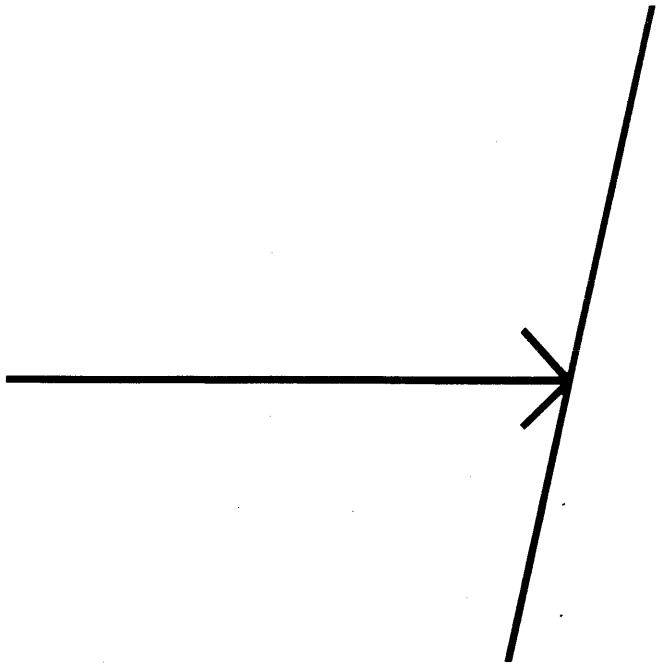

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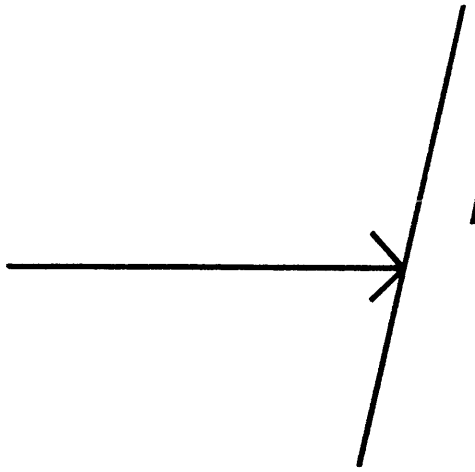

TALLY®

INSTRUCTION MANUAL

MODEL

P-120

SERIES _____

SO P-120 Rev. A Nov. 1966

TALLY CORPORATION • 1310 MERCER STREET • SEATTLE, WASHINGTON 98109

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ILLUSTRATIONS (continued)

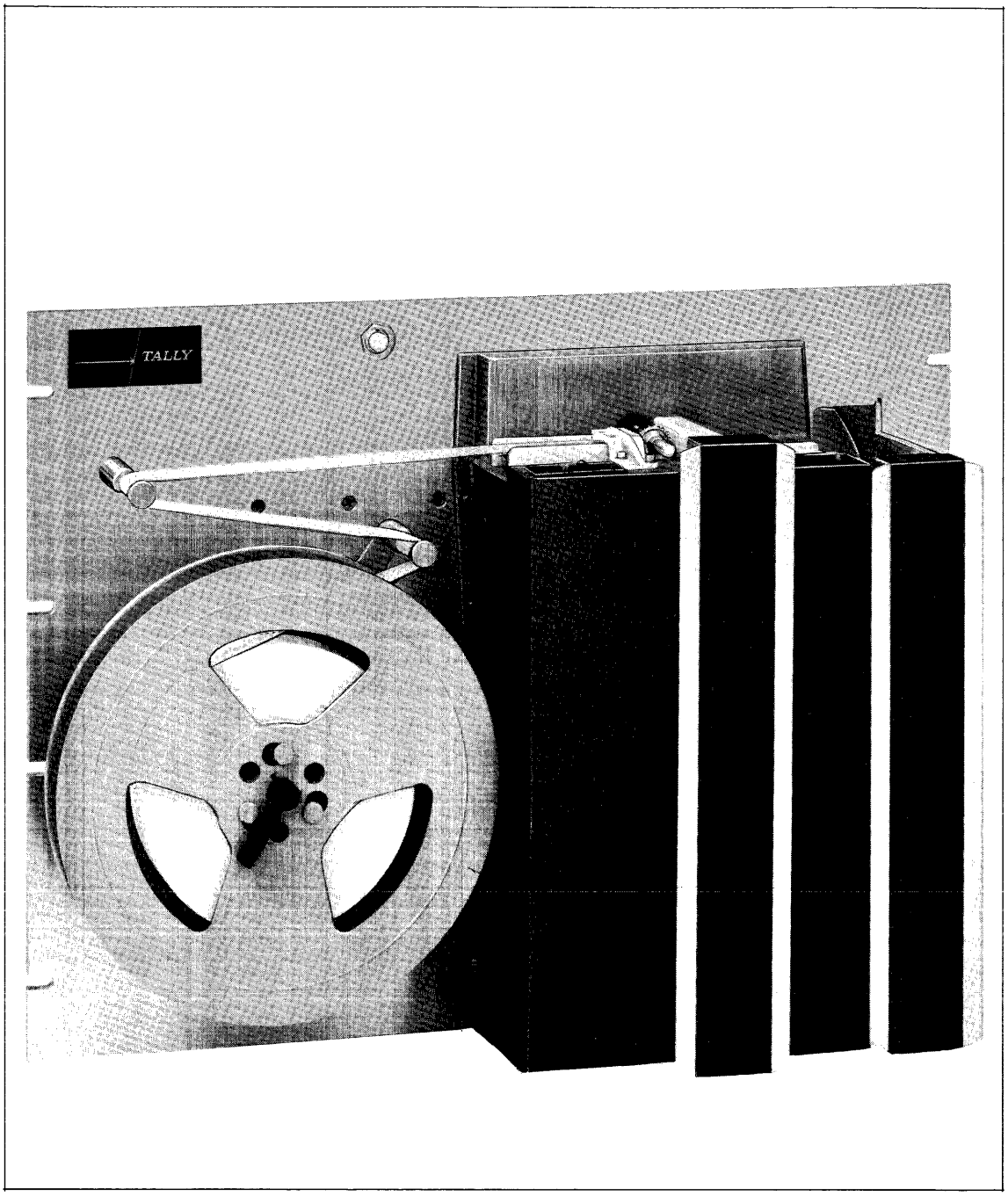


Figure 1

Model P-120

INTRODUCTION

The Tally Model P-120 Tape Perforator is a high speed, panel-mounted unit operating at asynchronous speeds to 120 characters per second. It is capable of punching paper, foil or mylar types of varying widths up to one inch maximum (eight channels). Tape supply and take-up is an integral part of the unit.

The unit uses a wire-spring clutch drive for each punch. This permits completely asynchronous operation, allowing the perforator to be slaved to other equipment. This feature eliminates the design compromises required when the perforator is the controlling unit.

The perforator mechanism is enclosed in a metal oil case, which permits quiet operation and seals in the lubricating oil. Oil is distributed as a mist throughout the mechanism by an oil lead gear partially submerged in the oil pan.

Many options are available for Model P-120, which make it readily adaptable for a great variety of applications. The standard unit is uni-directional, and is designed for eight channel operation; it requires 120VAC at 60 cps motor input and 48VDC input to the advance and punch coils. All variations from this standard, though they are considered to be options, are discussed in applicable sections of the manual through use of footnotes and parentheses. Special features such as Parity, Tape Motion Sensor, Low Tape, End of Tape (to name a few) are discussed under OPTIONS, page 27.

Environmental Specifications

The Model P-120 will operate satisfactorily at a temperature range of 50 to 110 degrees Fahrenheit at 20 to 85 per cent relative humidity, as long as no temperature humidity combination produces condensation.

Physical Specifications

The unit is 19 inches wide, 14 inches high, 14.65 inches deep and weighs 38 pounds. See Figure 2.

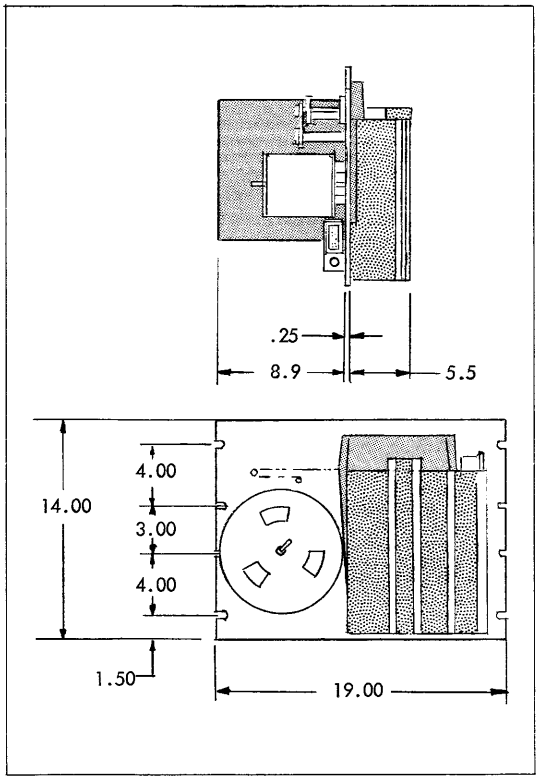


Figure 2
Outline Diagram - Model P-120

Input Requirements

The eight data lines and the sprocket line input signal must have the following characteristics:

1. Delay period from leading edge of sprocket punch pulse should be a nominal 5 milliseconds.

2. Must be able to drive nominal 25 ohm coils (10 ohm for 24 volt units) with series RC network as shown in Figure 3. Note: Figure 3 shows effective capacitance, not component values.

3. Pulse Duration of 1.8 ms ± .15 ms.

4. Pulse Amplitude of 48 ± 3 volts, or 24 + 2.4, - 1.2 volts (option).

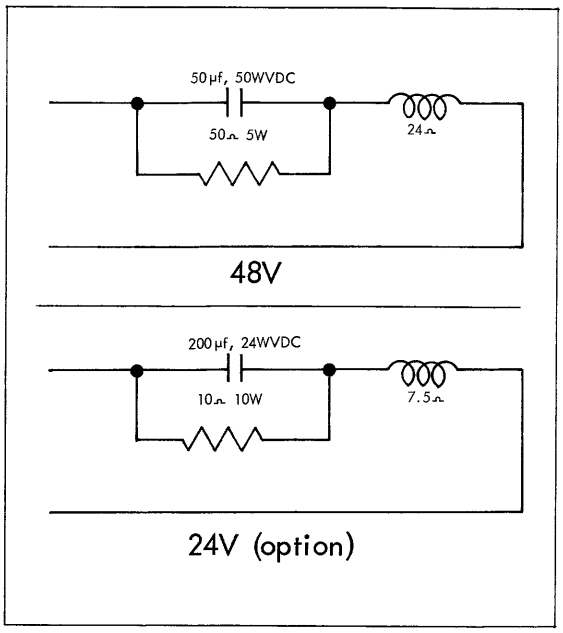


Figure 3
RC Network

5. Assuming 120 char/sec operation, all pulses must be simultaneous within ± 25 microseconds. At slower speeds, the data may be entirely random in nature, one data line to the other, if:

   a. the sprocket command is the last command of any character;

   b. the next data command is not less than 8.33 milliseconds after the preceding sprocket command;

   c. the tape advance delay is triggered by the sprocket command (as in Tally drivers for Model P-120).

Tape Handling

The Model P-120 is fitted with a free-wheeling tape supply reel and braking system, mounted behind the right side of the panel. It is magnetically latched, and can be pulled out from the front for refill. Tape is fed by the capstan, eliminating the need for a separate tape feed mechanism. For tape take-up, see Reel Drive Mechanism, page 8.

INSTALLATION

Unpacking and Mounting

Remove the P-120 from the carton, and perform the following steps:

1. Remove the shipping plug from the air vent at the rear of the perforator.

2. Remove the wooden cross braces from the stand blocks.

3. Loosen the screws on the stand blocks and slide the blocks off the panel.

4. Mount the perforator in the rack; be sure that the perforator panel lies flat against the rack and does not bend while being secured.

   Note: When the P-120 uses a Tally driver, the two are shipped separately for their protection in handling. Secure the side plates to the driver as shown in Figure 4, and bolt the two units together.

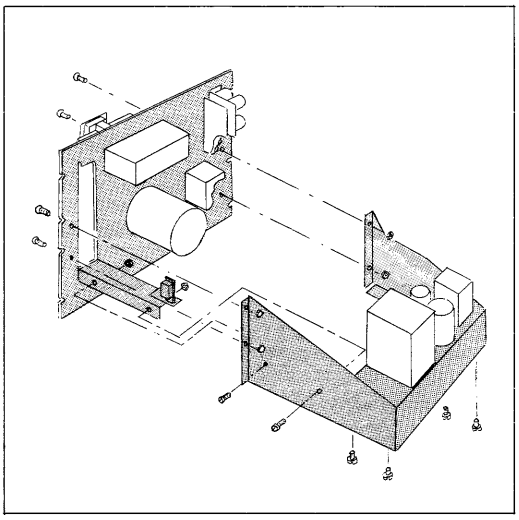


Figure 4
Perforator/Driver Assembly

Pre-Operational Lubrication (See Figure 5)

Design of the P-120 requires that the unit be right-side-up to prevent leakage when there is oil in the Perforator Mechanism. The mechanism is therefore drained and the vent hole plugged before the unit is shipped from the Tally plant. Before operation, remove the plug from the vent hole, and lubricate as follows:

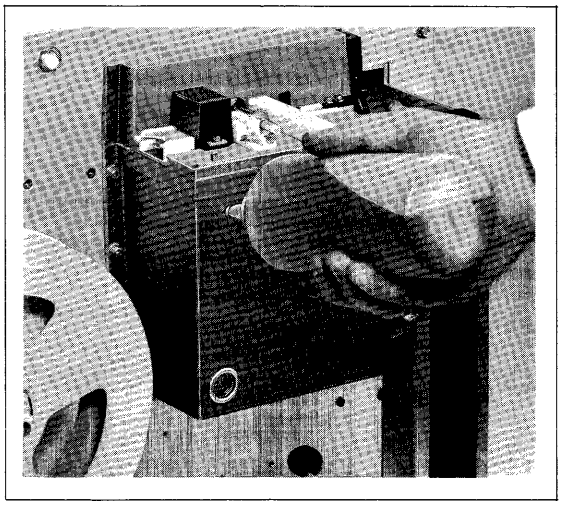


Figure 5
Lubricating the Mechanism

1. Remove the chad box and the oil filler plug.
2. Fill the perforator mechanism to the center of the oil gage with Tally Mechanism Oil #311270. Fill slowly, to avoid over-filling.
3. Replace the oil filler plug and the chad box.

See also, Lubrication, page 12.

Threading Tape

1. Before running a new roll of tape, always empty the chad box to avoid clogging the mechanism with chad overflow. Grasp the box near its bottom and pull straight out, then lift the box off its hooks.

2. To insert a new roll of tape in the perforator, pull the tape supply slide out of the panel. It is held by a magnetic catch.

   Pull the supply reel apart, and replace the old roll with the new one. Place it so the tape comes off the top of the reel. Put the side back on the reel.

   Thread the tape under the tape guide roller and back up to the top of the assembly. Hold the end of the tape while sliding the tape supply assembly back into place. The magnetic catch will click as it contacts the assembly.

3. Move the tape tension arm on the take-up reel to the left as far as it will go. Do not force it; it will hold in that position. Note: Many units use the Clockwise Reeling option. On these units, the tape tension arm should be moved to the right.

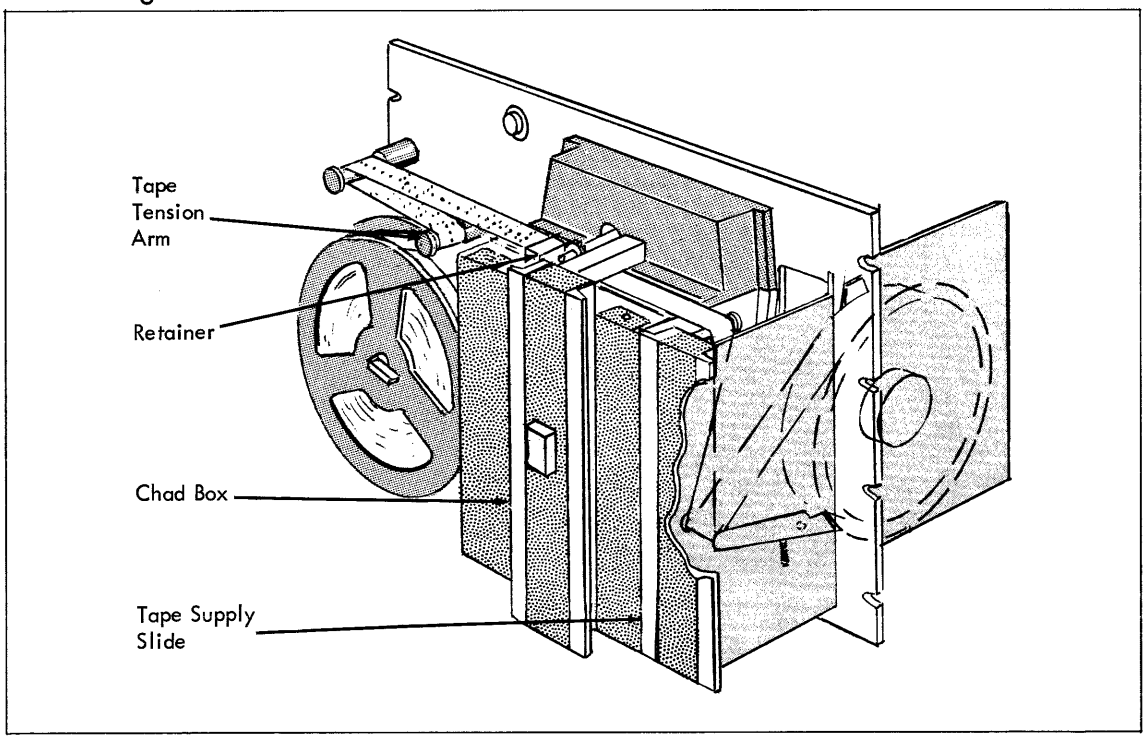


Figure 6
Threading Tape

4. Press the retainer release tab, allowing the retainer to move away from the capstan. Twist the tape one-half turn clockwise. To facilitate threading, tear the tape end diagonally, with the longer edge toward the panel. Thread the tape through the tape guide assembly and over the tape guide roller. The tape tension arm is to the left and out of the way at this time. Fasten the tape to the hub of the take-up reel. Feed enough tape into the reel to insure its staying on.

5. Move the tension arm to the right so that it contacts the tape. Push the retainer back against the capstan; it will lock in place.

6. Press the Tape Feed switch momentarily before starting to record, to provide several inches of sprocket tape. Check to see that the tape pulls smoothly through the perforator, without binding or twisting. The perforator is now ready for operation.

Clutch Protection

Sometimes (when the unit has been subjected to shock, or to noise pulses at shutdown) wire spring clutches become unlatched. These clutches are designed to grip the shaft on which they are mounted -- but only on command. A clutch unlatched while the unit is off will be only partially latched at startup, and will remain so until pulsed at full motor speed; the resulting friction produces intense heat.

Figure 7 shows an unlatched clutch with its wire spring firmly gripping the shaft. When AC power is applied to the motor, the clutch will rotate with the shaft until the control sleeve contacts the armature. This contact must be made with enough force to unwind the spring and release the shaft. The rotation allowed in Figure 7 is not enough; neither is an additional 60° allowed by pulsing the escapement before the shaft has reached full RPM. But pulsing the escapement after the motor has reached full speed will generate the necessary force.

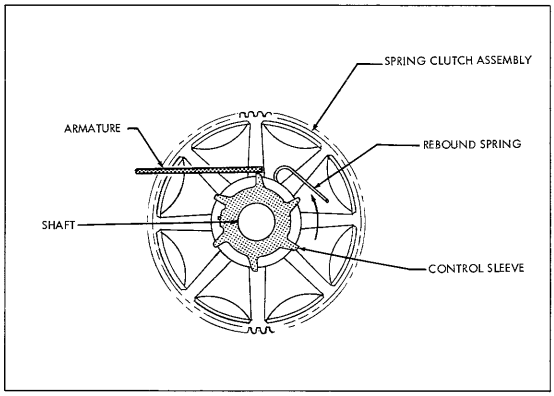


Figure 7
Unlatched Wire Spring Clutch

Therefore, when there is any reason to believe clutches may be unlatched, pulse all escapements within 60 milliseconds after applying AC power; pulse them again after the motor has reached full speed (about 500 milliseconds after applying AC power). Or, pulse continually (maximum rate -- 120 pulses per second) through the 0 - 500 millisecond period after start up. Failure to do so will cause partially latched clutches to overheat, resulting in their destruction and that of adjacent parts. Units operating on less than eight channels must have provisions made to pulse the unused channels. Or, factory modifications can be made for their permanent protection.

Capstan Drive Mechanism (Figure 8)

This discussion applies only to the standard, unidirectional, unit. For units incorporating the reverse option, see OPTIONS, page 27.

Drive power is transferred from the motor through a lug belt and pulleys to the input shaft (1). The bevel gear (2), which is mounted on the input shaft and held with a set screw, transfers this power to the friction clutch assembly (3). Pulsing the escapement assembly (4) causes its armature to release the friction clutch momentarily. The clutch and capstan shaft rotate one step. The capstan (5), which is mounted on the capstan shaft, rotates one step. The armature engages the next tooth of the clutch assembly, stopping the action.

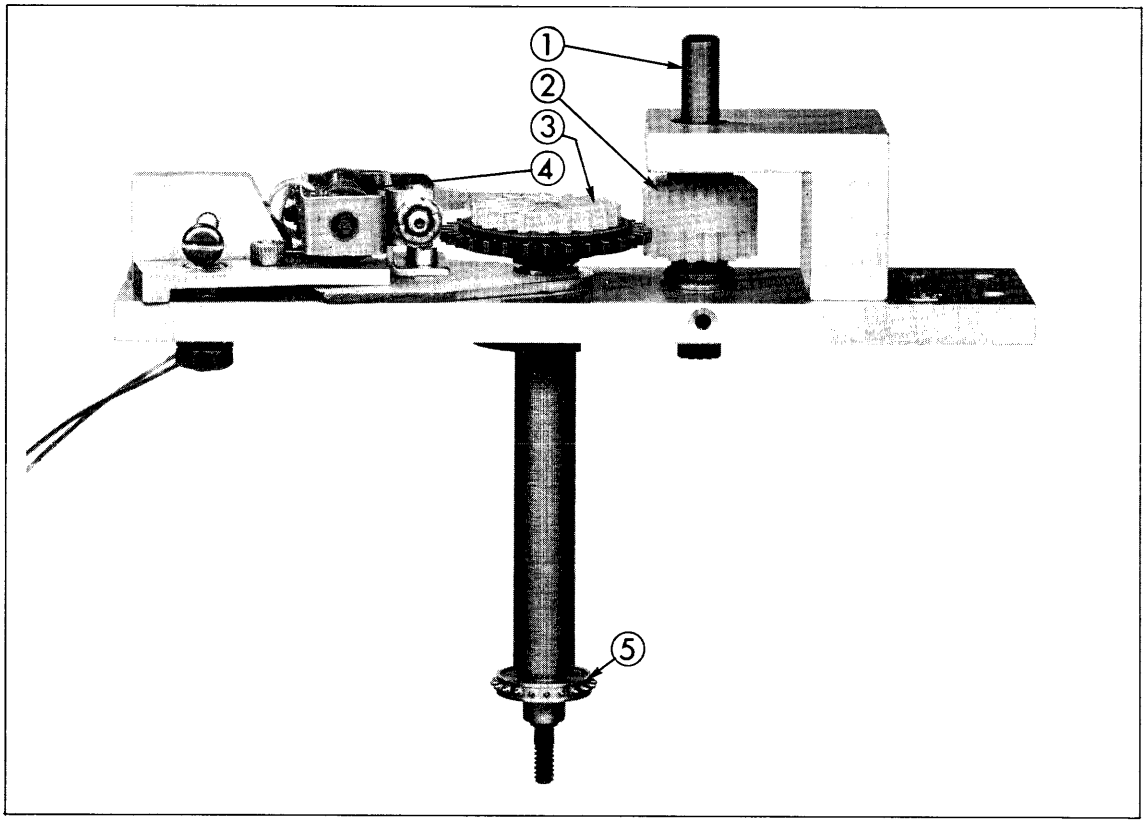


Figure 8
Capstan Drive Mechanism

Perforator Mechanism

The perforator mechanism, mounted on the front of the panel, consists essentially of one pivot shaft, nine punch drive eccentrics, nine punch linkages and four clutch shafts (with gears molded on), all enclosed in an oil tight case.

Drive power is supplied to the four clutch shaft driven gears through a drive gear mounted on the motor shaft and centered within the four driven gears. Figure 9 shows the gears and their relationship to each other. Note: The shaft (1) on the drive gear represents the motor shaft, for reference only.

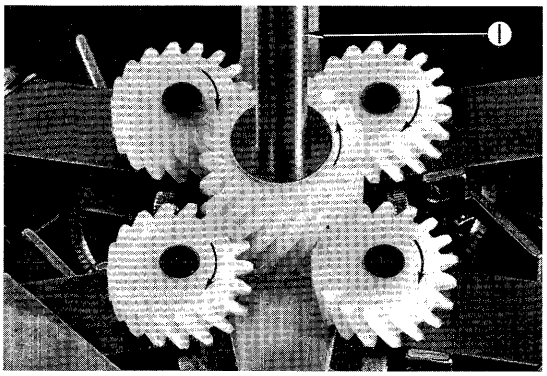


Figure 9
Power Transfer, Perforator Mechanism

All five gears are helical, to insure quiet operation.

Each driven gear is molded to a shaft, so that the shaft turns with the gear. On each shaft are either two or three clutch units, which are secured against rotation by the armatures of their respective escapement mechanisms.

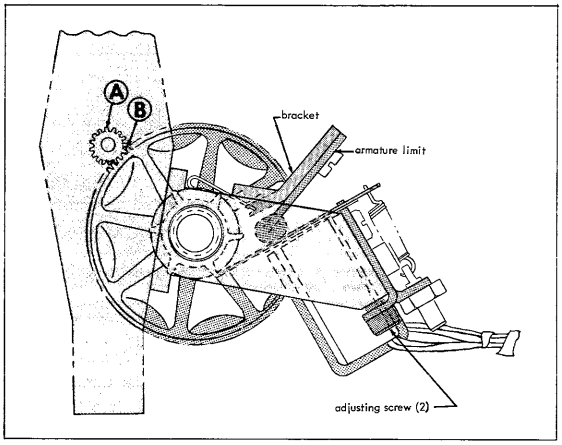


Figure 10
Clutch/Eccentric Relationship

On the outer rim of each clutch is a gear (B, Figure 10), which is engaged with the gear (A) of a corresponding punch drive eccentric. Pulsing an escapement allows the corresponding clutch to advance one-sixth revolution, which in turn advances the eccentric one full revolution, thereby executing one full punch stroke.

The forward escapement on the Capstan Drive Mechanism is pulsed 5.0 milliseconds after the leading edge of the last data pulse, when the punch pins are in the paper tape. A further delay of approximately 1.3 milliseconds occurs as a result of the inertia of both the latch and the clutch output members. This total time allows the punches to operate and to clear the tape before tape movement begins.

The punch pins, which are molded to the punch linkages, protrude through the pin guide and into the stripper, where the tips rest .013" (.33mm) below the top of the stripper. This allows free movement within the punch head assembly when no holes are being punched. When a hole is punched, the corresponding punch pin moves through the paper tape and .015" (.38mm) into the die block. Overtravel is .022 ± .002" (.56 ± .05mm), as shown in Figure 11.

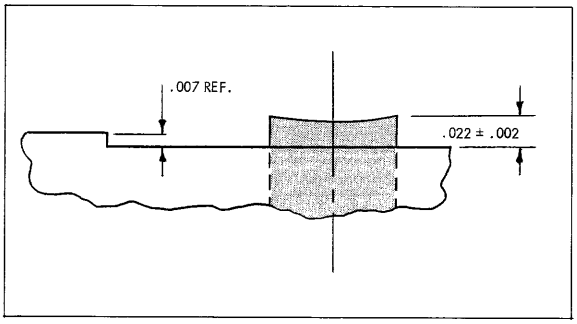


Figure 11
Punch Penetration

Chad Auger

A rotating auger is gear-coupled to the capstan input shaft and mounted above the die block as shown in Figure 12. It forces the chad to the front of the perforator; the chad then falls into the chad box, located under the mechanism.

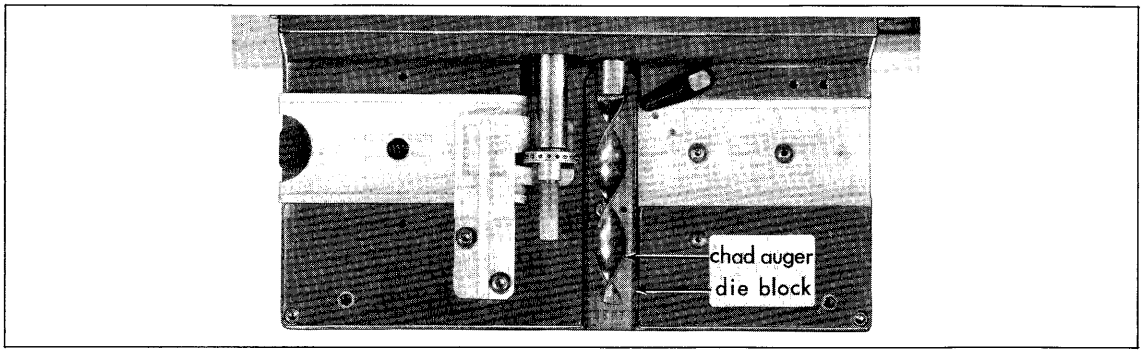


Figure 12
Tape Deck, with Chad Chute Removed

Reel Drive Mechanism

The takeup reel drive mechanism, mounted on the left-rear side of the panel, consists essentially of a differential gear arrangement and a braking mechanism.

Drive power to the reeling mechanism is supplied by the motor to the input shaft (8) through a drive belt and pulleys. Rotation of the input shaft and the gear mounted on it transfers this power to gear (3), which free-wheels on the reeling shaft. Gear (3) rotates the differential gear (2), which is pinned to the reeling shaft. The differential gear is meshed with gear (7), which with the brake off free-wheels on the reeling shaft.

A tape tension arm on the front of the panel is positioned to rest on the tape between the capstan and the takeup reel, forming a loop in the tape. As tape is fed from the capstan the loop lengthens, permitting the arm to drop.

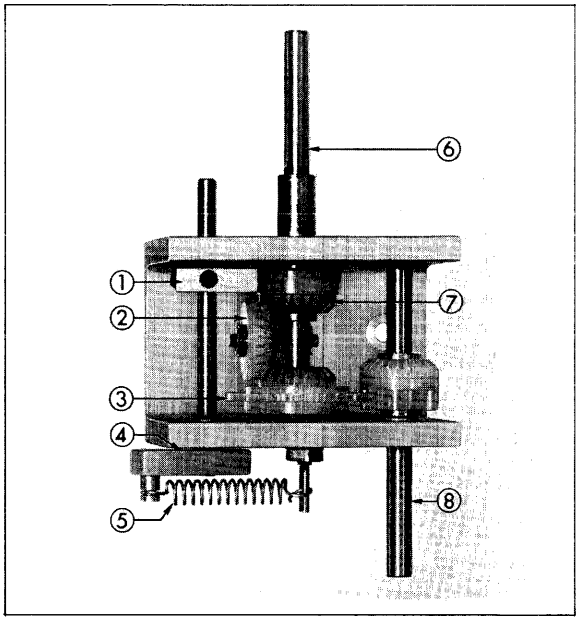


Figure 13
Reel Drive Mechanism

This applies the brake (1) to gear (7), stopping its rotation. The differential gear must then revolve around the reeling shaft, rotating the shaft to take up the tape.

Punching

To record a character in the tape, an electric pulse is applied simultaneously to the electromagnets of the escapement assemblies which control the punches required for the character. When the electromagnets are energized, the corresponding armatures are momentarily disengaged from the clutch control sleeves, permitting the clutch assemblies to rotate one-sixth turn. The gear on the periphery of the clutch assembly rotates the corresponding eccentric one full revolution (Figure 10), sending its punch through one up and down cycle to perforate the tape.

Before the clutch completes the one-sixth revolution, the escapement armature has been released, thus engaging the clutch control sleeve and stopping rotation of the sleeve. See Perforator Mechanism, page 6.

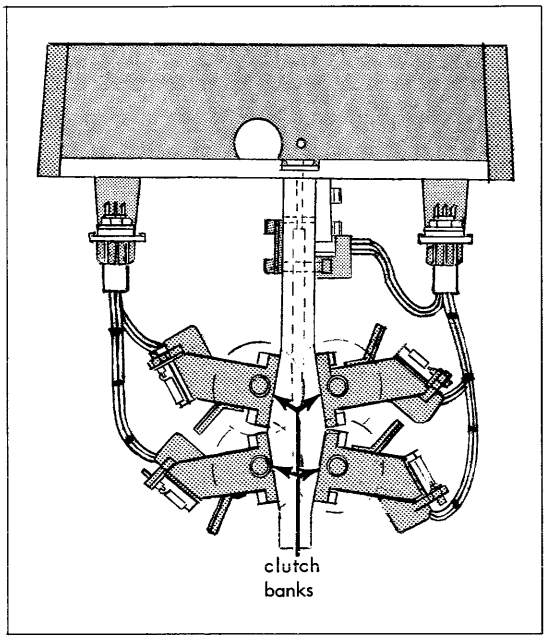


Figure 14
Perforator Mechanism

Tape Feed Switch

The Tape Feed switch, mounted on the panel, is a momentary-contact, two circuit switch used to advance the tape manually. This is normally done to produce a leader on a new tape, or to provide several inches of tail leader when the tape is torn off at the completion of recording. Depressing the Tape Feed switch causes a series of pulses to be fed to the sprocket punch and tape feed escapement actuators, resulting in a series of sprocket holes being punched in the tape. A customer-supplied source of drive pulses, not to exceed 120 char/sec, is required for use with the Tape Feed switch.

Terminations

All power input, tape advance pulses and punch pulses are delivered to the standard perforator assembly through a 34-pin connector. Connections to the terminals and to the escapement coils are shown in the wiring diagram, Figure 44. The receptacle and the mating plug are both supplied with the tape perforator.

PREVENTIVE MAINTENANCE

This section is intended to serve as a checklist. It gives maintenance intervals, and lists specific points for service. Detailed information on how to service these points may be found under MAINTENANCE PROCEDURES, page 12. The following PM intervals are based upon intermittent use, and assume that one 1,000-foot roll of tape is perforated each hour. Note that Daily Maintenance consists of cleaning and inspection. This is an operator function. 125 and 250 Hour Maintenance, however, require special tools and some familiarity with the unit. This is a technician-level responsibility.

Daily Maintenance

1. Clean the die block, capstan and tape track, using an air blast or a brush. Inspect the unit for overall cleanliness and proper operation. Note: The die block may at times become clogged with chad or bits of tape which cannot be removed with a brush or compressed air. This is not likely with regular maintenance. See Die Block Cleaning, page 12.

2. Check general punch operation. Check for proper spacing, tape tearing, double punching and bit deletion. Call for service when problems develop; an early call could prevent costly down time.

125-Hour Maintenance

Perform the Daily Maintenance to ascertain that the unit is operating correctly before you begin the 125 Hour Maintenance.

Static Inspection

1. Inspect the Capstan Drive Mechanism for excessively worn or damaged parts, and for lug belt wear and alignment.

2. Check escapement actuators for cleanliness and proper clearances (Figure 25).

3. Inspect the reeling mechanism for excessively worn or damaged parts. Check for belt wear and alignment. Check tension arm positioning (Reeling Adjustment, page 20).

Dynamic Inspection

1. Observe tip to clutch tooth operation in the Capstan Drive Mechanism -- see that the armature tips are contacting clutch teeth squarely, with not more than .015" (.38mm) overhang.

2. Observe the tape tension arm for smooth operation.

3. Observe the Reeling Mechanism for smooth operation.

250-Hour Maintenance

Perform the Daily Maintenance to ascertain that the unit is operating correctly before you begin the 250 Hour Maintenance.

Static Inspection

1. Inspect the Capstan Drive Mechanism for excessively worn or damaged parts. Check for lug belt wear and alignment, and for excessive shaft play as indicated in the Reference Table, page 26.
2. *Check escapement actuators for: anti-residual shim wear; armature tip wear; clutch tooth wear; cleanliness; clearances (Figure 25).
3. Inspect the Reeling Mechanism for worn or damaged parts. Check for belt wear and alignment. Check tension arm positioning (Reeling Adjustment, page 20).
4. Lubricate the unit according to Lubrication, page 12.

Dynamic Inspection

1. Observe tip to clutch tooth operation in the Capstan Drive Mechanism. See that armature tips are contacting clutch teeth squarely, with no more than .015" (.38mm) overhang.
2. Observe the tape tension arm for smooth operation.
3. Check punch operation for clean holes and proper spacing. Check also for tape tearing, double punching and bit deletion. Observe the data drive pulses on an oscilloscope.
4. Observe the Reeling Mechanism for smooth operation. See that the belts are not slipping.

375-Hour Maintenance

Perform the 125 Hour Maintenance.

500-Hour Maintenance

Perform the 250 Hour Maintenance. Inspect the unit for overall wear. Factory service may be advisable at this time. In any event, the unit may be ready for factory service after 750 hours of motor operation. This involves replacement of worn parts and readjustment to factory specifications. The factory service interval varies widely, depending on (1) the volume and abrasive quality of the tape punched, and (2) environmental conditions.

* See Wear Points, Escapement Assemblies (page 20).

Die Block Cleaning

The die block may at times become clogged with chad or bits of tape that cannot be removed with a brush or air blast as noted under Daily Maintenance. When this happens, pass a .005" (.13mm) cleaning shim through the tape track, from right to left (see Figure 15). A die block too badly clogged to allow passage of a cleaning shim may require removal for cleaning. See Die Plate Removal, page 25.

CAUTION: Removing the die plate is a technician-level project.

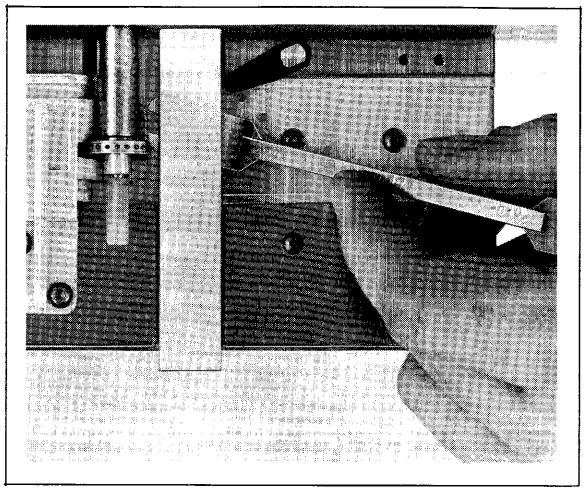


Figure 15
Cleaning the Die Block

Lubrication

The tape punch drive gearing and escapement mechanisms are enclosed in a rectangular oil can. A supply of oil in the can is distributed as a mist, generated by a splash gear partially submerged in the oil can.

Check the oil level in the mechanism daily. With the motor off, keep the oil level centered in the gage at the front of the oil can.

Check for dirty oil every 250 hours of operation. The change period varies with environmental dirt, temperature and duty cycle.

To add oil, remove the plug from the access hole in the front of the oil can. Insert the tip of a container that allows spill-free pouring, and fill to the desired depth. See Figure 5. To drain the mechanism, remove the drain plug from the bottom of the oil can.

LUBRICANT: Tally Mechanism Oil #311270

CAUTION: Clutch performance is extremely sensitive to changes in character of the lubricant. Substitution of any other lubricant without Tally approval may result in impaired performance, and will void performance warranties.

Lubricate the following points, as shown in Figure 16.

Point 1: After every 500 hours of motor operation, lubricate bushings in the capstan drive mechanism and the reel drive mechanism.

LUBRICANT: Bardahl BOA 30 or equivalent.

Point 2: After every 250 hours of motor operation, clean the escapement and then lubricate its armature's felt pad with three or four drops of lubricant. Do not over-lubricate. See Detail B.

LUBRICANT: Bardahl BOA 30 or equivalent.

Point 3: Apply evenly, two drops of lubricant to both sides of each friction clutch, inserting the tip of the oil dispenser between the fiber friction washer and the drive gear. Take care not to scratch or damage either component. Lubricate initially at 250 hours, then each 500 hours thereafter. See Detail A.

LUBRICANT: Silicone 350cs (Dow Corning 200).

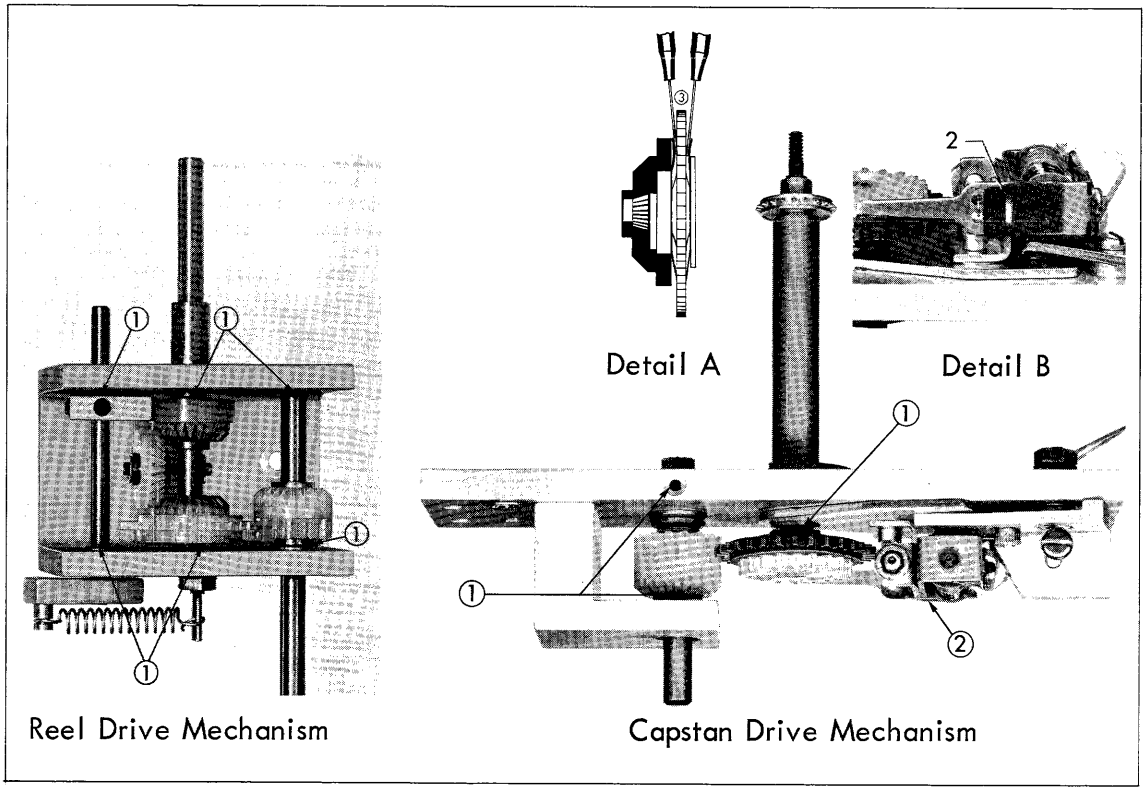


Figure 16
Lubrication Points

Hole Spacing Adjustments

The Model P-120 is designed to operate within the hole spacing requirements of American Standards Association (ASA) specifications. See Figure 17.

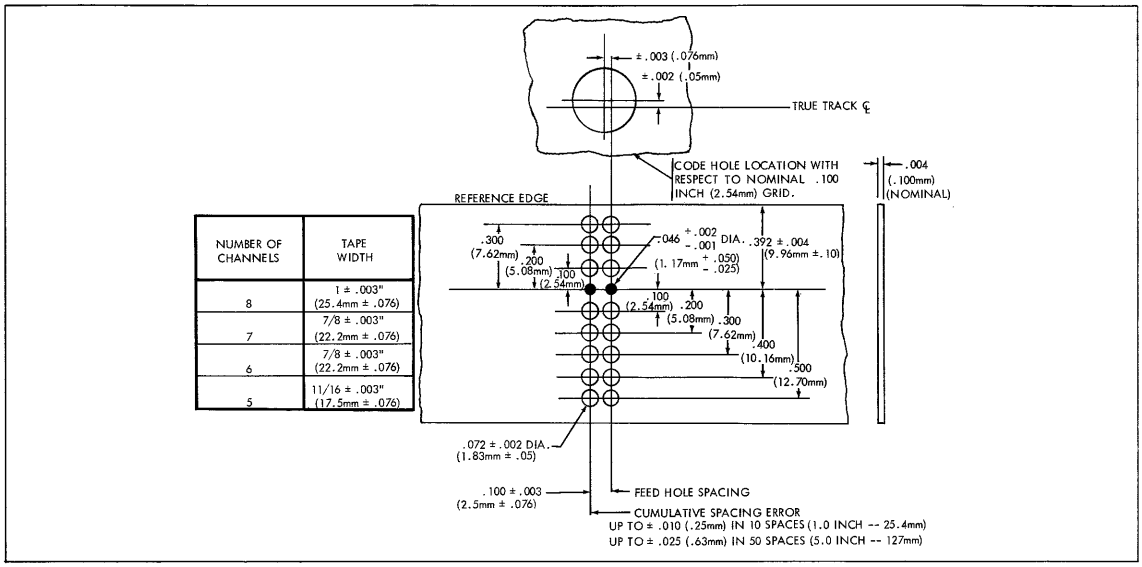


Figure 17
Standard Tape Dimensions

Hole spacing may be defined in two areas: edge-to-hole (centerline of sprocket hole to three-hole edge of tape) and hole-to-hole (10 holes per inch). Edge-to-hole spacing is controlled by the Tape Guide Insert and Capstan Positioning. Hole-to-hole spacing is controlled by the Stripper, the Retainer, and the Capstan Drive Mechanism.

Tape Guide Insert

Run a short length of test tape, and with a tape hole gage check to see that the sprocket hole centers are .392 ± .004" (9.9 ± .1mm) from the three hole side, as shown in Figure 17. If not, loosen the two Allen head mounting screws on the tape guide insert (Figure 18). Re-position the insert and check the tape again.

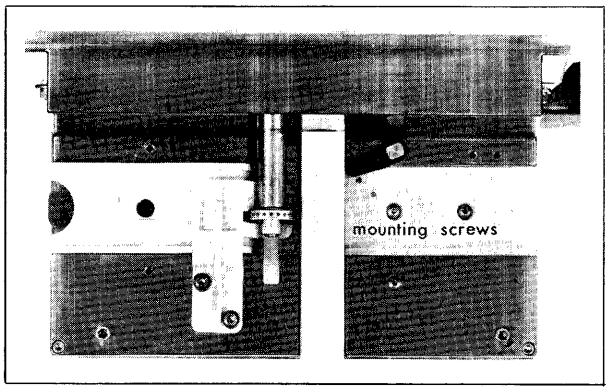


Figure 18
Tape Guide Insert

Capstan Positioning (See Figure 19)

CAUTION: To avoid damaging the escapement gear during this operation, release the forward escapement by inserting a .016" (.41mm) shim in the slot of the armature limit. Hold the escapement gear with the fingers. The capstan should have .001 - .002" (.025 - .050mm) clearance from shims (barely perceptible end play).

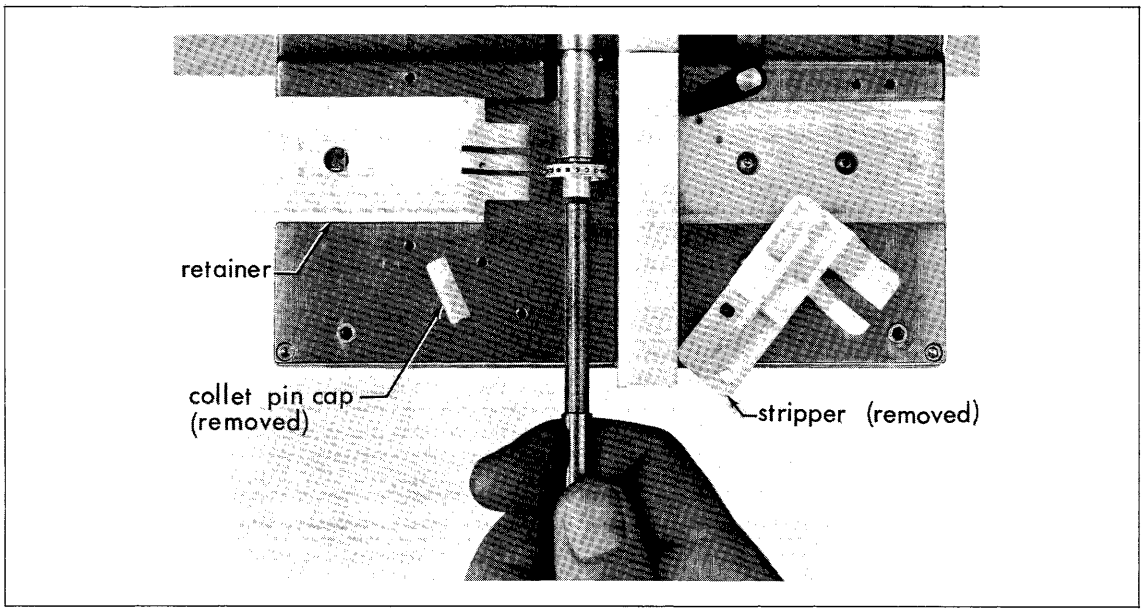


Figure 19
Removing the Capstan

This operation is normally not required in the field, unless shims have been lost during repair. Position the capstan to line up with the sprocket punch by installing or removing shims on the shaft behind it. To remove the capstan, first move the retainer to the load position. Remove the collet pin cap and the tape stripper. Remove the collet pin (using Tally wrench #319030) by turning the pin clockwise and pulling at the same time. Remove the capstan, install or remove the required shims and replace the capstan. To retighten the capstan, re-insert the collet pin. Push it all the way in, twisting clockwise at the same time. This will secure the capstan to the shaft. Note the CAUTION preceding this paragraph. Recheck end play as specified on page 26. An improperly aligned capstan will cause burrs on the edge of the sprocket holes.

Stripper

Loosen the stripper's two mounting screws. Position the stripper to line up with the capstan. Note: Stripper adjustment affects Retainer adjustment. Check Retainer.

Retainer

Insert an Allen wrench through the access hole on top of the retainer. Loosen the mounting screw. Thread tape between the retainer and the capstan, and push the retainer snugly (but not tightly) against the tape. If after adjustment the tape does not move, the retainer may be too tight against the tape. If the hole spacing is erratic, the retainer may be too loose.

Capstan Drive Mechanism

The center-to-center hole spacing on the Model P-120 must be maintained at 0.100 ± .003" (2.54 ± .08mm) and the accumulated spacing error over five inches of tape must be within ± .025" (.64mm). Check and adjust spacing as follows:

1. Measure the spacing over a length of tape containing exactly 50 sprocket holes. The distance from hole one to hole 51 (leading edge to leading edge) should be between 4.975 and 5.025 inches (12.64 and 12.76 centimeters.) Tally tape gage #T18118 may be used for an approximate spacing check.
2. If the measurement is outside of the limits specified, loosen the clamping screw (1, Figure 20) on the capstan adjusting plate and turn the adjusting screw (2). Turn the screw clockwise to lengthen hole spacing; counter-clockwise to shorten it. See that the adjust lever (3) is hard against the adjusting screw. Tighten the clamping screw.
3. Repeat these steps as necessary to secure correct hole spacing.
4. If the above adjustment proves insufficient, return the adjusting screw to its mid-point. Loosen the capstan as described in Capstan Positioning, page 14. Rotate it one-half step in either direction, and retighten. Repeat steps 1–4.

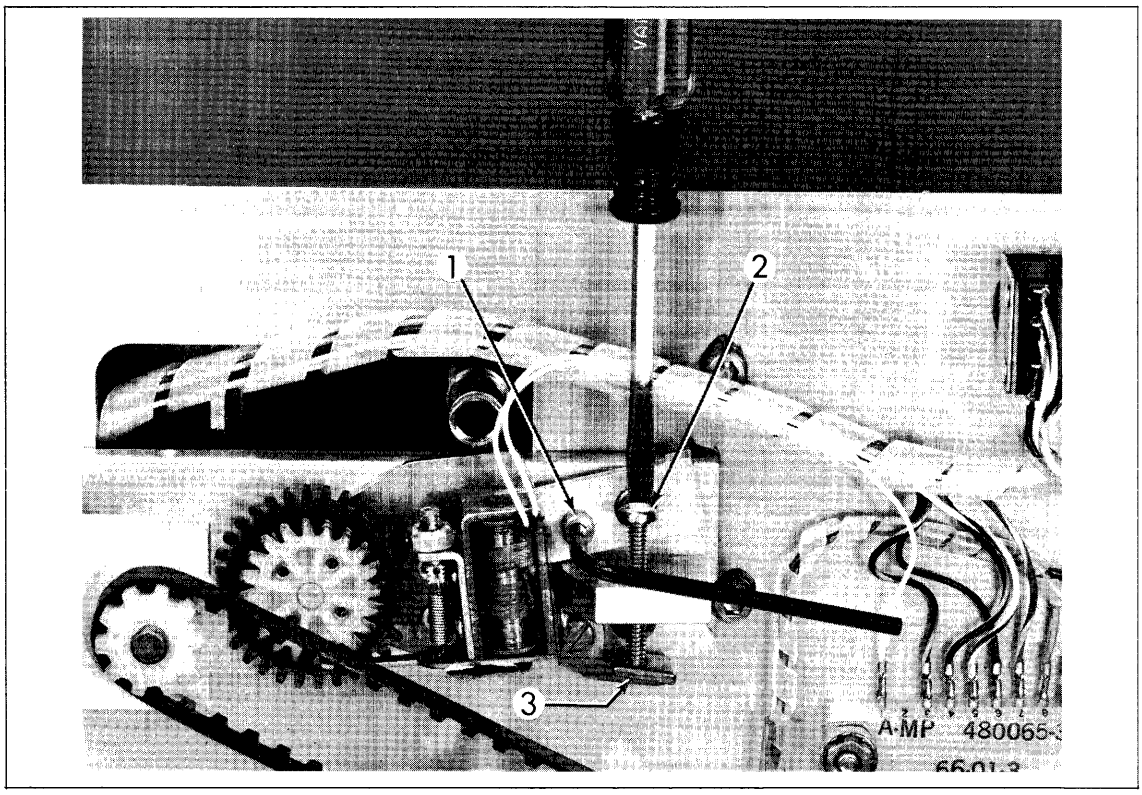


Figure 20
Hole Spacing Adjustment
(center-to-center)

Escapement Adjustments, Perforator Mechanism

The following adjustments must be made with the clutch bank removed from the Perforator Mechanism. See Clutch Bank Replacement, page 24.

Armature Tip*

Tip adjustment affects all escapements on a clutch bank at once. Loosen the four 6-32 socket cap screws (A, Figure 21). With the armatures actuated, turn the two adjusting screws (B) to achieve a .010 - .012" (.25 - .30mm) gap between the highest tooth on each control sleeve and the corresponding armature tips. See Figure 22A. Be sure the armatures are flat on their fulcrums, and not pulled down farther than their normal travel. Note: Tip adjustment affects air gap. Check air gap.

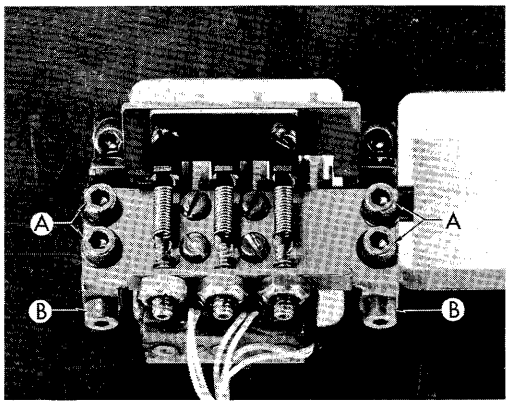


Figure 21
Tip Adjustment

Air Gap*

Bend each armature limit to achieve an air gap of .018 - .020" (.46 - .51mm), as shown in Figure 22B. Note: Air gap adjustment affects armature spring tension. Check spring tension.

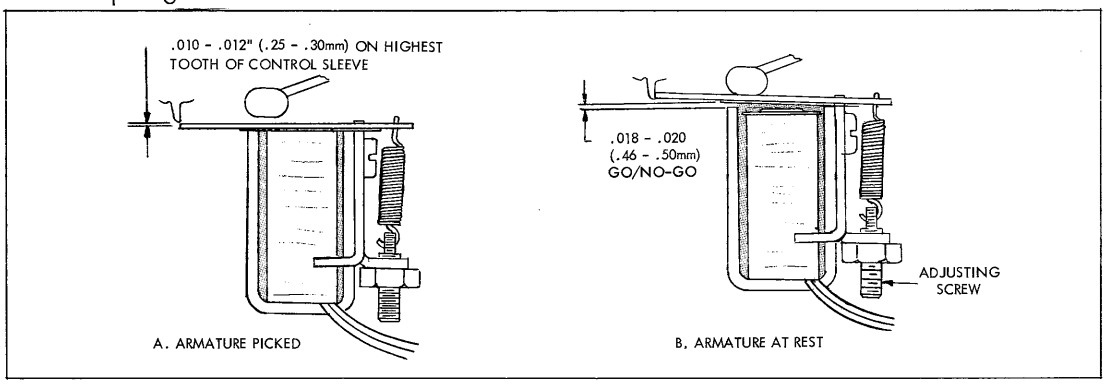


Figure 22
Escapement Adjustments

Armature Spring Tension

Proper air gap must be achieved before making this adjustment. Hold the adjusting screw (Figure 22) with an allen wrench. Turn the 6-32 elastic stop nut mounted on it until it takes 50 grams pull at the tip of the armature to achieve first motion. Force exerted must be 90° from the armature, as shown in Figure 23.

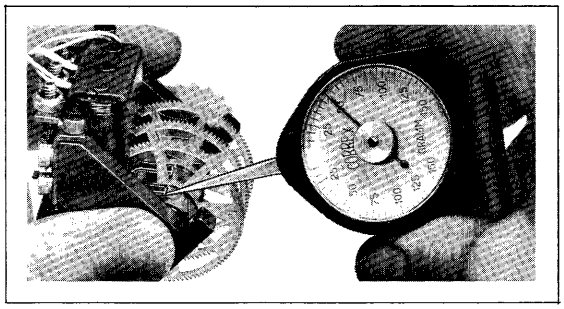


Figure 23
Armature Spring Tension

* This adjustment is especially difficult to achieve without use of special jig #319040. Service sites without this jig should not attempt to do so.

Punch Phasing

When a clutch bank is replaced on the Perforator Mechanism, its punches must be phased with those of the other clutch banks. This insures that all punches called are in and out of the tape at the same time.

To check phasing, run a short length of all-hole tape, and shut the unit down. Remove the die plate (Die Plate Removal, page 25). See that all punches are the same distance below the exposed surface. An out-of-phase punch will protrude above the other punches.

When a punch is out of phase, mark its clutch so that it can be rotated and then brought back to its original position. Rotate the clutch until its punch is even with the others. Remove the clutch bank and rotate the clutch back to its original position, as marked. See Figure 24. Replace the clutch bank and recheck punch phasing.

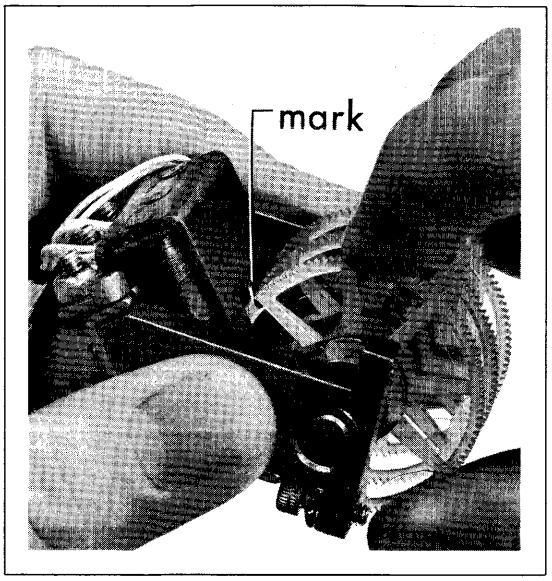


Figure 24
Phasing Adjustment

Escapement Adjustments, Capstan Drive Mechanism

Figure 25 shows the tolerances to which the escapement assembly in the Capstan Drive Mechanism must adhere. Note that units incorporating the Reverse Option contain two such escapements. Adjustment procedures are identical for both forward and reverse escapements, but clearances differ and therefore require different size gages. See Reference Table - Measurements, page 26. The following procedures are based on a forward escapement. But they include gage identification for reverse escapements.

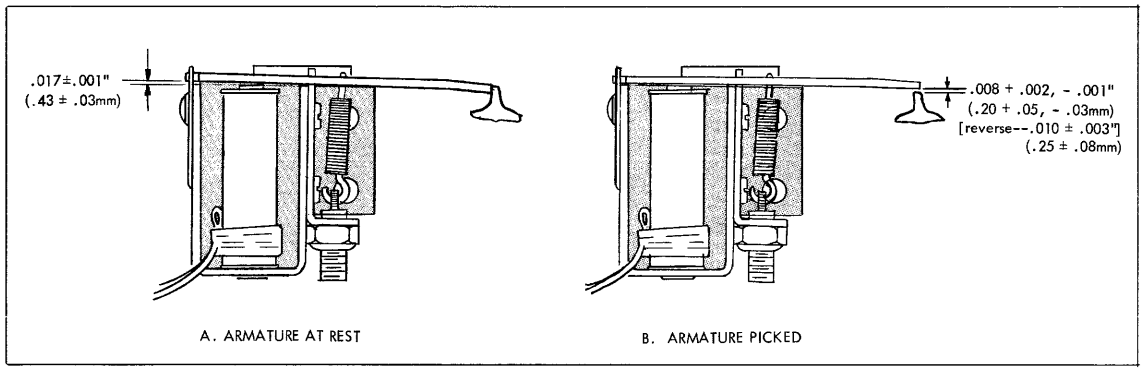


Figure 25
Escapement Tolerances,
Capstan Drive Mechanism

Heel Gap

Insert a .016" (.41mm) gage into the slot of the armature limit as shown in Figure 26. It must slip in easily. Repeat with a .018" (.46mm) gage, and see that it slips in with perceptible drag. Use Proto gage kit #000E, or equivalent.

To adjust, loosen screw "A" and reinsert the .018" gage; press the armature limit firmly against the gage and tighten screw "A" securely, taking special care that the coil frame does not pivot on the bracket at point "B".

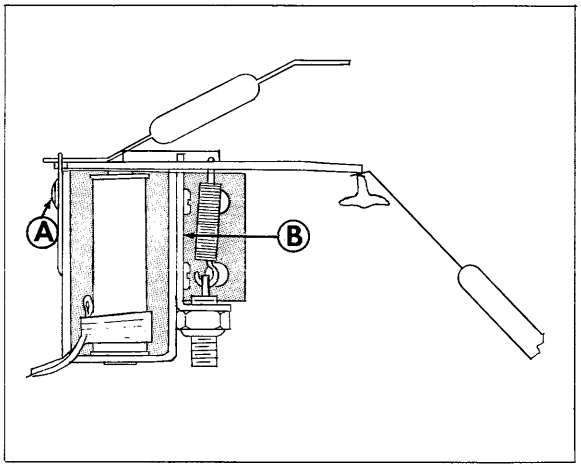


Figure 26
Heel Gap and Tip Clearance

Armature Tip Clearance

Insert a .016" (.41mm) gage into the slot of the armature limit. Turn the clutch so that the flat of a tooth rests under the armature tip. Pushing tip clearance gage #327940 from clutch toward coil as shown in Figure 26, see that the .008" (.2mm) end slips easily through the gap between the armature tip and the clutch tooth, and that the .010" (.25mm) end does so with perceptible drag. Note: For reverse escapements, use tip clearance gage #228860.

To adjust tip clearance, loosen slightly the assembly mounting screws shown in Figure 27. Place a small screw driver or awl between the mounting screws and bracket, and rotate the assembly in the desired direction. Retighten the mounting screws. An alternate method is to tap the assembly in the desired direction; point "A" or "C" to reduce clearance, and point "B" or "D" to increase it. Great care must be taken to avoid distorting the coil frame or bracket. In this respect, note that points "A" and "D" are on the bend of the bracket, applying force directly upon its shaded area.

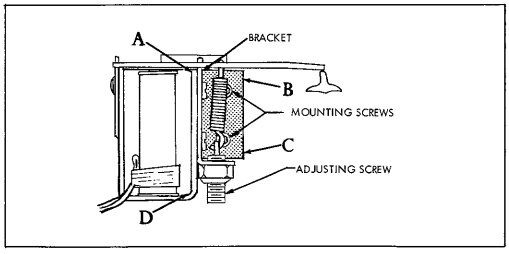


Figure 27
Tip Clearance Adjustment

Armature Spring Tension

Adjust the armature spring for 190 - 220 grams tension, measured at the armature end of the spring. Hold the adjusting screw (Figure 27) with an Allen wrench. Turn the 6-32 elastic stop nut mounted on it until it takes 200 grams pull at the spring to achieve first motion. Force exerted must be 90° from the armature, and the armature must be free of contact with the control sleeve.

Reeling Adjustment

Adjust the Reel Drive Mechanism so that the tension spring (5, Figure 13) is near maximum extension with the brake (1) hard against the brake gear (7). Adjust the Tape Tension Arm so that in its farthest counter-clockwise travel it does not protrude beyond the edge of the panel, and it holds in position at the opposite end of its travel.

Wear Points, Escapement Assemblies

Most parts in the P-120 which are subject to wear will show this wear in an obvious manner. A worn bushing, for instance, may result in sloppy shaft rotation -- or a worn wave washer may result in excessive end play. But some parts -- particularly in escapement assemblies -- are less direct in calling attention to themselves. This section will identify these parts and define "wear" in terms of replacement need. The worn parts shown in Figure 28 are not necessarily those used in a current Model P-120. The wear points, however, are representative of what to look for.

Clutch Teeth

Wear on the clutch teeth occurs where the armature tip strikes the tooth, and shows an indentation in the leading edge of the tooth as shown in Figure 28A.

Anti-Residual Shims

Anti-residual shims show wear in three areas: the slot where the shim fits over the bracket, the area where the shim strikes the pole of the coil, and the edge. Figure 28B shows a badly worn shim. Note the impact scars, the uneven tip and the jagged edge. Any of these indicates the need for replacement. Note: A worn shim is often accompanied by a worn armature, bracket or limit. Check these items.

Bracket

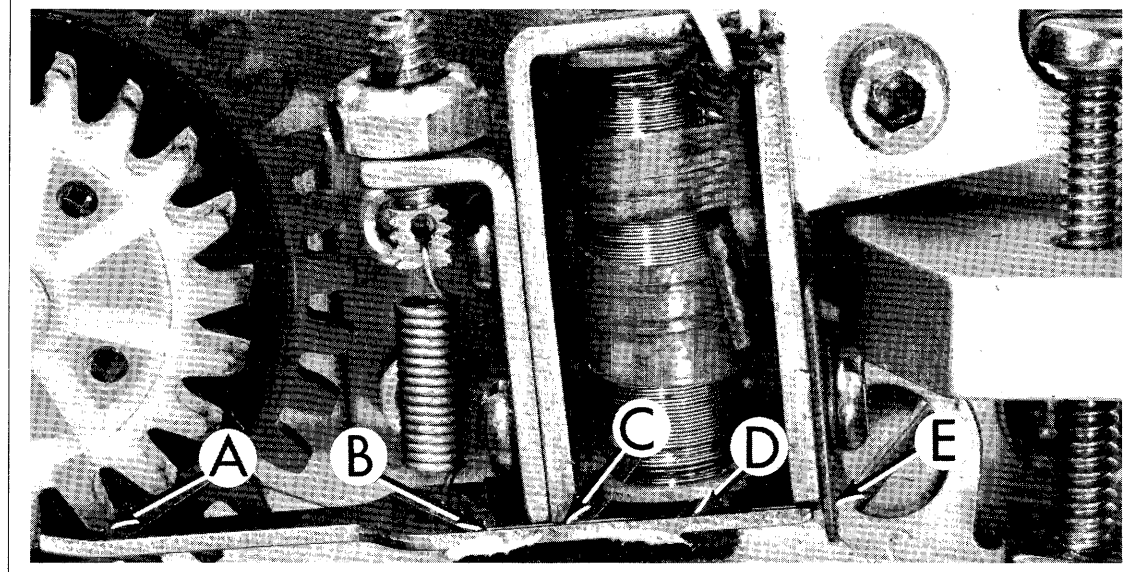
Wear on the bracket occurs where the anti-residual shim strikes its bottom edge, shown in Figure 28C.

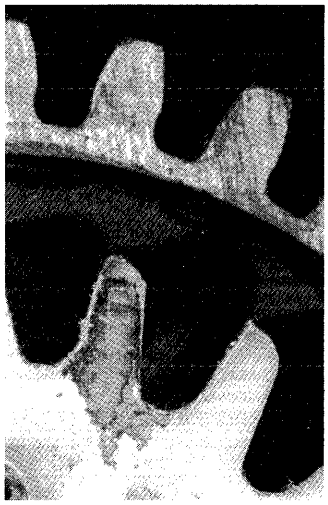
Armature

Wear points on armatures are similar to those on anti-residual shims. Figure 28D shows a Capstan Drive armature. Though this is of a different design from those in the Perforator Mechanism, wear points are the same.

Armature Limit

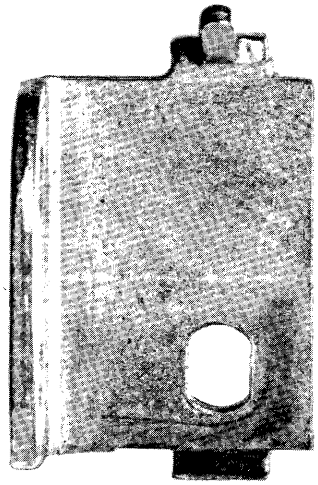
Wear on the armature limit is evident in deformation of the slot that receives the heel of the armature. See Figure 28E.



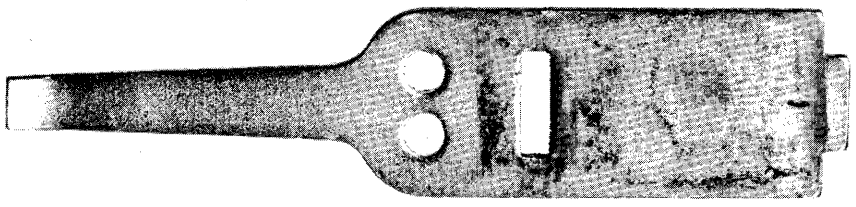


A

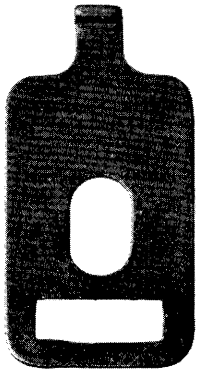
B



C



D



E

Figure 28
Wear Points, Escapement Assemblies

Motor

Remove the motor according to the following steps:

1. Drain the oil.
2. Disconnect the motor wiring.
3. Remove the three motor mount screws and lift the motor off.

Install the motor according to the following steps:

1. Put the oil seal on the motor end boot (11, Figure 48).
2. Put the gear (14, Figure 47) on the motor shaft.
3. Slide the motor into position, turning the motor shaft slightly to facilitate gear meshing.
4. Install the motor mount spacers and screws loosely (put RTV891 silastic on screw threads for oil sealing).
5. Move the motor up and down slightly while turning the motor shaft to find a free-running position, and tighten screws. Check for sufficient gear backlash to prevent binding.
6. Replace the oil.

Capstan Drive Mechanism

Parts replacement in the capstan drive would, at the absolute maximum, consist of replacing friction clutches, ball bearings and escapements (and reverse stepper for bi-directional units).

Friction clutches are factory stocked as broken in, adjusted assemblies, and need only be installed. Escapement assemblies are also stocked as assemblies, but require adjustment on installation. Individual escapement parts are also on hand.

The Capstan Drive Mechanism must be removed as a unit for access to these assemblies. This is done in the following procedure:

1. Pull the taper pins connecting the coil leads to the taper pin board.
2. Remove the drive belt and the escapement adjusting screw to expose the two mounting screws (B, Figure 29).
3. Remove the four mounting screws (A and B, Figure 29). Slide the package back and up to pull it away from the panel.

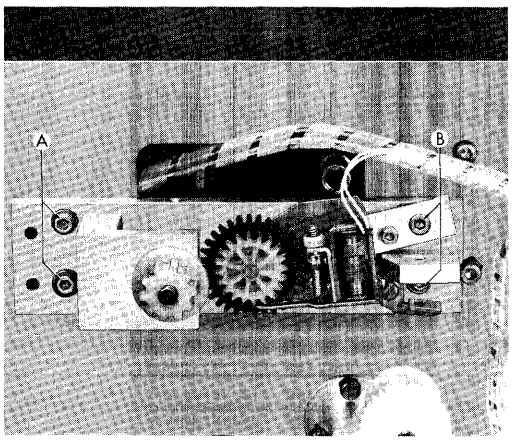


Figure 29
Removing the CDM

Clutch/Shaft Assembly

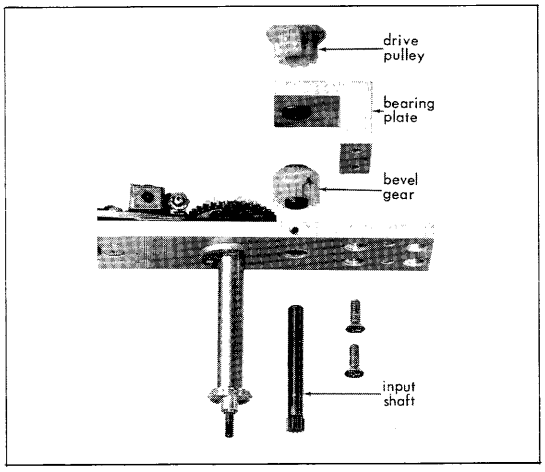


Figure 30
Input Shaft Removal

1. Remove the drive pulley.
2. Loosen the set screw on the bevel gear; remove the capstan input shaft, allowing the bevel gear to drop out. Retain the shims.
3. Remove with a Phillips screw driver, the two screws holding the cantilevered bearing plate; remove the bearing plate.
4. Remove the armature and anti-residual shim.
5. Remove the collet pin cap. With Tally wrench #319030, remove the collet pin, by twisting clockwise and pulling at the same time. See Figure 19.
6. Remove the capstan; retain the shims, as they are selected for this particular unit and will insure correct edge-to-hole spacing upon reassembly.
7. Press the clutch/shaft assembly out of its bearings. If the bearings are worn, replace them.
8. To install a new clutch/shaft assembly, reverse the above procedure. Be sure to reinstall all shims. Note: Adjustments must now be made. See Escapement Adjustments, Capstan Drive Mechanism (page 18).

Escapement Assembly Replacement

Replacing the escapement assembly involves simply removing the two mounting screws and changing the assembly. Adjust according to Escapement Adjustments, Capstan Drive Mechanism (page 18).

Capstan Drive Unit Reassembly

1. Reverse the disassembly technique.
2. Check end plays according to the table on page 26.
3. Install the pulley to clear the bearing plate by 1/32 inch.

Capstan Drive Unit Reinstallation

Reverse the removal technique under Capstan Drive Mechanism, page 22. Check the chad auger gear for worn or stripped teeth. Allow a small amount of backlash between the chad auger drive shaft and the metal gear on the input shaft.

Perforator Mechanism

When repairs or adjustments are necessary within the perforator mechanism, disconnect power from the unit. Remove the chad box and drain the oil from the oil pan. Remove the ten screws holding the oil pan to the panel, and the two screws holding it to the tape deck. Remove the oil pan, exposing the mechanism. See Figure 31.

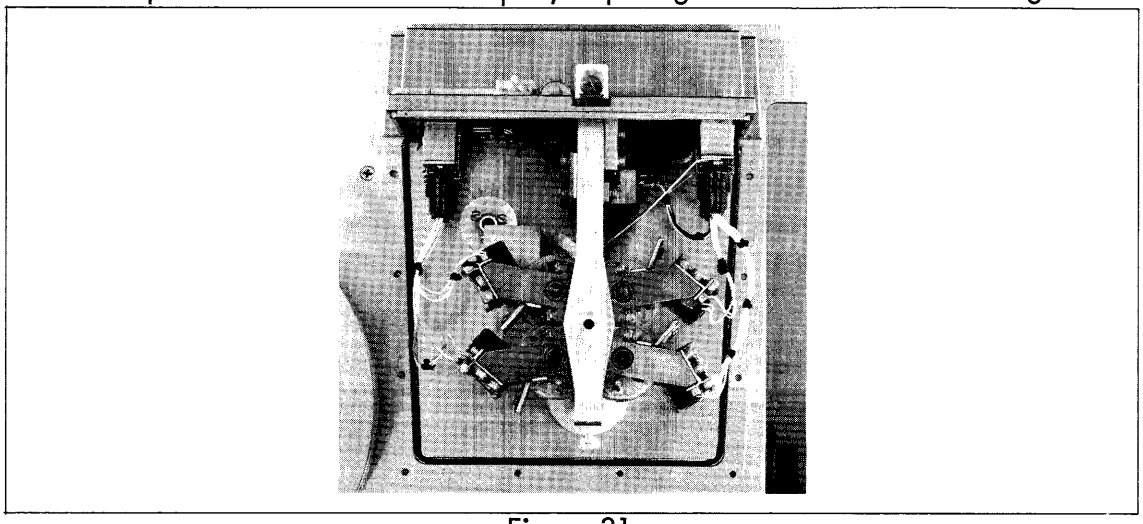


Figure 31
Perforator Mechanism Exposed

Clutch Bank Replacement

When a malfunction is traced to any part within one of the four clutch banks, Tally suggests that the assembly be replaced and returned to the factory for repair and/or adjustment, for proper clutch bank assembly is extremely difficult to perform in the field.

To remove the clutch bank, simply unplug its cable assembly and remove the screws holding the bank to the mechanism.

When installing a clutch bank, first check its adjustments according to Escapement Adjustments, Perforator Mechanism, page 16. Then turn all corresponding eccentrics to bottom dead center, so that their punches are down. Release all armatures on the clutch bank. Turn the shaft until all control sleeves are in contact with the armatures. Turn each gear an additional three teeth; their rebound springs will hold them. Screw the clutch bank to the mechanism, and plug the clutch bank connectors in their respective sockets as shown in Figure 50. Note: It is now necessary to phase the bank's punches with the rest of the punches in the perforator mechanism. See Punch Phasing, page 18.

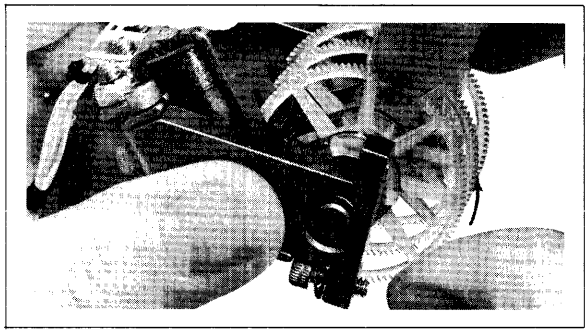


Figure 32
Winding the Clutches

Die Plate Removal

Removal of the die plate is sometimes necessary for cleaning chad, or checking punch phasing. The following steps are required. See Figure 33.

1. Remove the chad box.
2. Slide off the delrin chad chute (Detail A).
3. Unscrew the chad auger by stroking it as shown in Detail B. Note that uni-directional capstan drive mechanisms use a left-hand thread.
4. Remove the two mounting screws and gently pry the die plate off the dowel pins. Take care to avoid breaking dowel pins.

   For installation, first run the punch pins up to assure proper alignment. Then, reverse the above procedure.

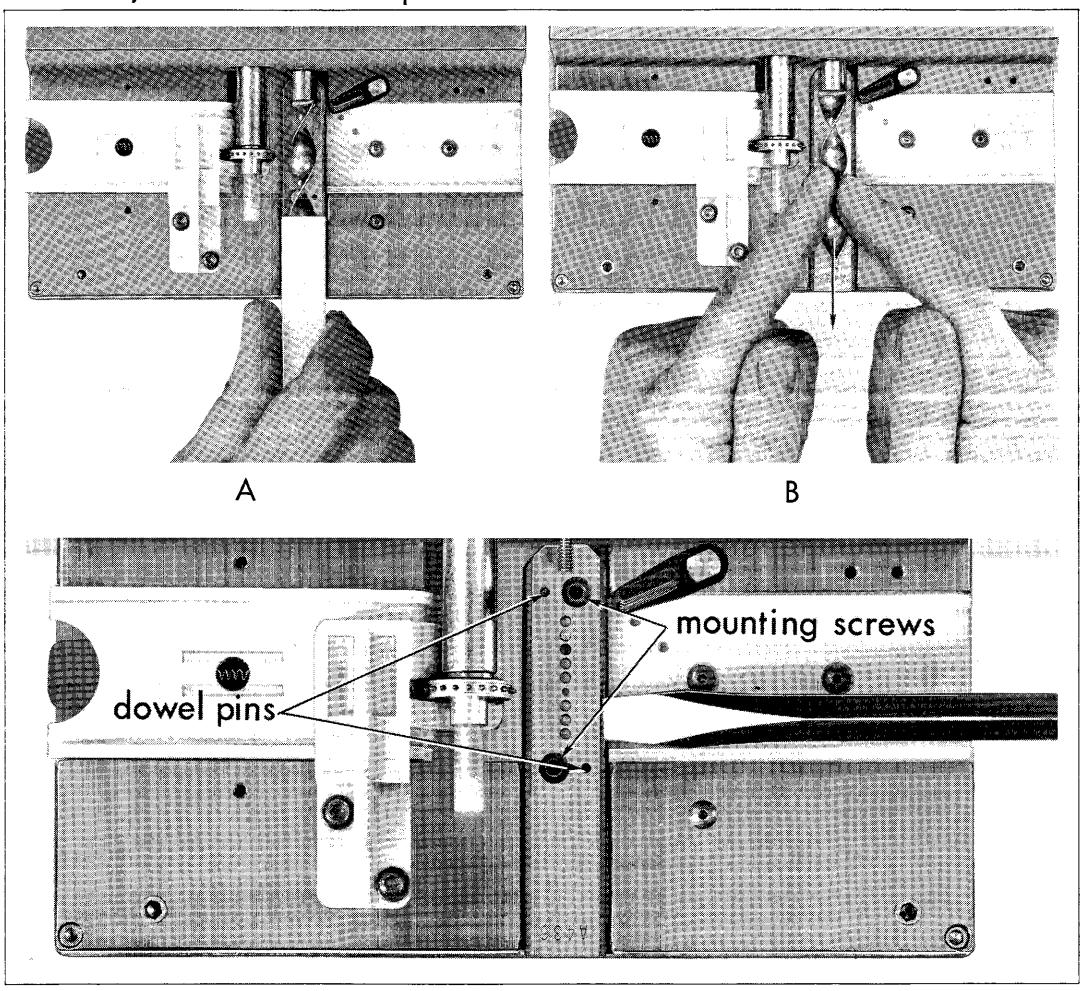


Figure 33
Die Plate Removal

Reference Table—Measurements

CAPSTAN DRIVE MECHANISM

Input Shaft End Play	.005 - .015" (.13 - .38mm)
Capstan Shaft End Play	.001 - .002" (.03 - .05mm)
Drive Shaft and Gear Assembly End Play	.005 - .015" (.13 - .38mm)
Idler Pulley End Play (reverse option only)	.001 - .02" (.03 - .51mm)
Idler Bevel Gear End Play (reverse option only)	.001 - .010" (.03 - .25mm)
Armature Limit Clearance	.017 ± .001" (.43 ± .03mm)
Armature Tip Clearance	
Forward	.008 + .002, - .001" (.20 + .05, - .03mm)
Reverse	.010 ± .003" (.25 ± .08mm)
Armature Tip Face	Full engagement on tooth. .015" (.38mm) overhang allowed
Spring Tension	200 + 20, - 10 grams.

REELING MECHANISM

Input Shaft End Play	.010 - .020" (.25 - .50mm)
Drive Shaft End Play	.010 - .020" (.25 - .50mm)
Brake Arm Shaft End Play	.002 - .025" (.05 - .64mm)
Input Drive Gear Clearance	.002 - .012" (.05 - .30mm)
Clearance between Reeling Mechanism Frame and Brake Spring Link	.005 - .040" (.13 - 1.0mm)

GENERAL

Belt Deflection	1/4 ± 1/8" (6.4 ± 3.2mm) Belt all on pulley, with no climb on flanges.
Sensing Arm	Lockout position must not overhang panel.

OPTIONS

The Model P-120 has two classes of option: that which adds a function to the unit, and that which limits the unit's operation. Examples of the latter are Five Channel, Six Channel, Seven Channel and Teletypesetter. These are covered in the standard parts lists, as are 24VDC pulse amplitude and 230VAC/50 cps motor power.

Reverse

This option allows the perforator to reverse-step at 25 char/sec maximum. It requires a bi-directional Capstan Drive Mechanism to replace the standard one. Wiring is shown in Figure 44.

Lubrication and other maintenance requirements are similar to those of the uni-directional Capstan Drive Mechanism, except there are more parts involved.

Mechanical Operation (See Figure 34)

Power is applied through the input shaft (33) to the bevel gear (14), which is mounted on it and held with a set screw. The bevel gear transfers this power to the reverse friction clutch assembly (4), which turns the forward clutch assembly (9).

Energizing the forward escapement coil (16) causes the armature on the forward escapement to release the forward friction clutch (9), which steps the capstan (40) one step forward. The armature engages the next tooth of the clutch assembly, stopping the action.

Energizing the reverse escapement coil (8) causes the armature of the reverse escapement to release the reverse friction clutch (4). The reverse friction clutch drives the stepper drive gear, turning the stepper (6), which is attached to the same shaft. The stepper momentarily engages the forward escapement gear -- part of the forward friction clutch assembly -- and kicks it back one and a half steps. As the stepper clears the forward escapement gear, the gear returns to forward rotation, and after a half step engages the forward escapement, thereby indexing in forward motion. This action allows positive tape indexing for direct overpunch on delete codes.

Escapement Adjustments

Escapement adjustments are the same as those shown in Figure 25, except that armature tip clearance on the reverse escapement is .010 ± .003" (.25 ± .08mm).

Parts Replacement

Remove the Capstan Drive Mechanism as outlined in steps 1, 2 and 3 of Capstan Drive Mechanism, page 22.

The package may now be broken into two parts, the "front bearing plate assembly" and the "rear bearing plate assembly." Remove the pulley (30, Figure 48) and six Phillips head screws holding the three spacer plates (11, 24, Figure 34). Take the screws from the rear bearing plate side, so that the spacer plates go with the front bearing plate assembly. Note: When replacing either the forward or reverse clutch or escapement assembly, readjust tip clearances as shown in Figure 25 and Escapement Adjustments, Capstan Drive Mechanism, page 18.

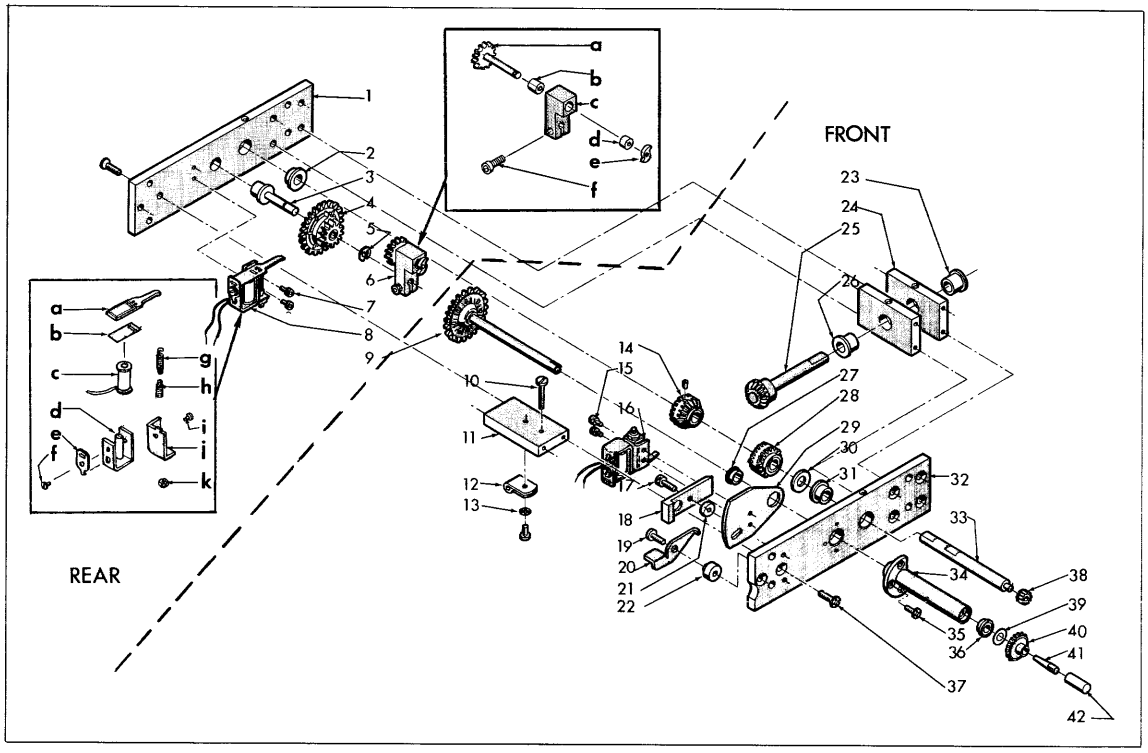


Figure 34
Exploded View,
Bi-Directional Capstan Drive Mechanism

PARTS LIST

Bi-Directional Capstan Drive Mechanism
(48 volt -- 301171 24 volt -- 301172)

Index	Part Number	Description	Index	Part Number	Description
1	300060	Plate, Rear Bearing	5	4096200	Ring, Retaining, (TRUARC #5133-18)
2	304212	Bearing			
3	300240	Pivot, Reverse Clutch	6	300890	Step Jack Assembly
4	301810	Clutch Assembly, Reverse	6a	301160	Gear Assembly

Index	Part Number	Description
6b	304209	Bearing
6c	300500	Bracket, Bearing
6d	304209	Bearing
6e	300630	Stepper, Reverse
6f	4165100	Screw, Socket Cap, 8-32 x 1/2"
7	4155000	Screw, Socket Cap, 4-40 x 1/4"
8	300172	Escapement Assembly, 48 volt
8	319941	Escapement Assembly, 24 volt
8a	318460	Armature Assembly, w/Oil Reservoir
8b	226374	Shim, Anti-Residual
8c	220532	Coil Assembly, 220Ω (48V)
8c	220535	Coil Assembly, 50Ω (24V)
8d	223760	Frame Assembly, Coil
8e	223770	Limit, Escapement
8f	4157500	Screw, Pan Head Slotted, 4-48 x 1/8"
8g	300372	Spring, Actuator
8h	304370	Screw, Spring Tension Adjust
8i	4157500	Screw, Pan Head Slotted, 4-48 x 1/8"
8j	313740	Bracket
8k	4172400	Nut, Elastic Stop, 6-32
9	301200	Clutch Assembly, Forward
10	4161800	Screw, Pan Head, 6-32 x 3/4"
11	300040	Spacer, Bearing Block
12	4097900	Clamp, Cable, 1/8"
13	4155100	Screw, Pan Head Slotted, 4-40 x 1/4"
14	138240	Gear, Bevel Cluster
15	314370	Screw, Socket Head Cap, 4-40 x 1/8"
16 ▷1	319940	Escapement Assembly, 48 volt
16 ▷1	319941	Escapement Assembly, 24 volt
17	4160100	Screw, Socket Head Cap, 6-32 x 3/8"
18	300260	Clamp, Adjust Plate
19	4160200	Screw, Pan Head Slotted, 6-32 x 3/8"
20	300070	Lever, Adjust
21	340630	Spacer, Adjust Plate Clamp
22	300080	Spacer, Adjust Lever
23	304213	Bushing
24	220640	Spacer, Bearing Block
25	135511	Drive Shaft and Gear Assembly
26	304213	Bushing
27	320822	Bearing, Ball
28	135540	Gear, Bevel Cluster, w/Set Screw
29	300280	Plate, Capstan Adjust
30	320221	Washer, Thrust
31	304212	Bushing
32	300050	Plate, Front Bearing
33	300781	Shaft, Capstan Drive
34	300510	Tube, Bearing Support
35	4156300	Screw, Flat Head, Phillips, 4-40 x 5/16"
36	320822	Bearing, Ball
37	4165500	Screw, Flat Head Phillips, 8-32 x 1/2"
38	301050	Gear, Chad Auger Drive
39	225370	Shim (as required)
40	300300	Capstan Assembly
41	310460	Pin, Collet

* * *

▷1 Same as Item #8, except:

8c	391961	Coil Assembly, 24Ω (48V)
8c	329391	Coil Assembly, 7 1/2Ω (24V)
8d	319240	Frame Assembly, Coil

Note: Change also item 47, Figure 47, from 322070 to 300740.

End of Tape (P/N 334050)

The End of Tape option is located as shown in Figure 35. It consists essentially of a switch w/cover (1) and actuator (2). Tape passes between the actuator and the tape guide. When the end of the tape passes under the actuator, the bottom of the actuator drops into a depression in the tape guide; its lever action operates the switch. The switch may provide an open or closed circuit, depending on the customer's requirements. See the wiring diagram, Figure 44.

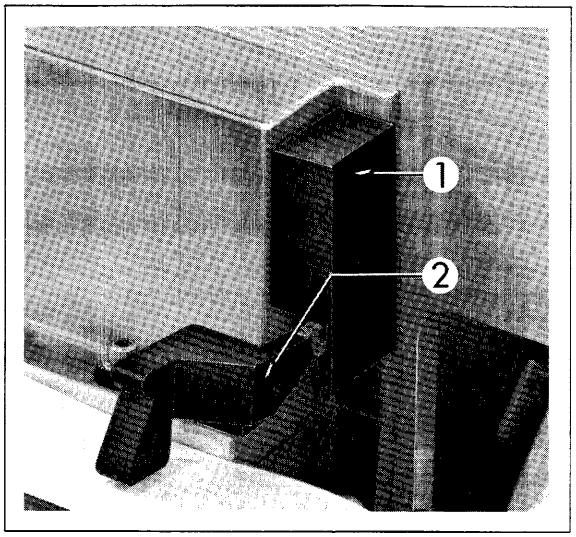


Figure 35
End of Tape Option

Adjustment

Slide the switch cover (1) up and off exposing the switch. Loosen the switch on its mounting plate and move it up or down to achieve switch operation when changing from "tape" to "no-tape."

Parts Changes

To incorporate End of Tape, the following parts are changed in Figure 48:

Part Number	Description
334420	Cable Assembly, 26 and 34 pin connectors (replaces item 51)
320301	Block, Taper Pin (added to item 48)
4098300	Clamp, Cable; 1/2" (2, replacing those on items 43 and 48)
4161860	Screw, Flat Head Phillips, 6-32 x 7/8" (2, replacing 2 on item 48)
4162050	Screw, Flat Head Phillips, 6-32 x 1" (1, replacing 1 on item 48)
336080	Kit, Maintenance (replaces item 53)

Also, the following parts are added to Figure 50: (See Figure 35 for location of major parts).

Part Number	Description
331860	Bracket and Lever Assembly
330000	Plate, Mounting, End of Tape Switch
330010	Cover, End of Tape Switch
333610	Actuator, End of Tape Switch
334040	Switch and Cable Assembly

Part Number	Description
4179100	Lockwasher, #2 Internal Tooth (2)
4179300	Lockwasher, #4 Internal Tooth (3)
4152600	Screw, 2-56 x 5/16" Pan Head Slotted (2)
4155100	Screw, 4-40 x 1/4" Pan Head Slotted (4)
4175100	Washer, 1/4" O.D. x 1/8" I.D. x .020" (4)

Low Tape (P/N 327520)

The Low Tape option is composed of a switch mounted on a bracket alongside the tape supply reel, and a sensing arm which rests on the roll of tape in the supply reel.

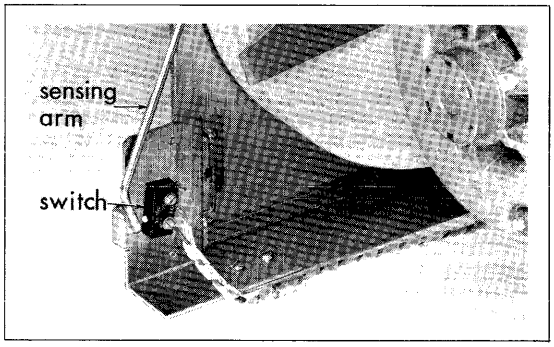


Figure 36
Low Tape Option

It normally operates when approximately 50 feet of tape remains on the supply reel, but it may be adjusted to indicate any amount of tape by bending the sensing arm. The switch may provide an open or closed circuit to indicate low tape, depending on the customer's requirements. See the wiring diagram, Figure 44.

To incorporate the Low Tape option, the following parts are added to Figure 48:

Part Number	Description
321440	Bracket, Mounting (replaces item 3)
332570	Switch and Cable Assembly
148620	Arm, Sensing
319921	Ring, Grip (TRUARC #5555-12)
4155600	Screw, Pan Head Slotted, 4-40 x 3/8" (replaces item 5)
4152500	Screw, Pan Head Slotted, 2-56 x 3/8" (2)
4179100	Lockwasher, #2 Internal Tooth (2)
4160200	Screw, Pan Head Slotted, 6-32 x 3/8"
4161820	Screw, Flat Head Phillips, 6-32 x 3/4"
4172850	Nut, Hex (Keps) 6-32
4097900	Clamp, Cable, 1/8" (3)

Tape Motion Sensor (P/N 335810)

The Tape Motion Sensor accessory is located on the left side of the tape deck as shown in Figure 37. It consists of a light source, a photo cell and a tape-driven idler sprocket rotating between them. Its inverted and amplified output is delivered to the interface as a + 12 volt level, as the photo cell senses a light condition. The amplifier printed circuit card is located on the back panel.

Operating as a focal plane shutter, a tape-driven idler sprocket with measured frames rotates between the light source and the photo cell. This provides the photo cell with a dark-light-dark sequential input at each character step. Normal tape motion steps the shutter at the same rate as the capstan. When the tape fails to advance, pulse output stops.

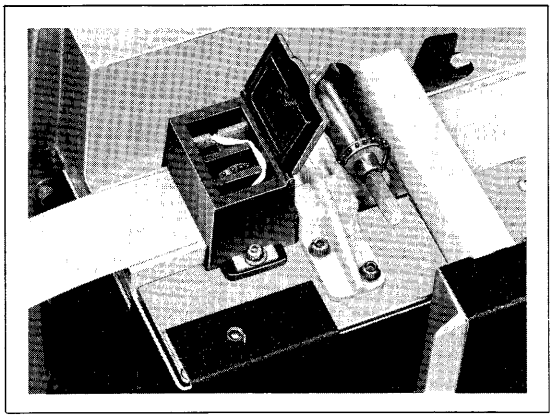


Figure 37
Tape Motion Sensor

Photo cell output is amplified to + 12 volts in the dark condition; output in the light condition is less than - 0.5 volts. These levels are inverted for delivery to the interface.

Tape advance occurs in a stepping manner. Since the timing of each step depends upon motor speed rather than perforator speed, Tape Motion Sensor pulse duration will be constant -- between one and two milliseconds. See Figure 38. Note: Customer logic should look for a negative shift to confirm tape motion.

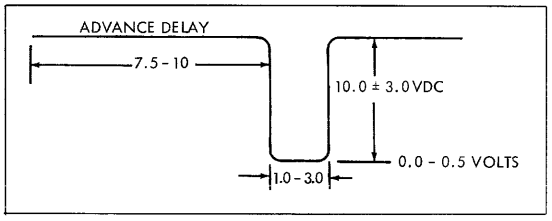


Figure 38
Timing, Tape Motion Sensor

To incorporate the Tape Motion Sensor accessory, the following parts are changed in Figure 48:

Index	Part Number	Description	Replaces
51	334420	Assembly, Cable, 26 & 34 Pin Connectors	334370
53	336080	Kit, Maintenance	336080
-	4098300	Clamp, Cable, 1/2" I.D. (2)	- -
-	4161200	Screw, 6-32 Flat Head Phillips (2)	Deleted
-	4160210	Screw, 6-32 x 3/8" Flat Head Phillips	Deleted
-	326320	Assembly, Tape Motion Sensor (See Figure 39)	Added
-	833076	Assembly, Tape Motion Amplifier (See Figure 40)	Added
-	328990	Hold-Down, Tape Motion Sensor (2)	Added
-	320301	Block, Taper Pin	Added

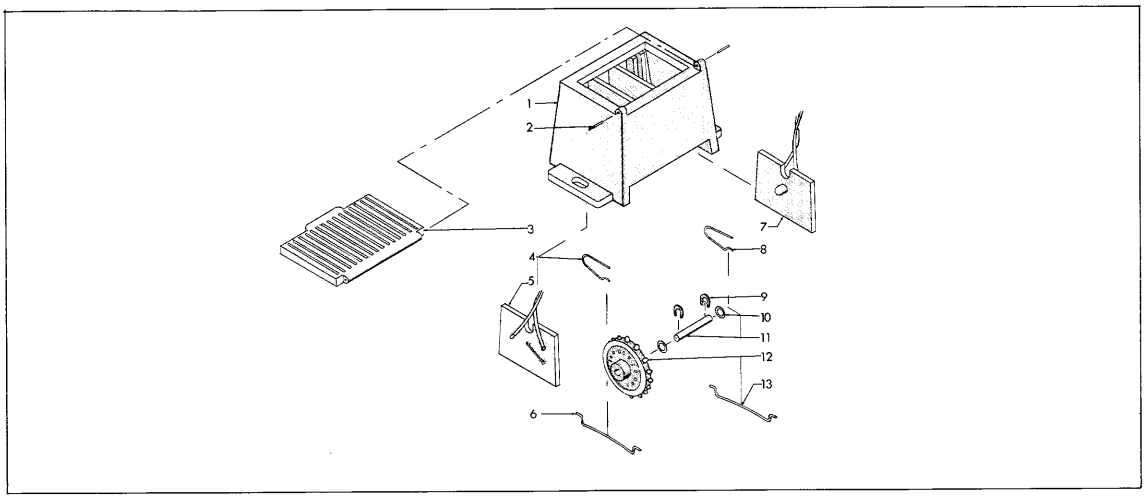


Figure 39
Exploded View,
Tape Motion Sensor (335810)

Index	Part Number	Description
1	325170	Housing
2	329260	Hinge Pin, Lid
3	329080	Lid, Housing
4	329100	Spring, Pivot Shaft
5	832637	Card Assembly, Light Sensor Mounting
6	329090	Spring, Retainer
7	833594	Card Assembly, Lamp Mounting
8	329100	Spring, Pivot Shaft
9	4096450	Ring, Grip (TRUARC #5555 G-9)
10	309793	Shim
11	329000	Shaft, Capstan
12	325110	Capstan
13	329090	Spring, Retainer

* * *

1	325171	Housing (Rev. option)
2	832638	Card Assembly, Lamp Mounting (5.5V)

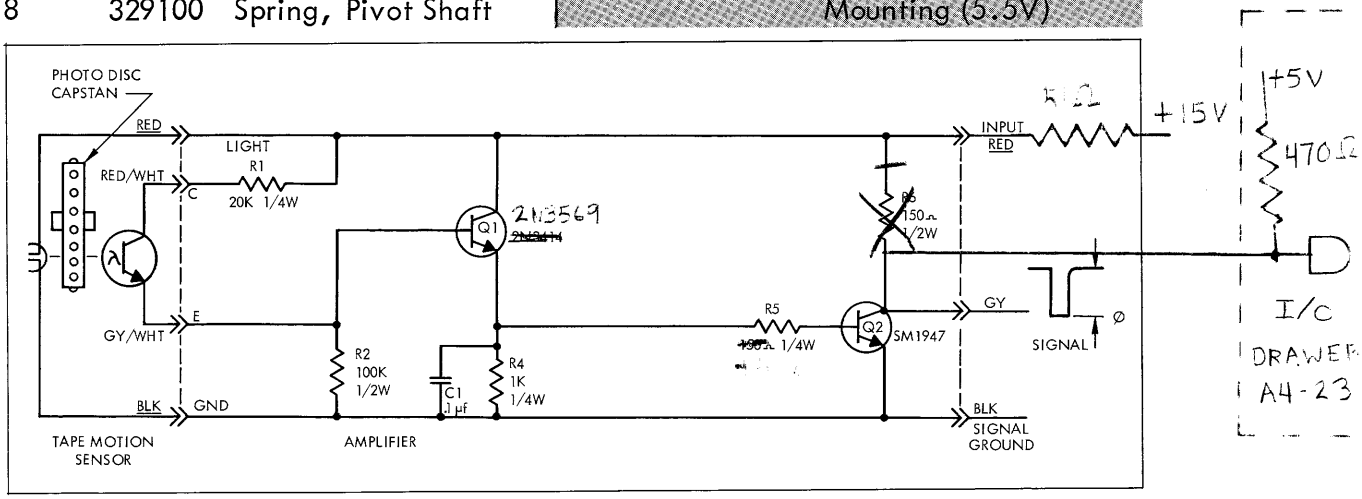


Figure 40
Circuit Diagram
Amplifier Assembly

Parity (P/N's 327500, 338640, and 334800, for 8, 7 or 5 channel operation)

The Parity option consists of eight modified form "C" switches -- one for each channel. Each switch is tied to its punch as shown in Figure 41. As the punches move through the paper tape, the corresponding punch linkages force their movable contacts from the "no-hole" to "hole" position. This gates a delayed interrogation pulse (customer supplied) through an odd or even output, depending on how many channels are punched.

This action takes place in time for the customer to exercise his option to stop on character in the event of a parity error. See Figure 42 for switch-controlled pulse routing.

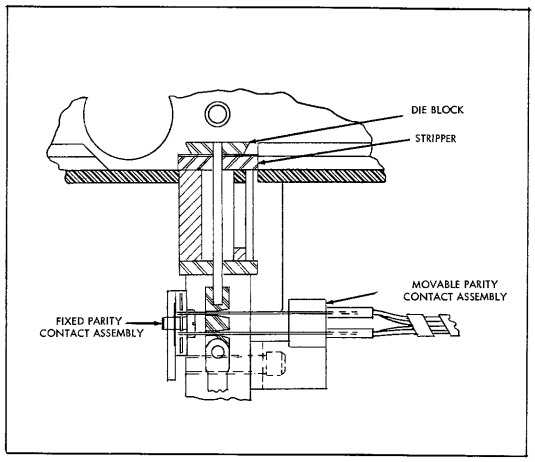


Figure 41
Parity Switching

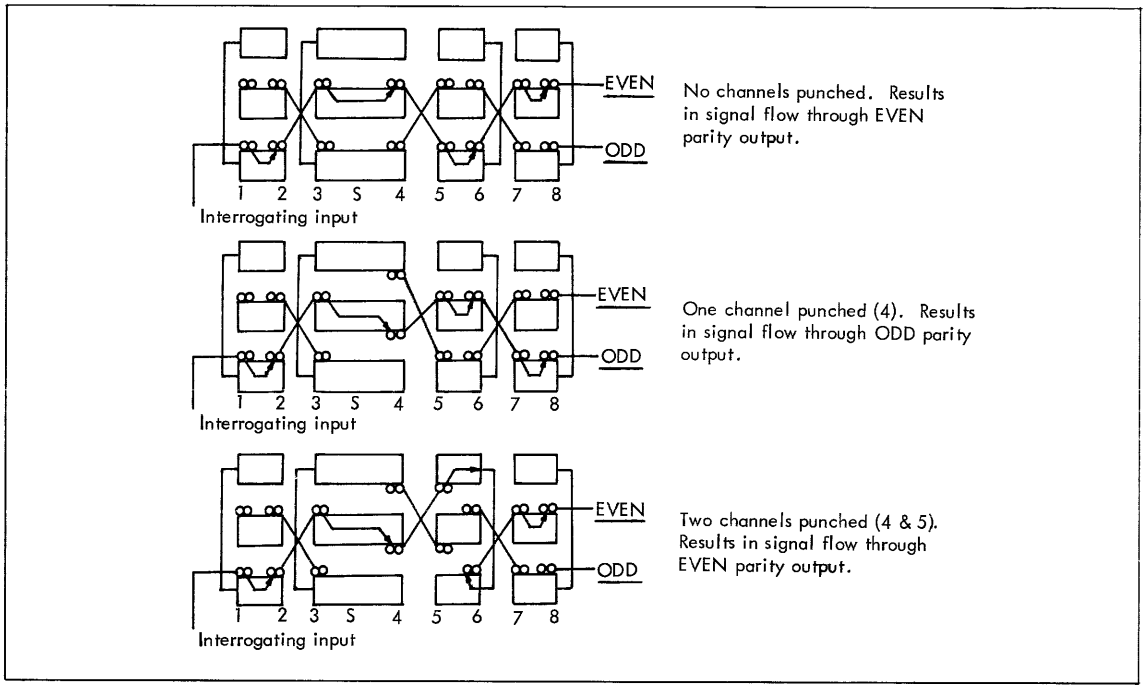


Figure 42
Pulse Routing, Parity

The movable contacts are adjusted so that their contact wires are parallel to the tape deck surface and the punch linkages are not deflecting the wires, when the punch pins are at mid-travel. The fixed contact board is adjusted so that the movable contact wires are centered within the fixed contact gap with the punch pins at mid-travel. With this adjustment, a dynamic inspection should show contact closures of at least 1.0 millisecond duration.

In order to obtain the necessary information at the proper time, the following circuit criteria are necessary:

1. Test Delay Period: 4.5 milliseconds after start of data pulse, with a stability of 0.1 milliseconds or better.
2. Test Pulse Period: 300 microseconds minimum. This period is determined by the external circuitry it controls; the pulse is triggered by the trailing edge of the Parity Test Delay.
3. Test Pulse Amplitude: 15 to 30 volts. Impedence on the output side of the contacts should be approximately 470 ohms to provide sufficient current to break through the oil film present on the contacts. The contacts are rated for 2.0 amperes, gated switching.

To obtain maximum accuracy, the customer logic should test for a contact closure rather than an open. Since the parity contacts are subject to bounce, any closure within the test zone should be considered a successful test. When no closure occurs, the circuit should indicate an unsuccessful test. Consult the P-120 engineering specification (ES-P-120) for suggested circuits.

To incorporate the Parity Option, the following parts are added to Figure 50:

Part Number	Description
300580	Bracket, Fixed Contacts
301040	Spacer, Fixed Contacts
[1] 301120	Contact Assembly, Fixed
[1] 303800	Contact Assembly, Movable
[1] 300950	Jumper, Fixed Contacts (4)
334490	Cable Assembly

[1] For 7 or 5 channel units, replace these items with one "Parity Contacts and Connector Assembly" (338660 for 7 channel or 334790 for 5).

Bit Echo (P/N 334870)

The Bit Echo option provides a switch closure to the interface for each channel as it is punched. It consists of nine form "A" switches -- one for each channel and one for the sprocket punch. Each switch is tied to its punch as shown in Figure 41. As a punch moves through the paper tape, its linkage closes the switch for that channel. An interrogation pulse at pin A of P2 will be gated to any combination of pins B through L, depending on which channels were punched. See Figure 44.

Adjustments and circuit criteria are the same as those for the Parity option. See Parity, page 34.

Bit Echo (continued)

To incorporate the Bit Echo option, the following parts are changed:

Part Number	Description
334420	Cable Assembly, 26 and 34 Pin Connector (replaces item 51, Figure 48)
320301	Board, Taper Pin (added to item 48, Figure 48)
336080	Kit, Maintenance (replaces item 53, Figure 48)
4161860	Screw, Flat Head Phillips, 6-32 x 7/8" (2, replacing those on item 48, Figure 48)
4162050	Screw, Flat Head Phillips, 6-32 x 1" (1, replacing one on item 48, Figure 48)
4098300	Clamp, Cable, 1/2" (2, replacing those on items 43 and 48, Figure 48)
334620	Cable Assembly (replaces item 7, Figure 50)
329790	Contacts and Connector Assembly (mounts like item 28, Figure 50)
300580	Bracket, Mounting, Fixed Contacts (see item 13, Figure 50)
301040	Spacer, Fixed Contacts (2 -- see item 11, Figure 50)
4160000	Screw, Socket Cap, 6-32 x 3/8" (6)
4179400	Lockwasher, #6 Internal Tooth (6)
4154600	Screw, Pan Head Slotted, 4-40 x 3/16" (2)

5-8 Level Switch (P/N 335040)

The 5-8 Level Switch option provides a switch closure to the interface to indicate the position of the tape width arm on the tape guide insert. Mounted under the tape deck as shown in Figure 43, a microswitch closes when the tape width arm is moved to the 5 Level Tape position. Wiring is as shown in Figure 44.

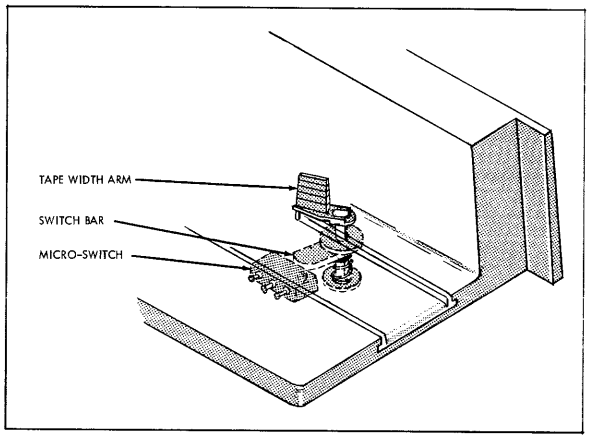


Figure 43
5-8 Level Switch

To incorporate the 5-8 Level Switch option, the following parts are added to Figure 50:

Part Number	Description
325010	Switch Bar
334910	Switch and Cable Assembly
4178500	Lockwasher, #2, Split (2)
4179100	Lockwasher, #2, Internal Tooth (2)
4152750	Screw, 2-56 x 1/2" Flat Head Phillips (2)
4176150	Washer, 1/8" I.D. x 5/16" O.D. x .020"

TROUBLE SHOOTING

Malfunction	Possible Cause	
	Mechanical	Electrical
CAPSTAN DRIVE MECHANISM		
Erratic hole spacing (low speed)	1. Hole-to-hole spacing misadjusted. 2. Tape retainer too tight. 3. Tape stripper too tight. 4. Tape retainer too loose (Tape must go to pitch line immediately).	1. Advance delay too early.
Erratic hole spacing (high speed)	1. Sluggish capstan: a. bent shaft. b. insufficient capstan end play. c. insufficient friction clutch torque. d. tape retainer and tape stripper too tight. e. punches out of phase. f. tape supply slide not feeding properly.	1. Advance delay too late.
Hole-to-hole spacing "on" at low speed and "off" at 120 char/sec.	1. Tape retainer too loose. 2. Tape stripper too loose. 3. Punches out of phase. 4. Tape supply slide not feeding properly.	1. Advance delay too early or too late.
Hole spacing changes while running at constant speed.	1. Capstan loose on shaft. 2. Capstan lock plate loose.	

Malfunction	Possible Cause	
	Mechanical	Electrical
CAPSTAN DRIVE MECHANISM (continued)		
Fails to advance tape.	1. Insufficient tip clearance.	1. No advance pulse.
	2. Excessive heel gap.	2. Insufficient duration of advance pulse.
	3. Excessive spring tension.	3. Insufficient amplitude of advance pulse (48 ± 3 volts).
	4. Reverse stepper engaged (reverse option only).	
	5. Mechanical bind on capstan or shaft.	
	6. Dirty die block.	
Skip -- advances two or more steps on one pulse.	1. Excessive tip clearance.	1. Excessive pulse duration.
	2. Insufficient spring tension.	
Skip -- in repetitive fashion (every 20 spaces).	1. Broken or nipped escapement tooth.	
PERFORATOR MECHANISM		
Fails to punch.	1. Insufficient tip clearance.	1. Improper pulse duration or amplitude.
	2. Excessive air gap.	2. Motor not running.

Malfunction	Possible Cause	
	Mechanical	Electrical
PERFORATOR MECHANISM (continued)		
Fails to punch	3. Excessive spring tension. 4. Armature interference. 5. Defective coil. 6. Stuck punch pin. 7. Broken clutch anchor. 8. Defective eccentric.	3. Burned out coil. 4. Broken connections. 5. Faulty series capacitor.
Double punch	1. Excessive tip clearance. 2. Insufficient spring tension 3. Armature interference.	1. Improper pulse.
REVERSE (option)		
Fails to reverse step	1. Defective stepper tooth. 2. See "Fails to advance tape," Capstan Drive Mechanism, page 38.	1. Improper wiring.

PARITY (option)

Although the oscilloscope pictures of Figure 45 show parity timing, note that the problems they depict are often in other areas of the unit. These pictures, therefore, can be an aid in overall trouble shooting on a unit with the Parity option. To check the parity contacts without using a special tester, disconnect pins 5, 6 and 7 from the top of TC-1. Connect a 47K resistor from pin 1 of TC-1* to the solid black wire which was removed from pin 6. Attach the oscilloscope probe to the junction of the 47K resistor and the solid black wire. To monitor EVEN output, ground the white/red wire to the same ground source to which the oscilloscope is grounded. To monitor ODD output, ground the black/white wire. See Figure 44.

* This procedure assumes a constant + 50 volts at this point - the capstan drive common.

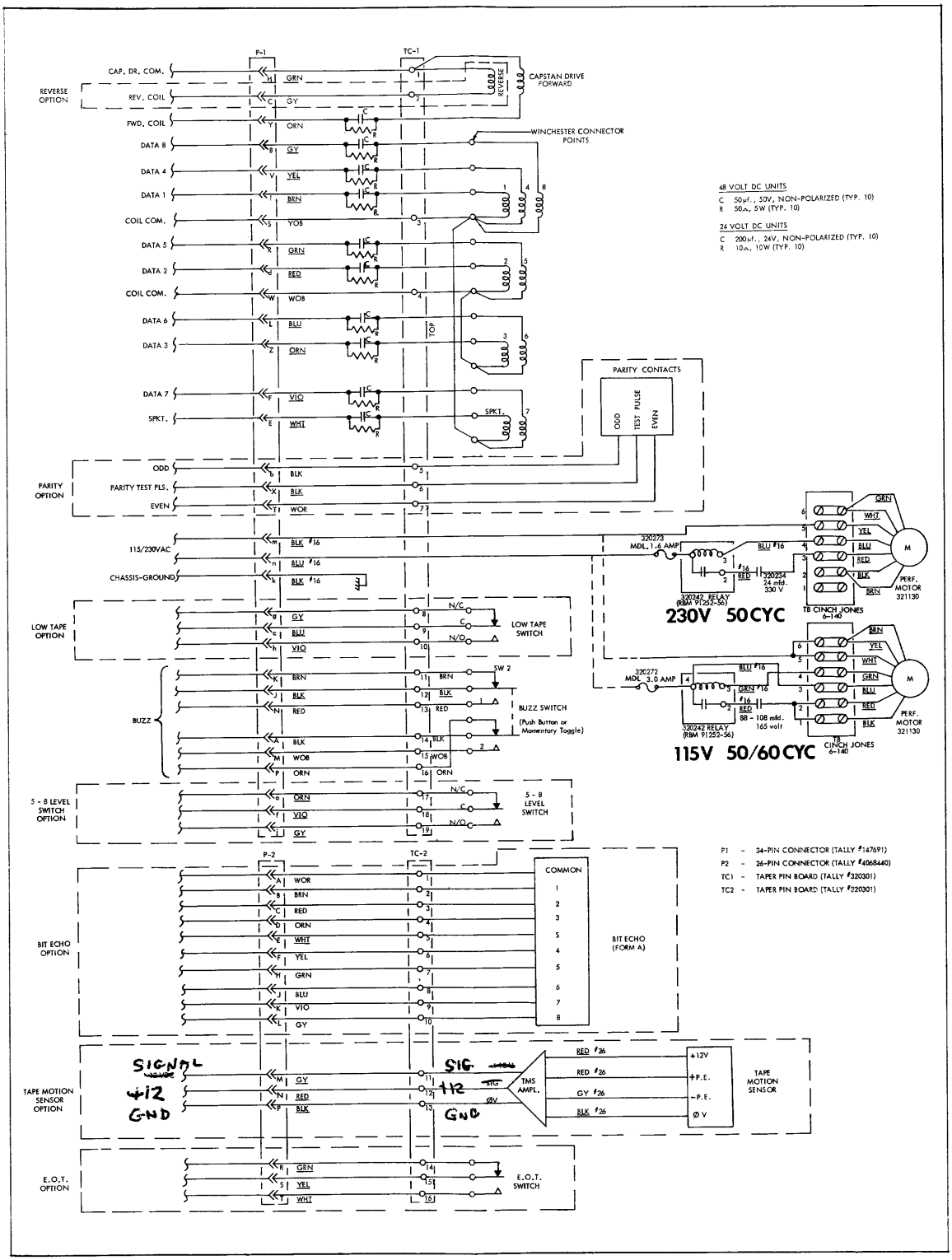
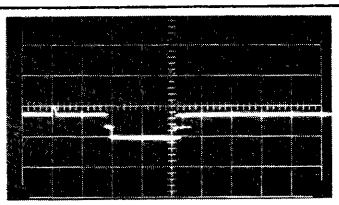
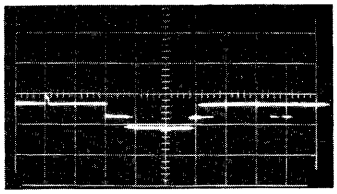
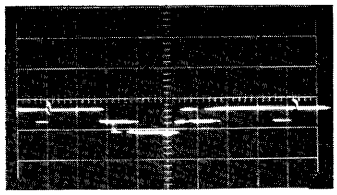
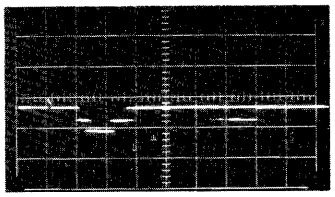
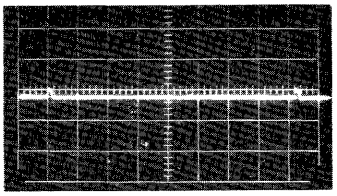
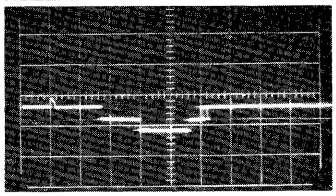
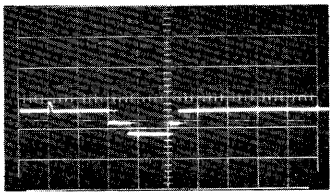
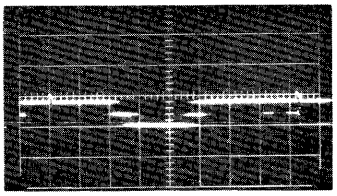
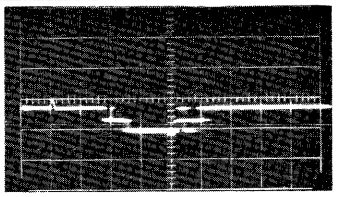
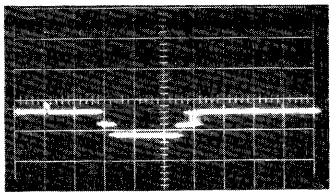
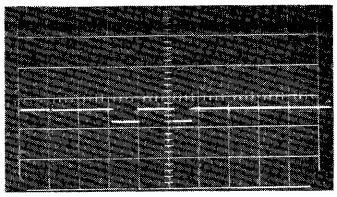
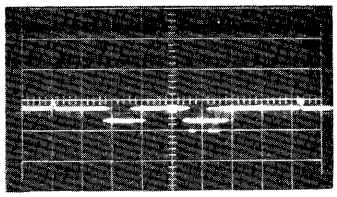
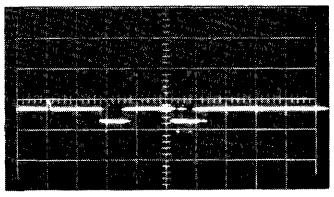


Figure 44
Wiring Diagram

Picture	Malfunction	Possible Cause
A	Normal picture for one punch.	
B.	Clutch overshot (contact open downstream).	1. Early phasing. 2. Clutch too fast. 3. Too much clutch overshoot. 4. Defective rebound spring.
C	Same as B, but worse.	
D	Same as C, but worse.	
E	No parity at all.	1. Parity circuit open. a. clutch far out of phase. b. broken parity wire. c. miswired. d. open fixed parity board.
F	Extremely sensitive and possibly erratic operation.	1. Parity board adjusted too low. 2. Extremely slow clutch. 3. Dragging punch pin. 4. Binding eccentric. 5. Low contact pressure.
G	Insufficient parity.	1. Parity board adjusted too high.
H	Double punch.	1. Incorrect drive pulse. 2. Incorrect spring tension. 3. Incorrect tip clearance.
I	Jitter.	1. Defective control sleeve. 2. Parity contacts rubbing side of fixed contact board.
J	Contact bounce.	1. Movable contact interference (i.e., rubbing fixed contact board). 2. Bent movable contact wires.
K	Normal picture.	
L	Same as J.	
M	Insufficient parity closure.	1. Extremely poor phasing.

 A single punch	 B single punch	 C single punch
 D single punch	 E single punch	 F single punch
 G single punch	 H single punch	 I single punch
 J any odd number of punches	 K any even number of punches	 L any even number of punches
 M any even number of punches		

Note: Timing starts at zero; one millisecond per division.

Figure 45
Scope Pictures,
Parity Trouble Shooting

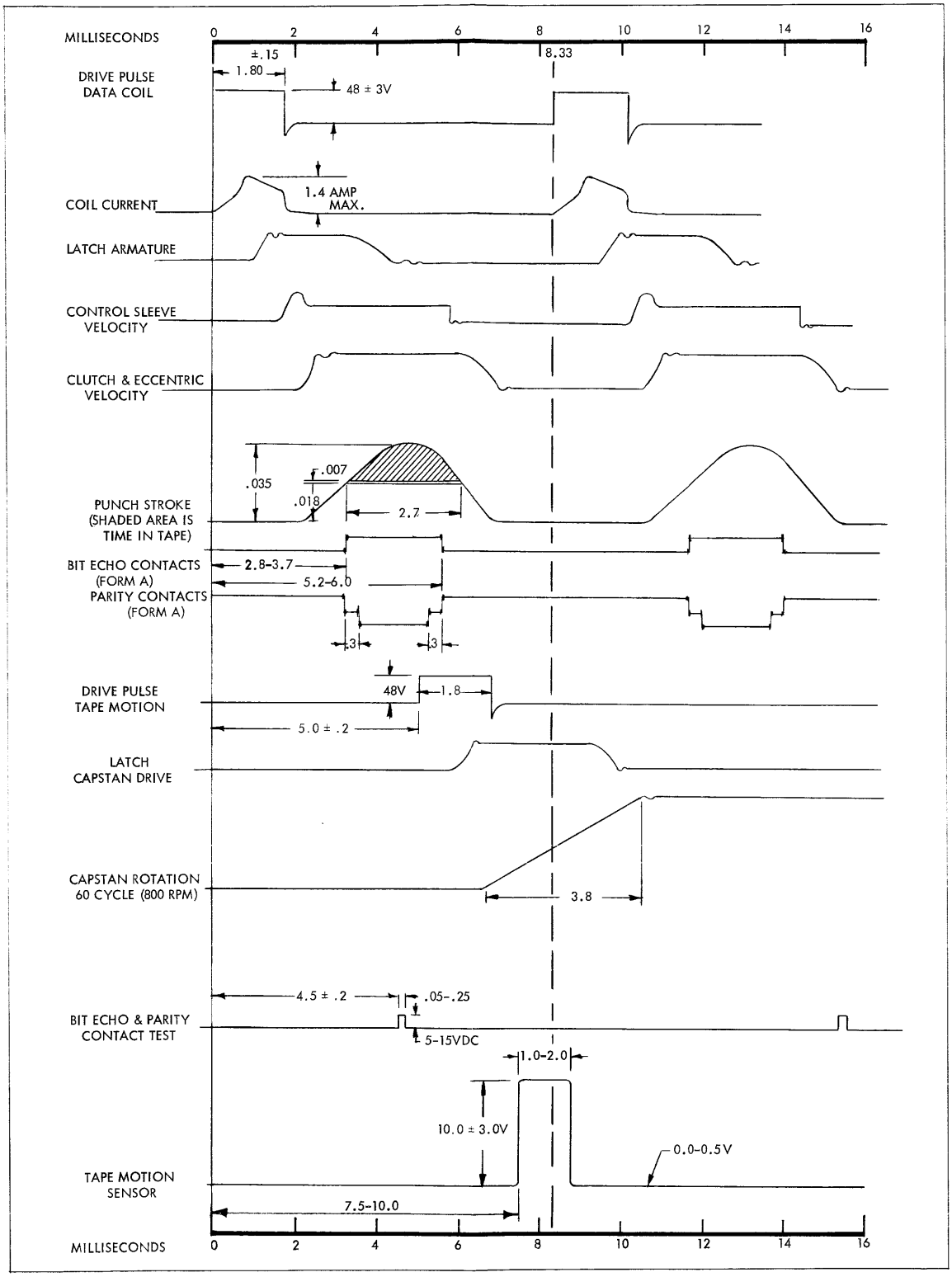


Figure 46
Timing Diagram

PARTS LIST KEY, OPTIONS

Option	Figure	Index	New Part Number (60 cps)	(50 cps)
8 Channel, 48 Volts	47	14	- -	320951
	47	46	- -	341770
	50	17	- -	341730
	50	18	- -	341750
	50	27	- -	341740
	50	32	- -	341760
8 Channel, 24 Volts ▷	47	14	- -	320951
	47	46	329400	341960
	50	17	319904	341920
	50	18	319906	341940
	50	27	319905	341930
	50	32	319911	341950
7 Channel, 48 Volts	47	14	- -	320951
	47	46	337360	341900
	50	17	- -	341730
	50	18	- -	341750
	50	27	- -	341740
	50	32	327450	341760
	50	34	324710	324710
7 Channel, 24 Volts ▷	47	14	- -	320951
	47	46	338650	341980
	50	17	319904	341920
	50	18	319906	341940
	50	27	319905	341930
	50	32	329530	342690
	50	34	324710	324710
6 Channel, 48 Volts	47	14	- -	320951
	47	46	336100	341880
	50	17	- -	341730
	50	18	- -	341750
	50	27	327451	342710
	50	32	327450	342720
	50	34	324710	324710
6 Channel, 24 Volts ▷	47	14	- -	320951
	47	46	336110	342010
	50	17	319904	341920
	50	18	319906	341940
	50	27	329531	342680
	50	32	329530	342690
	50	34	324710	324710

Option	Figure	Index	New Part Number (60 cps)	(50 cps)
5 Channel, 48 Volts	47	14	- -	320951
	47	46	319881	341870
	50	17	327452	342730
	50	18	- -	341920
	50	27	327451	342710
	50	32	327450	342720
	50	34	324710	324710
5 Channel, 24 Volts ▷	47	14	- -	320951
	47	46	329430	342020
	50	17	329532	342700
	50	18	319906	341940
	50	27	329531	342680
	50	32	329530	342690
	50	34	324710	324710
Teletypesetter, 48 Volts	47	14	- -	320951
	47	46	336370	344060
	50	1	336400	336400
	50	17	- -	341730
	50	18	- -	341750
	50	27	327451	342710
	50	32	327450	342720
	50	40	336410	336410
Teletypesetter, 24 Volts ▷	47	14	- -	320951
	47	46	336380	344050
	50	1	336400	336400
	50	17	319904	341920
	50	18	319906	341940
	50	27	329531	342680
	50	32	329530	342690
	50	40	336410	336410
8" NAB Reel (Lexon)	47	13	318600	318600
	47	36	AMERLINE #8262	
8" NAB Reel (Aluminum)	47	13	318600	318600
	47	36	310623	310623
7 1/2" Reel (Lexon)	47	36	519950	519950
6" Reel (Aluminum)	47	36	220301	220301
	48	49	341200	341200
Clockwise Reeling (See Figure 52)	47	5	DELETED	
	47	6	DELETED	
	47	49	329690	329690

▷ Change Also:	Figure	Index	New Part Number
	48	29	319931
	48	50	329410
	49	--	319941
	49	---	319951

PARTS ORDERING PROCEDURE

To order a replacement part, find the part required and order by the part number and name. Include the model and serial number of the unit on which it is to be used.

Spare parts should be ordered from Tally Corporation, 1310 Mercer Street, Seattle, Washington 98109. A major inventory of replacement parts is maintained at the factory for prompt service.

Normal Parts Order

Any order for production parts will be recognized as a normal order -- unless otherwise stated. Parts are shipped within three (3) to four (4) working days from receipt of order.

Emergency Parts Order

Tally will ship parts within 24 hours to fill any order marked "EMERGENCY--RUSH" if such order is for production parts and they are not ordered in quantity.

Note: Minimum Order $5.00. Terms F.O.B. Seattle. Payment net 30 days.

RECOMMENDED SPARE PARTS

The following list (Tally P/L 353150) denotes items on which wear is most likely to occur. These parts should be kept on hand if on-the-spot repair of simple breakdown is necessary. Quantities are suggested on the basis of one to five units. Note that this list assumes a 48 volt unit operating at 115VAC with 7 1/2" reeling. Substitute where necessary.

Item	Quantity	Part Number	Description
1	2	4000610	Bearing, Ball, 5632 FCHH (MPB)
2	2	4000620	Bearing, Ball, 6632 FCHH (MPB)
3	2	324680	Bearing, Ball, Flanged
4	2	316500	Belt, "O" Ring #2-170 219-7
5	1	305081	Belt, Timing, XLB-38
6	2	304213	Bushing, FB-46-3
7	1	304212	Bushing

RECOMMENDED SPARE PARTS

(continued)

Item	Quantity	Part Number	Description
8	1	301200	Forward Clutch Assembly
9	5	4101000	Fuse, 3 Amp. MDL
10	2	300410	Gear and Eccentric Assembly
11	1	300760	Shaft, Pivot
12	2	300940	Shim, Anti-Residual
13	10	225374	Shim, Clutch Shaft
14	10	225375	Shim, Clutch Shaft
15	10	225376	Shim, Clutch Shaft
16	5	225371	Shim, Capstan
17	5	225372	Shim, Capstan
18	5	225373	Shim, Capstan
19	3	309790	Shim, Eccentric
20	3	309791	Shim, Eccentric
21	3	309792	Shim, Eccentric
22	2	306150	Spring Clutch and Control Sleeve Assembly
23	1	320281	Washer, Sealing (Stat-O-Seal 7100-1/4)
24	1	322070	Auger, Chad (Uni-directional only)
25	1	300740	Auger, Chad (Bi-directional only)
26	1	4009001	Capacitor, 100-100µf, 50VDC (#BB0085)
27	1	319971	Coil and Frame Assembly (Mech.)
28	1	319972	Coil and Frame Assembly (Mech.)
29	1	319980	Coil and Frame Assembly (Lower Right only)
30	1	301031	Gear, Chad Auger Drive (Uni-directional only)
31	1	301030	Gear, Chad Auger Drive (Bi-directional only)
32	1	319940	Magnetic Actuator Assembly
33	1	4028410	Resistor, 50Ω, 5W
34	5	320273	Fuse, 1.6 Amp.,MDL (230V option only)
35	1	4077200	Microswitch, 115M1-T (Low Tape option only)
36	1	301120	Contact Assembly, Fixed (Parity option only)
37	1	303800	Movable Contacts and Connector Assembly (Parity option only)
38	1	325611	Contact Assembly, Fixed (Bit Echo option only)
39	1	325340	Movable Contacts and Connector Assembly (Bit Echo option only)

FIELD SERVICE TOOL KIT

The following list denotes the basic tools necessary for service and repair of the Model P-120 perforator.

Item	Part Number	Description
1	319170	Torque Arm
2	314590	Pull Hook
3	314630	Tape Gage
4	4042950	Snap-Ring Wrench #2, 90°
5	4043400	Snap-Ring Wrench (CR25-025)
6	314670	Allen Drive Set
7	4143120	Allen Driver w/handle, 7/64"
8	4143130	Allen Driver w/handle, 9/64"
9	321890	Lube Kit, P-120
10	314710	Steel Rule, 6", w/graduations of .01 and .1 inch
11	327940	Tip Clearance Gage (.008" - .010")
12	304612	Shaft End Play Gage
13	319030	Collet Pin Driver
14	4043100	Case for Steel Rule (Starrett #6512)
15	4043302	Screw Driver, 1/4" bit (Williams #4G)
16	4043305	Screw Driver, #2 Phillips (Williams #TP2G)
17	4043304	Taper Pin Tool (Amphenol #380306-3)
18	4043404	Gram Gage, 15 - 150 grams, with "max" pointer
19	4043500	Gram Gage, 500 grams, with "max" pointer
20	4043300	Hose Clamp Pliers, Corbin (P-8)
21	4043301	Wrench, open end, 5/16" (Williams #1160)
22	4043600	Gage, Proto #000E
23	228860	Gage, Tip Clearance, .007 - .013"

General Assembly (front)

Note: This parts list assumes a 48 volt uni-directional unit operating at 60 cycles per second with counter-clockwise reeling. Except as footnoted, it carries no options. For variations of the list, see PARTS LIST KEY, OPTIONS (page 42).

Index	Part Number	Description
1	4165900	Screw, Socket Head Cap, #8-32 x 5/8"
2	335560	Switch and Cable Assembly, Tape Feed Switch
3	4161200	Screw, Flat Head Phillips, #6-32 x 1/2"
4	318740	Panel
5	304670	Pin, Roller
6	141280	Roller, Tape Reeling
7	318870	Post, Tape Guide
8	4165500	Screw, Flat Head Phillips, #8-32 x 1/2"
9	309660	Gear, Tension Arm
10	321190	Arm Assembly, Tension
11	4175760	Washer, Thrust, .031 x 1/2 x 17/64"
12	4096800	Ring, Retaining, (TRUARC #5555-25)
13	229490	Adapter Assembly, Reel
14	320950	Gear Assembly, Helical
15	318790	Shaft, Idler
16	320222	Washer, Thrust
17	318840	Gear Assembly, Idler
18	321370	Bushing, Drive Shaft
19	320221	Washer, Thrust
20	4095800	Ring, Retaining, (TRUARC #5103-31)
21	323221	Magnet, Button
22	4160800	Screw, Pan Head, #6-32 x 1/2"
23	318850	Gear and Shaft Assembly, Drive
24	301031	Gear Assembly, Chad Auger Drive
25	318841	Gear Assembly, Oil Splash
26	320222	Washer, Thrust
27	4095800	Ring, Retaining, (TRUARC #5103-31)
28	4153800	Screw, Button Head Socket Cap, 4-40 x 1/8"
29	300600	Latch, Tape Retainer
30	301100	Retainer, Tape
31	145020	Spring, Retainer
32	4177150	Washer, Sealing
33	4169600	Screw, Pan Head, 1/4 x 20 x 1/4"
34	316500	Seal, "O" Ring
35	304992	Pan, Oil

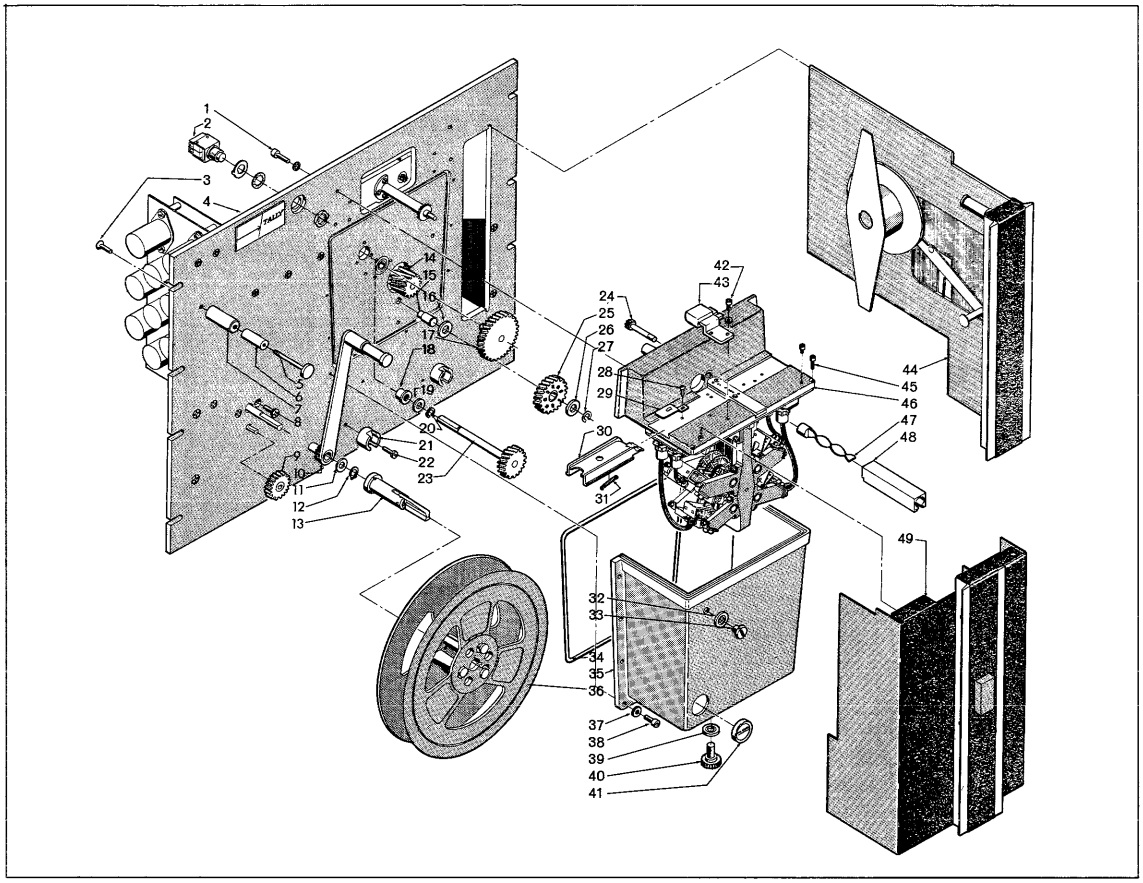


Figure 47
Exploded View,
General Assembly (front)

Index		Part Number	Description
36	1	519951	Reel, 8 1/2" Dia.
37		4175300	Washer, Flat, #6
38		4160000	Screw, Socket Cap, #6-32 x 3/8"
39		320281	Washer, Sealing
40		4169600	Screw, Thumb
41		4088900	Gage, Oil
42		4155000	Screw, Socket Head, #4-40 x 1/4"
43		329360	Stripper Assembly, Tape
44		335570	Slide Assembly, Tape Supply
45		4159380	Screw, Socket Head Set, #6-32 x 1/4"
46		319880	Mechanism Assembly, Perforator
47		322070	Auger, Chad, Uni-directional
48		300610	Chute, Chad
49		323230	Assembly, Chad Box

1 Varies with option. See Note, above.

General Assembly (back)

Note: This parts list assumes a 48 volt uni-directional unit operating at 60 cycles per second with counter-clockwise reeling. Except as footnoted, it carries no options. For variations of this list, see PARTS LIST KEY, OPTIONS (page 42).

Index	Parts Number	Description
1	4154200	Screw, Pan Head, #4-40 x 1/8"
2	305110	Catch, Magnetic
3	145160	Bracket, Magnetic Catch
4	341820	Assembly, Supply Slide Bracket
5	4155100	Screw, Pan Head, #4-40 x 1/4"
6	4172850	Nut, Keps, #6-32
7	4098450	Clamp, Capacitor (MS 21919 DB23)
8	4172100	Nut, Keps, #4-40
9	4009150	Capacitor, 88-108MFD
10	300020	Spacer, Motor
11	300030	Boot, Motor
12	4168900	Screw, Socket Cap, #10-32 x 1"
13	321130	Motor
14	302341	Gear, Uni-directional
15	4095700	Ring, Retaining, (TRUARC #5103-25)
16	324680	Bearing, Ball , Flanged
17	320870	Shaft, Belt Adjusting
18	320540	Bracket, Bearing
19	304213	Bushing
20	4166350	Screw, Socket Cap, #8-32 x 7/8"
21	4095700	Ring, Retaining, (TRUARC #5103-25)
22	302341	Gear, Uni-directional
23	144910	Pulley, 3/4" w/Set Screw
24	305098	Belt, "O" Ring
25	305081	Belt, Drive
26	220445	Pulley, 10-Tooth
27	324680	Bearing, Ball, Flanged
28	4095700	Ring, Retaining, (TRUARC #5103-25)
29	319930	Mechanism Assembly, Capstan Drive
30	220445	Pulley, 10-Tooth
31	324680	Bearing, Ball, Flanged
32	4095700	Ring, Retaining, (TRUARC #5103-25)
33	4160000	Screw, Socket Cap, #6-32 x 3/8"
34	4160800	Screw, Pan Head, #6-32 x 1/2"
35	4160000	Screw, Socket Cap, #6-32 x 3/8"
36	318760	Tube, Bearing
37	4159700	Screw, Pan Head, #6-32 x 5/16"

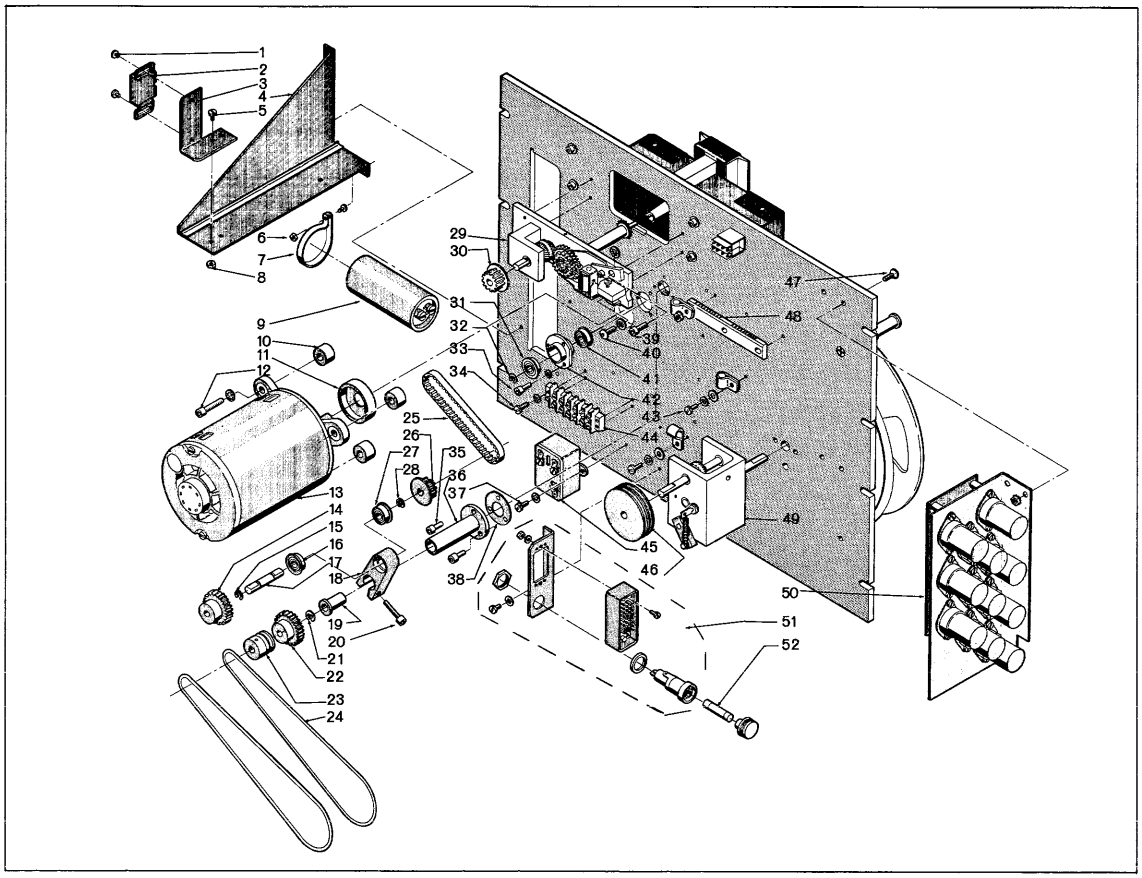


Figure 48
Exploded View,
General Assembly (back)

Index	Part Number	Description
38	318770	Gasket, Bearing Tube
39	4165900	Screw, Socket Cap, #8-32 x 5/8"
40	4165000	Screw, Button Head Socket Cap, #8-32 x 1/2"
41	324680	Bearing, Ball, Flanged
42	324980	Tube, Bearing
43	4160200	Screw, Pan Head, #6-32 x 3/8"
44	4044650	Board, Terminal
45	4070150	Relay (RBM #91252-56)
46	309710	Pulley, 2"
47	4160800	Screw, Pan Head Phillips, #6-32 x 1/2"
48	4047504	Block, Taper Pin
49	320320	Mechanism Assembly, Reeling
50	322010	Network Assembly, RC
51	334370	Cable Assembly, 34-Pin Connector (cable not shown)
52	4100950	Fuse (see wiring diagram)
53	321890	Kit, Maintenance (not shown)

Capstan Drive Mechanism (319930)

Note: This parts list assumes a 48 volt unit. For variations of this list, see PARTS LIST KEY, OPTIONS (page 42).

Index		Part Number	Description
1		301200	Clutch Assembly, Friction
2		4161800	Screw, Pan Head, #6-32 x 3/4"
3		320800	Plate, Spacing Adjust
4		314370	Screw, Socket Head Cap, #4-40 x 1/8"
5	▷1	319940	Escapement Assembly, 48 volt
5a		319240	Frame Assembly, Coil
5b		223770	Limit, Escapement
5c		4157500	Screw, Pan Head Slotted, #4-48 x 1/8"
5d	▷1	319961	Coil, 48 volt 24Ω
5e		4172400	Nut, Elastic Stop, #6-32
5f		4157500	Screw, Pan Head Slotted, #4-48 x 1/8"
5g		313740	Bracket
5h		304370	Screw, Spring Tension Adjust
5i		300372	Spring, Actuator
5j		226374	Shim, Anti-Residual
5k		318460	Armature Assembly, w/Oil Reservoir
6		4160100	Screw, Socket Head Cap, #6-32 x 3/8"
7		300260	Clamp, Adjust Plate
8		4160200	Screw, Pan Head, #6-32 x 3/8"
9		300070	Lever, Adjust
10		340630	Spacer, Adjust Plate Clamp
11		300080	Spacer
12		300280	Plate, Capstan Adjust
13		320520	Plate, Bearing, Cantilever
14		304212	Bushing
15		320821	Bearing, Ball
16		304212	Bushing
17		138240	Gear, Bevel, w/Set Screw
18		320221	Washer, Thrust
19		300510	Tube, Bearing
20		4156300	Screw, Flat Head Phillips, #4-40 x 5/16"
21		320822	Bearing, Ball
22		225370	Shim (as required)
23		300300	Capstan Assembly
24		300050	Plate, Front Bearing

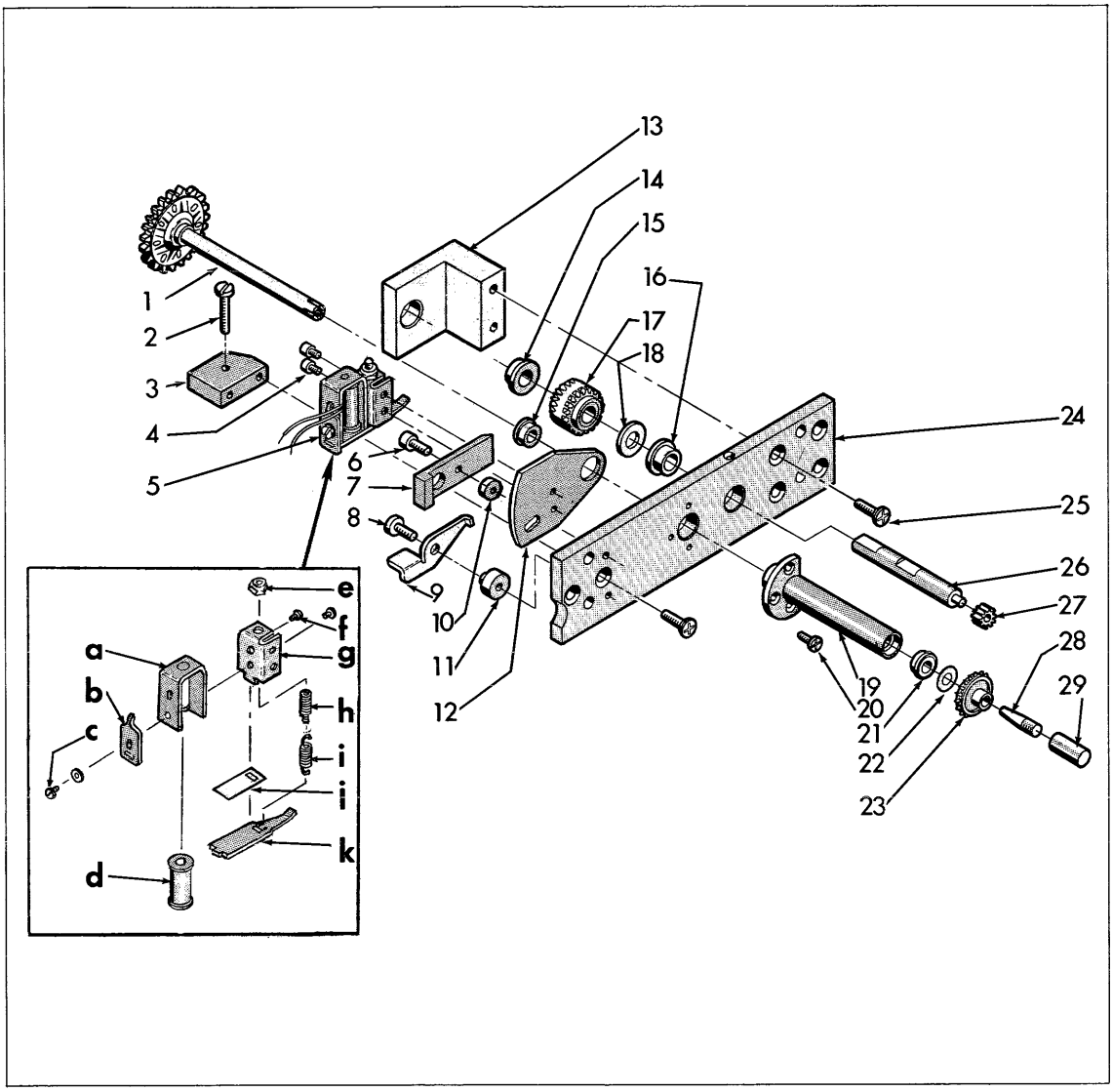


Figure 49
Exploded View,
Capstan Drive Mechanism
(319930)

Index	Part Number	Description
25	4165500	Screw, Flat Head Phillips, #8-32 x 1/2"
26	320790	Shaft, Capstan Input
27	301050	Gear, Chad Auger Drive
28	300640	Pin, Collet
29	310460	Cap, Collet Pin

1 Varies with option. See Note, above.

Perforator Mechanism (Standard – 319880)

Note: This parts list assumes a 48 volt unit operating at 60 cycles per second. Except as footnoted, it carries no options. For variations of this assembly, see PARTS LIST KEY, OPTIONS (page 42).

Index	Part Number	Description
1 [1]	300570	Punch Head Assembly
2	325020	Pin, Arm
3	307460	Bushing, Chad Auger
4	324960	Tape Width Arm Assembly
5	300360	Tape Deck
6	304920	Screw, Chad Box
7 [2]	334490	Cable Assembly
8	319890	Plate, Air Vent
9	4159100	Screw, Pan Head, 6-32 x 1/4"
10 [3]	4159100	Screw, Pan Head, 6-32 x 1/4"
11 [3]	301040	Spacer, Fixed Contact
12 [3]	301120	Fixed Sensing Contact Assembly
13 [3]	300580	Bracket, Fixed Contact
14 [3]	4160100	Screw, Socket Cap, 6-32 x 3/8"
15	301110	Frame, Main
16	4152100	Screw, Socket Head Set, 2-56 x 1/4"
17	319901	Clutch Bank Assembly Upper Left
18	319903	Clutch Bank Assembly Lower Left
19	330520	Washer, Flat Nylon
20	4176150	Washer, 1/8 x 5/16 x .020"
21	4094415	Spring, Compression (LEE SPRING #LC-022C-3)
22	4106100	Cotter Pin, .031 x .375"
23	300830	Gasket, Cable Bushing
24	300820	Bushing, Cable
25	4159700	Screw, Pan Head, 6-32 x 5/16"
26	332010	Baffle, Oil Control
27	319902	Clutch Bank Assembly, Upper Right
28	303800	Movable Contact Assembly
29	4160100	Screw, Socket Cap, 6-32 x 3/8"
30 [1]	300570	Punch Head Assembly
31	4160100	Screw, Socket Cap, 6-32 x 3/8"
32	319910	Clutch Bank Assembly, Lower Right
33 [4]	309790	Shim, .003"
33 [4]	309791	Shim, .005"
33 [4]	309792	Shim, .010"
34	300410	Gear and Eccentric Assembly
35	300760	Shaft, Pivot
36	4151900	Screw, Phillips Flat Head, 2-56 x 3/16"
37	317510	Plate, Punch Head Cover
38	317820	Gasket, Cover Plate
39	4153800	Screw, Button Head Socket Cap, 4-40 x 1/8"
40	335030	Insert, Tape Guide
41 [2]	334490	Cable Assembly

* * *

[1] Items 1 and 30 together constitute Punch Head Assembly #300570.
[2] Items 7 and 41, together with wires to Taper Pin Board #320301 (Figure 48) constitute Cable Assembly #334490.
[3] Parity option only.
[4] Use as required.

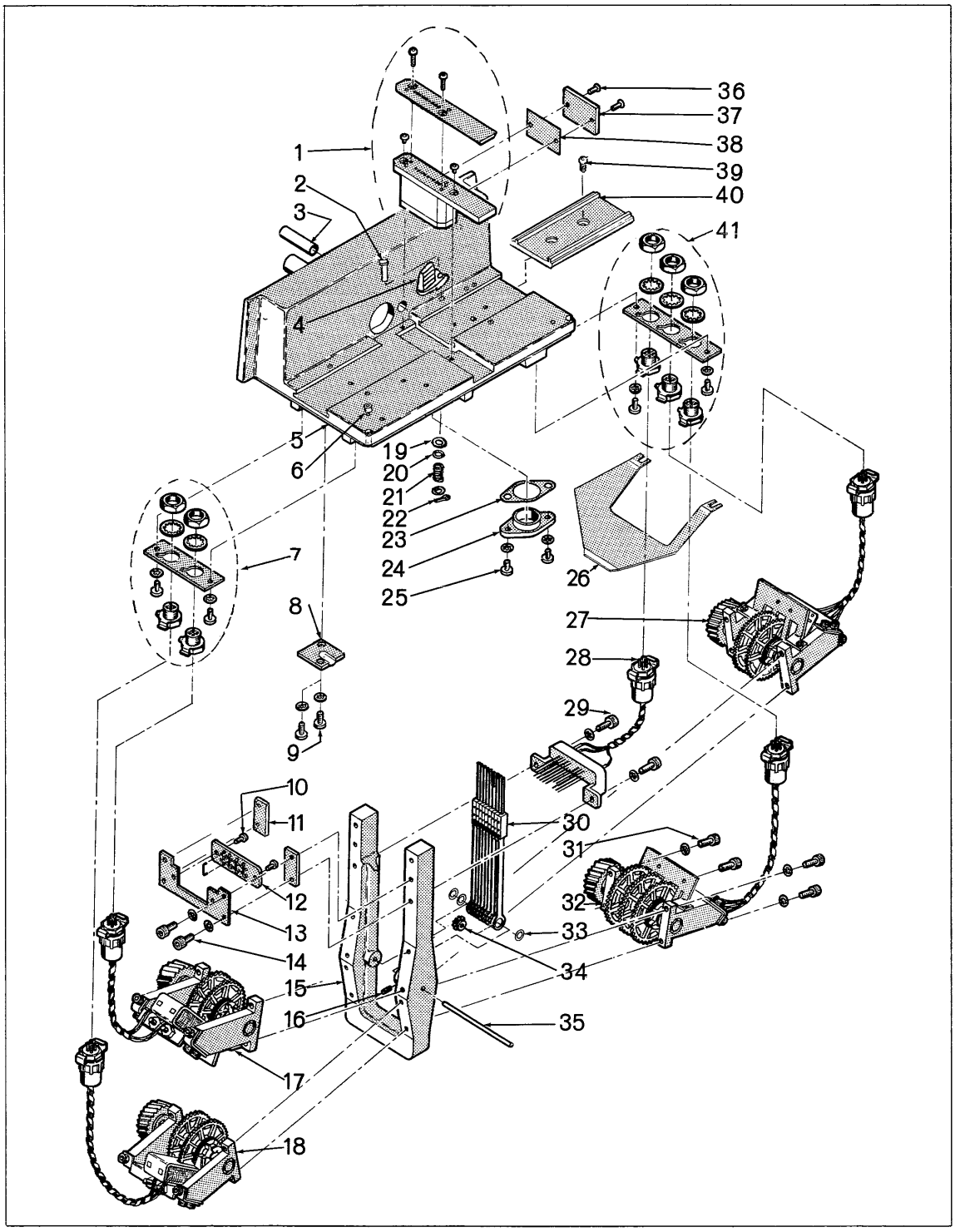


Figure 50
Exploded View,
Perforator Mechanism

Left Hand Clutch Bank Assemblies (319901 and 319903)

This parts list assumes an eight-channel, 48 volt unit operating at 60 cycles per second -- that is, the standard clutch banks found in Figure 50. Variations of this list are noted at its end, and identified by assembly number. See also, PARTS LIST KEY, OPTIONS, page 42.

Index	Part Number	Description
1	300662	Bracket, Escapement
2	300661	Bracket, Escapement
3	4179400	Washer, Internal Star, #6
4	4158600	Screw, Pan Head Slotted, #6-32 x 1/4"
5	4157500	Screw, Pan Head Slotted, #4-48 x 1/8"
6	4172400	Nut, Elastic Stop, #6-32
7	300940	Shim, Anti-Residual
8	304370	Screw, Spring Tension Adjust
9	300371	Spring, Actuator
10	322702	Gear and Clutch Shaft Assembly
11	322701	Gear and Clutch Shaft Assembly
12	305300	Screw, Escapement Bracket Adjust
13	300730	Bracket, Bearing
14	319971	Coil & Coil Frame Assembly
15	319972	Coil & Coil Frame Assembly
16	4160100	Screw, Socket Head Cap, #6-32 x 3/8"
17	4179400	Washer, Internal Star, #6
18	300713	Bracket, Rebound Spring
19	300712	Bracket, Rebound Spring
20	300480	Latch, Armature
21	300722	Limit, Armature
22	4154200	Screw, Pan Head Slotted, #4-40 x 1/8"
23	308950	Bushing
24	225370	Shim (as required)
25	4095700	Ring, Retaining (TRUARC #5103-25)
26	4096210	Ring, Retaining (TRUARC #5133-25)
27	225370	Shim (as required)
28	306150	Spring Clutch & Control Sleeve Assembly
29	4096210	Ring, Retaining (TRUARC #5133-25)
30	4154700	Screw, Flat Head Phillips, #4-40 x 1/4"
31	306150	Spring Clutch & Control Sleeve Assembly
32	225370	Shim (as required)
33	4096210	Ring, Retaining (TRUARC #5133-25)
34	320221	Washer, Thrust, #1/4 x 1/2 x .062"
35	308950	Bushing
36	4096210	Ring, Retaining (TRUARC #5133-25)
37	300730	Bracket, Bearing

OPTIONAL CLUTCH BANK ASSEMBLIES

(See Page 42)

Clutch Bank Assembly	Change to Index Number	New Part Number
319904	14	319973
319906	15	319974
327452	31, 33, and one each of 6, 7, 8, 9, 10	deleted
329532	14	319973
	31, and one each of 6, 7, 8, 9, 10	deleted
341730	10	318822
341750	11	318821
341920	10	318822
341940	11	318821
	15	319974
342700	10	318822
	14	319973
	31, 33, and one each of 6, 7, 8, 9, 20	deleted
342730	10	318822
	31, 33, and one each of 6, 7, 8, 9, 20	deleted

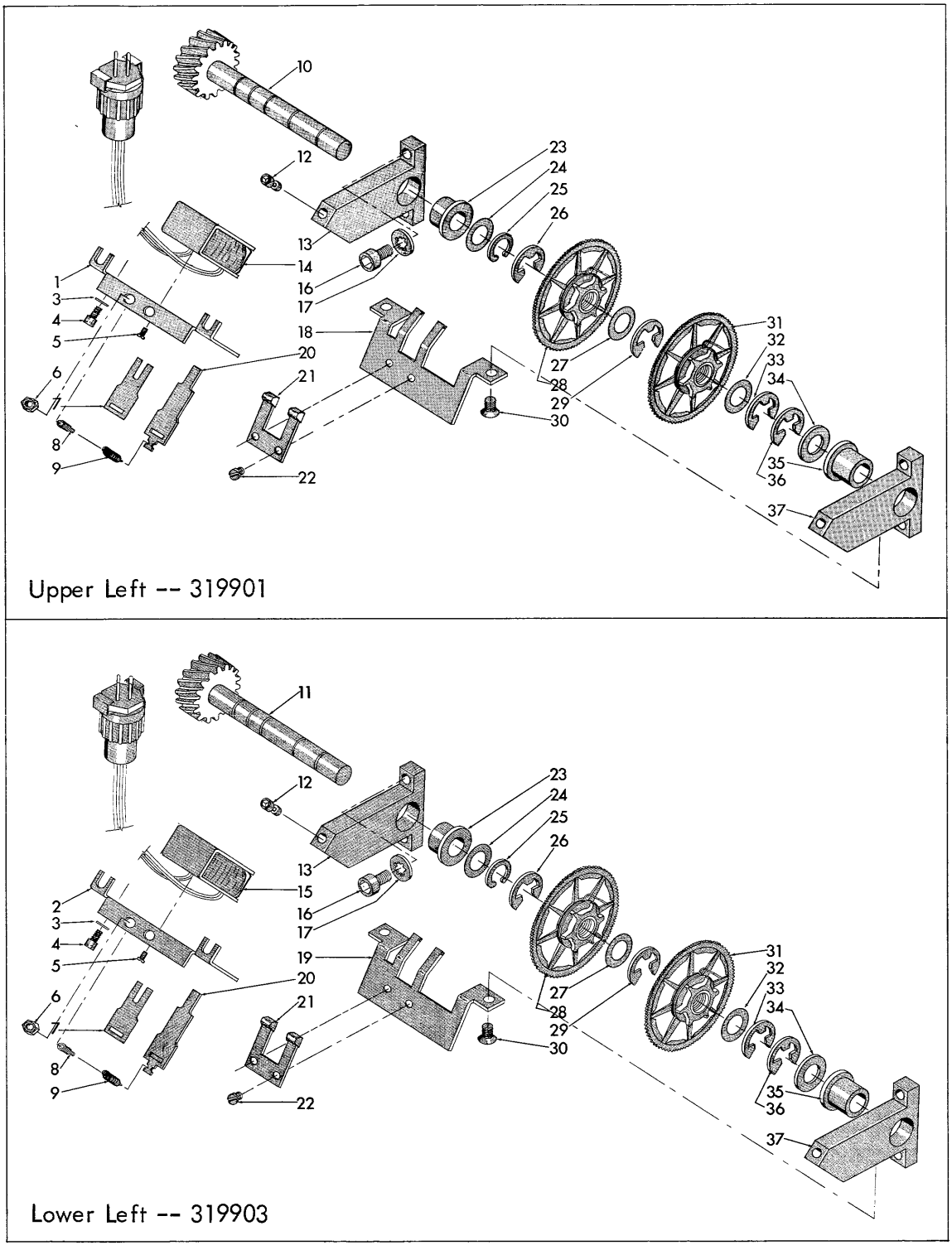
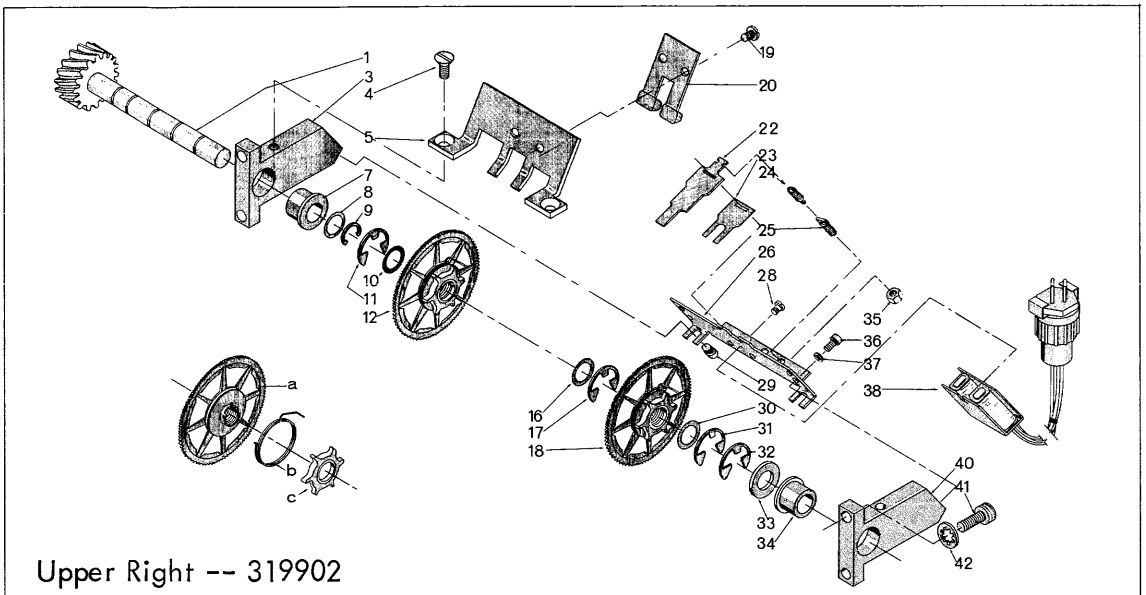


Figure 51
Exploded Views,
Left Hand Clutch Bank Assemblies

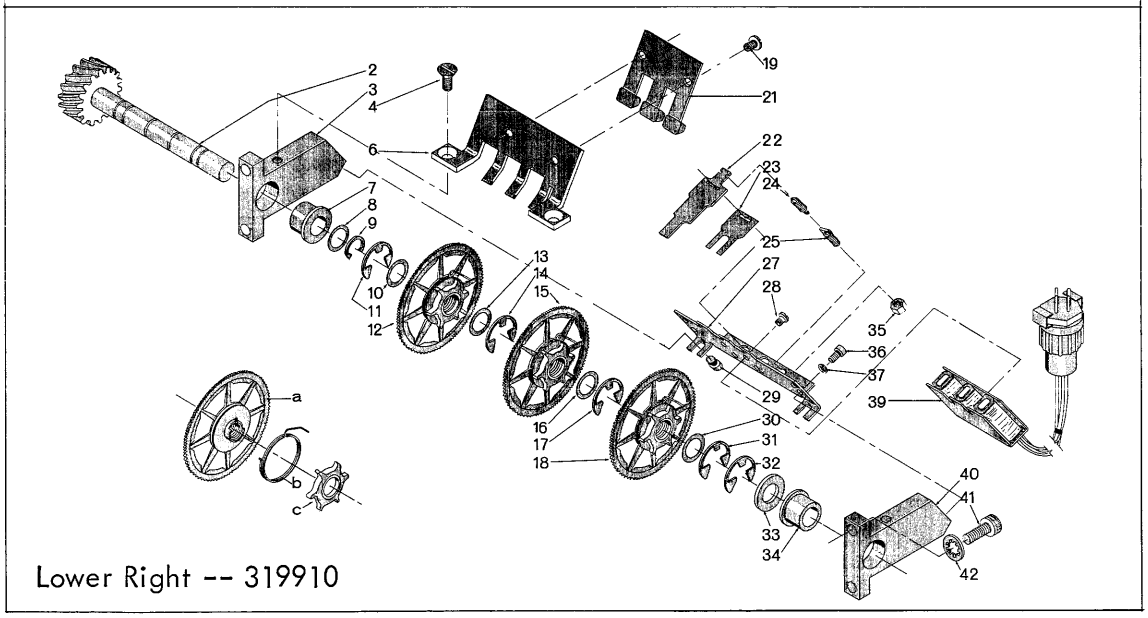
Right Hand Clutch Bank Assemblies (319902 and 319910)

This parts list assumes an eight-channel, 48 volt unit operating at 60 cycles per second -- that is, the standard clutch banks found in Figure 50. Variations of this list are noted at its end, and identified by assembly number. See also, PARTS LIST KEY, OPTIONS, page 42.

Index	Part Number	Description
1	322703	Gear and Clutch Shaft Assembly
2	322700	Gear and Clutch Shaft Assembly
3	300730	Bracket, Bearing
4	4154700	Screw, Flat Head Slotted, #4-40 x 1/4"
5	300714	Bracket, Rebound Spring
6	300711	Bracket, Rebound Spring
7	308950	Bushing
8	225370	Shim (as required)
9	4095700	Ring, Retaining (TRUARC #5103-25)
10	225370	Shim (as required)
11	4096210	Ring, Retaining (TRUARC #5133-25)
12	306150	Spring Clutch and Control Sleeve Assembly
12a	300400	Spring Clutch Assembly
12b	216400	Spring, Rebound
12c	300430	Control Sleeve Assembly
13	225370	Shim (as required)
14	4096210	Ring, Retaining (TRUARC #5133-25)
15	306150	Spring Clutch and Control Sleeve Assembly
16	225370	Shim (as required)
17	4096210	Ring, Retaining (TRUARC #5133-25)
18	306150	Spring Clutch and Control Sleeve Assembly
19	4154200	Screw, Pan Head Slotted, #4-40 x 1/8"
20	300722	Limit, Armature
21	300721	Limit, Armature
22	300480	Latch, Armature (2 used on U.R.; 3 on L.R.)
23	300940	Shim, Anti-Residual (2 used on U.R.; 3 on L.R.)
24	300371	Spring, Actuator (2 used on U.R.; 3 on L.R.)
25	304370	Screw, Spring Tension Adjust (2 on U.R.; 3 on L.R.)
26	300663	Bracket, Escapement
27	300650	Bracket, Escapement
28	4157500	Screw, Pan Head Slotted, #4-48 x 1/8"
29	305300	Screw, Escapement Bracket Adjust
30	225370	Shim (as required)
31	4096210	Ring, Retaining (TRUARC #5133-25)
32	4096210	Ring, Retaining (TRUARC #5133-25)
33	320221	Washer, Thrust, 1/4 x 1/2 x .062"
34	308950	Bushing
35	4172400	Nut, Elastic Stop, #6-32
36	4158600	Screw, Socket Head Cap, #6-32 x 1/4"
37	4179400	Washer, Internal Star, #6
38	319971	Coil and Coil Frame Assembly
39	319980	Coil and Coil Frame Assembly
40	300730	Bracket, Bearing
41	4160100	Screw, Socket Head Cap, #6-32 x 3/8"
42	4179400	Washer, Internal Star, #6



Upper Right -- 319902



Lower Right -- 319910

Figure 52
Exploded Views,
Right Hand Clutch Bank Assemblies

OPTIONAL CLUTCH BANK ASSEMBLIES
(See Page 42)

Clutch Bank Assembly	Change to Index Number	New Part Number
319905	38	319973
319911	39	319981
327450	15, 31, 32, and one each of 22, 23, 24, 25, 35	deleted
327451	15, and one each of 22, 23, 24, 25, 35	deleted
329530	39	319974
	15, and one each of 22, 23, 24, 25, 35	deleted
329531	38	319973
	15, and one each of 22, 23, 24, 25, 35	deleted
341740	1	318823
341760	2	318820
341930	1	318823
	38	319973
341950	2	318820
	32	319981
342680	1	318823
	38	319973
	15, 31, 32, and one each of 22, 23, 24, 25, 35	deleted
342690	2	318820
	39	319981
	15, 31, 32, and one each of 22, 23, 24, 25, 35	deleted
342710	1	318823
	15, 31, 32, and one each of 22, 23, 24, 25, 35	deleted
342720	2	318820
	15, 31, 32, and one each of 22, 23, 24, 25, 35	deleted

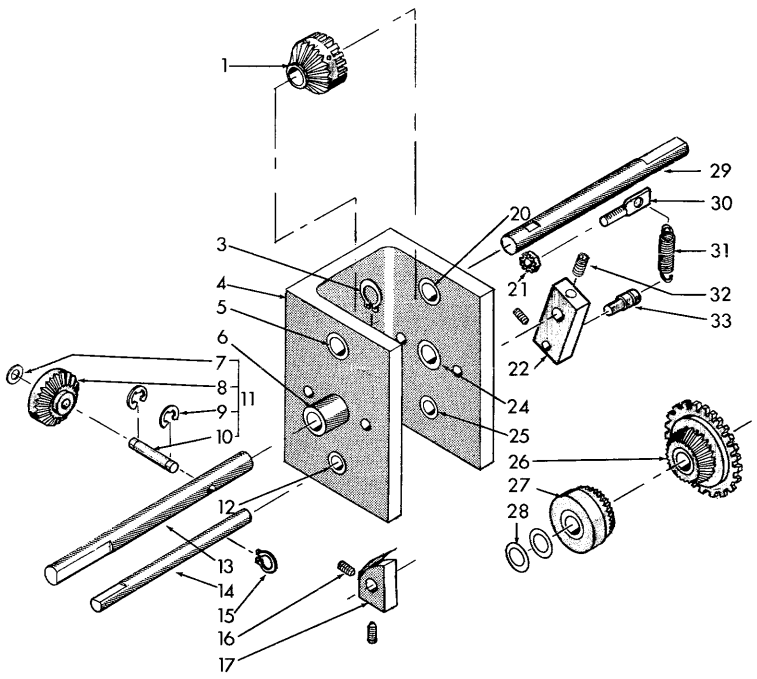
Reeling Mechanism (320320 and 329690)

Index	Part Number	Description
1 [1]	138240	Gear, Bevel Cluster, w/Set Screw
1 [2]	135540	Gear, Bevel Cluster
2	146440	Gear, Bevel
3	4096800	Ring, Retaining (TRUARC #5555-25)
4	515941	Frame
5	304201	Bushing
6	324740	Bushing
7	4175250	Washer, Plain (.141 I.D. x .280 O.D. x .032)
8	226520	Spider Bevel Gear Assembly
9	4096400	Ring, Retaining (TRUARC #5144-12MD)
10	228880	Pin, Differential Spider
11	228930	Differential Spider Assembly
12	304197	Bushing
13	318890	Shaft, Reeling
14	144840	Shaft, Tension
15	4096700	Ring, Retaining (TRUARC #5555-18)
16	4163330	Screw, Socket Head Set (cup point), #8-32 x 1/4"
17	144930	Brake Assembly
18	4106800	Pin, Dowel, 3/16 x 7/8"
19	146630	Spacer
20	304201	Bushing
21	4173250	Nut, Keps, #8-32
22	312040	Link, Tension
23	135560	Gear, Spider Bevel
24	304201	Bushing
25	304197	Bushing
26	228870	Combination Bevel and Spur Gear Assembly
27	228910	Gear, Brake Drum
28	225376	Shim (as required)
29	144850	Shaft, Drive
30	4170700	Bolt, Spade
31	144940	Spring, Brake
32	4163300	Screw, Socket Head Set (cup point), #8-32 x 1/4"
33	146701	Post, Spring

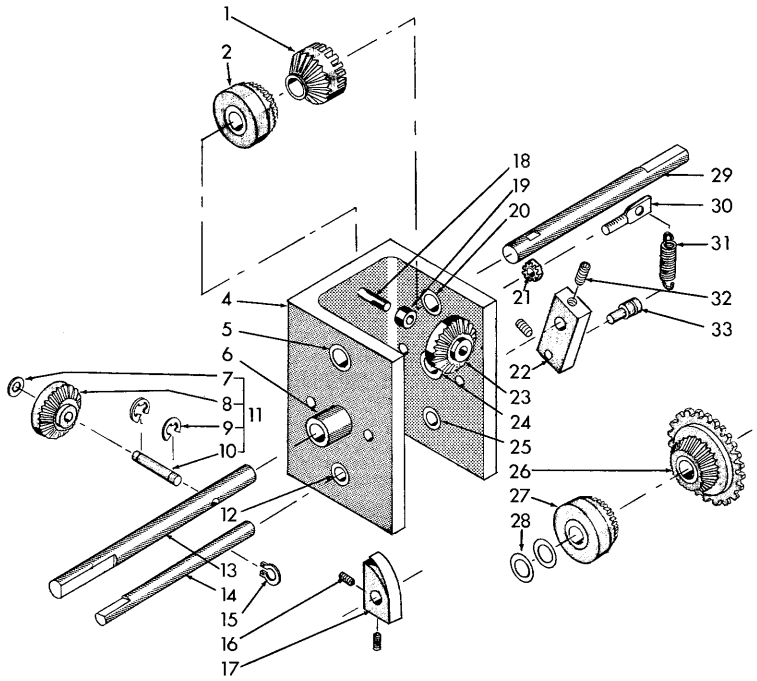
* * *

[1] Standard (counter-clockwise) reeling only.

[2] Clockwise reeling option only.



Counter-clockwise (standard - 320320)



Clockwise (option - 329690)

Figure 53
Exploded Views, Reeling Mechanism

Tape Supply Slide Assembly (335570)

Index	Part Number	Description
1	[1] 335550	Plate, Supply Slide
2	4095300	Ring, Retaining, (TRUARC #5100-25)
3	333751	Flange Assembly, Front
4	333780	Flange Assembly, Rear
5	145280	Stop
6	4154600	Screw, Pan Head, #4-40 x 3/16"
7	[1] 333110	Shaft, Bearing
8	[1] 330080	Brake Assembly
9	330100	Spring, Brake Arm
10	[1] 323410	Handle, Supply Slide
11	333050	Roller Assembly, Tape
12	4161200	Screw, Flat Head Phillips, #6-32 x 1/2"
13	324130	Cover, Handle, Supply Slide

[1] Items 1, 7, 8 and 10 must be ordered together and specified "assembled."

RC Network Assembly (322010)

1	4111321	Lug, Terminal (Cambian #2186-2 -- 20 used)
2	[2] 4028410	Resistor, 50Ω 5W (10 used)
3	902750	Board, Etched
4	[2] 832058	Card Assembly, Printed Circuit (48 volt)
5	4159700	Screw, Pan Head Slotted, #6-32 x 5/16" (4 used)
6	4179400	Washer, Internal Star #6 (4 used)
7	4172900	Nut, Kep, #6-32 (15 used)
8	4175300	Washer, Flat, #6 (3 used)
9	4097910	Clamp, Cable, 1/4" (2 used)
10	4172900	Nut, Kep, #6-32
11	4175300	Washer, Flat, #6
12	4097905	Clamp, Cable, 3/16"
13	321010	Standoff, Resistor Board (4 used)
14	320590	Bracket
15	4012550	Plate, Capacitor Mounting (10 used)
16	4160200	Screw, Pan Head Slotted, #6-32 x 3/8" (3 used)
17	4179400	Washer, Internal Star #6 (3 used)
18	[2] 4009001	Capacitor, Dual 100μf, 50VDC (10 used)
19	4179400	Washer, Internal Star #6 (17 used)
20	4159700	Screw, Pan Head Slotted, #6-32 x 5/16" (17 used)

[2] 24 Volt Units -- Assembly #329410

2	402710	Resistor, 10Ω 10W (10 used)
4	832954	Card Assembly, Printed Circuit
18	4009520	Capacitor, 200μf, 24VDC (10 used)

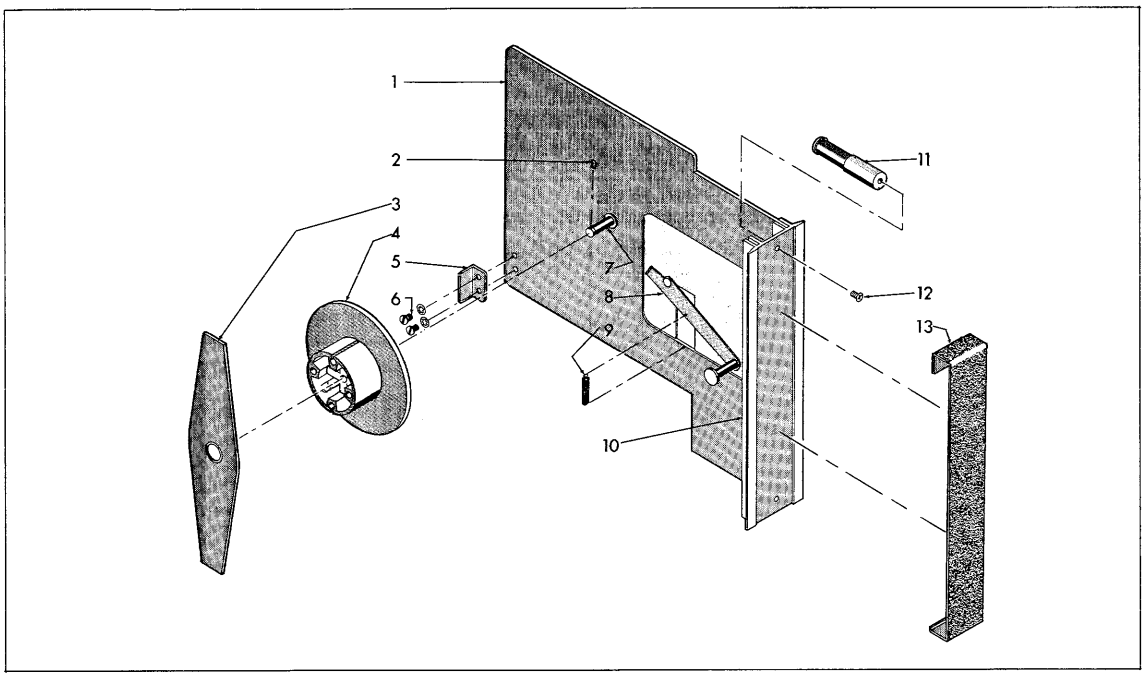


Figure 54
Exploded View,
Tape Supply Slide Assembly
(335570)

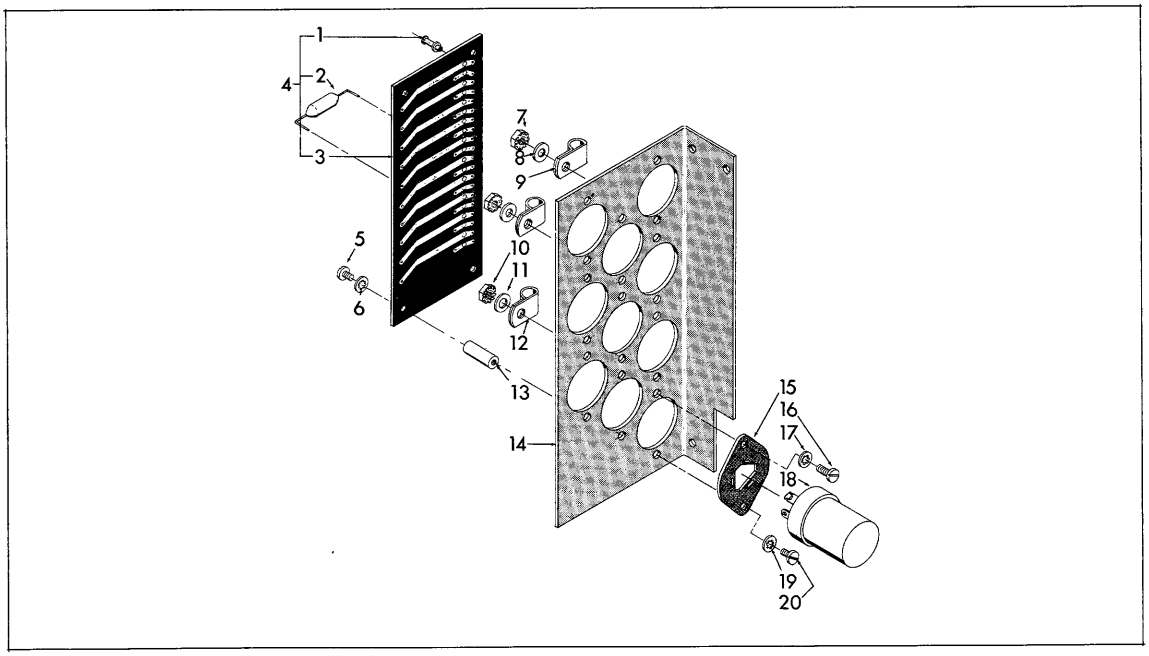


Figure 55
Exploded View,
RC Network Assembly
(322010)

Warranty

Tally Corporation warrants its equipment to be free from defect in materials and workmanship. Tally's sole obligation, under this warranty is to bear the cost of parts and labor for the repair or replacement of equipment which fails to meet the applicable Tally specification within three (3) months after installation by the end user; and to bear the cost of the parts only, for any repair made to the equipment for an additional nine (9) months.

Notice of installation must be given by returning the postpaid card which accompanies the equipment. If said card is not returned to Tally within fifteen (15) days following installation, the warranty shall be considered to have begun at time of shipment from the Tally plant. The date of installation shall be subject to verification by an employee or representative of Tally Corporation.

This warranty includes a maximum allowable shelf life of six (6) months, so that the parts and labor coverage terminates, in any event, nine (9) months following shipment from the Tally plant; and the parts only coverage terminates, in any event, eighteen (18) months following shipment from the Tally plant.

This warranty does not extend to any Tally products which have been subjected to misuse, neglect, accident, improper installation or application, or failure to follow a required lubrication schedule where specified in the manual.

For service under this warranty, call the nearest Tally authorized service agency listed in the equipment manual. All requests for service should refer to the model and serial number of the equipment.

The above warranty to repair or replace defective equipment is in lieu of all other warranties, express or implied, statutory or otherwise and Tally Corporation shall not be liable for damages or delays.

TALLY CORPORATION
1310 Mercer Street
Seattle, Washington 98109

TALLY

TALLY CORPORATION

FIELD SERVICE PROGRAM

The EDPS Division of RCA Service Company is Tally's National Service Agent. Service is also available in a number of cities where our sales representatives each maintain one or more full-time trained service personnel. In addition to this coverage, service locations are maintained in over a dozen other countries. A list of these sites is on the other side of this page.

To arrange service through RCA, find the city listed nearest you, regardless of state boundaries. The number in parentheses represents the district office serving you. The key at the bottom of the list identifies this office and its telephone number. Call the district office, collect. The district manager will provide service from the nearest available serviceman. He will also provide emergency service phone numbers, and in general set up service arrangements according to your needs. After the initial call to the district office, make all routine service requests to the local office supplying the actual service capability.

Requests for service by our sales representatives should be directed to the Service Manager at the appropriate office listed under U. S. SALES REPRESENTATIVES, on the reverse side of this page.

Routine requests for spare parts only should be directed to Tally Corporation, 1310 Mercer Street, Seattle, Washington 98109. Emergency spare parts are available through the nearest RCA sales representative's service office.

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Tucson	(7)

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Millbrae	(13)
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San Diego	(7)
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Morristown	(11)
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Perth Amboy	(11)
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Rahway	(11)
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Canton	(5)
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Cleveland	(5)
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Philadelphia	(2)
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Swarthmore	(2)

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1. Atlanta, Georgia	(404-525-8359)	
2. Camden, New Jersey	(609-663-4680)	
3. Chicago, Illinois	(312-346-1761)	
4. Dallas, Texas	(214-351-5361)	
5. Detroit, Michigan	(313-353-3650)	
6. Hartford, Connecticut	(203-527-7158)	
7. Los Angeles, California	(213-461-9215)	
8. Miami, Florida	(305-444-2583)	
9. New York City, N. Y.	(212-944-5575)	
10. Pittsburgh, Pennsylvania	(412-261-1080)	
11. Rahway, New Jersey	(201-381-4000)	
12. St. Louis, Missouri	(314-726-5328)	
13. San Francisco, California	(415-981-7785)	
14. Washington, D. C.	(202-337-8500) Ext. 533	

U. S. SALES REPRESENTATIVES

(with service facility)

MOXON ELECTRONICS CORPORATION

Los Angeles, California (213-272-9311)

INSTRUMENT ASSOCIATES

Hartford, Connecticut (203-246-5686)
Arlington, Massachusetts (617-648-2922)

PIVAN ENGINEERING COMPANY

Chicago, Illinois (312-539-4838)

S. STERLING COMPANY

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Pittsburgh, Pennsylvania (412-884-5515)
Cleveland, Ohio (216-442-8080)

SBM ASSOCIATES, INC.

Elmsford, New York (914-592-8850)
Rochester, New York (716-271-7430)

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Buenos Aires

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Av. Graca Aranha 226
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Don Mills, Ontario

R-O-R ASSOCIATES, LIMITED
3285 Cavendish Boulevard
Montreal 28, Quebec

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Filipstadsbacken 48
Fack 59, Farsta 1
Stockholm, Sweden

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TEL INTER AKTIEBOLAG
Filipstadsbacken 48
Fack 59, Farsta 1
Stockholm, Sweden

FRANCE

IMPRESSION ENRIGISTREMENT DES RESULTATS
6, rue Blondel
Courbevoie
Seine

GERMANY

TECHNICAL MEASUREMENT CORPORATION-GmbH
Mainzer Landstrasse 51
6 Frankfurt/Main 1
Frankfurt

GREECE

MARIOS DELLEGGIO REPRESENTATIONS
2, Alopekis Street
Athens 139

ISRAEL

EASTRONICS, LIMITED
75 Haifa Road
P. O. Box 21029
Tel Aviv

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PRODEST ELETTRONICA
Via Achille Grandi, 23
Cinisello Balsamo (MI)
Milano

JAPAN

MITSUBISHI SHOJIKAISHA, LIMITED
P. O. Box 22, Tokyo Central
20 Marunouchi, 2-Chrome
Chiyoda-Ku, Tokyo

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NUCLEAR DATA EUROPE
Building #112
Schiphol Airport
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SAMPLE ELECTRONICS (N.Z.) LIMITED
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Fack 59, Farsta 1
Stockholm, Sweden

SWEDEN

TEL INTER AKTIEBOLAG
Filipstadsbacken 48
Fack 59, Farsta 1
Stockholm

SWITZERLAND

MUNZIG INTERNATIONAL, INC.
6 Av. de Frontenex
1207 Geneva

UNITED KINGDOM

(England, Scotland, Wales,
Northern Ireland, Irish Free State)

AUTOMATIC PUNCHED TAPE LIMITED
6a George Street
Croydon, Surrey
England

TALLY EUROPE LIMITED
Radnor House
1272 London Road
London S. W. 16, England

Please incorporate the following changes and additions to your P-120 Instruction Manual.

ELECTRONIC PARITY

Electronic Parity has been added as an option to the Model P-120 Tape Perforator. Utilizing Bit Echo contacts for punch sensing, this feature replaces the previous parity option.

Replace Parity on page 34 of the P-120 Instruction Manual with the following:

Description:

Electronic Parity consists of integrated circuits, solid state switches, and a power supply. The integrated circuits are used to decode each character of data and identify it as an Even or Odd character. The solid state switches consist of two transistors which are used to interface to external equipment. The Power Supply is self-contained, and is composed of a transformer, a bridge rectifier, and a capacitor filter.

The complete unit is mounted on a single card (See Figures 1 and 2) with the exception of the transformer which is separately mounted on the chassis.

The Integrated Circuit Logic Modules interface directly with the Bit Echo Contacts in the Perforator (See Figure 3). The Bit Echo Contacts are utilized for parity checking and not for Bit Echo Testing. The Integrated Circuit Logic is made up of Quad Gates and "Exclusive Or" type integrated circuits. (See Figures 4 and 5). The output of the Integrated Circuit Logic is positive or negative, depending upon customers requirements. The output of the Integrated Circuit Logic is fed into two solid state transistor switches. These switches need to be interrogated by external equipment to identify punched characters as having either Odd or Even parity. Only one of the switches is closed or turned on at any given time.

Power Requirements

The Power Supply requires 115/230 Volts AC ± 10%, 50/60 Cycles, ± 1 cycle. The current requirements are approximately 0.1 ampere.

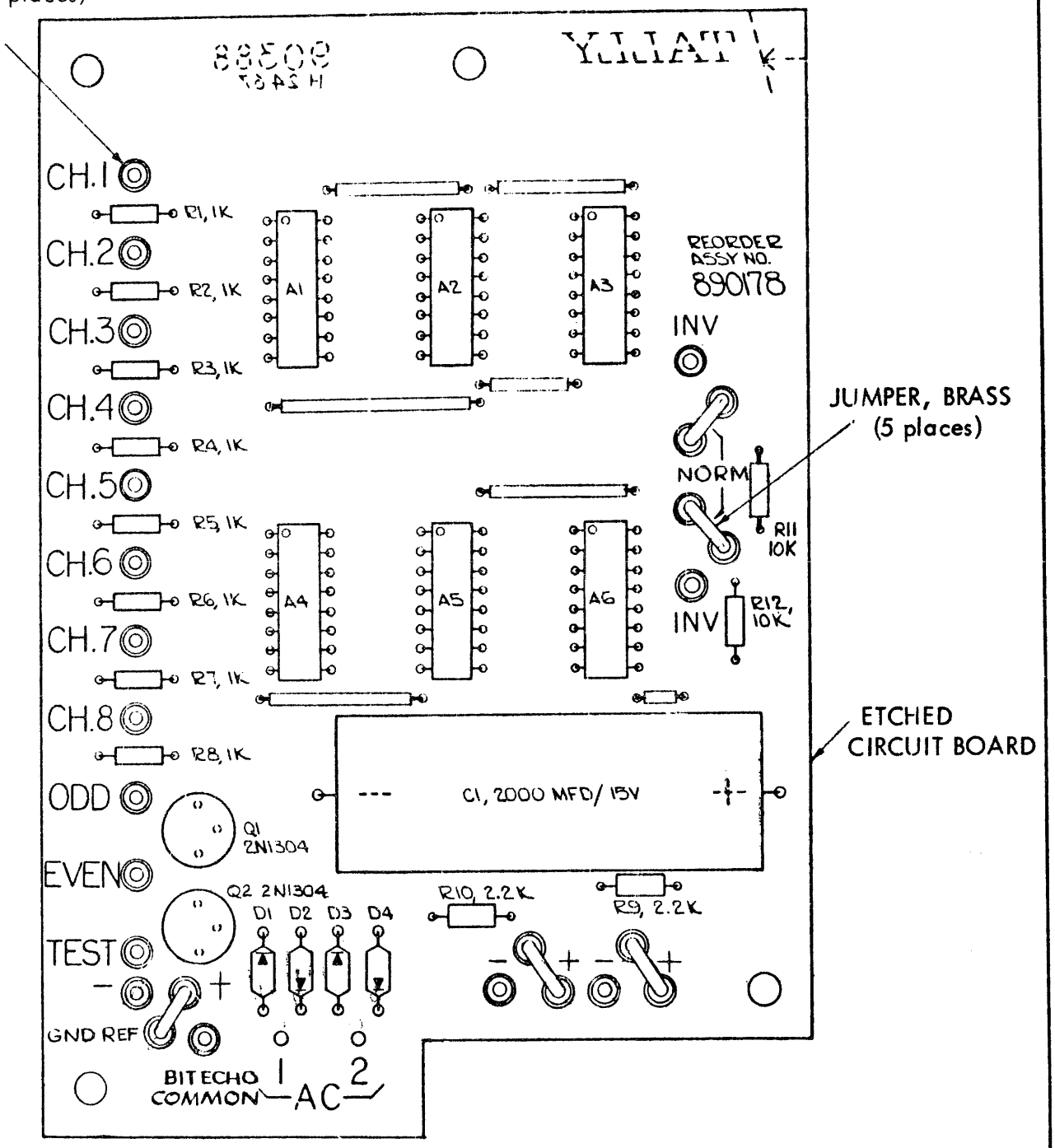


Figure 1
Bit Echo Parity Generator
(Normal Output)

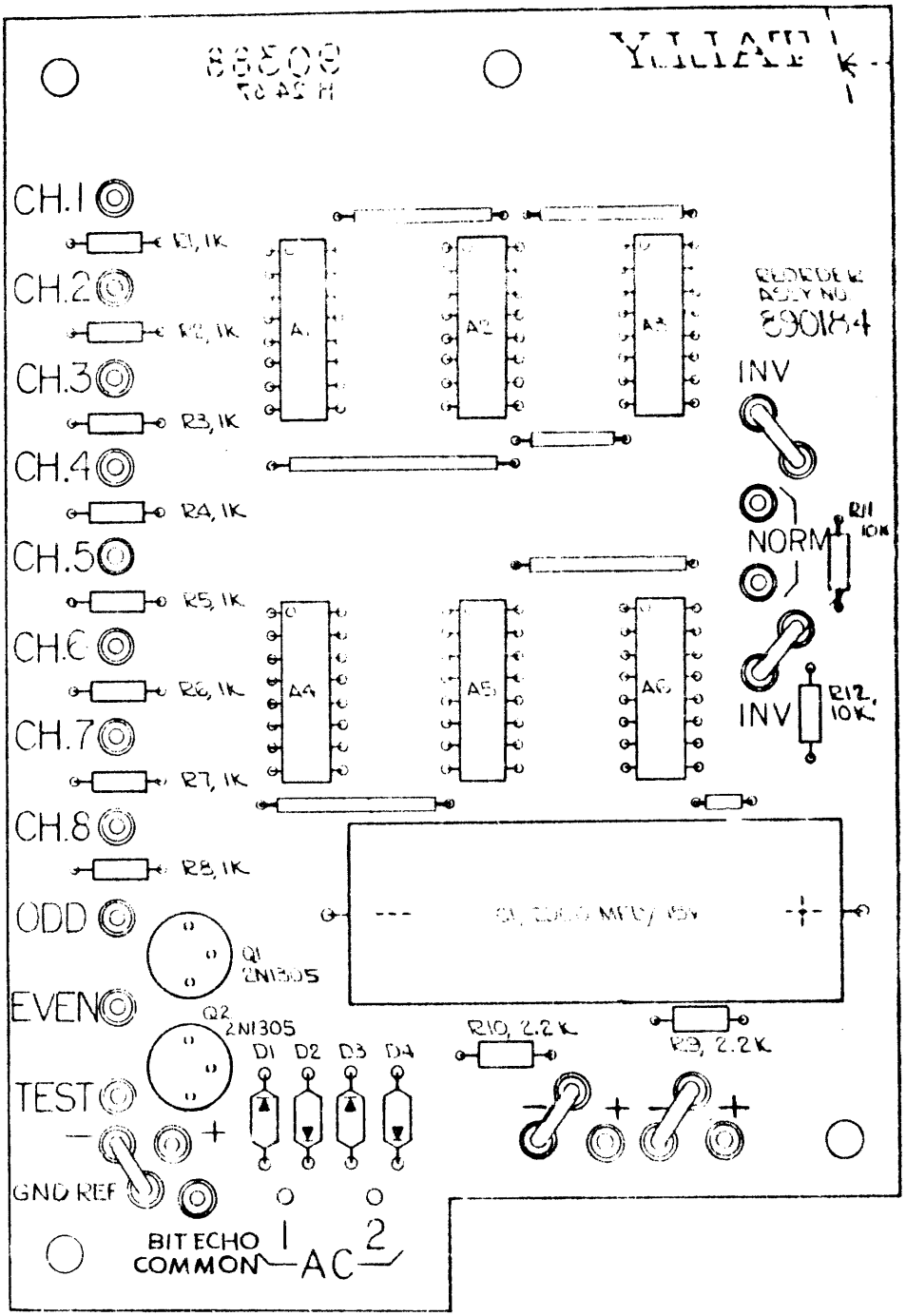


Figure 2
Bit Echo Parity Generator
(Normal Output)

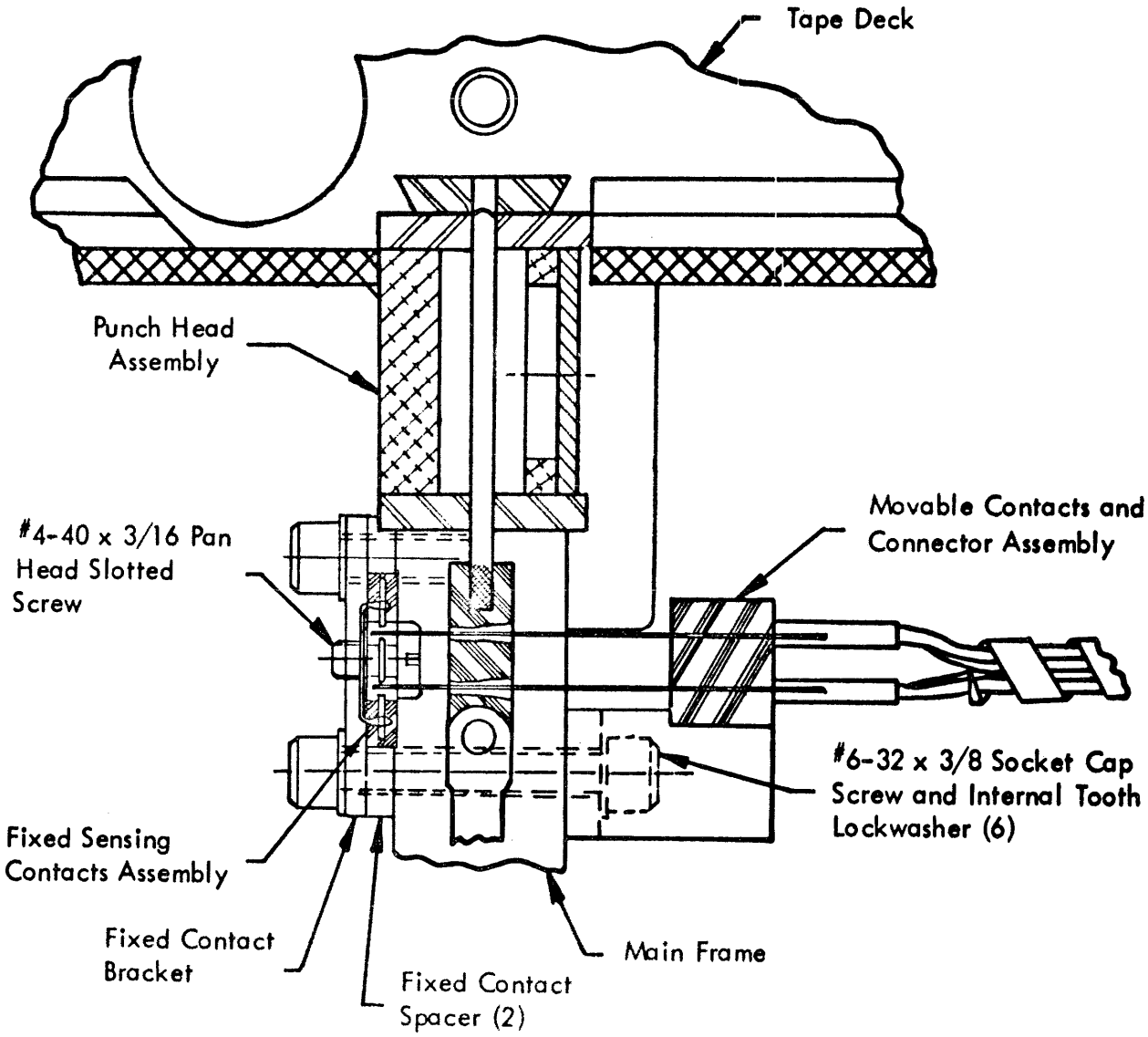
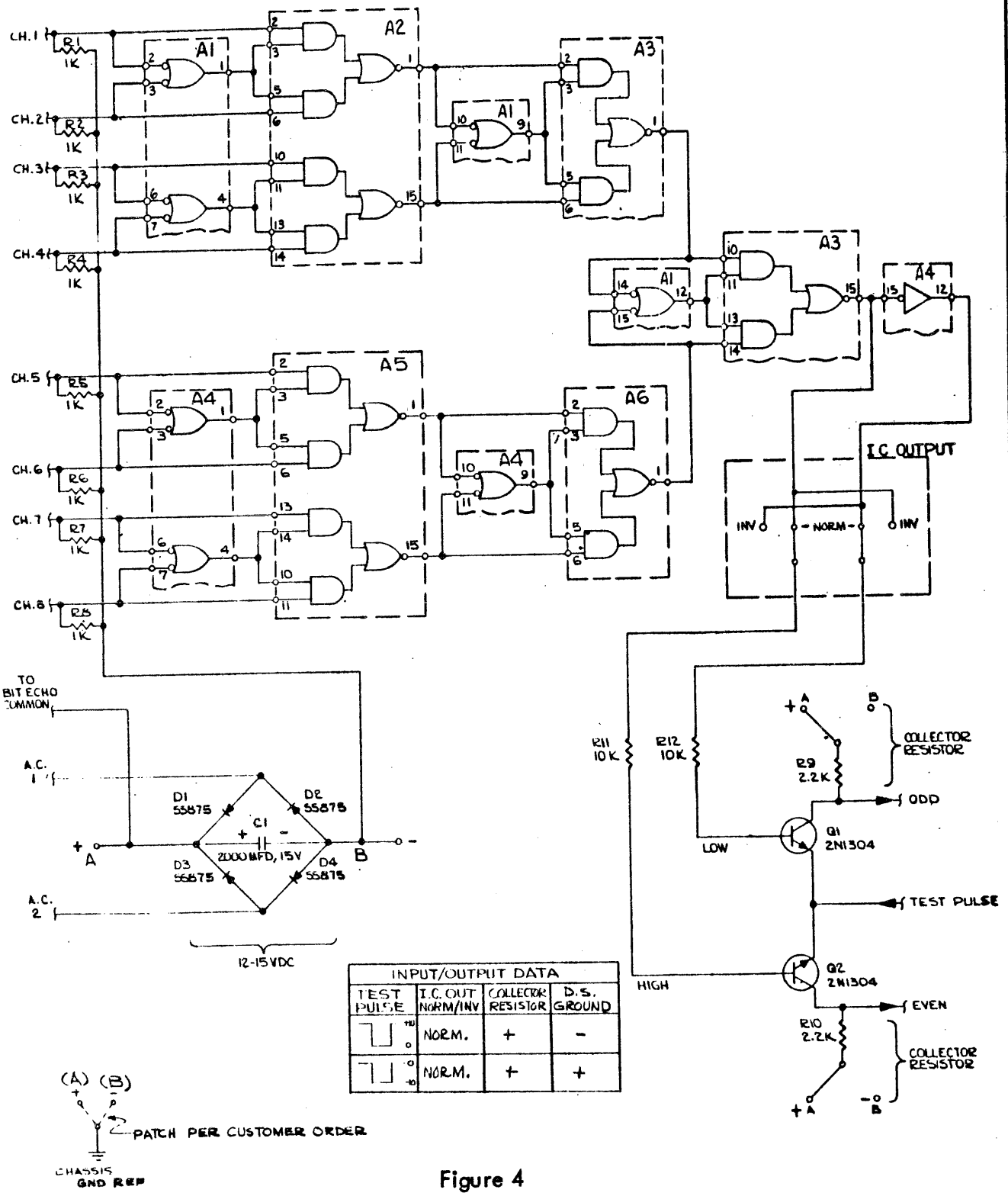
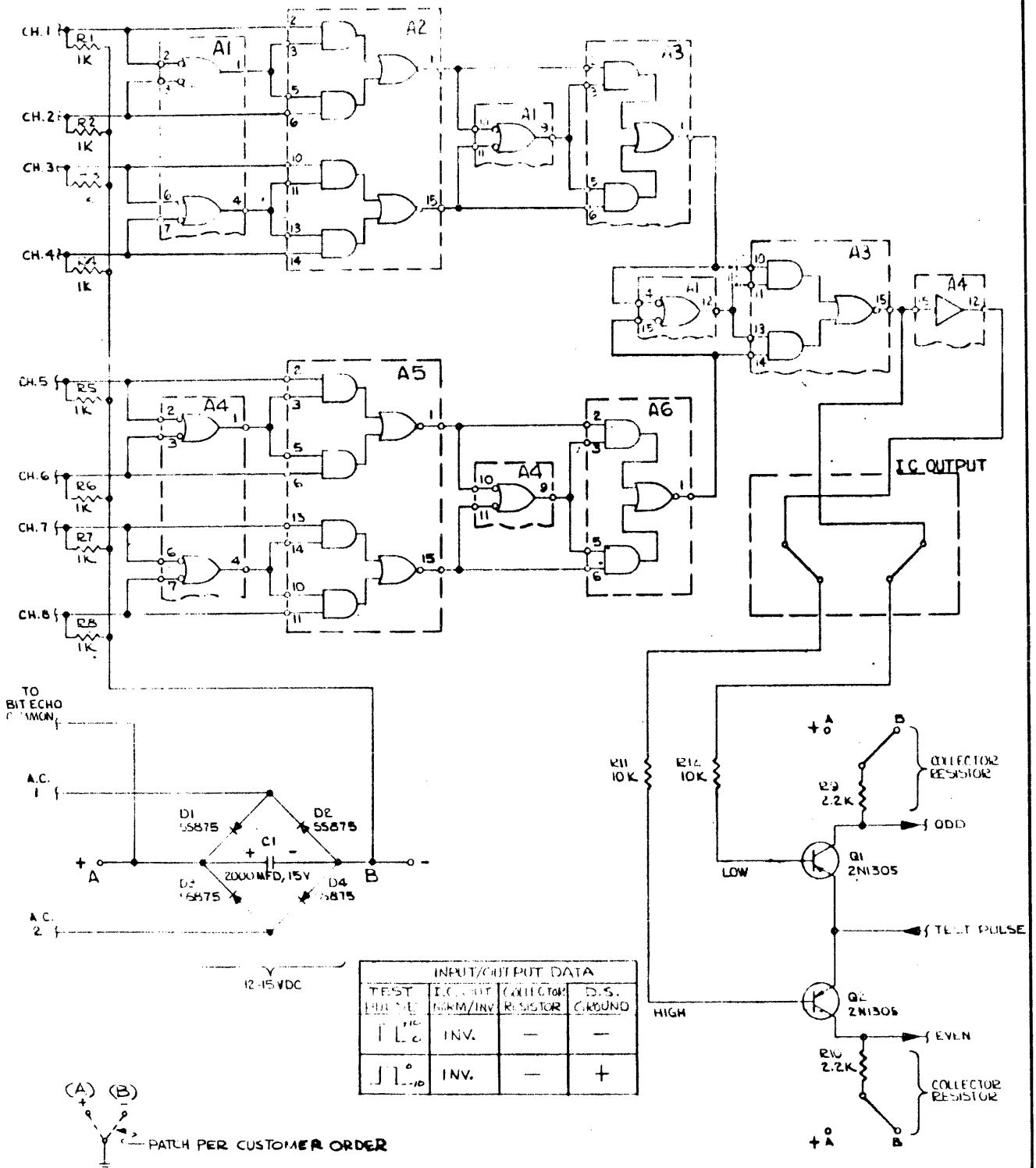


Figure 3
Bit Echo Parity Sensing



INPUT/OUTPUT DATA			
TEST PULSE	I.C. OUT NORM/INV	COLLECTOR RESISTOR	D.S. GROUND
+10 / 0	NORM.	+	-
0 / -10	NORM.	+	+

Figure 4
Logic Diagram
(Normal Output)



INPUT/OUTPUT DATA			
TEST PULSE	I.C. OUT NORM/INV	COLLECTOR RESISTOR	D.S. GROUND
TL	INV.	—	—
JL	INV.	—	+

Figure 5
Logic Diagram
(Inverted Output)

Interface Requirements

The method of interrogating the Bit Echo Parity Generator must be in accordance with the chart in Figure 6.

INTERROGATE PULSE	PRINTED CKT. BOARD ASSY. #	COLLECTOR * RESISTOR REFERENCE	POWER * SUPPLY REFERENCE
+7 ± 3V / ØV	#890184	-	-
+7 ± 3V / ØV	#890178	+	-
ØV / -7 ± 3V	#890178	+	+
ØV / -7 ± 3V	#890184	-	+

* Voltage references are strapable on the printed Circuit Board Assembly.

Figure 6
Interface Requirements

Voltage across the Bit Echo contacts must not exceed 15 volts at 15 milliamperes current. It is permissible to check the individual punches with the oil can removed. However, with the oil can removed, the punch mechanism may be run only intermittently at speeds not greater than 30 characters per second. There must be sufficient oil remaining around the punch pins and the clutch banks to keep the mechanism lubricated during this low speed operation. Failure to observe these rules may result in destruction of punch coils and adjacent components. Adequate measures also must be taken to prevent any chad from sifting on to mechanism parts.

CAUTION: Under no circumstances should the punch mechanism be allowed to run dry for more than three minutes of continuous operation.

Using an oscilloscope, verify that the Parity contact waveforms conform in time and amplitude to those shown in Figure 7. A parity test pulse should occur at 4.15 milliseconds from the beginning of the cycle.

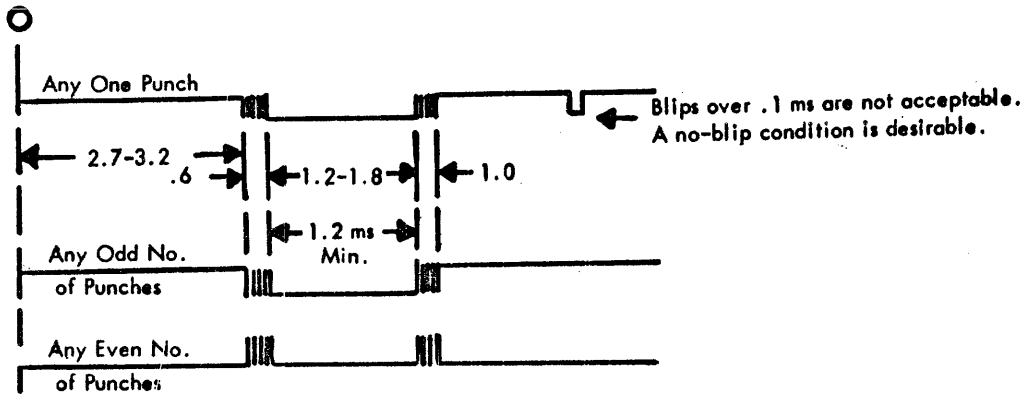


Figure 7
Timing Diagram

The first waveform in Figure 7 shows a typical pattern for one punch. The 1.2 - 1.8 closure period is minimum/maximum for any punch. A significant variation between punches will be corrected by proper adjustment of the fixed contact board.

The 2.7 - 3.2 millisecond value is also minimum/maximum. The unit should have a maximum of .6 millisecond from the earliest punch to the latest punch.

The second waveform in Figure 7 shows any odd number of punches, and the third waveform shows any even number of punches. With all eight data punches operating, there should be a total closure of 1.2 - 1.7 milliseconds. A closure of 1.4 ms is recommended.

Because timing may be affected when tape is being punched and oil is in the mechanism, a test should be run under these conditions. Replace the oil can, fill with oil, and run the unit for approximately 15 minutes. The switching zones should remain constant during this time period. It may be necessary to remove the oil can and readjust the parity contacts to being the switching zone into conformance with Figure 7.

Bit Echo Parity Interface Wiring is shown in Figure 8.

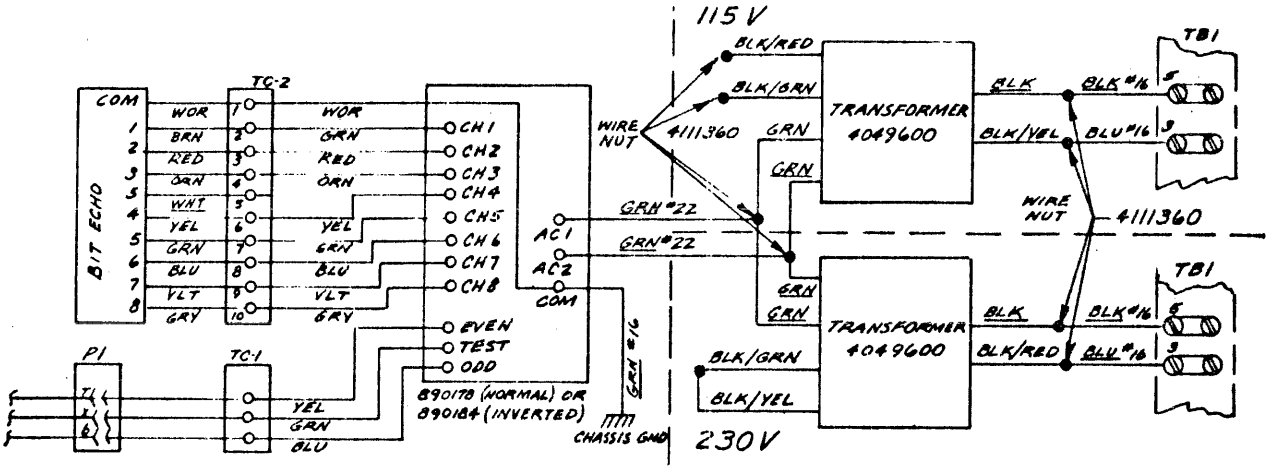


Figure 8
Interface Wiring

To incorporate the Bit Echo Parity Option, the following parts must be added:

Figure 48

Part Number	Description
4047504	Board, Taper Pin
4161860	Screw, #6-32 x 7/8", Flat Head Phillips (3) (used to mount Taper Pin Board)
4049600	Transformer
364970	Bracket, Transformer Mounting
364980	Bracket, PC Board Mounting
4090200	Washer, Fiber
890178	Assembly, Bit Echo Parity Generator (Normal Output) OR
890184	Assembly, Bit Echo Parity Generator (Inverted Output)
4174550	Spacer (3)
4162235	Screw, #6-32 x 1 - 1/2", Pan Head Slotted (3)

Figure 50

Index	Instruction Manual Designation	Replacement Part Number	Description
10	4159100	4160800	Screw, #6-32 x 1/2", Pan Head Slotted (2)
--	341010	334620	Assembly, Cable
--	Addition	329791	Assembly, Contacts and Connector
--	Addition	146043	Spacer (2)

ADDITIONAL CHANGES

Also change the following in your P-120 Instruction Manual. (These changes are separate from the previous information on Electronic Parity).

Figure	Index	Instruction Manual Designation	Replacement Part Number	Description
34	41	310460	300640	Pin, Collet
34	42	Addition	310640	Cap, Collet Pin
47	11	4175760	4176260	Washer, Thrust, .031 x 1/2 x 17/64".
47	16	320222	4176270	Washer, Thrust
47	19	320221	225376	Shim, .005 - .015" (as required)
47	20	4095800	4095700	Ring, Retaining, (TRUARC #5103-31)
47	24	301031	301030	Gear Assembly, Chad Auger Drive
47	41	4088900	323241	Gage, Oil
52	126	216400	358950	Spring, Rebound

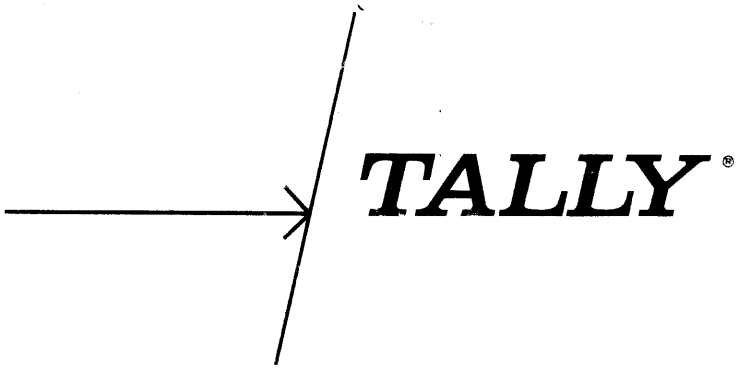
Recommended Spare Parts

Make the following changes to the Recommended Spare Parts List:

Item	Quantity	Instruction Manual Designation	Replacement Part Number	Description
9	5	4101000	4100950	Fuse, 3 Amp. MDL
23	1	320281	4177150	Washer, Sealing (Stat-O-Seal 7100-1/4)

ADDENDUM	FRICTION CLUTCH LUBRICATION	PERFORATORS/ READERS

Experience has shown that lubrication of the friction clutches can be a liability, rather than an asset. For this reason, we ask that you delete "Point 3" of the lubrication schedule in this manual.



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