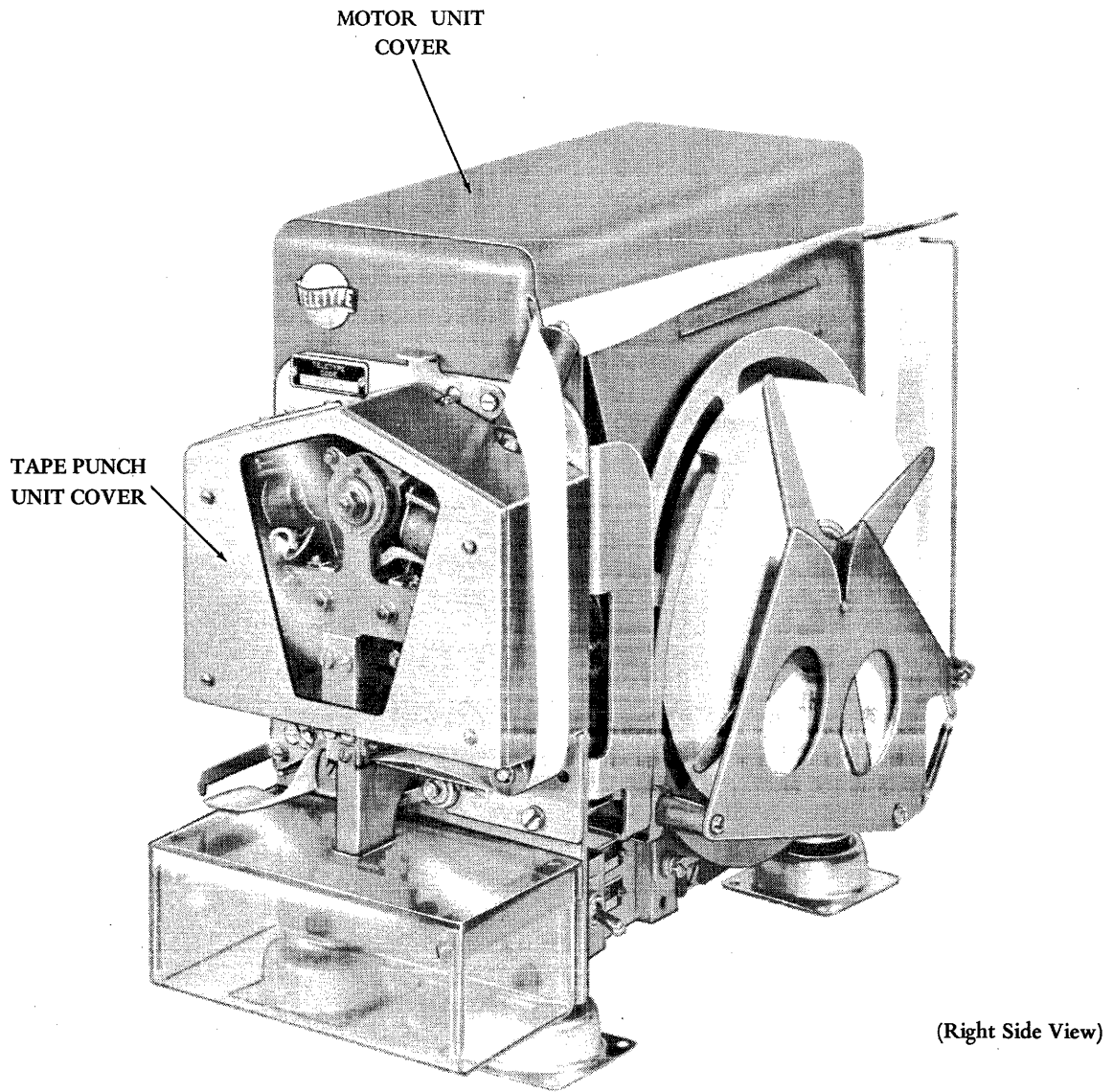


Figure 2 - Tape Punch and Motor Unit Covers

HIGH SPEED TAPE PUNCH UNIT

(BRPE TYPE)

ADJUSTMENTS

CONTENTS	PAGE	CONTENTS	PAGE
1. GENERAL . . . . .	1	3. BASIC UNIT (Early Design) . . . . .	20
2. BASIC UNIT (Late Design) . . . . .	3		
Punch Mechanism		Punch Mechanism	
Drag links . . . . .	12	Blocking pawl . . . . .	21
Long toggle arm springs . . . . .	6	Feed magnet armature spring . . . . .	22
Magnet armature spring (each code level) . . . . .	8	Long toggle arm spring . . . . .	21
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Magnet plate . . . . .	7	Punch bail . . . . .	20
Operating link spring . . . . .	12	Punch block . . . . .	22
Punch block . . . . .	11	Punch magnet armature spring . . . . .	22
Punch pin retaining plate . . . . .	3		
Stop plate with guides . . . . .	5 ←	Tape Feed Mechanism	
Stop plate without guides . . . . .	4 ←	Feed pawl adjustable link . . . . .	23
Tape bias spring . . . . .	10	Feed pawl eccentric stud . . . . .	24
Tape guide alignment . . . . .	9	Feed pawl spring . . . . .	23
Tape guide detent . . . . .	10	Feed ratchet detent . . . . .	23
Tape guide detent spring . . . . .	10	Feed ratchet detent spring . . . . .	24
		Tape feed-out lever spring . . . . .	25
Tape Feed Mechanism		Tape tension lever spring . . . . .	25
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Feed pawl link . . . . .	15	Contactor points . . . . .	26
Feed pawl spring . . . . .	15	Indicator plate . . . . .	27
Feed ratchet detent arm . . . . .	14	No. 1 contactor mounting plate . . . . .	27
Feed ratchet detent arm spring . . . . .	14	No. 2 contactor mounting plate . . . . .	27
Magnetic pickup . . . . .	17		
Operating range . . . . .	17	1. GENERAL	
Tape feed-out lever spring . . . . .	18	1.01 This section contains adjustment proce-	
Tape lid spring . . . . .	14	dures for the high speed tape punch unit	
Ten to the inch . . . . .	13	(BRPE type). It is reissued to include engineer-	
Wedge block . . . . .	16	ing changes for a new stop plate guide and to	
		correct an illustration error. Marginal arrows	
Timing		indicate changes or additions.	
Magnetic pickup (early design) . . . . .	18		
Magnetic pickup (late design) . . . . .	18	CAUTION: REMOVE POWER FROM PUNCH	
Range . . . . .	19	UNIT BEFORE MAKING AN ADJUSTMENT	
		UNLESS STATED OTHERWISE.	

1.02 Read the entire adjustment procedure carefully before making the adjustment. When directed, loosen nuts and screws friction tight; then tighten when adjustment is complete. Adjustments are arranged in a sequence that is followed when a complete readjustment of the punch unit is undertaken.

1.03 Parts or assemblies that are removed to simplify a particular series of adjustments should not be replaced until that particular series of adjustments is complete.

1.04 Unless stated otherwise, references to left or right, front or rear, and up or down are front views of the punch unit in its

normal operating position. If more than one adjustment appears on an illustration, follow the letter sequence (A), (B), (C), etc.

1.05 For tools needed to make adjustments, refer to Section 570-005-800TC. For parts ordering information on the late-design punch units and the early-design punch units, refer to Sections 592-802-800TC and 592-802-802TC respectively.

1.06 The spring tension ratings given are indications, not exact values. Check springs with the proper scales in the positions shown. If no adjustment procedure is given, replace springs not meeting requirements.

2. BASIC UNIT (Late Design)

2.01 Punch Mechanism

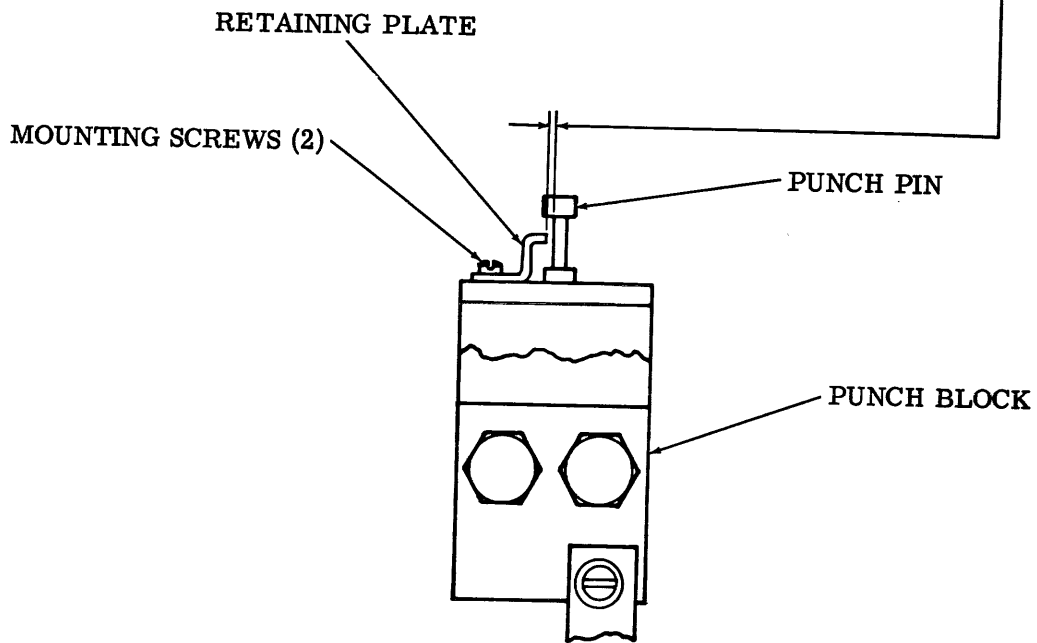
PUNCH PIN RETAINING PLATE

**Requirement**

Punch pins should move freely with minimum clearance between punch pins and retaining plate.

**To Adjust**

Loosen mounting screws. Position retaining plate to meet requirement.



(Front View)

**Note:** If punch block is removed, make the adjustment before remounting it.

**CAUTION:** DO NOT ADJUST PUNCH BLOCK DIE PLATE.

2.02 Punch Mechanism (continued)

→ STOP PLATE WITHOUT GUIDES

To Check

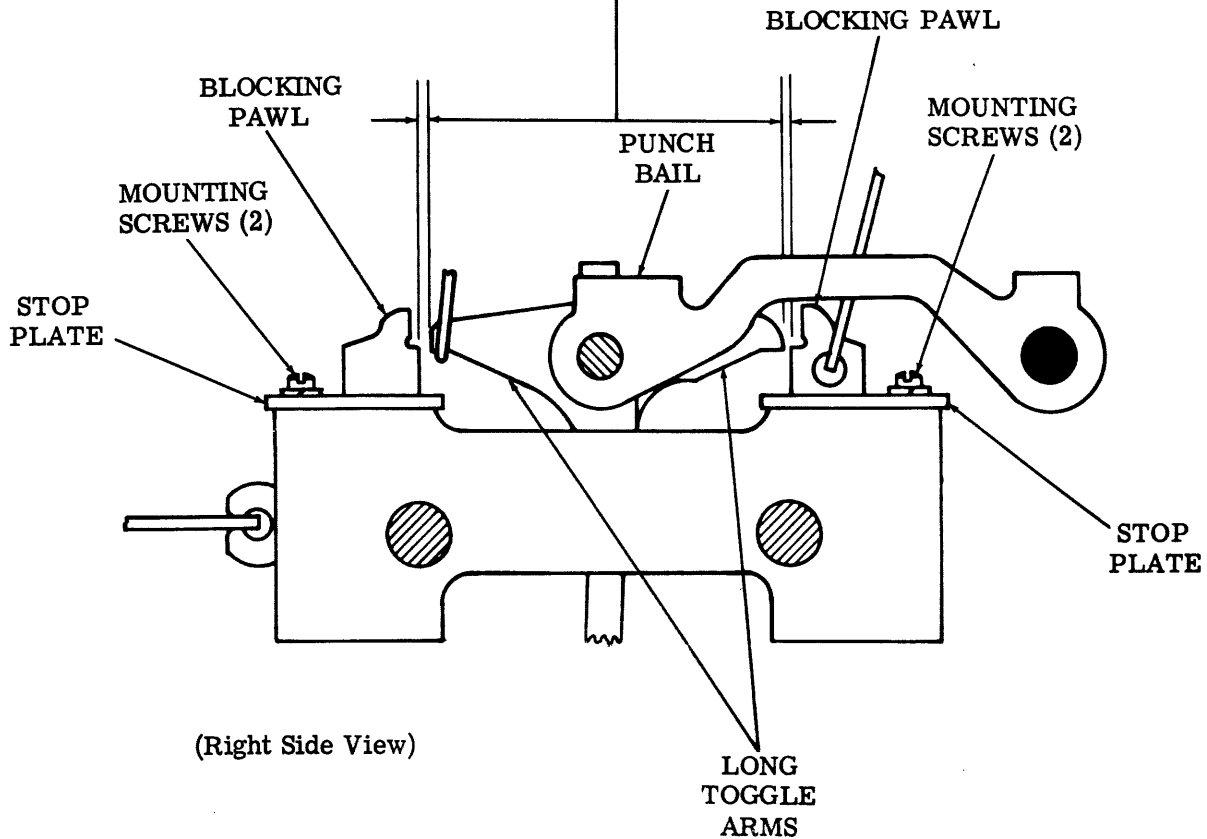
Hold the blocking pawls against their stop plates. Rotate main shaft until the long toggle arms are below the engaging surfaces of the blocking pawls.

Requirement

Clearance between the long toggle arms and the blocking pawls should be  
--- Min 0.002 inch---Max 0.010 inch

To Adjust

Loosen mounting screws. Position stop plates to meet requirement.



2.03 Punch Mechanism (continued)

STOP PLATE WITH GUIDES

To Check

Hold blocking pawls against stop plates away from toggle arms. Rotate main shaft until long toggle arms are below engaging surfaces of blocking pawls.

(1) Requirement

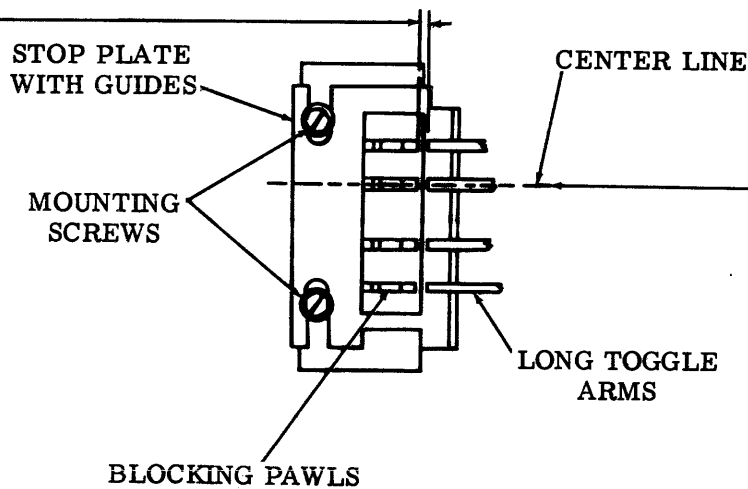
Clearance between long toggle arms and their blocking pawls should be  
 Min 0.002 inch---Max 0.010 inch

(2) Requirement

Center line of blocking pawl and long toggle arm should be in line within  
 0.010 inch gauged by eye

To Adjust

Position stop plates with mounting screws loosened for both requirements.  
 When requirements are made, tighten screws.



2.04 Punch Mechanism (continued)

LONG TOGGLE ARM SPRINGS

To Check

(1) Code Magnets

Set punch bail to its uppermost center position. Hook scale under long toggle arm and pull until knee buckles.

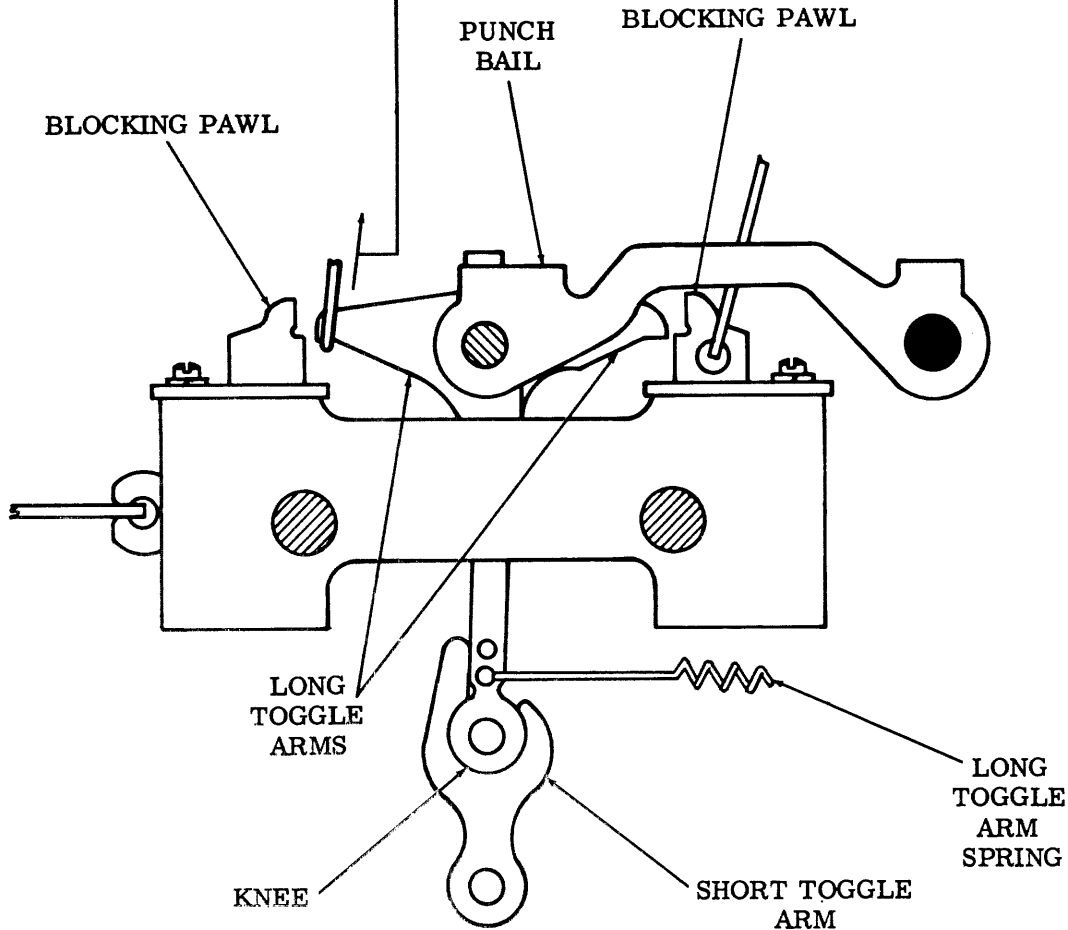
(2) Feed Magnet

Rotate main shaft counterclockwise until the code magnet long toggle arms touch their respective blocking pawls. Release feed magnet long toggle arm from its blocking pawl. Hook scale under long toggle arm and pull until knee buckles.

Requirement (Each Spring)

Min 8 oz---Max 11 oz

to start short toggle arm moving away from long toggle arm.



(Right Side View)



2.05 Punch Mechanism (continued)

(A) MAGNET PLATE

**Requirement**

With armature attracted, there should be  
— Min 0.004 inch---Max 0.006 inch  
clearance between armature and pole face.

**To Adjust**

Loosen mounting screws. Position magnet plate to meet requirement.

Note: Clearance may be altered to meet range and operational requirements.

(B) MAGNET ARMATURE SPRING (Feed Level Only)

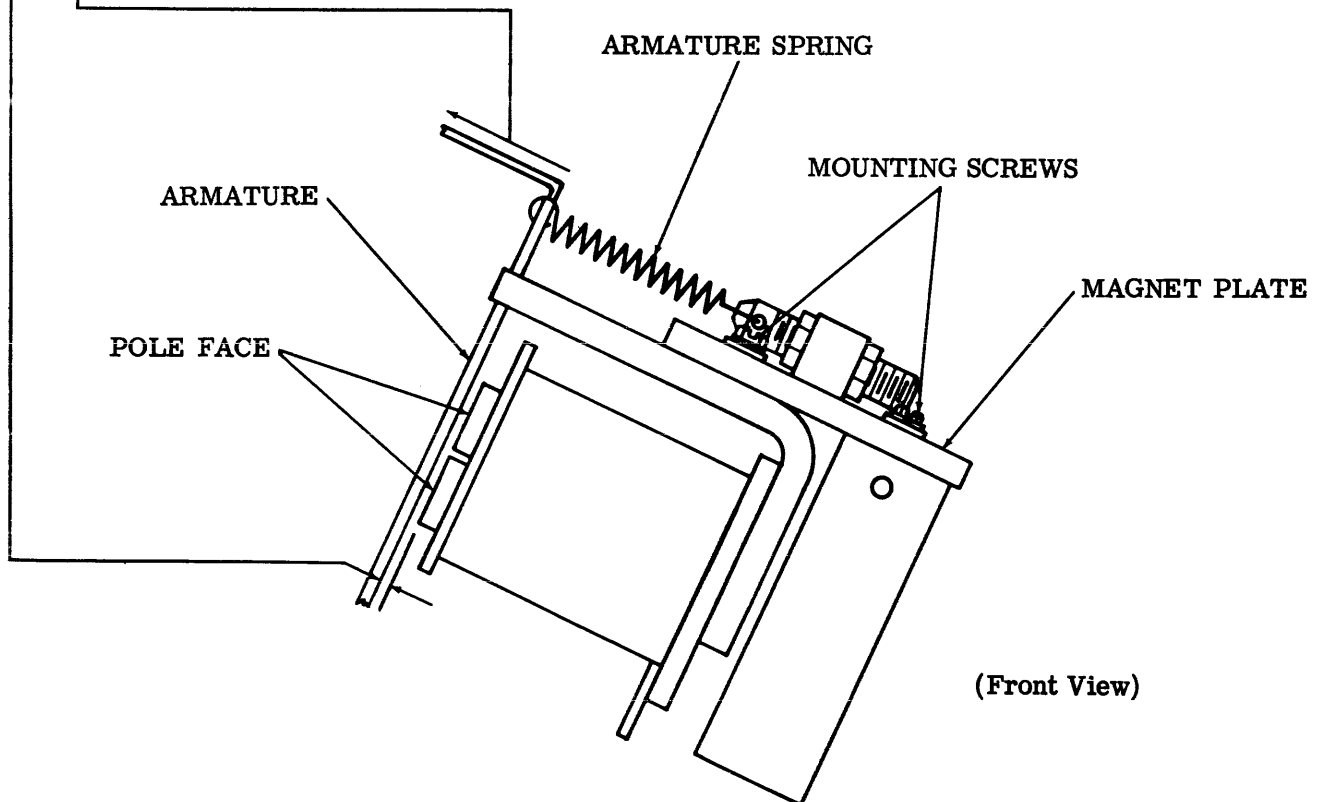
**To Check**

Set punch bail to its uppermost center position.

**Requirement**

— Min 14 oz---Max 17 oz  
to move armature.

Note: Spring tension may be altered to meet range and operational requirements.



2.06 Punch Mechanism (continued)

MAGNET ARMATURE SPRING (Each Code Level)

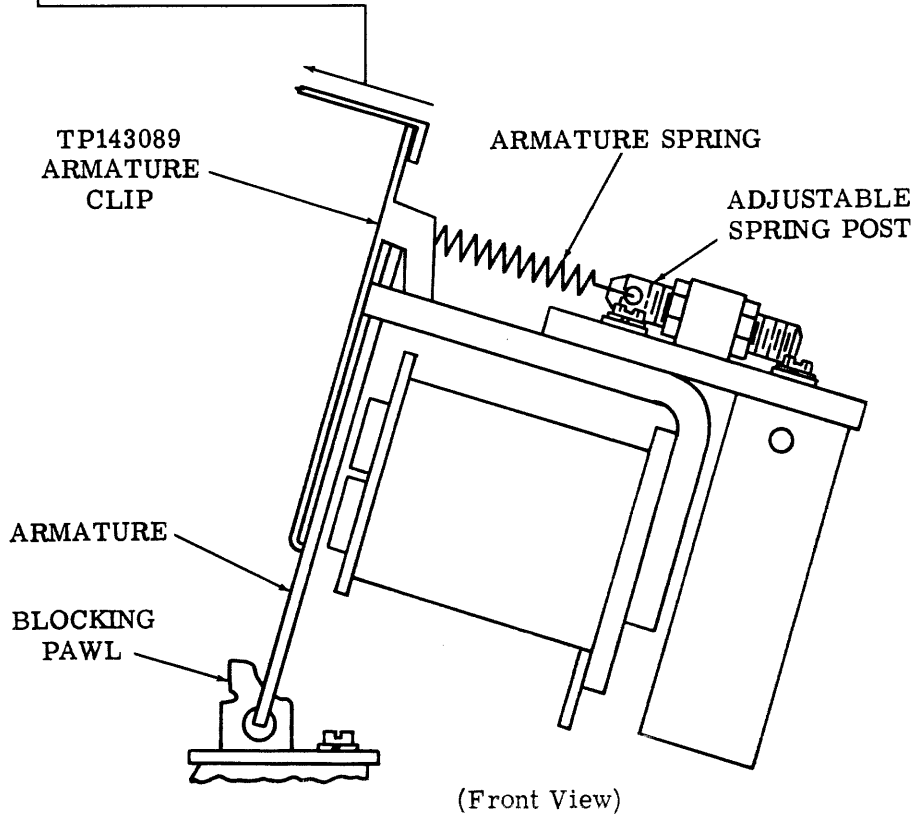
To Check

Insert armature clip TP143089 as shown. Set punch bail to its uppermost position. Hook scale under armature clip and pull in on a line with the armature spring until armature moves.

Requirement

Min 5-1/2 oz---Max 6-1/2 oz  
to move armature.

Note: Spring tension may be altered to meet range and operational requirements.



2.07 Punch Mechanism (continued)

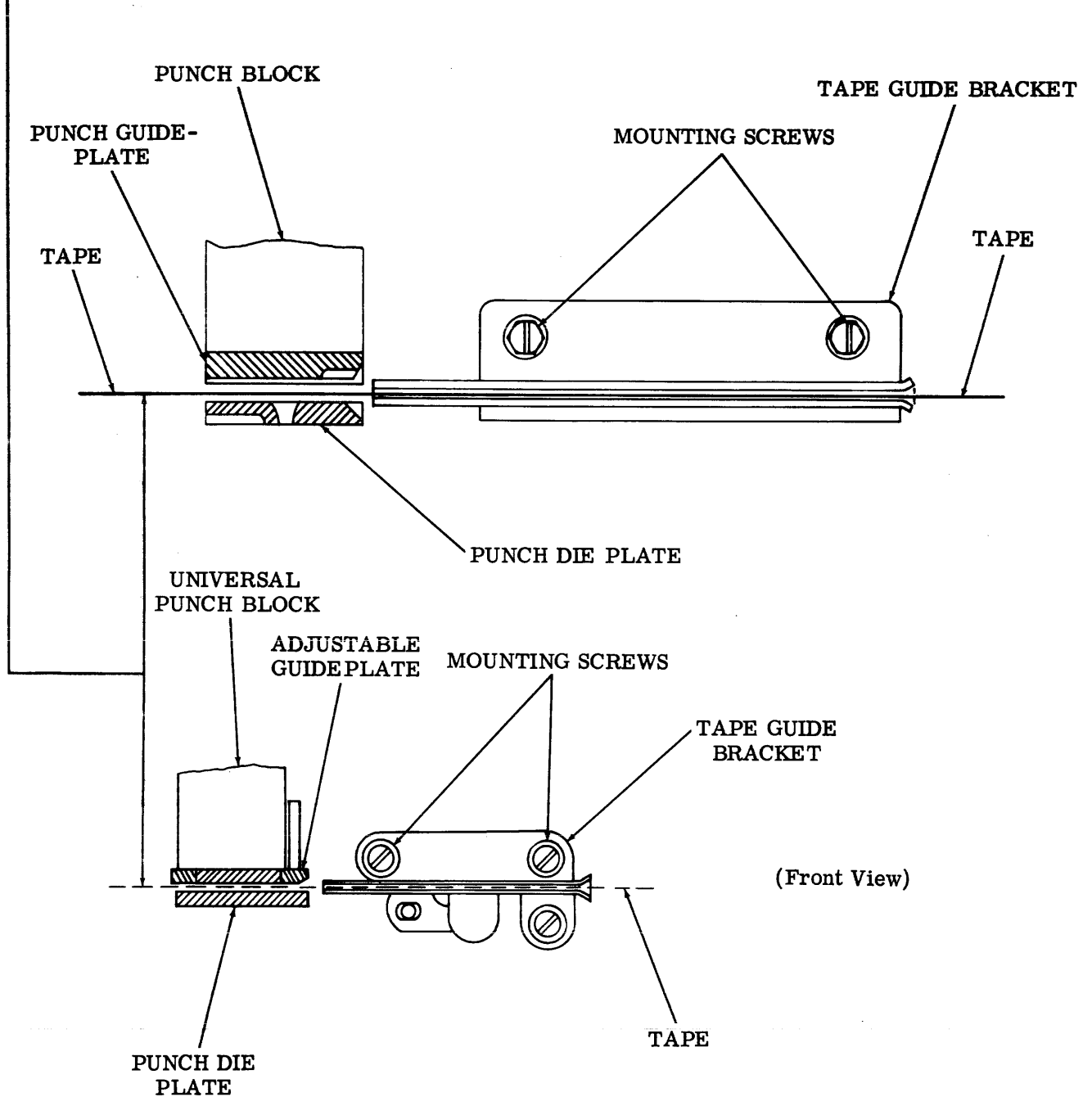
TAPE GUIDE ALIGNMENT

**Requirement**

With punch bail in uppermost position, tape should pass freely from tape guide bracket through punch die plate.

**To Adjust**

Loosen tape guide bracket mounting screws. Position tape guide bracket to meet requirement.



2.08 Punch Mechanism (continued)

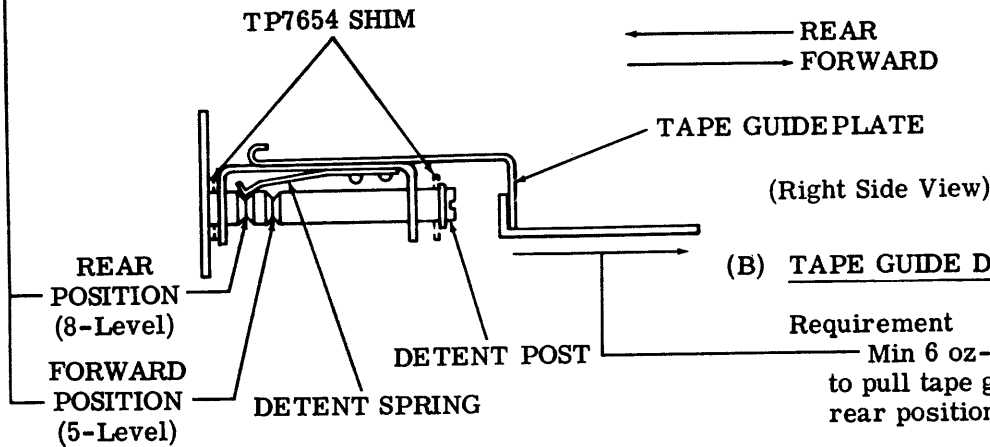
(A) TAPE GUIDE DETENT

Requirement

Tape guideplate should detent in rear and forward positions.

To Adjust

Insert shim(s) TP7654 at front or rear of detent post to meet requirement.



(B) TAPE GUIDE DETENT SPRING

Requirement

Min 6 oz---Max 14 oz  
to pull tape guideplate from detent at rear position.

To Adjust

Reform detent spring to meet requirement.

Note: Adjustments (A) and (B) pertain only to punch units with a universal punch block capable of punching either 11/16-inch or 1-inch tape.

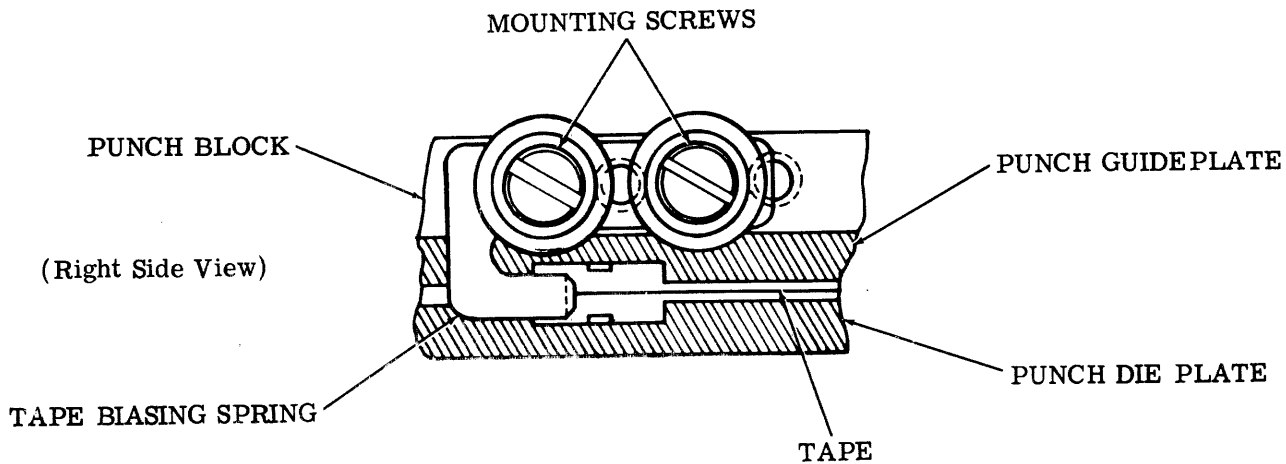
TAPE BIAS SPRING

Requirement

The tape bias spring should slant the tape toward the rear of the punch block without crimping or curling the front edge of the tape.

To Adjust

Loosen mounting screws. Position spring to meet requirement.



Note: The tape bias spring must not bind against the punch guideplate or the punch die plate.

2.09 Punch Mechanism (continued)

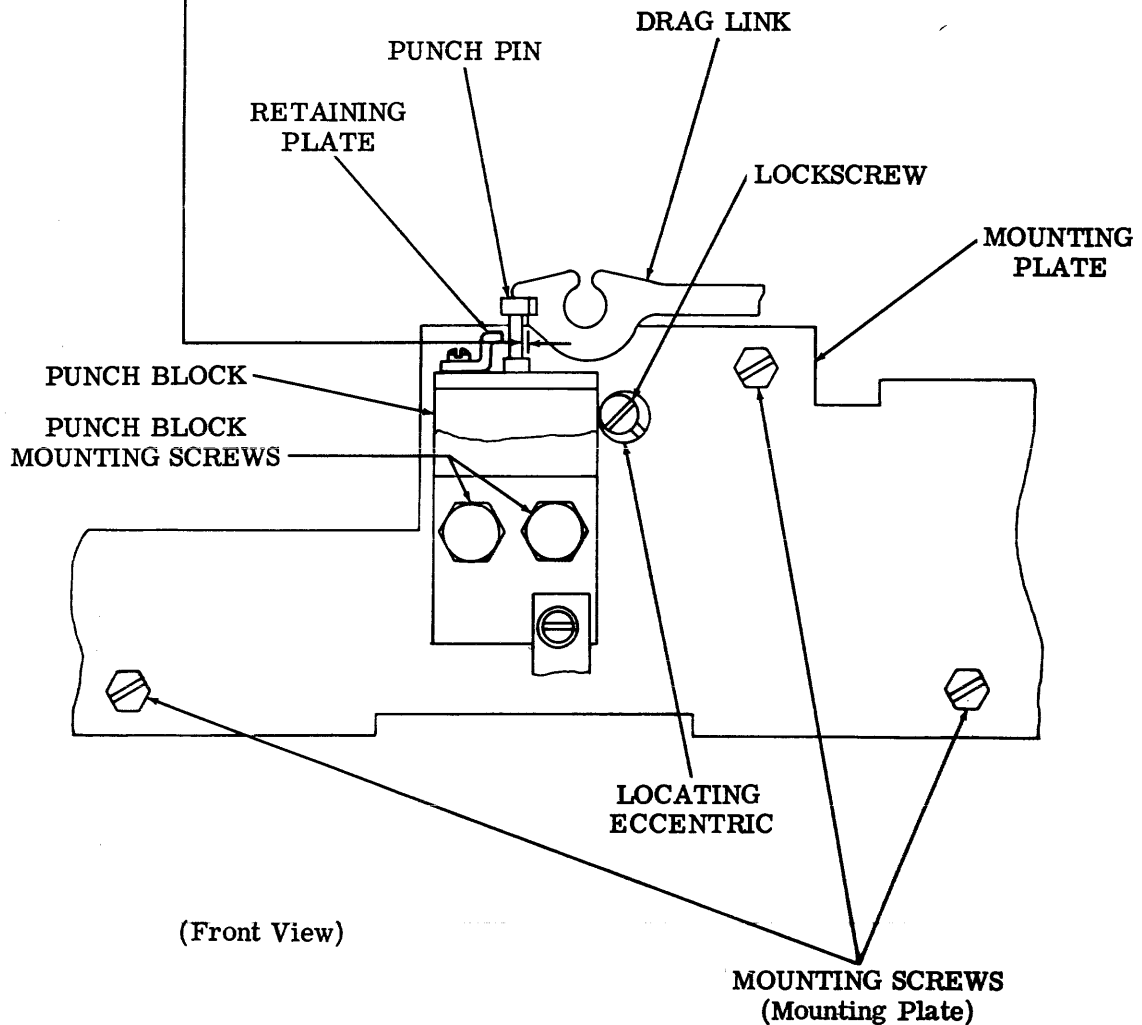
(A) PUNCH BLOCK

Requirement

Min some---Max 0.005 inch  
clearance between drag links and punch  
pins.

To Adjust

Loosen mounting plate mounting screws.  
Position punch block to meet requirement.  
To refine the adjustment, loosen punch  
block mounting screws and the locating  
eccentric lockscrew. Position punch  
block locating eccentric to meet require-  
ment.



2.10 Punch Mechanism (continued)

(B) OPERATING LINK SPRING

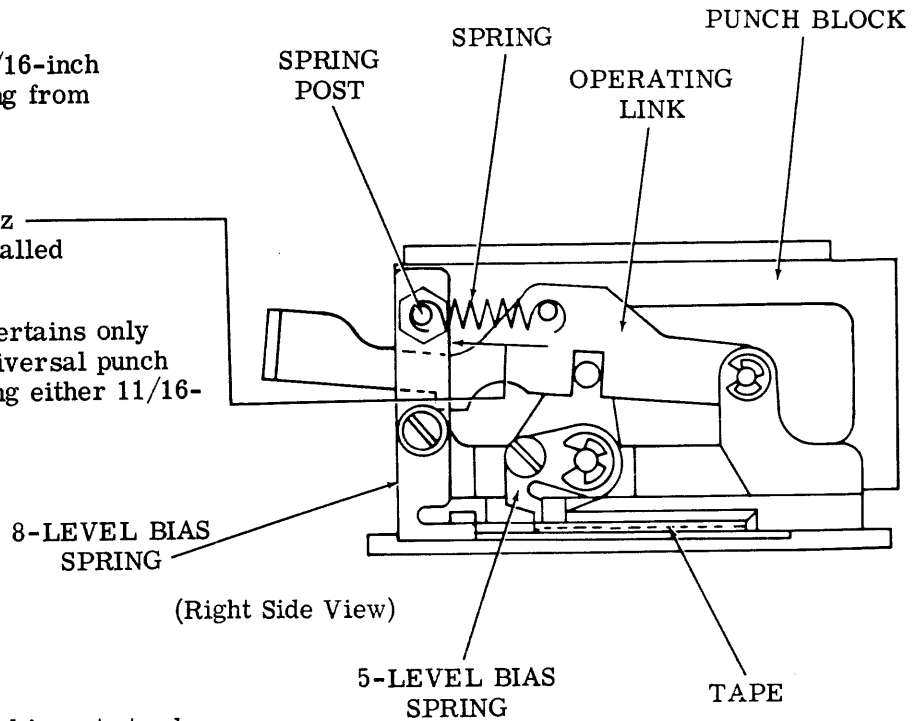
To Check

Set operating link to 11/16-inch position. Remove spring from post.

Requirement

Min 6 oz---Max 10 oz to pull spring to its installed position.

Note: Adjustment (B) pertains only to punch units with a universal punch block capable of punching either 11/16-inch or 1-inch tape.



DRAG LINKS

(1) To Check

Set punch unit to idle and insert standard tape.

Requirement

After idling five minutes, tape should be free of punch pin impressions.

(2) To Check

Apply power and punch a series of marking codes.

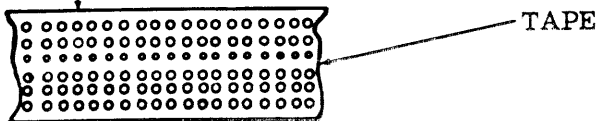
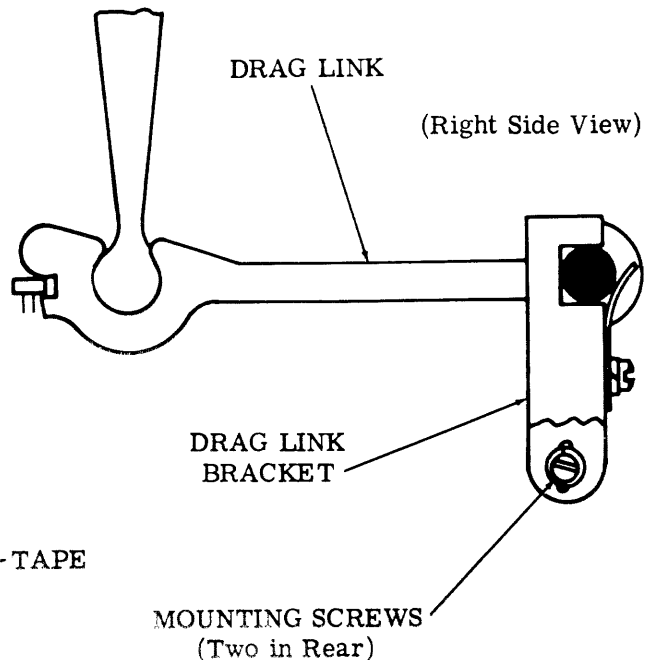
Requirement

All hole edges should be clean cut.

To Adjust

Loosen three mounting screws. Move drag link bracket to its center range. If tape shows any punch pin impressions, move bracket down. If tape shows any burrs, move bracket up.

Note: If punch pins continue to make impressions when the drag link bracket is in its lowermost position, loosen punch block mounting screws and push punch block down. Repeat DRAG LINKS adjustment.



2.11 Tape Feed Mechanism

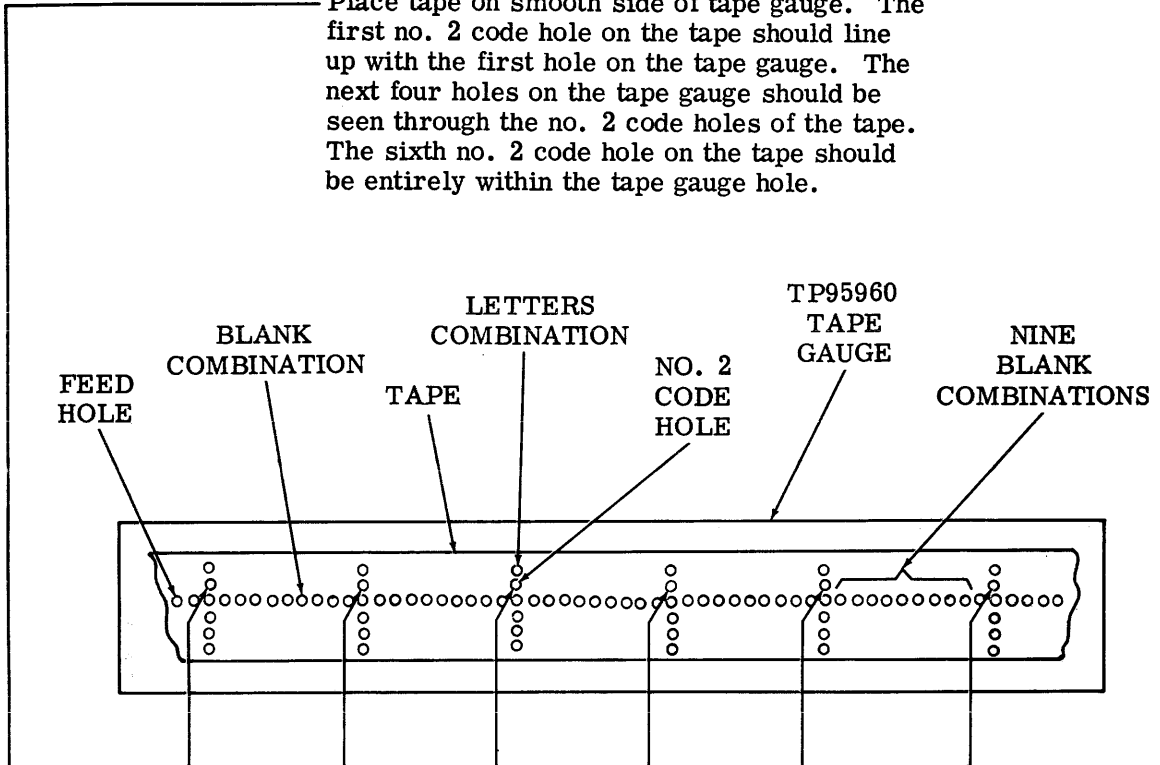
TEN TO THE INCH

To Check

With a full supply of tape, punch six series of nine "blank" codes followed by one "letters" code.

Requirement

Place tape on smooth side of tape gauge. The first no. 2 code hole on the tape should line up with the first hole on the tape gauge. The next four holes on the tape gauge should be seen through the no. 2 code holes of the tape. The sixth no. 2 code hole on the tape should be entirely within the tape gauge hole.



(Top View)

Note: The following seven adjustments (A through G) must meet the TEN TO THE INCH requirement.

2.12 Tape Feed Mechanism (continued)

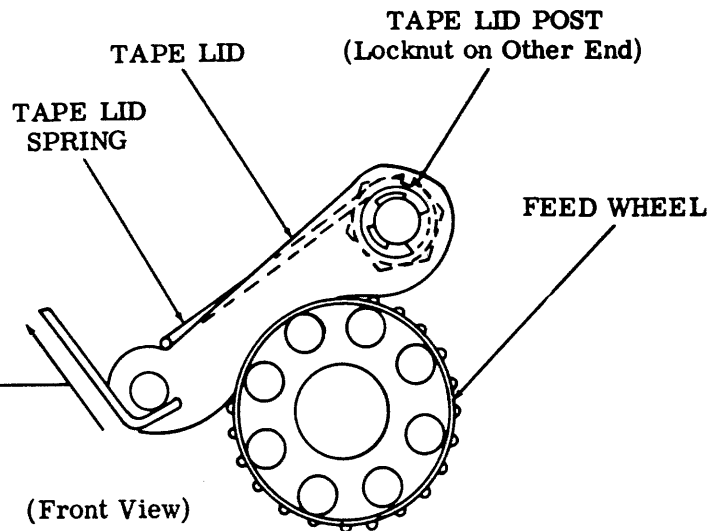
(A) TAPE LID SPRING

**Requirement**

Start tape lid moving with  
Min 4 oz---Max 6 oz

**To Adjust**

Loosen tape lid post locknut.  
Rotate tape lid post to meet  
requirement.



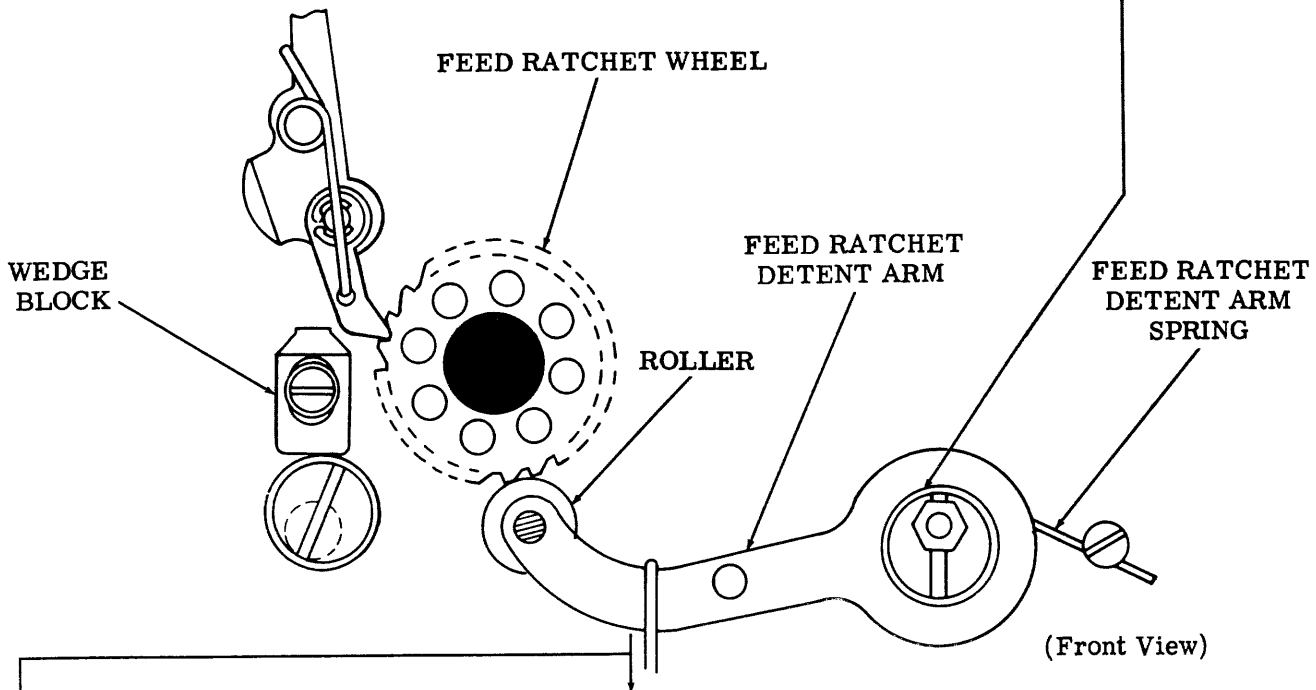
(B) FEED RATCHET DETENT ARM

**Requirement**

Set feed ratchet detent arm eccentric to its lowermost position.

**To Adjust**

Loosen eccentric locknut. Position eccentric to meet requirement.



(C) FEED RATCHET DETENT ARM SPRING

**To Check**

Hook scale over feed ratchet detent arm as shown and pull downward.

**Requirement**

To move feed ratchet detent arm it should require  
Min 36 oz---Max 46 oz



2.13 Tape Feed Mechanism (continued)

(D) FEED PAWL LINK

To Check

Loosen wedge block mounting screw and eccentric locknut. Move wedge block and eccentric to their lowermost positions. Operate feed magnet armature and rotate main shaft by hand.

Requirement

Feed pawl should advance feed ratchet one full tooth with noticeable overtravel beyond the fully detented position of the feed ratchet.

To Adjust

Loosen plate mounting screws and plate eccentric locknut. Position feed link by rotating plate eccentric. Check feed pawl at top of next feed cycle. To refine adjustment, reduce overtravel.

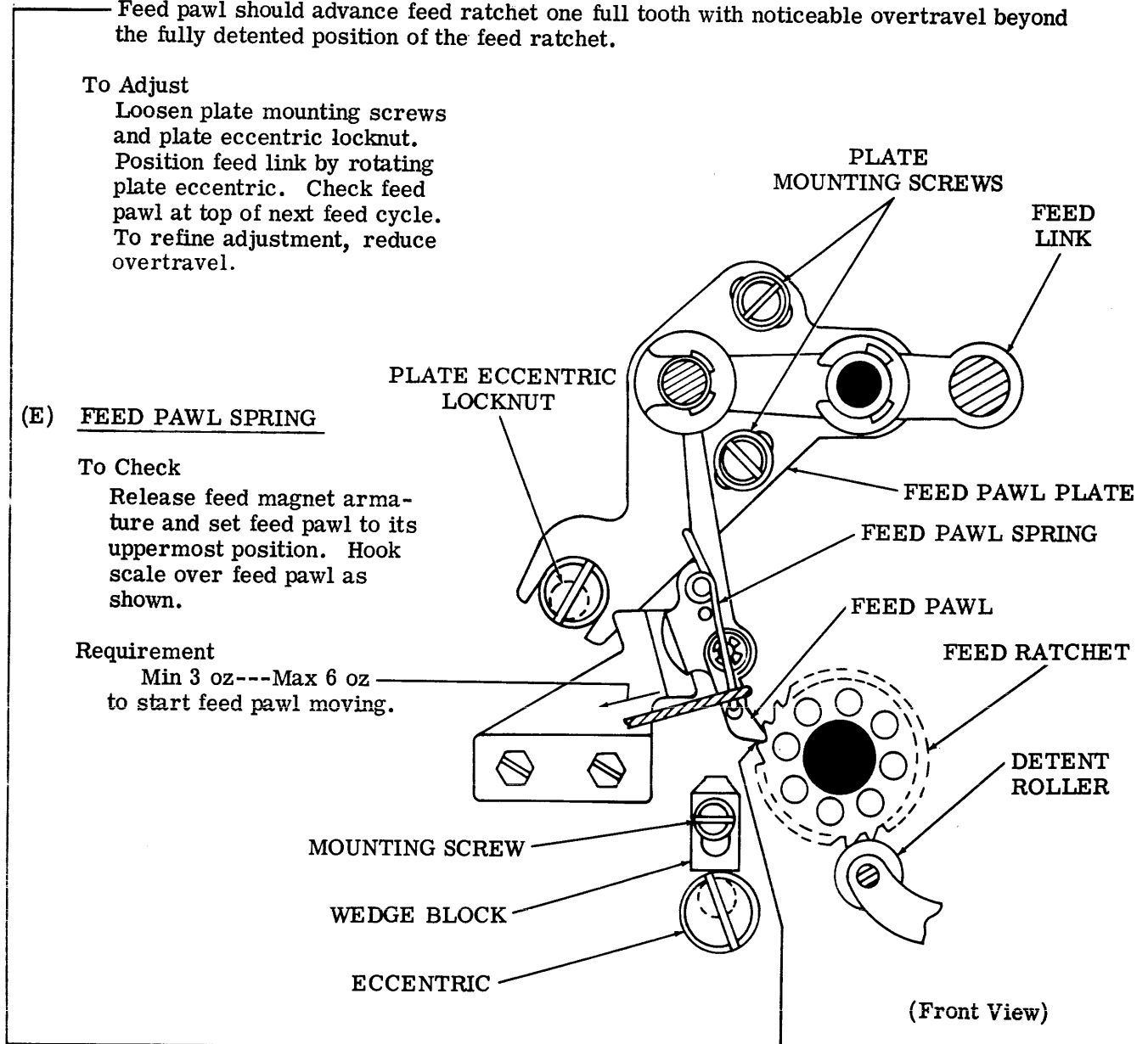
(E) FEED PAWL SPRING

To Check

Release feed magnet armature and set feed pawl to its uppermost position. Hook scale over feed pawl as shown.

Requirement

Min 3 oz---Max 6 oz to start feed pawl moving.



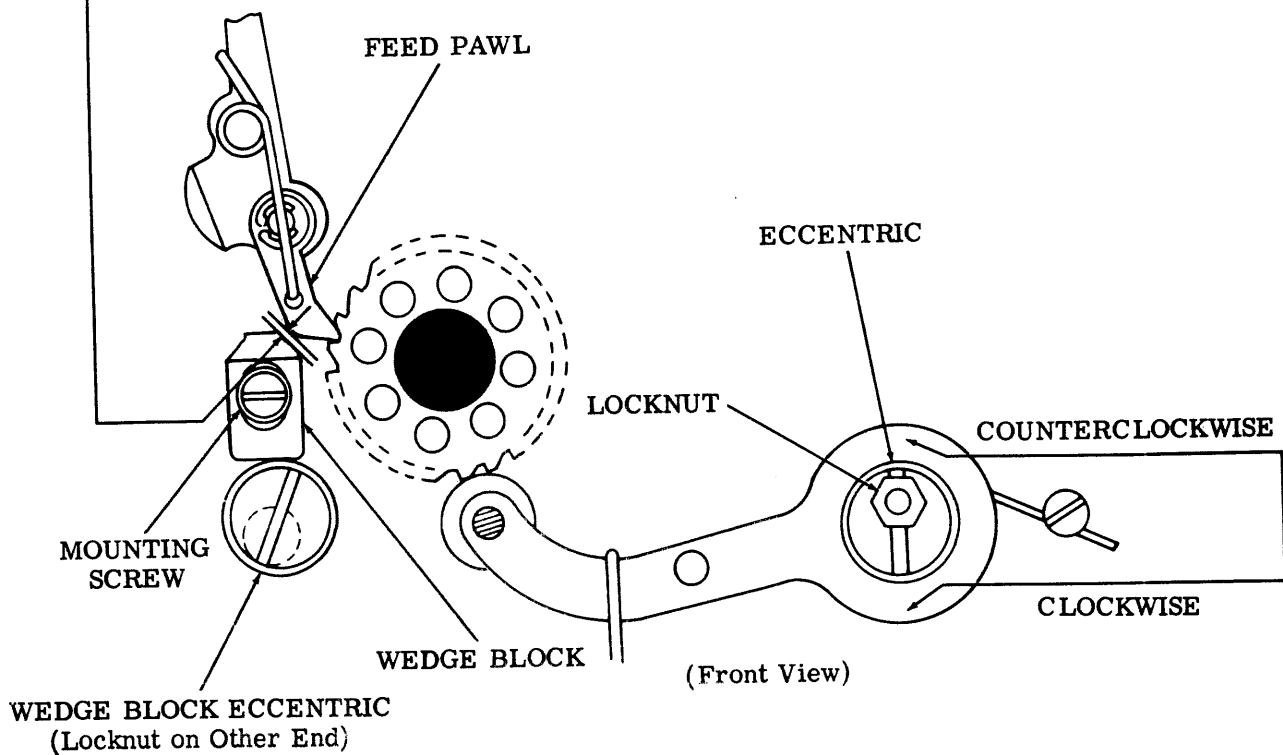
## 2.14 Tape Feed Mechanism (continued)

**(F) WEDGE BLOCK****Requirement**

With feed pawl in lowermost position, clearance between wedge block and feed pawl should be  
Min some---Max 0.002 inch

**To Adjust**

Loosen wedge block mounting screw and eccentric locknut. Move wedge block to uppermost position, and wedge block eccentric to lowermost position. Release feed magnet armature. Rotate main shaft by hand to position wedge block. Move wedge block eccentric to touch bottom of wedge block.

**(G) CHECK FOR TEN TO THE INCH****Requirement**

Repeat TEN TO THE INCH (2.11) requirement.

**To Adjust**

Loosen eccentric locknut. If punched holes are too far apart, move eccentric slightly clockwise. If punched holes are too close, move eccentric slightly counterclockwise.

## 2.15 Tape Feed Mechanism (continued)

MAGNETIC PICKUP**To Check**

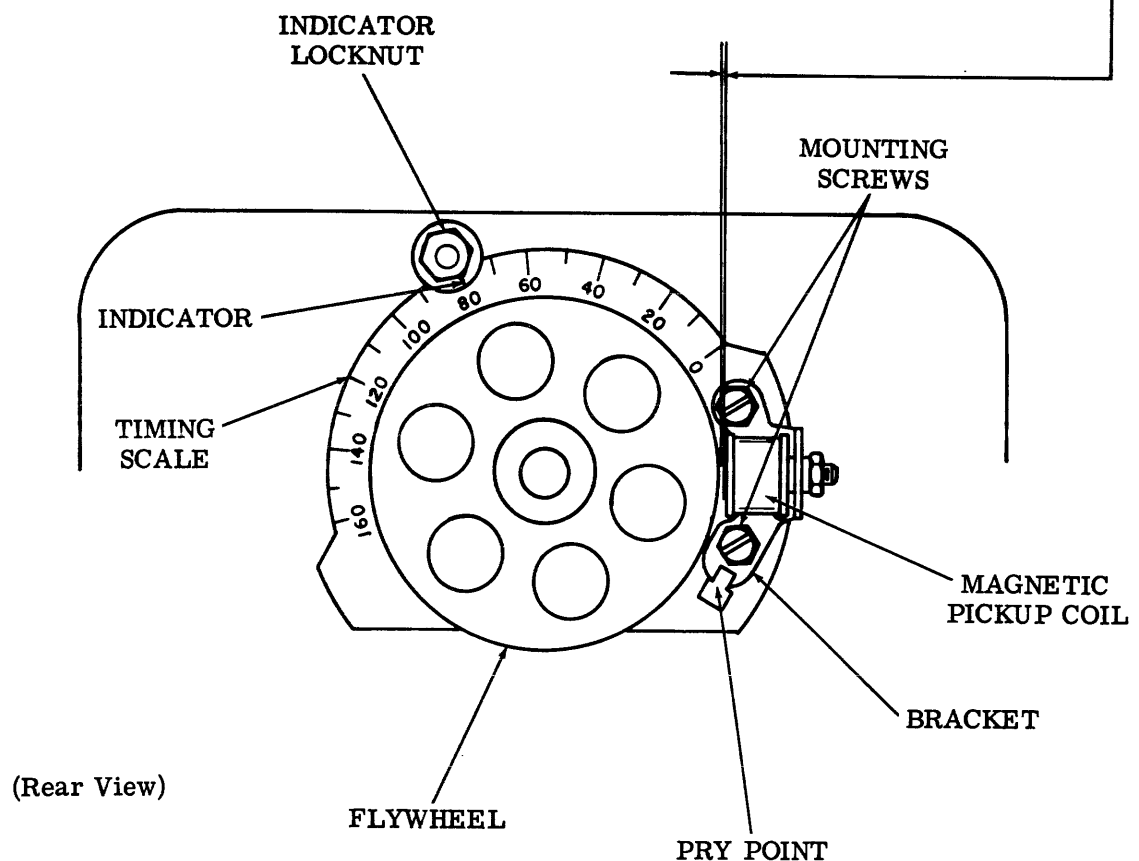
Set timing scale on 80 opposite indicator. Take up play between flywheel and magnetic pickup for least clearance.

**Requirement**

Min 0.010 inch---Max 0.015 inch  
at point of least clearance.

**To Adjust**

Loosen mounting screws. Position bracket at pry point to meet requirement.

OPERATING RANGE**To Check**

Connect punch unit to its control circuits. Using test tape TP146605 or equivalent, rotate the magnetic pickup bracket in one direction and then in the other until errors occur. Note the numbers on the range scale at the points of error.

**Requirement**

A minimum 80 points of error free operation for 110 ops and 115 v dc at 1 ampere.

**To Adjust**

Loosen mounting screws. Set operating range indicating line opposite middle of operating range.

2.16 Tape Feed Mechanism (continued)

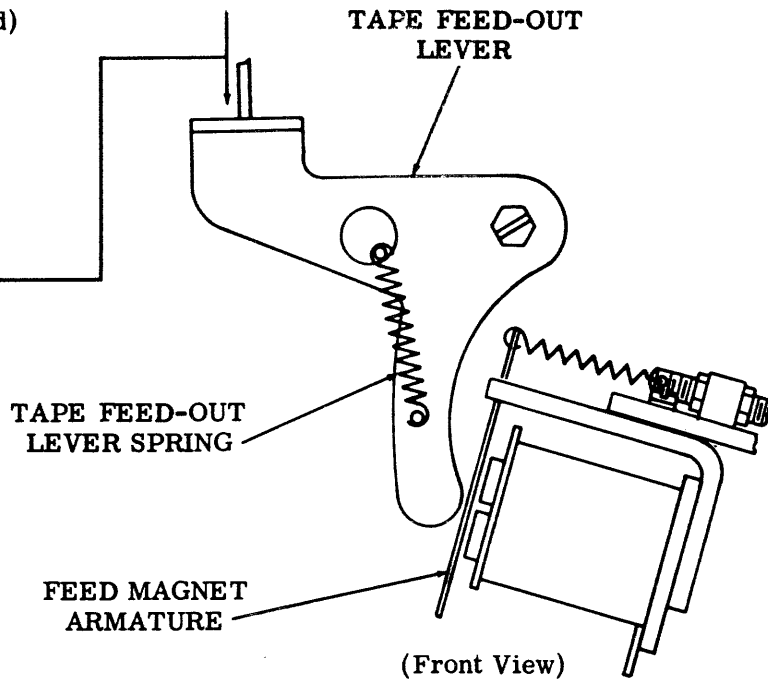
TAPE FEED-OUT LEVER SPRING

**Requirement**

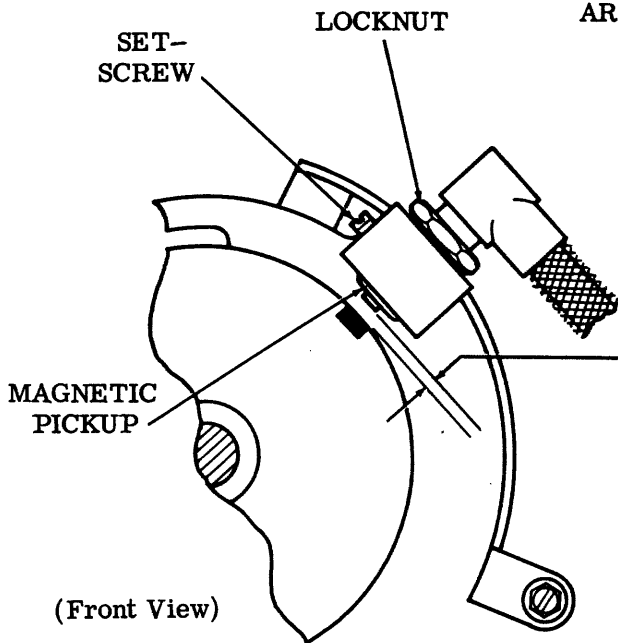
Move tape feed-out lever  
Min some---Max 1 oz

**To Measure**

Place scale on top of tape feed-out lever and push down.



2.17 Timing



MAGNETIC PICKUP (Early Design)

**To Check**

Set indicator on range scale to 30.  
Take up play between flywheel and magnetic pickup for minimum clearance.

**Requirement**

Min 0.005 inch---Max 0.010 inch  
at point of minimum clearance.

**To Adjust**

Loosen setscrew and locknut.  
Position magnetic pickup to meet requirement.

MAGNETIC PICKUP (Late Design)

**To Check**

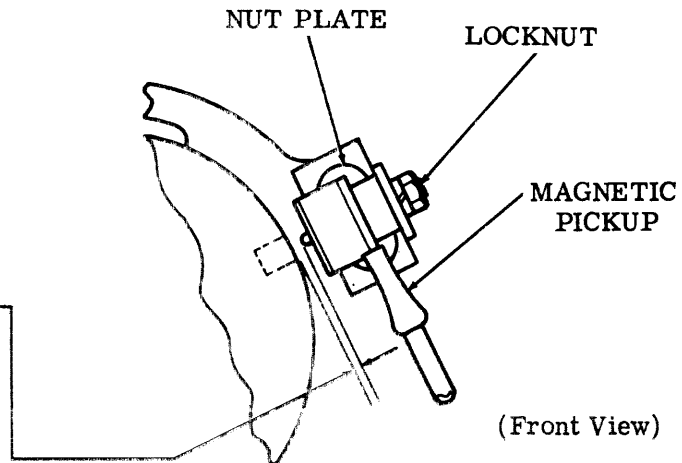
Set indicator on range scale to zero.  
Take up play between flywheel and magnetic pickup for minimum clearance.

**Requirement**

Min 0.010 inch---Max 0.015 inch  
at point of minimum clearance.

**To Adjust**

Loosen locknut. Position magnetic pickup to meet requirement.



## 2.18 Timing (continued)

RANGE

## To Check

With test tape TP146605 or equivalent, operate punch from its control circuits. Loosen bracket locknut. Rotate pickup bracket in one direction and then in the other until errors occur. Note the numbers on range scale at the points of error.

## (1) Requirement

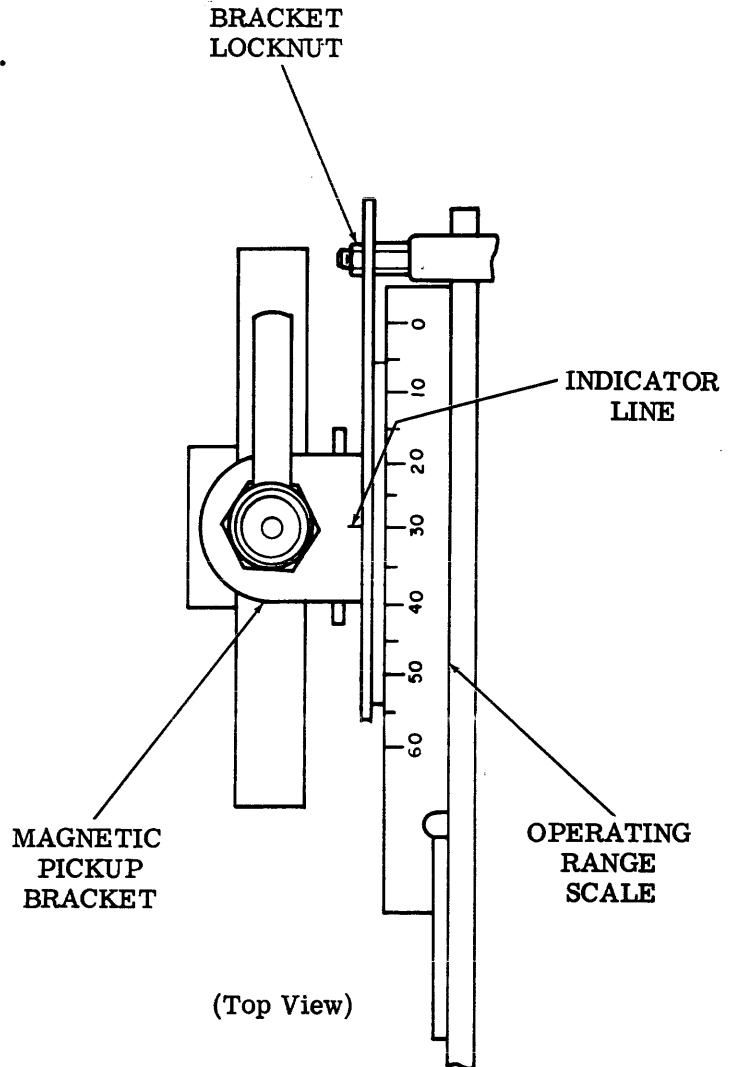
Minimum 80 points of error free operation for 110 ops and 28 v dc at 1 amp.

## (2) Requirement

Minimum 40 points of error free operation for 110 ops and 115 v dc at 0.15 amp.

## To Adjust

Loosen bracket locknut. Set range scale indicator line opposite middle of operating range.



**Note:** Check and correct MAGNET ARMATURE SPRING (2.05 and 2.06) and MAGNET PLATE (2.05) adjustments to meet the requirements (1) and (2) as follows:  
MAGNET ARMATURE SPRING (Feed Level) Min 12 oz---Max 20 oz  
MAGNET ARMATURE SPRING (Code Levels) Min 4-1/2 oz---Max 7-1/2 oz  
MAGNET PLATE Min some---Max 0.003 inch

3. BASIC UNIT (Early Design)

3.01 Punch Mechanism

PUNCH BAIL

To Check

Rotate main shaft slowly until lower surface of the long toggle arm contacts the surface of the blocking pawl. Set armature to attracted position, and place blocking pawl against stop plate. Continue rotating main shaft until the engaging surface of the long toggle arm is slightly below the engaging surface of its corresponding blocking pawl.

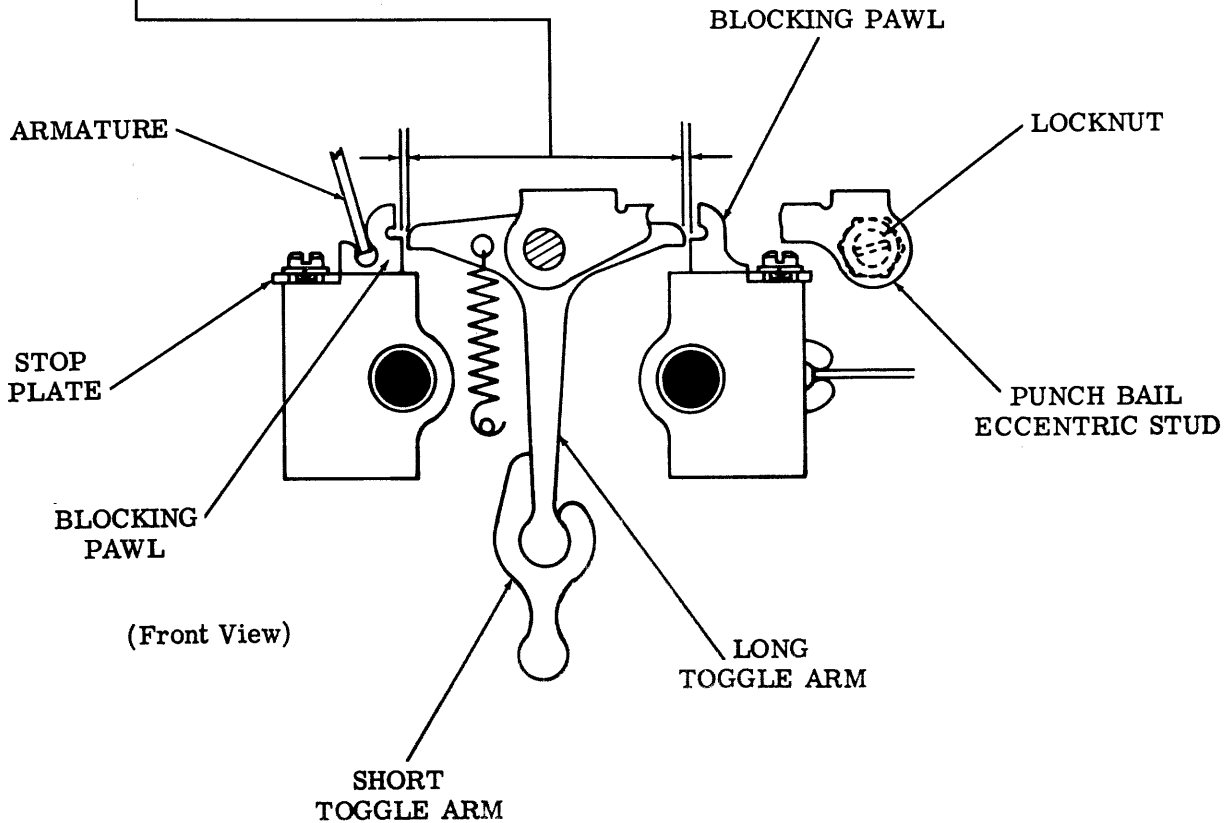
Requirement

Clearance between blocking pawl and long toggle arm should be

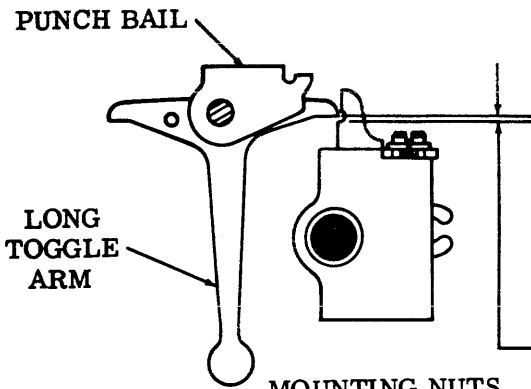
Min 0.003 inch---Max 0.015 inch

To Adjust

Loosen punch bail eccentric stud locknut. Position eccentric stud to meet requirement.



3.02 Punch Mechanism (continued)



(A) BLOCKING PAWL

To Check

Set punch bail to uppermost position. Place each blocking pawl to blocking position.

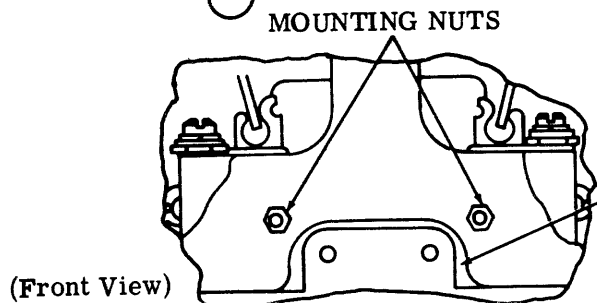
Requirement

Overtravel between each pawl and lower surface of long toggle arms should be

Min some---Max 0.003 inch

To Adjust

Loosen mounting nuts. Tap down stop arm bracket to meet requirement.



STOP ARM BRACKET

(Front View)

(B) LONG TOGGLE ARM SPRING

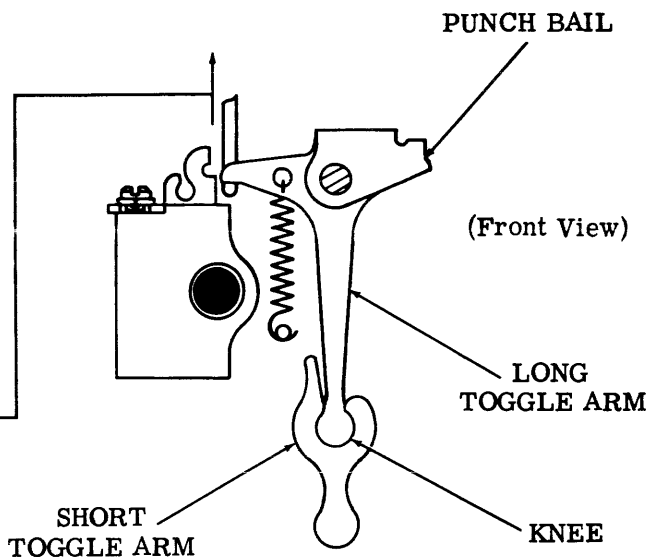
To Check

Hold armature operated. Set punch bail to lowermost position. Hook 8 oz scale under long toggle arm as shown and pull until knee buckles.

Requirement

Min 3 oz---Max 6 oz

to prevent the long and short toggle arms from rejoining when there is just a perceptible separation between them.

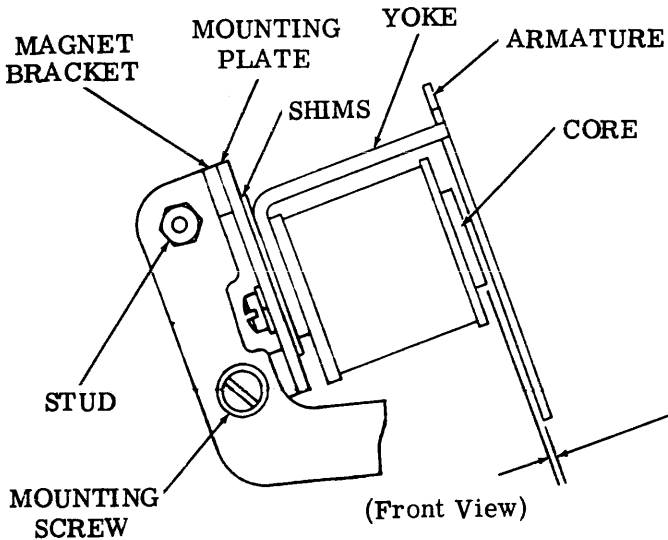


(Front View)

SHORT TOGGLE ARM

LONG TOGGLE ARM

KNEE



(C) MAGNET BRACKET

Requirement

With armature operated, clearance between armature and core should be Min 0.003 inch---Max 0.006 inch

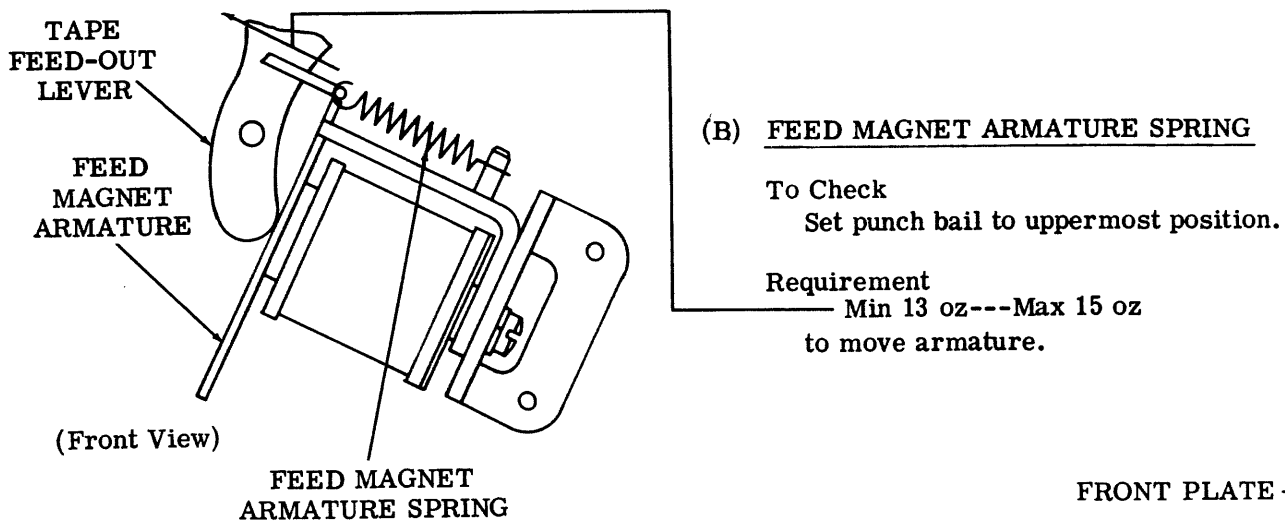
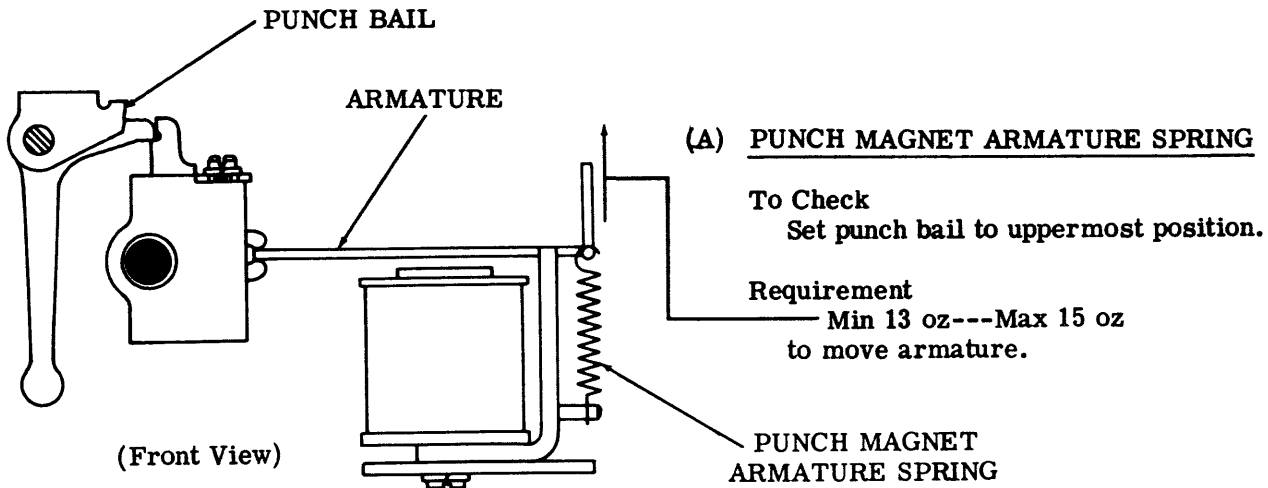
To Adjust

Loosen magnet bracket mounting screws. Rotate bracket to meet requirement.

MOUNTING SCREW

(Front View)

3.03 Punch Mechanism (continued)

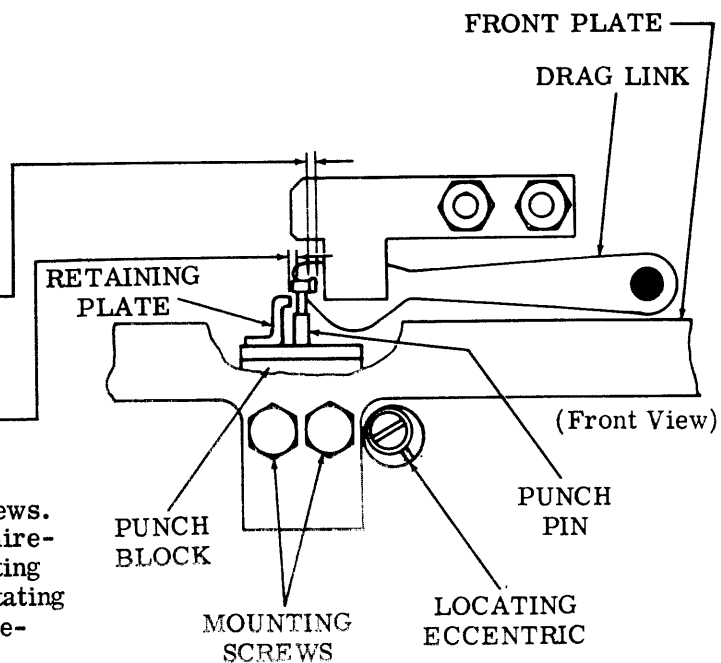


**(C) PUNCH BLOCK**

(1) Requirement  
Punch pins should move freely in punch block with minimum clearance between punch pins and drag links.

(2) Requirement  
Some clearance between retaining plate and punch pins.

To Adjust  
Loosen retaining plate mounting screws. Position retaining plate to meet requirement (2). Loosen punch block mounting screws. Position punch block by rotating its locating eccentric to meet requirement (1).





3.04 Tape Feed Mechanism

(A) FEED RATCHET DETENT

To Check

Apply power and punch a series of marking codes. Inspect feed holes for TEN TO THE INCH (2.11) spacing with tape gauge TP95960.

Requirement

Same as 2.11.

To Adjust

Loosen feed ratchet detent eccentric locknut. Position feed ratchet detent eccentric to meet requirement.

(B) FEED PAWL ADJUSTABLE LINK

To Check

Hold feed magnet armature operated. Rotate main shaft by hand.

(1) Requirement

Feed pawl should advance the feed ratchet one full tooth without noticeable overtravel. Detent roller should fully detent ratchet wheel.

(2) Requirement

With feed magnet armature released and feed pawl in its lowest position, the feed pawl should make contact with the next tooth.

To Adjust

Loosen clamp screw. Using a screwdriver, move feed pawl up or down to meet requirements.

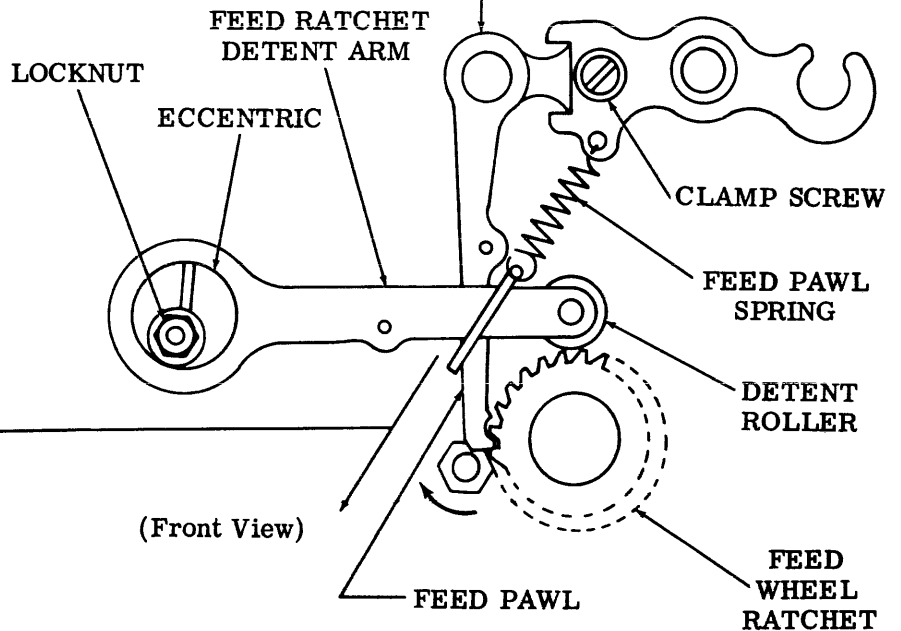
(C) FEED PAWL SPRING

To Check

Set punch bail drive assembly to highest position.

Requirement

Min 4 oz---Max 5 oz to pull spring to position length.



(Front View)

3.05 Tape Feed Mechanism (continued)

(D) FEED PAWL ECCENTRIC STUD

To Check

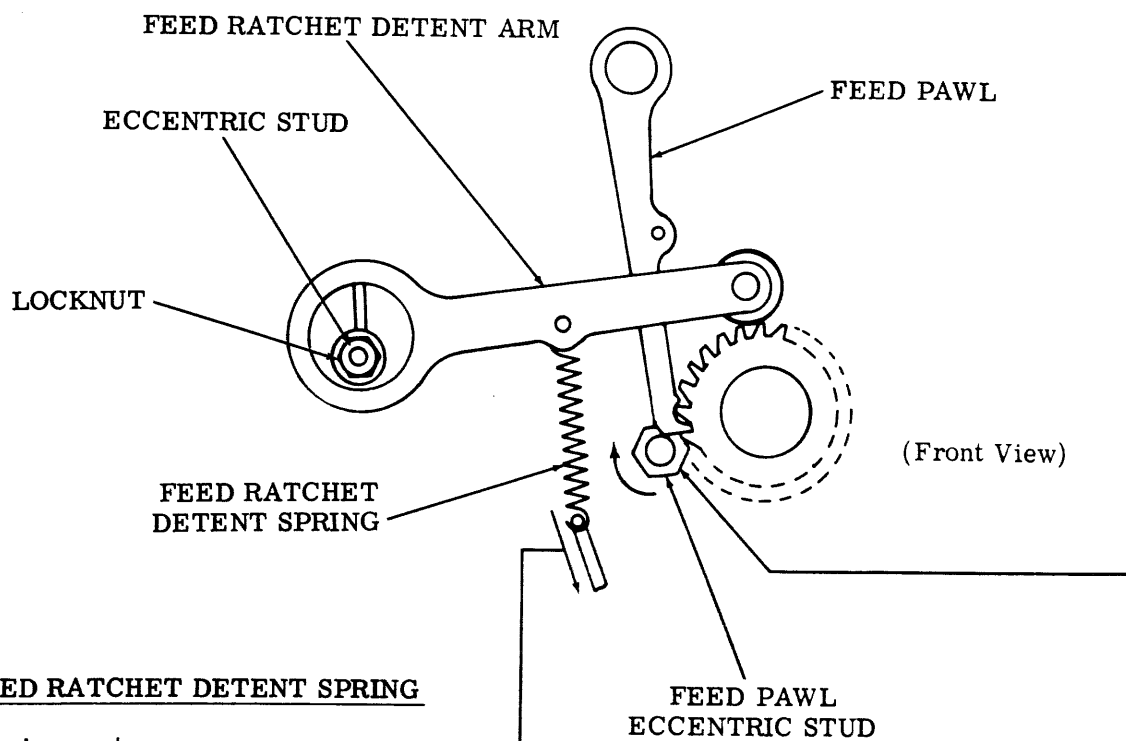
Rotate main shaft by hand until feed pawl is in lowest position.

Requirement

With feed pawl held firmly against ratchet, feed pawl should make contact with feed pawl eccentric stud.

To Adjust

Loosen eccentric stud locknut. Rotate eccentric stud counterclockwise to meet requirement.



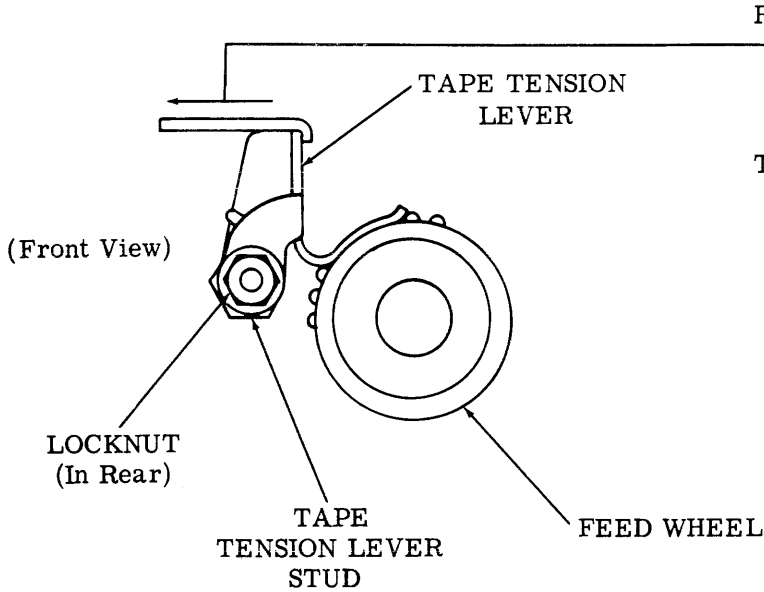
(E) FEED RATCHET DETENT SPRING

Requirement

Min 38 oz---Max 44 oz  
to pull spring to position length.

3.06 Tape Feed Mechanism (continued)

(A) TAPE TENSION LEVER SPRING



Requirement

Min 4-1/2 oz---Max 5-1/2 oz  
to start tape tension lever moving  
away from feed wheel.

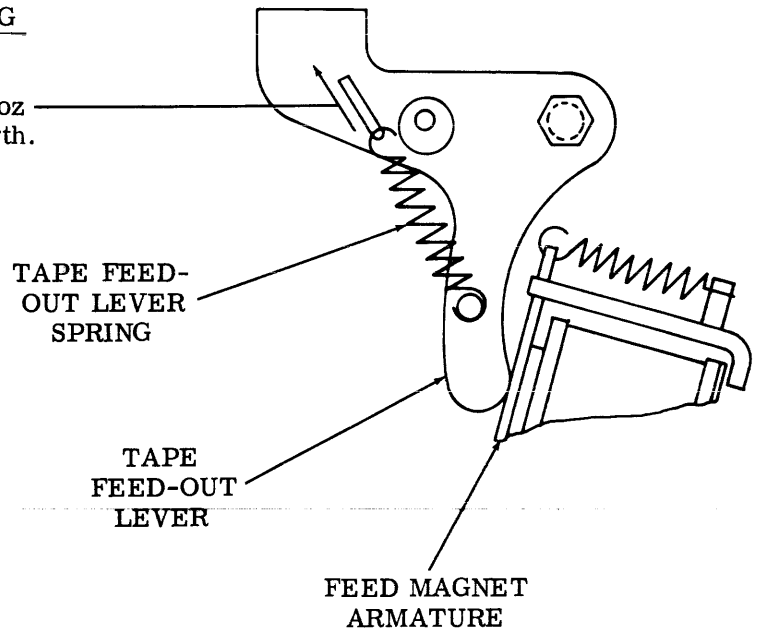
To Adjust

Loosen tape tension lever stud lock-  
nut. Rotate stud slightly in either  
direction to meet requirement.

(B) TAPE FEED-OUT LEVER SPRING

Requirement

Min 2-1/2 oz---Max 3-1/2 oz  
to move spring to position length.



3.07 Timing

Note: The following adjustments, A through D, relate to contactor operation. Contactor openings or closures can advance or delay the punching cycle by rotating the contactor mounting plates. To advance the contactor operation, rotate contactor mounting plates counterclockwise. To delay the contact operation, rotate contactor mounting plates clockwise. The contactors can be moved separately or together in either direction to simplify coupling the punch unit to auxiliary control equipment.

(A) CONTACTOR POINTS

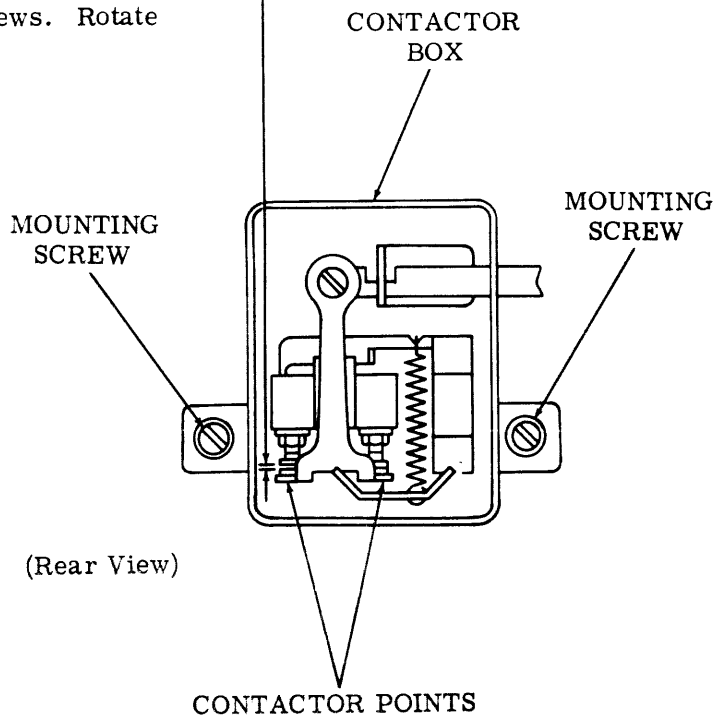
Requirement

With main shaft rotating, clearance between each set of contactor points should be

Min 0.008 inch---Max 0.012 inch  
and equal to each other within 0.002 inch.

To Adjust

Loosen contactor box mounting screws. Rotate contactor box to meet requirement.



3.08 Timing (continued)

(B) INDICATOR PLATE

Requirement

Min 0.020 inch---Max 0.030 inch clearance between indicator and no. 2 contactor mounting plates.

To Adjust

Loosen indicator plate screw. Position indicator plate to meet requirement.

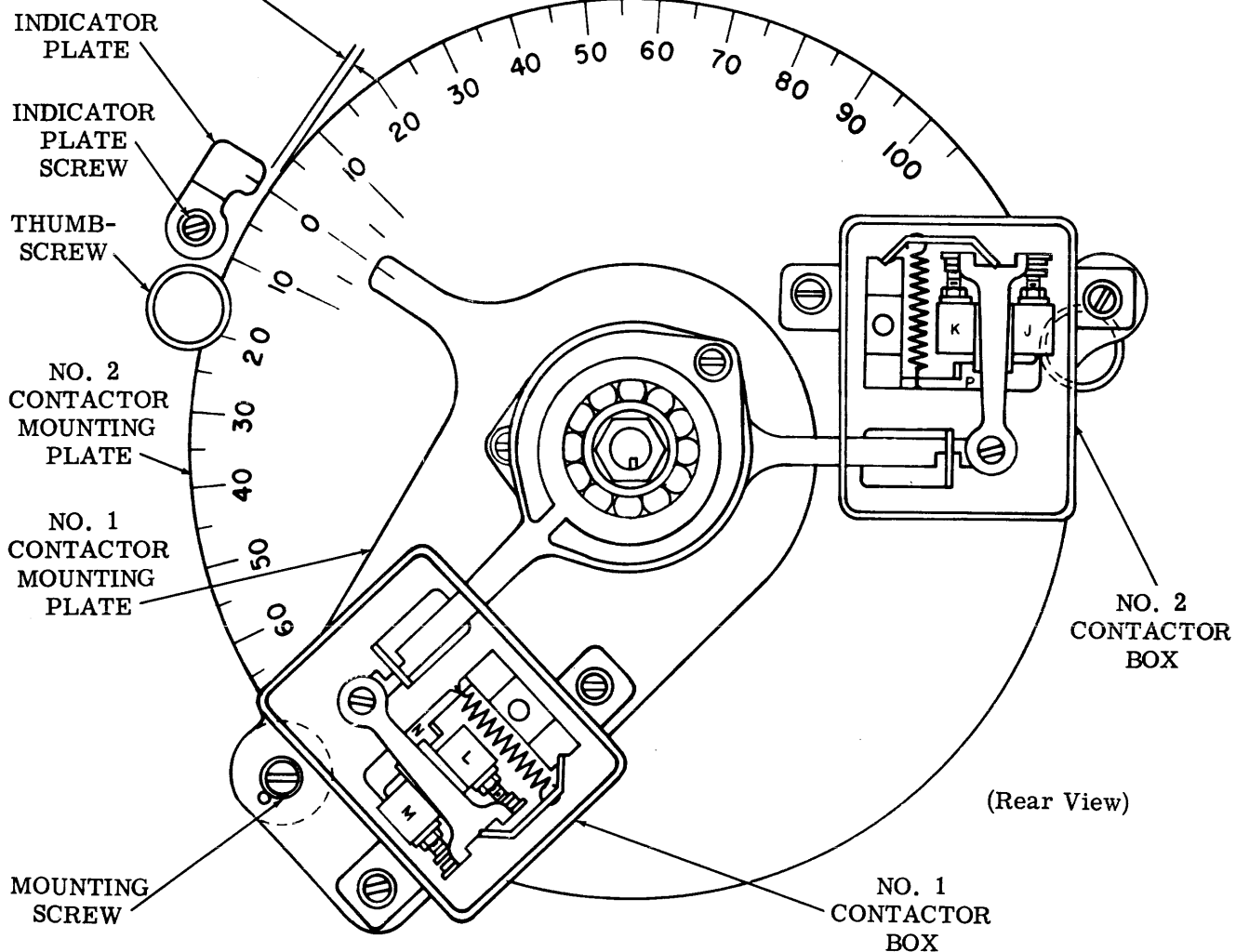
(C) NO. 2 CONTACTOR MOUNTING PLATE

Requirement

The scribed line on the indicator plate should be opposite the zero on the no. 2 contactor mounting plate.

To Adjust

Loosen thumbscrew. Position contactor mounting plate no. 2 to meet requirement.



(D) NO. 1 CONTACTOR MOUNTING PLATE

Requirement

The scribed line on the no. 1 contactor mounting plate should be opposite the zero on the no. 2 contactor mounting plate.

To Adjust

Loosen mounting screw. Position no. 1 mounting plate to meet requirement.

HIGH SPEED TAPE PUNCH UNIT

(BRPE TYPE)

LUBRICATION

CONTENTS	PAGE
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Feed and code magnets . . . . .	2
Punching mechanism . . . . .	3
Feed and Drive Mechanisms	
Drive mechanism . . . . .	6
Feed mechanism . . . . .	5

1. GENERAL

1.01 This section gives lubrication information for the high speed tape punch unit (BRPE type). It is reissued to include the latest lubrication information. Marginal arrows indicate changes or additions.

1.02 Lubricate the punch unit as directed in this section. Line drawings show the points to be lubricated as well as the type and quantity of lubricant to be used. Lubricate the punch unit before using and again after a few weeks. Thereafter, every 160 hours or one month of service.

1.03 Use oil KS7470 and Mobil #2 grease (TP143484, one pound can) to lubricate punch unit. See Section 570-005-800TC for tools.

1.04 Saturate all spring wicks, felt oilers, and oilite bearings; lubricate friction surfaces of all moving parts. Avoid overlubrication. Prevent lubricant from getting between electrical contacts or between stepper magnet coils and armatures.

Note: Be sure to saturate the felt wick in the hub of the toggle arm (which can be reached from the back of rear plate, through cutout), the felt wick in the feed pawl guide link, and the oilite bearing in detent roller.

1.05 The photographs indicate paragraph numbers that refer to line drawings of specific mechanisms and the location of these mechanisms. Unless stated otherwise, mechanisms on line drawings are shown upright.

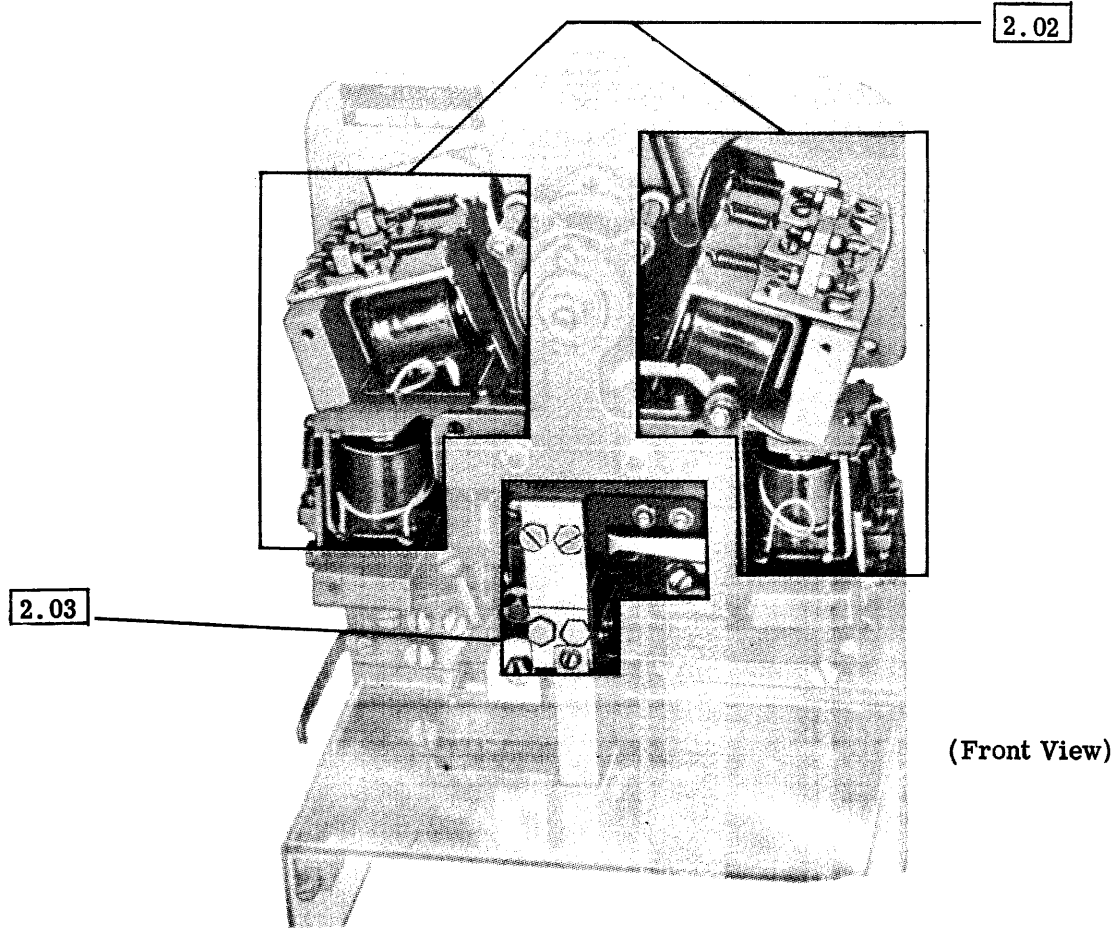
1.06 The following lubrication symbols are used throughout the text:

- O1 - Apply one drop of oil.
- O2 - Apply two drops of oil, etc.
- SAT - Saturate with oil (felt oilers, washers, wicks, and oilite bearings).
- FILL - Fill with oil (oil holes and oil cups).
- G - Apply 1/64-inch film of grease unless directed otherwise.

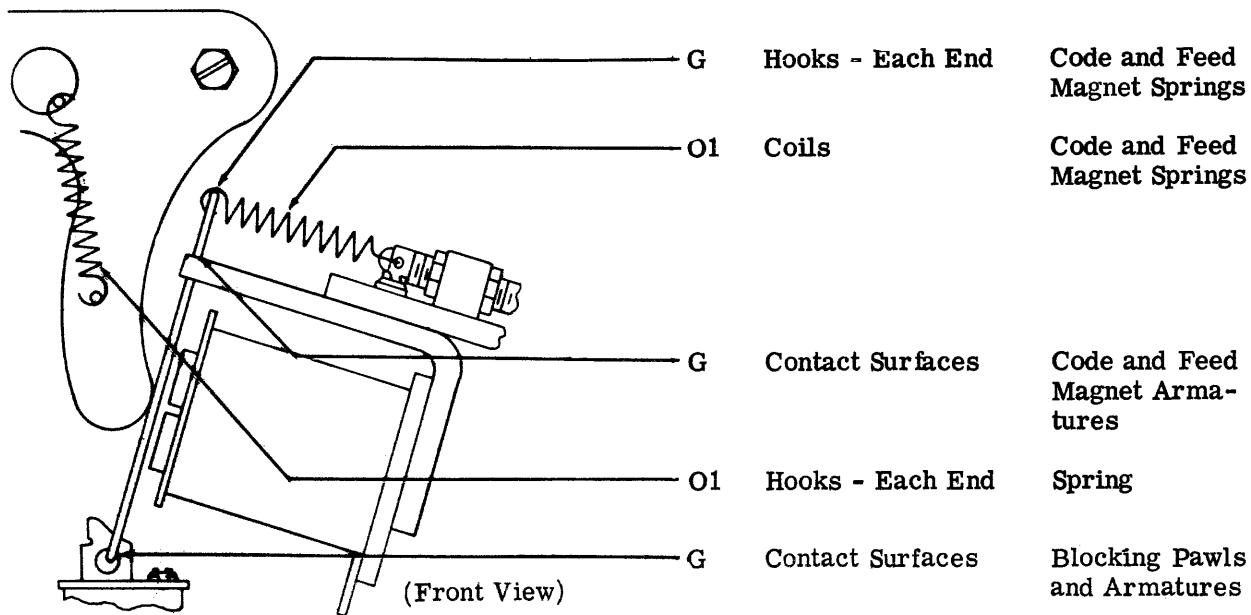
1.07 After each lubrication interval, wipe excess lubricant from upper tape guide-plate and punch pins.

2. BASIC UNIT

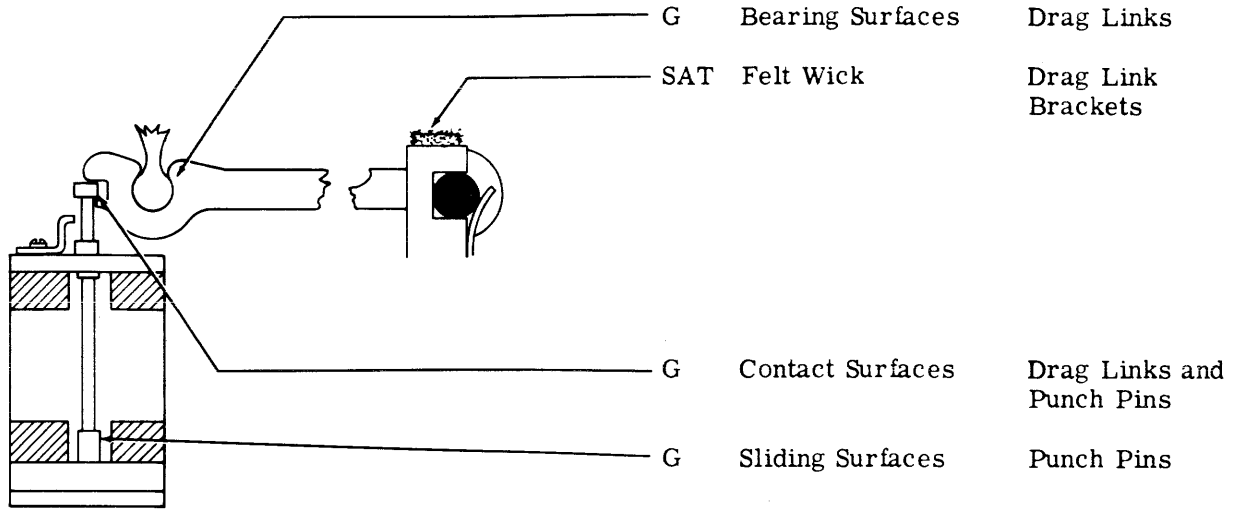
2.01 Feed and Code Magnets, and Punching Mechanism



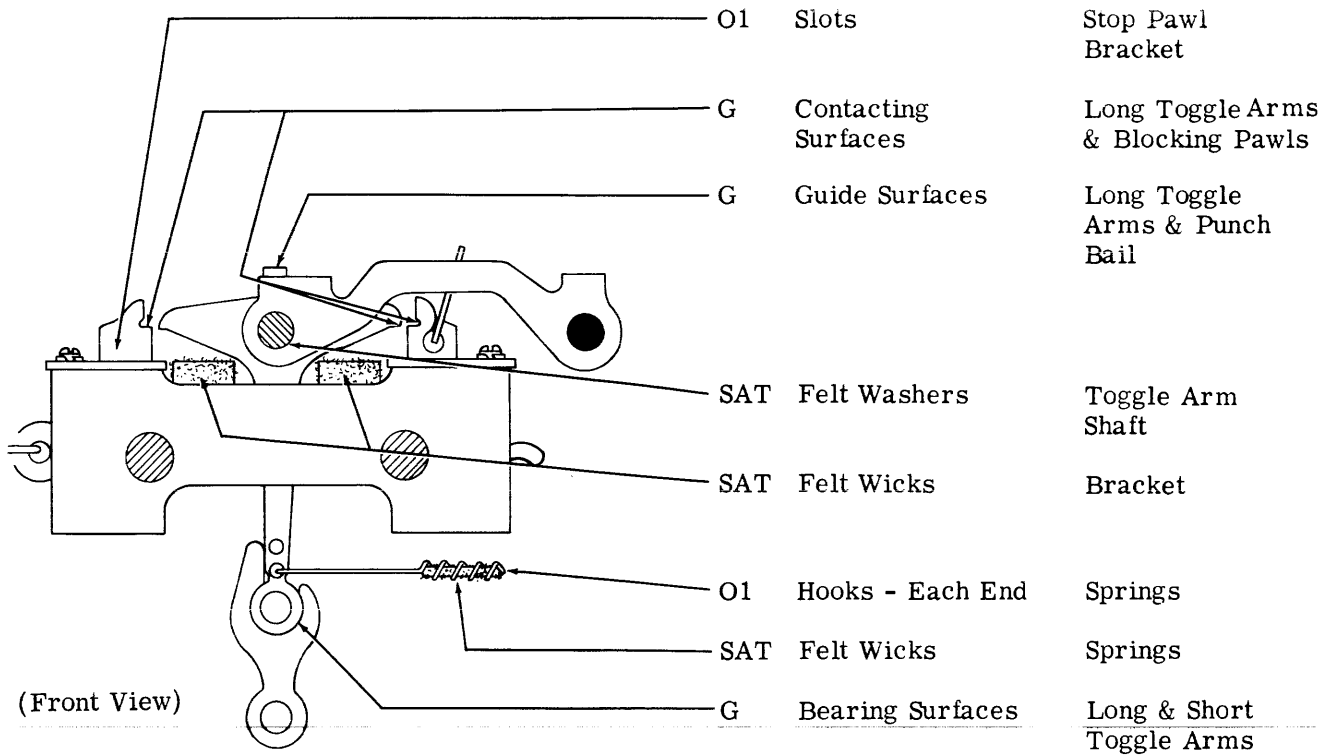
2.02 Feed and Code Magnets



2.03 Punching Mechanism



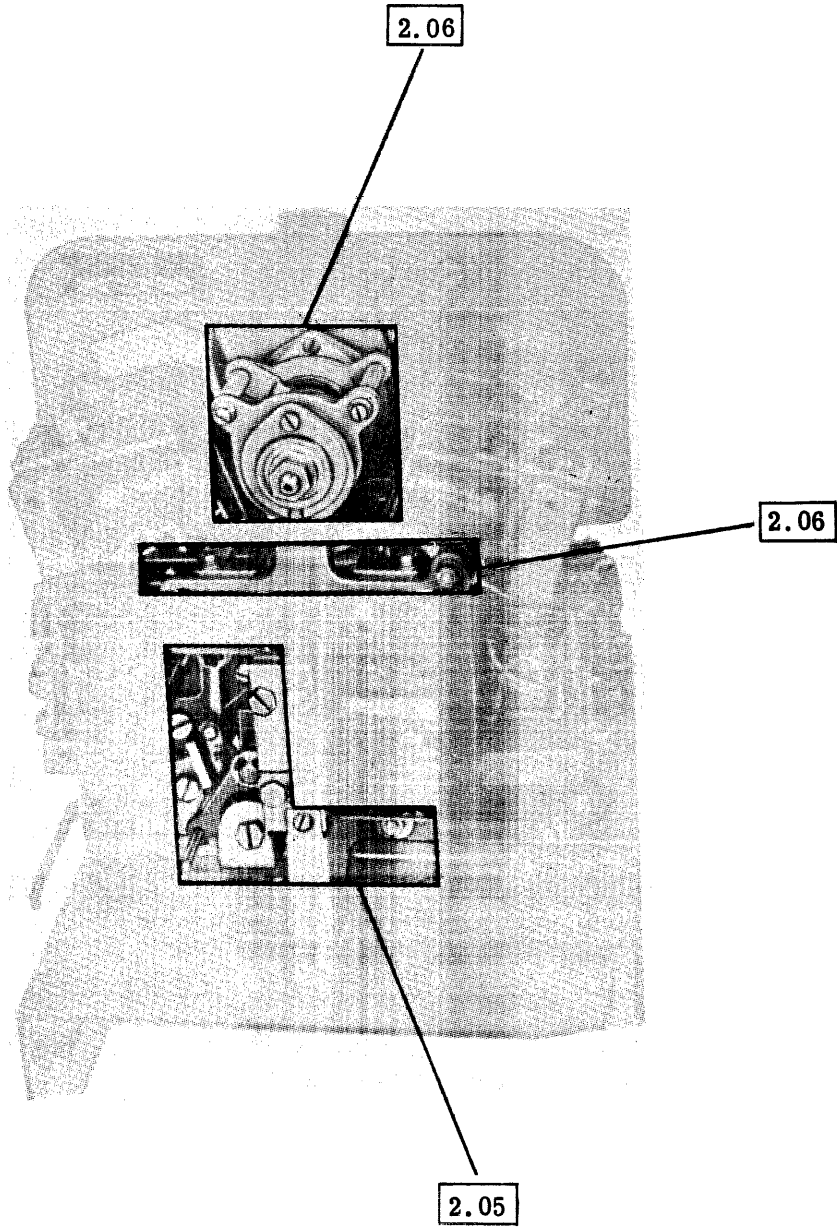
(Front View)



(Front View)

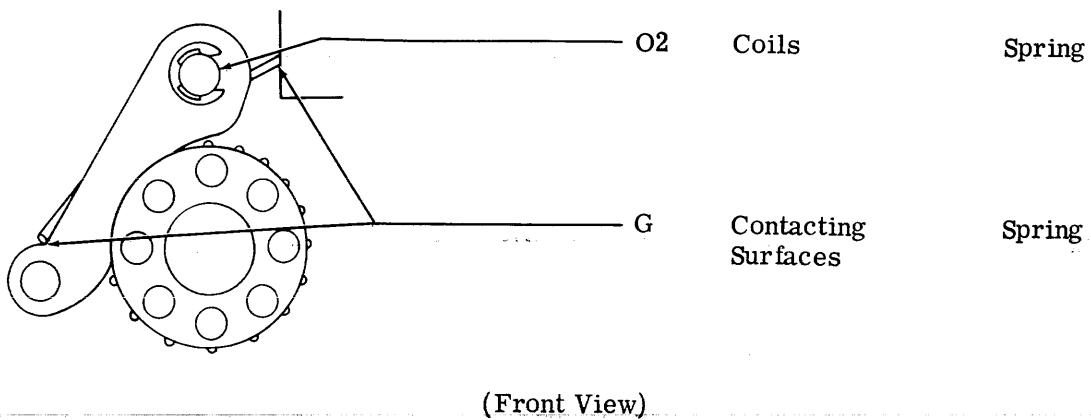
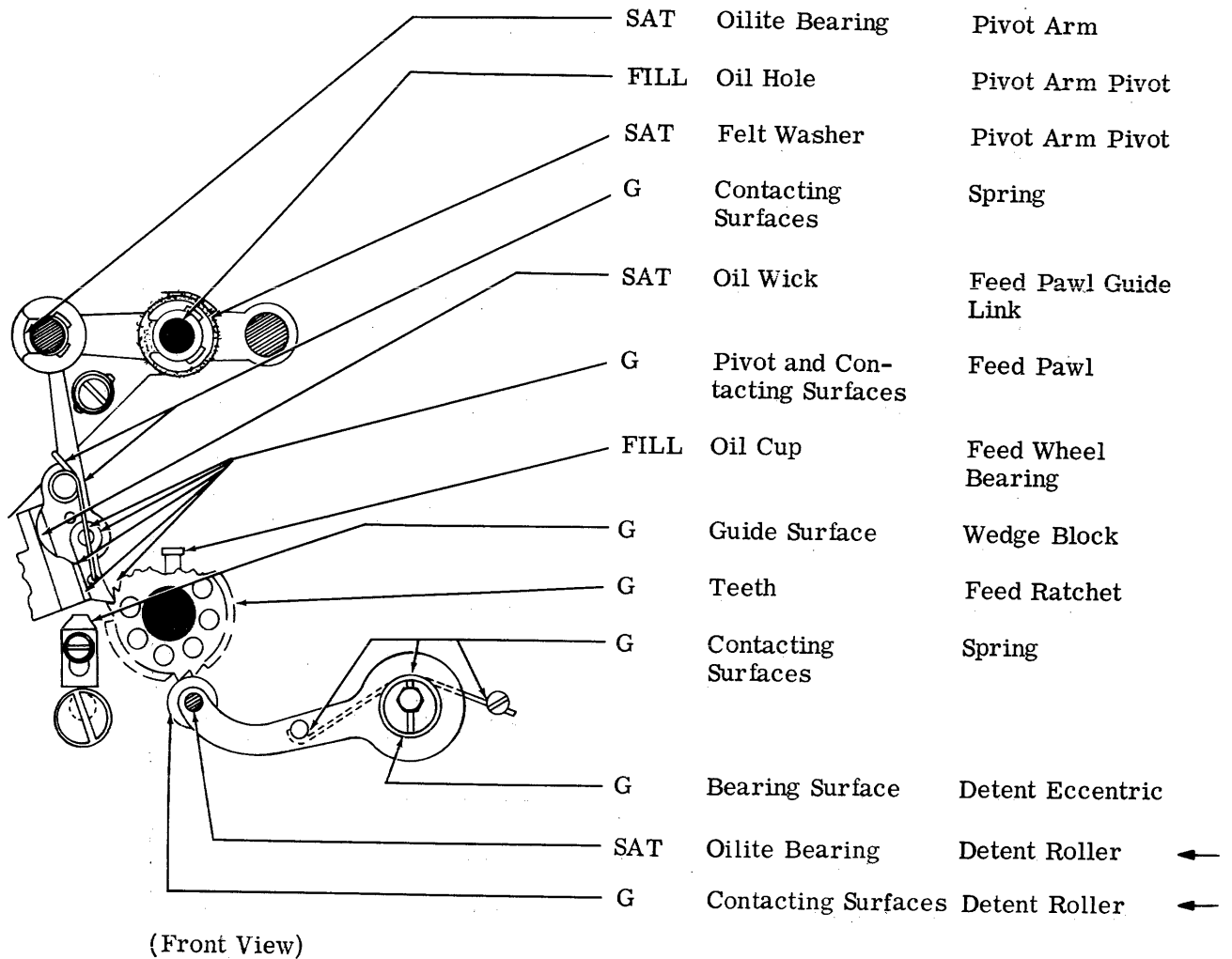


2.04 Feed and Drive Mechanisms

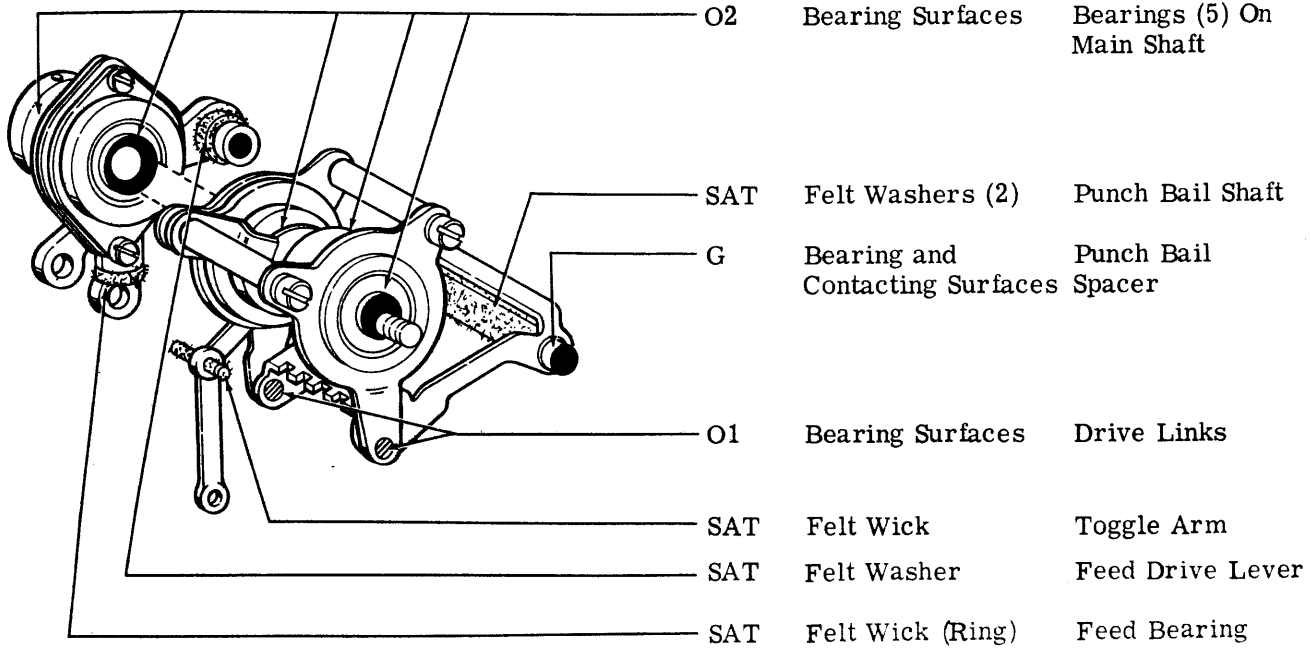


(Front View)

2.05 Feed Mechanism



2.06 Drive Mechanism



(Right Front View)

HIGH SPEED TAPE PUNCH UNIT

(BRPE TYPE)

DISASSEMBLY AND REASSEMBLY

	CONTENTS	PAGE
1.	GENERAL . . . . .	1
2.	DISASSEMBLY AND REASSEMBLY . . . . .	1
	COVER . . . . .	1
	MOTOR UNIT . . . . .	1
	PUNCH UNIT . . . . .	2
	PUNCH BLOCK MOUNTING PLATE ASSEMBLY . . . . .	3
	FEED AND PUNCH MAGNETS . . . . .	3

1. GENERAL

1.01 This section provides disassembly and reassembly information for the high speed tape punch unit (BRPE type). It is reissued to expand the text, add a figure, and change the title. Because this is a general revision, marginal arrows used to indicate changes and additions have been omitted.

1.02 The disassembly procedure divides the punch unit into its major subassemblies in the reverse order to that normally used in the assembly of a new unit. If further disassembly is needed, refer to Section 592-802-800TC for a detailed arrangement of parts.

1.03 Most maintenance, lubrication, and adjustments can be done by removing the punch unit from its enclosure. However, if disassembly beyond the level of subassembly is performed some adjustments may be disturbed. Therefore when remounting subassemblies, check all associated adjustments, clearances, and spring tensions as outlined in Section 592-802-700TC.

1.04 If any part mounted on shims is removed, note the number of shims in the pile-up so that the same amount can be used when remounting the part.

1.05 Retaining rings have a tendency to release suddenly. To avoid loss of these rings, remove as follows: Hold retaining ring and place a screwdriver blade in one of the ring's slots. Rotate screwdriver to increase the ring diameter. Remove the retaining ring.

1.06 When removing a subassembly from the punch unit, carefully note the procedure followed and the position and location of parts so as to simplify reassembly. If no specific instructions are given for reassembly, reverse the disassembly procedure used. If the punch unit has been disassembled beyond the subassembly level, follow the adjustment sequence given in Section 592-802-700TC for reassembly.

1.07 Refer to Section 570-005-800TC for tools needed to aid in the disassembly and reassembly of the punch unit.

**CAUTION: DISCONNECT POWER FROM PUNCH UNIT BEFORE STARTING DISASSEMBLY.**

2. DISASSEMBLY AND REASSEMBLY

COVER

2.01 To remove the cover, lift it up and away from the punch unit.

2.02 To remount the cover, place it over the punch unit assembly. Carefully lower cover to fit the four rubber grommets on the base into the provided slots.

MOTOR UNIT

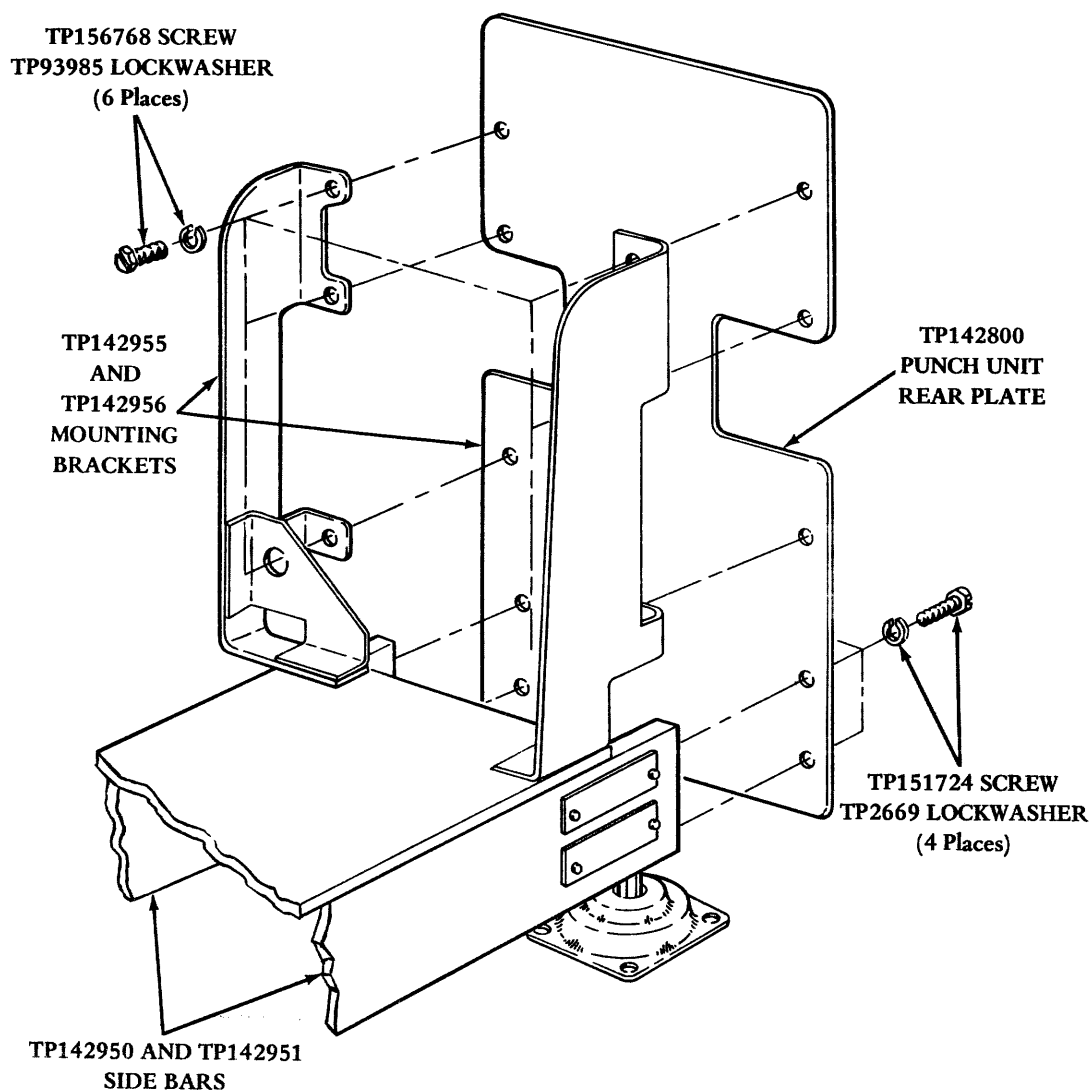
2.03 To remove the motor unit, disengage the timing belt from its sprockets. Disconnect the motor cable leads from the terminal board on the base. Note the position of the hardware on the four motor mounting screws and then remove them. Lift the motor unit from its base.

**PUNCH UNIT**

2.04 Remove the chad disposal tube and the timing belt. Disconnect the punch unit cable pin connector. Remove the punch unit by removing six mounting screws (see figure) that pass through mounting brackets TP142955 and TP142956 on the base and into rear plate TP142800.

Also remove four mounting screws that pass through the rear plate into side bars TP142950 and TP142951. Pull punch unit forward to remove.

2.05 To remount the punch unit, reverse the procedure used to remove it. Refer to Section 592-802-700TC to check any adjustments or spring tensions suspected of going out of tolerance.



Rear Plate Mounting

#### **PUNCH BLOCK MOUNTING PLATE ASSEMBLY**

2.06 To dismantle the punch block mounting plate assembly, remove the chad container first. Then remove the punch unit cover by removing its four mounting screws. Remove the retaining ring from the stud at the left end of feed link TP143014. Remove tape cutter TP142917 by loosening its mounting screw. Remove the two screws that pass through punch block plate TP142911 into front plate TP142880. Remove three mounting screws from mounting plate TP142901, and slide the mounting plate slightly to the left. Disconnect the punch pins from the drag links. Pull the assembly forward slowly and disconnect feed pawl link TP143045 from the stud on feed link TP143014.

2.07 To remount the assembly, place it into position and connect feed pawl link TP143045 onto the stud of feed link TP143014. Make sure that the drag links properly engage the punch pins, then reverse the procedure used to remove the assembly.

#### **FEED AND PUNCH MAGNETS**

2.08 To remove any group of magnets, remove the two mounting screws and lockwashers from the magnet bar. To remove an individual magnet assembly, remove the two mounting screws with hardware from the mounting plate.